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**Fifth Joint Conference on
Agriculture, Food and the Environment**

Proceedings of a Conference Sponsored by
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**SESSION VII: SUSTAINABLE DEVELOPMENT OF
AGRICULTURE IN METROPOLITAN AREAS**

**PAPER 5: A SYSTEMATIC REPRESENTATION OF
METROPOLITAN AREAS: THE CASE OF THE
CENTRAL APULIA SYSTEM**

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**A systematic representation of metropolitan areas:
the case of the Central Apulia System**

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A SYSTEMATIC REPRESENTATION OF METROPOLITAN AREAS: THE CASE OF THE CENTRAL APULIA SYSTEM¹

by Sebastiano Carbonara and Giovanna De Fano

1. Introduction

The planning for large area, within the Italian context, represents a good example of the gap existing between formal regulations and their concrete implementation in the real world. In fact, nobody raises doubts about the importance and the utility of supra-communal planning; actually, very few examples of this level of planning can be mentioned. Facing the problems of territorial changes requires the adoption of a sustainable development approach and, consequently, operational tools incorporating the concept of sustainable development. On the contrary, is very easy to find concrete examples of planning for large areas in other countries. These examples could not merely be transferred in the Italian context, because of its own specificities, especially as far as the administrative structures, the environmental regulations and, last but not least, the cultural basis are concerned.

For all these reasons, the problems to be faced are numerous, although this must not discourage the necessary efforts. This idea inspired the contribution is going to be presented here.

2. Methodology

The principal research objective is to set up a territorial approach for planning purposes. This approach should support territorial policy decisions, taking into account the complexity of relations and equilibria among the components of the "territorial system". Main characteristics of such an approach are intersectorality and agro-environmental resources' conservation.

This objective has been progressively defining during the research work, on the basis of new disciplinary progresses and deep further analysis of various aspects. The research group has focused the work on the approach which can fulfill two kind of requirements: a) firstly, to provide a simple and sufficiently accurate instrument of territorial analysis; b) secondly, to provide an useful instrument supporting the planning for large area. The geographical scale taken as unit of reference is the province (the province is Bari), an administrative district made up of communes (Comuni).

¹ Work conducted within the Advanced Project of Research for Innovation of Agricultural System - Italian National Research Council's (CNR - PF Raisa, subtheme: Land Resources and Intersectorial Development of Rural Areas). Participants of research group: prof G. Grittani (coordinator); A. Barbanente; S. Carbonara; G. Defano; F. Gentile; F. Milillo; M. Mininni; F. Pace; S. Puglisi; V. Santandrea; G. Trisorio Liuzzi.

The research work was conducted in different phases. In the first phase the various components of the territorial system were selected and studied with the help of specific approaches and disciplinary competences. Among these components, the following have been studied:

- hydrogeological resources;
- landscape;
- agricultural system;
- socio-economic context;
- human and productive settlements;
- infrastructural transport system.

The idea which inspires the whole research project is the need for avoiding a separation between environmental conservation, on one hand, and socio-economic activities, on the other hand, when strategies of territorial development have to be conceived and implemented.

In the second phase, and on the basis of the results of the previous phase, the research group focused on the matrix building. A set of indicators was chosen in order to represent the various components of the territorial system. These indicators have been selected because they can synthetically represent the main characteristics of the territory considered. This selection was the result of an interdisciplinary debate, where each researcher, on the basis of its own competences, gave its contribution to the choice of the most appropriate and effective indicators. The need for a simple and effective representation of the territorial system is a very relevant topic in the field of planning, especially as far as the preliminary analysis of the territory is concerned.

Fifteen indicators were chosen in this phase. They can be listed as follows :

1. Agricultural Added Value;
2. Labour requirements;
3. Agricultural land to be preserved;
4. Biopotentiality;
5. Porosity;
6. Index of species diversity;
7. Connectivity;
8. Index of environmental hazard;
9. Road network density;
10. Railway network density;
11. Total estate resources;
12. Unoccupied estate resources;
13. Per capita income;
14. Non-agricultural enterprise density;
15. Index of social discomfort.

These indicators have been used to build two different matrices, the first one being preliminary to the second. In the first matrix (cfr. tab. 1) the above mentioned indicators were calculated for each of the forty-eight communes belonging to the province of Bari (cfr. fig. 1). Then, in the second matrix (cfr. tab. 2) the same indicators were calculated by groups of communes. Four groups of

communes were selected on the basis of the presence within each group of one or more communes working as the center of economic activities and other minor communes gravitating towards the center. The existence of this polycentric structure has not only been hypothesized on the basis of selected indicators, but also on the basis of previous studies focusing on demographical trends, the recent dynamics of urban and productive settlements, the distribution of the road and railway networks, etc.

3. The principal results

From the methodological point of view, the principal result is the effort to take into account the multidimensional nature of a large area, as the province is, by a matrixial representation. This matrix should allow an easier comprehension of the different aspects of the geographical space (physical, social, economical, infrastructural, etc.).

From the operational side, the implementation of this matrix in the study area - the Urban System of the central Apulia - highlighted that the traditional economic-geographical classification by longitudinal strips (the coastal strip and the medium-high hill strips of Murge) (cfr. fig. 2) appears to be largely inadequate to the province of Bari. As a result of this analysis we hypothesize here that the territorial representation is strongly related to polycentric development trends. This territorial representation can be identified by four main macro-areas (cfr. fig. 3):

- 1) Bari area, which includes Bari and the neighbouring communes;
- 2) North of Bari, includes Barletta, Andria, Trani and the neighbouring communes;
- 3) South East, includes Putignano, Noci, Alberobello and neighbouring communes;
- 4) Alta Murgia, includes Altamura, Gravina, Santeramo and other minor communes.

A more detailed description has been developed in the pages enclosed to this paper (cfr. par. 4).

Moreover, the availability of a basic framework for the knowledge and the interpretation of the territory is very relevant both to the economic programming and to the urban-territorial planning. This basic framework, capable of taking into account of all ongoing interventions, is still lacking in the Italian context.

The Provincia, a public institution with competences above the Communes, is potentially one of the most important beneficiaries of this methodology. In fact, the national law 142/1990, concerning local Autonomies, provide the Provincia with functions in the field of territorial planning and management. According this law, the Provincia prepares and approves the Territorial Plan of Coordination ("Piano generale di Coordinamento"), giving the general guidelines for territorial policies. More specifically, the Plan should include:

- i) the different territorial uses according to the related prevailing potentiality;

ii) the approximative location of the main infrastructures and communication networks;

iii) the general interventions in the field of water and hydrological management;

iv) the areas destined to parks and nature reserves.

Assuming these as the objectives of the Plan, the matrix can represent the operational instrument to define the strategies and choices to be adopted in the programming processes. The nature of selected indicators should facilitate this work.

Another potential implication of this approach, which is worthy of consideration, is related to the participation to the planning process. This approach, in fact, can contribute to improve the level of knowledge existing among the various actors involved within the planning process.

4. The case of study²

The study area³

The study-area covers the territory extending within the 48 communes of the province of Bari, in the Region of Apulia (fig. 1-2).⁴



According to a classical schematization of the area made on the basis of the physical characteristics, a more or less sharp distinction can be made between the

coastal strip and the medium-high hill strips of Murgia which follow on the former inland, with a dominantly longitudinal northwest-southeast orientation (cfr. fig. 2). The pedoclimatic factors are considerably more favourable on the coastal and sub-coastal strips where the flat or gently sloping fertile soils and the typical Mediterranean climate favour, and by not

accident, intensive agriculture extremely receptive to technological innovations. Moving towards the Murgia, this situation gradually changes with increasing

² The case of study summarizes the research: *Un approccio metodologico alla pianificazione di area vasta. Il caso del Sistema Urbano Puglia Centrale*, (G. Grittani ed.) that will be published by Franco Angeli, Milano (november 1996).

³ This paragraph is in: S. Carbonara, "A Method for the Evaluation of a large area: the case of Central Apulia System", in D. Borri, et al., *Evaluating Theory-Practice and Urban-Rural Interplay in Planning*, Kluwer Academic Publisher, Dordrecht, 1996.

⁴ It is the subject of a general "institutional attention" in the matter of environmental and land planning, considering that in this part of Apulia neither the definition of the "Città Metropolitana" (Metropolitan City) (ex lege 142/90), nor the Catchment basin of the Adriatic Coast have been defined yet, as stated by Soil Protection Act 183/89.

altitudes; winters are more severe and prolonged, and soils are poorer and exhibit frequent rocky outcrops. A common characteristic is the almost total absence of surface water, however the presence of notable ground water resources relate to the basically karst nature of the subsoil.

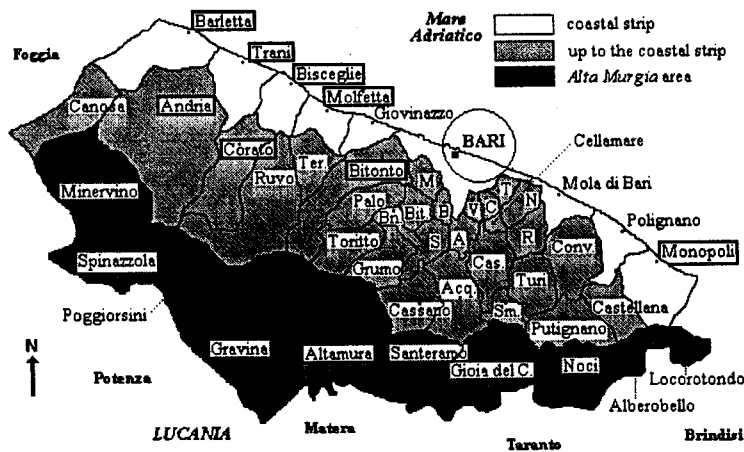


Fig. 2

Agricultural activity accounts for over 90% of provincial land use.

There is an urban frame made-up of 48 communes most of which are densely populated: in the hemispherical ring around the capital city (which has just over 340,000 inhabitants) 23 centres have a population exceeding 20,000 inhabitants, including the

cities with more than 40,000 inhabitants (90,000 in the case of Andria). Most towns (40) are ranged in the altimetric class below 400 m.

The population growth of the province of Bari along the Adriatic coast has given rise to medium and large size centres (mostly having industrial and commercial activities), whose accessibility is ensured by a well-structured transport network along the coastal axis where the centrality of the capital of the province is evident (it also has a major port and airport).

The hydrogeological analysis⁵

After studying the physical characteristics of the province of Bari (geology, geomorphology, climate, hydrology, hydrography, pedology and vegetation) the principal problems of soil protection were dealt with, the most predominant to arise being the hydrogeological risk.

This risk is not only strongly connected to the physiography, but also planning decisions. In some areas (the most important example being that of Bari up until 1926) the planning blindness has been increased by the ephemeral character of the water courses. The water courses because of their pluvial metric regime and the calcareous nature of the land, often remain scarce or dry for extended periods. However, this is reversed in case of exceptional meteorological events that provoke flooding, the consequences of which depend on the vicinity to inhabited areas or productive sites.

⁵ This paragraph summarizes the paper: F. Gentile, F. Milillo, *et al.*, *La difesa del suolo*, in G. Grittani (ed.), *Un approccio metodologico alla pianificazione di area vasta. Il caso del Sistema Urbano Puglia Centrale*, Franco Angeli, Milano, 1996, p. 133-151.

To evaluate the risk in this phase we have adopted an index, which was obtained by an analysis of past occurrences reported in local papers and literature for the period 1945-1990.

The research of environmental resources in the province of Bari has followed two different methodological criteria: the first consists of gathering the morphological elements of the landscape; and then these results are reinterpreted under the principles of landscape ecology.

The eco-landscape analysis⁶

The first part of the work has been carried out according to traditional landscape physiocratic reading; instead in the second part was read again the landscape through an eco-systemic method analysing the landscape in its entirety and the elements characterising the main ecological processes were researched on.

At the end of the work it has been possible to identify four indicators that represent the eco-landscape reading of the territory.

The biopotentiality: it is a compound indicator of the landscape quality; it is a synthetic eco-landscape indicator referred to the latent capacity of homeostasis of an eco-system; it is derived from the notion of resistant stability referred to the main types of biosphere ecosystems, based on the measure of metabolic or biomass data.

The grain-size (porosity): measures the size of the "spots" which are able to define the micro-macro-heterogeneity in a landscape structure.

The index of species diversity: it is the expression of the value elements of landscape: the presence of biotypes, parks, wetlands, protected fauna, valuable archeological sites, ecc.

Connectivity: expresses the set of components ensuring an exchange between the different elements of landscape.

The agricultural system analysis⁷

The agricultural system has been analysed considering the multiple functions that agriculture performs. We have observed agriculture under two different perspectives: under the first we analysed its economical and productive functions; and under the second we highlighted same non-productive functions such as landscaping, entertaining, and environmental.

Regarding the productive functions, the analysis of the agricultural system has been carried out as follows:

- classification on the basis of farming systems (13 types of systems) of the communes of the Bari province;

⁶ This paragraph summarizes the paper: M. Mininni,, *Risorse ambientali*, in G. Grittani (ed.), *Un approccio metodologico...*, op. cit., p. 35-86.

⁷ This paragraph summarizes the paper: G. De Fano, *Il sistema agricolo*, in G. Grittani (ed.), *Un approccio metodologico...*, op. cit., p. 87-132.

- classification of the same communes on basis of **added value, labour requirements and labour productivity**.

The analysis and representation of the non agricultural productive functions have been based on the use of the following indicators.

Agricultural land to be preserved (Urban agricultural area): the ratio between the population pressure and the available agricultural areas; it expresses the minimum amount of farmland to be preserved in peri-urban areas. The area to be preserved may be determined on the basis of both its resident population and the latter's density. Operationally it has been translated into a stepwise estimation of the minimum amount of farmland to preserve within a given area.

Diversity of landscape types: express the different types of landscape in a given district through a chart of descriptive elements, typical of agricultural sites, based on the degree of connection of “strong” characterizing signs of anthropic and environmental value.

The analysis of socio-economic context⁸

The objective of this part of the study consists of identifying the main economic and social variables of central Apulia, their fundamental characteristics and their evolution in order to interpret the changing processes occurring, and the probable future modifications of the territorial structure in relation with the population needs, and the productive system and dynamics.

To this aim 16 indicators have been selected, grouped into 4 sections:

- i) social-demographic;
- ii) productive structure;
- iii) the structure of the available revenue and consumption;
- iv) services and productive, entertaining, and tourist activities.

To better appreciate what arises out of the analysis, we have constructed a synthetic development index for each commune in the study area. This index has been obtained from the average of 6 indicators (available per-capita revenue + local units for every 1000 inhabitants + local artisan units for every 1000 inhabitants + telephone users for every 100 inhabitants - unemployment rate - illiteracy rate) transformed into index numbers setting the average value of the total area to 100.

Regarding the model of territorial representation, there have been elaborated three indicators of the economic system: **per capita income indicator** (in thousand liras), **non-agricultural enterprise density** (local units/1000 people), **unemployment indicator** (jobseekers/100 resident people).

The human and productive settlement analysis⁹

⁸ This paragraph summarizes the paper: V. Santandrea, *Le caratteristiche socio-economiche*, in G. Grittani (ed.), *Un approccio metodologico...*, op. cit., p. 152-170.

The survey is based upon interpretation of the dynamics and patterns of settlement that have characterised the study area over the last decade (1980-'90). The aims of the study have been:

- i) to define a picture of the internal relations existing in social and economic processes
- ii) to reconstruct a cognitive path of dominant planning models
- iii) to analyse the type of influence exercised by urbanistic tools on the patterns of settlement;
- iv) individualise possible modifications to the planning approaches used to date.

The survey further wants to supply an updated view of the intensity and character of the most recent urbanisation processes and to research the links of the said processes with the social-economic dimensions of the territorial growth and landscape characteristics.

In analysing the dynamics of settlement patterns, the following indicators have been identified: **total estate resources; unoccupied estate resources.**

The analysis of the infrastructural transport system¹⁰

The strong correlation existing between the infrastructural system and the different types of land use requires an analysis into what form and how that correlation acts.

The study of the road infrastructure has been carried out through:

- a recognitive-cartographic analysis of the road communication network;
- classification of the road network (using the criteria of functional hierarchy);
- analysis of the movements and used means of transport with particular reference to vehicle flows.

As a summarising indicator there have been chosen indicators that can best represent the accessibility conditions and the presence of infrastructure in the area under examination, i.e: **km of freeways/km of land area; km of railway (excluding the narrow-gauge line/km of land area)**; both indicators are taken as an expression of the degree of accessibility of each area and subsequently of their "degree of resistance" to transformation.

⁹ This paragraph summarizes the paper: A. Barbanente, *Dinamiche e forme insediative: tendenze in atto e pratiche urbanistiche*, in G. Grittani (ed.), *Un approccio metodologico ...*, op. cit., p. 171-199.

¹⁰ This paragraph summarizes the paper: F. Pace, *Infrastrutture per la mobilità*, in G. Grittani (ed.), *Un approccio metodologico ...*, op. cit., p. 200-224.

As a result of this analysis we hypothesize a new territorial representation of province of Bari that can be identified by four main macro-areas.

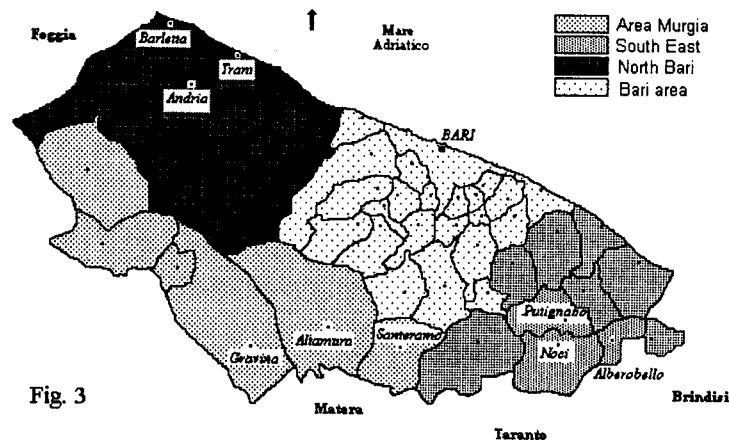


Fig. 3

Bari Area

The configuration of Bari area (708.649 inhabitants) has resulted as such because of the dependency of between the various other centres of Bari area from the capital city which plays a leading role.

The inner urban nucleus (342.309 inhabitants) exercises, inside this geographical space, a dominion of the area, which not only has a "centripetal" effect thanks to the presence of functions and services that create an attractive capacity; but also induced territorial modifications that interests both adjacent communes (for residency, industry and wholesale commerce), and centres beyond the first and second out-lying zones that are characterised by seasonal tourism in second homes.

The level of road and railway infrastructure is the highest of the four areas, providing a good level of communication between the various centres.

Bari

The first element that marks out this area (469.534 inhabitants) is the presence of districts of relevant dimensions in terms of both population and total living area.

There is a significant presence of industrial and agro-industrial activities operating in the shoe industry, in lithoid manufacture and in olive oil and wine production.

The strengthening and/or developing of those activities has involved, especially in the last decade, intense processes of farmland reduction thus being detrimental

¹¹ This paragraph summarizes the paper: S. Carbonara, *La visione consolidata del territorio*, in G. Grittani (ed.), *Un approccio metodologico ...*, op. cit., p. 225-264.

to the primary activity. These processes are mainly localised along the coastal ridges.

Even though the agricultural production is differentiated into three large sections of different economic importance - greenhouse floriculture, olive-growing and viticulture - in spatial terms, the big landscaping impact that olive-growing (which covers a wide area) creates, allows us to define a "monocultivating" agro-system model.

This characteristic becomes associated to the nearly complete absence of rural settlements which underlines the existence of a strict interactive relation between city and rural countryside.

Alta Murgia

The area of the Alta Murgia (141.847 inhabitants) presents factors of uniformity and spatial homogeneity of pedological characteristics which have modelled the total territorial quality.

The rocky and inaccessible type of land explains its developing aspects: limited urbanised areas, high density of population in urban centres and hardly any existence of rural settlements and scattered housing, semi-wilderness conditions in the open areas, and extensive agriculture.

The network infrastructure, being poorly developed, makes difficult not only communications within the area, but also (external) access to it.

Despite the unfavourable situation, this area in some respects can be defined as "emerging"; in the last decade, beyond valuing the natural qualities of the territory (the setting up of the National Park of Alta Murgia is a clear example), the area has shown a considerable population growth and development of manufacturing activities concerning mainly furnishing products.

South East

The area of the South East (210.140 inhabitants) has many productive and environmental resources characterising zones with different interests of high integration:

- diversification of the productive system, into three equal main sectors, enables us to find a direct link between agricultural, tourist and industrial activities;
- diversification of environmental-landscaping elements which create a qualitatively high environmental offer;
- diversification of the agricultural productive organisation: the poly-cultivating set up is due mainly to the irregular orographic development which enables, according to the local pedology and micro climate, a more or less intensive farmland use.

A common peculiarity is the presence, even to-day, of numerous and dynamic rural settlements.

This group of elements allows us to consider the South East area in an antithetic position to the northern one.

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Tab. 1 - Chart containing indicators broken down for communes

Indicators Communes	Agriculture			Environmental				Social and Economic				Building and Infrastructure			
	manpower requirement hrs/ha	added value (thousand)	urban farmable land	environ- mental risk	biopoten- tiality	index of naturalistic interest	poro-connec- tivity	employ- ment rate	density	per capita income (thousand)	building stock (%)	overall building stock (%)	unoccupied building stock (%)	km roads/ km surface area	km railway/ km surface area
Acquaviva	311	5.315,9	0,29	0	2,89	6,00	0,27	4,80	55,46	10,28	19,69	11,25	0,108	0,111	
Adelfia	500	11.083,2	1,66	0	2,88	0,00	0,19	6,70	46,40	10,14	41,77	10,54	0,047	0,157	
Alberobello	274	3.658,4	0,93	0	2,39	11,00	0,89	6,10	100,55	10,98	22,87	20,87	0,000	0,143	
Altamura	61	1.682,2	0,22	0	1,60	41,00	0,24	3,40	57,74	8,68	22,51	17,36	0,000	0,084	
Andria	257	2.376,5	0,36	5	2,66	17,00	0,13	4,50	55,41	7,58	14,92	21,60	0,033	0,005	
Bari	331	6.196,4	50,66	10	2,40	11,00	0,29	2,80	54,30	15,17	3,07	13,17	0,343	0,384	
Barietta	393	6.665,3	3,26	5	2,87	2,00	0,31	3,80	51,61	9,89	21,60	12,18	0,263	0,194	
Binetto	263	2.031,1	0,28	0	2,98	0,00	0,27	4,50	51,62	8,59	49,74	15,49	0,000	0,295	
Bisceglie	368	4.077,0	3,48	0	2,84	11,00	0,25	2,00	51,76	7,85	17,80	26,22	0,367	0,162	
Bitetto	308	3.064,2	0,93	0	3,01	1,00	0,28	9,20	48,66	8,88	18,59	10,17	0,000	0,191	
Bitonto	298	2.100,6	1,10	0	2,77	6,00	0,12	8,10	55,86	8,22	1,86	13,60	0,058	0,074	
Bitritto	349	3.499,1	1,92	3	3,05	0,00	0,44	6,20	44,87	12,13	53,10	11,22	0,431	0,000	
Canosa di P.	251	3.888,3	0,38	16	2,94	7,00	0,31	4,50	51,40	7,85	24,63	24,26	0,042	0,096	
Capurso	464	9.909,7	7,19	4	2,80	0,00	0,31	5,20	56,85	11,06	31,98	10,77	0,300	0,329	
Casamassima	358	8.262,0	0,33	0	3,02	3,00	0,14	4,20	68,08	9,35	23,22	15,04	0,000	0,131	
Cassano	255	2.704,7	0,22	0	3,13	23,00	0,59	5,80	53,10	10,53	41,14	41,12	0,000	0,000	
Castellana G.	422	9.688,4	0,81	5	2,63	22,00	0,28	4,10	67,52	9,71	11,86	21,95	0,000	0,100	
Cellamare	421	7.819,8	3,28	0	2,44	0,00	0,14	2,50	36,75	9,95	95,77	14,68	0,000	0,000	
Conversano	356	7.992,1	0,30	12	2,91	13,00	0,13	4,60	64,11	8,30	28,49	24,94	0,000	0,105	
Corato	244	2.443,6	0,96	0	2,63	8,00	0,14	3,60	59,70	7,68	15,43	21,63	0,000	0,049	
Gioia del C.	227	3.775,1	0,24	0	2,44	16,00	0,68	4,20	55,55	10,26	5,20	15,45	0,108	0,061	

(segue)

Tab. 2- Chart containing indicators for macro areas

Indicators Communes	Agriculture			Environmental			Social and Economic				Building and Infrastructure				
	manpower requirement hrs/ha	added value (thousand)	urban farmable land	environ- mental risk	biopoten- tiality	index of naturalistic interest	poro-connec- tivity	enterprises density	employment rate	unemployment rate	per capita income (thousand)	overall building stock (%)	unoccupied building stock (%)	km roads/ km surface area	km railway/ km surface area
Polo Barese	320	5,10	3,81	43	2,92	15,50	0,11	1,90	25,13	52,92	12,46	11,97	13,91	0,093	0,135
Nord Barese	386	5,00	1,40	46	2,79	14,00	0,14	2,80	25,52	49,94	8,56	17,57	17,45	0,086	0,064
Alta Murgia	102	2,50	0,16	5	2,00	21,00	0,19	2,70	24,37	58,04	8,31	21,69	20,65	0,000	0,084
Sudest Barese	304	6,20	0,55	22	2,70	17,50	0,36	6,80	22,10	63,58	9,27	15,53	22,37	0,044	0,099