

## **HISTORIC CENTER EVALUATION USING GIS: A SYSTEM PROVIDED TO GOVERNMENT**

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### ATTRIBUTIONS

Domenico Enrico MASSIMO conceived and set up the research and authored the *Paper* (paragraphs 1, 2, 3, 4, 5, 6). Antonino BARBALACE: coordinated field work evaluation; prepared and organized field work data; processed data with Multi Criteria Analysis; built-up the GeoDataBase and the Historic Geographic Information System.

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### ABSTRACT

In Europe and Mediterranean areas an interesting focus of new urbanism are the small Historic Centres located around major towns. An important element is missed toward the implementation of the strategy for revitalization: their systematic knowledge and evaluation. Urban Appraisal provides a first step for organizing a state-of-the-art DataBase including rare historic censuses, cartographic almanacs, spatial data, scientific information. Data are georeferenced and dynamically updateable, prefiguring an "Atlas of Historic Centres", or GIS for Evaluation and Appraisal. It is useful to set-up the intermediate step of building-up an Historic Centre ranking based upon intrinsic value, use value, need for repair. Ranking is derived from thorough multi dimensional evaluation. Output of the research is a GIS containing synthesis of knowledge and critical evaluations useful for real world conservation and revitalization strategies. GIS build up has been successful because Cultural Institutions adopted it for government action design, implementation and management.

### 1. INTRODUCTION

Given the growing and dangerous urban sprawl over the Planet (Chalthorpe, Fulton, 2001; Cattanei, 2002, p. 19; Dunay, Plater-Zyberk, Alminana, 2003), planners, designers, citizens, entrepreneurs and corporations, organizations and governments are converging toward "an environmental approach" and to a "new sustainable urbanism" which paramount goals are, among others:

- foster-up the revitalization and up-grading of existing districts and neighborhoods *versus* further and additional urban sprawl;
- foster-up the rehabilitation of existing constructions transforming them in Green Buildings (Oppio, 2002, pp. 39-52) *versus* replacement with totally new and energy demanding buildings;
- in case of new settlements, design and building of new communities and villages with compact growth, Transport Oriented Development (TOD), small urban blocks, measured buildings, mixed use, pedestrian orientation, definite public squares;
- in case of new development, design and construction of small buildings with environmental orientation, ecological materials, energy saving nature, and long lasting and durable structures.

These goals are also expressed in the Charter issued by the Congress of New Urbanism.

“The Congress for the New Urbanism views disinvestment in central cities, spread of placeless sprawl, increasing separation by race and income, environmental deterioration, loss of agricultural lands and wilderness, and the erosion of society's built heritage as one interrelated community-building challenge.

We stand for the restoration of existing urban centers and towns within coherent metropolitan regions, the reconfiguration of sprawling suburbs into communities of real neighborhoods and diverse districts, the conservation of natural environments, and the preservation of our built legacy. We recognize that physical solutions by themselves will not solve social and economic problems, but neither can economic vitality, community stability, and environmental health be sustained without a coherent and supportive physical framework.

We advocate the restructuring of public policy and development practices to support the following principles: neighborhoods should be diverse in use and population; communities should be designed for the pedestrian and transit as well as the car; cities and towns should be shaped by physically defined and universally accessible public spaces and community institutions; urban places should be framed by architecture and landscape design that celebrate local history, climate, ecology, and building practice.

We represent a broad-based citizenry, composed of public and private sector leaders, community activists, and multidisciplinary professionals. We are committed to reestablishing the relationship between the art of building and the making of community, through citizen-based participatory planning and design.

We dedicate ourselves to reclaiming our homes, blocks, streets, parks, neighborhoods, districts, towns, cities, regions, and environment.

We assert the following principles to guide public policy, development practice, urban planning, and design: The Region: Metropolis, City, and Town. The Neighborhood, the District, and the Corridor. The Block, the Street, and the Building”.

These goals aim to preserve from disappearance existing environmental, ecological, cultural, urban and architectural values and capitals.

In the peculiar and idiosyncratic Mediterranean Europe and Italian settlements, the strategy toward the “new sustainable urbanism” shall be implemented setting up the priority, along with few others, of “Historic Center rehabilitation and up-grading” (*i.e.* as in the Charter of Congress of New Urbanism: “restoration of existing urban centers and towns”) instead of additional urban spreading-out. This is to avoid the waste of huge amount of physical, cultural and historic resources such as land, buildings, peculiar environmental values, technological networks, system, and pipelines.

There is a relevant difficulty in implementing the above strategic program: the almost total lack of knowledge and valuation about Historic Centers and their characteristics. In fact, at the present time it does not exist an exhaustive “Atlas of Italian Settlement and Historic Centers” despite its world cultural relevance and tourism prominence.

In the Case Study, the research gives the answers to specific requests coming from institutions and social bodies interested in knowing for government and social purposes: “how many are the Historic Centers in a defined geographic boundary?”; “what are their characteristics and potentialities (physical; cultural; social; economic)?”. Operational contribution of Appraisal may help to overcome this dramatic lack of data developing the framework of a General information System for Evaluation and Appraisal (GiS.EvA; in Italian: SGV). It should be a general support for spatial management and local government, and also a specific tool for the Historic Center knowledge and revitalization

## **2. MEANING OF THE RESEARCH. A SYSTEM FOR HISTORIC CENTER EVALUATION PROVIDED TO GOVERNMENT**

There is a strong demand (informal as well as expressed, as well as formalized and Institutional) for systematic knowledge and evaluation about Historic Center network, coming from planners and new urbanism technicians, local and regional governments, economic development agencies and social councils, state and international institutions devoted to treasuring and conservation of historic settlements. Requests of information are specific and concern:

1. complete quantitative census and account of all Historic Centers existing and existed within a given geographic boundary;
2. qualitative knowledge of each settlement, structured in characteristics of centers and expressed through criteria for subsequent assessment;
3. related multi dimensional evaluation of all urban entities by the mean of approaches which output is a qualitative hierarchy useful for decision, government, management, interventions, future researches;
4. Web use of all information for consultation by general public and remote evaluation by evaluators.

The appraisal project gives a substantial and operational contribution providing answers to each of the above questions, as well as an operational tool to Institutions and Government for real world management of legacy such as historic settlements.

The general framework tool is the “Hyper Atlas of Historic Centers” which relies upon a sound basis of historic cartography and historic pioneer censuses. Built-up on numerous previous and peculiar researches (Massimo 2005; Massimo, 2006; Massimo, Musolino, Barbalace, 2006) it shapes several information layers as the following.

#### **Hyper Atlas of Historic Centers. Structure**

<i>N</i>	<i>Name</i>	<i>Layer information contents</i>
1	<b>Heritus</b>	Total inventory or censUS of urban HERITage, based on historic data and maps
2	<b>Heritknow</b>	KNOWledge of urban HERITage, based on selected characteristic (criteria) checking and scoring
3	<b>Heritval</b>	Quality VALuation of urban HERITage, based on multi dimensional assessment of characteristics, <i>i.e.</i> Multi Criteria Analysis
4	<b>HeritWeb</b>	WEBGis of urban HERITage, available for both consultation and remote evaluation

The above framework is an innovation in completeness. It structures an articulated knowledge and assessment of all Historic Centers located in the Case Study area *i.e.* Calabria region and specifically Reggio Calabria province: from first detection and inventory; to analysis concerning objective characteristics of each center; to single out of boundaries of historic settlement derived from analyses of georeferenced historic military maps; to state-of-the-art qualitative and ordinal evaluation of entity characteristics; to Web consultation for both data and remote evaluation practice and tools (Massimo, Barbalace, Castagnella, Mercuri, Vescio, 2005, Massimo, Barbalace, 2007).

Additional innovation is that “Hyper Atlas” becomes an operational tool for Institutions devoted to real world environment and historic preservation such as a management framework.

A further innovation is in the content of the largest evaluation that has been performed in the territory of the Southmost Italian province, to single out among many and many (202) just few (32) historic centers that can be considered dominant in the settlement structure.

A further innovation produced by Appraisal is the replicated assessment over time, *i.e.* the attempt of a continuous evaluation to start the building-up of a dynamic assessment system. In fact, replication of some multi dimensional evaluations over time, after a time span of five-ten years, gives several advantages. First, it helps to assess impacts of nature, time, men actions, during the period from the first evaluation to the subsequent *i.e.* to perform the monitoring. Second, it allows to focus on absence/presence of public and local government interventions. Third, it assesses their impacts on urban preservation, conservation, restoration. Fourth, it helps to detect comparative emergencies and then to set-up priorities for well shaped actions. Fifth, it allows to criticize and correct or just update previously done similar evaluations, giving different outputs. In the case of Greek District the evaluation of four centers validated previous leading one and confirmed as well as emphasized the lack of maintenance and preservation in the center of Staiti which went down and down in the rank.

### **3. “HYPER ATLAS OF HISTORIC CENTERS” AND MULTI DIMENSIONAL EVALUATION**

As stated above, the systematic “Hyper Atlas of Historic Centers” is very useful. In Italy a complete Atlas still does not exist, even if some attempts have been made in the past.

A first list of Italian Historic Centers has been compiled between 1986-1990 relying upon a set of historic topographical maps. A second list has been compiled between 1990-1994, for seismic prevention purpose, relying upon Toponymy DataBase. A third list has been compiled in 1999 (Marconi *et alii*, 1999) relying upon the zoning maps of urban plans: Historic Centers should be the areas named as such in planning drawings.

No complete and systematic Atlas compilation based on scientific methodology has been built-up and applied. So, questions still remain un-answered.

Research and Case Studies here presented, try to set-up a systematic methodology to build a definitive list of all Italian Historic Centers as a general framework finalized to their treasuring. Framework will rely upon scientific basis of historical objective documents. It is accompanied by a systematic appraisal approach through a multi dimensional evaluation of each entity. It allows sequentially updating, monitoring of each entity, and controlling of the impacts over time of local agents and government actions.

The methodological framework (helping Historic Center conservation and treasuring) is based upon census, knowledge criteria, valuation, communication, *i.e.* upon the above cited specialized approaches: “heritus”, “heritknow”, “heritval”, “heritweb”.

Applications in Case Studies give the opportunity to test, validate, correct and ameliorate the theoretical and methodological framework of GiS.Eva, SGV, as it is reported in the specific paragraphs.

### **Heritus. Total inventory or censUS of urban HERITage, based on historic data and maps**

Cornerstones of cultural conservation and treasuring actions should be, first of all, a comprehensive detection, description, registration, classification and, this is a news, valuation of all entities. The goal is the “exhaustive, topographical and thematic inventory” recommended by the Council of Europe (Council of Europe, 2001). It is here named Total Inventory or Total CensUS of HERITage or “heritus”.

It is an updated technique that leads to systematic knowledge and numeric assessment of Cultural Heritage, behind and above the roster in the State National Register of enlisted entities or properties and the known and published tourist guide (Massimo, Barbalace, Castagnella, Mercuri, Vescio, 2005).

Relevant difference between official roster and “heritus” is that the former enlists only the registered masterpieces, instead the latter attempts to detect and quantify through hard desk work all relevant resources existing and localized in the territory. The technical bases for the total census and account are a large number of historic population censuses and cartographies. In particular, among the many available maps detected, scanned, and georeferenced on GIS, Historic Centers have scientifically been detected thanks to the cartography called “Carta Generale del Regno delle Due Sicilie” published in 1829-1831 and in second edition in 1852. It was edited by the South Italy cartographer Benedetto Marzolla. This cartography synthesizes spatial data and population consistency in terms of individual residing in each center and not in terms of number of families per municipality.

A further scientific innovation is the building-up of a Geographic Information System (GIS) including all these spatial and cognitive data reorganized in the related Data Base Management System.

### **Heritknow. KNOWledge of urban HERITage, based on selected characteristic (criteria) checking and scoring**

It is possible to perform qualitative evaluation of historic centers in a consolidated framework of well established discipline of Environmental and Cultural Heritage Appraisal founded by Forte in 1977 and strongly fostered by ICOMOS in 1981 (Forte, 1977; ICOMOS, 1981; Liechfield, 1981; Nijkamp, 1981; Fusco Girard, 1981; Therond, 1981; Mattia, 1983; Fusco Girard, 1987; Rizzo, 1989; Amata *et alii*, 1991; Coccossis, Nijkamp, 1995).

The news/novelty in recent years is that quantitative and cardinal sub-discipline of Economics such as Quantitative Methods and Cultural Econometrics called-up to evaluate urban alternative programs, adopted MCA for hierarchical ranking of alternatives (Torrì, sd).

According to basics of scientific epistemology, entities of interest to be analyzed are knowledgeable “by heart”, *i.e.* by a synthetic and informal intuition.

An entity can also be known in more formalized terms if it is analyzed “as a bundle of characteristics”. This epistemological approach can be applied to knowledge of historical centers investigated such as a “bundle of characteristics”. Each characteristic can be expressed and qualified by the use of parallel correspondent criteria. Criteria can be scored by evaluation practice. The problem is the availability and manageability of approaches, methods, tools, rank scales and, specially, criteria to perform multi dimensional evaluation (IIUE, 1985).

For the experiment a choice has been confirmed, excluding evaluations procedures based upon perceptive criteria or visual indexes (Lynch, 1960, 1962, 1974, 1981; Steiniz, Roger, 1968; Sekler, 1989; Tempesta, Crivellaro, 1999; and also, Ferretti, 1995) because too complex for available experts and for time planned. As experimented in several previous cited researches, specific typologies and generations of MCA approaches (Nijkamp, 1979; Hinloopen, Nijkamp, Rietveld, 1983) have been developed and experimented for the specific purpose (Massimo, 1991; Cerreta, De Toro, 1999; Nijkamp, Finco, 1999).

To know better and evaluate Historic Centers at hands, some criteria have been tested in pioneer specific experiences of urban analysis and evaluation (Nijkamp, 1988; Fusco Girard, 1992; Bentivegna, 1995; Massimo, 1995, 1997, 1998, 2002, 2005; Fusco Girard, Nijkamp, 1997; Massimo, Vescio, 2000).

If criteria are well conceived, selected, defined and managed, MCA gives an understanding about values, conservation, and interrelated needs for intervention ranking, of each analyzed center.

Innovation and novelty in the present research, with respect to other very recent (Massimo, 2006), is the increased number of criteria adopted. In fact these have been increased from 12 to 14, making more sense and transforming the evaluation in a more demanding and complex procedure.

Then, criteria used in the present research are now 14 and are as usual articulated in four scenarios: insediative; urban or settlement; architectural; cultural\tourist. Criteria for insediative scenario are: position-accessibility; location\orientation-exposition; physical consistency. Criteria for urban scenario are: urban original characteristics \ qualities; urban street; urban blocks. Criteria for architectural scenario are: construction; integrity; fronts; urban squares. Criteria for cultural \ tourist scenario are: landscape attractiveness; urban attractiveness; extraordinary monuments; monument density.

In one section of the general framework named “heritknow”, criteria have been applied by panelist experts who visited the centers and expressed their scores in an individual matrix. The heavy field work for criteria scoring has been done without any communication neither information to other assessors, following the tested and rigorous methodology of historical analysis. A short description of all criteria follows.

#### A. SETTLEMENT FRAMEWORK

- 01 A.1. Geographic location and accessibility in the province**  
Geographic location in the spatial an infrastructural provincial framework. Level of territorial and street accessibility. Higher scores are assigned to better position and accessibility.
- 02 A.2. Good location and orientation-exposition in the territory**  
Positive and harmonic relationship between site and overall building and town construction, aesthetic landscape outcome of global construction or “cityscape”, and orientation-exposition. Higher scores are assigned to Historic Center with good territorial location and orientation-exposition.
- 03 A.3. Perceived quantitative Historic Center consistency**  
Quantitative consistency of the Historic Center in terms of perceived physical extension. It makes it possible the reasonable comparability between center too different for typology and dimension.

#### B. URBAN QUALITY

- 04 B.1. Urban qualities. Preservation and persistency of original characteristics**  
Harmonic relationship between streets, squares, buildings, and symbolic elements of analyzed center. More harmonic the existing spatial proportions among urban elements, higher scores are assigned.
- 05 B.2. Dimension and ramification of urban streets**  
Width, articulation and organicity of urban streets. Higher scores are assigned to streets wide, numerous and in harmonic relationship with urban blocks.
- 06 B.3. Dimension of urban blocks**  
Original and present length and width of urban blocks and relation among all blocks, with special positive attention to smaller dimensions. Width of streets in between blocks, better larger than minimum. Smaller or more proportional original and present blocks, higher scores are assigned.

#### C. ARCHITECTURAL QUALITY

- 07 C.1. Construction or building technical characteristics**  
Building original system: materials; techniques; technologies. Valuation of: original constructive quality; classification of elements; link to provenance site \ locality. More physical quality \ solidity and larger permanence of original materials, higher scores are assigned.
- 08 C.2. Original architectural characteristics or integrity**  
Architectural, aesthetic and linguistic features and their permanence and integrity in all buildings, or alterations \ modifications operated by men over time. Score are proportional to aesthetic and architectural integrity and quality.
- 09 C.3. Fronts**  
Building fronts on public spaces such as streets, squares, vistas, belvederes. Bi-dimensional element of urban scenery. Their elements are: proportions; specific aesthetic; shape; materials; colors. Better quality and integration with front spaces, than higher the assigned scores.
- 10 C.4. Urban spaces and squares**  
Quality and quantity of urban squares and collective spaces which foster-up meetings and call together people.

#### D. CULTURAL \ TOURIST ATTRACTIVENESS

- 11 D.1. Landscape attractiveness of the historic center**  
Potential environment and landscape attractiveness and evocativeness of the historic center
- 12 D.2. Urban attractiveness of the historic center**  
Attractiveness of historic urban pattern or new plantation scheme \ drawing
- 13 D.3. Relevance or extraordinariness of monuments inside center or monumental characters of the historic center**  
Extraordinariness of building, works of art or tradition having artistic features, historical interests, or demo-anthropological importance recognized by: people\folks feelings; or\and experts opinions; or\and landmark official register or\and roster; or\and scientific publications. Higher relevance, higher score are assigned to the center.
- 14 D.4. Monuments inside historic center**  
Number, density and level of building having artistic features and historical interests, recognized by: people\folks feelings; or\and experts opinions; or\and landmark official register or\and roster; or\and scientific publications. Higher the number of monumental buildings, higher score are assigned to the center.

For each Historic Center criteria are sorted-up and set-up by specialized analysts and evaluators and later scored on the basis of field work.

All scores assigned by each evaluator to each criterion for each center, checked and summed up, produced the multi dimensional table of MCA, namely the Qualitative Effect Matrix (QEM), which it will be processed by the mean of the suitable evaluation tools.

**Heritval. Quality VALuation of urban HERITage, based on multi dimensional assessment of characteristics**

Inside sub-regional clusters of villages, a deep knowledge is required about each single center to understand characteristics, features, values, tourism potentialities, in a relative hierarchical form, and to grasp possible future re-uses and revitalization in a rank order. Degree of physical and functional conservation should be known to grasp the needs for intervention and then to set-up the combined final rank order of values and priorities. For each center, each evaluator writes down an heuristic and intuitive assessment, *i.e.* a Report describing: 1. general intuitive value or quality; 2. special attractors; 3. effective level of conservation *vs* (and) real crisis conditions; 4. intuitive potentialities for economic revitalization.

There is no question about the imperative to know deeply and evaluate Historic Centers in their quality.

Qualitative data have been processed to understand latent relationships and detect latent implicit variables, relying upon: robust ordinal qualitative statistics (Hinloopen, 1985; Hinloopen, Nijkamp, 1986); experimented methodology (Coccosis, Nijkamp, 1995; Fusco Girard, Nijkamp, 1997); specific Case Studies applied in the same region (Massimo, 1991, 1995, 1997, 2002, 2005, 2006; Massimo, Vescio, 2000). MCA process provides a rank order of evaluated Historic Centers.

Strong innovation is to detect from prestigious sources and direct field work the leading centers of the entire province and to derive the related rank order.

Potential innovation is in repeating evaluations over time (five-ten years). Differential in replicated evaluations can help in giving hints about the positive or negative impact of owner actions as well as of interventions done or not done by local government and single owner.

**Heritweb. WEBGIS of urban HERITage, available for both consultation and remote evaluation**

The knowledge developed by census (“heritus”), field work (“heritknow”) and analytical evaluation (“heritval”) can be made available to potential users via Web, enlarging dramatically its service, diffusion, efficacy.

This capital of knowledge can be accessible by structuring an Internet service for both uses: consultation for general public; appraisal and valuation support and performances for analysts, evaluators and experts (Massimo, Barbalace, Mercuri, 2005).

A key preliminary statement.

The knowledge capital to be usable, moveable, interchangeable and efficient should be structured in a Geographic Information System (GIS). There is no alternative to this state-of-the-art tool to transfigure generic data in an “Knowledge Information Summa”.

The subsequent step, after GIS building-up, is the transfiguration in a Web site accessible to analysts, evaluators experts and other general users.

Consequently, for remote use and fruition by general users “Hyper Atlas GIS of Historic Centers” will be transformed in WebGIS, and for appraisers will be transformed in an evaluation GIS, *i.e.* General information System (GiS) for Evaluation and Appraisal (EvA), or GiS.EvA, in Italian SGV.

**4. FOCUS OF THE RESEARCH. TRENDS IN MULTI DIMENSIONAL EVALUATION**

Private and specially public decisions rely upon several families of support and evaluation tools, some of which can be grouped and synthesized as follows:

- *one dimensional* and monetary, based upon cost principle compared to financial revenues or\and benefits or\and effectiveness;
- *multi dimensional* with discrete or continuous alternative to be chosen, based upon utility approach: decision alternatives are considered as a “bundle of characteristics” valued by criteria; scores are assigned to each criteria for each alternative; weight can be assigned to public preferences;
- *decision* oriented, based on leader’s choice tree having a bifurcation in each critical point of management path;
- *negotiation* oriented, based on collective decision approach obtained through group negotiations, referenda simulations, voting procedures, multilateral bargaining.

As stated before, multi dimensional evaluation is articulated in several approaches. Among them, the ones dealing with discrete alternatives to be ranked upon the basis of ordinal and mixed criteria are the so-called MCA.

Applications of MCA are growing, in number and extension, in critical sectors such as alternative choice and decision making concerning environmental actions, energy policies, urban interventions, land use, local and regional transportation (SAMI, 1998; classical implementation in transportation mode decision and ranking: Alexander, Manheim, 1962; Giuliano, 1985; Rietveld, 1980).

In recent years (Nijkamp, Bal, Medda, 1999; Nijkamp, Vreeker, 2000; Vreeker, Nijkamp, Ter Welle, 2001) a multitude of MCA typologies have been developed. Attention has been given to some families of MCA, such as the following:

- pair-wise comparisons;
- hierarchical procedures;
- critical threshold approach.

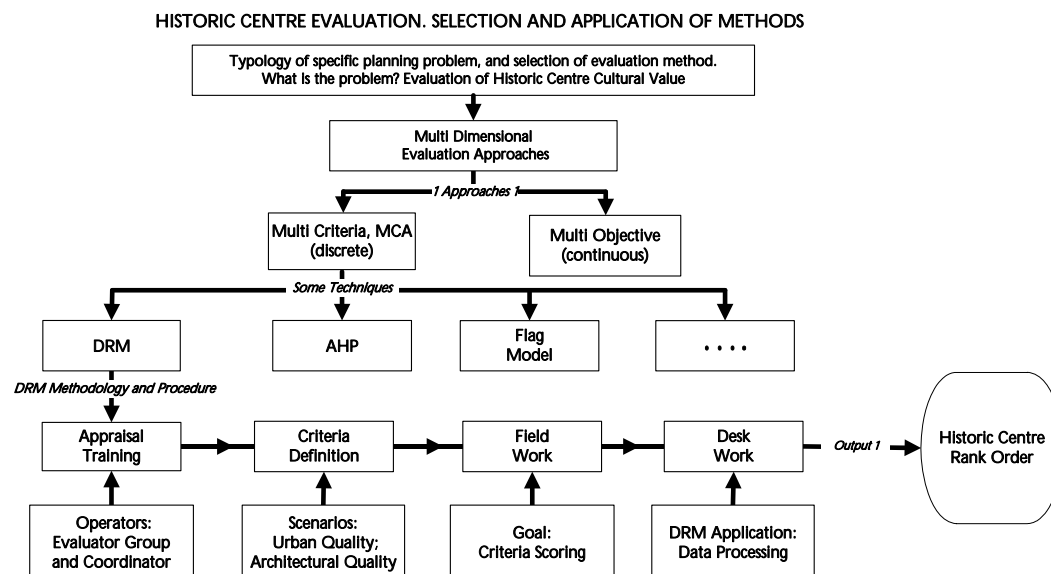
Core of *pair-wise comparisons approach* is generalized form of concordance analysis. Basic idea is to rank a set of alternatives by means of their pair-wise comparisons in relation to the chosen criteria. In most case there are only ordinal information about characteristics of alternatives, criteria to rank them, weight of leader's preferences. Strength of most updated generalized pair-wise comparison approach, such as the one adopted in the present Case Study, is the ability to cope with binary, ordinal, categorical and, exceptionally, mixed data (Vreeker, Nijkamp, Ter Welle, 2001, pp. 9-10).

Core of *hierarchical procedures* is an ordinal pair-wise comparison of all criteria. It requires a specific preference statement: "per pair of criteria the decision-maker is asked to which degree a criterion is of more importance than the other". The method defines relative position of one criterion in relation to all other criteria. The weight assigned to each criterion reflects the importance which agent involved in evaluation gives to the objectives. From the pair-wise comparison a final comparison matrix is compiled from which a weight vector is derived. The latter is the tool for following knowledge, investigation and final evaluation. It is possible to check the consistency of the final comparison matrix by the eigenvalues method (Vreeker, Nijkamp, Ter Welle, 2001, pp. 11-12).

Core of *critical threshold approach* is the assessment of degree to which competing alternative satisfy pre-defined requirements of the evaluation process. Requirements can be reference values, than the method can be named as critical threshold value approach. Critical threshold approach can be used like both for classification and visualization. In the first case, it can determine the preferred alternative, in conjunction with an analytical tool such as pair-wise comparison approach. In the second case, it is the visualization of outcomes of other analytical procedures (Vreeker, Nijkamp, Ter Welle, 2001, pp. 7-8)

One of the more updated trend is to develop a new analytical framework blending more than one approach. In incipient experiment reported by literature, this approach seems to offer a more powerful and cohesive framework, better than separate applications. Results seem to be stronger than the ones developed by each separate and single tool (Vreeker, Nijkamp, Ter Welle, 2001).

Chart01. Historic Centers multi dimensional evaluation. Selection of evaluation method



### **Multi Criteria Analysis Implementation**

The collection of all judgments, *i.e.* the scores assigned to each criterion for each Historic Center, as said above, produces the table of evaluation, called

#### **Qualitative Effect Matrix, QEM.**

Among several alternative approaches, in the Case Study the Dominant Regime Method (DRM; Hinloopen, 1985; Hinloopen, Nijkamp, 1986) is applied. Data are processed by DRM. The rank order of the Historic Centers is produced and provided for decision in planning and political arena. The several rounds of DRM may be performed given different weight to groups of criteria and FIVE scenarios are set: Neutral Scenario, giving the same importance to all criteria; insediative scenario, giving higher weight to geographic criteria; Settlement Scenario, giving higher weight to urban criteria; Architectural Scenario, giving higher importance to architectural and urban architecture criteria; tourist scenario, giving higher weight to cultural and recreational criteria. For this Case Studies, neutral scenario has been set, analyzed and adopted *i.e.* the scenario where political weights are not assigned to criteria.

### **5. CASE STUDY AT LARGE LEVEL OF PROVINCE TERRITORY**

The main, newest and hardest Case Study tries to answer the most demanding Institutional request: to detect, select, visit directly, score and rank the most prominent and highest potential Historic Centers of the whole province. Among 202 centers only 32 have been selected by an experimental trans-disciplinary singling-out or selection procedure, then ranked through the consolidated MCA methodology and the DRM.

Key choice in this first and pioneer experiment is the subdivision of the province in sub-provincial areas called districts. The latter represent territories having cultural identity and geographic homogeneity. Ranking of centers belongs to separate districts and this gives a lot of sense to the interpretation of final results.

#### **Preliminary selection of the most prominent Historic Center among 202**

The selection procedure has been based upon several different prestigious contemporary or authoritative historical sources.

First, the detection of the historical leading function of 28 centers as main town (“capoluogo”) during the province civil history of sub-county administrative (non-constituent) territorial sub-division. This list, derived from historical documents and cartographies, has been compared to other lists created by contemporary researches. It is the following.

1. Ardore; 2. Bagnara; 3. Bova; 4. Calanna; 5. Casalnuovo; 6. Castelvetero; 7. Cinquefrondi; 8. Gallina; 9. Gerace; 10. Gioiosa; 11. Grotteria; 12. Laureana; 13. Mammola; 14. Melito; 15. Oppido; 16. Palmi; 17. Pedavoli; 18. Polistena; 19. Radicena; 20. Reggio; 21. San Luca; 22. Scilla; 23. Seminara; 24. Siderno; 25. Sinopoli; 26. Staiti; 27. Stilo; 28. Villa San Giovanni.

Consequently, the second list is the selection of 25 most relevant 14 Historic Centers and 12 Historic Plantation (so-called: “new settlement towns”) of the province, made by the fifteen year long research of PAU University Department in the field of Architecture (History; Restoration; Treasuring; Planning), Conservation, Urbanism. Two lists are the followings.

- Historic Centers: 1. Bova; 2. Brancaleone Superiore; 3. Caulonia; 4. Galliciano; 5. Gerace; 6. Mammola; 7. Palizzi; 8. Pentadattilo; 9. Reggio Calabria; 10. Roghudi Vecchia; 11. San Giorgio Morgeto; 12. Scilla; 13. Siderno Superiore; 14. Stilo. New settlement towns: 1. Bagnara; 2. Bianco; 3. Cittanova; 4. Fiumara di Muro; 5. Gallina; 6. Oppido Mamertina; 7. Palmi; 8. Polistena; 9. Reggio; 10. Sant’Eufemia d’Aspromonte; 11. Seminara; 12. Taurianova.

The third list has been extracted from the draft of Regional Spatial Plan. The list contains for the province a typological taxonomy of 27 Historic Centers, namely as follows.

- Two with highest relevance: 1. Gerace; 2. Stilo. Eight of high relevance: 1. Bagnara; 2. Bova; 3. Brancaleone (S); 4. Caulonia; 5. Gioiosa Ionica; 6. Grotteria; 7. Mammola; 8. Siderno (S). Just one of medium relevance: Roccella Ionica. Twelve of supposed new settlement after earthquake and natural catastrophic events: 1. Cinquefrondi; 2. Cittanova 3. Gioia Tauro; 4. Laureana di Borrello; 5. Locri; 6. Oppido Mamertina; 7. Palmi; 8. Polistena; 9. Reggio Calabria; 10. Rosarno; 11. Sant’Eufemia d’Aspromonte; 12. Siderno Marina. Four with strong emotional landscape and perceptive value: 1. Canolo; 2. Pentadattilo; 3. Roghudi; 4. Scilla.



Three different sources provide almost the same amount of leading Historic Centers (28, 25, 27, among the total of 202), having high intrinsic value, to be regarded as top priority for investment program giving their higher probably responsiveness to investment for treasuring.

The three different sources are integrated with two prestigious guides concerning the best Italian Historic Centers or “burg” (“*I borghi più belli d’Italia*”).

First is the book of Italian Touring Club (Gambi, 1996), the publisher that is the most prestigious tourist guide maker and printer of artistic itineraries. The guide titled “*Italia da scoprire. Viaggio nei centri minori*”, enlists Locri and Gerace as top “burgs” of the province, that are already included in the network by the three sources queried before.

Second, is the book titled “*I Borghi più belli d’Italia. Il fascino dell’Italia nascosta*” (Associazione Nazionale Comuni Italiani, 2005). It is authored by the prestigious Association “*I Borghi più belli d’Italia*” promoted by the authoritative official federation of all Italian Town Halls (*Associazione Nazionale dei Comuni Italiani, ANCI*). The guide enlists Bova, Chianalea di Scilla, Gerace, Stilo, as outstanding “burg” of the province, already included in the network by the three original lists previously cited.

The outcome is a comparative table of all five sources. It has been used as basis for an itinerary performed by the evaluation team for a preliminary check, on heuristic basis, that allows to derive the final list of:

Network of prominent Historic Centers of Reggio Calabria province.

The MCA-DRM rigorous methodology has been applied relying on an evaluation team well trained, highly skilled, motivated, experienced and very strong.

The demanding tour allowed both the scoring according to methodology, and a relevant innovation. It is the check by written report and picture documentation about the blight and decay of settlements and their architectures. This is the first documented monitoring act sub-sequent analytic and evaluative research.

### **Field work in main Case Study**

A second demanding tour has been performed to accomplish the field work including conservation documentation and assessment, as well as Multi Criteria scoring of each settlement for each criterion, for four sub-provincial districts.

A huge amount of scoring and assessment operations have been performed producing an Evaluation Data Base. Operations have been  $32 \times 14 \times 4 = 1.792$  (alternative x criteria x evaluators = total).

They have been imputed in the special Multi Criteria Analysis software that is the Dominant Regime Method software (DRM2).

First outcome in the DRM software procedure is the sum of all scoring for each Evaluator in the Qualitative Effect Matrix, run separated and autonomously (by each evaluator, for each district), then unified partial results in a

unified Qualitative Effect Matrix.

Alongside with “heritknow” related to intrinsic value scoring, a fresh knowledge sector has been created and it is the anthology of Reports and picture galleries regarding the decay and physical deterioration of each settlements. It is an autonomous partition of the Data Base that is upgraded in a spatial one, and is named “GeoDataBase”. The survey, documentation, analysis and assessment of deterioration level is of paramount importance because it is a pioneer field work information, built for the first time and for a large number of settlements. It is otherwise not available in the real world where no one knows the conservation and maintenance levels of buildings and urban patterns. This is important to infer the relationship between original urban value of center and actual residual value after natural deterioration and human damage of construction and structures. It is also a basis for the alphabetic Report containing direction for future interventions and public works on physical side of each settlement.

### **Running Multi Criteria Evaluation through Dominant Regime Method**

Software runs the autonomous Qualitative Effect Matrices, then the main unified Qualitative Effect Matrix. Outcome is the ranking of all Historic Centers according to scoring activity of Evaluator Panel articulated per district.

The uncovered process is managed by a Senior Evaluator Master or Coordinator that checks for coherence the first results of few initial runs, before the definitive one.

The personal skill of each Evaluator is improving because all of them are called up to write down, in secret mode, a personal heuristic final ranking of all the settlements they are going to score up in numerical expression.

Afterwards, Senior Evaluation Master or Coordinator promotes bilateral meetings with each Evaluator, commenting final analytical outcomes with heuristics, trying to understand differentials.

Figure 01. Multi dimensional evaluation of Historic Centers. Chart derived from Multi Criteria Analysis. Historic Center rank order of Locride Cultural District. Neutral scenario

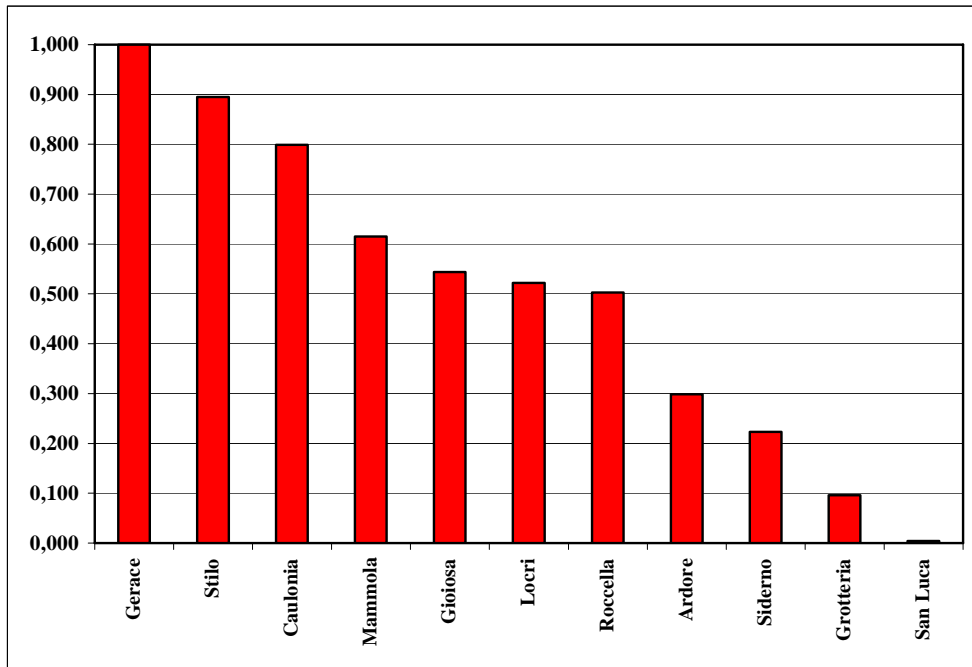


Figure 02. Multi dimensional evaluation of Historic Centers. Chart derived from Multi Criteria Analysis. Historic Center rank order of Tauro Cultural District. Neutral scenario

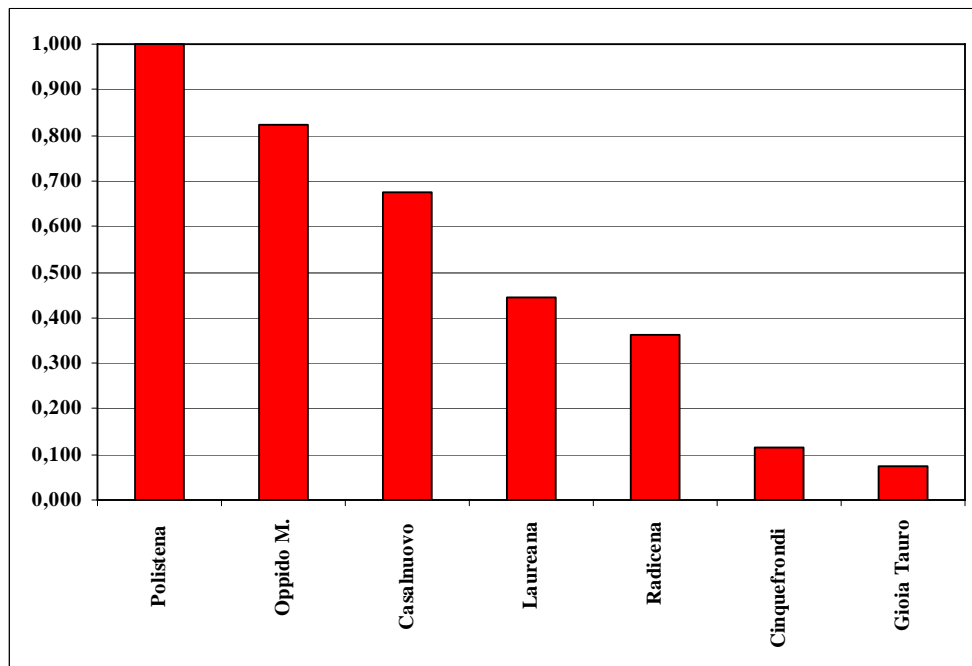


Figure 03. Multi dimensional evaluation of Historic Centers. Chart derived from Multi Criteria Analysis. Historic Center rank order of Costa Viola Cultural District. Neutral scenario

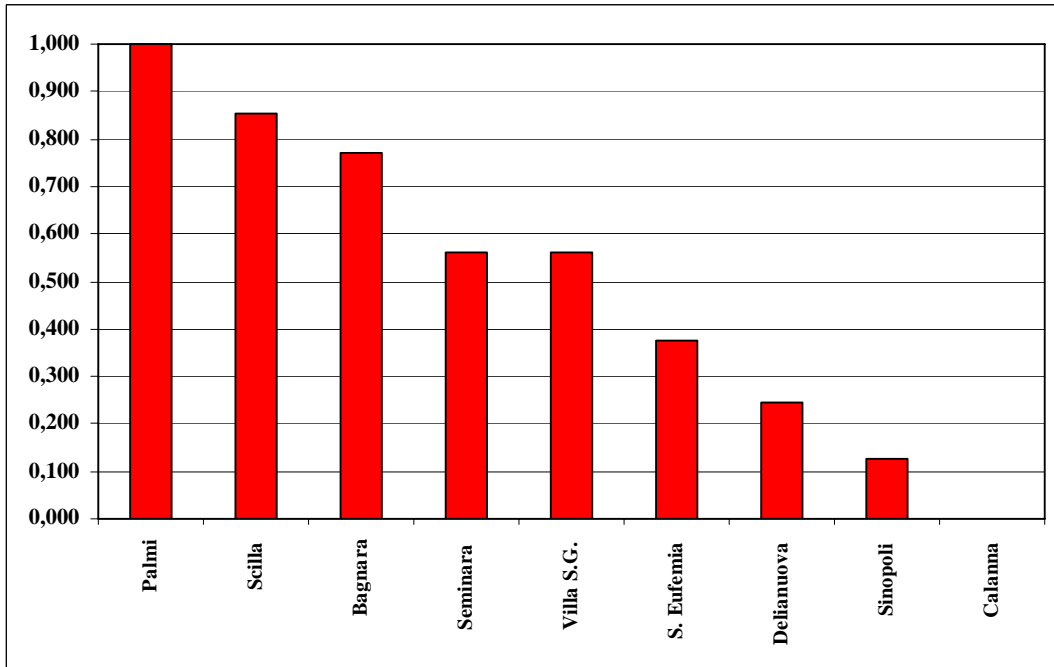
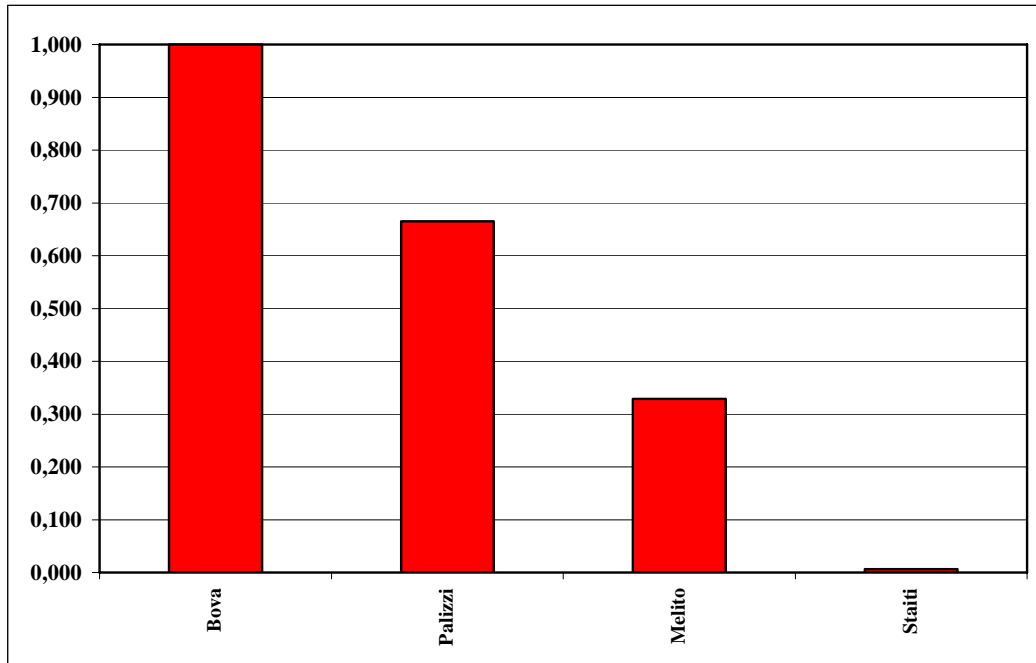


Figure 04. Multi dimensional evaluation of Historic Centers. Chart derived from Multi Criteria Analysis. Historic Center rank order of Greek Cultural District. Neutral scenario



## 6. CONCLUSIONS

A specific methodology, has been set-up allowing research team to produce at same time both: a systematic “Atlas of Historic Centers” based on objective data; a set of linked multi dimensional evaluations performed with a defined methodology, and specifically with a MCA. The output gives a hierarchical ranking, articulated for sub-provincial district, useful to set-up a revitalization strategy.

The main and newest Case Study is the direct answer to the Institution request and demand to detecting and ranking the most prominent and highest potential Historic Centers of a whole province. Of the 202 centers only 32 have been selected, then ranked through the MCA consolidated methodology.

The re-use of historic villages, for a compatible tourism activities, agriculture centers and small historic town, as productive services and trade small sites, may be a key alternative *versus* new spreading out, urban sprawl and further landscape contamination.

The point is exactly to set-up a hierarchical or ranking evaluation of all historic villages compared each other inside sub-provincial district. Multi dimensional evaluation has a strategic relevance. It is the basis for decision making about priorities of intervention for settlement revitalization. It is positively advisable to take action starting from the strongest Historic Centers where the positive impacts of interventions will be the fastest and most effective, and it will pull-in other small Historic Centers, in a cluster interaction, toward revitalization.

Research output is the above cited global ranking based upon an exhaustive knowledge about the number of Historic Centers, linked to a systematic multi dimensional evaluation, performed through criteria, of their characteristics.

Additionally, a structure for remote evaluation has been set-up. Several pairs\groups of evaluators are active in different places at the same time using some standards for evaluation. A new evaluation agent took action: a central and experienced senior doing the Appraisal Coordinator or Master, acting in remote link thanks to state-of-the-art WebGIS tools. Each pairs\group of appraisers sends, by state-of-the-art WebGIS tools, first draft estimate to the Appraisal Master who coordinates operations. He\she gives back suggestions and directions, fostering and supporting the final multi dimensional evaluation of Historic Centers characteristics and the standard application.

Concluding, results of the present Case Study seem to be reasonably consistent compared to rational expectations.

Finally, the set-up of such methodology made possible and easy the future monitoring over time (*e.g.* in a time span of two-four as well as five-ten years) of Historic Centers features, characteristics and quality level. This follow-up will make possible to check-out the positive or negative impacts over time of four agents: nature acting over building; unavoidable decay of building materials; owners maintenance actions; bad or good public interventions.

The system has been validated, experimented, revised, then adopted by Institution as a prototype GIS for knowledge preservation, conservation, treasuring of Cultural Heritage of the province.

Table 01. Historic Center ranking articulated in sub-provincial Cultural Districts

N.	Locride	Score	N.	Tauro	Score	N.	Costa viola	Score	N.	Grecanica	Score
01	Gerace	1.000	01	Polistena	0.999	01	Palmi	1.000	01	Bova	1.000
02	Stilo	0.895	02	Oppido	0.824	02	Scilla	0.855	02	Palizzi	0.665
03	Caulonia	0.799	03	Casalnuovo	0.676	03	Bagnara	0.770	03	Melito P.S.	0.329
04	Mammola	0.615	04	Laureana	0.446	04	Seminara	0.563	04	Staiti	0.006
05	Gioiosa	0.544	05	Radicena	0.362	05	Villa S. G.	0.562			
06	Locri	0.522	06	Cinquefrondi	0.117	06	S. Eufemia	0.376			
07	Roccella	0.503	07	Gioia Tauro	0.076	07	Delianuova	0.247			
08	Ardore	0.299				08	Sinopoli	0.128			
09	Siderno	0.223				09	Calanna	0.000			
10	Grotteria	0.096									
11	San Luca	0.004									

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## Biography

Domenico E. MASSIMO is Professor at Mediterranean University of Reggio Calabria, Italy, Department # 1 PAU, where he teaches Civil Appraisal, Economics of Project Evaluation, Environmental Economics at School of Architecture. He has been trained as research fellow at MIT (Cambridge, Ma, Usa), Department of Economics and Department of Urban Studies and Planning in the joint SPURS Program with Prof. Karen R. Polenske and Prof. Jerome Rothenberg, and at Northeastern University (Boston, Ma, Usa), Department of Economics with Prof. Gustav Shachter and Prof. Gregory H. Wassall.

He specializes in: environmental (bio-ecological, natural, landscapes) and cultural (urban, architectural, historic, artistic) Heritage total census and account by the mean of GIS; specific monetary and non-monetary evaluation by the mean of appraisal methods and ordinal multi-dimensional assessment approaches linked to GIS tools; treasuring for local economic development with the help of econometric growth models. He studied at Harvard University (Cambridge, Ma, Usa) and Boston University (Boston, Ma, Usa). He has a Master of Art in Architecture (University of Rome, Italy), Diploma SPURS in Urban and Regional Studies (MIT, Cambridge, Ma, Usa), Master of Science in Economic Planning (Northeastern University, Boston, Ma, Usa), Ph.D. in Environmental Planning (University of Reggio Calabria, Italy).

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**FIGURES**

Figure 05. Calabria region. Detection of centers existing at 1851, articulated for historic provinces and districts, on the basis of systematic historic cartography

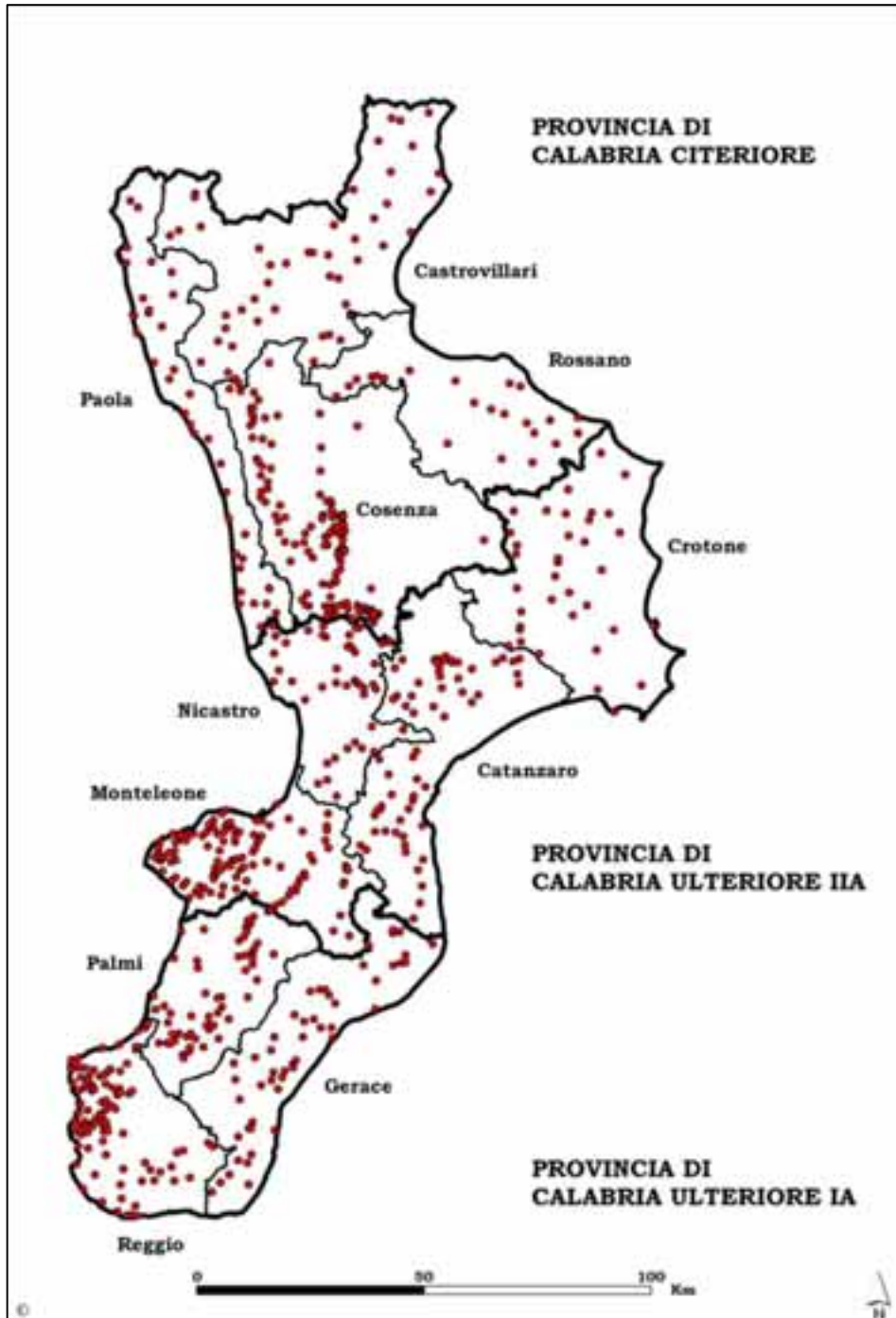


Figure 06. Calabria region. Reggio Calabria province. Provincial territory at 1870. Perimeter of 202 settlements at 1870. Source: Istituto Topografico Militare, Florence, 1870

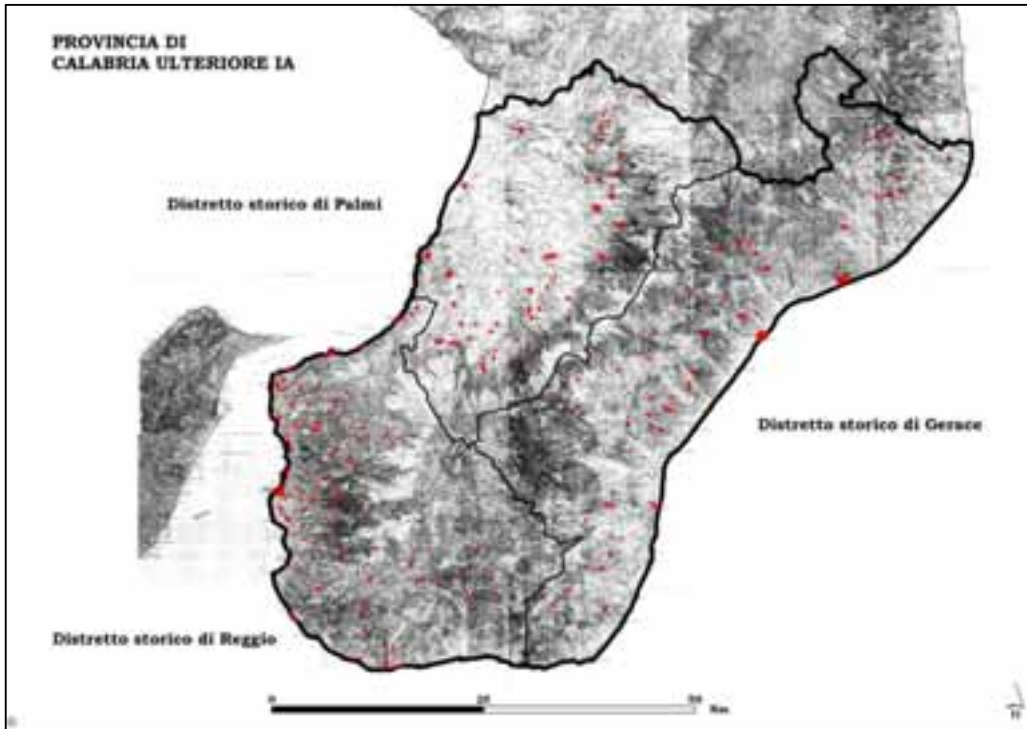


Figure 07. Calabria region. Reggio Calabria province. Perimeter of 202 settlements existing at 1870 and insediative census data at 2001. Overlapping between historic centers and settlements at 2001

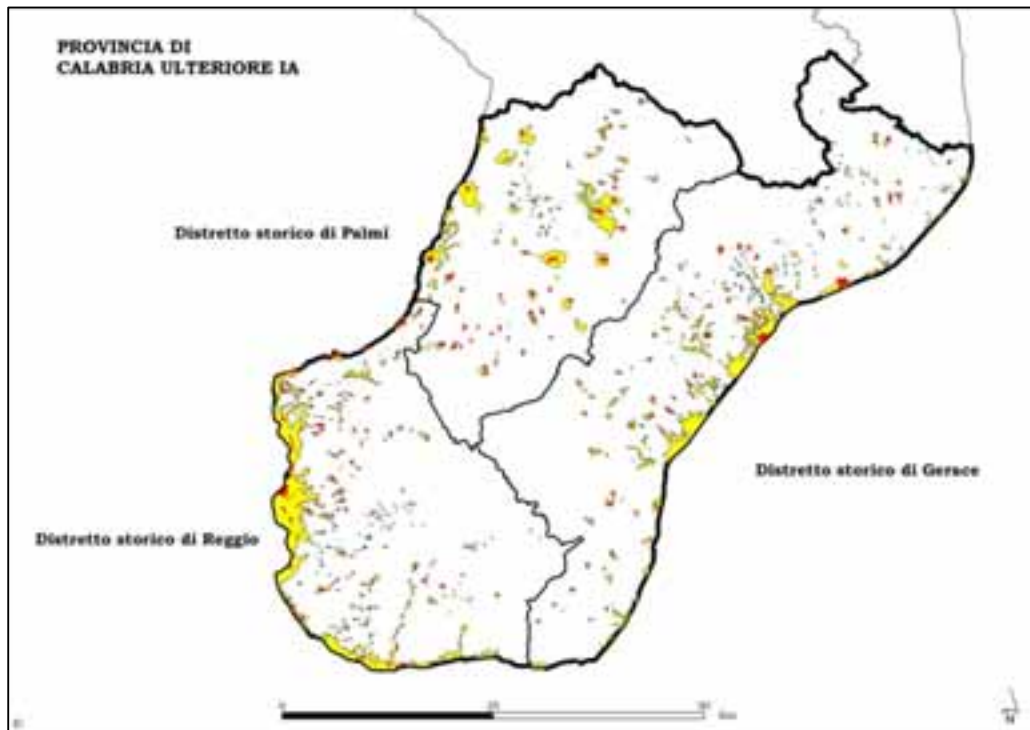


Figure 08. Historic Center Index proposal for detection and classification. First part. Case Study: Caulonia (Rc)

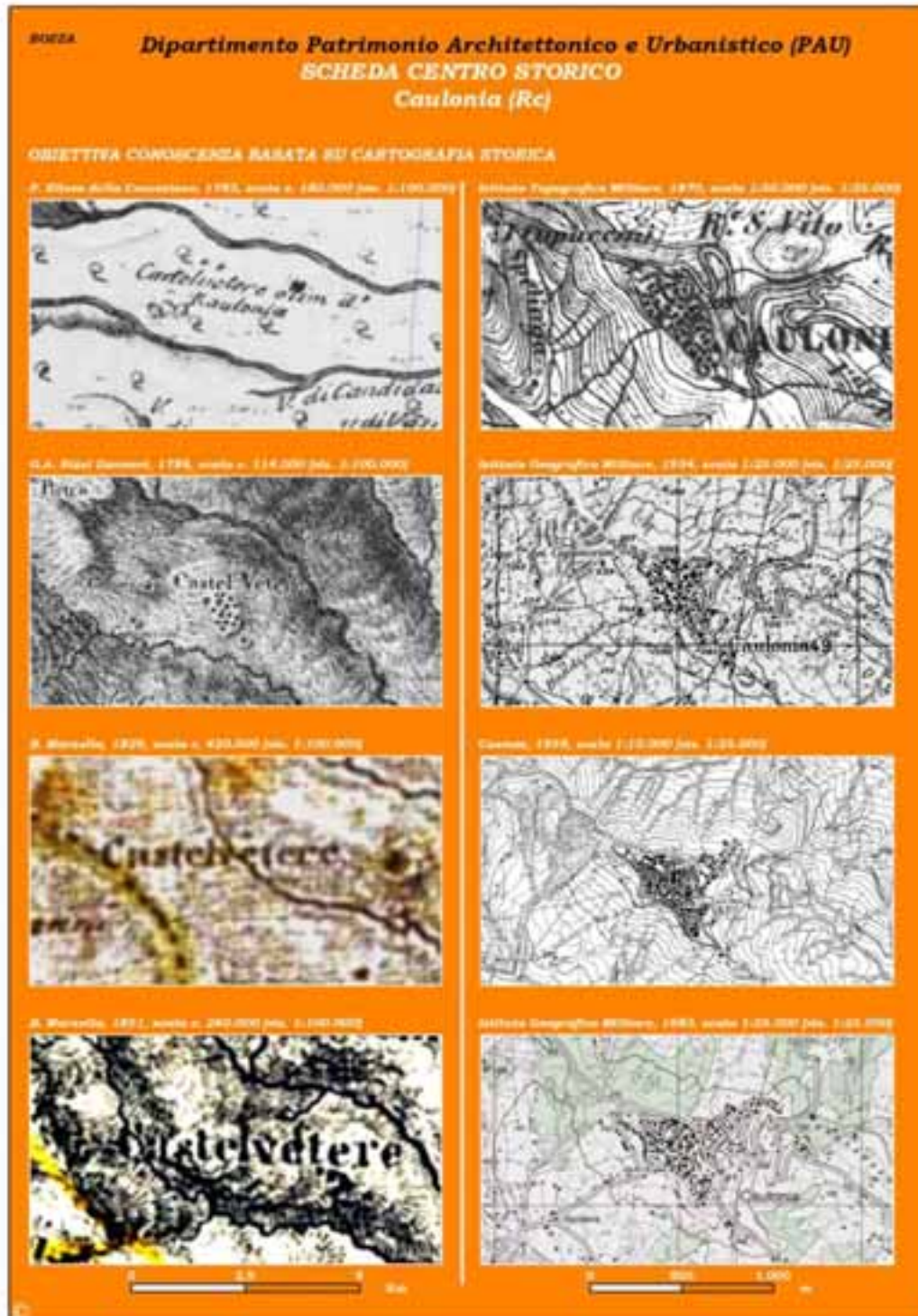




Figure 09. Historic Center Index proposal for detection and classification. Second part. Case Study: Caulonia (Rc)

**Dipartimento Patrimonio Architettonico e Urbanistico (PAU)**  
**SCHEDA CENTRO STORICO**  
**Caulonia (Rc)**

LIVELLO DI RICERCA: OBBLIGATORIETA'		DEMOGRAFIA STORICA E DENOMINAZIONE CENSUARIA			
Tipo Scheda	CS	1783	Esale	1901	Caulonia 4.501
Obbligatorietà	Occasionale	1788	Esale	1936	Caulonia 4.827
TOPONIMASTICA DA CARTOGRAFIA STORICA		1829	5.117	1961	Caulonia 5.114
Toponimo 1783	Castelvetere olim Kaulonia	1881	5.402	1961	Caulonia 1.591
Toponimo 1788	Castel Velare	1881	Caulonia 4.396	1972	Caulonia 3.402
Toponimo 1829	Castelvetere	1901	Caulonia 6.344	1981	Caulonia 3.326
Toponimo 1851	Castelvetere	1911	Caulonia 5.592	1991	Caulonia 1.791
Toponimo 1870	Caulonia	1921	Caulonia 8.708	2001	Caulonia 1.569

DATI AMMINISTRATIVI STORICI (AL 1851)		AFFONDIAMENTI DI CONOSCENZA				
Comune 1851	Castelvetere	Cartografia	Catasto	Storia	Referenze	
Cronotario 1851	Castelvetere	Inseparato	Beni	Vincoli	Parchi	PRG
Distretto 1851	Gerace	OBBLIGATORIETA' SCHEDA ESISTENTI				
Provincia 1851	Calabria (Storica) LA	SCHEDA CS	ICCD 1970	ICCD 1990		

DATI AMMINISTRATIVI ATTUALI		SIT SCHEDA CS DI VALIDAZIONE	
Regione	Calabria	Multicriteria Analysis	Valutabilità Simile
Provincia	Reggio Calabria	Interventi, Sostenibilità	Attrazione Economica
Comune	Caulonia		
Località abitata	Caulonia		
Codice Istat	18-080-025		
Altitudine	200 m s.m.		
Tipo insediamento	B. Insure		

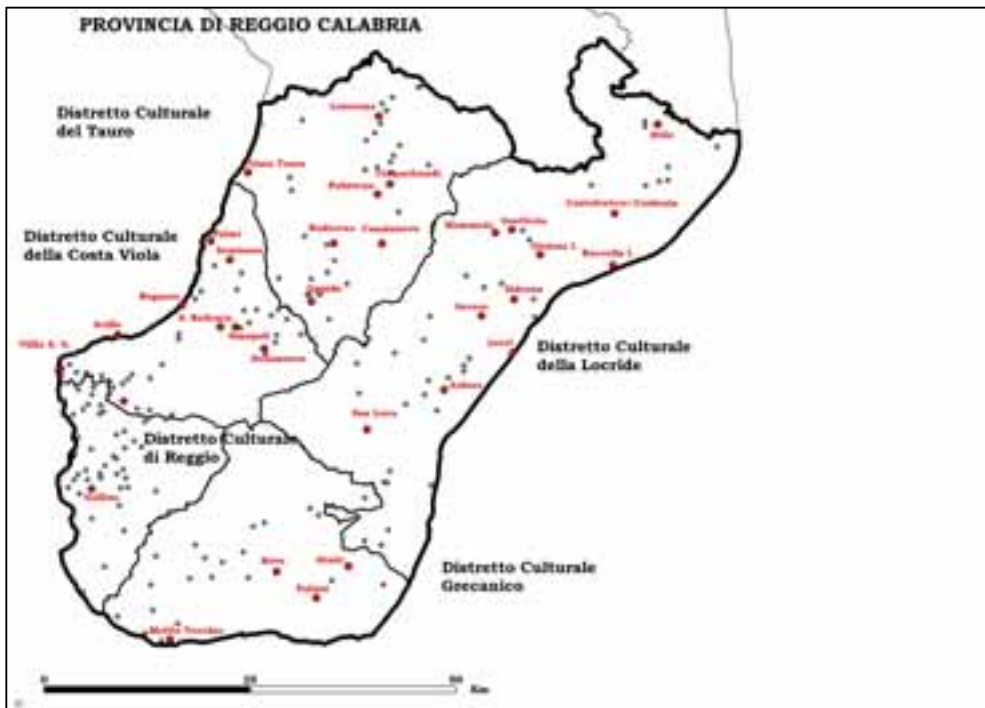
  

**CENTRO STORICO NELL'INSEDIAMENTO ATTUALE**  
 Centro Storico di Caulonia. Individuazione del perimetro di 1870 su cartina aerea di 2001 (sc. 1:10.000)

Figure 10. Population GeoDataBase for each settlement from 1829 to 2001, in Reggio Calabria province. It includes the cartographic validation of the center existence at 1783 and at 1788

The image shows a screenshot of a software application displaying a large data table. The table has multiple columns, with the first column listing settlement names and subsequent columns representing population counts for different years. The years listed include 1829, 1834, 1842, 1850, 1858, 1866, 1874, 1882, 1890, 1898, 1906, 1914, 1922, 1930, 1938, 1946, 1954, 1962, 1970, 1978, 1986, 1994, and 2001. A row in the middle of the table is highlighted in yellow, indicating a specific settlement or data point of interest.

Figure 11. Historic Centers (32) ranked through Multi Criteria Evaluation, articulated in sub-provincial districts



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