

A Rational Method for the Quick Assessment of the Areas' Weights Applied to the Italian Context

Francesco Tajani[1], Benedetto Manganelli[2(✉)], Francesco Sica[1], Pierfrancesco De Paola[3], and Davide D'Ugo[1]

[1] Department of Architecture and Design, "Sapienza" University of Rome, 00196 Rome, Italy
[2] School of Engineering, University of Basilicata, 85100 Potenza, Italy
benedetto.manganelli@unibas.it
[3] Department of Industrial Engineering, University of Naples "Federico II", 80125 Naples, Italy

Abstract. When referring to NRRP treatments for brownfield site rehabilitation and regeneration, location's weights and measures are crucial factors. Public administration and private subjects can greatly benefit from the use of rapid estimating techniques that consider the location of the intervention through coefficients connected with the area incidence of the region under consideration when designing "win-win" project solutions. It becomes necessary to have valuation tools that allow for an assessment of the eminently building areas while also taking into account their location in order to provide assistance for resource allocation.

The core-objective of this work is to identify an innovative method for assessing the weight of positional return that allows public and private entities to be aware of the presence of a trade area in the considered territory. The method consists on defining the positional performance through the determination of a coefficient that takes into account the incidence of the localization.

The area-wide impact factor estimation method has been implemented for all 104 Italian provinces. The results are empirically collected and spatially translated using appropriate cartography with the distribution of the incidence factor for each trade area of the considered city. In the conclusions, the practical implications and benefits of the proposed evaluation method are clarified.

Keywords: Urban rent · real estate assessment · rational model · location

1 Introduction

The National Recovery and Resilience Plan (NRRP), established by Italy to administer European funding for recovery and resurgence, operates across the country through a number of urban redevelopment and regeneration projects [1]. This instrument heavily focuses on the suburbs, functioning through Integrated Urban Plans (PUI) and supporting the National Innovative Programme for Housing Quality (PINQuA) [2–4]. The first strategy aims to mainly improve the suburbs of Metropolitan Cities, whereas the second aims to build new public housing and redevelop degraded areas across the country, implementing a new management of social housing with the goal of ensuring urban social welfare.

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O. Gervasi et al. (Eds.): ICCSA 2024 Workshops, LNCS 14822, pp. 66–77, 2024.
https://doi.org/10.1007/978-3-031-65318-6_5

In order to have assistance for resource allocation, evaluation methods that provide a trustworthy assessment of building areas that also takes into consideration the influence of their location on value are required. Determining the location's weight and estimating the area are both highly relevant in NRRP interventions for the rehabilitation and regeneration of brownfield sites. In this regard, public administration and private subjects can greatly benefit from the use of rapid estimation procedures, which consider the location of the intervention through coefficients correlated to the area incidence of the considered plot, when defining «win-win» project solutions.

2 Aims

The inability of applying direct processes for estimating building areas owing to a lack of purchasing and selling prices in similar locations prompted the development of a new tool to address this issue. The approach consists in determining a coefficient that, starting from the trade area quotes, takes into consideration the area's location and hence the extrinsic characteristics that join the assets inside it. It is a tool that allows to determine not only the market worth of a region, but also its weight within the territory under consideration.

Because it is difficult to identify a potentially active market and carry out a direct (synthetic-comparative) approach, the transformation value is mostly used to estimate building areas. The suggested procedure overcomes the limitation of a lack of comparison samples by integrating with existing approaches, resulting in an accurate and quick estimate that considers location weight.

Integrating with the estimation by transformation value not only supports a faster valuation, but also takes into consideration all of the elements that describe the area in which the place is situated. Building types, geographical features, the existence of urban services and infrastructure, and the socio-economic backdrop are all examples of extrinsic qualities.

This process aims to be supplementary rather than a replacement for techniques like a Discounted Cash Flow Analysis (DCFA), as it is still required to be performed and is therefore an auditing instrument. It was developed to remove the difficulties associated with estimating building areas in situations where there are no purchase and sale prices for comparable areas. Consequently, an estimate of the area's value may be obtained fast by using this coefficient.

The identification of these incidence determinants is helpful not just for the urban regeneration and redevelopment actions envisaged by the NRRP, but also in other settings. It is a useful tool for both public and private actors: it may assist private actors in determining the conveniences of an activity, as well as offering an assessment of the weight of the buildable area on the revenues. In the case of public-private partnerships, it enables public entities to grasp the true convenience of an operation, allowing them to make appropriate requests to the private entities carrying out interventions.

Its application is also beneficial for valuation companies, who frequently do valuations using indirect methods. For example, in the case of the implementation of the DCFA, the use of an area incidence factor verifies the valuation performed by indirect procedures, taking into account the uncertainty that can be found in the use of a DCFA

due to several ordinary assumptions, such as the determination of the development phase, development indices, and discount rate. As a result, the approach in question serves as a check tool that integrates with the current methods.

As a result, the technique in question gains significant relevance in the technical and economic feasibility project (TFPE) after the revisions provided by the Italian D.L. 36/2023 on design levels [5]. The suggested approach has received more credibility when the second level of planning (former final project) was shelved. This is because the D.L. 36/2023 mandates a better connection between the executive project and the technical-economic feasibility project. The direct communication between the first and second levels of planning, which shifts from three to two levels, calls for perspective change-set. Less randomness is possible when using the suggested strategy in the TEFP since localization effects and market specificity are taken into consideration when choosing event elements. Because the goal of public administrations is to keep technical expenditures to a minimum, utilising this know-how would significantly cut them. In fact, the proposed method may be used at the preliminary level before performing an advanced analysis such as a DCFA, resulting in a rapid, reliable, and cost-effective estimate. The developed method therefore allows for an understanding of the cost-effectiveness of a project, when it is still in the TFPE phase, before performing an advanced assessment in the executive project, cutting technical expenditures and time while also working as a dependable, integrative, and controlling tool.

The proposed method, in light of the ideas just outlined, provides for a surprisingly useful instrument for identifying the region and assessing the suitability of the intervention. It is highly important in urban reconstruction and regeneration since the areas are not necessarily abandoned, but they may contain industrial warehouses, obsolete structures, or require clean up. As a result, determining the worth of the unoccupied land would support to define the intervention's appropriateness.

Deconstructing the convention of processes is actually crucial in the suburbs, especially in the harder-to-locate places. Urban regeneration initiatives are not always convenient for private individuals because of market values that are comparable to construction costs. There are additional costs associated with purchasing the area, possibly reclaiming it, and putting community interventions into place, which run the risk of rendering the project unprofitable [6–8].

Therefore, it is suggested as a simple way for private citizens and governmental administrations to manage and comprehend the benefits of both empty spaces and buildings, as well as places that need to be reclaimed or developed.

The research is articulated as follows. In Sect. 3 the method implemented is explained. In Sect. 4, the method is applied to the trade areas ("microzones") of the 104 Italian provinces, in order to define an abacus of the value coefficients and to elaborate appropriate thematic maps. Finally, in Sect. 5 the main conclusions are drawn.

3 Method

The purpose of the method developed is to measure the income in terms of the incidence of the value of built-up land, by identifying a coefficient called the INCidence income factor (INC_j). Its determination takes from Guerrieri's proposal [9] that assumes the

following configuration:

$$INC_j = \frac{(Quot_j - Quot_{min})}{Quot_j}$$

where $Quot_j$ and $Quot_{min}$ refer respectively to the quotation of the relevant trade area ("microzone") and the minimum market quotation. The quotes used to calculate the coefficient in question are based on the residential market quotations for the microzones as published on the website of the Italian Revenue Agency [10]. The Italian real estate agents consider a geographical segmentation of the market in microzones, defined according to the Presidential Decree 138/1998 and ensuing the Regulation issued by the Economy and Finance Ministry. A microzone is described as «a portion of the municipal territory […] that is homogeneous in terms of location, urban-style, historical-environmental, socioeconomic characteristics, as well as the endowment of urban services and infrastructures». For the Italian regulation, the "microzone" is a part of the urban area that must be urbanistically homogeneous and, at the same time, must constitute a homogeneous real estate market segment. A microzone is an area of the real estate market in which exogenous factors (accessibility, presence of services, building characteristics, green areas, pedestrian zones, etc.) contribute to the formation of real estate prices in a uniform manner: a microzone includes properties that differ only by intrinsic characters, which are specific to the individual property. In each microzone, the real estate units are uniform in terms of typological characteristics, age of construction, and prevailing use; it identifies homogeneous territorial market areas in terms of income and values, and in particular in terms of the extrinsic characteristics of the real estate units' incidence on these entities [11].

By identifying the marginal region in the area under consideration and adding an absolute annuity to which an annuity of zero is given, this formula may be used to convey a minimal quotation ($Quot_{min}$). In contrast, the other areas have a different rent from the marginal area because of their location-related production capability. The area incidence factor may be calculated by dividing the differential rent, which is determined by the difference between the quotation of a j-*th* area and the marginal region, by the quotation of the reference area.

The location is already taken into account in the property market quotations for the microzones, therefore identifying a coefficient quantifying the area incidence allows for the provision of a numerical number representing its weight.

4 Application of the Proposed Method in the Italian Context

Based on the method illustrated above, the incidence factor for the microzones of all 104 Italian provinces has been calculated.

The study focused on residential data of the main Italian cities, divided in microzones B (central), C (semicentral), and D (peripheral) with the exception of L'Aquila, where - after the earthquake event in 2009 - the results for several types in the commune's centre areas remain unknown. As a result, it was decided to exclude it from the analysis because the areas where the evaluations are being carried out represent more than half of the population, and so would not be representative of the city.

The corresponding market prices were established by a factual search of data from property market quotations released by the Italian Revenue Agency on October 15, 2023, in comparison to the first semester of that year. The market values taken into account refer to conventional conservative residential areas; if these characteristics were not present, they were assumed to be existent in the area. For example, in Milan's microzone C13 - CITY LIFE, only market values for civil housing with a high level of maintenance conditions were present, whereas in Savona, only market values for affordable houses with a normal level of maintenance conditions were present. Because the goal of the study is to assess the area's incidence, the values of the finished work must be assumed in the various zones.

The determined area incidence factor for all Italian provinces has been displayed on a map using the QGis programme, with the objective of representing how they spread all over the national territory. The province of Piacenza is depicted in Figs. 1 and 2, which serve as an example of the outputs of the analysis and illustrate the structure of the data acquired in an empirical and graphic form (the microzone characterized by $Quot_{min}$ is highlighted in yellow).

It is possible to observe that, in the majority of provinces, the central zones are characterized by a higher incidence factor, as theorized by classic economists who considered the centre as a location in which there are the most services, activities, employment, and urban transportation, i.e. the location in which the functions are located. One example is the province of Piacenza, where the area with the lowest incidence is in the outskirts and it increases as it gets closer to the historical centre, which has the highest incidence. This slow progression may be seen primarily in the northern Italian provinces, with the exception of Reggio Calabria and several central provinces.

However, not all provinces have a progressive move towards the centre; in fact, there are various situations, such as in Cosenza, where there is a significant difference between the peripheral and central zones, or provinces that have the highest percentages in both semi-central and peripheral zones, such as Terni and Rieti. From the preceding example, it is possible to discover the opposite of what was previously said; in fact, the province of Frosinone has the lowest incidence in the centre and the highest in the periphery, with a percentage of around 56% (see Figs. 3 and Fig. 4).

zone code	area	microzone	market value [€/m²]			INC factor
			min	max	average	
B1	central	CENTRO STORICO ENTRO LE MURA FARNESIANE	1200	1700	1450	37%
C1	semicentral	B.RA MILANO, VIALE S. AMBROGIO, P.LE ROMA, VIA COLOMBO, VIA BEATI	960	1300	1130	19%
C2	semicentral	STRADA RAFFALDA, VIA XXIV MAGGIO, VIA IV NOVEMBRE, VIA CAMPI	1000	1500	1250	26%
D1	**peripheral**	**ZONA CAPITOLO, ZONA CAORSANA, LE MOSE, GIARONA**	**740**	**1100**	**920**	**0%**
D2	peripheral	SAN LAZZARO, ZONA PEEP, ZONA FARNESIANA OLTRE VIA BEATI E CORSO EUROPA	800	1200	1000	8%
D3	peripheral	ZONA STADIO, ZONA 2000, ZONA GALLEANA, ZONA BELVEDERE E BESURICA	970	1300	1135	19%
D4	peripheral	VEGGIOLETTA, SANT`ANTONIO, BORGOTREBBIA	770	1150	960	4%

Fig. 1. Compute the Piacenza area incidence.

As previously stated, while there is a progressive northerly trend towards closer proximity to the central zone, there are more varied and diversified situations in the south and the centre of Italy; it is more common to come across situations similar to those previously mentioned in Terni and Rieti, where the incidence is distributed in an irregular and discontinuous manner. The two announced provinces can be supplemented

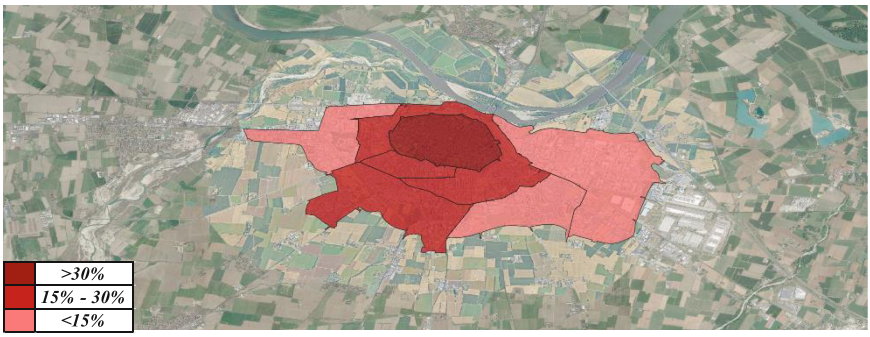


Fig. 2. Area incidence map based on Piacenza's microzones.

zone code	area	microzone	market value [€/m²]			INC factor
			min	max	average	
B1	**central**	**P.V.VENETO,V.G.MATEOTTI,C.REPUBBLICA,L.TURRIZIANI,L.S.ANTONIO**	**670**	**830**	**750**	**0%**
B2	central	P.M.FANI,V.MARITTIMA,V.MAZZINI,V.MORO,P.DE MATTHAEIS,V.MARIA	810	2500	1655	55%
B3	central	V.MARITTIMA (FANI), V.CIAMARRA, V.FIRENZE, V.BRIGHINDI, V.A.LATINA	700	940	820	9%
C1	semicentral	V.LA BOTTE,INCR.SS214,INCR.SS155,INCR.SS6,V.CAVONI,V. FABI	840	960	900	17%
C2	semicentral	SS 214, V.MARIA,V.P.FONTANA,MASTRUCCIA,CIMITERO,ORTO FRUTTICOLO	740	940	840	11%
C3	semicentral	CASALENO,LA TORRE,CERRETO,C.COTTORINO,LA BOTTE,C.DEL VESCOVO	790	990	890	16%
D1	peripheral	V.VALLE,CONTESSA,PIGNATELLE,CERRETO,VETICHE,COLLEMARTE, MANIANO	690	890	790	5%
D2	peripheral	CASA CIRCONDARIALE,MOLA D ATRI,SODINE, FONTANA DEL CERRO	690	890	790	5%
D3	peripheral	VIA CASILINA SUD, VIA F. CORINA, VARIANTE CASILINA	1400	2000	1700	56%

Fig. 3. Calculation of Frosinone area incidence.

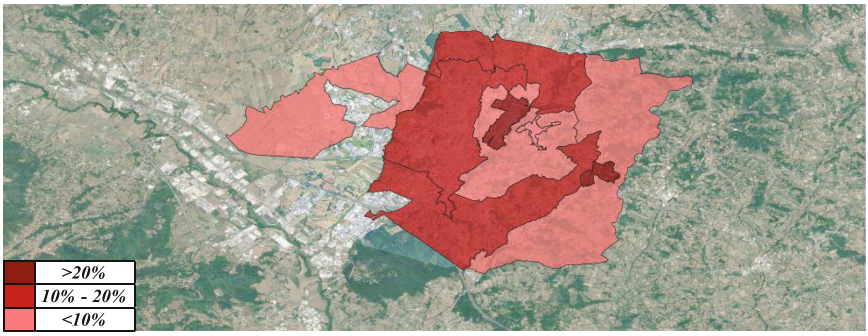


Fig. 4. Map of area incidence in relation to Frosinone's microzones.

by Benevento and Enna, where, in addition to having an erratic distribution of the incidence factor, it is possible to determine the maximum and the minimum percentages in the central zones or the province of Cagliari, which shows the maximum and the minimum percentages in the peripheral zones. The geographical value distribution and empirical findings for the Cagliari case are followed at this point in Figs. 5 and 6.

An additional tendency that has been observed concerns the coastal provinces, that report higher incidence rates in uniformly positioned areas near the sea (like in the cases of Siracusa, Rimini, Pescara, Catanzaro, and Messina).

Undoubtedly, the characteristic shared by all Italian metropolitan cities is the location of the area with greater and lesser influence inside their own territory. Where the former

is mainly located in central areas, the latter is always located in the suburbs with the exception of Palermo.

zone code	area	microzone	market value [€/m²]			INC factor
			min	max	average	
B1	central	MARINA - STAMPACE	1900	2400	2150	37%
B2	central	SAN BENEDETTO - TRIBUNALE - VIA SONNINO	1800	2300	2050	34%
B3	central	VILLANOVA	1600	2300	1950	31%
B4	central	CASTELLO	1500	2200	1850	27%
C2	semicentral	LA VEGA - FONSARDA	1700	2200	1950	31%
C3	semicentral	VIA POLA - VIALE MERELLO - BUONCAMINO	1700	2300	2000	33%
C4	semicentral	MONTE URPINU - BONARIA	2000	2700	2350	43%
C5	semicentral	GENNERUXI - VIA CASTIGLION	2000	2500	2250	40%
D2	peripheral	SANT`AVENDRACE - SAN MICHELE	1500	2100	1800	25%
D3	peripheral	AMSICORA - MONTE MIXI	1900	2400	2150	37%
D4	peripheral	QUARTIERE DEL SOLE - LA PALMA	2000	2700	2350	43%
D9	peripheral	MULINU BECCIU - FANGARIO - BROTZU	1300	1800	1550	13%
D10	peripheral	IS MIRRIONIS - MONTE CLARO	1500	2100	1800	25%
D11	peripheral	PIRRI NORD (BARRACCA MANNA - IS ARGIOLAS - S. TERESA)	1500	2000	1750	23%
D12	peripheral	PIRRI CENTRO - MONREALE - SANTA MARIA CHIARA	1650	2000	1825	26%
D13	peripheral	/PIRRI OVEST (IS BINGIAS - VIA VESALIO)	1700	2200	1950	31%
D14	**peripheral**	**LA PLAYA - VIA SAN PAOLO**	**1200**	**1500**	**1350**	**0%**
D15	peripheral	SAN BARTOLOMEO - SANT`ELIA - CALAMOSCA	1600	2000	1800	25%
D16	peripheral	POETTO	2200	3100	2650	49%

Fig. 5. Compute the Cagliari area incidence.

The majority of the provinces with extremely high incidence factors belong to those specific circumstances where the market quotations for residential properties in a typical maintenance condition were absent. The province's maximum incidence factor can reach 79% due to places like Genoa, which have many areas with values referring to affordable civil dwellings in a normal state of preservation. This increases the difference between the $Quot_{min}$ and $Quot_j$, i.e. the minimum and the reference market quotations.

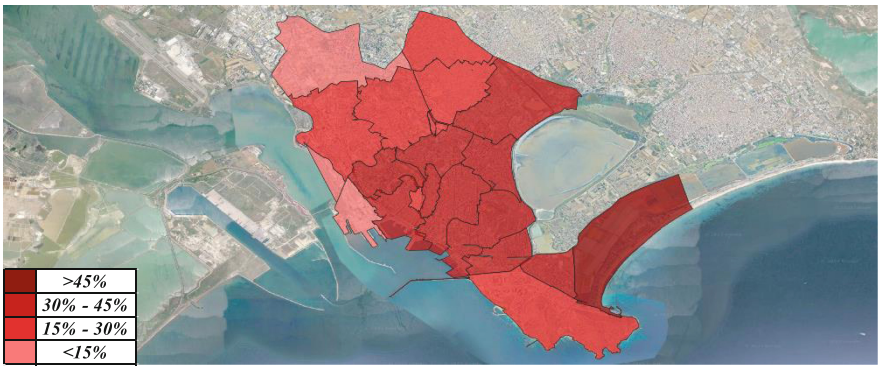


Fig. 6. Map of area incidence based on Cagliari's microzones.

Thereafter, a national map has been created, on which the average incidence rate for each Italian province has been represented (Fig. 7).

As the above-reproduced map illustrates, the national incidence rate is almost equal to 22% and it is distributed rather evenly over the whole territory. The provinces where the incidence is higher, like Taranto, with a median of around 58%, and where it is lower, like Vercelli, with a median of roughly 3%, have been identified.

provinces	INC factor
AGRIGENTO	34%
ALESSANDRIA	6%
ANCONA	18%
AOSTA	16%
AREZZO	18%
ASCOLI PICENO	22%
ASTI	40%
AVELLINO	9%
BARI	31%
BELLUNO	9%
BENEVENTO	8%
BERGAMO	27%
BIELLA	12%
BOLOGNA	20%
BOLZANO	21%
BRESCIA	26%
BRINDISI	21%
CAGLIARI	30%
CALTANISSETTA	57%
CAMPOBASSO	18%
CASERTA	17%
CATANIA	33%
CATANZARO	43%
CHIETI	9%
COMO	27%
COSENZA	29%

provinces	INC factor
CREMONA	6%
CROTONE	10%
CUNEO	16%
ENNA	25%
FERMO	9%
FERRARA	24%
FIRENZE	28%
FOGGIA	18%
FORLI'	10%
FROSINONE	19%
GENOVA	52%
GORIZIA	10%
GROSSETO	12%
IMPERIA	23%
ISERNIA	13%
LASPEZIA	15%
LATINA	20%
LECCE	28%
LECCO	10%
LIVORNO	15%
LODI	6%
LUCCA	23%
MACERATA	17%
MANTOVA	36%
MASSA CARRARA	13%
MATERA	22%

provinces	INC factor
MESSINA	21%
MILANO	42%
MODENA	14%
MONZA	19%
NAPOLI	37%
NOVARA	19%
NUORO	16%
ORISTANO	10%
PADOVA	27%
PALERMO	36%
PARMA	20%
PAVIA	20%
PERUGIA	30%
PESARO	19%
PESCARA	32%
PIACENZA	16%
PISA	24%
PISTOIA	6%
PORDENONE	18%
POTENZA	20%
PRATO	16%
RAGUSA	12%
RAVENNA	34%
REGGIO CALABRIA	27%
REGGIO EMILIA	23%
RIETI	13%

provinces	INC factor
RIMINI	17%
ROMA	33%
ROVIGO	7%
SALERNO	27%
SASSARI	25%
SAVONA	32%
SIENA	31%
SIRACUSA	43%
SONDRIO	11%
TARANTO	58%
TERAMO	18%
TERNI	14%
TORINO	43%
TRANI	8%
TRAPANI	9%
TRENTO	23%
TREVISO	23%
TRIESTE	16%
UDINE	31%
VARESE	27%
VENEZIA	15%
VERBANIA	22%
VERCELLI	3%
VERONA	27%
VIBO VALENTIA	21%
VICENZA	25%
VITERBO	17%

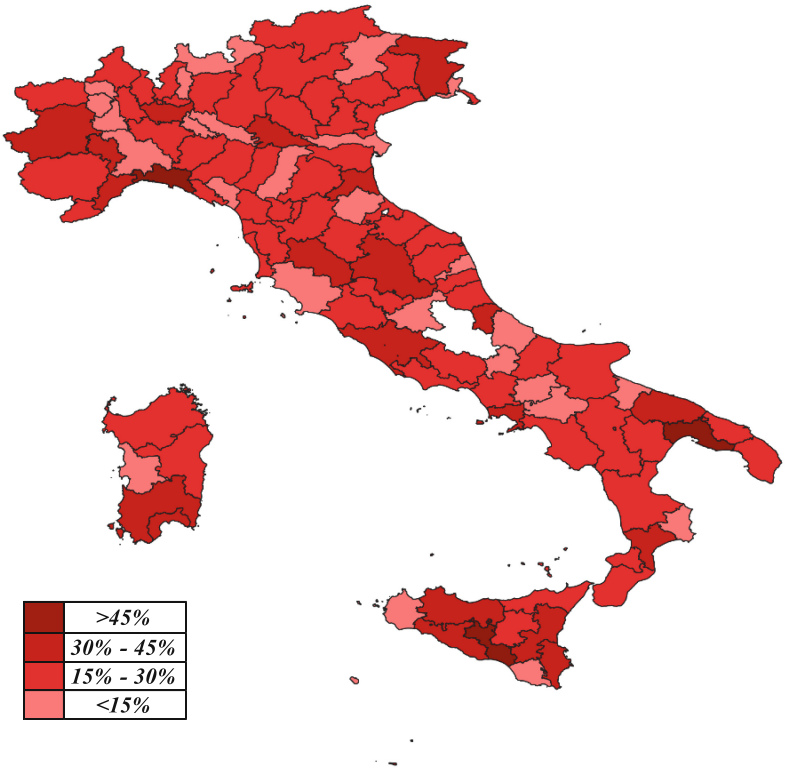


Fig. 7. Mapping of the average area incidence factors for the Italian provinces.

regions	INC factor
ABRUZZO	20%
BASILICATA	21%
CALABRIA	26%
CAMPANIA	20%
EMILIA ROMAGNA	20%
FRIULI VENEZIA GIULIA	15%
LAZIO	17%
LIGURIA	30%
LOMBARDIA	20%
MARCHE	19%

regions	INC factor
MOLISE	11%
PIEMONTE	18%
PUGLIA	26%
SARDEGNA	16%
SICILIA	27%
TOSCANA	17%
TRENTINO ALTO ADIGE	22%
UMBRIA	22%
VAL D'AOSTA	16%
VENETO	19%

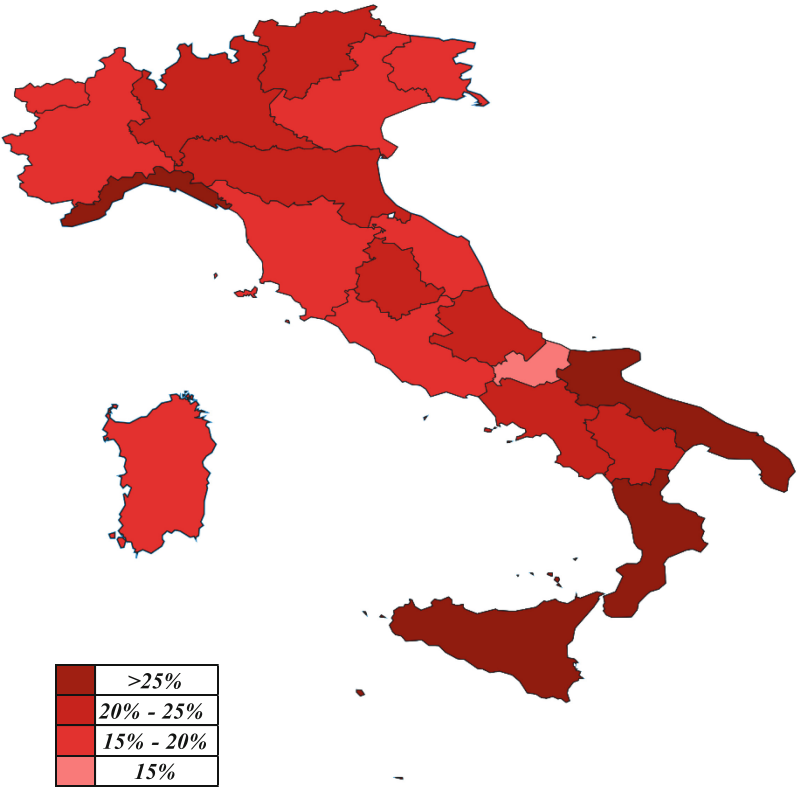


Fig. 8. Mapping of the average area incidence factors for the Italian regions.

The majority of cities have an incidence rate that, on average, ranges between 15% and 30%. However, some provinces, like those in Genova, Taranto, and Caltanissetta, have incidence rates that are noticeably higher than the average value, due to the absence of normalcy in the percentage of civil-dwelling units as previously stated.

Following that, a national map has been elaborated, in which the average incidence per area for each region has been displayed (Fig. 8).

The average area incidence throughout the regions is 20%; the Liguria region is characterized by the greatest occurrence at 30%, whereas the Molise region reports the lowest prevalence at 11%.

Southern Italy has the largest area incidence, as the chart in Fig. 8 already makes clear, with three regions over 25%: Apulia (26%), Sicily (27%), and Calabria (26%). Only Liguria surpasses the 25% threshold in the North, with 27% being the area with the highest rate, according to the Centre. The average proportions for the south, centre, and north of Italy are respectively equal to 24%, 20%, and 21%, based on the incidence factor averaged over the areas of the several zones. After careful analysis, it has been possible to conclude that this trend is due to the fact that there is a greater difference in the population densities of different zones in the southern.

5 Conclusions

The objective of the work has been to provide an innovative tool that is able to consider the weight of the position rent in the overall value of an urban transformation interior. Specifically, the method in question allows stakeholders (public and private ones) to be aware of the incidences of the microzones, both locally (within the province) and nationally (by region or macroarea).

The main results of this work have been: *i*) a detailed abacus, which makes it possible, for each microzone of each Italian province, to quickly identify the area incidence factor; *ii*) a geo-referencing of the outputs on each Italian province and on the entire national territory, in order to support public and private operators, by means of a graphic interface of easy consultation that visually translates the area incidence factors through a rational and objective method in the investment decisions on the territory. These coefficients are therefore fundamental in identifying the effective incidence of the areas in the transformation/re-qualification/regeneration projects of the territory, making it possible to arrive at a reliable judgement of convenience on the real estate initiatives considered. In synthesis, the main advantages of the method are:

i. the quick assessment of a "first" market value of buildable areas, depending on their location;
ii. a rational evaluation of the incidences of location rent, in order to provide for value-for-money judgements on urban regeneration and redevelopment projects that are less affected by uncertainty;
iii. a valid tool for the integration and control of indirect procedures (income approach methods), in particular of a Discounted Cash Flow Analysis, as the most applied technique for the assessment of the market values of buildable areas [11].

The proposed method constitutes a tool that makes it possible to check, in an integrated manner, the valuations that are performed for buildable areas and also to understand and quantify the convenience of an investment on the territory. In the light of the NRRP (National Recovery and Resilience Plan), the outputs of these types of methods are useful in order to adequately support the evaluation of the conveniences of urban

regeneration and redevelopment interventions. Furthermore, the area incidence factors determined by the developed method also represents a useful reference in the case in which the cost approach is applied, in order to objectively assess the weight of the area on the market value of a building.

The method has further uses for local public entities, such as municipalities, which have to annually estimate the values of building areas for the calculation of property tax. Having a coefficient at their disposal to quickly assess the market values of the building plots will make it easier for public authorities to identify them, as well as for citizens to understand how much they have to pay. The usefulness of the proposed method can be also seen in the process of determining the values of the superficiary rights in social housing initiatives [12, 13].

The procedure adopted makes a significant contribution and suggests several directions for future research, such as the application of this tool as a comparison check of a Discounted Cash Flow Analysis on multiple case studies, in order to test and ascertain the validity of the method. Future developments, moreover, could concern the implementation of the developed method to other intended uses (commercial, productive, tertiary), possibly also in a combined manner, where, in most cases, large urban redevelopment projects foresee a mixture of functions. Finally, another research perspective concerns the temporal analysis of the area incidence factor of each microzone of the considered cities, in order to reconstruct the evolution of the differentiated location rent throughout the national territory [14, 15].

Note: The current study has been developed within the current research P.R.I.N. Project 2022: "INSPIRE—Improving Nature-Smart Policies through Innovative Resilient Evaluations", Grant number: 2022J7RWNF.

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