Environmental and Landscape Constraints and Legislative Provisions in Territorial/Urban Planning and Building Constructions: Impacts in Urban Regeneration

Fabrizio Battisti[1](✉), Giovanna Acampa[1], and Mariolina Grasso[2]

[1] Department of Architecture, University of Florence, Via di S. Niccolò, 93, 50125 Florence, Italy
{fabrizio.battisti,giovanna.acampa}@unifi.it
[2] Faculty of Engineering and Architecture, University of Enna "Kore", University Square, 94100 Enna, Italy
mariolina.grasso@unikore.it

Abstract. Legislative framework on territorial and urban planning has become more and more rich and complex in the European Union and in particular in Italy. The structured – and often hindering – system of division of responsibilities between the central State, Regions, local institutions, and organisms, generates different levels of administrative verification. The several environmental and landscape constraints by which each public administration with jurisdiction over the territory exercises its powers have a strong impact on the territorial management and negative effects on investments. Over years, this has been one of the main reasons behind the significant dilation of the risk and the time required to obtain the authorizations required to start construction, hence producing "business risk". Based on this premise, the present work investigates, on a methodological point of view, the relationships between environmental and landscape constraints, the regulatory framework to which a building is subjected, and its impacts in urban regeneration processes. This is finally aimed at finding suitable methods and procedures to formulate an opportune discount rate considering the constraints and the related regulations that operate on an asset. A mixed method that integrates Capital Asset Pricing Model, Analytic Hierarchy Process and Delphi Method is proposed to assess the discount rate component related to urban risk.

Keywords: landscape · environmental · constraints

1 Introduction

The complexity that characterizes the tools for territorial governance has a relevant role in interventions connected to development of urban plans and programs, and in new constructions or building renovations, especially with changes in in-use destinations and/or building extensions [1], actions that characterize urban regeneration interventions.

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In the last years, the legislative framework on territorial and urban planning – including all laws on zoning, landscape, environment, and building constructions that affect building transformations – has become more and more rich and complex [2].

This is compounded by the frequent changes in constraints: when these affect already-started authorization processes, they mutate the context of the building production intervention.

This complexity is diffusely present throughout the European Union; in Italy, it is combined with a structured – and often hindering – system of division of responsibilities between the central State, Regions, local institutions, and organisms, with a strong impact on the territorial management and negative effects on investments.

In Italy, in addition to Municipality-level legislative frameworks (General Regulatory Plan and its Regulations, implementation tools, and Building Regulations), building transformation also depends on a complex system of national and regional laws, and on the framework of constraints. This is the result of different sectorial plans with a conjunct efficiency, which impose different levels of administrative verification since as a rule, specific responsibilities are attributed to respective Public institutions according to the typology of the field regarded by the constraints.

Indeed, it must be considered that tendentially (not always) there is a dynamic relationship between the constraints and the territory: the legislative framework on constraints constantly changes and gets updated, modifying the intervention possibilities on an asset (this occurs and produces effects also after the start of authorization processes).

Over years, this has been one of the main reasons behind the significant dilation of the time required to obtain the authorizations required to start construction, hence producing "business risk" [3–5]: the complex administrative process for the approval of plans/projects can lead to significant variations from the starting hypotheses. This is compounded by the issues related to the insufficient service personnel of the Public Administration, with respect to the present workload, which often leads to a delay in administrative times; the juridical periods established by the laws, which usually represent the foundation for intervention plans and financial and economic assessments, end up being significantly exceeded [6].

The resulting uncertainty, which characterizes every single action of building transformation – yet in different entities according to the specific cases and territorial contexts – must be taken into account when assessing a building, for urban regeneration purposes, associated with an expected transformation intervention (real estate development, new construction, or refurbishment), and consequently with an investment opportunity, also in light of the financialization of the real estate sector. The latter requires transparency on the investment risks, as the profitability of these operations depends on them [7–9].

The complex system of planning constraints has a significant impact on the assessment of the Market Value of the asset to be regenerated, as it requires estimating an adequate discount rate to relate the return on industrial capital to the risks and times of real estate development initiatives [10].

In the evaluations of buildings and projects based on the capability to generate financial/economic flows both in the private and public sectors, the discount rate is a

key parameter to understand the profitability of investments; however, its definition is certainly problematic.

Indeed, the discount rate must incorporate all the factors that influence the investment risk (inflation, condition of financial markets, monetary policy, and possibility of alternative investments). Unlike financial investments, real estate investments are characterized by high inhomogeneity and by a fixed position, which makes each of them unique and unrepeatable, and requires a specific risk/return evaluation in the choice of the rate [11–13].

The complex legislative framework on building transformations has specific effects on the component of the discount rate that is defined by the literature as "regulatory/administrative risk" [14, 15]. The relationship between the administrative system and the framework of constraints in a given territory, and their corresponding effects on the expected profitability, has been the object of a renovated interest in recent times.

Based on this premise, the present work investigates the relationships between constraints, the regulatory framework to which a building is subjected, and its Market Value. This is finally aimed at finding suitable methods and procedures to formulate an opportune discount rate considering the constraints and the related regulations that operate on an asset.

More in detail, the article shows the first methodological results of an (in progress) research work whose (primary) goals are: i) the recognition of constraints (landscape, environmental) on the territory; ii) the construction of an evaluation procedure within the so-called "mixed methods", integrating the Analytic Hierarchy Process (AHP) [16, 17], the Delphi Method (DM) to gain experts opinion about constraints [18, 19], and the still applicable Capital Asset Pricing Method (CAPM) [20–23], to ponder the capacity of the various typologies of constraints to consider specific risk levels for the legitimation of programs/projects of building transformations. From an operational standpoint, the implementation of the AHP through DM allows the construction of regulatory/administrative risk indexes. Following an opportune elaboration process, these could generate a "fictitious Beta" to implement the CAPM for the determination of a discount rate that considers the suitable return on the equity capital needed for the start of the building transformation/real estate development, which will be transformed/valorized with certainty only after a complex administrative authorization process.

Through this clarification on the administrative conditions of the asset, the estimation can significantly contribute to the definition of the basket of investments, given the transparency of real estate players in relation to the risks of the action.

The paper fits in the theme of internationally codified mixed methods. In particular, the definition of the method is a contribution to the implementation of the Highest and Best Use [24] as a methodological approach, recognized by the Royal Institution of Chartered Surveyors (RICS) for the Market Value appraisal of assets that: need to undergo a transformation, have not obtained yet the authorizations for the intervention, and are subjected to the establishment of constraints and/or limitations by the regulatory framework. In this sense, the model can be also applied in extra-national contexts, following an opportune operational articulation.

In the rest of the paper: paragraph 2 proposed a literary review of the materials and methods in the theme of the research work: a synthesis of the European references for

the environmental and landscape constraints and a synthesis of AHP, DM and CAPM; paragraph 3 illustrates the proposed method, which integrates AHP, DM, and CAPM; paragraph 4 includes the discussions on the expected results of the proposed method and the conclusions of the present work.

2 Materials and Methods

A constraint - in detail environmental, landscape and zoning constraints - is a tool of protection, which can completely prohibit, limit, or regulate in detail the transformations of an area and/or a building. Hence, only some constraints lead to the total inhibition of any territorial and/or building transformation. In most cases, a constraint creates pre-conditions for a territorial transformation (both at an urban and building scale).

In general, territorial constraints, which regulate territorial management/transformation, fall into 3 categories: "environmental" constraints, "landscape" constraints, and "zoning" constraints. The latter derive from specific territorial plans and are aimed at the functional protection of specific territorial infrastructures/equipment.

The individuation of the constraint can occur through delimitations on the maps of the respective competent authorities. Constraints can be established or placed through specific provisions, such as national/regional decrees and laws, or through landscape plans, aimed at regulating this complex theme [25]. Delimitations can be: i) punctual: localized on a single building or a portion of a single building; ii) linear: a buffer zone, traced in parallel to the route of a linear element (rivers, power lines); iii) areal: a wide perimeter of any shape, defined according to the specific needs (landscape-related).

The European Union considers natural resources as a key contribution to ecosystemic balance, but also to the attractiveness of regions, their recreational value, and life quality: this is the basic motivation behind the need for protection and valorization [26–29].

Environmental preservation and protection are performed through the safeguarding of ecological diversity, hydric resources, reconstitution, and protection of ecosystems, including ecological networks, all vulnerable areas with high ecological value, and wetlands, which are part of those networks. To achieve this goal, several ecological elements must be individuated: these include proximal natural areas, hydric resources, therapeutic climates, and abandoned industrial areas to be redeveloped. Their care requires adequate protective measures, which result in direct constraints or prescriptions of constraints by the Member States.

Concerning the environment, the legislator framework currently includes several hundred Directives, regulations, and decisions. However, the effectiveness of the environmental policy in the European Union largely depends on its national, regional, and local implementation.

At the same time, in some areas, the European Union has directly established regulations in the Member States. Among these, the ones with the greatest (territorial) impact are below: Natura 2000 network, Sites of Community Importance (SCI), Special Protection Areas (SPAs), Important Bird and Biodiversity Area (IBA), Wetlands of International Importance, Landscape Protection.

2.1 Analytic Hierarchy Process, Delphi Method, and Capital Asset Pricing Model

This section is aimed at a synthetic outline of the structure of AHP, DM, and CAPM (Fig. 1).

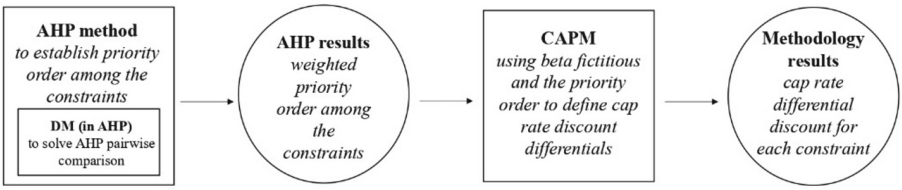

Fig. 1. Summary diagram on the integration of the methods used

These methods are already widely tested in the scientific literature and commonly used.

AHP is a multi-criteria decision support system, which allows comparing several alternatives according to multiple criteria, both quantitative and qualitative, based on pairwise comparisons. It has been considered to use, within the diversification of multi-criteria analysis methods available in the scientific literature, AHP as it allows, also thanks to Saaty's semantic scale, an easy pairwise comparison between the elements that constitute the evaluation. It is precisely from such a comparison that, through the proposed method, one can arrive at defining an order of importance to the various constraints that may intervene in a settlement transformation initiative.

The AHP process is broken down as follows:

- it starts with the definition of different alternatives to be ranked, and decision criteria, that is the factors to consider in the decision;
- the "evaluation problem" must be structured according to a hierarchy: first is the general goal, from which specific goals derive, then criteria are defined from specific goals, and indicators are associated with them. It is possible to attribute specific importance to each criterion through weight. Through a pairwise comparison related to the importance of each factor at every level (performance of the alternatives with respect to a single criterion, criteria with respect to specific goals, specific goals with respect to the general goal), it is possible to insert dominance coefficients in the pairwise comparison matrix, using Saaty's semantic scale. Saaty's semantic scale allows one to make a "weighted" judgment based on one's co-knowledge and experience regarding the comparison of evaluation items;
- after defining the problem and establishing criteria and alternatives, it is necessary to set the A matrix, that is an n x n matrix with the pairwise comparisons between the selected criteria, to attribute to each of them a preference degree (weight) with respect to the others. As mentioned above, preference degrees are attributed according to Saaty's scale;
- to guarantee an objective attribution judgment for the criteria preference degree, the decision-maker's opinion might result inadequate. For this reason, AHP is often supported by ad-hoc methods or tools for the evaluation of the preference degree.

These include the analysis of experts point of view, carried out by Delphi Method, described in the following section;

- after acquiring the experts' opinions, it is possible to attribute a weight to each criterion and hence proceed with the calculation of the vector with the criteria priorities. The latter, too, are hierarchized according to the preference degree. After calculating the vector with the criteria priority, the following step is the verification of is Consistency Ratio (CR), which is equal to:

$$CR = \frac{CI}{RI}$$

while the Consistency Index (CI) is:

$$CI = \frac{\lambda max - n}{n - 1}$$

where:

λmax represents the maximum eigenvector of the A matrix of criteria, while n is its dimension.

RI is the Random Index, a tabulated value associated with the size of the A matrix of criteria. The A matrix is considered to be consistent if CR <0,1 (10%);

- after verifying the Consistency Ratio, the final step is the hierarchization of alternatives (and the resolution of the evaluation problem). n B matrices with m x m size are defined, assigning a preference degree between alternatives with respect to the selected criteria. In this case, too, for each of the n matrices, a priority vector is calculated. At the end of this process, it is always possible to obtain the hierarchy between alternatives.

As mentioned above, within AHP, the attribution of a preference degree between the criteria is fundamental for the correct resolution of the evaluation problem. For this purpose, experts are consulted: this refers to subjects with a recognized experience and knowledge in the field of investigation/object of the problem. In the literature, the process of expert individuation is not methodologically standardized, but there are some best practices to follow:

- definition of the scope of the investigation in which the judgment is required;
- definition of the skills to seek in the experts: the expert must have proven knowledge in the field of investigation/object of the problem;
- choice of the criteria for the verification of their knowledge, such as: i) criterion 1: publications in the subjects in which the experience is required (monographs, contributions to collective volumes, articles in national and international journals, etc.); ii) criterion 2: degrees (PhD, specialization courses, masters concerning the subjects under evaluation); iii) criterion 3: professional skills and experiences.

After individuating the experts, it is only fundamental to define the most suitable consultation technique. Consultation techniques refer to the critical listening of the subjects' (experts') opinions, to expand the knowledge base related to the problem under evaluation.

There are several techniques to achieve consensus which have a specific role and are applied to support the decision-making process if the research context is characterized by a lack of scientific evidence, or if they are not demonstrated or fully shared, or even in the case of contradictions between the pieces of evidence or the sources that generated them, resulting in a misaligned picture, within which a reference point or shared guidelines must be sought. These techniques can include experts, stakeholders or both of them. Can be mentioned:

- Delphi Method is a typical methodology of social research, whereby a selected group (also known as a panel) of experts are interviewed anonymously to express their views and opinions on a given topic, with the aim of validating some of them through mutual comparison and progressive sharing [30];
- Focus Group: a discussion among a limited number of experts with the presence of the decision-maker, often supported by a tutor, to describe the nature and the main characteristics of a problem [31];
- Interviews: qualitative interviews are "extended" conversations between the researcher and interviewed people, during which the researcher tries to obtain as detailed and in-depth information as possible on the research theme [31];
- Questionnaire: an observation tool to quantify and compare the data collected on a population sample, chosen according to the characteristics of the evaluation [31].

The CAPM is a model that explains the capital market price formation mechanism. The CAPM allows determining the suitable expected return or discount rate considering the characteristics of the (generally financial) activity under evaluation (discounted cash flows generated by the activity), in relation to its risk.

The most common formula of the CAPM is [20]:

$$r_a = r_f + \beta_a * \left(r_m - r_f\right)$$

where:

ra = expected return on investment (in this case, asset);
rm = expected return of the market or its segment (in this case, real estate market);
rf = risk-free rate;
βa = beta coefficient of the investment (in this case, asset), that is the sensitivity coefficient of the stock in relation to the market [32].

In the CAPM, a particularly interesting element is the Beta coefficient, which synthetizes the relationship between the average market return rate and a specific return rate through the risk that can be associated with an asset [33].

In this sense, by expressing the covariance between a single stock and the whole market, it provides the simplest measurement of systematic risk, and hence information on the volatility and liquidity of the market. It is a simple risk index of a coefficient with practical use. Within the use of the CAPM in the field of finance, there is wide literature on the estimation of the Beta coefficient. The following proposal of a mixed method starts from the idea of considering a fictitious Beta to use for the estimation of the discount rate in real estate development actions; AHP and DM are conjunctly used for its estimation.

3 Articulation of Proposed Method

The structure of the proposed mixed method is based on AHP, DM, and CAPM, and is aimed at the determination of a discount rate that takes into account constraints and the regulatory framework that can affect urban transformation; the discount rate can hence be used for the appraisal of the Market Value of buildings that can be subjected to real estate development (pre-transformation or Transformation Value).

In detail, the proposed method is aimed at evaluating the so-called "regulatory/administrative risk" within the specific discount rate of an asset that will be subjected to a transformation intervention (that is, it will be transformed only at the end of a complex administrative authorization process). This component of the discount rate is a key element for the estimation of the pre-transformation Market Value and it also provides a parameter for the profitability of the initial capital that will be immobilized for the acquisition of the asset to transform.

The determination of the discount rate in relation to the real estate development risk can contribute to the definition of the basket of investments of real estate players.

The proposed method is articulated into 2 macro-phases:

1. the first, general, phase is aimed at the transformation of the constraints of a given context into a range of discount rate differentials depending on the same framework of constraints that affect the "regulatory/administrative risk" component;
2. the second, specific, phase is aimed at the definition of a specific discount rate for the building, in relation to the regulatory/administrative risk that can be envisaged in the valorization action.

Phase 1 is divided into the following actions:

1. recognition of the constraints within a specific territorial context, affecting territorial transformations (excluding not-buildability constraints);
2. application of the AHP, conjunctly with the DM, for the hierarchization of constraints (according to their importance) to attribute an importance index to (national) constraints. The AHP, carried out using Delphi Method results obtained with the support of experts in regulatory/administrative subjects (public officials of Regional Direction of the Urban Planning sector), will perform the pairwise comparison of each territorial constraint within the area, based on the elements that characterize the constraint itself, inferred from regulations. Two criteria are used: i) capacity to inhibit the transformation; ii) administrative-procedural time for the verification of the compatibility/conformity with the constraint. The capacity to inhibit the transformation is intended as the complexity of the constraint (so-called "vestizione", specification) and the verification process to which it is subjected (compatibility/conformity, or both). The administrative-procedural times for the verification of the compatibility/conformity with the constraint are related to the average time needed by the competent Authorities of the given constraint to elaborate the authorization/nihil obstat request and issue the related provision. The objective of this phase is to obtain weights/coefficients (as a result of the AHP) that, after opportune elaboration, can provide useful indications on the specific discount rate of a real estate development initiative in a constrained area. Each potential constraint in a given territorial area is

associated with a score, resulting from the AHP; these scores represent the "base" dataset to elaborate or normalize to proceed to the estimation of the fictitious Beta of the CAPM.

Phase 2 is articulated into the following actions:

1. identification of the fringe parameters related to the financial Beta coefficient of the CAPM. The proposed procedure considers numerical fringe values that, in the market, express the Beta coefficient that can be considered related to a riskless investment (minimum parameter) or a high-risk investment (maximum acceptability by an investor). Fringe values are related to the context where an asset has to be transformed or built, hence expressing the risk components connected to the context, hence the market, inflation, etc.;
2. conversion of AHP results (scores representing hierarchical ratios) into coefficients between the minimum and maximum Beta. In brief, the point is to interpolate AHP results within a value scale between the minimum and the maximum Beta. The interpolation leads to transforming "real Beta" coefficients related to the financial market into fictitious Beta coefficients related to the real estate market, and in the specific segment of real estate development. In particular, each constraint (within the taxonomy of a specific territorial context) is associated with a variation of the fictitious Beta. To implement the AHP, a DM has to be carried out considering the point of views of Experts regarding the relation between constraints (environmental and landscape); in other words, Experts solve the AHP pairwise comparison;
3. the obtained fictitious Beta coefficients can be used in the Capital Asset Pricing Model (CAPM); in particular, they contribute to the determination of the "overall fictitious Beta" coefficient referred to a given asset to be transformed. Beta values above 1 imply a higher risk, compared to the average market (constraint condition above the average, associated with an expected lower "reactivity" in the conclusion of the authorization procedure, which remains under risk); instead, beta values below 1 correspond to a lower risk. It is evident that the overall dummy beta, whose estimation is based on the increase in the risk of the transformation of the asset due to the constraints, embeds the risk that is generally defined in the scientific literature as "regulatory/administrative", but it does not include all the multiple variables underlying the return rate, which also depend from other factors (generally: sector, location, typology, technical and financial aspects); in this case, these additional elements can be overlooked if the considered market return rm has no time and location inhomogeneity (with respect to the asset under evaluation). Considering the above, considering results from AHP implementation (phase 2.2), this phase is implemented through the summation of the variables of fictitious Beta associated with constraints, only in relation to the constraints that are present on the asset to transform, according to the formula:

$$\beta_a = f(v_1 + v_2 + v_3 + \cdots + v_n)$$

4. Implementation of the CAPM in its traditional formulation: the result of the implementation of the CAPM is a discount rate that is calibrated on the specific constraint condition of the asset (deriving from the elaboration of the regulatory/administrative risk in one coefficient through AHP and EA), but also related to its historical-temporal-geographic context (deriving from the adoption of fringe parameters related to specific

contexts and periods). After determining the expected return through the CAPM, the future cashflows of the analyzed financial activity can be discounted, determining their current value. The discount operation allows determining the correct price of the financial activity. Hence, a riskier real estate development will have a higher beta value and will be discounted at a higher rate; less risky financial activities will have lower beta values and will be discounted at lower rates.

4 Discussion and Conclusions

This article has presented the methodological proposal for the investigation of the relationship between constraint frameworks and the Market Value of assets that suit real estate development initiatives, despite not having yet received the authorization for their transformation.

The financialization of the real estate market, that is considering real estate development interventions on assets as investments, led to the plausibility of the use of a method – the CAPM – that is typically used to determine the relationship between the return of a stock and its risk, measured through a single risk factor, called Beta.

This proposition of the CAPM provides the expected return through a fictitious Beta, which represents the object of the proposed method, configured as a suitable discount rate for the characteristics of the financial activity underlying the real estate development intervention. The premium will strongly depend on the fictitious Beta coefficient, which will measure the reactivity of the expected return in relation to the constraint conditions of the building, which determines whether an intervention is authorizable.

As in financial markets, the higher the Beta coefficient, the higher the expected return of the activity, as it has a greater degree of undiversifiable risk. Hence, an investor will require a higher return to carry out a riskier financial activity [34, 35].

With reference to the return range expressed by the financial market in a given geographic context and historical moment, the proposed procedure implicitly associates return with success risk (regardless of the specific industrial sector); the procedure, developed on a theoretical level, will have to be operatively verified by applying it on a set of buildings within a specific administrative context, for example within a Municipality.

Hence, the following developments of the research reside in its experimentation, which is aimed to achieve the results of mapping the municipal territory, which is associated with a given risk level in relation to the development of an initiative (and, consequently, a risk parameter) [36].

After mapping an administrative context, it will be possible to verify the results by comparing the discount rates and expected returns with the parameters of qualified investors within the sector.

In this sense, the proposed method aims at reducing the margins of error in the estimation of real estate with complex administrative and regulatory conditions and constraint frameworks, increasing the transparency on investment risks, which determine profitability.

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