Multi Criteria analyses, Life Cycle approaches and Delphi Method: a methodological proposal to assess design scenarios

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Abstract

The different aspects of sustainability emerge in the choices between projects in the property sector, in the form of impacts – economic, energy, environmental, social, aesthetic – often associated with uncertainty and conflict. Uncertainty is often linked to the measurement of impacts, developed also often the application of specific techniques. Conflict, on the other hand, is linked to difficulties in gaining the consensus of opinions or shared solutions. This is evident in the case of energy retrofitting of existing buildings or new construction operations for energy efficient buildings: in this case, the principles of sustainability have to be compared with global performance requirements, which are implemented in technological-economic scenarios (Directive 2010/31/EU; Directive 2018/844/EU).

The Multicriteria approaches, consolidated in the case of decisions in complex and conflictual contexts, and therefore capable of dealing with the many dimensions of sustainability, reveal points of fragility that can be offset by the integration of other approaches.

On this basis, the aim of the work is to present a methodological proposal based on the integrated use of Multicriteria Analysis, participatory approaches (Delphi Method) and Life Cycle approaches (Life Cycle Costing - LCC, ISO 15686-5:2008 and Life Cycle Assessment - LCA, ISO 14040:2006). In particular, it proposes an operating mode centred on the Analytic Hierarchy Process - AHP method, with the addition of: on one hand, the LCC and LCA approaches (which can also be combined), to support the identification/selection of criteria and the quantification of parameters of energy-economic-environmental sustainability using measurable indicators; and on the other, the Delphi Method, to support the identification of the preferred scenario(s) on which there can be convergence and correspondence in terms of broad social consensus, based on opinions expressed by panels of experts.

Designed for residential properties, widely used in our country, large interventions on public assets or large infrastructure works involving different parties and having different purposes are not excluded from the reasoning. Indeed the recent legislation on Public Works pays special attention to them (in Articles 95 and 96 of Legislative Decree 50/2016 and subsequent updates in DL "Simplifications" 135/2018 and Budget Law 145/2018).

1. INTRODUCTION

Multicriteria methods can be combined with existing tools for the assessment of economic, environmental, energy and social sustainability, as well as the aesthetic and performance quality of projects. In fact, the potentialities of Multicriteria Decision Analysis emerge during complex problems structuring phases, by supporting preliminary and briefing stages in decision processes. Furthermore, emerge in the following phases in which alternative project options are compared, involving multiple aspects and subjects, by facilitating the potential conflicts individuation and by facilitating the convergence towards shared solutions.

Assuming the different dimensions of sustainability, using appropriate techniques it is possible to define the representative criteria, selected by number and type on the basis of the interventions under analysis. These, in turn, are represented by a wide range of cases, within which particular attention should be paid to the energy/retrofitting of existing buildings, or new construction of high-performance energy buildings.

In line with international guidelines on energy policies and with the regulatory framework for their implementation (Directive 2010/31/EU; Directive 2018/844/EU), this category of actions is particularly representative of all actions taken in the property sector. Investments for residential stock retrofitting in Italy, in fact, at present represent 37% of investment value in the construction sector. Comparing for example with year 2017, it is possible to estimate, for this segment, a growth of 0.5% in real terms, considering (Legge di Bilancio 2019) the strengthening of 50% of the deductions for building renovation and of 65% of the deductions for building energy retrofit interventions. Furthermore, retrofit intervention of existing buildings or high-energy performance new buildings construction can also be used to think about how to reconcile energy-environmental goals with financial goals. Furthermore, according to an operative viewpoint, to reason about how to integrate technological elements with manufacts sometimes interested by technical or regulatory constraints.

The legislation - not only with reference to private projects, but also in the field of Public Works and public-private partnership projects - provides methodological guidelines, which are attracting lively interest in research. Particular importance is assigned to research and experimentation in the Multicriteria field when entering the framework of Public Works, by virtue of recent legislation (Legislative Decree 50/2016; DL " Simplifications " 135/2018; Budget Law 145/2018) and major infrastructure projects involving parties with goals that are often hard to reconcile (Ponti et al., 2011; Novara, 2015; Fiorini, 2016).

In many cases, this translates into the assessment of economic-technological scenarios in order to obtain preferred rankings and, consequently, to support decision-making processes on the basis of economic-energy aspects, as well as the multiplicity of possible impacts on society and the environment.

The weak nodes of the Multicriteria approaches have already been studied by the authors and merged into a theoretical contribution (Coscia and Fregonara, 2007) and another applicative article published in this Journal (Brigato et al., 2010). The writings proposed the joint use of the Analytic Hierachy Process (AHP) and of the Delphi Method, starting from the limits of AHP and focusing on the contribution of Delphi.

Assuming the theoretical premises and the results of previous works, this paper proposes a methodological advancement based again on the contribution of the Delphi Method associated, this time, with the Life Cycle approaches (in particular Life Cycle Costing -LCC and Life Cycle Assessment - LCA, also jointly), in support of Multicriteria analyses.

Among the numerous Multicriteria approaches used to date (Bottero et al., 2008), the Analytic Hierarchy Process - AHP method is assumed once again (Saaty, 1987). The AHP approach is particularly flexible and suitable for the assessment of projects for the energy adaptation/retrofitting of existing buildings, or for projects for the new construction of energy-efficient buildings. The method – as the generality of Multicriteria methods - allows the aggregation and comparison of parameters with different units of measurement, envisaging their weighing, even when the criteria are the result of the application of other techniques and even when these results are not convergent. With regard to the first point we propose the inclusion of energy, economic, environmental parameters calculated by applying Life Cycle models.

The paper - which represents the first phase of a research that will be followed by a practical application - is divided into the following points: section 1 presents a methodological proposal that aims to represent an operational advancement: in section 2, a reasoning is presented with respect to the node of identification/selection of assessment criteria and measurement of the relative measurable indicators, using Life Cycle approaches; in section 3, a reasoning is presented with respect to the node of the assignment of weights to the criteria and the gaining of consensus through participatory models (Delphi Method); section 4 concludes the work.

2. METHODOLOGICAL PROPOSAL

Taking the results of previous studies, referred to above, we illustrate a methodological proposal for progress. The introduction recognises assessment as a process applied simultaneously to a set of alternatives, cyclic and strictly dependent on the problems dealt with, time, the organisational context and the knowledge available, which can be retroactive. Moreover, it is assumed that the decision-making problem may concern the choice between a finite number of alternative projects.

The heart of the methodology is Multicriteria Analysis,

solved by the Analytic Hierarchy Process - AHP technique, developed by. Saaty (Saaty, 1987). For the reasons expressed before, AHP is an approach suitable for dealing with complex, non-linear problems, for "managing complexity", as it is capable of organising the variables of the problem into a hierarchy. In particular, the technique allows the production of both qualitative and quantitative evaluations, starting from the construction of a hierarchy from which it is possible to infer orders of preference, through the comparison in pairs of criteria (or parameters), with respect to a specific goal. Furthermore, the AHP approach is here proposed and selected among the quantity of Multicriteria techniques available, mainly for continuity with previous researches (Coscia and Fregonara, 2007).

The process is organised according to the following logical steps:

- identification of the problem(s), needs of the goal;
- identification of the options;
- identification of the criteria (or parameters, o attributes), calculation of the relative indicators measurable and assignment of weights;
- analysis of options;
- scoring and ranking of options;
- interpretation of results and decision.

Referring to fundamental literature for theoretical and formal aspects and for examples ((Figueira et al., 2005; Saaty, 1980; Saaty, 1986; Saaty, 2000; Saaty e Vargas, 2006), it should be remembered that the method unfolds through three successive operational phases based on three fundamental principles:

- breakdown of problem data into their basic components (based on the breakdown principle). The step consists in identifying a series of criteria, possible subcriteria and alternatives, organised into a hierarchy;
- comparison in pairs, to obtain, at each level of breakdown, a scale of priorities among the alternatives (based on the principle of comparative judgments). This phase consists in identifying the priorities of the elements of each element of the hierarchy; the elements of each level are compared in pairs with each element of the upper level considered as a criterion for comparison. The comparison is made using the principle of comparative judgments, according to which each binary relationship is assigned a positive real number (based on Saaty's "fundamental scale") which corresponds to a judgment of value;
- calculation of the order of priority (based on the principle of summary of priorities). Scales of priorities or weights are produced (by calculating the main carrier of each matrix of comparison in previously produced pairs), until the final order is obtained (ranking of preference of the options).

As highlighted in previous studies, the AHP method reveals some weaknesses. These include: in the phase of identification of decision-makers, the MCA model does not provide explicit formal indications, leaving the verification of the actual presence of the parties involved in the multidisciplinary comparison to the decision-makers and the preliminary phase of the decision-making process (Bottero, 2014; Bentivegna, 2016); the definition of the problem and the definition of the goal (or the system of goals) is sometimes poorly participated in by the parties involved. The same can be said for the subsequent phase of identification of the set of project alternatives and for the definition of the set of criteria; the crucial phase of assigning weights to the criteria, which allows the formation of the hierarchy of the relative priorities, envisages weak consideration of the scales of values of the community, delegating the synthesis of the priorities among the options to the technical stage; the analysis of the alternatives, which must lead to the identification and elimination of any dominated alternatives by comparing different units of measurement is delegated to the technical stage of normalisation of the elements; on a more general basis, the assignment of the scores is based on the principle of comparative judgements with low participation by the subjects and in the absence of scales of values assigned by the community. Lastly, the final phase of arranging alternatives is carried out more in terms of reaching a technical compromise than in terms of "social compromise", as would be desirable.

Taking into account the weaknesses of the AHP test method, the proposed advancement concerns two aspects:

- the use of life cycle approaches to support the identification/selection phases of the project options to be assessed on the basis of a preliminary economic and environmental assessment phase. The results of the latter can also be fed into the set of criteria supporting the measurement of economic and environmental impacts, also in joint form and considering the entire life cycle "from cradle to grave";
- the use of the Delphi Method, which is ideal for the foreshadowing of alternative scenarios and for the delicate phase of assessing their degree of preference, to support individual assessments (opinions) and consensus-building using groups of experts which expertise on specific issues is unanimously recognized as authoritative, even if built and consolidated on different backgrounds (expert advisors, researchers, decision makers, etc.).

The diagram presented in Figure 1 summarises the workflow of the analysis. Taking into particular account the contribution of participatory models, the logical steps of the AHP are preceded by a phase dedicated to identifying the decision-makers.

The first step in the workflow is dedicated to identifying the purpose of the analysis. In the case in question - energy efficiency measures for existing buildings/new construction of energy-efficient buildings - the aim is to obtain the ranking of preference among design alterna-

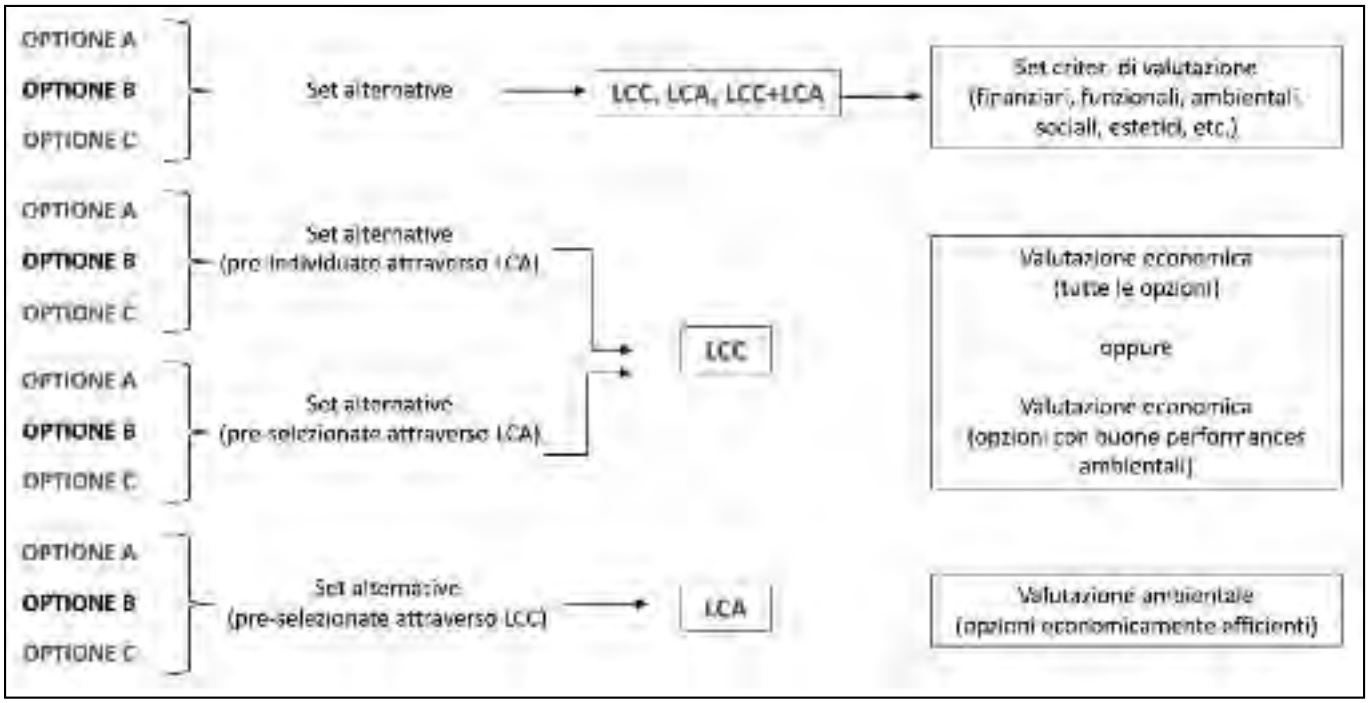

Figure 1 - *Methodological proposal: workflow with focus on Life Cycle and Delphi Method.*

tives. The idea is to compare alternatives that differ in terms of the technologies used (or technological scenarios), capable of guaranteeing energy performance levels that are compatible with the requirements of the regulations but differentiated in terms of the costs required for the entire life cycle and in terms of the relative environmental impacts. The second step is intended for the identification/selection of alternatives with the analytical support illustrated below (section 2) and, at the same time, on the basis of a set of criteria identified in step 3. The assignment of weights to criteria, the heart of step 3, is supported by the Delphi Method in the manner described in section 3. Step 4 envisages the development of the Multicriteria analysis, the results of which are obtained again with the help of Delphi in the phases of assessment of the results and final decision.

3. CONTRIBUTION OF LIFE CYCLE APPROACHES

The use of life cycle approaches combined with Multicriteria Analysis is not new, but still little explored (Falcone et al., 2016). Recent research reveals the potential that can arise, especially in cases of comparison of retrofit projects of buildings that involve multiple aspects in decision-making processes, particularly management, energy, economic and social issues (Mondini, 2016; Re Cecconi et al., 2017; Fattinnanzi, 2018).

The LCC (Langdon 2007; DOE 2014) and LCA (Basbagill 2013) approaches are usually applied when choosing the technological/performance configuration of buildings to assess their economic and environmental sustainability. There is a vast amount of literature proposing applications of Life Cycle approaches both for new construction projects and for the efficiency of existing buildings, in this second case addressing the specific problems of retrofitting (Ma et al., 2012).

Studies reveal that the uncertainty of the input data used in the analyses is able to condition their results, so much so as to require the contribution of risk analyses in deterministic (Sensitivity Analysis) or probabilistic (Probability Analysis) (Boussabaine and Kirkham, 2004) form.

Starting from international documents - European Standards and Directives - a line of study has recently been developed aimed at exploring the joint use of the two techniques, starting from the assumption that, as already mentioned, the results of the applications may not be convergent. Extracting some useful points from literature, here we highlight some possible synergies between the two approaches (Langdon, 2007). Figure 2 shows a summary of the ways in which LCC and LCA, applied individually or jointly, can:

- establish criteria for assessing the environmental and economic performance of projects, in particular when environmental impacts may be hard to assess in monetary terms, by merging financial, functional, social, aesthetic, etc. criteria into the set of assessment criteria;
- support the initial identification and/or selection of options to be submitted to the next steps of the assessment process. The set of alternatives can be previous-

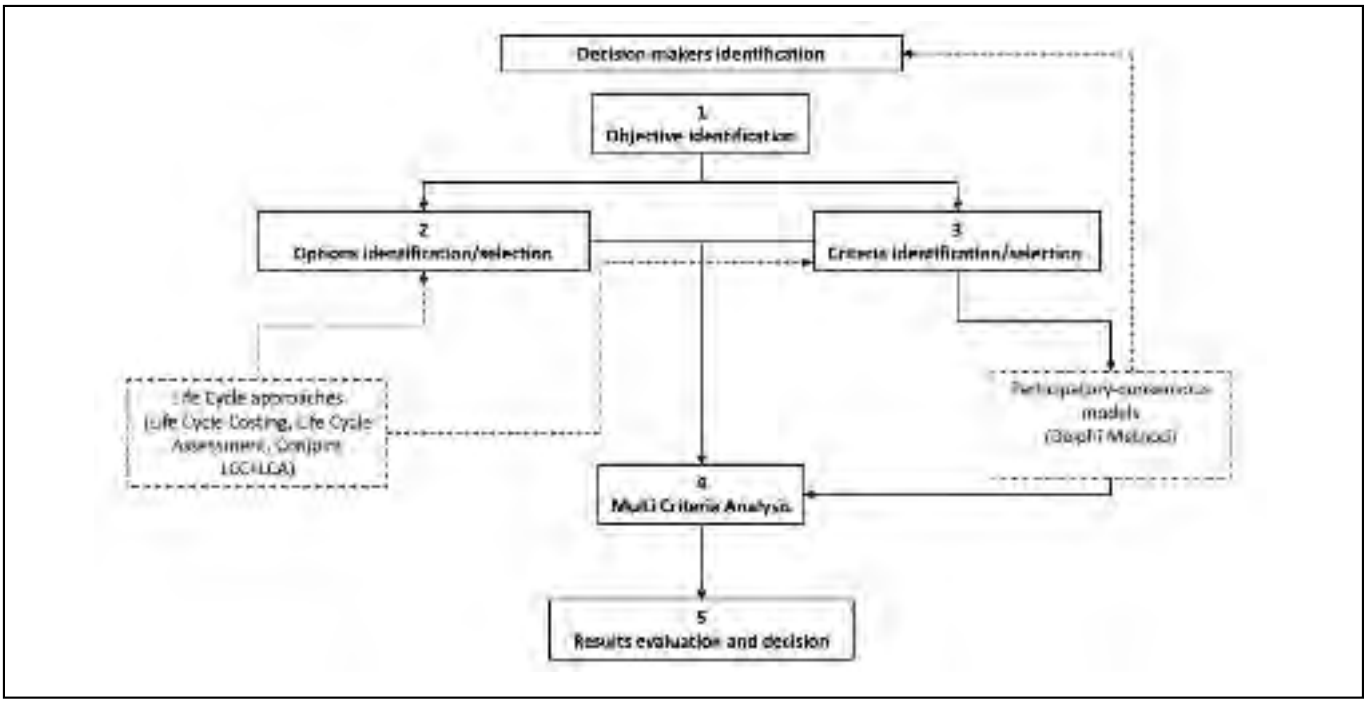

Figure 2 - *Life Cycle approaches: synergies and modalities for supporting options identification/selection/valuation.*

ly identified/selected by applying the LCA analysis, subjecting all the options identified for the analysis to an economic assessment by LCC, or only those options that achieve a good level of environmental performance (in this case, the LCA analysis can only be applied in the presence of environmental impacts measurable in monetary terms); conversely, the set of alternatives pre-sorted by an LCC application, as cost-effective options, can be subject to an environmental assessment by LCA analysis.

With respect to case a), we consider the results calculated using the LCC, LCA, LCC+LCA models as measurable indicators of "Economic sustainability", "Environmental sustainability" and "Economic-environmental sustainability" respectively. More specifically, these criteria can be supported:

- through the application of LCC by economic performance indicators, such as Net Present Value (NPV, or NPC when only costs are considered), Net Savings (NS), Savings to Investment Ratio (SIR), Simple or Discounted Pay-back Period (SPB, DPB), Adjusted Internal Rate of Return (AIRR);
- through the application of LCA by environmental performance indicators such as (more frequently) Embodied Energy (EE), Embodied Carbon (EC);
- through the joint application of the LCC + LCA approaches by an economic-environmental "index composed of sustainability".

With respect to the last criterion, "Economic-environmental sustainability", the results of previous studies in which a methodology aimed at harmonising economic and environmental analysis through the calculation of quantitative indicators are implemented (Fregonara et al. 2017). The methodology, applied to calculate the performance of alternative design solutions, was based on a three-stage approach:

1. calculation of environmental indicators using LCA and according to Life Cycle Thinking principles, in terms of Embodied Energy, Embodied Carbon, level of disassembly of building systems, quantity of recycled material and waste production;
2. calculation of economic indicators using LCC, in terms of Global Cost (EN 15459:2007);
3. calculation of a synthetic, monetary, economic-environmental indicator that can be implemented in the presence of different sets of alternatives and at different levels (materials, components, technologies, systems), considering that the levels usually considered are the entire building, the building systems and the building materials.

4. CONTRIBUTION OF THE DELPHI METHOD

The topic of scenario forecasting and analysis covers a significant range of quantitative, qualitative and quali-quantitative techniques (Murry Jr & Hammons, 1995; Stagi, 2000). The use of techniques based on experts in literature has been an "alternative" response in contexts characterised by limited time and resources or by particular uncertainty. The "informed judgement" in sup-

port of the choice is an outcome aimed at reaching an agreement, which may reflect a broad social consensus. The choice is made thanks to a process of convergence of judgments with rounds of interviews. It is well known that scenario analyses - the methodological bedrock of the Delphi Method - were introduced by Dalkey and Helmer (Dalkey and Helmer 1963; Dalkey, 1969) and their co-workers at the RAND Corporation in the 1950s on national defence issues and military analysis and forecasting. Recently, technology has also been involved in technological and social science studies (Landeta, 2005). From the outset, the method has required the collection of statistical data and qualitative information in order to analyse and predict complex phenomena and to refine quantitative analyses with qualitative assessments (Gasparini, 2017), sometimes replacing traditional statistical surveys.

Operationally, the technique makes use of general assumptions, which instruct certain steps in the decision-making process of the technique (Brigato et al. 2010; Tintori, 2012). In literature, the fundamental passages, highlighted in one of the most well-known texts on the Method (Linstone and Turoff, 1975), presuppose: identification of a panel of experts (expertise and number in relation to the field of application), called upon to represent, on behalf of the community, situations that they know better than anyone else, thanks to the social or professional role that they play or have played (Sackman, 1974; Fabbris and Martini, 2008); collection of information through online questionnaires or interviews (in relation to the problem and the field of application), administered by surveyors, guaranteeing the independence of opinions and the anonymity of the members of the panel, who must express expert opinions and weights; data analysis and reporting phase of the statistical processes in a feedback document checked by the researcher/interviewer between one survey and another; conclusive statistical analysis of the responses obtained by the group of experts, paying attention to the levels of convergence of judgments and rankings of merit. Figure 3 shows the Delphi process, highlighting the most significant and common steps of all the experiences conducted from the 1950s to the present (Gupta, Clarke, 1996; Okoli and Pawlowski, 2004).

Interesting developments of the Method have recently been generated, also thanks to some critical readings (Goldschmidt, 1975), particularly through hybridisations with other approaches: e.g. with Multicriteria analyses (Bottero et al., 2008), with SWOT Analysis (Tintori, 2012), and others. With respect to integration with Multicriteria techniques - subject to attention in this paper - some of the great potential of the Delphi process emerge. With reference to the workflow in Figure 1, in relation also to the Delphi process in Fig. 3, research addresses can be found in particular with respect to the phases:

- of identification of decision-makers, which in the Delphi process takes place at the moment of preliminary investigation after data collection and before the construction of the Delphi dossier (Investigation Phase, step 2, Fig. 3);
- of identification/selection of the judgement criteria and, in particular, attribution of the relative orders of weights, which in the Delphi Method takes place in the preliminary phase of preparation of the Dossier (Investigation Phase, step 2, Fig. 3);
- interpretation of the results of the Multicriteria application and final decision, involving the final data processing stages of the Delphi process (Phase 2 questionnaire, step 2, Fig. 3).

In particular, the first point of potential indicated above, in the preliminary phase of the Delphi Method, is presented as a further element of the process of building scenarios and identifying the goals to be pursued. These

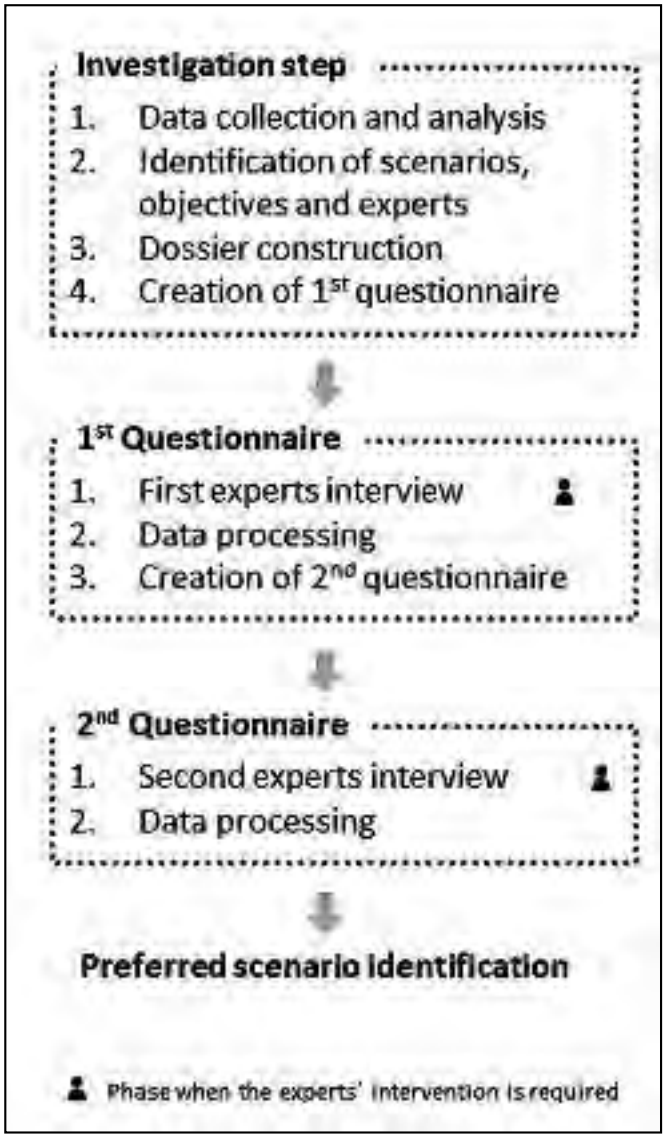

Figure 3 - *The Delphi procedure: the significant steps (Source: Coscia et al., 2019)*

two "technical" moments form the basis for the interviews, repeated until the expected values of convergence of opinions and consensus on the ranking of the scenarios are reached. The selection of experts is indicated as one of the most debated moments of the entire Delphi process and one on which the scientific community has often questioned itself. This contribution to the AHP method also transfers the rich background, which Delphi has faced and partly solved. The central issues investigated were: 1) the ideal number of panellists; 2) how to weigh their judgement, based on each member's particular expertise. The panel members are selected by emphasising the expertise of the individual members, who are not seen as stakeholders, but as pure experts on strategic issues that the scenarios should pursue.

The second point involves the process of designing the questionnaire, which in the Delphi process is closely linked to the brainstorming of building the Delphi dossier, which contains alternative scenarios on which to make the choice and seek consensus. The Method deals with the investigating phase of identification of intervention concepts by the assessor/analyst/interviewer. It is in this methodological step that the assessor (then interviewer) defines the three meta-design scenarios. The experts - selected on the basis of their authority in relation to the strategic objectives to be pursued - express their "informed" judgement both with an assessment scale proposed by the interviewees on the scenarios by goals, and with a qualitative scale of judgements on the degree of "reliability" of their own judgement and that of the members of the panel.

The third question highlights the participatory and "competent consensus" nature of the Delphi process, in which the structuring of the interaction between experts in anonymous form validates the final orders and provides outputs that take into account both the judgment of experts and the process of "approaching opinions" (Jeste et al., 2010; Rodríguez-Mañas et al., 2012). Moreover, recent studies (Hsu and Sanford, 2007; Yousuf, 2007; Coscia et al., 2019) indicate that the statistical processing phase at the end of the rounds of interviews is the result of judgments by subjects who have not been subjected to any pressure, real or perceived, to align their responses with those of another participant and have not been influenced by social norms, habits or by the "dominant" position within an organisation. With Delphi, the assessor processes the results from the interviews and provides greater strength to the validation of the final AHP orders.

It is interesting to note that a lively literature is developing in relation to these crucial steps of the process. For example, while the method typically seeks to elicit consensus on the subject under study, recent Delphi experiments analyse dissent or aim (Policy Delphi) to seek a wide range of opinions without gaining consensus (Rieger, 1986; Plaisant, 2009; Castellani and Valente, 2012). Moreover, studies have been conducted on the subject of the level of convergence of judgments and consensus (Fink e al., 1984; Diamond et al., 2014; Amendola, 2016; Latif et al., 2016) which investigate the definition of what constitutes consensus. Different approaches are used to define consensus, through formal measures of agreement, considering the degree of uncertainty around a precise estimate, in relation to group responses or in proportion to the number of participants who have agreed on a particular point of view. There is also an interesting debate (Skulmoski et al., 2007, Castellani e Valente, 2012) on the role of the interviewer/assessor and their choices in the construction of the panel of experts.

Taking the more consolidated and experimented Delphi approach, in order to make the contribution of this tool clearer compared to the workflow in Figure 3, Table 1 is presented. This section highlights the steps of the methodological proposal in which the Delphi process can offer strengthening elements (with a brief reference to the underlying operational aspects).

Further topics may generate future research developments. Among these, it is worth mentioning the further development of predictive approaches that combine the "qualitative" potential of scenario analysis with the "quantitative" potential of operational research. (Again, the development of the application of the method with respect to the development of design proposals: Delphi effectively supports the preliminary scale of operations, while other techniques come into play in the process of choice on the more detailed design scales (final and executive).

5. CONCLUSIONS

In the paper, the result of a first phase of research has been illustrated, followed by a practical application on a real case on the basis of the defined operating modes. The joint use of the Multicriteria methods with the Delphi Method, as outlined also in recent debates, is not new, but has been re-proposed here because it offers interesting openings, Which can be summarized in:

1. preliminary phase, thanks to the expert contribution of Delphi method in the validation and weighting of criteria in AHP and relative sorting, after the analysis of panel selection and composition;
2. in selecting indicators to be evaluated and measured according to LCC+LCA approach;
3. in the important moment of vaidation and results interpretation, these last obtained also for minimizing conflict areas and uncertainty elements.

As said, the joint use of Multicriteria and Delphi Method has already been object of study; on the contrary, the conjoint use of LCC and LCA approaches for the measurement, in quantitative terms, of sustainability criteria, is still poorly treated in literature. Considering the results of previous researches on the use of Problem Structuring Methods (Fregonara, 2009; Fregonara et. al, 2013; Norese et al., 2015, Fregonara et al., 2016) in this contribution the synergy between life cycle approaches and Multicriteria

Table 1 - *Contribution of the Delphi Method to the methodological proposal*

Methodology step	Delphi contribution	Strengthening elements
Identification of decision-makers	The Delphi method is based on the testimonies of experts called upon to represent, on behalf of the community, situations they know better than anyone else, thanks to the social or professional role they play or have played. They are leaders in their fields of expertise	Structuring of expertise in the selection phase Minimisation of the component of arbitrariness in judgments and weights
Identification/selection of the criteria for judgement and assignment of the related systems of weights	Surveys are carried out by processing applications until a certain degree of convergence, or consensus, is reached among experts on the estimates The repeated collection of information is carried out by means of questionnaires to be filled in or interviews administered by surveyors, guaranteeing the independence of opinions and the anonymity of experts	Criteria of judgement that take into account the degree of expertise of the interviewees (own and other experts) Minimisation of uncertainty Transparency in the allocation of judgments and orders Reduction in the cross influence of judgments" Incremental knowledge of judgment criteria
Interpretation of results and final decision	The results explain the levels of divergence on scenarios and goals and the steps of research and improvement of convergence Statistical analysis can ensure that the opinions generated by each expert are well represented in the final iteration because, "(…) at the end of the exercise there may still be a significant spread in individual opinions" (Dalkey, 1972, p. 21) Statistical analysis tools allow an objective and impartial analysis and a summary of the data collected	Moment of conjunction between quantitative and qualitative predictive approaches Conflict analysis and comparison of technical, economic, social, environmental and political value judgments Conflicts/divergences resolved through the identification of acceptable compromises

methods has been proposed, specifically through the AHP method.

Particularly, we have offered a reading that recalls and adopts the principles of Life Cycle Thinking, with the aim of experimenting with new synergies between Multicriteria methods and life cycle approaches. Some operational analyses have been proposed, specifically for the calculation of simple or compound measurable indicators, in relation to economic-environmental criteria. At the same time, the potential contributions of prefiguring scenarios and processes methods in order to reach shared opinions on complex problems and to strengthen some fragile steps of multi-criteria processes were focused on.

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The work was discussed by the Authors in each part. Nevertheless, Elena Fregonara wrote sections 1 and 2; Cristina Coscia wrote section 3. The other sections were written jointly.

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