

## XXVIII CONFERENZA ITALIANA DI SCIENZE REGIONALI

### LA MISURA DEL LIVELLO DI DEPRESSIONE DELLE COMUNITÀ URBANE MINORI SVANTAGGIATE: UN APPROCCIO METODOLOGICO

### A MEASURE OF THE DEPRIVATION LEVEL IN MINOR URBAN COMMUNITIES: A METHODOLOGICAL APPROACH

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#### **ABSTRACT**

This work aims to give a methodological tool to explore, rate and improve the different policies for sustainable development in minor deprived communities. The focus is on the measurability of the level of depression in minor communities, through a process able to translate the idea of “deprivation” in parametrical conditions. The methodological approach aims to reach a classification of the communities linked to the rate of deprivation, in different scales (from a national level to the regional or provincial). To do this some measurable quantities (indicators) were found, numerical and comparable, which describe the condition of deprivation, and the built-up analysis model has been statistically set up on a “population” of all Italian municipalities at first, then only on the municipalities in Lombardia, physically, socially and economically more confined.

The methodology can be used both in a synchronic analysis to define deprived situations in a specified moment, and in a diachronic analysis to focus on the communities which evolved in time as for the level of depression.

## **1 INTRODUCTION**

This study is part of the COST Action C27, “Sustainable Development Policies For Minor Deprived Urban Communities”, which tackles the problem of minor deprived communities’ protection and rehabilitation and is geared to sustainable development. Its concrete objectives include “analysing the range of threats for sustainable development faced by small communities and rural areas and the planning tools developed for them”, and “using suitable indicators and parameters (planning tools, specific technical improvements) to analyse and assess the best practice case studies already implemented in participating countries to explore the transferability of these success stories to different institutional contexts”.

An analysis concerning minor deprived urban communities, with positive and consistent planning results, has to deal with a deep and framed knowledge of the specific settings and of the territorial and socio-economic context in which they grow and develop. The aim of this work is to suggest a method to help identify deprived areas and understand their basic conditions, as well as carry out further analyses and supervise their development; to do this sets of indicators are used belonging to evaluation matrixes at different levels of elaboration: indicators also allow a comparison of different case studies.

Some applications of the method are presented for Italy: in this phase, indicators and parameters are adapted so they have meaning and function in the specific territorial context.

Finally, we shall present a possible categorization of the case studies found thus far in order to highlight the characteristic features of deprived communities and links with the higher level administrations to which they belong (district, province, region, nation, etc.).

The aim is to identify best practice case studies whose analysis can highlight interesting applications of policies for sustainable development, which can then be proposed to be applied to similar cases, it is essential to measure the lexical definition of “minor deprived urban communities”, taking into consideration, amongst other things, the differences, which will surely emerge from a comparison between European contexts, which are not homogeneous from a socio-economic and geographical point of view.

## **2 A METHODOLOGICAL APPROACH TO DEMOGRAPHIC AND SOCIO-ECONOMICAL RESEARCH ON DIFFERENT SCALES**

The following methodological approach aims to reach a classification, according to the level of depression, of the municipalities, identified as communities of reference, on different scales (from national to regional or provincial).

To do this it is necessary to introduce measurable quantities, which describe the level of depression in numerical and comparable terms, in other words indicators that best quantify this concept.

It is believed that the levels of studying the socio-economic analyses must be diversified according to the territorial scale of reference, with specific sets of indicators.

Consequently, on a national level, indicators will be used that require official data, which is immediately available, while on a regional or provincial level reference will also be made to indicators, which might require more effort in terms of retrieving and processing the raw data. The proposed method presupposes that the levels of analysis are carried out in cascade, starting with an initial identification of depressed municipalities, which will be assigned the subsequent level of more in-depth analysis.

The indicators cannot be compared immediately, both because of the different physical meaning they have, which also translates into different units of measurement, and because of the different intervals of values that these indicators may assume. Therefore, an operation of normalization is required.

Consequently, the operation of normalization makes it possible to combine the indicators with an assessment matrix, in which a different weight may be attributed to each indicator depending on its importance.

The final classification derives from the assessment matrix.

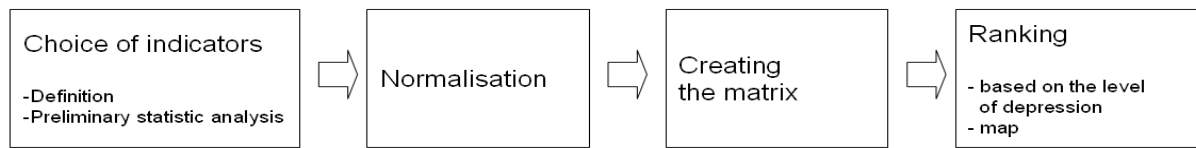


Figure 1 Schematization of the classification method of the level of depression

### 3 FIRST IMPLEMENTATION OF THE METHODOLOGY

#### 3.1 The Choice of the indicators

Four indicators were identified for the first level (national), which take into consideration the socio-economic and demographic structure of the areas in question.

*I1 – Change in population, in a  $\Delta t$  time frame*

Defined as the increase in population in the chosen period of time, compared to the resident population at the start of the time interval.

$$I1 = \frac{P_{t+\Delta t} - P_t}{P_t}$$

### *I2 – Population density*

Defined by the relationship between the resident population P and the regional expansion E of the municipality.

$$I2 = \frac{P}{E} \text{ [inhab/km}^2\text{]}$$

### *I3 – Old age rate*

Expressed by the relationship between the population aged over 65 and the population under 15.

$$I3 = \frac{P_{>65 \text{ years}}}{P_{<14 \text{ years}}}$$

### *I4 – Number of old people per child*

Determined by the relationship between the population >65 and the population <5.

$$I4 = \frac{P_{>65 \text{ years}}}{P_{0-6 \text{ years}}}$$

These indicators were chosen for specific reasons, which are dictated by an analysis of the minor urban communities' evolutionary trend and problems.

One of the main problems that affect these municipalities is depopulation, which leads the inhabitants to move away to areas where there is a greater supply of services, a greater level of accessibility and greater employment opportunities.

The indicators chosen also provide information about the generational turnover. What is expected for disadvantaged municipalities is a negative evolution of the number of inhabitants (i.e. the area being abandoned) over a time frame, which may vary depending on the context being analysed.

It should be noted that, for the area density indicator, the idea of a small, depressed urban community is closely related, at least in the meaning that is to be given in this context, to the rural environment. From this it is possible to deduce that the use of the indicator for the population density may prove particularly useful. In fact, a low density generally indicates a scarcely inhabited area, and its use in the analysis consequently makes it possible to identify minor rural centres, discarding the large urban centres and assessing the presence of sprawl phenomena.

The last two indicators relate to the social structure of the urban community. They regard the age composition of the population living in the municipality. Both measure the size of the elderly population and as they are closely related, they are considered in the analysis with halved values.

This type of indicator is deeply related both to the social organisation and services and to the area's economy.

Three more indicators were chosen for the second level of analysis (regional and provincial), besides the previous ones, whose creation requires data that is not quite so easily available as the data required for the first level.

#### *I5 –Rate of Dependence*

Expressed by the reverse of the relationship between the population aged between 15 and 64 years old inclusive and the rest of the population.

$$I5 = \frac{P_{0-14\text{ years}} + P_{>65\text{ years}}}{P_{15-64\text{ years}}}$$

#### *I6 - Annual budget*

This indicator considers the difference between the municipal administration's income and expenses for the current year, compared to the arithmetic average between income and expenses for the same year.

$$I6 = \frac{\frac{E - S}{E + S}}{2}$$

#### *I7 – Average time to access the chief town of the Province*

*I7 = time \_to – access [min.]*

This is the average time it takes to travel along the fastest road that connects the chief inhabited centre of the municipality in question to the chief town of the province. The means of transport considered is a utilitarian car.

We can see how the rate of dependence is closely related to the municipality's economic and social structure. In fact, it represents the number of inhabitants who are unemployed compared to those who are employed, in other words those who depend on the community for support and those who need sociological services, such as for example schools and homes for the elderly. A high figure represents a significant financial burden on the municipality. This figure is probably high in depressed communities because of the increased number of older people living in the municipality.

The second indicator concerns the annual budget and considers the amount of the municipality's income and expenses: consequently it provides information about the municipality's economic situation. It is also useful for gaining an idea of how much the administration has at its disposal for a subsequent assessment of what type of good practices it can implement.

Finally, the indicator that concerns the average time it takes to access the chief town of the Province makes it possible to see the level of accessibility of the area's services. It supposes that the chief town is the centre where most of the main and secondary services are located; the level of temporal accessibility is related to the level municipality's isolation, and consequently influences its state of depression. The more isolated a municipality is, the more likely it is that the population will emigrate to the chief town, where services are guaranteed

and more accessible, increasing the phenomenon of abandoning the area and increasing its state of “depression”.

### 3.2 Normalization, creation of the matrix and ranking

A preliminary statistical analysis was carried out for each of the chosen indicators (on the basis of sets of regional and national data), to allow any existing relationships between the indicators to be highlighted.

Moreover, it is necessary to identify the probability distribution (usually normal or log-normal) to determine the method for calculating the normalised variable  $Z$  (Montgomery, Runger, Hubele, 2004 and Vicario, Levi, 1997)

Before proceeding with aggregating the normalized indicators in the assessment matrix, it is worth attributing a different  $p_i$  weight to each normalized indicator depending on its importance in relation to the analysis carried out and then obtain a column vector from the matrix by aggregating the data of each municipality.

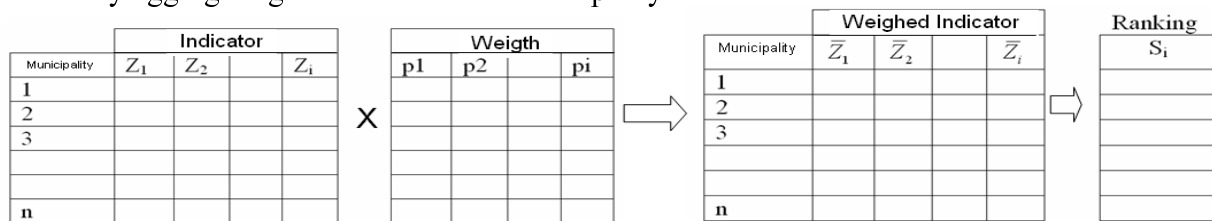


Figure 2 From normalized indicators to ranking

For further details see (Tiboni, Fumagalli, Garlanda, 2007).

### 3.3 Applying the method to Italy and Lombardia

The previously illustrated method was applied nationally and regionally, choosing the following values for the weights to be attributed to each indicator:

	<b>First Level Indicators</b>	<b>Weight</b>
Z1	Change in population, in a $\Delta t$ time frame	0,3
Z2	Population density	0,5
Z3	Old age rate	0,1
Z4	Number of old people per child	0,1

	<b>Second Level Indicators</b>	<b>Weight</b>
Z5	Rate of Dependence	0,2
Z6	Annual budget	0,3
Z7	Average time to access the chief town of the Province	0,5

For the first level of analysis, the indicator which is attributed greater importance in defining minor urban communities in disadvantaged areas is density, with the aim of excluding densely populated areas: large cities or periurban areas are of no interest to the study in question, and, with them, represent a continuum from a social and town planning point of view.

At the same time, areas must also be considered, which have suffered a considerable population loss, consequently a relatively high weight is attributed to changes in population, but lower than before.

From the statistical analysis, old age rate and the number of old people by the number of children proved to be closely related, which also emerges just by observing the definitions. Instead of eliminating one of the two from the analysis, it was decided to keep them both, but consider them with a reduced weight.

For the second level of the analysis study, the key indicator used to measure the level of depression of a community is the time it takes to access the chief town of the province, which is attributed the highest value. This shows the municipalities whose populations will have more difficulty than the others in using the services in the chief town.

The second disadvantage factor taken into consideration, both the consequence of an already difficult situation and the cause of further problems, is the low income that must meet a high number of costs by the administration, which means high figures for the annual budget indicator.

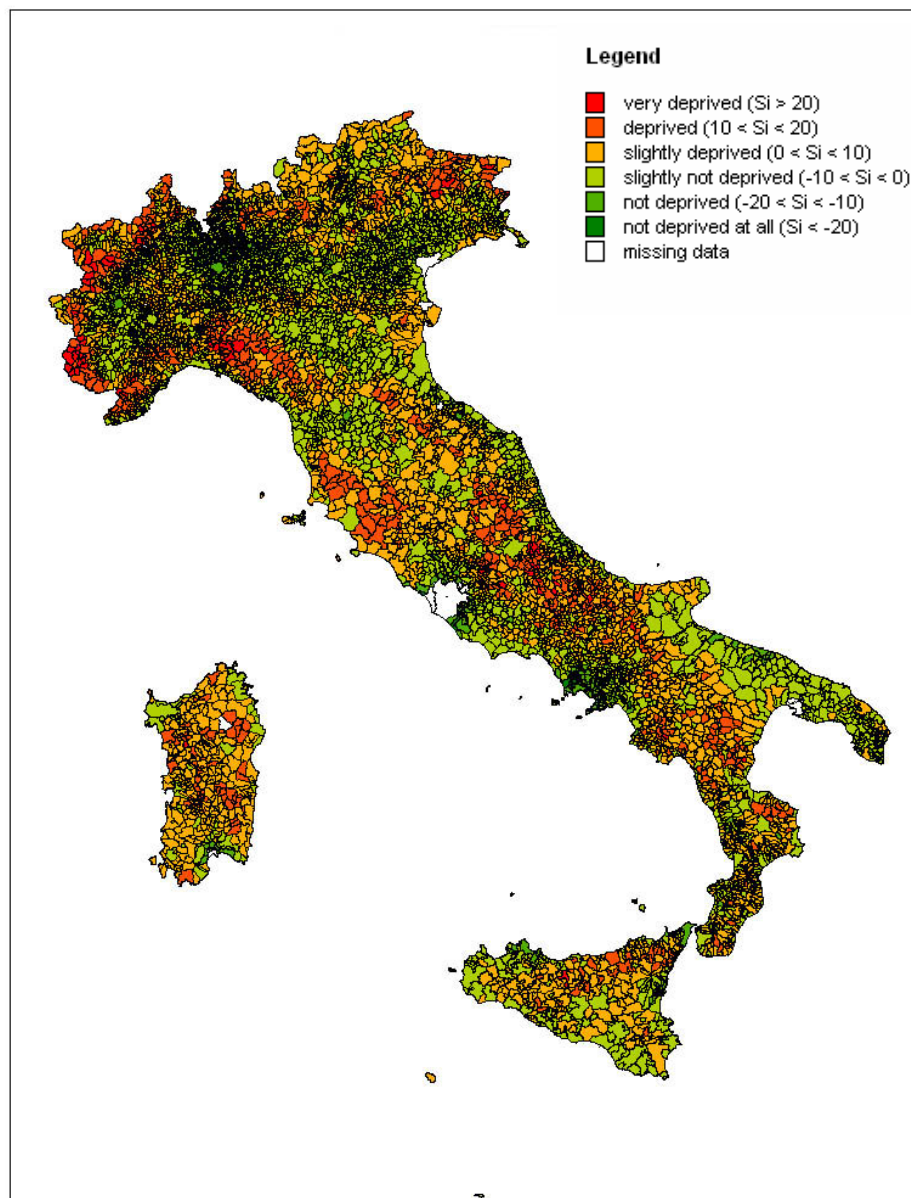
Finally, a lower value is attributed to the indicator of dependence, which, for the purposes of the analysis to be carried out, may be more of a social than economic type completion to the information contained in the previous indicator: a higher percentage of young people and old people in the population in relation to those of a working age can make it necessary for the administration to increase its costs for social services for the elderly and children and weigh on the budget.

### *3.4 National results*

A series of municipalities emerge from a first analysis carried out on a national level, which best satisfy the definition of “minor deprived urban communities” (in red on the thematic map) according to the indicators chosen. In many cases they are situated in mountain areas, in the Alps, in the Apennines or on the islands, away from the big cities. It is interesting to note how areas can be identified where the most disadvantaged minor communities are amassed, the most important of which is in east Piedmont, all along the border with France, into Liguria, and on the northernmost reliefs of the Tuscan-Emilian Apennines. Other less clearly identified areas, which, on the other hand, see extremely disadvantaged municipalities next to others that correspond less to the definition, can be found in Lazio and along the Apennines of

Umbria and Molise. A number of areas can be identified in the south, in Calabria and Sicily. Several critical situations can be found in Sardinia, in an averagely disadvantaged context. Next to these more easily identifiable areas, we also find isolated cases of “deprived” communities in areas, which, on the contrary, seem not to be deprived, for example Campodimele in Lazio or Talla in Tuscany, cases that would probably be interesting to study, to identify the causes of the disadvantaged situation; similarly there are areas, which are not at all disadvantaged surrounded by municipalities, which, on the contrary, are disadvantaged: see for example the case of the Aosta Valley, where the whole homogenous central area is surrounded by municipalities (also situated on the national border), which are relatively or extremely disadvantaged.

It must be noted that the disadvantaged situations in the border areas, in the northern Alps, can probably be attributed to the low area density, an indicator which was attributed an important value.





*Figure 3* Italian municipalities classified according to Si – Year 2001 (Source: ISTAT data processing, census of the population and houses 1991, 2001.)

The model of analysis used here was adapted from a statistical point of view to a “population” comprising all of the municipalities in Italy. No differences were made in considering a disadvantaged municipality in the North of Italy, in the Centre and in the South or on the Islands. However, the great economic, social and geographical differences in the country require a more circumscribed analysis, which involves a more homogeneous area compared to the parameters of interest: we only have to consider the fact that if the “depopulation” of minor centres and the increase in the percentage of old people in the North are phenomena that are currently taking place, minor communities in disadvantaged areas in the South can nonetheless have a high percentage of young people but be subject to problems relating to, for example, a lack of easily accessible services, a low employment rate, etc..

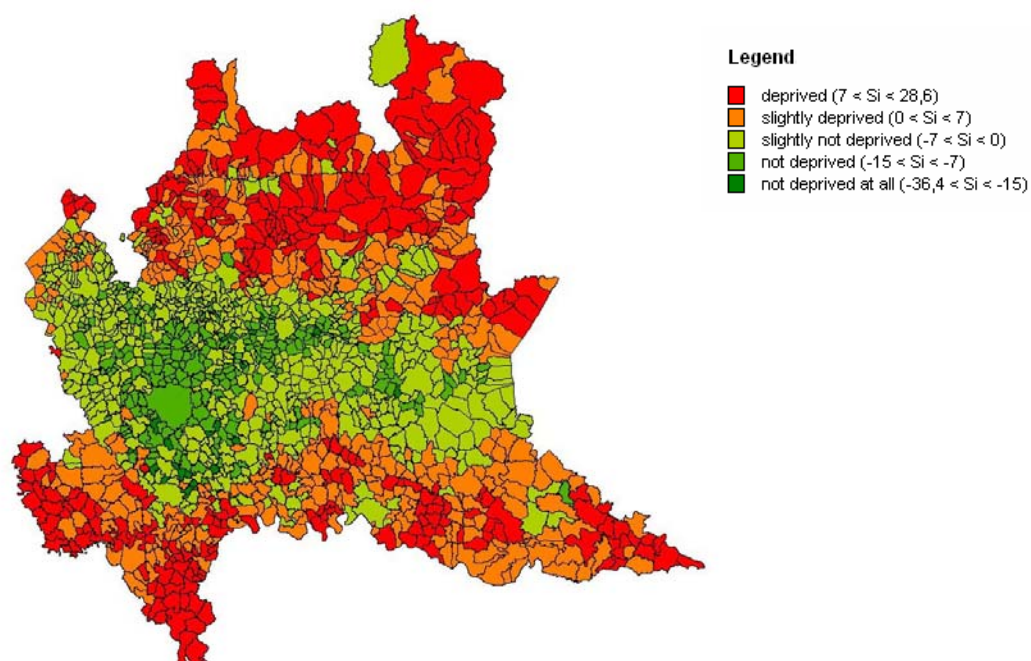
In view of the fact that the adjustment made was “statistical”, in other words with the values of reference of the indicators based on average and standard deviation of the “population” of reference data, it is better to circumscribe the analysis to a less far-reaching, and more homogeneous context, but with a range of elements that are significant from a statistical point of view.

An ideal context might be the region. Moreover, the weight of each indicator will have to be adapted according to the regional context of reference.

### *3.5 Regional results. Lombardia*

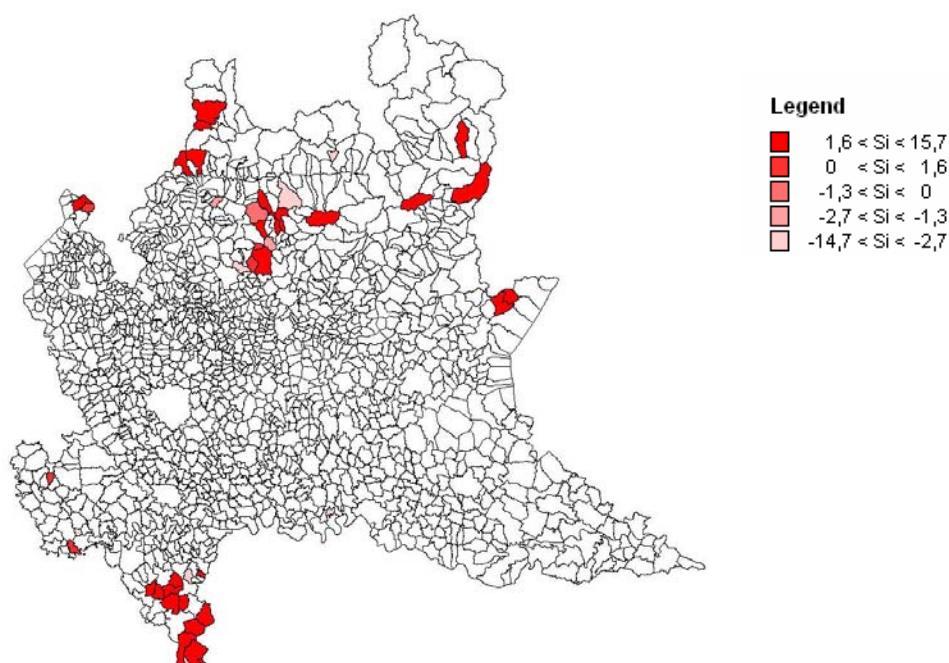
The second step was to analyse only the municipalities in the region of Lombardia, proceeding with a statistical re-adjustment of the indicators, which were normalized in relation to the average and the standard deviation of the new statistical population of reference.

In this case too, the areas identified as the most disadvantaged were those furthest away from the big cities, both in the area of the Alps, in the north, and in the area of the well-watered plain in the south. It is interesting to note how, especially in mountain communities, there are cases situated in disadvantaged areas, which present a less disadvantaged situation, for which it might prove beneficial to carry out an in-depth analysis to identify the reasons for this difference in relation to the geographical context: the fact that a municipality surrounded by “disadvantaged” municipalities is in a more flourishing socio-economic situation may be a sign of the administration applying good practices with regard to planning and management and, more generally running the area. This can constitute a method for identifying “virtuous” case studies, in which the application of good practices has led to a less disadvantaged situation in relation to their context.



*Figure 4* Municipalities in Lombardia classified according to the value of the assessment matrix – 2001 (Source: ISTAT data processing, census of the population and houses 1991, 2001.)

Municipalities were chosen from among those in Lombardia with the highest level of depression by applying the assessment matrix. The second level of analysis was applied to these 40 municipalities, obtaining a new classification.



*Figure 5* Second level classification of the 40 municipalities in Lombardia that were the most depressed in the first level classification – 2001 (Source: ISTAT data processing, census of the population and houses, 2001; Ministry of the budget and treasury, 1999.)

## 4 SECOND IMPLEMENTATION OF THE METHODOLOGY

The second implementation of this methodological approach tries to correct some imperfection found in the previous version, and it's developing through a collaboration between the Italian and Portuguese COST C27 working team in which different approaches has been compared.

In particular there are four main new features:

- Choice of group of indicators instead of specific indicators to make them fit in different context, i.e. different European countries,
- The preliminary statistical analysis is now lighter because such a careful analysis doesn't make the results much more precise;
- Some indicator has been changed to define better the economic and demographic size;
- Different and lighter normalization has been used to compare indicators and different sets of weights has been applied.

The main problem we faced with was that of availability of data for measuring the best indicators. There are several indicators which are really helpful to describe what is minor or deprived, but, as we have seen, the accessibility of data is often inadequate. The result that came out was that is not possible to use the same indicators among every country. The solution could be found in the setting up of groups of indicators which share approximately the same meaning and descriptive incisiveness. Among them it will be possible to choose the ones with the best availability of data in every specific country.

The new set of indicators is described in the following list:

*I1 - Population in the year 2001*

*I2 - Population density*

Defined by the relationship between the resident population P and the municipality regional expansion E.

$$I2 = \frac{P}{E} \text{ [inhab/m}^2\text{]}$$

*I3 - Revenue of Municipalities*

Expressed by the revenue of each municipality in a specific year.

*I4 - Change in population, in a  $\Delta t$  time frame*

Defined as the increase in population in the chosen period of time, compared to the resident population at the start time interval.

$$I4 = \frac{P_{t+\Delta t} - P_t}{P_t}$$

*I5 - Old age rate*

Expressed by the relationship between the population aged over 65 and the population under 14.

$$I5 = \frac{P_{>65\text{ years}}}{P_{<14\text{ years}}}$$

The first three indicators describe the condition of “minor” and the last two that of “deprived”.

As said before groups of indicator can be created in order to choose those with the most availability in data. Examples of groups are shown in the table below:

Migration index	}	First group of indicators sort in a decreasing order of relevance.
Change in population		
Purchasing power		
Revenue per capita		
	}	Second group of indicators sort in a decreasing order of relevance.
Old age rate		
Population educational level		

After choosing the set of indicators the same work of evaluation was implemented for both countries obtaining some consistent results which will be presented later on.

The main discussion was about the methods of normalization of the indicators and their application to this case study. Two kinds of normalization processes were applied to check how much they affected the results and to find the best one solution.

The first normalization was implemented according to the following formula:

$$n = \frac{x - \mu(x)}{\sigma(x)}$$

Where

n is the normalized variable

μ is the series average

σ is the series deviation standard

The second normalization was made according to the following formula:

$$\|x\| = \frac{x - x_{\min}}{x_{\max} - x_{\min}}$$

Where

$x_{\min}$  represent the minimum value of the series

$x_{\max}$  the maximum

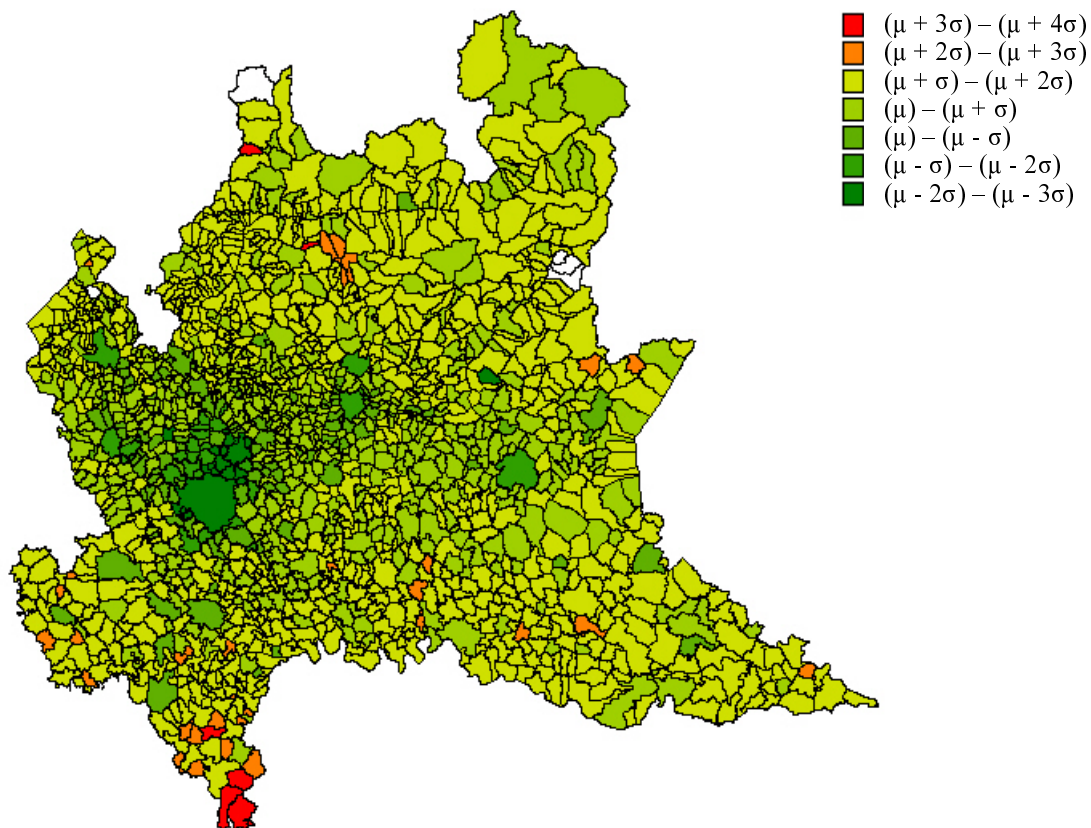
After the normalization process, weights were assign to every indicator. The following tables describe the two sets of weights applied to the Italian case:

	Indicator	Weight
11	Population in the year 2001	0.2
12	Change in population	0.3
13	Population density	0.5
14	Revenue of Municipalities	0.2
15	Old age rate	0.2

	Indicator	Weight
11	Population in the year 2001	0,25/2
12	Change in population	0,25
13	Population density	0,25
14	Revenue of Municipalities	0,25/2
15	Old age rate	0,25

Applying these two sets of weights it is possible to notice that the choice of weights has a great consequence in the final results (see *summary\_of\_results.ppt* attached). Due for this reason, a huge importance is to be given to this part of the methodology.

The classes of “deprivation” were chosen based on the standard deviation of the results obtaining, for the Italian case the following results:



*Figure. 6* Ranking of Municipalities based on the first normalization, first set of weights.

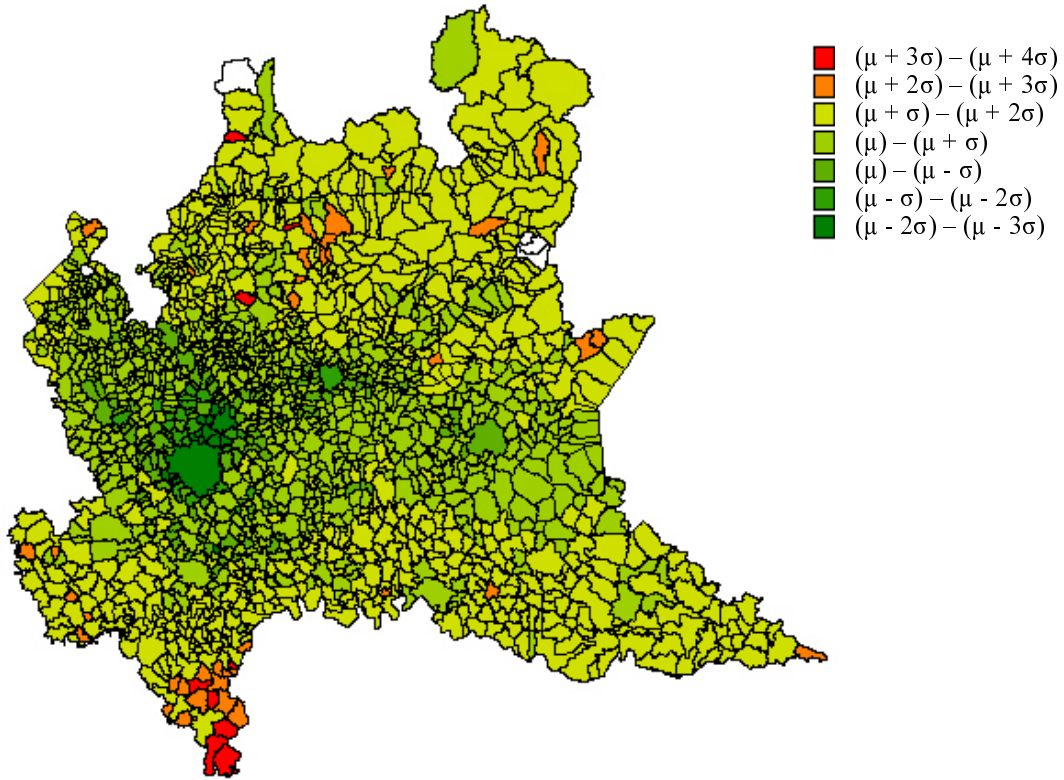


Figure. 7 Ranking of Municipalities based on the second normalization, first set of weights.

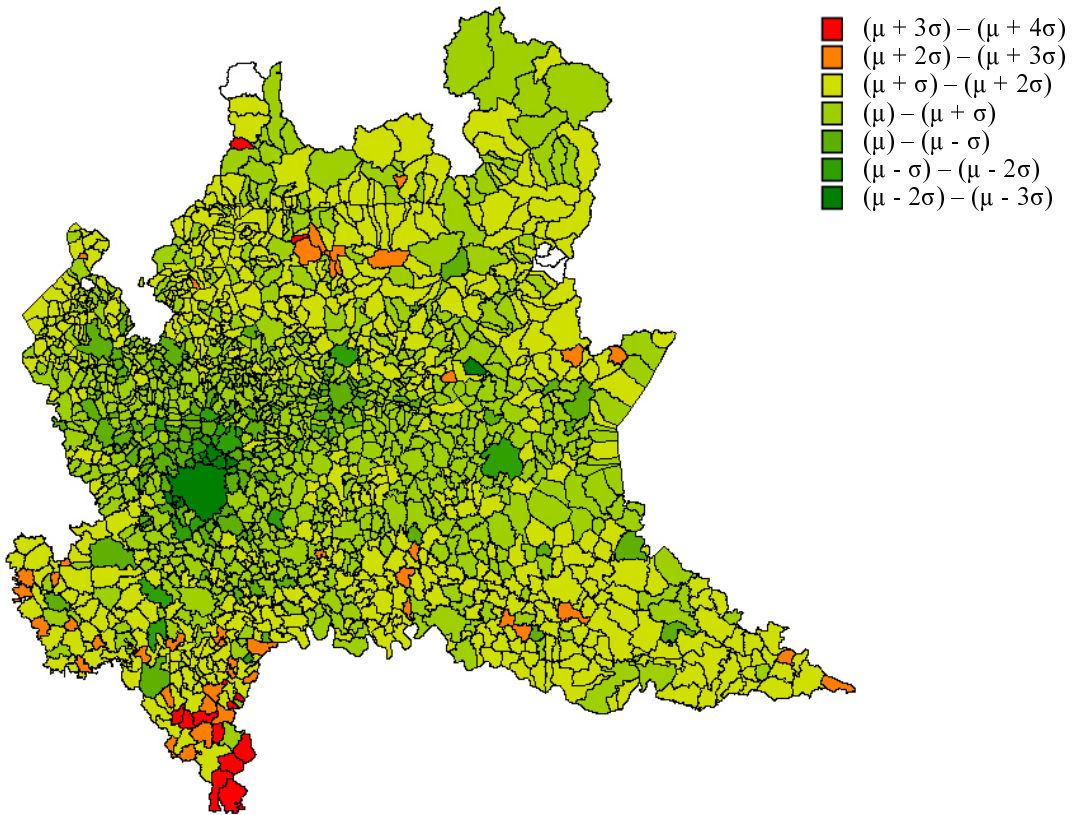
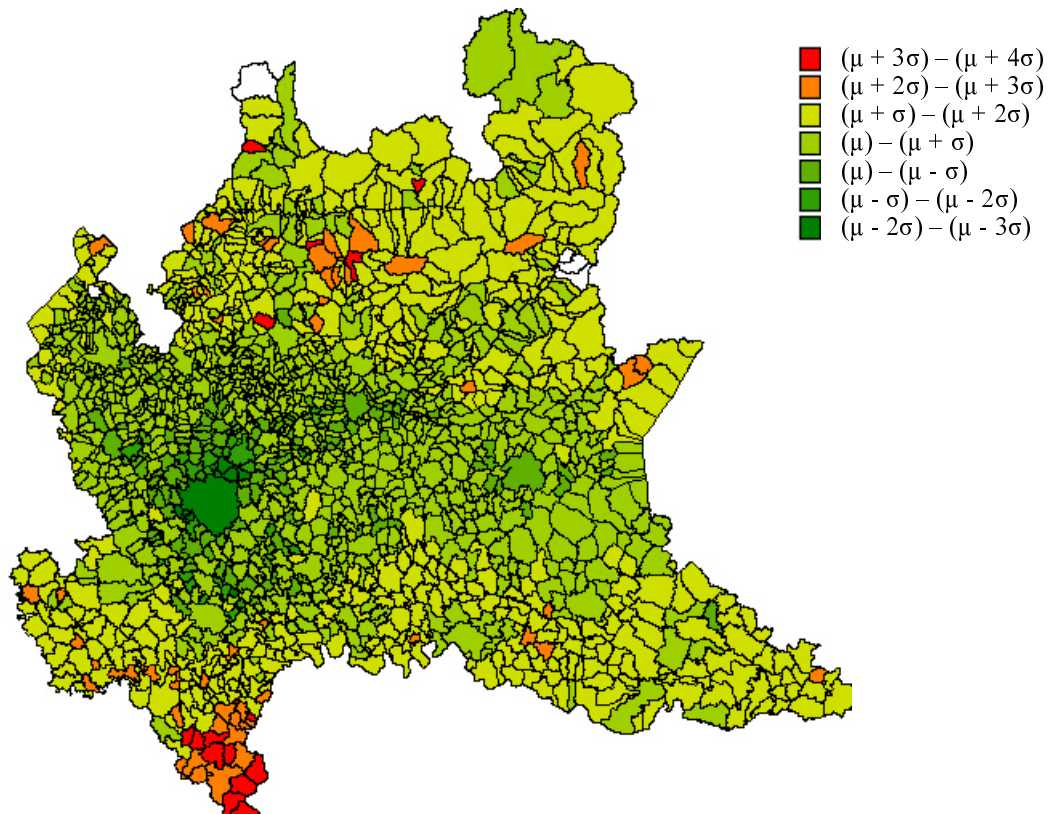


Figure. 8 Ranking of Municipalities based on the first normalization, first set of weights.





*Figure 9* Ranking of Municipalities based on the second normalization, second set of weights.

As the data suggests, results originating from the two kinds of normalization are very similar. The most deprived communities are represented in red and orange. There are some differences among the municipality belonging to various classes, but it could be due to the fact that some results are on the border between two different classes and can easily pass through it.

Anyway the most deprived communities represent in both cases the 20% circa of the municipalities of Lombardy. The most part of them can be found in mountain areas: in the north of the region the Alps area and in the south-west in the Oltrepò Pavese area which is also a mountain area.

These results are quite relevant and acceptable when comparing the municipalities trends and the geographic locations.





*Indicators dealing with richness*, for example electricity consumption, number of internet connections or other, for which data is readily available.

This set of indicators is more specific and in some case its availability is restricted and limited. For this reason they belong to the second level of investigation which relates only to a small part of the case studies.

## **5 POSSIBLE USES OF THE CLASSIFICATION METHOD FOR DEPRESSED COMMUNITIES**

This method can be applied to two types of analyses; the first, synchronic, to identify “deprived” areas in a specific point in time, the second, diachronic, to identify areas, which have been affected by variations in time (positive or negative) in the level of depression.

The diachoric type analysis can constitute an initial method for selecting potential case studies, allowing the identification of both those municipalities, which are in more “disadvantaged” situations, and those municipalities, which, despite being situated in a disadvantaged area, stand out for their positive situation. The latter can be analysed in greater depth to see whether their atypical situation in relation to their context is due to the application of “good practices” for managing the area.

The diachronic analysis takes into consideration the evolution of a municipality over a period of time. Therefore, from a technical point of view the first level assessment matrix is applied twice, using the data relating to two periods of time.

This analysis was applied to Lombardy considering the periods 1981-1991 and 1991-2001.

A number of situations emerge that show an inverse trend from a comparison between the thematic maps between 1991 and 2001, like the case of Livigno, which went from a moderately disadvantaged situation to a situation of moderate recovery, or the case of Tirano, which saw a worsening in its disadvantaged situation over the period of 10 years taken into consideration.

It would be particularly interesting to apply the method to the European regional and national contexts, to compare the different situations on a common basis.

## **6 FUTURE DEVELOPMENTS**

It will be interesting, through some deeper analysis to define which methodological approach allows better to highlight the deprived municipalities.

For the case studies identified it will be appropriate to carry out further, more in-depth analyses, which could be based on indicators, such as:

- Decrease in the number of people employed in the primary sector: in the contexts identified with the first and second level analyses it gives information about the

population abandoning activities that have always existed, which are today not particularly lucrative and extremely difficult. This may represent another factor for the economic, cultural impoverishment of the area, besides the physical impoverishment (abandonment and neglect of the landscape outside the town).

- Presence of a planning figure within the administration.
- Evolution of the use of the land.
- Number and type of services present in the area.
- Evolution of the number of houses (paying attention to tourist destinations where the increased number of houses does not necessarily mean an increase in the population due to the large number of second homes).

The case studies could be divided into categories, based on distinguishing features, on the basis of various criteria, such as:

- geographical areas (coasts, hills, plains, mountain communities, etc.)
- suitability of the area (farming, tourism, secondary production,...)
- presence of area resources to be valorised (historical, cultural and environmental heritage...)
- accessibility and infrastructure creation in the area

For comparing the various cases, it might prove useful, before the in-depth analyses, to fill in summary sheets, for classification with a database, that makes it possible to select the cases of interest according to different keys of access.

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## **SOMMARIO**

Il presente lavoro si pone come obiettivo quello di fornire uno strumento metodologico per l'esplorazione, valutazione e miglioramento delle diverse politiche idonee allo sviluppo sostenibile di comunità minori svantaggiate. Si focalizza l'interesse sulla "misurabilità" del livello di depressione delle comunità minori, proponendo un processo attraverso il quale si è cercato di tradurre l'idea di "deprivation" in termini parametrici. L'approccio metodologico seguito si pone come fine quello di giungere ad una classificazione, in funzione del grado di depressione, dei comuni, individuati come comunità di riferimento, a differenti scale (dal livello nazionale a quello regionale o provinciale). Per fare ciò sono state introdotte delle quantità misurabili, che descrivano in termini numerici e confrontabili la condizione di depressione, ovvero degli indicatori, e il modello di analisi messo a punto è stato tarato dal punto di vista statistico su una "popolazione" comprendente tutti i comuni d'Italia in prima battuta, e successivamente solo quelli della Lombardia, più circoscritta dal punto di vista geografico, sociale ed economico. La metodologia si può applicare ad un'analisi sincronica per individuare le realtà "deprived" in un determinato istante temporale, ad una diacronica per individuare le realtà che nel tempo sono state interessate da variazioni (in positivo o in negativo) del livello di depressione.