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A Case Study Driven Integrated Methodology to Support Sustainable Urban Regeneration Planning and Management

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Abstract: Urban regeneration involves the integrated redevelopment of urban deprived areas, covering physical, socio-economic and environmental aspects of cities, and it is concerned with interventions on early/inner-ring suburbs and historic centers, which are under pressure from population growth and sustainable development policies. The planning and management of urban regeneration interventions usually depend on the city and regional context. Although these interventions involve multiple issues and stakeholders, common characteristics can be identified, thus appealing for a holistic vision and coordination among the various dimensions of the problem. Based on the above context, and on the experience from a large-scale urban regeneration project, this article introduces an integrated methodology to support the planning and management of urban regeneration interventions. The methodology proposes a flexible baseline that can be adapted to urban regeneration projects of different contexts and dimensions, and defines steps, the corresponding stakeholders, and the teams' engagement, in an integrated framework to plan and oversee urban regeneration actions towards more sustainable and resilient interventions.

Keywords: urban regeneration; urban sustainability; project planning; integrated methodology

1. Introduction

Urban regeneration (UR) is a process of urban intervention which encompasses the reconstruction of old areas and assorted intervention actions on buildings and their nearby servicing urban space infrastructures. It is a topic of rising importance, with recognized social, economic and environmental repercussions, albeit some authors recognize that little attention has been paid to user needs and expectations or to managing regeneration in sustainable ways [1]. UR is nowadays a crucial factor in city policies and management, environmental protection, life quality improvement and sustainable development. As of late, it ceased being a mere field of study and grew into an integrating part of the new urban policies.

According to the Leipzig Charter [2], urban regeneration has gained prominence and a central role as an integral part of planning practice and urban governance. Taking as its starting point the traditional polycentric urban structure of Europe and changes in industry, transport systems and logistics, the urban planning and development strategies began to pay particular attention to deprived neighborhoods and abandoned urban spaces, in search of a more integrated urban development and a

more balanced territorial and social organization "within the context of the city as a whole, in order to reduce social polarization" [3] and to "make the model of a smarter, more sustainable and socially inclusive city" [4]. As noted by Sanz [3], "urban regeneration is not about new urban theories. It is a practical subject, rooted in the public realm that justifies urban planning".

Perceiving this new reality, and noting the degradation of housing conditions, salubrity, aesthetics and security in the main urban areas of a country, central public administration and municipalities have looked upon intervention needs very seriously and concretely, with an aim at reversing this unwanted situation. As interlinked social, economic and environmental problems occur in UR interventions, it has been recognized that the sustainable regeneration of urban distressed areas, present in many European cities, is very difficult, justifying the need for the development of ex-ante assessment methods specifically related to aspects of UR, offering more guidance for urban practitioners [5]. This need for adequate methods has also been noticed in China, where most cities lack effective planning and management tools for the complicated problems in the city and inner-city regions [6,7].

This article emerges from the experience gathered from a large scale UR project for downtown Coimbra, Portugal, named Processo de Renovação Urbana e Social da Baixa de Coimbra (PRUC). The city of Coimbra dates back to the Romans and the particular test area, located in the medieval city center, is a densely urbanized section of the city with many narrow streets and old buildings, some of them dating back to medieval times, and surrounding the old University which has been classified as UNESCO Human Heritage. Most of the area's streets are off-limits for motorized traffic. The area is mostly inhabited by poor and elderly people, many of whom live alone and have mobility difficulties, which led to the intervention strategy having as one of its main concerns, the adequate rehousing of residents during the intervention phase, giving priority to resettlement within the area itself to mitigate the possibility of future gentrification.

In this context, the purpose of this research is two-fold. First, it argues, in Section 2, for the need of planning and management UR following sustainability, resilience, empowerment and inclusive (multiplayer) concerns, and provides a write-up of the potential opportunities and gains if actions taken follow these recommendations. Second, it proposes, in Section 3, a methodology for developing UR actions, motivated by these concerns and from experience gathered from PRUC. A sum-up and conclusions are presented in Section 4.

2. Urban Regeneration: Impacts and Opportunities

The development of modern cities and city centers, their history and trends, has been thoroughly discussed in the literature. It is nowadays well established that cities have undergone four phases of development [8–11]: (i) Urbanization; (ii) suburbanization; (iii) counter urbanization; (iv) re-urbanization. This last phase, reurbanization, was already a reality in the 1990s in the more developed countries (France [12], UK [13], USA, Canada, Australia [8] and China [14]) and gained prominence in the sequence of the global economic crisis since 2008, which led to a stagnation of suburb growth. Reurbanization is triggered as a countermeasure to the stagnation, with many cities trying to regenerate their old city centers. The renewed demand by population for housing in the center also contributed to this triggering, with more and more signs showing up that young adults are abandoning their own houses in the suburbs and daily commuter trips, in favor of rented housing in the city center and access to public transportation [15]. In addition, UR has been connected to culture and urban tourism [16]. According to urban–rural population projections in EU-28 (2015–50), an increase of 11.1% in predominantly urban regions (cities), a marginal increase of 0.6% in intermediate regions (towns and suburbs) and a decrease of 7.0% in predominantly rural regions are expected [17]. UR is naturally linked to sustainable urban development, and, as it will be mentioned below, together with its impacts at manifold levels, UR is also an opportunity for all the stakeholders involved [14,18,19].

2.1. Urban Regeneration Impacts

2.1.1. The General Importance for Sustainability and Resilience

Taking into consideration the process of evolution and the development of cities, the actual tendencies of reurbanization and centralization, and of return to the historical center, it seems unanimous that UR has, and will have, a key role in the development of future cities and societies. Furthermore, as it will be argued below, UR is an opportunity towards achieving sustainable and resilient development, energy efficiency, revised land-use, revitalization of old city centers and citizen empowerment [20]. Moreover, translating sustainable development into practical dimensions will always imply devising strategies at the urban level [21], given the high percentage (74.5% in 2018, 83.7% expected in 2050) of European population living in urban areas [22].

The growing recognition of the importance of UR has been attested by several EU policies, legislation and instruments such as: The Europe 2020 strategy [23]; the Leipzig Charter [2]; the declaration of Toledo [4]; the Paris Agreement [24]; the 2030 Sustainable Development Goals [25]; and, the Pact of Amsterdam [26].

The main two instruments promoting sustainable buildings are the 2010 Energy Performance of Buildings Directive [27] and the 2012 Energy Efficiency Directive [28]. In 2018, the 2010 Energy Performance of Buildings Directive was amended for promoting the use of smart technology to improve the energy efficiency and overall performance of buildings [29]. This directive requires all new buildings to be nearly zero-energy by the end of 2020, and in the case of new public buildings, they should be nearly zero-energy by 2018. The market uptake of nearly zero-energy buildings (nZEB) across Europe is monitored by the ZEBRA2020 project (launched at the end of April 2014) [30].

The URBACT III program (2014–2020), that following the success of the URBACT I and URBACT II, has been developed in order to continue promoting sustainable, integrated urban development and to contribute to the delivery of the Europe 2020 strategy [31].

JESSICA II—The Joint European Support for Sustainable Investment in City Areas (2014–2020) financial instrument that follows the JESSICA (2007–2013) [32].

The Level(s) EU-tool, developed in close co-operation with industry stakeholders, for designing and constructing sustainable buildings. Its pilot phase was launched in September 2017 running until 2019 [33].

2.1.2. Energy Efficiency and Environmental Impacts

Recent bibliography on energy systematically refers to the buildings sector as crucial for climate change mitigation in the world (see [34–39]). Indeed, the buildings sector represents nearly 40% of the world's consumption of primary energy and 36% of the carbon dioxide (CO_2) emissions (EU, 2013) and the emissions may double by 2050 if nothing is done [40]. According to the Buildings Performance Institute Europe (BPIE), deep renovation of buildings could cut 36% of their energy consumption by 2030 [41]. The BPIE analyzed the available energy performance certificates and found that only 3% of the EU building stock has an A-label. According to these figures, 97% of buildings need to be upgraded [42]. The high relevance of UR and greenhouse gas mitigation to sustainable urban development has also been emphasized by Hassan and Lee [43].

Given their longevity, widespread energy inefficiency and age (about 50% of EU buildings have more than 50 years, and about 78% more than 30 years [44]), a significant potential for reducing energy consumption by renovating these buildings exists, both by intervening in the quality of the elements of the envelope and on the building facilities (such as sanitary hot water, heating and cooling systems) [39,45,46]. Building refurbishment within consolidated urban centers also contributes, albeit indirectly, to reducing energy consumption and emissions, through the potential for increasing the number of people living in urban centers and consequent reduction of transport needs [38,39,47]. Collier [48] also suggests possible impacts on local weather and air quality.

An additional environmental impact of UR that should not be ignored is the decreasing need for the construction of new buildings and demolishing/reconstructing actions, [37] and the corresponding decrease in materials volume requirements. Indeed, currently 40% of the materials entering the global economy are carried out by the building sector, with significant impacts resulting from the extraction of raw materials and their subsequent transformation [49]. Construction and demolition waste (CDW) accounted for 34.7% of the total waste in 2014 [50]. Although the recycling of materials from the deconstruction of buildings is increasingly a reality, the savings thus obtained can still be considered [51].

Vilches, et al. [52] carried out a literature review of life cycle assessment (LCA) of building refurbishment. They found that the total energy for the remaining life cycle in the refurbishment scenarios is between 30% and 80% less than in the no-intervention case. Therefore, renovation of buildings is essential to meet the EU's energy efficiency targets—in order to achieve the EU 2020 energy efficiency objectives, the renovation rate needs to increase from 1.2% (2015) per annum to at least 2%–3% [53].

Also, both new buildings and infrastructures associated with urban sprawl cause strong impacts and pressure on the environment, not only at the level of pollution, but also (and mainly) by occupation, waterproofing and destruction of agricultural land and forest, with the consequential loss of biodiversity [54,55]. Again, by reducing sprawl, UR can alleviate some of this pressure [56].

2.1.3. Economic, Social and Land-Use Impacts

The construction sector is crucial to the EU economy as it provides 18 million direct jobs and contributes to about 9% of the EU's GDP (EC, 2018d). The renovation part is recognized to be very important as it accounts for about 57% of those figures [57].

Moreover, as mentioned by several authors, other economic and social benefits are also obtained from energy and GHG emissions mitigation, namely: Reduced costs with energy services of households [38]; reduction of air pollution at local and regional scales [46]; improved quality of life inside buildings due to improvements in thermal-hygrometric comfort; indoor air quality due to use of more efficient ventilation systems; acoustic comfort due to use of double/triple glazed windows [58]; productivity gained from working in energy-efficient buildings [38]; increased energy security and decreased energy import needs [46]; and, increased economic activity, from investments in renovation of buildings [46,57].

Renovation of buildings, especially vacant ones, is also an opportunity to change its use, originating a more diversified land-use mix, which is known to improve economic activity and further reduce transport needs [37,38]. In fact, the connection between land-use characteristics and household consumption of energy and transport is known [59,60]. Land-use planning practices have consequences for individuals' transport patterns and demands: Dense and mixed development of cities (local mix of housing, business and services), which may be a result of UR interventions, make it easier for people to get to places they need, given the resulting reduced distances between people and destinations. This together with improved public transport systems, encourages mode switches away from car use, can reduce transport demand, which in turn reduces energy consumption for transport. Therefore, sustainable transport policies must be implemented, such as those based on land-use policies that reduce the need to travel, limiting access by traffic to urban areas, emphasizing accessibility, facilitating a move away from fossil fuel dependence, changing to active modes of transport (cycling and walking), increasing the use of ridesharing services, and encouraging the public to change their personal travel behavior [61]. Neighborhoods needing major UR can be catalyzed toward redevelopment by the addition of transit stations—pedestrian traffic generated by station users invites retailers to develop along the streets, and the access to transportation and jobs creates a demand for housing; infill may occur as well as new development, reinforcing urban areas revitalization.

2.2. Urban Regeneration as a Change of Paradigm

Policymakers, technicians, and the general public have recognized that a city's problems could not be solved solely with interventions in the built heritage, public infrastructures and spaces [62]. These problems are far more complex, requiring the consideration of multiple dimensions—economic, social, cultural, environmental, etc.—in the analysis and decisions, and they may incorporate a high degree of uncertainty [63]. They involve an increasing number of stakeholders in their resolution [64]. These new urban policies focus on a change of Government to Governance (see, e.g., [65]), i.e., a new form of acting in specific troubleshooting, with the active involvement of all stakeholders. They also rely on the Empowerment of populations [66] of specific neighborhoods and/or cities, through the promotion and motivation for participation in problem-solving, providing them with information, resources and means of analysis, and delegating powers in the decision-making process—transforming citizens into actors instead of objects [67]. An effort is also done to integrate the policies into a single, coordinated and coherent, action project through the use of arrangements/contracts that ensure the effective commitment of the involved parties, clearly defining the responsibilities of each, the goals and objectives to be achieved, as well as the assessment methodologies [68,69].

The fact that urban policy impacts tend to exceed the limits of its area, higher-scale decision-makers can be called upon for effective integration of urban management practices with regional and/or global sustainability policies [70]. The achievement of common interests encourages, in fact, requires, the sharing of experiences, results and resources [71].

It seems clear to the authors that UR interventions, which, as mentioned above, are large and complex projects with multiple and significant impacts, require careful planning and management, so as to coherently integrate all the aspects at stake and stakeholders, and to do so in a participative and inclusive way. It is precisely to address this need that the next section contains one such roadmap proposal.

3. Methodology for Planning and Management of UR Actions

The methodology presented below proposes a systematic holistic approach to develop UR interventions. It is motivated by the issues discussed in the previous section and aims at making sure that the UR effectively takes advantage of the opportunities it creates, in the aforementioned inclusive way. Together with the more theoretical issues already mentioned, the methodology incorporates practical knowledge, drawing from the experience gathered from the PRUC.

PRUC started as a multidisciplinary project to regenerate downtown Coimbra, which included circa 800 old and historic buildings. The University of Coimbra has been engaged with the city council to plan the regeneration action and three departments of the university (architecture, civil engineering and sociology) developed a detailed physical survey of the buildings, economic activity and residents. In total circa 60 people worked on the project full time. They were organized into four teams: Construction/structural engineers, architects, sociologists/economists and decision support analysts. The study generated photographs and CAD drawings of the interiors and exteriors of the buildings, identified the pathologies of their construction, recorded and analyzed the residents' socio-economic condition and the economic activities that occur in the intervention area. Due care was given to the study of the social sustainability dimension of the intervention, namely by ensuring an adequate rehousing program of all residents and avoiding future gentrification phenomena.

The decision support analysts team (including authors of this article), designed and implemented a web-based multicriteria spatial decision support system using GIS technology—see [72]. Examples of the outputs of the implemented system (including results of multicriteria analysis) are depicted in Figures 1 and 2.

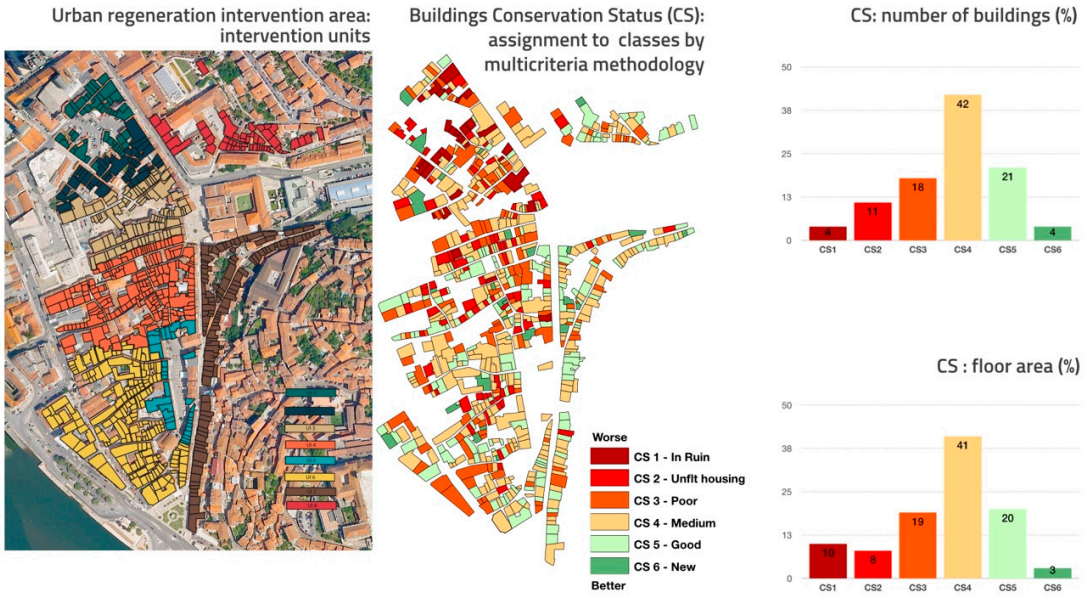

Figure 1. Case study area, buildings conservation status.

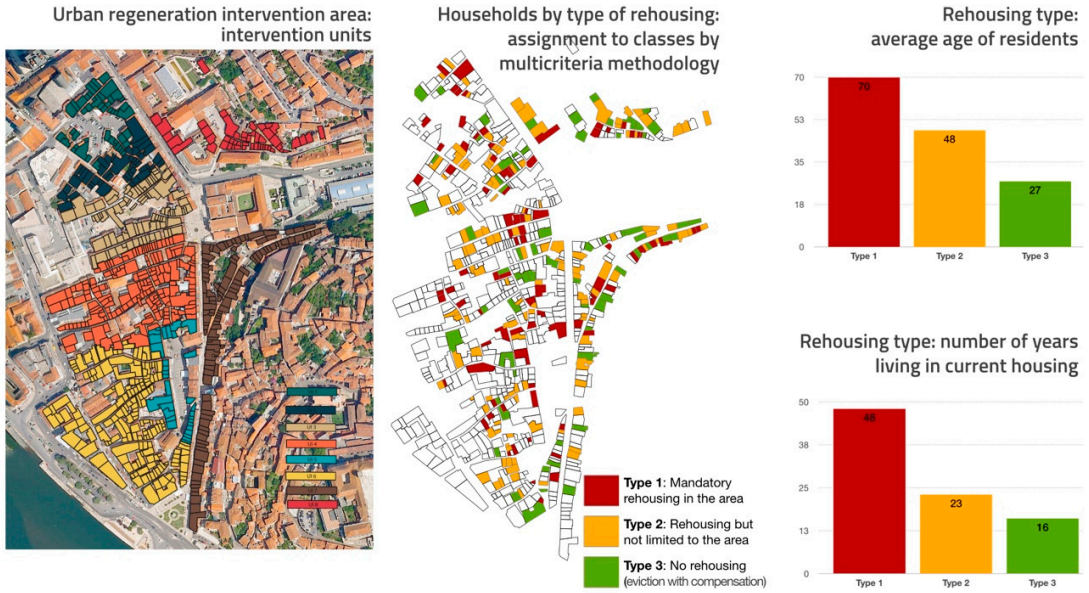

Figure 2. Case study area, rehousing needs.

During the development of works, the decision support analysts team, which was responsible for interacting with the other three and integrating all the information received, felt a very strong need for a guiding methodology. This methodology could act as an organizing and systematizing document for the undertaking of this large task in a coherent way, directed at the planning and management of the sequential intervention actions. In short, a roadmap for this could clearly define the steps, the corresponding stakeholders and the teams' engagement to make sure the UR intervention reaches its objectives. The worldwide economic crisis that followed the next year has put PRUC execution under severe financial constraints, ultimately leading to its adjournment sine die. The concept of a supporting methodology however subsisted, and this article presents one such proposal, based on both the conclusions from the lessons learned from PRUC and the opportunities UR actions present for all stakeholders and the city itself.

The proposed methodology, represented schematically in Figure 3, is composed of 15 steps, grouped into five phases. It tries to follow, as far as possible, the usual stages of the development of

a project (entire lifetime, from planning to management). Of these five phases, the first three can be called the "Strategic Plan", since it is during these phases that the intervention strategy is studied and elaborated. The last two phases fit on what is known as the "Operational Plan" (not to be confused with the UR intervention itself, which is the whole process), and correspond to the period in which the strategic options are implemented on the field.

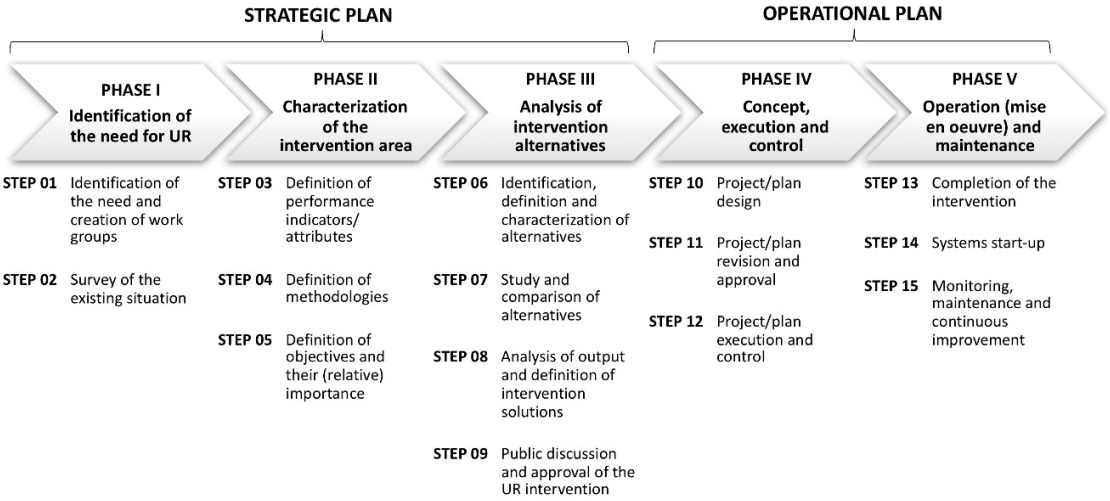

Figure 3. Methodology for planning and management of urban regeneration (UR) interventions.

Given the diversity of involved stakeholders in these projects, the importance of perceiving and mainly integrating their expectations, and making them more actively and effectively involved in decision-making processes [18,19,64,73], Table 1 lists in a clear, simple style, the specific tasks for each phase/step and suggests that stakeholders carry out each of these tasks.

3.1. Phase I—Identification of the Need for UR

3.1.1. Step 01—Identification of the Need and Creation of Work Groups

Authorities begin by identifying the urban spaces under their management that are degraded, in all or some of the dimensions of UR—Figure 2, and therefore warrant a UR intervention. This should take into account a set of general principles [74], namely: The principle of coordination, promoting convergence, articulation, compatibility and complementarity of the various actions of public and private initiative; the principle of fair consideration, promoting an appropriate weighting of all the interests at stake in UR actions, in particular, the interests of owners or other rights holders on buildings that are subjects of the regeneration interventions; the principle of equity, ensuring the fair distribution of costs and benefits arising from the implementation of UR actions; the principle of financial sustainability, guaranteeing that the intervention is based on a financially sustainable and balanced model, contributing to the valorization of urban areas and buildings intervened; and the principle of integration, preferring the intervention in areas whose boundaries enable an appropriate and articulated response to the morphological, economic, social, cultural and environmental components of urban development.

Table 1. Teams engagement/task stakeholders.

Phase	Steps	Stakeholders															Tasks and corresponding stakeholders
		(1) Promoter	(2) UR Area Residents	(3) Homeowners' Associations	(4) NGOs	(5) Public Administration	(6) Investors and Financiers	(7) Technicians and Specialists	(8) R&D Institutions	(9) Field Survey Teams	(10) Economists and Sociologists	(11) Environmental Agency Technicians	(12) Decision Support Analysts	(13) General Public	(14) Contractors	(15) Maintenance Companies	
I. Identification of the Need for UR	1. Identification of the need and creation of workgroups	●	●	●	●	●	●	●	●								Identifying degraded urban spaces (1) + (5) Provisionally delimit UR area (1) + (5) Identify potential stakeholders (1) + (5) Dissemination of information (All) Knowledge and viewpoint sharing (All) Creation of workgroups (All)
	2. Survey of the existing situation							●		●	●	●					Workgroup coordination (7) Data collection (All) Characterization of the built heritage (7) + (9) Building conservation status evaluation (7) + (9) Population characteristics evaluation (10) + (9) Economic and land-use activities evaluation (10) + (9) Environmental assessment (11) + (9) Creation of UR area analysis report (All)
II. Characterization of the Intervention Area	3. Definition of performance indicators/attributes					●		●			●	●					Definition of performance indicators (All)
	4. Definition of methodologies							●					●				Definition of analysis methodologies (All)
	5. Definition of objectives and their (relative) importance	●	●	●	●	●	●	●	●	●	●	●	●				Definition of specific objectives (All) Deployment and testing of decision-aid model (1) + (7) + (8)

Table 1. *Cont.*

III. Analysis of Intervention Alternatives	6. Identification, definition and characterization of alternatives	●				●		●					●				Identification and definition of alternatives (All)
	7. Study and comparison of alternatives												●				Study and comparison of alternatives (All)
	8. Study and comparison of alternatives	●	●	●	●	●	●						●				Analysis of output and definition of intervention solutions (1) + (5) + (8) Definition of the UR strategic plan (All)
	9. Public discussion and approval of the UR operation	●	●	●	●	●	●							●			Public discussion (All) Approval of the UR operation (1) + (5)
IV. Concept, Execution and Control	10. Project/plan design							●									Design of technical projects (All) Final review & compatibility check (All)
	11. Project/plan revision and approval	●				●	●	●									Final discussion (All) Approval of the intervention project (All)
	12. Project/plan execution and control	●						●							●		Bidding and contracting of construction teams (All) Physical execution (7)
V. Operation (Mise En Oeuvre) and Maintenance	13. Completion of the intervention	●	●	●	●	●	●	●	●	●	●	●	●				Project closure (All)
	14. Systems start-up	●	●			●		●							●		Start-up (All)
	15. Monitoring, maintenance and continuous improvement	●	●			●		●							●	●	Maintenance/conservation plans execution (All) Monitoring of further intervention needs (All)

Thus the promoter entity, which are usually the municipal and regional authorities, having identified the need for a UR intervention should, within these principles, begin by delimiting (provisionally) the intervention area (UR area) and identifying potential stakeholders [75], partners and other stakeholders in the intervention, e.g., citizens in general; UR area residents; homeowners' associations and relevant NGOs representatives; authorities and bodies of public administration (at local, regional and national levels); investors and financiers; technicians and specialists; and R&D institutions. Particular attention should be given to the latter aspect, since the involvement of all potential stakeholders from an early stage is essential for the perception and congregation of all the interests, views and objectives involved [64]. Indeed, it is well-known that the ability to influence the options and final characteristics of the project, without significantly affecting costs, is much higher in the early stages of development and decreases considerably as it evolves.

So, at step (01), an effort should be made to strongly encourage the exchange and dissemination of information (conferences, seminars, etc.), knowledge sharing and viewpoints (round tables, think-tanks, etc.) and active participation of all stakeholders (creation of workgroups, etc.). This first step ends with the definition of guidelines and general objectives for the UR intervention, with clear identification of interested stakeholders, the formation of workgroups and teams, the definition of their responsibilities and tasks, and the sharing and dissemination of the work carried out and results obtained.

3.1.2. Step 02—Survey of the Existing Situation

The survey and analysis of the current situation of the UR area should be carried out, including identification of its main problems, needs and opportunities, and the characterization of the built heritage and socio-economic environment of the UR area. Collecting data about the UR area's physical, economic, social and environmental realities, which is necessary for the ensuing work and tasks, is the main objective of this step. For this purpose, one should make use of the best means and techniques available, which may include, e.g., information gathering concerning plans, programs, projects (already existing or in preparation), surveys, interviews, physical inspection to buildings, equipment and urban infrastructure testing. The survey's output will allow initial estimates for costs, options, risks and benefits of the UR intervention. Some (very) short-term solutions may also be identified, particularly for high-risk and/or emergency situations (e.g., lack of minimum safety conditions; extreme social needs and crime). Survey teams typically include civil engineers, which will evaluate building conservation status; architects, for characterizing buildings; economists and sociologists, to evaluate population characteristics and economic and land-use activities; and eventually environmental agency technicians, to evaluate potential implications at this level.

3.2. Phase II—Characterization of the Intervention Area

In this phase, the area of intervention is characterized, based on the survey data collected in the previous step. It splits into the following three steps.

3.2.1. Step 03—Definition of Performance Indicators/Attributes

The different workgroups, following the guidelines and UR intervention objectives previously identified, design and carry out the studies needed for the identification and selection of performance indicators/attributes to be used in the multidimensional characterization (physical, economic, social, cultural, environmental, etc.) of the UR area. The terms "indicators/attributes" and "alternatives" are to be understood in the context of multicriteria methods, methods which the UR actions naturally require due to its aforementioned multidimensional nature. See e.g., [72,76].

3.2.2. Step 04—Definition of Methodologies

One thus seeks to analyze survey data and transform it into relevant information, to be used in this step (04). Indeed, after indicators/attributes are defined, methodologies and models should be identified and/or developed to use in the definition and evaluation of performance indicators of the

project (financial evaluation; environmental performance assessment; multi-attribute analysis; etc.). A decision support team should join in at this stage, if not already on-board.

3.2.3. Step 05—Definition of Objectives and Their (Relative) Importance

Once both the performance indicators and the methodologies/models to obtain them had been identified, a discussion is carried out to define specific objectives for each particular UR process. The definition of these objectives will enable deployment of the decision-making model and its testing and calibration through preliminary simulations. At this step, the tasks necessary for the definition of the relative importance of the different objectives should also be executed. This may be carried out through discussions among workgroups and teams, interviews with experts or even (if a broader scope is necessary) by conducting public consultation or population surveys. This stage is to be coordinated by the decision support team, in tandem with political authorities.

It is desirable that at the end of this stage the UR area is fully delimited and ready to undergo formal approval. This is, in fact, a requirement in some legislation (see e.g., [74]).

3.3. Phase III—Analysis of Intervention Alternatives

This phase, the last one at the Strategic Plan level is made up of four steps.

3.3.1. Step 06—Identification and Definition of Alternatives

It concerns works and studies necessary for the identification and characterization of project options and intervention alternatives meeting the objectives of the UR operation. When characterizing the alternatives, each of these must be assessed and compared with the procedures and methods previously defined and according to the indicators/attributes defined in phase II, steps 03–04. The decision support team proposes the alternatives, which are to be discussed together with the technical teams and political authorities. It is very important that the alternatives incorporate building energy efficiency and land-use improvements considerations.

3.3.2. Step 07—Study and Comparison of Alternatives

The study and comparison of these alternatives are carried out. This is done by the decision support team, which conducts feasibility studies, cost-benefit analysis, scenario simulation, multicriteria evaluation (this allows the explicit inclusion of all relevant dimensions of the problem using the respective natural measurement units with convenient trade-off and sensitivity analysis), etc.

3.3.3. Step 08—Analysis of Output and Definition of Intervention Solutions

By analyzing the output and its confrontation with the initial objectives, the selection of the intervention options that best address the needs and objectives of the project is carried out. These results must be presented to all stakeholders, among which a wider discussion should be promoted. The emerging conclusions should then result in a decision-making proposal—the definition of the UR strategic plan.

3.3.4. Step 09—Public Discussion and Approval of the UR Operation

It corresponds to the public discussion/consultation and final approval of the strategic plan. It is important to point out that this discussion should not be understood as a merely formal act (often enforced by legal provisions), but rather as a fundamental tool for the benchmarking and validation of the solutions found. Thus, all the resources necessary to promote an effective and enlightened public participation should be guaranteed in this step. This is essential to ensure the establishment of solid commitments and shared responsibilities in the implementation of the plan of action.

3.4. Phase IV—Concept, Execution and Control

Having defined and approved the strategic plan of action, its implementation follows. In the so-called operational plan, actions towards its effective implementation are undertaken. This phase subdivides into three steps.

3.4.1. Step 10—Project/Plan Design

The technical design teams, based on the strategic plan guidelines and the needs identified in the survey and subsequent characterization of the intervention zone, translate the decision-makers' choices into projects of solutions. These technical projects should allow setting up the timeline and financial planning of the UR intervention, quality and safety plans, as well as a detailed maintenance and conservation plan. All these elements of the intervention project should be subject to a final review to ensure its proper framing with the objectives set, eventual corrections notwithstanding.

3.4.2. Step 11—Project/Plan Revision and Approval

The final discussion and approval of the intervention project are carried out. It precedes the last step of this phase (step 12)—the physical execution of the UR intervention in all its aspects: Buildings, networks and urban infrastructure, public spaces, etc.

3.4.3. Step 12—Project/Plan Execution and Control

At the construction step, the usual tasks of management, control and monitoring of cost and quality of the work should be strictly carried out.

The work developed in the previous stages will, in principle, allow for the smooth execution of all construction works. However, if setbacks occur, they should be resolved in the same spirit of the above procedures and documented, to be avoided in future projects.

3.5. Phase V—Operation (Mise en Oeuvre) and Maintenance

This phase subdivides into the following three steps.

3.5.1. Step 13—Completion of the Intervention

Once the construction phase had been completed, analysis and reflection should be conducted concerning the entire UR intervention. In particular, the checklist should include: An analysis of the performance attributes and objectives set for the operation; implementation of conservation, maintenance and monitoring systems set to operate for the lifetime of the project; and a general outlook by all actors and stakeholders.

3.5.2. Step 14—Systems Start-Up

In this step, the commissioning of all systems, infrastructure and public spaces is done, and the buildings are put into use.

3.5.3. Step 15—Monitoring, Maintenance and Continuous Improvement

Permanent communication with users of public spaces and buildings should be established, and the execution and control of maintenance/conservation plans should be guaranteed, together with the on-going evaluation of any further intervention needs.

3.6. Final Remarks

The complex nature of a UR intervention may, as stages are implemented, imply the readjustment or resetting of guidelines, objectives, stakeholders, workgroups and teams. As such, throughout the lifetime of the project, the use phase included, information on its progress must be maintained and

organized. The difficulties, problems and faults detected, as well as the solutions found, should be reported and documented, so that the whole experience can be fed back into future projects. It is also very important to permanently monitor and coordinate the work done at all phases/steps, so as to ensure compatibility of the proposals with the territorial management instruments, compliance with legal norms and correct motivation of technical solutions.

4. Conclusions

Current reorganization trends, efficiency needs and sustainability concerns, make UR a subject of rising importance. The socio-economic, environmental and political context of nowadays call for inclusive and careful planning and management of such actions in order to turn the interventions into profitable and efficient long-term investments and serve as a laboratory for the development of complex interventions on the urban space with participative overtones.

In this article, a methodology to undertake UR interventions, motivated by these modern concerns and reflecting the authors' experience from a large-scale project, was presented. Conceived as a fully-integrated approach, including strategic and operational aspects, it is applicable to any UR intervention anywhere, suitable to be used as a baseline for consultancy in this respect. It is innovative because it is a holistic methodology (clearly defining steps, the corresponding stakeholders and the teams' engagement in an integrated framework) to plan and oversee UR actions. The introduced methodology can help city planners and decision-makers organize ideas and/or broaden their views on the subject.

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