Green Energy and Technology

Francesca Abastante · Marta Bottero · Chiara D'Alpaos · Luisa Ingaramo · Alessandra Oppio · Paolo Rosato · Francesca Salvo *Editors*

Urban Regeneration Through Valuation Systems for Innovation

Springer

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Preface: At the Origin of Circularity

The planning of a "sustainable" development path for urban areas is a challenge both difficult and promising at the same time. In fact, heavily anthropized areas present the highest environmental and social criticalities and, nevertheless, are an ever-coveted source of opportunities and well-being.

Urban areas host most of the world's population, and United Nations predicts that in a few decades, 80% of the population will reside in urban areas both for incoming migratory flows and for the expansion of urban areas themselves.

This trend has been constant over time and has slowed down only during exceptional and contingent events, such as the Second World War.

More recently, the spread of telecommunication networks (ICT) and the COVID-19 pandemic seem to have slowed this trend, but it is not known whether it is a structural or contingent phenomenon.

Urban areas, strong generators of explicit and implicit knowledge, offer better job and income prospects, better social services, better schools, better health care, and much more; likewise, they are also the places of conflict and degradation where the expectations of immigrants, if disregarded, generate frustration and marginalization.

On the environmental level, cities are formidable sinks of raw materials and energy and, consequently, of pollution of all environmental matrices: soil, water, and atmosphere.

Cities are made up of fragile and obsolescent physical infrastructures which, if not properly maintained, easily degrade, triggering similar phenomena on a social level.

Urban systems are always in a dynamic equilibrium between development and degradation, according to the resources invested in them, both public and private, and even the objectives of the urban policies underlying these resources.

In this regard, the declared goal of the public decision-maker in recent decades is the design of a "circular city" capable of reabsorbing—in the broadest sense—the "toxins" produced by urban metabolism. This means not only ensuring correct management of material waste and technological externalities but also generating "value systems" capable of mobilizing the resources necessary for the regeneration of the most compromised areas.

But what are the basic principles of the circularity of economic systems in general and urban ones in particular?

Much has been written from many points of view, so much so that the concept risks are appearing elusive in its concrete application. To go back to the founding principles, it seems useful to recall scholars who at the end of the 1960s started a rethinking of the traditional economic approach based on the uncontrolled extraction of natural resources for production purposes: Kennet Boulding, John Krutilla, and Garret Hardin.

Boulding [1] theorizes the distinction between open (linear) and closed (circular) economic systems and distinguishes the systems (open or closed) according to the reference: matter, energy, and information. He advocates, with the need for the reuse of waste material, the construction of circular economic systems in a closed environment such as the earth ecosystem.

Krutilla [2] focuses his thought on the value of natural resources in a long-term perspective and points out that these resources have a "plus value" that transcends the mere use value and that is linked to the legacy for the future generations, the existence of all living beings, and to the future options of use (known and unknown) that may be exercised.

He highlights that the value of a resource (including cultural) changes according to the information acquired with its use (learning by doing).

Finally, he recognizes that technical progress can temper the effects of scarcity by improving resources use efficiency but points out that the effect of technical progress is asymmetrical with respect to the resources transformation function into public and private goods since it is the result of private investment. Technology tends to evolve towards forms that favour the production of private goods and services, often sacrificing public goods and services produced by environmental resources.

Hardin [3] addresses the problem of the long-term sustainability of population growth which can also be extended to the concentration of the urban population. He stresses that many properties of natural resources, such as the ability to assimilate waste and most of the "amenities", are "commons" for which the market is inefficient (unable) to achieve a socially optimal management. He also demonstrates that there is no optimal solution based on individual rationality but only a "moral" solution, anticipating Nobel Prize Elinor Ostrom's work [4] on the role of institutions in the management of common resources.

Finally, he poses the basic problem in the definition of the optimal social solution, of the "weighing" of private and public goods in the formation of well-being.

The basic principles theorized by these three authors have been extensively reworked and developed; however, they still remain an important theoretical and cultural reference for the generation of environmental economists of the last fifty years.

As mentioned earlier, the identification of concrete solutions for the construction of circular urban systems passes through the recognition of a coherent system of values and adequate evaluation tools.

This book collects contributions on evaluation models in decision-making processes for the construction of circular urban systems in the digital era, with particular attention to the improvement of social and individual well-being.

The book is organized into three sections, reflecting the main topics.

Part One, entitled "Models and Metrics for Social Impact Assessment", presents some experiences in evaluating private and public assets in Italian cities, investigates the formation of value in urban regeneration projects, and tackles the problem of evaluating public and private advantages in urban planning choices.

Part Two includes eight contributions under the subtitle "Decision Making for Circular Cities" and addresses the problem of the transition between linear and circular systems in various fields: mining, social housing, and in the construction of architecture. It also presents some insights on the topic of sustainability with reference to the social, economic, and environmental dimensions.

Part Three faces the topic of "The Value of Spaces in the Digital Revolution" through five papers. The contributions focus, in particular, on the use of new technologies, such as webGIS and BIM, in economic and environmental assessment processes.

The book is addressed to experts and scholars working on urban regeneration and aims to encourage a multidisciplinary dialogue for shaping sustainable urban areas in the next future.

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Contents

An Evaluation Tool of Public–Private Conveniences in the Definition of Urban Planning Variants

Pierluigi Morano, Francesco Tajani, and Debora Anelli

Abstract The economic convenience of urban transformation interventions carried out as derogation of existing urban planning instruments is subject to the determination of the "higher value" generated by the urban planning variant. Aim of the work consists in the development and testing of a procedural protocol for supporting the municipal administrations for the "higher value" assessment, according with the provisions of the Italian D.P.R. no. 380/2001, art. 16, paragraph 4, letter *d-ter)*. The protocol's effectiveness is tested through an application to a case study located in the city of Taranto (Italy). The research intends to provide a tool that integrates the assessment methodology with the normative regulations provided by the national and regional legislator. The results obtained highlight the efficiency and usefulness of the proposed protocol of evaluation.

Keywords Extraordinary urbanization contribution · Public–private partnership · Financial feasibility analysis · Urban planning variant · Transformation value

The work must be attributed in equal parts to the authors.

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1 Introduction and Aim of the Work

The issue of urban rent is still very topical. At the international level there are numerous negotiation schemes between public and private subjects to assess, for public purposes, the capital gains that are generated by urban transformation interventions—the so-called *value recapture*—and to share these capital gains equally between administrations and real estate developers—the so-called *value sharing*—through regulations and negotiation agreements [1–6].

In Italy, the result of recent sectorial policies has led to the introduction and development of new negotiation tools, based on a taxation mechanism and reuse of resources in the context of urban transformation and development [7–15]. In particular, the establishment of the "extraordinary urbanization contribution"—which has been introduced in 2014 by the D.P.R. no. 380/2001, art. 16, paragraph 4, letter *d-ter)*—determines the minimum and mandatory share of the surplus value generated by the urban planning interventions, carried out by private developers, which must be paid to the municipal administration. This share is equal to 50% of the surplus value. At the regional level, the regulatory framework is miscellaneous. Only two regions out of twenty (Piedmont and Puglia) have fully applied the dictates of the state law. Some regions, albeit in the absence of specific legislation on the matter, provide for a "generic" contribution intended for the construction of public workings, also providing for a monetization form as a contribution for the lack of urban planning standards. This is the case of Umbria with art. 35 of the Regional Law no. 1/2015, of Abruzzo with the Regional Law no. 40/2017, of Lazio with the Regional Laws no. 21/2009 and no.7/2017, of Marche with the D.G.R. no. 1156/2012. The Emilia-Romagna region, with the Regional Law no. 24/2017, contradicted its previous circular of 2014, which was initially favorable, stating that the extraordinary urbanization contribution set forth by the Presidential Decree no. 380/2011 should not be applied within the urbanized territory. The Veneto and Lombardy regions opposed the extraordinary urbanization contribution, up to challenge before the Supreme Court, with a negative result, a decision (no. 68 of year 2016), instead in favor of the extraordinary urbanization contribution. The Tuscany region has delegated (art.184, paragraph 5-bis of the Regional Law no. 65/2014) the definition of the methods for applying the extraordinary urbanization contribution to the approval of a specific resolution of the Regional Council, which to date has not been yet enacted [16].

By examining the regulations of the regions that have applied the state provisions, differences are found regarding (i) the methodology for determining the "higher value"—indeed the *Highest and Best Use* defined by the International Valuation Standards (IVS), that is the use of an asset that maximizes its potential and that is possible, legally permissible and financially feasible [15]—of the urban planning variant and (ii) the likely inclusion of incentives and disincentives for achievement of public and general interest goals.

Therefore, from the framework outlined an uneven reception of state legislation emerges, in which the significant weakness is linked to the lack of a univocal methodology—set by the legislator—that can be easily implemented by the Public

Administration (PA) for determining the surplus value generated by the intervention subject to an urban planning variant. In this view, the aim of the work is to define a procedural protocol, divided into phases, and also consistent with the prodromes of the assessment methodology, which can be able to support municipal technicians in determining the surplus value pursuant to the D.P.R. no.380/2001, art.16, paragraph 4, letter *d-ter)* and subsequent amendments. In order to test its efficiency, the defined protocol is implemented to a case study, relating to a remodeling and variant intervention on a plot located in the city of Taranto (Italy).

The research is structured as follows. Section 2 describes the case study and the hypotheses of intervention *A* and *B*, respectively *before variant* and *variant*, that are compared. Section 3 illustrates the protocol and the associated assessment methodology. In Sects. 4 and 5 the financial returns of the intervention hypotheses *A* and *B* are determined. In Sect. 6 the advantages that are generated by the variant and the extent of the "higher value" acquired by the PA are evaluated. Finally, Sect. 7 outlines the conclusions of the work and the future developments.

2 Case Study of the Proposed Protocol

The case study concerns an area located in the south of the city of Taranto (Italy), in a peripheral area mainly dealt for agricultural use, which is part of a larger compendium affected by an Integrated Renovation Program (IRP). The functions forecasted for the area by the IRP are tourist-hotel facilities, subsidized residential units and shops (Fig. 1). The accessibility of the area is worthy, whereas it is poor of quantity and quality of public services.

The subjects involved are two: the private developer, that has the role of implementing the initiative; the PA, which represents the interests of the community. The remodeling and variant intervention, in synthesis, provides:

(a) the freely transfer to the PA by the private developer of 2,500 m^3, equal to 10% of the volumes allowed in the intervention area, to be allocated to the construction of a nursery school;
(b) the change in the intended use of the volumes (22,500 m^3) of the tourist-hotel structure that can be built in the area of intervention, partially with subsidized residential units (18,806 m^3), to be sold with controlled prices, and partially to commercial premises (3,694 m^3) to be sold at market rates;
(c) the construction, by the private developer, of a nursery school and pertinence spaces on the free plot near to the intervention area;
(d) the freely transfer to the PA of the nursery school and pertinence spaces.

The urban planning indices set by the IRP for the considered area can be summarized as follows (Table 1).

Fig. 1 Intervention area perimeter and functions provided by the urban planning variant

Table 1 Urban planning parameters established by the IRP on the intervention area

Urban planning parameters	Quantity
Plot area Soil intensity index	5,829 m^2 4.29 m^3/m^2
Coverage index	0.28 m^2/m^2
Maximum achievable height	24.80 m
Total achievable volume	25,000 m^3

2.1 Hypothesis A: Construction of Tourist-Hotel Facilities

The original intervention, hereinafter *hypothesis A*, involves the construction on the plot of a tourist-hotel building, with contiguous external accommodations, to be rented at market rates. The 8-floors building is designed with a reinforced concrete bearing structure and infill walls made by civil finishes with a total height of 24.80 m and a total volume of 24,573.98 m^3. The pertinence space will be used for parking (2,477.29 m^2) and partially (917.59 m^2) for greenery and sidewalks. In the residual portion of the pertinence space, two swimming pools and a paved terrace will be usable by guests.

2.2 Hypothesis B: Construction of Subsidized Residential Units and Shops

The *hypothesis B* identifies the urban planning variant under evaluation: it involves the construction on the intervention area of a building intended for subsidized residential units and shops. As for *hypothesis A*, the construction of a reinforced concrete bearing structure and infill walls made by civil finishes will be developed on 8 floors, for a total height of 24.80 m and a total volume of 22,500 m^3. On the ground floor, in addition to the stairwell and the technical areas, there will be four commercial premises with a gross surface area of 934 m^2, for a total volume of 3,694 m^3. The upper floors will be used for apartments-residences, with the same quantities and typologies to those provided for *hypothesis A*, for a total of 18,806.34 m^3 and 5,550 m^2 of Overall Surface (OS). The pertinence space will be arranged for 2,250 m^2 of parking and 1,947 m^2 of greenery and sidewalks.

3 Methodological Aspects for the Surplus Value Assessment in the Proposed Protocol

The art. 16, paragraph 4, letter *d-ter)* of the D.P.R. no. 380/2001 and subsequent amendments provides that: "*The incidence of primary and secondary urbanization costs is established by resolution of the municipal council based on the parametric tables that the region defines by classes of municipalities in relation* […] *of the higher value generated by interventions on areas or buildings defined by urban planning variants. This higher value, calculated by the municipal administration, is shared - not less than 50% - between the municipality and the private subject and it is paid by the latter to the municipality in the form of an extraordinary urbanization contribution, which certifies the public interest, in financial payment, linked to the cost for the construction of public workings and services to be carried out in the intervention context, the sale of areas or buildings to be used for public utility services, social housing or public workings*". According to the law, therefore, when an urban planning variant is provided on an area, determining the transition from an initial intervention solution to a new one, it is necessary to investigate whether this variation generates a financial benefit. The "higher value" can be assessed as the difference between the financial convenience of the hypothesis connected to the urban planning variant (*hypothesis B*) and that relating to the original one (*hypothesis A*).

For urban transformation projects, the financial convenience can be determined through the transformation value (*Vt*) and therefore subtracting the costs occurred in the transformations (*Vkt*) from the market value of the realized buildings and/or services (*Vmt*). In symbols: $Vt = Vmt - Vkt$.

The transformation costs include: the purchase price of the plot, the primary and secondary urbanization fees, the construction costs of buildings, the technical and

general expenses, the interest expense on borrowed capital. The developer's profit will be included in the value of the area.

In this case, the greater value generated by the urban planning variant on the plot considered can be determined by adopting the following procedural protocol:

Phase 1 Analysis of the urban environment surrounding the area and description of the original intervention solution (*hypothesis A*), and of the intervention solution related to the urban planning variant (*hypothesis B*);

Phase 2 Determination of the financial convenience of *hypothesis A* through the assessment of the transformation value (Vt_A);

Phase 3 Determination of the financial convenience of *hypothesis B* through the assessment of the transformation value (Vt_B);

Phase 4 Assessment of any "higher value" generated by the urban planning variant ($\Delta_{BA} = Vt_B - Vt_A$) through the difference in the amounts of the previously obtained transformation values;

Phase 5 Assessment of the construction cost of the nursery school (C_{school}) on the area contiguous to the intervention one, in order to verify that this cost is at least 50% of the "higher value" assessed ($C_{school} \geq \Delta_{BA}/2$).

It should be emphasized that in the analysis only the amounts of the balance sheet items of the initiative that determine an actual change, i.e. introduced by the urban planning variant, should be considered with respect to the original solution. Therefore—for example—the amounts incurred for the purchase of the plot or for the construction of primary urbanization workings are not to be considered, as these amounts are intended to affect the same extent in both intervention hypotheses under evaluation. Furthermore, it should be noted that the assessment carried out recalls the judgments of economic convenience, the outcome of which is specifically valid. Therefore, the prices and the times of sale, the types of buildings, the duration of the workings and the other elements that occur in the evaluation are calibrated on the technical–economic characteristics and on the expectations of the private developer. The assessment refers to the values, parameters and conditions of the local real estate market on the first quarter of 2019.

4 The Convenience of *Hypothesis A*

The transformation value (Vt_A) of *hypothesis A* relating to the construction of tourist-hotel facilities, is calculated by subtracting the costs of the transformation (Vkt_A) from the market value of the property after transformation (Vmt_A). It is assumed that the private developer is responsible for the construction and management of the buildings that will be realized.

The market value of the transformed asset can be indirectly determined with the income approach. With this method, the market value of an asset capable of producing an income is given by the initial accumulation, at an appropriate capitalization rate (r), of the annual, constant, deferred and unlimited income (R) that the asset can produce

during its economic life. In symbols: $Vmt_A = R/r$. The potential revenues that can be generated by the accommodation rates can be quantified taking into account (i) the trend of the tourism-accommodation sector of the city of Taranto in 2019, (ii) the characteristics of the properties to be built, (iii) the conditions of the tourism market of the area. The data of the accommodation sector, obtained by processing the information data published by *Italian Hotel Monitor* (source: www.trademarkitalia.com) are illustrated in Figs. 2 and 3. In particular, Fig. 2 reports the monthly occupancy rates of the rooms in 2019, whereas Fig. 3 summarizes the changes in monthly employment rates recorded in 2019 compared to the previous year.

The graph in Fig. 2 shows that, for all months, an employment rate of approximately 50% was recorded, except for the month of January (48.7%). The most intense months were September (65.3%) and October (58%), followed by August (57.7%) and June (57.1%).

The graph in Fig. 3 shows a slight increase in monthly employment rates in 2019 compared to the previous year: in particular, the months of August (+ 3.7%),

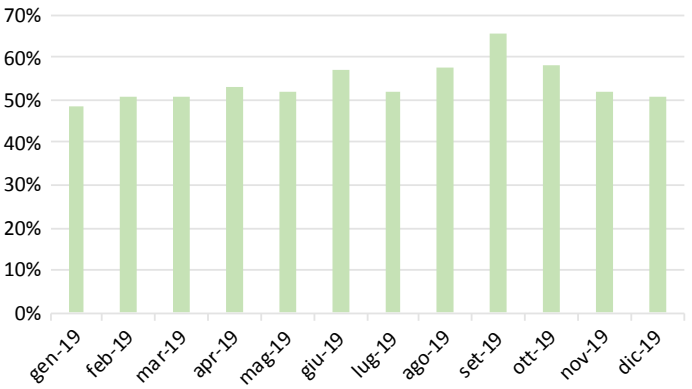

Fig. 2 Monthly occupancy rates for Taranto accommodation facilities in 2019

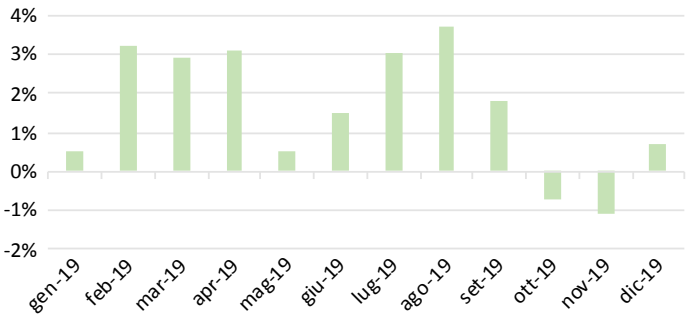

Fig. 3 Change in the monthly occupancy rate in 2019 compared to the previous year for hotels in Taranto

January - December (2019)							
City	Room occupancy (RO) rate %	RO variation (2018)	Rate (4 stars accomodation)	City	Room occupancy (RO) rate %	RO variation (2018)	Rate (4 stars accomodation)
TORINO	64,7%	+2,7	111,01	FIRENZE	74,6%	+0,2	128,39
GENOVA	68,2%	+2,8	102,50	PISA	64,5%	+0,8	88,32
MILANO	71,5%	-0,2	132,26	SIENA	66,3%	+0,7	96,70
COMO	62,5%	-0,1	113,92	ANCONA	61,0%	+1,9	85,83
BRESCIA	50,3%	+2,0	85,63	PESARO	60,0%	+0,1	83,29
BERGAMO	67,1%	+1,4	90,18	PERUGIA	51,5%	+0,1	86,45
PARMA	59,9%	-0,7	88,96	ROMA	73,4%	+1,0	120,28
REGGIO E.	54,0%	+1,7	84,07	VITERBO	51,7%	+1,1	84,38
MODENA	55,8%	+2,3	86,57	LATINA	52,5%	+2,0	83,84
TRENTO	57,7%	+1,4	86,10	RIETI	49,0%	-1,4	83,01
BOLZANO	64,2%	+1,6	86,13	PESCARA	56,4%	+1,7	86,13
VENEZIA	70,1%	+0,4	154,16	NAPOLI	70,6%	+3,0	102,87
VERONA	61,3%	+0,2	94,92	BARI	59,9%	+1,9	88,00
VICENZA	56,1%	+2,0	84,48	FOGGIA	44,5%	+0,0	83,12
PADOVA	62,2%	+0,4	87,15	TARANTO	54,9%	+1,6	82,66
TREVISO	58,5%	+1,5	85,71	POTENZA	46,1%	+0,2	81,24
UDINE	61,1%	+4,0	89,48	REGGIO C.	51,1%	+1,1	83,26
TRIESTE	63,6%	+1,7	90,60	PALERMO	62,6%	+1,8	92,94
FERRARA	56,3%	+1,7	89,73	MESSINA	56,3%	+1,2	83,84
S. MARINO	57,4%	-0,6	84,90				

Fig. 4 Average room occupancy rate and daily rates recorded in the main Italian cities in 2019 (*source* www.trademarkitalia.com)

February (+ 3.2%), April (+ 3.1%) and March (+ 2.9%). On the other hand, there was a contraction in employment rates in the months of October (− 0.7%) and November (− 1.1%).

The upper limit of the average annual employment rate considered for the purposes of the assessment is 54.9%, recorded for Taranto in 2019 (Fig. 4). The daily rates and occupancy rates were differentiated for low and high season, according to the statistics outlined in Figs. 2 and 3.

The annual revenues from the accommodation business under analysis can be assessed with the prices detected in the same area for similar and competing facilities. Specifically, the determination of the daily rates per apartment is obtained by weighing the prices detected by three competitors operating in the area (source: www.hundredrooms.it). Figure 5 shows the asset to be assessed (green one) and the three competitors (red ones).

The main features of the competitors are the following:

- Competitor 1—"Bed and Milk": recently refurbished accommodation facility with air-conditioned rooms that have a terrace, dining area, stove, coffee machine, kitchen equipped with fridge and oven, and living area with flat-screen TV. The average area of the apartments is 130 m^2. The average rate in the low season is 73 €, whereas the average rate in the high season is 140 €.
- Competitor 2—"Masseria Ducale": residence consisting of eight villas, equipped with at least one bedroom, with a large living area, an American kitchen equipped with modern hobs, bathroom with glass shower, terrace, Dolby surround and safe. The average area of the apartments is 110 m^2. The average rate in the low season is 60 €, whereas the average rate in the high season is 180 €.
- Competitor 3—"Villa Giovanna": this is a 60 m^2 apartment, consisting of a kitchen complete with oven and microwave, coffee machine and kettle, a flat-screen TV,

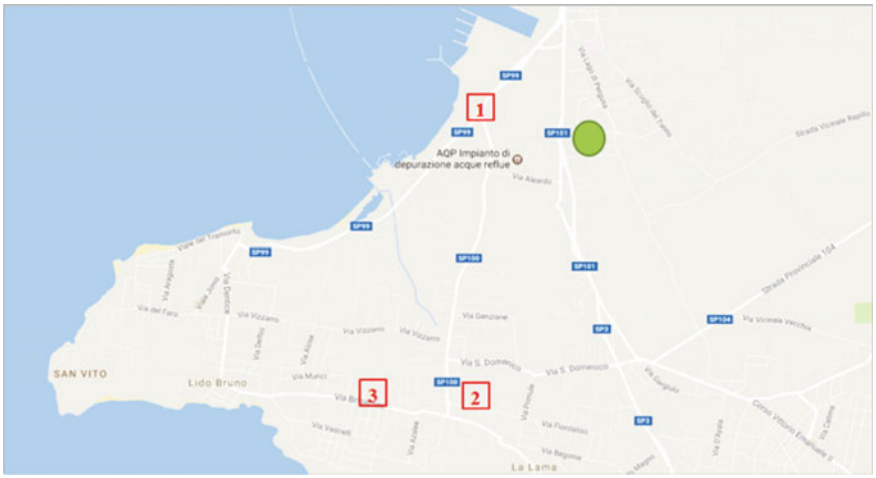

Fig. 5 Asset being assessed (green one) and competitors identified in the reference area (red ones)

a private bathroom with bathtub or shower and two bedrooms. The average rate in low season is 55 €, whereas the average rate in high season is 110 €.

- In Table 2, for each competitors the average unit rates relating to the low and high season periods are determined.

The average unit rates for low (t_{low}) and high season (t_{high}) are determined by considering a reduction of 15% [14], related to the ordinary negotiation phase, to the arithmetic average of the unit prices per night detected for the competitors, by obtaining:

$$t_{low} = \frac{0.562 + 0.545 + 0.917}{3} = 0.573 \ €/\text{m}^2/\text{night}$$

$$t_{high} = \frac{1.077 + 1.636 + 1.833}{3} = 1.288 \ €/\text{m}^2/\text{night}$$

The gross potential annual income of the tourist/accommodation facility under evaluation can be assessed equal to 746,727 € by considering:

Table 2 Average daily unit rates relating to the competitors

		Low tourism season		High tourism season	
Competitor	Surface [m^2]	Average rate/night [€]	Unit rate/night [€/m^2]	Average rate/night [€]	Unit rate/night [€/m^2]
1	130	73	0.562	140	1,077
2	110	60	0.545	180	1,636
3	60	55	0.917	110	1,833

i. the breakdown of 365 days of annual activity into 90 days of high season and 275 days of low season;
ii. an average annual occupancy rate set conservatively at 46.16%, therefore lower than the average annual occupancy rate of 54.9% recorded by *Italian Hotel Monitor* for Taranto (cited in Fig. 4);
iii. an additional income from secondary activities (restaurant, reception room, bar on the ground floor) equal to 15% of the accommodation's income.

The capitalization rate, due to the lack of specific indications on the gross profitability rates of the tourism-hotel sector, is determined by comparing the maximum unit values for leasing and sale relating to the "offices" intended use, reported by the Real Estate Market Observatory of the Revenue Agency for the Microzone "D7" of the Municipality of Taranto, as this function is the most similar one to the sector analyzed and For this reason, the "maximum" value has been considered more appropriate than the "average" one. Therefore, r is equal to 8.308% ([9 €/m^2/month · 12 months]/1,300 €/m^2).

The market value of the hypothetical tourist-hotel facility, obtained by comparing the gross annual income to the gross annual capitalization rate, is equal to 746,627:

$$V_{mtA} = 8,987,181 €(R/r = 746.627 €/0.08308).$$

In Table 3 the expense items for determining the transformation cost of *hypothesis A* are reported.

The secondary urbanization charges are calculated by applying to the gross OS of the tourist/hotel building, the parametric amount envisaged for hotel construction reported in the municipal tables. The construction costs include the amounts for the building's construction, the private parking spaces, the swimming pools and the contiguous terrace area, the arrangement of the green areas and sidewalks. The measurement of construction costs was taken from the "Building typology prices" list, according to [17]. These amounts were reduced by 10% to take into account the existing diminutive effect of the of Milan's market and that of Taranto [18, 19]. The expanses adopted were also confirmed by an informal survey carried out among the construction companies operating in the area. Therefore, the construction costs are equal to: 216 €/m^3 for the building; 44.10 €/m^2 for the parking spaces; 135 €/m^2 for the swimming pools; 35 €/m^2 for the paved terrace; 40.50 €/m^2 for the arrangement of the external areas.

The technical expenses include the commitments for the design, management, testing and operations required by the transformation intervention. The amount was estimated assuming an incidence of 6% on the total construction cost [9]. General expenses, on the other hand, involve the disbursements for the assembly operation, the fees for consultancy, the costs for the marketing of the real estate units built, etc. General expenses are estimated according to an incidence of 3% on the total construction cost. The total amount of the technical and general expenses is therefore equal to 495,536.45 €.

Table 3 Transformation cost of *hypothesis A*

Costs	Unit cost/percentage incidence	Quantity	Total (€)
Urbanization fees			
Secondary urbanization (hotel)	15.26 €/m^{2}OS	6,408 m^{2}OS	97,786
Sub total A	–	–	97,786
Construction costs			
Apartment building	216 €/m^3	24,574 m^3	5,307,980
Private parking	44.10 €/m^2	2,477 m^2	109,248
Pools	135 €/m^2	235 m^2	31,725
Pools area arrangement	35 €/m^2	567 m^2	19,845
External area arrangement (greenery, sidewalk etc.)	40.50 €/m^2	918 m^2	37,162
Sub total B	–	–	5,505,961
Technical and general expenses	9%	Sub total B	495,536
Total investment costs before financial charges	–	–	6,099,283
Financial charges	10%	(Sub total A + B) + tec. and gen. exp	609,928
Total costs			6,709,211

The financial charges include the price of undifferentiated capital use, that the private developer borrows for the accomplishment of the intervention. This is an item destined to vary according to the extent of the amount, the interest rate payable on the market at the time of valuation, the guarantees offered by the subject who contracts the debt and the duration of the loan. In the case under consideration, the financial charges are calculated assuming that the entire capital required for the operation is loan capital, in the flat rate of 10% of the total investment costs before financial charges. The result is a cost for financial charges of 609,928.31 €.

Definitely, the overall cost of transformation of hypothesis A is equal to: $Vkt_A =$ 6,709,211.40 €.

The transformation value (Vt_A) of *hypothesis A*, relating to the construction of tourist-hotel residences, is calculated through the difference between the market value of the transformed asset (8,987,181 €) and the costs to be incurred for the transformation (6,709,211.40 €), obtaining the following amount:

$$Vt_A = Vmt_A - Vkt_A = 8{,}987{,}181\,€ - 6{,}709{,}211.40\,€ = 2{,}277{,}969.60\,€.$$

It should be noted that the assessment was developed without considering the distribution of costs and revenues over time and therefore neglecting the diminutive

effects deriving from discount transactions. In fact, given that the time duration of the initiative can be quantified in about two years, including processing and sales times, it is supposed that the instant assessment does not introduce appreciable fluctuations in the results.

5 The Convenience of *Hypothesis B*

As for the construction of residential buildings and shops of *hypothesis A*, the transformation value of *hypothesis B* (Vt_B) is obtained by subtracting the costs of the transformation itself (Vmt_B) from the market value of the asset after transformation (Vkt_B). In symbols: $Vt_B = Vmt_B - Vkt_B$.

Regarding the market value of the transformed asset (Vmt_B), this assessment requires to determine the revenues obtainable from the sale of subsidized residential units and the shops achievable through the initiative. With regard to the sale of subsidized residential units, the Municipality of Taranto has set a maximum unit sale price, including parking space, equal to 1,550 €/m^{2}OS. By applying this price to the 5,550 m^2 of surface area of the subsidized residential units, a market value of 8,602,500 € (= 1,550 €/m^2 · 5,550 m^2) is obtained.

The market value of the shops can be assessed by applying to the 934 m^2 of gross surface area to be built, the price of 1,100 €/m^2, according to a market survey in the area, obtaining the amount of 1,027,400 € (= 1,100 €/m^2 · 934 m^2). Ultimately, the market value of the transformed asset, assessed by adding the quantities reachable from the sale of the subsidized residential units and the revenues from the sale of the shops, is: Vmt_B = 9,629,900 € (= 8,602,500 € + 1,027,400 €).

The expense items that define the transformation cost of *hypothesis B* are shown in Table 4.

The secondary urbanization fees are calculated by applying to the OS of residential units and commercial spaces the parametric amounts provided for the same functions in the municipal tables. The construction costs include the amounts for the construction of residences, shops, parking and private green areas.

As for *hypothesis A*, the construction costs were assessed by consulting the "Building types prices" list, according to [17]. The construction costs are equal to: 216 €/m^3 for residences and shops; 40.50 €/m^2 for the arrangement of green areas; 44.10 €/m^2 for parking spaces. The technical and general expenses was estimated on the assumption of a 9% incidence on the total construction cost, for a total amount of 447,305 €. As well as for *hypothesis A*, the financial charges are assessed considering that the entire capital required for the intervention is borrowed, with a flat rate of 10% of the total investment costs before financial charges: therefore, the total financial charges are equal to 549,400 €. Ultimately, the total cost of transforming *hypothesis B* is equal to: Vkt_B = 6,043,405 €.

In conclusion, the transformation value of *hypothesis B,* relating to the construction of subsidized residential units and shops, can be assessed subtracting by the market value of the transformed asset, estimated at 9,629,900 €, the cost necessary

Table 4 Transformation cost of *hypothesis B*

Costs	Unit cost/percentage incidence	Quantity	Total (€)
Urbanization fees			
Secondary urbanization (res)	11.74 €/m^{2}OS	5,550 m^{2}OS	65,157
Secondary urbanization (shops)	15.26 €/m^{2}OS	753 m^{2}OS	11,491
Sub total A	–	–	76,648
Construction costs			
Residences	216 €/m^3	18,806 m^3	4,062,096
Shops	216 €/m^3	3,269 m^3	706,104
Private green spaces	40.50 €/m^2	2,534 m^2	102,627
Private parking	44.10 €/m^2	2,250 m^2	99,225
Sub total B	–	–	4,970,052
Technical and general expenses	9%	Sub total B	447,305
Total investment costs before financial charges	–	–	5,494,004
Financial charges	10%	(Sub total A + B) + tec. and gen. exp	549,400
Total costs			6,043,405

for the transformation, determined into the extent of 6,043,405 €, therefore: $Vt_b = Vmt_B - Vkt_B = 9{,}629{,}900\,€ - 6{,}043{,}405\,€ = 3{,}586{,}495\,€$.

As for *hypothesis A*, the distribution over time of costs and revenues are not considered.

6 The "Higher Value" Generated by the Urban Planning Variant

The verification of the potential "higher value" (Δ_{BA}) generated by the *hypothesis B* can be performed through the difference between the amount of the transformation value (Vt_B) assessed for *hypothesis B* and the amount of the transformation value (Vt_A) determined for *hypothesis A*:

$$\Delta_{BA} = Vt_B - Vt_A = 3{,}586{,}495\,€ - 2{,}277{,}969.60\,€ = 1{,}308{,}525.44\,€.$$

Table 5 Projectual parameters of the nursery school

Parameter	Quantity
Plot surface	2,530 m^2
Building gross surface	714.29 m^2
Maximum height	3.5 m
Total volume	2,500 m^3

This amount identifies the "higher value" that, pursuant to art.16, paragraph 4, letter *d-ter)* of D.P.R. no. 380/2001, the private developer is required to pay to the PA (not less than 50%). Finally, the extraordinary urbanization contribution to be paid to the PA must be at least equal to: $\Delta_{BA}/2 = 1{,}308{,}525.44\ €/2 = 654{,}262.72\ €$.

In order to check that the cost of realization of the nursery school (C_{school}), that the private developer has undertaken to build and freely transfer to the PA, is at least equal to 50% of the "higher value" generated by the urban planning variant ($C_{school} \geq \Delta_{BA}/2$), the construction of a nursery school with three sections (90 children) is assumed, whose projectual parameters can be summarized as follows (Table 5).

A square shape is assumed with a canopy to protect the main entrance of the nursery school. It will be built with the three sections and the canteen arranged around a common area intended for free activities, which will take light from the surrounding garden and from above. The central space will have direct access from both the school and the garden. The school will be equipped with a photovoltaic system for energy autonomy. The areas pertaining to the school will be arranged in green areas and pavements. Table 6 shows the expense items that define the realization cost of the nursery school.

Table 6 Realization cost of the nursery school

Costs	Unit cost/percentage incidence	Quantity	Total (€)
Construction costs			
School	198 €/m^3	2,500 m^3	495,000
Photovoltaic system			35,000
External arrangement (greenery, sidewalks, etc.)	40.50 €/m^2	1,815.71 m^2	73,536
Sub total A	–	–	603,536
Technical and general expenses	9%	Sub Total A	54,318
Total investment costs before financial charges			657,855
Financial charges	10%	Sub total A + tec. and gen. exp	65,785
Total costs			723,640

The construction costs include the amounts to build the nursery school, the photovoltaic system, the external green arrangements and sidewalks. Also, in this case, the measurement of construction costs was assessed by consulting the "Building types prices" list of the [17]. The construction costs used are therefore equal to: 198 €/m^3 for the school; 35,000 € for the photovoltaic system; 40.50 €/m^2 for the arrangement of green areas. Technical and general expenses have been estimated assuming an incidence of 9% on the total construction cost, for an amount of 54,318 €.

The financial charges were assessed assuming that the entire amount required for the operation is a loan capital, considering a flat rate equal to 10% of the total investment costs before financial charges. The result is a cost for financial charges equal to 65,785 €. Ultimately, the total realization cost of the three-section nursery school is: $C_{school} = 723{,}640$ €.

Summarizing the data illustrated so far:

- the "higher value" (Δ_{BA}) generated by the urban planning variant corresponds to 1,308,525.44 €;
- the minimum amount that the private developer is required to pay to the PA as extraordinary urbanization contribution, pursuant to art.16, paragraph 4, letter *d-ter*) of D.P.R. no.380/2001, equal to half of the "higher value", is 654,262.72 €;
- the realization cost of the nursery school (C_{school}), which the private developer has undertaken to build and freely transfer to the PA, is equal to 723,640 €.

Ultimately, the realization cost of the nursery school exceeds for an amount equal to 69,377.28 € (= 723,640 € − 654,262.72 €) the minimum amount that the private developer must pay to the PA, pursuant to art. 16, paragraph 4, letter *d -ter)* of D.P.R. no. 380/2001. This surplus value represents an additional benefit for the community.

7 Conclusions

The institution of the extraordinary urbanization contribution constitutes an important innovation in the Italian regulatory framework, capable of aligning the country with the most virtuous European countries in the context of urban taxation policies aimed at directing more capitals for public purposes [20–24]. The absence of a methodology established by the legislator for the determination of the "higher value" generated by the interventions provided by art. 16 letter *d-ter)* of the D.P.R. no.380/2001, has currently caused a methodologically uneven regulatory panorama.

This work, in line with the described framework, intended to define a reference procedural protocol for the municipal administrations, in accordance with the prodromes of the assessment methodology for determining the "higher value" generated by the urban planning variants. The effectiveness of the proposed methodology was verified by applying it to a case study, in the Municipality of Taranto (Italy). The results obtained made it possible to (i) reconstruct, through a series of clear and coded

phases, the logical-operational process to be implemented for the correct determination of the transformation value of the two intervention hypotheses, (ii) verify the existence of the "higher value" produced by the hypothesis of a variant with respect to the original intervention, (iii) determine the economic benefit achievable by the public subject, following the approval of the urban planning variant.

Future insights may concern (i) the possibility of applying the proposed protocol for other urban transformation interventions in the planning variant form in order to generalize its procedural structure, (ii) the definition of a rational methodology for the assessment of the sustainable extraordinary urbanization contribution that the private developer must pay to the PA, in compliance with the legal minimum percentage equal to 50%, able to guarantee the economic-financial balance sheet of the subjects involved, (iii) the implementation of the evaluation tool proposed taking into account the impact of the time for the development of the Discount Cash Flow Analysis.

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