INTEGRATED APPROACH FOR THE ANALYSIS AND MANAGEMENT OF URBAN RELOCATION AND INFRASTRUCTURE DEVELOPMENT PROJECTS:
THE CASE OF THE SOUTHWESTERN SUBURBS OF BEIRUT, LEBANON

by

CHRISTIAN A. SAAD

B.E. Civil and Environmental Engineering
American University of Beirut
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Signature of Author ....
Department of Civil and Environmental Engineering
August 17, 2001

Certified by ....
Fred Moavenzadeh
Professor of Civil and Environmental Engineering
Thesis Supervisor

Accepted by ....
Oral Buyukozturk
Chairman, Departmental Committee on Graduate Studies

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Abstract

Relocation of inhabitants and infrastructure development for urban renewal is a main problem facing major cities and their suburbs. It is always subject to economic, political, social, cultural, religious, and environmental constraints. Urban renewal had been adopted by governments and international development agencies for years, and was subject to failure when the solution implemented did not fully account for the unique circumstances on hand. This thesis, by using a case study in Beirut, Lebanon, aims at providing a framework that integrates construction management, decision-analysis, and urban planning tools, and that offers a stronger and robust platform for solving urban relocation and infrastructure development projects.

The project of Elyssar, which aims at planning, developing, and revitalizing the southwestern suburbs of Beirut, Lebanon, is chosen as a case study to investigate the economic/financial component of the overall multiobjective-multicriterion decision-analysis problem and to suggest ways for the public sector to increase the project's revenue stream, decrease its large cost components which dominate the cash flow, and determine the cost that will need to be subsidized. This is done using the net present value and sensitivity analysis method of assessment. The results conclude that no direct benefits are encountered. The public sector will have to subsidize the project by buying upfront the social welfare and the economic improvements that are to materialize in the future. The involvement of the private sector in project implementation is also tested and the feasibility of a public-private partnership is evaluated. The outcome concludes that if the public sector shows commitment to the project, it would be attractive to procure the project through the public-private partnership format.

Finally recommendations are provided to the Elyssar management as to what critical urban relocation elements and policies need to be addressed more closely to ensure the success of the project. It also encourages further research along this line to allow future integration of related factors that are social, political, and anthropological in nature.

Acknowledgement

To my Parents…

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Chapter 1 Thesis Structure and Objectives

1.1   Raison d'Etre

One of the major urban planning problems in developing countries is relocation of inhabitants and infrastructure development. Relocation is triggered by the compounded effects of ill-planning and design in urban settings, lack of regulations or enforcement, unspecified institutional roles with conflicting objectives, chaotic economic conditions, and unbalanced social and political conditions.

Urban relocation is not a new remedy for the encountered human condition. It had been adopted by governments and international development agencies for years, and was subject to failure when not tailored to the existing situation. Today many countries face the synergistic effect of poverty, utilization of land without the consent of its owners, unbalanced and inhomogeneous growth between neighboring areas of a city, limited economic development, and unfair distribution of national resources within its territories. Success of urban relocation projects strongly depends on the ability to account for the unique conditions and attributes of the actual situation. Unfortunately, there is no single template model to follow that guarantees ultimate success.

Because relocation is closely tied to infrastructure development, a framework that offers integration of tools from construction management, urban planning, and decision-analysis is needed to perform a comprehensive assessment leading to a fair and equitable solution to the relocation problem.

1.2   Problem Definition

Urban centers are usually the drivers of the economy in many countries. The services sector, which is the largest sector nowadays, provides a large variety of job opportunities to all classes of people and is usually located in urban centers. Many industries as well are located in the proximity of urban centers, providing more opportunities for low-income people to work and earn their living. This makes it attractive for people of all income levels to move to cities and their suburbs where they can find abundant job opportunities and a wide variety of businesses that need cheap labor and workforce, and where changing jobs is relatively easy. This induces migration to city centers and their suburbs, and encourages practices such as unauthorized occupancy of others lands.

This thesis focuses on the issue of mandated relocation of a large number of people from urban settings. The problem of mandated urban relocation is subject to economic, political, socio-cultural and religious, and environmental constraints. Economically, it is a burden because it usually involves low-income households who cannot afford relocation expenses; it also requires governments to pay compensation rates that are not matched by any direct source of revenue. Politically, it is complicated because it involves (1) different parties with different interests or potentially conflicting objectives, and (2) a large voting population that has their own demands and serves the different political groups. From the social, cultural, and religious perspectives, relocation imposes many impoverishment risks including loss of homes, loss of prior jobs or small businesses, and loss of access to educational, health, and religious facilities. It also causes disruption to social networks and the site's cultural identity. Environmentally, it involves challenging and innovative ways of mitigating existing problems such as water pollution, waste management, and air and noise pollution, while providing services at a better quality, reasonable costs, and conforming to international health and environmental standards.

1.3   Thesis Objectives

This thesis recognizes that urban relocation has contemporary facets without which governments' and development agencies' actions are doomed to fail. Challenging and innovative ideas and concepts need to be introduced, and a framework that could encompass all major aspects of urban relocation and infrastructure development needs to be created.

From this perspective, a general framework that integrates construction management and decision-analysis concepts with those of urban planning offers a stronger platform for solving urban relocation and infrastructure development projects. Research along this line also allows future integration of related factors that are social, political, and anthropological in nature.

Using the Elyssar Project as a case study from Lebanon, the economic/financial component of the overall multiobjective-multicriterion decision-analysis problem is investigated. The project of Elyssar, which aims at planning, developing, and revitalizing the southwestern suburbs of Beirut, is chosen to analyze the feasibility of the project from three different perspectives: pace of project implementation, earlier land sales, and sale of low-cost housing units and shops. The objective is to investigate ways for the public sector to increase the project's revenue stream, decrease its large cost components which dominate the cash flow, and determine the cost that will need to be subsidized. The involvement of the private sector in project implementation is also tested and the feasibility of public-private partnerships in such projects is evaluated.

This thesis also aims at providing recommendations to the Elyssar management as to what critical urban relocation elements and what policies need to be addressed more closely to ensure the success of the project.

1.4 Proposed Methodology

An outline of the multiobjective-multicriterion decision-making approach is initially presented. First, a literature review is performed to identify a class of objectives and criteria typically encountered in urban relocation and development projects, including general constraints that face the public sector in procuring these projects.

Then, the Multi-Criterion Decision-Making (MCDM) process is described followed by an outline of available MCDM techniques. The resource allocation cycle is modeled, and an adaptive feedback mechanism is created to practically implement urban relocation and infrastructure development projects.

Due to the limited scope of this thesis, one component of the whole decision-making process was selected and used in the analysis. This component, which consists of a financial analysis, models cost-related criteria for urban relocation and infrastructure development projects.

The tool used to implement a financial analysis is the Net Present Value (NPV). Before employing the net present value technique, alternatives need to be developed to include the stakeholders' needs. Then the net present value technique is used to calculate the NPV associated with each alternative, and prioritize the alternatives according to the results.

A financial analysis is performed on the project life cycle, including operation and maintenance, from the public and private sectors perspectives, thus providing a range of options for the implementation of such projects.

Finally, the financial analysis is complemented by a set of sensitivity analyses to illustrate the elements with greatest effect on the net present value of the project that require special consideration in the implementation of the project.

1.5   Thesis Organization

The second chapter provides the necessary background on the urban relocation and infrastructure development problem. It starts by summarizing the history of relocation and the methods applied by governments and international development agencies for project assessment and program implementation. Commonly encountered objectives and criteria that the public sector needs to adopt in undertaking these projects are then identified. A presentation follows on major constraints that the public sector faces and needs to satisfy in order to meet the stakeholders' goals, including the public, the government, the project sponsor or funder, and the developers and the private investors.

Chapter three outlines the framework that integrates tools from construction management, urban planning, and decision-analysis. The objective is to perform a comprehensive assessment results that leads to a fair and equitable solution of the urban relocation problem. This chapter is divided into two parts. The first is a brief description of the overall multiobjective-multicriterion decision-analysis problem and a presentation of the different multiobjective-multicriterion decision-analysis techniques, prioritization of the needs of the different actors, the criteria and the alternatives, the resource allocation cycle, and the adaptive feedback mechanism. Part two focuses on the economic factor component of the multiobjective-multicriterion decision-analysis framework for application in this thesis work. The NPV tool is chosen to analyze urban relocation and infrastructure development projects from a financial viewpoint. This part also includes a discussion on financial mechanisms for increasing project revenues. It ends with a brief description of sensitivity analysis as a tool to investigate the sensitivity of the net present value to the different components of the life cycle cash flow of the project.

Chapter four presents the "Elyssar" case in Lebanon. A background is given on the situation that led the government to undertake a relocation and infrastructure development project. A description of the public agency "Elyssar" is included with its prerogatives, the project overview, the overall development and design concept, and the implementation strategy as summarized in the Elyssar master plan documents.

Chapter five presents a financial analysis of the Elyssar case based on the methodology developed in chapter three (i.e. NPV and sensitivity analysis). It first begins by describing the sources of utilized information. Five alternative scenarios are developed to reflect factors of potential interest to the stakeholders. The first four scenarios are analyzed as if the public sector is implementing the project, whereas the fifth gives that role to the private sector. Scenario 1 is first introduced with all the assumptions covering costs and revenues for all scenarios. Only the assumptions that differed from Scenario 1 are mentioned in the analysis of the other scenarios. A financial analysis is conducted on each scenario, followed by a sensitivity analysis on the parameters that are considered to mostly affect the NPV. Finally, the results are summarized in a table at the end of chapter five to better compare results and provide recommendations.

Finally, chapter six provides recommendations for the Lebanese government to fine tune the Elyssar Project's implementation strategy in order to generate a fair and equitable solution for all stakeholders on short- and long-term bases. This chapter begins by highlighting the challenges that face the Elyssar Project with the purpose of bringing awareness of the criteria that are critical to the project's success. Then a strategy is recommended at the macro and micro levels for both short- and long-term. Since decision-makers would be most interested in immediate actions, the short-term strategy at the project level has been divided into two parts. The first applies if the government decides to proceed with the public sector approach while the other applies if the government decides to change the Elyssar Company into a private company operating under a public-private contract. Finally, further studies are recommended to encourage additional research and integration of multidisciplinary fields of study for the purpose of providing a comprehensive assessment and a fair and equitable solution to the Elyssar relocation project.

Chapter 2 Scoping of the Problem

2.1 Generic Features of the Relocation/Development Problem

One of the major problems that city centers and their suburbs all over the world, and specifically in developing countries, suffer from is the emergence and drastic growth of devastatingly neglected areas, typically referred to as slums, where housing and living conditions are appallingly sub-standard. Slums result from failed land and housing markets and from cities that do not keep up with the services that they provide. Both could be a consequence of original ill- planning and design, inadequate and outdated policies and regulations, or of civil unrest and unstable political environment involving the country under consideration.

2.1.1 History of Relocation

For nearly forty years, developing countries sought to solve the problems of poverty and housing deficiencies by removing the poor from slum neighborhoods and re-housing them in more durable shelter. The failure of these policies led many developing countries during the 1960's and 1970's to try massive public housing construction. The problems of the poor were defined primarily by the condition of their housing, and the solution was to construct public units with relatively low rents. Again, neither services nor employment opportunities were usually provided, and the results were equally disappointing. The cost of public housing construction was high and rentals were expensive. As a result, these policies benefited middle-income rather than the poorest families. Most slum dwellers were merely pushed from cleared sites to other parts of the city. In Madras, India, for example, slums containing more than 58,000 families were cleared between early 1950's and the mid-1970's, replacing their shanties with public housing tenements. As in many other cities that attempted to solve shelter problems through public housing programs, the costs of construction in Madras were much higher than expected and the acquisition of private land was seriously delayed by litigation (a

situation encountered in the case presented in Chapter 4). In the meantime, the slum population continued to grow rapidly. As a result, in the mid-1970's the Slum Clearance Board of the World Bank, who is one of the main players in such projects and programs, restricted such activities to flood prone areas and to those places in the city where land would be taken for highways or other public purposes (Seguchi, 1985).

Countries with rapidly growing economies were no more successful with slum removal and public housing for meeting the needs of the poorest groups than countries with sluggish economic growth.

The inability of slum clearance, relocation, and the public housing policies alone to deal effectively with the problems of slum dwellers or to provide other services needed by growing numbers of poor households in urban settlements became clear by the early 1970's. Among the most serious problems with these policies is the exorbitant cost to national governments attributed to high level of compensation to owners of demolished properties. These policies create serious problems of social displacement and disruption for the residents of slums. Furthermore, they are delayed by social and political pressures exerted by slum residents who resist forced removal from their homes; and, they impose high transport costs on families who are relocated far from their workplaces in the center of the cities. Moreover, the policies do not alleviate the housing problems of the poor and indeed, exacerbate them in many countries. The poor cannot afford much of the public housing that replaces slum dwellings and, thus, the destruction of slum communities often reduces the stock of low-income housing and worsens overcrowding in low-rent units. Often slum clearance in one part of the city simply increases overcrowding in other slum communities (World Bank, 1980; Kulaba, 1981).

Later practices focused on urban upgrading, which involves improving the physical environment of slums. This includes improving and/or installing basic infrastructure like water, sanitation, waste collection, access roads and footpaths, storm drainage, lighting, public telephones, and others. Upgrading also deals with regularizing security of land

tenure and housing improvements, as well as improving access to social support programs such as health and education, and municipal services.

Experience has shown that basic services can be provided to slums at a realistic cost if carefully planned. It has also shown that upgrading can be affordable, low income residents are willing to pay, political commitment is key, and fully involving the community in the development process is essential.

2.1.2 Objectives and Criteria of Relocation/Development Projects

It is true that relocation has many economic, political, and social problems, but sometimes governments are forced to seek this solution or see it as the best alternative to reach their objectives which could be focused: (1) on the micro level through criteria such as improving the living condition of the community and/or resolving the issue of illegal occupancy of land; (2) on the macro level through criteria such as improving the economy, restructuring of land ownership policies, and/or increasing tourism; or (3) a combination of both.

The theory that is proposed is that if the government has certain objectives that it wants to achieve and finds that relocation and development of the infrastructure is the only solution, then it has to set the policies, define the institutional structure, serve the interest of all the stakeholders involved, seek innovative ways to lower costs of implementation, improve environmental conditions, and restore or improve the socio-economic conditions of the community involved, as well as maintain or improve the economic, political, and the social structures.

The objectives and criteria that governments should seek in planning and implementing relocation/development projects are studied next.

2.1.2.1   Planning and Designing Affordable Low-Cost Housing

Affordability is a dominant and controversial issue in housing policy all over the world (Hui, 2001). The key is financial sustainability, which can be achieved by designing low-cost houses in a way that is affordable based on the income of the community.

Standards need to be flexible and designs need to conform to the affordable budget envelope. The availability of alternative methods of construction and use of materials allows for planning cost controls. The planning of a low-cost housing project should address available resources and their constraints. Planning and design should consider, among other factors, the use of land at regional and neighborhood levels, shape and size of buildings and housing units, and specifications of design details and construction elements. Also, the use of standard element types reduces the cost of housing, and is suitable for multistory residential buildings (Ziara and Ayyub, 1999).

2.1.2.2   Infrastructure Upgrading/Development

In the context of this research, 'infrastructure upgrading/development' includes the provision of: (1) capital facilities such as schools, hospitals, and government buildings; (2) transportation facilities such as roads and public transportation, and telecommunication networks; (3) public services and utilities such as water, power, drainage, including sewage collection, solid waste disposal, and wastewater treatment; and (4) green places and parks.

The provision of these services to a specific standards benefits the community in terms of: better quality of products and services delivered and used, and at less cost on a long run, more jobs created, better communication and transportation to working places, less mortality and morbidity cases and better health facilities, better education, and increased environmental protection, as well as historical sites preservation.

Besides the benefits that the community gets, the national economy as a whole improves. This is manifested in decreased unemployment rates, better and more skillful labor force created, less health problems, increased public safety, increased literacy rates, increased productivity of goods and services, easier transportation of people and goods, and increased tourism.

The theory is that provision of infrastructure services induces economic competitiveness and improves the well being of a community.

2.1.2.3 Zoning and Optimizing Land Distribution

One of the objectives of relocation and development projects is improved performance of the local government in managing future urban population growth by effectively carrying out basic land use planning such as setting aside basic rights-of-way for primary infrastructure, which reduces the costs of extending networks (The World Bank Group, 1999-2001).

Furthermore, a number of options or methods are available for optimizing the use of land for low-cost housing construction, some of which are listed below (Ziara and Ayyub, 1999):

- Construction of multistory buildings in areas where land value is high
- Maximizing the built-up area with respect to the shape of land while pertaining to building regulations related to zoning, and
- Avoiding the use of centers of cities where cost of land is usually very high

Also, selected areas for new housing developments should be of adequate condition for construction, and should have transportation and infrastructure accessibility (Ziara and Ayyub, 1999).

2.1.2.4 Socio-Economic Development of the Community Involved

Since resettlement can destroy previous means of livelihood, all resettlement operations must be development programs. There is a need for alternative employment strategies for the displaced, including preferential hiring in the project itself and in the public sector when appropriate (Clara, 1999). The strategy of nearly all displacements worldwide is still centered on expropriation payments and not yet on income reestablishment. Expropriation laws provide for compensation for condemned assets, but they do not aim, nor do they promise, to reestablish prior levels of living. The intrinsic socio-economic risks of resettlement can and must be brought under control only through an encompassing strategy of safeguarding livelihoods and reestablishing income sources (Cernea, 1999). Programs should be offered to increase income earning opportunities and the general economic health of the community resettled.

2.1.2.5 Environmental Protection and Management

Special consideration should be paid to the potential environmental impacts of resettlement. Density-related issues such as transportation capacity, access to potable water, sanitation system, health facilities, and others should be carefully studied and analyzed to comply with the regional or national environmental standards and regulations, laws and policies. An environmental assessment should be conducted and a mitigation plan developed to allow for sustainable development and better environmental management, thus providing good opportunities and benefits to resettlers and host population (World Bank Operational Directive 4.30: Involuntary Resettlement June 29, 1990).

2.1.2.6 Improvement of Education

"Education is a cornerstone of development, the foundation on which much of economic and social well-being is built" (Dervis, 1998). School facilities and teacher training are needed to attack the lack of basic education. Education is a key to increasing economic

productivity and social cohesion. It helps to raise the poor from poverty. By increasing the overall productivity and intellectual flexibility of the labor force, education helps to ensure that a country is competitive in world markets characterized by changing technologies and production methods. By increasing a child's integration with disparate social or ethnic groups early in life, education contributes significantly to nation building and interpersonal tolerance (Dervis, 1998).

2.1.2.7 Improvement of Health/Sanitary Conditions

For many people in developing countries, and particularly in densely populated urban areas where the large majority of dwellers are typically low-income people, the lack of adequate sanitation services is the most important of all environmental issues. It is estimated that over half a billion urban people lack sanitation services. These unsanitary living conditions are the primary cause of many diseases and illnesses in developing countries. Moreover the lack of adequate sanitation is a major cause of the degradation of the quality of groundwater and surface water (World Bank, 2001). Provision of a reliable wastewater collection system, and adequate treatment facilities will reduce health problems, improve the quality of groundwater and surface water, and reduce environmental pollution and degradation.

General health issues need to be addressed as well by providing clinics and health education programs. The government should adopt a long-term urban health and development initiative that aims at improving the health and well being of people living and working in cities. This initiative should be based on a number of key principles: (1) that health should be an integral part of settlements management and development; (2) that health can be improved by modifying the physical, social and economic environment; (3) that conditions in settings such as the home, school, village, workplace, and city profoundly influence health status, and (4) that inter-sectoral coordination for health is necessary at the local level (World Health Organization, 2001).

2.1.2.8 Active Community Participation in Project and Integration with the Host Community

Participation of resettlers especially in the planning phase of a resettlement project is critical. Resettlers will initially resist the idea of resettlement and thus to gain their confidence in the resettlement project and obtain cooperation, participation, and feedback, the responsible organization should systematically inform and consult resettlers about their options and rights in the preparation phase. This can be achieved directly or through formal and informal leaders and representatives. It is also seen from previous experience that local Non-Governmental Organizations (NGOs) can play a significant role in providing valuable assistance and ensuring viable community participation.

Each stage of a project involves the community and the city in a relationship that best serves their mutual interests. The bias is on decision-making and delivery of agreed outputs. Following is a summary and a chart illustrating the different levels of community participation recommended (Hamdi and Goethert, 2001):

- The **Initiation** stage may be at the consultative, shared control, or full control level.
- The **Plan** stage is the stage at which key decisions are taken and full project program is defined. It is seen as the most crucial for the community and the city to be jointly involved.
- The **Design** stage is less crucial for full community involvement because it is time intensive and requires a change in customary practice, even though it offers the potential advantage of inducing innovative solutions.
- The **Implementation** stage is also seen as less critical because involving the community requires a training program, which not all potential individuals can undergo due to the different works they are involved in. On the other hand, it can also be a source of cheap labor if not much implementation skill is required and if a training program can be implemented successfully.

- At the **Maintenance** stage, the community can be involved according to where and what it can contribute. Local people can be a means of pumping income into a community. Community members can readily manage day-to-day maintenance of public facilities, such as school buildings and streets cleaning, while major repairs often require significant financial resources and technical skills.

FRAMEWORK OF PARTICIPATION AND STAGES OF PROJECTS

- **Municipalities continue to handle maintenance focused on large-scale, city-wide services and infrastructure**

- **Involvement of local people offers opportunity for innovation, income generation, and training.**

- **Communities become formally involved in maintenance.**

- **Communities assume some of the implementation, either together with municipalities or on their own.**

- **Projects are initiated at all levels by municipalities or as a result of community pressure. Important is a community role to avoid unneeded or inappropriate projects.**

- **Shared decisions are the most critical in effective participatory programs.**

Figure 2.1 Framework of participation and stages of project[1]

[1] Source: Upgrading Urban Communities, (1999-2001). The World Bank Group-Website: http://web.mit.edu/urbanupgrading/

It is also necessary to hold institutionalized arrangements between responsible authorities, institutions and the community throughout the planning and implementation phases. Such institutionalized arrangements include regular meetings between the resettled community and project officials. These meetings would allow the community to communicate its concerns to the project staff who will try, as much as possible, to accommodate for the resettlers' demands.

Particular attention should be given to the host community. Any payment for land should be promptly rendered. Conditions in host communities should either be maintained or improved. A better social climate for the integration of the host and the resettled community can be achieved by improving education, water, health, and production services. This will minimize conflicts between the two communities on the long run.

Transfer of responsibility from settlement agencies to settlers should be achieved in order to avoid the creation of a dependency relationship and also tying agency resources in a limited number of continually supervised schemes. Local leadership must be encouraged to assume ultimate responsibility for environmental management and infrastructure maintenance.

The theory is that community participation is integral for the success of a relocation/development project and for the economic and social enhancement of the resettled community.

2.1.2.9 Provision of Land Tenure to Resettlers

Recognizing title and security of tenure makes a positive contribution to both the economic prospects of the poor, as well as the national economy.

Resettlement plans should review the main land tenure and transfer systems in order to treat customary and formal rights as equally as possible in devising compensation rules and procedures. They should also address issues raised by the different tenure systems

found in a project area. Some of these issues include: (a) the compensation eligibility of land-dependent populations, (b) the valuation procedures applicable to different tenure rights, and (c) the claims and disputes over land acquisition (World Bank Operational Directive 4.30: Involuntary Resettlement June 29, 1990).

Regulation of land tenure results in significant private investment in the resettled communities. It also allows the government to collect taxes on land ownership, thus increasing long-term project revenues. Offering tenure would also allow the city to maintain its vitality and social diversity.

2.1.2.10 Institutional Building

To implement a successful relocation project, the institutional arrangement must be set right: agencies must be given incentives to work with the poor; everyone should be kept informed of what is happening; coordination between stakeholders is needed; and the roles of the various agencies involved should be clearly defined (The World Bank Group, 1999-2001).

2.1.2.11 Public-Private Partnerships Applicability

Many countries' infrastructure challenges require joint government and private sector response because governments simply do not have the sufficient resources to finance projects directly (i.e. through public financing). Many capital projects require indirect financing (i.e. complete financing by the private sector).

There are a variety of different roles for the public and private sectors. In the United States, depending on the situation, the government's interest has fluctuated between "direct control" and "general regulation". On other occasions, the government's focus has fluctuated between "public" and "private" ownership. The strategy for deployment of new technologies has fluctuated between "exclusive" and "non-exclusive" rights. The fluctuations in infrastructure strategy were produced by changes in politics, technology,

economy, and international relations (Miller, 2000). Similar cases are typical of many countries all over the world. Objectives of many of the developing countries' governments vary depending on available resources, the need for direct control on infrastructure, the need to deploy new technologies, introduce competition to lower prices and shorten procurement time, and the need to balance between these different factors, especially between politics, economy, socio-cultural trends, and environmental issues. The availability of different combinations of delivery and finance methods will produce new solutions to changing public needs.

Simultaneous use of alternative delivery methods such as Design-Bid-Build (DBB), Design-Build (DB), Design-Build-Operate (DBO), and Design-Build-Finance-Operate (DBFO) gives governments endless opportunities to acquire private sector technology, equipment, expertise, and investment. Private sector firms will structure their services, products, and systems to meet demand from both private and public infrastructure owners (Miller, 2000).

2.1.2.12 Increasing Private Investment and Improving National Economy

Tens of trillions of dollars will need to be invested in cities to improve levels of service of present populations, as well as to accommodate the new urban dwellers of the future. Though it is extremely difficult to project the needs for capital in cities of the developing world, Table 2.1 provides a notional indicator of basic services and infrastructure, derived from per capita needs and projected over the next 10 years.

Table 2.1Envelope of capital assistance needs in cities 2010[2]

(Rough estimate of current prices)*

Financing Needs	Unit (Household size= 5)	Unit Costs (US$)	Total Cost by 2010 (US$ billions)
Land	50m2 @ $30 per meter (5 persons)	1,500	3000.0
Shelter	$1,500 per unit of 5 persons	1,500	3000.0
Water and sewerage	100 LCD @ $300	300	3000.0
Public sector services (drainage, solid waste, other)	$20 per capita per year	200	2000.0
Transportation (public roads and vehicles)	$50 per capita		5000.0
TOTAL			**US$16,000 Billion**

* Excludes regional and national grids for power, water, transportation and telecommunications

Past experience has shown that only a fraction of these investment needs is unlikely to come only from donor resources. Cities will have to improve their financial resource base, improve the operation and maintenance of existing infrastructure and improve its credit-worthiness for accessing domestic and international resources (World Bank, 2000).

Engaging private financial institutions is essential to develop institution-based strategies that extend access to credit for housing and investment in services to the poor, including both financing for developers and infrastructure providers, and micro-credit for households (The World Bank Group, 1999-2001).

2.1.3   Constraints of Relocation and Infrastructure Development Projects

Development projects that displace people involuntarily generally give rise to severe economic, social, and environmental problems: productive assets and income source are lost; people are relocated to environments where their productive skills may be less applicable and the competition for resources greater; community structures and social

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[2] Source: The World Bank.

networks are weakened; relatives and close friends and neighbors are dispersed; and cultural identity, traditional authority, and the potential for mutual help are diminished. Involuntary resettlement may cause severe long-term hardship, impoverishment, and environmental damage unless appropriate measures are carefully planned and carried out. (Source: World Bank Operational Directive 4.30: Involuntary Resettlement June 29, 1990)

The major constraints that face governments in planning and implementing relocation and infrastructure development projects are listed next.

2.1.3.1 Public Support

The most important element that is usually hard to achieve in order to reach success is commitment by all: the funders, the City or government, the implementing agency including the private sector, and most importantly the community/families. A sense of partnership must be developed between the public and the rest of the entities involved in the resettlement project and implementation program. The public must want it and understand its value (The World Bank Group, 1999-2001).

2.1.3.2 Economic Risks

Economic risks include: (1) economic downturn risk, which represents a weak country macroeconomics that could result in an economic slowdown seriously affecting the project's financial performance, (2) inflation risk, represented by unpredictable variations of the inflation rate which results in unreliable projects of inflation factors, (3) foreign exchange rate, which is only relevant when capital expenditures, revenues, operating expenses, and borrowings are not in the same currency, (4) convertibility risk, which occurs when the host country government blocks the transfer of funds for debt repayment and funds repatriation, and (5) sovereign risk, which represents the country loan credit rating and which can ultimately impact the project funding and the cost of capital (Martinez, Halpin, Rodriquez-Ayala, 2000).

Although listed under economic risks, many of these risks are influenced by and impact other factors (e.g. political, social, cultural, environmental and health). Political and health factors have considerable impact on economic risks.

The level and nature of impact will also depend on the stage at which the project is: Development, Execution, and Operation (Martinez, Halpin, Rodriquez-Ayala, 2000).

2.1.3.3 Socio-Cultural and Religious Constraints

Besides the economic risks, displacement imposes major socio-cultural risks.

Most people are used to a certain lifestyle and resist at first the idea of change and relocation. They usually form a sense of community and enjoy their neighborhoods especially if they had lived in it for a significant time and have shared similar religious practices. Social problems may arise as a result of allocating separate areas for lower-income people, reducing diversity and integration of population.

The concern is to minimize socio-cultural problems and create jobs for low-income people. Hence, the acceptability of a resettlement plan can be achieved and the disruption caused by resettlement on the community can be minimized by moving people in groups, thus reducing dispersion, sustaining existing patterns of group organization, and retaining access to cultural property such as temples and pilgrimage centers, and by developing mixed areas in which people from all income categories live.

Current development thinking is concerned with incorporating socio-cultural dimensions in the development paradigm.

> "We cannot adopt a system in which the macro-economic and financial is considered apart from the structural, social, and human aspects, and vice versa. Integration of each of these subjects is imperative"
>
> (Wolfensohn, 1999)

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Thus, the need to bridge the gap between economic and social/cultural and religious information in addressing an important challenge faced by many current and forthcoming development programs such as population resettlement is integral for the success of the project.

2.1.3.4 Political Constraints

Political risk constitutes legislative and regulatory changes, induced by the government, that occur during the different project phases or inadequate enforcement of existing laws. Other events include nationalization, expropriation, intervention, social unrest and violence (Martinez, Halpin, Rodriquez-Ayala, 2000).

Although not considered as a political risk, it is worth mentioning the existence of force majeure, which are those types of risks that result from events beyond the control of the project participants (Martinez, Halpin, Rodriquez-Ayala, 2000).

2.1.3.5 Construction and Operation Risk

The risks involved in Cash Flow Dependent projects are related to both the construction and operation periods. The construction period is considered high-risk while the operation period is considered low risk.

Construction risks include (1) technology and logistics risk when the technology involved is not known, well proven, and/or experimental, and (2) execution risk, which arise during the design, procurement, and construction phases, and impact the cost, schedule, and performance completion of the project (Martinez, Halpin, Rodriquez-Ayala, 2000).

Operation risk represents the failure of a project to generate its output at the planned volume levels, or the increase in the anticipated cost to operate the project at the planned level of production (Martinez, Halpin, Rodriquez-Ayala, 2000).

2.1.3.6 Land Acquisition and Expropriation Constraints

One of the most intractable problems facing housing provision has to do with land acquisition and with the rising cost of urban land. Acquisition of sufficiently large blocks of suitable vacant land within or in the immediate environs of urban centers is often difficult. Even more important is the rising process of urban land, a result of increasing demand and land speculation, often in those areas that are most suitable for residential development. The ability of government to move quickly enough to acquire blocks of suitable land for in advance of such speculation has, in practice, been limited. Among other things, this has affected the ability of government to implement some of the lower-cost options to formal-housing provision, which generally require fairly large contiguous blocks of land, but which also, at least in theory, would be more amenable to accommodation of existing residents and the poor (Jones and Visaria, 1991).

Cost of land is one of the most important constraints encountered in selecting sites for low-cost houses. The government has to spend large amounts of capital to acquire the desired portions of land for its developments, and lands in urban areas tend to be extremely expensive.

2.1.3.7 Existing Regulatory Framework

The enforcement of building regulations constitutes an important set of constraints on the housing industry (McMurray and Cole, 1959a). Regulations should cover all aspects of building construction, such as planning and architectural criteria, building and design codes, land use and taxation, and construction safety (Ziara and Ayyub, 1999).

Besides building regulations, there are concession, permits and licenses risks. Approvals are required by the different regulatory entities in the system. There are also contractual, legal, and advisory risks where professional advisors create unworkable, faulty or unenforceable documentary structure. This may affect other factors such as funding and tax efficiencies (Martinez, Halpin, Rodriquez-Ayala, 2000).

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2.1.3.8 Environmental/Health Risks

The environmental impact caused by a project could result in violation of environmental laws and/or regulations that can raise litigation, non-governmental organizations reactions, and funding difficulties (Martinez, Halpin, Rodriquez-Ayala, 2000).

2.1.3.9 Financial Limitations and Cost of Sales

The unavailability of relevant financial institutions constitutes an important constraint limiting the ability of people to own their own houses. The financial system in many developing countries and specifically the Middle East lacks in general special financing programs that serve the housing sector and the construction industry (Mayo, 1997). The options related to housing finance may include the introduction of regulations and a finance guarantee to encourage financing institutions to provide home mortgages. Subsidy programs must be designed to serve extremely poor people and social cases without causing distortion in the financing system. The suitability of contract management, construction planning and cost control, and sale campaigns should be carefully studied in order to reduce the total cost of housing (McMurray and Cole, 1959c).

There is also the issue of sovereign risk, which represents the country loans credit rating and can ultimately impact the project funding and the cost of capital.

2.1.3.10 Availability of Human Resources

Labor-related constraints include the shortage in skilled and semi-skilled construction workers and the need to pay increased wages, which consequently add to the cost of housing units. An economic way to save on labor costs is to use prefabricated and semi-industrialized elements the can easily be handled and assembled and do not require much skill (Ziara and Ayyub, 1999).

2.1.3.11 Public Sector Capabilities

The role of the public sector in provision of urban infrastructure, whether related to transport, public roads, housing, or other utilities, is constrained in both policy and fiscal terms. The public sector has not normally kept pace with population growth, industry demand, and demographic changes in terms of providing urban infrastructure. The history of public subsidy to infrastructure in many countries and especially in the Middle East has rendered public works and services as inexpensive and almost freely available. Such circumstances raise the need to introduce the private sector in the provision and maintenance of infrastructure facilities in order to reach full capital recovery and compensation for the cost of the advanced provision of these facilities and services.

2.1.3.12 Sources of Funding and their Conditions and Terms

The capital exists to finance infrastructure development projects, a World Bank report states. Bank Economists point out that cities are the engines of growth in the developing world, accounting for more than 50% of the country's GDP. Rising per capita income is closely linked to urbanization. One good example is the city of Sao Paolo in Brazil, which generates 18% of Brazil's GDP and one third of domestic industrial output, with just 12% of the country's population.

In general, the seed money to begin relocation and infrastructure development projects may come from the national government and international agencies, but both a share of the investments as well as the cost of maintaining the infrastructure must be paid for by the residents and local taxes (World Bank, 1996).

Many policy options for financing service provisions exist. Regardless of the policy options selected, new policy alternatives for financing must also be explored. The alternatives available for financing shelter, services, and infrastructure for the poor include (UNCHS, 1987):

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- Expansion of the general revenue base for the services or infrastructure that benefit the community as a whole;

- Earmarking special revenue or funds from specific revenue sources, such as tax surcharges, import duties, and fees and fines for housing, infrastructure, and services;

- Adoption of user charges for those services or infrastructure for which there is a direct relationship among the costs of providing services, the amount charged for the services, and the amount of services received;

- Application of betterment levies (later explained) on properties the value of which is enhanced by the provision of new or additional services, the costs of providing the services being recovered by taxing surplus value due to service provision;

- Adoption of co-financing, an arrangement through which the user participates in providing a service, and thereby reduces the overall cost to a level lower than if the service were provided entirely by the government;

- Mobilization of government resources (through loan guarantees, creation of secondary mortgage markets, or subsidized credit) for borrowing by individuals or private sector organizations to provide housing, infrastructure and services;

- Use of government assets, such as publicly owned real property, to provide collateral to borrow funds for financing housing, infrastructure and services;

- Use of indirect subsidies from the government to the private sector to provide services, or provision of services such as electricity or water that will stimulate private investment in the development of low-income areas of the city;

- Exchange of services or labor of beneficiaries in return for the extension of services or infrastructure by the municipal or local government, or the assessment of a charge on neighborhood residents by the municipal government to extend services into a community; and

- Solicitation of ad hoc contributions and donations.

Most countries will require a combination of these options to raise the financial resources needed to meet even the basic shelter and services needs of their growing urban populations (UNCHS, 1987).

The only conditions and terms of financing related to multinational lending and development agencies that deal with resettlement, such as the World Bank and the UNCHS (Habitat), will be discussed briefly.

Where large-scale displacement of population is unavoidable, agencies require detailed resettlement plans to be developed, including schedules and budgets. These plans should include: (1) project organization and organizational responsibilities, (2) socio-economic surveys, (3) legal framework, (4) alternative sites and selection, (5) valuation of and compensation for lost assets, (6) community participation and integration with the host community, (7) land tenure, acquisition, and transfer, (8) access to training, employment, and credit, (9) shelter, infrastructure, and social services, (10) environmental protection and management, and (11) implementation schedule, monitoring, and evaluation (World Bank Operational Directive 4.30: Involuntary Resettlement June 29, 1990).

The resettlement plans should be built around a development strategy that aims at improving the economic base for the population relocated. Liquid compensation alone is normally inadequate. Also, voluntary resettlement should be investigated in resettlement plans but provided measures for involuntary resettlement must be included (World Bank Operational Directive 4.30: Involuntary Resettlement June 29, 1990).

Chapter 3 Methods of Assessment

The criteria used to assess relocation alternatives for high-growth urban settings are many and often times compete with each other. It is often impossible to develop objectives with individually maximized criteria, thus trade-offs and optimal search must be sought when assessing and ranking relative importance of one objective (or alternative) against the other (Balling and Brown, 1999).

Decision-makers, including policy makers, elected officials, engineers, planners, and the public are faced with the crucial task of allocating different reasonable weights for each of the criteria, as well as evaluating commensurable and non-commensurable objectives, in order to reach a fair and equitable solution for all stakeholders, and particularly the public.

The evaluation of relocation and infrastructure projects requires the involvement of a large set of factors, both qualitative and quantitative (Martinez, Halpin, and Rodriquez-Ayala, 2000). Although the methodology adopted in this research (Net Present Value and Sensitivity Analysis) to evaluate relocation projects is just one part of the whole decision analysis problem, a brief description of the broader decision-making technique is presented in the first part of this chapter.

3.1   Multiobjective-Multicriterion Decision-Making

A relocation and infrastructure development project can be formulated as a multiobjective-multicriterion decision problem. Besides the criteria of minimizing design and implementation costs, planners and engineers are also concerned with minimizing social disruption and improving the national economy as a whole. Certainly other criteria and objectives (see chapter 2) are involved, but the theory is that Multi-Criterion Decision-Making (MCDM) techniques can help decision makers, including engineers and planners, tackle different qualitative and quantitative objectives of relocation and

infrastructure development. A brief overview of the MCDM process is presented next, illustrating the techniques of MCDM and the different steps involved in the process.

3.1.1   Brief Overview of Multicriterion Decision-Making

MCDM techniques can help planners and engineers plan, design, and successfully implement relocation and infrastructure development projects by showing what trade-offs there are between criteria and by helping decision makers voice their values and make a choice in a rational, consistent, and documentable manner (Duckstein, Tecle, Nachnebel, and Hobbs 1989).

As describe by Duckstein et al. (1989), the MCDM process is an 11-step process that starts with problem definition and ends with implementation. A brief description of each of the 11 steps is presented next:

- **Step1** includes a triggering mechanism that makes the Decision-Maker (DM) recognize the need for some action to be taken. In relocation problems, such triggering mechanisms include extremely unhealthy and unsafe living conditions of the population involved, extreme poverty situations, illegal occupation of land, the need for macroeconomic improvements, and so on. Thus, step 1 stimulates the DM to provide clear verbal definitions of problem criteria and possible decision alternatives, or variables.

- **Step 2** includes the collection of the appropriate information needed for the decision-making process. Two kinds of date are usually required: (1) Hard date (or objective data) such as number of resettlers included, their average income and outcome, inventory of existing infrastructure, and so on, and (2) Soft data (or subjective data), which may include measurement of unquantifiable attributes, such as opinions, individual preference structures, and so forth.

- **Step 3** requires the DM to explicitly state the essential parts of the problem. This includes identification of the different decision-makers (Cordeiro-Netto, Parent, and Duckstein, 1996), specification of relevant criteria, establishment of the set of

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variables or feasible decision alternatives, definition of the problem constraints, estimation of the impact of decision alternatives upon the individual criteria selected, and the identification of needed parameters.

- **Step 4** uses the parameters and criteria values that were obtained in step 3 to construct a quantitative relationship between the inputs (decision alternatives or variables, constraints, and parameters) and the outputs (values and criteria). This quantitative relationship may be expressed in the form of either algebraic equations or evaluation matrices.

- **Step 5** deals with either the selection of an appropriate MCDM model to solve the problem or the construction of a new one if the available techniques cannot handle the problem adequately. The model should: (1) capture the essence of the problem under consideration, (2) be robust, and (3) be valid, in the sense that it measures a DM's preference with sufficient accuracy (Hobbs, 1986).

- **Step 6** uses the model chosen in step 5 to determine the viable (non-dominated) alternatives and eliminate the alternatives that are no better than any other alternative in all criteria, and are strictly worse in at least one criterion.

- **Step 7** incorporates the DM's preference structure into a decision model.

- **Step 8** used the model in step 7 to choose one or more of the efficient alternatives.

- **Step 9** involves the subjective assessment of the solution obtained in step 8 by the DM. To do this, the DM takes into consideration other personal aspirations and other relevant external elements. If the solution is accepted, then it is ready for implementation (step 11).

- **Step 10** is implemented if the solution in step 9 is found to be unsatisfactory. In this step, further interaction between the DM and the analyst will be needed. Trade-offs between different objectives are made by adjusting the DM's personal preference structures, or committing additional resources to the analysis.

- **Step 11** closes the solution process and accepts it for implementation.

3.1.2   A Sample of MCDM Techniques

Several techniques are identified to solve steps 7 and 8 in the MCDM process. The techniques vary in their structure of algorithm and their types of solutions obtainable. These techniques are (Duckstein, Tecle, Nachnebel, and Hobbs 1989):

- **Outranking MCDM Techniques**, which use outranking relationships to select the most "satisfying" alternative. An outranking relation represents the pair-wise preference ordering of a finite set of alternatives. Four pair-wise preference relations can be defined: strict preference, indifference, weak preference, and incomparability.

- **Distance-Based MCDM Techniques**, which use the concept of distance to choose a satisfying solution. Most of these methods choose the alternative that minimizes some measure of distance between the alternative and reference set of criteria values.

- **Value- or Utility-Type of MCDM Techniques**, which attempt to model mathematically a DM's preference structure by a value function if the problem is deterministic or by a utility function if there is any risk involved in the problem. For multicriterion problems, utility functions can, in principle, provide a complete ordering of the alternatives, thus allowing the DM to choose the alternative that yields the highest utility.

- **Mixed Techniques,** which possess elements of two or more of the types of techniques described previously. An example is the Multi-Criterion Q-Analysis (MCQA), which is a MCDM technique that allows many options or alternatives to be compared simultaneously with respect to a set of criteria, some or all of which may be non-numerical.

3.1.3   Prioritization of the Needs

Before employing one of the MCDM techniques to compare, narrow down, and select one alternative among the large set of potential alternatives, one needs to identify the

DMs, the set of alternatives from which one or more will be selected, and the criteria by which these alternatives will be assessed (Cordeiro-Netto, Parent, and Duckstein, 1996).

3.1.3.1 Stakeholders and Decision Makers

In relocation and infrastructure development project four main actors may be identified:

1. **The Funder;** could be the government itself, the private sector, bilateral or international development agencies, or some other kind of loan, grant, or investment.

2. **The Government** and the different ministries.

3. **The Implementer;** could be an existing or a new public agency. It could also involve the private sector and different Non-Governmental Organizations (NGOs), as well as community-based units.

4. **Families** involved in the relocation process.

The main power of decision-making usually lies with the funder and the government. The implementer (if it is a public agency) may also have power for decision-making if the government grants it the right to do that through a decree. The others would rather be considered as stakeholders.

3.1.3.2 Criteria

The criteria for the relocation and infrastructure development project can be agreed upon or developed by the different actors and decision-makers. Most of these criteria were described in Chapter 2. Table 3.1 lists some of these criteria, specifying for each the unit and direction of preference (increasing or decreasing preference):

Table 3.1 Sample of the criteria selected by the DMs

Type of Criterion	Criterion	Unit	Direction of Preference
Micro-Economic	Design and Planning Costs	$US	<
	Construction Costs	$US	<
	Compensation Costs	$US	<
	Land Sale Costs	$US	>
	Affordability/Rentals/Leases/Sales of Units	$US	>
Macro-Economic	Institutional Building	1-10	>
	National Economy	% GDP	>
	Private Investment	1-10	>
	Socio-Economic Development of Community	1-10	>
Socio-Cultural	Education Improvements	1-10	>
	Health Improvements	1-10	>
	Community Participation	1-10	>
	Disruption of Social Networks	1-10	<
	Faith-Based Effects	1-10	<
Political	Political Effects/Acceptability/Will	1-10	>
Environmental	Environmental Impact	1-10	<

Some criteria, mainly the quantitative, are measured in terms of standard units such as $US. Other qualitative criteria may be evaluated on a subjective scale rating from 1 to 10 according to the will of the DMs.

The relation of the criteria to the different DM groups can be measured on a certain agreed-upon scale. A four-level scale that is typically used measures the preference of each of the criteria based on one of the following levels: none, low, medium, and high. Table 3.2 illustrates the assessment of the importance of each criterion with respect to the different DMs.

Table 3.2 Sample matrix on assessment of importance of each criterion

Criterion	Funder	Government	Implementer	Families
1. Design and Planning Costs	High	High	Low	Medium
2. Construction Costs	High	High	Low	Medium
3. Compensation Costs	High	High	Low	High
4. Land Sales	Medium	High	None	Medium
5. Affordability/Rentals/Leases/Sales of Units	Medium	High	Low	High
6. Institutional Building	Medium	High	Low	High
7. National Economy	Medium	High	Medium	Medium
8. Attraction of Private Investment	High	High	Medium	High
9. Socio-Economic Development of Community	High	High	Medium	High
10. Education Improvements	High	High	Low	High
11. Health Improvements	High	High	Low	High
12. Community Participation	High	High	High	High
13. Disruption of Social Networks	High	High	Medium	High
14. Religious Consideration	Medium	High	None	High
15. Political Commitment	Medium	High	Medium	High
16. Environmental Impact	High	High	High	High

3.1.3.3 Alternatives

Alternatives are evaluated based on the criteria previously discussed. Professional engineering planning and design is required as well as a comparison and a review of past successful implementation of similar projects. Some other critical issues that shape the development of alternatives for relocation projects, and that might not have been discussed before, include the desire to maximize initial inflow of capital to the project, the availability and proximity of vacant lands to implement relocation, the pace of implementation of the project, the desire to sell vacated lands to increase revenues, and phasing the project and dividing it into smaller projects to ensure the minimization of social disruption to the community and to improve the project implementation process through the adaptive feedback mechanism.

3.1.4   Resource Allocation

Resource allocation is an important aspect of decision-making. A typical resource allocation cycle begins with consideration of the needs and objectives of stakeholders, followed by identification of actions or projects that may meet those needs and objectives. With limited resources as are typical of most decision situations, these potential project are subjected to some sort of evaluation criteria (previously discussed) that should usually be derived from stakeholders' needs and objectives, resulting in a prioritization of projects. The top ranking-project or combinations of projects are selected based on resource availability, as well as other social, cultural, and political factors, as discussed earlier. Allocation of these resources is made for the implementation of those projects over the period covered by the budget cycle. At the end of the cycle, any new unmet needs and objectives feed back into the next iteration of the cycle to serve as a basis for identification of new projects (Pearce, Gregory, and Vanegas, 2000). This last step constitutes an important part in the adaptive feedback process described later in this chapter. Following is a schematic representation of the cyclic resource allocation process:
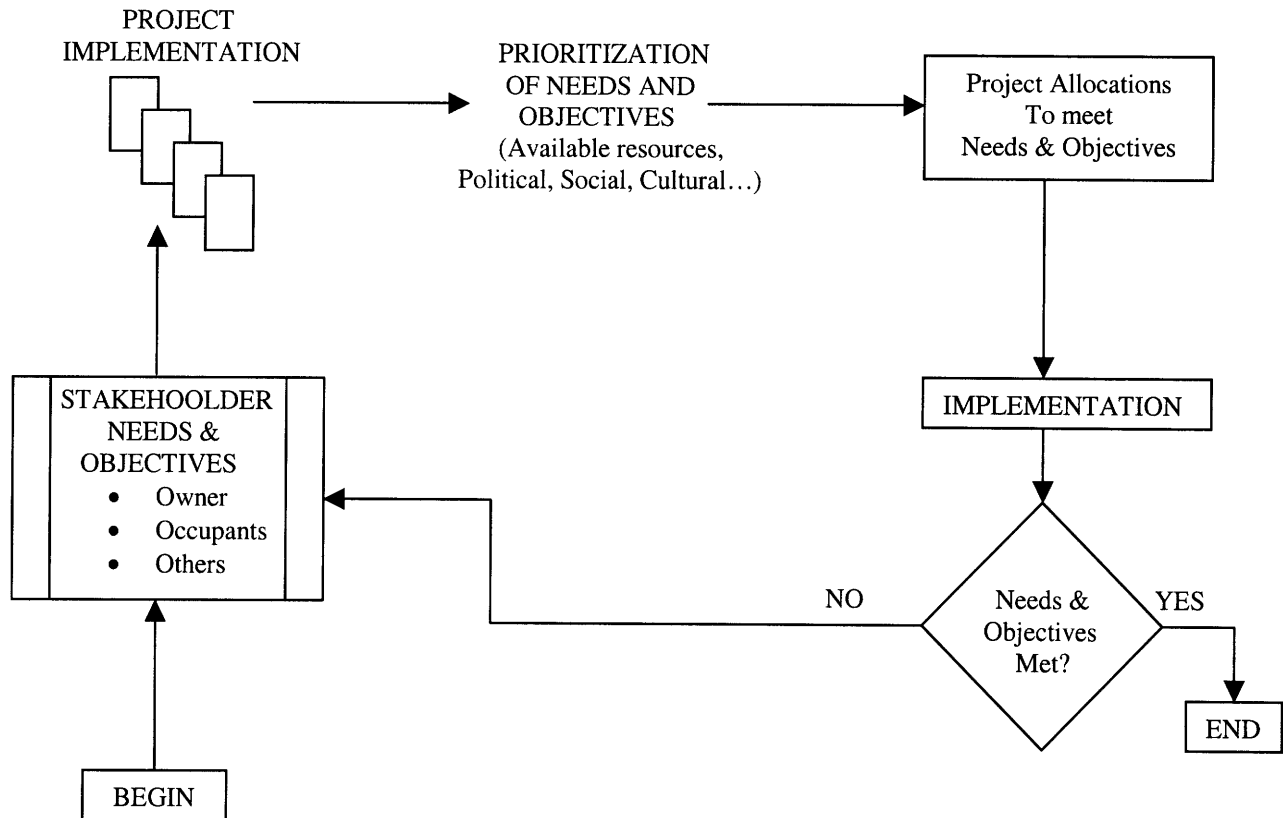
Figure 3.1 Cyclic Resource Allocation Process[3]

A key element of resource allocation for relocation and development capital projects is prioritization of different project components according to how well their realization will meet the objectives of the decision process.

3.1.5   Adaptive Feedback Mechanism

This mechanism has been mentioned several times before in this research. The Adaptive Feedback Mechanism (AFM) can be modeled such that the input of each phase within a project is a function of the output of the previous phase after being practically implemented, provided that the project is divided into more or less phases with similar activities and tasks. The AFM includes a process of monitoring the implantation of the

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[3] Source: Gregory & Pearce, (1999).

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project within each phase. At the end of each phase, the output should be studied and evaluated, and then used as a mechanism to modify, eliminate, and/or add to the next similar-in-context phase in order to enhance the implementation and ensure the success and the social, as well as the political acceptability of the project.

Entire Project
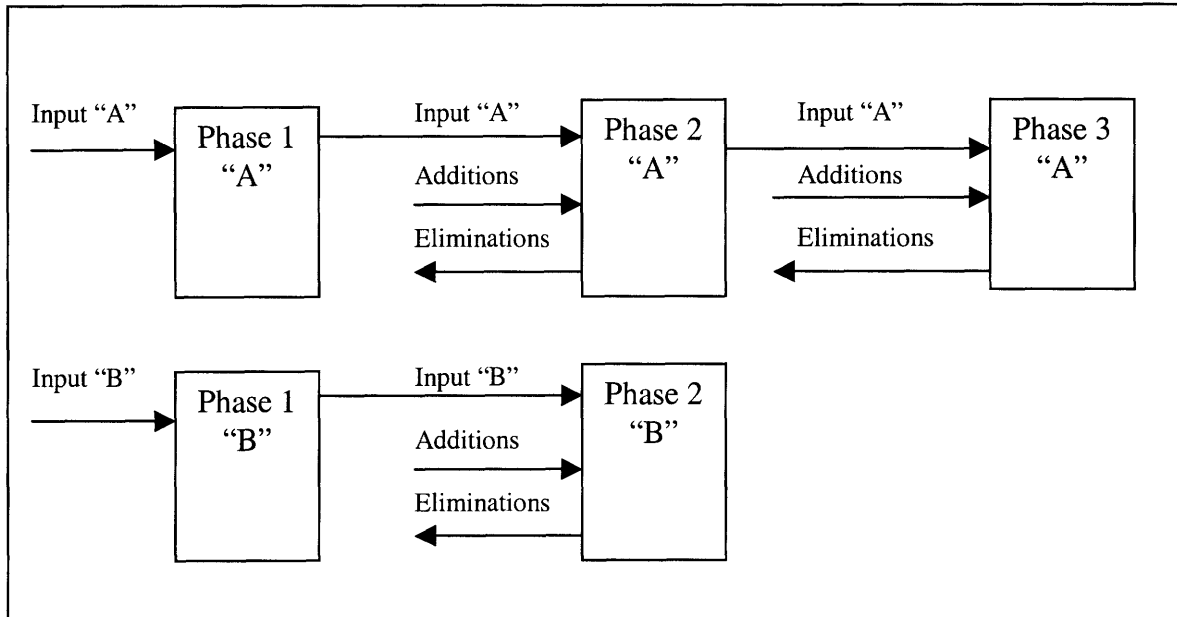
Figure 3.2 Illustration of the AFM

The letter "A" represents all the phases that have similar activities and tasks. Similarly, the letter "B" represents the phases that have similar activities and tasks but differ in context than those with the letter "A". The entire project can be grouped into as many groups as desired for better assessment and evaluation of the project components and activities. Infrastructure, for example, can be divided into several groups: (1) water and sanitation, (2) road networks, (3) buildings and other structures, (4) power and electricity, and (5) telecommunications.

Although this method has been broadly described in this chapter, it will not be used in the financial analysis of the relocation and infrastructure development project in this research. Further research into this fields as well as practical use is encouraged.

3.2   Economic/Financial Risk Analysis

Conventional economic risk analysis evaluates the sources, magnitude, and effects of risks that may reduce the rate of return to capital investments in development projects. It estimates the switching values of key variables such as duration of project implementation, duration of O&M, cost overruns, and inflation. It also undertakes a sensitivity analysis for each key risk, testing the project's net present value to possible changes in the variables.

It is clear that existing conventional economic and financial risk analysis methods and techniques are not tailored to the specifics of displacement (Cernea, 1999). Political and cultural factors influence the "selection" of risks (Douglas and Wildawski 1982, Rosa 1998) that are seen to merit policy attention and economic-technical analysis in development projects.

Conventional economic risk analysis selectively focuses only on the risks to capital investments, but not on various kinds of "post-normal risks" (Rosa 1998) that displacements impose upon affected people. However, it is considered as one of the essential steps for the complete economic analysis of the project, and so for the purpose of this research, it is used for the comparison of the alternative scenarios developed and for the identification of the most relevant and sensitive variables that affect the total cost of project implementation. The conventional economic analysis will also serve as one of the essential tools for the design and implementation of an effective decision-making process for the relocation and infrastructure development problem and for guiding investments in such projects.

There are four standard methods for the economic analysis of courses of action with regard to an investment type of project, and in our case it is a relocation and infrastructure development project: (1) Net Present Value (NPV), (2) Annual Worth (AW), (3) Cost/Benefit Ratio (CBR), and (4) Internal Rate of Return (IRR) (Steiner, 1996).

This section presents the tool that will be used to distinguish among the alternatives developed: *Net Present Value (NPV) of discounted cash flows*. The limitations and benefits of using the NPV as a decision rule will be reviewed. Also presented in this section are the financial mechanisms that enable cost recovery for relocation and infrastructure development projects. As Miller puts it, every infrastructure project requires money to plan, design, construct, operate, and replace an infrastructure facility and this money typically comes to governments from taxpayers and users and to private owners through operating revenues and debt. The different financial mechanisms that are usually typical of developing countries will be investigated. Finally, a description of the sensitivity analysis procedures will be presented along with its benefits.

3.2.1 Net Present Value

The NPV method is widely favored by analysts because it is the most foolproof. Its computation is straightforward and its meaning clear to persons acquainted with the method (Steiner). One particular advantage for its use in relocation and infrastructure development projects is the involvement of real property appraisal. The value of a piece of property in the marketplace is equal to the present value of its net discounted benefits less its net discounted costs.

Other economic analysis methods such as the CBR method do not clearly model where and to whom the benefits and costs are being captivated. In their book, *"Principles of Corporate Finance"*, *Brealey and Meyers* explain the reasons for preferring NPV to other methods of financial decision-making: (1) the NPV method recognizes the time value of money; (2) NPV is based upon the calculation of forecasted cash flows associated with

each project and the opportunity cost of capital, and most importantly (3) NPV calculations are linear.

The steps in using the NPV method can be summarized from Miller's "Principle of Public and Private Infrastructure Delivery" as follows:

- **Step 1** is to forecast all the cash flows associated with the project over its economic life. Cash flows should be expressed in terms of nominal values, that is, in the same period they were paid or received. Revenue sources (including reductions in cost) are modeled as positive cash flows, whereas costs are modeled as negative cash flows.

- **Step 2** is to determine the appropriate "opportunity cost of capital" for the investment, that is, the time value of the money invested in the project, adjusted by the risk associated with the project.

- **Step 3** is to use the opportunity cost of capital to discount the project cash flows of each period back to the period of initial investment. The discounted value of each period is referred to as the Present Value (PV) of that period. The formula that is used to calculate the PV is the following:

$$PV_0 = \frac{F}{(1+r)^t} \tag{1}$$

Where PV_0 is the Present Values at year 0, F is the future value or the nominal value of the cash flow in year t, t is the year at which the cash flow is analyzed, and r is the opportunity cost of capital.

- **Step 4**, which is the last step, is to calculate the net present value of the investment by summing the present values of each period obtained in step 3.

$$\sum_{j=0}^{N} (B_j - C_j) \times \frac{1}{(1+r)^j} \tag{2}$$

Where B represents the total revenues at period j, C represents the total costs at period j, and N represents the total number of periods over which the analysis is performed.

Although this may look simple, the financial analysis of the investment includes several assumptions about which there is substantial uncertainty (Miller, 2000). There is uncertainty in the forecasted and estimated initial construction costs, the operations and maintenance costs, the periodic revenues (such as rentals) and other randomly generated revenues (such as land sales), and the construction schedules. The timing of the different estimated costs and revenues associated with the project are likely to vary from the forecast as well (especially when the relocation and infrastructure development project is huge and has a timeframe of 5 or more years).

There is also uncertainty in the estimation of the opportunity cost of capital, which plays a major role in the calculation of the NPV and the evaluation of an investment in any project (Miller, 2000).

As for the procurement of relocation and infrastructure development projects by the private sector through Public-Private Partnerships (PPPs), the NPV still lacks the means to provide a good decision rule to invest in such projects. Following are 3 reasons described by Miller why the NPV method does not provide a good decision rule for the public sector to procure projects with the private sector, whether through DBO, DBFO, or any other PPP or privatization contract (Miller, 2000):

- First, the NPV analysis includes real cash flows attributed to the costs of construction, operation and maintenance and assumed cash flows that do not appear in the cash flow analysis (such as safer environment to the public). Miller argues that actual expenses and revenues (including societal benefits) that are not completely integrated in current cash flow analyses of the public sector confuse the practical problem of how to deliver a project (or a portfolio of projects) within available funding limits.

- Second, the public sector ignores the fact that the private sector will use their own assessment of expected revenues and costs, and their own opportunity cost of capital, thus rendering the NPV assessment of the public sector irrelevant to the private sector's decision to compete.

- Third, the NPV analysis by the public sector might show that a certain delivery method results in the most benefits to the public sector, but at the same time, this delivery method might not be attractive at all to the private sector, thus making no practical sense. If the public sector expects and desires the private sector to invest in a project, the project must be structured in a way that offers sufficient revenue to the investor.

3.2.2   Financial Mechanisms

There are three primary sources of finance for a public institution providing infrastructure services: user charges, taxes, and loans. Transfers from other government bodies are also extremely important financing sources but are not considered among the primary sources because they depend on one of the other three mechanisms. Transfer financing issues are thus institutional, rather than financial (Azad and Jacobs, 1986).

Primary revenue sources can be divided into two groups: one that is suitable for current expenditures on operations and maintenance (primarily user charges and taxes) and another suitable for capital expenditures (Azad and Jacobs, 1986).

3.2.2.1 Financial Instruments for Expenditures on O&M

Revenues for current expenditures on local government provision of infrastructure are raised primarily from taxes and user charges. Typically, in developing countries, between 60% and 90% of total expenditures are financed from local sources. Local taxes provide more than half of the locally raised revenues, while self-financing revenues (or user charges) contribute about one third, and other local revenues the remainder. On the whole, non-local revenue sources (transfers and borrowings) finance less than one fourth

of total expenditures by local governments in developing countries, with grants and shared taxes accounting for about two thirds of this shared portion (Bahl and Linn, 1984).

3.2.2.1.1   Taxes

There are 3 major types of taxes: property taxes, automotive taxes, and other local taxes.

Property taxes, in principle, are of 3 types:

(a) Annual and rental value systems where the property tax is assessed against annual rental value of the property,

(b) Capital value systems where some proportion of the market value of the property (both land and improvements) is used as the tax base, and

(c) Land value systems where the base used is the market value of the land excluding improvements (Bahl, 1979).

All 3 types are widely used internationally, but in practice, many variations of these 3 systems exist. The cultural values and unique set of political considerations that characterize each country and city is reflected in its property tax system (Prest, 1981).

Local automotive taxes are of 2 types: direct and indirect. Unrestricted local license taxes (registration fees) are the most common and most popular direct automotive taxes whereas local government automotive fuel taxes are the most significant indirect taxes.

Other local taxes include local sumptuary and entertainment taxes. In most developing country cities, the local government commonly levies taxes on various forms of entertainment. Among these are taxes on restaurants and hotels, theaters and movie houses, and other types of public entertainment events (Davey, 1983).

3.2.2.1.2 User Charges

User charges are an appropriate source of revenue for provision of infrastructure services if properly designed and effectively administered. In the majority of countries, user charges are limited to water, sewerage, toll roads, and transit (Bahl and Linn, 1984).

The disadvantage of user charges is that there is considerable resistance among local governments to bringing the charges in line with the expenditure requirements for the provision of infrastructure services due to several reasons:

- Local levels of government may be using transfers from higher levels of government for purposes other than intended, thus enabling them to avoid shifting costs to the users
- The political influence of particular user groups can make price increases extremely sensitive, and
- The availability of capital transfers creates an incentive for local governments to allow facility deterioration instead of taxing their own constituents to pay for operations and maintenance (Bolton, 1985).

3.2.2.2 Financial Instruments for Capital Expenditures

Financial instruments used for capital expenditures are divided into 3 types: financial intermediaries, intergovernmental loan mechanisms, and realizing asset values.

3.2.2.2.1 Financial Intermediaries

There are two general sources of funds when government agencies seek capital for infrastructure investment: the loan institutions and the bond market. Bond markets are more common in the United States, whereas many other countries rely on loan financing for infrastructure investment.

Loan arrangements are either done through bank intermediaries or through specialized government institutions. Banks that finance infrastructure capital investments can further be subdivided into two categories: General Purpose Banks that provide general purpose loans for local government investment, and Infrastructure Banks that provide loans for infrastructure investment (Azad and Jacobs, 1986).

3.2.2.2.2   Intergovernmental Loan Mechanisms

This is another mechanism for providing debt finance to municipal governments. Such loans are provided at below market rates by the central government and other sources, such as pension funds, to intermediate entities that channel the resources to the poorer municipalities in need for infrastructure investment.

3.2.2.2.3   Realizing Asset Values

Public expenditures on infrastructure have often contributed in raising the value of the land held by the private sector. Two mechanisms have been widely employed to enable the authority making the investment to recover the costs incurred: land readjustment, and betterment levies (valorization).

Local authorities usually use the land readjustment mechanism when developing or redeveloping a large area of land with inadequate or non-existent infrastructure. The authorities acquire the large piece of land that is divided into many small private plots, construct the appropriate infrastructure and the desired public spaces, and reduce the size and realign the plots before returning them back to their owners. In this way, the authorities would have set aside an area of land whose resale value after development will cover the capital expenditure, and reduced the size but increased the value of the plots returned to the original owners.

The problem with land readjustment is the issue of equity. It is rarely easy to ensure that the post-development plots have been fairly adjusted and that all affected parties have reached an agreement on a scheme (Azad and Jacobs, 1986).

On the other hand, a betterment levies can be used as a cost recovery mechanism for capital expenditures on infrastructure. A betterment levy is a tax designed to capture the increases in property value attributed to a public infrastructure investment or other public action.

Some combination of land acquisition and betterment charge is also feasible. These procedures have been employed in countries with different economic and institutional characteristics, and have proven to be successful in permitting authorities to recover the costs of their investment in the face of very different urban contexts (Azad and Jacobs, 1986).

3.2.3   Sensitivity Analysis

Risk analysis processes are often performed with one of the following techniques or tools (Martinez, Halpin, and Rodriquez-Ayala, 2000): Sensitivity Analysis, Variance Analysis, and Probability Analysis. The tool that will be reviewed and used in this research is sensitivity analysis. Sensitivity analysis studies the effect on the project's discounted cash flow's outcome when changes are made to the value of the assumptions/variables of the model or the baseline scenario/alternative. In other words, sensitivity analysis measures the change that results in an output variable, such as the NPV or the IRR, from changing one or more input variables (Steiner, 1996).

Sensitivity analysis will help identify the variables that most affect the NPV and the decision to invest in a certain project. Thus, input variables that will cause the greatest change will be examined with great care versus those that are less important and need not much attention. Sensitivity analysis allows us to model the variation of the output variable (in our case it is the NPV) with respect to one or more of the input variables.

Questions such as "what would be the effect on the NPV of the project if rentals were increased to their maximum value, as a percentage of household income?" could be answered. Sensitivity analysis will also allow DMs to model how much change to a certain variable will be needed to change a decision. For example, how much should rentals be so that the NPV of the project becomes zero, or how much should the discount rate be in order for the NPV to be zero or positive. This will not just answer direct questions as what the value of the variable should be but will also allow DMs to make other decision as well. For example, if the discount rate needed turned out to be too small, decision to subsidize the discount rate can then be studied.

Although sensitivity analysis is a good tool to study the effect of a certain output variable with respect to some input variable(s), the process has some limitations associated with it. One drawback as described by Brealey and Meyers is that the underlying variables are likely to be interrelated, thus making no sense to look at a single variable that might have an effect on other variables (Brealey and Meyers, 2000). Another problem is the large number of variables that may enter the cash flow, which makes it a hard task to simulate the variation of the output variable with respect to two or more of the input variables at once. Therefore, for simplicity reasons in this research, only one input variable at a time will be varied to study its effect on the output variable (in this case the NPV).

Chapter 4 Case Study: The "Elyssar" Project

Most of the information in this chapter has been adopted from the "Planning & Development of Beirut South-Western Suburbs" master plan.

4.1   Introduction

Less than fifteen years ago, the southwestern suburbs of Beirut, Capital of Lebanon, were mainly agricultural land with low population density. Today, this area is dominated by large concentrations of residents dwelling in illegal settlements and living in poverty and substandard conditions. Until the early seventies, this area housed middle class, religiously mixed population who had been locally rooted for decades. The civil war that started in 1975 induced rural to urban migration, the concentration of residents of the same religion and sect, and their marginalization from the rest of the city's neighborhoods. Furthermore, the southwestern suburbs offered relatively cheaper land prices and unregulated access, and became the main residence of people with low or no income, and to refugees as well (Fawaz, 1998).

With the return of stability to Lebanon, the country started to witness long overdue planning and development efforts. Since 1992, the government has been addressing issues of land development, urban and regional planning, infrastructure upgrade and social development. In addition, it has worked on a fiscal restructuring of the tax system in order to better face the challenges of a new millennium and a rapidly changing world.

The southwestern suburbs of Beirut considered in this analysis (Figure 4.1) encompass a large community living in substandard and often illegal conditions. The unsuitable conditions facing the people living in the area necessitated immediately the creation of a public agency responsible for the planning and development of the entire district.

Figure 4.1 Aerial View of the Southwestern Suburbs of Beirut and the Study Area[4]

This agency was named "Elyssar" after a Phoenician queen who is known for inspiring an active engagement in facing challenges and striving to create a better future for her people.

The priorities of the Elyssar projects have been to:

- Implement projects to improve the infrastructure of the area.

- Redevelop the south shores of Beirut.

- Construct low-cost housing units.

- Relocate people living in illegal settlements.

- Create roads that will better connect Beirut to the south of the country.

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[4] Source: "Planning and Development of Beirut South-Western Suburbs" Master Plan.

One major goal of Elyssar is to build 1440 units of affordable housing and workshops. There are 170,000 square meters of land devoted to this project: 150,000 square meters for housing and the remaining 20,000 for Workshops.[5]

This chapter will provide the necessary background describing the Elyssar initiatives, which to this day have not been implemented. It will start by describing the public agency "Elyssar" and its prerogatives. It will then move to scope the problem by describing the current condition of the area covered by Elyssar (i.e., socio-economic surveys, existing infrastructure, zoning, and land use). This will reveal most of the constraints that Elyssar is facing, as well as show the need for re-planning. Planning initiatives are then presented including cost estimates of the different components of the project, based on objectives and criteria developed by Elyssar.

These objectives and criteria were used by Elyssar consultants, within defined legal, operational, and regulatory frameworks also described in this chapter, to come up with scenarios and analyze the feasibility of the whole project as seen in the latter part of this chapter.

The objectives and criteria adopted by Elyssar, together with those presented in Chapter 2 will be subsequently used in Chapter 5 to derive scenarios for feasibility investigation using the methodology defined in the second part of Chapter 3.

4.2   The Elyssar Background and its Prerogatives

The Planning and Development of Beirut South-Western Suburbs is regarded by the Lebanese government, as one of the strategic projects aiming at revitalizing and improving the Greater Beirut area, and at resolving some of the most complicated social and legal issues that have arisen in the aftermath of the civil war.

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[5] Source: Website: http://www.rafikhariri.net/v1/index.php

To that end, the government promulgated, on the 29th of June 1995, a decree for the Establishment of Elyssar as a Public Agency for the Planning and Development of Beirut South-Western Suburbs. The Public Agency "Elyssar" has been formed to take charge of the implementation and deal with the size and complexity of the problems associated with the objectives of the proposed planning. Elyssar has been organized to be autonomous administratively and financially (subject to the later control of the Government Accounting Department) and empowered to undertake commercial transactions to implement planning actions and finance its development program under the direct supervision of the Prime Minister.

The Public Agency has the following prerogatives:

- Temporary ownership through expropriation, of all land plots situated within the area of its jurisdiction, including all rights attached to the land.
- Preparation of a program of public infrastructure and public facilities provision and its execution directly through appointed contractors or indirectly through other government departments, agencies, and municipalities.
- Land assembly and reparcellation within its area of jurisdiction, and the redistribution of reparcelled, land to owners, each in relation to the valuation of the original share, following the deduction of areas required for roads and public facilities.
- Paying compensation to small owners or to occupiers of incompatible uses subject to the approval of the Council of Ministers.
- Preparation of a building program or a plan of action that guarantees rebuilding and its execution either directly, through owners, or through any other appropriate agreements as it sees fit.
- Ensure either the return of tenants and investment right owners to new premises in constructed buildings or their compensation.

4.3   Project Overview (Part I)

4.3.1   Prevailing Development Pattern

The Elyssar project area extends from the Summerland Beach Resort and the Sports City in the north (southern part of the capital Beirut) down to the Airport as its southern boundary, and from the Airport Road in the east to the Mediterranean Sea in the west (see Figure B.1 in Appendix B).

The project area covers some 560 Ha, and contains an existing population estimated at around 130,000 (1996 surveys). Included in the area are the localities of Jnah, Hay Al-Zahra, Sabra-Chatila, Bir Hassan, Horch Al-Katil, Ouzai, Al-Maramel, and Raml Al-Ali (see Figure B.2 in Appendix B).

The project area is mostly occupied by residential land use. There are however, significant areas of commercial and workshop. Government facilities face the Sports City and the entertainment/tourist complexes of Summerland and Coral Beach adjoin each other with sea front locations.

The project area, in terms of development, has been classified into 4 broad categories:
1. Areas typified by low rise, poor quality construction and unplanned layouts. Most of these areas are illegally occupied.
2. Areas typified by medium rise, fair and good quality construction built on planned subdivisions. Most of these areas are legally occupied and not yet fully developed.
3. Vacant lands that some 43 Ha and that are not yet subdivided.
4. Areas containing a mixture of legal and illegal development.

4.3.2   Status of Existing Utility Infrastructure

Surveys have been undertaken to determine the existing situation regarding the road network, water supply, sewerage collection, storm drainage, electricity distribution, and

telecommunication services. The provision of utility infrastructure is closely linked to the current state of urban development within the Study area. As a result, the following categories have been identified:

- Areas that lack formal infrastructure services. Within this category are 2 different types of areas: (i) vacant and undeveloped areas which do not have these services at present, and (ii) the illegally occupied areas which have some informal infrastructural provision for water and electricity done to very poor standards. Completely new infrastructure is required.
- Areas with low standards of infrastructure services. These areas could benefit from the upgrading of their existing infrastructure.
- Areas with partial provision of infrastructure services to an acceptable standard. This applies to the legally planned parts of some of the localities that are currently being developed, and which could benefit from road improvements including pavement, sidewalks, and lighting.

4.3.3   Major Issues

The major planning issues that provided the rationale for the re-planning of the project area can be summarized in the following points:

- The illegal occupation of large tracts of land owned either by municipalities or in shared private ownership and the necessity to resolve this issue within a framework acceptable to all parties.
- The substandard living conditions of the majority of households living in illegally occupied areas, and the low quality of the man made environment associated with these areas.
- The informal nature of business located in illegally occupied areas, their makeshift and substandard accommodation and the negative implications of their status on security of employment and future employment prospects.

- The very poor standards of infrastructure provision in the illegal housing areas, which affect negatively the environment in these areas. These have led to severe seawater contamination along the entire coastline of the project area.

- The poor level of provision of community facilities in many parts of the project area to include educational, recreational and social facilities. The negative impacts connected to this issue could seriously impair future social development prospects.

- The large number of approved and planned major projects including major infrastructure projects such as the Beirut International Airport project and major roads, as well as major facilities such as Sports City, the new Government Hospital, and a technical school complex. These projects will produce major improvements that need to be matched in other parts of the Elyssar area.

4.3.4   Objectives and Contents of the Approved Outline Master Plan

The Outline Master Plan was prepared in the early part of 1995 and served as the initial document for the establishment of "Elyssar" as the Public Agency in charge of the Planning and Development of the Beirut South-Western Suburbs.

A. Master Plan Objectives:

The Outline Master Plan incorporates many of the objectives inherent in the Planning of the Project Area. "Elyssar" has adopted these objectives as its policy objectives. They are expressed as follows:

1. The improvement of the area's housing conditions through:
   - The gradual eradication of illegal housing.
   - The provision of low-cost housing in selected areas to relocate households presently living in illegally occupied areas.
   - The return of displaced people who are willing and can return to their former areas of residence.

2. The reintegration of the project area into the Greater Beirut through:

- Freeing some of the sandy beaches for recreational and leisure activities.

- Widening and improving the main road network giving priority to international roads.

- Rationalizing the land use network through proper zoning for employment areas and along major transport corridors.

3. The improvement of environmental conditions through:

- The execution of infrastructure projects (mainly sewerage and drainage) aimed at solving the problems related to waste disposal, sea and land pollution.

4. A better exploitation of the development potential through:

- Zoning changes designed to improve the development potential of some of the areas surrounding the airport following the relocation of the Airport runway.

- Capitalizing on the advantages offered by committed and planned projects and the presence of major sports facilities such as the Golf Club and the Sports City.

5. A practical framework for implementation through:

- Compatibility with the prescriptions of the Lebanese Law.

- A phased approach to improvement.

- A financial balance sheet that ensures project continuity during implementation.

B. Content of the 1995 Approved Outline Master Plan

The Outline Master Plan proposes a number of planning interventions and land uses. It includes a broad allocation of areas reserved for:

- Low-cost housing and community facilities.

- Workshop and light industrial development.

- Private residential and commercial development (following reparcellation).

It also delineates the areas that are exempted from any major planning intervention. Table 4.1 represents a brief inventory of the Outline Master Plan land use allocations with respect to locality.

Table 4.1 Represents a brief inventory of the Outline Master Plan land use allocations[6]

	Low-cost housing	Re-parcellation	Work-shops	Community Facilities	Sports & Open Spaces	Coastal Development Areas	Areas Exempted from Planning Intervention
Ouzai	√	√	√	√	√	√	-
Jnah	-	√	-	-	-	√	-
Hay Al-Zahra	√	√	√	√	√	-	√
Bir Hassan	-	-	-	-	-	-	√
Sabra-Chatila	√	√	√	√	√	-	√
Horch Al-Katil	√	√	√	√	√	-	√
Raml Al-Ali	√	√	-	√	√	-	√
Al-Maramel	√	√	√	√	√	-	-
Golf Club	-	-	-	-	-	-	√

The cumulative effect of the above proposals signaled an official policy to:
- Eradicate the illegal occupation of land.
- Introduce low-cost housing into areas illegally occupied and areas currently unplanned and undeveloped.
- Comprehensively plan the entire area to modern development standards.

[6] See Source 4.

4.4 Overall Development and Design Concept (Part II)

The development framework for the Elyssar project subdivided the project area into 4 categories in terms of intervention:

- Areas that were to be gradually cleared from illegal occupation and redeveloped comprehensively; either by Elyssar or by the private sector.

- Areas of new development undertaken either by Elyssar or by the private sector.

- Areas where limited restructuring of the existing fabric was to take place to improve accessibility and allow for infrastructure upgrading.

- Exempted areas where no planning intervention was to take place beyond the normal provision of infrastructural services.

Figure B.3 in Appendix B shows an aerial view of key components and landmarks within the Elyssar Project.

In order to formulate an overall realistic program that enables the successful implementation of the Elyssar project, field surveys were necessary. These were designed to provide an up-to-date inventory of dwellings and establishments in non-exempted areas to include all illegally occupied areas within the project boundary. Three surveys were conducted in this respect:

- A 100% dwelling and establishment count by type.

- A 10% sample socio-economic survey of households.

- A 10% sample survey of all establishments including shops, workshops, and other types of commercial establishments.

4.4.1 Inventory in Areas of Illegal Occupation

At the time of the survey, the areas of illegal occupation within the project area included the following number of dwellings and establishment:

- 13912 dwellings distributed by locality (see Table 4.2).

- 1510 shops, 1679 workshops, and 258 other commercial establishments distributed by locality (see Table 4.2).

Table 4.2 Distribution of Dwellings and Establishments in Areas of Illegal Occupation[7]

Localities	Dwellings		Shops		Workshops		Other Establishments	
	#	%	#	%	#	%	#	%
Hay Al-Zahra	1023	7.35	154	10.20	60	3.57	19	7.36
Jnah	2613	18.78	307	20.33	396	23.59	45	17.44
Ouzai	4492	32.29	444	29.40	599	35.68	85	32.95
Al-Maramel	343	2.47	124	8.21	182	10.84	18	6.98
Horch Al-Katil	2879	20.69	254	16.82	267	15.90	46	17.83
Sabra	2562	18.42	227	15.03	175	10.42	45	17.44
Total	13912	100%	1510	100%	1679	100%	258	100%

The inventory served as a basis for defining the size of the target relocation and compensation program of Elyssar.

4.4.2   Socio-Economic Characteristics of Households in Areas of Illegal Occupation

A household survey was undertaken in 1996 to include details of income and expenditures, demographic characteristics, and characteristics of residential buildings.

The illegally occupied areas contained an estimated total population of some 80500 persons. The average household size was found to be around 5.75 persons, and households of this size accounted for almost one third of the total. Little variation was found between different localities in terms of size of households.

In term of age and gender, males accounted for over 51.6% of the total population. The school age population for the 5-19 year age group comprised 36.32% of the total population and the working population age group of 19-65 years comprised 49.3%.

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[7] See Source 4.

Illiteracy rates were high at around 23.5% of the population, but were proportionally higher for the over 45-years group. Over 38% have received primary education, over 22% intermediate level, and only 14% have received secondary and higher level education.

Around 82% of the residents were Lebanese, 12.5% Palestinians, and 5% Syrians. Around 50% of the population originally came from other areas of Greater Beirut and around 35% moved into the area because of war conditions, with around 75% having been residents in the area since the mid-1980s.

Household monthly income averaged around US$ 425 a month. Around 40% of households had incomes of between US$ 151-300, while 33% had incomes between US$ 301-500 a month (see Figure 4.2).

Expenditures on housing rent was found to be low, with around 40% households paying less than US$50 per month, corresponding to an average of 20-25% of household income. Around 15% of households paid between US$50-100 whilst around 13% paid US$100-300 for housing rent (see Figure 4.3). Rental rates average about $100 per month.
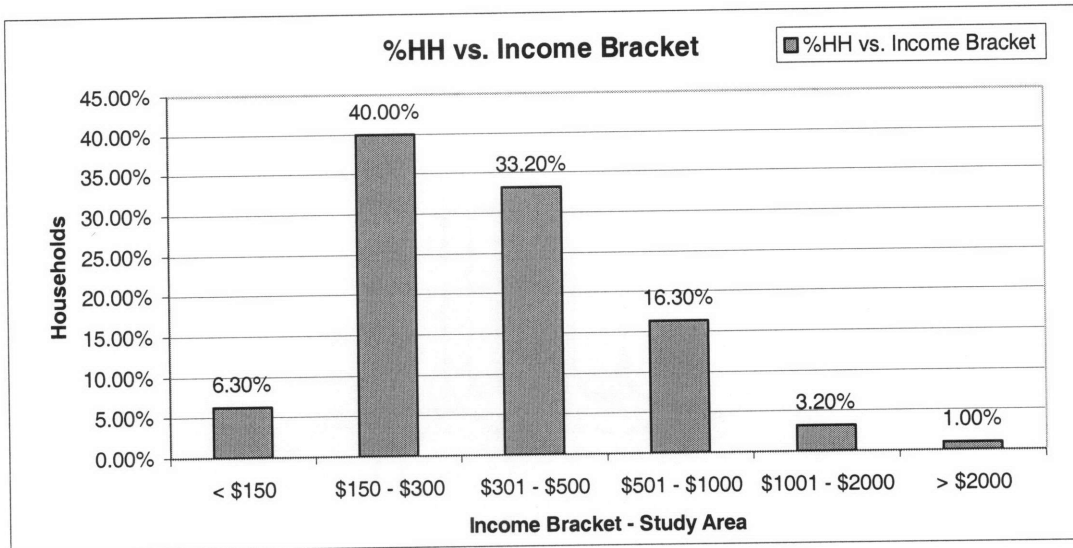
Figure 4.2 Distribution of HH with respect to income value[8]
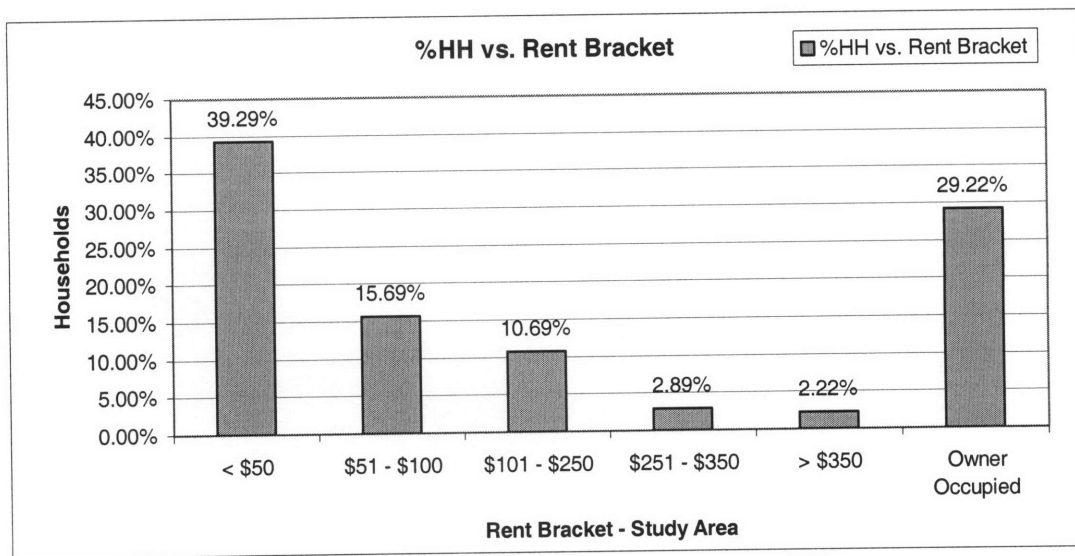
Figure 4.3 Distribution of HH with respect to rent bracket[9]

Figure B.4 in Appendix B shows the distribution of the different illegal settlements within the Elyssar area.

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[8] See Source 4.

[9] See Source 4.

4.4.3 Traffic Data and Forecasts

In 1994 and d1995, traffic studies were undertaken for Greater Beirut and for parts of the planned area. These traffic studies and assessments were submitted to the Elyssar consultants for review. The results of the projected traffic volumes have been analyzed in relation to their impact on the primary road network in the project area, taking into consideration the variations that appeared between the different studies. Based on this analysis changes were made to the primary and secondary road networks within the Elyssar project. Changes included adding new primary road links, widening some existing roads, and the construction of new primary and secondary roads, all designed based on the 2015 traffic forecast.

4.4.4 Land Use Validations

An analysis for the potential of the Elyssar area to attract non-residential uses was undertaken. This validation analysis was undertaken with reference to committed projects in the study area and in other parts of Greater Beirut. The analysis covered the potential for retailing, offices, recreational leisure and hotel activities, and special residential uses.

A more detailed description of the land use framework is presented in section 4.4.7. The Land use framework includes:

- The enlargement of areas earmarked for low-cost housing to maximize the potential for other areas for the development of office and specialized commercial uses connected with planned major government facilities and other institutions.
- A major accurate delineation of areas where commercial and residential development would occur along major highways and in residential neighborhoods.
- A better definition of the capacity of the project area for office development and where such development would occur.
- A better definition of the potential of the project area for recreational, leisure and hotel development particularly in areas adjacent to the seafront as well as the

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introduction of new playgrounds, public gardens, and sports facilities in various parts of the Elyssar project area.

4.4.5 Zoning

The aim was to achieve a balance in the future distribution of land uses reflecting an integration of social, economic, and physical requirements. This has been achieved through:

- Rationalizing the distribution of non-residential uses (Government and Institutional uses, light industrial and workshop uses, commercial uses and recreational and leisure uses)
- The provision of mixed use zones that encourage the development of interrelated activities
- The adoption of a flexible and socially workable community structure in low-cost housing areas

The allocation of workshop and light industrial areas has been closely associated with low-cost housing catering for uses compatible with adjoining residential development.

Commercial development has been allocated to provide easily accessible shops and services to the population and to ensure compatibility between the type of shops and the catchment areas they served.

The coastline provided an opportunity for recreational and leisure developments. The sandy beaches were reserved for beach clubs and associated special residential and hotel development.

Low-cost housing areas were conceived as a combination of neighborhoods that were supported by their own facilities located within walking distance.

4.4.6   Land Use Framework

4.4.6.1   General Land Use Allocation

The proposed land use framework delineates areas allocated for various land uses. The areas were mainly divided between:

- Private residential development, low-cost housing, and community facilities
- Open space, sports facilities, and cemeteries
- Light industrial development and workshops
- Major areas of mixed commercial and residential development, shopping centers, and markets
- Government and institutions
- Mixed-use development
- Recreational, leisure, and beach developments

A synopsis of the land areas occupied be each category of land use is given in Table 4.3. Figure B.5 in Appendix B also shows the land use framework in a plan developed by the Elyssar consultants.

Table 4.3 Schedule of Land Areas Allocated by Type of Use[10]

Land Use	Area (Ha)	% Of Total Area
1. Private Residential Development	185.1	31.6
2. Residential Development by Elyssar	58.9	10.1
3. Commercial and Residential (city wide)	11.1	1.9
4. Commercial Centers/Markets	7.6	1.3
5. Major Institutional	24.8	4.2
6. Light Industrial/Workshops	9.6	1.6
7. Mixed-Use Development	27.8	4.7
8. Major Sports Facilities	54.9	9.4
9. Local Open Space/Cemeteries	16.5	2.8
10. Beach Development	25	4.3
11. Maritime Domain Areas	14	2.4
12. Circulation (Roads + Pedestrian)	150.7	25.7
Total	**586**	**100**

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[10] See Source 4.

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The proposed allocation of land uses was to have a considerable influence on employment generation. The main centers of employment to be were the Sports City shopping complex, commercial areas, leisure facilities, major Government and other institutions, workshop areas, and community facilities associated with low-cost housing.

4.4.6.2 Residential Development

The Elyssar project area contains three types of residential development: Private Residential, Low-Cost Housing, and Special Residential. The distribution of residential development with respect to locality, along with related population estimates, is shown in Table 4.4.

Table 4.4 Distribution of residential development with respect to locality[11]

	Residential Private Units	Low-Cost Residential Units	Special Residential Units	Total Residential Units	Estimated Population
Ouzai & Al-Maramel	3176	3340	248	6764	36159
Jnah	1807		1794	3601	18006
Hay Al-Zahra	2847			2847	14233
Bir Hassan	2190			2190	10950
Golf Club	639			639	3193
Raml Al-Ali	1243	860		2103	11117
Horch Al-Katil	3575	3200		6775	36116
Sabra-Chatila	7146	2320		9466	48954
Sport City				0	
Total	**22623**	**9720**	**2042**	**34385**	**178728**

Private Residential: The largest type of residential development will be privately built and will cover the majority of the land area allocated for residential purposes. The estimated capacity of areas reserved for private residential development has been estimated at around 22,600 dwellings.

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[11] See Source 4.

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Low-Cost housing: A total of 9720 low-cost dwellings would be built. The density of the units built will vary slightly between an area and another in accordance with the variation of densities of surrounding development.

Special Residential: This category is allocated only to beach frontage developments that will attract a transient residential population particularly in the summer season. This type of development will include chalets and sea view apartments linked to beach clubs and may offer a hotel style form of service for tourists and special targeted groups such as airlines for temporary crew accommodation.

4.4.6.3 Commercial and Office Development

The demand for commercial and office floor space has been considered in the context of the overall future requirements for retail and office space in Greater Beirut. It is proposed that Elyssar target 1/3 of the demand for modern retailing (about 40,000 m^2). As for office development, the Elyssar project area may target only a small percentage of the demand (about 30,000 m^2) since the bulk of this demand will be met by office developments in the Beirut Central District (BCD).

4.4.6.4 Recreational and Tourist Demand

Recreational development includes the Sports City complex, the Golf club with associated swimming and sports facilities, and a series of small local recreational facilities such as public open spaces and parks.

Tourist development includes beach clubs, hotels, restaurants, promenades, amusement parks, beach apartments, and other recreational and leisure facilities.

4.4.6.5 Light Industrial Development

Some areas within the Elyssar project boundary will be allocated for workshops and light industrial units. These areas are not expected to absorb the relocation of all existing workshops and light industrial establishments. A selective relocation policy will exclude from the workshop areas all industrial uses that are not compatible with residential areas (as a general policy, any polluting activities).

4.4.6.6 Government, Major Institutions, and Community Facilities

In addition to existing facilities such as the Post Office and telephone headquarters for South Beirut, this area will witness the development of the Beirut Government teaching hospital and the technical schools complex. In addition, a site has been reserved for the future location of the Ministry of Health and other sites reserved for future government use. Government schools will be built and operated by the Ministry of Education. Other educational and health institutions and clinics are also planned either for development or for future expansion and upgrading. The private sector is assumed to provide for the majority of these educational and health facilities. In addition, a number of embassies will continue to be located in the area.

4.4.7   Transportation

Existing Situation: The existing road network within the Elyssar project area is composed of 57.6 km of asphalted road subdivided into the following categories:

- International roads   11.4 km
- Primary roads   3.7 km
- Local roads (planned)   13 km
- Local roads (unplanned)   29.6 km

Properly planned roads to approved standards will replace all unplanned roads in illegally developed areas. Currently the road network is characterized by the following:

- Lack of maintenance

- Lack of drainage infrastructure facilities

- Violations of users

- Proximity of illegal commercial and residential developments on the land adjacent to the road

- Inadequacy of local circulation pattern

- Lack of control of access points on the various road categories

- Considerable increase in traffic volumes on the international and primary roads

Road Network Planned by Elyssar: The road network to be executed by Elyssar is of total 47.1 km divided into two main parts:

- New roads with a total length of 32 km

- Existing roads that will be upgraded with a total of 15.1 km

Table 4.5 presents the distribution of the road network per category.

Table 4.5 Distribution of the road network per category[12]

Category	Length (km)				R.O.W (m)
	New Roads		Improved Existing Roads		
	Elyssar	Others	Elyssar	Others	
International	2.7	3.5		3.6	40-80
Primary	2.3	2.65	4.6		24-32
Secondary	8.6		5.5	1.6	16-20
Local	16.7		5	1	12-15
Corniche	1.7				
Total	32	6.15	15.1	6.2	

Several road projects are being constructed or rehabilitated under separate projects such as the Airport road and the Cocodi-Cola Expressway (by the Council of Development and Reconstruction).

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[12] See Source 4.

A public bus transport study has been conducted by TEAM International Consultants. This study established the preliminary basic structure of the bus routes in order for the bus service to operate in an effective, efficient, and attractive manner.

Also parking provision has been studied and 2 modes of car parking had been identified:

- On-Street parking (on secondary and local roads)
- Off-Street parking (incorporated within developers' individual schemes in accordance with standards set in the Lebanese building regulations)

Cost Estimates: The cost estimates related to the road network are given for each locality of the project area (see Table 4.6). The costs include, for new roads, normal excavation and earthworks, base course, compacting and asphalting, cost of civil works related to bridges and tunnels, retaining walls and road protection structures where applicable as well as sidewalks and road marking. For the improvement of existing roads, they include any applicable combination of the above elements.

Table 4.6 Cost estimates for the road network for each locality[13]

Locality	New Roads		Improved Roads		Total Cost
	Length (km)	Cost ($)	Length (km)	Cost ($)	($)
Ouzai	9.7	$13,095,000	0.2	$80,000	$13,175,000
Al-Maramel	2.7	$3,645,000	0.4	$160,000	$3,805,000
Golf Club	1.1	$1,485,000	0.5	$200,000	$1,685,000
Jnah	2.5	$3,375,000	2	$800,000	$4,175,000
Bir Hassan	1	$1,350,000	3.2	$1,280,000	$2,630,000
Hay Al-Zahra	2.9	$3,915,000	1.2	$480,000	$4,395,000
Sabra	3.6	$4,860,000	3	$1,200,000	$6,060,000
Horch Al-Katil	5.6	$7,560,000	3.7	$1,480,000	$9,040,000
Raml Al-Ali	2.9	$3,915,000	0.9	$360,000	$4,275,000
Total	**32**	**$43,200,000**	**15.1**	**$6,040,000**	**$49,240,000**

The cost estimates are given only for road works that will be undertaken by Elyssar and exclude work undertaken by other authorities within the Elyssar project area. They also exclude major works connected to the excavation, disposal of waste material and site

[13] See Source 4. Some figures are modified and rounded to the nearest US$5,000.

grading (estimated at around US$ 24.05 million), as well as land reclamation (estimated at around US$ 13.0 million).

4.4.8 Infrastructure

4.4.8.1 Water and Landscape Irrigation Networks

The source of water for Elyssar will be obtained through conveyance pipes that connect the Elyssar network At full development capacity, the project area will have a total average daily demand of approximately 510l/s (44,000 m^3/day), equivalent to an average daily per capita demand of 230 liters (230 l/c/d). The total length of pipelines including those running along tertiary roads is approximately 61 kms.

Preliminary estimates were undertaken for the cost of the water network based on the following criteria:

- Measurement: Lengths of primary and secondary pipes were measured from road layout.
- The costs of pipe material were obtained from similar ongoing contracts in the southern suburbs.
- Cost of valves, fitting and fire hydrants were assumed at 10% and 15% of pipe costs.
- House connections were priced at $400 per unit.
- Rates for pipes and house connections cover material excavation, installation backfilling and testing.

Table 4.7 gives a breakdown of the network cost by locality.

Table 4.7 Water network cost by locality[14]

Locality	Total
Ouzai	$865,379
Al-Maramel	$681,653
Golf Club	$255,155
Jnah	$534,268
Bir Hassan	$795,598
Horch Al-Katil	$1,435,446
Sabra	$2,503,099
Hay Al-Zahra	$768,121
Raml Al-Ali	$551,317
Total	**$8,390,036**

As for irrigation, an irrigation system will be provided for the landscaped roads and public open spaces of the project area. The system will be semi-automatic and will consist of a well, a pump, a ground reservoir, a distribution network, and a secondary irrigation network and equipment. Table 4.8 presents the estimated cost of the irrigation network by locality of the project area.

Table 4.8 Estimated cost of the irrigation network by locality[15]

Locality	Total (US$)
Raml Al-Ali	$134,750
Horch Al-Katil	$214,100
Sabra	$136,200
Hay Al-Zahra	$109,400
Jnah	$112,300
Bir Hassan	$39,900
Golf Club	$42,800
Al-Maramel	$194,100
Ouzai	$193,750
Headwork not distributed	
Source: well	$20,000
Reservoir	$50,000
Pump Station	$40,000
Sub-Total	$1,287,300
Contingency (15%)	$193,095
Total	**$1,480,395**

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[14] See Source 4.
[15] See Source 4.

4.4.8.2 Sewerage

The sewerage network for Elyssar has been designed within the framework of the system proposed for this drainage basin. The sewerage network will be required to convey both, offsite and internally generated flows.

Estimates of the volume of flow were calculated by estimating the potential levels of sewage in the basin using an average water demand rate of 230-l/c/d. the generated flow for the Elyssar was calculated as follows:

- 85% of the projected water demand recovered as sewage.
- An infiltration rate of 10% of the generated flow.

The proposed network has a total length of around 44 km. Two pumping station will be required with the sewage network. The main pumping station will have a capacity of 1700 l/s and will pump the flow to a high point where it flows by gravity to the treatment plant thereafter.

The length of collectors, secondary and tertiary sewers; and manholes number were measured from network layout. Rates for pipes cover: material, excavation, bedding, laying, testing, and backfilling. Rates for manholes cover: excavation, reinforced concrete, protective coating, testing, covers and frames, and backfilling. Rates for service connections cover: material, transport, excavation, bedding, laying, testing, pipe connection to the network, and backfilling. The costs of pumping stations covers: excavation, dewatering, reinforced concrete, pumps, electrical installation, piping, stand-by generator testing and commissioning, ventilation, and odor control. Table 4.9 gives a summary of the cost estimate per locality of the sewage system.

Table 4.9 Cost Estimate of the sewerage network by locality[16]

Locality	Total
Ouzai	$1,893,850
Al-Maramel	$674,673
Golf Club	$790,708
Jnah	$2,851,056
Bir Hassan	$949,663
Horch Al-Katil	$1,670,254
Sabra	$1,366,626
Hay Al-Zahra	$834,959
Raml Al-Ali	$884,386
Total	**$11,916,175**

4.4.8.3   Stormwater Drainage

The Elyssar area constitutes a drainage basin of approximately 660 Ha (excluding the Gold Club area). The approximate length of the drainage network is 30 kms. Moreover, an additional 30 km pipes are required to connect the street inlets to the stormwater network.

Quantity takeoff and costing were carried out according to design criteria and unit costs similar to those from ongoing contracts in Beirut suburbs. Table 4.10 gives an estimate of the cost of the stormwater network by locality.

Table 4.10 Estimate of the cost of the stormwater network by locality[17]

Locality	Total
Ouzai	$2,107,950
Al-Maramel	$969,795
Golf Club	$248,745
Jnah	$1,431,520
Bir Hassan	$741,071
Horch Al-Katil	$1,466,250
Sabra	$3,090,854
Hay Al-Zahra	$2,773,340
Raml Al-Ali	$1,023,155
Total	**$13,852,680**

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[16] See Source 4.
[17] See Source 4.

4.4.8.4 Electricity

The estimate of power requirements for the Elyssar project area has been based on the schedule of built up areas by type of land use presented earlier and on unit area demand figures. The lighting of roads and public open spaces has also been added to the estimated demand.

The total load is found to be around 210 MVA. Applying an overall diversity factor of 0.7, a demand of 148 MVA is anticipated.

The area is already partially developed and serviced from nearby substations. The extra power requirements will be brought in from a nearby substation at medium voltage. Electricite du Liban (EDL) will install all cables and medium to low voltage substations upon development request. For low cost housing and light industry areas to be developed by Elyssar the cost of network will be financed by Elyssar.

The cost estimate for power installation covers the cost of works to be undertaken for low cost housing and workshop areas developed by Elyssar. For other areas developed by the private sector, the cost of power installation will be directly recovered from the developers and consumers. Table 4.11 shows the power cost estimates for the localities developed directly by Elyssar.

Table 4.11 Power cost estimates for each locality within the Elyssar area[18]

Locality	Estimated Load (Kva)	No. Of Transformers	Cost (US$)
Ouzai	3070	7	$574,000
Al-Maramel	7296	16	$1,312,000
Raml Al-Ali	1914	4	$328,000
Horch Al-Katil	7235	15	$1,230,000
Sabra	6115	13	$1,066,000
Total	25630	55	$4,510,000

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[18] See Source 4.

4.4.8.5 Telecommunications

The estimate of telephone requirements was conducted in relation to land use classification. The demand forecast was based on the recommendations of another project that was carried out for the Ministry of Post and Telecommunications (MPT).

The total telephone line requirements for the next twenty years were calculated to be around 55,500 lines for the project area. MPT stated that Elyssar would be responsible only for the civil works such as ducts and manholes. The actual cabling with all accessories and telephone exchanges would be under MPT's responsibility.

The cost estimates for the telephone installations are based on the estimated demand for telephone line for the next twenty years. The cost includes all civil works required on the basis of $100 per line. However, it excludes the cost of building and furnishing new telephone exchanges or the rehabilitation of existing ones. Table 4.12 shows the cost estimate for telephone installation by locality in the project area.

Table 4.12 Cost estimate for telephone installation by locality[19]

Locality	Total No. of Telephone Lines	Cost (US$)
Ouzai	6589	$658,900
Al-Maramel	4515	$451,500
Jnah	6677	$667,700
Hay Al-Zahra	8435	$843,500
Bir Hassan	3348	$334,800
Golf Club	1059	$105,900
Raml Al-Ali	2935	$293,500
Horch Al-Katil	9385	$938,500
Sabra-Chatila	12616	$1,261,600
Total	**55559**	**$5,555,900**

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[19] See Source 4.

4.5   Implementation (Part III)

Implementation issues are central to the Elyssar project, the first urban redevelopment project in Lebanon to be implemented by a Public Agency. The following sections deal with: (1) the implementation context with reference to the legal, operational, and regulatory factors that will affect the implementation process, (2) the development program and its proposed phasing, and (3) the financial cash flow analysis related to the proposed phasing and the alternative phasing scenarios.

4.5.1   Implementation Context

4.5.1.1   Legal Framework for Land Restructuring

4.5.1.1.1   Legal Instruments for Land Restructuring

Elyssar is empowered to use a number of legal instruments to implement its proposals for land restructuring. These are:

- The right of temporary ownership through expropriation for the duration of the project implementation to perform its initiatives.
- The right of permanent expropriation, which grants Elyssar the same powers of expropriation as the Administration.
- The right to undertake land assembly and reparcellation for part of the whole area under its jurisdiction in accordance with the rules stipulated in the law concerning land assembly and reparcellation in inhabited areas.

The factors that will influence the selection of any of the above instruments to undertake Elyssar's planning actions are:

- The existing pattern of land ownership within the project and/or parts of it.
- The legal status of land occupation in the area under consideration.
- The master plan proposals concerning the area.

- The mechanism to be adopted for marketing Elyssar assets (lease, rental, or sale of dwellings, shops, and workshops).
- The implication of the selected instrument on Elyssar's cash flow, bearing in mind that the public agency is empowered to undertake commercial transactions to cover its expenses.

4.5.1.1.2 The Legal Status of Land Occupation and Development

Land in the Elyssar project area can be subdivided into 4 main categories with regard to the status of its occupation:

- Legally occupied land (either under private or government ownership), forming part of planned subdivisions, which is either legally developed or vacant.
- Legally occupied land developed without the benefit of an approved land subdivision.
- Unplanned and illegally occupied land developed, without the consent of its owners, by others who have no legal title over the land.
- Vacant and un-subdivided land under shared ownership.

4.5.1.2 Operational Framework

In order to achieve its objectives, Elyssar has to have clear policies regarding its relocation program for households and establishments. The development program has to be tailored to the needs and capacity of payment of its beneficiaries. Four themes related to relocation are discussed: (1) housing affordability and relocation issues to housing, (2) relocation issues related to establishments, (3) the definition of beneficiaries, and (4) the marketing of Elyssar properties.

4.5.1.2.1   Housing Affordability and Relocation Issues to Housing

The average size of dwellings in illegally occupied areas rounds to about 100 m². Rents paid average to around $100 per month per dwelling, accounting for about 22% of the overall household income. The amount could be raised only slightly, to around 25%.

An average apartment in a standard Elyssar low-cost housing development is expected to cost around $42,000 ($21,000 for superstructure, $3,500 for the provision of infrastructure, and $17,500 for land). The price is not affordable to the majority of households in the Elyssar area. Even with compensation of 30% of the apartments cost and a subsidized finance rate of 6% over 15 years, only 5% to 6% of households will be able to afford it. The amount of monthly rent likely to be afforded will not exceed an average of $105.

As for relocation issues related to housing, two factors are considered: (1) minimizing community disruption and safeguarding neighborhood ties, and (2) keeping the traditional proximity between workplace and dwelling for a sizeable portion of the households.

4.5.1.2.2   Relocation of Establishments

The average size of establishments is around 75 m². Workshops are about 15% larger on average. Based on average monthly sales ($4,100 for shops and $3,300 for workshops), around 7% of gross turnover is paid by establishment per rent giving an average monthly rent per establishment of around $265. Such levels of turnover indicate that around 75% of shops and 90% of workshops serve local catchments in the Elyssar area and cannot be dissociated from residential developments. Thus affordable rental in Elyssar low-cost housing areas for small retail establishments may be in the vicinity of $250 per month per shop on average or around 10% of average turnover while rentals for workshops may be around $340 per month per workshop or around 15% of average turnover. The average

cost has been estimated at around $15,000 per shop and $30,000 per workshop (including land, site preparation, infrastructure, and building costs).

4.5.1.2.3   The Definition of Beneficiaries

Two beneficiaries are identified: (1) Households, and (2) Establishments.

Households: All Lebanese households, which account for 82% of all households living in illegal housing areas or 11400 of 13900, living in the project area will be eligible to relocate in dwellings developed by Elyssar. The 2500 non-Lebanese households will be compensated by Elyssar to enable them to relocate elsewhere.

The selective policy for the allocation of dwellings to beneficiaries will be based on a balance between giving priority to the most needy (such as widows, large families and older households as well as to a heads of households whose work premises have been relocated within the Elyssar area) and to those who are most capable to pay, on the assumption that the poorer households will be more likely to be attracted by compensation in the form of cash payment.

For residents allocating outside the Elyssar area, a fair relocation allowance (compensation payment) will be needed to compensate for the difference between the low-cost housing rent in Elyssar premises and the cost of property on the commercial market.

Establishments: The selective policy that Elyssar will adopt to relocate establishments will be based on the following criteria:
- The type of establishment and the compatibility of its activities with permitted uses in the Elyssar developments.
- The willingness of the establishment to engage in an investment contract valid for a number of years (3 to 5 years).

- Acceptance of the fact that Elyssar has no responsibility whatsoever in the case of any loss incurred in business due to relocation.

4.5.1.2.4   The Marketing of Elyssar Assets

The key factor for marketing successfully the Elyssar assets will include: (1) rallying the public opinion around the benefits of the project, (2) managing land sales to maximize revenues, (3) convincing households and establishments to relocate to low-cost housing and workshop convincing households developments undertaken by Elyssar (by moving them to larger and better equipped dwellings, legalizing their tenancy, and keeping the same rent as the rent they were paying but increasing it by 10% for additional maintenance and 4% for annual inflation adjustment), and (4) convincing households and establishments that would not relocate within the Elyssar premises that the compensation proposed was fair.

4.5.1.3 The Regulatory Framework

The existing zoning regulations in the study area are the result of ad hoc planning rather than an overall attempt to rationalize land use and densities. They have been evolved gradually since 1950 and have been subject to several changes prompted by specific projects or parcellation layouts. The project area shares 2 types of zoning districts:
- Those that follow the zoning regulations of the municipality of Beirut (only 7%).
- Those that follow the zoning regulations of Beirut suburbs (majority of the project area).

The International Airport of Beirut imposes a number of restrictions on building in the study area. Some restrictions are related to the cone of flight of the existing western runway which incorporates a no building zone in some of the areas within Elyssar, and some other are related to the Radar of the airport, which limits the height of buildings. However, these restrictions will be subject to revisions due to some changes (such as the relocation of the western runway) that will affect the delimitation of zones, building

heights, and floor area ratios. These latter two can be increased once the restrictions are lifted.

4.5.2   Development Program and Phasing

The Elyssar development program includes several components:
- Clearance of illegal structures.
- Comprehensive development.
- Installation of new utilities infrastructure.
- Upgrading of existing infrastructure.
- Construction and Upgrade of major roads

Figure B.6 in Appendix B shows a graphical representation of the planned development components for different parts of the study area.

Clearance of structures built illegally on other owners land constitutes the most important element of the development program, being the major objective of Elyssar's strategy. Owners of illegally occupied structures will be compensated and the residents and tenants of the illegal structures will either be compensated to vacate and leave the study area or to relocate within the proposed development. The illegal structures will be gradually demolished and the sites cleared for permanent redevelopment in accordance with established regulatory procedures.

The comprehensive redevelopment will be promoted by Elyssar and will take place in a large scale in sharp contrast to private redevelopment projects. It will consist of building the superstructures related to low-cost housing; shops and commercial establishments, workshops, and public open spaces.

The installation of public utilities infrastructure (roads, water supply, sewage collection, Stormwater drainage collection, electricity supply, and telecommunications) will be promoted and coordinated by Elyssar, with private selected contractors or the relevant

authorities executing those works within their specific jurisdiction (e.g. EDL and MPT). Two types of areas will witness new infrastructure installation: (1) areas to be cleared from illegal occupation, and (2) areas that have not yet been developed or developed without proper infrastructure provision.

Upgrading of existing infrastructure will include the areas that are currently in the process of development but in which provision of infrastructure is not yet complete or up-to-date.

Other major works include the clearance of existing dumping grounds is some parts of the project area and the reclamation works to gain additional lands from the sea.

4.5.2.1 Factor Affecting the Phasing Program

A number of strategic factors influenced the phasing program:

- Availability of limited vacant land for immediate development implied that a very large part of the relocation program would be constructed on land currently illegally occupied. This would result in extensive delays involved in the slow process of 'construct-relocate-demolish-construct' and in relatively smaller housing construction packages.
- Pressures for the execution of strategic projects (major highway and a main sewerage line both running through the project area) and their interrelation.
- Completion of the Beirut International Airport Project.
- Availability of finance especially that the relocation and compensation program would require large budgets and at the same time public funds are very limited and are being competed upon by other projects.

4.5.2.2 The Relocation and Low-Cost Housing Program

The relocation program involves 7,400 households out of 13,900 or around 54% of households currently living in illegally occupied areas. The program is determined by a

combination of the size of the areas of undeveloped land available for immediate relocation, the speed of the construction process, the areas of illegally occupied land to be cleared prior to construction of low-cost housing, and the time taken in administrative procedures to settle complex matters of compensation.

The program is divided into four phases each comprised of two years for construction and one year for administrative procedures. The overall program takes 15 years for implementation, including design and planning.

Details of the proposed Elyssar phasing program for the benchmark scenario are given in Figure B.7 and Table B.1 in Appendix B.

4.5.3   Financial Analysis

Elyssar's consultants in association with Arthur D. Little International Inc carried a series of financial analyses. The scope of work entailed preparing a financial model to project cash flows and the financing needs that were to ensue in the course of project implementation. The model provided the facility of simulating a set of financial and development program parameters to determine their financial implications. The financial model was thus designed to serve as a decision making tool in the hands of planners and decision makers to assist in making policies and adopting the right technology for implementing the project.

4.5.3.1 Financial Model

The model extensively covered the financial elements of the action program planned for the whole of the Elyssar project area. Detailed cash flow statements that matched revenues and costs on a year-by-year basis were produced over a forecast span of 25 years. The model also produced a consolidated cash flow statement that gave the integrated picture of Elyssar's financial status at any point in time within the 25 year forecast period. This statement provided Elyssar with annual budget estimates for its

planned operations. It also indicated the level of external financing needed in each of the budget years.

The model also served to highlight the significant financial parameters and through sensitivity tests identified the uncertainties/changes that Elyssar was most vulnerable to and that consequently required special consideration.

4.5.3.2 Revenues and Basic Assumptions

Several revenue sources were identified and those considered practical, were included in the simulations. Other less likely sources, including taxation of land owners, or relocation premiums to be collected from re-housed tenants for the upgrade in living standards, were considered impractical and excluded.

In the financial simulations that were considered, the major proportion of revenue was generated by:

- The sale of land, and by
- Rentals collected from relocated tenants.

Other less important revenue sources included:

- The contribution by land owners to the costs incurred by Elyssar in clearing land before handing it back to its proprietors.
- Government and other contributions/subsidy.

In conjunction with validating the land use scheme, forecasts were made for land sale values and appreciation potential. The revenue assessment took into account expected developments in the various real estate sectors.

Rentals proposed were based mainly on an analysis of affordability for relocated households and establishments.

4.5.3.3 Costs and Basic Assumptions

The financial analysis considered all potential cost elements of the project. Estimates of these cost elements were prepared by the consultants (development costs) and by Elyssar (expropriation and compensation). Cost elements included in the forecast cash flows fall into 2 main categories:

4.5.3.3.1 Non-Administrative Costs

- Studies and pre-operating costs that comprise:
    - Pre-operating expenses of company setup, etc.
    - Cost of studies and supervision
    - Cost of engineering consulting
    - Cost of real-estate consulting

- Expropriation and compensation costs that comprise:
    - Money paid for owners of expropriated land
    - Compensation paid to building owners
    - Compensation paid to tenants
    - Compensation paid to involved intermediaries, if any

- Project execution/Development costs that comprise:
    - Reclamation
    - Demolition and site clearance
    - Site preparation
    - Infrastructure installation
    - Major infrastructure development
    - Infrastructure upgrade
    - Low-cost housing, shops, and workshops development
    - Execution management and supervision

4.5.3.3.2   **Administrative Costs**

     1. Project management

     2. Sales and marketing

     3. Maintenance and repair of low-cost housing

A 10% contingency allowance was added to forecast outflows to allow for unintentionally neglected costs and uncertainties.

All cost estimates were obtained for the first year (1996), and different inflation/escalation rates were applied to each cost element when extrapolating outflows in the future.

4.5.3.4 Results of the Cash Flow Analysis of the Target Scenario

Alternative scenarios were analyzed to simulate alternative courses of action (e.g. modes/timing of paying expropriation and phasing of infrastructure implementation). In total nine scenarios were investigated. The selected scenario is referred to as the "Target Scenario".

According to the consultants and Elyssar, the "Target Scenario" represents a balanced approach that coordinates the scheme of relocating illegal occupants, the program envisaged for infrastructure implementation, and the low cost housing program.

The consolidated cash flow can be summarized as follows:

- Project revenues totaling, $851 million by year 15, are not expected to cover project outflows, totaling $1,676 million by year 15.

- Except for years 5, 6 and 7 when land sale is expected to occur, Elyssar is expected to face annual deficits that range between $11 million and $132 million.

- The largest annual deficits are expected to occur in years 5, 8, 11 and 14 when the bulk of compensation payments associated with moving people are easy.

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- The cumulative deficit is expected to gradually build up its peak amount of around $760 million by year 15.

- Expropriations and compensations, $780 million in total, are expected to be the largest cost components, being larger than development costs at $462.5 million, accounting for roughly 28% of total outflow.

- Of revenues, land sale is the largest item at around 59% of total revenue up to year 15.

- Rent revenue, around $30 million per year at full capacity, is also an appreciable revenue source, especially as it represents a perpetually, recurring inflow item.

- At a discount rate of 12%, the projected cash flow has an estimated worth of around negative $342 million today.

The conclusion that was drawn after performing a set of sensitivity tests on a number of input variables such as development costs, land sale prices, compensation rates, expropriation rates, and rental rates, was that the project couldn't be self-financing. A cumulative deficit of about $825 million will have to be financed over the project span.

A cash flow statement representing the Target Scenario is presented in Table B.2, Appendix B.

Chapter 5 Financial Analysis of the Elyssar Case

5.1   Introduction

The analysis presented herein is based on the methodology described in Chapter 3, i.e. Net Present Value and Sensitivity Analysis. It aims at: (1) performing a financial analysis on each alternative scenario, (2) comparing scenarios, (3) identifying the basic or most critical parameters that the cash flow is sensitive to, and (4) evaluating the value of the proposed approaches.

The universe of information used to develop the alternative scenarios and to perform the financial analyses is initially presented. It includes: existing/surveyed data, baseline planning requirements, new estimated data, and method assumptions. The following sections describe and perform a financial analysis on each alternative. Five alternative scenarios are developed to reflect the factors of potential interest to the stakeholders. The first four scenarios are analyzed as if the public sector is implementing the project, whereas the fifth gives that role to the private sector. Finally, the results are summarized at the end of the chapter to better compare results and provide recommendations.

5.2   Database for Analysis

The database required to develop scenarios and perform the financial analysis can be grouped in four categories:

1. Existing information system, which includes socio-economic data and inventories in areas of illegal settlements. This information is usually obtained through actual field surveys and measurements. For the purpose of this research, the data collected by Elyssar will be used.

2. Elyssar planning requirements, which were generated for the initial planning phase in 1996. It mainly includes baseline land use and infrastructure data, which is then adjusted for inflation prior to utilization in this analysis.

3. Estimated data intended to fill the gap in Elyssar's initial database. This mainly includes current land prices, compensations costs, and areas for site preparation. Some of the data, such as current land costs, was estimated after conducting interviews with some of the Elyssar consultants, as well as some real estate consultants, and actual field surveys. Other information, such as areas that need site preparation, was estimated based on measurements conducted from existing Elyssar plans.

4. Assumptions on uniformity and homogeneity of the population involved in terms of social-cultural and religious trends and economic activity (same average income, same value of rentals paid, etc...), and values utilized in the financial analysis performed by Elyssar. In the latter type, values were assumed to be equal to those used by Elyssar. Such values include interests on expropriation bonds. They were used as initially planned by Elyssar without introducing any changes. Other similar assumptions include the legal, operational, and the regulatory frameworks that were adopted by Elyssar.

Following is a graphic illustration of some of the database presented.

Existing Information System

No. Of Illegal Dwellings per Locality (Section 4.4.1)	Socio-Economic Data (e.g. No. of households in study area, avg. income/month/hh, avg. rentals/month, (Section 4.4.2)

Elyssar Planning Requirements

Land Use Data (e.g. no. Of Low-Cost Units per Locality) (Section 4.4.6)	Transportation Data (e.g. Cost of New Road per Locality, Cost of Improved Roads per Locality) (Section 4.4.7)	Water and Irrigation Networks Data (e.g. Cost of Networks per Locality) (Section 4.4.8.1)	Sewerage Data (e.g. Cost of Network per Locality) (Section 4.4.8.2)	Storm-water Drainage Data (e.g. Cost of Storm-water Network per Locality) (Section 4.4.8.3)	Electricity Data (e.g. Power Cost per Locality) (Section 4.4.8.4)	Telecommunications Data (e.g. Cost of Telephone Network per Locality) (Section 4.4.8.5)

Estimated Data for this Analysis

Current Land Price per Locality	Expropriation Costs (in US/m^2) per Locality	Area of Land for Site Preparation per Locality

Method Assumptions

Uniformity and Homogeneity of Population	Unchanged Values (e.g. Interests on Expropriation Bonds)	Legal, Operational, and Regulatory Frameworks (Section 4.5.1)
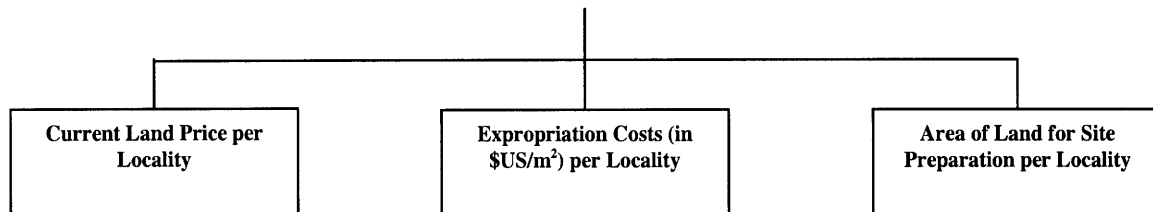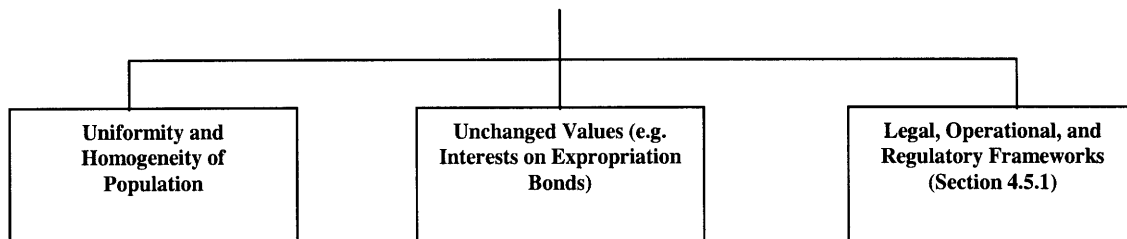
Figure 5.1Graphic Illustration of the data used

5.3 Alternative/Scenario Development

Three basic alternatives/scenarios have been developed and tested from the public sector viewpoint. In these scenarios, three main concepts are tested: pace (i.e. timeframe or project life cycle), timing of phases involving land sales, and selling of low-cost housing units and shops to non-relocated people. A combination of these three scenarios is also developed in a fourth scenario and a fifth scenario is developed to model the effect of the private sector (through public-private partnerships).

The following sections describe each scenario as developed by the author. A comprehensive description of all the values used in the analyses is given for Scenario 1. For Scenarios 2, 3, 4, and 5 only the values that differ from those used in Scenario 1 will be discussed, since they have the same basic assumption.

5.3.1 Scenario 1 (Pace)

The main aspect that this scenario investigates is pace. This scenario consists of 9 phases (each 3 years in average) spread over 25 years compared to the benchmark scenario, which consists of 4 phases spread over 14 years.

Besides the factors affecting the phasing program on the benchmark scenario (availability of vacant land for immediate development, pressure for the execution of strategic projects, completion of the Beirut International Airport Project, and the availability of finance), the phases were packaged so that the relocation distance would be minimal. Illegal settlers in a certain locality would be displaced to either a low-cost housing unit in the same locality or to another unit in the nearest locality planned for low-cost housing construction.

The phases were also developed locality-by-locality or part-by-part of a locality, if the locality was large and involved a lot of illegal resettlers. This was done to ensure minimal

disruption to socio-cultural networks of resettlers and to somehow preserve the identity of each locality. Table 5.1 shows some characteristics of the different phases of Scenario 1.

Table 5.1 Summary of the data needed in each phase for the financial analysis of Scenario 1

Phase		Al-Maramel 1	Al-Maramel 2	Ouzai 3	Raml AL-Ali 4	Horch Al-Katil 5	Horch Al-Katil 6	Sabra 7	Sabra 8	9
No. of years	24	2	3	3	3	3	3	3	3	1
No. of houses to be Constructed	9700	250	2175	925	850	1150	2050	1150	1150	0
No. of shops to be Constructed	1560	25	300	470	100	125	225	158	157	0
No. of workshops to be Constructed	875	80	320	265	0	50	50	55	55	0
No. of houses to be relocated	13930	345	3250	1250	1275	1605	3075	1590	1540	0
In Elyssar	9700	250	2175	925	850	1150	2050	1150	1150	0
Outside Elyssar	4230	95	1075	325	425	455	1025	440	390	0
No. of shops to be relocated	1520	40	420	110	150	150	260	193	197	0
In Elyssar	1060	25	300	70	100	125	225	158	57	0
Outside Elyssar	460	15	120	40	50	25	35	35	140	0
No. of workshops to be relocated	1690	185	600	265	50	130	95	105	260	0
In Elyssar	875	80	320	265	0	50	50	55	55	0
Outside Elyssar	815	105	280	0	50	80	45	50	205	0
No. of structures to be demolished	17140	0	570	4270	1625	1475	1885	3430	1888	1997
% Infrastructure completed		10%	90%	100%	100%	34%	66%	51%	49%	100%

Scenario 1 involves the relocation of 70% of the population to low-cost housing units within the Elyssar area, compared to the benchmark scenario developed by Elyssar, which relocates only 54% of the population to areas within the study region (see tables 5.2 and 5.3).

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Table 5.2 Summary of the number of dwellings relocated within the Elyssar boundaries

Housing Distribution				
	Existing[20]	2/3 of existing	Scenario 1 Proposal	Elyssar Proposal[21]
Hay Al-Zahra	1025	683	700	0
Jnah	2615	1743	1850	0
Ouzai	4500	3000	3100	925
Al-Maramel	345	230	250	2425
Horch Al-Katil	2880	1920	2000	3200
Sabra	2565	1710	1800	2300 (non-relocated)
Raml Al-Ali	0	0	0	850
Total	**13930**	**9287**	**9700**	**9700**
			70%	54%

Table 5.3 Summary of the number of shops relocated within the Elyssar boundaries

Shops				
	Existing[22]	2/3 of existing	Scenario 1 Proposal	Elyssar Proposal[23]
Hay Al-Zahra	155	103	110	0
Jnah	310	207	215	0
Ouzai	445	297	305	470
Al-Maramel	125	83	90	325
Horch Al-Katil	255	170	180	350
Sabra	230	153	160	315
Raml Al-Ali	0	0	0	100
Total	**1520**	**1013**	**1060**	**1560**
			70%	

[20] Source: "Planning and Development of the Southwestern Suburbs of Beirut" Master Plan.
[21] See Source 20.
[22] See Source 20.
[23] See Source 20.

Table 5.4 Summary of the number of workshops that are relocated within the Elyssar boundaries

Workshops	Existing[24]	2/3 of existing	Scenario 1 Proposal	Elyssar Proposal[25]
Hay Al-Zahra	60	40	35	0
Jnah	400	267	220	0
Ouzai	600	400	320	265
Al-Maramel	185	123	80	400
Horch Al-Katil	270	180	140	100
Sabra	175	117	80	110
Raml Al-Ali	0	0	0	0
Total	**1690**	**1127**	**875**	**875**
			52%	

5.3.1.1 Revenues and Basic Assumptions

The revenue sources assumed in Scenario 1 are the same practical sources that were used in the benchmark scenario and that have considerable significance in the cash flow statement. Other less likely sources, such as taxation of landowners, were not considered for the analysis since the benchmark scenario excluded them and considered them as impractical and insignificant for the cash flow analysis.

As the benchmark scenario, the major proportion of revenue is generated by sale of land and by rentals collected from relocated tenants.

Sale of land is considered in the same areas delineated for land sale in the benchmark scenario but is assumed to occur proportionally to the percentage of demolished structures in the corresponding localities. Conservative values for land sales were used in the analysis based on interviews and field surveys conducted in the month of January 2001 (see Table 5.5).

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[24] See Source 20.
[25] See Source 20.

Table 5.5 Summary of Land Costs per Locality

Locality	Today's Approx. Land Value (US$/m2)	Area Sold (m²)	Land Sale (US$)
Ouzai	$450	185000	$83,250,000
Al-Maramel	$300	0	$0
Golf Club	$750	0	$0
Jnah	$900	410000	$369,000,000
Bir Hassan	$400	0	$0
Horch Al-Katil	$250	0	$0
Sabra	$250	0	$0
Hay Al-Zahra	$200	178500	$35,700,000
Raml Al-Ali	$300	20000	$6,000,000
Total		**793500**	**$493,950,000**

Rentals collection of the low-cost housing units, shops, and workshops constructed is assumed to occur in the years following their construction. Rentals proposed for low-cost housing are based on the analysis of affordability for relocated households and establishments, and average (US$105 per month), the rent they were paying at the time the study was conducted, but increased by 10% for maintenance. As for the shops, the value used is US$250 per month and for workshops US$340 per month.

After the 25th year, no sale of land occurs and the rental value becomes constant except that it is adjusted for annual inflation.

The "Contribution of Owners to Land Clearance" before handling it back to its proprietors, which is a less significant parameter, is assumed as a constant value, approximately equal to that considered in the benchmark scenario, and is distributed proportionally to the number of demolished structures in each year.

Table 5.6 Summary of some of the revenue sources assumed in the financial analysis of Scenario 1

Variation of rent from planned rent	0%
Current Avg. Rental per month	$105
Affordable Avg. Rental for housing per month	$116
Affordable Avg. Rental for housing per year	$1,386
Affordable Avg. Rental for shops per month	$250
Affordable Avg. Rental for shops per year	$3,000
Affordable Avg. Rental for workshops per month	$340
Affordable Avg. Rental for workshops per year	$4,080
Percentage increase in rent for maintenance in 1st year	10.0%
Inflation Rate	4.0%
Total Contribution of Owner to Land Clearance	$13,000,000

The inflation rate that was used in the financial analysis of all scenarios was assumed to be 4% (an average of the increase in the last 5 years). Figure 5.2 is a graphical representation of the increase in inflation rate per quarter. It can be observed that huge increases in inflation rate occurred between 1993 and 1997 whereas it remained somehow constant between 1998 and 2000. Deflation occurred in the first quarter of 2001.
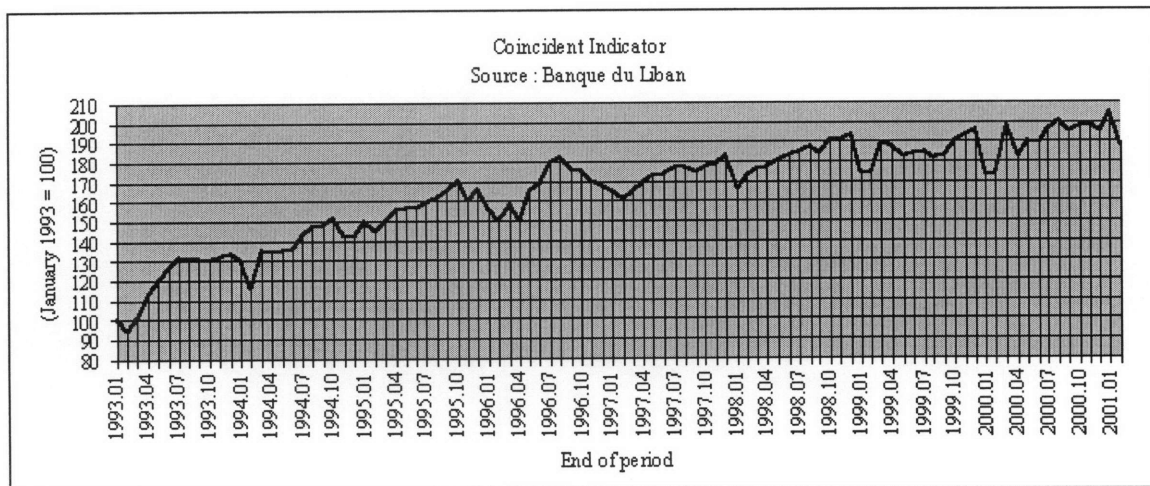
Figure 5.2 Graphical representation of the variation in inflation rate between 1993 and 2001[26]

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[26] Source: Banque du Liban-Central Bank of Lebanon.

5.3.1.2 Costs and Basic Assumptions

The financial analysis considers most potential cost elements of the project. As in the benchmark scenario, cost elements included in scenario 1 fall into 2 main categories: Non-Administrative and Administrative Costs. Basically, the same elements or cost parameters were used in the financial analysis as the benchmark scenario. The different assumptions that were used are discussed next.

5.3.1.2.1 Non-Administrative Costs

The pre-construction or design costs were all assumed as a percentage of the total project execution cost (4% in Scenario 1) and were distributed among the first 4 years of the project timeframe in the following manner:

- 50% in the 1st year
- 25% in the 2nd year, and
- 12.5% in the 3rd and 4th years

The costs used for land expropriation are assumed based on field surveys and interviews conducted in the month of January 2001 (see Table 5.7). No costs for temporary expropriation were incurred in the analysis.

Table 5.7 Summary of Expropriation Costs per Locality

Locality	Expropriation (US$/m2)			Area to be Expropriated (m2)	Expropriation Cost (US$)
	Lower limit	Upper limit	Average		
Ouzai	$200	$425	$313	150000	$46,875,000
Al-Maramel	$135	$300	$218	225000	$48,937,500
Golf Club	$0	$0	$0	0	$0
Jnah	$200	$425	$313	0	$0
Bir Hassan	$0	$0	$0	0	$0
Horch Al-Katil	$300	$400	$350	0	$0
Sabra	$250	$400	$325	0	$0
Hay Al-Zahra	$200	$425	$313	22500	$7,031,250
Raml Al-Ali	$200	$425	$313	0	$0
Total				397500	$102,843,750

Total building owners compensation cost was assumed as a constant cost approximately equal to the deflated value of the total building owners compensation cost in the benchmark scenario. Building owners compensation cost per year was assumed to occur proportionally to the number of relocated units in the corresponding year.

Compensation paid to tenants was assumed to be US$15,000, approximately a third of the cost of a US$40,000-US$45,000 low-cost dwelling in low-end neighborhoods of Beirut's suburbs.

For shops and workshops, a relocation allowance of US$35,000 is assumed per establishment, as in the benchmark scenario.

The cost of demolition and site clearance is assumed to be US$700 per unit, where units include dwellings, shops, and workshops. This cost was estimated by deflating the costs of demolition incurred in the benchmark scenario and then dividing the total demolition cost by the number of units demolished.

Similarly, the same procedure was applied for site preparation but the deflated total cost of site preparation in the benchmark scenario was divided by the total assumed area for site preparation instead of the total number of units. In both cases, the deflation rate used was 4%.

Infrastructure, which includes water and irrigation systems, sewerage, drainage systems, electricity and public lighting, telecommunication, and other controls, was calculated as a total cost for each locality and the cost spent in each year was sometimes assumed proportional to the number of low-cost dwellings constructed if there any or otherwise assumed proportional to the number of dwellings demolished. Table 5.8 shows the costs per locality for infrastructure provision and site preparation.

Table 5.8 Summary of the Costs of Infrastructure and Controls, and Costs of Site Preparation per Locality

Locality	Cost of Infrastructure[27]	Extra Costs Of Controls[28]	Extra costs of Pumps & well[29]	Area of Locality (m²)	Area of Intervention (m2)	% Of Area for Site-Preparation	Area for Site-Preparation (m2)
Ouzai	$20,492,538	$50,344	$4,111,111	650000	650000	100%	650000
Al-Maramel	$8,699,159	$50,344	$4,111,111	375000	360000	100%	360000
Golf Club	$3,885,546	$50,344	$4,111,111	550000	200000	0%	0
Jnah	$10,468,945	$50,344	$4,111,111	670000	570000	100%	570000
Bir Hassan	$5,985,588	$50,344	$4,111,111	300000	300000	0%	0
Horch Al-Katil	$16,974,868	$50,344	$4,111,111	840000	840000	50%	420000
Sabra	$15,352,378	$50,344	$4,111,111	870000	840000	50%	420000
Hay Al-Zahra	$9,770,411	$50,344	$4,111,111	600000	600000	35%	210000
Raml Al-Ali	$8,980,906	$50,344	$4,111,111	375000	280000	35%	98000
Total	**$100,610,338**	**$453,095**	**$37,000,000**	**5230000**	**4640000**		**2728000**

The cost of construction of each of the low-cost houses, shops, and workshops was calculated in the same way as demolition was calculated (i.e. total deflated cost incurred for each of the low-cost houses, shops, and workshops divided by the total number of low-cost houses, shops, and workshops correspondingly).

Execution and management of the above elements was assumed as a percentage of each of the above project execution costs and was included in each of these cost elements.

5.3.1.2.2   Administrative Costs

Project management and administration cost was assumed as a percentage of the total project execution cost. Similarly sales and marketing was assumed in the same way. Maintenance and repair of low-cost housing was assumed as a percentage of the rentals paid each year (10% of rentals).

The interest on expropriation bonds was assumed to be exactly the same value as in the benchmark scenario and distributed over the same period of years.

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[27] See Source 20.
[28] See Source 20.
[29] See Source 20.

The contingency allowance was assumed to be 10% of the total of the expropriation and compensation, project execution, and project administration and operating costs in each year.

Table 5.9 Demolition, Site Preparation, and Construction Costs

No. Of Structure to be Demolished	17,140
Unit Cost of Demolition (US$ per Structure)	$700
Area for Site Preparation (m2)	2,728,000
Unit Cost of Site Preparation (US$/m2)	$13
Cost of Housing Construction (US$/unit)	$20,000
Cost of Shop Construction (US$/unit)	$5,000
Cost of Workshop Construction (US$/unit)	$8,500

Table 5.10 Compensation, Administrative, and Pre-Construction Costs

Building Owners Compensation	$135,000,000
Compensation per dwelling located outside Elyssar (US$)	$15,000
Compensation per shop located outside Elyssar (US$)	$35,000
Compensation per workshop located outside Elyssar (US$)	$35,000
Years to complete project	25
Project Mngt & Admin. Cost as % of Total Const. Cost	4.5%
Sales & Marketing as % of Total Const. Cost	1.5%
Increase in O&M per Year	4.0%
Contingency as % of all Costs except Design	10.0%
Planning and Design (as % of Project Execution)	$15,790,517

5.3.1.3 Financial Analysis

A financial analysis was conducted on Scenario 1 using the NPV method described in Chapter 3. The Discount Rate (DR) that was used was similar to that used by the Elyssar consultants in the benchmark Scenario (i.e. 12%), simply to enable comparison between scenarios. Evaluation of the DR value used will not be discussed in this research.

The consolidated cash flow statement is shown in Table C.1 in Appendix C and it can be summarized as follows:

- Project Revenues totaling US$1,555 million by year 2024 compared to project costs totaling US$2,149 million.

- Except for years 18, 21, and 24 when major land sales are expected to occur, Elyssar is expected to face annual deficits that range between US$8 million and US$147.5 million. The first value is less than the one that occurs in the benchmark scenario (US$11 million) whereas the second is higher.

- The largest annual deficits are expected to occur in years 3, 6, 9, 12, and 15, when the bulk of compensation payments associated with moving people are paid and no major land sales occur simultaneously.

- The cumulative deficit is expected to gradually build up to its peak amount of around US$971 million by year 17. Thereafter, it starts dropping gradually to end up around US$595 million by year 24 (see figure 5.3).
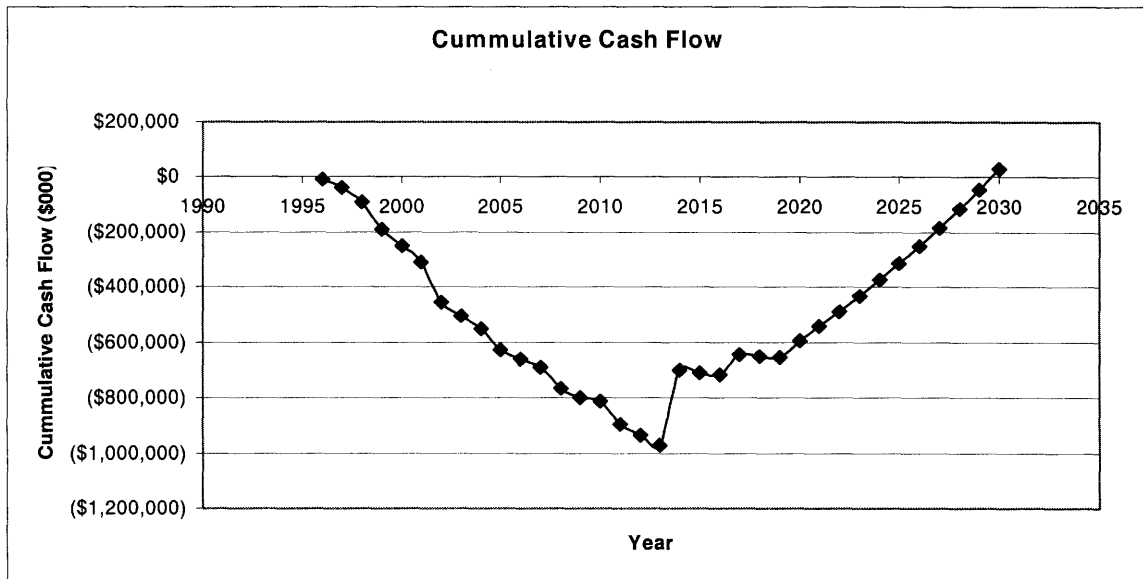
Figure 5.3 Cumulative Cash Flow for a 35-Year Analysis of Scenario 1

- Expropriations and compensation, US$939 million in total, are expected to be the largest cost components, being larger than development costs at US$679 million, which accounts for roughly 32% of total outflow.

- Of revenues, land sale, totaling around US$1,011 million, is the largest component at around 65% of total revenues up to year 24.

- Rent revenues, around US$56 million (2020 values) per year at full capacity, is also an appreciable revenue source, especially as it represents a perpetually, recurring inflow component.

- At a DR of 12%, the project cash flow has an estimated NPV of negative US$352 million for a 25-year analysis and negative US$332 million for a 35-year analysis. To compare the NPV results of Scenario 1 to those of the benchmark scenario, the NPV values were transformed into annuities. The annual worth for a 25-year analysis of Scenario 1 is around US$45 million compared to US$58.5 million for the benchmark scenario. Hence Scenario 1 is economically better than the benchmark scenario.

- The IRR of the project is never zero, thus whatever DR used the project will not yield a positive NPV for Scenario 1.

5.3.1.4 Sensitivity Analysis

A set of sensitivity tests was performed on the financial model. A number of tables and graphs illustrating the variation of the NVP with several input parameters are presented in Appendix C. Table 5.11 shows the percentage variation in NPV for a 10% increase and a 10% decrease in each of the following variables over a 25-year analysis: Discount Rate, Inflation Rate, Cost of Demolition per Structure, Cost of Site Preparation per Square Meter, Cost of Structure Construction, Rentals, Contribution of Owners, Compensations, Project Management and Administration, Sales and Marketing, Contingency, Design, and Land Sales.

Table 5.11 Percentage Variation of NPV with a Number of Input Variables for a 25-Year Analysis

% Change of Variable	Variable	NPV	% Change of NPV
	DR (25 years)	($352,085)	
10%	13.20%	($331,627)	-5.81%
-10%	10.80%	($373,919)	6.20%
	Inflation Rate	($352,085)	
10%	4.40%	($355,871)	1.08%
-10%	3.60%	($348,304)	-1.07%
	Cost of Demolition/Structure	($352,085)	
10%	$770	($352,626)	0.15%
-10%	$630	($351,544)	-0.15%
	Cost of Site Prep. /m^2	($352,085)	
10%	$14	($353,764)	0.48%
-10%	$12	($350,793)	-0.37%
	Cost of Structure Constr.	($352,085)	
10%	10%	($362,366)	2.92%
-10%	-10%	($341,804)	-2.92%
	Rentals	($352,085)	
10%	10%	($345,435)	-1.89%
-10%	-10%	($358,735)	1.89%
	Contrib. Of Owners	($352,085)	
10%	$14,300,000	($351,593)	-0.14%
-10%	$11,700,000	($352,576)	0.14%
	All Compensations	($352,085)	
10%	10%	($370,389)	5.20%
-10%	-10%	($333,780)	-5.20%
	Project Mngt. $ Admin.	($352,085)	
10%	4.95%	($352,847)	0.22%
-10%	4.05%	($351,323)	-0.22%
	Sales & Marketing	($352,085)	
10%	1.65%	($352,339)	0.07%
-10%	1.35%	($351,831)	-0.07%
	Contingency	($352,085)	
10%	11.00%	($356,089)	1.14%
-10%	9.00%	($348,081)	-1.14%
	Design	($352,085)	
10%	4.40%	($353,371)	0.37%
-10%	3.60%	($350,799)	-0.37%
	Land Sales	($352,085)	
10%	10%	($338,797)	3.77%
-10%	-10%	($365,373)	-3.77%

Since the rate of change of the NPV within the range considered (between 10% increase and 10% decrease of the given value of 12%) can be assumed to be monotonously

increasing with respect to the DR (see figures 5.4 and 5.5), it can be concluded that the NPV is most sensitive to the DR value for a 25-year analysis of Scenario 1.

Another issue to be considered is the increase of NPV with increasing DR. The reason for this is that the cash flow is mostly dominated by costs, which are not matched by any significant amount of revenues. Considerable revenues come only later in the analysis thus not affecting much the NPV when discounted. So discounting the high costs initially at a higher DR would give a lower NPV than discounting it at a lower DR (figure 5.6) and this is why the NPV increases with an increased DR (figures 5.4 and 5.5). From these graphs and results, the use of a lower NPV for cash flows that have their revenues at a later stage is justified.

The curves in figures 5.4 and 5.5 keep increasing asymptotically to zero but never get positive. In order to improve the cash flow, other sources of funding need to be looked at in order to increase initial revenues; grants, soft loans, taxes and levies collection, and subsidies and cross-subsidies.
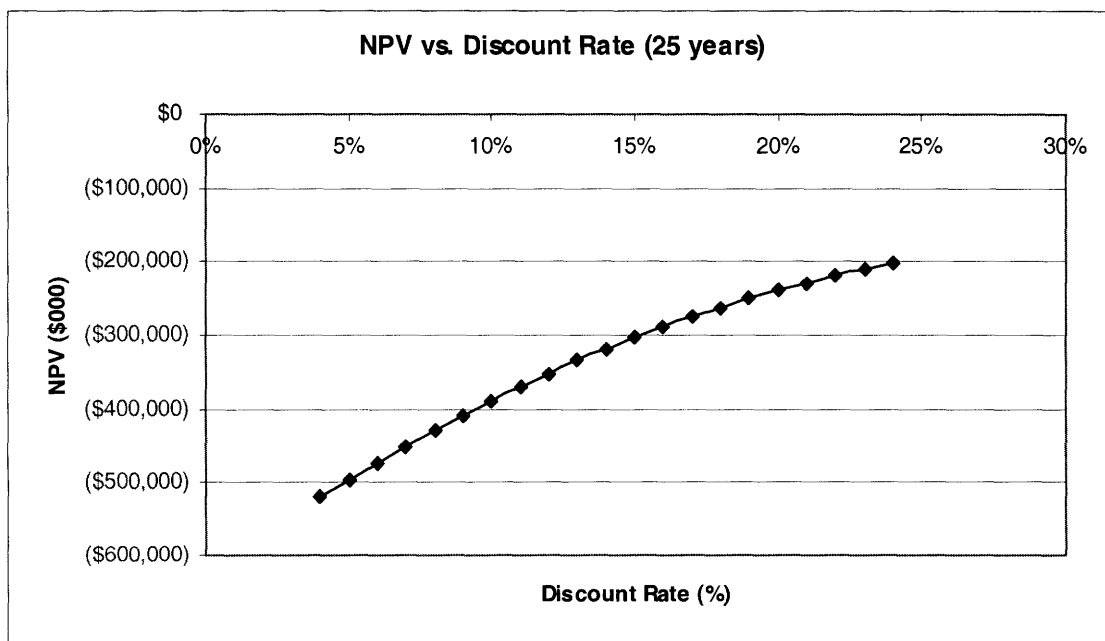

Figure 5.4 Variation of NPV with DR for a 25-Year Analysis

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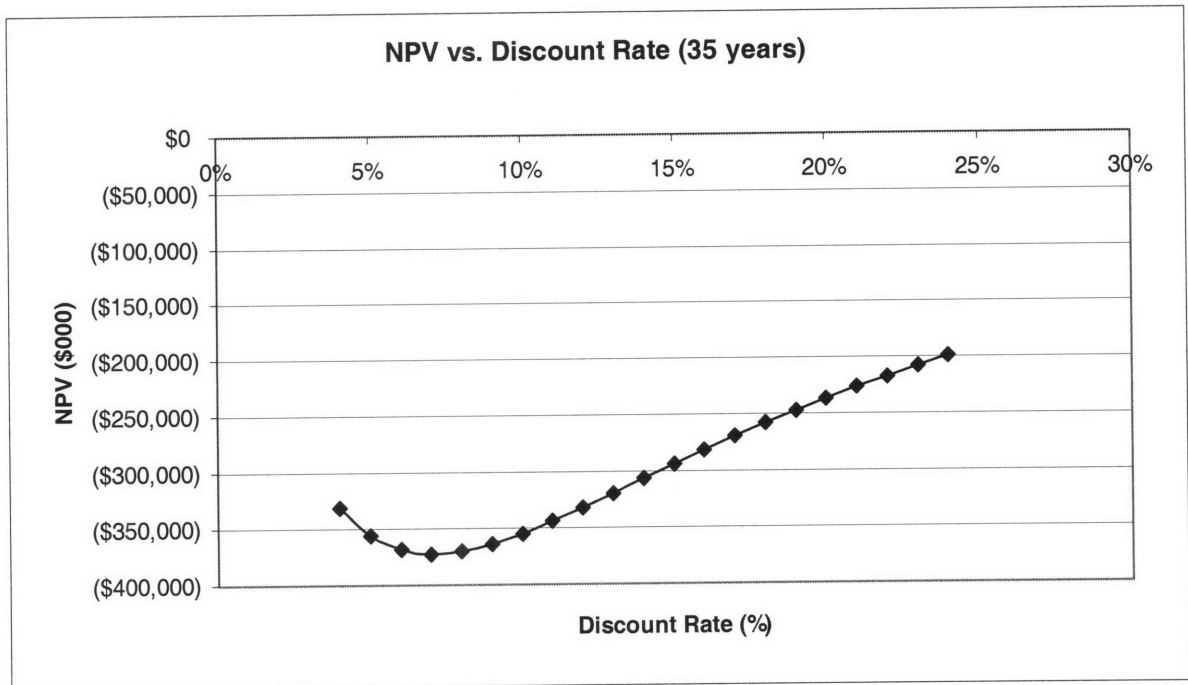
**Figure 5.5 Variation of NPV with DR for a 35-Year Analysis**
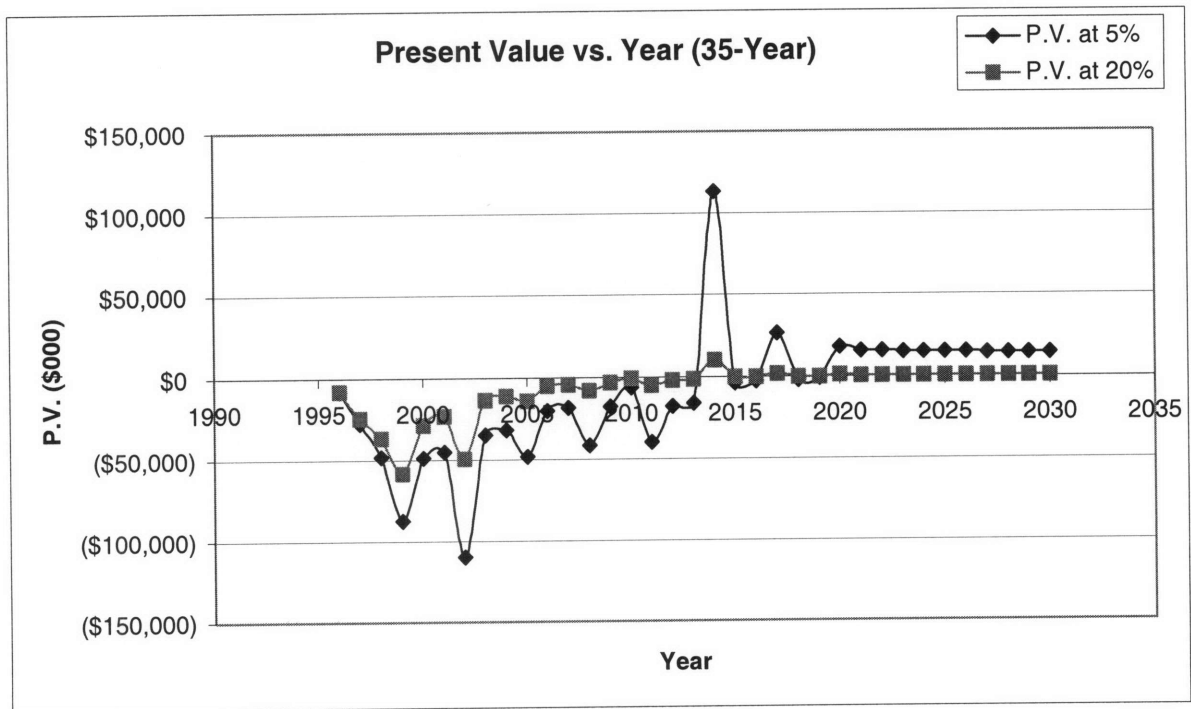
Figure 5.6 Present Value of the Cash Flow at each Period when Discounted at 5% and 20%

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The second most sensitive variable is the value of the compensations paid. The values used in the analysis are the minimum acceptable and cannot be lowered any further. Besides recent news indicate that the population involved is demanding increased values of compensation. Thus more sources of revenues and subsidies should be explored as discussed earlier.

In descending order of effect on the cash flow, considered changes could be ranked as follows:

1. Discount Rate (Largest effect)
2. Expropriation and Compensation Rates
3. Land Sales
4. Development Costs
5. Rentals
6. Contingencies
7. Inflation Rate

Other variables are less significant.

The 35-year analysis of Scenario 1 resembles that of the 25-year analysis except that Expropriation and Compensations Rate becomes the variable that the NPV is most sensitive to, followed by the DR.

The percentage variation in NPV value with respect to these variables for a 35-year analysis is shown in Table C.2 in Appendix C. Tables and figures depicting the variation of the NPV with different input variable for Scenario 1 are also presented in Appendix C.

5.3.2   Scenario 2 (Earlier Land Sales)

The main aspect that this scenario investigates is early land sales. The project starts with the phases that allow for early land sales of some of the most strategic areas that have high demand especially from the private sector demand. Most of these areas include beachfronts that have attractive and high investment opportunities.

As discussed earlier, most of the developed scenarios will have the same basic assumptions as Scenario 1. Scenario 2 has the same assumptions for revenues and costs as Scenario 1, and the same regulatory, operational, and legal frameworks apply.

Scenarios 1 and 2 have the same phasing (9 phases each) but they differ in that some phases, which occur late in Scenario 1, occur earlier in Scenario 2. More specifically, phases 4, 5, 6, 7, and 8 in Scenario 1 become phases 1, 2, 3, 4, and 5 in Scenario 2. Phases 1, 2, and 3 in Scenario 1 become phases 6, 7, and 8 in Scenario 2. Table 5.12 shows some characteristics of the different phases of Scenario 2.

Table 5.12 Summary of the data needed in each phase for the financial analysis of Scenario 2

		Raml AL-Ali	Horch Al-Katil	Horch Al-Katil	Sabra	Sabra	Al-Maramel	Al-Maramel	Ouzai	
Phase		1	2	3	4	5	6	7	8	9
No. of years	24	3	3	3	3	3	2	3	3	1
No. of houses to be Constructed	9700	850	1150	2050	1150	1150	250	2175	925	0
No. of shops to be Constructed	1560	100	125	225	158	158	25	300	470	0
No. of workshops to be Constructed	875	0	50	50	55	55	80	320	265	0
No. of houses to be relocated	13930	1275	1605	3075	1590	1540	345	3250	1250	0
In Elyssar	9700	850	1150	2050	1150	1150	250	2175	925	0
Outside Elyssar	4230	425	455	1025	440	390	95	1075	325	0
No. of shops to be relocated	1520	150	150	260	193	197	40	420	110	0
In Elyssar	1060	100	125	225	158	57	25	300	70	0
Outside Elyssar	460	50	25	35	35	140	15	120	40	0
No. of workshops to be relocated	1690	50	130	95	105	260	185	600	265	0
In Elyssar	875	0	50	50	55	55	80	320	265	0
Outside Elyssar	815	50	80	45	50	205	105	280	0	0
No. of structures to be demolished	17140	50	80	45	50	205	105	280	0	0
% Infrastructure completed		100%	34%	66%	51%	49%	10%	90%	100%	100%

The disadvantage of Scenario 2 is that vacant areas are not used efficiently from the start of the project. Instead Phase 1 starts with a small vacant area and proceeds to implement the following phases, which permit early land sale of beachfront areas earmarked for sale to the private sector.

5.3.2.1 Financial Analysis

As Scenario 1, a financial analysis was conducted on Scenario 2 using the NPV method and a DR of 12%. The consolidated cash flow statement is shown in Table C.9 in Appendix C and it can be summarized as follows:

- Project Revenues totaling US$1,308 million by year 2024 compared to project costs totaling US$2,077 million.

- Except for year 10, 13, 16, and 17 when major land sales are expected to occur, Elyssar is expected to face annual deficits that range between US$8 million and US$240 million. The second value is considerably larger than that of the benchmark scenario and that of Scenario 1.

- The largest annual deficits are expected to occur in years 3, 6, 9, 12, 15, and 18 when the bulk of compensation payments associated with moving people are paid and no major land sales occur simultaneously.

- The cumulative deficit is expected to gradually build up until year 9 where it drops due to land sales. Fluctuations in cumulative deficit occur between years 9 and 17. After that the deficit gradually increases again until it reaches its peak amount in year 24, which is around US$770 million. Thereafter, it starts dropping gradually to end up around US$145 million by year 34 (see figure 5.7).

- Expropriations and compensation, US$908 million in total, are expected to be the largest cost components, being larger than development costs at US$655 million, which accounts for roughly 32% of total outflow.

- Of revenues, land sale, totaling around US$852 million, is the largest component at around 65% of total revenues up to year 24.

- Rent revenues, around US$56 million (2020 values) per year at full capacity, is also an appreciable revenue source.

- At a DR of 12%, the project cash flow has an estimated NPV of negative US$319 million for a 25-year analysis and negative US$299 million for a 35-year analysis. The annual worth for a 25-year analysis of Scenario 2 is around US$41 million compared to US$58.5 million for the benchmark scenario and US$45 million for

Scenario 1. Hence Scenario 2 is economically better than the benchmark scenario and Scenario 1.
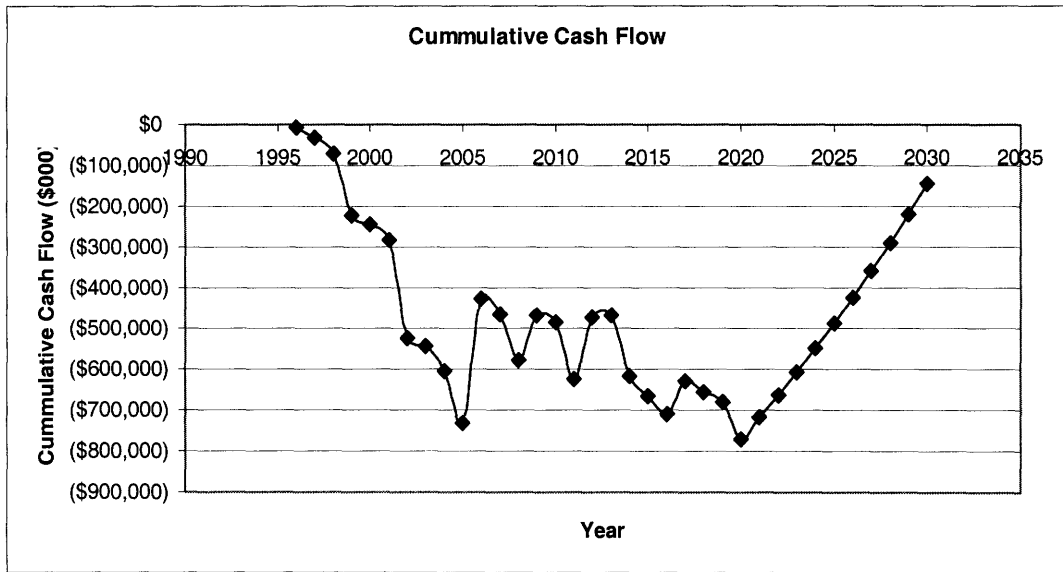
Figure 5.7 Cumulative Cash Flow for a 35-Year Analysis of Scenario 2

5.3.2.2 Sensitivity Analysis

A set of sensitivity tests was also performed for Scenario 2. Table 5.13 shows the percentage variation in NPV for a 10% increase and a 10% decrease in the same variables used for sensitivity analysis in Scenario 1 over a 25-years analysis.

Table 5.13 Percentage Variation of NPV with a Number of Input Variables for a 25-Year Analysis

% Change of Variable	Variable	NPV	% Change of NPV
	DR (25 years)	($319,302)	
10%	13.20%	($299,881)	-6.08%
-10%	10.80%	($340,950)	6.78%
	Inflation Rate	($319,302)	
10%	4.40%	($323,036)	1.17%
-10%	3.60%	($315,684)	-1.13%
	Cost of Demolition/Structure	($319,302)	
10%	$770	($319,815)	0.16%
-10%	$630	($318,788)	-0.16%
	Cost of Site Prep. /m2	($319,302)	
10%	$14	($320,871)	0.49%
-10%	$12	($318,095)	-0.38%
	Cost of Structure Constr.	($319,302)	
10%	10%	($329,264)	3.12%
-10%	-10%	($309,340)	-3.12%
	Rentals	($319,302)	
10%	10%	($314,228)	-1.59%
-10%	-10%	($324,375)	1.59%
	Contrib. Of Owners	($319,302)	
10%	$14,300,000	($318,845)	0.02%
-10%	$11,700,000	($319,759)	0.14%
	All Compensations	($319,302)	
10%	10%	($338,493)	6.01%
-10%	-10%	($300,111)	-6.01%
	Project Mngt. $ Admin.	($319,302)	
10%	4.95%	($319,975)	0.21%
-10%	4.05%	($318,628)	-0.21%
	Sales & Marketing	($319,302)	
10%	1.65%	($319,526)	0.07%
-10%	1.35%	($319,077)	-0.07%
	Contingency	($319,302)	
10%	11.00%	($323,180)	1.21%
-10%	9.00%	($315,424)	-1.21%
	Design	($319,302)	
10%	4.40%	($320,587)	0.40%
-10%	3.60%	($318,016)	-0.40%
	Land Sales	($319,302)	
10%	10%	($302,314)	5.32%
-10%	-10%	($336,290)	-5.32%

As in Scenario 1, the variation on the cash flow, as depicted by the percentage change in NPV, was most significant to the change in DR, if it is assumed that the rate of change of the NPV is monotonously increasing with increasing DR for the specified range (figures

5.8 and 5.9). This shows that even though considerable land sales occur earlier in the project (at year 10), hence more revenues occurring earlier in the cash flow, these values are still insignificant when discounted on such values of DR close to 12%. Figure 5.10 also shows the present value at each period when a DR of 5% and 20% are used. The occurrence of significant revenues at a later stage in the cash flow as depicted in figure 5.10 and as discussed earlier would not have much effect on the NPV when discounted, and this is the reason again why discounting at a higher DR would give a better or higher NPV.
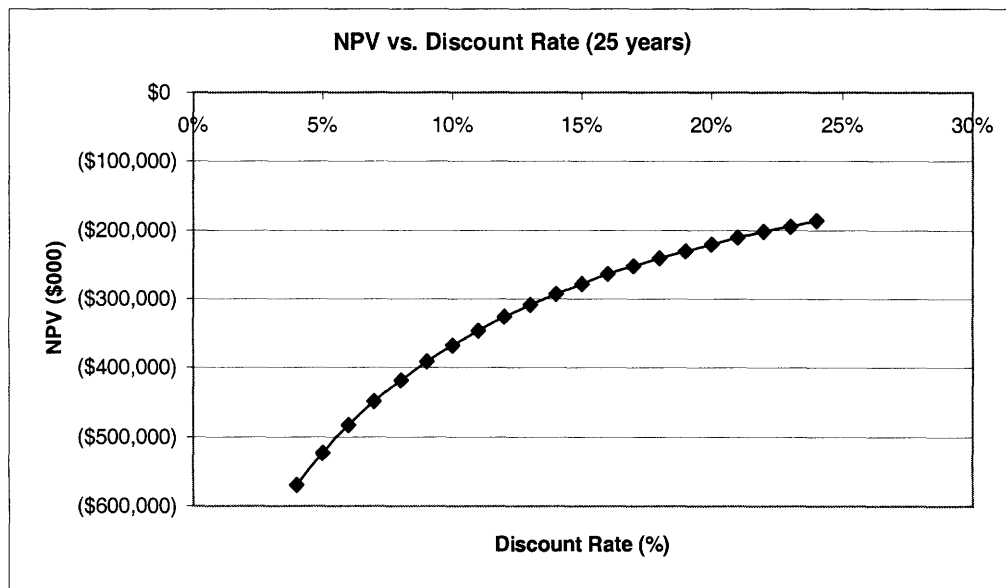
Figure 5.8 Variation of NPV with DR for a 25-Year Analysis
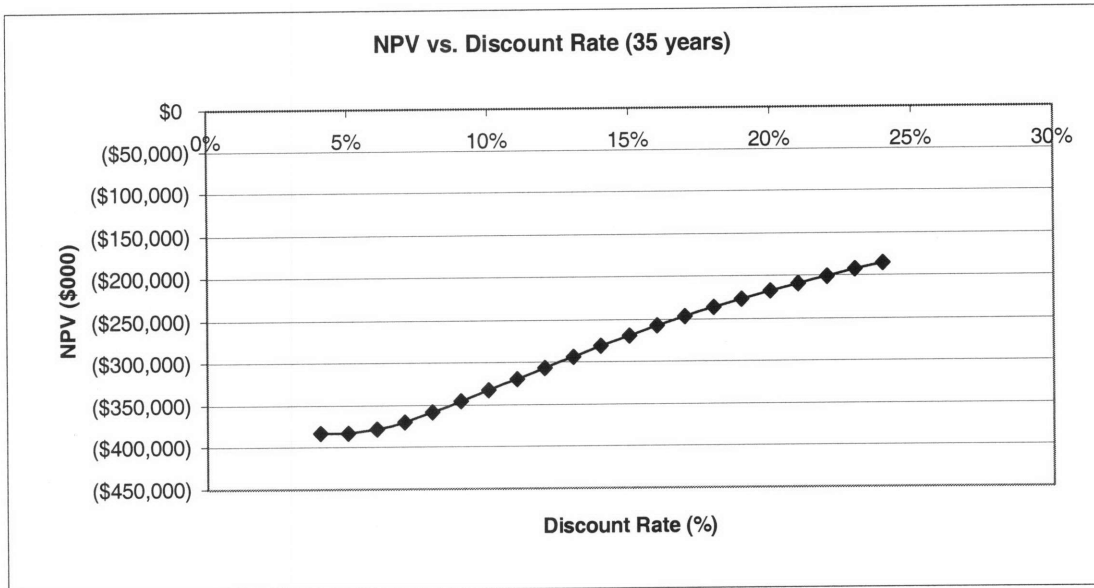
Figure 5.9 Variation of NPV with DR for a 35-Year Analysis
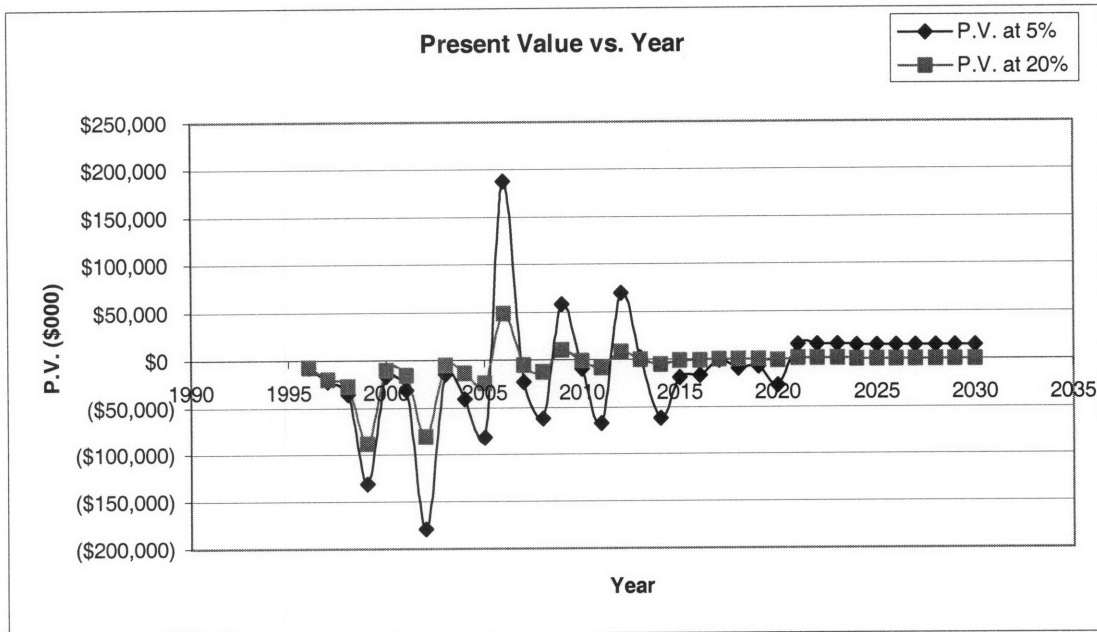
Figure 5.10 Present Value of the Cash Flow at each Period when Discounted at 5% and 20%

The ranking of the significant variables in descending order is similar to that of Scenario 1:

1. Discount Rate (Largest effect)
2. Expropriation and Compensation Rates
3. Land Sales

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4. Development Costs

5. Rentals

6. Contingencies

7. Inflation Rate

The 35-year analysis of Scenario 2 yields quite a different ranking for the variables. In this case, the NPV of the project is most sensitive to the Expropriation and Compensation rates followed by Land Sales. DR comes third in descending order of sensitivity. The ranking of the rest of the variables is the same as before.

The percentage variation in NPV value with respect to these input variables for a 35-year analysis is shown in Table C.10 in Appendix C. Based on the NPV value and ignoring the financial structure of the cash flow, Scenario 2 is favored over Scenario 1.

5.3.3 Scenario 3 (Sale of Low-Cost Housing Units and Shops)

Scenario 3 investigates the effect of selling low-cost housing units and shops on the NPV of the project. The assumption is that most likely, the people in the Elyssar area will not be able to buy any of these low-cost housing units and shops, thus people from outside the Elyssar area will be willing to do that and consequently the number of relocated people in the Elyssar region will decrease. From this assumption, it turned out in the analysis of Scenario 3 that around 53% of the resettlers could be accommodated by the Elyssar developments in comparison to 70% in Scenarios 1 and 2. The 53% is almost equal to the planned value (54%) by the Elyssar consultants. This is the main disadvantage of Scenario 3. According to World Bank and other multinational and bilateral funding agencies, this percentage is somewhat lower than the minimum required.

The other assumptions in Scenario 3 are similar to those explained in Scenario 1 (basic revenue assumption and basic cost assumption: administrative and non-administrative). The same regulatory, operational, and legal frameworks also apply.

Scenario 3 has the same phasing (9 phases) as Scenario 1. The differences are the following:

- 400 shops are sold in phase 3, and 100 in phase 8.
- 2300 low-cost housing units are sold in phases 7, 8, and 9.
- Some changes in the land sales occur since in phases 7 and 8 all the people to be resettled would have been resettled. This means that the beachfronts and some other areas would have been freed for sale slightly earlier than in Scenario 1 (in phases 7 and 8 instead of in phases 7, 8, and 9).

Table 5.14 shows some characteristics of the different phases of Scenario 3.

Table 5.14 Summary of the data needed in each phase for the financial analysis of Scenario 3

Phase		Al-Maramel 1	Al-Maramel 2	Ouzai 3	Raml AL-Ali 4	Horch Al-Katil 5	Horch Al-Katil 6	Sabra 7	Sabra 8	9
No. of years	24	2	3	3	3	3	3	3	3	1
No. of houses to be Constructed	9700	250	2175	925	850	1150	2050	1150	1150	0
No. of shops to be Constructed	1560	25	300	470	100	125	225	158	158	0
No. of workshops to be Constructed	875	80	320	265	0	50	50	55	55	0
No. of houses to be relocated	13930	345	3250	1250	1850	2545	3990	700	0	0
In Elyssar	7400	250	2175	925	850	1150	2050	0	0	0
Outside Elyssar	6530	95	1075	325	1000	1395	1940	700	0	0
No. of shops to be relocated	1520	40	420	110	150	150	260	193	197	0
In Elyssar	1060	25	300	70	100	125	225	158	57	0
Outside Elyssar	460	15	120	40	50	25	35	35	140	0
No. of workshops to be relocated	1690	185	600	265	50	130	95	105	260	0
In Elyssar	875	80	320	265	0	50	50	55	55	0
Outside Elyssar	815	105	280	0	50	80	45	50	205	0
No. of structures to be demolished	17140	0	570	4270	1625	2050	2825	4345	998	457
% Infrastructure completed		10%	90%	100%	100%	39%	61%	100%	0%	100%

5.3.3.1 Financial Analysis

The same tools and DR (12%) were used to perform a financial analysis for Scenario 3. The consolidated cash flow statement is shown in Table C.11 and it can be summarized as follows:

- Project Revenues totaling US$1,746 million by year 2024 compared to project costs totaling US$2,099 million.

- Except for year 18, 19, 20, 21, 22, and 23 when major land sales, low-cost units sale, and/or shops sale are expected to occur, Elyssar is expected to face annual deficits that range between US$8 million and US$147.5 million. The second value is larger than that of the benchmark scenario but equal to that of Scenario 1 and less than that of Scenario 2.

- The largest annual deficits are expected to occur in years 3, 6, 9, 12, and 15, when the bulk of compensation payments associated with moving people are paid and no major or significant sale of land, low-cost units, and/or shops occur simultaneously.

- The cumulative deficit is expected to gradually build up until its peak value totaling around US$1,023 million in year 17. After that the deficit gradually decreases until it hits a positive value in year 32 (see figure 5.11).
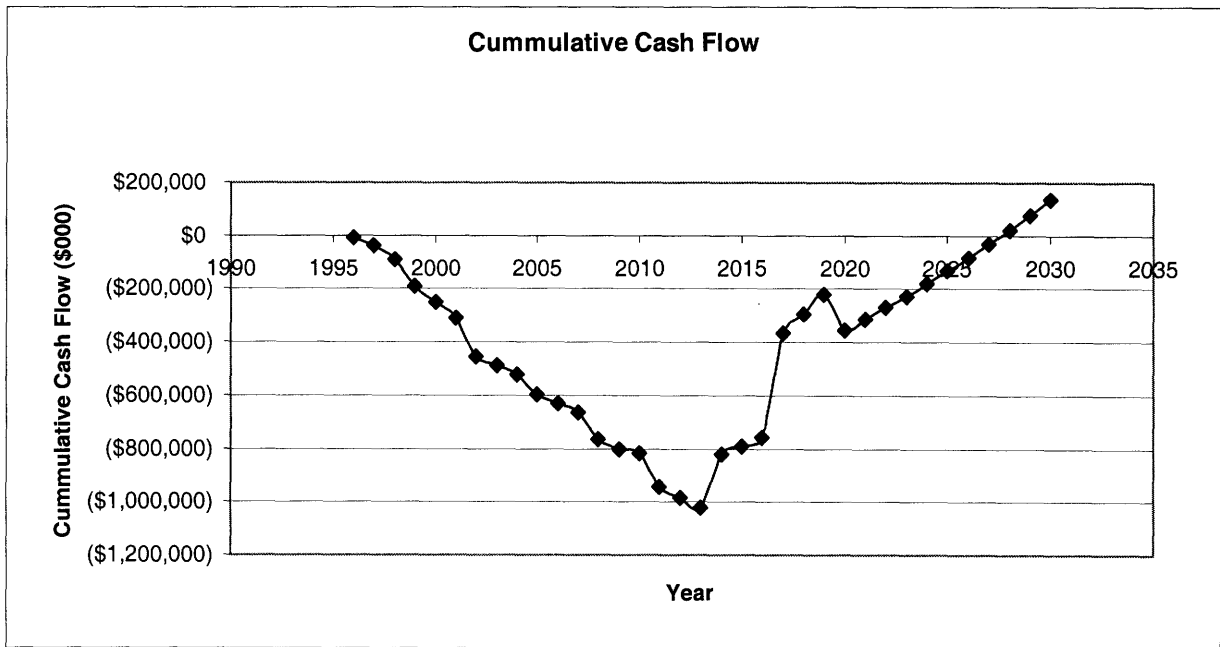
Figure 5.11 Cumulative Cash Flow for a 35-Year Analysis of Scenario 3

- Similar to Scenarios 1 and 2, expropriations and compensation, US$904 million in total, are expected to be the largest cost components, being larger than

development costs at US$674 million, which accounts for roughly 32% of total outflow.

- Of revenues, land sale, totaling around US$982 million, is the largest component at around 56% of total revenues up to year 24. Sales of low-cost units and shops, US$236 million in total, account for about 14% of total revenues. This makes the sale of low-cost units and shops a somewhat significant revenue source and thus a trade-off or an acceptable decision should be reached between the number of low-cost units and shops that should be sold and the percentage of resettlers being resettled within the Elyssar boundaries.

- Rent revenues, around US$44 million (2020 values) per year at full capacity, is also an appreciable revenue source.

- At a DR of 12%, the project cash flow has an estimated NPV of around negative US$330 million for a 25-year analysis and negative US$315 million for a 35-year analysis. Transforming the NPV of the 25-year analysis into annuities gives an annual worth of around US$42 million for Scenario 3 compared to US$58.5 million for the benchmark scenario, US$45 million for Scenario 1, and US$41 million for Scenario 2. As a result, Scenario 2 is still economically the most feasible scenario. Scenario 3 ranks second, followed by Scenario 1.

5.3.3.2 Sensitivity Analysis

A set of sensitivity tests was performed for Scenario 2 on the same variables used in Scenarios 1 and 2. Table 5.15 shows the percentage variation in NPV for a 10% increase and a 10% decrease in each of these variables over a 25-years analysis.

Table 5.15 Percentage Variation of NPV with a Number of Input Variables for a 25-Year Analysis

% Change of Variable	Variable	NPV	% Change of NPV
	DR (25 years)	($330,405)	
10%	13.20%	($314,038)	-4.95%
-10%	10.80%	($346,995)	5.02%
	Inflation Rate	($330,405)	
10%	4.40%	($332,552)	0.65%
-10%	3.60%	($328,139)	-0.69%
	Cost of Demolition/Structure	($330,405)	
10%	$770	($330,971)	0.17%
-10%	$630	($329,839)	-0.17%
	Cost of Site Prep. /m2	($330,405)	
10%	$14	($332,101)	0.51%
-10%	$12	($329,101)	-0.39%
	Cost of Structure Constr.	($330,405)	
10%	10%	($340,686)	3.11%
-10%	-10%	($320,124)	-3.11%
	Rentals	($330,405)	
10%	10%	($324,407)	-1.14%
-10%	-10%	($336,403)	1.82%
	Contrib. Of Owners	($330,405)	
10%	$14,300,000	($329,908)	-0.15%
-10%	$11,700,000	($330,902)	0.15%
	All Compensations	($330,405)	
10%	10%	($349,471)	5.77%
-10%	-10%	($311,339)	-5.77%
	Project Mngt. $ Admin.	($330,405)	
10%	4.95%	($331,171)	0.23%
-10%	4.05%	($329,639)	-0.23%
	Sales & Marketing	($330,405)	
10%	1.65%	($330,660)	0.08%
-10%	1.35%	($330,150)	-0.08%
	Contingency	($330,405)	
10%	11.00%	($334,479)	1.23%
-10%	9.00%	($326,331)	-1.23%
	Design	($330,405)	
10%	4.40%	($331,691)	0.39%
-10%	3.60%	($329,119)	-0.39%
	Land Sales	($330,405)	
10%	10%	($316,740)	4.14%
-10%	-10%	($344,070)	4.14%

Scenario 3 possesses a slight variation from Scenarios 1 and 2. It turns out that the NPV in Scenario 3 is most sensitive to the compensations cost and not to the DR. Even though this is the case, still the project needs more revenues in its early phases to create a

significant difference on the NPV. Figures 5.12 and 5.13 show the variation of the NPV with the D.R and figure 5.14 shows why a higher DR gives a higher NPV than a lower DR. Most revenues, which come later in the cash flow, are not sufficient to cover for the difference with the costs incurred early in the cash flow (figure 5.14).
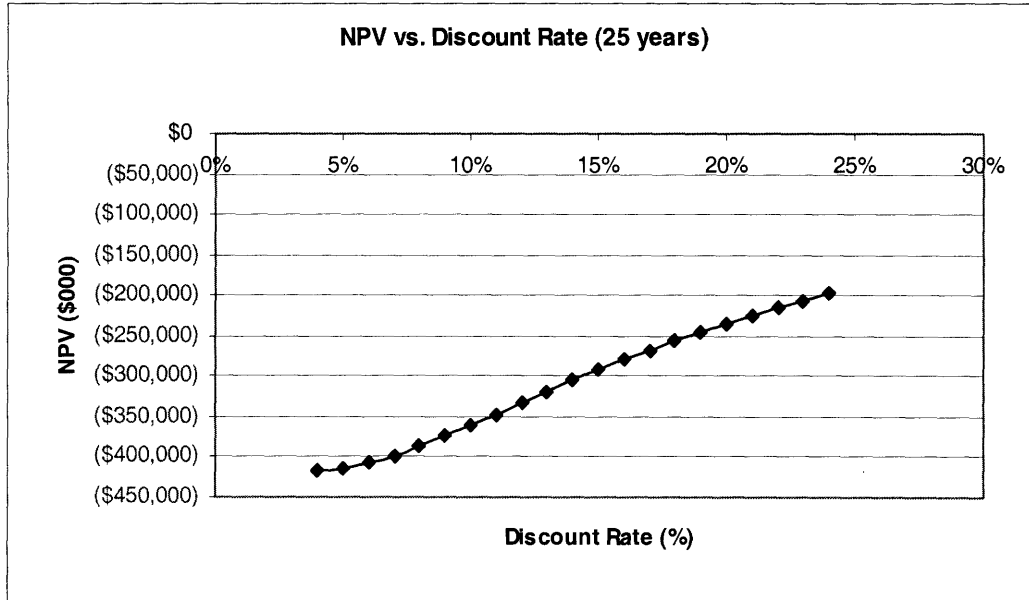
Figure 5.12 Variation of NPV with DR for a 25-Year Analysis
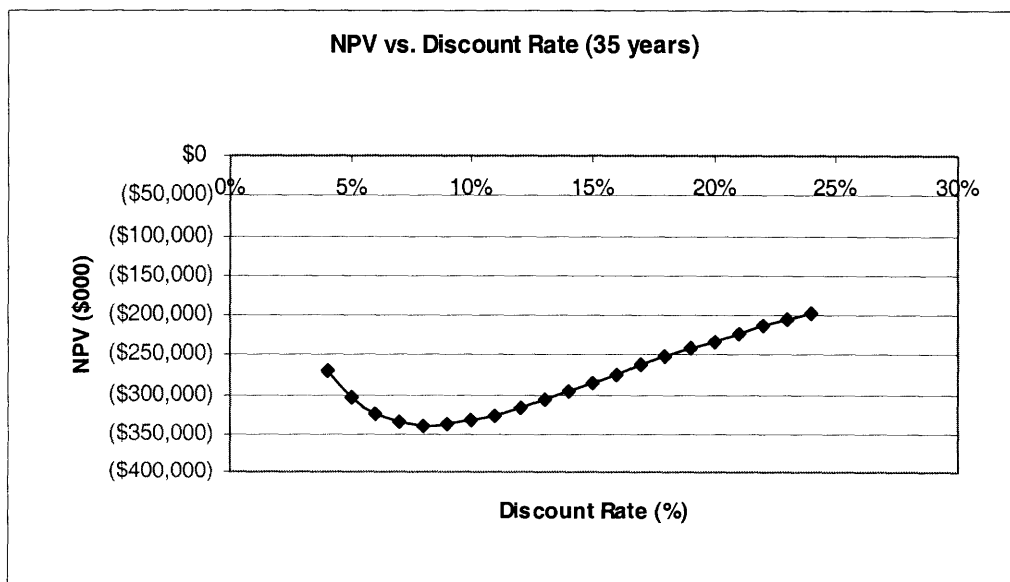
Figure 5.13 Variation of NPV with DR for a 35-Year Analysis
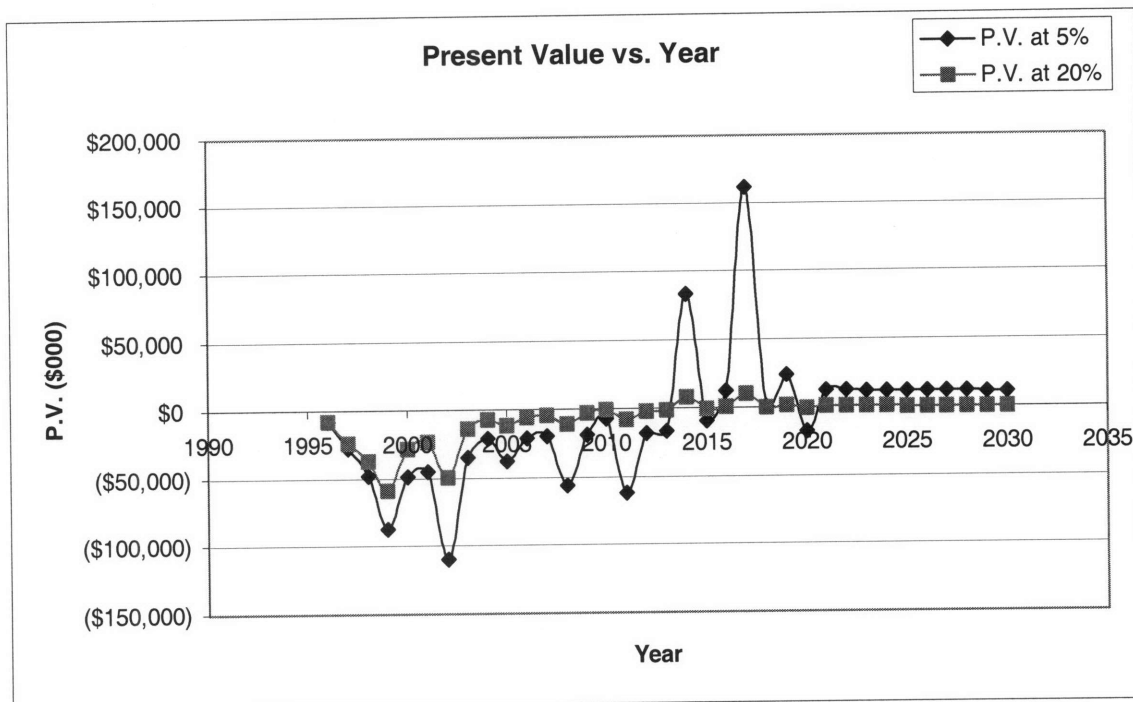
Figure 5.14 Present Value of the Cash Flow at each Period when Discounted at 5% and 20%

The ranking of the significant variables in descending order for Scenario 3 is the following:

1. Expropriation and Compensation Rates (Largest effect)
2. Discount Rate
3. Land Sales
4. Development Costs
5. Rentals and Contingencies
6. Inflation Rate

As for the 35-year analysis of Scenario 3, the variable that the NPV of the project is most sensitive to is the Expropriation and Compensation rates followed by Land Sales. DR comes third in descending order of sensitivity. The ranking of the rest of the variables is the same as before.

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The percentage variation in NPV value with respect to these input variables for a 35-year analysis is shown in Table C.12 in Appendix C.

Based on the NPV value and ignoring the financial structure of the cash flow and other factors such as the percentage of people resettled within the same area, Scenario 3 ranks second after Scenario 2 in terms of economic feasibility.

5.3.4 Scenario 4 (A Combination of Scenarios 1, 2, and 3)

Scenario 4 is a mix of Scenarios 1, 2, and 3. The timeframe of Scenario 4 is the same as that of Scenario 1. The phases that have land sales are the same as those in Scenario 2 and occur at the same time. The number of low-cost units and shops sold are the same as those for Scenario 3. All other assumptions remain the same. Table 5.16 shows some characteristics of the different phases of Scenario 4.

Table 5.16 Summary of the data needed in each phase for the financial analysis of Scenario 4

		Raml AL-Ali	Horch Al-Katil	Horch Al-Katil	Sabra	Sabra	Al-Maramel	Al-Maramel	Ouzai	
Phase		1	2	3	4	5	6	7	8	9
No. of years	24	3	3	3	3	3	2	3	3	1
No. of houses to be Constructed	9700	850	1150	2050	1150	1150	250	2175	925	0
No. of shops to be Constructed	1560	100	125	225	158	158	25	300	470	0
No. of workshops to be Constructed	875	0	50	50	55	55	80	320	265	0
No. of houses to be relocated	13930	1850	2545	3990	700	0	345	3250	1250	0
In Elyssar	7400	850	1150	2050	0	0	250	2175	925	0
Outside Elyssar	6530	1000	1395	1940	700	0	95	1075	325	0
No. of shops to be relocated	1520	150	150	260	193	197	40	420	110	0
In Elyssar	1060	100	125	225	158	57	25	300	70	0
Outside Elyssar	460	50	25	35	35	140	15	120	40	0
No. of workshops to be relocated	1690	50	130	95	105	260	185	600	265	0
In Elyssar	875	0	50	50	55	55	80	320	265	0
Outside Elyssar	815	50	80	45	50	205	105	280	0	0
No. of structures to be demolished	17140	0	2050	2825	4345	998	457	570	4270	1625
% Infrastructure completed		100%	39%	61%	100%	0%	10%	90%	100%	100%

5.3.4.1 Financial Analysis

Although the financial analysis of Scenario 4 resulted in much improvement than all other scenarios, still the NPV turned out to be negative and the IRR zero. This shows that large amounts of public funds will be needed and much in the form of grants. The Public Agency will face difficulties raising the funds.

The results of the financial analysis are summarized below:

- Project Revenues totaling US$1,464 million by year 2024 compared to project costs totaling US$2,028 million.

- Except for year 10, 13, 14, 16, and 21 when major land sales, low-cost units sale, and/or shops sale are expected to occur, Elyssar is expected to face annual deficits that range between US$8 million and US$241 million.

- The largest annual deficits are expected to occur in years 3, 6, 9, 12, 15, and 18 when the bulk of compensation payments associated with moving people are paid and no major or significant sale of land, low-cost units, and/or shops occur simultaneously.

- The cumulative deficit is expected to gradually build up until its peak value totaling around US$740 million in year 9. After that the deficit fluctuates until year 24 after which it starts decreasing at a constant rate until the end of the project lifetime (see figure 5.15).
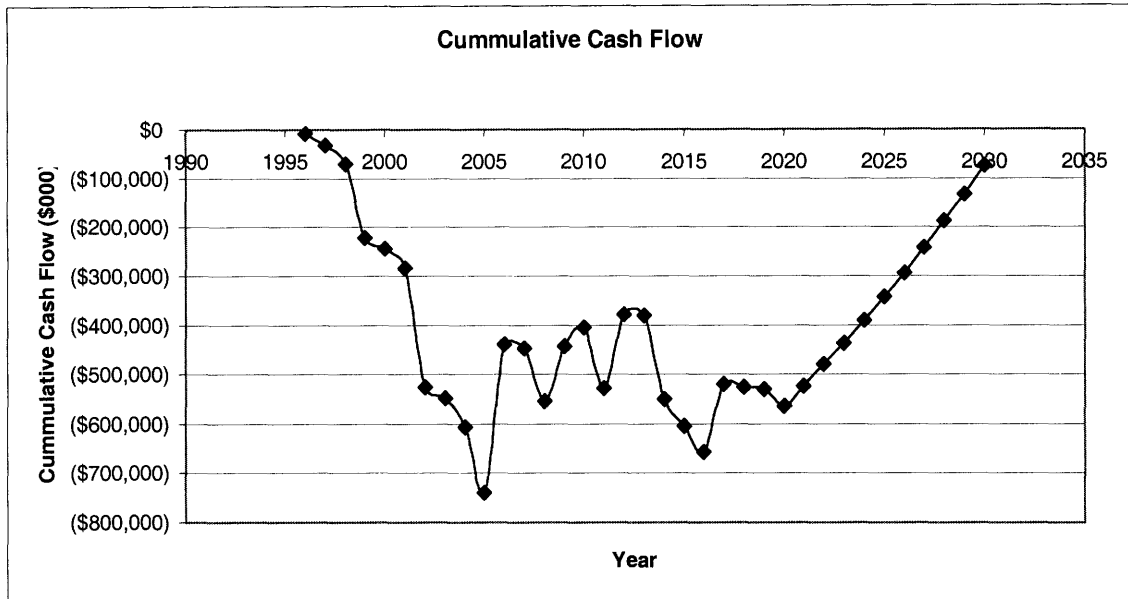
Figure 5.15 Cumulative Cash Flow for a 35-Year Analysis of Scenario 4

- Expropriations and compensation, US$874 million in total, are the largest cost components, being larger than development costs at US$651 million, which accounts for roughly 32% of total outflow.

- Of revenues, land sale, totaling around US$852 million, is the largest component at around 58% of total revenues up to year 24. Sales of low-cost units and shops, US$241 million in total, account for about 16.5% of total revenues.

- Rent revenues, around US$44 million (2020 values) per year at full capacity, is also an appreciable revenue source, especially as it represents a perpetually, recurring inflow component.

- At a DR of 12%, the project cash flow has an estimated NPV of around negative US$296 million for a 25-year analysis and negative US$280 million for a 35-year analysis. Transforming the NPV of the 25-year analysis into annuities gives an annual worth of around US$38 million for Scenario 4 compared to US$58.5 million for the benchmark scenario, US$45 million for Scenario 1, US$41 million for Scenario 2, and US$42 million for Scenario 3. As a result, Scenario 4 is economically the most feasible scenario followed by Scenario 2, then 3, then 1 and finally the benchmark scenario.

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5.3.4.2 Sensitivity Analysis

In Scenario 4, the NPV is most sensitive to the variation in Expropriation and Compensation costs. The next variable that the NPV is most sensitive to is land sales, followed by the DR. Table 5.17 shows the sensitivity of the NPV of a 25-year analysis of Scenario 4 to a 10% increase and a 10% decrease in some of the most relevant variables.

Table 5.17 Percentage Variation of NPV with a Number of Input Variables for a 25-Year Analysis

% Change of Variable	Variable	NPV	% Change of NPV
	DR (25 years)	($295,676)	
10%	13.20%	($280,365)	-5.18%
-10%	10.80%	($312,238)	5.60%
	Inflation Rate	($295,676)	
10%	4.40%	($297,811)	0.72%
-10%	3.60%	($293,557)	-0.72%
	Cost of Demolition/Structure	($295,676)	
10%	$770	($296,234)	0.19%
-10%	$630	($295,118)	-0.19%
	Cost of Site Prep. /m2	($295,676)	
10%	$14	($297,276)	0.54%
-10%	$12	($294,445)	-0.42%
	Cost of Structure Construction	($295,676)	
10%	10%	($305,638)	3.37%
-10%	-10%	($285,714)	-3.37%
	Rentals	($295,676)	
10%	10%	($291,390)	-1.45%
-10%	-10%	($299,962)	1.45%
	Contrib. Of Owners	($295,676)	
10%	$14,300,000	($295,209)	0.03%
-10%	$11,700,000	($296,143)	0.16%
	All Compensations	($295,676)	
10%	10%	($315,694)	6.77%
-10%	-10%	($275,658)	-6.77%
	Project Mngt. $ Admin.	($295,676)	
10%	4.95%	($296,357)	0.23%
-10%	4.05%	($294,995)	-0.23%
	Sales & Marketing	($295,676)	
10%	1.65%	($295,903)	0.08%
-10%	1.35%	($295,449)	-0.08%
	Contingency	($295,676)	
10%	11.00%	($299,636)	1.34%
-10%	9.00%	($291,716)	-1.34%
	Design	($295,676)	
10%	4.40%	($296,962)	0.43%
-10%	3.60%	($294,390)	-0.43%
	Land Sales	($295,676)	
10%	10%	($278,688)	5.75%
-10%	-10%	($312,664)	-5.75%

Even though Scenario 4 combines a longer pace, earlier land sales, and sale of units and shops, still considerable revenues do not occur in the early parts of the cash flow and

hence the project is dominated by costs. Revenues only come later, thus when discounted, they do not match the huge amount of costs incurred initially (see figure 5.16).
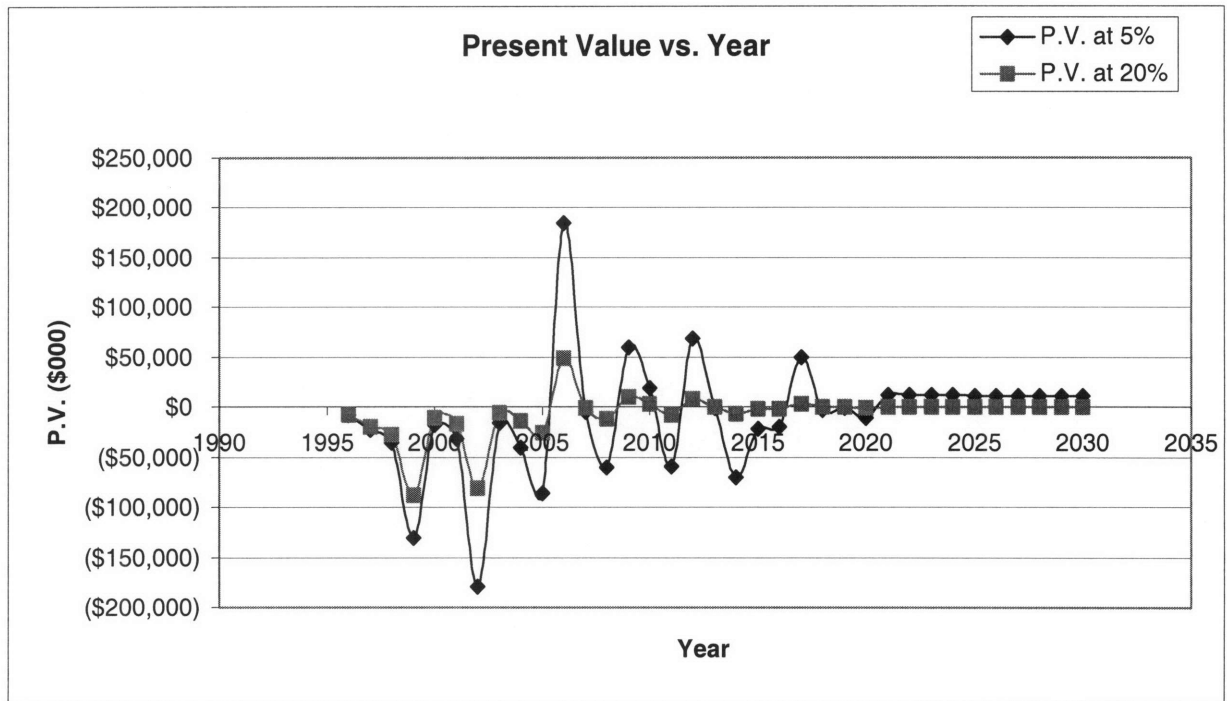
Figure 5.16 Present Value of the Cash Flow at each Period when Discounted at 5% and 20%

A 25 and 35-year sensitivity analysis give the same ranking of variables in terms of their effect on the NPV. Starting with the variable that has the most effect on the NPV:

1. Expropriation and Compensation Rates (Largest effect)
2. Land Sales
3. DR
4. Development Costs
5. Rentals
6. Contingencies

5.3.5   Scenario 5 (Public/Private Partnership over a 28-Year Analysis)

Through Public-Private Partnerships (PPPs), governments have often reduced budgetary strains, provided better services to citizens, and improved the economical environment as a whole. Public services could also be offered by the private sector at a lower cost and a higher level of quality. This constitutes the basis of investigating Scenario 5 and its variances.

Five cases were studied under PPP with one of the objectives being to find a break-even cash flow. All the cases assume that the public agency Elyssar is transformed into a private company, publicly traded, similar to "Solidere", the Lebanese company for the development and reconstruction of Beirut Central District. The company would be formed as an association of property right holders, who will offer the land, and investors, who will offer the financial contribution used for the execution (implementation) of the project.

Two of the assumptions used apply to all five cases. The major assumption was that expropriation and compensation payments would be the responsibility of the government and would be undertaken by the Central Fund for the Displaced in the form of a grant. The private sector would be responsible for undergoing the rest of the components of the project.

The second assumption, which has a minor effect on the NPV, was that pre-construction services, including design, were done according to the following:
- 30% in the 1st year
- 30% in the 2nd year
- 30% in the 3rd year, and
- 10% in the 4th year

The rest of the assumptions differ between one scenario and the other.

The first case under PPP was developed based on Scenario 1. This case assumes that the public agency does not have enough funds to implement the project even if the Central Fund for the Displaced handled the expropriation and compensation costs. Thus a cash flow similar to that of Scenario 1 was analyzed except that expropriation and compensation costs were removed. The result was still a negative NPV with an IRR equal to 7.84% for a 35-year analysis, which is somewhat low for the private sector.

The second case under PPP was developed based on Scenario 2 since Scenario 2 gave better results than Scenario 1. The same cash flow was used less the expropriation and compensation costs. The result was a negative NPV as well and an IRR of 8.52%, which is better than the first scenario under PPP but still unattractive for the private sector.

To improve on the previous results a third case was developed by introducing further assumptions to the second case under PPP. The first assumption introduced was that the PPP could implement the project in less time per phase (2 years instead of 3), which resulted in a total schedule of 28 years instead of 35. The second assumption was that the project management and administration costs could be lowered to 3% instead of 4.5% and the contingency to 7% instead of 10%. The third assumption was that the PPP could implement the project at a lower infrastructure cost, lower demolition cost, lower site preparation cost, and lower building construction cost. The result was a positive NPV for an 18-year analysis (compared to the 25-year analysis) only if the costs of infrastructure, demolition, site preparation, and building construction were reduced by 22%. In this case the IRR comes out to be 12.01% for an 18-year analysis and 15.45% for a 28-year analysis.

Since no unit and shop sales occur, which is somehow necessary for increased revenues, and since reducing such costs as infrastructure and others by 22% is somewhat hard to achieve, a fourth case was developed based on Scenario 4, which is a combination of scenarios 1, 2, and 3. The assumptions were similar to those made for the third case under PPP except that the project remained to be implemented in a 35-year timeframe. A positive NPV for a 25-year analysis of the fourth case under PPP would be guaranteed

provided that execution costs (infrastructure, demolition, site preparation, and construction costs) are lowered by 15 %. This is better than the third case, which required a 22% reduction in execution costs. The IRR of the fourth case under PPP was found to be 13.2% for a 35-year analysis.

The fifth case, which will be referred to as Scenario 5 thereon is the most feasible and realistic scenario among the PPP cases and potentially the most attractive among all other scenarios developed and tested in this investigation. Following is a description of Scenario 5 with tables and graphs representing and justifying its feasibility and preference over the other scenarios.

Scenario 5 was developed based on Scenario 4, which is a combination of scenarios 1, 2, and 3. Scenario 5 is an application of PPP as described earlier with the assumption that expropriation and compensation costs are taken care of by the Central Fund for the Displaced and minor assumption the pre-construction is done at 30%, 30%, 30%, and 10% in the first four years correspondingly instead of 50%, 25%, 12.5%, and 12.5%.

Another assumption in Scenario 5 is that the PPP can also complete the project in a shorter schedule (28 years instead of 35) due to the experience, efficiency, and better management provided by the private sector. Each phase is completed in two years instead of three. This assumption differentiated Scenario 5 from the fourth cases developed under PPP.

Finally, it is assumed that the PPP would be able to reduce the costs of project execution (infrastructure, demolition, site preparation, and construction). This reduction would be determined in a way that allows the cash flow to break even, and evaluated whether it is a feasible course of action for the private sector.

5.3.5.1 Financial Analysis

In the analysis of Scenario 5, the project management and administration cost, and the contingencies costs were kept the same in terms of percentages of execution costs. No assumptions on those two variables were made. The only variables that were altered were the ones related to the execution cost (i.e. infrastructure, the demolition, the site preparation, and the construction costs). Each of these variables was changed at the same percentage as the other, that is, if infrastructure costs were reduced by 5%, then demolition, site preparation, and construction costs were also reduced by 5%.

The results were that a positive NPV for an 18-year analysis would be reached only if the PPP reduced the execution cost by 3%. A summary of the results of this analysis follows:

- Project Revenues totaling US$1,424 million by year 2017 compared to project costs totaling US$946 million.
- The annual deficits that the PPP is expected to face range between US$4.5 million and US$101.5 million, which is better than all previous scenarios developed.
- The cumulative deficit is expected to gradually build up until its peak value totaling around US$286 million in year 6. After that the deficit starts decreasing randomly until year 9 of the project when the cumulative cash flow becomes positive and the PPP starts making profit. At year 18 of the project, the profits incurred by the PPP start increasing at a constant rate until the end of the project lifetime (see figure 5.17).
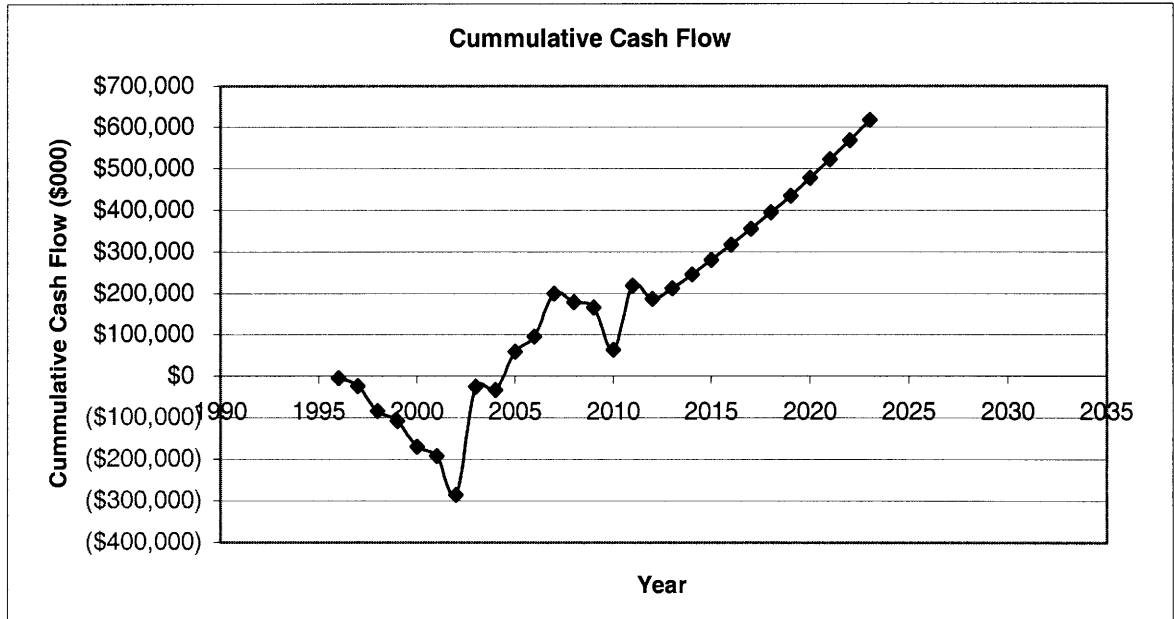
Figure 5.17 Cumulative Cash Flow for a 35-Year Analysis of Scenario 5

- The largest cost component is project execution totaling US$537 million, which accounts for roughly 57% of total outflow.

- Of revenues, land sale, totaling around US$721 million, is the largest component at around 51% of total revenues up to year 18. Sales of low-cost units and shops, US$201 million in total, account for about 14% of total revenues.

- Rent revenues, around US$36 million (2013 values) per year at full capacity, is also an appreciable revenue source since it represents a perpetually recurring inflow component.

- At a DR of 12%, it was found that a positive NPV could be reached only if the PPP lowered the execution cost by about 3% than that of the public sector. After all, it is the reason why the private sector is chosen to be involved in the project. By involving the private sector, the public sector induces competition for better quality services at lower costs to users.

Below is a table showing the variation of the IRR for an 18-year analysis with the percentage change in project execution. The percentage change is measured based on

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the original costs incurred by the public sector. The 18-year analysis table is shown in Appendix C.

Table 5.18 Variation of IRR for an 18-year analysis
with the variation in execution cost

% Change in Execution Cost	IRR (18-Year) 12.13%
0%	11.20%
-1%	11.51%
-2%	11.82%
-3%	12.13%
-4%	12.43%
-5%	12.73%
-6%	13.03%
-7%	13.33%
-8%	13.62%
-9%	13.92%
-10%	14.21%
-11%	14.51%
-12%	14.80%
-13%	15.09%
-14%	15.38%
-15%	15.67%

Based on these results, it can be said that Scenario 5 is a potentially attractive alternative compared to the others and is the most realist since it involves a combination of all the strategic approaches developed (longer pace, earlier land sales, sale of units and shops) and combines the abilities of the private sector (funding, better quality, lower cost of execution, shorter duration per phase) in a single scenario.

5.3.5.2 Sensitivity Analysis

Two variables do not play a role in the sensitivity analysis of Scenario 5: contribution of owners and expropriation and compensation costs. The NPV of Scenario 5 is most sensitive to the variation in land sales. This is due to the fact that land sales occur earlier in the project and the revenues in this case have considerable effect on the cash flow.

Next, the NPV is sensitive to the DR and the Construction Cost. Table 5.19 shows the sensitivity of the NPV of a 25-year analysis of Scenario 5 to a 10% increase and a 10% decrease in some of the most relevant variables.

Table 5.19 Percentage Variation of NPV with a Number of Input Variables for a 25-Year Analysis

% Change of Variable	Variable	NPV	% Change of NPV
	DR (25 years)	$876	
10%	13.20%	($6,928)	-891.27%
-10%	10.80%	$10,055	1048.38%
	Inflation Rate	$876	
10%	4.40%	$6,397	630.58%
-10%	3.60%	($4,454)	-608.72%
	Cost of Demolition/Structure	$876	
10%	$747	$205	-76.63%
-10%	$630	$1,360	55.30%
	Cost of Site Prep. /m2	$876	
10%	$14	($1,070)	-222.17%
-10%	$12	$1,817	107.47%
	Cost of Structure Construction	$876	
10%	10%	($15,077)	-1821.87%
-10%	-10%	$9,465	981.01%
	Rentals	$876	
10%	10%	$5,061	478.03%
-10%	-10%	($3,310)	-478.03%
	Project Mngt. $ Admin.	$876	
10%	4.95%	$33	-96.18%
-10%	4.05%	$1,718	96.18%
	Sales & Marketing	$876	
10%	1.65%	$595	-32.06%
-10%	1.35%	$1,156	32.06%
	Contingency	$876	
10%	11.00%	($975)	-211.34%
-10%	9.00%	$2,726	211.34%
	Design	$876	
10%	4.40%	($338)	-138.65%
-10%	3.60%	$2,090	138.65%
	Land Sales	$876	
10%	10%	$23,295	-2560.40%
-10%	-10%	($21,543)	2560.40%

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In Scenario 5, it is viewed that revenues have a significant effect on the cash flow. And, since most revenues come later in the cash flow, the lower the DR the better is the NPV (see figures 5.18 and 5.19).

NPV vs. Discount Rate (25 years)
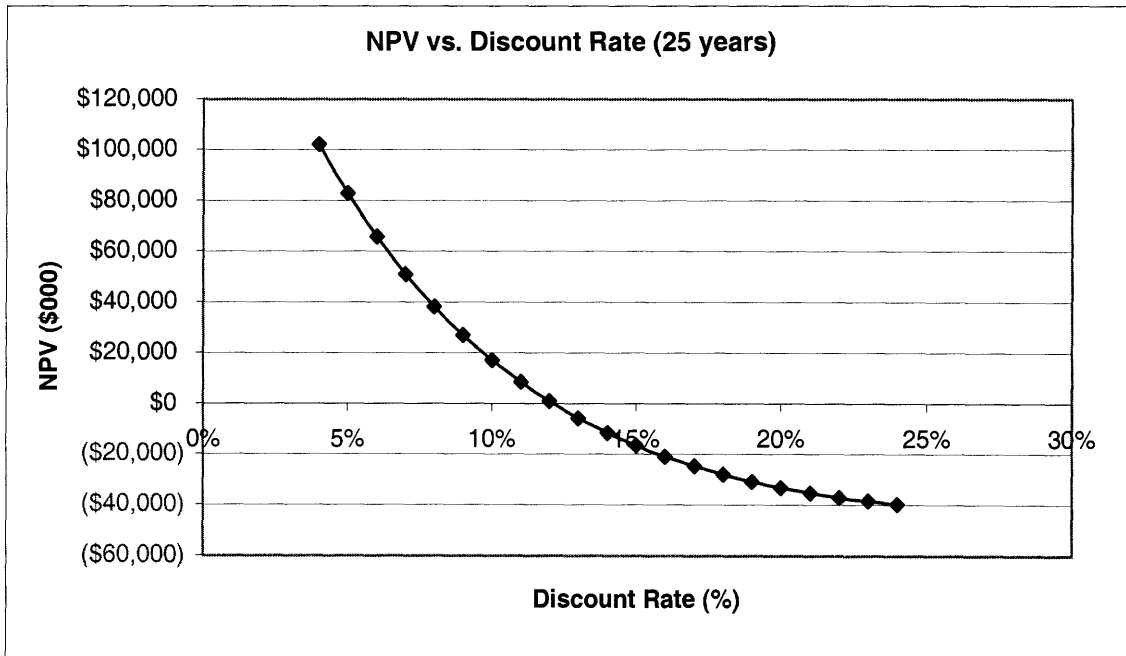
Figure 5.18 Variation of NPV with DR for a 25-Year Analysis

NPV vs. Discount Rate (35 years)
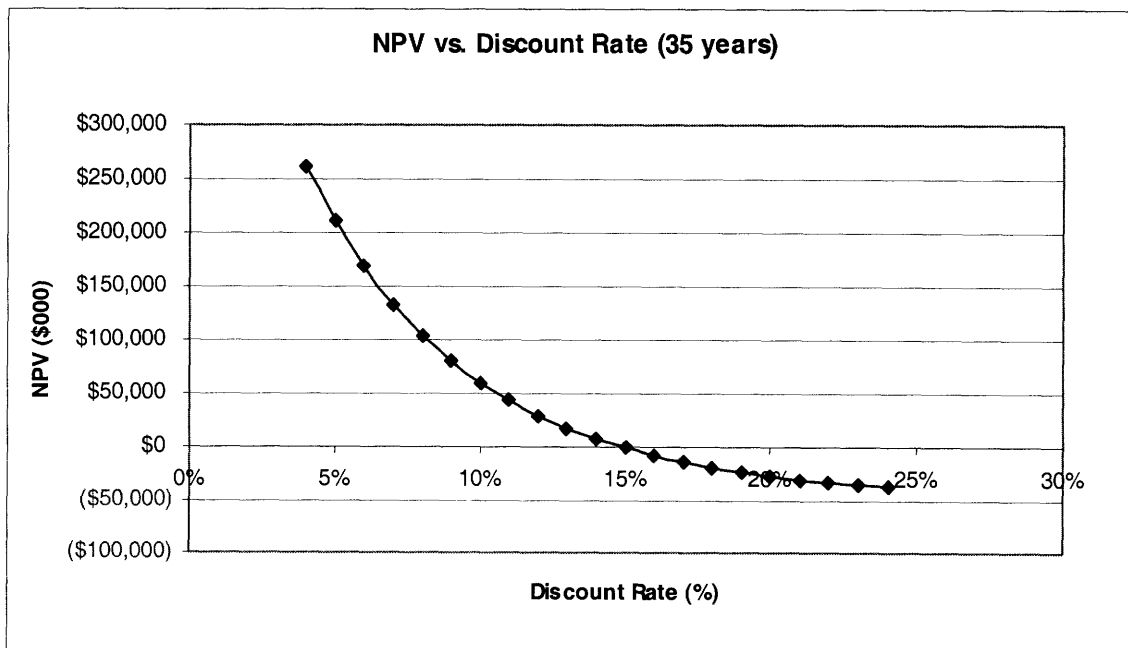
Figure 5.19 Variation of NPV with DR for a 25-Year Analysis

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This can also be illustrated in figure 5.20 where the cash flows at each period are higher if discounted at a lower DR and since revenues dominate the cash flow then a lower DR gives a better NPV.
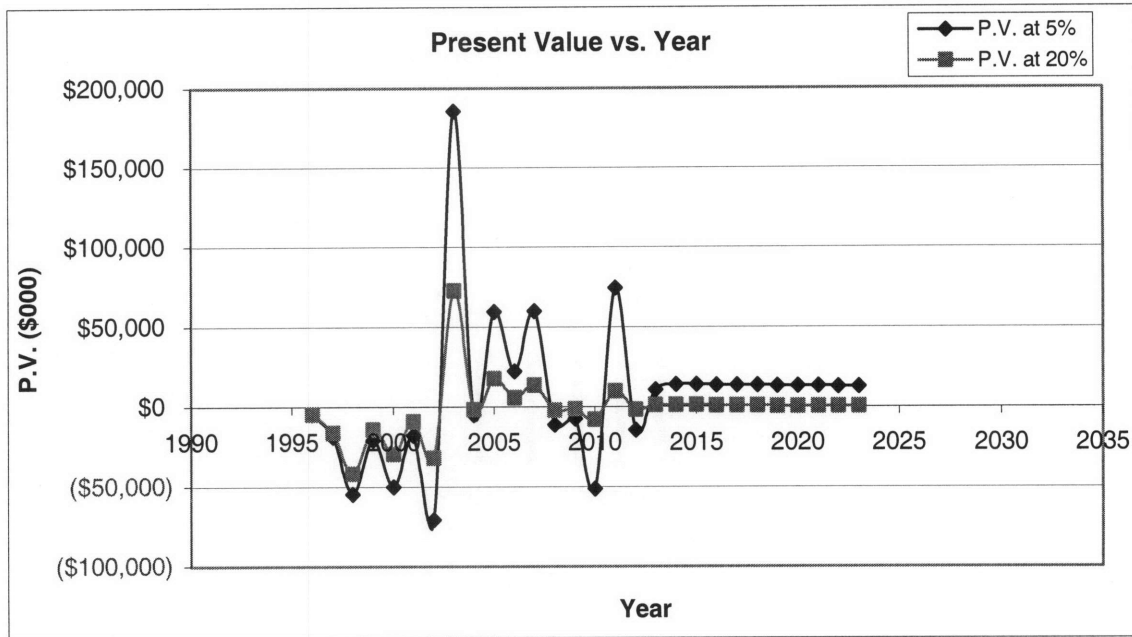
Figure 5.20 Present Value of the Cash Flow at each Period when Discounted at 5% and 20%

5.4   Summary of Results

The results of the financial analysis on each of the developed scenarios can be summarized in the following table:

Table 5.20 Summary of the financial analysis performed on the developed scenarios

Scenario	(w/o 10-year Operation)			(w 10-year Operation)		
	NPV	A.W.	IRR	NPV	A.W.	IRR
Benchmark (Public)	($398,050)	($58,440)	0.00%	-	-	-
1 (Public)	($352,085)	($44,891)	0.00%	($332,053)	($40,616)	0.00%
2 (Public)	($319,302)	($40,711)	0.00%	($299,270)	($36,606)	0.00%
3 (Public)	($330,405)	($42,127)	0.00%	($314,703)	($38,493)	0.00%
4 (Public)	($295,676)	($37,699)	0.00%	($279,974)	($34,246)	0.00%
1st (PPP)	($103,729)	($13,225)	5.41%	($83,698)	($10,238)	7.84%
2nd (PPP)	($68,707)	($8,760)	4.22%	($48,676)	($5,954)	8.52%
3rd (PPP) (break-even)	$31	$4	12.01%	$33,683	$4,219	15.45%
4th (PPP) (break-even)	$1,062	$135	12.09%	$16,763	$2,050	13.20%
5 or 5th (PPP) (break-even)	$876	$121	12.13%	$29,582	$3,705	14.90%

The shaded rows were used to identify the best scenario. The white rows are different scenarios modeling PPP. Scenario 5 is the most realistic and most feasible for it provides a comprehensive accounting of all the previous requirements in addition to private sector contribution (e.g. reduction in execution cost and shorter project life cycle).

Should the government decide to implement the project through the public agency, it has to consider Scenario 4, which is a combination of Scenarios 1, 2, and 3, as mentioned earlier.

Scenario 1 is an improvement on the benchmark Elyssar analysis, indicating that a longer pace for the project would enhance its feasibility. Scenario 2 further enhances project feasibility since it also combines pace and allows earlier land sales. Scenario 3 is a combination of pace and unit and shops sale but does not give better results than Scenario 2.

Scenario 4 combines the components of Scenarios 1, 2, and 3 to give the most feasible outcome for the public sector. The public agency would have to: (1) increase the duration of the project as mentioned in Scenario 1, (2) implement the phases that allow land sales first, and (3) find a tradeoff between the percentage of people to be displaced and the selling of units and shops to people from outside the Elyssar region.

On the other hand, if the government is willing to involve the private sector in the project, either through PPPs or through privatization, then Scenario 5 should be chosen. This would however be a harder task since the Elyssar project is a low-cost housing project that does not create an attractive revenue stream for the private sector,

Scenario 5 has given the best results in terms of NPV, reflecting the following conditions:

(1) The PPP would have to fast track the project relative to the 35-year plan. This would be done by designing each phase to be implemented in 2 years rather than 3 as designed for in the 35-year plan.

(2) The PPP would have to adopt the same method as in Scenario 4, which is a combination of Scenarios 1, 2, and 3.

(3) The expropriation and compensation costs would have to be handled by the Central Fund for the Displaced.

This last factor is the most critical factor in this thesis work since projects normally involve conceptual planning, preliminary design, permitting, design, bidding, construction, testing and commissioning, and sometimes operation and maintenance and decommissioning; they rarely involve large costs as expropriation and compensation for a population of 130,000 people. The expropriation and compensations costs in the Elyssar Project always form the largest cost components and are never matched by any considerable source of revenue. This is demonstrated in the sensitivity analysis that was performed on the different scenarios.

The DR is also an important factor. It is a function of all cost and revenue components including expropriation and compensation costs. Large costs were incurred when expropriation and compensation rates were carried out by the public agency. This proves why increasing the discount rate has decreased the NPV of the project in the first four scenarios by the public sector. This also shows why a lower DR would be better for cash flows with revenues occurring in the latter part.

As for land sales, they were the basic revenue source, although rentals were also an appreciable amount. Because they came later in the cash flow, rentals have less significance than land sales. Land sale becomes the most critical factor affecting NPV when the expropriation and compensation costs are handled by the Central Fund for the Displaced. This also confirms that cash flows dominated by revenues would result in higher NPVs when lower DRs are used.

Chapter 6 Conclusions and Recommendations

6.1   General Findings Summary and Challenges Facing the Elyssar Project

Governments in developing countries often face the problem of illegal settlements growing in urban cities and their suburbs. A solution generally adopted is relocation of these settlements with compensation provided to the affected people.

Relocation is sometimes the best and only solution in large needed to allow planning and promote potential growth opportunity of the land. It is rarely the case that a fair and acceptable solution is found that would satisfy the goals and interests of all stakeholders, including the government, funders, private sector/developers/implementers, and the public.

Relocation projects may not be well received by the public, particularly when the benefits are not properly communicated to them as part of the interactive public involvement process. Relocation to nearby vacant lands is usually the first to be undertaken prior to redeveloping the occupied areas. Relocation to vacant lands in rural areas is another option; however this solution is less attractive to the community and the government. For example, individuals of the resettled community working in the city would have to find their own means of transportation in the absence of a public transit system; they could be forced to change work and look for other jobs, in rural areas, perhaps unrelated to their skills. This can dismantle their in-place social and business networks and potentially affect the livelihood of many businesses. Besides, job opportunities in rural areas are not guaranteed and thus most people would have to work in different sectors, such as the agricultural sector, which may have a profit margin lower than what was achieved by their original businesses. On the other hand, the government would be faced with the burden of securing transportation for the resettled community to and from the city at low

cost and at frequent time intervals. It would also be obligated to provide an adequate infrastructure for the resettled community, create job opportunities, and restore, improve and integrate the rest of the living conditions with the adjacent populace.

The Elyssar project is a relocation and infrastructure development project to resettle around 130,000 individuals living in sub-standard conditions in the southwestern suburbs of Beirut, Lebanon. The public agency "Elyssar" is responsible for the implementation of this project. Elyssar faces a number of challenges: (1) building the low-cost housing units, shops, and workshops, (2) providing the adequate infrastructure, (3) addressing the intricate concerns of land owners, building owners, and tenants, (4) fairly compensating all people affected, (5) creating public confidence and political support of the relocation initiative, (6) restoring or improving the living conditions of the population resettled, and (7) meeting the vital health and welfare needs of the resettled population within the planned project boundaries, including minimizing social and economic disruption to the community involved.

Funding the project is also a major challenge for the Lebanese government. This project is the first of its kind in Lebanon to be implemented by a public agency. Public funds are very much constrained and thus the public agency will have to rely on loans with very low interest rates. Even this is not enough. More innovative ways of delivering the project should be investigated, including restructuring of the regulatory, operating, and legal frameworks.

Income generation and livelihood reestablishment are important challenges that face most governments implementing relocation projects and programs. This issue should be given high priority during all phases of implementation of the Elyssar Project. The resettlement process should not end when the population has been moved. Ensuring the community's sustainability is a necessity: adaptation to the new site and new housing, rebuilding social networks and the structure of the community, new relations with the host population, recovery of prior family income level, management and maintenance of new services, and so on. These challenges go far beyond the mere physical relocation of the population.

Social and economic rehabilitation programs, which are the backbone of sustainable urban resettlement, should continually be monitored, evaluated and improved (Mejia, 1999).

This thesis has discussed the different objectives and criteria that the government or the public sector ought to adopt when implementing urban relocation and infrastructure development projects for urban renewal. These objectives and criteria would help governments obtain funding from multinational development agencies such as the World Bank and the United Nations, as well as bilateral and other forms of funding.

Finally, a decision-making methodology has been outlined for analyzing multiobjective-multicriterion project alternatives and selecting the optimal solution. Because of the limited scope of work, the main focus of this thesis has been on the economic/financial analysis of these alternatives, which is necessarily required by decision-makers and funding agencies but not sufficient to fully assess the project benefits as a whole.

Implementation of the relocation and infrastructure development project of Elyssar from a financial viewpoint has been analyzed. Five scenarios have been developed in Chapter 5 to investigate innovative ways for implementing the project while improving its net present value. Four scenarios were modeled as if the public sector is implementing the project; in this case it is the public agency Elyssar. The fifth scenario was modeled assuming that Elyssar is turned into a private company, and the project is implemented under a public-private partnership (PPP) between the public and private sectors.

6.2   Conclusions of the Analysis

Three basic aspects that the Elyssar agency can adopt have been modeled in the aforementioned five scenarios: (1) the pace at which the project was being implemented, which helps determine the number of project phases and duration, (2) proceeding with earlier land sales, which affects the sequence of the phasing, and (3) sale of low-cost

units and shops to individuals assumed not to be originally residing within the Elyssar boundaries.

Accounting of these three aspects simultaneously in the same scenario would allow the public agency to reduce its negative Net Present Value (NPV) by almost 25% to a deficit of about US$296 million. This is a significant improvement on the NPV of the benchmark Elyssar study, which is a deficit of about US$398 million.

Although the NPV remains negative, it is not reasonable to ignore the public sector approach. The deficit of US$296 million resulting from the financial analysis of Scenario 4 can be leveraged by the long-term expected socio-economic health and welfare benefits, an aspect that cannot be modeled using the financial analysis framework alone.

Scenario 5 modeled the procurement of the Elyssar project through a PPP. Several cases were simulated. Based on the assumptions made and the results that were obtained from the cash flow and the sensitivity analyses, it was concluded that Scenario 5 is the preferred scenario among all the PPP cases investigated. This scenario assumes that the Central Fund for the Displaced handles the expropriation and compensation rates and the private sector executes the project combining all three aspects described earlier (pace, earlier land sales, and sale of low-cost units and shops).

The private sector would be able to fast track the project (18 years instead of 25) while keeping the same phasing and sequence of project execution, thus increasing project revenues and consequently the NPV.

To get a break-even cash flow, the private sector would have to decrease execution cost by about 3%. With the efficiency, innovation, and technical expertise of the private sector, this value should be relatively easy to achieve, rendering the project attractive to private investment.

One disadvantage is that the project could be unattractive to private sector investment since it involves building low-cost housing units and providing adequate infrastructure to low-income households occupying a property without authorization. Thus many legal issues are involved and cost recovery is not certain unless the government guarantees subsidy for the unmet return on investment.

Another disadvantage is that the public is not confident that the private sector will account for the social values that the community wishes to maintain because of the possible conflict with its interests.

6.3   Strategy Recommended

Based on the results of the analyses obtained earlier and the conclusions drawn, recommendations are given for a short and long-term strategy should the project be implemented by the public sector or a partnership between the public and the private sectors.

6.3.1   Short-Term Strategy

The short-term strategy is more focused on the project itself and provides practical guidance for transforming strategies into action. Nevertheless, some changes at the macro or government level need to be implemented in order to provide the foundation for a smooth implementation of the project. Recommendations are given at the government level first, followed by short-term recommendations at the project or micro level.

6.3.1.1 Recommendations at the Macro/Government Level

Initially, the government must address several issues in order to keep alignment between the Elyssar project goals and acceptability by the public. The ultimate goal is to find an equitable and fair solution.

One of the first issues to be dealt with is the legal framework. A framework for solving the problems of illegal construction and occupancy should be defined, as well as the right of tenure for the resettled and the rights of compensation or property return for property owners.

Housing laws and regulations, such as that of long-term leases, would have to be developed in order for Elyssar to better market its assets and potentially increase its revenue stream. The law would also confer security of tenure to relocated households, contributing towards social stability. Today, the likely option for Elyssar is to rent its assets because selling assets would be unaffordable to the resettled community and the law of long-term leases is still undefined in Lebanon.

The government also needs to undertake a reformation of tax laws on property and on commercial use, laws on property valorization, and its tariff system. This would enable Elyssar to collect tax revenues, betterment levies, and others from selling lands and developing properties, consequently increasing its revenue stream.

The government would have to identify all the involved institutional systems and define their role with respect to the Elyssar project. This would include the role of each ministry in charge of the electricity, transportation, water, and wastewater systems. Thus, by defining the role of each institution, the government would be able to secure subsidies and cross-subsidies from these public entities for the Elyssar project. This would also help Elyssar attract more foreign funds (e.g. World Bank Funds) because then, the multinational development agencies would see cooperation between the different government entities, a willingness to invest, and a commitment to successfully implement the project by the Lebanese government.

Finally, a consensus should be reached between political representatives to leverage the public interest and reach an equitable and fair solution.

6.3.1.2 Recommendations at the Micro/Project Level

This section represents the bulk of all recommendations since it is based on the results of the analyses conducted in Chapter 5. First, recommendations will be given should the government implement the project through the public agency. Second, recommendation will be given on how to convert strategy into action if the public agency is turned into a private company and the project is implemented under a public-private partnership.

6.3.1.2.1 Public Sector Approach

The first four scenarios in Chapter 5 modeled the implementation of the project through the public sector. Based on the results of the analyses it is recommended that the public agency:

- Package the project such that each phase involves development within a single locality at a time or part of a locality if that locality involved a large number of people to be relocated.
- Start by developing vacant lands first and use them to relocate households.
- Relocate households in groups to the nearest areas available from their current dwellings to minimize social disruption and preserve as much as possible the social and economic networks that exist and the cultural identity of the communities.
- Adopt a longer implementation schedule that extends over 25 years instead of 14.
- Structure the project such that the phases that involve land sales occur as earliest as possible to increase the revenue stream and relieve the cash flow from the dominancy of large costs especially in its early stages.
- Find a reasonable tradeoff between the percentage of population to be relocated and the number of low-cost units and shops to be sold to individuals from outside the Elyssar region. This will involve conducting more surveys and interviews with the population involved in the relocation project to determine the percentage of households willing to accept cash compensation and relocate in their villages or other areas. It will also involve community participation in the decision process,

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which will allow them to define their needs and demands and give them responsibility for the decisions made.

- Apply for grants (such as one from the Central Fund for the Displaced), include Non-Governmental Organizations (NGOs) in the project implementation, negotiate for subsidies and cross-subsidies from other government agencies, ministries, and private developers and land owners, and attract soft loans with reduced interest rates (from the World Bank or others).

6.3.1.2.2   Private Sector Approach

The second approach is when the project is procured through the private sector either by complete privatization or through some type of public-private partnership. "Direct" and "indirect" strategies may be used to allocate public resources and attract private financial resources to the development of infrastructure facilities and implementation of such urban relocation projects as that of Elyssar. "Direct" financing is when the owner of the project applies his own cash resources to finance the project, whereas "indirect" financing is when the owner structures the project so that the developer provides his cash resources to pay for the project (Miller, 2000).

Many infrastructure challenges require joint government and private response especially when government agencies do not have sufficient resources to pay for all projects directly. Through Public-Private Partnerships (PPPs) governments have endless opportunities to acquire private sector technology, equipment, expertise, and investment. If governments package these opportunities in ways that make them widely visible to private sector firms, much of the government's task in acquisition is already complete (Miller, 2000).

In this section recommendations are given to the Lebanese authorities to transform Elyssar into a private company, publicly traded, and procure the project through a PPP. The company would be similar to "Solidere", the Lebanese company for the development and reconstruction of Beirut Central District. The company would be formed as an

association of property right holders, who will offer the land, and investors, who will offer the financial contribution for the execution of the project

It is recommended that Scenario 5 be applied should the government consider turning Elyssar into a private company for the following reasons:

- The government will benefit from private sector expertise and technology to execute the project at a better quality, while decreasing the costs.
- The government will benefit from the private sector capital to fund the project.
- The government will be able to shift much of the project risk to the private sector, although it will have to pay for that risk in some way (e.g. the government can buy the risk through subsidizing the expropriation and compensation payments).

To convince the private sector that the PPP would be profitable and shareholders would get an attractive return on their investment, and to make it acceptable for the public and tailor the project to their needs and demands as well as the demands of the different political parties involved, it is recommended that the government implement the following:

1. Define a risk sharing agreement. When rentals rates, numbers of households to be relocated, and other conditions are all set by the government, the private sector will have no control over the rate of return. For this reason, the government cannot transfer all the risk to the private sector. Vice versa, the private sector will accept a higher level of risk in exchange of a higher rate of return or some form of guarantee from the government (e.g. subsidize all rental revenues if actual revenues turned out to be less than the forecasted).

2. Have a benchmark study and demand from the private sector certain conditions for bidding with respect to that study, which would stimulate private sector innovation, induce competition, and produce cost savings. An example from the American infrastructure history is the case of the Tolt River project in Washington State. In this case the government prepared a benchmark study based on a Design-Bid-Build delivery method and demanded that the private sector produce at least a 15% savings in project life

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cycle costs to proceed with a Design-Build-Operate procurement. This induced competition and resulted in proposals offering savings of more than 30% off the DBB benchmark (Miller, 2000).

3. Show commitment to the project and the private sector. Governments, private funders, private sector developers, and the public cannot realistically rely on strong competition for projects to which the government has little commitment. The government can show commitment through various ways. An example is the Northumberland Bridge case in Canada where the government through legislation, reduced the costs of private sector financing to levels very close to tax-exempt government financing (Miller, 2000). In the Elyssar case, if the government subsidizes the expropriation and compensation costs, this would show that the government is committed to the project and is willing to invest and ensure the implementation of the project. This would also stimulate foreign investment once they see that the government is fully committed to the project. It will also consolidate the public's acceptance of the project and increase their trust in the government. Commitment by the government is essential to attract local and foreign investment, convince the private sector to involve in the Elyssar project, and earn the acceptability and support of the public.

6.3.2   Long-Term Strategy

Projects should also be viewed from a long-term perspective. It is true that the public is concerned with seeing immediate changes materializing, but long-term planning and monitoring for both the project and the region as a whole should also take place. It is possible for the government to follow a strategy that enhances the regional social, economical, and political situation through implementing a relocation and infrastructure development project, and that addresses area specific concerns.

Together with the short-term strategy, a long-term strategy is recommended both at the macro/national level and at the micro/project level.

6.3.2.1 Recommendations at the Macro Level

The first recommendation is that the government should prioritize its needs and match them with its available funds. The problem lies in the absence of a well-defined strategy and lack of sufficient resources. Today, the government's major concern is the huge public debt and making the provision of basic utilities more efficient. The government should have a determination to improve the infrastructure services and the living conditions of poor households to meet the future needs of the country and enhance its economic situation. One method that is being adopted lately is privatization.

Privatization helps reduce public spending, increase efficiency and improve on quality of services provided to the public, and reduce costs, but it should be well studied and assessed for its application in the Lebanese system. In Hayek (1996), a sequencing strategy is proposed based on: setting up a statutory regulation, providing an adequate environment, fixing a priority list of the needed infrastructure projects, and studying on a project by project basis the most suitable type of PPP. It is also recommended that the government look at the backlog of infrastructure projects and treat them as elements of a single portfolio of projects to determine the best delivery method for each project and evaluate the degree or private sector interference in each project.

The role of NGOs should be defined and they should be allowed to take part in many of the development projects in Lebanon. Currently, local and international NGOs are working to establish income-generating projects that are essential to getting the economy moving in the country. Local NGOs have been active in implementing agricultural, educational, and health projects, whereas a group of international ones have been working together with funding from USAID and the US Agriculture Department.

Much can be done to improve policies in Lebanon and make the economy more productive. One option would be to decrease customs tariffs and improve the telecommunication system to encourage potential investors who are willing to invest in the country when there is a competitive and efficient environment and services are

produced at lower rates. World Bank's chief representative in Lebanon, P. Hari Prasad, referred to the lack of efficiency as a cost for everybody, for the people who could not get the jobs and would be forced to immigrate, for the people who would pay for inefficient services when the companies would run into the ground, and a cost for the government in keeping these companies afloat.

All this should be coupled with political will and political consistency in the different political administrations.

6.3.2.2 Recommendations at the Micro Level

The project's long-term implications and outcome should also be analyzed and integrated in the planning and development of the relocation and infrastructure development project. Priority should be given to the public, and more specifically the population affected by the displacement. It is recommended that the government address the Elyssar project more as a socio-economic development program for the population residing in the southwestern suburbs of Beirut, rather than simply aim at improving the economic situation of the region as a whole. According to Mejia, since involuntary displacement can destroy previous means of livelihood, all resettlement operations must be development programs (Mejia, 1999).

Other experts argue that what needs to be done is to restore and improve livelihoods: the rehabilitation that must follow displacement. Landlessness risks should be eliminated through land reestablishment; homelessness, through sound shelter programs; joblessness, through employment creation; and social disarticulation through community reconstruction and host-resettler inclusionary strategies. Furthermore, provisions to ensure that those displaced share in the specific benefits generated by the program that caused them to relocate should be included in the project (Cernea, 1999). In one sentence it can be said that the strategy the government should start adopting is livelihoods safeguarding and income reestablishment rather than remain centered on expropriation and compensation payments.

The World Bank's view is that delivering only monetary compensation, while acceptable in select cases, often jeopardizes living standards, especially for low-income groups. Such compensation often ends up in the hands of moneylenders and intermediaries, or is spent on old debts, consumer goods, or other expenses that do not ensure the reestablishment of homes, communities, and social networks (Mejia, 1999).

Besides, and according to the World Bank's basic policy, the population that is forcibly displaced should not have to bear any of the resettlement costs and also should have a variety of resettlement options. Additional financial burdens must not be placed on low-income families that are already at risk of impoverishment due not only to precarious income but also to labor instability. Even those that appear capable of making modest payments might be at risk of losing their homes due to economic crisis, inflation, and currency devaluations. Forced imposition of a debt when no other alternative is offered is not acceptable to the World Bank (Mejia, 1999).

Socioeconomic development including income reestablishment for the displaced can take place in several ways: (1) alternative employment strategies, including preferential hiring in the project itself and in the public sector when appropriate, (2) adequate participation of social development agencies, (3) creation of micro-enterprises, and others (Mejia, 1999).

Moreover, it is recommended that systematic and reliable data regarding the impact of the completed relocation project on the social development and economic welfare of the resettled families, and the economic development of the region as a whole, be collected and systematically monitored. Usually only a narrowly focused sample survey is carried out to determine the level of satisfaction of relocated families with housing and new services.

It is also recommended to look and compare projects with similar ones. Although the Solidere Project differs from the Elyssar Project in a number of aspects (e.g. significantly less population displaced, different economic activities involved, and different

development goals), still it can be used as a benchmark to: (1) evaluate the reaction of the public and the effect of politics, and (2) improve on the inefficiencies that were observed and encountered in the development phases and after completion of the project.

Finally, it is recommended that the government agency involve in early consultation with affected people and involve them in the decision-making process, which are key factors to the success of most relocation cases.

6.4 Further Studies and Recommendations

Relocation of inhabitants and infrastructure development for urban renewal is a major problem facing many countries. It is still not firmly established that relocation is an optimal solution that accompanies policy changes at the macro level, and work at the institutional or program level.

What is evident is the need for more work in attempt to coherently integrate urban planning concepts with construction management and decision-analysis theories. In this thesis, the relocation and infrastructure development problem has been investigated from a construction management and engineering economic/financial analysis point of view alone. Although the scope was limited to a net present value and sensitivity analysis of alternatives, it is clear that this attempt does not provide a comprehensive evaluation mechanism and complete assessment of the global problem.

It should also be noted that each country is endowed with its own unique situation, and the method of analysis needs to be tailored to project specific conditions. Some governments and multinational development agencies oppose the relocation approach and believe that other alternative solutions do exist. In the case of Elyssar, the government has focused on relocation as a solution. On the other hand, the public has opposed this view and has requested provision of public services, education and health facilities, to guarantee its welfare. The proposed solution needs to be further explored, including public involvement and participation in the decision-making process.

It is further recommended that the following concerns be investigated and addressed by the Elyssar Project:

1. Whether the population should bear any of the resettlement costs in case of mandatory displacement. The World Bank's policy, as mentioned earlier, is that the risks of impoverishment in forced relocation must be avoided. This can be done by avoiding placing additional financial burdens on low-income families that are already at risk of impoverishment. On the other hand, faced with declining budgets, needs for investment recovery, and increasing land and construction prices, housing agencies tend to transfer, openly or surreptitiously, part of the resettlement costs to the displaced people. Agencies also fear that not requiring the relocated people to pay part of the resettlement cost will encourage new occupations of public land. Paying part of the housing cost makes resettled families feel more rooted, increases their sense of ownership, and creates greater social discipline and capacity for self-management (Mejia, 1999).

2. The level and nature of public participation in the decision-making process. Sometimes, the public is completely unskilled or even semi-skilled and thus can only contribute in the decision-making process more than in the implementation. The public can also effectively be used in the development and implementation of a solution. For example, providing technical training and professional rehabilitation on a short-term basis would open up an avenue for the displaced population to participate in the actual project implementation and carry-on newly acquired skills for future jobs. More specifically, this training effort generated through government funded programs for the displaced populace, would lead to utilization of local skilled labor in the construction sector during and after the completion of the project, hence provide security and stability conditions long awaited by the affected workforce.

3. The degree of dependence of the resettled population on the informal sector economic activities, which are the largest source of income for residents in marginalized areas, and the instability of jobs within this sector.

4. The point at which projects are considered to be successfully completed, taking into account performance monitoring programs and corrective actions to address potentially emerging failures.

5. The methodology for forecasting long-term benefits.

In conclusion, this thesis has provided a framework for the analysis of the relocation problem in the areas surrounding the City of Beirut. It is by no means comprehensive, and further work on integrating social, economic, political, and welfare factors needs to be the future focus of the Elyssar Project.

APPENDIX A General Overview of the Geographic, Demographic, Governmental, and Economic Situation of Lebanon

Geography: Lebanon is a small strategically located country on the Eastern shore of the Mediterranean Sea, bordered in the north and east by Syria and in the south by Israel.[30] It is located at the meeting point of three continents and, as such, has been the crossroads of many civilizations whose traces may still be seen today. Its coastline is about 225 km (150 miles) in length and is, on average, 45 km (30 miles) wide. The total area of the country amounts to 10,452 square km (4,500 square miles). Along the coast are the five famous cities of Beirut, Byblos, Sidon, Tripoli, and Tyre.

Demography: Lebanon's population is around 3,600,000 (1999 est.) and its population growth rate is around 1.61% per year (1999 est.). Close to 84% of the population lives in urban areas compared to 16% who live in rural areas. About 48% are males and 52% females (1999 est.).[31] Around 40% of the population is Christians, while around 60% are Sunni, Shiite or Druze Muslims. Arabic is the official language, but French and English are also widely spoken and often used for government and diplomatic purposes. The literacy rate aged 15 or over is around 80% (1995 est.) and is among the highest in the Arab world.

Government and Politics: Because of its long history, natural beauty, and rich culture, the Republic of Lebanon has always inhabited a special place in the world. Beginning with its independence on November 22, 1943, Lebanon has been and continues to be an integral player in the Middle East and throughout the international community. As a democratic republic, Lebanon enjoys a parliamentary system of government and a cabinet headed by a Prime Minister. The structure of government at the national level is based on its constitutional principle of separation of executive, legislative, and judicial powers. The incorporation of the 1990 Taif Agreement into the Lebanese constitution effectively transferred executive power from the president to the council of ministers. The president, in consultation with members of parliament, appoints the Prime Minister and is responsible for the promulgation and execution of laws enacted by the National Assembly.[32]

Economy: Prior to the 1975 civil war, Lebanon had one of the most developed economies in the region, dominated by a large services sector, a growing industrial sector, and a small agricultural sector. The ensuing civil war and Israeli invasions brought an end to this economic heyday.

The 1975-91 civil war seriously damaged Lebanon's economic infrastructure, cut national output by half, and all but ended Lebanon's position as a Middle Eastern "entrepot" and banking hub. The services sector interests were relocated overseas, and the industrial and agricultural infrastructure was devastated. The degree of destruction caused by the internal rifts made the intervention of the state in economic matters necessary. The public sector suffered most, as the government lost most of its revenues. Its contribution to

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[30] Source: The Lebanese Embassy Website in Washington D.C.-
http://www.lebanonembassy.org/country_lebanon/overview.html
[31] Source: Website on Lebanon- http://www.geocities.com/CapitolHill/Parliament/2587/
[32] See Source 30.

Lebanon's GDP before 1975 was only 12 %, but by 1991 (at the end of the civil war) public expenditure accounted for more than half of the GDP.

Peace has enabled the central government to restore control in Beirut, begin collecting taxes, and regain access to key port and government facilities. Since 1992, Lebanon's economy has made significant gains. An $18 billion reconstruction program named "Horizon 2002" was launched in 1993, and Lebanon's GDP grew by about 8% in 1994 and 7 % in 1995. Between 1992 and 1998, annual inflation dropped from 170 % to 6 %, and the foreign exchange reserves increased from $1.4 billion to close to $6 billion. Progress has also been made in rebuilding Lebanon's physical infrastructure.[33] Economic recovery has been helped by a financially sound banking system and resilient small- and medium-scale manufacturers, with family remittances, banking services, manufactured and farm exports, and international aid as the main sources of foreign exchange.

Burgeoning capital inflows have generated foreign payments surpluses, and the Lebanese pound has remained relatively stable. Progress has also been made in rebuilding Lebanon's war-torn physical and financial infrastructure. The government nonetheless faces serious challenges in the economic arena. It has had to fund reconstruction by tapping foreign exchange reserves and boosting borrowing. The stalled peace process and ongoing violence in southern Lebanon could lead to wider hostilities that would disrupt vital capital inflows. Furthermore, the gap between rich and poor has widened recently, resulting in grassroots dissatisfaction over the skewed distribution of the reconstruction's benefits and leading the government to shift its focus from rebuilding infrastructure to improving living conditions. [34]

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[33] See Source 30.

[34] Source: Website on Lebanon- http://uatlax3.uniontrans.com/demo/demoleba.htm

APPENDIX B   The Elyssar Project-
Pictures, Plans, and Tables

(Source: "Planning and Development of Beirut South-Western Suburbs" Master Plan.)

Figure B. 1 Aerial View of the Southwestern Suburbs of Beirut and the Project Area
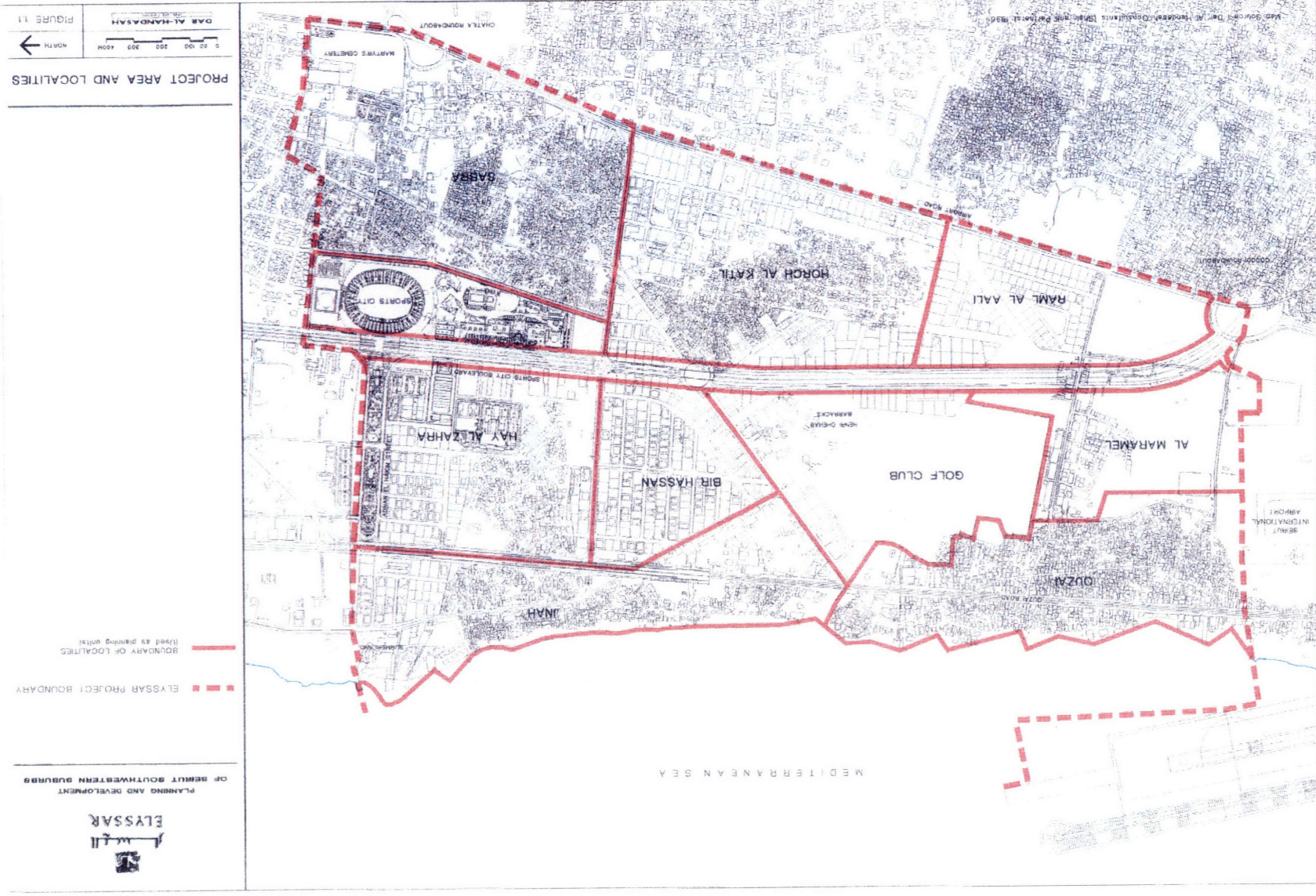
Figure B. 2 Boundaries of the different localities within the study area

PROJECT AREA AND LOCALITIES

DAR AL-HANDASAH

FIGURE 1.1

NORTH

0 50 100 200 300 400M

ELYSSAR
PLANNING AND DEVELOPMENT
OF BEIRUT SOUTHWESTERN SUBURB

BOUNDARY OF LOCALITIES
(Used as planning units)

ELYSSAR PROJECT BOUNDARY

Map Sources: Dar Al-Handasah Consultants (Shair and Partners), 1995.

SHATILA ROUNDABOUT

MARTYR'S CEMETERY

SABRA

HORCH AL KATIL

RAML AL AALI

AIRPORT ROAD

COCODI ROUNDABOUT

SPORTS CITY

SPORTS CITY BOULEVARD

HAY AL ZAHRA

BIR HASSAN

NEAR EHEHAB BARRACKS

GOLF CLUB

AL MARAMEL

BEIRUT INTERNATIONAL AIRPORT

JNAH

OUZAI

OUZAI ROAD

MEDITERRANEAN SEA

Figure 1.1

– – –		Elyssar Project Boundary
———		Illegal Developments
		Sandy Beach
4		Beirut International Airport
3		Golf Club
2		Beirut Government Hospital
1		Sports City

Figure B. 3 Aerial view of some of the key components of the Elyssar Project

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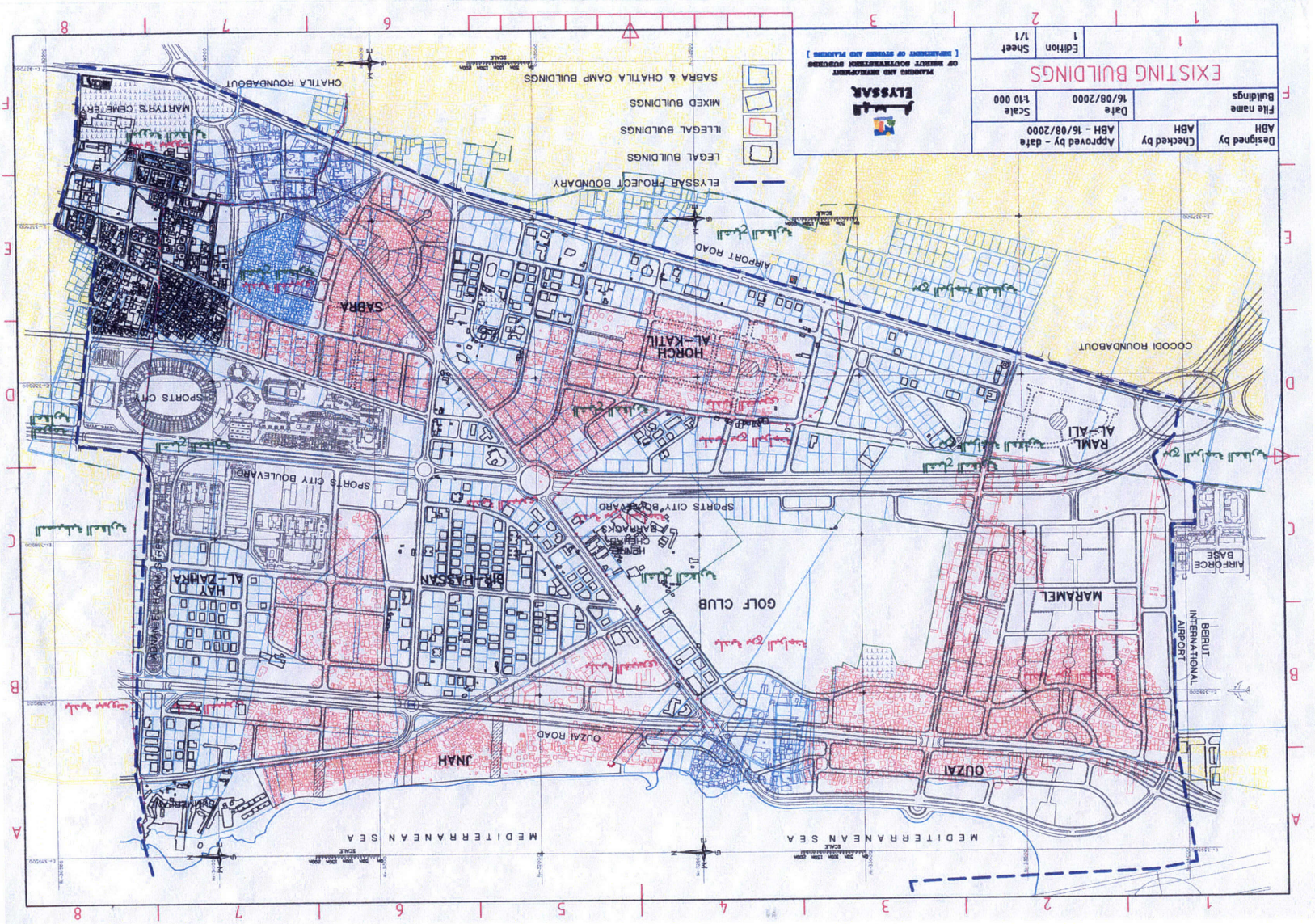
Figure B. 4 Distribution of the different types of illegal settlements in the Elyssar area

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Figure B. 5 Components of the Elyssar Development Project

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MEDITERRANEAN SEA

ELYSSAR

PLANNING AND DEVELOPMENT
OF BEIRUT SOUTHWESTERN SUBURBS

- - - - - ELYSSAR PROJECT BOUNDARY

RESIDENTIAL

LOW COST HOUSING

COMMERCIAL - RESIDENTIAL

COMMERCIAL - RESIDENTIAL - RECREATIONAL

OFFICES - RESIDENTIAL

COMMERCIAL - OFFICES - RESIDENTIAL

RECREATIONAL BEACH DEVELOPMENT

M   COMMERCIAL CENTRE/MARKET

WORKSHOPS

E H R   EDUCATION, HEALTH AND RELIGIOUS FACILITIES

G D UN   GOVERNMENT AND INSTITUTIONAL

MAJOR SPORTS FACILITIES

PUBLIC SQUARES GARDENS

FOOTPATH

SANDY BEACH

REVISED MASTER PLAN
LAND USE FRAMEWORK

0 50 100   200   300   400M

NORTH

DAR AL-HANDASAH

FIGURE 4.1

SPORTS GROUND/
PUBLIC BEACH

BEIRUT
INTERNATIONAL
AIRPORT

AIRFORCE
BASE

GOLF CLUB

HENRI CHEHAB
BARRACKS

SPORTS CITY

OULAI ROAD

SPORTS CITY BOULEVARD

AIRPORT ROAD

MARTYR'S CEMETERY

CHATILA ROUNDABOUT

Figure B. 6 Land Use Framework for the Elyssar Project

Figure B. 7 The Number of Low-Cost Housing Units Constructed within each Phase of the Elyssar Project

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ELYSSAR
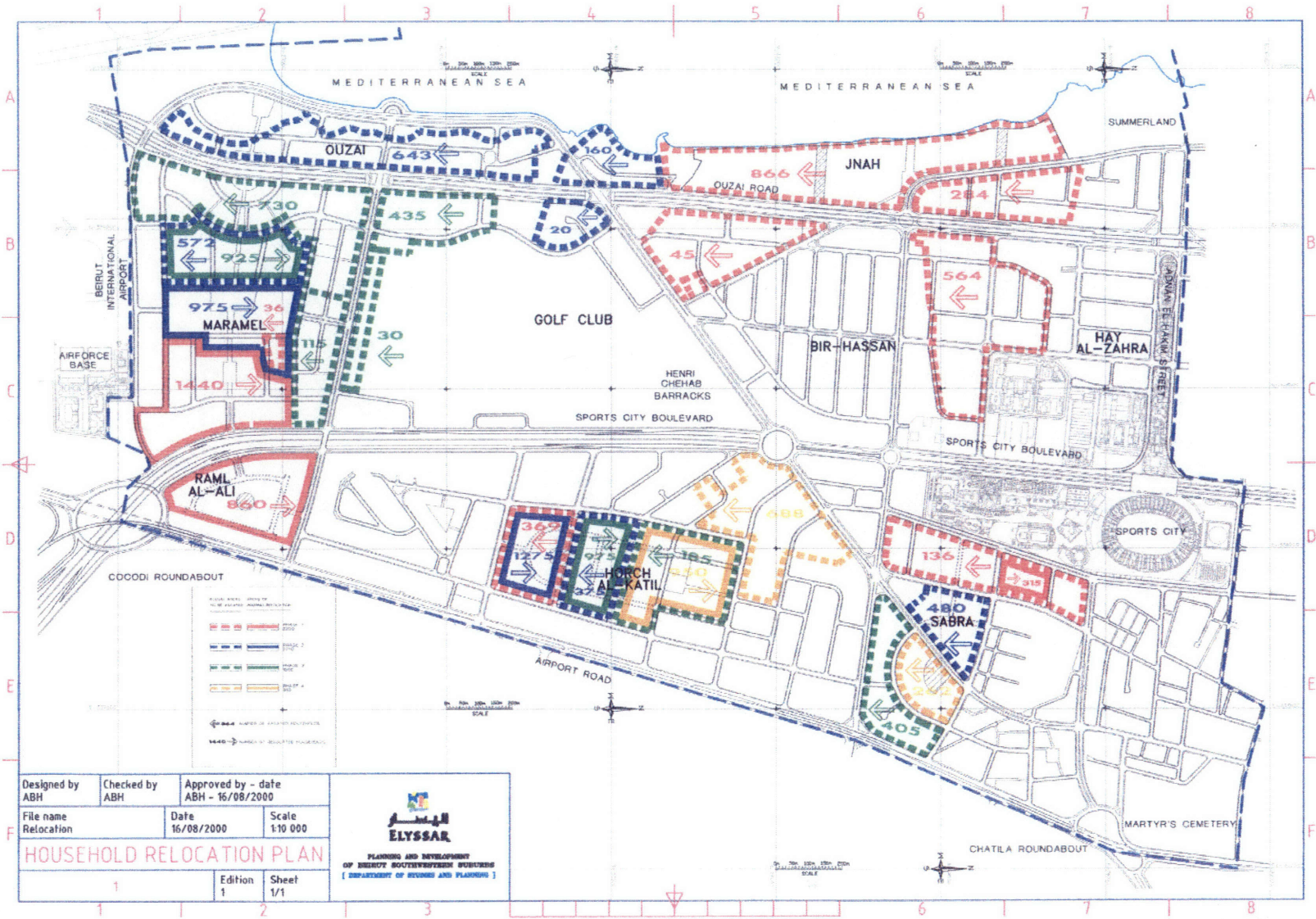
Project Execution per Phase

Phase	Region	N° of Housing Units	N° of shops	N° of Workshops	Major Road Length (m)	Housing Infrastructure Area (1000 m²)	Infrastucture Upgrade Area (1000 m²)	New Infrastructure Area (1000 m²)
ONE	Al-Maramel	1,440	190	201	-	150	-	-
	Ram Al-Aali	860	100	-	-	90	-	-
	Sabra & Chatila	810	123	108	740	38	412	13
	Ouzai	-	343	-	1,915	-	-	-
	Bir Hassan	-	-	-	-	-	390	-
	Hay Al-Zahra	-	-	-	-	-	211	-
	Jnah	-	-	-	745	-	77	-
	Horch Al-Katil	-	-	-	-	-	-	-
	Sub Total	*3,110*	*756*	*309*	*3,400*	*278*	*1,090*	*13*
TWO	Al-Maramel	975	135	200	-	85	-	58
	Ram Al-Aali	-	-	-	350	-	37	223
	Sabra & Chatila	260	49	-	820	22	-	15
	Ouzai	-	-	-	1,700	-	48	233
	Bir Hassan	-	-	-	-	-	-	-
	Hay Al-Zahra	-	-	-	-	-	-	169
	Jnah	-	-	-	-	-	36	263
	Horch Al-Katil	1,275	135	-	-	66	254	-
	Sub Total	*2,510*	*319*	*200*	*2,870*	*173*	*375*	*960*
THREE	Al-Maramel	-	-	-	655	-	-	-
	Ram Al-Aali	-	-	-	-	-	-	-
	Sabra & Chatila	690	80	-	-	43	-	79
	Ouzai	925	125	264	116	100	-	160
	Bir Hassan	-	-	-	-	-	-	-
	Hay Al-Zahra	-	-	-	-	-	-	-
	Jnah	-	-	-	-	-	-	-
	Horch Al-Katil	975	115	-	-	77	-	-
	Sub Total	*2590*	*320*	*264*	*770*	*220*	-	*239*
FOUR	Al-Maramel	-	-	-	-	-	-	97
	Ram Al-Aali	-	-	-	-	-	-	-
	Sabra & Chatila	560	60	-	-	30	-	50
	Ouzai	-	-	-	-	-	-	145
	Bir Hassan	-	-	-	-	-	-	-
	Hay Al-Zahra	400	40	-	-	-	-	-
	Jnah	-	-	-	-	-	-	-
	Horch Al-Katil	950	100	100	-	49	-	101
	Sub Total	*1,910*	*200*					
	Total	10,120	1,595	873	7,040	750	1,465	1,605
	Approximate total built up area (m²)	1,143,560	59,494	58,928				

Table B.2 Benchmark Elyssar Analysis

	Up to 2010	1 1996	2 1997	3 1998	4 1999	5 2000	2001	2002	7 2003	8 2004	9 2005	10 2006	11 2007	12 2008	13 2009	14 2010	Up to 2020
Cash Inflow (in millions)																	
Land Sale	$498.10				$4.36	$45.00	$216.27	$187.30	$31.90	$13.27		$21.61	$22.48	$23.38	$27.04	$28.12	$498.10
Rental	$186.18					$6.80	$7.08	$7.36	$13.55	$14.10	$14.66				$5.08		$537.31
Contribution of Owners to Land Clearance	$18.92								$5.04			$8.80					$18.92
Sale of Built Units	$148.10								$38.12	$20.01	$10.51	$44.13	$23.17	$12.16			$238.29
Government & Other Contribution	$0.00																
Total Cash Inflow (in millions)	$851.30	$0.00	$0.00	$0.00	$4.36	$51.80	$223.35	$194.66	$88.61	$47.38	$25.17	$74.54	$45.65	$35.54	$32.12	$28.12	$1,292.62
Cash Outflow (in millions)																	
Studies, Consulting Work, & Supervision of Studies	($12.51)	($6.05)	($3.16)	($1.50)	($1.80)												($12.51)
Land Expropriation	($215.80)	($0.06)	($0.10)													($215.64)	($215.80)
Building Owners' Compensation	($179.59)		($7.92)			($51.92)			($45.53)			($51.73)			($22.49)		($179.59)
Occupiers Compensation	($384.17)	($77.78)	($45.72)			($88.91)			($54.14)			($76.85)			($40.77)		($384.17)
Residents	($200.14)		($20.38)			($51.52)			($47.31)			($53.35)			($27.58)		($200.14)
Shopkeepers	($47.80)		($14.11)			($13.97)						($11.91)			($7.81)		($47.80)
Workshop Users	($58.45)		($11.23)			($23.42)			($6.83)			($11.59)			($5.38)		($58.45)
Total Expropriation and Compensation	($779.56)	($77.84)	($53.74)			($140.83)			($99.67)			($128.58)			($63.26)	($215.64)	($779.56)
Demolition	($15.39)	($2.03)	($1.34)			($3.43)			($3.06)			($3.84)			($1.69)		($15.39)
Site Preparation	($39.82)		($24.72)			($3.66)	($6.78)	($4.66)					($5.53)	($5.70)			($39.82)
Infrastructure	($137.76)		($4.42)	($30.68)	($30.99)	($0.33)	($18.09)	($19.16)		($11.43)	($11.43)		($14.19)	($14.61)		($10.36)	($137.76)
Superstructure Development	($259.24)			($31.97)	($32.81)		($39.63)	($39.67)		($37.81)	($38.19)		($14.19)	($13.92)		($9.76)	($269.49)
Housing	($240.06)			($29.48)	($30.24)		($36.89)	($36.91)		($34.51)	($34.84)		($13.51)	($13.92)		($9.76)	($249.70)
Shops	($9.85)			($1.25)	($1.29)		($1.51)	($1.51)		($1.43)	($1.44)		($0.49)	($0.50)		($0.43)	($10.29)
Workshops	($9.33)			($1.24)	($1.28)		($1.23)	($1.25)		($1.87)	($1.91)		($0.19)	($0.19)		($0.17)	($9.50)
Total Project Execution	($452.21)	($2.03)	($30.48)	($62.65)	($63.80)	($7.42)	($64.50)	($63.49)	($3.06)	($49.24)	($49.62)	($3.84)	($19.72)	($20.31)	($1.69)	($10.36)	($462.46)
Project Management and Administration Costs	($18.80)	($0.80)	($1.22)	($2.51)	($2.55)	($0.30)	($2.58)	($2.54)	($0.12)	($1.97)	($1.98)	($0.15)	($0.79)	($0.81)	($0.07)	($0.41)	($19.22)
Sales and Marketing	($6.45)				($0.04)	($0.45)	($2.16)	($1.87)	($0.70)	($0.33)	($0.11)	($0.44)	($0.23)	($0.12)			($7.36)
Maintenance and Repair	($27.92)					($1.02)	($1.06)	($1.10)	($2.03)	($2.11)	($2.20)	($3.24)	($3.37)	($3.51)	($4.06)	($4.22)	($80.60)
Total Administration and Operating Costs	($53.17)	($0.80)	($1.22)	($2.51)	($2.59)	($1.77)	($5.80)	($5.51)	($2.85)	($4.41)	($4.29)	($3.83)	($4.39)	($4.44)	($4.13)	($4.63)	($107.18)
Interest on Expropriation Bonds	($252.33)		($19.41)	($19.41)	($19.41)	($19.41)	($19.41)	($19.41)	($19.41)	($19.41)	($19.41)	($19.41)	($19.41)	($19.41)	($19.41)		($252.33)
Contingencies	($126.29)	($8.67)	($8.85)	($6.67)	($6.82)	($14.85)	($6.71)	($6.60)	($10.28)	($5.12)	($5.16)	($13.26)	($2.05)	($2.11)	($6.50)	($22.64)	($127.37)
Total Cash Outflow (in millions)	($1,676.07)	($95.39)	($116.86)	($92.74)	($94.42)	($184.28)	($96.42)	($95.01)	($135.27)	($78.18)	($78.48)	($168.92)	($45.57)	($46.27)	($94.99)	($253.27)	($1,741.41)
Net Cash Flow		($95.39)	($116.86)	($92.74)	($90.06)	($132.48)	$126.93	$99.65	($46.66)	($30.80)	($53.31)	($94.38)	$0.08	($10.73)	($62.87)	($225.15)	
Cumulative Cash Flow		($95.39)	($212.25)	($304.99)	($395.05)	($527.53)	($400.60)	($300.95)	($347.61)	($378.41)	($431.72)	($526.10)	($526.02)	($536.75)	($599.62)	($824.77)	
NPV (in millions)	($398.05)	12%															
Annual Worth (in millions)	($398.05)	($58.44)	($58.44)	($58.44)	($58.44)	($58.44)	($58.44)	($58.44)	($58.44)	($58.44)	($58.44)	($58.44)	($58.44)	($58.44)	($58.44)	($58.44)	

APPENDIX C   Graphs and Tables for the Variation of the NPV with Various Input Parameters

Table C.1 Scenario 1 Financial Analysis

	Up to 2020	1996	1997	1998	1999	2000	2001	2002	2003	2004
Year Index		0	1	2	3	4	5	6	7	8
Year		1996	1997	1998	1999	2000	2001	2002	2003	2004
Phases		0	1	1	2	2	2	3	3	3
Inflation factor		1.00	1.04	1.08	1.12	1.17	1.22	1.27	1.32	1.37
Cummulative No. of units built										
Housing		0	0	250	250	1338	2425	2425	2888	3350
Shops		0	0	25	25	175	325	325	560	795
Workshops		0	0	80	80	240	400	400	533	665
Cash Inflow (US$000)										
Land Sale	$1,011,248							$105,338		
Rental of houses	$300,994	$0	$0	$0	$390	$405	$2,255	$4,253	$4,423	$5,477
Rental of Shops	$114,703	$0	$0	$0	$84	$88	$639	$1,234	$1,283	$2,299
Rental of Workshops	$104,726	$0	$0	$0	$367	$382	$1,191	$2,065	$2,148	$2,973
Total Rentals	$520,423				$841	$875	$4,085	$7,551	$7,854	$10,750
Contribution of Owners to Land Clearance	$22,904		$171		$1,745			$2,831		
Sale of Built Units	$0.00									
Government & Other Contribution	$0.00									
Total Cash Inflow	$1,554,576	$0	$171	$0	$2,586	$875	$4,085	$115,720	$7,854	$10,750
Cummulative Cash Inflow	$1,554,576	$0	$171	$171	$2,757	$3,632	$7,717	$123,437	$131,291	$142,041
Draw Down Schedule	(%tage of respective total)									
Pre-construction		50%	25%	12.5%	12.5%					
Cash Outflow (US$000)										
Studies, Consulting Work, & Supervision of Studies	($15,790.52)	($7,895)	($3,948)	($1,974)	($1,974)					
Land Expropriation	($131,985)		($4,884)		($49,765)			($59,312)		
Building Owners' Compensation	($240,092)				($6,050)			($42,556)		
Occupiers Compensation	($566,638)				($14,679)			($106,658)		
Residents	($375,172)				($5,821)			($61,684)		
Shopkeepers	($94,977)				($1,575)			($18,600)		
Workshop Users	($96,489)				($7,283)			($26,572)		
Total Expropriation and Compensation	($938,714)	$0	($4,884)	$0	($69,495)	$0	$0	($208,724)	$0	$0
Units to be Demolished	17,140	0			570			4,270		
Area of Site Preparation to be completed (m2)	2,728,000		34,548		325,452			469,444		
% of infrastructure Infrastructure to be done				100%		50%	50%		50%	50%
Superstructure Units to be Development	12,135			355		1,398	1,398		830	830
Housing	9,700			250		1,088	1,088		463	463
Shops	1,560			25		150	150		235	235
Workshops	875			80		160	160		133	133
Demolition	($21,337)	$0	$0	$0	($449)	$0	$0	($3,782)	$0	$0
Site Preparation	($62,482)	$0	($467)	$0	($4,759)	$0	$0	($7,722)	$0	$0
Infrastructure	($241,445)			($21,014)		($6,801)	($6,801)		($16,221)	($16,221)
Superstructure Development	($353,543)			($6,279)		($27,913)	($29,029)		($15,201)	($15,809)
Housing	($330,229)			($5,408)		($25,444)	($26,462)		($12,172)	($12,659)
Shops	($12,641)			($135)		($877)	($912)		($1,548)	($1,608)
Workshops	($10,673)			($735)		($1,591)	($1,655)		($1,482)	($1,541)
Total Project Execution	($678,808)	$0	($467)	($27,292)	($5,208)	($34,713)	($35,830)	($11,504)	($31,422)	($32,030)
Project Management and Administration Costs	($30,546)	$0	($21)	($1,228)	($234)	($1,562)	($1,612)	($518)	($1,414)	($1,441)
Sales and Marketing	($10,182)	$0	($7)	($409)	($78)	($521)	($537)	($173)	($471)	($480)
Maintenance and Repair	($52,042)				($84)	($87)	($409)	($755)	($785)	($1,075)
Total Adminstration and Operating Costs	($77,074)	$0	($28)	($1,638)	($397)	($2,170)	($2,558)	($1,445)	($2,671)	($2,997)
Interest on Expropriation Bonds	(252,330)		(19,410)	(19,410)	(19,410)	(19,410)	(19,410)	(19,410)	(19,410)	(19,410)
Contingencies	($171,029)	$0	($538)	($2,893)	($7,510)	($3,668)	($3,839)	($22,187)	($3,409)	($3,503)
Total Cash Outflow	($2,149,443)	($7,895)	($29,275)	($53,207)	($103,993)	($59,962)	($61,637)	($263,251)	($56,912)	($57,940)
Cummulative Cash Outflow	($2,149,443)	($7,895)	($37,170)	($90,377)	($194,370)	($254,352)	($315,989)	($579,240)	($636,153)	($694,092)
Net Cash Flow	($811,389)	($7,895)	($29,104)	($53,207)	($101,407)	($59,107)	($57,552)	($147,531)	($49,059)	($47,190)
Cummulative Cash Flow	($811,389)	($7,895)	($36,999)	($90,206)	($191,613)	($250,720)	($308,272)	($455,803)	($504,862)	($552,052)
NPV (25-year)	($352,085)	12%								
NPV (35-year)	($332,053)	12%								
Annual Worth for 25 years	($352,085)	($44,891)	($44,891)	($44,891)	($44,891)	($44,891)	($44,891)	($44,891)	($44,891)	($44,891)
Annual Worth for 35 years	($332,053)	($40,616)	($40,616)	($40,616)	($40,616)	($40,616)	($40,616)	($40,616)	($40,616)	($40,616)
IRR (25-year)										
IRR (35-year)										
Present Value of Each Period	5%	($7,895)	($27,718)	($48,260)	($87,600)	($48,628)	($45,093)	($110,090)	($34,865)	($31,940)
Present Value of Each Period	20%	($7,895)	($24,253)	($36,949)	($58,685)	($28,505)	($23,129)	($49,408)	($13,691)	($10,975)

9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
4	4	4	5	5	5	6	6	6	7	7	7	8	8	8	9
1.42	1.48	1.54	1.60	1.67	1.73	1.80	1.87	1.95	2.03	2.11	2.19	2.28	2.37	2.46	2.56
3350	3775	4200	4200	4775	5350	5350	6375	7400	7400	7975	8550	8550	9125	9700	9700
795	845	895	895	958	1020	1020	1133	1245	1245	1324	1403	1403	1481	1560	1560
665	665	665	665	665	690	715	715	740	765	765	793	820	820	848	875
$8,540									$448,516			$168,173			$280,682
$6,609	$6,873	$8,055	$9,320	$9,693	$11,460	$13,354	$13,888	$17,211	$20,778	$21,609	$24,219	$27,004	$28,084	$31,172	$34,462
$3,395	$3,530	$3,903	$4,299	$4,471	$4,974	$5,511	$5,731	$6,618	$7,566	$7,869	$8,701	$9,588	$9,971	$10,953	$11,996
$3,862	$4,016	$4,177	$4,344	$4,518	$4,875	$5,254	$5,464	$5,881	$6,323	$6,576	$7,085	$7,624	$7,929	$8,522	$9,151
$13,865	$14,420	$16,134	$17,963	$18,681	$21,310	$24,119	$25,084	$29,710	$34,667	$36,054	$40,006	$44,216	$45,984	$50,647	$55,609
$1,889			$1,099			$2,368			$5,361			$3,482			$3,958
$24,294	$14,420	$16,134	$19,062	$18,681	$21,310	$26,487	$25,084	$29,710	$488,544	$36,054	$40,006	$215,871	$45,984	$50,647	$340,248
$166,335	$180,754	$196,888	$215,950	$234,631	$255,941	$282,428	$307,511	$337,222	$825,766	$861,819	$901,825	$1,117,696	$1,163,680	$1,214,327	$1,554,576
															($18,023)
($18,218)			($18,601)			($26,739)			($54,731)			($33,878)			($40,319)
($45,368)			($41,627)			($61,007)			($118,612)			($76,076)			($100,212)
($25,687)			($30,620)			($43,358)			($93,441)			($54,349)			($59,212)
($5,480)			($8,405)			($9,455)			($18,435)			($15,353)			($17,674)
($13,201)			($2,802)			($8,194)			($6,735)			($8,374)			($23,326)
($63,586)	$0	$0	($60,428)	$0	$0	($87,746)	$0	$0	($173,342)	$0	$0	($111,855)	$0	$0	($158,555)
1,625			1,475			1,885			3,430			1,888			1,997
278,556			144,038			275,962			555,355			320,645			324,000
	50%	50%		50%	50%		50%	50%		50%	50%		50%	50%	100%
	475	475		663	663		1,163	1,163		681	681		681	681	
	425	425		575	575		1,025	1,025		575	575		575	575	
	50	50		63	63		113	113		79	79		79	79	
	0	0		25	25		25	25		28	28		28	28	
($1,819)	$0	$0	($1,653)	$0	$0	($2,376)	$0	$0	($4,864)	$0	$0	($3,011)	$0	$0	($3,583)
($5,154)	$0	$0	($2,998)	$0	$0	($6,481)	$0	$0	($14,626)	$0	$0	($9,499)	$0	$0	($10,797)
	($9,727)	($9,727)		($6,035)	($6,035)		($13,008)	($13,008)		($10,442)	($10,442)		($11,377)	($11,377)	($73,214)
	($12,952)	($13,470)		($20,023)	($20,823)		($39,848)	($41,442)		($25,551)	($26,573)		($28,741)	($29,891)	
	($12,582)	($13,085)		($19,148)	($19,914)		($38,396)	($39,932)		($24,229)	($25,198)		($27,254)	($28,344)	
	($370)	($385)		($520)	($541)		($1,054)	($1,096)		($830)	($883)		($933)	($970)	
	$0	$0		($354)	($368)		($398)	($414)		($492)	($512)		($554)	($576)	
($6,773)	($22,679)	($23,197)	($4,651)	($26,057)	($26,658)	($8,637)	($52,853)	($54,447)	($19,490)	($35,993)	($37,015)	($12,510)	($40,118)	($41,268)	($87,594)
($305)	($1,021)	($1,044)	($209)	($1,173)	($1,209)	($398)	($2,378)	($2,450)	($877)	($1,620)	($1,666)	($563)	($1,805)	($1,857)	($3,942)
($102)	($340)	($348)	($70)	($391)	($403)	($133)	($793)	($817)	($292)	($540)	($555)	($188)	($602)	($619)	($1,314)
($1,386)	($1,442)	($1,813)	($1,798)	($1,868)	($2,131)	($2,412)	($2,508)	($2,971)	($3,467)	($3,605)	($4,001)	($4,422)	($4,598)	($5,065)	($5,561)
($1,793)	($2,803)	($3,005)	($2,075)	($3,432)	($3,742)	($2,942)	($5,680)	($6,238)	($4,636)	($5,765)	($6,221)	($5,172)	($7,006)	($7,541)	($10,817)
(19,410)	(19,410)	(19,410)	(19,410)	(19,410)											
($7,215)	($2,548)	($2,620)	($6,715)	($2,949)	($3,060)	($9,953)	($5,853)	($6,069)	($19,747)	($4,176)	($4,324)	($12,964)	($4,712)	($4,881)	($25,697)
($98,777)	($47,440)	($48,233)	($83,279)	($51,848)	($33,661)	($109,478)	($64,386)	($66,754)	($217,215)	($45,934)	($47,560)	($142,600)	($51,836)	($53,689)	($282,682)
($792,889)	($840,309)	($888,542)	($981,821)	($1,033,669)	($1,087,329)	($1,176,807)	($1,241,193)	($1,307,947)	($1,525,162)	($1,571,095)	($1,616,856)	($1,761,256)	($1,813,092)	($1,866,781)	($2,149,443)
($74,483)	($33,020)	($32,099)	($74,218)	($33,167)	($12,351)	($82,991)	($39,303)	($37,043)	$271,330	($9,880)	($7,555)	$73,271	($5,851)	($3,042)	$57,587
($828,534)	($659,555)	($691,653)	($765,871)	($799,038)	($811,389)	($894,379)	($933,682)	($970,725)	($699,396)	($709,276)	($716,831)	($643,560)	($649,412)	($652,454)	($594,867)
($44,891)	($44,891)	($44,891)	($44,891)	($44,891)	($44,891)	($44,891)	($44,891)	($44,891)	($44,891)	($44,891)	($44,891)	($44,891)	($44,891)	($44,891)	($44,891)
($40,616)	($40,616)	($40,616)	($40,616)	($40,616)	($40,616)	($40,616)	($40,616)	($40,616)	($40,616)	($40,616)	($40,616)	($40,616)	($40,616)	($40,616)	($40,616)
($48,012)	($20,272)	($18,767)	($41,327)	($17,589)	($6,238)	($39,920)	($18,005)	($16,162)	$112,743	($3,910)	($2,847)	$26,300	($2,000)	($991)	$17,856
($14,435)	($5,333)	($4,320)	($8,324)	($3,100)	($962)	($5,387)	($2,126)	($1,670)	$10,191	($309)	($197)	$1,593	($106)	($46)	$724

	25	26	27	28	29	30	31	32	33	34
	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
	9	9	9	9	9	9	9	9	9	9
	2.67	2.77	2.88	3.00	3.12	3.24	3.37	3.51	3.65	3.79
	9700	9700	9700	9700	9700	9700	9700	9700	9700	9700
	1560	1560	1560	1560	1560	1560	1560	1560	1560	1560
	875	875	875	875	875	875	875	875	875	875
	$35,840	$37,274	$38,765	$40,315	$41,928	$43,605	$45,349	$47,163	$49,050	$51,012
	$12,476	$12,975	$13,494	$14,034	$14,595	$15,179	$15,786	$16,418	$17,074	$17,757
	$9,517	$9,898	$10,294	$10,705	$11,134	$11,579	$12,042	$12,524	$13,025	$13,546
	$57,833	$60,147	$62,552	$65,054	$67,657	$70,363	$73,177	$76,105	$79,149	$82,315
	$57,833	$60,147	$62,552	$65,054	$67,657	$70,363	$73,177	$76,105	$79,149	$82,315
	$1,612,409	$1,672,555	$1,735,108	$1,800,162	$1,867,819	$1,938,182	$2,011,359	$2,087,464	$2,166,612	$2,248,927
	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
	($5,783)	($6,015)	($6,255)	($6,505)	($6,766)	($7,036)	($7,318)	($7,610)	($7,915)	($8,231)
	($5,783)	($6,015)	($6,255)	($6,505)	($6,766)	($7,036)	($7,318)	($7,610)	($7,915)	($8,231)
	($5,783)	($6,015)	($6,255)	($6,505)	($6,766)	($7,036)	($7,318)	($7,610)	($7,915)	($8,231)
	($2,155,220)	($2,161,241)	($2,167,496)	($2,174,002)	($2,180,767)	($2,187,803)	($2,195,121)	($2,202,732)	($2,210,647)	($2,218,878)
	$52,050	$54,132	$56,297	$58,549	$60,891	$63,327	$65,860	$68,494	$71,234	$74,083
	($542,817)	($488,686)	($432,388)	($373,839)	($312,948)	($249,622)	($183,762)	($115,268)	($44,034)	$30,049
	($40,616)	($40,616)	($40,616)	($40,616)	($40,616)	($40,616)	($40,616)	($40,616)	($40,616)	($40,616)
	$15,370	$15,224	$15,079	$14,935	$14,793	$14,652	$14,513	$14,375	$14,238	$14,102
	$546	$473	$410	$355	$308	$267	$231	$200	$174	$151

Table C. 2 Percentage Variation of NPV with a Number of Input Variables for a 35-Year Analysis

% Change of Variable	Variable	NPV	% Change of NPV
	DR (35 years)	($332,053)	
10%	13.20%	($317,054)	-4.52%
-10%	10.80%	($346,265)	4.28%
	Inflation Rate	($332,053)	
10%	4.40%	($333,488)	0.43%
-10%	3.60%	($330,382)	-0.50%
	Cost of Demolition/Structure	($332,053)	
10%	$770	($332,595)	0.16%
-10%	$630	($331,512)	-0.16%
	Cost of Site Prep. /m^2	($332,053)	
10%	$14	($333,732)	0.51%
-10%	$12	($330,762)	-0.39%
	Cost of Structure Construction	($332,053)	
10%	10%	($342,334)	3.10%
-10%	-10%	($321,773)	-3.10%
	Rentals	($332,053)	
10%	10%	($323,400)	-2.61%
-10%	-10%	($340,707)	2.61%
	Contrib. Of Owners	($332,053)	
10%	$14,300,000	($331,562)	-0.15%
-10%	$11,700,000	($332,545)	0.15%
	All Compensations	($332,053)	
10%	10%	($350,358)	5.51%
-10%	-10%	($313,749)	-5.51%
	Project Mngt. $ Admin.	($332,053)	
10%	4.95%	($332,815)	0.23%
-10%	4.05%	($331,292)	-0.23%
	Sales & Marketing	($332,053)	
10%	1.65%	($332,307)	0.08%
-10%	1.35%	($331,800)	-0.08%
	Contingency	($332,053)	
10%	11.00%	($336,057)	1.21%
-10%	9.00%	($328,050)	-1.21%
	Design	($332,053)	
10%	4.40%	($333,339)	0.39%
-10%	3.60%	($330,768)	-0.39%
	Land Sales	($332,053)	
10%	10%	($318,765)	4.00%
-10%	-10%	($345,342)	-4.00%

Table C. 3 Variation of NPV with Compensation Rates for a 25-Year Analysis of Scenario 1

Compensation Rates For dwellings	NPV ($352,085)
0	($271,666)
5000	($298,472)
10000	($325,279)
15000	($352,085)
20000	($378,891)
25000	($405,698)
30000	($432,504)
35000	($459,311)
40000	($486,117)
45000	($512,923)
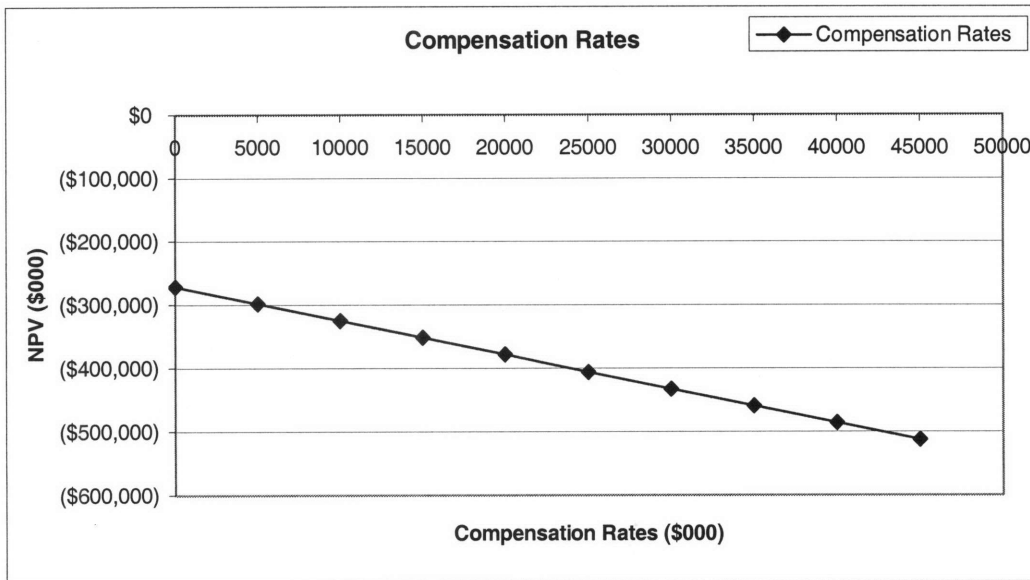
Figure C. 1 Variation of NPV with Compensation Rates for a 25-Year Analysis of Scenario 1

Table C. 4 Variation of NPV with Rentals for a 25-Year Analysis of Scenario 1

% Variation in Rent	NPV ($352,085)
-20%	($365,385)
-15%	($362,060)
-10%	($358,735)
-5%	($355,410)
0%	($352,085)
5%	($348,760)
10%	($345,435)
15%	($342,110)
20%	($338,785)
25%	($335,460)
30%	($332,135)
35%	($328,810)
40%	($325,485)
45%	($322,160)
50%	($318,835)
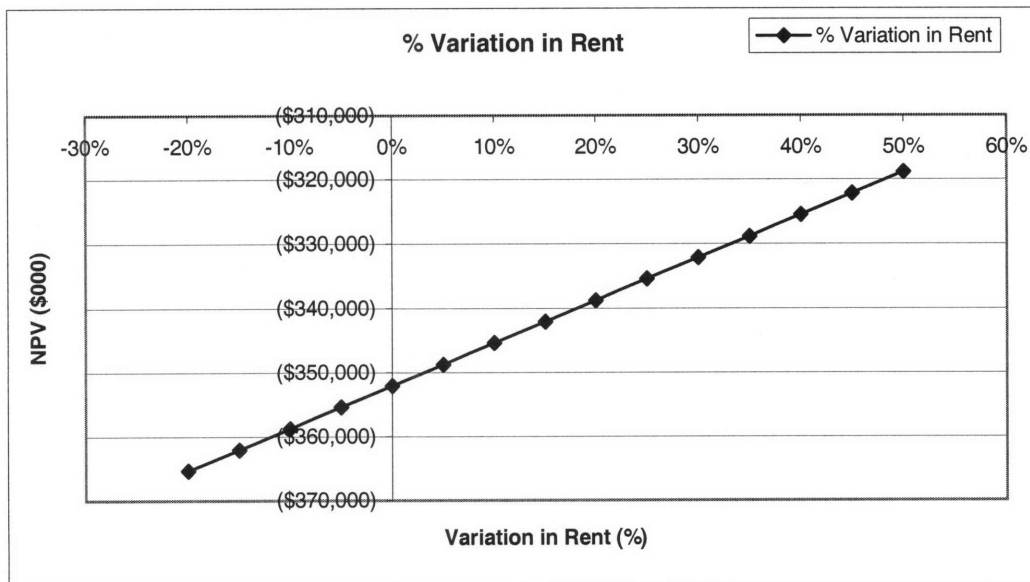
Figure C. 2 Variation of NPV with Rentals for a 25-Year Analysis of Scenario 1

Table C. 5 Variation of NPV with Total Contribution of Owners for a 25-Year Analysis of Scenario 1

Total Contribution Of Owners	NPV ($352,085)
$0	($357,000)
$5,000,000	($355,110)
$10,000,000	($353,219)
$15,000,000	($351,329)
$20,000,000	($349,438)
$25,000,000	($347,548)
$30,000,000	($345,657)
$35,000,000	($343,767)
$40,000,000	($341,876)
$45,000,000	($339,986)
$50,000,000	($338,096)
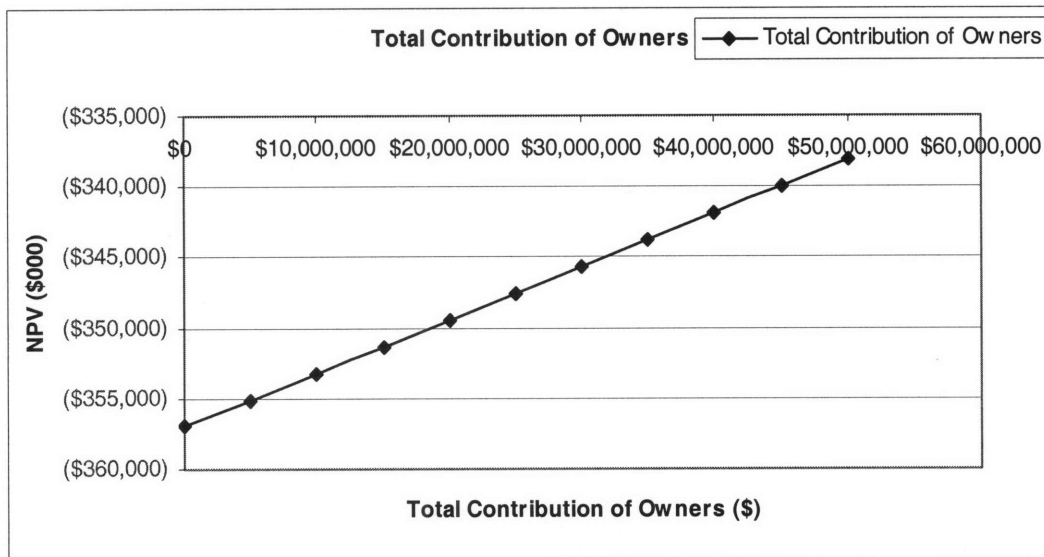
Figure C. 3 Variation of NPV with Total Contribution of Owners for a 25-Year Analysis

Table C. 6 Variation of NPV with Building Owners
Compensation for a 25-Year Analysis of
Scenario 1

Building Owners Compensation	NPV ($352,085)
$0	($298,761)
$25,000,000	($308,636)
$50,000,000	($318,511)
$75,000,000	($328,386)
$100,000,000	($338,260)
$125,000,000	($348,135)
$150,000,000	($358,010)
$175,000,000	($367,885)
$200,000,000	($377,759)
$225,000,000	($387,634)
$250,000,000	($397,509)
$275,000,000	($407,383)
$300,000,000	($417,258)
$350,000,000	($437,008)
$400,000,000	($456,757)
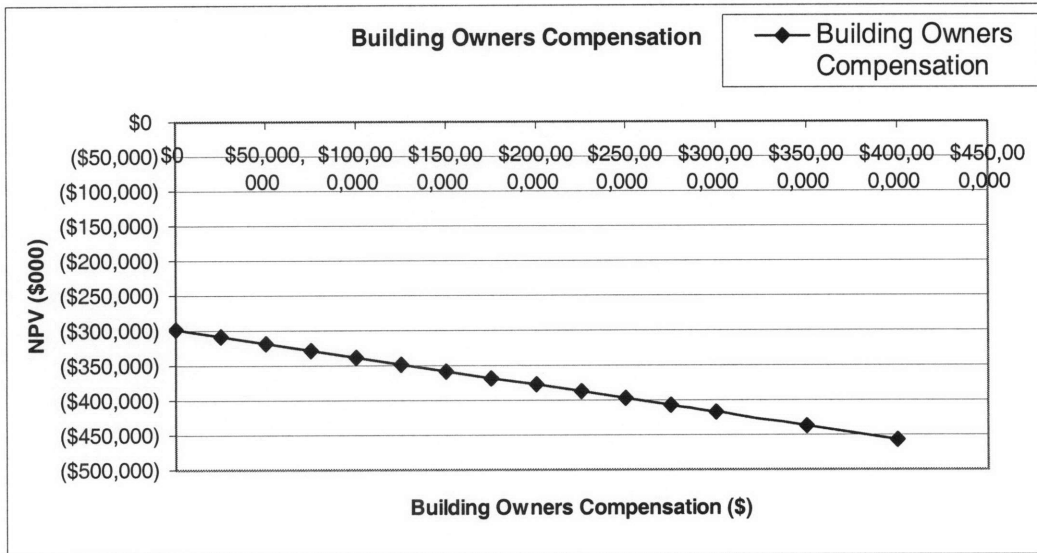
Figure C. 4 Variation of NPV with Building Owners Compensation for a 25-Year
Analysis of Scenario 1

Table C. 7 Variation of NPV with Building Owners Compensation for a 25-Year Analysis of Scenario 1

% Variation in Compensations	NPV ($352,085)
-20%	($315,476)
-15%	($324,628)
-10%	($333,780)
-5%	($342,933)
0%	($352,085)
5%	($361,237)
10%	($370,389)
15%	($379,542)
20%	($388,694)
25%	($397,846)
30%	($406,998)
35%	($416,151)
40%	($425,303)
45%	($434,455)
50%	($443,608)
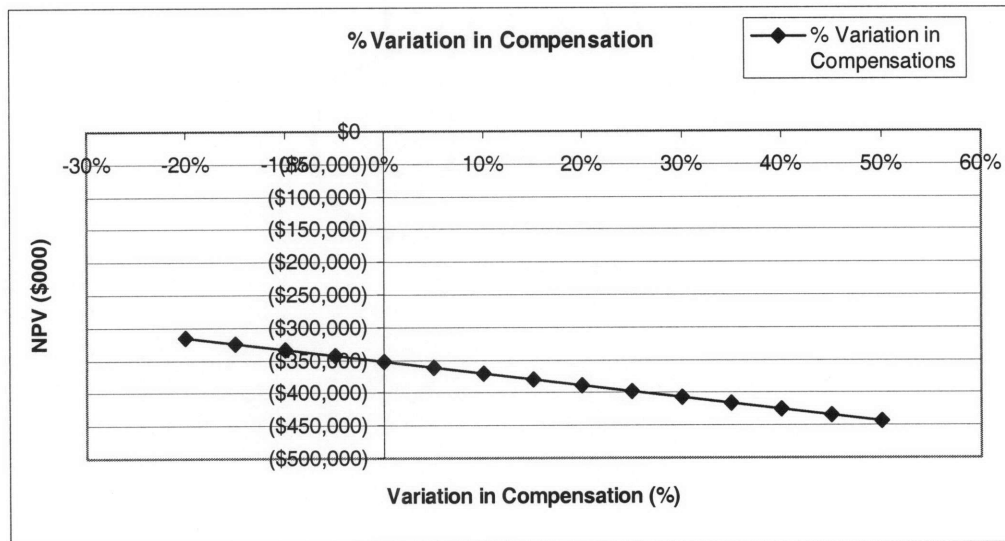
Figure C. 5 Variation of NPV with Percent Variation in Compensation for a 25-Year Analysis of Scenario 1

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**Table C. 8 Variation of NPV with Planning and Design
for a 25-Year Analysis of Scenario 1**

Planning and Design (As % of Project Exe.)	NPV ($352,085)
0%	(339,229)
1%	(342,443)
2%	(345,657)
3%	(348,871)
4%	(352,085)
5%	(355,299)
6%	(358,513)
7%	(361,727)
8%	(364,941)
9%	(368,155)
10%	(371,368)
11%	(374,582)
12%	(377,796)
13%	(381,010)
14%	(384,224)
15%	(387,438)
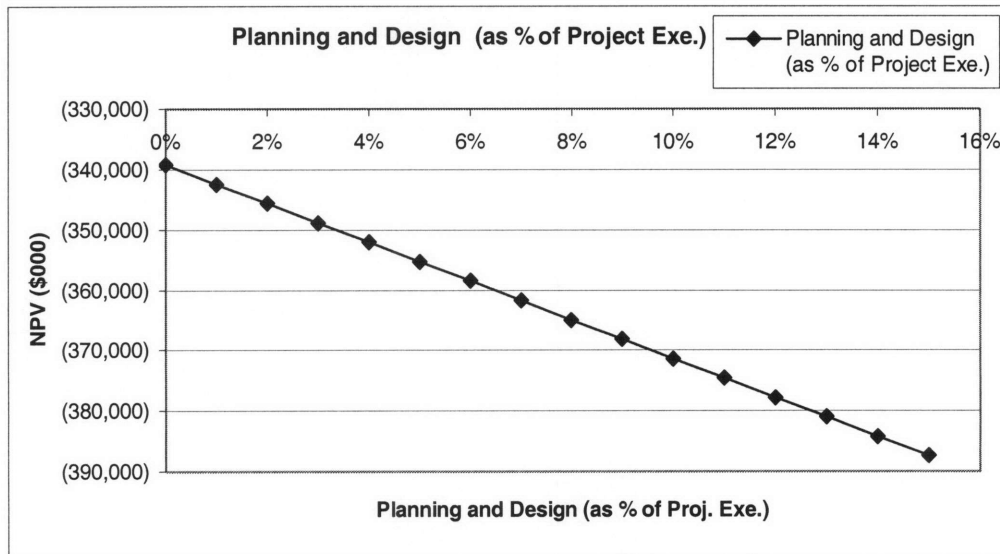
Figure C. 6 Variation of NPV with Planning and Design for a 25-Year Analysis

Table C.9 Scenario 2 Financial Analysis

	Up to 2020	0 / 1996	1 / 1997	2 / 1998	3 / 1999	4 / 2000	5 / 2001	6 / 2002
Year Index		0	1	2	3	4	5	6
Year	Up to 2020	1996	1997	1998	1999	2000	2001	2002
Phases		0	1	1	1	2	2	2
Inflation factor		1.00	1.04	1.08	1.12	1.17	1.22	1.27
Cummulative No. of units built								
Housing		0	0	425	850	850	1425	2000
Shops		0	0	50	100	100	163	225
Workshops		0	0	0	0	0	25	50
Cash Inflow (US$000)								
Land Sale	$851,647		$6,240					
Rental of houses	$302,826	$0	$0	$0	$663	$1,378	$1,433	$2,499
Rental of Shops	$83,006	$0	$0	$0	$169	$351	$365	$617
Rental of Workshops	$47,040	$0	$0	$0	$0	$0	$0	$129
Total Rentals	**$432,872**				$831	$1,729	$1,798	$3,245
Contribution of Owners to Land Clearance	$23,126		$486			$803		
Sale of Built Units	$0.00							
Government & Other Contribution	$0.00							
Total Cash Inflow	**$1,307,645**	$0	$6,726	$0	$831	$2,532	$1,798	$3,245
Draw Down Schedule		(%tage of respective total)						
Pre-construction		50%	25%	12.5%	12.5%			
Cash Outflow (US$000)								
Studies, Consulting Work, & Supervision of Studies	($15,790.52)	($7,895)	($3,948)	($1,974)	($1,974)			
Land Expropriation	($131,985)		($4,884)		($49,765)			($59,312)
Building Owners' Compensation	($208,951)				($37,832)			($16,195)
Occupiers Compensation	($566,638)				($14,679)			($106,856)
Residents	($375,172)				($5,821)			($61,684)
Shopkeepers	($94,977)				($1,575)			($18,600)
Workshop Users	($96,489)				($7,283)			($26,572)
Total Expropriation and Compensation	**($907,574)**	$0	($4,884)	$0	($102,277)	$0	$0	($182,363)
Units to be Demolished	17,140	0	0			1,475		
Area of Site Preparation to be completed (m2)	2,728,000		98,000			144,038		
% of infrastructure Infrastructure to be done				50%	50%		50%	50%
Superstructure Units to be Development	12,135			475	475		663	663
Housing	9,700			425	425		575	575
Shops	1,560			50	50		63	63
Workshops	875			0	0		25	25
Demolition	($21,852)	$0	$0	$0	$0	($1,208)	$0	$0
Site Preparation	($63,089)	$0	($1,325)	$0	$0	($2,191)	$0	$0
Infrastructure	($210,479)			($5,972)	($5,972)		($4,410)	($4,410)
Superstructure Development	($359,181)			($9,464)	($9,843)		($14,630)	($15,215)
Housing	($329,213)			($9,194)	($9,561)		($13,992)	($14,551)
Shops	($14,673)			($270)	($281)		($380)	($395)
Workshops	($15,295)			$0	$0		($259)	($269)
Total Project Execution	**($654,600)**	$0	($1,325)	($15,436)	($15,814)	($3,398)	($19,040)	($19,625)
Project Management and Administration Costs	($29,457)	$0	($60)	($695)	($712)	($153)	($857)	($883)
Sales and Marketing	($9,819)	$0	($20)	($232)	($237)	($51)	($286)	($294)
Maintenance and Repair	($43,287)				($83)	($173)	($180)	($324)
Total Adminstration and Operating Costs	**($70,468)**	$0	($79)	($926)	($1,032)	($377)	($1,322)	($1,502)
Interest on Expropriation Bonds	(252,330)		(19,410)	(19,410)	(19,410)	(19,410)	(19,410)	(19,410)
Contingencies	($164,474)	$0	($629)	($1,636)	($11,912)	($378)	($2,036)	($20,349)
Total Cash Outflow	**($2,077,331)**	($7,895)	($30,275)	($39,382)	($152,419)	($23,563)	($41,608)	($243,249)
Net Cash Flow	($486,513)	($7,895)	($23,549)	($39,382)	($151,588)	($21,031)	($40,010)	($240,004)
Cummulative Cash Flow	($486,513)	($7,895)	($31,445)	($70,827)	($222,415)	($243,445)	($283,455)	($523,460)
NPV (25-year)	($319,302)	12%						
NPV (35-year)	($299,270)	12%						
Annual Worth for 25 years	($319,302)	($40,711)	($40,711)	($40,711)	($40,711)	($40,711)	($40,711)	($40,711)
Annual Worth for 35 years	($299,270)	($36,606)	($36,606)	($36,606)	($36,606)	($36,606)	($36,606)	($36,606)
IRR (25-year)								
IRR (35-year)								
Present Value of Each Period	5%	($7,895)	($22,428)	($35,720)	($130,948)	($17,302)	($31,349)	($179,095)
Present Value of Each Period	20%	($7,895)	($19,625)	($27,348)	($87,725)	($10,142)	($16,079)	($80,377)

7	8	9	10	11	12	13	14	15	16	17	18	19	20
2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
3	3	3	4	4	4	5	5	5	6	6	7	7	7
1.32	1.37	1.42	1.48	1.54	1.60	1.67	1.73	1.80	1.87	1.95	2.03	2.11	2.19
2000	3025	4050	4050	4625	5200	5200	5775	6350	6350	6600	6600	7688	8775
225	338	450	450	529	608	608	686	765	765	790	790	940	1090
50	75	100	100	128	155	155	183	210	210	290	290	450	610
			$327,726			$122,882			$205,091				
$3,648	$3,794	$5,967	$8,309	$8,641	$10,263	$12,001	$12,481	$14,415	$16,484	$17,144	$18,531	$19,273	$23,346
$888	$924	$1,441	$1,998	$2,078	$2,540	$3,035	$3,156	$3,708	$4,298	$4,470	$4,801	$4,993	$6,179
$268	$279	$436	$604	$628	$833	$1,053	$1,095	$1,341	$1,605	$1,669	$2,397	$2,493	$4,023
$4,804	$4,997	$7,844	$10,911	$11,348	$13,636	$16,088	$16,732	$19,464	$22,388	$23,283	$25,729	$26,759	$33,548
$1,731			$3,917			$2,544			$3,200		$3,142		
$6,535	$4,997	$7,844	$342,555	$11,348	$13,636	$141,515	$16,732	$19,464	$230,679	$23,283	$28,871	$26,759	$33,548

7	8	9	10	11	12	13	14	15	16	17	18	19	20
			($16,536)			($23,771)			($48,655)		($30,118)		
			($45,368)			($41,827)			($61,007)		($118,612)		
			($26,687)			($30,620)			($43,358)		($93,441)		
			($5,480)			($8,405)			($9,455)		($18,435)		
			($13,201)			($2,802)			($8,194)		($6,736)		
$0	$0	($61,904)	$0	$0	($65,598)	$0	$0	($109,662)	$0	$0	($148,729)	$0	$0
1,885			3,430			1,888			1,997		570		
275,962			555,355			320,645			358,548		325,452		
	50%	50%		50%	50%		50%	50%		100%		50%	50%
	1,163	1,163	681	681		681	681		355		1,398	1,398
	1,025	1,025	575	575		575	575		250		1,088	1,088
	113	113	79	79		79	79		25		150	150
	25	25	28	28		28	28		80		160	160
($1,736)	$0	$0	($3,554)	$0	$0	($2,200)	$0	$0	($2,618)	$0	($808)	$0	$0
($4,721)	$0	$0	($10,687)	$0	$0	($6,941)	$0	$0	($8,730)	$0	($8,571)	$0	$0
	($9,503)	($9,503)		($7,630)	($7,630)		($8,313)	($8,313)		($53,497)	($2,404)	($12,248)	($12,248)
	($29,116)	($30,281)		($18,670)	($19,417)		($21,001)	($21,841)		($11,308)	($50,269)	($52,280)
	($28,056)	($29,178)		($17,704)	($18,412)		($19,914)	($20,711)		($9,740)	($45,824)	($47,657)
	($770)	($801)		($606)	($630)		($682)	($709)		($243)	($1,580)	($1,643)
	($291)	($302)		($360)	($374)		($405)	($421)		($1,325)	($2,865)	($2,980)
($6,457)	($38,819)	($39,784)	($14,241)	($26,300)	($27,047)	($9,141)	($29,314)	($30,154)	($64,845)	($13,712)	($9,379)	($62,517)	($64,528)
($291)	($1,738)	($1,790)	($1,183)	($641)	($1,183)	($1,217)	($411)	($1,319)	($1,357)	($2,918)	($617)	($422)	($2,813)	($2,904)
($97)	($579)	($597)		($214)	($394)	($406)	($137)	($440)	($452)	($973)	($206)	($141)	($938)	($968)
($480)	($500)	($784)	($1,091)	($1,135)	($1,364)	($1,609)	($1,673)	($1,946)	($2,239)	($2,328)	($2,573)	($2,676)	($3,355)
($868)	($2,817)	($3,171)	($1,946)	($2,713)	($2,986)	($2,157)	($3,432)	($3,756)	($6,129)	($3,151)	($3,136)	($6,427)	($7,226)
(19,410)	(19,410)	(19,410)	(19,410)	(19,410)	(19,410)	(19,410)							
($733)	($4,144)	($10,486)	($1,619)	($2,901)	($9,563)	($1,130)	($3,275)	($14,357)	($7,097)	($1,686)	($16,124)	($6,694)	($7,175)
($27,468)	($64,990)	($134,755)	($37,215)	($51,324)	($124,604)	($31,838)	($36,020)	($157,929)	($78,072)	($18,549)	($177,369)	($75,838)	($78,930)
($20,933)	($59,993)	($126,911)	$305,340	($39,976)	($110,969)	$109,677	($19,289)	($138,465)	$152,607	$4,734	($148,497)	($49,080)	($45,382)
($544,392)	($604,385)	($731,297)	($425,957)	($465,933)	($576,902)	($467,225)	($486,513)	($624,979)	($472,371)	($467,637)	($616,135)	($665,214)	($710,596)
($40,711)	($40,711)	($40,711)	($40,711)	($40,711)	($40,711)	($40,711)	($40,711)	($40,711)	($40,711)	($40,711)	($40,711)	($40,711)	($40,711)
($36,606)	($36,606)	($36,606)	($36,606)	($36,606)	($36,606)	($36,606)	($36,606)	($36,606)	($36,606)	($36,606)	($36,606)	($36,606)	($36,606)
($14,876)	($40,606)	($81,808)	$187,452	($23,373)	($61,791)	$58,164	($9,742)	($66,604)	$69,911	$2,065	($61,704)	($19,422)	($17,104)
($5,842)	($13,953)	($24,596)	$49,314	($5,380)	($12,446)	$10,251	($1,502)	($8,987)	$8,254	$213	($5,578)	($1,536)	($1,184)

21	22	23	24	25	26	27	28	29	30	31	32	33	34
2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
8	8	8	9	9	9	9	9	9	9	9	9	9	9
2.28	2.37	2.46	2.56	2.67	2.77	2.88	3.00	3.12	3.24	3.37	3.51	3.65	3.79
8775	9238	9700	9700	9700	9700	9700	9700	9700	9700	9700	9700	9700	9700
1090	1325	1560	1560	1560	1560	1560	1560	1560	1560	1560	1560	1560	1560
610	743	875	875	875	875	875	875	875	875	875	875	875	875
$189,707													
$27,715	$28,823	$31,556	$34,462	$35,840	$37,274	$38,765	$40,315	$41,928	$43,605	$45,349	$47,163	$49,050	$51,012
$7,452	$7,750	$9,797	$11,996	$12,476	$12,975	$13,494	$14,034	$14,595	$15,179	$15,786	$16,418	$17,074	$17,757
$5,671	$5,898	$7,467	$9,151	$9,517	$9,898	$10,294	$10,705	$11,134	$11,579	$12,042	$12,524	$13,025	$13,546
$40,838	$42,471	$48,820	$55,609	$57,833	$60,147	$62,552	$65,054	$67,657	$70,363	$73,177	$76,105	$79,149	$82,315
$5,098			$2,206										
$235,643	$42,471	$48,820	$57,814	$57,833	$60,147	$62,552	$65,054	$67,657	$70,363	$73,177	$76,105	$79,149	$82,315
			($18,023)										
($35,844)			$0										
($78,076)			($100,212)										
($54,349)			($59,212)										
($15,353)			($17,674)										
($8,374)			($23,326)										
($113,920)	$0	$0	($118,236)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
4,270			1,625										
469,444			180,556										
	50%	50%	100%										
	830	830											
	463	463											
	235	235											
	133	133											
($6,811)	$0	$0	($2,916)										
($13,907)	$0	$0	($6,017)										
	($29,214)	($29,214)											
	($27,376)	($28,471)											
	($21,922)	($22,799)											
	($2,785)	($2,896)											
	($2,669)	($2,776)											
($20,718)	($56,590)	($57,685)	($8,932)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
($932)	($2,547)	($2,596)	($402)										
($311)	($849)	($865)	($134)										
($4,084)	($4,247)	($4,882)	($5,561)	($5,783)	($6,015)	($6,255)	($6,505)	($6,766)	($7,036)	($7,318)	($7,610)	($7,915)	($8,231)
($5,327)	($7,642)	($8,343)	($6,097)	($5,783)	($6,015)	($6,255)	($6,505)	($6,766)	($7,036)	($7,318)	($7,610)	($7,915)	($8,231)
($13,996)	($6,423)	($6,603)	($13,326)										
($153,961)	($70,655)	($72,630)	($146,591)	($5,783)	($6,015)	($6,255)	($6,505)	($6,766)	($7,036)	($7,318)	($7,610)	($7,915)	($8,231)
$81,681	($28,184)	($23,810)	($88,777)	$52,050	$54,132	$56,297	$58,549	$60,891	$63,327	$65,860	$68,494	$71,234	$74,083
($626,914)	($657,098)	($680,909)	($769,686)	($717,636)	($663,504)	($607,207)	($548,658)	($487,767)	($424,440)	($358,581)	($290,086)	($218,853)	($144,769)
($40,711)	($40,711)	($40,711)	($40,711)										
($36,606)	($36,606)	($36,606)	($36,606)	($36,606)	($36,606)	($36,606)	($36,606)	($36,606)	($36,606)	($36,606)	($36,606)	($36,606)	($36,606)
$29,319	($9,635)	($7,752)	($27,527)	$15,370	$15,224	$15,079	$14,935	$14,793	$14,652	$14,513	$14,375	$14,238	$14,102
$1,775	($511)	($359)	($1,117)	$546	$473	$410	$355	$308	$267	$231	$200	$174	$151

Table C. 10 Percentage Variation of NPV with a Number of Input Variables for a 35-Year Analysis

% Change of Variable	Variable	NPV	% Change of NPV
	DR (35 years)	($299,270)	
10%	13.20%	($285,308)	-4.67%
-10%	10.80%	($313,295)	4.69%
	Inflation Rate	($299,270)	
10%	4.40%	($300,653)	0.46%
-10%	3.60%	($297,762)	-0.50%
	Cost of Demolition/Structure	($299,270)	
10%	$770	($299,784)	0.17%
-10%	$630	($298,757)	-0.17%
	Cost of Site Prep. /m2	($299,270)	
10%	$14	($300,840)	0.52%
-10%	$12	($298,063)	-0.40%
	Cost of Structure Construction	($299,270)	
10%	10%	($309,232)	3.33%
-10%	-10%	($289,308)	-3.33%
	Rentals	($299,270)	
10%	10%	($292,194)	-2.36%
-10%	-10%	($306,347)	2.36%
	Contrib. Of Owners	($299,270)	
10%	$14,300,000	($298,813)	0.02%
-10%	$11,700,000	($299,727)	0.15%
	All Compensations	($299,270)	
10%	10%	($318,461)	6.41%
-10%	-10%	($280,079)	-6.41%
	Project Mngt. $ Admin.	($299,270)	
10%	4.95%	($299,944)	0.23%
-10%	4.05%	($298,597)	-0.23%
	Sales & Marketing	($299,270)	
10%	1.65%	($299,495)	0.08%
-10%	1.35%	($299,046)	-0.08%
	Contingency	($299,270)	
10%	11.00%	($303,148)	1.30%
-10%	9.00%	($295,392)	-1.30%
	Design	($299,270)	
10%	4.40%	($300,556)	0.43%
-10%	3.60%	($297,985)	-0.43%
	Land Sales	($299,270)	
10%	10%	($282,282)	5.68%
-10%	-10%	($316,258)	5.68%

Table C.11 Scenario 3 Financial Analysis

	Up to 2020	0	1	2	3	4	5	6	7	8
Year Index										
Year		1996	1997	1998	1999	2000	2001	2002	2003	2004
Phases		0	1	1	2	2	2	3	3	3
Inflation factor		1.00	1.04	1.08	1.12	1.17	1.22	1.27	1.32	1.37
Cummulative No. of units built for rental										
Housing		0	0	250	250	1338	2425	2425	2888	3350
Shops		0	0	25	25	175	325	325	360	395
Workshops		0	0	80	80	240	400	400	533	665
Number of Low-Cost Units for Sale	2300								200	200
Number of Shops for Sale	501									
Cash Inflow (US$000)										
Land Sale	$981,958							$105,338		
Sale of Low-Cost Units	$236,306								$15,791	$16,423
Sale of Shops	$46,790									
Rental of houses	$277,774	$0	$0	$0	$390	$405	$2,255	$4,253	$4,423	$5,477
Rental of Shops	$75,462	$0	$0	$0	$84	$88	$639	$1,234	$1,283	$1,478
Rental of Workshops	$104,726	$0	$0	$0	$367	$382	$1,191	$2,065	$2,148	$2,973
Total Rentals	**$457,962**				$841	$875	$4,085	$7,551	$7,854	$9,929
Contribution of Owners to Land Clearance	$22,636		$171		$1,745			$2,831		
Government & Other Contribution	$0									
Total Cash Inflow	**$1,745,653**	$0	$171	$0	$2,586	$875	$4,085	$115,720	$23,645	$26,351
Cummulative Cash Inflow	**$1,745,653**	$0	$171	$171	$2,757	$3,632	$7,717	$123,437	$147,082	$173,434

Draw Down Schedule	(%tage of respective total)									
Pre-construction		50%	25%	12.5%	12.5%					
Cash Outflow (US$000)										
Studies, Consulting Work, & Supervision of Studies	($15,790.52)	($7,895)	($3,948)	($1,974)	($1,974)					
Land Expropriation	($131,985)		($4,884)		($49,765)			($69,312)		
Building Owners' Compensation	($228,210)				($5,050)			($42,556)		
Occupiers Compensation	($544,011)				($14,679)			($106,856)		
Residents	($352,544)				($5,821)			($61,684)		
Shopkeepers	($94,977)				($1,575)			($18,600)		
Workshop Users	($96,489)				($7,283)			($26,572)		
Total Expropriation and Compensation	**($904,205)**	$0	($4,884)	$0	($69,495)	$0	$0	($208,724)	$0	$0
Units to be Demolished	17,140	0			570			4,270		
Area of Site Preparation to be completed (m2)	2,728,000		34,548		325,452			469,444		
% of infrastructure Infrastructure to be done				100%		50%	50%		50%	50%
Superstructure Units to be Development	12,135			355		1,398	1,398		830	830
Housing	9,700			250		1,088	1,088		463	463
Shops	1,560			25		150	150		235	235
Workshops	875			80		160	160		133	133
Demolition	($20,281)	$0	$0	$0	($449)	$0	$0	($3,782)	$0	$0
Site Preparation	($61,752)	$0	($467)	$0	($4,759)	$0	$0	($7,722)	$0	$0
Infrastructure	($238,715)			($21,014)		($6,601)	($6,601)		($16,221)	($16,221)
Superstructure Development	($353,543)			($6,279)		($27,913)	($29,029)		($15,201)	($15,809)
Housing	($330,229)			($5,408)		($26,444)	($26,462)		($12,172)	($12,659)
Shops	($12,641)			($135)		($877)	($912)		($1,546)	($1,608)
Workshops	($10,673)			($735)		($1,591)	($1,655)		($1,482)	($1,541)
Total Project Execution	**($674,292)**	$0	($467)	($27,292)	($5,208)	($34,713)	($35,830)	($11,504)	($31,422)	($32,030)
Project Management and Administration Costs	($30,343)	$0	($21)	($1,228)	($234)	($1,562)	($1,612)	($518)	($1,414)	($1,441)
Sales and Marketing	($10,114)	$0	($7)	($409)	($78)	($521)	($537)	($173)	($471)	($480)
Maintenance and Repair	($45,796)				($84)	($87)	($409)	($755)	($785)	($993)
Total Adminstration and Operating Costs	**($70,810)**	$0	($28)	($1,638)	($397)	($2,170)	($2,558)	($1,445)	($2,671)	($2,915)
Interest on Expropriation Bonds	(252,330)		(19,410)	(19,410)	(19,410)	(19,410)	(19,410)	(19,410)	(19,410)	(19,410)
Contingencies	($166,475)	$0	($538)	($2,893)	($7,510)	($3,688)	($3,830)	($22,167)	($3,409)	($3,494)
Total Cash Outflow	**($2,099,346)**	($7,895)	($29,275)	($53,207)	($103,993)	($59,982)	($61,637)	($263,251)	($56,912)	($57,849)
Cummulative Cash Outflow	**($2,099,346)**	($7,895)	($37,170)	($90,377)	($194,370)	($254,352)	($315,989)	($579,240)	($636,153)	($694,002)
Net Cash Flow	($816,138)	($7,895)	($29,104)	($53,207)	($101,407)	($59,107)	($57,552)	($147,531)	($33,267)	($31,498)
Cummulative Cash Flow	($816,138)	($7,895)	($36,999)	($90,206)	($191,613)	($250,720)	($308,272)	($455,803)	($489,070)	($520,568)
NPV (25-year)	($330,405)	12%								
NPV (35-year)	($314,703)	12%								
Annual Worth for 25 years	($330,405)	($42,127)	($42,127)	($42,127)	($42,127)	($42,127)	($42,127)	($42,127)	($42,127)	($42,127)
Annual Worth for 35 years	($314,703)	($38,493)	($38,493)	($38,493)	($38,493)	($38,493)	($38,493)	($38,493)	($38,493)	($38,493)
IRR (25-year)										
IRR (35-year)										
Present Value of Each Period	5%	($7,895)	($27,718)	($48,260)	($87,600)	($48,628)	($45,093)	($110,090)	($23,643)	($21,319)
Present Value of Each Period	20%	($7,895)	($24,253)	($36,949)	($58,685)	($28,505)	($23,129)	($49,408)	($9,284)	($7,325)

	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
	4	4	4	5	5	5	6	6	6	7	7	7	8	8	8
	1.42	1.48	1.54	1.60	1.67	1.73	1.80	1.87	1.95	2.03	2.11	2.19	2.28	2.37	2.46
	3350	3775	4200	4200	4775	5350	5350	6375	7400	7400	7400	7400	7400	7400	7400
	395	445	495	495	558	620	620	733	845	845	924	1003	1003	1031	1060
	665	665	665	665	690	715	715	740	765	765	793	820	820	848	875
											575	575		575	575
														50	50
	$8,540									$433,565	$54,515	$56,695	$434,515	$61,322	$63,775
														$7,145	$7,431
	$6,609	$6,873	$8,055	$9,320	$9,693	$11,460	$13,354	$13,888	$17,211	$20,778	$21,609	$22,473	$23,372	$24,307	$25,279
	$1,687	$1,754	$2,055	$2,378	$2,473	$2,896	$3,350	$3,484	$4,281	$5,135	$5,341	$6,072	$6,853	$7,128	$7,623
	$3,862	$4,016	$4,177	$4,344	$4,518	$4,875	$5,254	$5,464	$5,881	$6,323	$6,576	$7,085	$7,624	$7,929	$8,522
	$12,157	$12,643	$14,287	$16,041	$16,683	$19,232	$21,958	$22,836	$27,373	$32,236	$33,525	$35,630	$37,849	$39,363	$41,425
	$1,889			$1,248			$2,201			$7,356			$1,238		
	$22,586	$12,643	$14,287	$17,289	$16,683	$19,232	$24,158	$22,836	$27,373	$473,157	$88,040	$92,325	$473,603	$107,830	$112,631
	$196,020	$208,663	$222,950	$240,239	$256,922	$276,154	$300,312	$323,148	$350,521	$823,678	$911,718	$1,004,044	$1,477,646	$1,585,476	$1,698,107
	($18,218)			($25,852)			($40,073)			($69,331)			($17,904)		
	($45,368)			($58,636)			($86,400)			($146,416)			($47,655)		
	($26,687)			($44,429)			($68,751)			($121,245)			($23,927)		
	($5,480)			($8,405)			($9,465)			($18,435)			($15,353)		
	($13,201)			($2,802)			($8,194)			($6,736)			($8,374)		
	($63,586)	$0	$0	($81,488)	$0	$0	($126,473)	$0	$0	($215,747)	$0	$0	($65,569)	$0	$0
	1,625			2,050			2,825			4,345			998		
	278,556			163,565			256,435			762,000			114,000		
		50%	50%		50%	50%		50%	50%		50%	50%		50%	50%
		475	475		663	663		1,163	1,163		681	681		681	681
		425	425		575	575		1,025	1,025		575	575		575	575
		50	50		63	63		113	113		79	79		79	79
		0	0		25	25		25	25		28	28		28	28
	($1,610)	$0	$0	($2,297)	$0	$0	($3,561)	$0	$0	($6,162)	$0	$0	($1,591)	$0	$0
	($5,154)	$0	$0	($3,404)	$0	$0	($6,004)	$0	$0	($20,068)	$0	$0	($3,377)	$0	$0
		($9,727)	($9,727)		($6,853)	($5,853)		($12,085)	($12,085)		($20,556)	($26,573)		($28,741)	($29,891)
		($12,952)	($13,470)		($20,023)	($20,823)		($39,846)	($41,442)		($25,561)	($25,198)		($27,254)	($28,344)
		($12,582)	($13,085)		($19,148)	($19,914)		($38,396)	($39,932)		($24,228)	($863)		($933)	($970)
		($370)	($385)		($520)	($541)		($1,054)	($1,096)		($830)	($512)		($564)	($676)
		$0	$0		($354)	($308)		($398)	($414)		($492)				
	($6,773)	($22,679)	($23,197)	($5,702)	($26,875)	($27,676)	($9,585)	($51,933)	($53,527)	($26,229)	($46,107)	($47,129)	($4,968)	($28,741)	($29,891)
	($305)	($1,021)	($1,044)	($257)	($1,209)	($1,246)	($430)	($2,337)	($2,409)	($1,180)	($2,076)	($2,121)	($224)	($1,293)	($1,345)
	($102)	($340)	($348)	($86)	($403)	($415)	($143)	($779)	($803)	($393)	($692)	($707)	($75)	($431)	($448)
	($1,216)	($1,264)	($1,429)	($1,604)	($1,668)	($1,923)	($2,196)	($2,284)	($2,737)	($3,224)	($3,353)	($3,583)	($3,785)	($3,936)	($4,142)
	($1,622)	($2,625)	($2,620)	($1,946)	($3,281)	($3,584)	($2,770)	($5,400)	($5,949)	($4,797)	($8,119)	($6,391)	($4,083)	($5,661)	($5,936)
	(19,410)	(19,410)	(19,410)	(19,410)	(19,410)										
	($7,198)	($2,530)	($2,602)	($8,914)	($3,016)	($3,126)	($13,881)	($5,733)	($5,948)	($24,677)	($5,223)	($5,362)	($7,461)	($3,440)	($3,583)
	($98,589)	($47,245)	($48,029)	($117,459)	($52,582)	($34,386)	($152,689)	($63,066)	($65,423)	($271,451)	($57,449)	($58,872)	($82,071)	($37,842)	($39,409)
	($792,591)	($839,835)	($887,865)	($1,005,324)	($1,057,906)	($1,092,292)	($1,244,981)	($1,308,047)	($1,373,470)	($1,644,921)	($1,702,370)	($1,751,242)	($1,843,312)	($1,881,155)	($1,920,564)
	($76,003)	($34,601)	($33,743)	($100,170)	($35,899)	($15,154)	($126,531)	($40,230)	($38,051)	$201,707	$30,591	$33,453	$391,532	$69,988	$73,221
	($595,571)	($631,172)	($664,915)	($765,085)	($800,984)	($816,138)	($944,669)	($984,899)	($1,022,950)	($821,243)	($790,651)	($757,198)	($365,666)	($295,678)	($222,457)
	($42,127)	($42,127)	($42,127)	($42,127)	($42,127)	($42,127)	($42,127)	($42,127)	($42,127)	($42,127)	($42,127)	($42,127)	($42,127)	($42,127)	($42,127)
	($38,493)	($38,493)	($38,493)	($38,493)	($38,493)	($38,493)	($38,493)	($38,493)	($38,493)	($38,493)	($38,493)	($38,493)	($38,493)	($38,493)	($38,493)
	($48,992)	($21,242)	($19,729)	($55,778)	($19,038)	($7,654)	($61,825)	($18,430)	($16,601)	$83,813	$12,106	$12,608	$140,537	$23,925	$23,839
	($14,730)	($5,588)	($4,541)	($11,235)	($3,355)	($1,180)	($8,342)	($2,176)	($1,715)	$7,576	$958	$873	$8,511	$1,268	$1,105

	24	25	26	27	28	29	30	31	32	33	34
	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
	9	9	9	9	9	9	9	9	9	9	9
	2.56	2.67	2.77	2.88	3.00	3.12	3.24	3.37	3.51	3.65	3.79
	7400	7400	7400	7400	7400	7400	7400	7400	7400	7400	7400
	1060	1060	1060	1060	1060	1060	1060	1060	1060	1060	1060
	875	875	875	875	875	875	875	875	875	875	875
	$26,290	$27,342	$28,436	$29,573	$30,756	$31,986	$33,266	$34,596	$35,980	$37,419	$38,916
	$8,147	$8,473	$8,812	$9,165	$9,531	$9,913	$10,309	$10,722	$11,150	$11,596	$12,060
	$9,151	$9,517	$9,898	$10,294	$10,705	$11,134	$11,579	$12,042	$12,524	$13,025	$13,546
	$43,589	$45,332	$47,146	$49,031	$50,993	$53,032	$55,154	$57,360	$59,654	$62,040	$64,522
	$3,958										
	$47,546	$45,332	$47,146	$49,031	$50,993	$53,032	$55,154	$57,360	$59,654	$62,040	$64,522
	$1,745,653	$1,790,986	$1,838,131	$1,887,163	$1,938,155	$1,991,188	$2,046,341	$2,103,701	$2,163,355	$2,225,396	$2,289,918
	($18,023)										
	($9,227)										
	($41,000)										
	$0										
	($17,674)										
	($23,326)										
	($68,250)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
	457										
	324,000										
	100%										
	($820)										
	($10,797)										
	($73,214)										
	($84,830)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
	($3,817)										
	($1,272)										
	($4,359)	($4,533)	($4,715)	($4,903)	($5,099)	($5,303)	($5,515)	($5,736)	($5,965)	($6,204)	($6,452)
	($9,449)	($4,533)	($4,715)	($4,903)	($5,099)	($5,303)	($5,515)	($5,736)	($5,965)	($6,204)	($6,452)
	($16,253)										
	($178,782)	($4,533)	($4,715)	($4,903)	($5,099)	($5,303)	($5,515)	($5,736)	($5,965)	($6,204)	($6,452)
	($2,099,346)	($2,103,879)	($2,108,594)	($2,113,497)	($2,118,596)	($2,123,900)	($2,129,415)	($2,135,151)	($2,141,116)	($2,147,320)	($2,153,773)
	($131,230)	$40,799	$42,431	$44,128	$45,893	$47,729	$49,638	$51,624	$53,689	$55,836	$58,070
	($353,693)	($312,894)	($270,463)	($226,334)	($180,441)	($132,712)	($83,074)	($31,450)	$22,239	$78,075	$136,145
	($42,127)										
	($38,493)	($38,493)	($38,493)	($38,493)	($38,493)	($38,493)	($38,493)	($38,493)	($38,493)	($38,493)	($38,493)
	($40,692)	$12,048	$11,933	$11,820	$11,707	$11,596	$11,485	$11,376	$11,267	$11,160	$11,054
	($1,651)	$428	$371	$321	$278	$241	$209	$181	$157	$136	$118

Table C. 12 Percentage Variation of NPV with a Number of Input Variables for a 35-Year Analysis

% Change of Variable	Variable	NPV	% Change of NPV
	DR (35 years)	($314,703)	
10%	13.20%	($302,615)	-3.84%
-10%	10.80%	($325,318)	3.37%
	Inflation Rate	($314,703)	
10%	4.40%	($315,008)	0.10%
-10%	3.60%	($314,091)	-0.19%
	Cost of Demolition/Structure	($314,703)	
10%	$770	($315,269)	0.18%
-10%	$630	($314,137)	-0.18%
	Cost of Site Prep. /m2	($314,703)	
10%	$14	($316,399)	0.54%
-10%	$12	($313,399)	-0.41%
	Cost of Structure Construction	($314,703)	
10%	10%	($324,984)	3.27%
-10%	-10%	($304,423)	-3.27%
	Rentals	($314,703)	
10%	10%	($307,135)	-2.21%
-10%	-10%	($322,272)	2.40%
	Contrib. Of Owners	($314,703)	
10%	$14,300,000	($314,207)	-0.16%
-10%	$11,700,000	($315,200)	0.16%
	All Compensations	($314,703)	
10%	10%	($333,769)	6.06%
-10%	-10%	($295,638)	-6.06%
	Project Mngt. $ Admin.	($314,703)	
10%	4.95%	($315,469)	0.24%
-10%	4.05%	($313,938)	-0.24%
	Sales & Marketing	($314,703)	
10%	1.65%	($314,959)	0.08%
-10%	1.35%	($314,448)	-0.08%
	Contingency	($314,703)	
10%	11.00%	($318,778)	1.29%
-10%	9.00%	($310,629)	-1.29%
	Design	($314,703)	
10%	4.40%	($315,989)	0.41%
-10%	3.60%	($313,418)	-0.41%
	Land Sales	($314,703)	
10%	10%	($301,039)	4.34%
-10%	-10%	($328,368)	4.34%

Table C.13 Scenario 4 Financial Analysis

	Up to 2020	0 / 1996	1 / 1997	2 / 1998	3 / 1999	4 / 2000	5 / 2001	6 / 2002	7 / 2003	8 / 2004
Year Index		0	1	2	3	4	5	6	7	8
Phases		0	1	1	1	2	2	2	3	3
Inflation factor		1.00	1.04	1.08	1.12	1.17	1.22	1.27	1.32	1.37
Cummulative No. of units built for rental										
Housing	7400	0	0	425	850	850	1425	2000	2000	3025
Shops	1060	0	0	50	100	100	163	225	225	338
Workshops	875	0	0	0	0	0	25	50	50	75
Number of Low-Cost Units for Sale	2300									
Number of Shops for Sale	501									
Cash Inflow (US$000)										
Land Sale	$851,647		$6,240							
Sale of Low-Cost Units	$172,667									
Sale of Shops	$68,666									
Rental of houses	$238,900	$10,256	$0	$0	$663	$1,378	$1,433	$2,499	$3,648	$3,794
Rental of Shops	$75,382	$3,179	$0	$0	$169	$351	$365	$617	$888	$924
Rental of Workshops	$50,610	$3,570	$0	$0	$0	$0	$0	$129	$268	$279
Total Rentals	$364,892				$831	$1,729	$1,798	$3,245	$4,804	$4,997
Contribution of Owners to Land Clearance	$22,931		$486			$912				$1,608
Government & Other Contribution	$0.00									
Total Cash Inflow	$1,463,798	$0	$6,726	$0	$831	$2,641	$1,798	$3,245	$6,413	$4,997
Draw Down Schedule (%tage of respective total)										
Pre-construction		50%	25%	12.5%	12.5%					
Cash Outflow (US$000)										
Studies, Consulting Work, & Supervision of Studies	($15,790.52)	($7,895)	($3,948)	($1,974)	($1,974)					
Land Expropriation	($131,985)		($4,884)		($49,765)			($59,312)		
Building Owners' Compensation	($198,389)				($37,832)			($16,195)		
Occupiers Compensation	($544,011)				($14,679)			($106,856)		
Residents	($352,544)				($5,821)			($61,684)		
Shopkeepers	($94,977)				($1,575)			($18,600)		
Workshop Users	($96,489)				($7,283)			($26,572)		
Total Expropriation and Compensation	($874,384)	$0	($4,884)	$0	($102,277)	$0	$0	($182,363)	$0	$0
Units to be Demolished	17,140	0	0			2,050			2,825	
Area of Site Preparation to be completed (m2)	2,728,000		98,000			163,565			256,435	
% of infrastructure Infrastructure to be done				50%	50%		50%	50%		50%
Superstructure Units to be Development	12,135			475	475		663	663		1,163
Housing	9,700			425	425		575	575		1,025
Shops	1,560			50	50		63	63		113
Workshops	875			0	0		25	25		25
Demolition	($21,080)	$0	$0	$0	$0	($1,679)	$0	$0	($2,802)	$0
Site Preparation	($62,555)	$0	($1,325)	$0	$0	($2,488)	$0	$0	($4,387)	$0
Infrastructure	($208,484)			($5,972)	($5,972)		($5,007)	($5,007)		($8,831)
Superstructure Development	($359,181)			($9,464)	($9,843)		($14,630)	($15,215)		($29,116)
Housing	($329,213)			($9,194)	($9,561)		($13,992)	($14,551)		($28,056)
Shops	($14,673)			($270)	($281)		($380)	($395)		($770)
Workshops	($15,295)			$0	$0		($259)	($269)		($291)
Total Project Execution	($651,300)	$0	($1,325)	($15,436)	($15,814)	($4,166)	($19,638)	($20,223)	($6,989)	($37,947)
Project Management and Administration Costs	($29,308)	$0	($60)	($695)	($712)	($187)	($884)	($910)	($315)	($1,708)
Sales and Marketing	($9,769)	$0	($20)	($232)	($237)	($62)	($295)	($303)	($105)	($569)
Maintenance and Repair	($34,789)				($83)	($173)	($160)	($324)	($480)	($500)
Total Adminstration and Operating Costs	($61,703)	$0	($79)	($926)	($1,032)	($423)	($1,358)	($1,538)	($900)	($2,776)
Interest on Expropriation Bonds	(252,330)		(19,410)	(19,410)	(19,410)	(19,410)	(19,410)	(19,410)	(19,410)	(19,410)
Contingencies	($159,955)	$0	($629)	($1,636)	($11,912)	($459)	($2,100)	($20,412)	($789)	($4,072)
Total Cash Outflow	($2,027,626)	($7,895)	($30,275)	($39,382)	($152,419)	($24,458)	($42,505)	($243,946)	($28,088)	($64,205)
Net Cash Flow	($404,894)	($7,895)	($23,549)	($39,382)	($151,588)	($21,817)	($40,707)	($240,701)	($21,675)	($59,209)
Cummulative Cash Flow	($404,894)	($7,895)	($31,445)	($70,827)	($222,415)	($244,232)	($284,939)	($525,640)	($547,315)	($606,525)
NPV (25-year)	($295,676)	12%								
NPV (35-year)	($279,974)	12%								
Annual Worth for 25 years	($295,676)	($37,699)	($37,699)	($37,699)	($37,699)	($37,699)	($37,699)	($37,699)	($37,699)	($37,699)
Annual Worth for 35 years	($279,974)	($34,246)	($34,246)	($34,246)	($34,246)	($34,246)	($34,246)	($34,246)	($34,246)	($34,246)
IRR (25-year)										
IRR (35-year)										
Present Value of Each Period	5%	($7,895)	($22,428)	($35,720)	($130,948)	($17,949)	($31,895)	($179,615)	($15,404)	($40,075)
Present Value of Each Period	20%	($7,895)	($19,625)	($27,348)	($87,725)	($10,521)	($16,359)	($80,610)	($6,049)	($13,770)

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
#	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
	3	4	4	4	5	5	5	6	6	7	7	7	8	8	8	9	9
	1.42	1.48	1.54	1.60	1.67	1.73	1.80	1.87	1.95	2.03	2.11	2.19	2.28	2.37	2.46	2.56	2.67
	4050	4050	4050	4050	4050	4050	4050	4050	4300	4300	5388	6475	6475	6938	7400	7400	7400
	450	450	529	608	608	636	665	665	690	690	840	990	990	1025	1060	1060	1060
	100	100	128	155	155	183	210	210	290	290	450	610	610	743	875	875	875
			575	575		575	575							200	200		
						50	50										
		$327,726	$39,833	$41,427	$122,882	$44,807	$46,599	$205,091					$189,707				
						$5,221	$5,430							$28,439	$29,577		
	$5,967	$8,309	$8,641	$8,987	$9,347	$9,720	$10,109	$10,514	$10,934	$12,073	$12,556	$16,361	$20,450	$21,268	$23,699	$26,290	$27,342
	$1,441	$1,998	$2,078	$2,540	$3,035	$3,156	$3,436	$3,734	$3,883	$4,190	$4,358	$5,518	$6,765	$7,035	$7,575	$8,147	$8,473
	$436	$604	$628	$833	$1,053	$1,095	$1,341	$1,605	$1,669	$2,397	$2,493	$4,023	$5,671	$5,898	$7,467	$9,151	$9,517
	$7,844	$10,911	$11,348	$12,360	$13,434	$13,972	$14,886	$15,852	$16,486	$18,661	$19,407	$25,903	$32,886	$34,202	$38,741	$43,589	$45,332
		$5,375			$905			$3,200			$3,142		$5,098			$2,206	
	$7,844	$344,013	$51,181	$53,786	$137,221	$64,000	$66,916	$224,144	$16,486	$21,803	$19,407	$25,903	$227,692	$62,641	$68,318	$45,794	$45,332
									($15,917)				($8,203)			($18,923)	
																$0	
	($22,982)				($36,625)		($61,635)		($146,416)				($47,655)			($41,000)	
	($45,368)				($55,838)		($86,400)		($121,245)				($23,927)			($17,674)	
	($26,687)				($44,429)		($68,751)		($18,436)				($15,353)			($23,326)	
	($5,480)				($8,405)		($59,455)		($8,736)				($6,374)				
	($13,201)				($2,802)		($8,194)										
	($68,350)	$0	$0	($91,261)	$0		($148,035)	$0	($162,332)	$0	$0	$0	($55,857)	$0	$0	($59,023)	$0
			4,345		998			457		570			4,270			1,625	
		762,000			114,000			358,548		325,452			469,444			180,556	
	50%		50%	50%		50%	50%			100%		50%	50%	50%	50%	100%	
	1,163		681	681		681	681			355		1,398	1,398	830	830		
	1,025		575	575		575	575			250		1,088	1,088	463	463		
	113		79	79		79	79			25		150	150	235	235		
	25		28	28		28	28			80		160	160	133	133		
	$0	($4,502)	$0	$0	($1,163)			($699)			($808)		($6,811)	($13,907)		($2,918)	
	$0	($14,663)			($2,458)			($8,730)	($2,404)		($8,571)					($8,017)	
	($8,631)		($15,020)		($15,020)		($21,001)	($21,841)	($53,497)	($11,308)		($50,269)	($52,280)	($27,376)	($28,471)		
	($30,281)		($18,670)		($19,417)		($19,914)	($20,711)	($9,740)			($45,824)	($47,657)	($21,922)	($22,799)		
	($29,178)		($17,704)		($18,412)		($682)	($709)	($243)			($1,580)	($1,643)	($2,785)	($2,896)		
	($801)		($806)		($630)		($405)	($421)	($1,325)			($2,865)	($2,980)	($2,669)	($2,776)		
	($302)		($360)		($374)												
	($39,112)	($19,165)	($33,890)	($34,437)	($3,830)	($21,001)	($21,841)	($62,826)	($13,712)	($9,379)	($62,517)	($54,528)	($20,718)	($56,590)	($57,685)	($8,932)	$0
	($1,760)	($862)	($1,516)	($1,550)	($163)	($945)	($983)	($2,827)	($617)	($422)	($2,613)	($2,904)	($932)	($2,547)	($2,596)	($402)	
	($587)	($287)	($505)	($517)	($54)	($316)	($328)	($942)	($206)	($141)	($938)	($968)	($311)	($849)	($865)	($134)	
	($784)	($1,091)	($1,135)	($1,236)	($1,343)	($1,397)	($1,489)	($1,585)	($1,649)	($1,866)	($1,941)	($2,590)	($3,269)	($3,420)	($3,874)	($4,359)	($4,533)
	($3,131)	($2,241)	($3,156)	($3,302)	($1,561)	($2,657)	($2,799)	($5,355)	($2,471)	($2,429)	($5,892)	($6,462)	($4,532)	($6,816)	($7,335)	($4,895)	($4,533)
	(19,410)	(19,410)	(19,410)	(19,410)	(19,410)												
	($11,059)	($2,141)	($3,685)	($12,900)	($519)	($2,366)	($17,268)	($6,818)	($1,618)	($17,414)	($6,821)	($7,099)	($8,111)	($6,341)	($6,502)	($7,286)	
	($141,062)	($42,957)	($59,941)	($161,310)	($25,121)	($26,024)	($189,943)	($74,999)	($17,501)	($191,555)	($75,030)	($78,089)	($89,218)	($69,746)	($71,622)	($80,136)	($4,533)
	($133,218)	$301,055	($8,760)	($107,524)	$112,100	$37,976	($123,027)	$149,145	($1,315)	($169,752)	($55,622)	($52,186)	$138,474	($7,105)	($3,204)	($34,341)	$40,799
	($739,743)	($438,687)	($447,447)	($554,971)	($442,870)	($404,894)	($527,921)	($378,776)	($380,091)	($549,843)	($605,465)	($657,652)	($519,178)	($526,282)	($529,486)	($563,828)	($529,029)
	($37,699)	($37,699)	($37,699)	($37,699)	($37,699)	($37,699)	($37,699)	($37,699)	($37,699)	($37,699)	($37,699)	($37,699)	($37,699)	($37,699)	($37,699)	($37,699)	($34,246)
	($34,246)	($34,246)	($34,246)	($34,246)	($34,246)	($34,246)	($34,246)	($34,246)	($34,246)	($34,246)	($34,246)	($34,246)	($34,246)	($34,246)	($34,246)	($34,246)	
	($85,874)	$184,822	($5,122)	($59,873)	$59,449	$19,180	($59,178)	$68,325	($574)	($70,535)	($22,012)	($19,668)	$49,704	($2,429)	($1,043)	($10,648)	$12,048
	($25,819)	$48,622	($1,179)	($12,059)	$10,477	$2,958	($7,985)	$8,067	($59)	($6,376)	($1,741)	($1,361)	$3,010	($129)	($48)	($432)	$428

	26	27	28	29	30	31	32	33	34
	2022	2023	2024	2025	2026	2027	2028	2029	2030
	9	9	9	9	9	9	9	9	9
	2.77	2.88	3.00	3.12	3.24	3.37	3.51	3.65	3.79
	7400	7400	7400	7400	7400	7400	7400	7400	7400
	1060	1060	1060	1060	1060	1060	1060	1060	1060
	875	875	875	875	875	875	875	875	875

	2022	2023	2024	2025	2026	2027	2028	2029	2030
	$28,436	$29,573	$30,756	$31,986	$33,266	$34,596	$35,980	$37,419	$38,916
	$8,812	$9,165	$9,531	$9,913	$10,309	$10,722	$11,150	$11,596	$12,060
	$9,898	$10,294	$10,705	$11,134	$11,579	$12,042	$12,524	$13,025	$13,546
	$47,146	$49,031	$50,993	$53,032	$55,154	$57,360	$59,654	$62,040	$64,522
	$47,146	$49,031	$50,993	$53,032	$55,154	$57,360	$59,654	$62,040	$64,522

	2022	2023	2024	2025	2026	2027	2028	2029	2030
	$0	$0	$0	$0	$0	$0	$0	$0	$0
	$0	$0	$0	$0	$0	$0	$0	$0	$0
	($4,715)	($4,903)	($5,099)	($5,303)	($5,515)	($5,736)	($5,965)	($6,204)	($6,452)
	($4,715)	($4,903)	($5,099)	($5,303)	($5,515)	($5,736)	($5,965)	($6,204)	($6,452)
	($4,715)	($4,903)	($5,099)	($5,303)	($5,515)	($5,736)	($5,965)	($6,204)	($6,452)
	$42,431	$44,128	$45,893	$47,729	$49,638	$51,624	$53,689	$55,836	$58,070
	($480,598)	($436,469)	($390,576)	($342,847)	($293,209)	($241,585)	($187,896)	($132,060)	($73,990)
	($34,246)	($34,246)	($34,246)	($34,246)	($34,246)	($34,246)	($34,246)	($34,246)	($34,246)
	$11,933	$11,820	$11,707	$11,596	$11,485	$11,376	$11,267	$11,160	$11,054
	$371	$321	$278	$241	$209	$181	$157	$136	$118

Table C. 14 Percentage Variation of NPV with a Number of Input Variables for a 35-Year Analysis

% Change of Variable	Variable	NPV	% Change of NPV
	DR (35 years)	($279,974)	
10%	13.20%	($268,942)	-3.94%
-10%	10.80%	($290,561)	3.78%
	Inflation Rate	($279,974)	
10%	4.40%	($280,266)	0.10%
-10%	3.60%	($279,509)	-0.17%
	Cost of Demolition/Structure	($279,974)	
10%	$770	($280,532)	0.20%
-10%	$630	($279,416)	-0.20%
	Cost of Site Prep. /m2	($279,974)	
10%	$14	($281,574)	0.57%
-10%	$12	($278,744)	-0.44%
	Cost of Structure Construction	($279,974)	
10%	10%	($289,936)	3.56%
-10%	-10%	($270,012)	-3.56%
	Rentals	($279,974)	
10%	10%	($274,118)	-2.09%
-10%	-10%	($285,830)	2.09%
	Contrib. Of Owners	($279,974)	
10%	$14,300,000	($279,508)	0.03%
-10%	$11,700,000	($280,441)	0.17%
	All Compensations	($279,974)	
10%	10%	($299,992)	7.15%
-10%	-10%	($259,957)	-7.15%
	Project Mngt. $ Admin.	($279,974)	
10%	4.95%	($280,655)	0.24%
-10%	4.05%	($279,294)	-0.24%
	Sales & Marketing	($279,974)	
10%	1.65%	($280,201)	0.08%
-10%	1.35%	($279,747)	-0.08%
	Contingency	($279,974)	
10%	11.00%	($283,934)	1.41%
-10%	9.00%	($276,014)	-1.41%
	Design	($279,974)	
10%	4.40%	($281,260)	0.46%
-10%	3.60%	($278,689)	-0.46%
	Land Sales	($279,974)	
10%	10%	($262,986)	6.07%
-10%	-10%	($296,962)	6.07%

Table C.15 Scenario 5 Financial Analysis

	Up to 2013	0 1996	1 1997	2 1998	3 1999	4 2000	5 2001
Year Index		0	1	2	3	4	5
Year	Up to 2013	1996	1997	1998	1999	2000	2001
Phases		0	1	1	2	2	3
Inflation factor		1.00	1.04	1.08	1.12	1.17	1.22
Cummulative No. of units built for rental							
Housing	7400	0	0	850	850	2000	2000
Shops	1560	0	0	100	100	225	225
Workshops	875	0	0	0	0	50	50
Number of Low-Cost Units for Sale	2300						
Number of Shops for Sale	501						
Cash Inflow (US$000)							
Land Sale	$721,126		$6,240				
Sale of Low-Cost Units	$147,426						
Sale of Shops	$53,877						
Rental of houses	$295,880		$0	$0	$1,325	$1,378	$3,373
Rental of Shops	$122,549		$0	$0	$337	$351	$821
Rental of Workshops	$83,367		$0	$0	$0	$0	$248
Total Rentals	**$501,797**		$0	$0	$1,663	$1,729	$4,442
Total Cash Inflow	**$1,424,227**	**$0**	**$6,240**	**$0**	**$1,663**	**$1,729**	**$4,442**
Draw Down Schedule		(%tage of respective total)					
Pre-construction		30%	30%	30.0%	10.0%		
Cash Outflow (US$000)							
Studies, Consulting Work, & Supervision of Studies	($15,482.48)	($4,645)	($4,645)	($4,645)	($1,548)		
Units to be Demolished	17,140	0	0		2,050		2,825
Area of Site Preparation to be completed (m2)	2,728,000		98,000		163,565		256,435
% of infrastructure Infrastructure to be done				100%		100%	
Superstructure Units to be Development	12,135			950		1,325	
Housing	9,700			850		1,150	
Shops	1,560			100		125	
Workshops	875			0		50	
Demolition	($17,239)	$0	$0	$0	($1,566)	$0	($2,334)
Site Preparation	($51,120)	$0	($1,285)	$0	($2,320)	$0	($3,934)
Infrastructure	($172,659)			($12,687)		($9,341)	
Superstructure Development	($296,045)			($18,360)		($27,291)	
Housing	($272,258)			($17,836)		($26,100)	
Shops	($11,774)			($525)		($709)	
Workshops	($12,013)			$0		($482)	
Total Project Execution	**($537,063)**	$0	($1,285)	($31,047)	($3,886)	($36,632)	($6,268)
Project Management and Administration Costs	($24,168)	$0	($58)	($1,397)	($175)	($1,648)	($282)
Sales and Marketing	($8,056)	$0	($19)	($468)	($58)	($549)	($94)
Maintenance and Repair	($50,180)				($166)	($173)	($444)
Total Adminstration and Operating Costs	**($64,542)**	$0	($77)	($1,863)	($399)	($2,371)	($820)
Interest on Expropriation Bonds	(252,330)		(19,410)	(19,410)	(19,410)	(19,410)	(19,410)
Contingencies	($58,985)	$0	($136)	($3,291)	($429)	($3,900)	($709)
Total Cash Outflow	**($946,264)**	**($4,645)**	**($25,553)**	**($60,255)**	**($25,672)**	**($62,313)**	**($27,207)**
Net Cash Flow	$63,687	($4,645)	($19,313)	($60,255)	($24,009)	($60,584)	($22,765)
Cummulative Cash Flow	$63,687	($4,645)	($23,958)	($84,213)	($108,223)	($168,806)	($191,571)
NPV (25-year)	$876	12%					
NPV (35-year)	$29,582	12%					
Annual Worth for 25 years	$876	$121	$121	$121	$121	$121	$121
Annual Worth for 35 years	$29,582	$3,705	$3,705	$3,705	$3,705	$3,705	$3,705
IRR (25-year)	12.13%						
IRR (35-year)	14.90%						
Present Value of Each Period	5%	($4,645)	($18,394)	($54,653)	($20,740)	($49,842)	($17,837)
Present Value of Each Period	20%	($4,645)	($16,094)	($41,844)	($13,894)	($29,217)	($9,149)

	6	7	8	9	10	11	12	13	14	15	16	17
	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
	3	4	4	5	5	6	6	7	7	8	8	9
	1.27	1.32	1.37	1.42	1.48	1.54	1.60	1.67	1.73	1.80	1.87	1.95
	4050	4050	4050	4050	4050	4050	4300	4300	6475	6475	7400	7400
	450	450	608	608	765	765	790	790	1090	1090	1560	1560
	100	100	155	155	210	210	290	290	610	610	875	875
				1150	1150						400	
					101							
		$291,347		$105,040		$168,570				$149,929		
			$70,823		$76,603						$44,952	
					$8,926							
	$3,507	$7,387	$7,682	$7,989	$8,309	$8,641	$8,987	$9,924	$10,320	$16,162	$16,809	$19,978
	$854	$1,777	$1,848	$2,594	$2,698	$3,533	$3,674	$3,946	$4,104	$5,889	$6,125	$9,116
	$258	$537	$558	$900	$936	$1,319	$1,372	$1,970	$2,049	$4,482	$4,661	$6,954
	$4,620	$9,700	$10,088	$11,484	$11,943	$13,493	$14,033	$15,840	$16,473	$26,534	$27,595	$36,049
	$4,620	$301,047	$80,912	$116,524	$97,471	$182,064	$14,033	$15,840	$16,473	$176,462	$72,546	$36,049
		4,345		998		457		570		4,270		1,625
		762,000		114,000		358,548		325,452	469,444			180,556
	100%		100%		100%		100%		100%		100%	100%
	2,325		1,363		1,363		355		2,795		1,660	
	2,050		1,150		1,150		250		2,175		925	
	225		158		158		25		300		470	
	50		55		55		80		320		265	
	$0	($3,882)	$0	($964)	$0	($478)	$0	($644)	$0	($5,222)	$0	($2,149)
	$0	($12,645)	$0	($2,046)	$0	($6,960)	$0	($6,833)	$0	($10,661)	$0	($4,435)
	($15,839)		($25,905)		$0	($42,651)	($1,917)		($19,529)		($44,791)	
	($52,224)		($32,199)		($34,826)		($9,015)		($80,157)		($41,972)	
	($50,322)		($30,533)		($33,024)		($7,765)		($73,068)		($33,611)	
	($1,381)		($1,045)		($1,131)		($194)		($2,520)		($4,269)	
	($522)		($621)		($671)		($1,056)		($4,569)		($4,092)	
	($68,063)	($16,527)	($58,104)	($3,010)	($34,826)	($50,089)	($10,932)	($7,478)	($99,686)	($15,883)	($86,764)	($6,584)
	($3,063)	($744)	($2,615)	($135)	($1,567)	($2,254)	($492)	($337)	($4,486)	($715)	($3,904)	($296)
	($1,021)	($248)	($872)	($45)	($522)	($751)	($164)	($112)	($1,495)	($238)	($1,301)	($99)
	($462)	($970)	($1,009)	($1,148)	($1,194)	($1,349)	($1,403)	($1,584)	($1,647)	($2,653)	($2,759)	($3,605)
	($4,546)	($1,962)	($4,495)	($1,329)	($3,284)	($4,355)	($2,059)	($2,033)	($7,628)	($3,606)	($7,965)	($4,000)
	(19,410)	(19,410)	(19,410)	(19,410)	(19,410)	(19,410)	(19,410)	(19,410)	($10,731)	($1,949)	($9,473)	($1,058)
	($7,261)	($1,849)	($6,260)	($434)	($3,811)	($5,444)	($1,299)	($951)				
	($99,280)	($39,747)	($88,269)	($24,183)	($61,331)	($79,298)	($33,700)	($29,872)	($118,046)	($21,438)	($104,202)	($11,643)
	($94,660)	$261,300	($7,357)	$92,341	$36,140	$102,765	($19,667)	($14,032)	($101,572)	$155,024	($31,655)	$24,406
	($286,232)	($24,932)	($32,289)	$60,053	$96,193	$198,958	$179,291	$165,260	$63,687	$218,712	$187,056	$211,462
	$121	$121	$121	$121	$121	$121	$121	$121	$121	$121	$121	$121
	$3,705	$3,705	$3,705	$3,705	$3,705	$3,705	$3,705	$3,705	$3,705	$3,705	$3,705	$3,705
	($70,637)	$185,701	($4,979)	$59,524	$22,187	$60,085	($10,951)	($7,441)	($51,301)	$74,569	($14,502)	$10,648
	($31,701)	$72,924	($1,711)	$17,896	$5,837	$13,831	($2,206)	($1,311)	($7,911)	$10,062	($1,712)	$1,100

	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
	2.03	2.11	2.19	2.28	2.37	2.46	2.56	2.67	2.77	2.88							
	7400	7400	7400	7400	7400	7400	7400	7400	7400	7400							
	1560	1560	1560	1560	1560	1560	1560	1560	1560	1560							
	875	875	875	875	875	875	875	875	875	875							
	$20,778	$21,609	$22,473	$23,372	$24,307	$25,279	$26,290	$27,342	$28,436	$29,573							
	$9,481	$9,860	$10,254	$10,665	$11,091	$11,535	$11,996	$12,476	$12,975	$13,494							
	$7,232	$7,521	$7,822	$8,135	$8,461	$8,799	$9,151	$9,517	$9,898	$10,294							
	$37,491	$38,990	$40,550	$42,172	$43,859	$45,613	$47,438	$49,335	$51,308	$53,361							
	$37,491	$38,990	$40,550	$42,172	$43,859	$45,613	$47,438	$49,335	$51,308	$53,361							
	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0							
	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0							
	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0							
	($3,749)	($3,899)	($4,055)	($4,217)	($4,386)	($4,561)	($4,744)	($4,934)	($5,131)	($5,336)							
	($3,749)	($3,899)	($4,055)	($4,217)	($4,386)	($4,561)	($4,744)	($4,934)	($5,131)	($5,336)							
	($3,749)	($3,899)	($4,055)	($4,217)	($4,386)	($4,561)	($4,744)	($4,934)	($5,131)	($5,336)							
	$33,742	$35,091	$36,495	$37,955	$39,473	$41,052	$42,694	$44,402	$46,178	$48,025							
	$245,204	$280,295	$316,790	$354,745	$394,217	$435,269	$477,963	$522,364	$568,542	$616,567							
	$3,705	$3,705	$3,705	$3,705	$3,705	$3,705	$3,705	$3,705	$3,705	$3,705							
	$14,020	$13,887	$13,755	$13,624	$13,494	$13,365	$13,238	$13,112	$12,987	$12,863							
	$1,267	$1,098	$952	$825	$715	$620	$537	$465	$403	$350							

**Table C. 16 Variation of IRR for a 28-year analysis
with the variation in execution cost**

% Change in Execution Cost	IRR (28-Year) 14.90%
0%	14.26%
-1%	14.47%
-2%	14.69%
-3%	14.90%
-4%	15.12%
-5%	15.34%
-6%	15.56%
-7%	15.78%
-8%	16.00%
-9%	16.22%
-10%	16.45%
-11%	16.67%
-12%	16.90%
-13%	17.13%
-14%	17.35%
-15%	17.58%

Table C. 17 Percentage Variation of NPV with a Number of Input Variables for a 35-Year Analysis

% Change of Variable	Variable	NPV	% Change of NPV
	DR (35 years)	$29,582	
10%	13.20%	$15,574	-47.36%
-10%	10.80%	$46,808	58.23%
	Inflation Rate	$29,582	
10%	4.40%	$37,623	27.18%
-10%	3.60%	$21,931	-25.86%
	Cost of Demolition/Structure	$29,582	
10%	$747	$28,911	-2.27%
-10%	$630	$30,067	1.64%
	Cost of Site Prep. /m2	$29,582	
10%	$14	$27,637	-6.58%
-10%	$12	$30,523	3.18%
	Cost of Structure Construction	$29,582	
10%	10%	$13,630	-53.93%
-10%	-10%	$38,172	29.04%
	Rentals	$29,582	
10%	10%	$36,639	23.85%
-10%	-10%	$22,526	-23.85%
	Project Mngt. $ Admin.	$29,582	
10%	4.95%	$28,740	-2.85%
-10%	4.05%	$30,425	2.85%
	Sales & Marketing	$29,582	
10%	1.65%	$29,302	-0.95%
-10%	1.35%	$29,863	0.95%
	Contingency	$29,582	
10%	11.00%	$27,732	-6.26%
-10%	9.00%	$31,433	6.26%
	Design	$29,582	
10%	4.40%	$28,368	-4.10%
-10%	3.60%	$30,796	4.10%
	Land Sales	$29,582	
10%	10%	$52,001	-75.78%
-10%	-10%	$7,163	-75.78%

Bibliography

Azad, B. and Jacobs, M.D. (1986). "Infrastructure Finance and Institutions: A Review of International Experience." Report No. 47. Multinational Planning Staff, Department of Urban Studies and Planning, M.I.T., Cambridge, Massachusetts.

Bahl, Roy W. (1979). "The Practice of Urban Property Taxation in Less-Developed Countries". Madison, WI: University of Wisconsin Press, pp.9-47.

Bahl, Roy W., and Johannes F. Linn. (1984). "Urban Finances in Developing Countries". The World Bank Research News, Vol.5, No. 1 (Spring), pp. 3-13.

Balling, Richard J., and Brown, Michael R. (1999). "Multiobjective Urban Planning Using Genetic Algorithm." *Journal of Urban Planning and Development*, Vol. 125, No.2.

Beaumont, P., and Tippett, H. (1993). "Affordable housing through regulation: An evaluation of the performance based New Zealand building Code." Proc., 4th Annual Rinker Int. Conf. on Building Construction College of Arch., University of Florida, Gainesville, FL.

Bolton, Roger (1985). "Infrastructure in Massachusetts: An Economist's Perspective." Massachusetts Infrastructure Project Report of Research. Volume III. Amherst, MA: University of Massachusetts at Amherst (June).

Brealey, R.A. and Meyers, S.C. (2000). "Principles of Corporate Finance." 6th Edition. The McGraw Hill Companies Inc.

Cernea, M. M. (1999). "The Economics of Involuntary Resettlement: Questions and Challenges." The World Bank, 1818 H Street, N.W., Washington D.C. 20433.

Cheah, C.Y.J., Kuschinsky N., and Miller J.B. (2000). "Application of Portfolio Planning to Urban Settings." *Department of Civil and Environmental Engineering, Massachusetts Institute of Technology*, MA, U.S.A.

Coon, A. (1997). "Land and building use in relation to urban policies." The Reconstruction of Palestine: Urban and Rural Development, A. Zahlan, ed., Kegan Paul, London, 185-206.

Corson, J. N. (1994). "Reuse of materials readily marketable with little or no processing." *Proc., 1st Int. Conf. of CIB TG 16*, C. J. Kibert, ed., Braun-Brumfield, Ann Arbor, MI., 857–863.

Davey, K.J. (1983). "Financing Regional Government: International Practices and Their Relevance to The Third World". New York, NY: John Wiley and Sons.

Dervis, K. (1998). "Education in the Middle East & North Africa: A Strategy Towards Learning for Development." *World Bank Report.* Website: http://www.worldbank.org/education/strategy/MENA-E.pdf

Duckstein L., Tecle A., Nachnebel H.P., and Hobbs B.F. (1989). "Multicriterion Analysis of Hydropower Operation." *Journal of Energy Engineering*, Vol. 115, No. 3.

Fear, J., Hutchinson, K., and Putt, T. (1993). "Affordable future: Management of house procurement to optimize capital and maintenance costs." *Proc., 4th Annual Rinker Int. Conf. on Build. Construction*, University of Florida, Gainesville, FL.

Gregory, R.A. and Pearce, A.R. (1999). "Cost Effective Allocation of Research Funds for the Development of Emerging Technologies. " *Journal of Professional Issues in Engineering Education and Practice.*

Halliday, S. P. (1994). "An environmental code of practice for buildings and their services." Proc., 1st Int. Conf. of CIB TG 16, C. J. Kibert, ed., Braun-Brumfield, Ann Arbor, MI, 153-162.

Hamdi, N. (1997). "Housing Alternatives: Lessons from experience.: the Reconstruction of Palestine: Urban and Rural Development, A. Zahlan, ed., Kegan Paul, London, 405-420.

Hamdi, N. and Goethert, R. (2001). "Action Planning for Cities." John Wiley & Sons, Chichester, p.77. Website: http://web.mit.edu/urbanupgrading/upgrading/issues-tools/issues/participation.html

Handa, V. K., and De Oliveira, R. (1993). "Affordable housing system." *Proc., 4th Annual Rinker Int. Conf. on Build. Construction*, College of Arch., University of Florida, Gainesville, FL.

Hayek, Kamal F. (1996). "Infrastructure Development in Lebanon: Public/Private Partnerships". Masters Thesis, MIT.

Hui, E. (2001). "Measuring Affordability in Public Housing From Economic Principles: Case Study of Hong Kong." *Journal of Urban Planning and Development, Vol. 127, No. 1*, ASCE.

Hobbs, B. (1986). "What can we learn from experiments in multicriteria decision analysis?" *Trans. Systems, Man, and Cybernetics*, Inst. Of Electrical and Electronic Engrs., SMC-16(3), May-Jun., 410-425.

Jones, Gavin W., and Visaria, Pravin (1991). "Urbanization in Large Developing Countries". United States: Oxford University Press Inc., New York.

Knocke, J. (1993). "Adequate technical quality assurance makes commercial housing finance available to third world low-income households." *Proc., 4th Annual Rinker Int. Conf. on Build. Construction*, College of Arch., University of Florida, Gainesville, FL.

Kulaba, S.M. (1981). "Housing, socialism and national development in Tanzania: a policy framework ". Dar el Salaam, Tanzania: Da Rotterdam, Netherlands: Center for Housing Studies, Ardhi Institute; Bouwcentrum International.

Lagos, C. P., and Handa, V. K. (1993). "Affordable housing within existing codes." *Proc., 4th Annual. Rinker Int. Conf. on Build. Construction*, College of Arch., University of Florida, Gainesville, FL.

Martinez, L-H Halpin, D.W. and Rodriquez-Ayala I. (2000). "Combining Qualitative and Quantitative factors in Risk Analysis of Cash Flow Dependent Infrastructure Projects." *Conference Proceedings, Construction Congress VI.*

Mayo, S. (1997). "Housing sector performance and housing strategy in Gaza and West Bank." *The Reconstruction of Palestine: Urban and Rural Development*, A. Zahlan, ed., Kegan Paul, London, 510–555.

McMurray, J. P., and Cole, A. M. (1959a). "Code enforcement, problems and recommendations. " *Housing Codes, Vol.* 1, New York State Division of Housing/ Housing and Home Finance Agency, New York.

Master Plan Review-Draft Report, (1996). *"Planning and Development of Beirut South-Western Suburbs."*

McMurray, J. P., and Cole, A. M. (1959c). "Administrative guide for local programs." *Housing Codes, Vol.* 3. New York State Division of Housing/Housing and Home Finance Agency, New York.

Mejia, M.C. (1999). "Economic Dimensions of Urban Resettlement: Experience from Latin America." Chapter 4 of "The Economics of Involuntary Resettlement: Questions and Challenges." The World Bank, 1818 H Street, N.W., Washington D.C. 20433.

Miller, John B. (2000). "Principles of Public and Private Infrastructure Delivery". U.S.A.: MIT, MA.

Pearce, A.R. Gregory, R.A. & Vanegas, J.A. (2000). "Resource Allocation and Problem Prioritization for Sustainable Facilities and Infrastructure." *Conference Proceedings, Construction Congress VI.*

Pinta, T. P., and Agopyan, V. (1994). "Construction wastes as raw materials for low-cost construction products." *Proc., 1st Int. Conf. of CIB TG 16*, C. J. Kibert, ed., Braun-Brumfield, Ann Arbor, MI., 335–342.

Prest, A.R. (1981). "The Taxation of Urban Land". Manchester, United Kingdom: Manchester University Press.

Steiner, H.M. (1996). "Engineering Economic Principles." Second Edition. The McGraw Hill Companies, Inc.: Singapore.

The World Bank (1996). *"World Bank says World's Worst Slums can be Transformed." Press Release*, Washington, U.S.A.

The World Bank (2000). *"Making Cities Work For All."* Global Action Plan for City Development Strategies. Cities Alliance.

The World Bank Group, (1999-2001). "Urban Upgrading Communities". Prepared by SIGUS-MIT, with the support of the Cities Alliance, a global partnership to achieve the promise of well-managed cities, for the Thematic Group on Services to the Urban Poor, The World Bank. Website: http://web.mit.edu/urbanupgrading/

UNCHS (Habitat), (1987). *"Shelter, Infrastructure, and Services for the Poor in Developing Countries: Some Policy Options."* Nairobi: UNCHS (Habitat), pp.3-4.

Yazbek, Karim A. (1994). "Public-Private Large-Scale Downtown Redevelopment in the Middle East". Masters Thesis, MIT.

Ziara, Mohamed M., and Ayyub, Bilal M. (1999). "Decision Analysis for Housing-Project Development." *Journal of Urban Planning and Development*, Vol. 125, No. 2.

Websites:

Central Bank of Lebanon Website: http://www.bdl.gov.lb/

The Lebanese Embassy Website in Washington D.C.-
http://www.lebanonembassy.org/country_lebanon/overview.html

The World Bank Group (1999-2001)-Website: http://web.mit.edu/urbanupgrading/

Website on Lebanon- http://uatlax3.uniontrans.com/demo/demoleba.htm

Website on Lebanon- http://www.geocities.com/CapitolHill/Parliament/2587/

World Bank Website on "Water & Sanitation: (2001):
http://www.worldbank.org/html/fpd/water/topics/sanitation.html

World Health Organization (WHO) Website (2001):
http://www.who.int/m/topics/healthy_cities/en/index.html