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A Decision Support System for Plot Pricing of BOT Projects in the State of Kuwait

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Abstract

Build-Operate-Transfer (BOT) projects in Kuwait have increased in number, size and type over the last couple of decades. The usage of an inflexible annual rental rate as a plot pricing system which disregard social gain, environmental considerations, general economic conditions, etc. has led to a sub-optimum level of public revenue and inadequate protection of the public fund. And over a number of years, the magnitude of the losses in public revenue from these projects has led to the accusation of public fund mishandling, cancelation of many BOT contracts by the government and the call by the National Assembly to the enactment of a legislation that would regulate the BOT projects, and establish a fair, transparent and justified pricing system for public plots of land offered to these projects.
In response to this critical national problem[1]*, this paper presents a decision support system for the Plot Pricing of BOT Projects in the State of Kuwait. The decision support system includes a multidimensional plot pricing model specified in [1]. The objective of the decision support system is to create an environment that would directly enable the maximization of public revenue and indirectly provide the necessary protection of the public fund.*

1. Introduction

Build-Operate-Transfer (BOT) projects in Kuwait have increased in number, size and type over the last couple of decades. The usage of an inflexible annual rental rate as a plot pricing system which disregard social gain, environmental considerations, general economic conditions, etc. has led to a sub-optimum level of public revenue and inadequate protection of the public fund. And over a number of years, the magnitude of the losses in public revenue from these projects has led to the accusation of public fund mishandling, cancelation of many BOT contracts by the government and the call by the National Assembly to the enactment of a legislation that would regulate the BOT projects, and establish a fair, transparent and justified pricing system for public plots of land offered to these projects.[1]
this paper presents a decision support system for Plot Pricing of BOT Projects in the State of Kuwait. The decision support system includes a multidimensional plot pricing model specified in [1]. This multi-dimensional plot pricing model, the cornerstone of this DSS, and as shown in Figure 1, covers several key issues such as *Location Allowance, Strategic National Objectives Allowance, National Labor Allowance, Return on Investment, Investment Expenditure, Commercial-Noncommercial Ratio, Energy Consumption Coefficient* and *Environment Protection.* The model as implemented in this dss, should eliminate the deficiencies in the uni-dimensional plot pricing system currently in practice in the State of Kuwait. The utilization of such DSS in turn should fulfill the demand and requirement for optimum revenue generation, protection of public properties and a transparent and just system, and when executed in an iterative manner, should provide an environment that directly enable the maximization of public revenue and indirectly enable the necessary protection required for the public fund.

2. BOT Background

For BOT background including BOT approach, leasing of public land, see [2], [3], [4],[5], [6,[7],[8],[9],[10],[11]. For Land Lease for BOT Projects in Kuwait see [12],[13] and [14] and for the present leasing system see [15].
Since 1994, nearly 100 BOT projects with an approximate cost of 1.5 billion US dollars ranging from

[1] This project was partially funded by a contract from the Ministry of Finance, State of Kuwait.

large utility schemes to commercial malls, schools, universities, health and other enterprises have been allocated plots of public land under discretionary and ad hoc rules and on a case-by-case basis However, in 2006 the government of Kuwait decided to halt new BOT plans after the detection of financial and administrative violations in some of build-operate- transfer (BOT) projects by Kuwait's Public Audit Bureau, [1].

Topping the list of these project is the $390 million Sulaibiya Waste Water Plant, the largest facility of its kind in the world that uses reverse osmosis and ultra-filtration membrane-based procedures. Other major projects include the free trade zone at Shuwaikh port, the $162 million fifth waterfront development project comprising of Marina Mall, Marina Crescent and Hotel, the $44.5 million sixth waterfront development project comprising of Alkout Mall, the $132 million Sharq Mall, the $73.2 million Heritage Village project, the $35.7 international golf stadium and club, the $23.2 million Hawally amusement park, the $21.5 million Friday market development project, the $10.7 million plant for the recycling of construction waste, and the $8.2 million KFAS scientific center [13].

The allocation of plots of public land for such dissimilar and diverse projects and the establishment of annual leasing rate for such plots are based upon a parallel simple pricing procedure that disregards social gains, environmental considerations, general economic conditions, and a host of other relevant aspects, on one hand, and have led to the sub-optimum level of public revenues and inadequate protection of public fund. Plot lease rates for key BOT projects are usually established by the State Property Department at the Ministry of finance or the Public Authority of Industry. Such rates are worked out by merely the chosen location and the proposed project's internal rate of return (IRR). whereas lease rates for schools, health services, car parks and alike projects are already assigned by government resolutions which also disregard dissimilarity between these projects. Yet, bidder's influence, and bargaining skills play a role in this process [15].

Only as recent as 2008, Law No 7 (amending Law No 105 of 1980 regarding state-owned properties) was issued to re-regulate the BOT and similar techniques. Nevertheless, the new law does not deal with the significant issue of pricing of public land [16].

3. Multi-Dimensional Plot Pricing Model (MDPPM)

The cornerstone of the decision support system is the Multi-Dimensional Plot Pricing Model(MDPPM) the dimensions of which are shown Figure 1 [1].

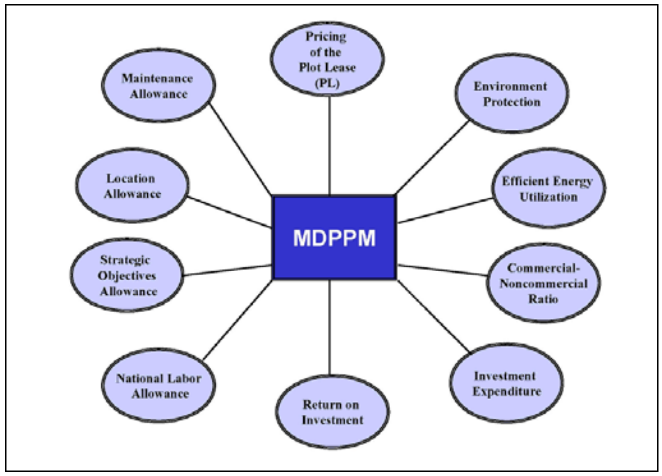

Figure 1. MDPPM dimensions

The formula shown below represents the main MDPPM formula which incorporates all the equations representing the dimensions shown in Figure 1 except for the Environment Protection. The Environment Protectionwhich requires some technical criteria that currently lack and are to be set by Kuwait Public Authority for Environment(PAE) [1].

$$\sum_{i=1}^{n} MDPP_i = PL_i + (LWA + ARI + CNR)$$

$$-(AME + IE + ACNO + ECC + NLA)$$

The appendix which is taken from [1] contains the mathematical equations representing MDPPM dimensions and their justifications. The appendix also shows, in a progressive manner, the impact of the addition of each dimension's measurement on the initial formula.

In the MDPPM formula PL stands for Plot Leasing, LWA for the Location Weight Adjustment, ARI for Adjusted Return on Investment, CNR for Commercial- Noncommercial Ratio, AME for Adjustment for Maintenance Expenditure, IE for Investment Expenditure, $ACNO$ stands for Adjustment for Contributions to National Objectives, ECC for Energy Consumption Coefficient, NLA stands for national labor adjustment, and i stands for time periods where $i = 1, \ldots, n$. Also to account for the

future values of fund, given the multi-period nature of the BOT contracts, these values are discounted and the MDPP variables, as shown in the formula, are multiplied by the appropriate Discount Rate(r). However, to balance the effect of each dimension in the MDPP formula on the end- value of the multi- dimensional plot lease, the incorporated variables have been weighted and reduced to reflect their partial importance in the model. The weights and the reduced values have been selected based on through reviews, group discussions and data experiments. As such and as show in the Appendix, the location Allowance is weighted in percentage, the IRR effect in the Adjusted Return on Investment is set at 20%, the Allowance for the Commercial – Noncommercial ratio are both set at 10%, the Maintenance Expenditure Allowance is set at 5%, the Investment Expenditure and the project Contribution to National Objectives are divided by 100 and so it the weight of national labor categories[1].
As discussed in section 4.1, the MDPPM when its parameters are assigned various values would generate different pricing scenarios to choose from.

4. The Plot Pricing Decision Support System (PPDSS)

In the following subsections the architecture and information flow of the PPDSS is presented followed by the implementation aspect and PPDSS functionality.

4.1 The Architecture and Information Flow of the PPDSS

Figure. 2 shows the system architecture and the information flow within its components. The components of the system are a simplified version of a typical dss framework [17] and is presented to show the iterative nature of the environment in which the MDPPM would be utilized.

-As a data-driven System, PPDSS's data requirements such as general parameters, standard project, projectsand scenarios creation are handled by the data Management component.

-Model Management is responsible for creation and maintenance of various aspect of MDPPM.

-Scenario Management is responsible for the scenario creation, what-if analysis (through scenario creations), scenario evaluation and reporting.

4.2. Implementation of the PPDSS

The PPDSS is built within an object-oriented paradigm using VB.NET and SQL Server. The PPDSS is derived by the MDPP Class representing and implementing the MDPP model specified in the section 3 and the Appendix. The MDPP Class encapsulates all the data requirements of the MDPP model as embedded classes and all the MDPP dimensions equations as its methods. These embedded classes are as follows

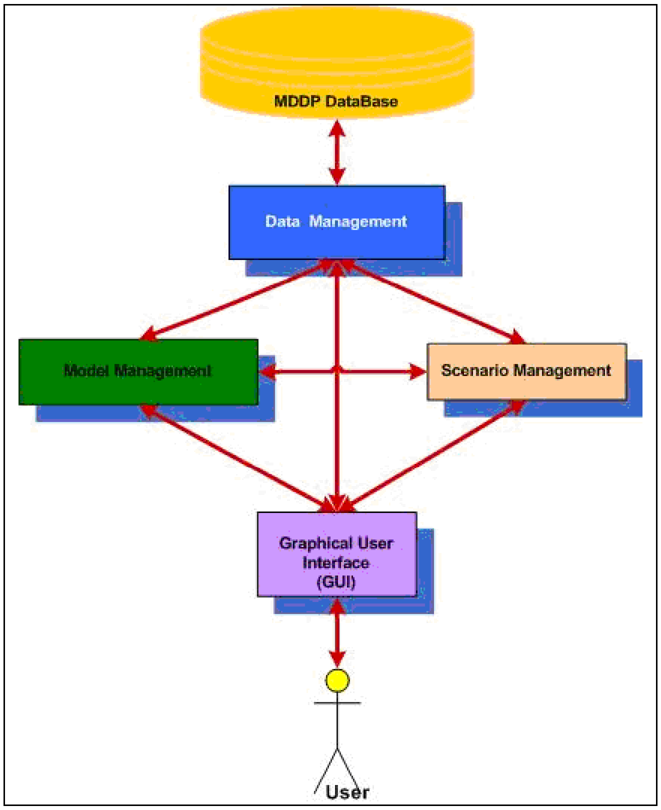

Figure 2. Decision support system architecture and information flow

1. General Requirement Classes
   - LW Class encapsulates the data and equation requirements for the computation of Location Weight
   - IE Class encapsulates the data and equation requirements for the computation of Investment Expenditure
   - NLC Class encapsulates the data and equation requirements for the computation of National Labor Categories
   - SNOW Class encapsulates the data and equation

requirements for the computation of National Objective Weights

2. Standard Project Class: encapsulates the data and the methods required for the standard project manipulation
3. Project Class: encapsulates the data and the methods required for the project manipulation
4. Scenario Class: encapsulates the data and the methods required for the scenario manipulation
5. MDDP Class: an object of class MDDP , the cornerstone of the DSS, once instantiated in turn instantiates and populates other embedded objects
6. Result Class: the data elements contained within the Result Class are:*Year, DRate,EMPL, PL, LWA, IRI, CNR, AME,IE , ACNO, ECC, NLA, MDPP*

The objects for these classes are instantiated using the forms shown in Figures 3, 4,5,6 and 7.

4.3. PPDSS Functionality

The PPDSS is used in three main iterative steps: 1) General Requirements Setup; 2) Projects and Scenarios Generation and Execution ; 3) Scenario Analysis and Reporting. In the following subsections, each of these component are briefly described.

4.3.1. General Requirements Setup

Through the forms depicted in Figure 3 and Figure 4, the model's general requirements objects of types SNOW, LW, NLC, IE classes and various standard projects objects of type standard project class are instantiated and manipulated. This is an infrequent step performs once at the initial system setup or when attributes of the above mentioned classes change or a new standard project object comes into existence.

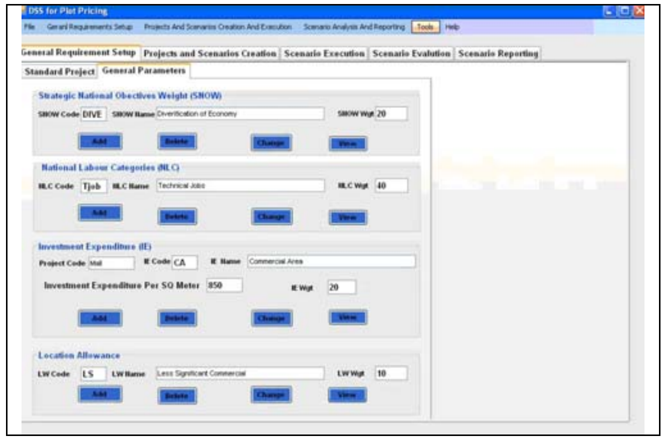

Figure 3. General requirements setup

4.3.2. Projects and Scenarios Generation and Execution

In this step a project is created and an initial scenario is generated and subsequently is executed. New scenarios can be generated in an iterative manner by changing attributes of the scenario form and then executed these scenarios. The cycle of generation-execution provides the user with the what-if analysis capability necessary for the generation of various scenarios' outcomes that would allow the user to evaluated and select the most "optimum" or appropriate scenario or the most cost-effective one. Figure 5 and 6 shows the forms for project and scenario

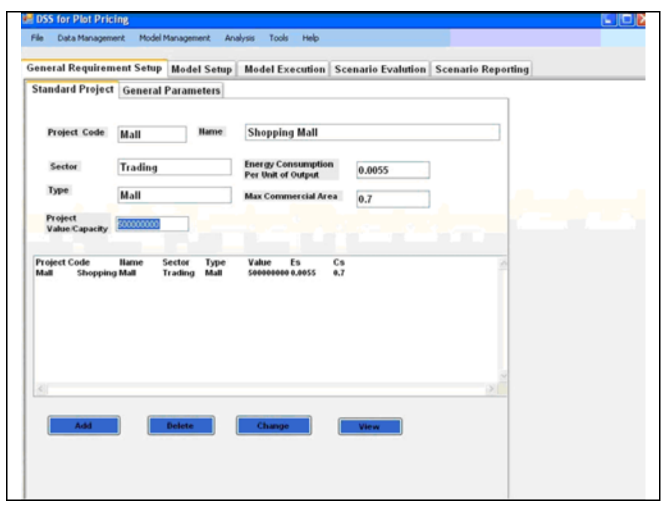

Figure 4. Standard Project

creation and figure 7 shows the outcome of the execution of a scenario, scenario 1 for project 1.

4.3.3. Scenario Analysis and Reporting

Scenario(s) are evaluated and those that maximize public revenue and provide the necessary protection for the public fund would be accepted and reported to the executive management. If rejected, Scenario Generation and Execution cycle would be repeated with different parameters values and scenario results would be evaluated until an acceptable result is generated.

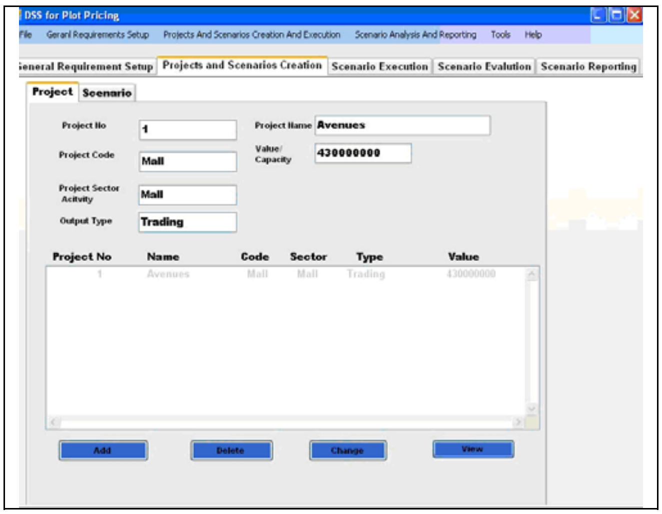

Figure 5. Project

5. Experimentation

The system was initialized with a set of general requirements and standard projects as shown in Figure 3 and Figure 4. A significant BOT project, Avenues the largest mall ever built in Kuwait was selected as the project as shown in Figure 5. We have created three scenarios as follows:

1. Scenario 1: the values of its parameters are depicted in Figure 6 and its execution outcome is shown in Figure 7.

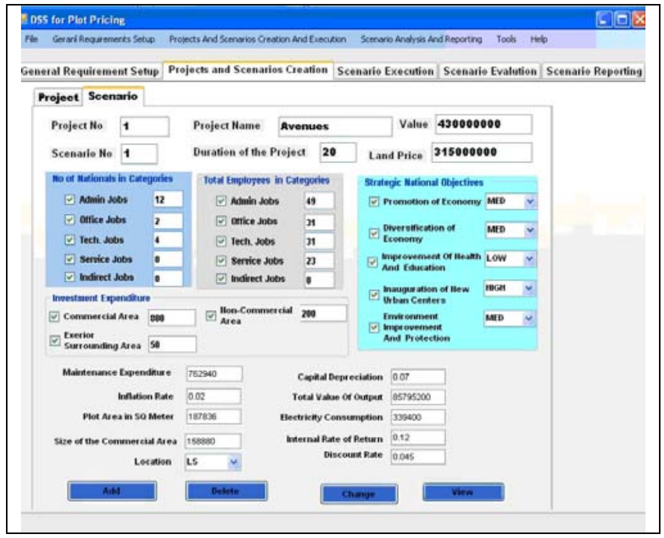

Figure 6. Scenario

2. Scenario 2 and 3: the values of their parameters are shown in Tables 1 to 5 and the their execution outcomes are shown in Figure 8 and 9 respectively.
3. Scenario 3: in this scenario we have changed the following parameters with the shown values and the outcome of its execution is shown in Figure 9.

5.1. Analysis of the Scenarios'Outcomes

As mentioned above, through an iterative what-if analysis we have created three scenarios the interpretation of their outcomes are described in the following subsections.

5.1.1. Interpretation of Scenario 1 Outcome

Interpretation of Columns in Figure 7 are as follows:

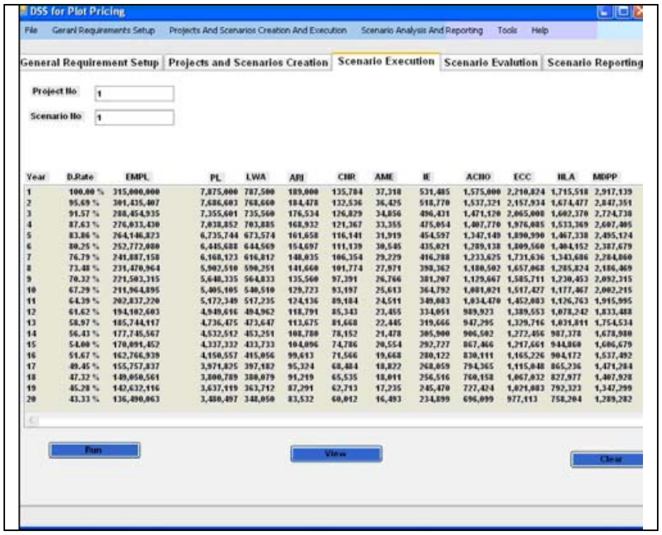

Figure 7. Project 1, scenario 1 execution

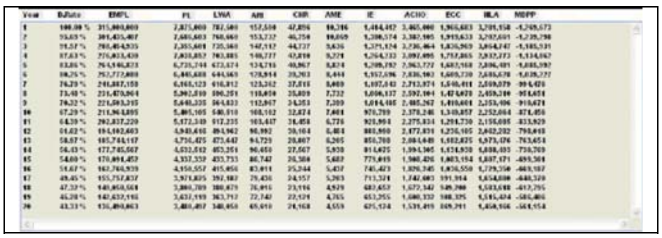

Figure 8. Project 1, Scenario 2 Execution

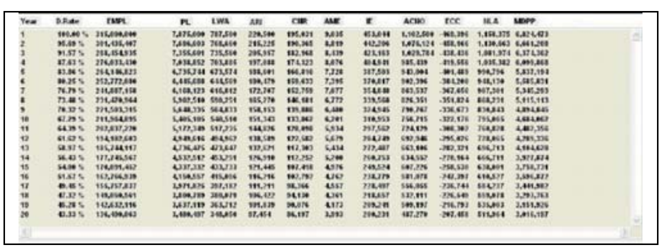

Figure 9. Project 1, Scenario 3 Execution

- EMPL: The estimated market plot price(EMPL) is adjusted, starting from the second year, by multiplying the original estimated market plot price by the d, the discount computation variable as shown in subsection 3.2
- PL: The plot leasing (PL) column takes into consideration the incentives to private investors by cutting the EMPL by 50% and assumes 5% of the remaining value to stand for the annual rent, as it has been indicated in equation (1) in subsection 3.2. It also considers the inflation rate starting from year 2.
- LWA: The Location Allowance LWA column considers the adjustment for the significance of the plot location. This Project is located in a less significant commercial area (Location code LS) which has a weight of 10% and hence LW is 10% and PL_i is adjusted by LW according to formula 2 and the value for LWA_i , is shown in under LWA column.
- ARI: IRR for the project was set at 12% and IRA becomes .024 after dividing it by 5 and and PL_i is adjusted by IRA according to formula 3 and the value for IRA_i , is shown in under IRA column.
- CNR: The percentage of the commercial size to the plot size, CR, is 85% (15888 sq meters / 187836) and the percentage for the standard project, CS, is 70%. As such CNR becomes 0.017 and PL_i is adjusted by CNR according to formula 4 and CNR_i , is shown in under CNR column.
- AME: The annual Maintenance Expenditure(ME) is KD 762940 for this scenario, and according to subsection 3.6, the annual amount of the estimated capital depreciation (ECD) is KD8,050,000 (calculated by multiplying the total project investment (excluding the land value) by the capital depreciation rate(7%)). AME becomes 0.005 (the ratio of ME to ECD divided by 20) and as such PL_i is adjusted by AME according to formula 5 and AME_i , is shown in under AME column.
- IE: The per sq meter investment expenditure of this project in commercial area, non-commercial area and exterior surrounding are KD800, KD200 and KD50 respectively as opposed to KD850, KD250, and kd120 for the standard project. Multiplying the ratio between these figures by their corresponding weights of 20%, 40% and 40% according to subsection 7 and using formula 6 resulted in IE of 0.067 and an adjusted PL_i as shown by the value under IE.
- ACNO: The contribution of this project toward the strategic national objectives of promoting of economy, diversification,

improvement of health and education, inauguration of new urban centers and environment improvement and protection were med, med, low, high and med respectively. Multiplying the contribution of toward the national objective by their corresponding weights, as described in section 3.8 and according to formula 7 resulted in ACNO of 0.20 and an adjusted PL_i as shown by the value under ACNO.

- ECC: The energy consumed by the project per unit of output is 0.004 and the one for the standard project is 0.0055. And as such ECC becomes 0.28 and the adjusted PL_i value is shown under ECC.
- NLA: NLA for this project is 0.22, computed according to section 3.10 and PL_i is adjusted according to formula 9 and its value is shown under NLA.

Table 1. Values for certain key model parameters

Scenario No	1	2	3
IRR	0.12	0.1	0.14
Total Investment	115,000,000	205,000,000	65,000,000
Commercial Area	158,880	140,000	174,768
Maintenance Expenditure	762,940	953,675	610,352
Total Value	85,795,200	65,800,000	85,795,200
Electricity Expenditure	339,400	271,520	500,000

Table 2. Non-Kuwaiti Employment

Scenario No	Admin. Job	Office Job	Tech. Job	Service Job	Indirect Job
1	49	31	31	23	0
2	49	31	35	25	40
3	60	40	35	25	0

Table 3. Kuwaiti national employment

Scenario No	Admin. Job	Office Job	Tech. Job	Service Job	Indirect Job
1	12	2	4	0	0
2	12	2	8	2	15
3	18	1	0	0	0

Table 4. Investment expenditure

Scenario No	Commercial Area	Non-Commercial Area	External Surrounding
1	800	200	50
2	600	300	150
3	1000	150	30

Table 5. Contribution to national ojectives

Scenario No	1	2	3
Diversification Of the Economy.	MED	HIGH	LOW
Improvement Of Health & Education	LOW	LOW	LOW
Inaug. Of New Urban Cent	HIGH	HIGH	LOW
Environment Improvement & Protection nt	MED	HIGH	MED
Promotion Of Economy	MED	MED	MED

5.2 Interpretation of Scenarios 2 and 3 Outcomes

Our what-if analysis attempts were to create two extra scenarios, 2 and 3. Tables 1 to 5 shows some of the values of key parameters for the two scenarios. We have also included the values for scenario 1 as well for comparison. As shown in Figure 8 and Figure 9, scenario 2 reduced the MDPP significantly while scenario 3 increased it substantially.

As noted earlier, due to the multi-period nature of the BOT contract, future values of fund were discounted to their present values. In feasibility studies of private enterprizes, it is usually common to use the market average interest rate which reflects private preferences. However, during the past three decades, many feasibility studies in Kuwait have applied the rate of 10% to private investments as a standard discount rate. Nevertheless, because major BOT projects have high initial costs but a long stream of benefits, a low discount rate would make a project looks more favorable[19].

Given the fact that allocating plots of land to BOT projects must be regarded as an incentive to private sector involvement in developmental projects, their proceeds should be discounted at a favorable rate. Thus, it is fairly reasonable to use the rate of return on long-term government bonds as a benchmark. Between 1995 and 2007, the interest rate on the long-term Kuwaiti treasury bonds has been 6.5%[18]. Additionally, in development literature, economists frequently advise to reduce the discount rate by certain ratio, say 2%, when considering a project with development dimensions[20]. Consequently, all values in RUN1, RUN2, RUN3 were discounted at the interest rate on the long-term Kuwaiti treasury bonds minus 2%, i.e., at 4.5%.

6 Summary and Future Research

The paper presents a decision support system for plot pricing of BOT projects in Kuwait. Included in this DSS a multi-dimensional plot pricing model reported in a previous paper by the same authors [1]. The PPDSS reported in this paper enable the decision makers to create various scenarios for a particular projects and thought this what-if capability, empower them to fulfill the demand and requirement for optimum revenue generation, protection of public properties and a transparent and just system.
Future research is underway for a BOT Proposal selection using a Multi-Criteria (Goal-Programming) approach the results of which will be reported in an upcoming paper.

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Appendix

Pricing of the Plot Lease

Initially, MDPP formula could be calculated using the plot leasing rent equation given that the market price of the designated plot is established. For that we first compute the discount calculation using the following formula:

$$d_i = [\frac{1}{(1+r)^{i-1}}]$$

where d_i is the result of discount calculation for the period i when $i > 1$ and accordingly $EMPL_i$ would be as follows:

$$EMPL_i = initEMPL * d_i$$

where initEMPL is the initial market price of the designated plot. And consequently the plot lease equation would be computed as follows:

$$PL_i = (\frac{EMPL_i}{2} \times 0.05) \times (1 + F_j) \quad (1)$$

Where PL stands for the annual lease value of the plot measured at 5% of half of the estimated market price of the plot ($EMPL$) .The 5% represents the lowest ratio of annual rent of a commercial site in Kuwait, while the 50% discount in this value represents an incentive provided to the BOT leaseholder. F stands for Inflation Rate and i and j for time periods where $i = 1, \quad , n$ and $j = 2, \quad ...., n$

Location Allowance

The Leasing Rent should also be adjusted based on the location of the land. To this end, the possible location of BOT projects are divided between five zones with different economic importance. These zones and their corresponding weights are as follows:

1. 50 percent for Coastal front of Kuwait City
2. 30 percent for Commercial Urban Centers
3. 10 percent for Other Less-Significant Commercial Centers
4. 0 percent for Low-Inhabited Areas
5. -40 percent for New Development Areas

These weights are assigned based on evaluation of the importance of each zones to the Kuwaiti economy. The formula for calculating the Location Weight Adjustment (LWA_i) is as follows:

$$LWA_i = PL_i(LW)$$

Where LW stands for the location weight in percentage. And accordingly equation (1) should be adjusted as follows:

$$PL_i = PL_i + LWA_i \quad (2)$$

Return on Investment

Though, return on investment reflects financial ability of concessionaires, one must be cautious in adding this component to the plot lease estimate equation because an increase in the plot lease along with an increase in the project's rate of return would represents a penalty for efficient operation. Thus, the present approach reduces the weight of such component in the formula to 0.20% of the ratio. Hence its effect on plot lease is minimized by the Adjusted Return on Investment (ARI_i) formula:

$$ARI_i = PL_i(IRR/5)$$

Where IRR is the project internal rate of return. And consequently, equation (1) should be adjusted as follows:

$$PL_i = PL_i + ARI_i \quad (3)$$

Commercial- Noncommercial Ratio

Also, given the public nature of these projects, allowance has been added to lesser commercial or income-generating areas as a ratio of the maximum commercial area which is permitted in a similar customary project.

The following formula represents the allowance for Commercial- Noncommercial Ratio (CNR_i):

$$CNR_i = PL_i(1 - (1/(Cr/Cs)) \div 10)$$

Where Cr stands for actual commercial areas in the project and Cs for maximum commercial areas that is permitted in a similar customary project. And consequently, equation (1) should be adjusted as follows:

$$PL_i = PL_i + CNR_i \quad (4)$$

Maintenance Allowance

Since it is important for the State to receive the project at the end of the BOT agreement with good operational conditions, the quality of maintenance, shown by the amount of maintenance spending, becomes crucial for such projects. As such, concessionaires who spend sufficiently on maintenance, must be rewarded and others who do not must not. This implies that the investor will be rewarded whenever the gap between his/her spending on maintenance and the actual consumption of fixed capital get smaller. The formula for calculating the Adjustment for Maintenance Expenditure (AME_i) is as follows:

$$AME_i = PL_i((ME_i \div ECD_i) \div 20)$$

Where ME stands for Maintenance Expenditure, ECD for the Estimated Capital Depreciation, i for the particular period. And accordingly equation (1) should be adjusted as follows:

$$PL_i = PL_i - AME_i \quad (5)$$

Investment Expenditure

Given the public nature of the BOT infrastructural projects, higher weights have been assigned to any increase in investment spending per square meter above a selected standard level of spending in similar typical customary project. For this purpose, project's areas were divided into three different type of areas:

1. areas that generate income or commercial areas. 20 points have been assigned to investment expenditure in such areas.
2. none-commercial areas which were assigned 40 points.
3. exterior surrounding areas which were assigned 40 points.

The following formula represents the positive reception of these extra expenditure.

$$IE_i = PL_i \sum_{h=1}^{h=3} [(Er_h / Es_h) \times (W_h / 100)] \div 10$$

Where $h = 1, .., 3$ representing the project areas, Er stands for real or actual investment expenditure per square meter, Es for the chosen standard investment expenditure per square meter, and W for weight assigned to each area. And accordingly, equation (1) should be adjusted as follows:

$$PL_i = PL_i - IE_i \quad (6)$$

Strategic National Objectives Allowance

Given the large number of the country's long term national objectives as stated in development plans, government action programs, and other official documents, and in order to simplify the model, five major national objectives were selected to weigh BOT projects contribution with regard to these goals. These objectives, which were given an equal weight of 20%, given their almost equal significance to the national economy, are:

1. Promotion of the economy to become a regional commercial and financial center.
2. Diversification of economic sources of income.
3. Improvement of health & education services.
4. Inauguration of new urban centers.
5. Environment improvement and protection.

The contribution of the project to each one of these objectives is weighted by the following five levels which have the corresponding assigned points to represent degrees of project contribution to each objective: 40 points for Excellent, 30 points for High , 20 points for Moderate , 10 point for Low , and zero for none.

Thus, the following equation represents the plot lease Adjustment for Contributions to National Objectives ($ACNO_i$).

$$ACNO_i = PL_i \sum_{n=1}^{n=5} (NO_n) \times (C_n / 100)$$

Where NO_n stands for the weight of each national objective, i.e., 0.20, C_n for the corresponding degree of contribution to each objective and $n = 1, \ \ ..,5$. And accordingly equation (1) should be adjusted as follows:

$$PL_i = PL_i - ACNO_i \quad (7)$$

Efficient Energy Consumption

Given the far-reaching value of energy conservation to the society in general and to the environment in particular, an allowance has been given to concessinares that achieve efficient use of energy per unit of output by calculating this coefficient, i.e. the Energy Consumption Coefficient(ECC_i), as follows:

$$ECC_i = PL_i(1 - (Eq / Es))$$

Where Eq stands for energy consumed by the project per unit of output and Es for energy consumed per unit of output by a similar customary project. And consequently, equation (1) should be adjusted as follows:

$$PL_i = PL_i - ECC_i \quad (8)$$

National Labor Allowance

Employment opportunities in a BOT project were classified into five major categories, and a specific weight was given to each category based on its significance to the Kuwaiti society. However, indirect jobs were given a lower weight as concessionaires do not pay salaries to their holders and hence do not incur an additional cost.

As such the weights for labor categories are: 20 points for administrative jobs, 20 points for work office jobs, 40 points for technical jobs, 10 points for service and marginal jobs, and 10 points for indirect jobs.
Thus, the following equation represents the plot lease adjustment for weighted national labor adjustment(NLA_i).

$$NLA_i = PL_i \sum_{z=1}^{z=5} (KL_z / LB_z)(WNL_z / 100)$$

Where $z = 1, .., 5$, KL stands for the total number of Kuwaitis hired at each of the z categories of job, LB for the total number of people employed at all z categories of job and WNL for the point weight of national labor at each of z categories. And consequently, equation (1) should be adjusted as follows:

$$PL_i = PL_i - NLA_i \qquad (9)$$

Environment Protection

Based on techniques available at the Public Authority for Environment, effect of each BOT project on the quality of environment aspects must be scientifically assessed using a measurable system in order to incorporate such effect into the BOT plot pricing formula.