

Article

Well-Being and Sustainability in Crisis Areas: The Case of Taranto

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Abstract: Unresilient and fragile regions need methods and data able to make policy-makers acknowledge the specific criticalities by which they are affected, so as to build effective development strategies and policies. This research explores whether and to what extent well-being and sustainability measurement frameworks are able to recognize crisis areas. We identified Taranto (Italy), declared as both a National Priority Contaminated Site and a Complex Industrial Crisis area, as a paradigmatic and extreme case of crisis areas and adopted the single case approach to address our research question. After reviewing several frameworks able to measure well-being at local level, we focused on Benessere Equo e Sostenibile dei Territori (Equitable and Sustainable Territorial Well-being, BESdT). We used two aggregate indexes to analyze data, namely the Adjusted Mazziotta-Pareto Index and the Adjusted Differences Mean Index. The study shows that, although BESdT does detect some criticalities of the examined area, it seems not able to adequately frame the multifaceted crisis that affects the area of Taranto. Even in presence of a full-blown crisis, the problematic situation does not always reflect into lower territorial performance, neither at the level of single indicators nor at the level of entire domains. Such discrepancy appears to be particularly evident within the economic domain. The paper ends with a discussion on the research and policy implications and some proposals for further research.

Keywords: well-being; crisis areas; sustainability; Taranto; policy making; Benessere Equo e Sostenibile dei Territori; equitable and sustainable well-being



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1. Introduction

Unresilient and fragile regions need methods and data able to make policy-makers acknowledge the specific criticalities by which they are affected so as to build effective development strategies and policies [1,2]. Social, economic and environmental data collected at local level are also fundamental to assess the effects of pandemics (e.g., Covid-19) or shock events (e.g., due to natural catastrophes or environmental disasters produced by industries) and monitor crises in specific areas [3]. The presence of severe crises at a local scale could indeed be obscured when using only data aggregated at country level [4]. In such cases methods and data able to study phenomena at a local scale are crucial for the correct assessment of the crises, the development of strategies and policies to address them and the appraisal of the results achieved after their implementation. Identifying and monitoring local crisis areas is essential also at a national level to better calibrate public policies and allocate direct funds towards the most fragile territories that, therefore, mostly need them [2].

Scholars, practitioners and policy makers now agree in recognizing social, economic and environmental crises as complex phenomena which cannot be analyzed and monitored through a single-domain lens [1–3,5]. Rather, it is urgent to identify measurement frame-

works able to assess the multifaceted aspects of local crises, ranging from environmental depletion to social deprivation, from economic downturns to overall people well-being.

In this paper, the attention is focused on the case of Taranto, a city located in Southern Italy. The area of Taranto, due to its peculiar environmental, occupational, social and health conditions, can be considered as a complex crisis area [6]. The area is officially recognized by the Italian state as a crisis area from both the environmental and the socio-economic point of view. Within its borders, a Site of National Interest (SIN or National Priority Contaminated Site, NPCS) as well as a Complex Industrial Crisis Area (CIC) are localized. Due to the severity of the crisis and its peculiarities, the case of Taranto can be defined as “extreme and paradigmatic” [7] as well as unique in the Italian panorama. Such a uniqueness depends on the intensity of the crisis that, under different perspectives (e.g., socio-economic, health, environmental, political) and for several decades, distressed the area in a way that required an increasing attention by several institutions both at national and European level [6].

Specifically, in the study we investigate whether and to what extent existing frameworks for the measurement of multidimensional well-being are able to recognize Taranto as a crisis area. By the careful analysis of the case of Taranto, valuable information and potentially generalizable conclusions can be derived.

After reviewing the frameworks able to measure well-being at the local level, we focused on *Benessere Equo e Sostenibile dei Territori* (BESdT, in English: Equitable and Sustainable Territorial Well-being), which gathers data about sustainable well-being among Italian provinces and metropolitan cities (NUTS3 level) [8]. BESdT is an institutional measurement framework aimed at measuring well-being at the provincial level through a collection of indicators that cover different well-being domains (e.g., Economic Prosperity, Health, Education). Data published in BESdT annual reports are robust and reliable as they are validated by the Italian National Institute of Statistics (ISTAT). Moreover, time series data are available for all the Italian provinces. To our knowledge, BESdT is the only framework whose data satisfy the three mentioned criteria (i.e., robustness, reliability and availability of time series for the specific area).

BESdT data available for Taranto were processed by using two methods, namely the Adjusted Differences Mean Index (ADMI) and the Adjusted Mazziotta Pareto Index (AMPI) [9]. Results were discussed also based on a comparison with those obtained for the other provinces of the same Region (Puglia Region).

To our knowledge, the paper represents the first attempt to verify whether a well-being framework is able to recognize a crisis area. As mentioned, methods and data to recognize such areas are essential to effectively allocate public funds, define—both at national and local level—public policies to address problems and monitor their effects. Based on our analysis, BESdT only partially succeeds in the identification of the crisis area. Some results on the issues to be further explored as well as research and policy implications of the study are discussed in the paper.

The paper is structured as follows. After an overview of the literature (Section 2), in Section 3 the research design is explained. The case of Taranto is presented in Section 4. Results of the study are reported and discussed in Section 5. Finally, in the Conclusions, we discuss the research and policy implications and outline future research avenues.

2. Background

This Section provides a brief introduction on the main well-being and sustainability measurement frameworks and describes the BESdT framework in details. Then, the concept of crisis area, as we adopt it, is clarified and an overview of the literature on crisis areas and well-being is proposed.

2.1. Equitable and Sustainable Well-Being

In the last decades, the debate on sustainable development has involved the aspects related to its measurement. One of the limitations of mainstream economic literature is that

the concepts of progress and development have been commonly assimilated to economic expansion [10]. Consequently, development has been measured almost exclusively through the Gross Domestic Product (GDP) and economic policies in each country have been defined and evaluated accordingly [11]. With this respect, in the Report of the Commission on the Measurement of Economic Performance and Social Progress [12], Stiglitz et al. claimed that “what we measure affects what we do; and if our measurements are flawed, decisions may be distorted. Choices between promoting GDP and protecting the environment may be false choices once environmental degradation is appropriately included in our measurement of economic performance. So too, we often draw inferences about what are good policies by looking at what policies have promoted economic growth; but if our metrics of performance are flawed, so too may be the inferences that we draw”. The same Report also: (i) underlines the importance of putting the well-being of the person back at the center of development measurements; (ii) discusses well-being as a multidimensional and complex concept; and (iii) highlights the need to develop a dashboard of sustainability indicators to be used to check well-being over time.

Some of those concepts were not new. Even before the Istanbul Declaration signature at the 2nd Organization for Economic Co-operation and Development (OECD) World Forum [13], the “beyond the GDP” movement was quite broad. However, the Declaration greatly contributed to the promotion of a culture of evidence-based decision making. The national statistical institutes of all countries were also called to develop frameworks suitable to measure the progress in all of its dimensions, overstepping the mere economic dimension. Such an appeal was welcomed by many national statistical institutes (e.g., Canadian Index of Well-being, Measures of Australia’s Progress, UK Measuring National Well-Being) and by international bodies and institutions (e.g., ISO with the ISO 37,120 standard: Sustainable Development of Communities and the UN 2030 Agenda). Several frameworks, also rooted on the early experimentations carried out by UN (e.g., Genuine Progress Index and Human Development Index), were developed [14–16].

Well-being measurement frameworks are tools aimed at estimating the real living conditions of people and the overall quality of their life [17]. After critically reviewing the main well-being measurement frameworks, the Global Happiness Council in [17] underlines that all the existing frameworks define well-being as a multidimensional construct, often including purely subjective well-being indicators (e.g., happiness, personal satisfaction), to interpret the instances of the aforementioned “beyond the GDP” movement.

In Italy, a project aimed at measuring the quality of life, known as Equitable and Sustainable Well-being (*Benessere Equo e Sostenibile*—BES), was started in 2010 by the Italian Statistics National Institute (ISTAT) and the National Council of Economy and Labour (CNEL). Based on a participatory and inclusive design process, academics, institutions, associations and citizens developed a well-being framework and an attendant dashboard of indicators [18]. The framework includes 130 indicators clustered in 12 domains, namely: Health, Education and training, Work and work-life balance, Economic prosperity, Social relationships, Politics and institutions, Security, Subjective well-being, Landscape and Cultural heritage, Environment, Innovation, Research and Creativity, Quality of services [19]. Since 2013, ISTAT has annually published a report on the country’s well-being performance based on BES indicators. Furthermore, based on the Law 163/2016, Italy was the first member State of both the European Union and G7 to adopt some indicators of equitable and sustainable well-being in its economic planning, in addition to GDP. An ad-hoc created Commission was involved in identifying the BES indicators to be used by the Government to describe the conditions of the Country and to carry out an ex-ante estimation of the efficacy of the policies as designed in the Economic and Financial Document (EFD). In a special EFD Annex, the Italian Minister of the Economy describes the state of the Country according to the selected BES indicators and develops a forecast of the effects of the policies proposed in the EFD on such indicators. The 2020 EFD contains a broad discussion about the impacts of the actual pandemic situation on well-being [20]. For example, environmental well-being indicators will probably register a positive performance during the pandemic,

due to the lower emissions associated with the stop (or reduced activity) of transports and several other industries. On the other hand, such a stop will cause a negative performance of economic well-being indicators [20]. The BES framework may reveal crucial to detect such impacts. Alongside with the evaluations carried out at the national level, ISTAT has launched a project aimed at measuring the levels of equitable and sustainable well-being at the scale of provinces, metropolitan areas and cities [21–24]. In particular, Benessere Equo e Sostenibile dei Territori (BESdT) is configured as the BES framework application at a provincial (NUTS3) scale: BESdT dashboard consists of 61 indicators clustered in 11 domains (the same as BES but for Subjective Well-being, excluded because of the lack of data at local level). To the authors' knowledge, BESdT is one of the most advanced projects in the direction of local measurement of well-being. Another interesting project is "How's life" promoted by OECD [25] within the Better Life Initiative. It assesses well-being in 392 OECD regions. As in the case of BESdT, the project stems from the consideration that "national averages can mask our actual well-being as experienced where we live and work". Measurement at the local level can represent "a way to gauge what policies work and can empower a community to act to achieve higher well-being for its citizens". Measuring well-being at the local level is extremely relevant in informing policy makers about local needs, getting indications about actions that have proved to be ineffective and about the specific features of each territory [21,26–28]. The availability of data on well-being at the local level is fundamental to define policies aimed at pursuing an equitable and sustainable development. Such data are indeed essential to assess whether citizens benefit from good life quality in each area of a country. In Italy, BES and BESdT frameworks are the only active institutional statistical resources that systematically operate with this aim [18].

2.2. Crisis Areas

From a well-being perspective, Italy is characterized by strong territorial inequalities which systematically emerge also in BESdT reports: in particular, starting from BES data, scholars found evidence of North-South imbalance [29,30], which is well known and historically documented [31]. In 2019, ISTAT used BESdT to measure "Territorial well-being differences" [32], a study that explores disparities among Italian provinces, which remarked the North-South well-being imbalance. However, that study did not investigate the issue of well-being in the crisis areas. As all countries in the world, Italy presents multiple areas characterized by persistent multifaced crisis. In the case of Italy, the acknowledgement occurs, at the institutional level, with the classification of a given area as National Priority Contaminated Sites (NPCS) and/or Complex Industrial Crisis Area (CIC), based on the kind of crisis.

By law (D. Lgs 152/06, clause 252), the Italian State defines NPCS as identifiable "in relation to the characteristics of the site, the quantities and dangers of the pollutants present, the impact on the surrounding environment in terms of health and ecological risk, as well as damage to cultural and environmental assets". NPCSs are areas institutionally recognized as National Priority Contaminated Sites due to scientifically documented substantial contamination, which could potentially impact the health of residents [33]. NPCSs have been the subject of several studies, spacing from environmental to medical sciences [34–36]. From an epidemiological point of view, Italian NPCSs have been monitored by the Italian Epidemiology Association [37], which is conducting a project aimed at identifying and quantifying negative contamination impacts on residents' health. The project, called SENTIERI, disseminates its results yearly by providing epidemiological and statistical information about each Italian NPCSs population. Last SENTIERI report undermarks the "detection of excesses for the diseases which showed an a priori epidemiological evidence of a causal association with the environmental exposures specific for each considered NPCS" [37].

On the other hand, to identify the areas affected by economic and employment crises, the Italian government defined CICs as "concerning territories subject to economic recession and employment loss of national significance and with a significant impact on national industrial policy, which cannot be solved with resources and instruments of

regional competence only. The complexity comes from: (i) crisis of one or more large or medium-sized companies with effects on related industries; (ii) serious crisis of a specific industrial sector with high specialization in the area” [38]. After the establishment of a CIC area (which concerns single municipalities or group of them), the areas become eligible for initiatives called Industrial Reconversion and Requalification Projects (*Progetti di Riconversione e Riqualificazione Industriale*—PRRI) aimed at their recovery (Law 181/1989).

Together NPCCs and CICs contribute to identify areas affected by complex crises that involve environmental, health, employment and economic problems in a consistent and data-driven way. Although the definitions of CIC and NPCCs have been defined by the Italian government to apply on the national territory, similar definitions and equivalent instruments are also found in other European and non-European countries. With regard to contaminated sites, the European Environment Agency (EEA) has estimated the presence of 250,000 awaiting remediation sites, thousands of which in Italy. Among them, the NPCCs represent the most dangerous ones [39]. The European Commission Joint Research Center highlighted that the European Union does not define precisely what is meant as a contaminated site, and, in the lack of a common framework, a certain degree of discretion is given to member States’ institutions [40]. At international level, however, the case of the United States stands out: US have a detecting framework and a register of contaminated sites shared by all States, the National Priority List [41]. In addition, the American Environmental Protection Agency (EPA) provides a synthetic index, named Hazard Ranking Score, “to assess the relative potential of sites to pose a threat to human health or the environment” [42].

To explore the state of the art on the topic of well-being in areas affected by local crises, a review of the literature was carried out based on the query reported in Table 1.

Table 1. Literature search criteria.

Search Engine:	Scopus	Query Entry
Reference Period:	α—2021	TITLE-ABS-KEY
Subject Areas:	Social Sciences	((“contaminated site *” OR
	Environmental Science	“local crisis” OR “crisis area *”
	Business & Management	OR polluted site *”) AND
	Economics	(“wellbeing” OR “well-being”
	Medicine	OR “well being” OR “quality
	Multidisciplinary	of life”))
	Engineering	

The research returned 25 documents. Most of them (22 out of 25) dealt with epidemiological and medical investigations, validation of technical tools aimed at pollution remediation, spatial distribution of pollutants or were completely off-topic. Thus, they resulted not relevant to the purpose of our study. No study was specifically aimed at investigating well-being in crisis areas with a multidimensional approach. The only attempt in a similar direction was made by Prior et al. [43], who investigated some specific aspects of well-being and quality of life, namely safety and subjective emotional state, of people living in 13 Australian contaminated sites. To do so, quantitative and qualitative tools (survey) designed within the research were used. Data collected were successively examined by using regression and coding analysis. Granieri in [44] and [45] explored the psychological well-being of Casale Monferrato’s population, an Italian NPCCs (DM 10/01/2000) and concluded that an in-depth investigation could also be useful in the context of other contaminated sites because who lives in such sites is generally subject to burdens that compromise the psychophysical well-being.

3. Materials and Methods

This Section illustrates the main steps carried out in the study and their rationale. In particular, Section 3.1 illustrates how the definitions of NPCCs and CIC were used to identify the statistical-geographical units object of the analysis. Section 3.2 describes the data-source

and Section 3.3 discusses the data processing methods adopted. Finally, Section 3.4 explains how the data processing methods were applied and the results interpreted.

3.1. Case Study Selection

As discussed in Section 2.2, the areas classified as NPCCs and CICs are affected by multidimensional local crises which comprises serious environmental, health, economic and employment problems. With reference to the definitions of NPCCs and CICs, it is useful to underline that the formers are defined by territorial perimeters (land or sea) regulated by Italian Laws 426/1998 and DM 468/2001, while the latter do not involve territories but geo-political entities such as municipalities or groups of them, as established in Italian DM 83/2012. In order to bring the analysis back to homogeneous statistical units, eventually recognized at the institutional level (national and European), within this work we define as “Crisis Area” any district at the geographic granularity NUTS3 which simultaneously satisfies the following conditions: (i) at least a perimeter NPCC area or a part of it fall within its boundaries; (ii) at least one municipality belonging to the district is included in a CIC.

Among the Italian provinces and metropolitan cities (which are the NUTS3 levels in Italy), 14 satisfy both conditions (Savona, Trieste, Turin and Venice in the Northern Italy; Frosinone, Livorno, Rome and Terni in the Central Italy; Caltanissetta, Catania, Naples, Sassari, Sud Sardegna and Taranto in the Southern Italy and Islands). Such a result was obtained by gathering data from different institutional data sources [38,46,47].

Among the above mentioned crises areas, we believe that the province of Taranto embodies many of the contradictions of the current development model and can be classified as paradigmatic and extreme as defined by Flyvbjerg [7]. In particular, a paradigmatic case is defined as a case “that highlights more general characteristics of the societies in question” and which is therefore configured as a prototype example. An extreme case is defined as a case whose analysis allows “to obtain information on unusual cases which can be especially problematic”. Taranto hosts, among the others, the largest steel plant in Europe (ex ILVA plant, in 2018 rented by Arcelor Mittal), a military base and dockyard and an oil refinery (Eni SpA). The coexistence of such heavy industries has made Taranto one of the most polluted town in Europe, a place wherein the percentage of people affected by lung cancer is several times larger than in the rest of Italy and where people continuously face the work vs. health and environment dilemma [48]. The crisis of Taranto also involves urbanistic, occupational, social and political problems. Separately considered, such problems characterize several areas in Italy and in the world. Probably, the uniqueness of the case of Taranto is due to the severity and acuteness of all the mentioned problems that concentrates in a single area. In Table 2 we report some figures that describe the area.

Table 2. Taranto area: main figures.

Province (NUTS 3)	Population	Extension (km ²)	CIC	SIN
Taranto (ITF43)	563,995	2467.35	DL 7 August 2012 n. 129	DM 10 January 2000

(Population data updated at January, 2019, normative references as reported in [46]).

The validity and importance of the single case approach in social sciences and public management research is well-known (e.g., [49]). Deepening a single paradigmatic and extreme case can be useful both for conducting preliminary analyses and for drawing generalizations [7]. In our study, we decided to adopt such an approach and studied the case of Taranto.

3.2. Dataset

The dataset used in this research was published by ISTAT in October 2020, within the BESdT project [50]. It provides historical data for 55 indicators, clustered into 11 thematic domains. For each Italian province (NUTS3), region (NUTS2) and macro-area (NUTS1) and for each indicator, the dataset include time series, whose length varies from indicator to

indicator, depending on their availability. Appendix A (Table A1) reports all the indicators included in the dataset with the measurement units, the ISTAT standardized identification codes, the polarity (correlation with well-being) and the length of the associated time series.

3.3. Data Processing: Composite Indexes

This study explores whether BESdT succeeds in acknowledging the crisis areas. We used the case of Taranto, considered as paradigmatic and extreme, to address the question. To this regard, the BESdT indicator time series related to the chosen statistical units, as provided in [50], were used. Raw data were extracted and, in order to obtain valuable information, processed through indexes aggregation. Ciommi et al. [29] and OECD [51] stress the importance of aggregating several well-being indicators to analyze a reduced number of meaningful composite indicators. Composite indicators indeed summarize complex and multidimensional realities (such as well-being), provide more easily interpretable results, reduce the size of a set of indicators without dropping the underlying information base, enable complex realities comparison and help communication with general public [51].

To perform data aggregation, two indexes were adopted. One of them, called Adjusted Differences Mean Index (ADMI), allows precise and historical assessments to be obtained by considering the entire time series of each indicator. Developed within this study, it is described in Section 3.3.1. The other index, that is, the Adjusted Mazziotta-Pareto Index (AMPI) [9], makes it possible to obtain aggregate and instantaneous information, therefore related to each domain, in the most recent years only. The algorithm to compute AMPI is synthetically described in Section 3.3.2. These two indexes were used to obtain interpretable and aggregated information to analyze. Table 3 summarizes the indexes, the analyzed historical series, the levels of aggregation that have been adopted and the rationales of the choices.

Table 3. Two aggregate indexes used in the study.

Index	Analyzed Time Series	Clustering Level	Rationale
Adjusted Differences Mean Index (ADMI)	Entire time series available for each indicator	None: the analysis has been carried at the level of BESdT indicators	The small sample size (granularity at the Province level) led considerable fluctuations in many indicators, caused by outliers. Furthermore, some indicators are associated with phenomena having high inherent variability. To overcome these problems, the entire time series available in BESdT were considered (temporal dilution of the variability)
Adjusted Mazziotta-Pareto Index (AMPI)	Last three years measurements available	BESdT domains	ADMI does not provide information on the current state of crisis areas. Since the described fluctuations are likely to introduce distortions, we proceed by diluting the fluctuations horizontally (dilution by aggregation)

3.3.1. Adjusted Differences Mean Index

ADMI has been purposely developed by the authors for this study to compare time series related to the analyzed territorial unit against the homologous time series related to a reference unit, so as to obtain a synthetic index of their dissimilarity, also considering the inherent variability of the phenomena described by the time series.

For this purpose, with respect to each BESdT domain h ($h = 1, \dots, H$), two matrices are defined:

$$X^h = \{x_{ija}^h\}$$

and

$$R^h = \{r_{qja}^h\},$$

which respectively relate to the province i (generally speaking, a territorial unit at the NUTS3 level) and to the region q to which the i -th province belongs (generally speaking, the NUTS2 statistical unit including the i -th territorial unit, which we use as reference). Each element x_{ija}^h of the former matrix indicates the value that in the year a ($a = 1, \dots, A$) the j -th indicator of the h -th BESdT domain assumes with respect to the i -th province. Similarly, each element r_{qja}^h of the latter matrix indicates the value assumed in the year a by the j -th indicator with respect to the region q . The proposed notation extends the one proposed in [9] by adding the time dimension (index a , related to a specific year of the series). Within each domain h , indicators can be characterized in accordance to their polarity, as defined in [9]. If the j -th indicator has positive polarity, that is, if it is positively correlated with well-being, the mean of the deviations of its time series between the i -th province (territorial unit) and the corresponding region q (reference unit) is defined as:

$$S_{ij}^h = \sum_{a=1}^A \frac{(x_{ija}^h - r_{qja}^h)}{A}$$

Vice versa, if the j -th indicator has negative polarity, that is, it is negatively correlated with well-being, the mean of the differences for the province i and the corresponding region q will be equal to:

$$S_{ij}^h = \sum_{a=1}^A \frac{(r_{qja}^h - x_{ija}^h)}{A}$$

S_{ij}^h overlooks the variability that is naturally associated with the phenomenon that is described in the BESdT by the j -th indicator. To take it into account, a proxy of this variability is considered, namely the standard deviation over time for the j -th indicator related to the region, which is defined as follows:

$$\sigma_{qj}^h = \sqrt{\frac{\sum_{a=1}^A (r_{qja}^h - \mu_{qj}^h)^2}{A}}$$

where in μ_{qj}^h is the mean of the values that, for that region q , the j -th indicator assumes in all the years a included in the analyzed time series. The comparison of the mean of the differences for the province i and the corresponding region q , as defined above (S_{ij}^h) against a proxy of this variability σ_{qj}^h , the following ratio is considered, which we call Adjusted Difference Mean Index (ADMI):

$$\varepsilon_{ij}^h = \frac{S_{ij}^h}{\sigma_{qj}^h}$$

ADMI provides aggregate information on the differences between the time series of the analyzed territorial unit i (province) and the reference q (region). Note that if $\sigma_{qj}^h = 0$ (i.e., if the regional time series is constant) ADMI cannot be computed.

3.3.2. Adjusted Mazziotta-Pareto Index

The Adjusted Mazziotta-Pareto Index (AMPI) is a composite index that gives a summary evaluation (score) for each territorial unit (i.e., within this study, province) with regard to each domain. Given a territorial unit i and a domain h composed by J indicators ($j = 1, \dots, J$), such a score depends on the arithmetic mean of the values that the territorial units gets with respect to the all the J indicators, suitably corrected in order to mitigate compensatory phenomena among indicators [29].

More specifically, the first step to compute AMPI is normalizing data, taking into account the polarity of each indicator [9]. Referring to the notation introduced in the

previous section, if the j -th indicator of the h -th domain has positive polarity, then for each province i and in every year a , its normalized value is:

$$z_{ija}^h = \frac{x_{ija}^h - \overline{x_{ja}^h}}{\overline{x_{ja}^h} - \underline{x_{ja}^h}},$$

where

$$\overline{x_{ja}^h} = r_{qja}^h + \frac{1}{2} \left[\max_i \{x_{ija}^h\} - \min_i \{x_{ija}^h\} \right] \text{ and} \\ \underline{x_{ja}^h} = r_{qja}^h - \frac{1}{2} \left[\max_i \{x_{ija}^h\} - \min_i \{x_{ija}^h\} \right],$$

being r_{qja}^h the value that the homologue indicator j of the domain h assumes in the q -th reference unit (i.e., the region wherein the i -th province is located) for the same year a .

Vice-versa, if the j -th indicator of the h -th domain has negative polarity, its normalized value is:

$$z_{ija}^h = \frac{\overline{x_{ja}^h} - x_{ija}^h}{\overline{x_{ja}^h} - \underline{x_{ja}^h}}.$$

Normalized values are then subjected to rescaling [9], in order to ensure that the definition domain is within the range [70, 130].

$$y_{ija}^h = 60 \cdot z_{ija}^h + 70.$$

Once the normalized and rescaled value y_{ija}^h is obtained for each z_{ija}^h , all the indicators belonging to the same domain of the BESdT are aggregated. With respect to the domain h for the i -th province in the a -th year, the aggregate index called Adjusted Mazziotta-Pareto Index (AMPI) is defined as follows:

$$AMPI_{ia}^h = \mu_{ia}^h \pm \sigma_{ia}^h \cdot c_{ia}^h$$

being

$$\mu_{ia}^h = \frac{\sum_{j=1}^{n_h} y_{ija}^h}{n_h} \\ \sigma_{ia}^h = \sqrt{\frac{\sum_{j=1}^{n_h} (y_{ija}^h - \mu_{ia}^h)^2}{n_h}} \text{ and} \\ c_{ia}^h = \frac{\sigma_{ia}^h}{\mu_{ia}^h}$$

respectively the arithmetic average, the standard deviation and the coefficient of variation of all the normalized and rescaled J indicators, related to the h -th domain, the a -th year and the i -th province. As proposed in [29], the sign (“+” or “−”) is introduced to adequately take into account the polarity of the indicator with respect to the measure of well-being.

It is therefore clear that AMPI is an index based on the unweighted arithmetic mean to which a corrective function is added. The corrective function is used to reaffirm the non-substitutability and the equal relevance of each indicator [29]. In other terms, in the aggregation phase, AMPI penalizes the territorial units that exhibit non-homogeneous performance to avoid compensation phenomena between indicators.

3.4. Analysis of the Results

Composite indexes are powerful tools for synthesizing complex information such as those contained in a well-being dataset collection [29]. OECD [51] illustrated how aggregation allows direct comparisons between homogeneous statistical units. In the context of this study, the composite indexes described in Sections 3.3.1 and 3.3.2 were computed as follows:

- ADMI was calculated for the BESdT indicators of Taranto province. Puglia was taken into consideration as the reference unit. Results are reported in Appendix A (Tables A2 and A3).
- AMPI was calculated for all provinces located in Puglia. In order to mitigate the effects of outliers, instead of considering data referred to a specific year, the average performance registered during the three-year period 2015–2017 (i.e., the most recent three-year period available) was taken into account. Results are reported in Appendix A (Table A4).

As for the computation of ADMI, we decided to compare NUTS3 (provincial) historical series with those of the attendant NUTS2 (region) because of the aforementioned North-South imbalance that affects Italian provinces.

On the other hand, AMPI was calculated for the area of interest (Taranto) as well as for all the other NUTS3 that fall within Puglia (NUTS2). In this way, it was possible to rank the various provinces based on each domain performance.

4. The Case of Taranto

In this Section, we discuss the case of Taranto based on five different perspectives. The perspectives, the documents proving the severity of the attendant crisis and the BESdT domains more directly associated to them are reported in Table 4.

Table 4. Taranto’s crisis perspectives, main reference documents and their relative BESdT domains.

Analysis Perspective	Main Sources	BESdT Domain
Town planning and Landscape	[52,53]	09—Landscape and Cultural Heritage
Environment	Law n°462 of the 9 December 1998 (Site of National Interest)	10—Environment
Human Health	Law n°462 of the 9 December 1998 (Site of National Interest)	01—Health
Politics and Institutions	[6]	06—Politics and institution
Socio-Economics and Employment	Law n°171 of the 4 October 2012 (Complex Industrial Crisis area)	02—Education and Training 03—Work and Work-life Balance 04—Economic Prosperity 10—Innovation, research and creativity

4.1. The Landscape and Urbanistic Perspective

Taranto is one of the oldest human Mediterranean settlement: its foundation dates back to the 8th century BC. The city initially developed on the peninsular border that separates two salt water basins, called Mar Piccolo and Mar Grande [54]: this position, so strategically and logistically advantageous, will mark the industrial history of Taranto and its urban development [52]. Shortly after the unification of Italy (1861), Taranto was identified as the best national site, for strategic, political and geographical reasons, for hosting the Royal Military Dockyard (*Arsenale della Marina Militare*): this decision would affect not only the urban planning of Taranto but also its social composition and economic system.

The development of the Royal Dockyard, inaugurated in 1889 and of its outbuildings, generated a significant environmental impact especially in the area of Mar Piccolo, that transformed a beautiful coastal rural zone with a touristic vocation into an area dedicated to logistic-military operations [55], while remaining an important site for aquaculture. Simultaneously to the development of the military industry, the social composition of the city underwent significant changes: the proletarian naval-mechanical class took the place of the (mainly maritime) classes that had constituted the majority of the population for centuries [52]. The demographic boom was associated to an unregulated and chaotic urban development and to the birth of new proletarian districts around Arsenale and Cantieri

Navali Tosi (shipyard specialized in the building of submarines), which lacked the most basic urban planning services [54]. During the Fascist period, the urban situation did not improve: to face the housing emergency, numerous social housing plans were developed to restore the hygienic-sanitary security in the overcrowded areas of the historical center [53].

At the end of the Second World War, Arsenale diminished its capacity to absorb labor and Taranto suffered from new problems: in the absence of adequate regulatory plans, the building sector became the only one able to absorb the growing slice of unemployed population [52]. Also because of that profound occupational crisis, Taranto was selected as the city to host the fourth national steel pole: the site was located close to the Tamburi workers' district, near the port, to make people and goods move easier. The impact on the landscape of Taranto and its urban planning was devastating (among the others, it costed the removal of 20,000 olive trees). The expansion project presented by Italsider in 1968 was even more impactful, the industrial site area was extended for about 1000 hectares. This second project provoked the first disagreements: in 1971 Antonio Cederna, one of the founding members of Italia Nostra (an important Italian cultural and environmental association), described the Taranto's industrialization process as "barbaric". He also denounced the state of urban *laissez-faire* that affected the interior as the exterior of the industrial enclosure [52]. Taranto was and still is a urbanistically wounded city, marked by at least four macro-processes: urban decay, abandonment of the historic center [56], suburbanization and depopulation [53].

In years, the city has not undergone significant urban planning changes: there have been attempts of urban regeneration but it is difficult, especially in the historic center, to evaluate the results [53]. However, in 2016, Invitalia, the National Development Agency, launched OpenTaranto, an international competition aimed at collecting design ideas capable of contributing to the redevelopment of the historical center [57]. Many well-known architects and engineers presented projects to rethink the area in the sign of urban sustainability. The competition was included in the Institutional Development Contract for the Taranto area (DL. N.1 5/1/2015). Aimed to the development of the Taranto area, the Contract involved several Italian Ministries (Environment, Health, Infrastructure, Economic Development, University and Defense). The Contract is one of the most important recent attempts, carried out at national level, of urban and industrial regeneration of the town. At urban level, a strategy to move towards a green transition, called Ecosistema Taranto, has also been recently approved.

4.2. The Environmental Perspective

The serious environmental impacts of the largest iron and steel plant in Europe began to be perceived as a problem by the Taranto's civil society in recent times, in conjunction with the privatization of the industrial pole in 1995 [6]. Notwithstanding the death of 93 ILVA workers in 1974 [58] and some previous important environmental protests, the social recognition of the environmental crisis started slowly in the nineties and was followed by an institutional acknowledgment (Law 426/1998). A vast area of the province was secured and recognized as in need of urgent reclamation. However, the environmental disaster cannot be exclusively ascribed to the ex Ilva plant (now Arcelor Mittal): Taranto is still home of an important Navy Dockyard, a military port and several other polluting industrial activities [52].

The pollution of air, water and soil in the Taranto area is widely documented [52]. For the sole purpose of having a rough idea of the magnitude of the environmental impact, in 2006 the local industrial sector introduced into the atmosphere 96.1% of the dioxin, 95.6% of the polycyclic aromatic hydrocarbons and 84.7% of the lead introduced in Italy as a whole [53].

4.3. The Health Perspective

The pollution generated by industrial activities has had significant negative impacts on the health of the local population. In 2019, the European Court of Human Rights

condemned the Italian State for failing to protect the health and life of Taranto citizens: the procedure was started in 2016 after the correlation between the pollutants emitted by heavy industry located in Taranto and the oncological incidence was documented [6]. A more detailed picture of the Taranto's health crisis is given by SENTIERI, the mentioned epidemiological study that examines the mortality causes in all SIN areas since 2007. According to the last SENTIERI report [37] the municipalities of Taranto and Statte (a town located in the same area) show an excess of mortality in the 2006–2013 period, dramatically significant in relation to lung cancer and pleural mesothelioma. Hospitalizations related to diseases directly associated with the exposure to pollutants emitted by ex-ILVA plant are in excess as well. Recent studies are also investigating correlations between site emissions and kidney diseases [59], leukemia and bladder and pancreatic tumors [37]

4.4. The Political and Institutional Perspective

The delicate health, economic and social situation has negatively impacted the relationship of citizens with institutions as well as, more generally, with politics. The demonstrations of distrust towards national and local politics are recurrent. The debate on environmental and employment issues related to the ex-ILVA plant (now Arcelor Mittal) has manifested itself within institutions and public opinion in a form that Greco and Bagnardi [6] defined as post-political with two well-defined factions, those of environmentalists and industrialists, “failing to problematize the multiple dimensions of environmental injustice and to connect the crisis to broader social relations of production”.

However, retracing the political history of Italy's largest steel industry, it is evident that the political vision has radically changed over time. The political analysis of the role and impacts of Italsider on Taranto's area started very slowly among the employees in the seventies, conjointly with the battle for a safer and more livable workplace, which, at that time, was perceived as a trade-union problem more than a political issue. Only starting in the eighties, local associations began to treat the impact of the steel industry as a community problem, organizing demonstrations and awareness-raising marches [58]. Paradoxically, ILVA blossoms as a political case simultaneously with the abandonment of “Industry of the State” garments: with privatization in 1995, the case assumed the contours of a national environmental, political and economic crisis and began to be thought of as a clear exemplification of the well-known “work vs. health” dilemma.

4.5. The Socio-Economic and Employment Perspective

The singular demographic increase that affected the area of Taranto after World War II is closely related to the great demand of labor that the state-owned industry for a long time guaranteed. For several decades, the city has been a strong demographic attractor, even in the context of Southern Italy characterized by huge outgoing migration phenomena. When problems associated with the steel production started, in the eighties, the local economic fabric, to some extent asphyxiated by the so-called “monoculture of steel,” failed to compensate the tendency for industrial jobs to shrink. The most recent recognition of the territory as Complex Industrial Crisis area (law 171/2012) has only certified a consolidated critical situation.

5. Analysis and Discussion

In this Section, we used the methodology and data described in Section 3 to calculate the composite indexes ADMI and AMPI and analyze the case of Taranto through the lens of BESdT. Results, reported in Tables A1–A4 (Appendix A) are presented and discussed based on the five perspectives reported in Section 4.

5.1. The Landscape and Urbanistic Perspective

In relation to the Landscape and Cultural heritage domain, Taranto shows a particularly low AMPI compared to the rest of Puglia (Appendix A, Table A4). The negative results concerning Density and Relevance of Museum Heritage (09PAE002) and Diffusion

of touristic farmhouses (09PAE008) are consistent with the situation depicted in [60]. To this regard, it is confirmed the negative effect that the environmental pollution and the impoverishment of the landscape described in Section 4.1 had on tourism development and the enhancement of the local archaeological and cultural heritage. Such an effect is indeed well known and documented [61].

As for urban planning, the uncontrolled and chaotic development described in [52] is reflected, to some extent, in the particularly negative results for Density of Historic Gardens (09PAE009): during the XX century, many green areas in the surroundings of the city, that—as mentioned—has a long history, were destroyed to allow popular suburbs being built. The density of historic gardens in Taranto is six times lower than the Italian average [62].

5.2. The Environmental Perspective

For the Environment domain, AMPI ranks Taranto as antepenult among the provinces in Puglia (Appendix A, Table A4). The presence of environmental problems in Taranto is confirmed. However, it is important to underline that the Apulian reference time series as well as all the Apulian provinces register an all zero time series regarding the indicator Urban air quality—PM 10 (10AMB005), making the inclusion of that indicator uninfluential. Furthermore, Quality of urban air—PM 10 does not take into account the nature of the detected particulate. In Taranto almost all the airborne particulate comes from the industrial sector rather than domestic heating, transport or agricultural activities [63]: then it would be necessary to evaluate its actual composition, which BESdT indicators leave undetected.

As for the analysis of specific indicators (Appendix A, Table A2), the province performs extremely negatively with regard to Allocation of waste to landfills (10AMB004), Energy from renewable sources (10AMB016) and Soil Sealing (10AMB018). Taranto's energy dependence on non-renewable sources could be associated to the persistence of heavy industry sectors historically linked to the use of fossil fuels. Results for Public green appears to be countertrend. Positive results for that indicator, apparently inconsistent with those associated to Density of Historic Gardens (Landscape and Cultural Heritage domain), could depend on the dilution on the entire province (that also include a large green area in the northern part) that could obscure the extreme criticality of the environmental problems. It is also important to emphasize that none of the indicators of the Environment domain is able to directly capture the specificities of the environmental crisis in Taranto. For example, none of the indicators investigates soil pollutants, although these have generated relevant side effects also in terms of foreclosing of primary economic activities, like sheep farming which is currently forbidden in an area of 20 km around the steel plant [64].

5.3. The Health Perspective

The extremely critical situation that emerges from the epidemiological investigations described in Section 4.3 reflects into the negative performance of the province in relation to BESdT Health domain. As expected, in this domain, based on AMPI, Taranto ranks the worst province in Puglia (Appendix A Table A4).

But, surprisingly, the analysis on single indicators, carried on by considering the whole time series, seems not to reflect any particularly critical situation. More specifically (Appendix A, Table A2), Taranto shows performance roughly in line with those of Puglia in relation to Life expectancy at birth (01SAL001) and Infant mortality (01SAL004), whereas the only indicator with slightly negative performance is Mortality due to tumor (20–64 years) (01SAL006).

With respect to the latter, it is necessary a proper in-depth analysis: the image recorded by BESdT with regard to the oncological incidence might seem inconsistent with the severe epidemiological picture described in [37]. As discussed by the ISTAT Scientific Committee for Well-being assessment [65], the mortality indicator for cancer is inserted in the BESdT as a proxy for avoidable mortality. In particular, BESdT inserts Mortality due to tumor (20–64 years) in the Health domain to detect potentially avoidable deaths achievable

through better primary and secondary prevention. Cancer that is etiologically linked to environmental pollution can be hardly considered as avoidable by implementing more or less radical changes in personal lifestyle other than monitoring and controlling health (secondary prevention). In this sense, in the sites wherein environmental pollution is severe, the indicator would lose its effectiveness as a proxy function of the avoidable mortality and not be really representative of the burden that the cancer disease generates on the population. Additionally, BESdT indicators do not make any distinction among tumor types: the excessive level of aggregation does not allow any critical issue related to specific cancer sites to be detected.

None of the other indicators included in the Health domain is able to record the epidemiological impacts directly generated by the pollution in Taranto. It should also be noted that no indicator is representative of the incidence of oncological pathologies in the 0–19 age group, which is commonly considered as one of the sadly prominent effects of the environmental pollution. This results from assuming the cancer pathology as typical of adulthood. Such a consideration, generally valid, is particularly distortive in sites, such as Taranto, wherein excesses of cancer incidence are recorded in the pediatric, adolescent and juvenile sectors [37]. BESdT does not monitor such data.

5.4. The Political and Institutional Perspective

Data related to BESdT Politics and institutions domain show a situation of severe criticality for Taranto, which presents the lowest AMPI for the domain (Appendix A, Table A4).

The analysis of the entire time series for the indicators one at time (Appendix A, Table A2), however, shows performance in line with, if not better than, those of the other Apulian provinces for the indicators related to Voters turnout at the polls (06POL001), Municipalities collection capacity (06POL009P) and Women/young local administrator (06POL002P and 06POL003P). The sole performance relative to Overcrowding of prisons (06POL012P) is extremely negative, confirming what was found in [66].

5.5. The Socio-Economic and Employment Perspective

The picture described by indicators in the BESdT Economic Prosperity domain seems not to be consistent with the actual situation of Taranto. On the one hand, based on AMPI the province of Taranto ranks second in Apulia (Appendix A, Table A4). Such an apparently quite good performance largely depends on the high inertia of some indicators of this domain, for example, Pro-capita capital (04BEC007) and Average annual pension income per capita (04BEC005P), which are only slightly affected by changes occurred in the last years. The analysis of the individual indicators over the entire time series (Appendix A, Table A2) indeed seems to confirm a positive situation.

On the other hand, the analysis of the Work and work-life balance domain shows that Taranto performs overall worse than the regional average (Appendix A, Table A3). Appendix A (Table A2) shows a particularly negative result throughout the time series of Rate of fatal work accidents and permanent disability (03LAV007) caused by work-related accidents, which is associated to the high accident rate in the industrial sectors in Taranto. It would be interesting to analyze the relationship between accidents at work and the precarious employment situation, which is a distinctive element of Taranto [6]. Conversely, the positive performance carried out by the indicator Paid working days per year (03LAV004P) is a consequence of the modest seasonality of the work activities that prevail in the province.

For both the Education and training domain and Innovation, Research and Creativity domain, the results are extremely negative. The scarce propensity to innovate is probably a consequence of the specific kind of growth, usually state-driven, that has characterized the area. Despite the good results associated to young students' literacy and numeracy skills, the low propensity to get a university degree as well as the actual education and

training levels can be probably justified by the still high attraction level of the factory (the steel plant in particular).

Education and innovation are usually the leverages used to address crisis situations. Policy-makers should define policies to invert the trend and carefully monitor the effects.

From one side, the analysis confirms the importance for policy-makers to adopt BESdT to make more informed decisions, formulate policies able to address the real problems and monitor their effects. Different problems that affect the area of Taranto are clearly identified. On the other hand, BESdT seems not able to detect the crisis Taranto is living, in its complexity and severity.

The study of the case of Taranto let important problematics, at the moment not detectable by BESdT, to be identified. Most of them afflict different areas in Italy (and in the world). The analysis of a paradigmatic and extreme case facilitated their assessment. Issues such as urban sprawl, soil consumption, abandonment of historical centers (with crumbling old buildings and loss of the cultural heritage) are some of the aspects that could be taken into consideration within the Landscape and Cultural heritage domain. Economic prosperity should include the measurement of aspects related to for example, the amount of payroll subsidies. Also, as the case of Taranto showed, the rate of industrial concentration should be to some extent monitored because it impacts on the (economic) resiliency of the area. As to the Health and Environment domains, indicators ad hoc defined to monitor the peculiar problems of an area should be added to detect the specific problems.

6. Conclusions

In the study, we investigated whether and to what extent the well-being framework of *Benessere Equo e Sostenibile dei Territori* (BESdT, Equitable and Sustainable Territorial Well-being) is able to recognize a crisis area. We identified the province of Taranto (Italy), declared as both a National Priority Contaminated Site (NPCS) and a Complex Industrial Crisis area (CIC), as a paradigmatic and extreme case of crisis area and adopted the methodology of the single case approach to address our research question.

Two aggregate indexes were adopted to investigate the effectiveness of BESdT in identifying a crisis area. The first index, called Adjusted Differences Mean Index (ADMI), was ad hoc developed for this study. ADMI examines the historical series of a province by analyzing every BES indicator and comparing it with the homologous value of the region wherein the area is located. That was done in the attempt to reduce the impact of a specific region on its provinces (by considering that a province located in a more prosperous area of the country tends to perform better than a province in a disadvantaged one). The second index is Adjusted Mazziotta-Pareto Index (AMPI) which, as discussed in [9], aggregates the values assumed by the different indicators of a given domain. Even in this case, the Region wherein the province is located is taken as a reference to calculate the aggregate indicator.

This paper shows that BESdT is able to describe an area which is poor or deficient in terms of well-being. Indeed, BESdT detects many problems that affects the area of Taranto, which is not surprising given that the framework was developed right for this aim. However, it seems that the framework is not able to detect the serious criticalities that distress the area. Even in the presence of a full-blown crisis, the problematic situation does not always arise, neither at the level of single indicators nor at the level of entire domains. The possible reasons may be several. A first explanations deals with the available data: in some cases, data are not available or lack adequate historical series. Such a problem is discussed for example in [21] and in [22]. It should also be emphasized that not all the indicators are appropriate to describe the peculiarities of a crisis area. For some peculiarities to emerge, more specific indicators would be needed, for example, in the case of the Environment domain, for which the monitoring of pollution indicators strictly related with the specific polluting sources would be needed. Also, the exposure to specific pollutants may reverberate in a greater morbidity or mortality due to a specific pathology. Yet, the problem does not appear if Health domain indicators are associated with a whole family of pathologies (e.g., in some cases it would be necessary to disaggregate

Mortality due to tumor indicator by etiology or anatomical cancer site in order to frame the epidemiological situation of a certain area). A third possible explanation is related to the granularity of the available data: the provincial scale is not always suitable to isolate geographic areas affected by crisis conditions. The crisis may be characterized by a sub-provincial dimension or may concern areas belonging to adjacent provinces. Hence, when considering the values assumed by the indicators on a provincial scale, the risk of acute crisis camouflaging exists. Such consideration completes what already underlined in [21].

From a theoretical point of view, the paper emphasizes the importance of research on methods and indicators useful to detect criticalities by which fragile areas are affected and sheds some lights on some of the issues that should be further explored. It is therefore necessary, for scholars, a broader reflection on the indicators of territorial well-being useful to detect and monitor a crisis area. Further research would be needed to develop indicators to monitor the issues identified. Some of them should be developed from scratch, others might be derived from other existing well-being frameworks.

The paper also presents some policy implications. Policymakers, both at national and local level, should use BESdT to assess the well-being of the different areas so as to better calibrate and monitor the effect of their policies. They should also encourage and facilitate the creation of units (working as well-being observatories)—within the public administration, especially at the regional level—dedicated to (i) the definition of ad hoc indicators for the most fragile areas and (ii) the measurement and analysis of such indicators over time. The knowledge necessary to develop data driven policies is developed through inferences that, as emerged from our work, at present must rely on data coming from different data sources. Well-being observatories, capable of collecting well-being data at local scale, as well as analyzing them and disseminating results, would certainly be useful not only to policymakers—as they would support result-oriented and data-driven policies—but also to citizens.

Such an intervention would also contribute to address the problem of data scarcity at the local level, as well as promote a more efficient use of public resources and an easier control by third parties of the results obtained from the adopted policies. As mentioned in the Introduction, the multidimensional effects of the pandemic crisis is already considered by the Italian Government at the national level in its complexity and domain-dependent consequences [17]. The BESdT framework will be important to detect such effects on a local scale. Also, it could be investigated whether and to what extent well-being frameworks are able to assess the resilience of specific territories to the pandemic shock as well as support a more effective management of relief funds. The paper presents some limitations. It is necessary to specify that the choice of the method of aggregation inevitably affects each province performance [29]. Different aggregation indexes may lead to a slightly different picture of the same area. A second limit concerns the choice of the statistical units: environmental, social and/or economic crises rarely have well defined boundaries that correspond to the statistical-geographical entities for which data are available. In our study, we considered the province as a Local Crisis Area (NUTS3). However, within the province, NPC and CIC differ in nature, size and impact. Finally, it should be specified that the choice of comparing the province's data with those related to the nearest territories (e.g., those within the same region), on the one hand, avoid distortions due to any macro-territorial imbalance (e.g., North-South imbalance for Italy), yet, on the other hand, it may introduce other types of distortions, essentially due to phenomena of spatial autocorrelation.

The results are still preliminary and represent a first attempt to gain insights into the analyzed subject. Further efforts are needed to enhance the effectiveness of the proposed indexes and identify specific indicators to detect a crisis area. To this aim, the study will be carried out at a larger scale, by considering other Italian provinces characterized by a crisis, even if less critical than Taranto's.

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Appendix A

Table A1. List of BESdT indicators with unit of measurement, ISTAT code, polarity (correlation with well-being) and length of the time series associated.

Indicator (Clustered by Domain)	Unit of Measurement	Code	Polarity	Time Series Length
<i>Domain 1—Health</i>				
Life expectancy at birth	Average number of years	01SAL001	+	14
Infant mortality	Cases per 1000 live births	01SAL004	-	13
Road Traffic Accident Deaths (age 15–34)	Cases per 10,000 residents	01SAL005	-	14
Mortality due to tumor (age 20–64)	Cases per 10,000 residents	01SAL006	-	13
Mortality due to dementias and nervous system diseases (65+)	Cases per 10,000 residents	01SAL007	-	13
<i>Domain 2—Education and training</i>				
Persons with at least a diploma (age 25–64)	Percentages	02IST002	+	15
Graduates and other tertiary titles (25–39 anni)	Percentages	02IST003P	+	15
Transition to University	Percentages	02IST004	+	4
Neet (young people who do not study or work)	Percentages	02IST006	-	15
Participation in lifelong learning	Percentages	02IST007	+	15
Literacy skills of students	Percentages	02IST008P	+	1
Numeracy skills of students	Percentages	02IST009P	+	1
<i>Domain 3—Work and Worklife Balance</i>				
Employment rate (age 20–64)	Percentages	03LAV001	+	15
Rate of non-participation in work	Percentages	03LAV002	-	15
Rate of fatal accident and permanent disability	Cases per 10,000 workers	03LAV007	-	9
Rate of youth employment (age 15–29)	Percentages	03LAV003P	+	15
Rate of youth non-participation in work (age 15–29)	Percentages	03LAV006P	-	15
Paid working days per year (employees)	Percentages	03LAV004P	+	9
<i>Domain 4—Economic Prosperity</i>				
Average income per head	Euro	04BEC001P	+	5
Average annual income per employee	Euro	04BEC002P	+	9
Average annual pension income per capita	Euro	04BEC005P	+	7
Pensioners with low pension	Percentages	04BEC006P	-	7
Capital per capita	Euro	04BEC007P	+	5
Rate of bank loans non-performing entries to households	Percentages	04BEC009P	-	14
<i>Domain 5—Social Relationships</i>				
Non profit organizations	Organizations per 10,000 residents	05REL008	+	1
Accessible Schools	Percentages	05REL007P	+	1
<i>Domain 6—Politics and Institutions</i>				
Voter turnout (European Elections)	Percentages	06POL001	+	3
Voter turnout (Regional Elections)	Percentages	06POL001P	+	3
Female city managers	Percentages	06POL002P	+	15
Under 40 city managers	Percentages	06POL003P	+	15
Detention centres crowding	Percentages	06POL012P	-	15
Municipalities: collection capacity	Percentages	06POL009P	+	10
Provincial Administrations: collection capacity	Percentages	06POL007P	+	10

Table A1. Cont.

Indicator (Clustered by Domain)	Unit of Measurement	Code	Polarity	Time Series Length
<i>Domain 7—Security</i>				
Murders	Cases per 100,000 residents	07SIC001P	-	14
Other reported violent crimes	Cases per 100,000 residents	07SIC002P	-	14
Reported widespread crimes	Cases per 100,000 residents	07SIC003P	-	10
Road mortality in suburban areas	Percentages	07SIC008P	-	14
<i>Domain 8—Landscape and Cultural heritage</i>				
Density and Relevance of Museums Heritage	Standardized rate per 100 km ²	09PAE002	+	2
Diffusion of touristic farmhouses	Standardized rate per 100 km ²	09PAE008	+	8
Density of Historic Garden	Standardized rate per 100 m ²	09PAE009	+	7
<i>Domain 9—Environment</i>				
Losses from municipal water supply	Percentages	10AMB003	-	1
Disposal of municipal waste to landfill	Percentages	10AMB004	-	14
Urban air quality—PM10	Percentages	10AMB005	-	5
Urban air quality—Nitrogen Dioxide	Percentages	10AMB006	-	5
Urban green spaces	m ² per resident	10AMB008	+	7
Energy from renewable sources	Percentages	10AMB016	+	5
Separate collection of municipal waste	Percentages	10AMB017	+	14
Soil sealing	Percentages	10AMB018	-	2
<i>Domain 10—Innovation, research and creativity</i>				
Patenting propension	Patents per 1,000,000 residents	11RIC002	+	13
Employees in cultural companies	Employees per 1000 graduate residents	11RIC007	+	9
Mobility of young talian graduates (age 25–39)	Percentages	11RIC004P	+	6
<i>Domain 11—Quality of Services</i>				
Children who have benefited from municipal childcare services	Percentages	12SER002	+	13
Irregularities in electricity supply	Average number of irregularities per user	12SER007	-	13
Seats-km offered by local public transport	Seats-km per resident	12SER008	+	13
Hospital emigration to another region	Percentages	12SER001P	-	13

Table A2. Results obtained by adopting ADMI. The colors used correspond to the coding described in Table A3. Not available values are due to: * time series unavailable (less than two samples); ** constant reference time series (standard deviation is null).

Code	Indicator	ADMI Score Intervals
1—Health (domain mean)		
		(3.2)
01SAL001	Life expectancy at birth	3
01SAL004	Infant mortality	3
01SAL005	Road Traffic Accident Deaths (age 15–34)	4
01SAL006	Mortality due to tumor (age 20–64)	2
01SAL007	Mortality due to dementias and nervous system diseases (65+)	4
2—Education and training		
		(2.6)
02IST002	Persons with at least a diploma (age 25–64)	2
02IST003P	Graduates and other tertiary titles (25–39 anni)	2

Table A2. Cont.

Code	Indicator	ADMI Score Intervals
02IST004	Transition to University	1
02IST006	Neet (young people who do not study or work)	2
02IST007	Participation in lifelong learning	1
02IST008P	Literacy skills of students	5
02IST009P	Numeracy skills of students	5
	3—Work and Worklife Balance	(3.0)
03LAV001	Employment rate(age 20–64)	2
03LAV002	Rate of non-participation in work	4
03LAV007	Rate of fatal accident and permanent disability	1
03LAV003P	Rate of youth employment (age 15–29)	3
03LAV006P	Rate of youth non-participation in work (age 15–29)	3
03LAV004P	Paid working days per year (employees)	5
	4—Economic Prosperity	(4.5)
04BEC001P	Average income per head	5
04BEC002P	Average annual income per employee	5
04BEC005P	Average annual pension income per capita	5
04BEC006P	Pensioners with low pension	5
04BEC007P	Capital per capita	5
04BEC009P	Rate of bank loans non-performing entries to households	2
	5—Social Relationships	(2.0)
05REL008	Non-profit organizations	2
05REL007P	Accessible Schools	*
	6—Politics and Institutions	(3.1)
06POL001	Voter turnout (European Elections)	3
06POL001P	Voter turnout (Regional Elections)	3
06POL002P	Female city managers	3
06POL003P	Under 40 city managers	4
06POL012P	Detention centers crowding	1
06POL009P	Municipalities: collection capacity	3
06POL007P	Provincial Administrations: collection capacity	5
	7—Security	(4.5)
07SIC001P	Murders	5
07SIC002P	Other reported violent crimes	5
07SIC003P	Reported widespread crimes	5
07SIC008P	Road mortality in suburban areas	3
	8—Landscape and Cultural heritage	(1.3)
09PAE002	Density and Relevance of Museums Heritage	1
09PAE008	Diffusion of touristic farmhouses	2
09PAE009	Density of Historic Garden	1
	9—Environment	(2.2)
10AMB003	Losses from municipal water supply	*
10AMB004	Disposal of municipal waste to landfill	1
10AMB005	Urban air quality—PM10	**
10AMB006	Urban air quality—Nitrogen Dioxide	3
10AMB008	Urban green spaces	5
10AMB016	Energy from renewable sources	1
10AMB017	Separate collection of municipal waste	2
10AMB018	Soil sealing	1

Table A2. Cont.

Code	Indicator	ADMI Score Intervals
	10—Innovation, research and creativity	(1)
11RIC002	Patenting propension	1
11RIC007	Employees in cultural companies	1
11RIC004P	Mobility of young Italian graduates (age 25–39)	1
	11—Quality of Services	(3)
12SER002	Children who have benefited from municipal childcare services	5
12SER007	Irregularities in electricity supply	1
12SER008	Seats-km offered by local public transport	5
12SER001P	Hospital emigration to another region	1

Table A3. Five equally spaced numerical intervals, associated with five attendant colors, used to facilitate the reading/interpretation of results reported in Table A2.

ε_{ij}^h	Traffic Light Coding	Digit Coding
$\varepsilon_{ij}^h \leq -1$	Red	1
$-1 < \varepsilon_{ij}^h < -0.33$	Orange	2
$-0.33 \leq \varepsilon_{ij}^h \leq 0.33$	Yellow	3
$0.33 < \varepsilon_{ij}^h < 1$	Clear green	4
$\varepsilon_{ij}^h \geq 1$	Dark green	5

Table A4. Results obtained adopting AMPI (years 2015–2017) for Taranto and the other Apulian provinces. Colors gradient (red-yellow-green) was applied at each domain scores subgroup.

Region (NUTS2)	Puglia					
Province (NUTS3)	Bari	Brindisi	Lecce	BAT ⁷	Taranto	Foggia
1—Health	104.3	88.1	96.9	94.4	86.0	92.2
2—Education and training ¹	116.3	91.0	106.0	73.5	89.9	72.5
3—Work and Worklife Balance	116.1	103.5	90.4	98.4	93.1	67.8
4—Economic Prosperity	118.4	92.3	81.0	77.8	103.3	78.0
5—Social Relationships ²	106.8	98.6	104.7	76.4	98.9	76.1
6—Politics and Institutions ³	98.8	96.1	101.8	83.6	74.2	96.7
7—Security	85.2	113.2	118.9	96.7	110.8	66.1
8—Landscape and Cultural heritage ⁴	98.0	110.1	109.5	107.4	92.6	91.5
9—Environment ⁵	86.6	108.6	89.5	106.0	90.2	109.5
10—Innovation, research and creativity ⁶	123.4	77.1	102.5	87.9	69.7	73.5
11—Quality of Services	110.8	97.0	100.5	90.1	91.7	75.5
Mean (all domains)	105.9	97.8	100.1	90.2	90.9	81.8
Mean (domains 1,3,4,6,8,9)	103.7	99.8	94.8	94.6	89.9	89.3

¹ Indicators 02IST008P and 02IST009P were excluded from the computation due to lack of data. ² Data for indicator 05REL008 year 2015 are missing. Indicator 05REL007P is included considering the only available datapoint, referring to the year 2019. ³ Indicators 06POL001 and 06POL001P refer to triennial elections, last three available data were used. ⁴ Data for the indicator 09PAE008 year 2016 is missing and was not included in the computation. ⁵ Data for the indicator 10AMB003 year 2016 and 2017 is missing and was not included in the computation. ⁶ Data for the indicator 11RIC002 year 2017 is missing and was not included in the computation. ⁷ Data for BAT province 02IST004 (2015, 2016, 2017), 03LAV004P (2015, 2016, 2017), 04BEC002P (2015, 2016, 2017), 06POL007P (2015, 2017) is missing and was not included in the computation.

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