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Future proof real estate companies through sustainable development of institutional building stocks – Basics and tools

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Abstract. The stakeholders and companies in the real estate industry are facing new challenges. They must react to megatrends such as climate change, resource depletion, shift in social values, demographic change and digitalization and at the same time comply with their responsibility to society and environment. In order to contribute to sustainable development and thereby ensure the future viability of the company, it is necessary to consider the social, environmental and economic impact of any business activities and decisions. Referring to the German market, a discussion will be based on the example of housing companies to show how sustainability aspects can be integrated into the instrument of portfolio analysis. The interactions between sustainability aspects resulting of the external business environment, the respective location characteristics, the building performance and the rentability and marketability as a success factor will be discussed. In this context, it will be explained how to react dynamically to a changing environment by using adaptable weighting factors and to local location and market requirements. As a conclusion, it will be discussed how the concerns of society, the cities (housing districts) and the tenants can be taken into account in addition to the economic interests of the housing companies.

Keywords: institutional building stocks, portfolio analyses, risk assessment, real estate companies, sustainability

1. Introduction

The housing and real estate industry is facing challenges of a dynamically changing environment. In addition to the further development of regulatory framework conditions and the increased consideration of interactions between the real estate and the financial sectors, the change within the real estate industry results in an increasing responsibility towards environment and society. As a result, there is an intensive discussion in the context of a sustainable development. The issues affect the future viability of the company, its contribution to climate protection, and to sustainable district and urban development. This ongoing transformation process, illustrated in **Figure 1**, has a strategic significance for stakeholders in the housing and real estate industry, in particular with regard to investment decisions in connection with the further development of their building stocks. The transformation provides significant potential, but at the same time puts existing business models under pressure to adapt [1].



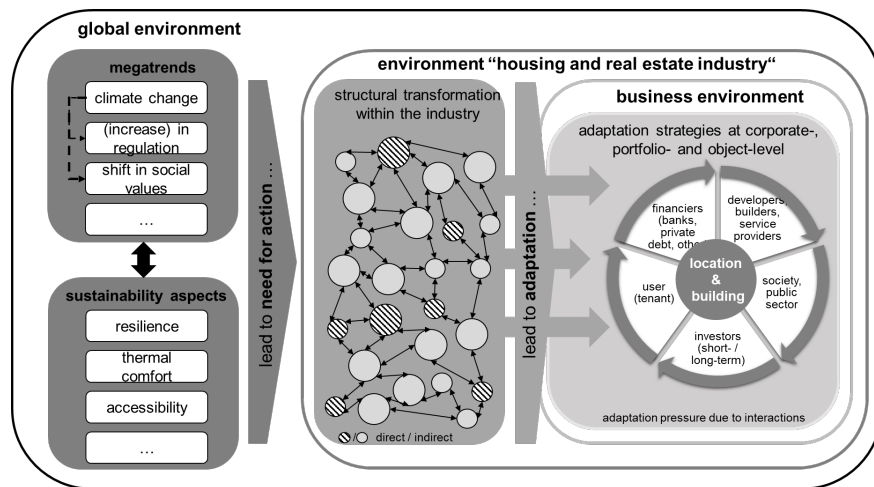


Figure 1: Megatrends and the transformation in the business environment

The identified long-term changes in the global environment (environmental changes) lead to an (in)direct need for action within the real estate industry. In particular, there is a need to adapt the corporate strategy and processes at corporate, portfolio and object-level. Decision-makers in the real estate industry must take into account additional requirements for market, location and building characteristics, resulting from the goals of sustainable development. A shift in social values towards sustainability (currently particularly in the area of climate risks) is also leading to a changing demand behavior [2].

An essential task of housing and real estate companies (H&REC) to secure their future viability is to ensure the future rentability and marketability of their building stocks (portfolio). Managing the opportunities and risks arising from changing market conditions plays a decisive role in the management of companies' own building stocks. The instruments of portfolio management already used to manage the development of building stocks do not take sustainability aspects adequately into consideration. The aim is not to replace these instruments with new ones, the aim is to improve them in terms of integrating sustainability aspects. The question that arises is which current and, in particular, future requirements for location and building characteristics will result from a changing environment and what consequences these will have for the further development and application of instruments such as risk analysis and portfolio management.

In the following, a concept for the further development of tools for risk analysis and portfolio management is introduced. The concept is addressed primarily to housing companies. In a first step, those characteristics of a building are identified which, in addition to traditional aspects, have an impact on the opportunity and risk profile of building stocks in the future. In a second step, interactions between the dimensions "environment" / "location" / "building" on the one hand and "location" / "building" on the other hand are assessed and the dynamics of their interactions are modelled. It will be discussed the contribution of companies to a sustainable district and urban development. This is based on the research by the authors with reference to the existing publications. Methods for H&REC in Germany are discussed, which can be applied to comparable real estate markets.

2. Risk analysis and portfolio management - basics and further need for development

2.1. Requirements - basics

The future viability of housing companies' building stocks in the context of ensuring future rentability and marketability is fundamental to ensure the companies' competitiveness. At the same time, only profitable companies are able to provide a positive contribution to a sustainable district and urban development. The companies also benefit from the improvement of the location [3]. Taking into account the

economic benefits, represented here by a constant rental income and a positive increase in asset value with predictable financial risks, it is important to support the stakeholders in their responsibility towards environment and society, as well as in the implementation of their economic interests, with suitable instruments.

Housing companies are already recognizing that managing sustainability-related information on buildings and locations is a key success indicator for corporate development. Instead of ignoring climate-related risks as in the past, they are now focusing on how a more responsible approach to climate mitigation and adaptation can both create resilient revenues, a positive asset (value) development, as well as a positive contribution to sustainable development. Studies on the economic benefits of sustainable buildings are increasingly complemented by evidence that sustainable buildings are associated with less (climate-related) risk [2].

In the context of future-proof corporate development, the building stocks must be continuously assessed to determine whether current and future requirements are already being addressed and if they can also be achieved in the future. Risk and portfolio analysis tools that link location and building characteristics with rental success are used for this purpose. However, such risk and portfolio management instructions have a relatively short-term risk-related time horizon. In contrast, sustainability- and climate-related risks typically have long-term impacts, and thus have not been part of risk analysis so far. Nevertheless, they can have significant (financial) relevance.

2.2. Risk management

Risk management is an interdisciplinary management function. It is an essential part of the corporate management's duty of due diligence (corporate level) and includes all activities for identifying and managing risks [4]. As part of risk management, the (predicted) impact of the identified risks on the balance sheet, income statement and cash flow must be assessed. Applied to the subject of "real estate", the results aggregated at portfolio-level are transferred to corporate-level and integrated into the annual financial report [5]. Corporate activities are subject to future developments and are therefore associated with uncertainties (risks). The identification of future risks and the derivation of market, location and building characteristics as a reaction to these challenges are the basis for required analyses and future investment decisions.

Figure 2 describes this interdependency and translates the identified environmental developments (1) via direct and indirect correlations (2) into monetary risks (3).

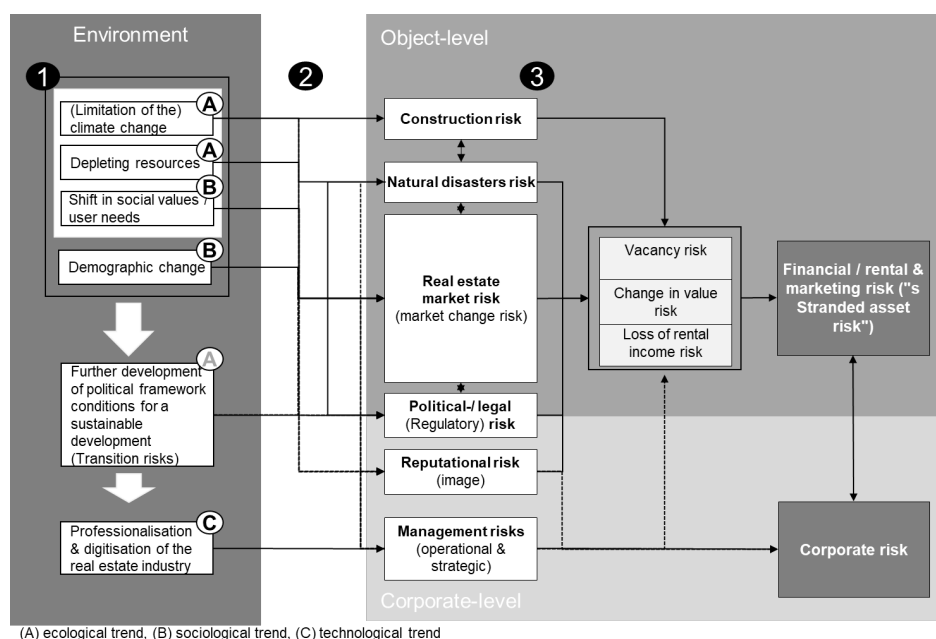


Figure 2: Transformation of environmental developments into risks

2.3. Proposal for further development of existing risk analysis models

The integration of sustainability aspects into the building analysis as part of the risk analysis proposed by the authors, aims to identify those characteristics of buildings as well as needs and requirements that are expected to result in a changed opportunity and risk profile in the future. In addition to the building characteristics already taken into account in practice, the aspects listed in **Table 1** should be considered in addition or to a higher extent in the future. In the case of existing buildings, it is important to consider environmental and market risks by the level of adaptability, and location and building risks by the level of retrofitability of the building.

The authors suggest an integration of the identified new features and characteristics into already existing corporate risk analysis instruments. The advantage of an integration consists in the criteria and weighting factors of the respective models, which are already tailored to the company's focus (corporate strategy and risk policy).

Table 1: Additional sustainability aspects taking into consideration megatrends.

Sustainability aspect and sub-aspect		Megatrend*	
location characteristics	micro-location	consequences of climate change at the location	(A)
		access to public transport / alternative traffic concepts (shared mobility) / charging station	(B) / (C)
	land characteristics	solar radiation (e.g. for solar power generation)	(B)
		land conditions (e.g. rainwater infiltration, heat pump)	(B)
		access to renewable energy (e.g. local heating / district heating)	(B) / (C)
	media supply	(B) / (C)	
building performance	building-characteristics	resilience to the consequences of climate change	(A)
		summer heat protection	(A)
		energy performance	(B)
		ecologically and health oriented building materials	(A) / (B)
		water consumption	(A) / (B)
	user / tenant satisfaction	thermal comfort in summer / winter	(A) / (B)
		indoor air quality	(B)
		accessibility	(B)
		flexibility of the floor plan / utilization neutrality	(B)
		image (GHG neutrality / sustainability certifications)	(B)
	outdoor- / community areas / balconies	(B)	
	individual feeling of safety	(B)	

Notes:

* (A) ecological trend, (B) sociological trend, (C) technological trend – distribution based on demand and development

See also figure 2 & 6

The following analysis of existing methods and instruments is based on TEGoVA Real Estate Rating, published in October 2003 by the European umbrella organization of national real estate valuation organizations [6]. One of the authors' criticism concerning established instruments is their static approach. In the context of the dynamic character of a changing environment, the resulting interdependency between environmental development and physical building characteristics has so far been inadequately represented. The proposed approach shown in **Figure 3** is a response to this criticism. The authors' suggested systematic development of existing risk analysis tools includes a content-related development based on the derivation of sustainability-related, risk-relevant characteristics, features and indicators as well as a methodological development taking into account the interactions between "environment", "location" and "building" over time.

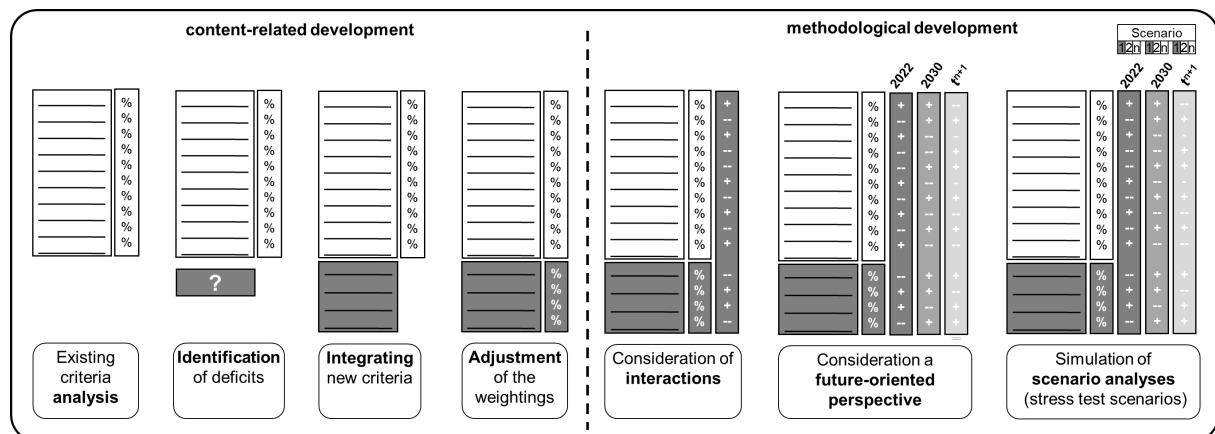


Figure 3: Proposal for systematic further development of risk analysis tools

The consideration of different assumptions (scenarios) enables the companies to have a dynamic future-oriented perspective. Both the selected criteria and the underlying weighting factors are subject to a "dynamic regionalization". On the one hand, this considers existing regional characteristics and, on the other, (regional) developing trends that may change over time. This adaptive adjustment of the weightings enables a risk assessment based on a building's environment instead of an isolated assessment. Taking into account possible interdependencies and the changing significance of characteristics in response to environmental developments, the weighting factors are dynamically adjusted on a regional basis in line with the company's strategy and the real estate submarket. The integration of sustainability aspects into the risk and property analysis (individual object analysis) provides the framework for a qualitative portfolio analysis of the whole building stock (portfolio level).

2.4. Portfolio-Management

The instruments of real estate portfolio management (IPM) provide decision-makers with valuable information for the strategic alignment of the company. According to Wellner, the aim of IPM is to secure the value of the building stocks in relation to their future rentability and marketability [4]. As a result, it is essential to have an active management of large building stocks. In addition, the instruments themselves must be actualized and adapted, currently to the requirements, which result from the goals of a sustainable development and in particular of the climatic protection. In the real estate industry, in addition to mathematical-statistical approaches based on Markowitz's portfolio selection theory [7], a wide range of qualitative approaches have been developed over time. Based on strategic corporate planning, qualitative instruments, especially the market share / market growth portfolio of the Boston Consulting Group (BCG) and the market attractiveness / business area strength portfolio of McKinsey, have been transferred to the real estate industry. A distinctive feature of qualitative portfolio models is the visualization of their interdependence in a two-dimensional matrix. Kook/Sydow even integrated a third perspective with the dimension "rental success" [8]. The portfolio approach of Wellner tried to solve the disadvantages by a synthesis of quantitative and qualitative portfolio approaches [4]. Sustainability aspects have so far been taken into account only rarely in the instruments used in practice in Germany. Schleich, for example, provides a first methodical approach to show real estate investors' strategies for including sustainability aspects in their corporate orientation and management processes [9].

2.5. Proposal for further development of existing portfolio management processes

With regard to the assessment of the future rentability and marketability of building stocks, a forecast of the environment and market development must always be included in the decision process before an investment is made. In the following, a systematic proposal for the further development of portfolio analysis tools is illustrated in **Figure 4**, based on McKinsey's nine-field matrix, which on the one hand

integrates sustainability aspects and at the same time can simulate the current and future resilience of the building stocks in the context of dynamically challenging changes (environmental developments).

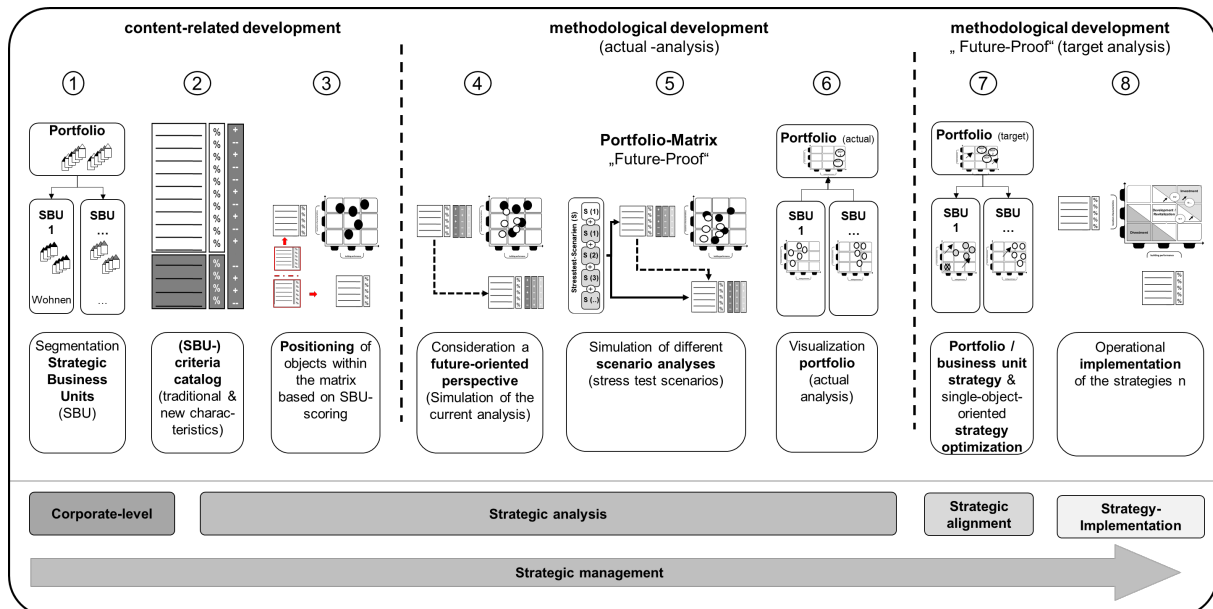


Figure 4: Proposal for systematic further development of portfolio analysis

Starting point for the building-oriented further development of real estate portfolios is the segmentation of the existing portfolio into strategic business units (1). The analysis is based on the (business area-specific) characteristics catalog developed as part of the risk analysis with traditional and new additional sustainability-related location and building characteristics (2). The application of the catalog of characteristics by using a scoring model, as a central analysis tool in qualitative risk and portfolio management, is recommended. Following this, based on the results of the analysis, the positioning within a portfolio matrix is made (3). The methodological development is based on the risk analysis and includes in a fourth step the "regionalized", dynamic, future-oriented modification of the characteristic weightings, taking into account possible interactions (4), in order to simulate in a next step, based on this, the scenario of external environmental developments on the existing building stocks (5). In the context of assessing the future viability of building stocks, it is essential in addition not only to obtain an analysis relating to the reporting date, it is also essential to determine the positioning (opportunities and risks) of the buildings during the assessment horizon. The results of the individual strategic business units are now aggregated at the company level (6) to derive a target portfolio (7). The target portfolio results from object- or business unit-specific norm strategies (8). This dynamic approach enables the development of strategic business units to be illustrated in time, taking various scenarios into account.

2.6. Proposal for integrating sustainability aspects into a portfolio model

The developed approach (**Figure 5**) shows an instrument for portfolio analysis and portfolio management with an improved informative value with regard to the long-term risk-opportunity profile of existing buildings. The qualitative assessment of individual buildings is based on a two-dimensional matrix along the dimensions of "location characteristics" and "building performance", taking into account a changing environment. The assessment of the dimension "location characteristics" includes the "market", the "micro-location" and the "land characteristics". The attributes of the "building performance" dimension are divided into the two subcategories "building characteristics" and "user/tenant satisfaction", documenting a snapshot of the physical condition of the building and also describing key characteristics that influence the current and future rentability and marketability from the user/tenant

perspective. For this reason, value-relevant building characteristics from tenancy / rental surveys are integrated into the building analysis.

Environmental developments are events which are uncertain in terms of their occurring date, significance or intensity, but are expected with a sufficiently high degree of probability. With regard to the assessment of future rentability and marketability, stress test scenarios are a useful tool for estimating the effects of possible environmental developments that are associated with uncertainties, either as of the reporting date or with a view to a mid-term and long-term forecast. Stress tests are special scenario analyses that are used to assess the impact of certain stress scenarios, for example on the value of a real estate portfolio, either at the reporting date or in the future [10]. The authors suggest aligning the scenarios to the already identified environmental developments (see Figure 2). As a result, the predictable consequences of the climate change, already occurring at the respective location, lead to increased demands on the technical performance, here represented by the resilience of the building construction as well as the performance of the summer thermal protection. At the same time, the consequences lead to an increase in the relative importance (weighting) of these criteria of the building characteristics on the reporting date as well as in the future (stress test scenario climate change). In addition, a continuous increase in the regulatory framework can significantly affect the assessment of the future viability of the building stocks. The stress test scenario "Regulatory" enables the simulation of the effects of an increase in the energy thresholds on the building stock ("stranded asset risk") by adapting the catalog of characteristics, the assessment scale and the underlying weighting factor. The importance of compliance with regulatory requirements is shown by existing and planned rental and marketing bans if a defined energy performance is not maintained [11,12].

The stress test scenario "demographic development" additionally provides the opportunity to simulate the resulting market change risk, either simultaneously or independently of other environmental developments. From the perspective of the housing company, it is important to know the scope by which the existing building stock already meets the requirements for housing suitable for the ageing population, both on the reporting date as well as in the future.

An object-related (adaptation) strategy for regions with a high (future) average age [13], for example, is a housing concept without or with few barriers. In the context of the economic value significance of the building characteristic "accessibility" (§ 2 Abs. 3 ImmoWertV) a regionalized, dynamic portfolio analysis [14] under the aspect "senior-friendly floor plans", with consideration of an adjustment of the weighting factors, is to be recommended in consequence. This contributes to the long-term value stability of the building stock and therefore to the future competitiveness of the company.

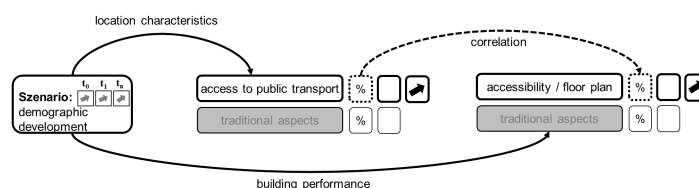


Figure 5: Correlation "environment", "location" and "building performance" based on the example of an ageing society

A supporting source of information could be, among others, the building standard "ready" [15], which can be used in connection with DIN 1840-2 [16] as a dynamically adaptable, stage-based measuring standard for existing floor plans. A distinction is made between "planned and prepared for living in old age", "suitable for visiting", "accessibility", "wheelchair accessibility".

From a social perspective, a senior-friendly construction enables people to live independently for longer, indirectly supports public care facilities, and therefore contributes significantly to social development.

Especially in regional real estate markets with a supply surplus, senior-friendly housing also offers increased user satisfaction, contributes to tenant loyalty and improves rentability. In the future, demand for housing-related services, in the sense of serviced apartments [17], will also increase. As a result, in addition to location and object characteristics, the performance of services can also be included in a portfolio analysis in the future.

The stress test scenario analysis provides an early warning indicator of stranded assets and the associated financial consequences. The term "stranded asset" describes a building whose initial usage and commercialization can no longer be fulfilled at its location due to functional, physical, technical, environmental, regulatory and economic factors or a combination of these, at the current time or with a focus to the assessment period. The stranding of buildings can be the result of changing tenant demands, management decisions, lack of modernization, technical requirements, demographic changes, or an increase in regulatory requirements. The aggregate result of the qualitative two-dimensional property analysis (sum of the point values in the dimensions "location characteristics" and "building performance"), which is determined under the assumptions of the scenario analyses or environmental developments, is finally transformed into a matrix point, whereby the diameter of the circle indicates the current market value, determined by the capitalized rental income. This is based on a statement regarding the expected rental income on the basis of the risk- and valuation-related characteristics of regional rent indexes. The integration of this third economic perspective within the matrix is recommended by the authors.

In a next step, the results at the individual object level can be aggregated to a portfolio position (strategic business unit). The aggregation is not based on the arithmetic average of the individual positions, rather on the weighted average of the market values, in order to ensure that the analysis also takes into account the significance of the individual objects within the portfolio as a whole, under the effect of sustainable risk characteristics.

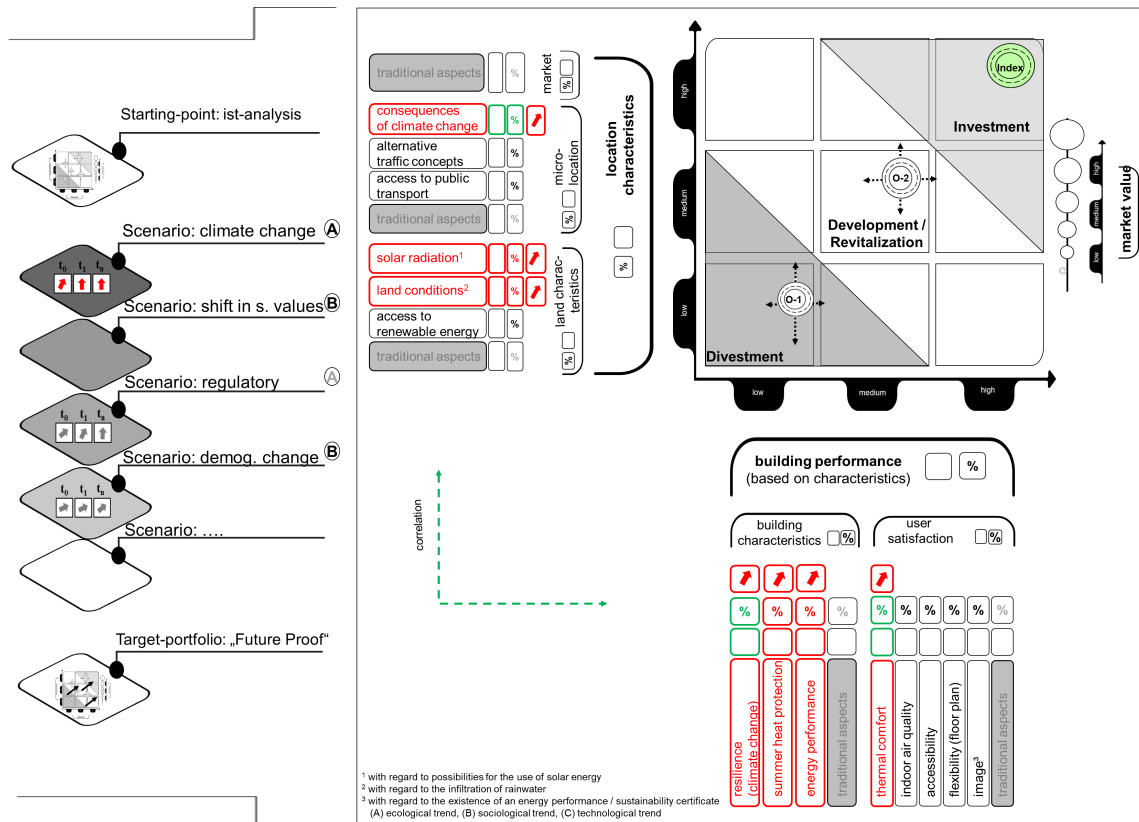


Figure 6: Integration of sustainability aspects into a two-dimensional portfolio matrix, considering different stress-test scenarios

2.7. Derivation of norm strategies

General recommendations for action (norm strategies) can now be derived from the respective matrix position of the objects or the strategic business units, which support the process of portfolio optimization. The derivation of a portfolio or individual object strategy can be based on a regional benchmark object (best-in-class approach based on GRESB) [18]. Examples include "energy modernization" (norm range: development, revitalization) or a sale of the buildings (norm range: disinvestment). A strategy for upgrading the buildings (norm range: development & investment), if necessary in cooperation with other owners of a district (housing improvement districts) [3], is another possibility for further development [19]. In the context of operative implementation, three management strategies can be distinguished:

- 1) (life-cycle related) upgrading strategy (increase in market value through active management, value-increasing modernization measures).
- 2) (life-cycle related) maintenance strategy (market value stabilization)
- 3) Inaction strategy (reduction in market value through "aging" over time)

The implementation of the strategies within the assessment horizon is visualized in **Figure 6** on the basis of two case studies. The illustration based on assumptions made by the authors in the categories assessment horizon, object, location, market and market value assessment.

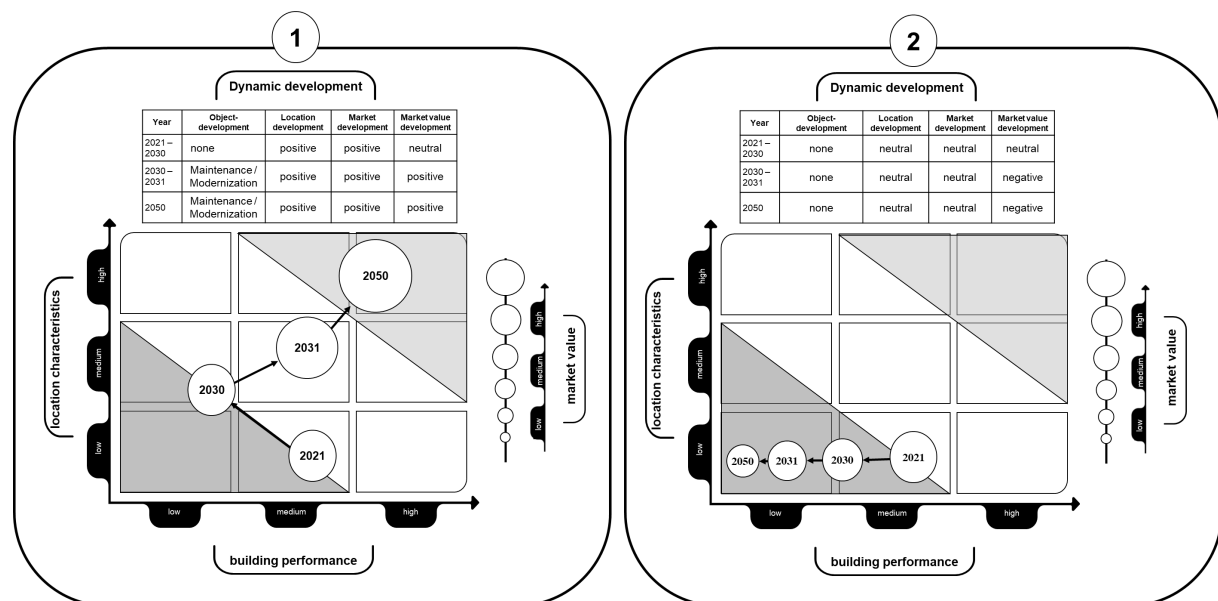


Figure 7: Dynamic building development, case study (1) & (2)

Case study (1) describes an inaction on maintenance and modernization measures over time, with the result that the process associated with aging, e.g. technically outdated building equipment, is associated with a progressive reduction in market value (2030 to 2050). In comparison, case study (2) describes the best-case scenario of an upgrading strategy from 2030 onwards; the positive development of the location in the assessment horizon 2021-2030, e.g. as a result of a positive development of the district, is initially neutralized by an age-related reduction in the building characteristic with regard to a possible increase in market value. Due to the implementation of maintenance and modernization measures, the building's physical characteristics will increase in the year 2030/2031 and, in combination with a predicted continued positive development of the location and the market, this will lead to an increased market value (radius of the circle). The continuous value-

increasing modernization over time, under consideration of the remaining positive development of the environment, results in a continuous increase in market value (2050).

3. Conclusion

The assessment of the future rentability and marketability requires a continuous, dynamic process of identifying new risk and value-related characteristics and integrating them into risk and portfolio analysis methods. There is no need for new, additional methods, in fact a systematic further development of the already existing instruments is required. In particular, the potential for further development, illustrated by the dynamic stress test scenarios, have shown that there are approaches that enable stakeholders in the real estate industry to simulate the resilience of their building stocks under a variety of (time-related) assumptions.

The results demonstrate that a future-proof building stock represents the economic interest of the housing company. In addition, ecological (energy efficiency, circularity, environmentally and health compatible building materials), user/tenant specific (increased housing comfort, health, comfort and safety) and societal (sustainable upgrading of urban and residential districts) developments are supported. The introduced contribution supports housing companies in the sustainable development of their building stocks and thus contributes to the achievement of the goals of SDGs 11, 12 and 13.

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