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GIS Application in Real Estate Investment

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Abstract. **The profession of real estate investment contains the activity of facility management, consultancy, expertise and planning. The professionals of real estate industries are engineers, lawyers, economist, environmentalists, etc. For the successful fulfilment of the different tasks it is essential to make data acquisition, create a decision support system. During the decision support especially in those cases when we have spatial data, the GIS can give an indispensable assistance. In the development process of real estate a kind of synergy occurs while we integrate several data bases and different knowledge which can lead us to more effective decisions and information. The decision support model contains the requirements raised by different speciality against real estate development. In the article we outline the above mentioned facts with the help of different examples.**

Keywords: **GIS, Spatial Decision Support, Real estate management, Real Estate Investment**

I. Introduction

In the real estate investment market also some global tendencies has been occurred recently which can give GIS -as the tool for the management of spatial data - a chance to help experts in their everyday work. General tendency in real estate market is globalization, which means that global multinational companies appeared with the motto: "Think global, act local". It is also observable that in one project more investors are interested. In these sequence we ought to mention that Giga projects are appeared and in one project there are many functions are available. Another interesting tendency is the so called network expansion which means sets of real estates with equal qualities with one decision head quarter with uniform facility management system etc. Another indispensable tendency is the revolution of communication. (internet, open databases etc) [3,4]. Because of the globalization of the real estate market it is essential to make decisions as soon as possible. In this process a decision support system aided by GIS can shorten and enhance the quality of decisions.

II. The model of real estate investment

In the process of real estate investment modelling has a very important role. We can differentiate three kind of model:

1. Process model
2. Market model
3. Value model.

The process model can be divided into 11 different phase:

1. Real estate register
2. Planning
3. Marketing
4. Expansion
5. Building, construction
6. Utilization and management
7. Real estate sale
8. Valuation
9. Investment
10. Information flow
11. Validation of interests

In our study from these sequence we examine the phase of real estate investment. From the aspect of the real estate investment there are several process where GIS can be applicable.

Actually the value of the real estate is determined by three groups of factors, more specifically:

1. a location
2. position within the building
3. and the technical conditions, internal structure of the real estate. [6,7]

In the process of the real estate investment we should take into consideration of the interest of the investors. Their intentions define the main aspects of the investments (see detailed in the V. section).

The important factors for the investors are:

- the quality of the assets;
- the compound of the tenants;
- the period of the lease;
- the conditions of the contracts;
- the real rental fee;
- the costs of facility management;
- yield.

III. Location as a key concept in real estate investments

The theoretical basis for the location analyses is taking into consideration the specific requirements of the different participants of the economy.

The location theory is an economic theory which is explaining the factors which account for the location of a particular economic user and the associated hierarchy of land values. The goal of location theory is to show where consumers and producers will settle and establish economic activity; to explain the preference for one site or location compared to another; to calculate the relative land values, and to highlight movements in land values over time. The basement of most location theories is the principle of "comparative advantage" – land is fixed in space and limited in quantity therefore it is essential to know which it has the greatest ratio of advantage or the least ratio of disadvantage compared to an other area of land.

The real estate investment itself means a process where investors take part in the proportion of their investments. It is essential to reduce the risk and enhance the quality of the investment. In the course of the project GIS has a very important role in the decision support phase and also in the feasibility study. In these phases the investors should decide the most effective way and geographical site of the future investment. A lot of aspects should be considered.

Location is not just about finding any site but finding the best site. The geographic information system technology can deliver the results what the investors need. By analyzing data connecting to locations—demographics, aerial photographs, traffic networks, shopping center usage, merchandise potential data, and competitive influences— the investors can find ideal locations for property. GIS helps the real estate industry analyze, report, map, and model the merits of one site or location over another.

The location or the position of the real estate is one of the most important factors determining the value of the real estate.

It is not only a geographical, but much rather an economic term, it is summing up for the totality of those environmental conditions and services that jointly influence the quality, comfort, use value and market value of the given real estate.

GIS can combine and integrate different types of information to help making better decisions and also give high quality visualisation tools that can improve the understanding and enhance strategic planning. With the utilization of GIS web mapping services it is easy to create services and give information through Internet which can be an indispensable tool in marketing. These services can show additional data like school districts, social amenities, shops, crime data, or transportation links.

It means also that the location is not a static, never-changing value, it's market value can change significantly over the time in case of a given real estate though its geographical location is always the same. With the help of GIS standardized models can be created which can be easily modified by the software to the local market.

IV. The Type of Real Estate And its Relation to Location

The value of the location is not equal in the different sectors of real estate market either. Different elements are important for the different real estate sectors and the sensitivity of each sector is different to the location.

The main sectors are:

- Residential Real Estates
- Retail Real Estates
- Offices
- Industrial-Logistical Real Estates
- Agricultural Real Estates

Residential real estates:

The sensitivity to the location in residential real estate sector is very characteristic. Sensitivity linearly increases with the specific value. A block of freehold flats of medium category can be built at many places in a large city, more locations can fulfil the conditions of such an investment, though the construction of a luxury villa may be started only in a special environment, under special conditions if we want to sell it efficiently [3,4].

For example in the housing market of Budapest the specific price of a newly built flat with all modern conveniences is three times lower than the flat prices in the castle district of Buda or in Rózsa Hill (prime location) – supposing the same technical content.

GIS allows residential real estate developers to analyze a lot of different information, such as parcel, zoning, tax, census, flood risk, and demographic data, to create accurate business models that establish the economic potential of different sites or land units.

Concerning the Budapest housing market Tilk L.G. [15]. compiled a value map by statistically processing of the supply data to illustrate the value relations of each region. He took the area related to a postal code as a basic unit (there are 160 districts in Budapest like this), and within it he calculated the average of the supply square meter prices. He carried up the average values on a map with a different colour (Figure 1).

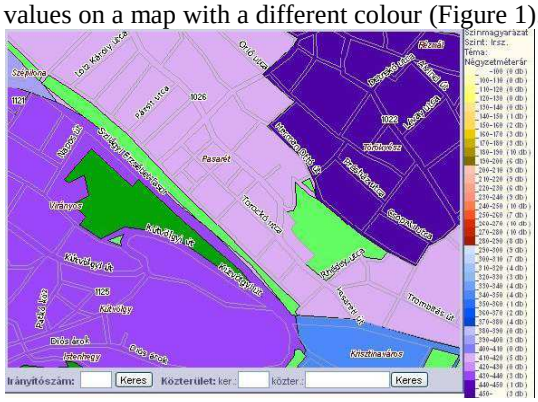

Fig. 1. Value Map Source: Tilk L.G. [15]

In case of a building complex the position determines the value of the real estate, it has a significant role where the given estate is located within the building complex. It is also alter its value how far it is from the lift, if it is in the north or south side of the building, etc.

Retail Real estates

The groups of retail real estates, the shops, shopping centres are also extremely sensitive to the location. In the case of a shopping centre is very important that it can be easily reached by transportation, whether the market nearby has enough buying capacity, etc. Commercial real estate is fiercely competitive. The retail, industrial, and commercial landscape is continually changing, and real estate companies must stay knowledgeable of the critical factors impacting the performance of their property portfolios. [11]

GIS and data integration let real estate companies combine market and territorial knowledge with proven business analysis and site selection methodologies, providing deeper insight into the local real estate environment and market forces. In GI System we can store data about GDP, income, habits, demographic composition of the given territory so we can execute location analyse with these data sources.

It is essential to execute the Location Analyse which is for to find the best „Prime location" The prime location is a part of an

urban area where a business might expect to achieve the highest profit relative to any other location.

Offices

The office real estates are primarily sensitive to the transportation, stops, parking possibilities, the surrounding services (restaurants, shopping possibilities). It is also important whether the neighbourhood is appropriate for an office.

Industrial real estates

Primarily this sector is sensitive to the transportation conditions, the closeness of the main transportation routes, motorways (railway, water transportation) and the safe connection are important. Of course, it is also important that customers can reach it easily, therefore the logistical centres, industrial parks often settle next to the ring roads surrounding the large cities.

Agricultural real estates

The agricultural real estates, within it the arable land, constitute a special group of the real estates. The market of the arable land as a factor of production is a specific market.

The land market – due to the spatial limitation – is primarily adjusted to the local supply and demand conditions. The seller can draw the attention of only some potential buyers – to the land to be sold.

The land market is also specific in that term that the arable land is tied to a given place, its spatial position is usually the function of the change of the environment. In many cases the land is purchased with speculative purposes for example during the establishment of an industrial plant, or the construction of the transportation road, because in this cases the geographical position (and the value) of the lands are changed. [3,4].

V. The relation of the participants of The real estate industry to the location

The different elements of the location are important for the several participants of the real estate market. The location is analysed from another view by a real estate developer, an investor or a bank financing the development. [8]

The real estate market makes the above mentioned Location Analyses in accordance with their own points of view.

In case of the lender the most important factors of location analysis are connected to the project's accessibility, neighbourhood or district zoning and utility availability.

In most cities can be a growth path detected where tenant and/or user demand for space is greatest. Recently another new factor is the environmental status of land. It is essential to avoid places where natural hazards can be expected, or waste management can be a future problem etc.

According to Berdár [8] the location analyse of the investor can be set into more characterized points:

Geographical Location

The first factor naturally is what should be examined the Geographical Location. The investors primarily like investing in the economic centres or along the routes connecting them.

Stability, Safety

The real estate investment is a long term investment, so the investor's profit is function of the extent and safety of the yield. It is understandable that the calculable, stabile, safe environment is essential for the investment. This environment means that legal, physical safety, the gained profit is ensured, and no unexpected changes will be expected.

Maturity, Structure of the Market

"We talk about a mature, structured market if all the important elements of the real estate market are present in the given geographical region, and each element of the market operates properly." [5,6]

It is also essential in real estate investment to find the targeted market. A wealth of data and software solutions allows commercial real estate companies to select the most appropriate target marketing strategy. GIS reduces the risk of targeting the wrong group of potential tenants or providing poorly qualified and inappropriate information to the right mix of prospects. [10]

Transparency of the Market

It is important that investors have reliable, credible information about the targeted market, the different transactions and the participants of the transactions, and this information should be public and accessible for everybody.

Infrastructure

The development of the infrastructure (network of roads, public utilities, public transportation, bank network, services, etc.) is an important point of view for the investor as evidence, since the investor purchases not a real estate, but future yield. [8].

In the countries having a developed culture of real estates the analysts and investors apply a wide range of facts and information, while there is a possibility to apply fewer indexes in the developing markets, and there the reliability is weaker. The investor can count not only the facts but the interpretation of the opinions related to the trends. The practice of the opinion-climate analyses were formed for this assumption. (Korpacz-index etc.)

Cost Levels

The operating cost of the real estates is an important element in the tendency of the level of the net yield. The greatest ratio of the operating costs is constituted by the pubic utility charges. Another important field, the cost level is the building costs (material prices, contract prices.

Risks, Yields

"It is the basis of the investor's approach based on the yield calculation that the value of the real estate is a function of the yields expected by the investor. Upon the establishment of the extent of the expected yield the connection of the alternative cost of the risk, yield and capital have to be taken into consideration." [8].

VI. The role of location in the assesment and valuation of real estates

There are two types of assessment exists the first when we examined a wider environment is the regional analysis, when we search the surroundings it is the analysis of the direct environment.

A. Regional Analysis

The regional analysis is started with the determination of the region and its borderlines. The region is meant as the largest geographical area, which has an economic effect on the examined real estate. In the expert opinion the appraiser has to give reasons for the selection of the borderline of the region, and it has to be recorded in a map.

A brief, clear analysis has to be provided about the specified region, expatiating on the following subject matters:

- Historical review
- Description of the public administration
- Geographical circumstances (climate, terrain, natural factors, energy, resources)
- Population (present population, demographical tendencies)
- Employment (rate of unemployment, main work possibilities, planned workplace-establishing investments, planned termination of workplaces, regional support of the establishment of workplaces)
- Income conditions (average salary, consumption- and saving inclination)
- Enterprises
- Real estate developments (tendency of development in each real estate sector)
- Transportation (motorways, motor roads, public roads, planned developments, railway and water transportation, air transportation, vehicle traffic)
- Services (public health, social institutes, public services, banks, insurance companies, telecommunications, etc.)
- Education and culture (primary-, secondary- and academic educational institutions, kindergartens, museums, theatres, cinemas, sports establishments, entertaining centres).
- Trade (shops, shopping centres).
- Tourism [8]

With the implementation with GIS we can store these data in one system, and use them in our analyses. The usability of the GIS system is relying on the data which is stored. To all extent these data should be properly gathered and relevant concerning time and punctuality. The correct data base is the most expensive part of the system

As a summary of the analysis it has to be provided how the listed conditions affect the market value of the examined real estate, how they influence the tendency of the market value.

B. Analysis of the Direct Environment

As a first step the borders of the neighbourhood has to be determined, and it has to be presented in a map. The neighbourhood is the smallest area surrounding the real estate, which has an effect on the tendency of the value of the real estate.

The examination has to present the following points:

- Listing of the surroundings by zones (zoning)
- Role of the surroundings in the life of those living there
- Reputation, prestige of the neighbourhood
- -State of the public security
- Tendency of the population, demographical trends
- Services (for example utilities like water, central heating, etc and complementary services like healthcare, education, leisure, commercial areas etc.)
- Transportation (the nearest stops, connection possibilities)
- Income levels
- Land and building attributes(owner, taxes, etc)
- Sales records
- Planning and economic factors (planning constraints, permitted us and potential change for use)
- Other information that is significant from the point of view of the value establishment [8,9].

In GIS data base we should decide which data is necessary to implement out of the above listed data. It is essential that the cadastral data should be the base of our system. The cadastral maps identify each parcel. These maps can give us information of the location, shape and size of the given area.

C. Evaluation of Agricultural Land

Before agrarian and rural development may proceed, it is necessary to be able to classify and provide a true evaluation of the land's agricultural characteristics, in other words, its soil attributes and the production types and locations.

The main user of the land is the agriculture; the land evaluation with agricultural purposes has special importance. It is usually the examination of bearing of which condition is the classification of ecological suitability of the land area for cultivation of plants, usually completed with economic evaluation.

Features of agricultural land:

- It is the element of the earth ecosphere with basic importance
- It serves the satisfaction of one of the most important human needs, the production of food
- Its quantity is limited; there is no possibility to increase its size
- Any other land usage spreads at the expense of agriculture
- In the current quality of the agricultural land drawn into cultivation – together with the result of the natural progresses – the activities of many farming generations manifest
- In terms of economy the agricultural land is peculiar factor of the agricultural production, in some relations it is goods but in the process of production it is not used up, its value does not decrease
- Due to the environmental damages endangering its quality, it needs continuous protection.

FAO guidelines:

- The classification according to ecological eligibility has to be performed by well-determined land usage categories.
- Both the expenditures and the achievable incomes have to be analysed.
- Multidisciplinary approach is necessary.
- The natural, economic and social environment has to be considered nationally, regionally and locally.
- The ecological eligibility has to be explained according to the principle of maintainability in order to avoid the deterioration of the agricultural land.

- During the evaluation at least two or rather more different kinds of land usage should be compared [13].

Concerning the different types of land properties Table I. shows a short summary with the main properties which can define the values of real estates and which data would be desirable to store in GIS.

VII. The Real Estate Investment and GIS

"Displaying information in maps, combined with the analytical power of a GIS, often reveals trends, patterns, and opportunities that may not be detected in tabular data alone" [10,11]

There are special tasks in real estate investment where the GIS can be employed:

- Site Selection/Strategic Planning, where GIS can be helpful in combining different type of data like aerial photos, competitor locations, planned residential subdivisions, customer surveys, census data. It can visualize topography, drive time, custom trade area, market penetration, market share, market change and percent of occupancy. The markets change, GIS can help you better understand existing locations and identify new markets to penetrate.

TABLE I

Main factors affecting value of the real estates [13]

Value elements of land properties (sites) built over and not built over		
Land not built over		
technical	**economic**	**aesthetic**
Building zone Availability of public supplies Possibility to public supplies Physical features Function (stipulations by authorities)	Right of use Right to or obligation of servitude Other obligation (dispute) Obligations by authorities One- or more-purposes Accessibility Services Building costs	Aero features Air purity Noises Accessibility Environmental surrounding Functionality
Land built over		
Technical	Economic (legal)	aesthetic
Built-in ratio Way of building in Possibility to form it Possibility to upgrade it Level of equipment Function(s) Security stipulations Orientation Life time Heritage (historic) building Term of management Environmental effect features of soil	Right of use Warranty Right to or obligation of servitude Other obligation (dispute) Obligations by authorities Costs of rebuilding Depreciation One- or more-purposes Possibility to rebuild it Accessibility Services Parking facility Ability to making profit Maintenance costs Costs of modernization Property protection	Environmental safety Atmospheric features Air purity Noises Accessibility Environmental surrounding Functional obsolescence
Value ratios		
60-70 %	20-25 %	5-20 %

- Portfolio Analysis, where GIS can help in evaluating the whole store network in a market. It can assist in modelling the market change with the help of demographic change; also can visualize the cannibalization effect.
- Competitive Market Analysis, where GIS can answer why customers were lost, where the other costumers are located what the trade area dynamics are, can show distances to other competitors.
- Demographic Mapping and Reporting can visualize the demographic, socioeconomic and purchasing behaviour of the given location.
- Site Assessment, where GIS can highlight the specific characteristics of the area. It can reveal potential sites, traffic network, infrastructure, environmental hazards, residential subdivisions, site accessibility, security etc.
- Site Potential Analysis can be based on the major demographic trends and potential market change. GIS can present consumer expenditure, the demography by age, income, household, education level.
- Market Research and Marketing and Sales, where GIS can visualize zoning, labour force availability, targeting prospective tenants etc.

CONCLUSION

As we can see from the article, location has a key role in real estate investment. It is very important to identify and define the factors of the location from the geographical components to the economical ones, because they influence the yield of further investments. GIS is the tool of spatial data management. If we have proper datasets store behind the GI System, we can use it to model market changes, chose the best site in site selection process, highlight future trends, make location analyse and visualize the data and the analyse trough maps.

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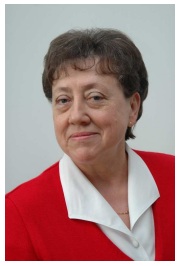

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Andrea Pődör, Judit Nyiri. GIS pielietošana nekustamā īpašuma investīcijās

Nekustamā īpašuma investīciju profesija ietver iestādes vadības, konsultāciju, ekspertīzes un plānošanu darbības. Uzskaitīti pasākumiem piemīt arvien sarežģītāks saturs, pamatojoties uz šo faktu projekta vadība ir saistīta ar iekšējo arhitektūru; nekustamā īpašuma novērtēšana nav nošķirama no konsultācijām par ieguldījumiem, mārketings no arhitektūras utt. Nekustamā īpašuma ekonomikas attīstības procesā norēķinu speciālistiem jāveic pasākumus, lai saglabātu nekustamā īpašuma vērtību, kā arī noteikt pievienoto vērtību. Šajā procesā visiem nekustamā īpašuma ieguldījumu nozares dalībniekiem ir sava lomu. Apdzīvotās teritorijas sastāv ne tikai no apbūvētām teritorijām, bet arī no lauksaimniecības teritorijām. Teritoriju plānošana ir arī ļoti nozīmīga darbība apdzīvojamo punktu izvietošanas procesā. Nekustamā īpašuma nozares speciālisti ir inženieri, juristi, ekonomisti, vides speciālisti u.c. Veiksmīgai dažādu uzdevumu izpildei ir būtiski veikt datu ieguvi, izveidot lēmumu atbalsta sistēmu. Lēmumu pieņemšanas laikā, jo īpaši gadījumos, kad mums ir telpiskie dati, ĢIS var sniegt nepieciešamu palīdzību. Nekustamā īpašuma attīstības procesā sinerģija notiek tad, kad mēs apvienojam vairākas datu bāzes un dažādas zināšanas, kas var palīdzēt mums pieņemt efektīvākus lēmumus un iegūt labāku informāciju. Lēmumu atbalsta modelis satur prasības, kas ir izvirzītas dažādām specialitātēm, saistītiem ar nekustamā īpašuma attīstību, piemēram, investīcijām jāizvairās no īpaši aizsargājamām dabas teritorijām; aktīvi var būt hipotekāro kredītu brīva forma utt. Rakstā autores izklāstam iepriekš minētos faktus, izmantojot dažādus piemērus.

Андреа Подор, Юдит Нуири. Использование ГИС в инвестициях в недвижимость

Бизнес инвестиций в недвижимость включает в себя управление, консалтинг, экспертизу и планирование деятельности. Мероприятия, включенные в список, становятся все более сложными по содержанию, основанное на этом управление проектами связано с внутренней архитектурой, оценка недвижимости неотделима от инвестиционного консультирования, маркетинг от архитектуры и т.д.. В процессе развития экономики недвижимости специалисты должны принять меры для сохранения стоимости имущества, а также определить добавленную стоимость. В этом процессе у всех реальных игроков отрасли недвижимости есть свои роли. Населенные территории состоят не только из населенных пунктов, но также и из сельскохозяйственных районов. Территориально-пространственное планирование также является очень важным в процессе размещения населенных пунктов. Специалистами в области недвижимости являются инженеры, юристы, экономисты, экологи и т.д. Для успешного выполнения различных задач необходимо собирать данные, создавать системы поддержки принятия решений. Во время принятия решений, особенно тогда, когда у нас есть пространственные данные, необходимую помощь может предоставить ГИС. В процессе развития недвижимости, синергия появляется тогда, когда мы объединяем несколько баз данных и различные знания, что может помочь нам принимать более эффективные решения и получить более полную информацию. Модель поддержки принятия решений содержит требования, которые накладываются на различные специальности, связанные с развитием недвижимости, например, инвестиции не следует вкладывать в охраняемые районы, активы могут быть свободной формой ипотечных кредитов и т.д. В статье авторы объясняют вышеупомянутое с использованием различных примеров.