

MULTI-CRITERIA ANALYSIS IN THE MANAGEMENT OF TEMPORARY REUSE OF SPACES

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ABSTRACT:

Urban change has always marked the way of rethinking cities, bringing continuous studies aimed at urban regeneration. In contrast to traditional approaches, centered on the duality of demolition and construction, the temporary reuse of spaces addresses the issue of urban transformation with a multi-criteria approach involving the participation of community representatives.

Analytic-hierarchical methods are support systems based on multiple criteria able to process a large number of different factors. Analytic-Hierarchy Process (AHP) is a specific instance of the general methods by means of which weights and quantities of an element, respect to the category taken into consideration, are assigned.

The multi-criteria fuzzy criterion, applied in a study-case to three different alternatives (hypotheses) of reusing industrial ex-spaces abandoned in a municipality of the Milan province (Italy,) allows one to select the best alternatives in all cases in which many selection choices (spaces typology, required functions, benefits, timing) are possible and the optimal choice can be achieved by analyzing the different scopes of each criterion and sub-criterion as well as the relevant weights. Criteria are mutually compared in terms of the global objective while the alternatives are compared as function of the criterion. As outcome of this operative sequence the most sustainable solution, among the three different alternatives of the temporary re-use of the urban spaces addressed in the study-case, measures the relative priority of the alternatives existing at the lower level with respect to the achievement of the main objective and it is implemented according to the lowest economic cost.

1. INTRODUCTION

The concept of town, intended as model-guide of the government of the space, considers the unit basis as the dimension referred to the re-use space practices by the communities and the policies that govern the changes, the actions and the functions of these areas.

Based on this principle, the geographer-urbanist Jacques Lèvy identifies the public space as location of the town where the community moves freely. Actually, within this space, one can identify two matrices, one of “the movement” and the other “of the contact”, where people co-exist and randomly interact with each other, maturing, at the same time, unexpected transformations of the same space (Lévy, 2018).

In the last years, by observing in particular the urbanistic discipline, it is possible to discern more or less clearly as the use practices of the spatial entities and of their functions are one of the principal themes of discussion about urban development,

In this regard, the proposed approach not only considers a new way to use disused places, but it introduces a new methodology of urban action focused on a multidisciplinary approach in the articulated phase of transformation and re-use of the urban places.

Specifically, this paper employs a combination of analysis of the “multi-criteria fuzzy logic” and a decision making method in the application of the concept of urban re-use.

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First, this study proposes a hierarchical process named Analytical Hierarchy process (AHP), to weight each selected criterium and, successively, the fuzzy logic to establish contextual relationships among the selected criteria.

In this way a dominance hierarchy is established, i.e. a reticular structure composed of almost two levels that includes all elements of the problem; this one, initially, complex and unstructured has been successively broken down and syntetized in a more rationale way.

Through this process, the evaluated factors are mutually compared offering a choice of alternative design solutions applied within spatial contexts, so guaranteeing, a solid theoretical operational structure for the temporary re-use.

This article is organized in the following sections:

section 2 presents the theoretical fundamental concepts on which the urban regeneration is based; section 3 presents the principal aspects of the multi-criteria decision making process; section 4 describes the results applied to the three analyzed study-cases, representing the choice alternatives for a team of expert decision makers; section 5 reports some conclusive considerations of the whole implemented process.

2. THE TEMPORARY REUSE OF SPACES

Interactions between time, space, natural and anthropic environment become the place where to mobilise "hidden", dispersed and misused resources, to develop human relations as well as focus on production processes, social interactions, where knowledge and skills are handed down and renovated over time (Marra, 2015).

An initial suggestion in this regard was expressed as early as 1954 by architect Giancarlo De Carlo, on the occasion of the 10th Milan Triennial Exhibition, who used three thematic insights: the use of space, the close relationship between society and space and the drift of modern cities managed by technical-bureaucratic practices, where man is not the protagonist in urban actions (De Carlo, 1954).

For centuries, urban planning has attempted and tried to create a social order, in an attempt to organise and to shape growth, through actions aimed at organising, disciplining and controlling space. Since the 60s in order to modify this tendency, within the planning context, specific reforms of the territorial planning process began to be identified, influenced by the growing and continuous demand for popular involvement in the planning choices.

These perspectives are also studied, observed and described by the Californian sociologist Margaret Crawford, professor of Urban Planning and Design Theory at Harvard University's Graduate School of Design, author of the fundamental text *Everyday Urbanism* (Chase, Crawford, Kaliski, 1999). According to what is expressed within this approach, which many of the urban theories such as the "pop-up city" (Sacchi, 2019) and the "Do It Yourself" urban practice theories (Lydon, Garcia, 2014) refer to, the "everyday urbanism" addresses the infinite number of relationships that a community establishes and how it uses spaces to give an expressive form to its life, as well as to manifest its everyday uses. In search of the first attempt to change the constructivist urban logic, however, we have to look at the end of the 90s of the 1900s, where the first concrete movements can be spotted, capable of setting a tangible and effective basis for the urban reuse of urban spaces. In 1998, in Amsterdam, an urban movement composed mainly of artists, intellectuals and architects, called "De Gilde", published the research "Laat 1000 vrijplaatsen bloeien", that proposed innovative strategies to the public administration to re-think and re-interpret planning instruments specifically. These suggestions were oriented towards the regulation of the abandoned areas of the municipal seaport, that had fallen into disuse over the years and were occupied by spontaneous artists. In this sense, the organisation promoted a policy of involvement and recovery, capable of using the current urban heritage, going beyond the logic of demolition and reconstruction of spaces typical of the rationalist thought. The goal of this approach has been to focus on unused or hardly used spaces that do not find a new functional use, becoming a testing ground for different communities, which start to turn these spaces into places where they can try out new forms of art, music and culture, applying social projects aimed at creating spaces for recreational events, for gardening, for the informal trade of local markets, or as representative places for associations, spaces for 'zero kilometre' agriculture or public spaces within which freely express a common use of surfaces.

This condition has led living spaces to experiment with forms, activities and projects of a temporary nature, creating a good basis for the development of new local economies by giving companies the opportunity to be promoters of urban transformation.

The PRECARE project of the organisation City Mine, founded in Brussels in 1999, has experimented in a number of European

cities (London and Barcelona) with a new urban development project aimed at integrating temporary uses of derelict spaces into longer-term development projects, also designed to improve the socio-cultural context. Another major European project developing strategies for temporary re-use is Urban Catalyst, that, during the years 2001-2003, explored the potential for temporary re-use in five European metropolises in collaboration with 11 international partners, collecting some fundamental ideas on the process of urban re-use. The project, initiated by Philipp Oswalt and Klaus Overmeyer, established an interdisciplinary platform to research projects, public interventions and various publications related to temporary reuse of spaces during the period 2004-2013. In 2013 this operation, which started in the early years of the 21st century, led to the publication in 2013 of the book 'Urban Catalyst - The Power of Temporary Use' (Oswalt et al. 2013), in which the authors draw attention to the ways in which informal processes find their way into urban planning and what urban planners can learn from temporary users.

3. ANALYTICAL HIERARCHICAL METHOD

The proposed multi-criteria model uses a hierarchical analytic process that selects the "best compromise" alternative among a discrete set of proposals previously formulated by different social actors. (Figure 1)

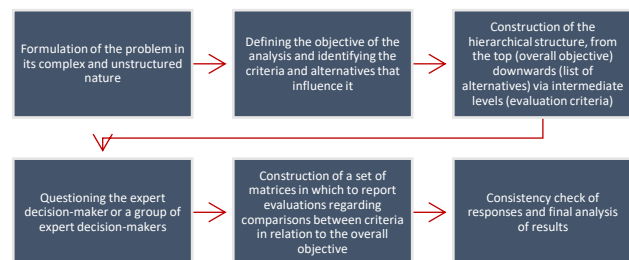


Figure 1. Logical sequence of activities

The levels composing the model are:

- the first contains the goal to pursue, identifying the complex problem to deal with;
- the underlying level contains the different criteria identified within the first participatory processes, where content and meanings of the principal theme are detailed;
- each criterium can be subdivided, in turn, in more specific actions inserted in the class of the sub-criteria relative to more specific objectives;
- a fourth level is a filter between the elements and solutions, within which the intermediaries will be called in the visualization of the results and in the creation of the alternatives to suggest;
- finally, in the last level, the final product will be essentially composed of various planning feasible solutions within the territorial context.

In the study case discussed in the sequel the selective alternative will be oriented to achieve the most economical and optimal solution..

Then, a hierarchy dominance will be created, i.e. a reticular structure made of almost two levels that will contain all simplifying elements of the problem, initially complex and poorly structured.

This methodology permits to organize the several themes involved inside the urban re-use process, creating a clear structure that may be modifiable depending on future changes (Figure 2).

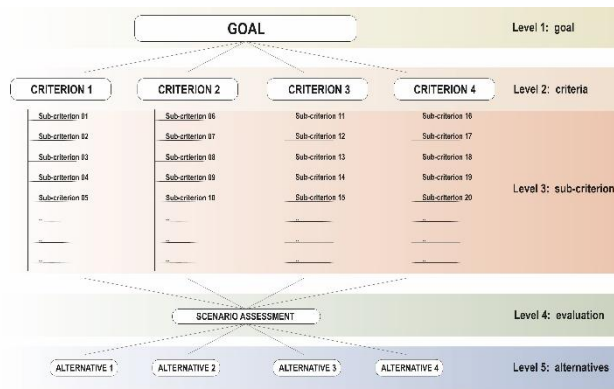


Figure 2. Hierarchical structure of the multi-criteria model

Once the hierarchical structure of the model has been completed a series of pairwise comparisons is performed for each element belonging to a certain level, referred to the element present at the immediately higher level.

Hence, criteria are mutually compared in relation to the global goal, sub-criteria will be compared depending on the membership criteria.

The conceptual approach underlying the method used for evaluating the criteria dates back to the process introduced by Thomas Loric Saaty; towards the end of the seventies he developed a logic that permits to analyze and evaluate the different impacts that plans, projects and programs can have inside the contexts.

The Analytical Hierarchy Process (AHP) allows one to identify the hierarchy of dominance, “membership”, inside a decision making process, applies a sequence of operations that allow one to assign weights and quantities of an element, in relation to the category taken in consideration.

Following the rationale by Saaty, it is equally important to assign the values of the weights that the different factors, under evaluation, take within each level.

To perform the comparison, the Saaty’s semantic scale has a role essential to the coding, expressing through a quantitative and qualitative relationship the intensity of dominance of a factor with respect to all factors of the analyzed set.

Intensity of dominance	Opinion
1; 1; 1	Equal importance
2; 3; 4	Weak predominance
4; 5; 6	Strong predominance
6; 7; 8	Evident predominance
9; 9; 9	Absolute predominance
1; 2; 3 3; 4; 5 5; 6; 7 7; 8; 9	Values of compromise

Table 1. Saaty’s scale structure

The matrix of pairwise comparisons, \tilde{A}^k , built by a single decision-maker, has the following form:

$$\tilde{A}^k = \begin{bmatrix} \tilde{a}_{11}^k & \tilde{a}_{12}^k & \dots & \tilde{a}_{1n}^k \\ \tilde{a}_{21}^k & \tilde{a}_{22}^k & \dots & \tilde{a}_{2n}^k \\ \dots & \dots & \dots & \dots \\ \tilde{a}_{n1}^k & \tilde{a}_{n2}^k & \dots & \tilde{a}_{nn}^k \end{bmatrix} \quad (1)$$

where \tilde{a}_{ij}^k denotes the k -th preference of the single decision-maker with respect to the i -th criterion in relation to the j -th criterion, expressed by a triangular fuzzy number. As an example, the fuzzy value \tilde{a}_{13}^1 could represent the preference of the single decision-maker relative to the first criterion with respect to the third criterion with a judgment defined as:

$$\tilde{a}_{13}^1 = (2, 3, 4) \quad (2)$$

If K decision-makers are involved, the individual preferences \tilde{a}_{ij}^k are averaged and computed as follows:

$$\tilde{a}_{ij} = \frac{\sum_{k=1}^K \tilde{a}_{ij}^k}{K} \quad (3)$$

According to the averaged preferences a new general matrix of pairwise comparisons, \tilde{A} is assembled; it will show the averaged triangular coefficients of dominance and it will assume the following form:

$$\tilde{A} = \begin{bmatrix} \tilde{a}_{11} & \tilde{a}_{12} & \dots & \tilde{a}_{1n} \\ \tilde{a}_{21} & \tilde{a}_{22} & \dots & \tilde{a}_{2n} \\ \dots & \dots & \dots & \dots \\ \tilde{a}_{n1} & \tilde{a}_{n2} & \dots & \tilde{a}_{nn} \end{bmatrix} \quad (4)$$

According to the Buckley’s method (Buckley, 1985) it is computed as the geometric average of the values obtained from the fuzzy comparisons of each criterion, \tilde{u}_i . The values \tilde{u}_i are triangular numbers and are defined by the following formula:

$$\tilde{u}_i = \left(\prod_{j=1}^n \tilde{a}_{ij} \right)^{\frac{1}{n}} \quad i = 1, \dots, n \quad (5)$$

Then, the vector sum of each fuzzy element \tilde{u}_i is computed and it is elevated to the exponential value (-1) by the following relation in which the symbol \oplus denotes the fuzzy sum:

$$\tilde{u} = (\tilde{u}_1 \oplus \tilde{u}_2 \oplus \tilde{u}_3 \oplus \dots \oplus \tilde{u}_n)^{-1} \quad (6)$$

The subsequent step amounts to computing the fuzzy weight relative to the i -th criterion expressed by the following relation:

$$\tilde{o}_i = \tilde{u}_i \otimes (\tilde{u}_1 \oplus \tilde{u}_2 \oplus \tilde{u}_3 \oplus \dots \oplus \tilde{u}_n)^{-1} = (lw_i; mw_i; uw_i) \quad (7)$$

where the symbol \otimes denotes the fuzzy product and the vector containing fuzzy weight in ascending order. Since the term \tilde{o}_i is a triangular number as well, it needs to be “de-fuzzified”, by using the “center of gravity” method, i.e. by applying the following equation:

$$M_i = \frac{(lw_i + mw_i + uw_i)}{3} \quad (8)$$

Notice that M_i is not a fuzzy number and it has to be normalized as:

$$N_i = \frac{M_i}{\sum_{i=1}^n M_i} \quad (9)$$

These phases need to be executed in sequential steps in order to compute the normalized weights both of the criteria and of the alternatives. Subsequently, multiplying each weight of the alternative by the relative criterion, the scores relative to each alternative are computed. On the basis of these results, the alternative with higher score represents the choice of the decision-maker or of the decision-makers in the team (D’Urso and Masi, 2015; D’Urso et al. 2018).

The proposed model permits the right degrees of flexibility and stability of a system capable to respond to the different judgments of the actors.

By virtue of this characteristic property, a dual nature of the structure can be distinguished:

- complex nature: where all the phases of the structuring and analytical-logic operations are performed in the precise sequence shown. The model will include multiple criteria and sub-criteria of evaluation. Participation will have an important role for inserting the temporary functions aimed to help the sectoral transformations of the areas, immediately providing vitality and attractiveness to the places;
- simplified nature: the effectiveness of a participatory and evaluation process in a short-medium period certainly requires a simplified procedure. The system presents its setup, identifying the aim, the criteria, the sub-criteria, the evaluations and the alternatives, providing to adjust the executive process and to set up a participatory program usable in a territorial context of minor relevance (small areas in a small to medium range municipalities; urban unusable fragments; private real estates). In this way is possible to govern the comparisons among the different levels with greater ease, establishing a pairwise comparison of the criteria introduced in the structure of the model and, at the same time, to express a preferential value for the sub-criteria.

The reduced nature of the model requires different computing procedures that can be summarized:

- pairwise comparison: the comparison of different criteria is carried out in pairs, evaluating the importance inside the project;
- comparison of the set of sub-criteria: with reference to the computation of the factors inserted in the level, the evaluation is oriented towards the value of a weight, in a scale from 1 to 9, that will express the interest of each single user for each sub-criterion chosen in the set.

Data expressed through the arithmetic average of the results represents the set of the preferences expressed by a group of social actors, showing the planning process of the community for the selected sector.

Each result, identified in this way, allows one to show the social preferences for acting the temporal process of re-use, forming in accordance the various actionable alternatives.

4. STUDY CASE

The case study focuses on Bareggio, a municipality in the province of Milan, one of those urban dimensions having a multifunctional character, articulated and composed of numerous economic and social dynamics.

The territory of Bareggio involves a complex system of more extensive spatial relations: starting from the large territorial systems, it is possible to observe the urban environment as a whole, with a very close relationship between the natural and anthropic landscape and the supra-local mobility system.

Analyzing the municipal context of Bareggio, the recovery of disused areas not only provides the starting point for urban regeneration, but also allows for substantial changes to be made in terms of limiting land consumption, without affecting the social and economic development of the town. On the other hand, this aspect guarantees secure responses to the demands of new urban development models, aiming at new standards of quality of life and focusing on functional mixes of housing, services and economic offer.

These objectives, declined at local level, have been identified in three transformation areas, for which it has been possible to identify some spatial specifications:

- **Ex Cartiera:** the area involves the disused industrial plant of the Ex Cartiera area, within the consolidated urban fabric, near the central square and surrounded by numerous residential

structures. The structure, originally designed to house a spinning mill for paper production in the 1940s, has been abandoned since the early 90s.

- **Ex Sapla:** the transformation area consisting of the Ex-Sapla buildings is a disused industrial area, considered within the consolidated urban fabric. The area is close to the historical fabric of the city centre and borders, on the western side, with the Ex Cartiera area defining a single project system.

- **Ex Alma:** another area subject to urban regeneration is located along Via Papa Giovanni XXIII, Via XXV Aprile and Via Armando Diaz, occupying an area of 11,000 m². The area involves a disused industrial area within the consolidated urban fabric and bordering on agricultural land, but also in close proximity to the city center.

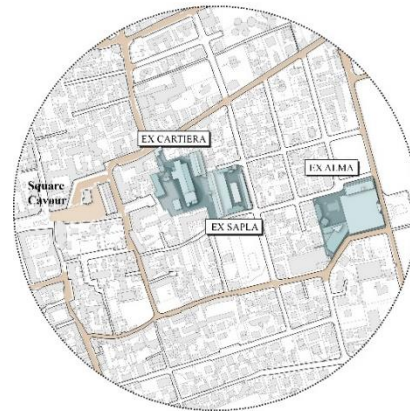


Figure 3. Location of the intervention areas within the local context of Bareggio

The participatory process of the social component (private individuals, public authorities, associations, citizens) made it possible to identify the main criteria and sub-criteria of the multi-criteria model, providing a structure capable of responding to local needs, as described in Figure 4:

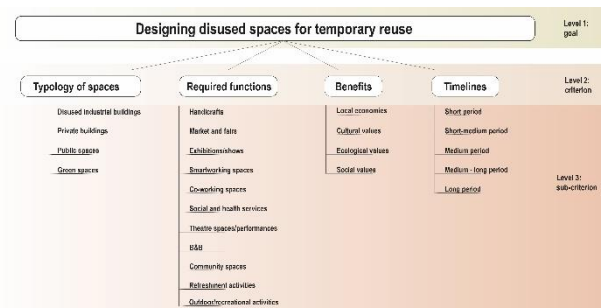


Figure 4. Hierarchical structure of the applied multi-criteria model

Starting from the design of disused spaces, different criteria can be identified in the second level of the structure:

- **Typology of spaces (C₁):** one of the first selection criteria concerns the typology of spaces on which to focus the design intentions. Among the factors that emerged during the participatory tables, urban spaces requiring a greater speed of intervention have been identified, and they compose the sub-criteria of this category: the various abandoned industrial buildings, the interventions on private buildings in bad conditions, the public spaces for new urban centralities, the green areas for a more livable city;

- **Required functions (C₂):** great planning attention will certainly be paid to the functions that users consider necessary for social and cultural development, including: crafts, a new space for the city market (an important value for the economy of the municipality), city/intermunicipal fairs, exhibitions and displays, smart-working and co-working spaces, which are very popular in the light of the latest pandemic events, social-health services, theatre and cultural performances, Bed & Breakfast for temporary events, refreshment and outdoor or recreational/ludic activities;

- **Benefits (C₃):** this evaluation criterion is much less important than the physical implementation of the interventions. The sub-criteria included in this class/criteria of evaluation place the focus on the future developments that the city must have and the directions that the projects must follow. The direction given by this criteria allows one to evidence which are the main objectives that the project has to achieve, ranging from local economic benefits, to the development of cultural values of the society, from values essentially related to ecological development and less environmental impact, to social values, designing spaces able to respond to contemporary social needs;

- **Timing (C₄):** the last class/criteria of evaluation plays a purely informative role for the realization of the project, with indications on the preferences that these environments must assume, giving the possibility to realize multi-purpose and ductile spaces, subdivided not only by the different functions they can cover, but also by the timing that governs them. This category makes it possible to obtain design solutions based on different needs, allowing several solutions for the use of spaces within the same lot, for limited periods of time.

For each evaluation criteria it was necessary to identify within the third level of the hierarchical structure the different sub-criteria, which will be an important reference for the evaluation of the design alternatives for the temporary re-use of spaces:

- **Typology of spaces (C₁):**
 - Disused industrial buildings (S₁)
 - Private buildings (S₂)
 - Public services (S₃)
 - Green services (S₄)
- **Required functions (C₂):**
 - Crafts (S₅);
 - Market and fairs (S₆);
 - Exhibitions/shows (S₇)
 - Smart-working spaces (S₈)
 - Co-working spaces (S₉)
 - Social/health spaces (S₁₀)
 - Theatre/performance spaces (S₁₁)
 - B & Bs (S₁₂)
 - Community spaces (S₁₃)
 - Refreshment activities (S₁₄)
 - Outdoor/recreational activities (S₁₅)
- **Benefits (C₃):**
 - Local economies (S₁₆)
 - Cultural values (S₁₇)
 - Ecological values (S₁₈)
 - Social values (S₁₉)
- **Timing (C₄):**
 - Short term (S₂₀)
 - Short to medium term (S₂₁)
 - Medium term (S₂₂)
 - Medium-long term (S₂₃)
 - Long term (S₂₄)

The use of the model structured according to a multi-criteria logic, thanks to the construction of a general matrix of pairwise comparisons, made it necessary to identify a number of

representatives of the various social institutions in the municipality of Bareggio.

A sample of 31 users (actors) was asked to express their personal opinion on the dominance (membership) of the various 'criteria' and 'sub-criteria' that make up the model, in a pairwise comparison approach, returning these values through Saaty's intensity scale. The collection of the necessary data was organized through a direct interview of the different social partners, within an age ranging from 23 to 60 years, quantitatively assessing the factors affected by to the subjective choices of each user.

It is necessary to specify that, for the construction of the matrix of the pairwise comparisons 'unidirectional', comparison questions were carried out, i.e. asking people to answer with numerical values, ranging from 1 to 9, the evaluation of how much '**criteria a**' is dominant over '**criteria b**', thus obtaining the reciprocal weight ('**criteria b**' over '**criteria a**') and returning, for each line, the weight of dominance of each criteria. The general matrix of criteria TYPOLOGY OF SPACE (C₁), REQUIRED FUNCTIONS (C₂), BENEFITS (C₃), TIMING (C₄) is reconstructed:

O	C ₁	C ₂	C ₃	C ₄
C ₁	1;1;1	1;2;3	4;5;6	4;5;6
C ₂	1/3;1/2;1	1;1;1	4;5;6	3;4;5
C ₃	1/6;1/5;1/4	1/6;1/5;1/4	1;1;1	1;2;3
C ₄	1/6;1/5;1/4	1/5;1/4;1/3	1/3;1/2;1	1;1;1

Table 1. Matrix of pairwise comparisons of criteria against the overall objective

Subsequently, after carrying out the necessary calculation operations set out in the fuzzy model methodology, it was possible to return the normalized values of social opinions on the different evaluation criteria:

Criteria	\tilde{u}_i	\tilde{d}_i	K_i	N_i
C ₁	2; 2,659; 3,224	0,302; 0,495; 0,777	0,525	0,520
C ₂	1,414; 1,778; 2,213	0,214; 0,331;0,334	0,293	0,291
C ₃	0,409; 0,532; 0,658	0,062; 0,099; 0,159	0,107	0,106
C ₄	0,325; 0,398; 0,537	0,049; 0,074; 0,129	0,084	0,083

Table 2. Standardized criteria values

Following the phase of pairwise comparison between the various criteria, as described in the simplified model under consideration, the sub-criteria were subjected to evaluation. For each of them, the actors were asked to make a quantitative assessment according to a scale of values from 1 to 9, where each assigned attribute corresponds to an increasing dominance.

This phase allows one to observe, more specifically, what and which alternative for the actors involved is more timely and incisive within the re-use project.

Through the application of the simplified model it was possible to obtain the following table.

SUB-CRITERIA	\tilde{x}_i
S_1	5,613
S_2	3,581
S_3	5,419
S_4	4,806
S_5	5,613
S_6	3,806
S_7	4,871
S_8	4,774
S_9	3,581
S_{10}	4,452
S_{11}	5,613
S_{12}	3,258
S_{13}	4,645
S_{14}	4,000
S_{15}	5,226
S_{16}	4,161
S_{17}	5,290
S_{18}	4,613
S_{19}	3,839
S_{20}	3,065
S_{21}	4,097
S_{22}	4,710
S_{23}	4,516
S_{24}	5,742

Table 3. Average values of sub-criteria

The results thus obtained, indicated by different shades of colour, indicate the dominance of each sub-criteria assessed in relation to the whole. This operation makes it possible to observe, more specifically, the choices made by the actors involved, which make it possible to modulate the various project alternatives. The results with the greatest qualitative and quantitative 'weight' are represented by the following values of the sub-criteria:

Disused industrial buildings (S_1), for the criteria **TYPOLOGY OF SPACE** (C_1); *Crafts* (S_5) and *Theatre/performance spaces* (S_{11}), for the criteria **REQUIRED FUNCTIONS** (C_2); *Cultural values* (S_{17}), for the criteria **BENEFITS** (C_3); *Long-term* (S_{24}), for the criteria **TIMING** (C_4).

5. PROJECT HYPOTHESES

The dominant criteria for the city of Bareggio resulting from the multi-criteria analysis is the 'Typology of spaces'; the next step is the evaluation and choice of the re-use site on the basis of economic considerations. The three areas, the Ex Cartiera, the Ex Sapla and the Ex Alma, have been specifically studied in order to be able to hypothesize alternative project scenarios, evaluating as well all the positive and negative factors of each area. For each

area, the aspects that were introduced and at the same time assessed were:

- Economic feasibility: the feasibility of the economic impact on each individual project area becomes fundamental if such an intervention is to be envisaged.
- Legislative conditions: for an overall assessment of the general characteristics of the intervention it is fundamental to observe, for each area, the feasibility of the project actions according to the legislative provisions made available by the competent bodies.
- Contextual variables: in order to allow for a complete and diversified reading of the areas, some specifications are inserted for each area, trying to assign a 'weight' according to the different impacts that these could have on the other evaluation characteristics.

According to what has been described, the following project alternatives can be constructed:

5.1 Temporary re-use area 01– Ex Cartiera

Ex Cartiera is a structure originally designed to accommodate a paper production spinning mill since the 1940s. The area has a considerable surface area, both internally and externally, capable of accommodating a large number of functions. The ground floor can accommodate both theatrical functions and performance spaces (cinema, presentations / conventions / public lectures...) as well as large areas for the municipal market or weekly fairs. The remaining areas are large enough to meet the demands of craft functions, exhibition spaces and common areas for meetings/associations, as well as providing rooms for sanitary facilities. The space outside the building can function both as a free space for use/play and as a supporting surface for internal activities (Fig. 5). Considering the first floor, the areas affected by the intervention can accommodate both smart-working and co-working functions, as well as provide additional community spaces. On the second floor, the existing area has the potential to accommodate social and health functions requiring more space, as well as additional space for health services. On the third and fourth floors, located along the south side, the organization of spaces to accommodate smart-working or co-working activities seems to be the most suitable. Moreover, access will be provided by a lift to facilitate the accessibility of the spaces.

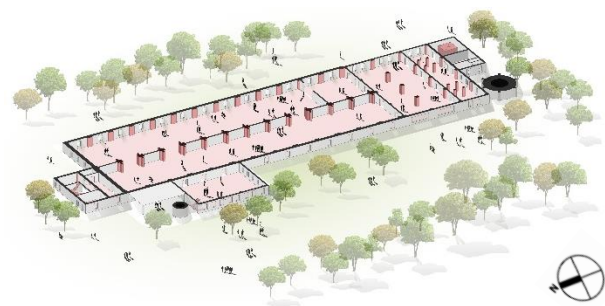


Figure 5. Design hypothesis ground floor – Ex Cartiera area

5.2 Temporary re-use area 02 – Ex Sapla

Another disused production site, ex Sapla, is an area of the Ex Sapla is arranged along a single floor above ground, with the main areas along the east and west sides of the intervention area. According to the different areas made available, the insertion of various functions is foreseen (Fig. 6):

- East side: within the volumes it is planned to insert spaces aimed at crafts, as well as functions for the market / fairs, including spaces for the display of craft products and sanitary facilities;
- West side: for these spaces it is planned to include community functions, smart-working compartments and an exhibition space for cultural events;
- North building: within the isolated volume, it is possible to plan a small space for crafts, or other uses according to the needs of the citizens.
- The central section of the temporary reuse area includes de-waterproofing of the land, in order to gain more green and multifunctional spaces.



Figure 6. Project hypothesis - Ex Sapla area

5.3 Temporary re-use area 03 – Ex Alma

The industrial disused ex-Alma is internal to the consolidated urban fabric and to the border with the agricultural land. Being a private property, currently it is object at the center of local administrative discussions, for some time now, towards a transformation centered on the building density of the lot. The Ex Salma area is mostly developed along a single above-ground floor (Figure 7). According to the project hypothesis, the larger areas will host theatrical and performance functions, exhibition/show spaces, refreshment areas previously organised to host the private cafeteria, rooms for social and health services, spaces for craft activities and an area for the market and trade fairs. Inside the volumes located to the north of the area, spaces for smart-working are planned. On the other hand, spaces for the local community will be organized, in the premises outside the main facility. On the first elevated floor it is planned to insert functions such as smart-working and co-working, given the predisposition of the spaces to accommodate administrative functions.

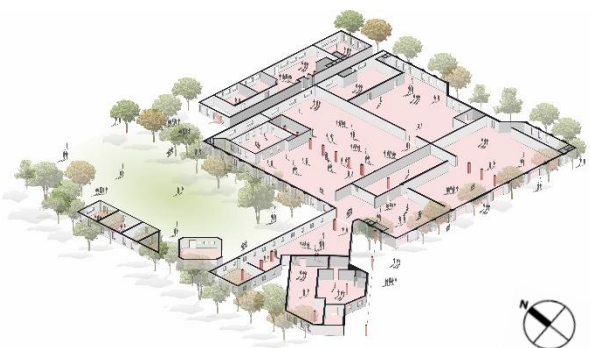


Figure 7. Design hypothesis ground floor - Ex Alma area

6. ANALYSIS OF RESULTS

In summary, comparisons between the areas highlighted by the temporary reuse process are reported:

6.1 Applications of the multi-criteria model

- Ex Cartiera: the extent and variety of the surfaces guarantees an excellent degree of adaptability. The functions involved and the difference in volumes give the possibility for activities to fit easily between the spaces.
- Ex Sapla: although the surfaces are limited, the spaces and functions introduced are in accordance with those predicted by the multi-criteria model. Ductility remains medium-high, with different spaces available.
- Ex Alma: the large surfaces and the different variety of the internal spaces allow for a wide ductility of the spaces, being able to implement different functions according to the common needs. The external space, although limited, can be used for different outdoor functions, giving greater flexibility to the area.

6.2 Economic feasibility

- Ex Cartiera: the interventions required for the reuse of the spaces show a high economic impact within the general estimate. In addition, the condition of the existing structures may further burden our estimates.
- Ex Sapla: the estimate composed for the area shows a lower impact than the other analyzed areas, providing the necessary spaces to activate the interventions requested by the citizens. The foreseen works and their related cost could have a general decrease if the internal and structural conditions are favorable to reuse, leading to a reduction of the general economic estimate.
- Ex Alma: given the huge surfaces available in the area, the activation of the general re-use process would imply a high cost. Through a more in-depth study one could think of a decrease in the estimate of the intervention costs, given the current state of the spaces. However, given the size of the spaces, it is considered more difficult to activate a restructuring and partial reuse of the surfaces. By looking specifically at the economic impact incurred within the different case studies it is possible to reconstruct an economic estimate for each area:

Area of intervention	Total surfaces (mq)	Estimation of interventions (€/mq)
EX CARTIERA	16.814	2.944.780,50
EX SAPLA	4.225	901.078,84
EX ALMA	11.428	4.250.380,44

Table 4. General estimate of the economic impact on each area of intervention

The costs, stable on the basis of the general prices for the realization of the works, allow one to point out some important aspects. Considering the Ex Sapla area, it is the most suitable solution for a project of temporary reuse of spaces compared to the Ex Cartiera and Ex Alma areas, as the area involved in the interventions is substantially smaller than the others. Although the area of the Ex Sapla is much smaller in size, it presents a more complete involvement of human resources, the maximum exploitation of environmental resources in relation to a greater recovery of land, returned to green space and, finally, an optimal and greater re-adaptation of the existing volumes.

6.3 Context variables

In relation to the context variables, the following considerations can be made:

- Ex Cartiera: the decommissioning of the area and its non-use since the early 90s implies a necessary structural analysis of the building, verifying the safety conditions of the plant. Although this condition would burden the total economic estimate, it could rehabilitate a space with a strong historical-landscape importance.
- Ex Sapla: the changes that the economic estimate could produce as a result of a structural survey could add to the finances for the general rehabilitation of the area.
- Ex Alma: the buildings have been used until recent years, suggesting a better structural condition than the Ex Cartiera area. This condition, however, needs to be ascertained by a thorough structural analysis of the buildings. Moreover, the difficult implementation of a project by parts does not benefit the overall cost of the works. However, given the size of the spaces, it is considered more difficult to implement a restructuring and partial reuse of the surfaces.

In conclusion, on the basis of what emerges from the project alternatives, constructed on the basis of the multi-criteria model applied to the different contexts and the economic estimate of the interventions, it is possible to state that the area with the greatest feasibility of interventions is the **EX SAPLA** area.

7. CONCLUSIONS

The concepts and experiences described have shown an urban system in constant search of alternative solutions to the ever-increasing demands for renewal in city re-use practices. The modern necessity centered on the development of community participation in the planning field shows a new approach capable of inverting the static and traditional logics of the territorial government structure, promoting, moreover, the community as the actual protagonist of the territorial project.

The illustrated approach, based on a multi-criteria analysis of the choices of temporary re-use of urban spaces and of the different alternatives evaluated by the community of inhabitants/users, on the basis of fixed parameters defined as 'criteria' and 'sub-criteria', can be an opportunity for the managers of the governance of a given territory.

From the various theoretical experiences reported, it clearly emerges how the application of these new development approaches gives the governance of a territory the possibility to take into account the socio-cultural, economic and environmental values of a community and its citizens. The ability to translate citizens' needs becomes essential for the construction of a multi-criteria model that can best adapt to the demands of the various actors.

The application of the multi-criteria model, in order to find an optimal solution for the temporary re-use of spaces, was carried out in the municipality of Bareggio, in the province of Milan, and specifically on three disused industrial areas: the Ex Cartiera area, the Ex Sapla area and the Ex Alma area.

Among these, the results of a multi-criteria analysis centered on the optimal choice of the type of spaces to be reused and the functions to be performed, in relation to the costs and timing of implementation, showed that the former Sapla area was the most suitable for urban reuse. In fact, compared to the results of the simulation of the other two areas, in compliance with the regulations and constraints of urban re-use, the Ex Sapla area presents a more complete involvement of human resources, the maximum exploitation of environmental resources in relation to

the greater recovery of land and, finally, an optimal and greater re-adaptation of the existing volumes.

Finally, the need to re-think both the functions and the evolution of an area, respecting its vocations and the needs of the community, must necessarily be placed at the center of the 'best practices' of an urban study, favoring, in this way, the socio-economic, cultural and tourist development of the territory and its inhabitants.

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