Arab Journal of Administrative Sciences

2009, Vol. 16, No. 2, 253 - 270

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A PLOT PRICING DECISION SUPPORT SYSTEM FRAMEWORK FOR THE STATE OF KUWAIT

Key Words

Kuwait; BOT Projects; Decision Support System; Plot Pricing Model; Public Land.

Abstract

The significant growth of Build-Operate-Transfer (BOT) projects in Kuwait, in number, size and type, on one hand and the utilization of a uni-dimensional public plots pricing system, such as an inflexible annual rental rate, which disregard social gain, environmental considerations, general economic conditions, etc., on the other hand, have led to the sub-optimum level of public revenue and inadequate protection of the public fund. 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, this paper presents the specifications of a framework for a plot pricing decision support system for the State of Kuwait including a multidimensional plot pricing model, the architecture of the framework and the functionality of its major components. The framework should be able to create an environment that will directly enable the maximization of public revenue and indirectly provide the necessary protection of the public fund.

- Submitted May 2008, accepted August 2008.
- This project was partially funded by a contract from the Ministry of Finance, State of Kuwait.

Introduction

The significant growth of Build-Operate-Transfer (BOT) projects in Kuwait, in number, size and type, on one hand and the utilization of a uni-dimensional public plots pricing system, such as an inflexible annual rental rate, which disregards social gain, environmental considerations, general economic conditions, etc., on the other hand, have led to the sub-optimum level of public revenue and inadequate protection of the public fund. 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 ai 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 and strategic problem, this paper presents the specifications of a dynamic and flexible decision support system framework for plot pricing for the State of Kuwait. The cornerstone of the framework is a multi-dimensional plot pricing model covering 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,* as shown in Figure 1, eliminating the deficiencies in the uni-dimensional plot pricing system currently in practice. Also, to fulfill the demand and requirement for optimum revenue generation, protection of public properties and a transparent and just system, the framework includes other components such as a model setup , a model execution and scenario generation, and a scenario evaluation. Together and when executed in an iterative manner, these components provide an environment that directly enables the maximization of public revenue and indirectly enable the necessary protection required for the public fund.

BOT Background

The BOT Approach

Governments in different parts of the world are increasingly facing higher budget deficits and public funding difficulties that are creating barriers in developing essential public projects. In recent years, an increasing number of these governments have opted to outsource diverse public projects to private investors that can provide capital, management, and operating expenses to such projects using the Build-Operate-Transfer (BOT) approach.

The first official private facility development under the name BOT was used in Turkey in 1984 as part of an enormous privatization program to develop new infrastructure. However, the BOT approach was used as early as 1834 with the development of the Suez Canal which was financed by European capital with Egyptian financial support [1].

BOT contracts enable private investors to design, finance, construct and operate large scale public project to specifications agreed to by the concerned public agency. However, to recover their capital and earn a fair return on investment, private investors are granted the right to generate revenues from the project for a specific concession period which usually lasts from 10 to 50 years. After the specified period, the project is transferred back to the government in good condition to assume operating responsibility for the project or choose to contract the operations back either to the same concessionaire or a new one.

Certainly, the BOT approach has a number of advantages. One being, the costs and risks of financing fall on the shoulders of the private partner who is often in a much better position to bear these costs than public authorities. Also, many essential public projects, that otherwise would have to wait for allocation of public funds, can be realized in a shorter period of time. Besides, projects will likely benefit from private efficient cost-effective managerial skills which are often superior to their counterparts at the public sector.

On the other hand, the government is usually responsible to provide the BOT project with some assets including public plots of land at a subsidized lease, especially when the project is not highly gainful. However, leasing of state land to diverse private economic activities is common procedures in many industrial, as well as developing countries. These activities may take different forms such as grazing, industrial, commercial, tourism, housing, sport or recreation projects, etc.[2].

Leasing of Public Land

A variety of regulations and lawful procedures, which differ from one country to another, deal with leases of public land and the transfer of land from a leaseholder to a new lessee, subdividing, subcontracting or converting from a lease to freehold. Based on the leasing arrangement, a lessee must pay to the State the annual rent stated in the lease contract. Some BOT agreements offer concessionaries the right to own the land during the term of the project. This right means that concessionaries can sell, buy or release the land to a third party, and can use the project as well as the public land itself as collateral to borrow from banks. Such ownership rights are provided in Moscow, the Russian Federation capital, where it is not possible to protect rights of land users without registering the proprietary rights on land which entitles users to involve the land lots in market transactions [3].

A survey about the methods of public land price policy and execution of that policy in a number of European cities (Frankfurt, Stockholm, Helsinki, Riga, Vienna, Stuttgart, London and Amsterdam) revealed significant differences among the surveyed cities in the way they regulate and interfere in the setting of land prices. In the estimation of land prices allocated for business functions, some of the cities take the intensity of land use into account. In the city of Frankfurt, the Committee of Land Valuation Experts determines the value per plot. A density coefficient is being used, which is different for the downtown area and the outskirts. In Helsinki and Vienna, sometimes the land price is dependent upon the floor space index, a measure of density. In Amsterdam, the density is standard taken into account in the determination of the land prices for business functions. In the case of leisure and recreational functions, due to the variations of these activities, it was difficult to determine land price policy. An example of this is shown in Frankfurt, where the price sometimes depends on the surrounding area. If the leisure function is situated within a housing area, the housing land price will apply, or the price is determined as a deduction from the former function of the land. Whereas, in the case of parking functions, most cities set up the land price based on the functions that will use that same parking facilities. However, Amsterdam seems to be the only city that looks upon the land prices for parking facilities separately and link it to a financial incentive. It is notable that in Helsinki, it is difficult to make parking facilities profitable, so prices are very low[4].

In 1994, France introduced a legislation opening the possibility to create "real property rights" on the public land. The principle is explicitly acknowledged in the law that states: "The beneficiary of a temporary authorization on the public domain of the state is entitled, except is the contract explicitly excludes this possibility, to a real property right on the installations, buildings, or other structures that he has been building corresponding to the activity that is expected by the initial authorization"[5]. Additionally, in Strasbourg, East of France, concessionaires are given a lease period of time which is equal to twice the time needed to settle their banking loans that initially have been used to build the projects and to buy the equipments and other assets[5].

In 1988, immediately after its first public land lease, the People Republic of China deleted from its constitution the provision that land cannot be used for lease. In line with the modification, the right to use public land in urban areas has been regulated to incorporate transfer of land by ways of contract - tender and auction - from without compensation, to with compensation; without a time limit, to with a time limit; and without mobility to with mobility [6].

In Australia, different economic activities licensed on state's land pay diverse lease rates which are based on pre-determined ratio of unimproved value of land: 0.8% for agriculture and grazing and 3% for intensive primary production [7].

In the USA, federal public land leases and state land leases follow different regulatory systems. In general, large areas of public land are leased for different economic purposes such as oil exploration and production, grazing, farming, industrial, commercial, services, and other uses. In most cases, lease rates of federal land are nominal, whereas states' rates are based upon appraised market rent. Other factors are considered depending on the type of use. In Arizona, for example; a percentage of gross sales is used as a criterion for a retail business whereas the income producing potential of the land is utilized in the case of other uses[8].

Land Lease for BOT Projects in Kuwait

Metropolitan areas in Kuwait are assembled along the southern coast of the country and represent less than 10% of the total land area (17344 squared kilometers). A large portion of the land in the metropolitan areas and most land outside these areas are owned by the State. Land outside the inhabited areas is either arid desert or predominantly used for oil production [9]. Inside the populated areas, Kuwait city (the capital), Salmyia, and Hawally represent the most congested and busiest business districts.

Kuwait's economy has been dominated by the Sstate since the early beginning of the crude oil industry which is fully owned by the state and generates most of the country's income. For decades, the Government has been utilizing the state land for public projects and facilities and allocating parts of it for the use of different forms of private economic activities against heavily subsidized rent. Prior to the extensive allocation of land to major BOT projects in Kuwait during the 1990s, pricing criteria of public land allocated to private entrepreneurs was not a considerable issue. However, during the past decade, BOT projects have been gaining increasing acceptance in Kuwait, with BOT projects proposed in the power, waste-water, real estate development, and transportation sectors. The $390 million Sulaibiya Waste Water Plant, the largest facility of its kind in the world which uses reverse osmosis and ultra-filtration membrane-based procedures, represents one of the largest BOT contracts in Kuwait. Other major contracts involved the free trade zone at Shuwaikh port, the Fifth Waterfront Development Project comprising of the $162 million Marina Mall, Marina Crescent and Hotel, the $132 million Sharq Mall, the $73.2 million Heritage Village project, the $44.5 million Sixth Waterfront Development Project comprising of Alkout Mall, 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. The number of BOT projects in Kuwait since 1994 is about 95 at a cost of $ 1.3 billion [10].

Nonetheless, in October 2006, the Government decided to cancel several BOT contracts with major local companies. The decision was based on an assessment carried out by the State Audit Bureau which accuses concessionaries of violating the terms of their contracts by, for example, illegally seizing state land and introducing unauthorized changes to the projects for profit-increase. Among the canceled contracts were Showbiz and the Free Trade Zone at Shuwaikh Port [11].

The Present Leasing System

Pre-qualified and interested investors are usually requested by Kuwait Municipality to submit bids along with technical and economic feasibility studies for a specific public project. A thorough examination of all bidders' proposals is usually conducted by an assessment committee which assigns points to nearly fifteen different dimensions for each proposal and bidder. Full compliance with tender requirements is important and hence lowest tender is not necessarily the winner. However, due to engineers' dominance of the assessment committee, more attention and higher scores are usually assigned to technical (designs, structures, architectures, etc.) rather than financial elements. After deciding on the winning bidder and allocating the project site, a government relevant authority like the State Property Department at the Ministry of Finance or the Public Authority of Industry is requested to draw a final contract where the lease has to be established.

The present land lease rate for schools, health services, car parks and alike BOT projects is pre-assigned by government resolutions which disregard dissimilarity between these projects, whereas land lease rate for larger BOT public projects is worked out by merely the chosen location and the proposed project's internal rate of return (IRR). Bidders' economic influence, intermediation, and bargaining play a role in this procedure [12].

Multi-Dimensional Plot Pricing Model (MDPPM)

The Multi-Dimensional Plot Pricing Model (MDPPM) is the cornerstone of the decision support system framework. Figure 1 shows the dimensions of the MDPPM, and in the following subsections the mathematical equations representing the MDPPM dimensions are discussed along with their justifications. The impact of the addition of each dimension's measurement on the initial formula in a progressive manner is also shown. The integrated dynamic multi-dimensional equation representing MDPPM when its parameters, as discussed in section 4.1, are assigned various values would generate different pricing scenarios to choose from.

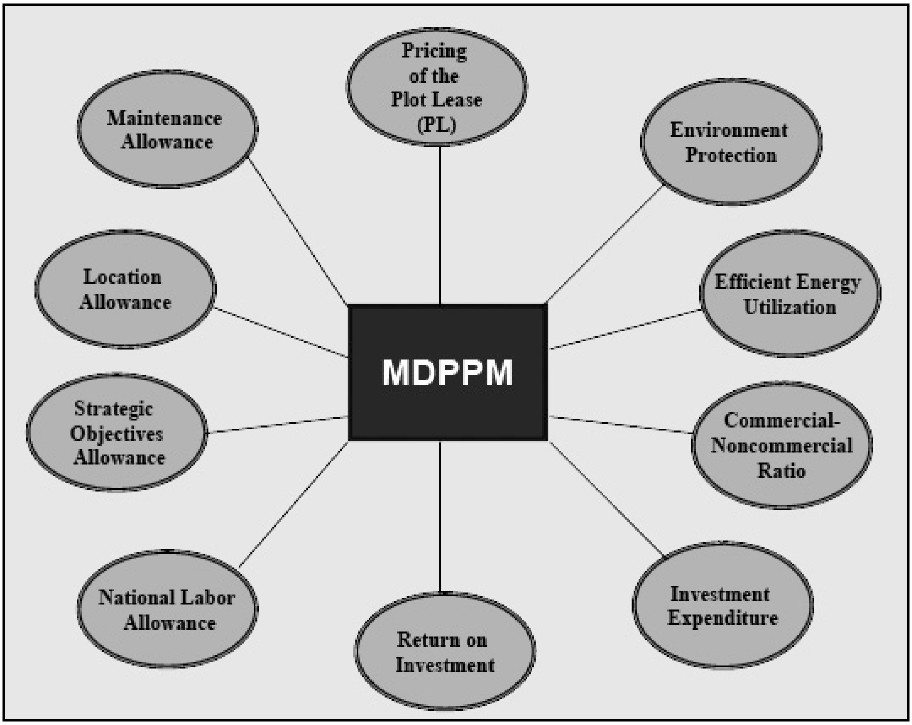

Figure 1: MDPPM Dimensions

The MDPP Formula

The MDPP formula incorporates all the equations representing the dimensions shown in Figure 1, except for the Environment Protection, which requires some technical criteria to be set by Kuwait Public Authority for Environment (PAE). The Multi-Dimensional Plot Pricing (MDPP) formula is shown below:

$$\begin{aligned} MDPP = \quad & \{\textstyle\sum_{i=1}^{n} PL_i + \sum_{i=1}^{n} PL_i \\ & [(LWA + ARI + CNR) \\ & -(AME + IE + ACNO \\ & +ECC + NLA)]\}[\tfrac{1}{(1+r)^i}] \end{aligned}$$

Where, 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 $i = 1, \ldots, n$.

In addition, given the multi-period nature of the BOT contracts, future values of funds must be discounted. This 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 through reviews, group discussions and data experiments. For this purpose, the location allowance in subsection 3.3 is weighted in percentage, the IRR effect in the Adjusted Return on Investment in subsection 3.4 is set at 20%, the Allowance for the Commercial - Noncommercial ratio in subsection 3.5 are both set at 10%, the Maintenance Expenditure Allowance in subsection 3.6 is set at 5%, the Investment Expenditure in subsection 3.7, the project Contribution to National Objectives in subsection 3.8 is divided by 100 and the weight of national labor categories in subsection 3.10. In the following subsections, the elements and logic of each dimension of MDPP formula is explained and justified.

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:

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

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 $i = 1, \ldots.., n$ and $j = 2, \ldots.., n$

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 is divided between five zones each with different economic importance. These zones and their corresponding weights are as follows:

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

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

$$LWA_i = PL_i(LW)$$

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

$$PL_i = PL_i + PL_i(LWA) \qquad (2)$$

Return on Investment

Though, Return on Investment reflects the 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 a 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) formula:

$$ARI = IRR/5$$

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

$$PL_i = PL_i + PL_i(ARI) \qquad (3)$$

Commercial- Noncommercial Ratio

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):

$$CNR = 1 - [1/(Cr/Cs)] \div 10$$

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

$$PL_i = PL_i + PL_i(CNR) \qquad (4)$$

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) is as follows:

$$AME_i = [ME_i \div ECD_i] \div 20$$

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

$$PL_i = PL_i - (PL_i \times AME_i) \qquad (5)$$

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 areas were divided into three different types:

1. Areas that generate income or commercial areas. 20 points have been assigned to investment expenditure in such areas.
2. Non-commercial areas were assigned 40 points.
3. Exterior surrounding areas were assigned 40 points.

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

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

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:

$$PL_i = PL_i - PL_i(IE) \qquad (6)$$

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 and 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 $(ACNO)$.

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

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 $n = 1, ..., 5$ stands for the national objectives. Accordingly, equation (1) should be adjusted as follows:

$$PL_i = PL_i - PL_i(ACNO) \qquad (7)$$

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), as follows:

$$ECC = 1 - (Eq/Es)$$

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. Consequently, equation (1) should be adjusted as follows:

$$PL_i = PL_i - PL_i(ECC) \qquad (8)$$

National Labor Allowance

Employment opportunities in a BOT project were classified into five

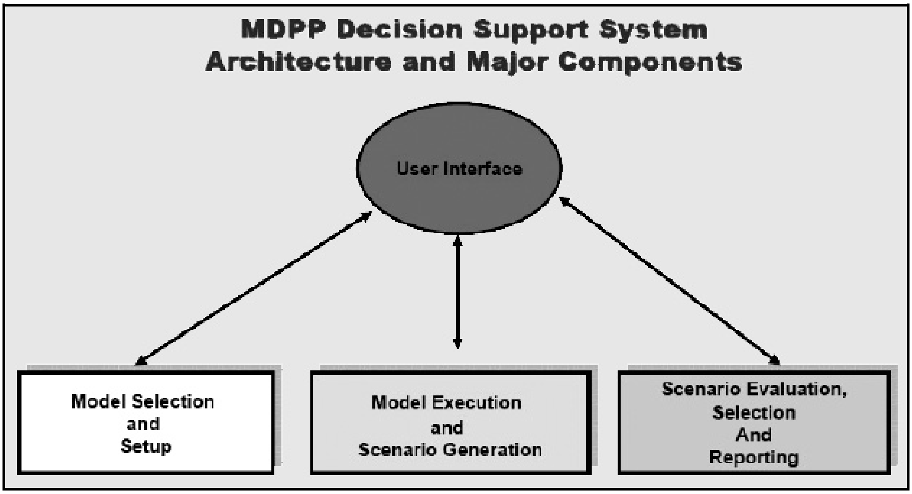

Figure 2: MDPP Decision Support System Components

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).

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

Where $z = 1, .., 5$, represents the employment categories 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. Consequently, equation (1) should be adjusted as follows:

$$PL_i = PL_i - (PL_i \times NLA) \qquad (9)$$

Environment Protection

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

The DSS Architecture

The architecture and components of the framework depicted in Figure (2) is a simplified version of a typical

DSS framework found in many DSS textbooks such as [13] and is presented to emphasize the dynamic and iterative nature of the environment in which the MDPPM will be utilized.

The framework is to be used in three main iterative steps: 1) Model Selection and Setup; 2) Model Execution and Scenario Generation; 3) Scenario Evaluation, Scenario Selection and Reporting.

Model Selection and Setup

The Model Selection and Setup component of the framework allows the user to select a particular model from the model base in case there are multiple plot pricing models. Upon the model selection, the system, from the information and the date stored in the model base and database, would dynamically create the user interface with the Model Parameters, i.e. the variables and constants, required for the model computation. The user would then be allowed to enter the desired values for these parameters.

In the current DSS framework, there is one mode, MDPPM and the parameter that would be presented to the user is as follows:

1. Duration of the project,
2. Land price,
3. Inflation rate,
4. Spending on maintenance,
5. Capital depreciation,
6. Investment expenditures,
7. Number of national employees in each type of job,
8. Number of total employees in each type of job,
9. Electricity consumption,
10. Total value of output,
11. Internal rate of return,
12. Investment expenditure per square meter,
13. Plot area in square meters,
14. Size of the commercial area,
15. Project sector of activity,
16. Output type and capacity,

The last two parameters are needed to determine the project's contribution to the strategic objectives. The inflation rate can be selected only in the case when the user decides to choose a rate that is different than the 2% fixed parameter which is already incorporated in the formula.

Model Execution and Scenario Generation

Model Execution and Scenario Generation allows the user, with the 'what-if' analysis capability, iteratively to generate various scenarios.

Scenario Evalution, Selection and Reporting

Scenarios are evaluated and if rejected Model Setup would be reinvoked with different parameters values and the model would be executed again. Scenario(s) that would maximize public revenue and indirectly provide the necessary protection of the public fund would be accepted and reported to the executive management.

Preliminary Experimentation

A preliminary model verification and validation experiments were conducted to show that the model is feasible. The outcomes of the experiments determine the accuracy of the model. The testing of each formula was based on a hypothetical BOT project (project X). The plot price formulas for this project have been worked out using the following set of simple assumptions:

1. The concession time period is 10 years.
2. The plot of land has in year 1 an average market price of one million Kuwaiti Dinar (KD).
3. From year 6 and after, the average market price rises to 1.2 million KD.
4. The plot is located in a Commercial Urban Center.
5. Project X Internal Rate of Return (IRR) is 12%.
6. Project X commercial area is less by 20% than the maximum permitted area.
7. Annual Expenditure on maintenances and repairs is 10,000 KD.
8. Annual Capital Depreciation is 12,000 KD.
9. The investment spending of project X in all of the three different types of areas mentioned in section 3.8 is 20% higher than the corresponding standard levels of spending in a similar customary project.
10. Project X contributes to two of the five major national objectives and the level of these contributions are high for one and moderate for the other.
11. Project X consumes 10% less energy per unit of output than its corresponding consumption in a similar customary project.
12. 50% of the administrative jobs and 50% of the technical jobs in project X are filled with national employees.

These simple assumptions were incorporated into the set of the plot pricing formula to produce the results which are shown in Table 1. The plot price column in Table 1 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) at subsection 3.2. It also considers the inflation rate starting from year 2. The Location Allowance *LA* column considers the adjustment for the significance of the plot location. The

Adjustment for the Return on Investment ARI column assumes that IRR is 12% as stated in assumption 5 earlier. The allowance provided to lesser commercial or income-generating areas as a ratio of the maximum commercial area that is permitted in a similar customary project is shown by CNR column using assumption 6. Column AME presents the adjustment for maintaining the assets based on assumptions 7 and 8. According to the AME equation, project X is eligible for a rent reduction of 4.2%. Similarly, rewarding for the increase in investment spending per square meter above a selected standard level of spending in similar customary project is shown by IE column using assumption 9. ACNO column shows the adjustment related to the project's contribution to the country's main national objectives using assumption 10. The allowance provided to the efficient use of energy per unit of output is shown by ECC column using assumption 11, and rewarding the project as its national employment ratio increases is shown in NLA column using assumption 12.

As noted earlier, due to the multi-period nature of a BOT contract, future values of funds are discounted to their present values. In feasibility studies of private enterprises, 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 will make a project looks more favorable[15].

Also, 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%[14]. Additionally, in development literature, economists frequently advise to reduce the discount rate by certain ratio, say 2%, when considering a project with development dimensions[16]. Consequently, all values in table (1) were discounted at the interest rate on the long-term Kuwaiti treasury bonds minus 2%, i.e., at 4.5%.

Furthermore, a set of full fledge experiments for the entire DSS system as a whole will be conducted and the results will be reported in an upcoming paper when the DSS framework is implemented.

Table 1
Formulas Experimentations

Years	Dis. Rate	EMPL	PL	LWA	ARI	CNR	AME	IE	ACNO	ECC	NLA	MDPP
1	1.000000	1000000.0	25000.0	7500.0	600.0	-625.0	-500.0	-3000.0	-2500.0	-2500.0	-7500.0	16475.0
2	0.956938	956937.8	24401.9	7320.6	585.6	-610.0	-488.0	-2928.2	-2440.2	-2440.2	-7320.6	16080.9
3	0.915730	915730.0	23818.1	7145.4	571.6	-595.5	-476.4	-2858.2	-2381.8	-2381.8	-7145.4	15696.2
4	0.876297	876296.6	23248.3	6974.5	558.0	-581.2	-465.0	-2789.8	-2324.8	-2324.8	-6974.5	15320.6
5	0.838561	838561.3	22692.1	6807.6	544.6	-567.3	-453.8	-2723.1	-2269.2	-2269.2	-6807.6	14954.1
6	0.802451	962941.2	24073.5	7222.1	577.8	-601.8	-481.5	-2888.8	-2407.4	-2407.4	-7222.1	15864.5
7	0.767895	921474.0	23497.6	7049.3	563.9	-587.4	-470.0	-2819.7	-2349.8	-2349.8	-7049.3	15484.9
8	0.734828	881793.6	22935.5	6880.6	550.5	-573.4	-458.7	-2752.3	-2293.5	-2293.5	-6880.6	15114.5
9	0.703185	843822.0	22386.7	6716.0	537.3	-559.7	-447.7	-2686.4	-2238.7	-2238.7	-6716.0	14752.9
10	0.672904	807484.8	21851.2	6555.4	524.4	-546.3	-437.0	-2622.1	-2185.1	-2185.1	-6555.4	14399.9

Summary and Future Research

The paper presents an overview and a set of specifications for a Plot Pricing Decision Support System Framework for the State of Kuwait including a multi-dimensional plot pricing model. The framework creates an environment that will directly enable the maximization of public revenue and indirectly provide the necessary protection of public fund. The implementation of this framework is underway and the results of its performance will be reported in an upcoming paper.

References

[1] Delmon, Jeffrey, Project Finance: BOT Projects and Risk, Kluwer Law International 2005. This reference addresses general issues in BOT projects and issues specific to various sectors.

[2] Levy, Sidney, Build, Operate, Transfer: Paving the Way for Tomorrow's Infrastructure, John Wiley, 1996.

[3] Land Property Relations, The Russian Federation Embassy in Belgium Website: www.belgium.mid.ru/visit/moscow /Climate/2.htm.

[4] Land price policies in European cities: A comparative survey, Development Corporation, City of Amsterdam, September 2005. The report can be accessed on the net using the title.

[5] Renard, Vincent, the Practice of Land Leasehold in France and its Relationship with Housing Development, CNRS - Ecole Polytechnique, January 2006. The paper can be accessed on the net using the title.

[6] Deng, Frederic, Public Land Leasing and the Changing Roles of Local Government in Urban China, the Annals of Regional Science, Springer Berlin - Heidelberg, Volume 39, Number 2, June, 2005.

[7] Successful Land Leasing in Australia, A report for the Rural Industries Research and Development Corporation by R.G. Ashby, RIRDC Publication No 3/80, June 2003.

[8] Arizona State Land Department Website: www.land.state.az.us.

[9] Roy, Waleed, Gerard Grealish, Mapping arable soils using GIS-based soil information database in Kuwait, Management of Environmental Quality Journal, Vol.15 No. 3, 2004.) & (Kuwait Third Master Plan, Kuwait Municipality, 2005.

[10] Estimates of the BOT projects cost published by Al-Madar Finance Company in the Sixth Conference on the Role of the Private Sector in Development Projects in Kuwait, 17 - 18 February 2007.

[11] Menas Kuwait Politics & Security, August 12, 2006. Accessible on the net.

[12] Memorandum, The Department of the State's Property, Ministry of Finance, Kuwait, 2007.

[13] Turban, Efraim , et al., Decision Support and Bussiness Intelligenc Systems, 8th ed., Upper Saddle River, New Jersey, Pearson Prentice Hall, 2007.

[14] CBK Monthly Statistics, January 1995 - January 2008

[15] Assesssing Policy Alternatives, http://www.csulb.edu/ msaintg/ppa670/p&sch7.htm{\#}Discounting.

[16] Andrew Caplin and John Leahy, The Social Discount Rate, New York University, January 2004, PDF on line: http://www.econ.-nyu.edu/user/caplina/sdr.pdf.

الملخص

إطار عمل لنظام دعم القرار الخاص بتحديد مقابل الانتفاع بالأراضي العامة في دولة الكويت

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شهدت أعداد وأحجام مشروعات "البناء والتشغيل والتحويل BOT" في دولة الكويت نموا مطردا منذ مطلع التسعينيات. وقد نشأ عن ذلك وجود نظام تقليدي لمقابل الانتفاع بأراضي الدولة في هذه المشروعات، يقوم على تحديد إيجارات القسائم المخصصة لها بموجب قرارات إدارية لا تأخذ في اعتبارها المنافع الاجتماعية أو الاعتبارات البيئية أو غير ذلك من العوامل المترتبة على قيام تلك المشروعات، وقد نتج عن ذلك عدم الاستغلال الأمثل لتلك الأراضي وإلى هدر للمال العام. ومع تعاظم تكلفة الفرصة البديلة للقسائم المخصصة لمشروعات الـ BOT انتشرت اتهامات شتى بعدم عدالة الانتفاع المشار إليه وبإساءة استغلال المال العام، مما دفع الحكومة في العام ٢٠٠٦ إلى إلغاء عقود بعض من مشروعات الـ BOT، كما دفع مجلس الأمة إلى سن تشريع ينظم عملية انتفاع هذه المشروعات بالأراضي العامة، وإلى المطالبة بإيجاد نظام عادل وشفاف لتحديد مقابل الانتفاع بهذه الأراضي. وتتصدى هذه الورقة لهذه المشكلة الوطنية، من خلال تقديم إطار عمل لنظام دعم قرار الانتفاع بأراضي الدولة المستغلة في هذه المشروعات. ويتضمن هذا الإطار نموذجا اقتصاديا لحساب مقابل الانتفاع، وهو نموذج متعدد الأبعاد، يأخذ في اعتباره مختلف العناصر الاقتصادية والاجتماعية والبيئية التي تترتب على قيام مشروعات الـ BOT، وهي عناصر يمكن لمتخذ القرار، عند الحاجة، أن يختار بدائل لقيمها في النموذج، كما تتضمن الورقة تطبيقا افتراضياً للنموذج بهدف تقييمه من الناحية العملية، ومن شأن حساب مقابل الانتفاع بالأراضي العامة وفق هذا النموذج والإطار إيجاد بيئة موضوعية تمكن متخذ القرار من تعظيم الإيرادات العامة والحد من الهدر في المال العام.

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