# FINANCIAL VALUATION OF CONSTRUCTION INVESTMENT IN SERBIA

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## Abstract

One of the main objectives of development in Serbia is attracting Investors by proving value and return on Investments. An investment program is an integral part of the loan application, seeking co-financiers, foreign investment and other similar activities in determining "financial structure". The investment program, which effectively analyzes and calculates the cost of a project, by the current Serbian regulations, may not be an integral part of the investment and technical documentation, but it is a key document for managing investments in financial terms. In addition to the formation of the total cost, it is useful to express the value of the project by means of representative units of measurement. In our situation, it is common to adopt the square meter of usable space in the constructed facility as a representative. Setting up and customizing the input data is very important in the process of making the investment program, as the unit prices of individual components are not given in the form of the measurement unit selected as the representative price of the object. The authors have based their research on determining the algorithm for determining the value of the facility. In this paper, in addition to the methodology of determining the production rates, an overview of the whole life cost is given.

## Key words

Total building cost; investment program; investment valuation; whole life cost

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# 1 INTRODUCTION

A construction project is a complex and unique business venture which is undertaken in order to achieve future goals within the given time and cost constraints.

The scope and duration of the construction of a facility require the involvement of a large number of professionals from different fields, a large amount of different materials and components and the necessary machinery.

Due to the branched structure of the activities (there can be a few thousand activities), it is necessary to carry out a detailed analysis in order to have an overview of the cost of the works. When taking into account that the price of the works is only one component in a set of components which influence the final cost of the facility, it can be seen how complex the process is for forming its price. Also, aspects such as the comfort of the building and the flexibility of being able to change its function are difficult to express in terms of money, but they are extremely important when making decisions about the construction.

When planning for the future, the construction and maintenance of the building must be considered throughout its whole life cycle. In terms of the construction, the things to be taken into account are the architectural solution, physical parameters of the building, energy concept and the technology incorporated into the building. After the release of the building, these parameters change only in the case of major renovation work, which implies high expenditure of time and money.

The life-cycle of a project is the time period in which, through specific phases and a large number of activities, the project is brought to a conclusion, that is, a building is completed with its intended service life. It is a continuous process which consists of several basic stages:

- Identification of the project
- Project preparation
- Project assessment
- Implementation of the project and its supervision
- Maintenance
- (Demolition)

The method of life cycle costs was developed in the mid-1960s in the United States, at the Ministry of Defence, in the procurement of military equipment, and the first mention of the concept of life cycle costs was recorded in 1965. in the "Life Cycle Costing and Equipment Procurement" document [1].

From the perspective of sustainable construction, calculation of utility costs is of great importance since buildings are one of the largest consumers of energy, and it is estimated that they are responsible for approximately 40% of the total energy consumption [2], and the largest part of the energy consumed in buildings, 60%, is used for heating.

The international standard ISO 15686 Part 5 [3] gives the following definition: Whole life costing … "is a methodology for the systematic economic consideration of all the whole life costs and benefits over the period of analysis, as defined in the agreed scope"…

Life Cycle Costing … "is a methodology for systematic economic evaluation of the life cycle costs over a period of analysis, as defined in the agreed scoping". Life cycle costs are…"cost of an asset or its parts throughout its life cycle, while fulfilling the performance requirements". The terms Whole Life Cost (WLC) and Life Cycle Cost (LCC) have been used interchangeably – and their meanings have become confused. Furthermore, the components of

a whole life cost calculation have varied from client to client, consultant to consultant and among contractors.

The draft of the ISO Standard 15686-5 differentiates between the expressions WLC and LCC, as shown in figure 1. Their contention is that WLC is equivalent to LCC plus external cost. Even there it is admitted that sometimes all the terms are used interchangeably, but the ISO Standard does try to interpret those terms more narrowly. The Standard states that LCC should be used to describe a limited analysis of a few components, "life cycle costing" should be understand as the cost calculations themselves and WLC should be seen as a broader term which covers a wide range of analyses.

Use of LCC is not mandatory under the EC procurement Directives, however if contracting authorities wish to ascertain which product, from the available alternatives, is the most cost effective then they need to apply LCC approaches in their procurement award decisions.

LCC needs time and effort. For this reason, there has to be a clear output motive for using LCC techniques to make it worth the effort for the construction client [4]. Today, the availability of LCC data is rather limited. One reason is the lack of any framework for collecting and storing data [5]. Construction clients often give a low priority to LCC as they are not aware of its benefits [4].

Raymond and Stern point out that for the construction client the initial cost can be determined easily and reliably, but maintenance and operational costs are less predictable as they extend into the future. For that reason, initial cost is used as the main base for decision making today.

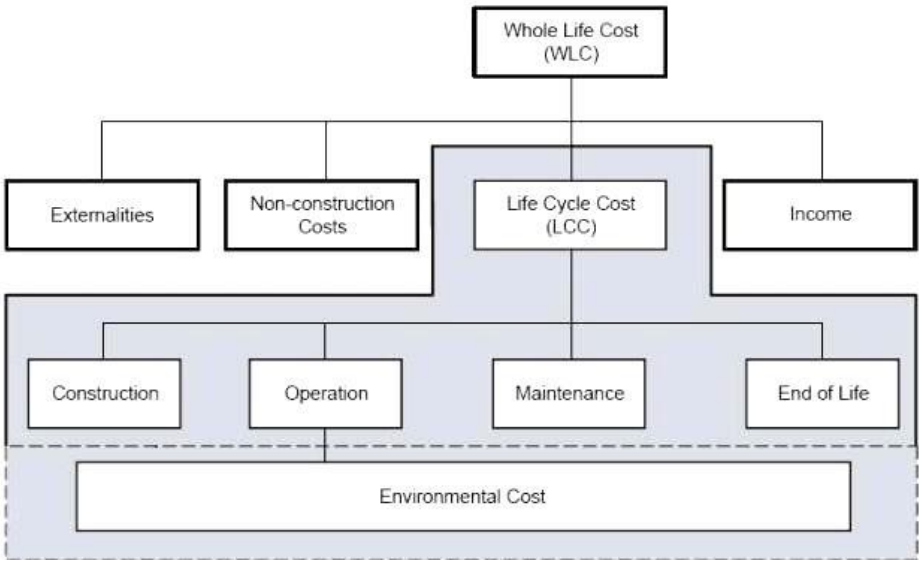


*Fig. 1: Clarifying the difference between Whole Life Costing and Life Cycle Costing*

In Serbia there is no database of costs incurred during the construction of already existing facilities, and which could be used for future research or to update existing costing models in order to improve them. In this regard, the application of the ISO standard mentioned is not yet in effect in Serbia, but rather the initial production value of the construction is calculated through an investment program.

## 2 PRODUCTION VALUE OF THE CONSTRUCTION

The pricing structure of an investment is defined by an investment program, meaning the production – the planned price of the building, including all costs, as well as the planned market price in relation to the contents of the building and the time section. The investment

program makes an overview possible – the planned profit, as the difference between the selling (market) price and the production price.

An investment program is needed by the investor for two main purposes. First, it is the main document for making investment decisions on the basis of an analysis of the identified conditions and the effects of realizing an investment and its application over a specified time period, usually within the first five years or, in short, within the loan period. Then, the investment program is an integral part of the loan application, for seeking co-financiers, foreign investment and other similar activities when establishing the 'financial construction', that is, the source and terms of financing the investment and the beginning of its use.

Finnerty [6] defines project finance as "the raising of funds on a limited-recourse or non-recourse basis to finance an economically separable capital investment project in which the providers of the funds look primarily to the cash flow from the project as the source of funds to service their loans and provide the return of and a return on their equity invested in the project".

In conditions where the investor is capable of reliably repaying the loan and meeting the other requirements for participation in the enterprise, it is customary to present the basic information in the form of an investment program.

Another common characteristic of project finance is risk-sharing. In general, there are dozens of parties involved in a typical project finance transaction. The rationale is that the involved parties try to optimally allocate the individual risks to the parties that are able to bear them [7]. The risks can be classified into several categories: technical, economic, political and risks in the natural environment. Namely, the building structure is not a commodity that can be subject to immediate purchase or sale. The price of buildings is agreed in one time section, and financial investment in their realization is made successively throughout this period, until the completion of the building. This may take several years. During this time, there might be a change in the market conditions, which result in a change in the initial value of the production resources (labour, materials and machinery), and also of the other components in the price structure of the whole project. This creates a problem in determining the price for a particular time section which has been delayed for a specific period of time compared to the section in which the initial/contract price of the building was calculated; that is, there is the problem of re-evaluating the initial price. Risk management is particularly significant for project financing and is often a part of separate studies.

In order to be rational and to increase the level of security, some investors first carry out a preliminary study which contains the basic elements of an investment, the conditions of its construction, the market and other data. The approach to the development of the investment program is based on such studies, that is, to see whether further research is required or withdrawal from the investment project.

Depending on the subject of the investment and its complexity, the investor organizes the development of programs for his or her own use, or hires professional institutions or individuals for this purpose. For a more complicated technological process it is essential to engage a professional team, which then starts from the technological project, and used this to determine which equipment is needed, and its allocation according to the requirements of the facility under construction. Mechanical engineers, electricians, ecologists and others all play a part in the project. All this provides a basis for determining an estimate for the investment and for the development of an investment program by the engineers, in cooperation with economists.

Included in the price of the building construction are the following costs:

- land development fee
- fees for the provision of electricity, central heating and telephone lines
- the cost of preparing the location
- the cost of equipping the location
- the cost of drafting and certifying the technical documentation
- the cost of works on the building and their professional supervision,
- taxes
- other associated costs including the cost of professionals who manage the project.

These cost items also contain a wide network of components.

For a more realistic view of these costs it is essential to make an algorithm (Figure 2) in which the entry parameters will be all the given costs, and the final output will be the investment price at the time of construction.

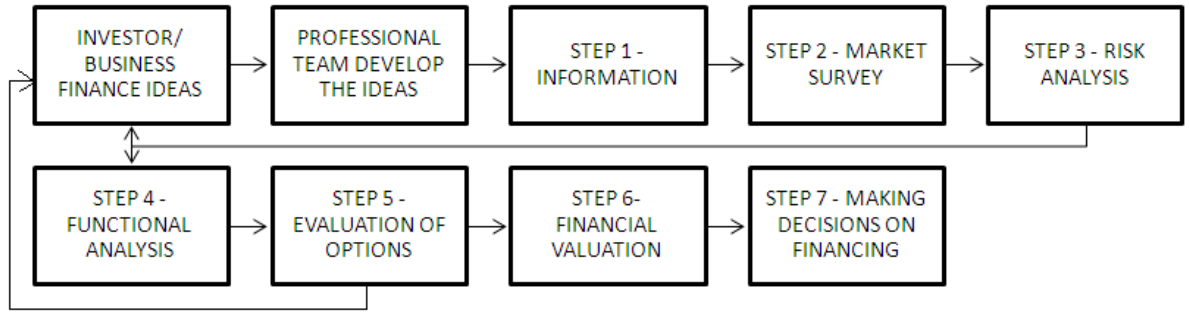


*Fig 2: Steps in financial valuation of construction*

Apart from forming the total price, it is useful to express the value of the project using a representative unit of measurement. In our situation, it is usual to adopt the measurement of $m^2$ of usable space of the constructed facility.

## 3 INFORMATION REQUIRED FOR FORMING A PRICE

The total production price of the building is shown below (Figure 3).

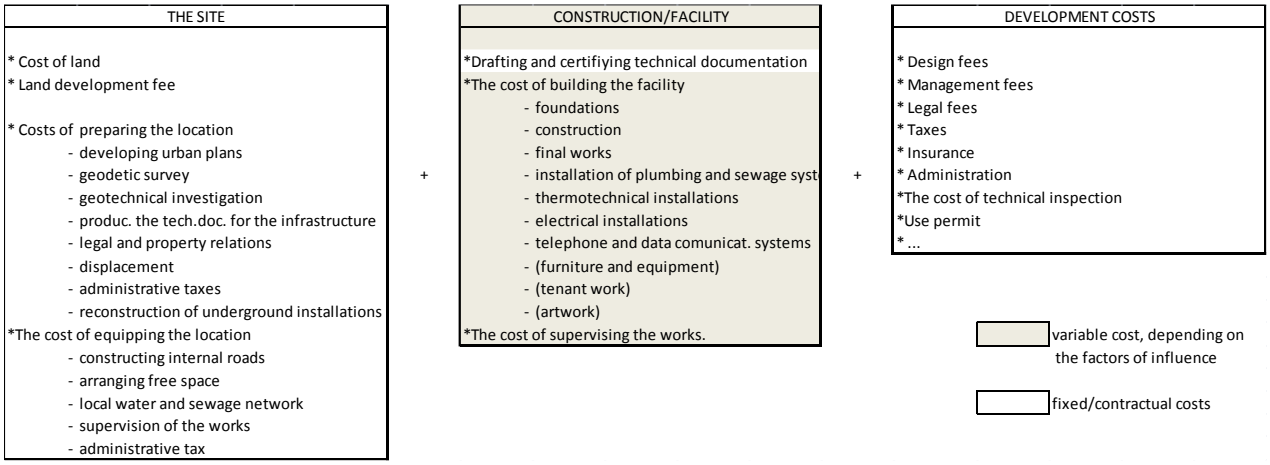


*Fig. 3: Total production price of the building*

The formation and adjustment of the input data is very important in the process of making the investment program, since the unit costs of the individual components in the investment program are not given in the form of the measurement units chosen to represent the cost of the building. For example: the unit cost of participation of connection to the electrical network and instalment of telephone lines is agreed according to the user unit (apartment or unit of office/work space); the price of apartments is given in $m^2$ of the apartment that is moved out of; works on the infrastructure are calculated according to the measurement unit of these works; the cost of supervising the works is formed according to the value of the works being supervised, and so on. All of these prices need to be brought together so that in the output data the price is given per unit of measurement of the facility – $m^2$ of the usable space.

### 3.1 Functional dependencies

Dell 'Isola [8] pointed out that regardless of industry, location, or financial situation, investors expect architects and contractors to manage project costs in an accurate and responsive manner. They expect a well-defined budget early in the process, and they want design and construction to deliver the quality and performance specified in the project scope while staying within the budget.

The identification and ranking of primary and secondary functions and their associated cost and worth relationship [9] are the best way for investment return.

During the construction of residential or commercial buildings, there are certainly costs which are not directly connected with the building itself, and are not covered by the investor, but rather, the local community. Those are the communal, infrastructure costs, but not those which are directly connected to the building, rather, those which are at the level of the local community (for example, the additional burden on the city's roads), environmental pollution, increased pressure on local schools, health-care institutions and similar. If the investor does not cover these costs, then the local community will have to cover them through local taxes or borrowing, and there will be a negative effect on existing users and/or the quality of the service offered. At the same time that arrangement would constitute a subsidy by the existing users for the new ones, which would even stimulate the construction beyond expectations.

As a corrective factor, i.e. as the factor which should internalize those costs and transfer them to the investor is what is known in Serbia as the land development fee, an instrument also known in the associated literature as the *Impact Fee*. It is an attempt for the local community to be paid by the investor (and future owner of the property) for all of the costs that would be involved in securing the utilities and infrastructure services for the future property owners, that is, to prevent a reduction in the quality of services offered.

The impact fee is paid by the investor, and the level of the fee is established in a contract between the investor and the municipality, or an authorized company on the basis of the criteria and measures established by the municipality. The impact fee depends on several different parameters: the area of the building, location (zone) and the purpose of the building. For example, the city of Belgrade is divided into 9 zones. In terms of their purpose, there are 6 different types of building: buildings for community use, residential buildings, industrial or production facilities, business and service facilities and individual housing units. This fee is generally considered as a fixed cost. However, in some cities (in Belgrade, for example) in the allocation of land leases, the land development fee is used as an item at an auction, and the land is leased to the investor who offers to pay the highest land development fee. In some cases, this system has, in terms of maximizing the size of the fee, achieved excellent results in New Belgrade (Novi Beograd) and other attractive locations. This bidding method of determining the fee clearly shows that the city authorities themselves think that their standard

system for its determination – through the mentioned formula – does not perform well, even when a good location and a favourable investment climate are in question. Then it is obviously better to announce an auction and reap large sums of money, and also choose the best investors – those who are most willing to pay for the plot. The appearance of the request for calculating the land development fee is shown in figure 4 [10].

The fees for the provision of utilities for the buildings, and constructing the building network infrastructure which are not covered by the agreement with the Belgrade Agency for construction and development – the electrical power system, telephone lines and heating – are agreed between the investor and the public utilities companies:

- with the public company for electricity for connecting the building to the system of electricity;
- with the telecommunications company in order to secure the required number of telephone connections.

The fees agreed with these companies are calculated and paid per connection to each residential/business unit, and in the investment program they have to be calculated in value per $m^2$ of the building.

- with the public company for the production and delivery of thermal energy to supply heat to the building.

The fees agreed with this company are calculated and paid per $m^2$ of the building, with different prices for residential and commercial space.

When connecting communal utilities objects which only serve individual residential buildings or objects for other purposes with the appropriate infrastructure, they are considered to be an integral part of the buildings they serve. They are not included in the framework of land development works and they are not included in the land development fee. The financing and execution of these works is borne by the investor.

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**LEGALIZATION**

**Request for fee calculation for land development in the process of legalization**

**Investor:** _____
(name, surname, address)

**Location:** _____

Facility type: family-residential Residential residential-business business

Calculation type: calculating fees for construction land development

Plot No: _____ Cadaster Municipality: _____ Area: _____ $m^2$

Enclosed with the request:

1.Notification of City Administration for Urban Development and Housing
2.As-built design
3.Tehnical control report
4.Copy of the plan and Proof of ownership
5.Decision on registration in the Register of Business Entities or other appropriate register
6.Other documents

Signature of the request submitter:

Request submitter:
_____ _____
(Name and surname/title)
_____ _____
(address and phone number)
_____ _____
(Tax Identification Number or PIN)
_____ _____
(Name and surname of contact person)
_____ _____
(Phone of contact person)

In Novi Sad,

_____
(date)

EVIDENCE ON PAYMENT:

1. City administrative fee of 1000.00 dinars (recipient: Budget of the City of Novi Sad; Purpose: city administrative fee; Gyro Account: 840-742241843-03; Reference number: 97 20-511.
2. Service charge in the amount of 2,489.00 dinars per family residential facilities increased by 20% value added tax (the wage 2,986.00 RSD); 4,149.00 RSD for residential and commercial buildings plus 20% VAT (for payment of 4,978.80 dinars); that is 5,151.00 dinars for commercial buildings, plus 20% VAT (payment 6,181.20 RSD). (Recipient: Public Enterprise "City Development Institute" Novi Sad. Purpose of payment: Request for fee calculation for land development, Current account: 840-29898845-75, reference number 11).

*Fig. 4: Request for calculation of the land development fee – Enterprise for construction and development, Novi Sad [10]*

The costs of urban and architectural construction projects, the geodetic survey and drafting technical documentation for infrastructure are largely a matter of negotiation with the authorized companies, they are fixed, but can vary to some extent, depending on the level of complexity of the work.

A minimal volume of geotehnical investigations and testing depends on the type of construction or procedure. The depth of ground testing is determined according to the type and position of the ground layers, the method for making the foundation, the burden on the ground, the size and significance of the building or its function, the susceptibility of the construction or part of it, not only to subsidence but to all other possible geotechnical and other data on the terrain. The extent of ground investigation in the laboratory depends on the size, durability and character of the construction, the form of the basic foundation, the static

system and susceptibility to subsidence, the planned method of making the foundation, the size and character of the burden on the foundation, the speed of construction and work methods, the type and composition of the works, the type and composition of the ground, the homogeneity and heterogeneity of the ground, the geological conditions and the hydrogeological situation in the ground, the geotechnical characteristics of individual layers of soil, and the available data on foundations and subsidence of adjacent buildings.

The necessity for population displacement significantly complicates the investment venture. Apart from increasing the costs, it considerably prolongs the pre-implementation phase. The actual move to a different location or the increased apetite of owners who are selling their plots of land and old houses, are some of the main reasons for the constant increase in the price per square meter for new buildings in large towns. To further complicate matters are the often unresolved property and legal relationships from having multiple owners. The above costs can only conditionally be considered as fixed, that is, they are a matter of agreement between the old and new owners of the building on the plot of land. So, moving can be up to 30% of the total cost.

Construction of a facility can contain a large number of phases, the prices of which are calculated by special analysis, and when added together they give the total cost of the construction and equipping of the facility. When developing the investment program, an expert team makes a detailed comparative analysis related to the final look of the project, including the selection of structural systems and materials for all the elements of the construction, mechanical, electrical and plumbing/sewage installations and a telecommunications system. This part of the cost is variable and it greatly affects the final choice of investment.

So, the energy installation system is chosen from out of the different types of central heating systems, alternative solutions (solar cells) and other types of equipment, together with their availability in the market.

To select which materials to install and the type of structural system, it is necessary to carry out a more detailed analysis of the market: the availability of materials, the capacity of local depots, the availability of labour (skilled in particular), ownership of adequate machinery, the capacity of local construction firms, accessibility of the location, closeness to concrete and asphalt plants and similar.

Here we should pay special attention to the risks (which is not common in Serbian construction); these are related to the price of materials and equipment, employees' salaries, unforeseen conditions for exceeding the construction period, inflation, and so on. Unplanned cost increases can be linked to the poor quality of the tender documents, mistakes in the interpretation of customs regulations for imported materials, additional transport costs, natural disasters, a lack of adequate geological groundwork and so on.

According to Dell 'Isola "although cost is relatively easy to measure, benefits can be difficult to interpret. Functional benefits may include reliability, maintainability, security, expandability, sustainability, safety, durability, convenience, accessibility, flexibility, and adaptability. Other benefits, such as the image the building projects (how it is perceived by users and visitors), are more subjective".

A decision on future development may be conditioned by a number of other influencing factors, of which some cannot be expressed in a monetary system. Those are, for example, the security of the location, the visual environment, acoustics and so on. These influencing factors can also be of great significance for the investment, and they should be expressed in some

way. A class of methods that can accommodate non-monetary benefits and costs is multi-attribute decision analysis. The simplest form of the cost function *C* can be represented in the form:

$$C = \sum_{i=1}^{n} V_i\left(x_i\right) w_i \tag{1}$$

where $V_i$ is the value of option $x_i$ and $w_i$ is weight coefficient.

C is the overall value of alternative *x*, $V_i(x_i)$ is the single attribute value function reflecting alternative x's performance on attribute *i*, and $w_i$ is the weight assigned to reflect the importance of attribute *i*. For the assessment of the single attribute value functions $V_i(x_i)$, the direct-rating method could be applied. In this method, the respondent is asked to estimate the strengths of preferences for different levels of an attribute on a numerical scale. First, the most and least preferred levels are identified and valued with 10 and 0, respectively. The remaining levels are then rated between the two endpoints. The relative spacing between the levels of the attribute reflects the strength of preference of one level compared with another.

Monitoring the works must be carried out according to the quantities of materials used, which can be seen either by its dependence on the method of contract agreement according to the appropriate cost matrix for paying for the works, or according to the quantities of finished works. Supervision of the works is usually contracted according to the value of the construction (as a % of the construction value).

## 4 INVESTMENT PROGRAM – CALCULATING PRODUCTION VALUES

Table 1 shows an entry from an investment program for a residential/commercial facility that has been analyzed, in the form of the final values of all the price elements. In addition to the total price of the price of the project and the price per individual unit, that is, the price per $m^2$ of usable space of the facility, the calculations are shown for the individual components of the cost structure. The prices are shown in euros.

The price of designing the project is linked to the price recommended by the Serbian Association of Engineers. The construction of facilities in constant prices is calculated by deflating the investment in current prices. As the total costs include the cost of building materials, energy, transport, workers' salaries, and many other expenses, the deflator for construction works – *the composite price index for construction works* – is obtained by weighting the appropriate price index for the manufacture of industrial products for the domestic market (elements and construction materials, energy, machinery and equipment, motor vehicles and trailers) and the index of average gross earnings in the construction sector. In this way, all the cost components (material costs, fixed capital spending and salaries for employees) are taken into account, bearing in mind their share of the total construction cost. Weights are calculated on the basis of data from the annual financial report of the construction company, by including each individual element of expenditure in the total expenditure of the company. To these values are added the values of the factors of influence that cannot be expressed using a price, but are instead given a weight coefficient.

*Tab. 1: Production value of constructed facility*

| **Investment program- Location CENTER** | | | | | |
|---|---|---|---|---|---|
| | Number | Area ($m^2$) | Price (€/$m^2$) | Price (€) | % of contribution to the cost |
| **A. Fees to public companies** | | | | | |
| A.1. % of contribution to the cost, fees for primary and secondary infrastructure | | | | | |
| Apartments | 54 | 2,999.10 | 150.00 | 449865.00 | 10.55 |
| Businesses | 2 | 36.20 | 170.00 | 6154.00 | 11.68 |
| | | | TOTAL A.1: | 456019.00 | 10.56 |
| A.2. Infrastructure fees paid to public utilities companies | | | | | |
| A.2.1. Electrical energy | | | | | |
| Apartments | 54 | 2,999.10 | 11.00 | 32400.00 | 0.76 |
| Businesses | 2 | 36.20 | 14.00 | 500.00 | 0.95 |
| | | | Total A.2.1: | 32900.00 | 0.76 |
| A.2.2. Telephone land-line | | | | | |
| Apartments | 54 | 2,999.10 | 2.00 | 5400.00 | 0.13 |
| Businesses | 2 | 36.20 | 6.00 | 200.00 | 0.38 |
| | | | Total A.2.2: | 5600.00 | 0.13 |
| A.2.3. Heating | | | | | |
| Apartments | 54 | 2,999.10 | 33.00 | 98970.00 | 2.32 |
| Businesses | 2 | 36.20 | 39.00 | 1412.00 | 2.68 |
| | | | Total A.2.3: | 100383.00 | 2.33 |
| | | | TOTAL A.2: | 138882.00 | 3,22 |
| | | | **TOTAL A**: | **594901.00** | **13.78** |
| **B. COST OF PREPARING THE CONSTRUCTION OF INFRASTRUCTURE AND FACILITIES AT THE LOCATION** | | | | | |
| Apartments | 54 | 2.999,10 | 380.00 | 1139701.00 | 26.72 |
| Businesses | 2 | 36,20 | 380.00 | 13757.00 | 26.10 |
| | | | **Total B:** | **1153457.00** | **26.72** |
| **C. COSTS OF BUILDING INFRASTRUCTURE AT THE LOCATION** | | | | | |
| Apartments | 54 | 2.999,10 | 76.00 | 227047.00 | 5.32 |
| Businesses | 2 | 36,20 | 76.00 | 2741.00 | 5.20 |
| | | | **Total C:** | **229787.00** | **5.32** |
| **D. COST OF DESIGNING THE PROJECT AND CONSTRUCTING THE FACILITY** | | | | | |
| Apartments | 54 | 2.999,10 | 728,00 | 2183354.00 | 51.20 |
| Businesses | 2 | 36,20 | 728,00 | 26354.00 | 50.01 |
| | | | **Total D:** | **2209698.00** | **51.18** |
| **E. EMPLOYMENT COSTS** | | | | | |
| Apartments | 54 | 2,999.10 | 43.00 | 127940.00 | 3.00 |
| Businesses | 2 | 36.20 | 44.00 | 1581.00 | 3.00 |
| | | | **Total E:** | **129521.00** | **3.00** |
| **TOTAL VALUE OF THE INVESTMENT (A+B+C+D+E)** | | | | | |
| Apartments | 54 | 2,999.10 | 1422.00 | 4264668.00 | 100.00 |
| Businesses | 2 | 36.20 | 1456.00 | 52697.00 | 100.00 |
| | | | **Total A+B+C+D+E:** | **4317365.00** | **100.00** |

## 5 DISCUSSION

When carrying out the analysis it was necessary to set up an investment program which would show all the phases of investment. What is evident at first glance is that the investment program is most commonly set up in the initial phase of investment, that is, in the phase of decision making on the part of the investor, and the majority of the price must be formed on the basis of the experience of experts in similar projects. Within the framework of the analysis, risks are not considered, which can later significantly affect the cost of the

investment. In addition, the cost of designing the project and implementing its works are predicted, but a detailed analysis of the variable market conditions, such as ours, must be repeated several times during the phase of realizing the investment.

An investment program must continuously innovate, monitor the condition of the real estate market and monitor any changes in deadlines and construction costs, so it is very useful to link it with a dynamic plan, in order to oversee the further course of the investment. The subsequent flow and progress of the investment program would be to determine the total price of the facility (Whole Life Cost) which would include the cost of its maintenance and management and the cost of environmental protection, with the purpose of having a realistic overview of the total cost of an investment over its lifetime.

## 6 CONCLUSION

This paper presents an approach for valuating financial investment in Serbia. The general concept of the investment financing is reviewed in the paper. The phases of the process of managing the investment are determined. Important remarks about realization of a proposed solution to a problem are pointed out.

## ACKNOWLEDGEMENT

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