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SUSTAINABLE DEVELOPMENT INDICATORS: THE ITALIAN EQUITABLE AND SUSTAINABLE WELL-BEING APPROACH AND ITS APPLICATION TO THE LOCAL LEVEL

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ABSTRACT: The aim of this article is to present both the methods through which sustainable well-being is measured on a local level and to improve its adherence to the subjective well-being of the community under study. The first part of the paper introduces the features and the assumptions generally adopted in literature to measure the progress towards sustainable development on a local level with special regards to the role of subjective perception. These assumptions are the basis of the Italian equitable, and sustainable well-being indicators framework (B-BES) used to measure the progress of communities. It was applied to a small Italian town, Ceccano, and was supported by a further innovative survey, the virtual budget, directed to measure the subjective preferences. Thanks to the virtual budget, it was possible to identify differences between the subjective preferences of respondents and the ex-ante results of the B-BES model. The approach used allows for better implementation of indicators on a local level by improving the indicators framework's consistency with the local specificity, preferences and aspirations.

KEY WORDS: sustainable development; sustainable development indicators; indicators for local communities; subjective well-being

Introduction

The indicators of sustainable development proposed for the evaluation of the quality of life within the local community would be better defined in the process of partner-like discussions and negotiations of sustainable development professionals with potential recipients, to whom information on the indicative assessment will be addressed (Chiras, Corson, 1997). The role of external and internal experts consists of informing, moderating consultation, and professional assistance in formulating the final list of indicators. Direct participation in the consultations of all stakeholders and interested parties is a condition for the success of the entire undertaking.

The Scandinavian and British (Strathclyde Sustainability Indicators, 1995; Quality of Life Counts. Indicators for a Strategy for Sustainable Development for the United Kingdom: A Baseline Assessment, 1999) publications and studies showed the character of these indicators and proved that in this approach self-management plays an extremely important role and considers the specificity and preferences of local communities. This was also represented in Polish studies addressing sustainability indicators and their applicability on the local level (Śleszyński, 1997; Borys, 2005a; Borys, 2005b; Gutowska, Śleszyński, 2012; Gutowska, Grodzińska-Jurczak, Śleszyński, 2012). In particular, the multidimensional character of sustainability was underlined by including sociological aspects like the subjective perception of environmental problems (Borys, Rogala, 2008).

The literature review here is not complete but convincingly indicates that two aspects are most important and valuable in formulating suitable indicators for the local community (Bell, Morse, 2000; Bell, Morse, 2003; Reed, Fraser, Dougill, 2006; Śleszyński, 2017).

First of all, indicators must reflect the specificity of a given place (Holman, 2009). The local community is a group of people, usually relatively homogenous, living in similar geographical conditions, often also economical, with the baggage of shared historical experience, with an identifiable resource of local tradition and culture. Under certain circumstances, these features are further strengthened. The specificity of the place becomes exceptionally clear in the case of geographically isolated locations, hence the distinct cultural differences of the inhabitants of islands and mountain areas. Strengthening the local specificity is also generated by racial dissimilarity, national identity, and linguistic diversity. Some places create a *mélange* of different traditions; we call them a melting pot, a singular and unique mix of dialects, customs, and behaviours.

The second important aspect that must be reflected in the indicators of the development of the local community is the specificity associated with

local aspirations and preferences. It is not surprising that several neighbouring and similar local communities will have their own goals and priorities. The similarity of historical fate, immersion in the same folk tradition, or the use of the same dialect do not exclude developmental differences, which are created by specific expectations and plans for the future, therefore requiring unique and specific monitoring.

Methodology: The BES framework

The BES is the Italian framework of sustainable and equitable well-being indicators set. It is a theme-based model composed of twelve domains: Health, Education and training, Work and life balance, Economic well-being, Social relationships, Politics and institutions, Security, Subjective well-being, Landscape and cultural heritage, Environment, Innovation research and creativity, Quality of services. It is provided by ISTAT (Italian Institute of Statistics) on an annual base, and some of these indicators are included in the DEF (Documento di Economia e Finanza, i.e. the financial report of the government). Its approach is consistent to “A framework to measure the progress of societies” (Hall et al., 2010), and its main philosophy avoids reductionist schedules, supporting the view that the complexity of the world cannot be reduced to synthetic indicators, thus, according to the so-called “beyond the GDP movement” which arose on the track of Stiglitz J., Sen. A., Fitoussi, J.-P. (2009).

The subjective sphere involves the economic, relational, cultural, environmental dimensions and others. Hence, the attempt to define well-being and measure its dimensions copes with a high degree of complexity. In the Italian experience, a panel of experts defined these domains and related indicators. The subjective well-being that is the core of all is relegated to one domain, and the population was not involved in its definition. However, instead of using a normative approach to define it, such as the Maslow’s “Hierarchy of Needs” (1954) or a panel of experts, at the local level it is recommended the citizens, or their representatives, be involved in defining these conditions or at least to weigh the domains. This is done here, in the very last part of the paper. Finally, the benchmark, according to which the degree of progress is measured, is the year 2010.

The Bova’s BES¹ (labelled from now on B-BES) is the Italian equitable and sustainable well-being approach for the local level (Bova, 2019). It follows the national approach, but it supports the idea that different publics need different accuracy degrees and, therefore, different levels of information.

¹ In its Italian application: BES (Benessere Equo e Sostenibile) Organico per comuni.

Hence, whenever the public is not specialized in these analyses, it is important to provide an integrated interpretation model. The B-BES includes these integrated areas, which are interconnected through an interpretational model, allowing for an integrated analysis of the town. These areas are the subjective well-being, that is the core element, the capitals (that allow its satisfaction/maintenance), their access (accessibility), and the sustainability and resilience capacity, in order to check whenever it will be maintained over time and its resilience to shocks. Moreover, the benchmark is the same, but the aggregation is done through the re-parameterized average (Bova, 2019) while the normalization is done by the ratio of the indicators with respect to the national average (if the polarization is positive) or vice versa (if the polarization is negative)².

More than one hundred indicators and data sources for the areas are listed in Bova (2019). According to the informative level structure of Montmollin and Altwed (2000) and what has been said in the previous paragraph, the structure that was followed takes into account the different publics and their different degree of knowledge to which the local level analysis refers: the community, the politicians, the entrepreneurs, the town managers, the associations. It is summarized in table 1.

Table 1. B-BES indicators for each public and degree of knowledge

Communication level*	Type of indicator (number of indicators)	Indicators' description
Scientists and experts	Basic indicators (110 or 86 without surveys)	All the indicators that refer to the local equitable and sustainable well-being domains. It includes many simple indicators relevant to the territorial analysis that may be considered for the integrated areas. In the B-BES the number of indicators is 110 or 86 (without surveys).
Politicians Entrepreneurs Associations Managers	Synthetic and composite (8)	The integrated areas are Subjective Well-being, Health, Economic Wellbeing, Social Wellbeing and Accessibility, Cultural Intensity and Accessibility, Environment, Economic Accessibility, Social and Cultural Resilience and Sustainability.
Politicians General Public	Synthetic and composite (3)	The TriBES indicators are three: Well-being, Equity and Sustainability. They aggregate all eight integrated areas.
	Synthetic and composite (1)	The product of the three TriBES indicators generates the final indicator of equitable and sustainable development of the community: Super TriBES.

*Communication levels follow the aggregation order of indicators

Source: author's work based on Bova, 2019.

² Such aggregation and normalization method avoids strange results (that at a local level can happen, due to the lower amount of data and high volatility), it also avoids that the lack of data could impede reaching any numerical result. More details are available comparing (Bova, 2019, pp. 105-11) and (Handbook on Constructing Composite Indicators: Methodology and User Guide, 2008).

Modelling the local framework B-BES

The B-BES model has its roots in the Italian framework. In “A framework to measure the progress of societies” (Hall et al., 2010), a general framework is provided for the measurement of the progress of a society. It defines the “progress of society” (or societal progress) as the improvement in human well-being and the ecosystem condition” and the “well-being of society” (or societal well-being) as the sum of the human well-being and the condition of the ecosystem.

Well-being that has a subjective status (Maggino, 2015), is a given condition to which a certain subjective degree of satisfaction and happiness is related. Progress is a set of goals and conditions that increases or protects such a degree. It becomes equitable and sustainable development if it makes well-being accessible (equitable) among the people and generations (sustainable). To reach precise progress implying the necessity to have a theoretical infrastructure with several principles and assumptions. The first assumption is the superiority of wellbeing-driven progress to the endogenous value. In other words, the progress is the sum of the individual’s well-being and is not attached to the value of something per se³.

This has huge implications because the BES model affects the politics and social choices, the policies are (or should be) based on the indicators selected, and the development path is (or should be) shaped by the model results and, therefore, by its assumptions. In turn, political agents should pursue a program or, more generally, a principle of justice, promoting the superiority of well-being defined as the sum of individuals’ well-being.

In order to pursue this principle reaching equality and equity in two different moments is necessary. The first is ex-ante: ignorance about the willingness and preferences of future generations forces us to provide them with the same (equality) possibilities (capitals and capitals accessibility, natural capital included). The logic is the veil of ignorance of Rawls (1971): it is better to agree ex-ante to a mutual provision and equity among generations. The second is ex-post: once the people have the same potential well-being, then everyone pursues it with different tools and, therefore, with different resources. To pursue well-being requires the possibility to generate capabilities (Sen, 1999). However, it is equity and not equality. Self-realization cannot hold under homogeneity; the possibility to be different is also a source of capabilities and well-being. Indeed, well-being and development pass through a certain degree of inequality (not too low, not too high) (Cornia, 2004; Cornia, 2006). The superiority of the well-being principle requires a

³ An interesting discussion on this perspective, albeit with different nomenclature, is provided in the first part of Żylicz (2010).

modern responsibility principle (Jonas, 1979) for the politicians: they have the responsibility to develop equitable and sustainable well-being. The sets of equitable and sustainable well-being indicators support the decision and the monitoring process.

A scientific and objective definition of well-being does not exist. It is a state declared by the subjects and, once declared, it becomes objective. Specifically, well-being is a multidimensional and subjective phenomenon (Maggino, 2015). As such, it can be treated, without loss of generalities, as a multidimensional utility function or, better, as the sum of different utility functions, each by dimension.

$$W_i = \sum_{d=1}^{d=n} U_d. \quad (1)$$

Where W is the well-being of the i -th person, U_d is the utility of the d -th dimension and n the number of dimensions. The utilities come from the exploitation of different capital outputs and outcomes: the social, the natural, the economic, the cultural and the human capitals. These utility functions do not have to be equal. The value W depends on the subject and, whenever we apply a model to its measurement without surveys, we estimate it. In particular, we could attempt to take a number of dimensions k lower than the real number of relevant dimensions n . into account.

$$W_i^e = \sum_{d=1}^{d=k < n} U_d^e. \quad (2)$$

Clearly, if the estimated well-being W_i^e is close to the individual well-being W_i , such that then the model is good, otherwise, it must be rejected. In order to make them comparable, it is necessary to normalize the results as long as the dimensions k and n are not equal. To check the estimation adequacy to the subjects' perceptions, it is necessary to generate a survey or eventually a panel analysis. The well-being function changes as time changes, the people's age, culture, education, experiences, and hence, requires updating (surveys) from time to time. In any case, the aim is still the maximization of well-being.

The equity is intended as equality of well-being and as equality of opportunities (accessibility). If the utility $U_{d,i}$ depends on the outcome of a capital X , then the access can be represented as the h -share of X acquired by the i -th individual:

$$U_{d,i} = f(h_i X). \quad (3)$$

The maximization of the utility passes through the allocation of the shares according to the individuals' utility function differences. Moreover, it highlights the trade-off between the individuals' well-being in the distribution process. In any case, an unequal distribution can be justified if it triggers the progress or if it raises the capabilities or social power and well-being. This is also reflected in the third dimension, sustainability and resilience.

Sustainability means the capacity to sustain well-being over time, and it naturally entails a trade-off between today and tomorrow⁴. The sustainability in normative terms is the intergenerational equity⁵. Function W needs to be updated over time such that the best we can do is to maximize the expected W , and because we cannot measure it, we focus on the conditions that are expected to maximize it. If there is a trade-off between the U_d in the time t and the U_d in the time $t+1$, then the intergenerational equity can be read as follows:

$$X_{t+1} = s_t X_t \Rightarrow U_{t+1} \geq U_t \Leftrightarrow s_t \geq 1, \quad (4)$$

where s stands for sustainability and involves all the factors that contribute to it. The limit is that we need to apply a symmetric or anonymity principle equating the utilities of the future to the present one.

The well-being, the equity, and the sustainability, in the terms presented here, are complementary: The future well-being has to balance with the present and the well-being of a person in a community with the well-being of another. We can assess this complementarity by multiplying the results obtained for each of these three pillars. This is called SUPER TriBES (where BES stands for sustainable and equitable well-being). Where the TriBES⁶ is the set of the three composite indicators for well-being, equity and sustainability.

$$\text{Super TriBES} = W \sum (h_i X s_i). \quad (5)$$

⁴ This has a strong implication because we do not attempt to measure the sustainability of anything else that does not provide well-being.

⁵ This is present in: Our Common Future. Brundtland Commission on Environment and Development (1987).

⁶ TriBES is the Italian short cut for Tripla BES (triple BES) and identifies the three indicators of Wellbeing (B), Equity (E) and sustainability (S).

Each of the composites is generated by indicators from the relative areas aggregated through the re-parametrized average (Bova, 2018).

The principal integrated area is the subjective well-being, that is mainly the life satisfaction and hopefulness. The first source of well-being and the first capital is the very same human body and mind, hence, the health. Health is intended as the quantity and quality of time where the well-being can be enjoyed. The main means to well-being, useful to generate well-being or capabilities, are reduced to four: the well-being deriving by the monetary trade, relationships (family, politics, law), knowledge (culture as evaluation criterion), human capital (as individual knowledge) and the environmental services. These are supported, respectively, by the economic, the social, the cultural, the human and the natural capital. Access to them can be measured as the income inequality and occupation, political representation, rights availability, the presence of schools, museums and cultural centres, and the quality of the air, land, and water. The sustainability and resilience assess the process that modifies the capitals and their regeneration capacity. Resilience includes those factors of innovation and tensions to change both in economic, cultural and social terms, such as the number of innovative and non-profit organizations. Sustainability considers the degree according to which an economic, social, and cultural system is accepted, shared and inclusive. Hence, it includes indicators such as the number of NEET and criminal offences. Finally, for the environment, resilience and sustainability are evaluated according to the indexes of human impact over the sustainability and preservation of biodiversity level.

The B-BES model has the advantage that it does not require a specific number of indicators. It can be covered to different degrees without losing its descriptive capacity while it can absorb more data over time, increasing it. This is a crucial quality on the local level where data is often scarce. Hence, the choice of indicators is free to the extent that they respect criteria that do not compromise the schedule structure (OECD, 2008).

The measurement of the adequacy of the model to the subjective well-being

To test the adherence of the B-BES model to the subjective perceptions of the community, the first steps are to measure the B-BES indicators and to collect the priority and the value for each integrated area through a particular survey: the virtual budget. Once the data is collected, it is possible to proceed with the tests presented below.

The virtual budget survey demands to assign X points (no more, no less) to Y dimensions (for us the integrated areas) according to the value and the priority assigned to their improvement. In this way, we simulate the expenditure of a budget (X points) in a “market” (Y goods) to, indirectly, gather information related to the marginal utility for a unitary improvement of a dimension. Moreover, the respondents must assign from 1 to 7 points to each area (1=no priority ... 7=absolute priority) and X is equal to four times Y such that the average “expenditure” is equal to the average priority.

Test I. The integrated areas’ adequacy to the subjectivity: Error test

If the model is adequate to the community preferences, then the corresponding subjective values should be symmetric to the model composite indicators (see figure 2). Indeed, if the model is correct, whenever the integrated area has a low (high) composite indicator value, we expect to assign a higher (lower) value and priority to this area. However, by doing so, we implicitly exclude that ignorance of the problem prompted respondents to assessments which are not consistent with their own interest.

The composite and subjective values are rescaled in order to be comparable. Such rescaling leads to having an average equal 1 by dividing all values with the average of the values. Since the subjective and the composite rescaled values (respectively s.r.v. and c.r.v.) have an average equal to one, the symmetric point is one. Therefore, we can compute the adequate subjective value (a.s.v.) as the symmetric point (equal 1) plus the distance from the symmetric point of the rescaled composite value (1 minus rescaled composite value):

$$\text{a. s. v.} = 1 + (1 - \text{c. r. v.}) = 2 - \text{c. r. v.} \quad (6)$$

The error corresponding to an integrated area is the distance between the adequate subjective value and the subjective rescaled value, and it is a measure of asymmetry.

Test II. The overall model adequacy to the subjectivity: Adequacy test

The sum of the absolute value of the errors contains information on the adequacy of the model to the preferences. Let me remark that the error was computed on the subjective and composite rescaled values to have an average equal to one. Then the average error can be evaluated on the same scale equal to 1, such that the distance of the average error to 1 is a measure of adequacy. Indeed, if there is perfect symmetry, then this average distance is 1, and if there is perfect asymmetry (the subjective and composite rescaled

values are equal), then the average distance is 0. We are going to express this distance in terms of percentage applying the formula (7).

$$\text{Adequacy index} = \left(1 - \frac{\sum|\text{error}|}{I}\right) \cdot 100, \quad (7)$$

where I is the number of integrated areas evaluated.

Test III. Overall approximation of the subjective well-being: Subjective weight test

Since the rescaled subjective values have an average equal to one, and since they depend on the preferences of the community, they may be used as weights for the corresponding integrated area composites in order to compute a weighted average. This weighted average is supposed to balance the different integrated areas according to their perceived contribution to the subjective well-being. Hence, this average can be compared to the subjective well-being, represented here by the life satisfaction index, to evaluate if the model improves by the survey information. If the distance between the weighted average and the subjective well-being is lower than the distance between the non-weighted average and the subjective well-being, then the introduction of the subjective preferences improves the model by reducing the asymmetries.

The empirical study of Ceccano and its results

The results are for Ceccano, a town of 23,000 habitants in Lazio, central Italy. They concern the year 2018. This town is famous for its high level of pollution in its river and lands. We collected all the indicators of the model, both subjective and objective. The subjective indicators come from a survey of 700 people in 2018 while the rest of the data from the ARCHIMEDE library of ISTAT (Italian Institute of Statistics) with an average lag of 2 years. Other results concerning Ceccano were described in (Bova et al., 2018).

In this survey, we gathered only six of eight integrated areas for two reasons. First, the subjective well-being was in an isolated question that people could assign from 1 to 7 points to describe their life satisfaction (1 = not satisfied ... 7 = very satisfied). It coincides with the life satisfaction index. Second, the “cultural and human capital intensity and accessibility” included too many heterogeneous and complex aspects such that it was considered erroneous to encompass it in such a survey type. We did it for “cultural resilience and sustainability” and, indeed, the perception bias was the highest.

It is assumed that the subjects' perception and value depend mainly on the context of life and that they slowly adjust over time. In other words, the subjects are assumed to evaluate their condition according to their context, we assumed the national average, and with a lag, we fixed the year 2010.

Table 2. Synthetic and composite indicators of the B-BES Model applied to Ceccano, 2018

Super TriBES			
Super TriBES 0.84			
TriBES			
Well-being 1.00	Equity 1.05	Sustainability 0.79	
Integrated Areas			
Subjective well-being 0.99	Subjective well-being 0.99	Subjective well-being 0.99	Social cohesion 1.34
Cultural resilience and sustainability 0.79	Cultural and human capital intensity and accessibility 0.79	Economic access 1.02	Environment 0.80
Average			
0.97			

Source: author's work.

Test I. The integrated areas adequacy to the subjectivity: Error test

Table 3. Results of test I

	Environ- ment	Economic Access	Economic Well-being	Social cohesion	Health	Cultural resilience and sus- tainability
Composites rescaled value (c.r.v.)	0.82	1.05	0.85	1.38	1.07	0.82
Adequate subjective value (a.s.v.)	1.18	0.95	1.15	0.62	0.93	1.18
Subjective rescaled value (s.r.v.)	1.19	0.90	1.05	0.81	1.21	0.85
Error	0.01	0.05	0.10	0.19	0.28	0.33

Source: author's work.

These assumptions require further studies but are standard. Nevertheless, the indicators are selected according to their low volatility over time⁷.

⁷ There is more and more research about the selection of the BES indicators in Italy. For instance, Mazziotta showed that the population size does not affect wellbeing while the labor intensity

Hence, the temporal lag does affect the results, but the error should be lower than the information provided.

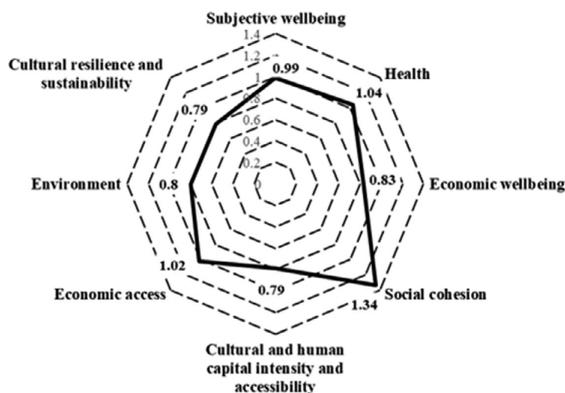


Figure 1. B-BES integrated areas indicators

Source: author's work.

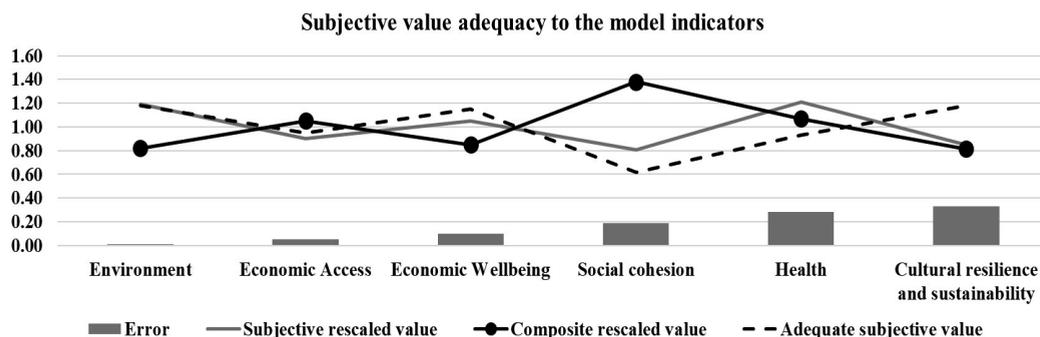


Figure 2. Subjective values adequacy to synthetic and composite indicators

Source: author's work.

As the graph shows, the B-BES is quite adequate with the exception of health and cultural resilience. The community of Ceccano has, on average, a higher sensibility to health and a lower sensibility to cultural resilience and sustainability. The reasons for this are connected with the history of Ceccano (Bova et al., 2018).

within the family is the most important factor (Mazziotta, Pareto, 2011).

Test II. The overall model adequacy to the subjectivity: Adequacy test

The result of the adequacy index is 84% showing that the asymmetries with the model count for a relevant part of the results.

Test III. Overall approximation of the subjective well-being: Subjective weight test

The life satisfaction index is normalized for the Italian average as we did all the other indicators. In the table, we also added the composite indicator of the subjective well-being, which considers the life satisfaction, the free time satisfaction, the judgment on the future index and the relative attractiveness index, to allow further considerations.

Table 4. Results of test III

Cultural resilience and sustainability	0.65
Economic access	0.90
Economic well-being	0.82
Environment	0.91
Health	1.25
Social cohesion	1.05
Average	0.93
Life satisfaction Index	0.95
Average – Life satisfaction Index	0.02
Subjective well-being composite	0.99

Source: author's work.

The distance between the average of the composite indicators weighted according to the community preferences and the life satisfaction index is 0.02. It is the same distance to the non-weighted average (see table 2); hence, there is no improvement in adding information about preferences. However, without the weights, there is an overestimation of the subjective well-being (+0.02) while with them, there is underestimation (-0.02). Since this is the first application of this methodology and considering the aforementioned precautions regarding the lags and the benchmark, further studies are desirable.

Conclusions

In this study, we have discussed the desirable features of the sustainability indicators for local communities applying the B-BES model as a set of sustainability indicators, to then test it empirically by introducing a new quantitative methodology. The objective was to check the B-BES's consistency with the subjective preferences of the community.

The local level is unique because of the opportunity to create direct contact with the community and include their aspirations and priorities to assess the living conditions and life satisfaction by consultations and surveys. It is also a necessity when sustainability is seen in terms of quality of life. The B-BES model measures the sustainable and equitable well-being. It contains integrated areas measuring specific parts of the socio-economic and natural systems in terms of how they contribute to the overall well-being, sustainability, and equity. Well-being can be better measured by involving the community directly. Hence, a methodology to check quantitatively whether the model and the local community preferences are consistent was introduced.

This quantitative methodology was composed of three tests. The first and the second concern respectively, the measurement of the adequacy to the local preferences for each integrated area and to the model as a whole. The third compares the life satisfaction index, as a measure of subjective well-being, to the weighted average of integrated areas, where the weights were given by the subjective preferences.

The case study was Ceccano, an Italian town of 23,000 inhabitants. The empirical results showed that the B-BES fits the aggregated individual preferences on the integrated areas of Environment, Economic accessibility, Economic Wellbeing and Social Cohesion while it does not fit adequately to the areas of Health, Cultural Resilience and Social Cohesion. Consequently, in the second test, the overall model showed a degree of adequacy of 84%. The third test revealed a difference between the weighted average and the life satisfaction index of -0.02 while the difference between the non-weighted average and the same index is +0.02, showing that the first underestimated the subjective well-being while the second overestimated it while their distance to the index was the same.

Summing up, the involvement of the population, crucial for the local assessment of the quality of life and sustainability, allows for a deeper evaluation of the usefulness of the B-BES model.

The contribution of the authors

Demetrio Miloslavo Bova, 60% (conceptualization, methodology, software, validation, formal analysis, investigation, data curation, writing – original draft preparation, writing – review and editing, visualization).

Jerzy Śleszyński, 40% (conceptualization, writing – original draft preparation, writing – review and editing, visualization).

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