

URBAN RENEWAL COST EVALUATION. STIMA DEI COSTI DELLA RIQUALIFICAZIONE URBANA

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Abstract

Works for urban renewal and building maintenance are increasing the percentage shared in the broad construction sector in European economy. Interventions are designed by architects, engineers and applied economists using CAD, spreadsheet, DB and cost regression tools. The related DataBase are disparate and fragmented. They can be tied together and integrated with the powerful ArcGIS framework that can be the basic element for a Decision Support System (DSS) giving more coordinated cost-benefit indicators to entrepreneurs, city managers, analysts, designers, engineers and general public. The Paper describes the construction of a DSS prototype, discusses the general design for urban enhancement\upgrade design\evaluation, focusing on the urban renewal cost forecast and using a dedicated ArcGIS (integrating CAD, spreadsheets, DB, regression models). A Case Study is developed for design and cost forecast regarding an urban renewal intervention.

Riassunto

Gli interventi di recupero urbano e di conservazione degli edifici costituiscono una percentuale sempre maggiore del più vasto settore delle costruzioni nell'economia europea. Tali interventi sono progettati da architetti, ingegneri, e analisti applicando strumenti CAD, *spreadsheet*, DB e analisi di regressione dei costi. Tutte queste informazioni e DB sono però separati e frammentati. Essi possono essere collegati e integrati nel potente *framework* di ArcGIS che può costituire un modulo di un *Decision Support System* (DSS) in grado di fornire indicatori coordinati dei costi-benefici a imprenditori, *city managers*, analisti, progettisti, ingegneri e soggetti pubblici. Il *Paper* descrive la costruzione di un prototipo di DSS, discute un progetto generale di riqualificazione, progettazione, valutazione urbana, focalizzando sulla previsione dei costi del recupero attraverso un dedicato ArcGIS (integrando CAD, *spreadsheets*, DB, modelli di regressione).

È stato sviluppato un Caso di Studio per la progettazione e la previsione dei costi concernenti interventi di rinnovo urbano.

1. Introduction

Research of PAU Geomatics and GIS Group, at *Mediterranean* University of Reggio Calabria (Italy), deals with two converging issues, strategic the first, operational the second.

First. Caring about atmospheric and cultural environment led a growing number of countries, regions, counties and cities to make a difference in the strategy of economic capital built-up. They shift from infrastructure new construction and neighbourhood spread-out to reuse\rehabilitation of existing facilities and to urban conservation\renewal. The structures of costs and benefits of this more ecological and alternative strategy are paramount complex. In fact they include intangible aspect: smaller quantity of used\compromised natural soil, geological resources and cultural heritage; greater quantity of open land safeguarded; reduced entity of pollution produced; reduced amount of overall transportation efforts. These aspects do not show up in the short term, are not easily evident even if real and consistent and are difficult to be grasped from the general public.

Second. In this new, alternative and more ecological scenario it is much harder, with respect to new construction investments, to get information and to perform estimate. This is on both overall benefits side (understanding \ identification; valuation \ appraisal) and on overall cost side (understanding \ identification; valuation \ appraisal).

Consequently, in regional and urban management the strategy of city renewal and open land preservation\saving (alternative to the strategy of urban spreading-out and infrastructure expansion) is very complex to be chosen\conceived, defined, set-up, detailed and, also, is very demanding in terms of data, information, valuation, appraisal.

2. Building Prices Related to Actual, Potential or Blighted Urban Quality

One relevant aim of the research is to detect and recognize the urban values of the settlement, related to parallel market price of buildings. These may be in three different conditions.

First. Relevant urban values may exist in some areas, and may be recognized by inhabitants and expressed by proxies such as coherent building prices *i.e.* real estate values. These areas are called “Areas with Aptitude for Urban Life Quality” or Aptitudinal Areas. Second. Urban values may exist objectively but contingent factors worsening the market, than real estate prices are not coherent with objective physical features and architectural-aesthetics characteristics. It may be an area\zone effect on real estate market, produced by “negative” racial and social dynamics or weak perception, about real estate potentialities, of inhabitants and potential buyers. Third. Urban values may exist, but they are particularly deteriorated and suffocated by inefficiency, slum factors and un-coordination in urban management.

In the first case we shall let alone the market to work, because monetary values are coherent with objective, architectural, aesthetic, physical values of settlement. In the second case contingent and light interventions may be useful and effective in fostering the coherence between potential physical value of urban areas or architectural units and real estate values. The third case is the most serious and it is a signal of a sub-optimal Pareto condition that may call for structural private-public coordination and heavy interventions. In fact, when there is not coherence between architectural-physical values and real estate prices this can be seen as a signal and an evidence of **sub-optimal Pareto condition**, where it is most probable the progressive deterioration of the qualitative characteristics. It is intuitive that in case of this incoherence, the in depth knowledge and system information become important. Where the market doesn't recognise the intrinsic values, coordinated and significant interventions are needed. A relevant lack must be solved and overcome and it is about the estimate of global and specific costs for urban renewal, building maintenance and architecture up-grading.

3. Magnitude of Intervention and Valuation of Renewal Costs

The spatial-economic comparison between areas, with an homogeneous level or rank of quality, and urban zones or Homogeneous Prices Areas or micro-zones, with homogeneous values and real estate prices, provides a possible platform for the decisions concerning the areas of intervention for renewal and up-grading.

When the comparison, aided by powerful Data Base and spatial information, detects sub-optimal Pareto condition, the degree and magnitude of differentiation between intrinsic values *versus* commercial prices can help to understand if there is just a short-term problem or, instead, a structural blight and a strong lack of efficiency. Consequently, it is possible to foresee and quantify intervention alternatively in light amount or in structural and heavy terms.

It is crucial to link the intervention typologies with tools to evaluate them in monetary terms. A spatial information system, organized in state-of-art version of GeoDataBase, is of paramount importance to evaluate costs for urban renewal and building up-grading. It might help also to assess the probabilistic positive impact of repair, enhancement, re-furbishment, site amelioration, on real estate value.

4. Valuation of Urban Renewal Costs and Impacts

As stated before, renewal management at neighbourhood and building levels, can be defined strategic when all phases of intervention such as visioning, conception, planning, design and implementation are accompanied by evaluation: economic-quantitative of activities; predictive of future probabilistic impacts.

Parts of the present research are focused on the first and crude economic factor of complex urban renewal strategies: **costs of intervention**. Cost quantification and forecast have to be applied systematically, and not occasionally, to activities and investments. In this way both information system and integrated evaluation tools aid strategic management and program implementation.

5. Focus on Cost Estimate of Urban Renewal and Architectural Up-Grade

Focus of present research are the activities of urban renewal and quantitative assessment of relative costs by the mean of appropriate tools coordinated by the GIS framework *i.e.* “preventive evaluation of the urban renewal and architectural up-grade and restoration costs”. The accomplishment of this aim cannot be taken for granted because, especially in Italy, there is an endemic absence of systematic data on the sector costs. This, despite the relevant weight that the activities of renewal and restoration have in this country, specially for buildings with historic, artistic and insediative characteristics.

The research tries to overcome the informative lack by starting the build-up of a Data Base containing a relevant collection of information concerning detailed costs of interventions. Costs are estimated by microeconomic analyses of the elemental technical factors of production for building restoration, physical conservation, maintenance. The Data Base, founded on analytic knowledge, aggregates elemental inputs in modular operations and works. The input combinations is based upon the information deriving from the monitoring of: real world interventions; real world building yards; contract implementations. The final aim is to synthesize technical data and related monetary assessment and quantifications, in order to forecast and monitor the costs. Consequently, the spatial informative structure is systematically linked with Data Base. Geometric data are related to the microeconomic analyses of the elemental input works and of the relative production factors. Thanks to this information it is possible to assess the interventions first in quantitative than in monetary terms. In order to verify the approach, an operative methodology has been set and then experimented by Case Study involving many worker units in monitoring and in research activity. At the first step, to have an efficient management, data collection have been decentralized and performed by different operators endowed with different Data Base run by accessible and inexpensive MSAccess ® tools. In a subsequent step, desk work structures and unifies all information in GIS GeoDataBase. The object oriented programming allows to link GIS to other useful engines as Multi Criteria Analysis for the choice among many alternatives. In fact, the choice of the interventions can be supported by both the Data Base and the scenario evaluation. Choice is related to costs of finished works and to important ecological characteristics of the materials:

energetic advantages; best resistance to the atmospheric agents; environmental compatibility. It makes it possible to choose the most ecological and best possible scenarios of renewal.

6. Case Study

The study area is the inner-city or historic centre of Reggio Calabria, the Southeast city of continental Italy inhabited by 2.000.000 people. Aim of the Case Study is the build-up an Urban Information System (UIS), *i.e.* an Urban GIS, that integrates the important economic data with detailed 3D spatial information. The integrated economic data concern cost estimate, potential benefit forecast, three-dimensional visualization of the properties to detect future beneficiaries of interventions, real estate market data. The research configures an Economic Geomatics as an integrated cognitive support to government action for amelioration of city quality and urban life. Visualization of the urban reality of Reggio Calabria on the official topographic map and aerial images is geo-referenced.

The boundaries of the cadastral maps and related cadastral sections are singled out. Their boundaries are drew on topographical map and on aerial orthophoto. This is in order to accurately visualize the cadastral entities ("Fogli", or Homogeneous Prices) in the different geodetic, projective and cartographic ambits. In fact, the ambits ("Fogli") included in the cadastral maps contain homogeneous real estate values in a past age around 1930, which should be systematically verified and validated through today up-dated observations of confidential market data.

These data are then georeferenced in GIS. In the latter, all such information can be available integrating different sources: physical descriptions expressed in CAD extensions; cadastre alphanumeric registrations expressed in DBMS extensions; aerial images and other aerial original documents expressed in Image extensions both at architectural and urban levels.

The basic methodology, supported by GIS, allows to single out the ambits of potential and/or actual blight and deterioration where priority should be given for interventions. Among these areas there is the Latin District, so named because is populated by university students of Architecture, Engineering, Forestry and Law Schools, and in analogy to the *Quartier Latin* in Paris. It is a Liberty (*Art Nouveau*) district situated in the North part of the historic centre of Reggio Calabria, between the port and the University. The detailed analyses make it possible to single out the high morphological-insediative and architectural qualities of Liberty urban blocks. The living units, in Liberty buildings, have been surveyed and drew in plan, elevation and section. Then they have been investigated to diagnose material deteriorations as well as structural mechanisms of collapse\breakdown.

The GIS tools memorize building and constructive elements with the in progress deterioration. There is therefore another link to the Data Base of interventions and the possible works to realize it. The data on the costs allow to calculate the monetary amount of interventions on each structural and typological deteriorated element. At the end there will be available both the list of the necessary works for the conservation of the housing unit, as well as the total monetary cost of interventions calculated in real time.

Concluding, this methodology makes it possible to know very accurately the boundaries of the property, the degree of conservation and maintenance of these buildings, and also the integrity of the original characteristics. This is in order to evaluate the types and costs of future interventions of maintenance and up-grading of every architectural unit, building, block, area.

7. Future Research. Revitalization of Latin District

Future research will investigate the probabilistic benefits of a great strategy for physical conservation and social revitalization of Latin District, where are located the extraordinary masterpieces of art called Riace Bronzes (fifth century before Christ, probably from Fidia epigones) and there is one of the world largest collection of Magna Graecia archaeological findings and relicts

as well as of sub-marine discoverings in the National Museum. The strategy outlines a global renewal of the blighted port area, the construction of a new branch of the National Museum directly connected to cruise ship pier, railroad station and highway exits, to attract a large number of visitors. Latin District and its fascinating Liberty architecture will be revitalized also to warmly host visitors with home hotel, *i.e.* bed and breakfast, organization. At that time architectural up-grade will be implemented and completed for an economic new deal. And GIS will have served again our local world.

8. Conclusions

The overall georeferenced analysis of an urban centre under the different aspects of intrinsic and potential insediative quality and of real estate prices, is a usefully support for urban strategy and management. It allows Civil and Urban Appraisal to single out (with good reasons) areas of blighting and potential deterioration. The latter deserves priority of intervention. When the potential values are significant, those areas have a higher aptitude to react with success to the interventions and to renewal programs. In the Case Study, the research starts to integrate geographic information and 3D visualization with knowledge of costs and potential benefits of the interventions. Also there is an interaction with the Cadastre, from which stems the list of properties and of proprietors (owners) visualized in the third-dimension. The latter allows to know the stakeholders of the program and people to be involved. All this powerful system helps to easily evaluate qualitative state of reality, need of interventions, magnitude of costs and probabilistic benefits, dimension and maze of the resources to be mobilized, subjects to be involved in the revitalization strategy.

Acknowledgement

The presentation refers to the Paper presented at Twenty-Fifty Annual ESRI International User Conferences, July 25-29, 2005, San Diego, California, USA.

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Figure

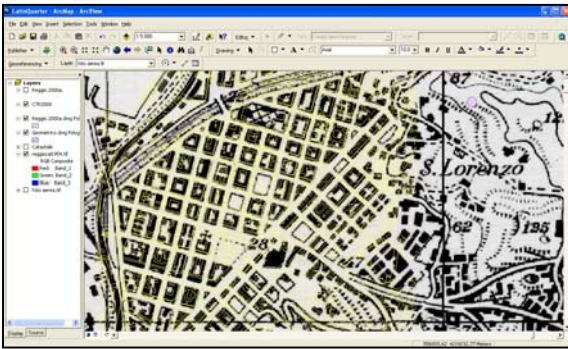


Figure1 – The area of Reggio Calabria. Case Study. Overlapping of topographical military map (IGMI) and technical vector map (Municipality). Zoom. Scale 1:5 000

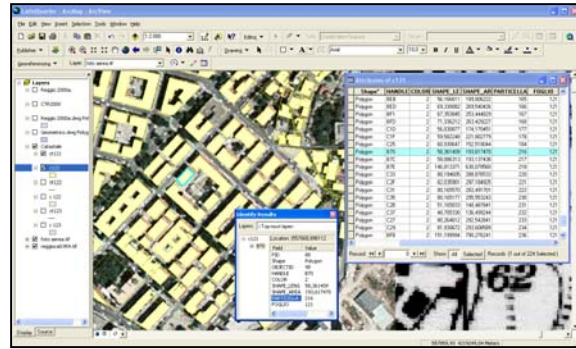


Figure 2 – Case Study. The Latin District. Cadastral Parcel 216. Overlapping of aerial-ortho-photo-image, cadastral map (Cadastr Administration) and technical vector map (Municipality). Zoom. Scale 1:2 000

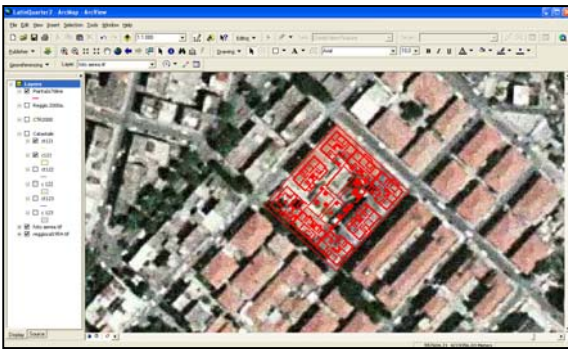


Figure 3 – Case Study. The Latin District. Cadastral Parcel 216. Overlapping of aerial-ortho-photo-image and architectural ground floor plan drawing (based on the work of: Praticò M., Pulvirenti R., Scarfò A., Scarfò C.). Scale 1:1 000

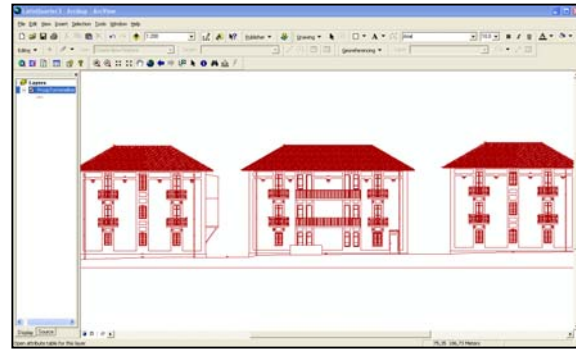


Figure 4 – Case Study. The Latin District. Cadastral Parcel 216. Elevation drawing (based on the work of: Praticò M., Pulvirenti R., Scarfò A., Scarfò C.). Scale 1:200

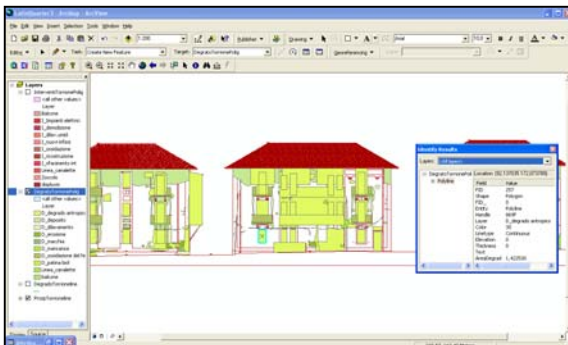


Figure 5 – Case Study. The Latin Quarter. Cadastral Parcel 216. Elevation drawing (based on the work of: Praticò M., Pulvirenti R., Scarfò A., Scarfò C.). Physical deteriorations. Scale 1:200

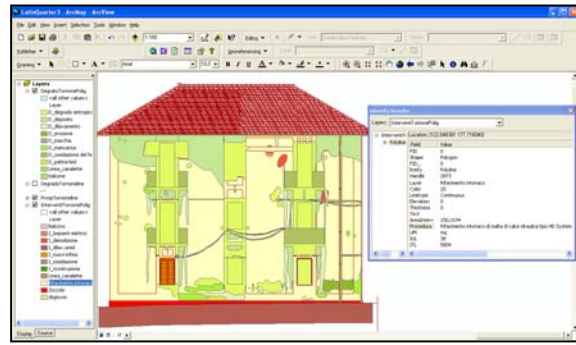


Figure 6 – Case Study. The Latin Quarter. Cadastral Parcel 216. Elevation drawing. Physical deteriorations, work of restoration (based on the work of: Praticò M., Pulvirenti R., Scarfò A., Scarfò C.). Total cost of intervention, linked to cost Data Base. Zoom. Attribute table. Scale 1:100