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Social Housing: An Appraisal Model of the Economic Benefits in Urban Regeneration Programs

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Abstract: The decision-making process relating to Social Housing (SH) policies and projects involves social and urban transformations and is consequently linked to urban planning, urban regeneration projects, the dynamics of the real estate market and cooperation between public and private developers. Furthermore, this decision-making process must be supported by assessments relating to economic feasibility and assessments on social and environmental sustainability. The paper illustrates a decision support evaluation model for the implementation of integrated urban redevelopment programs related to Social Housing interventions to be implemented in PPP. The model is based on the search for an economic balance between the interests of the parties involved, with the aim of maximizing the share of housing in SH by minimizing the public contribution quota. The model was developed on a degraded settlement of Public Residential Construction, the subject of a wider urban regeneration program in the Municipality of Reggio Calabria (Italy). Considering the financial feasibility constraint for the developer and the conditions of the local real estate market, with the risk of the investment attached to it, the model makes it possible to verify the economic sustainability and the financial feasibility of the interventions in SH through the estimation of: (i) The profit of the developer/investor; (ii) the trade-in value to be paid to the developer against the investment; (iii) the maximum share of SH to be carried out in development. The research and the results obtained highlight the utility of the model and the ease of use in the programming phase, in relation to urban regeneration programs that involve interventions in SH.

Keywords: real estate appraisal; capital gain; financial feasibility; economic sustainability; public–private partnership; risk assessment; social housing; urban regeneration

1. Introduction

In Italy the solution to the problem of guaranteeing a dwelling place for the disadvantaged classes was entrusted first to the work of the “Istituto Autonomo Case Popolari (IACP)” and subsequently to the territorial “Azienda Territoriale per l’Edilizia Residenziale (ATER)”, which had the task of promoting, realizing and managing public buildings from assignment to the less well-to-be leased to fixed fees.

The huge amount of dwellings built in the eighties and the nineties, with the undoubted improvement of the living conditions of Italian families, up to what has been defined as a “society of owners”, had effectively shut down the cultural and political debate on the “home problem”, relegating it to a marginal theme; that is, concerning only specific market niches to be faced with the classic tools of assistance.

In the last twenty years, however, the socio-economic changes that have hit the globalized world have favored a phenomenon in sharp contrast: In Italy, as in various European countries, access to

home ownership has become a significant problem that is affecting, today, ever wider segments of the population [1].

This is due to many issues. On the one hand the global economic and financial crisis, which began in 2007 and is still ongoing, has had effects in the form of fewer jobs and the reduction of labor income and, therefore, on the purchasing power of families, making it more difficult to access credit and the subsequent purchase of the house. On the other hand, the active policies on welfare aimed at securing a cap for the weakest sections of the population have been weakened, especially in Italy, due to the greater budgetary constraints and the relative contraction of public spending on investments.

A third factor has affected the sociological transformation of society and the family, which has added to the social classes historically considered weaker (low income, unemployed, homeless, ex-prisoners, immigrants) other population groups (young couples, singles, spouses) separated/divorced, students, elderly) who are unable to meet their housing needs on the free market [2].

Thus, a new concept of social housing construction spreads in Europe, to be used in social innovation and smart city policies, aimed at responding to the various housing needs by creating spaces for socializing and sharing and, at the same time, for undertaken urban renewal and energy saving actions. Thanks to the spread of a growing sensitivity to environmental protection, the Social Housing (SH) initiatives represent, in fact, an opportunity to pursue goals of sustainability and energy efficiency, through actions of redevelopment of the zero consumption of land and the use of technologically advanced solutions for energy saving.

However, what makes an SH operation feasible is the financial equilibrium that governs the convenience regime for all those subjects who are an active part of this operation. In a historical period in which the public sector is no longer able, on its own, to carry out urban regeneration interventions, with an “appropriate” endowment of equipment and infrastructures, adequate to the effective, qualitative and quantitative demand of the population that resides and lives in the areas subject to redevelopment, it is the private sector that provides the necessary resources.

This is part of the concept of the new ecology of development, based on interactions and relationships between the subjects that make up the ecosystem, relationships thanks to which new mechanisms are triggered for the production of the value (economic, social, institutional and environmental value) based on the ability to put society and territories at the center. The response to these needs, put in place at an entrepreneurial level, goes increasingly in the direction of hybrid organizations, business models devoted to keeping social mission together with commercial activities [3].

Through public–private partnership (PPP) it is possible to allocate private financial resources also for SH interventions, avoiding to commit public resources [4]. The public–private partnership regime, which allows the creation of SH, can materialize in two ways:

1. Through the introduction of plan variations such as to produce increases in building rights to be granted to the private investor by way of remuneration for the investment;
2. Through the transfer of publicly owned building land on which to carry out the transformation, producing capital gain. The addressed model falls into the second case: A degraded public area is made available by the public to allow the private to carry out the transformation. Part of the land value will be transferred to the private in a reasonable amount to allow both the recovery of the invested capital and the profit of the developer.

In order to analyze the regime of convenience and thus make complex PPP operations on the subject of SH, various evaluation methods exist in the literature. Some techniques are designed to analyze the financial balance from the point of view of the private developer. Others, instead, focus on the qualitative-quantitative judgment of SH's intervention from the point of view of the community, or public convenience, expressed in terms of the quantitative provision of housing to be guaranteed at a controlled rate and/or qualitative endowment of the services of neighborhood and technological measures to reduce the costs of buildings under management [5].

A third, intermediate approach is focused on the appraisal of the capital gain generated by redevelopment of degraded areas in complex urban programs, implemented in cooperation between

public and private operators, and on how this value should be shared between the developer and the community [6].

The latter approach was developed in the context of the definition of redevelopment programs for degraded areas of the city of Reggio Calabria: The ‘Contratto di Quartiere (CdQII)’ and the ‘Programma di Riqualificazione Urbana Ravagnese (Riurb)’ for which, given the obvious implications of an estimative and evaluative nature, the Municipal Administration had requested the technical, scientific support of the Economic Evaluations and Real Estate Appraisals Lab (LaborEst) of the Department of Cultural Heritage, Architecture and Urban Planning (PAU), in the phases of: preparation of the program, evaluation of the sustainability of the proposals private to admit to the Program, development of guidance tools for the promotion of architectural quality, appraisal of extra standard costs for developers that have adhered to the programs [7].

In this paper we intend to deepen the theme of the determination of the profit of the developer in the context of a redevelopment intervention carried out in PPP and, in the specific case of a SH intervention, to define in the feasibility analysis phase of the financial operation the distribution of the capital gain generated by the redevelopment intervention. Specifically, the contribution intends to deepen the method of determining the profit of the developer through the risk assessment phase related to real estate transactions.

The evaluation model developed is a synthetic tool to support decisions in the implementation of integrated urban redevelopment programs related to ERP interventions to be implemented in PPP, to be used in the feasibility study phase. It is based on the search for an economic balance between the interests of the parties involved, with the aim of maximizing the share of housing in SH by minimizing the public contribution quota.

The case study analyzed is a degraded settlement of ERP, the subject of a wider urban regeneration program in the Municipality of Reggio Calabria. Considering the financial feasibility constraint for the developer and the conditions of the local real estate market, the model allows to verify the economic sustainability and the financial feasibility of the interventions in SH through the appraisal of:

- Developer’s profit;
- The trade-in value to be paid to the developer against the investment;
- The maximum share of SH to be carried out by the developer.

The research and the results obtained highlight the utility of the model and the ease of use in the programming phase of SH interventions.

2. Methodology

2.1. Appraisal of the Capital Gain in Urban Regeneration Programs

The condition for it to be deemed convenient to carry out a building requalification is to generate value.

The surplus (PVL) thus defined is equal to the difference between the market value (VM) of building products and the price of all the factors used in the production cycle (CP), in the event that the original value of the area is considered, or (CP’) with the actual exchange value of the land (Different authors (Realfonzo, 1994; Prizzon, 2001) distinguish between ordinary profits and extra profits, including the former in the cost of production. In light of the specific cognitive framework and for the purposes of this work, it was considered more correct in the model to consider the production cost net of the ordinary profit of the promoter (UP). In the expression [1] the cost of the CA area is considered before the change of urban destination, its value is therefore corresponding to its original destination; in practice, however, the real production cost CP’ is higher than CP as it includes the actual purchase price of the CA land: Although not equal to that of the building areas, it is higher than the original value, incorporating in the form of ground income a share of the capital gain generated by the expected urban variation).

$$PVL = VM - CP \quad (1)$$

$$PVL' = VM - CP' \quad (2)$$

Some authors believe that the capital gain is entirely transformed into ground rent, being incorporated in the increase in value of the areas following the urban variation: in this case it is possible to calculate the capital gain as the transformation value of the area [8].

Conceptually, the capital gain actually incorporates not only land rent but also ordinary profits and extra profits of the developer [9].

Among the figures that can benefit from shares of the capital gain there are:

- The Administration, public entity promoting the redevelopment program that finalizes its action to achieve greater urban quality, also through the construction of collective works and equipment;
- The developer of the intervention, sole interlocutor of the public subject, whose objectives are related to the maximization of profit;
- The builder entrepreneur, who has the profit on the construction cost (if it does not coincide with the developer, he does not intercept any additional capital gain);
- The owner of the area, whose objective is to maximize the value of the property in the variation of the annuity determined by the modification of the current urban planning instrument and therefore benefits from a share of capital gain in the form of ground rent;
- The lender, which focuses its investment on maximizing returns compared to other types of investments.

For a redevelopment intervention aimed at the realization of SH housing, generally the interlocutors can, in fact, be reduced to two, in addition to the entrepreneur who is responsible for the physical construction of the site, and that is:

- The body that owns the area with or without existing structures worthy of redevelopment. In this case, it is a matter of the municipal administration or of the ATER;
- The developer of the intervention who, participating together with other competitors in a manifestation of public evidence, is called to invest with own capital (or exposing himself directly with credit capital) to the realization of the work, renouncing, as far as possible, at a share of its profit that coincides with the discount offered during the tender. This developer generally coincides with the entrepreneur builder.

2.2. The Total Benefit (Bt) and the Developer's Profit (UP)

In the economic analysis of urban transformations, as developer's profit increases, there is a decrease in the income from real estate [10]. However, the appraisal of the developer's profit from the empirical point of view is not easy since it is difficult to draw on sufficiently reliable information.

The international and Italian literature in particular (Prizzon, 1995 par. 1.1; Forte, de' Rossi, 1992, par. 7.7; Realfonzo, 1994, par. 4.4.2) [10–12] focus on the appraisal of the developer's profit UP; this, ordinarily portrayed at the end of the process, represents the remuneration of the entrepreneurial capacity and the risk assumed by the developer. Generally the profit of the developer, in the real estate sector, is appraisal as a rate of the cost of production and investment (30%–40%) or in percentage on the market value of the realized goods (ordinarily between 20%–25%) [13].

2.3. Appraisal of the Developer's Profit (UP)

The profit of the developer (UP) is ordinarily portrayed at the end of the process and can be estimated as a rate of the production cost; in reality the proposed procedure also allows an appraisal of the VM market value once the CP (In the economics of this discussion we will no longer distinguish the difference between CP and CP', although it is to be understood CP' considering that in it is included

the actual exchange value of the land after the transformation, greater than that possessed by the land before the intervention), production cost is known, as the sum of these costs and the developer's profit:

$$VM = CP + UP \quad (3)$$

On the basis of the considerations made in the previous contribution (6), to which we refer for due analysis, the gross profit (or the normal developer's profit) can take a value between 11% and 43% of the production cost value (CP).

Therefore:

$$UP = CP * 11 \div 43\% \quad (4)$$

that is, the profit of the developer can vary between a minimum and a maximum value:

$$UP_{min} = CP * 11\% \quad UP_{max} = CP * 43\% \quad (5)$$

In order to accurately determine the percentage of gross profit to be applied for the appraisal of the profit of the developer, not being an elementary data of easy and direct retrieval, it follows that it is necessary to determine it indirectly by analyzing the circumstances that influence it.

The previous contribution had proposed the hypothesis that it is possible to assume that the thirty-two points of variation between the minimum profit ($UP_{min} = 11\%$) and maximum ($UP_{max} = 43\%$) are determined by a certain number of "ascending or descending influences" (F) (Realfonzo, 1994) which act, in successive increments, on the minimum profit ($UP_{min} = 11\%$):

$$UP = UP_{min} + CP * F \quad (6)$$

where,

UP = developer's profit

UP_{min} = minimum developer's profit equal to 11% of C

CP = cost of building restoration intervention

F = UP variation factor, which fluctuates between zero and 32% of CP.

The variation factor "F" was calculated, through the application of a multi-criteria evaluation, as a percentage index of the influences due to the real estate market trend, to the geographical area, to the size of the city, to the urban location.

This contribution intends to offer an in-depth analysis on the determination of the variation factor F starting from the assumption that, as a rule, the profit of a developer is directly influenced by the risk of the financial transaction.

One of the most important assumptions in the financial field is that higher risk investments must necessarily correspond to a higher expected return; therefore the entity of the risk assumed by the investor will have to be related in some way and transferred to a quantity of profit that is expected to be generated by the financial transaction. To determine whether it will be adequately compensated for the risk it faces, an investor must therefore be able to understand the relationship between risk and return.

However, the quantification of risk is a very complicated operation especially in the real estate sector, given that real estate stands out, compared to other investment activities, due to a very high inhomogeneity and susceptibility to geographical space and time. The real estate developer is, in fact, faced with various types of risk since it does not have certainties about the occupancy/sale rates of the property units and does not know how long and to what rent or price fee it will be able to rent or sell them. Regardless of whether the investment will be made with own capital or will be characterized by financial leverage, the developer will have to face certain costs but will also have to face potentially very variable revenues distributed over a longer or shorter time [14].

Finally, we must not forget that PPP operations arise from the need of the public entity that, without satisfactory own resources, turns to private capital for the creation of a part of "public city"

and that when the private is involved to contribute with its investments to the realization of public services, to it are transferred also all the risks (or almost) that the operation brings with itself.

If this is true, then it is possible to compare some operations in PPP to a form of financial loan, even more singular than that carried out by the banking sector which provides itself with specific guarantees, since in real estate transactions all the risk is transferred to the subject developer.

2.4. Risk Assessment in Real Estate Investments

The risk, therefore, began to be linked to two variables that act simultaneously: the risk assumed by the creditor who was satisfied with an interest rate called “cost of money”, to which was added the risk deriving from the investment transaction itself, for a total value ranging between 9% and 13% [15].

It is in this context that the financial approach has crept into traditional methods of appraisal, and techniques such as the “Costing” which divides costs by type (direct and indirect) and variability (fixed and variable) [16,17]; Discount Cash Flow Analysis (DCFA) to examine financial results and risks [18]; Profit Volume Analysis (CVPA) [2], break-even analysis BEA [19], taken from the business economy, they have since been used (and still are) to appraise the feasibility of real estate investments from a private point of view.

In addition to the cost of money, the risk factors that influence the discount rate of real estate investments can be [20–22]:

- Context risk: It depends on the position of the asset within the urban context and on the intrinsic characteristics of the real estate market in the area. The provision of infrastructure and services, and therefore the palatability of the area, can affect the gap between demand and supply of real estate, on average transaction times, etc.;
- Endogenous risk (property): It depends on typological and qualitative aspects of the asset, on its fungibility (i.e., alternative uses) and on external influencing factors, such as mortgages, pending legal actions and real rights on the asset;
- Lessee risk: It is the risk connected to a rental return and it depends on the financial reliability of the lessee and, if the property can be rented to more than one tenant, by the number of tenants (the greater the number of tenants, the greater the risk split associated with the investment);
- Liquidity risk: This is the risk associated with the average waiting time between the offer and sale of the asset. Basically the liquidity of a property is better in a market with greater demand than the offer; on the other hand, a lack of demand leads to lower sales prices;
- Financial risk: It can be linked both to the performance and the general conditions of the financial markets and to the financial structure of the investment project. This risk is reflected in the difficulty of the investor to easily obtain the financial credit;
- System risk: Concerns the local market level in which the work is inserted. It distinguishes itself in environmental risk, relative to the demographic and economic evolution of the market area, and regulatory risk, which instead refers to changes within the regulatory framework (including fiscal) that can affect sales and leases;
- Insurable risk: It is linked to the possibility that particularly serious exogenous events (such as natural disasters) may cause damage to the structure. This risk is defined as insurable as there is the possibility for the investor to cover himself from it by entering into insurance contracts. The random nature of these exogenous events suggests considering this risk class according to the cost of the insurance policy;
- Construction risk: This is represented by the possibility of a change in the time and cost of carrying out the work on site. This risk increases with the continuation of work on the site, until it becomes maximum at the time of testing, and can be determined by any authorizations during construction, by procedures necessary for the provision of credit or by technical problems (defects and defects not hypothesized in the technology, errors in the construction phase that cause significant damage to the work), uninsured or badly insured events, etc.;

- Testing risk: It is considered a significant risk as it marks the transition between all investments in deficit and positive cash flows. In the event of a negative outcome, two roads will be accessible: the execution of further works to make the work suitable (this however entails other construction costs as well as a delay in the times) or a downgrading of the work (with the consequent loss of value of the same). (It is believed that, in the real practice of managing construction sites, the risk of testing is much less significant than the construction risk. A project designed and built correctly and in accordance with the project will have no difficulty in the testing phase. During the testing phase, further investigations may be necessary to compensate for deficiencies in the construction management phase, but these are negligible burdens compared to unforeseen events due to design errors or even work accidents that could lead to the suspension of the site);
- Management risk: The property can be sold or managed directly by the developer of the real estate initiative. In both cases, in order for the work to generate positive operating cash flows that meet expectations, it must be well managed;
- Political risk, country and exchange risk: These three risk categories must be considered only in special cases, namely in the case of real estate development projects that arise in non-European and developing countries.

Not necessarily all risks must fall on the developer of the initiative. In fact, through the stipulation of a series of contracts, it is possible that the various risks connected to a real estate initiative are allocated to the other subjects participating in the initiative itself.

There are four methods to determine the amount of risk that characterizes a system being evaluated [23].

The first two fall within the Discounted Cash Flow Analysis (DCFA), in which it is possible to appropriately adjust the risk rate used to discount expected cash flows of a risky asset or, alternatively, directly adjust the cash flow values which, once transformed into certain equivalent flows, they can be discounted at a risk-free rate.

The analyst can then choose whether to appropriately modify the discount rates or the cash flows, taking into account the risks to which the transaction is subjected.

A third way is to correct the final result after evaluation, intervening on the appraisal obtained with an increase or a reduction of the value based on the calculated risk. Finally, another possibility is to observe the discount rate applied in market transactions with risks similar to that to be estimated and act in the same way.

All four methods have a significant critical aspect, namely the degree of subjectivity used by the evaluator in the adjustment of rates and flows. This problem can be partly overcome through the knowledge of the specific context and of the reference market and the verification of the results with other objective feedback elements if available [24].

The most used method in the literature is that of adjusting the discount rates, according to the principle that the more the asset is risky and the higher the rate must be to reflect, in the current value, the possibility of uncertainty of future flows.

Three techniques belong to this first category: The Build-up Approach, the Real Estate Risk (RER) Model and the Risk Weighting Model [25,26].

These techniques make it possible to determine the Risk Premium (PR) to be added to the rate of return on risk-free assets ("risk-free rate") in order to obtain the "global discount rate" ("risk-free adjusted" rate):

$$R = r_f + PR \quad (7)$$

The risk-free rate represents the discount rate commensurate with the opportunity cost of capital, which only reflects the time value of money, net of the investment risk, and is represented by the return on government securities [10] (The risk-free rate comprises two portions. The first part depends on the forecasts that operators constantly develop on the evolution of the financial markets and therefore on expected inflation in the medium term. The second is the remuneration of an investment at zero

or almost zero risk: The typical case in Italy is that of government securities (BOT, CCP, BTP, etc.). From an operational point of view, the level of return covering these two units can be determined by comparison with government securities of similar duration. The actual yield on the securities, in fact, is defined by the nominal yield and the outcome of the placement auction, and this yield includes both inflation expectations and an almost risk-free profitability [10].

The risk-free rate is therefore the cost of the money which, in the case of an investment made partly with own capital and partly with bank loans, follows the theorem of Modigliani and Miller whereby the average cost of capital is given by the weighted average of the cost of debt and the cost of equity respectively for the amount of debt and equity on the total value. The Weighted Average Cost of Capital (WACC) is given by:

$$\text{WACC} = \text{Re} (E/V) + \text{Rd} (D/V) \quad (8)$$

where,

D = amount of the developer's debt

E = market value of equity

V = total value of capital

Re = cost of own capital

Rd = average cost of debt capital.

2.5. The Multi-Criteria Analysis for the Determination of the Risk Premium

The PR risk premium changes according to the type of investment in relation to its riskiness. As part of the analysis of real estate investments, this risk is connected to the specific activity that is intended to be undertaken, the management model of this activity and the intended use of the property. More specifically, for the real estate sector reference is made to the classification of the risks already defined in the previous paragraphs, using for their estimation consolidated techniques in the financial sphere (Build-up Approach, RER Model, Risk Weighting Model) but which, in fact, draw on operational research on the subject of multi-criteria evaluation, for which the Theories and quantitative techniques of a multi-criteria nature have also been used to support financial decisions [27].

In recent years, in fact, the development of literature in appraisal-estimative disciplines has identified a certain applicative effectiveness in terms of risk management precisely in the multi-criteria approach, not only because it has a strong value of supporting decisions in the planning phase, but because the risk management process is fundamentally of a multi-criteria nature [28].

The numerous techniques developed in the academic field (Electre and Promethee, Multicriteria Utility Theory, Rough Set Theory, Real Option Theory, etc.) with the aim of estimating (quantitatively through the use of cardinal scales, ordinal or nominally listed) the effects of potential risks, however, all share the difficulty of expressing numerically a probability of occurrence or a monetary appraisal; in these cases it is possible to compare with priorities, ordinal or nominal (considered units of measurement), using the experience of the experts involved [29] through the associated use of methods such as: Project Brainstorming, Swot Analysis, Focus Groups, DELPHI Method, Panel of Experts, Community Impact Analysis, etc. [30] (These judgments expressed by the subjects actually represent subjective forecasts, the limits of which can be partially overcome by risk assessment activities organized in groups, that is to say, trusting in the greater reliability of the group decisions compared to those of the individuals).

Whatever the model and the multi-criteria technique that is considered to be used in the various risk assessment situations, in the case in question the objective is to attribute to the PR risk premium a percentage value in the range between 11% and 43% of the CP production cost.

In the present contribution, which does not intend to reserve much space for the use of a specific technique, a simplified multi-criteria approach will be used. The overall risk share of 32% will be spread

evenly across the various risk criteria. Su n. 11 types of risk, the maximum attributable valuation is equal to a value of 2.909 (understood as a percentage value of CP).

Once the cardinal assessment scale has been defined at three levels (1, 2, 3, plus the zero score), it will be possible to assign an evaluation to each risk and, through an easy weighting operation, identify the corresponding risk value between zero and 2.909.

The sum of the scores obtained returns the value of the risk premium to be added to the minimum risk share of 11%. The value obtained corresponds to the risk factor F to be replaced in formula (6), necessary to quantify the developer's profit UP.

Therefore, CP is directly influenced by the nature of the work or by the qualitative elements of the same: the better the quality of the building works (quality of materials, endowment of collective services or greater allocation of urban standards, technological equipment, etc.) the greater will be the production cost of the work; F instead is directly linked to the investment risk. Below a threshold of 11% profit (of the invested capital) the investor does not have (or should not have) an investment interest. The share of profit above 11% represents the risk that the investor is willing to assume for an appropriate remuneration at the end of the financial transaction.

2.6. The Distribution of the Capital Gain Generated by the Investment in PPP

Once the value of the UP has been defined, it is a question of determining the right distribution ratio, between the public and private subjects, of the capital gain generated by the investment.

In the case of a building redevelopment (or urban regeneration) under the PPP regime, two other factors that can influence the share of private investment must be considered plausible:

- Any costs related to the temporary accommodation of the tenants of the public housing subject to redevelopment (Ctemp) which could also be charged to the developer;
- Any financial contributions made available to the public entity (e.g., regional and national loans or own economies) and which, although small, reduce the amount of private investment.

Therefore one has:

$$C = (C_p + C_{temp} - C_{pp}) \quad (9)$$

where,

C = invested capital

C_p = production cost of the work

C_{temp} = cost for temporary housing of residents

C_{pp} = co-financing of the public entity.

In a redevelopment intervention with private capital of a public good for the construction of SH housing, it is plausible that a part of the redeveloped good remains in the availability of the private subject to be destined for the free market, as a fair return on investment. This amount must be equal to the sum of the capital invested by the developer to cover production costs plus its reasonable profit. Therefore, it is a matter of establishing the quantity of buildings (expressed in terms of real estate value or square meters of useful area or cubic meters of volume) to be sold to the investor and the amount to be paid to the public entity to be allocated to SH.

This model of allocation of the redeveloped asset is configured as an actual real estate exchange transaction (V_{perm}):

$$V_{perm} = C + UP \quad (10)$$

Starting from the report

$$VM_t: Q = V_{perm}: Q_{perm} \quad (11)$$

where,

VM_t = value of the good after the transformation

Q = total quantity of the goods after processing (expressed in sqm or mc)

Vperm = value of the exchange to be recognized to the developer

Qperm = amount of goods to be exchanged in favor of the developer.

It can be established that

$$Q_{perm} = (V_{perm} * Q) / VMt \quad (12)$$

from which to derive the quantity of transformed good to be allocated to SH (Qsh):

$$Q_{sh} = Q - Q_{perm} \quad (13)$$

By making the necessary replacements you will have:

$$\begin{aligned} Q_{sh} &= Q - (V_{perm} * Q) / VMt = \\ &= Q - (C + UP) * Q / VMt = \\ &= Q - [(C_p + C_{temp} - C_{pp} + UP) * Q] / VMt = \\ &= Q * [1 - (C_p + C_{temp} - C_{pp} + UP) / VMt] \end{aligned} \quad (14)$$

In conclusion, the characteristic of the proposed model consists in the fact that the private (promoter/investor) does not have to invest equity capital for the purchase of the area to be redeveloped, as it is a disused public property area made available by the public authorities under the partnership agreement. However, it could be useful for the public authorities that the cost inherent in the temporary transfer of the residents, who already occupy the houses being redeveloped, is borne by the public promoter (Ctemp).

In this way, the public authorities has the advantage of activating a requalification process by leveraging only on private capital and without having to invest public resources. On the contrary, in case of availability of resources, the public authority can intervene contributing to the financial operation in order to allow the financial feasibility of the intervention.

2.7. Verification of Sustainability Finance

The determination of the investment risk in this document is equivalent to the value of the developer's profit (UP) in the context of a PPP transaction aimed at the construction of SH housing. The UP, according to what established in the introduction, must be between 11% and 43% of the production cost of the intervention (developer's investment).

The degree of inherent uncertainty in the assessment of risk, and therefore of the correct determination of the profit of the developer, would require an appropriate verification in order both to avoid generating an imbalance in the distribution of the capital gain harmful to the collective interests represented by the public entity and to avoid that very restrictive forecasts with respect to the developer may prove to be at all stimulating for the entrepreneurial interests of the latter.

Over the years many risk analysis techniques have been developed, attributable to sensitivity analysis, risk matrices, probability analysis, etc. [10,29,31,32].

In the case in question, the use of sensitivity analysis could be more appropriate, defined as the repetition of ultimate estimates always using the same model and systematically varying the inputs [28].

In the feasibility study phase of the PPP operation, it is possible to perform a simulation of the cash flows (DCFA) generated by the investment from the point of view of the developer, which takes into account the scenario resulting from the distribution of the capital gain and considering a plausible time span depending on the characteristics and size of the project.

As part of this simulation it will be necessary to use, as a discount coefficient, the value of the average cost of capital (WACC). The result will be the actual return in favor of the developer, or the risk premium (PR) consisting of the NPV.

In fact on the basis of the relation (7) $R = r_f + PR$, the value of the risk-free is represented within of the WACC (The WACC allows an investor to establish the cost of capital by analyzing all its components and is an integral and fundamental element of the DCFA method. It represents the weighted average cost of capital which is represented by both the cost of equity (estimated through the CAPM) and the cost of debt capital. The risk-free rate is one of the three parameters of the CAPM and is conventionally represented by the yield of government bonds issued by the governments of economically stable countries. In continuity with resolution no. 623/15/CONS and in line with the practice adopted by the majority of European regulators for the estimate of the cost of capital, we intend to use the average yields of the ten-year BTPs for the estimate of the risk-free rate) while the PR is represented by the NPV, that is by the remuneration for the business activity at the end of the investment period.

This consideration is significant if referred to the report (6) $UP = UP_{min} + CP * F$, since the latter, representing all the business risk R, includes both the risk free, the other components of the WACC, and the risk premium.

3. Application

3.1. The case Study of the ATERP Buildings under the “Contratto di Quartiere II” of Reggio Calabria

One of the most significant interventions of the urban revitalization program [33] to be implemented with the “Contratto di Quartiere II (CdQII)” of Reggio Calabria in 2004 was the recovery of an abandoned area owned by the “Azienda Territoriale per l’Edilizia Residenziale (ATER)” (Table 1). Following the non-payment of the loan by the Ministry of Infrastructure and Transport, the interventions that included public co-financing quotas to be added to the private investments were no longer realized.

In this paper we want to present a revised and corrected version of the model used for the CdQII, proposing the intervention of recovery of the ATER area for the purposes related to a hypothesis of a program in Social Housing. Obviously, reference will be made to the market and cost values relating to the current conditions of the real estate market.



The project area is 9420 sqm, with a floor plan marked in homogeneous area B for 8915 sqm and in a homogeneous area F2 (public green) for 515 sqm.

The intervention consists of the demolition of the two existing structures and the replacement with three buildings to be used as residences, for a total of 60 apartments of different sizes, and for commercial activities (A technical expertise, commissioned by the public body to verify the stability of the two existing structures, had established the need for their demolition, as they could not be recovered both for the poor quality of the materials and for the subsequent regulatory updates on buildings in earthquake areas). The footprint of the intervention area is characterized by a two-story

underground parking area, whose roof is partly used for public spaces and partly for private spaces for the exclusive use of some residences. Specifically, the project data are the following.

Table 1. Project quantity.

Intended Use	Project Quantity	
	mc	sqm
Residential (h = 3 mL)	21,326.5	7108.8
Commercial (h = 4 mL)	7472.3	1868.1
Parking for residential use (h = 2,8 mL)	13,188.0	4710.0
Parking for commercial use (h = 2,8 mL)	26,376.0	9420.0
Parking at the free market (h = 2,8 mL)	13,188.0	4710.0
Public space (green + outdoor parking)		5285.0
Total	81,550.8	33,101.9

From the analysis of the current market for the area of reference, the following parametric market values for private building have been obtained (Table 2).

Table 2. Market values of the project area.

Intended Use	Market Value (euro/sqm)		
	Min	Average	Max
Residential	730	860	990
Commercial	790	995	1200
Reserved parking space	160	195	230

Finally, the construction cost of the project estimated today at 14,600,000.00 euro has been revalued, net of the value of the area. To the construction cost has been added an amount equal to 15% of the promoter's general expenses cost, for a total of approximately 16,800,000.00 euro.

Once estimated the cost of production it is possible to derive the parametric cost on square meters of useful project area, through a necessary homogenization operation (Table 3). In fact, since the building project is very articulated (a frequent feature in SH projects) and difficult to break down into lots that have a structural autonomy coinciding with the functional one (The various parts of the project characterized by different uses, both private and public, have common structural elements and appurtenances, such as foundations, etc.), it is not possible to determine the parametric unit cost for each single intended use. It follows that the parametric cost is an average homogenized cost, which does not highlight the due differentiation of the functional parts of the project, which will however be identifiable and expressed in the market value.

We proceed, therefore, by comparing the production cost of the work on the project quantities per single functional portion (residential, commercial and market parking use destinations), leaving out however those functional portions (green and public parking lots) that have no market cannot generate financial returns. It is clear, however, that the parametric cost contains within it also the cost necessary for the realization of urban planning standards.

Table 3. Homogenization of production costs.

Intended Use	Project Quantity		Average Production Cost	
	sqm	Incidence	Absolute Value	euro/sqm
Residential + parking lots	11,818.8	42.5%	€ 7,137,978.34	€ 603.95
Commercial + parking	11,288.1	40.6%	€ 6,817,419.57	€ 603.95
Parking at the free market	4710.0	16.9%	€ 2,844,602.09	€ 603.95
Total	27,816.9	100%	€ 16,800,000.00	

The average unit cost of the work is equal to 603.95 euro/sqm which, evidently, does not include the value of the land rent.

The construction times are estimated at around 7 years. The first year includes the executive planning phase and the authorization requirements; another three years for the construction phase up to the testing and a further three years that are probably necessary for the allocation of assets to the market and for the relative return of the investment capital to the developer.

3.2. The Appraisal of the Developer's Profit (UP)

The appraisal of the profit of the developer UP according to the model illustrated in the previous paragraphs requires the prior determination of the variation factor F, that is of the coefficient between the values 0 and 32 as the percentage share to be attributed to the value of the total cost of operation C, obtained from the sum of the production cost of the work and the cost for temporary housing, net of any co-financing by the public entity (see report (9)). In the present case, considering both the costs for temporary housing and the public co-financing, there will be no:

$$C = (C_p + C_{temp} - C_{pp}) = 603.95 + 0,00 + 0,00 \text{ 603.95 euro/sqm}$$

The value of F is estimated with the application of a multi-criteria analysis, assigning a score between 0 and 3 to the various criteria representing risk conditions in real estate investments (Table 4).

Table 4. Rating scale for multi-criteria analysis.

Rating Scale
0 = zero risk
1 = low risk
2 = average risk
3 = high risk

The scores are attributed using the Delphi Method, through the expression of the judgment by a panel of experts of the appropriately selected local real estate sector. The members of the commission of experts will preferably be indicated by the various local institutional bodies of the Metropolitan City of Reggio Calabria: LLPP Office of the Municipality, Technical Office of the ATERP, Land Agency, National Association of Construction Builders, Professional Associations of Architects, Engineers and Surveyors. The role of facilitator is entrusted to the referents of the PAU Department project of the Mediterranean University.

In this discussion, which ranks prematurely with respect to the phases of actual implementation of the PPP project, a simple simulation of the attribution of scores in the multi-criteria model is proposed (Table 5).

Table 5. Application of the multi-criteria analysis.

Evaluation Criterion	Max Score	Average Evaluation of the Panel of Experts	Weighted Score
Context risk	2.909	1	0.97
Property risk	2.909	1	0.97
Renter risk	2.909	1	0.97
Liquidity risk	2.909	3	2.91
Financial risk	2.909	2	1.94
System risk	2.909	2	1.94
Insurable risk	2.909	0	0.00
Construction risk	2.909	2	1.94
Test risk	2.909	0	0.00
Management risk	2.909	1	0.97
Political risk, country and exchange risk	2.909	0	0.00
	32.000		12.61

On the basis of the report (6) it is possible to determine the unit value of UP:

$$UP = UP_{min} + C * F = 603.95 * 11\% + 603.95 * 12.61\% = 603.95 * 23.61\% = 142.57 \text{ euro}$$

3.3. The Appraisal of the Amount of Housing to be Allocated to SH

The District II Contract of Reggio Calabria did not provide for co-financing quotas for the specific intervention on buildings owned by ATERP, but only provided the building area with annexed building structures destined for demolition.

On the basis of the reports (12) and (14) it is possible to appraisal respectively the quantity of asset to be recognized in exchange for the developer at the end of the investment and the quantity to be allocated to SH (Table 6).

Table 6. Appraisal of the trade-in value.

	Residential	Commercial	Parking Lots
VMt	€ 950.00	€ 1,050.00	€ 195.00
C	€ 603.95	€ 603.95	€ 603.95
UP	€ 142.57	€ 142.57	€ 142.57
Vperm (C + UP)	€ 746.52	€ 746.52	€ 746.52

The generic formulation, however, can be applied for only one intended use at a time, since the algorithm does not simultaneously treat several variables relating to different market and cost values, which in turn depend on the type and destination of use. In the specific case, the recovery project for the ATERP lot is characterized by multiple uses (Table 7): 11,808.8 sqm for residential use, 11,288.1 sqm for commercial use and 4710.0 sqm of parking spaces. In this case, the Qperm and Qsh values for each of the intended uses must be calculated separately.

Table 7. Appraisal of the amount of Social Housing.

	Residential	Commercial	Parking Lots
Project data (sqm)	11,818.8	11,288.1	4710.0
Qperm (sqm)	9287.3	8025.5	18,031.3
Qsh (sqm)	2531.5	3262.6	−13,321.3

We will therefore have the following.

As can be seen from the results reported in Table 8, volumes that amounted to 24 million euro can be generated from the real estate operation on a completely disused area. Considering the investment costs of around 16.8 million, it can be deduced that the remaining portion (approximately 7.2 million euro) represents the total capital gain generated by the transaction, which in turn coincides with the land rent. This method, therefore, eludes the need for the difficult determination of the value of the abandoned and unproductive area.

Table 8. Distribution of capital gain.

	Residential	Commercial	Parking Lots	Breakdown Due
Real estate values (euro/sqm)	€ 950.00	€ 1,050.00	€ 195.00	
Qperm (euro)	€ 8,822,973.84	€ 8,426,743.76	€ 3,516,100.58	€ 20,765,818.18
Qsh (euro)	€ 2,404,917.83	€ 3,425,721.86	−€ 2,597,650.58	€ 3,232,989.11
	€ 11,227,891.67	€ 11,852,465.63	€ 918,450.00	€ 23,998,807.29

Based on the aims of the redevelopment program, it is clear that it is in the interest of the public entity to keep as much surface as possible to be used as SH residence, while it is in the private individual's interest to hold mainly commercial premises, which are also suitable for more flexible use (sale, leasing or own management) and parking (to be used for sale).

With a simple clearing operation based on real estate values, it is possible to transfer the amount of commercial and parking space to the developer in exchange for a corresponding share of residential housing allocated to the public entity. All to be completed with possible monetary adjustments (Tables 9 and 10):

Table 9. Distribution of capital gain.

	Residential	Commercial	Parking Lots	Compensated Allocation
Qperm (euro)	€ 7,994,902.56	€ 11,852,465.63	€ 918,450.00	€ 20,765,818.18
Qsh (euro)	€ 3,232,989.11			€ 3,232,989.11
Totale	€ 11,227,891.67	€ 11,852,465.63	€ 918,450.00	€ 23,998,807.29

Table 10. Determination of the balance value between public and developer.

	Breakdown Due	Compensated Allocation	Adjustment in Monetary Value
Qperm (euro)	€ 20,765,818.18	€ 20,765,818.18	
Qsh (euro)	€ 3,232,989.11	€ 3,232,989.11	
	€ 23,998,807.29	€ 23,998,807.29	

3.4. Verification of Financial Sustainability

Against a financial commitment of over 16.8 million euro for a period of 7 years, the investment produces the following nominal gross profit to the developer (Table 11).

Table 11. Investment indicators.

Financial transaction period (years)	7
Investment costs	€ 16,800,000.00
Costs for interest payable	€ 616,000.00
Revenues	€ 20,765,818.18
Total gross profit (not discounted, net of interest expense)	€ 3,349,818.18
Average annual profit (not discounted)	€ 478,545.45
Rate of return (UP profit but net of interest expense)	19.23%
Annual rate of return (UP profit but net of interest expense)	2.75%

This result is the product of an indirect analysis based on the ordinary values of the developer's profit derived from literary references, and from an analysis of the local context of the real estate market carried out by privileged stakeholders through the Delphi method. Both data carry with them any margins of error due respectively to:

- General scientific results removed from the actual market situation under study;
- Incorrect assessment by stakeholders called upon to interpret business risk in the local context.

The application of an inverse analytical procedure can confirm or not the validity of the previously performed analyzes. Therefore, a simulation of the financial flows generated by the operation is carried out from the point of view of the developer. In the DCFA the discounting coefficient is given by the WACC: in the simulation it is assumed that the developer, as financier of the work, may have to resort to credit capital at least for a portion. In the hypothesis that, under ordinary conditions, the developer has capital of its own only for a third of the total amount of the investment and that it must resort to the credit system for the remaining part, it is also necessary to appraisal the average cost of the capital referred to in the report (8) (Table 12).

Table 12. Determination of the WACC.

D	€ 402.63	amount of the developer's debt
E	€ 201.32	market value of equity
V	€ 603,95	total value of capital
Re	0.58%	cost of own capital: 7-year BTP income
Rd	5.50%	average cost of debt capital: average bank interest rate (TAEG)
WACC	3.86%	

The application of cash flow analysis returns the following evidently positive values (Table 13).

Table 13. Results of the financial analysis of the investment.

NPV	€ 1,142,650.43
IRR	6.54%

In fact, the IRR, which does not depend on the cost of capital (WACC) but on the whole of the non-discounted positive and negative flows, becomes a useful tool for comparison with the WACC. Therefore, since the IRR is greater than the WACC in the simulation, the former is certainly able to cover the cost of capital (WACC) generating an incremental wealth for the developer.

In cases where the IRR is lower than the WACC, the NPV is negative. However, it may happen that for some IRR values higher than the WACC, the NPV turns out to be positive but with values that are not high enough to attract private capital.

4. Discussion of Results

Sensitivity analysis is therefore important to verify the actual validity of the risk appraisal. In fact, re-proposing the whole simulation with UP values respectively of 11% and 43% of C, or the minimum and maximum of the profit of the developer, the following results were obtained (Table 14):

Table 14. Comparison of results with the max and min values of UP.

Indicators		UP/sqm		
		€ 142.57	€ 259.70	€ 66.43
Values not updated	Total gross profit	€ 3,965,818.18	€ 7,224,000.00	€ 1,848,000.00
	Total rate of return	23.61%	43.00%	11.00%
	Annual yield rate	3.37%	6.14%	1.57%
DCFA	NPV	€ 1,142,650.43	€ 3,774,912.49	−€ 568,319.91
	IRR	6.54%	12.36%	2.48%
	IRR—WACC	2.68%	8.50%	−1.38%

From this it is clear that if the panel of experts had evaluated a risk value F equal to zero, the producer profit would be at least 11% (which in any case returns a positive annual rate of return higher than the yield of the BTP) would have been in any case insufficient for the financial feasibility of the intervention.

In truth the discriminating element that allows to establish with certainty that the UP, calculated as a percentage share of the production cost of between 11% and 43%, is sufficient to make the investment financially feasible for the developer, is the “time” factor.

Getting a certain rate of return from an investment in a single year has a certain meaning; getting the same return in ten years has a completely different meaning. It follows that the range between 11% and 43% of the C_p , inferred from the analysis of the scientific literature, is in itself insufficient and of little significance if it is not in any way related to the temporal datum investment. Probably the min and max range identified in the literature depends not so much and not only on the specific characteristics of the real estate operation fielded but rather on the time span that involved the whole process.

If this is true, the report (6) will assume the following conformation:

$$UP_{\text{annual}} = (UP_{\text{min}} + CP * F)/T \quad (15)$$

where T = investment period expressed in years.

The condition to be verified is that the annual UP is greater than or equal to the average ordinary profit of the developer in the geographical area of reference.

The significant figure will be the annual return on the investment that will have to meet the developer’s expectations based on the type of investment and the options of choice compared to other investment opportunities.

In the real estate sector, in particular, in ordinary market situations the expected returns fluctuate between 5% and 6% per year, but these could also be significantly different in more or less dynamic market conditions. In the case of Reggio Calabria the gross return recorded in 2015 was 4.5% [34].

It is therefore necessary to give a critical judgment of the value of the NPV (derived from the application of the DCFA) and of the annual rate of return which must be consistent with the values expected by an ordinary developer, in relation to the type of investment and the local context of reference.

In the event of results that are clearly inconsistent with expectations, it may be appropriate to reformulate the value of the risk according to one of the methods indicated by Damodaran [23], after a more careful analysis of the contextual conditions that influence the business risk.

In summary, the approach is to align the two members of the equation, and this can happen in two ways that are not necessarily alternative to each other:

1. Co-finance part of the intervention with public capitals, if available;
2. Increase the amount of UP (euro/sqm) in order to improve the exchange conditions.

At the moment it is difficult to reach a unified judgment on the effectiveness of evaluating the return on equity as a fraction of the cost of production rather than drawing on financial indicators.

It is therefore believed that research should still be carried out further, testing the reliability of the proposed model also by applying consolidated financial techniques such as, for example, DCFA. These techniques allow, in fact, to critically analyze the results of the simulations. The repeated analysis on various case studies and the related sensitivity analysis could clarify the reliability level of the proposed model.

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