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# THE AGING OF A BUILDING VERSUS ITS LIFE CYCLE WITH REGARDS TO REAL ESTATE APPRAISAL

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## Abstract

Construction objects are subjected to aging processes and other changes and influences during their life cycle. The paper focuses on one of the stages of the life cycle of a developed property - the final part of the service life phase, which is referred to by the author as "the autumn years". The paper analyses the problem of classifying a building object to an appropriate life cycle when conducting a real estate valuation. The author searched for the answers to the question of when the liquidation phase begins, because the decommissioning of a building affects the landscape and spatial heterogeneity. The reasons for demolishing buildings were analyzed, and are as follows: the poor technical condition of building objects; functional wear; difficulties in carrying out renovation or reconstruction works; and financial unprofitability, which takes into account the life phases of buildings. This paper aims to prove the following theses:

- knowledge of the life cycle is the basis for the correct identification of a property's condition,
- the age of the elements of a building is not a fundamental quantity that determines the course of its physical depreciation,
- the liquidation of a building has a big impact on ecological awareness.

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## 1. Introduction

Construction objects are subjected to aging processes and other changes and influences during their life cycle, which, after some time, result in the occurrence of their technical, functional and environmental wear. The physical depreciation of buildings follows the laws of physics, and the influence of environmental factors can be considered with regards to the durability of the building. In turn, as a rule, the functional obsolescence of buildings occurs according to the laws of the real estate market, whereas the influence of environmental factors is evaluated with regards to their users. The attributes that are taken into account during the valuation of real estate (the so-called market features) contain elements of technical and functional wear. Both types of wear are often correlated with each other. Environmental obsolescence is associated with changes in the environment, and also has an impact on technical wear, e.g. in areas affected by underground mining operations (Bryt-Nitarska, 2017).

Along with the pace of changes in civilization, new needs for organizing public spaces are constantly emerging. There are changes in functional and aesthetic requirements, not to mention changes in the technical condition of buildings, which are caused by the passage of time. Buildings,

like people, also age, though in a different way. In public spaces, there are buildings built over a century ago that are still fascinating. Moreover, their market attractiveness does not decrease, and sometimes even increases. Time is not the only parameter of aging. Konior et al. (2021) proved that it is not just age that determines the course of the technical wear of the building components of old residential buildings (Konior et al., 2021). The authors searched for the aging function of residential buildings with regards to the type of building, socio-economic conditions, and the function the buildings perform.

The analysis of functional obsolescence involves the consideration of such areas as: architecture, urban and rural planning, the construction industry – a building's biology, a building's physics, technical knowledge (material science, material strength), aesthetics, economics (classical and behavioral), sociology, psychology, history and geography (tradition of construction, regionalism), physiography (distinguishing functional and spatial structures, diagnosis and indication of areas in which specific functions should be implemented), law, ergonomics, proxemics (science dealing with the study of the mutual influence of spatial relations between people), ecology, zoology (science dealing with the problems of nature conservation and its resources), and others.

When analyzing the goals of sustainable development, i.e. the method of managing real estate in which meeting the needs of the present generation does not reduce the chances of meeting the needs of future generations, it can be concluded that the main goal is the welfare of society. The natural environment is the basis of sustainable development, and the economy is its tool. In the era of increasing social awareness regarding the issue of sustainable development, the analysis of the life cycle of a building object more often appears during the design and implementation of construction investments – LCC (Life Cycle Cost) and LCA (Life Cycle Assessment). There is a growing interest in the study of the Life Cycle Assessment of buildings, which entails an estimate of the potential environmental impacts and the used resources of buildings. This is driven by an increasing awareness of the environmental impact of buildings, as well as the emergence of tools that enable their assessment (Nwodo & Anuba, 2019). Taking the last two decades into consideration, it can be said that there has been a positive change in the awareness, knowledge and legislation regarding sustainable development and the understanding of life cycles. It is not only the life cycles of construction products that are analyzed, but also the life cycles of buildings and other structures, such as bridges (Madaj, 2019; Martinez-Munoz et al., 2020) or roads (Górak & Szabat, 2019). Good knowledge of the life phases of a structure is the basis for the correct identification of its condition, and thus for the optimal estimation of its value.

## 2. Literature review - life cycle cost calculations

In the era of increased social awareness concerning the issue of sustainable development, the analysis of the life cycle cost of a building object appears in the foreground when designing and implementing construction investments (Górak & Szabat, 2019). The life cycle of a product and a building object, which is closely related to sustainable development, is the subject of new research and analysis. The problem of planning the service life of construction objects is very important, and has been noticed by both researchers and practitioners. The literature on the subject is widely researched, both in Poland (e.g. Dziadosz et al., 2015; Górak et al. 2019) and all over the world (e.g., Goulouti et al., 2020; Nwodo et al., 2019).

Life phases, starting from the production of building materials to the decommissioning of a building, occur at different times. Some of them may take as little as a few hours (e.g. the production of materials), while others may last for years (the operation phase). Figure 1 shows the life phases of a building object (the design and development phase, manufacturing phase, operation and maintenance phase, demolition phase) in relation to the life phases of construction products (the concept phase, manufacturing phase, operation phase, recycling phase). Both the duration of the phase and its cost intensity vary. Some of the phases are more expensive, and some less. This depends on many factors, including the type of building object (its function, structure and technology), the used building materials, how they are used, its erection, design, etc.

The longest phase - the operation and maintenance phase (O&M) - is determined in various manners. For example, the standard (PN-ISO 15686-1:2005) distinguished between different periods of use, i.e. service life (period from a building's construction in which the building or part of it meets at least its functional properties); reference service life (expected service life of a building or part of a building under fixed use conditions - ideal conditions); and estimated service life (expected service life

of a building or part of a building under specific conditions of use, which is calculated by adapting the ideal conditions to the materials, design and environment, as well as to the way of using the building and its maintenance). The question remains: how long is this period of O&M? It is also worth considering if, in addition to the passage of time, the change in the value of the property does not determine the life cycle of the building that is part of the property (see Fig. 2).

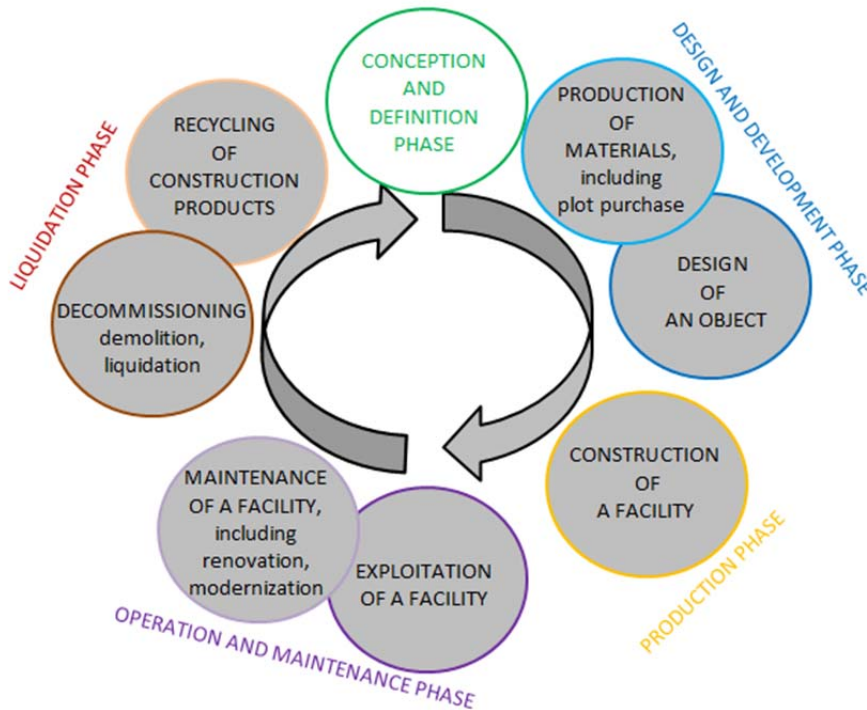


Fig. 1. Phases of the life cycle of a building object in relation to the life phases of construction products. Source: own study.

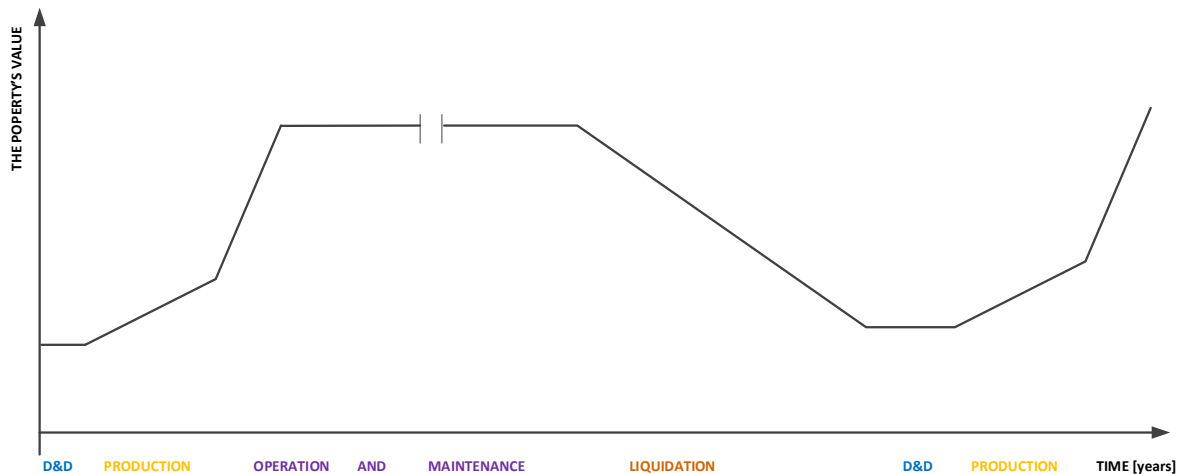


Fig. 2. Phases of the life cycle of a building object according to the property's value. Source: own study.

In accordance with Polish Regulation (Regulation 2021), the life cycle costs of a building are calculated as the sum of the costs of purchasing, operating and maintaining the building, and are calculated according to the following formula:

$$C_g = C_n + C_{uz} + C_{ut}, \tag{1}$$

where:

$C_g$  - the life cycle costs of a building during a 30-year building service life period, hereinafter

- referred to as the "calculation period",
- $C_n$  – acquisition costs,
  - $C_{uz}$  – operation costs,
  - $C_{ut}$  – maintenance costs (described in detail in Regulation 2021).

The maintenance costs that result from the operation of a building and enable the building to be kept in a good technical and aesthetic condition, are calculated as the sum of the unit maintenance costs of products during the calculation period, which are lowered by the value of the contractor's guarantee for a given product (Regulation, 2021).

Life cycle costs are currently the subject of increased interest, which can be seen in literature, standards, guidelines, legal regulations and EU directives. For example, the standard (PN-EN 60300-3-3:2017-07), in terms of the costs generated in subsequent phases of the life cycle of a building structure, distinguishes the following:

- concept and definition (including the costs of analyzing the market, analyzing a concept, and defining the requirements for a product),
- design and development (including the costs of preparing design documentation, producing a prototype, purchasing software, and providing quality management),
- manufacturing (including costs of production and delivery to the market - packaging, loading, transport),
- installation (including assembly costs),
- operation and maintenance (including costs of repairs, maintenance, spare parts, and technical support, which were incurred during the assumed operation time of the device or facility),
- decommissioning (including disassembly, recycling or disposal costs).

It should be emphasized that the cost of replacing a building does not only include the purchase price, but also the cost of using and maintaining, or even demolishing and recycling.

The costs related to the overall costs of any object can never be equated with the direct costs of its execution. This issue should always be considered with regards to a broader perspective. Therefore, when simplifying the problem, the total costs incurred by the owner of the facility (investor) and its users throughout the operation of the object, including its disposal, must always be analysed (Madaj 2019).

It is also worth noting that, when carrying out the life cycle cost calculations of a building, it is very important to take into account the risk and the possible range of changes in LCC results when making decisions (Dziadosz et al., 2015).

The issue of ecology is more and more often considered in LCAs due to the fact that the building and construction sector accounts for a significant part of the total energy consumption, and its related greenhouse gas emissions (Nydahl et al., 2022).

Life cycle assessment and life cycle cost are such broad topics that more and more researchers are attempting to use machine learning when estimating a building's life span (Ji et al., 2021).

### 3. Aging of a building object

Knowledge of the course of the life cycle, and therefore knowledge concerning the basic phases, functions and mechanisms that occur in it, is the basis for the correct identification of the condition of a building object at every moment of its construction, as well as its further existence. This, in turn, leads to the correct estimation of the replacement value of a building object by a property valuer. The condition of a facility, which takes into account its technical wear, is extremely important for the correct determination of the replacement value of the property, which, pursuant to Polish Act (Act, 2017), is equal to the cost of its reconstruction (taking into account the degree of obsolescence). The replacement value of real estate includes the value of the right to the ownership of land and the reconstruction value of construction objects located within the estimated real estate. The above can be described by the following formulas:

$$W_o = W_g + W_{ob}, \quad (2)$$

where:

- $W_o$  – the replacement value of the real estate,
- $W_g$  – the market value of the right to the land (ownership, perpetual usufruct),
- $W_{ob}$  – the replacement value of the construction object on the valuation date, where:

$$W_{ob} = W_{obn} \cdot (1 - S_z), \quad (3)$$

where:

$W_{obn}$  – the value of the object in its new state,

$S_z$  – the degree of obsolescence of the building object as of the date of establishing its value.

There are many methods of assessing the technical wear (physical depreciation) of buildings, e.g. the classic Ross methods - time methods that are based on two basic parameters: the age of the building and its durability (e.g. Baranowski, 2000); visual methods (e.g. Podworna and Mironowicz, 2017); methods that use the properties of neural networks (e.g. (Waszczyszyn, 1999)), accounting methods that take into account random factors (e.g. Wodyński, 2007; Konior, 2020), mathematical models (the prediction of obsolescence based solely on models), artificial intelligence techniques (Trabelsi et al., 2021), and others. The literature on the subject of a building's wear is very extensive (e.g. Baranowski, 2000; Hajdasz, 1991; Hopfer, 1991). One of the methods of estimating the degree of technical wear is the method of weighted average wear. When assessing the wear of the individual elements of a construction object, the durability of construction products should also be taken into account. In turn, the construction products, in accordance with Art. 4. (Act 2004), may be introduced to the market or made available on the domestic market if they are suitable to be used during construction works to an extent that corresponds to their performance characteristics and intended use. This means that these performance characteristics enable the properly designed and executed construction objects (in which the construction products are meant to be used permanently) to fulfil the basic requirements that are referred to in Art. 5 (Act 1994) (including the possibility of maintaining a proper technical condition). The performance characteristics of a construction product, as defined in European Regulation (Regulation, 2011), are performance characteristics that are related to relevant essential characteristics, which are expressed as either a level or class, or in a descriptive manner.

It is worth emphasizing the basic requirements for building structures that are contained in the above Regulation. According to this regulation, building objects (as a whole and in their separate parts) must be fit for their intended use. However, the health and safety of the people involved throughout the entire life cycle of such structures should be taken into account. When building objects are subjected to regular maintenance, they must meet the following basic requirements for an economically viable period of use:

1. mechanical resistance and stability,
2. safety in case of fire,
3. hygiene, health and the environment,
4. safety and accessibility in use,
5. protection against noise,
6. energy economy and heat retention,
7. sustainable use of natural resources.

The wear of a building is a loss of its economic value, which not only results from its physical wear, i.e. a decrease in technical efficiency over time, but also from its functional (utility) and environmental wear. Functional wear (functional obsolescence) can be determined by making comparisons of the analyzed object to currently erected building structures. Functional solutions (criterion of a building's modernity) and the standard of finishing and equipping with technical devices are most often compared. A building structure is also analyzed in terms of its possible specialized purpose, which may hinder or prevent a change in the way of it being used in the future. The measure of this wear is the reduction of the potential profitability of a given property in relation to similar properties located in a given area. In turn, technical wear is a function of many variables, including the age of the building object, the durability of the used materials, the quality of construction workmanship, the way of using the object, operating conditions, possible design defects, and renovation management. The basis for the determination of the amount of technical wear of an object is the assessment of its technical condition, which can be carried out either visually or with research. Environmental wear (environmental obsolescence) is one of the main factors of the technical wear of every building object, and should be taken into account whenever estimating the degree of physical depreciation. It results from the impact of the external environment on the object, including e.g. changes in the surroundings of the property that are related to the construction of new facilities, the location of roads with intense traffic (mainly heavy transport), changes in water conditions, changes in topography, and the existence of mining exploitation.

Table 1

General criteria for the assessment of the technical condition

Condition of object	Assessment criterion	Encountered ranges of the degree of technical wear $S_z(\%)$
Very good	Building elements (or type of structure, finishing, equipment) - are well maintained and preserved, do not show wear and damage. The features and properties of building materials meet the requirements of the standard.	0-15
Good	Building elements (or type of structure, finishing, equipment) - are well maintained and preserved and meet the normative requirements. They require ongoing maintenance.	11-35
Average	Elements of the building are properly maintained. Local damage and cavities are permissible. Current maintenance, as well as renovation and repair works for individual elements of the facility are required.	26-50
Unsatisfactory	The building elements have significant damage and losses. The features and properties of the embedded materials have a reduced class and technical age. Comprehensive renovation of the facility is required.	51-70
Bad	Building elements show considerable damage and wear, and may pose a risk for safety. Major renovation or demolition is required.	61-100
Emergency	The building is intended for liquidation.	Above 70

Source: Podwórna (2019).

The better the technical condition of the building, the lower its wear. In literature concerning this subject, and in numerous engineering studies, the degrees of wear are adopted very differently and, therefore, the percentage ranges given in Table 1 overlap, e.g. the degree of technical wear at the level of 70% may be described as unsatisfactory in one source, and as bad in others.

Determining the degree of obsolescence of a building for the purposes of preparing an appraisal report is not the same as determining the wear for the purposes of developing a technical expertise of a building object (which is performed by construction experts in accordance with Regulation (Regulation, 2014)). However, for a property valuer who has no technical education, determining the degree of wear of a building may be a difficult element of preparing a valuation of real estate. The degree of obsolescence is much easier to estimate in the case of facilities for which regular periodic technical inspections were carried out by people with qualifications in a relevant specialization. It is much easier to determine the technical condition of a facility for which the owner or manager keeps a "building object book" (i.e. a document intended, among others, for recording tests and inspections of its technical condition, repairs and reconstructions that were conducted during the use of the building object - in accordance with Polish Regulation (Regulation, 2003)) than is the case for an object without a known "history". The well-known "6 S's" division, according to Figure 3 (Steward, 1995), can be helpful during the assessment of the technical condition of a building. However, a building can also be "divided" into elements that differ in terms of their technical durability:

- group A (permanent elements) - elements, the physical durability of which exceeds the assumed durability of the building, and therefore they do not require (apart from minor repairs) renovation works during the entire period of operation - these are foundations, load-

- bearing walls and fireproof ceilings,
- group B (repairable and replaceable elements) – elements, the durability of which is lower than that of the building. They require repairs, or partial and sometimes complete, replacements - these are wooden roofs and ceilings, floors, plasters, carpentry and installation elements,
- group C (other elements) - elements with a durability shorter than that of the elements of groups A and B, but only those that need to be completely replaced if they lose the ability to perform their functions - these are, e.g. paint and varnish coatings, installation accessories.

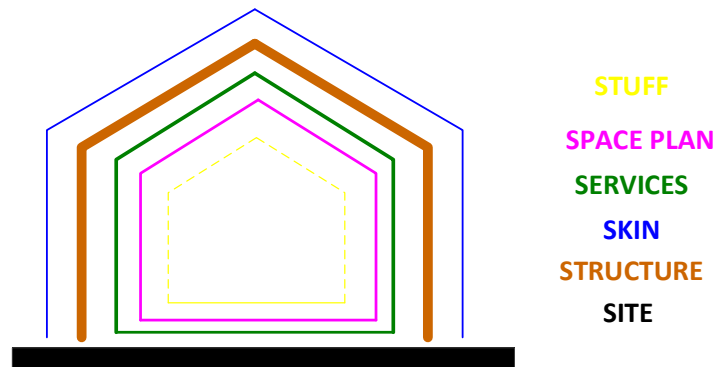


Fig. 3. Technical durability of building elements – based on Steward (1995).

When determining the technical condition of buildings, a real estate valuer must take into account many factors, and not only the passage of time and the manner of use. The economic aspect of the property should also be evaluated. The ultimate test for physical deterioration is for the valuer to consider the anticipated economic life of the asset, while keeping in mind the constituent parts and the rate at which they will deteriorate (TEGOVA, 2020). Valuers should be less interested in the expectations of the physical life of the building than in its expected economic life. The valuer will need to take a wide view of the 'economy' in which the entity operates, including the general trend towards a particular use (whether it is stable, declining or growing). (TEGOVA, 2020).

#### 4. Demolition

The last moment of a building's life is its demolition. Pursuant to Polish Act (Act 1994), the demolition of a building is treated as a type of construction work. This has consequences related to, among others, the requirements concerning demolition procedures, and administrative permits that are prior to the commencement of dismantling and demolition works. The reasons for the demolition of a building object are different. Undoubtedly, a construction disaster or a construction failure are such premises. A construction disaster is defined in Act (Act 1994) as the unintentional, extensive destruction of a building object, its part, or the structural elements of scaffolding, the elements of forming devices, sheet piling and excavation lining. In turn, a construction failure can be defined as an event that causes the structure of an object to be damaged to a degree that hinders or prevents further operation of all or part of the object. Pursuant to another Polish Act (Act 2002), a technical failure is understood as the sudden, unforeseen damage or destruction of a building object, technical device or system of technical devices, which in turn causes a break in their use or loss of their properties. If the facility is at risk of failure, it may also require liquidation. Examples of failure hazard conditions in the case of elements and entire objects include the lowering of the ultimate or service limit states by, e.g., the occurrence of scratches/cracks in the structure or its structural elements; ceiling deflections that significantly exceed the permissible values; the occurrence of significant corrosion losses of concrete and/or reinforcing steel in reinforced concrete structures; weakening of structural elements that have significant additional openings; weakening or destruction of structural elements as a result of fire or explosion, etc.

From the point of view of the technical condition, the autumn years of a building structure can be defined as an unsatisfactory, bad or emergency technical condition. Prerequisites for the demolition of a building object arise when it is damaged or not suitable for renovation, reconstruction or modernization. There may also be reasons for the demolition of a building structure when it is not used, or when it is functionally worn out. According to standard (PN-ISO 15686-1:2005), the replacement of elements caused by defects of performance properties should not be confused with any

replacement that is caused by the abandonment of use, which results from the inability to meet changing requirements. Examples of such real estate include commercial real estate with a changed purpose of use. At the end of the service life of a building, the owner must make a decision concerning demolition based on the analyses of many factors. It should be emphasized that the technical impossibility of reconstruction using the current technical means is very rare nowadays.

## 5. Case study

A real estate valuer selects the appropriate approach, methods and techniques for assessing real estate, taking into account the purpose of the valuation, the type and location of the real estate, its purpose in the local plan, the condition of the real estate, and available data concerning the prices, income and properties of similar real estate. The valuer has a choice of several approaches: comparative, profitable, cost, or mixed (Act 2017).

In the case study presented below, the expert did not have an imposed method of valuation for determining the market value. In accordance with the applicable Polish law (Act 2017), the market value of a property is defined as the estimated amount that can be obtained on the valuation date for the sale of the property on a commercial basis. The sale is concluded between a buyer and a seller who both have a firm intention to conclude a contract, to act with discernment, to act prudently, and are not in a forced situation. According to "the blue book" (TEGOVA, 2020), market value is defined as the estimated amount for which a property should be exchanged for on the date of valuation between a willing buyer and a willing seller acting independently of each other after proper marketing where the parties both acted knowledgeably, prudently and without being under compulsion. The EVS standards (TEGOVA, 2020) concern the concept of 'highest and best use' (HABU) as integral to market value. This is the use of a property that is physically possible, reasonably probable, legal or likely to become so, and that results in the highest value of the property at the date of valuation. In most cases, the market value of a property is the same as the value when considering the HABU concept. These values may sometimes seem very different, and it is therefore necessary to calculate the costs of changing the purpose of using the real estate, which can be large. Thus, in most cases, the HABU value should be at a similar level to the value of the current way of using the real estate on the measurement date.



Fig. 4. Different types of real estate values (Podworna et al., 2016).

When estimating the value of real estate that includes a building in its "autumn years", a real estate valuer may have difficulties in classifying such a building to the appropriate life cycle, and this has consequences in correctly determining the fair market value. An example of the autumn of a property's life is a real estate with commercial buildings of an average technical condition. From the point of view of their technical condition, there are no reasons for their demolition. However, after about 50 years of use, the owner decides to demolish them based on the analyses of many factors. The real estate appraiser, while estimating the fair value, analyzed various types of values (Fig. 4):

- the market value for the current way of using,
- the market value for an alternative way of using,
- the market value for the optimal way of using.

The real estate that is the subject of this analysis is a built-up area consisting of plots of land with a total area of almost 3.5 ha. It is a flat terrain with a complex of commercial and service buildings and warehouses of average technical condition. The total usable area of the buildings is almost 6,000 m<sup>2</sup>. Most of the real estate is paved with setts. Almost the entire property area is fenced – the fence is made of various elements. The property's area is fully developed. The real estate is located on the outskirts of a large city in Poland (population of 650,000) next to an exit road. The traffic intensity in

the adjacent street is high - the noise level is about 65 dB. The vicinity of the real estate includes warehouse facilities and storage bases, as well as unobtrusive production premises. On the other side of the asphalt street there are single-family houses and single service facilities. In the local spatial development plan, the vast majority of the area is intended for multi-family residential development (of up to five stories) with services.

Art. 4., point 16 (Act, 2017) defines a similar property as a property that is comparable to the property being valued in terms of location, legal status, function, the way of use, and other characteristics that affect its value. The real estate appraiser, when estimating the value of the property, in order to determine the value of the fixed asset of an enterprise, analyzed the local market for the date of the valuation. Unfortunately, he did not find similar properties that meet the above definition, and due to this he analyzed various solutions. The comparative approach for the current way of using the property provided the appraiser with a value on the level of PLN 8-9 mln (depending on the adopted similar properties); the income approach resulted in a value equal to PLN 8.7 mln; and the cost approach gave a value equal to PLN 7.5 mln. A similar level of value was obtained, both for the market value and the replacement value, for the current use of the property. The expert additionally estimated the market value for the optimal way of using the property. Assuming a change of functionality from commercial buildings (with an average technical and functional condition) to multi-family housing with services, the appraiser obtained a value equal to PLN 12.5 mln. This value is much higher than those obtained above. The real estate appraiser, while looking for the optimal way of using the property, analyzed whether the change in the function of the property:

- is possible, taking into account the technical and functional features of the property, and also adaptation possibilities,
- is legally permissible (mainly whether it is compliant with the local spatial development plan and construction law),
- is economically profitable,
- is consistent with social and business needs at the local level,
- is the best way of using it.

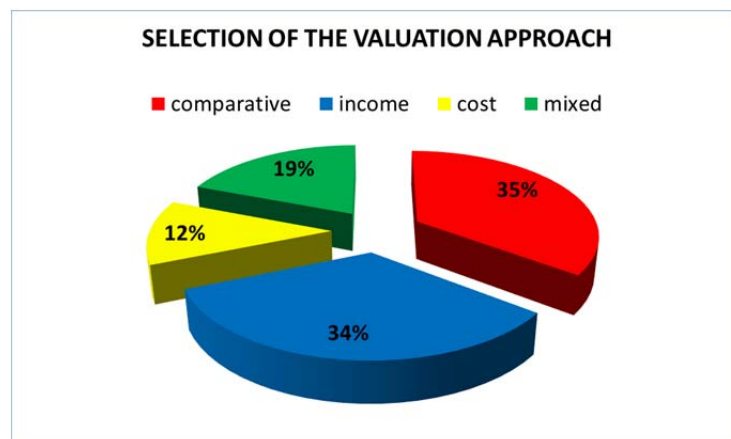


Fig. 5. The choice of the valuation approach by respondents. *Source:* own elaboration.

In order to carry out the research, the author conducted a survey among 100 respondents, including 59 property appraisers and 41 postgraduate students of real estate appraisal. The respondents were informed about the subject, scope and purpose of the valuation, as well as about the extensive analysis of the local market in terms of the sale of developed and undeveloped land (for various purposes), lease agreements, and the amount of vacant office buildings, warehouses and storage yards. Afterwards, many questions were asked. The answers to the question regarding the choice of the valuation approach is presented in Figure 5. The vast majority of appraisers and future experts chose the comparative and income approach - the estimation of the market value for the current way of using the property. A smaller group of respondents selected the cost approach - the estimation of the replacement value for the current way of using the property. Only 19% (24% of

appraisers, 13% of students) chose the analysis of the optimal way of using the property. When asked if they would change the valuation method for a different purpose of the valuation (estimation of the market value in order to determine the selling price of real estate instead of estimating the market value for the purpose of determining the value of the fixed asset component when conducting a valuation of the enterprise using asset-based approach), the vast majority of the respondents (70%) replied that they would not change the method of valuation. Based on the above study, it can be concluded that experts do not have a common attitude with regards to the approach and method of evaluating real estate that is in its "autumn years".

The conducted analyses led to the conclusion that the optimal way of using the real estate will involve the demolition of the current buildings and structures, even though their technical condition is not a direct premise. Buildings of average technical and functional condition could still be used. However, the financial analysis led to the decision that the demolition of the commercial buildings, and the construction of multi-apartment buildings, would start a new life cycle of the property. This proves that real estate appraisers should be able to cope with new consumer expectations and requirements (Żróbek et al., 2020).

## 6. Discussion and conclusions

When assessing the value of a property, a real estate appraiser must be aware of the life phase of the building, because the knowledge of the life cycle is the basis for the correct identification of the property's condition. When determining the value of an object after its prime time - in the "autumn of life" or "autumn years of a building object", it is more difficult to determine whether it is already in the phase of decommissioning or still in the phase of serviceability. It is assumed that the service life is the time when the costs related to the use, maintenance or repair of a structure or its parts are not excessive, and do not exceed ordinary expenses to a significant and noticeable degree (Michalik 2015). Prerequisites for the demolition of a building object arise when it is in a bad condition, is not used, is damaged, or, for some reason, is not suitable for renovation, reconstruction or finishing. At the end of the service life, the owner of the property must make a decision about the fate of the construction object. It is often decided to demolish a facility based on the analyses of many factors, the most important of which is usually finances. Demolition often takes place when there are plans of developing new buildings, roads and infrastructure in the places of neglected buildings. It is one of the elements that accelerates the decommissioning phase of a building and shortens its service life phase. LCA and LCC analyses are used in the decision-making process that concerns the economic and environmental aspects of a building concept (Gaulouti et al., 2020).

According to (Konior et al., 2021), the age of the elements of an old residential building with a traditional construction:

- is of secondary importance in the process of the intensity of the loss of its serviceability value,
- is not a fundamental quantity that determines the course of its technical wear.

The above thesis does not only apply to old residential buildings, and the cited case study proves that commercial real estate is similar. However, functional wear in commercial buildings is faster than in residential buildings.

The aging of a building can be considered in a completely different way - by determining the difference between absolute and relative obsolescence. "Absolute obsolescence" refers to the state of the building itself, regardless of the state of other buildings or of its users' demands. In the case of "relative obsolescence", a building becomes obsolete because it is outperformed by other (newer) buildings and/or because user demands have changed (Buitelaar et al., 2021).

When valuing real estate, it is important to correctly classify a building object to its life cycle (see Fig. 1). It is more difficult if the subject of the valuation is a building that is in its "autumn years", e.g. a building which is technically and/or functionally significantly worn. The appraiser may have a problem with determining whether the building is already in the decommissioning phase, or whether it is in the last years of its serviceability. It should be remembered that liquidation has a big impact on ecological awareness. Therefore, in the light of the need for more sustainable development and greater ecological awareness among societies, one should "weigh" the superiority of economic optimization over preservation of the environment very carefully (Grzesik & Żróbek, 2017). It is important to remember that different aspects of physical deterioration and functional/environmental obsolescence require further analysis, especially in terms of real estate valuation.

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