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Bc. Martin Glos



ZADÁNÍ DIPLOMOVÉ PRÁCE

I. OSOBNÍ A STUDIJNÍ ÚDAJE

Příjmení: **Glos** Jméno: **Martin** Osobní číslo: **468687**
Fakulta/ústav: **Fakulta stavební**
Zadávající katedra/ústav: **Katedra ekonomiky a řízení ve stavebnictví**
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Development and operation of an apartment building project

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HELFERT, Erich A. Financial analysis: Tools and techniques, McGraw-Hill, 2001

Jméno a pracoviště vedoucí(ho) diplomové práce:

Ing. Radan Tomek, MSc., katedra ekonomiky a řízení ve stavebnictví FSV

Jméno a pracoviště druhé(ho) vedoucí(ho) nebo konzultanta(ky) diplomové práce:

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Platnost zadání diplomové práce: _____

Ing. Radan Tomek, MSc.
podpis vedoucí(ho) práce

prof. Ing. Renáta Schneiderová Heralová, Ph.D.
podpis vedoucí(ho) katedry

prof. Ing. Jiří Máca, CSc.
podpis děkana(ky)

III. PŘEVZETÍ ZADÁNÍ

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Seznam použité literatury, jiných pramenů a jmen konzultantů je třeba uvést v diplomové práci.

Datum převzetí zadání

Podpis studenta

Study program: Civil Engineering

Branch of study: Project management and engineering

Author: Bc. Martin Glos

Supervisors: Ing. Radan Tomek, MSc., Czech Technical
University in Prague

Alvaro Garola Crespo, MSc., PhD., Universitat
Politécnica de Catalunya, Barcelona

Date: December 2021

Declaration

I declare that I have elaborated this thesis by myself only with the guidance of my thesis supervisor Ing. Radan Tomek MSc. from CTU in Prague and consultant Alvaro Garola Crespo MSc., Ph.D. from Polytechnic University of Catalonia in Barcelona.

I also declare that all the documents I used and from which I derived are listed in the bibliography.

In Barcelona 31.12.2021

.....

Bc. Martin Glos

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Development and operation of an apartment building project

Abstract

The diploma thesis deals with the development and operation of a residential building project in Turnov. A feasibility study is used as a tool for project evaluation. The thesis first explains and defines the most important parts of the feasibility study. Subsequently, the study is elaborated on a specific project in a variant solution. The aim of the thesis is to evaluate the project on the basis of the analyses performed and to give recommendations on how to proceed with the project

Keywords

Feasibility study, market analysis, financial analysis, construction project, cash flow

Abstract (cze)

Diplomová práce se zabývá vývojem a provozem projektu výstavby bytového domu v Turnově. Jako nástroj pro vyhodnocení projektu je použita studie proveditelnosti. Práce nejdříve vysvětluje a definuje nejdůležitější části studie proveditelnosti. Následně je studie vypracována na konkrétní projekt ve variantním řešení. Cílem práce je projekt vyhodnotit na základě provedených analýz a podat doporučení, jak s projektem dále nakládat.

Klíčová slova

Studie proveditelnosti, analýza trhu, finanční analýza, stavební projekt, cash flow

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1. Introduction

This diploma thesis focuses on the elaboration of a feasibility study of a residential building project Nádražní street, Turnov. First, the most important parts of the study are explained and defined. Subsequently, the study is elaborated in a variant solution. It compares two possible variants.

The first variant assesses the building and then selling all of apartments. The second variant considers the option of constructing and renting. In both variants, there are not only apartments, but there is also non-residential space.

I chose this topic and project because it is a current business plan that I would like to be a part of. At this time, it doesn't end with an elaboration of the feasibility study. However, I truly believe I can become a valid project team member who will help with the successful completion of the project.

The aim of this diploma thesis is to create a feasibility study for both variants (sell vs. rent), compare them and bring an evaluation or recommendation for the most advantageous solution on how make the investment as economically effective as possible.

To determine the structure of the study, the manual from Ministry of Regional Development (Czech Republic) called *Feasibility study metodická příručka* from 2004 [1] was used, as well as further publications from J. Fotr [2], [3], Mrs Prostějovská and Tománková [5] and [6] and others. The final structure has been modified according to the needs of the project. Adherence to this structure will ensure the detection of significant risks and the elimination of major problems and losses during the project realization.

The content of the study is divided into sub-chapters, some of which are divided due to variants. First, the project is introduced, and the area of the project is described. The following is an analysis of the market, where the demographic development is determined, comparison of the Czech Republic and the village of Turnov. Based on this chapter we will determine the target group. Marketing mix sets for example the price list of all units. The chapter concerning human resource management in variants determines the organizational structure of the operational part is next. Furthermore, the project will be presented in terms of technical and technological capacities. The impact of the project on the environment is an important factor already in the phase of planning proceedings. It is followed by the financial part of the study. Working capital management also determines the operating costs of the building. The financial plan and analysis of the project are one of the most important parts of the study - it is the determined calculation of total construction costs and Cash Flow plan in all project variants, based on which an evaluation of efficiency and sustainability is prepared. Risk analysis and management is not any less important chapter for financial management.

The study deals with the lifecycle of a project to build an apartment building in Turnov and deals with the pre-investment, investment and operational phases of this project. It does not deal with the demolition of the buildings after the end of operation, as this is the same in both scenarios.

2. Feasibility study – criteria for design and evaluation

2.1. Feasibility Study:

Feasibility Study, sometimes also referred to as a techno-economic study, is a document that complexly describes an investment plan. Its purpose is to provide the basis for investment decisions by assessing in detail all alternatives to the investment plan. This study is one of the more challenging ones in terms of its elaboration. [1]

The content of the feasibility study is primarily a detailed description of how to achieve the project aims. It is arranged in individual chapters, which are developed separately but influence each other. [2]

In the case of a positive investment decision, it also works as a basic tool for later project management in the investment phase. [1]

Other types of studies and analyses:

Other types of studies and analyses can also be used in the preparation of investment and construction projects. In the following paragraphs, some of them will be summarised.

Opportunity Study:

There are many occasions, impulses, motives that lead a man to some an interesting idea or thought that accompanies and at the same time stimulates to realise it. Of course, it is necessary to mention that there are also many factors that make it impossible. These reasons may be of different reasons due to the financial, time or personnel aspects. Therefore, targets should be selected that are achievable and, above all, those that are realistic. A review of the objectives and detailed identification of the factors that not only influence them but also have an impact on them. For this purpose, we use an opportunity study. [2]

An opportunity study is the most appropriate tool for assessing the initial idea for a project or business plan, including subsequent evaluation. As a result, it is then decided whether the topic will be developed in more detail in the near future through a follow-up feasibility study. [2]

Pre – feasibility Study:

This study is a kind of intermediate step between an opportunity study and a feasibility study. It is almost identical in structure to a feasibility study; the difference is in the detail in which it is elaborated. This makes it less time-consuming and less costly. If the view is positive and the project is recommended for the next stage, the project moves on to a feasibility study where the chapters are dealt with in more detail. [1]

Content of a feasibility study:

The following content is based on the Ministry of Regional Development's handbook. In the practical part, an effort is made to keep to this content. However, some chapters are modified according to the needs of the project. The manual allows the adaptation of chapters.

At the same time, it should be said that several recommendations can be found as to which chapters the feasibility study should contain. They are similar at their core. The following structure was chosen for the practical part of the thesis.

Figure 1 - Content of a feasibility study



Source: [1]; [2]; Own creation [2021-10-04]

2.2. Construction project:

A construction project is a unique, complex process (a sequence of activities) that aims to transform an investment plan into the final project goal of an operational building. The uniqueness of a construction project is due to the non-repeatability of specific conditions, such as start and completion dates, location, quality, or specific organization. [5]

A characteristic of construction projects is their long-term duration. This involves an amount of insecurity and therefore higher risk. Risk is defined as the possibility of an event occurring that changes the course of the project (i.e. deviates its course from the expected course, resulting in additional costs). [5]

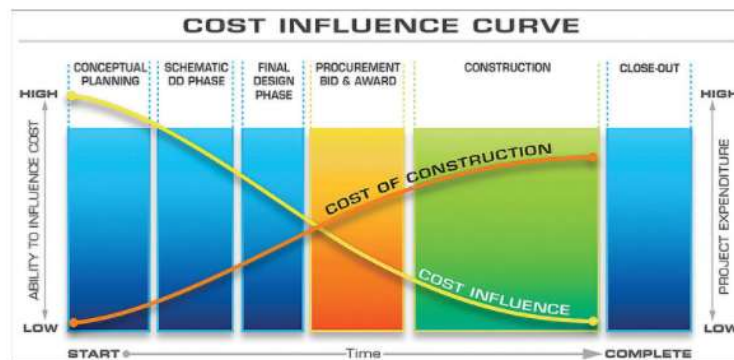
2.3. Construction project life cycle:

From the project owner's perspective, a construction project may be divided into 4 phases, namely the Pre-Investment Phase, Investment phase – investment and implementation preparation stage, Investment phase - construction stage and Operation phase and the Occupancy Phase. [6]

The different phases of the project may overlap with each other as long as the level of risk involved is acceptable. [6]

At the same time, the possibility of influencing the final cost of construction decreases by moving to later phases. [6]

Figure 2 - Cost influence curve



Source: friede.com [2021-10-04]

Pre-investment phase:

The project begins with the collection of information, its analysis and evaluation. The main objective is to decide on the technological and economic characteristics of the project and evaluate financial viability. [5]

The investment plot, the range of needs, the capacity and the quality standard of the resulting construction will be determined. The method of communication between individual participants shall be clarified, a feasibility study shall be carried out based on the method of financing and estimation of costs and revenues over time is determined. [5]

The resulting solution is processed into the documentation for the zoning procedure. The phase ends with an issue decision of zoning permit. [5]

Investment phase – investment and implementation preparation stage:

In this phase, the previous project documentation is specified for the building permit documentation. Contracts are being signed both with the project documentation supplier and with the construction supplier. [6]

The main objective of this phase is to obtain a building permit based on the building permit documentation, opinions of the authority concerned and other documents requested by the Municipal Turnov Office and its relevant departments. [6]

A schedule and plan of the construction organization will be prepared, including a financial plan. Based on tender documentation, the general contractor will be selected, the Contract for Work will be concluded between the client and the contractor, which sets out all the conditions and obligations for both parties. [6]

Investment phase – construction stage:

The implementation phase begins with handing the construction site to the contractor through the implementation of the project's construction work, handover to the investor and ending with the release of certificate of occupancy. [5]

During the construction of the project, the investor participates in the position of control over the execution of works in terms of technology and time. Provide technical supervision of the investor and author's supervision and visits building authority according to the dates of inspection days set by the decision of building permit. Handover of individual work stages according to contract. [5]

A key step is also the design of the actual construction documentation in case of deviations from project documentation confirmed by the building authority is required to apply for certificate of occupancy. [5]

The phase also involves pre-selecting employees for future property management in the case of own operation or tendering the company providing the facility management. It also includes the selection of future unit owners or tenants and foreclosure contracts on future contracts. [5]

Operation phase

The operational phase of the project is its last phase. In this phase, it is most important to evaluate the completed project in terms of time and finances. [5]

With the start of the operation, the warranty period begins the conditions of which are set out in the contract. [5]

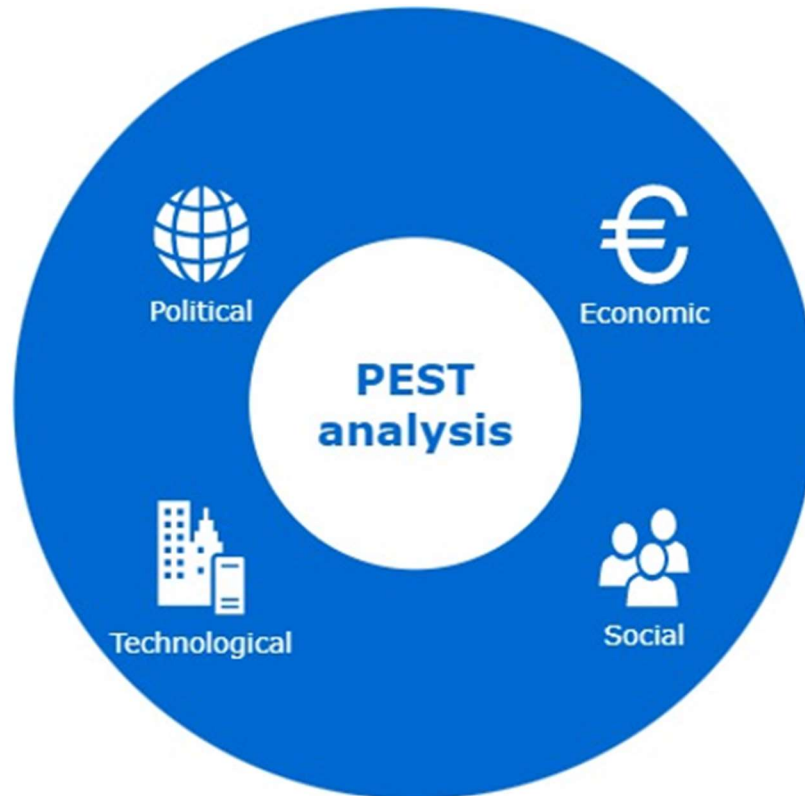
The operational phase, together with the entire project, ends with the financial and contractual settlement of the obligations of all parties involved. [5]

2.4. Marketing strategy and analysis

PEST analysis:

The name PEST analysis is composed of acronyms of the words political, economic, social and technological. These are also the areas that the analysis deals within terms of influencing the company in order to become more competitive in the market. [7]

Figure 3 - PEST analysis



Source: Own creation; [7] [2021-10-04]

PEST analysis may also be used to assess the internal structure of an organisation to identify the strengths and weaknesses of its internal policies, economic outlook, social climate and technology base. The results of this analysis can facilitate changes or improvements in areas that have been identified as suboptimal. [7]

The PEST analysis can be used in conjunction with other forms of strategic analysis of the business, such as the SWOT (Strengths, Weaknesses, Opportunities and Threats) model, to obtain an even more comprehensive result. A comparison of these completed analyses can provide a very solid basis for informed decision making. [7]

SWOT analysis:

The name SWOT analysis is composed of acronyms of the words strengths, weaknesses, opportunities, threats. It is a framework that helps to determine and evaluate a company's market position and develops strategic planning. [2]

Strengths build market position, weaknesses are the opposite of strengths - places where the competitors have an advantage. Project opportunities are those external chances that bring success if correctly identified. Threats are those situations that will jeopardise the project in terms of demand. [2]

The analysis is designed to facilitate a realistic, fact-based, data-driven look at the

strengths and weaknesses of a project, but at the same time it is a general analysis. It should be used as a guide and not necessarily as a prescription. [2]

Figure 4 - SWOT analysis table

SWOT Table	
<p>Strengths</p> <ol style="list-style-type: none"> 1. What is our competitive advantage? 2. What resources do we have? 3. What products are performing well? 	<p>Weaknesses</p> <ol style="list-style-type: none"> 1. Where can we improve? 2. What products are underperforming? 3. Where are we lacking resources?
<p>Threats</p> <ol style="list-style-type: none"> 1. What new regulations threaten operations? 2. What do our competitors do well? 3. What consumer trends threaten business? 	<p>Opportunities</p> <ol style="list-style-type: none"> 1. What technology can we use to improve operations? 2. Can we expand our core operations? 3. What new market segments can we explore?

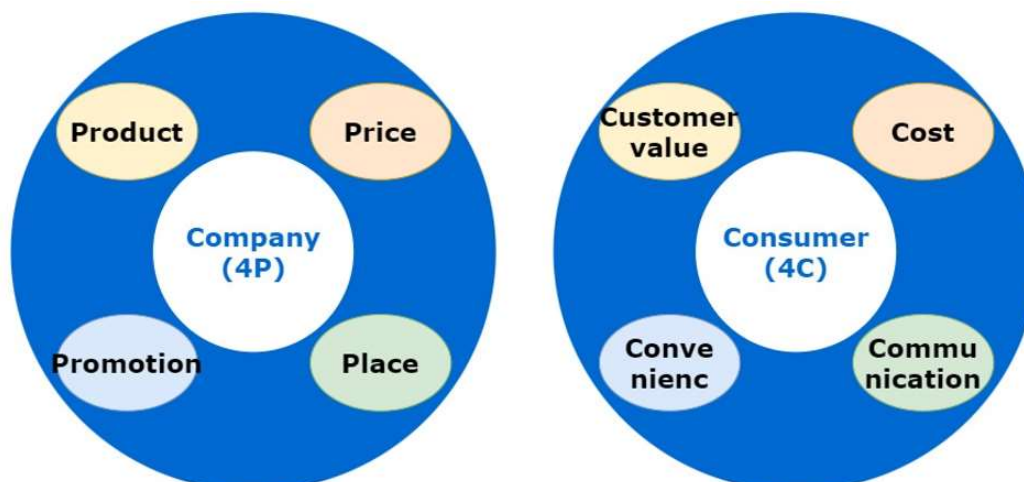
Source: Investopedia.com, [11] [2021-10-04]

Marketing mix (4P):

An important part of the marketing strategy is the marketing mix. Its importance lies mainly in the split into individual elements and the associated clearer analysis. [9]

The marketing mix is the set of tactical marketing tools that a company uses to adjust its offer according to its target markets. These tools are product, pricing, distribution (place) and communication policies (promotion), which the firm uses to adjust its offer according to target markets. These tools are otherwise known as the 4P. On the customer side, they are seen as the 4C. [8]

Figure 5 - Marketing mix 4P vs. 4C



Source: Own creation [2021-10-28]

Product

A product is seen as anything that it can be offered to the market for purchase, use or consumption. It includes physical objects, services, persons, places, organisations and ideas. At the same time, the product in marketing is seen more broadly than in everyday life. [8]

Price

In the narrowest sense, a price is a financial amount charged for a product or service. If the wider concept of price, it is considered as the sum of all the values that customers are willing to exchange for the benefits of owning or using the product or service. [8]

In addition to price, all elements of the marketing mix represent expenditures. Only price provides a source of revenue for the company. [8]

Place

The site represents all the activities of the company that ensure that the product is available to the target customers. [8]

Promotion

In the general concept of marketing, companies must communicate with their current and future customers and what they communicate to them cannot be left to random guesswork. Just as quality communication is important to building and maintaining any relationship, it is a key element of a company's efforts to establish a relationship with its customers. [8]

2.5. Project efficiency and sustainability

The basis for deciding whether to accept the project and implement it or which of the proposed project options should be implemented are financial ratios. [2]

The indicators used in this thesis are further explained.

Discount rate (k):

The discount rate is used to calculate future financial income or costs. This is done to obtain the present value of the investment. The discount rate is set as a percentage based on the following indicators:

$$k_0 = W_i * k_i * (1 - t) + W_p * k_p + W_e * k_e$$

k_0 - Discount rate

k_i - Pre-tax interest rate for new loans

t - Profit tax rate (decimal number)

k_p - Preferred stock expense ratio (preferred dividend rate)

k_e - Retained earnings and share capital expense ratio (equal to the dividend rate on common shares)

W_i, W_p, W_e - Capital elements determined as a percentage of total resources (in market values)

[3]

For the purposes of this paper, a simplified discount rate of 5% will be used.

Present value (PV):

Present value is the sum of all future cash flows arising from the investment converted to their present value. This conversion is done by discounting future flows.

$$PV_t = \sum_{t=1}^n \frac{CF_t}{(1 + k)^t}$$

PV_t - Present value of all cash flows from period 1 to period "n"

CF - Cash flow

k - Discount rate

t - Symbol of the specific period

n - Length of investment (last assessment period)

[2]

Interpretation of the result:

$PV > 1$ Project is acceptable

$PV = 1$ Project is acceptable

$PV < 1$ Project is unacceptable

[2]

Net present value (NPV):

To determine the NPV, the present value (PV) must first be determined. NPV is then expressed as the difference between the present value and the cost of the investment.

$$NPV = PV - IN = \sum_{t=1}^n \frac{CF_t}{(1+k)^t} - IN$$

NPV – Net present value

PV – Present value

IN – Investment costs

[2]

Interpretation of the result:

NPV = 0 Discounted income equals investment costs

NPV < 0 Costs exceed income, Project is not profitable

NPV > 0 Income exceed costs, Project is profitable

[2]

Internal rate of return (IRR):

This method is based on present value. It sets a discount rate at which the net present value is zero, or the present value is equal to the amount of the investment.

$$IRR = NPV = 0 = PV - IN = \sum_{t=1}^n \frac{CF_t}{(1+IRR)^t} - IN$$

[2]

Interpretation of the result:

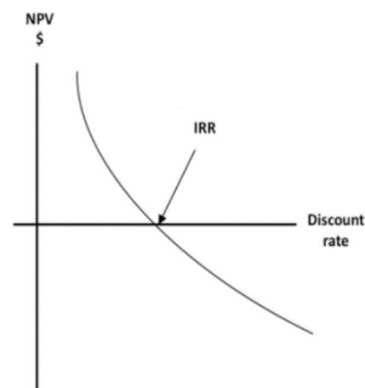
IRR > k Project is acceptable

IRR < k Project is unacceptable

[2]

When comparing indicators against each other, the project with the higher IRR would be selected. [2]

Figure 6 - Graph NPV as function of discount rate (k)



Source: accaglobal.com [2021-10-31]

Profitability index (PI):

The profitability index is determined as the ratio of discounted income to the amount of the project investment.

$$PI = \frac{PV}{IN} = 1 + \frac{NPV}{IN} = \frac{\sum_{t=1}^n \frac{CF_t}{(1+k)^t}}{INV}$$

[5]

Interpretation of the result:

PI < 1 Project costs exceed discounted income

PI = 1 Project costs equals discounted income

PI > 1 Project discounted income exceed costs, Project is acceptable

[5]

The profitability index can also be interpreted as how much a project earns per crown invested or how much is one crown invested at the end of the investment. [5]

2.6. Risk analysis:

Risk is a significant part of any project. Identifying them is one of the most important components of project management, leading to project success and keeping the project away from danger. Risk analysis determines the severity of impact and its probabilities. According to the risk ranking, measures are taken which may be of different nature:

- Avoiding risk
- Transfer of risk to another subject (insurance)
- Elimination – reducing the potential impact
- Risk exposure – no reaction

[9]

Risk management:

The most important thing for risk management is to know the risk rating. This factor should be assessed primarily on the basis of two criteria. The first is the intensity of the negative impact and the second is the probability of occurrence. These two criteria are multiplied together to show how threatening the risk is to the project. After obtaining information about the risk rating, we propose possible measures to eliminate or reduce it, see above. [9]

$$HR = P * D$$

HR - Risk rating

P - Likelihood that the risk will occur

D - Value of the expected impact

The concept of risk management can be defined as a set of activities designed to increase the probability of a successful project. This process is divided into 6 phases:

[9]

Initiation phase:

In the beginning, it is important to be aware that risks may occur and that we want to manage them. This includes defining the project objectives, specifying the risk management process, and identifying specific methods and tools, that will be used in risk management. [2]

Risk identification:

The objective of risk identification is to list all factors that have the potential to affect the outcome of the project. The result of this phase is then a list of these factors. [2]

Determining the significance of identified risks:

The purpose of this phase of risk management is to reduce the, usually very extensive, list of identified risks so that all attention can be focused on only the significant ones. The distinction between major and minor risks is usually made either by expert judgement or by sensitivity analysis. [2]

Determining the size of the risk (risk rating):

This section presents the determination of the basic quantitative characteristics of each risk, see above. [2]

Project risk evaluation:

The object of this phase of risk management and its purpose is to divide risks into 2 categories, namely acceptable and unacceptable risks. Acceptable risks are those for which the project owner is willing to bear their potential negative impacts. For the second category, i.e., unacceptable risks, the next stage of risk management reduction measures are proposed. [2]

Control measures:

The design of measures is the most important phase of risk management after risk identification. The aim is to design measures that reduce the economic impact of risks on the project by eliminating them completely or at least reducing the likelihood of their realisation. Possible risk measures have been explained above. [2]

2.7. Schedule:

This section addresses the timing of the individual phases/activities of the project. It should be clear when what starts and ends, which activities follow on from each other, which overlap, and which are on the critical path. The schedule is a very important tool used to manage the project and therefore it is also important to keep it updated. Compiling such a plan can be challenging from both a time and financial perspective. For this reason, it is necessary to think in which detail it is needed. [6]

In general, it can be said that planning happens at three levels in terms of time scale:

Long-term schedule:

This plan is strategic, it does not go into too much detail but instead plans the overall strategy. The individual activities are aggregated in it. It mainly uses the month or the quarter as the unit of time and only uses finance as a resource. [6]

Medium-term schedule:

This plan is tactical and also uses aggregated activities. It plans individual stages, using mainly weeks as a unit of time. Among the resources considered are also finances, but also materials and human resources. [6]

Short-term schedule:

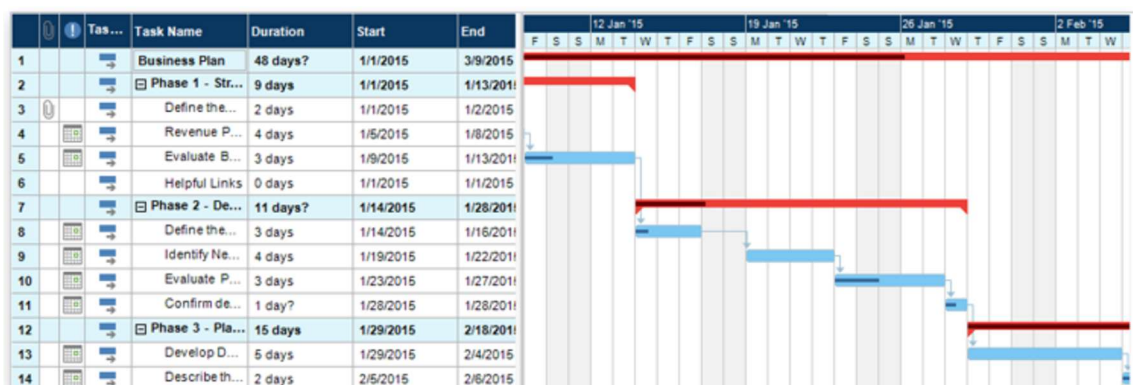
This is called the operational plan. It plans the implementation of a group of activities that have been aggregated in previous plans. The time unit of this plan is mostly days and it plans the activities in a lot of detail, as well as the resources. [6]

There are many methods for drawing up a timetable, each of which has its pros and cons. The most used methods are:

Gantt Chart (Bar Chart):

It is one of the most widely used and also the best presentable timetable. Its results can also be used for network analysis (see below). It is also a list of activities that are interrelated, with dates of finish and start assigned to them. Because costs are linked to each activity, this allows us to calculate the total resource requirements of the entire project over time. [6]

Figure 7 - Example of a Gantt chart

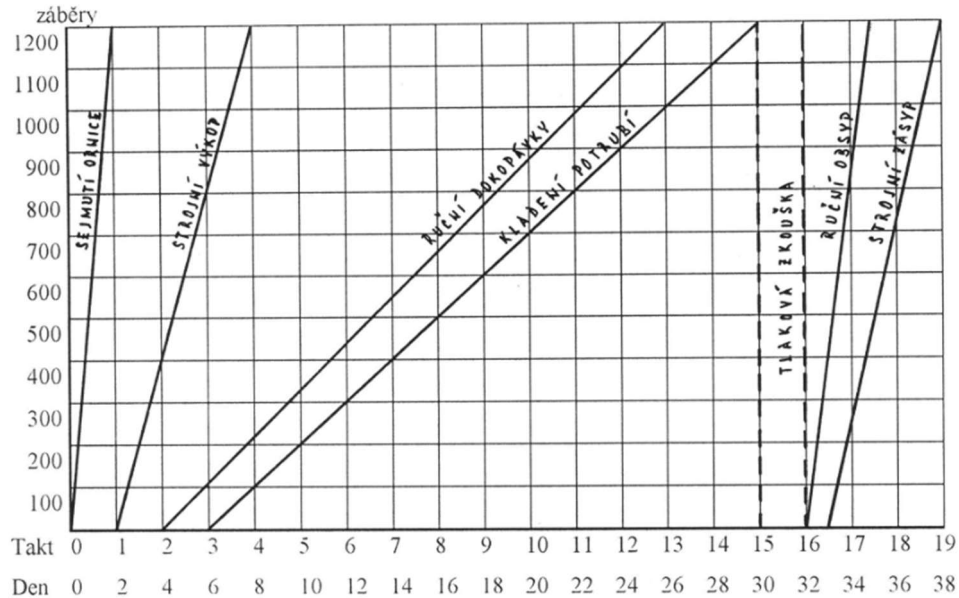


Source: Gantt.com [2021-10-31]

Space-time graph:

This method of scheduling expresses the relationship of time to the place of work performance and the sequence of work in space. It is most suitable for linear structures such as roads, railways etc. This is because it shows repetitive work on the same objects. The main disadvantage is its static character, deadlines are fixed, and it is not obvious which activities are a critical path. [6]

Figure 8 - Example of space-time graph

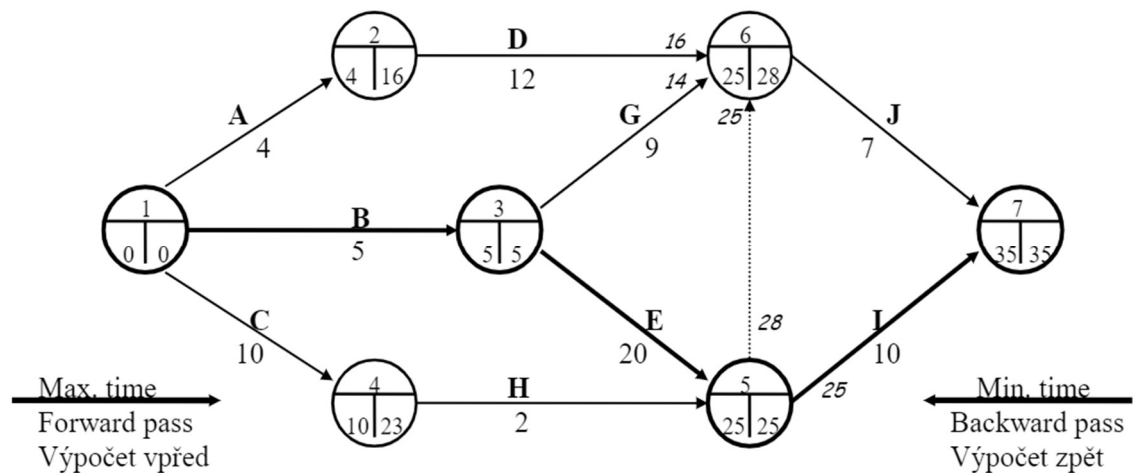


Source: fsv.cvut.cz [2021-10-31]

Network analysis:

This method represents a large group of methods, and they have a wide range of applications in planning and managing projects of any type. This is due to their variability in time, resource and cost analysis. The most used and well-known methods of this type are the PERT method and the critical path method. [6]

Figure 9 - Example of network analysis graph



Source: fsv.cvut.cz [2021-10-31]

3. Current project status

3.1. Project description

The investment plan labelled *Apartment House Turnov* is located on U Nádražní street in Turnov, Czech Republic. This project is based on the architectonic study (Attachment 1.) from Železná studio, owned by ČESKOMORAVSKÁ POZEMKOVÁ s.r.o.

The plan deals with apartment housing with no underground floor and five above-ground floors. The ground floor consists of parking spaces, cellars and non-residential space. The non-residential space has the possibility of being used for sales purposes. The rest of the floors are comprised of apartments with a disposition 1+kk, 2+kk and 4+kk. The project includes the necessary infrastructure, which is used for housing services and connection to public infrastructure. Landscaping and grassing are included as well.

Architectural documentation was used as a background. It was created by the studio Železná. Further materials such as maps, data from cadastre of immovables and information from meetings with the investor were used as well.

Table 1 - Basic project information

Project status	
Name	Apartement house Turnov
Owner	Českomoravská pozemková s.r.o.
Architect	studio Železná, Liberec, CZ
Location	p.č. 1926/1, 1926/2, 1928/3, 1928/4; K.Ú. Turnov; CZ
Land area	327 m ²
Built up area	217 m ²
Floor area	840 m ²
Floor area of condos	436 m ²
Enclosed area	2555 m ³

Source: Own creation [2021-08-21]

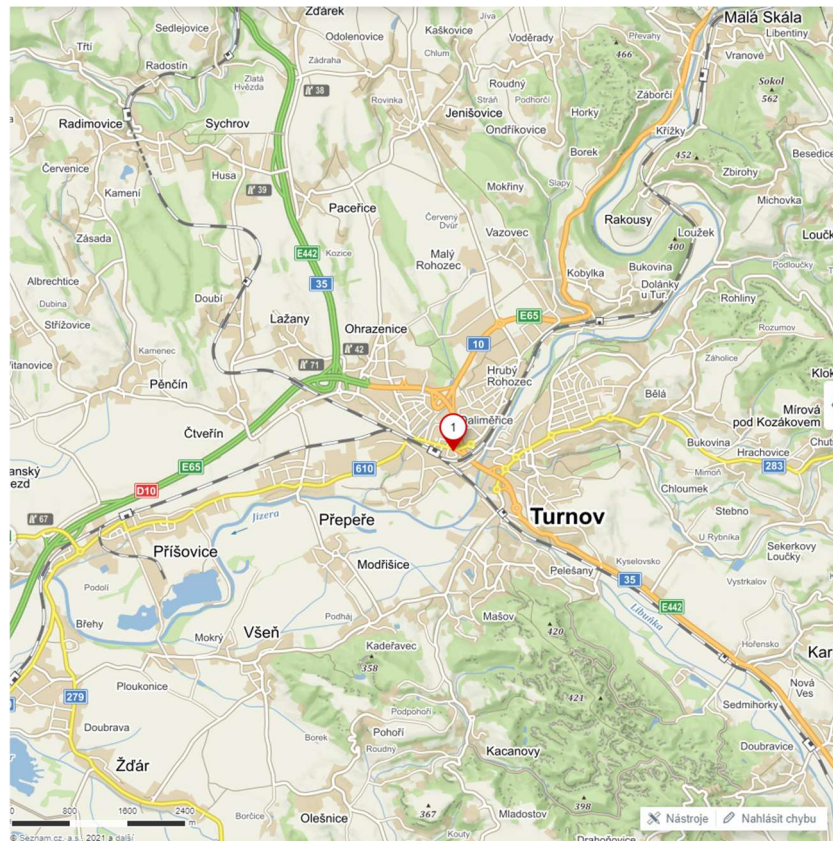
3.2. Land information

The area of interest is of a regular shape resembling a square. The total land area is 327 m² with a flat terrain and is located 1,5 km from the city centre (Figure 1.)

Adjacent to the north side is a land built up of residential buildings, which are designated for living. A covered bus station operates on the south side. U Nádraží street makes up the eastern border. On the west side parking spaces from other residential buildings can be found.

Currently, the land is unused, with the exception of a garage located in the centre of the area, and cars occasionally park on the north side. The remaining area is covered with wild shrubs (Figures 10-14.).

Figure 10 - The situation of wider relations



Source: Mapy.cz [2021-10-04]

Figure 11 - Current land status - 1



Source: Own creation [2020-10-12]

Figure 12 - Current land status - 2



Source: Own creation [2020-10-12]

Figure 13 - Current land status - 3



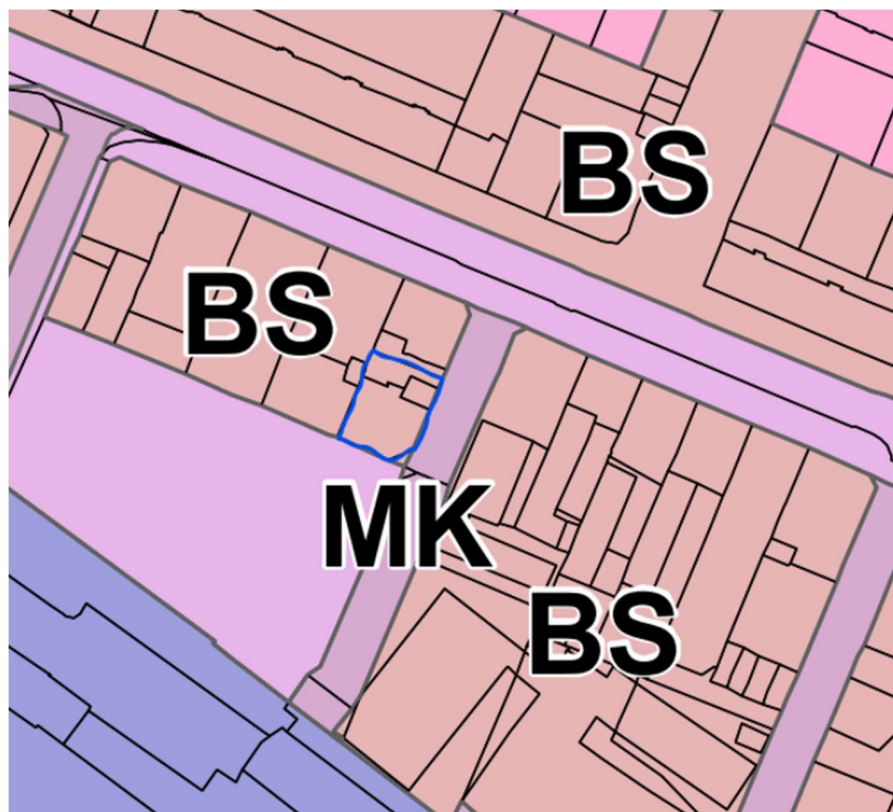
Source: Google.es/maps [2021-10-04]

Figure 14 - Current land status - 4



Source: Mapy.cz [2021-10-04]

Figure 15 - Turnov town zoning plan



Source: Turnov.cz, Own creation [2021-10-04]

Figure 16 - Cadastral map of the area of interest



Source: sgi-nahlizenidokn.cz [2021-10-04]

Table 2 - Project and adjacent plots

Plots	Area [m ²]	Type of land	Owner
Project plots			
1928/3	59	ostatní plocha	Českomoravská pozemková s.r.o.
1928/4	29	zastavěná plocha a nádvoří	
1926/1	195	zahrada	
Neighboring plots			
1928/2	44	ostatní plocha	Zaml Daniel
1924	348	ostatní plocha	Město Turnov
1926/4	7	zahrada	Město Turnov
1927	3384	ostatní plocha	Město Turnov
1930/1	226	zahrada	Ing. Hájek Ivan
1930/2	16	zastavěná plocha a nádvoří	Ing. Hájek Ivan
1929	314	zastavěná plocha a nádvoří	Ing. Hájek Ivan

Source: sgi-nahlizenidokn.cz, Own creation [2021-10-04]

Due to current ownership relationships, the investment in the land, that has already taken place, will not be taken into account in the next chapters.

3.3. Project milestones:

In terms of time, the project is divided into individual sub-activities, some of which form project milestones. These milestones represent the division of the project into basic stages. The milestones are based on the Building Law No. 183/2006 Coll. (Law on Zoning and Building Code), which determines the method of permitting the construction.

In the case of the Apartment Building project in Turnov, there will be a two-stage procedure, specifically for land and construction proceedings. Milestones dividing the individual stages will be:

- decision of zoning permit
- decision of a building permit
- handover construction site to the contractor
- Decision of Certificate of occupancy

[5]

The project follows the life cycle explained in the theoretical part. The different phases are used in the schedule, cash flow and other parts of the study. Next, the operational phase is added because of the differences in both models.

Operation phase

Sell

There is a settlement of the purchase contract, property settlement in the cadastre of real estate, financial settlement of the last deposit, physical handover of the units to the new owners.

Rent Model

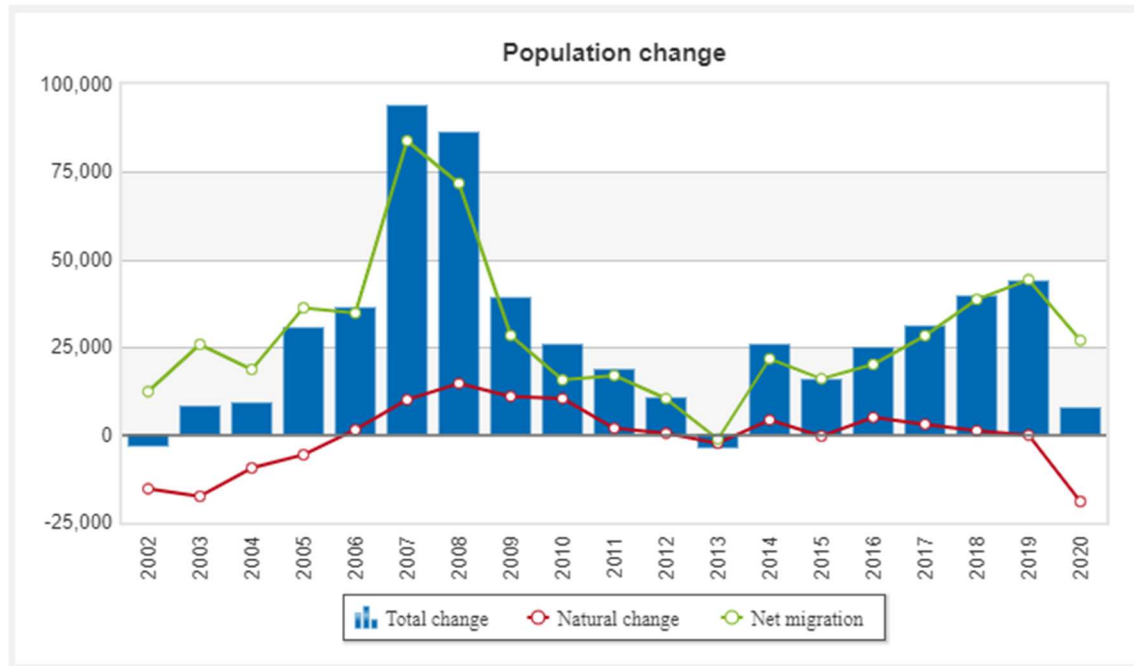
There is a deposit into the cadastre of real estate. Concluding contracts with energy suppliers. Final arrangement with future tenants, settlement of leases and deposits, transfer of units to use. They are also included in this phase.

4. Market analysis and marketing strategy

4.1. Evolution of demography in the Czech Republic

An important factor in determining a potential customer is taking into account the main demographics, which is population trends. We will first look at the issue from a global perspective, from the perspective of the Czech Republic.

Figure 17 - Population change of Czech Republic



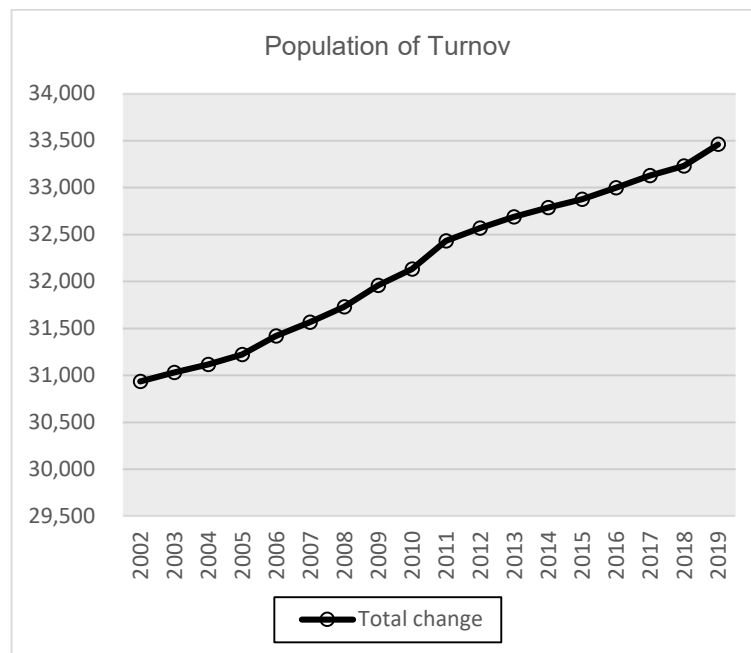
Source: czso.cz [2021-10-05]

From the graph, we can see that the population in the Czech Republic is regularly increasing. Between 2015 and 2019, the graph showed signs of a linear function. In 2020 we can see a change in the trend, this is due to the global pandemic Covid-19 and the corresponding global countermeasures. Despite the change in trend, the Czech Republic saw a population increase in 2020. At the same time, it should be noted that the increments are mainly due to population migration.

4.2. Evolution of demography in Turnov

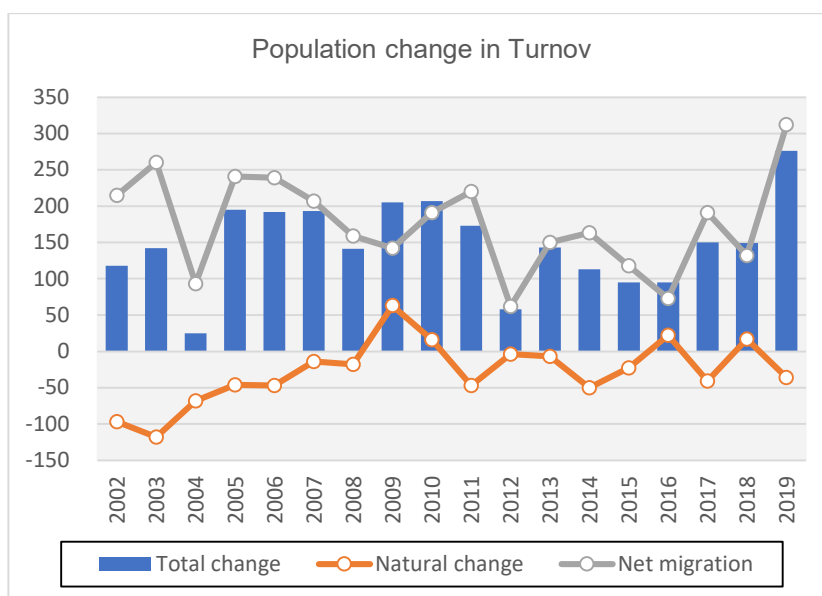
Given the location of the project, it is also important to reveal the trend of population development in the municipality of Turnov (Figures 18-19.).

Figure 18 - Population of Turnov



Source: Own creation, czso.cz [2021-10-05]

Figure 19 - Population change of Turnov



Source: Own creation, czso.cz [2021-10-05]

Based on the attached graphs of population development in Turnov, it can be said that the increase is regular. The curve of natural change mostly follows the curve shown for the whole Czech Republic. Comparing the migration curve, we can see more frequent deviations from the national trend. However, we can say that the vast majority of the population growth in Turnov is made up of migration, even in a larger proportion than the national trend.

For further estimation, it is difficult to say how the graph might evolve further, also because of the measures due to the pandemic Covid-19. We can see that in the town of Turnov the growth in 2019 did not have as much influence as on the whole Czech population. At the same time, it should be said that the figures may be misleading because the reported residence may not correspond to reality.

4.3. Target groups and demand analysis

With some generalization, we can say that everyone who plans to buy a apartment in a new building fall into one of three groups, which we call according to what they demand.

Modern family apartment

Looking for a good neighbourhood, not focused on discounts. They choose the apartment carefully and know that buying an apartment will be a compromise, they are counting on a mortgage. They need to solve a family situation and want an apartment for their family, they require an apartment larger than the current one.

Home for the demanding

They are in a situation where they have enough resources and want their own apartment. They don't want to spend foolishly on anything but are happy to pay extra for what they really want. They demand quality for their money and don't like to compromise.

A profitable investment

They buy the apartment primarily as an affordable investment, or they may move into it themselves in the future when they need a smaller apartment. The furnishing of the apartment comes second, functionality comes first. They prefer an affordable smaller apartment without big demands.

Representation of target groups in Turnov

Table with selected data about Turnov (Table 3.) helps us to identify the most represented groups.

Table 3 - Trend of construction, Lack of construction, Age composition of the population of Turnov

Ukazatel	SO ORP Turnov																	
	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Celkový přírůstek (úbytek) obyvatel	118	142	25	195	192	193	141	205	207	173	58	143	113	95	95	150	149	276
Byty																		
Dokončené byty	55	73	187	107	75	153	109	111	138	80	74	85	83	79	64	95	85	85
z toho v rodinných domech (%)	72.7	35.6	34.2	58.9	49.3	66.0	66.1	82.0	75.4	91.3	91.9	95.3	67.5	89.9	96.9	65.3	90.6	90.6
of with outside family houses	15	47	123	44	38	52	37	20	34	7	6	4	27	8	2	33	8	8
Shortage of apartments for movers (with an assumption of 2.9 people per apartment) referred to czso.cz	23	-1	-115	19	24	10	8	46	33	49	13	42	9	23	29	15	40	81
Cumulative	23	22	-93	-74	-50	-40	-31	15	47	96	109	151	161	183	212	227	267	348
Průměrný věk (roky)																		
muži	38.5	38.8	39.0	39.2	39.4	39.6	39.8	40.0	40.2	40.4	40.5	40.7	40.9	41.1	41.3	41.4	41.5	41.6
ženy	41.6	41.8	42.1	42.2	42.4	42.6	42.7	42.8	42.9	42.9	43.3	43.4	43.6	43.8	44.0	44.2	44.4	44.3
Podíl obyvatel ve věku 65 a více let (%)	15.4	15.4	15.4	15.5	15.6	15.7	16.3	16.6	16.9	17.4	18.2	18.6	19.1	19.6	20.2	20.7	21.1	21.2
Index stáří (počet osob ve věku 65 a více let na 100 dětí ve věku 0–14 let)	100	102	104	106	109	113	117	118	118	119	123	124	127	129	131	132	133	132
Sňatky	149	111	168	178	162	174	145	138	135	142	122	132	140	167	154	173	174	172
Věk ženicha:																		
25–29	65	46	68	71	60	64	51	41	39	39	34	39	42	42	38	44	41	49
30–34	28	22	34	56	33	46	46	39	38	46	29	32	29	43	38	50	37	47
Věk nevěsty:																		
25–29	57	55	75	77	59	75	57	60	51	52	43	53	47	56	49	65	56	57
30–34	19	12	19	28	29	37	28	31	29	33	20	25	32	49	27	36	40	33

Source: czso.cz, [10], Own creation [2021-10-05]

Housing data shows that more single-family homes are being built in the area. Between 2011-2019, the single-family housing completion rate approached or exceeded 90% 7 times. If we assume that all new residents will use non-family units for housing, we can see a deficit in the tens of units per year. Encouraging the construction of condominiums is in order and there is no danger of oversaturating the market. This reality will help the prices of flats in the locality to rise further and attract a group that looks at buying a flat as a profitable investment.

The table shows that the total population of Turnov is ageing. The average age in 2019 was 44 for a female and 41 for a male. This favours a higher proportion of families with older children and more members looking for a larger place to live.

At the same time, we can notice lower hundreds of marriages every year. This also suggests targeting of families, as newlyweds can be expected to start a family in the future and the associated need for more living space. The table then shows the largest age groups of people entering a marriage. For both women and men, these are the 25-29 and 30-34 age groups.

Further specification of target groups

No data suggests a greater representation of a demanding customer group. For this reason, only two locally dominant groups will be specified below. Namely, the modern family apartment and the apartment as a profitable investment.

Modern family apartment

Required layout: 3+kk, 4+kk, 5+kk

Apartment equipment: two bathrooms, two toilets, cellar, storage room

House equipment: parking, playground

Lifestyle: The apartment is their home - the place where they spend most of their time. They are not looking for a luxury home, but a comfortable place to live. They are risk-averse. They are hard-working and can earn enough money to provide for their family. They don't mind change, even if they don't seek it.

Other Observation: They highly value the time they can spend with their family; they approach work responsibly, are solution-oriented and task-oriented; they can indulge in quality things when they feel it is a good investment; the family tries to spend weekends together: trips and walks are common, as well as recreational sports with friends (cycling, swimming, inline skating, etc.), and in winter they go to the mountains.

- He usually cooks daily, and for this purpose he tries to provide practical and quality kitchen equipment (powerful oven, dishwasher, microwave, coffee maker). Connecting the kitchen and living room is a popular model.
- The apartment must have a cellar and a balcony or terrace. In general, storage space (if not a cellar, at least a closet) is almost a necessity for a family. Larger storage spaces are needed because as children grow, the range of equipment (typically bikes, skis) increases, in volume and in pieces.

Profitable investment

Required layout: 1+kk, 2+kk

Apartment equipment: toilet in the bathroom

House equipment: They do not deal with other accessories of the house. They don't want a smart home or other technological upgrades. Eventually, they would consider a garden accessible only to the occupants of the house. They would appreciate the use of local materials in construction

Lifestyle: They don't like change. They save and always try to save. They prefer to arrange everything around the apartment themselves rather than spend more money - not because they enjoy it, but because they are careful and vigilant.

Other Observation: They have finances that they want to invest wisely in the near future. When investing in property, they usually think about the needs of future tenants, sometimes in combination with the vision of living in the apartment themselves one day.

- They believe that even in an investment apartment, a balcony is needed because the apartment appreciates in value. They are not opposed to storage spaces (e.g., a storage room or a separate cellar).
- They are quite interested in eco-friendly solutions, but more in terms of savings and/or if they are considering the purchase for their own housing in the future.

Although we have identified and specified the target groups, these findings will not be included in the design of the housing mix and overall building design. This feasibility study is based on the architectural design of Studio Železná (Attachment 1.) from which all calculations will be based. Based on this chapter, a recommendation for modification or inclusion in the design will be made in the conclusion.

4.4. SWOT analysis

As explained above swot analysis is a general analysis. To make the right decision, individual points need to be analysed in more detail. In this case, the project risks are discussed in more detail in Chapter 12.

This analysis is prepared in two variants - for sale and for rent.

Table 4 - SWOT analysis – Sell Model

SWOT analysis - sell model		
	Strenghts	Weaknesses
Internal	The owner of the project own the land	Limited project possibilities - regulations of the authorities, land disposition
	Turnov is one of the ten municipalities with the best quality of life in the Czech Republic	Experience of the team - the owner's first construction project
	Location of the project in the city - accessible public transport, shops, education, sport	The project is not wheelchair accessible - only preparation for a lift.
External	Opportunities	Threats
	Acquisition of neighbouring land - extension of the project	Non-approval of the project in the proposed capacity
	Contributes to the development of the city - demographics, architecture	Other complications in the construction proceeding
	Solar power plant as a source of electricity in a building	Rising prices of construction materials
	Design efficiency residential area/total house area > 75%	

Source: Own creation [2021-10-07]

Table 5 - SWOT analysis – Rent Model

SWOT analysis - rent model		
	Strenghts	Weaknesses
Internal	The owner of the project own the land	Limited project possibilities - regulations of the authorities, land disposition
	Turnov is one of the ten municipalities with the best quality of life in the Czech Republic	Experience of the team - the owner's first construction project
	Location of the project in the city - accessible public transport, shops, education, sport	The project is not wheelchair accessible - only preparation for a lift.
External	Opportunities	Threats
	Acquisition of neighbouring land - extension of the project	Non-approval of the project in the proposed capacity
	Contributes to the development of the city - demographics, architecture	Other complications in the construction proceeding
	Solar power plant as a source of electricity in a building	Rising prices of construction materials
	Design efficiency residential area/total house area > 75%	Problem with occupancy of larger dispositions
	Regular rent increases	

Source: Own creation [2021-10-07]

The analysis clearly shows the prevalence of strengths over weaknesses in both the sales and rental models. The strongest points are the land owned by the project owner and the location, which is ranked among the ten best places with quality of life in the Czech Republic [12]. So far, we can say that the biggest opportunity is the acquisition of neighbouring land and the further expansion of the project in future phases. The biggest threat is not permitting the project in the proposed capacity and rising prices of construction materials.

4.5. Marketing mix (4P)

Product

The planned outcome is an apartment building with private parking on the property and commercial space on the ground floor. The project offers the following layout of residential units (Table 6). In addition, there is a commercial space for a café, 4 cellars and 6 parking spaces.

Table 6 - Table of apartments

apartment code	floor	disposition /layout	area [m2]	balcony [m2]	terrace [m2]
A201	2	1+kk	55	15	0
A202	2	2+kk	75	15	0
A301	3	1+kk	55	15	0
A302	3	2+kk	75	15	0
A401	4+5	4+kk	100	13	30
A402	4	2+kk	75	15	0

Source: Own creation [2021-10-11]

The project will meet the most up-to-date technology and housing standards concerning sustainability. It will also follow valid norms and regulations.

Price

Sell Model

Selling prices were determined based on the following inputs: Chapter 4 Market analysis and marketing strategy, market research of current listings (Attachments 2-4.), a comparison and return method of current listings (Attachments 5-7.), [13], [14], consultation with industry opponents and consultation with the project owner. The final price lists were determined considering all the mentioned factors.

In addition, all project costs were estimated, see Chapter 10.2. Determination of total costs – calculation of the structure.

Individual payments are made in the following steps:

- 1) If the customer is interested in the property, a pre-booking is created, in which we do not offer the apartment to anyone else and the customer has a few days to think about it.
- 2) The pre-reservation is valid until a reservation contract is created. The reservation contract includes a fee of 150 000 CZK payable within 5 days of signing the contract. This amount becomes part of the purchase price.
- 3) Within one month of signing the reservation contract, a future contract will be concluded with the customer. At this point, the customer will pay 20% of the price of the apartment within 10 days of signing the contract.
- 4) The remaining 80% is payable within 10 days after the final approval. The purchase contract is also concluded during this period.

Based on the price list of flats, commercial units parking places and cellars, the projected income from the sale of the property is 30 880 000 CZK. All prices are without VAT.

Rent Model

Selling prices were determined based on the following inputs: Chapter 4 Market analysis and marketing strategy, market research of current listings (Attachments 2-4.), a comparison and return method of current listings (Attachments 5-7.), consultation with industry opponents and consultation with the project owner. The final price lists were determined considering all the mentioned factors.

Payments will consist of:

- a security deposit in the form of two months' rent, which will be paid upon signing the reservation contract for future rental
- one month's rent, which will consist of a charge for the use of the apartment and a contribution to the utilities and the reserve fund. The utility bills of the apartment will be transferred to the tenant, therefore not an expense of the owner of the building

Based on the price list of flats, garages and cellars, the projected year income from the rent of the property (75% occupancy) is 1 150 650 CZK.

Summary

Based on the estimation (Chapter 10.2), the cost price of the project was determined 22 161 708 CZK without VAT.

Table 7 - Price list of apartments

Price list of apartments - sell,rent							
apartment code	floor	disposition /layout	area [m2]	balcony [m2]	terrace [m2]	VAR 1 price without VAT [Kč]	VAR 2 rent without services [Kč/month]
A201	2	1+kk	55	15	0	3,300,000 Kč	12,650 Kč
A202	2	2+kk	75	15	0	4,500,000 Kč	17,250 Kč
A301	3	1+kk	55	15	0	3,300,000 Kč	12,650 Kč
A302	3	2+kk	75	15	0	4,500,000 Kč	17,250 Kč
A401	4+5	4+kk	100	13	30	6,500,000 Kč	23,000 Kč
A402	4	2+kk	75	15	0	4,500,000 Kč	17,250 Kč
Total price of residential units:						26,600,000 Kč	100,050 Kč

Source: Own creation [2021-10-11]

Table 8 - Price list of commercial units

Price list of commercial spaces - sell,rent					
commercial code	floor	purpose	area [m2]	VAR 1 price without VAT [Kč]	VAR 2 rent without services [Kč/month]
C100	1	store	75	3,000,000 Kč	15,000 Kč
Total price of commercial units:				3,000,000 Kč	15,000 Kč

Source: Own creation [2021-10-11]

Table 9 - Price list of cellars

Price list of cellars - sell,rent				
cellar code	floor	area [m2]	VAR 1 price without VAT [Kč]	VAR 2 rent without services [Kč/month]
CE01	1	8	120,000 Kč	1,200 Kč
CE02	1	8	120,000 Kč	1,200 Kč
CE03	1	8	120,000 Kč	1,200 Kč
CE04	1	8	120,000 Kč	1,200 Kč
Total price of cellars:			480,000 Kč	4,800 Kč

Source: Own creation [2021-10-11]

Table 10 - Price list of parking places

Price list of parking places - sell,rent					
cellar code	floor	covered	area [m2]	VAR 1 price without VAT [Kč]	VAR 2 rent without services [Kč/month]
P01	1	yes	16	150,000 Kč	1,500 Kč
P02	1	yes	16	150,000 Kč	1,500 Kč
P03	1	yes	16	150,000 Kč	1,500 Kč
P04	1	yes	16	150,000 Kč	1,500 Kč
P05	1	no	16	100,000 Kč	1,000 Kč
P06	1	no	16	100,000 Kč	1,000 Kč
Total price of parking places:				800,000 Kč	8,000 Kč

Source: Own creation [2021-10-11]

Table 11 - Summary table – total construction incomes and costs

Summary table - incomes and costs		
Sell model	total income - sell	30,880,000 Kč
	total construction cost - estimation chapter 10.1	22,161,708 Kč
Rent model	total year income - rent (75% occupancy)	1,150,650 Kč
	Property insurance - year	6,300 Kč
	maintenance - year	64,712 Kč
	repair fund - year	165,288 Kč

Source: Own creation [2021-10-11]

Place

The residential building will be located in the centre of Turnov, in U Nádraží Street, on plots number 1926/1, 1926/2, 1928/2, 1928/4 in the cadastral area of Turnov.

Adjacent to the north side is a land built up of residential buildings, which are designated for living. A covered bus station operates on the south side. U Nádraží street makes up the eastern border. On the west side parking spaces from other residential buildings can be found.

In the immediate surroundings, there are all public amenities. In the outgoing distance in a few minutes, there are supermarkets, restaurants, school, kindergarten, sports facilities, cultural centre and more. Bus and train stations are literally around the corner. Reaching distances either by public transport or by car to cities such as Liberec, Boleslav or Prague are in tens of minutes.

Promotion

The main way to ensure promotion will be to inform the citizens of the town and the surrounding area about the project using a web portal that will be set up exclusively for this project. A list of the offered housing units will be posted there with the main parameters: the area of the apartment, the area of the terrace, the possibility of adding a basement or a parking space and their size, including prices without VAT and including VAT. In addition, there will be an updated construction plan and the implementation milestones achieved.

Internet advertising will also be used, along with print (city newspapers, billboards) with information on the start of construction and a link to the project website.

The cost of setting up and running the website is about 15 000 + 2 000 each month for maintenance [15]. Internet advertising costs about 3 000 per month.

The advertisement will be posted 2 months before the apartments go on sale after the last apartment is sold. In the case of rentals, advertising will be active from the start of construction until the last apartment contract is signed.

The total cost of the promotion of the apartment building can therefore be assumed to be around 150 000 CZK in both investment variants.

5. Project management

To ensure the functional planning, organization and reliable management of all processes will outline the needs of human resources in a variant solution according to the individual stages of the project. As the most important factor in an effective return on investment is achieving a plan, the greatest attention will be devoted not only to the operational phase in the Rent Variant but also to the investment and implementation preparation and the implementation itself. [5]

5.1. Pre-investment phase

The initial phase of the project consists of the development from the first initiatives for investment to the decision on implementation, defining the parameters of the intention, only after obtaining zoning permit. Steps about the determination of the scope and purpose of the intention are performed by project owner, after arranging documents and providing the necessary information, will choose a project manager for the entire project. At this stage, the architect and the general designer are also selected. Subsequently, a contract is concluded with them.[6]

5.2. Investment phase – stage of investment and implementation preparation

At this stage, the key point is obtaining a building permit for an investor. Obtaining the permit is in the hands of the project manager. He will protect the results of his team and set the project plan. He will coordinate all involved sides and will be responsible for meeting the project's objectives. At this stage, the architect and the general designer are design project for building permit based on zoning permit. Their documents are used for the building authority and the authorities concerned. [6]

5.3. Investment phase – stage of construction

The implementation of the project will be ensured by the general contractor, which will be the result of the tender of the previous phase. Communication with the construction will take place through the project manager until the takeover of the finished construction from the contractor. The selection of tenants or buyers and the conclusion of contracts will be ensured by project manager and his team. [6]

5.4. Operation phase

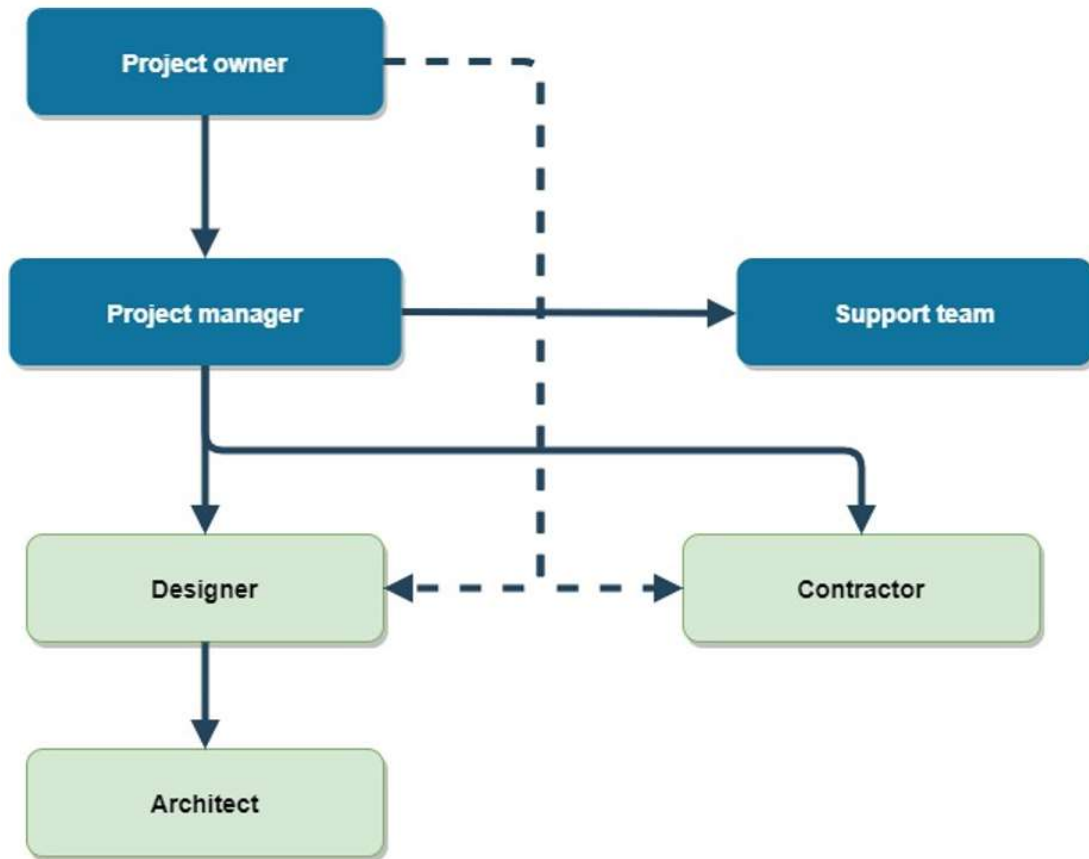
Sell

Management in the operational part will only represent compliance with the warranty period of 3 years for construction work. According to the Contract, the contractor's liability for defects will be determined. Any complaints in relation to the contractor will be resolved by client support, which will be making repairs. [5]

Rent

Management in the phase of use by the tenant will be covered primarily by the administration of rent, administration contracts and their observance, collection of tenants, selection of new tenants, all ensured by the business department. Additionally, maintenance and cleaning of public spaces, contracts with energy suppliers on common areas, both indoor and outdoor and ensuring revisions are handled as well. The performance of these activities will be provided by an external facility management company. [5]

Figure 20 - Diagram of the organisational structure in the investment phases



Source: Own creation [2021-10-05]

The entire project is coordinated by a project manager who has been selected by the project owner. The project manager and his team prepare the individual assignments and then coordinate the individual activities. They meet with the parties involved on review days to address deviations from the scope and other situations that arise. However, the contracts with each party are with the project owner, except for the contract with the architect, who is managed under the project designer. [5] [6]

6. Technical and technological solution of the project

6.1. Purpose of the structure

The residential building in Turnov is designed for housing and public facilities.

6.2. Construction objects

Main construction objects of the project:

- SO 00: Field preparation
- SO 01: Residential building
- SO 02: Access gate
- SO 03: Parking area
- SO 04: Connection
- SO 05: Internal Connection

6.3. Architectural solution

The construction of the new bus station created a new public building in the locality, which changed the meaning of the adjacent plots. The existing development to the north turns its “back” on the station, including its small yards. In terms of wider urban relationships, we see the residential house as the first of a possible development that will create a new representative frontage of houses facing the bus station in the future and may offer attractive housing and commercial space. However, our proposed house can also stand as free-standing floors with living space, and secondly, a lightweight concrete structure with an access staircase that adds value to the flats in the form of private entrances and generous areas of private loggias. The loggias form an aesthetically interesting façade from the most frequented view from the west while allowing future surrounding development to relate logically. [Attachment 1]

6.4. Disposition

The entrance to the house is designed from the back yard, where covered parking for residents is also located, the private yard is closed by an access gate, on which will be placed bells, mailboxes and a descriptive number. There are also small storage spaces for residents on the ground floor. The part of the ground floor facing the bus station is designed as a commercial space, for example for a café or small shop. The generous shopfronts and entrance from the bus station are adjusted to the public walkway and allows the commercial operator to provide covered outdoor seating for customers. [Attachment 1]

The second to third floor consists of two apartments with private access through a covered loggia. Each apartment has a large loggia facing west. The standard apartment is designed to correspond to the requirements of today's housing demands. The apartment includes a bathroom, separate toilet, storage room, living area connected to the kitchen and in the case of larger apartments one or more bedrooms. [Attachment 1]

On the fourth floor, there is an apartment 2+kk and the largest of the apartments 100 m²

4+kk. This luxury apartment is extended with a rooftop extension with a bathroom and three bedrooms, which offers great views and access to the roof terrace. [Attachment 1]

All apartments are generously lighted by a regular raster of windows. The windows will be fitted with external blinds, which will protect the apartments from overheating and possible noise from the bus and train station. [Attachment 1]

The house is designed in such a way that an elevator can be placed between the loggias in the future. Technical access to the roof is provided by a ladder from the fourth-floor loggia. [Attachment 1]

6.5. Project capacity

Table 12 - Project capacity

Project capacity										
Object	Object description	Built-up area [m ²]	Floor area [m ²]	Enclosed area [m ³]	Commercial units - 55 m ² [number]	1+kk - 50 m ² [number]	2+kk - 75 m ² [number]	4+kk - 100 m ² [number]	Parking places [number]	Cellars - 7 m ² [number]
SO 02	Residential building	217	840	2555	1	2	3	1	6	4

Source: Own creation [2021-10-13]

6.6. Design

The building is designed without basement, with four floors above ground level and a two-level flat roof (terrace). The study from which is referred to does not specify the use of material and technical solutions. After mutual consultation between the investor, the designer and experts' emphasis will be placed on the following solutions:

Basics:

The foundation structures are designed individually in relation to the engineering-geological survey, corrosion survey (stray currents), technical seismicity survey (vibration), groundwater level and according to the static design based on the relevant standards.

When designing the foundation structures, it is necessary to take care to optimise the design in terms of the safety of the structure (load-bearing capacity and stability, water penetration into the building) and from an economic point of view.

Vertical Structure:

In the architectural study, the vertical load-bearing structures are designed as a concrete column system with brickwork. The material used will be specified in the next stages of the project documentation.

The preferred solution is:

- A. Solution made of ceramic masonry (type and size according to the requirements of the static engineer), load-bearing external walls, the height of the parapet and ceiling to be adapted to the compositional dimensions
- B. Alternatively, concrete blocks, Velox, Vapis, reinforced concrete blocks (avoid solitary structures of other types (do not design solitary reinforced concrete blocks in the brick floor or the reverse if possible))

Horizontal structure:

Design the load of the ceiling structure to the standard values, always indicate in the project documentation. Ceiling slabs, including the slab above the basement under the living rooms, should be designed as cross-cut reinforced concrete, minimum thickness 180 mm. Determine the optimum ratio for specific structures - thickness of the structure vs. degree of reinforcement.

Roof:

Roof layers must be designed according to the applicable standards. The fire safety design and its requirements must be considered.

The minimum slope must correspond to the minimum requirement for the material used. The full minimum is 2% in area, not applicable for gutters.

Requirement for access to the roof according to "Subdivision of roofs according to EN 73 1901 (Design of roofs, basic provisions)".

Staircase and loggias:

The architectural design of the staircase and loggia is monolithic. The investor is inclined to use prefabrication, where it is possible and more economically favourable. When designing the precast elements, take into account the load-bearing capacity of the designed cranes.

Prefabricated internal staircase, seated on a tooth with acoustic pad, completely acoustically separated from the surrounding structures (insert acoustic pad locally and vertically into the tooth).

The minimum slope of the upper surface of the balcony slab is 3%. Balconies should be designed with a broken thermal bridge - separated by an ISO beam, the ISO beam should be insulated against water.

Floor structures:

Floor structures have not yet been designed. The decision will be made on the basis of the future investor's specifications.

The total thickness of the floor, including the footing in the normal NP, will be 130 mm. Within a single apartment unit, the tolerance between the different surfaces of the final flooring layers is a maximum of 2 mm.

Thermal protection:

The thickness and extent of insulation of all structures will be carried out according to the results of thermal technical calculations fulfilling the requirements of the standard for thermal protection of buildings ČSN 73 0540-2 and PENB parameters.

Surface modification – indoor:

It has not yet been specified. It will be specified in further stages of the documentation. The use of stucco on walls and tiling in wet areas is expected.

Plastering will always be done from the top edge of the ceiling structure (floor) to the bottom edge of the ceiling structure.

For tiling and paving, it is necessary to comply with Decree No. 398/2009 Coll.

Blowholes:

It has not yet been specified. It will be specified in further stages of documentation, according to the investor's and architect's specifications.

At the same time, the investor requires the design of a single key system (the so-called GENERAL KEY SYSTEM) in the common areas or an electronic access system. Take into account the requirements of the fire safety solution (panic fittings, door unlocking by EPS, etc.).

7. Environmental impact of the project

The project is not subject to an environmental impact assessment pursuant to Act No. 100/2001 Coll.

7.1. Air pollution

During earthworks and demolition work, increased dustiness can be expected, permissible limits will be respected through possible sprinkling.

Once completed, the construction will not be a source of air pollution. Air pollution limits will be significantly below average even under the most unfavourable dispersion conditions.

7.2. Effect of noise

The construction process will have a very little negative impact on the environment due to the increased concentration of freight traffic. Working hours will need to be adjusted to accommodate local infrastructure that will not be overloaded.

Once completed, the construction will not be a source of the noise. No facilities are designed to increase the existing noise impact on the surrounding development.

7.3. Wastewater management

During construction, the existing water on the site will be pumped out and the groundwater will be drained into the proposed sanitary sewer. Any solids will be avoided from entering the sewer.

Upon completion of the construction, the wastewater will be disposed of in a public sewer.

7.4. Waste management

During construction, all waste will be properly disposed of.

Disposal of mixed and sorted municipal waste will be provided by the municipality.

7.5. Harmful substances

Construction products releasing respirable fibres (mineral, glass, ceramic, etc.) will be suitably secured so that no further release will affect the users. Certified products and materials that comply with regulations of dangerous substances will be used.

From a global perspective, the environmental impact can be summarised as positive, as this is a project to use an empty area currently occupied by a run-down garage and unmaintained green space, which has a negative impact on the surrounding buildings.

8. Non-current assets management

The subject of the project is the acquisition of an asset in the form of real estate (apartment building) - the construction of the building will be provided by a general contractor. This is based on the investment already made in the land. It will be calculated on the basis of the equity investment already made, which will be included in the financial chapters of the project.

For each variant, the use of a loan of CZK 18 000 000 is considered at the same time, where each loan has different parameters and is further specified in Chapter 10.

8.1. Sell Model

No investments are expected to be made during the operational part of the project, there is no necessity to consider the provision of non-current assets.

8.2. Rent Model

The owner of the property will be obliged to manage the common areas of the property, all repairs, maintenance and expenses for the property will be under his/her management. It is therefore advisable to set aside a repair fund and implement repairs based on condition analysis and scheduling. Other expenses will be included in the operating costs of the project, see the following chapter.

The repair fund was set at CZK 165 288.

9. Current assets management

Reserve conditions in the implementation part of the project will be under the control of the construction contractor, it will not affect the financial plan of the investor.

In the operational part, it is not planned to purchase equipment for the residential units. Based on the length of the loan term, the building owner will incur monthly liabilities to the bank.

9.1. Rent Model

In the case of rental housing units, monthly receivables will be incurred for the use of the unit, which also consists of contributions to the utilities in the public areas of the property.

The entire property is covered by property insurance.

The following table sets out the main annual costs for the use of the building, which will be incurred by the building owner during operation phase.

Table 13 - Operating Costs of the building – Rent Model

Operating costs of the building - rent model	
Costs	CZK/year
Property insurance [16]	6,300 Kč
Cleaning - common area [17]	25,000 Kč
Disposal of waste [18]	7,920 Kč
Maintenance - outdoor [19]	5,000 Kč
Property tax [20]	8,464 Kč
Electricity demand - common areas [21]	18,328 Kč
Total operating costs	71,012 Kč

Source: Own creation [2021-10-13]

10. Financial model and analysis

10.1. Input data

The following premises will be used for the financial models:

Sell Model:

- The land will be acquired from own resources (actual starting point) - the land is already privately owned and the actual price is used in the model
- Pre-investment milestones will be financed from own resources
- The implementation part of the project will be financed partly from own resources and partly by a developer loan (Tables 14-15.).
- Discounted flows from the investment phase – construction
- Discount rate: 5%
- Period of consideration: I. 2020 – IV. 2026 (land acquisition – sale of all units)
- Lifetime of investment: 3 years

Table 14 - Loan input data - Sell Model

Loan input data - sell model	
Loan	18,000,000
Interest rate	4.00%
Total I will pay	18,529,760
Financial cost	529,760
Type	single payments

Source: Own creation [2021-11-06]

Table 15 - Instalment schedule - Sell Model

Repayment schedule - sell model												
year	2024				2025				2026			
quarter	I.	II.	III.	IV.	I.	II.	III.	IV.	I.	II.	III.	IV.
Amount owed			1,543,191	4,844,510	8,496,831	12,026,681	15,683,917	18,425,950	3,425,950	3,460,210	3,494,812	3,529,760
Repayment									15,000,000	-	-	3,529,760
Instalment									425,950	-	-	103,810
Amortization									14,574,050	-	-	3,425,950

Source: Own creation [2021-11-06]

Rent Model:

- The land will be acquired from own resources (actual starting point) - the land is already privately owned and the actual price is used in the model
- Pre-investment milestones will be financed from own resources
- The implementation part of the project will be financed partly from own resources and partly by a developer loan (Tables 16-17.).
- Discounted flows from the investment phase – construction
- Discount rate: 5%
- Income tax rate: 19% [22]
- Period of consideration: 2020 – 2063 (land acquisition – 38 years of operation)
- Lifetime of investment: 40 years

Table 16 - Loan input data - Rent Model

Loan input data - rent model	
Loan	18,000,000 Kč
Repayment length (years)	31
Interest rate	3.00%
Monthly payment	75,889 Kč
Total I will pay	28,058,508
Financial cost	10,058,508
Type	monthly instalments

Source: Own creation [2021-11-06]

Table 17 - Instalment schedule - Rent Model

Repayment schedule - rent model												
year	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Amount owed	4,829,079	18,144,872	17,778,551	17,401,239	17,012,608	16,612,318	16,200,020	15,775,353	15,337,945	14,887,416	14,423,370	13,945,403
Instalment			910,668	910,668	910,668	910,668	910,668	910,668	910,668	910,668	910,668	910,668
Interests			544,346	533,357	522,037	510,378	498,370	486,001	473,261	460,138	446,622	432,701
Amortization			366,322	377,311	388,631	400,290	412,298	424,667	437,407	450,530	464,046	477,967
year	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047
Amount owed	13,453,097	12,946,022	12,423,735	11,885,779	11,331,684	10,760,967	10,173,128	9,567,654	8,944,015	8,301,668	7,640,050	6,958,583
Instalment	910,668	910,668	910,668	910,668	910,668	910,668	910,668	910,668	910,668	910,668	910,668	910,668
Interests	418,362	403,593	388,381	372,712	356,573	339,951	322,829	305,194	287,030	268,320	249,050	229,201
Amortization	492,306	507,075	522,287	537,956	554,095	570,717	587,839	605,474	623,638	642,348	661,618	681,467
year	2048	2049	2050	2051	2052	2053	2054	2055	2056			
Amount owed	6,256,673	5,533,705	4,789,048	4,022,051	3,232,045	2,418,338	1,580,220	716,959	-			
Instalment	910,668	910,668	910,668	910,668	910,668	910,668	910,668	910,668	738,468			
Interests	208,757	187,700	166,011	143,671	120,662	96,961	72,550	47,407	21,509			
Amortization	701,911	722,968	744,657	766,997	790,006	813,707	838,118	863,261	716,959			

Source: Own creation [2021-11-06]

10.2. Determination of total costs – investor estimation of the structure

The investment costs were determined using a rough estimation of the total construction costs. The chapter addresses the sales variant, meaning total costs excluding operating costs, which will be determined later in the variant solution of cash flows.

First, the basic budget costs were determined for construction objects, of which the cost of other items is determined as a percentage. The price of the land is taken from the purchase contract, whose further details the investor does not want to publish.

A. Design and survey work

The price for design and survey work is determined using the design and engineering fee schedule. It is based on the amount of the basic budget costs, see point C. The amount of the basic budgeted costs (BBC) is CZK 15 901 232.

The following figures (Figures 21-22.) show the pricing of the design and engineering work. One pricing is based on the schedule of works. The second pricing is based on the fee schedules according to ČKAIT and ČKA. The average of these prices is used for the estimation. Specifically, CZK 1 428 625.

Figure 21 - Share of the fee in individual performance phases according to the Tariff for engineering and design work

Parametry stavby ^

Kategorie stavby ? Občanské, bytové a zdravotnické	Pásmo ? Pásmo III	Investiční náklady [Kč] ? 15 901 232	Rekonstrukce ? Ne
Očekávaná pracnost ? Průměrná	Celková pracnost [h] 2 150	Hodinová sazba Kč/hod ? 500	Celková cena [Kč] 1 075 000

Výkonová fáze	Projektová činnost (PČ)		Inženýrská činnost (IČ)	
	%	Cena [Kč]	%	Cena [Kč]
Zabezpečení vstupních podkladů Shromáždění podkladů, stanovení cílů (VSP) Zprostředkování průzkumů a zaměření (IČ VSP) - provedení není v ceně	<input checked="" type="checkbox"/>	1 10 750 Kč	<input checked="" type="checkbox"/>	2 21 500 Kč
Fáze předprojektové přípravy Zpracování studie (ST)	<input checked="" type="checkbox"/>	5 53 750 Kč	<input checked="" type="checkbox"/>	0 0 Kč
Fáze územního řízení Dokumentace pro územní řízení (DUR) Projednání, vypracování žádosti, vyvěšení informace (IČ ÚŘ)	<input checked="" type="checkbox"/>	12 129 000 Kč	<input checked="" type="checkbox"/>	4 43 000 Kč
Fáze územního a stavebního řízení Společná dokumentace pro územní řízení a stavební povolení (DUR+DSP) Projednání, vypracování žádosti, vyvěšení informace (IČ ÚŘ+SŘ)	<input type="checkbox"/>		<input type="checkbox"/>	
Fáze stavebního řízení Dokumentace pro stavební povolení nebo ohlášení stavby (DSP, DOS) Projednání, vypracování žádosti, vyvěšení informace (IČ SŘ)	<input checked="" type="checkbox"/>	23 247 250 Kč	<input checked="" type="checkbox"/>	2 21 500 Kč
Fáze stavebního řízení Dokumentace pro stavební povolení nebo ohlášení stavby bez předchozího stupně (DSP+, DOS+) Projednání, vypracování žádosti, vyvěšení informace (IČ SŘ)	<input type="checkbox"/>		<input type="checkbox"/>	
Fáze stavebního řízení a provádění stavby Dokumentace stavby jednodušší, vč. soupisu stav. prací, dodávek a služeb s výkazem výměr (DSJ) Projednání, vypracování žádosti, vyvěšení informace (IČ SŘ+PS)	<input type="checkbox"/>		<input type="checkbox"/>	
Fáze provádění stavby Dokumentace provádění stavby, vč. soupisu stav. prací, dodávek a služeb s výkazem výměr (DPS) Projednání (IČ PS)	<input checked="" type="checkbox"/>	24 258 000 Kč	<input checked="" type="checkbox"/>	2 21 500 Kč
Fáze spojené s prováděním stavby Autorský dozor (AD) Technický dozor investora (TDI)	<input checked="" type="checkbox"/>	5 53 750 Kč	<input checked="" type="checkbox"/>	23 247 250 Kč
Fáze po dokončení stavby Dokumentace skutečného provedení stavby (DSPS) Zabezpečení zkuš. provozu, kolaudace, předčasné užívání stavby (IČ DS)	<input type="checkbox"/>		<input type="checkbox"/>	
Součet		70 752 500 Kč		33 354 750 Kč

Nabídková cena ^

Celkem za PČ+IČ [Kč] 1 107 250	Ostatní náklady [Kč] 0	Zdůvodnění ostatních nákladů zaměření, průzkumy, model, cestovné, vč. poplatky, překlady
Zaokrouhlení 1	Nabídková cena bez DPH [Kč] 1 107 250	Sazba DPH 0%
		Nabídková cena vč. DPH [Kč] 1 107 250

Source: [23] [2021-10-05]

Figure 22 - Share of the fee in each phase according to the Fee Schedule Regulations

Základní soubor služeb

Změny zpracovatele, projektu, opakování Zobrazit termíny **Obnovit původní hodnoty**

<input type="checkbox"/>	Označení	Název služby	%	Pracnost [h]	Sazba [Kč/h]	Cena [Kč]
<input checked="" type="checkbox"/>	FS1	Příprava zakázky (PZ)	1	35	500	17 500 Kč
<input checked="" type="checkbox"/>	FS2	Dokumentace návrhu / studie stavby (DNS)	13	455	500	227 500 Kč
<input type="checkbox"/>	FS2*	Variantské řešení návrhu / studie stavby	13	455	500	227 500 Kč
<input type="checkbox"/>	FS2+	Dokumentace návrhu / studie stavby bez předchozí fáze (DNS+)	14	490	500	245 000 Kč
<input type="checkbox"/>	FS2_OČ	Obstaravatelská činnost pro návrh / studii stavby (OČ ST)	4	140	500	70 000 Kč
<input checked="" type="checkbox"/>	FS3	Dokumentace pro vydání územního rozhodnutí (DUR)	15	525	500	262 500 Kč
<input type="checkbox"/>	FS3+	Dokumentace pro vydání územního rozhodnutí bez předchozí fáze (DUR+)	21	735	500	367 500 Kč
<input type="checkbox"/>	FS3+FS4	Společná dokumentace pro územní rozhodnutí a stavební povolení (DUR+DSP)	30	1 050	500	525 000 Kč
<input type="checkbox"/>	FS3_OČ	Obstaravatelská činnost pro územní rozhodnutí (OČ UR)	8	280	500	140 000 Kč
<input checked="" type="checkbox"/>	FS4	Dokumentace pro vydání stavebního povolení nebo ohlášení stavby (DSP, DOS)	22	770	500	385 000 Kč
<input type="checkbox"/>	FS4+	Dokumentace pro vydání stavebního povolení bez předchozí fáze (DSP+ DOS+)	33	1 155	500	577 500 Kč
<input type="checkbox"/>	FS4+FS5	Dokumentace stavby jednodušší (DSJ)	50	1 750	500	875 000 Kč
<input type="checkbox"/>	FS4_OČ	Obstaravatelská činnost pro stavební povolení nebo ohlášení stavby (OČ SP OS)	8	280	500	140 000 Kč
<input checked="" type="checkbox"/>	FS5	Dokumentace pro provádění stavby (DPS)	32	1 120	500	560 000 Kč
<input type="checkbox"/>	FS5+	Dokumentace pro provádění stavby bez předchozí fáze (DPS+)	47	1 645	500	822 500 Kč
<input checked="" type="checkbox"/>	FS6	Soupis prací a dodávek (SPD)	5	175	500	87 500 Kč
<input type="checkbox"/>	FS6+	Soupis prací a dodávek zpracovaný před DPS, vč. rozpracování DPS (SPD+)	27	945	500	472 500 Kč
<input checked="" type="checkbox"/>	FS7	Autorský dozor projektanta (AD)	12	420	500	210 000 Kč
<input type="checkbox"/>	FS7+	Autorský dozor projektanta bez přechozí fáze (AD+)	17	595	500	297 500 Kč
<input type="checkbox"/>	FS8	Technický dozor investora (TDI)	23	805	500	402 500 Kč
<input type="checkbox"/>	FS9	Dokumentace skutečného provedení stavby (DSPS)	3	105	500	52 500 Kč
	Součet		100	3 500		1 750 000 Kč

Source: [24] [2021-10-05]

B. Operational sites

This investment is not expected.

C. Construction objects

The detailed itemized costs of SO 00 - Field preparation was composed on the basis of the study, visits to the area of interest, orthophotos, consultations with experienced cost experts and KROS software.

The prices of the other buildings are based on the construction industry price indices for 2021 [25]. The quantity is calculated from the drawing part of the study and the site visit.

Table 18 - Calculation of basic budget costs (BBC)

Calculation of basic budget costs (BBC)								
Object	Item name	UoM	Quantity	Kč/UoM	Total VAT not included [Kč]	VAT	Total VAT [Kč]	Total VAT included [Kč]
SO 00	Field preparation				358 567	21%	75 299	433 866
a	Bourání garáž				178 931			
1	bourání základů	m ³	27	5300	143 100			
2	bourání stěn	m ³	19.8	746	14 771			
3	bourání stropu	m ³	6	3510	21 060			
b	Kácení stromů	ks	1	316	316			
c	Kácení keřů	ks	30	17	510			
d	Bourání protihlukové stěny	m ²	76	610	46 360			
e	Bourání asfaltového povrchu	m ²	90	280	25 200			
f	Naložení, odvoz a uložení suti směsné na skládku	t	143	750	107 250			
SO 01	Residential building	m³	2555	5940	15 176 700	15%	2 276 505	17 453 205
SO 02	Access gate	kpl	1	50000	50 000	21%	10 500	60 500
SO 03	Parking area	m²	80	923	73 840	21%	15 506	89 346
SO 04	Connection				91 015	15%	13 652	104 667
a	vodovod DN200	bm	10	3600	36 000			
b	plynovod - DN50	bm	6.8	1010	6 868			
c	kanalizace - DN200	bm	4.4	6445	28 358			
d	elektro	kpl	1	19789	19 789			
SO 05	Internal connection				151 110	15%	22 667	173 777
a	kanalizace dešťová - DN150	bm	22	5505	121 110			
b	retenční nádrž - 5m ³	ks	1	30000	30 000			
Total BBC VAT not included [Kč]					15 901 232			
Total VAT [Kč]					2 414 129			
Total BBC VAT included [Kč]					18 315 361			

Source: Own creation [2021-10-16]

D. Machinery, facilities, inventory

This investment is not expected.

E. Work of art

This investment is not expected.

F. Side costs associated with the location of the building

This item mainly includes costs related to the construction, operation and disposal of site equipment, difficult production conditions associated with the location of the construction, or traffic constraints. The price will be set at a percentage of 4% of the BBC.

G. Other costs

Costs associated with fees, taxes, survey work. They are set at 2,5 % of the BBC.

H. Reserve

The reserve serves as a provision for unforeseen costs (claims). It is set at 20% of the BBC.

The reserve is left on the very safe side. It includes an amount for unexpected situations and risks. Such as increases in material prices etc.

I. Other investments

The price of the land is taken from the purchase contract, whose further details the investor does not want to publish. Price of the land was CZK 300 000.

J. Non-current capital assets

This investment is not expected.

K. Operating costs

Operating costs are not included in the total price of the work. They are included in the cash flow in the rental variant.

L. Completion activity

Project coordination costs are valued as 2% of the BBC.

Table 19 - Total structure estimation

Total structure estimation					
Section	Name	Price Vat not included [Kč]	VAT	VAT [Kč]	Price VAT included [Kč]
A.	Project and survey work	1 428 625	21%	300 011	1 728 636
B.	Operational sites		0		
C.	Construction objects	15 901 232	-	2 414 129	18 315 361
D.	Machinery, facilities, inventory		0		
E.	Work of art		0		
F.	Side costs associated with the location of the building [4% of BBC]	636 049	15%	95 407	731 457
G.	Other costs [2,5% of BBC]	397 531	21%	83 481	481 012
H.	Reserve [20% of BBC]	3 180 246	21%	667 852	3 848 098
I.	Other investment (land)	300 000	21%	63 000	363 000
J.	Non-current capital assets		0		
K.	Operating costs		0		
L.	Completion activity [2% of BBC]	318 025	21%	66 785	384 810
Total costs (estimation)		22,161,708 Kč		3,690,666 Kč	25,852,374 Kč

Source: Own creation [2021-10-16]

10.3. Project Cash Flow

Cash Flow or financial flow is defined as the difference between a company's income and expenses. The statement will be determined by the direct method - the income and expenses in each year of the project will be determined separately based on the previous chapters. [3]

In the case of this analysis, a portion is based on cash flows that have already taken place (land purchase), a portion is tied to expected milestones (obtaining permits), and the remaining portion is planned cash flows.

Own financial resources are not considered directly in the income table, but it is considered that negative flows need to be covered by own resources.

For comparison, the cash flow variation without and with financing will be determined in each model. Depreciation and income tax are only considered for the Rent Model. However, only depreciation of apartment building is considered. Depreciation does not include the amortisation of losses from previous years. Since this is mostly planned cash flow it allows us to be on the safe side as far as taxes are concerned.

The flows are compiled using the direct method, i.e. they are included in the table in the time period when they are committed and not in the period when they are actually made. [5]

In addition, the Cash Flow includes the cumulative Cash Flow balance without the effect of financing and with the effect of external financing, which is determined by the sum of the differences between the project's income and costs for the previous years, including the year under calculation.

Sell Model:

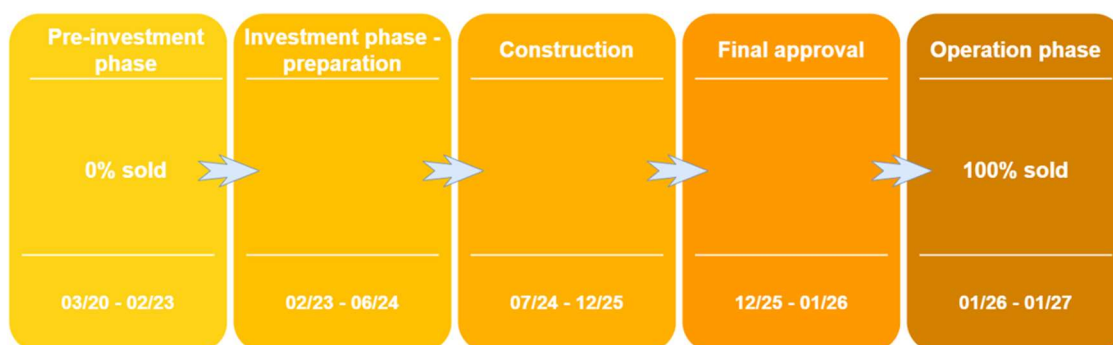
Income from sales:

The trend of the sales rate of individual residential and non-residential premises including their accessories is assumed analogically according to the consultation with experts and internal documents of the company, as see below.

The commercial launch will start from obtaining the building permit, i.e., 03/2024. It is assumed that the flats etc. will be sold within 1 year from the approval.

Absolute financial values will be used, inflation will not be included.

Figure 23 - Expected sales trend over time



Source: Own creation [2021-10-23]

Table 20 - Expected sales by trend - quantity

Expected sales by trend - quantity						
Phase/Unit	1+kk	2+kk	4+kk	com. sp.	cellar	parking
Preparation	0	1	0	0	1	1
Construction	1	2	0	0	2	2
Final approval	1	0	0	0	0	1
Operation	0	0	1	1	1	2
Total	2	3	1	1	4	6

Source: Own creation [2021-10-23]

The final cash flow statements for the Sell Model can be found in Attachment 8 - Cash flow variants.

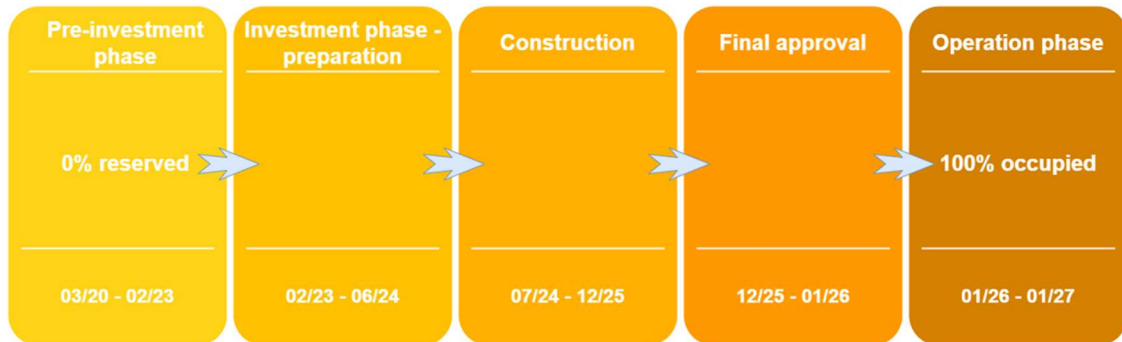
Rent Model:

Income from rent:

A reservation system will be launched with the start of construction. With the signing of the reservation contract for renting the apartment, the potential tenant will pay a deposit of two monthly rents. The occupation of the apartments will start after the building is approved. Payments will be made monthly.

All rental income is reduced in the cash flow by a factor of 0.75 to reflect the time to replace and find new tenants.

Figure 24 - Expected occupied (reservation) trend over time



Source: Own creation [2021-10-23]

Table 21 - Expected occupancy (reservation) by trend - quantity

Expected occupancy (reservation) by trend - quantity						
Phase/Unit	1+kk	2+kk	4+kk	com. sp.	cellar	parking
Preparation	0	0	0	0	0	0
Construction	2	2	0	1	3	4
Final approval	0	1	0	0	0	1
Operation	0	0	1	0	1	1
Total	2	3	1	1	4	6

Source: Own creation [2021-10-23]

The final cash flow statements for the Rent Model can be found in Attachment 8 - Cash flow variants.

10.4. Comment to the financial model

Financial planning was considered in two variants of the Sell Model and the Rent Model. First, the input data for each variant were determined. The main differences in the input data are in the method of financing with external resources. This is because each model is a different investment project that requires different financing.

In the Sell Model, a short-term development loan is considered, which is repaid in several large instalments corresponding to the expected income from the sale. This setup makes the project financially sustainable and does not involve an unnecessarily large financial cost in the form of interest.

In the Rent Model, a long-term development loan paid monthly is considered. The instalments are set to be covered by the income of the project in the operational phase. This setup makes the project sustainable in the long term. In addition, income tax is taken into account in this variant.

It can be noticed that the two investments are very different in character. The first can be described as short-term and the second as long-term. For this reason, it is also difficult to compare the investments with each other. In the following, the advantages and disadvantages of each model will be described. However, the final decision on which option to choose is up to the investor.

Cash Flow:

Sell Model

Based on the existing chapters of the feasibility study, the cash flow for the Sell Model has been elaborated.

As we can see from the purchase of land in the pre-investment phase to the end of the investment phase of preparation is a period of expenditure and negative cash flow.

With the obtaining of the building permit comes the first income of the project. The loan under consideration will also be reflected here. At the same time, the investment phase of construction, which is the most financially costly, also comes. However, due to the financing and additional income from unit reservations, some cash flow with financing is positive.

With the obtaining of the building permit comes the additional payments for the reserved units. This will allow a large portion of the loan to be repaid and start turning the project into a positive cumulative cash flow. The cumulative flow positivity continues to grow with the operational phase and the sale of the remaining units. The sale of the last units is associated with the instalment of the loan and the exit of the investment with positive cumulative cash flows.

An assessment of the financial indicators is made in the next chapter.

Rent Model

Based on the existing chapters of the feasibility study, the cash flow for the Rent Model has been elaborated.

As we can see from the purchase of land in the pre-investment phase to the end of the investment phase of construction is a period of expenditure and negative cash flow.

As we can see from the purchase of land in the pre-investment phase to the end of the investment phase of construction is a period of expenditure and negative cash flow. Already at the end of the construction, income from unit reservations is showing up. However, these amounts are minimal in relation to the expenditure in this phase and can be said to have little effect on cash flow.

With the start of the operational phase, the project is gaining positive cash flow. However, the effect in the variant with financing is minimal because the loan instalments and operating costs are set to be slightly covered by the rental income.

It can also be noticed that more than the first half of the operating phase of variant with financing generates positive cash flow, but no income tax is paid. This is due to the generation of a negative economic profit due to the effect of the expense in the form of interest. On the contrary, the last six years of repayment of the loan has generated negative cash flow thanks to the income taxes paid as a result of the reduction in interest and the generation of a positive economy profit.

The discounted cumulative cash flow remains negative after forty years. However, it should be noted that the residential house is still owned by the investor and this indicator would turn positive with the sale of this property.

An assessment of the financial indicators is made in the next chapter.

11. Project efficiency and sustainability

For the purposes of this thesis, a simplified real discount rate of 5% was chosen.

11.1. Sell Model

Table 22 - Main efficiency indicators – Sell Model

Main efficiency indicators - sell model	
NPV 3 years of investment - without financing	6,336,283
NPV 3 years of investment - with financing	6,875,116
IRR - without financing	7%
IRR - with financing	11%
PI - without financing	1.29
PI - with financing	2.65

Source: Own creation [2021-11-13]

As can be seen above, the net present value comes out positive in both variants. The option with financing is slightly more positive. In this case, there was a situation where the cumulative value of cash flow came out higher in the variant without financing. However, the NPV shows a different case. This is due to the use of external resources at a lower interest rate than the discount rate. In other words, a financial source that is cheaper for us is used. Based on the net present value, we can say that the project is profitable.

In both cases, the internal rate of return is higher than the discount rate used. We can say that from the IRR perspective, the project is acceptable in both variants and more favourable with the use of external resources.

The profitability indexes come out as acceptable in both variants. However, one crown invested earns us more in the variant with financing.

According to the main indicators, both options are acceptable. The option with financing, where for a smaller investment, we get more favourable indicators, is moved to the recommendation. Moreover, this will allow to use other own money for similar investment elsewhere at the same time, which will generate even higher profit.

This investment can be viewed as short-term with conversion to assets in the form of cash reserves. If the investor wants to use the cash further, this option is recommended.

11.2. Rent Model

Table 23 - Main efficiency indicators – Rent Model

Main efficiency indicators - rent model	
NPV 38 years operation - without financing	(7,474,651)
NPV 38 years operation - with financing	(3,332,733)
IRR - without financing	2.01%
IRR - with financing	0.41%
PI - without financing	0.66
PI - with financing	0.20

Source: Own creation [2021-11-13]

As we can see above the net present value comes out negative in both variants. In this case, there was a situation where the cumulative value of cash flow came out higher in the variant without financing. However, the NPV shows a different case. This is due to the use of external resources at a lower interest rate than the discount rate. At the same time, the cumulative cash flow comes out positive, but if we include the discount rate we cannot consider the project as positive in terms of net present value. Based on the net present value, we can say that the project is unprofitable.

In both cases, the internal rate of return is below the discount rate. We can say that from the IRR perspective, the project is unacceptable in both variants.

The profitability indexes come out as unacceptable in both variants. However, one crown invested loses less in the variant without financing.

According to the main indicators, both options are unacceptable and are not recommended for implementation.

Although all indicators point against the investment for a set period, it is important to remember that the investor has property instead of cash. This is something that the indicators do not show. The indicators would turn positive once the property is sold. If an investor does not want to continue to manage the money and at the same time wants to maintain the value of money and theoretically speculate on the price of real estate, this investment is recommended.

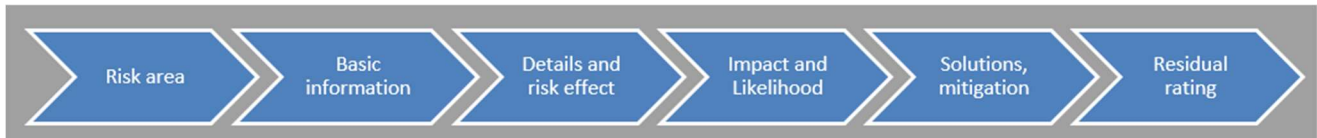
12. Risk analysis

This chapter will identify the risks. Although the risks in the two models are very similar in some ways they differ, therefore risks are identified in both the sale and Rent Models.

In Table 24, the impacts of the risks and their probabilities are set. In Attachment 9 – Risk management we can find the list of risks, their Risk Rating, the measures taken and the new Risk Rating after taking measures.

The following risk assessment procedure is used in this thesis (see Figure 25.).

Figure 25 - Risk assessment procedure



Source: Own creation [2021-10-30]

Table 24 - Risk management - severity/impact and likelihood

Risk management - severity/impact and likelihood table						
Area	Risk	Severity / Impact				
		1	2	3	4	5
Construction, Plannig, Financial, Legal and Market	Profit:	Impact in GM <0,2%	Impact on GM 0,2-1%	Impact on GM 1-2%	Impact on GM 2-4%	Impact on GM >4%
	Project start:	Risk of delay <3 months	Risk of delay <1 year	Risk of delay approx. 1 year	Risk of delay 1-2 year	Risk of delay >2 years
Health & Safety	Injury or illness:	First aid injury or illness	Minor injury or illness	Over 3 day injury or illness	Major injury or illness	Fatality, disabling injury etc.

Likelihood				
1	2	3	4	5
Very unlikely	Unlikely	Likely	Very Likely	Almost certain

Severity	catastrophic	5	5	10	15	20	25
	critical	4	4	8	12	16	20
	serious	3	3	6	9	12	15
	marginal	2	2	4	6	8	10
	negligible	1	1	2	3	4	5
			1	2	3	4	5

High Risk Substantive Reduction Action Required
Medium Risk ALARP Reduction Action Required
Low Risk Acceptable

incredible	remote	occasional	probable	frequent
Likelihood				

Source: Own creation [2021-10-30]

The final risk statements for the sell and Rent Model can be found in Attachment 9 – Risk management.

12.1.Comment to the risk analysis

All identified risks fall between high and medium risk. Therefore, measures need to be taken to reduce the impact or likelihood of occurrence.

After the measures have been taken, one risk still falls into the medium-risk category in each variant. This is the case for risks named 'Nona-sale of flats in the assumed scenario' respectively "Nona-rent of flats in the assumed scenario".

These risks need special attention and additional measures should be taken if necessary. Such measures may include public participation, continuous monitoring of market developments, timely marketing, etc.

The other risks fall into the low-risk category and are acceptable to the project.

13. Project schedule

The final project schedule can be found in Attachment 10 - Project schedule.

13.1. Comment to the schedule

The schedule includes activities from land purchase to the operation of the building. The activities are arranged in a time sequence. The schedule is made in detail of estimation and performance phases according to the engineering design work tariff. It is partly based on reality (e.g., land purchase or architecture study) and partly based on expectations.

A longer pause after the architectural study is considered. We are currently in this period. This is happening because of the change in the market due to the pandemic and the owner of the project is leaving space for the right decision whether to continue the project or not. This thesis could also help him to make the right decision.

Deadlines for consultation of the authorities concerned (DOSS), construction procedure and prerequisite time limits for appeals are set on the basis of expert consultations with specialists in engineering and their experience with similar projects.

Construction:

Before the construction of the main building can begin, it is planned to prepare the field and make the connections. The construction of the residential building is estimated for 16 months, this was done based on consultation with experienced engineers.

The construction durations were set rather pessimistic in order to cover possible risks associated with interruption of works due to bad weather.

14. Conclusion

In this thesis, a feasibility study was processed for an investment project in the form of the construction of an apartment building in Turnov in Nádražní Street. It focused on the preparation, implementation and operational part of the project. This project was solved in the variants of sale and rent of all units and relevant parts. Aim of the thesis was to contribute to the optimal decision making regarding the overall setting of the project, to recommend particular improvements of the project and to compare the mentioned variants.

At the beginning of the study planned plot for the project's realization was evaluated as favourable both in terms of accessibility and urban planning. It is located in an area zoned for residential development, in the centre of the town, with relatively good accessibility to Prague. Currently the land is very neglected, overgrown with wild bushes, there is an unused garage and in general the project can only benefit it. Otherwise, there are apartment buildings and a bus station in the neighbourhood. In general, unused sites in city centres with surrounding residential buildings and the possibility of construction according to the zoning plan are suitable sites for residential development.

Based on the market analysis, several factors have been identified that will help successful development of the project. Population in the Czech Republic is regularly increasing (since 2002 only two annual declines have been observed), the town of Turnov is above this trend (i.e. no decline has been recorded since 2002). The main reason of this trend is the increase in the number of people moving to the town. The data also shows that new housing construction does not cover the demand created by new inhabitants. The housing shortfall since 2002 is over 340 units cumulatively. It appears that the shortage is so significant that if any mix of the apartment types is chosen, there will always be some demand. The data show that the population in Turnov is ageing and the largest demand will be coming from families or couples starting a family.

In addition to the above said, a higher project's share of apartments with a large floor area, which also brings a higher selling price, could have a negative impact on the sales calendar. It is recommended that no more than one unit with a floor area above 90 sqm is included. This trend of insufficient housing construction relative to an overwhelming demand can be observed throughout the entire country. It can be said that the construction of new housing is not satisfying the demand.

On the basis of the market analysis, price lists of apartments, non-residential spaces, parking spaces and cellars were established. The estimated revenues from sales are therefore CZK 30.88 mil. and from renting are CZK 1.15 mil./year at 75% capacity.

Furthermore, the project was analysed in terms of technical and technological solutions. It was found out that if the technological procedures are respected the environmental impact of the structure will be positive.

In the chapters on assets management, the annual costs of operating the facility in the case of the Rent Model were estimated to the value of CZK 236 ths. The largest expenses are the repair fund and cleaning of common areas. Repair fund is an essential component to keep building in operatable condition and will also help extend the life of the building. Cleaning of common areas is part of the service provided by the facility operator. Other costs addressed in these chapters are, for example, property insurance or waste management. It can be said that every construction project in the operational phase faces these costs.

Financial analysis was an important part of the study. The input parameters for each model are very similar, they do differ regarding the type of loan. In both cases, a loan of CZK 18.00 mil. is considered. The sale model considers two early single instalments,

while the Rent Model uses monthly instalments over several years. In both cases, the payments are adjusted for a sustainable cash flow. The total investment costs are set at CZK 22.16 mil.. In order to establish the project's cash flows, a trend in sales or occupancy of rental units was established. Based on that income of the project were determined. Project costs are based on the project schedule, which is included in the final chapter.

Based on the outputs of the financial analysis, indicators of financial efficiency and sustainability of the project were determined: net present value (for the variant period), internal rate of return and profitability index. In both variants, benefits of the investment can be found. However, it is necessary to have the right financing setup for a sustainable cash flow. This means that we should generate as much positive cash flow as possible. By using early single instalments, we can achieve this in the sell variant. In the Rent Variant, it is important to have operating expenses lower than rental income, in this case the optimal adjustment of the instalment amount is the most important.

In general, we can say that the development of a residential property and its subsequent sale or rent brings profit or other value in the form of money saved in the property. However, it is important to remember that each project is unique and there are different conditions and consequences that may somehow affect the project. For this reason, all aspects of an investment should be carefully considered before making any such investment decision. The feasibility study performed has shown us that it can be used as a tool to properly evaluate the investment.

The risk analysis identified the most relevant risks and their impacts before and after the implementation of the measures. The most serious risk, even after the implementation of the measures, appears to be the risk of not meeting the expected sales or rents trends. Such a risk may jeopardise the financial indicators and the implementation of the whole project. It is therefore essential to pay close attention to it. For construction projects in general, it is crucial to find customers and to secure part of the financing through pre-sales/pre-reservations.

The last chapter consists of the construction schedule, which was based on real information obtained from consultations with designer and authorities. Based on that, a schedule has been elaborated with the pre-investment phase running from 03/2020 to 02/2023, investment preparation from 02/2023 to 06/2024 and construction from 07/2024 to 12/25. The schedule is something that is very specific and cannot be easily generalized for a construction project. The schedule depends on a lot of inputs such as size, location, time period, etc. Further investigation would be needed to make general conclusions regarding the schedule.

In conclusion, this thesis brings together all the necessary information needed for the correct decision making on the housing construction project Nádražní street, Turnov. The work considers two options and sees both as cost-effective and profitable. Each has its specifics and should be used for a different intention, primarily from the time perspective. It is up to the project owner to make the final decision and this work can be used as a guide. If the owner decides to continue with the project, the feasibility study created can be practically used as a management tool. In this case, it needs to be updated.

15. References

15.1. Literature

- [1] **Sieber, Ing. Petrik.** Studie proveditelnosti (Feasibility study). Ministerstvo pro místní rozvoj. [Online] 2004. [Citace: 28.3.2021.] <https://www.dotaceeu.cz/getmedia/c4772855-8ffc4036-97fc-2d7caa1ad86e/>.
- [2] **Fotr, Jiří, Souček, Ivan.** Investiční rozhodování a řízení projektů: jak připravovat, financovat a hodnotit projekty, řídit jejich riziko a vytvářet portfolio projektů. Praha: Grada Publishing, s.r.o., 2011. ISBN 80-247-3293-0.
- [3] **Fotr, Jiří.** Strategické finanční plánování. Praha: Grada Publishing, s.r.o., 1999. ISBN 80-716-9694-3
- [4] **Helfert, Erich.** Financial Analysis Tools and Techniques: A Guide for Managers. 1st ed. New York (USA): McGraw-Hill Education, 2001. 480 p. ISBN 978- 0071378345
- [5] **Prostějovská, Zita, a kolektiv.** Management výstavbových projektů. Praha 6 : Česká technika - nakladatelství ČVUT, Thákurova 1, 160 41 Praha 6, 2008. ISBN 978-80-01-04142- 0
- [6] **Tománková, Jaroslava, a Dana Čápková.** Management staveb. Praha: FinEco, , 2013. ISBN 978-80-0186590-12-7
- [7] **Rastogi, Nitank, and M.K. Trivedi.** Pestle Technique – A tool to Identify External Risk in Construction Projects [Online] 2016. [Citace: 28.3.2021.] <https://www.irjet.net/archives/V3/i1/IRJET-V3I165.pdf>
- [8] **Kotler, Philip.** Moderní marketing. Praha: Grada Publishing, s.r.o., 2007. ISBN 978-80-247-1545-2
- [9] **Fotr, Jiří, Hlinica, Jiří.** Aplikovaná analýza rizika ve finančním management a investičním rozhodování. Praha: Grada Publishing, 2007. ISBN 978-80-247-5104-7
- [10] **Český statistický úřad.** Domy a byty – úroveň bydlení [Online] 2014. [Citace: 5.10.2021.] https://www.czso.cz/csu/czso/13-5320-03-za_rok_2001-_5_uroven_bydleni.
- [11] **Investopedia.** Strength, Weakness, Opportunity, and Threat (SWOT) analysis [Online] 2021. [Citace: 7.10.2021.] <https://www.investopedia.com/terms/s/swot.asp>
- [12] **Obce v datech.** Obce v datech [Online] 2021. [Citace: 7.10.2021.] <https://www.obcevdtech.cz/>
- [13] **MMR, Delote.** Analýza nájmů v České Republice [Online] 2021. [Citace: 11.10.2021.] <https://www.mmr.cz/getmedia/64d1fb1f-7672-426c-a3ac-1d6c2ea9127e/MMR-MTR-Analyza-najemneho.pdf.aspx?ext=.pdf>
- [14] **RealityMix.** Statistika nemovitostí [Online] 2021. [Citace: 11.10.2021.] <https://realitymix.cz/statistika-nemovitosti/>
- [15] **Mioweb, Šebatský, Viktor.** Kolik stojí web [Online] 2021. [Citace: 11.10.2021.] <https://www.mioweb.cz/velky-prehled-kolik-stoji-web/>
- [16] **Kooperativa.** Pojištění majetku [Online] 2021. [Citace: 15.10.2021.] <https://www.koop.cz/pojisteni/pojisteni-majetku>
- [17] **Úklidové služby Richterovi.** Úklidové služby [Online] 2021. [Citace: 15.10.2021.] <https://www.uklidovesluzbyrichterovi.cz/>
- [18] **Turnov, oficiální stránky města.** Poplatek za komunální odpad v roce 2021 [Online]

2021. [Citace: 15.10.2021.] <https://www.turnov.cz/cs/aktuality/mestsky-urad-informuje/poplatek-za-komunalni-odpad-v-roce-2021.html>

[19] **Zaharada-raj.** Údržba zahrad [Online] 2021. [Citace: 15.10.2021.] <http://www.zaharada-raj.cz/udrzba-zahrad.html>

[20] **Adisreg.** Daňový portál [Online] 2021. [Citace: 15.10.2021.] http://adisreg.mfcr.cz/adisc/adis/idpr_reg/dne/koef/vyhledani.faces

[21] **Tzb-info.** Ceny elektrické energie 2021 [Online] 2021. [Citace: 15.10.2021.] <https://www.tzb-info.cz/ceny-paliv-a-energii/14-prehled-cen-elektricke-energie>

[22] **Zákony pro lidi.** Zákon č 586/1992 Sb. Zákon České národní rady o daních z příjmu – aktuální zdanění [Online] 1993. [Citace: 9.11.2021.] <https://www.zakonyprolidi.cz/cs/1992-586>

[23] **Cenyzaobjekty.** Návrh orientační nabídkové ceny projektových a inženýrských prací [Online] 2021. [Citace: 16.10.2021.] <https://www.cenyzaobjekty.cz/kalkulace/sazebnik>

[24] **Cenyzaobjekty.** Honorář za výkony projektových prací a obstaratelných činností [Online] 2021. [Citace: 16.10.2021.] <https://www.cenyzaobjekty.cz/kalkulace/honorarovy-rad>

[25] **Stavební standardy.** Cenové ukazatele ve stavebnictví pro rok 2021 [Online] 2021. [Citace: 16.10.2021.] http://www.stavebnistandardy.cz/doc/ceny/thu_2021.html

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