

From Evaluation to Monitoring: Multi-criteria Indicators and Assessments in Urban Regeneration Triggered by University Residences

PEER REVIEWED

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1. Urban Regeneration and University Housing.

Academic training paths, and the related learning and educational processes, have been profoundly influenced in recent years by the increasingly key role that university housing takes on in student life.

Because these facilities, virtuous processes are triggered involving new forms of socialization, a greater propensity for sharing, increased youth empowerment,² an improved sense of responsibility, good attitude to dialogue³ and, eventually, students develop a greater disposition to diversity.⁴ The pattern of life triggered, characterized by sharing and interactions allows students' social capital to be promoted and enhanced.⁵ The impact of the only presence of universities in urban areas consists precisely in the ability to trigger stable relationships and synergies between territorial actors,⁶ the improvement of local economies,⁷ and, in addition, the ability to promote knowledge networks and economic

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² Maria Stella Agnoli, *Spazi, identità, relazioni. Indagine sulla convivenza multiculturale nelle residenze universitarie* (Milan: Franco Angeli, 2010).

³ Nazirah Zainul Abidin and Nurul Najib, "Student Residential Satisfaction in Research Universities," *Journal of Facilities Management* 9, no. 3 (2011): 200-212.

⁴ Gary R Pike, "The Differential Effects of on-and Off-campus Living Arrangements on Students' Openness to Diversity," *Naspa Journal* 39, no. 4 (2002): 283-299.

⁵ Jules Pretty and Hugh Ward, "Social Capital and the Environment," *World development* 2, (2001): 209-227.

⁶ Margaret O'Mara, "Beyond the Town and Gown: University Economic Engagement and the Legacy of the Urban Crisis," *The Journal of Technology Transfer* 37 (2012): 234-250.

⁷ Joan W. Woffard, *Urban Universities: Rhetoric, Reality, and Conflict* (Washington, DC, USA: US Department of Health, Education & Welfare, 1970).

competitiveness.⁸ Urban development can strongly be characterized by the strength that the university has in a context to settle specific facilities such as hospitals, sports facilities, libraries, or others.⁹ In addition to these facilities, university residences also represent an opportunity to trigger, for the entire urban community as well as for students, a virtuous process that implements the regeneration of existing urban fabrics through densification strategies, with the possibility of developing a "new model of diffuse university campus".¹⁰ According to Bellini et al.,¹¹ students is a micro-community with some problems in common with the local community—difficulties of integration and cultural understanding, language barriers, distance from home—and other more original characteristics that distinguish them as high cultural profile and young, homogeneous age group.

The paper considers urban regeneration in terms of multidisciplinary research that includes urban planning, urban design, housing, transportation, economics, community development, and sustainability studies¹². General principles for urban regeneration are widely recognized, but urban regeneration programs must always be adapted to their specific geographic contexts and the urban development patterns adopted by local governments.¹³ Law 338/2000 "Provisions on housing and residences for university students" provides for co-financing by the state for interventions aimed at the construction of housing and residences for university students and is configured, as a strategic tool capable of promoting regeneration policies, conceiving the university and the city as an integrated system, with the aim of providing housing for students and, simultaneously, services and activities intended for users of the piece of city in which it is grafted,¹⁴ actuating lines of intervention also aimed at the redevelopment of the existing building stock. The paper presents the first results of a doctoral research that considers multi-criteria assessment methods both as a tool to support decision-making problem in urban planning and regeneration in terms of interfering dimensions and as a monitoring tool. The second section sets out the principles of Law

⁸ Gar Alperovitz, Steve Dubb and Tedd Howard, "The Next Wave: Building University Engagement for the 21st Century," *The Good Society* 17, no. 2 (2008):69-75.

⁹ Janet Bercovitz and Maryann Feldman, "Entrepreneurial Universities and Technology Transfer: A Conceptual Framework for Understanding Knowledge-based Economic Development," *The Journal of Technology Transfer* 31, (2006): 175-188.

¹⁰ Maria Argenti, Fabio Cutroni, Maura Pecroco, and Giulia Santarelli, "Un Campus Universitario 'Diffuso'," in *Residenze e Servizi per Studenti Universitari*, eds. Romano Del Nord, Adolfo F.L. Baratta and Claudio Piferi (Florence: Tesi, 2016), 151-62.

¹¹ Oscar. E. Bellini, Matteo Gambaro and Martino Mocchi, "Living and Learning: A New Identity for Student Housing in City Suburbs," in *Regeneration of the Built Environment from a Circular Economy Perspective*, eds. Stefano Della Torre, Sara Cattaeno, Camilla Lenzi and Alessandra Zanelli (Gewerbstrasse: Springer Nature Switzerland, 2020), 99-109.

¹² Michael E. Leary and John McCarthy, "Introduction Urban Regeneration a Global phenomenon," in *The Routledge Companion to Urban Regeneration*, eds. Michael E. Leary and John McCarthy (New York: Routledge, 2013).

¹³ Reinout Kleinhans, "Housing Policies and Regeneration," *International Encyclopedia of Housing and Home*, (2012): 590-95.

¹⁴ Francesco Musco, *Rigenerazione Urbana e Sostenibilità* (Milan: Franco Angeli, 2009).

338/200 and the strategies adopted for social inclusion and urban regeneration; the third section introduces the issue of decision-making processes and support through multi-criteria evaluations; the fourth section proposes a reading of indicators for post-operam monitoring processes; and the fourth and final section regards the concluding reflections.

2. Law 338/2000: an Urban Regeneration and Social Inclusion Tool.

In response to the imbalance between demand and supply, in the early 2000s, Italian government provided funding for the construction of student accommodation with Law 338/2000; later, with the issuing of decrees establishing the procedures and formalities for requesting funding, the law identified the qualitative and quantitative standards of the projects.¹⁵ Now, in its 5th Call for implementation¹⁶ (2021), the law has partially solved the imbalance between demand and supply;¹⁷ almost twenty years after the 1st call was issued, despite more than 200 design proposal put into operation and about 30,000 new and upgraded accommodation places,¹⁸ it fails to match the European situation: about 2.5% of available accommodation places in relation to the student population against 11% in Germany, 15% in France and 34% in England. Furthermore, the Covid-19 pandemic has challenged the student population by forcing them to deal with changes related to everyday life with significant repercussions in social, economic and welfare-related terms.¹⁹ Meaningful ties, relationships between students, colleagues and teachers are issues that influence the educational pathway.²⁰ Relationships and situations that, due to the pandemic situation, have not occurred and that strongly affect out-of-town students who, in addition to being engaged in educational activities, build a network of relationships that strongly affect health and the perception of well-being.²¹

¹⁵ Adolfo F. L. Baratta, "Students Housing: Functional Model Quality," in *Research Tools for Design*, eds. Nicoletta Setola (Firenze: Firenze University Press, 2011), 35–38.

¹⁶ From the Italian: V Bando di attuazione.

¹⁷ The 2018 ISTAT Census shows that 591,507 students were carrying out their academic activities in places other than their Province or Metropolitan City of residence; 35 percent of students (considering the 1,720,760 students enrolled in the 2018/2019 academic year) represent the potential demand for university housing.

¹⁸ Claudio Piferi, *La qualità dell'abitare a servizio del diritto allo studio. quaderni di opera 30 anni al servizio degli studenti* (Trento: Edizioni Opera Universitaria, 2021).

¹⁹ Aleksander Aristovnik, Damijana Keržič, Dejan Ravšelj, Nina Tomažević and Lan Umek, "Impacts of the COVID-19 Pandemic on Life of Higher Education Students: A Global Perspective," *Sustainability* 12, no. 20 (2020): 1-34.

²⁰ Giancarlo Gasperoni, "Studio universitario, orientamenti valoriali, consumi culturali," *Rassegna Italiana di Sociologia* 1, (2000): 109–30.

²¹ Andrea Amerio, Andrea Brambilla, Alessandro Morganti, Andrea Aguglia, Davide Bianchi, Francesca Santi and Luigi Costantini, "Covid-19 Lockdown: Housing Built Environment's Effects on Mental Health," *International Journal of Environmental Research and Public Health* 17, no. 16 (2020): 1-10.

2.1 The 5th Call of Implementation of the Law 338/2000.

The 5th Call for implementation of the law represents an opportunity not only for the increased provision of residential facilities for students, but also for the urban regeneration of the contexts in which the projects are included and the further social inclusion by re-weaving the community networks dispersed by the pandemic. The current call, which re-proposes the goal of enhancing the public heritage that can be used for the conversion of buildings and for the redevelopment of urban areas that are sometimes degraded and a source of social criticality²², provides for co-financing by the state for the recovery and construction of housing and residences for university students. The residences, in addition to the necessary conditions for the student's stay in the university city, must promote the social and cultural integration of students in the urban context in which they are proposed. In order to facilitate attendance and the attainment of the degree, as well as to improve the student's quality of life, the 5th Call for implementation provides indications both for functional areas dedicated to residences and for functional areas dedicated to teaching, research, support and cultural and recreational activities. The criteria for project requirements—in addition to those concerning the general functional and building dimensions and the requirements of the environmental units—concern environmental compatibility, integration with the city and services, the coexistence of individuality and sociality levels in fruition, the integration of information and multimedia technologies, environmental orientation, maintenance, and management (Ministerial Decree, 1256/2021).

The criteria for project requirements -in addition to those for general functional and building sizing and environmental unit requirements-concern (Ministerial Decree, 1256/2021):

- Environmental compatibility, whereby new buildings-and as far as possible also for extraordinary maintenance, rehabilitation, or renovation of existing buildings-must consider the principles for environmental protection from the perspective of Minimum Environmental Criteria and conforming all types of design proposal from the principle of Do No Significant Harm.²³ In addition, projects will be eligible for funding only if they document the achievement of four of six environmental criteria in the standard.
- Integration with the city and services, whereby newly constructed, rehabilitated, or renovated buildings must integrate with their surroundings.
- Coexistence of levels of individuality and sociality in fruition, whereby the residence must consider the individual need of the student

²² Romano Del Nord, "Processi e Metodi Innovativi per La Promozione Della Qualità Architettonica Delle Residenze Universitarie," in *Residenze e Servizi per Studenti Universitari*, eds. Romano Del Nord, Adolfo F. L. Baratta, and C. Piferi (Florence: Tesis, 2016), 13-16.

²³ Environmental objectives of the DNSH Assessment under EU Regulation No. 2020/852.

and that of sociality through the distribution of semi-private and semi-collective spaces.

- Integration of information and multimedia technologies, whereby buildings of new construction - and as far as possible also for extraordinary maintenance, rehabilitation, or renovation of existing buildings - the integration of information and multimedia technologies should be considered to enable management of services in IoT optics.
- Environmental orientation, whereby environmental units must be able to be easily recognized to improve their orientation not only for students but also for external users.
- Maintenance and management, whereby the residence hall must meet the requirements of maintainability and durability.

Design proposal for co-financing can also be entrusted to private entities under construction and management or service concessions, and are distinguished into (Ministerial Decree, 1256/2021):

- a1) Design proposals of extraordinary maintenance, recovery, building and urban restructuring and restoration, including the removal of architectural barriers and adaptation based on current provisions on seismic, hygiene and safety of real estate used or to be used as university residences.
- a2) energy efficiency design proposals for pre-existing university residences.
- b) demolition and reconstruction work, transformation, expansion, and completion of existing real estate, including new construction work only for existing university campuses.
- c) acquisition of buildings to be used as university residences, within existing real estate considering probable future transformation.

Table 1 | Summary of the aspects exposed on the 5th Call of the Law 338/2000.

Aims	General criteria	Sizing criteria	Type of proposal
(i) protection and facilitation of study attendance and degree attainment (ii) social and cultural integration at the location	(i) environmental compatibility (ii) integration with the city and services (iii) co-presence of the levels of individuality and sociality of fruition (iv) integration of information and multimedia technologies (v) environmental orientation (vi) maintenance and management	(i) residential functions (ii) service functions	(a1) extraordinary maintenance, rehabilitation, building and urban renewal and restoration work (a2) energy efficiency design proposals (b) design proposals of demolition and reconstruction, transformation, expansion and completion (c) purchase

The 5th Call introduces impact indicators, initially higher in number than what is present today, to which it was chosen to reduce it due to the reduced timeline for submitting applications for co-funding (Tables 2, 3 and 4) to be included through a computerized template when filling out the application for funding (Decree, 168/2022):

- Social impact indicators, including measurements on demand, merit, community, and inclusivity.
- Environmental impact indicators, including measurements on energy sustainability, energy efficiency, material resource consumption reduction and sustainability.
- Financial impact indicators, including measurements on the type of financing, speed of execution and management.

Table 2 | Social impact indicators.

Social impact indicators	Indicator	Measure	
	Demand	Demand for on-site accommodation places (a.y. 2019-2020) / supply of on-site accommodation places (November 1st, 2020)	a. p. / a. p.
	Merit	Number accommodation places for deserving students / total accommodation places	a. p. / a. p.
	Inclusivity	Number of accommodation places reserved for students with disabilities / total accommodation places	a. p. / a. p.
	Collectivity	Facilities surface (FA2+FA3+FA4) / total surface (FA1+FA2+FA3+FA4)	m2 / m2

Table 3 | Environmental impact indicators.

Environmental impact indicators	Indicator	Measure	
	Energy Sustainability	Use of renewable energy (solar, wind, water, geothermal, biomass)	0; 1; 2; 3; 4; 5;
	Energy efficiency	Energy class for new buildings and class increase for design proposals on the existing one	+1; +5; +4; +3; +2; +1;
	Reduction of material resource consumption	Material from reuse or recycling of materials and products/total material used	m3 / m3
	Sustainability	Use of sustainable technical solutions	Yes / No

Table 4 | Financial impact indicators.

Financial impact indicators	Indicator	Measure	
	Funding A	Third party funding / overall funding	€/€
	Financing B	Regional or autonomous province funding / overall funding	€/€

	Speed of execution	Presence of executive design level and administrative approvals	Si / No
	Management	Previous experience of the subject in managing university facilities	0-5, 6-10, 11-20, 21-30, >30

2.2 The 5th Call of Implementation of the Law 338/2000 Evaluation Criteria.

The criteria for evaluating proposals (Decree, 168/2022) must consider the objectives of the call, including: a) project effectiveness; b) project efficiency; c) project utility; d) project sustainability and durability; and e) impact indicators. The evaluation process implemented in the Law employs impact indicators and evaluation criteria (Table 5 and 6) for the construction of the ranking aimed at allocating funding. This method, on a multi-criteria basis, provides transparency, rationality and traceability to the project selection process. In this way, the 5th Call results such as regulatory tool capable of incentivizing not only the housing form of university residences, but a stimulus for interventions in the rehabilitation of the existing building stock and urban regeneration.

The vocation to urban regeneration is also corroborated by the types of design proposals upon completion of the 4th Call (2016), which shows that 60 percent of the projects accepted for funding since the 1st Call –about 200 out of 320–, contemplate design proposals on the existing heritage, including 128 interventions—completed or under implementation—in the field of building heritage rehabilitation and 72 interventions of ordinary, extraordinary maintenance and energy efficiency²⁴.

Table 5 | Rating title expressed by the Call for design proposals A2.

Typology proposal	Rating title	Score (max)
A2	(a) Requirement accommodation places and indicators of social impact	20
	(b) Co-financing and cost-sharing	10
	(c) Supply of accommodation places	10
	(d) Quality technical solutions, energy efficiency	60

Table 6 | Rating title expressed by the Call for design proposals A1, B, and C.

Typology proposal	Rating title	Score (max)
A1 B C	(a) Consistency with ministerial guidance	10
	(b) Housing place requirement, correspondence to indicators of social impact	20
	(c) Quality and indicators of environmental impact	20

²⁴ Roberto Bologna, "Student Housing in Architectural Renovation and Urban Regeneration Project," *Techne* 24 (2022): 198–206.

	(d) Financial sharing and indicator of financial impact	10
	(e) Co-financing from the regions	15
	(f) Work on buildings of historical interest	15
	(g) Applicant's experience	10
A2	(a) Requirement accommodation places and indicators of social impact	20
	(b) Co-financing and cost-sharing	10
	(c) Supply of accommodation places	10
	(d) Quality technical solutions, energy efficiency	60

3. Multi-criteria Evaluation as Decision Support Tool.

Urban regeneration sets as an aspiration an interfering reading of the different aspects, establishing the need to make choices based on the alternatives available. Indeed, territories are in constant transformation, subject to unpredictable changes, generated by an aggregate of intentions, projects and actions dependent on individual or collective wills, whose decisions overlap, contradict or deform. In these models, the decision is identified as a process delineated by interconnected actions; the activity that the individual performs with regard to an evaluation is based on an abstract process (Table 7) that is not necessarily stated, therefore, in the context of urban transformations and due to the numerous actors involved in the decision-making process, the complexity to be faced may be that of the non-comparability of objectives. Multi-criteria evaluation methods include a family of techniques that simultaneously consider different areas of the decision-making problem on the basis of a set of criteria. The methodology is configured within pre-determined alternative hypotheses or the introductory step requires the identification of the objective, which may be a preferred choice at the end of the evaluation process—as in the case of project selection—or an understanding of a problem, such as in the case of monitoring. The first step specifies the possible alternatives to solving the problem, the stage at which "scenario building" takes place²⁵. The second step identifies the criteria on which the final decision depends; the quantification and measurement of the criteria are closely related to the application domain in which the problem is grafted. The third step includes the estimation of the weights to be assigned to each criterion, either based on relevance to the decision maker or on the basis of logical mathematical function, resulting in the fourth step, i.e., the measurement of alternatives in relation to the criteria. The very nature of the decision-making problem confronts units of measurement relevant to the criteria being considered. Therefore, it is necessary to carry out a fifth step and normalize on the

²⁵ David Aaker, *Strategic Market Management* (New York: John Wiley & Sons, 2001).

basis of comparable scales by applying mathematical formulas, thus making it possible to relate the scores to the previously assigned weights. The ranking of alternatives that is obtained depends on the way in which the evaluator assigns weights to the evaluation criteria, representing, therefore, the point of view of the evaluation. Closing the evaluation process is a final step, a sensitivity analysis that tests the robustness of the results.

Table 7 | Steps of a multi-criteria analysis.

Phase	Description
(0) Objective identification	It is the introduction to the decision problem in that it requires the identification of the objective, problem and evaluation.
(1) Alternatives identification	Specification of the possible alternatives that provide different solutions to the problem.
(2) Evaluation criteria identification	Specification of the criteria on which the final decision depends, which includes information about the indicator, measurement scale and objective function.
(3) Estimation of the weights to be assigned to the criteria	Estimation of the weights to be assigned to each criterion, which can be on the basis of relevance to the decision maker (by ordering) or on the basis of logical mathematical function (cardinal).
(4) Measuring the performance of the alternative for each criterion	Each alternative will describe a performance based on each criterion.
(5) Normalization	Mathematical operation that allows measurement on the basis of different comparable scales.
(6) Ranking	Consists of the ranking of priorities among the pre-posed alternatives.
(7) Sensitivity analysis	Final operation designed to check the robustness of the result, which may involve variation in the assignment of weight values or variation in the normalization function.

The techniques—simple or complex—are manifold²⁶ but, but there are several classifications of them in the literature²⁷ (Table 8). The first considers the generation of alternatives: a) multi-criteria analysis, in which the problem is carried out with a set of finite alternatives, to which the objective is to identify a scale of preferability in a set of finite alternatives; b) multi-objective techniques, in which the decision maker responds to a set of infinite alternatives, the decision maker can be defined as the planner who chooses the best possible alternative based on the objectives set. The second classification considers the nature of the outcome: a) deterministic in nature; b) probabilistic in nature.

Table 8 | Techniques classification

Classification	Description
1. Generation of alternatives	(a) multi-criteria analysis
	(b) multi-objective techniques

²⁶ Mika Marttunen, Judit Lienert and Valerie Belton, "Structuring Problems for Multi-Criteria Decision Analysis in Practice: A Literature Review of Method Combinations," *European Journal of Operational Research* 263, no.1 (2017): 1-17.

²⁷ Pietro Rostirolla, *La Fattibilità Economico-Finanziaria. Metodi e Applicazioni* (Napoles: Liguori Editore, 1998).

2. Nature of the result	(a) deterministic
	(b) probabilistic

In general, the evaluation methods described above use of mathematical models and operations that identify a preferable alternative, surpassing the concept of a perfect alternative, confirming the idea that there may be a plurality of needs to be met depending on the design proposal.

In relation to the application of these methods to recent residences, they attempt to construct a ranking of criteria, sub-criteria and indicators for a sustainable evaluation of them. The methodology consists of a reiterative process involving the collection of data from the literature, interviews with students, selection and ranking of criteria, validation of the data through interviews, refinement of the criteria and definition of the evaluation model. The hierarchical structure is composed of three categories²⁸: 1) spatial configuration: covers the characteristics of bedrooms, common areas, furniture, accessibility and location, proximity to the university, public transport and services; 2) environmental quality and well-being: criteria related to air quality and thermal, visual and acoustic comfort, etc.; 3) housing management: is composed of the sub-criteria related to housing services, energy, water, waste and costs.

Similarly, Malaysian research²⁹ selects a set of criteria for the sustainable assessment of green university buildings. More specifically, they use the Analytic Hierarchy Process technique in order to structure the hierarchical evaluation model, which consists of the following criteria: indoor environmental quality, energy efficiency, site planning and sustainable management, reusable or recycled materials, and water collection and recovery; each is followed by its own sub-criteria.

In the above-mentioned application cases, the criteria of environmental quality and well-being—in the former—, and of housing management and energy efficiency—in the latter—appear to be the most relevant within the hierarchical evaluation model.

A further application case developed in Nigeria³⁰, aims to select the preferred housing solution-taking into account the student's point of view—from four alternatives: 1) traditional on-campus housing, whereby students can easily reach university services; 2) off-campus, university-managed housing; 3) off-campus, university-rented housing; and 4) off-campus, privately rented housing. The evaluation takes into account the views of two decision makers for each alternative described above and is

²⁸ Shady Attia, Pierre Alphonsine, Mohamed Amer and Guirec Ruellan, "Towards a European Rating System for Sustainable Student Housing: Key Performance Indicators (KPIs) and a Multi-Criteria Assessment Approach," *Environmental and Sustainability Indicators* 7, (2020): 1-12.

²⁹ Elaheh Yadegaridehkordi and Mehrbakhsh Nilashi, "Moving towards Green University: A Method of Analysis Based on Multi-Criteria Decision-Making Approach to Assess Sustainability Indicators," *International Journal of Environmental Science and Technology* 19, no. 9 (2022): 8207-30.

³⁰ Hammad Baba, Joel Musa Dabo, Ali Garba Rishi, Dabo Hammad and Isaac Ishaku Ayuba, "Criteria for the Selection of Students Accommodation Model in Nigeria Tertiary Institutions Using Analytic Hierarchy Process," *Academic Research International* 4, no. 5 (2013): 550-556.

done through a hierarchical AHP model of pairwise comparison of alternatives based on the criteria: a) proximity of academic services; studied discipline; maintenance cost; and safety.

Table 9 | Summary of the overexposed experiences.

Reference	Technique	Evaluation goal	Point of view	Macro-criteria
Attia et al. (2020)		Select a priority among criteria for choosing university housing	Students	Spatial configuration
				Environmental quality and well-being
				Housing management
Yadegaridehkor di and Nilashi (2022)	AHP	Select a priority among criteria for evaluating green university buildings	Experts in the application field	Indoor environmental quality
				Energy efficiency
				Site planning and sustainable management
				Reuse or recycled materials
				Water collection and recovery
Baba Hammad et al. (2013)	AHP	Choice of university housing preferred from: (1) Traditional on campus accommodation (2) Off-campus school managed (3) Off campus leased (4) Off-campus private	Students	Academic Proximity
				Student discipline
				Maintenance cost
				Students security

The three approaches described above, suggest possible evaluative applications for university residences and for the construction of indicator sets that are also useful in terms of urban regeneration, again suggesting a supporting tool on a multi-criteria basis.

4. Conclusions: from Project Selection to a Monitoring Process.

Law 338/2000 model refers to an evaluation based on criteria mostly concerning project characteristics. The measurement of the regenerative effect triggered on an urban fabric by a university student residence is not an objective of the Law 338/2000 process and the latter, in fact, does not incorporate criteria and indicators for this purpose. This is consistent with the fact that it is not in the planning stages of design proposals that the criteria for monitoring effects can be established, since planning instruments fail to crystallize in a pre-vision processes and interrelationships that are evolutionary, unpredictable, and creative in

nature³¹. The monitoring of regenerative effects—environmental, social and economic—should be undertaken in successive stages, in view of the fact that the effects of actions may take time to emerge and may present themselves with such discontinuities that certain thresholds must be reached before significant and measurable impacts occur³². However, it would be useful to subject the outcomes of policies to verification of their economic, social and environmental sustainability in order to produce feedback effects capable of modifying the plan or program that produced them³³. Among the many studies to measure the sustainability of urban regeneration, the indicator system approach is most widely used³⁴ and the literature presents many applications on different systems. There are applications that consider the measurement of quality-of-life improvement³⁵; others that employ sets based on five aspects³⁶ such as economy and labor, resource use, land use and buildings, transport and mobility, and community benefits; and finally, others cover environmental, financial, socio-economic and liveability aspects³⁷. However, the various systems or sets of indicators are not without criticism, such as the subjectivity in the choice of indicators or the strict adherence of the set used to the local context or the project being evaluated³⁸, which does not make the evaluation process replicable and comparable. A monitoring process should be based on a broad, non-redundant system of indicators capable of describing and making comparable the different interventions and the plurality of effects and impacts that can be triggered. At present, this research is reviewing the reference literature in order to select—and possibly modify—indicators classified by environmental-urban, social and economic dimensions. The ultimate aim is the implementation of a set of criteria that, subjected to due experimental verification, will become a useful tool for measuring the regenerative effects of a university residence and for comparing projects. An initial list drawn up in the course of the research—provisional, non-exhaustive and still being evaluated—is shown in Table 10 below.

³¹ Grazia Napoli, “La Valutazione Multicriteriale Nella Pianificazione Territoriale: Riflessioni Teoriche Su Un Caso Applicativo,” *AESTIMUM* 32, (2009): 861–86.

³² Peter Tyler, Colin Warnock, Allan Provins and Bruno Lanz, “Valuing the Benefits of Urban Regeneration,” *Urban Studies* 50, no. 1 (2013): 169–90.

³³ Napoli, “La Valutazione Multicriteriale”, 861–86.

³⁴ Yi Peng, Yani Lai, Xuewen Li and Xiaoling Zhang, “An Alternative Model for Measuring the Sustainability of Urban Regeneration: The Way Forward,” *Journal of Cleaner Production* 109, (2015): 76–83.

³⁵ Mee Kam NG, “Quality of Life Perceptions and Directions for Urban Regeneration in Hong Kong,” *Social Indicators Research* 71, no.3 (2005); 441–465.

³⁶ Lesley Hemphill, Jim Berry and Stanley McGreal, “An Indicator-Based Approach to Measuring Sustainable Urban Regeneration Performance: Part 1, Conceptual Foundations and Methodological Framework,” *Urban Studies* 41, no. 4 (2004): 725–55.

³⁷ G. Christopher Wedding and Crawford-Brown Douglas, “Measuring Site-Level Success in Brownfield Redevelopments: A Focus on Sustainability and Green Building,” *Journal of Environmental Management* 85, no. 2 (2007): 483–95.

³⁸ Helen Wei Zheng, Geoffrey Qiping Shen and Hao Wang, “A Review of Recent Studies on Sustainable Urban Renewal,” *Habitat International* 41 (2014): 272–79.

Table 10 | Set of criteria for measuring the regenerative effects of a university residence

Aspect	Criteria	Quantitative	Qualitative
Economic	Increase in the number of businesses	V	
	Increase in the number of jobs	V	
	Increase in the market values of real estate	V	
	Increase in average incomes	V	
	Increase in the number of new businesses operating in the area	V	
	Increased perception of overall community well-being		V
	Increase in public investment		
Sociale	Increase in the number of cultural activities present (cinemas, theaters and libraries)	V	
	Increase in the number of associations or third-sector entities	V	
	Improved overall satisfaction and sense of place		V
	Improved shared and collective enjoyment of public space		V
	Improved efficiency of community networks		V
	Increased access to education services	V	
	Increased perception of the level of quality of services		V
Reduction in petty crime and theft	V		
Urbano-ambientale	Increased areas of green areas (parks and urban green, public green and sports green)	V	
	Increase in the number of public transportation reaching the target area	V	
	Increase in the number of number of health care activities present (pharmacies, health garrisons, elderly care day care centers and disabled care day care centers)	V	
	Increased areas of pedestrian areas	V	
	Increase in the areas devoted to neighborhood services	V	
	Improving the surface area ratio between public and private spaces	V	

	Increase in the number of redeveloped buildings	V	
	Improvement in the overall quality of public space		V
	Increase in the surfaces of public parking lots	V	

The paper considered the issues of urban regeneration in a multidisciplinary context, the strategic tool of Law 338/2000 that can conceive of the city and university services as an organic system of functions and integrated: in approaching the above-described issues, decision-making processes and support through multi-criteria evaluations were considered. The contribution exposed the first results of a doctoral research regarding a reading of some sets of indicators, not only for the ex-ante choice of projects ex-ante but for a hypothetical process of monitoring them ex-post. The effectiveness over time of a university residence hall project that aspires to trigger regeneration processes can be measured through such an approach, which is still being studied. The matrix thus composed—projects by indicators—is not aimed at ranking research, but at building a framework. A useful "dashboard" for monitoring, in which even the simple comparison of the effectiveness of an intervention, criterion by criterion, becomes a tool for critical analysis of the project/context relationship, capable of returning feedback that is in turn useful for reorienting subsequent intervention strategies.

The next steps in the research will involve the development of a comprehensive evaluation framework that includes—in addition to several sets of criteria each suitable for each phase—, a system of capable of evaluating projects ex ante, in the planning and selection phase, correcting their course with *in itinere* evaluations in the implementation phase, and in conclusion monitoring their regenerative effects in the *ex-post* phase.

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