

Development of innovative knowledge frameworks for the protection and enhancement of rock habitat in a municipal planning experience

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Abstract – The knowledge produced during the process of urban planning and land-use planning is a source of information of great interest, useful for planning actions aimed at enhancing the cultural heritage, safeguarding autogenous resources and developing the territory.

The uniqueness of the heritage of rock habitat, as a sign of the historical-settlement stratification of the anthropic cavities and of the churches conceived as testimonies of the VI and VII century AD, true symbols of pagan and Christian religiosity, represents a perspective of protection and development in a tourist key on a territory, such as that of Massafra in the province of Taranto, with a strong environmental resilience.

The drafting of the new urban planning instrument, such as the Urban Planning Plan (PUG), expresses the need for careful planning for urban policies focused on the issues of development, protection and socio-economic development of the local heritage.

I. INTRODUCTION

Looking at the centrality of the Cultural Heritage with new attention to what the Municipal Planning has done for decades in Italy was undoubtedly one of the central objectives of the Urban Reform with the Regional Law of Apulia n. 20/2001. Furthermore, on the basis of the principle that there can be no proper safeguarding and exploitation of this heritage without having gained in-depth knowledge, the stage of building the Knowledge Frameworks within the process of drafting the new Urban Planning Plans is one of the fundamental steps of this process.

The Apulian Region, on the basis of the Regional Council Resolution n.1178 of 13 July 2009 "*Technical Instructions for Computerization of PUGs within the Regional SIT*", requires that all data relating to the planning of the Apulian municipalities constitute the

basis for the PUG mosaic construction, which can be used within the Regional Information System (SIT) portal and therefore available to all stakeholders to support proper programming and management of the territory. In the objectives of previous deliberation, there is a need to report, or rather directly to, plan works in Geographic Information System (GIS) environment.

All this should be seen in the light of the European Directive 2007/2 / EC INSPIRE, transposed into Italy by Legislative Decree 32/2010 and the Decree of 10 November 2011 of the Presidency of the Council of Ministers "*Adoption of the National Geodetic Reference System*" (Official Gazette n.48 of 27/02/2012), the purpose of which is to create a cartographic infrastructure for geographic information sharing at European level for geographical information sharing.

The knowledge produced during the PUG process is a source of information of great interest, detailed and precise for this reason of complex management.

This contribution refers to an example of planning the Reformation in the municipal territory of Massafra, in the province of Taranto, in an experience of the Third University Mission addressed by the Urban Planning Laboratory of the Department of Civil Engineering and Architecture of the Polytechnic of Bari in which the authors of this contribution work. [1.]

In support of the process of building the Framework of Knowledge and Interpretative Frameworks of Massafra, data collected and / or produced on the territory were organized in a Territorial Information System (SIT), built in line with the recommendations contained in the "*Instructions techniques for computerization of PUGs within the SIT Regional*" approved by Regional Council Resolution n. 1178 of July 2009, which far from limiting the ability to adequately represent the local specifics allows readings of analysis often carried out by different themes, disciplines and territorial backgrounds.

To this end, the knowledge system and consequently the SIT data base, in line with the DRAG

guidelines for PUG elaboration, has been organized according to the following subsystems:

- basic data,
- environmental resources,
- landscape resources,
- historical-monumental resources,
- rural resources,
- settlement resources,
- infrastructure resources,
- socio-economic reality,
- planning status.

All information layers available on the regional SIT (Regional Technical Map scale 1: 5.000, 8-meter Digital Territorial Model, Orthophotos, Soil Use, Idrogeomorphological Card, Cultural Heritage Card, etc ...) and other official databases (Es ISTAT, Territory Agency) were acquired in the municipal ITU. In particular, the Regional Technical Charter and Orthophotos were used as the basis for the production of original thematic data, produced for PUG, which complied with national / European standards and were therefore georiferous in the UTM WGS84 Geographic Projection System 33N. Where possible, the geometries were coincided with those on the Regional Technical Paper scale 1: 5.000, considering the 5% precision of the overlay mapping operation.

This important operation, as we have seen, concerns the system of resources to be identified, georeferenced and described also the Historical - Monumentals that in the specific case of the territory of Massafra the cultural heritage described by the studies of Cosimo Damiano Fonseca and its followers have defined the *Rocky Civilization* .[2.]

In fact, Massafra's communal territory is undoubtedly one of the wealthiest in Apulia for this type of property: entire rock villages where the Crypts were usually the central nucleus. The religious aspect concerns the reflection of the canons of the Churches of Constantinople and Rome affecting a local tradition of the first Christian places of gatherings hidden in Crypts-wells. The classification of this heritage will then have to look at the constructive excavation techniques of hypogeous structures and the cycles of mosaic frescoes that adorn them, highlighting the often very problematic conservation conditions so that they can propose in the phase of building the strategies of the plan and conservation and enhancement intervention programs. It is in the premortal belt of Massafra, surrounded by a dozen graves, canals and poles of a heritage of over fifty churches and chapels dating from the first centuries of the Christian Age until the Middle Ages. Moreover, the Cliff of Saint Mark and Madonna of Ladder are two erosive slopes crossing the communal territory creating conditions for integration between landscape and monumental historical aspects that constitute, if properly known, described and valued one of the great assets on which to build the urban policies of a high-ranking cultural and tourist offer, a real challenge to be confronted with in drafting the new Municipal Plan.

II. CONSTRUCTION OF THE KNOWLEDGE OF KNOWLEDGE IN THE COMMUNITY TERRITORIAL PLANNING

Programming and management of a territory is indispensable to pursuing a model of territorial growth aimed at improving the quality of life of the inhabitants, towards sustainable forms of tourism in full respect and development of rock habitats, local traditions and endogenous resources.

Computer support for the cognitive and interpretative process of a territory carried out during the drafting of the general urban planning tool is an indispensable element in building a knowledge framework, defining interpretive frameworks and implementing design choices useful to describe the specificities of the local territorial system.

At the time of the drafting of municipal urban plans, the Apulian Region already in the year 2001, first with Regional Law n. 20 of 27 July 2001 and then by Regional Council Resolution of August 3, 2007, n. 1328 with the approval of the Document Regional Attitude General (DRAG) has launched a new urbanization season, introducing aspects related to Co-planning, subsidiarity as a concertation between the various actors involved, the transparency of program choices and the participation of local communities on decision-making assessments of urban planning .

According to the guidelines set out in the DRAG, the local government instrument is useful in recognizing territorial elements, overcoming the foreseeable rigidity of old-fashioned plans, addressing the issue of protection as an opportunity for enhancement and territorial growth by focusing on the action of governance through themes targeted at urban regeneration policies, soil consumption, energy efficiency and sustainable development.

The editing of a PUG therefore takes an innovative approach that sees the construction of the future of the community and local development through a shared vision of the territory based on the principle of "*knowledge to action*". [3.]

The PUG therefore contains in its various stages of implementation (Acts of Address, Preliminary Design Document, Structural PUG and Program PUG) the city's future-oriented action lines, closely linked to the knowledge of the territory and built with the local actors, through priority objectives resulting from careful assessment of local resources. [4.]

The construction of Knowledge Frameworks must be carried out with the aim of analyzing the structures of a territory and its constituent elements, the identity characteristics, the values and the problems posed by the threats of reproducibility of environmental invariants.

The realization of a Territorial Information System (SIT) is the essential element to represent in a coherent and coherent manner all the territorial validity choices associated with the competence of each level and

institutional subject in the process of drafting the instrument of local government.

The use of Geographic Information System (GIS) in the process of the plan and in the spatial planning and management of the territory becomes indispensable for interpreting scenarios offering opportunities to use:

- spatial data with the possibility of spatial analysis on the different geographic scale;
- an analytical interpretation of territorial decisions;
- cartography to build a geographic database useful for the management of spatial and environmental information;
- results, scenarios, alternatives, and appropriate interpretations for building and sharing a territorial project.

The GISs therefore allow for the acquisition, processing, analysis, storage, and representation of georeferenced geographic information with the ability to manage geodata defined territorial elements in a fixed reference system with certain geographic coordinates.

Geodata are represented by graphs and descriptive alphanumeric information defined attributes.

Graphic elements can be in vector format (dots, lines, and polygons) and in raster format organized for elementary information cells

Attributes are organized into tables consisting of fields that can create information databases.

GISs also handle the correspondence between attributes and geometries that can use spatial relationships between the different elements.

Information processing in geographic information systems is represented by mapping themes or by assigning functional symbols to geometry reproduction, also by overlay mapping.

An operating tool used in environmental assessments through GIS becomes the indicator or qualitative and quantitative element capable of providing strategic information on land governance decisions, environmental management and landscape design.

The overlay mapping operation of different themes returns useful data in the spatial planning field to build a spatial data database referenced in a suitable reference system associated with specific cartographies.

The Data Bank to be considered for the construction of Knowledge Frameworks contains several aerial mapping maps of the entire municipal area compatible with scale 1: 5000, the update of the Regional Technical Paper scale 1: 5000, the paper CORINE LAND COVER (Level 3) Level IV, the Orthophotos obtained from the aerial respects and the Digital Terrain Model.

The knowledge system and consequently the SIT data base is organized according to the following subsystems:

- environmental resources,
- landscaping resources,
- residential resources,
- infrastructural resources,
- socio-economic reality,
- state of planning.

Due to the specificity and complexity of Massafra's territory to environmental and landscape resources, particular attention will be paid.

The knowledge framework will be articulated to the most appropriate scales for the description of the territorial system of large area and local territorial system.

The construction of interpretive frameworks will then lead to the identification of structural Invarianti of a historical-cultural, landscape-environmental and infrastructural nature, to identify the different urban and rural territorial contexts present in the territory.

The main objective to be pursued in the construction of the Knowledge Frameworks of the territory of Massafra is: the drafting of the new urban planning tool, intended as an act of great importance for the civil and cultural growth of the local community and the territory, capable of implementing an approach use and government of the territory, to be understood as a resource to be presented and development.

The Knowledge Frameworks of Massafra's territory will have to be geared towards pursuing sustainability goals in the many areas that characterize the peculiarities and development of its urban and rural territories.

III. THE CULTURAL HERITAGE OF MASSAFRA MUNICIPAL TERRITORY

The Massafra's city contains a rich heritage of history, art, culture and above all nature, preserving in its territory numerous complexes of rock settlements represented by blades, graves, crypts, churches and shrines, so as to define the "*Tebaide of Italia*" formerly designated the region of Egypt around the Tebe's city, a typical Egyptian center made up of numerous cave testimonies that became the refuge for hermits, oriental refugees forced to flee the persecution of Christianity in the early centuries.

The origins of the Massafra landmark are different, as with the term "*Massa afrorum*", we mean a nucleus of Africans left by King Annibale to the conquest of nearby Taranto, "*Massa fracta*", meaning fractured rock, "*Massa fera*", wild place, of "*Man sapris*" indicating a grotesque hermit environment, meaning all that show a single common denominator represented by the rurality that the massacre territory has. [5.]

During the years Norman invasions of the Normans and the peoples of the North, Massafra began to change face, suffering from the abandonment of rock life, due to the continuous exploitation of the rock, assisting in the medieval period to the birth of new hypogean houses with the same organization of cave houses that, in the late eighteenth century, will be called "neighborhood", whose setting shows the peasant character and the same poverty.

Nearby are typical houses of Massafra spread mainly in the historic center. They form typical sub-divo dwellings, small quarries, excavated or adapted to the

natural rock in the form of open courtyards, real cave-grotto houses with a common courtyard communicating with the accesses of several housing units.

The singularity of Massafra's territory, rich in vast environmental dominance, describes north of the village a peculiar agricultural landscape of the tarantine Murgia, characterized by typical woodland habitats and Mediterranean vegetation.

The most significant and significant landscape of the area is certainly outlined by its central area characterized by numerous erosive spurs of torrention called "*cliff*" where, in their catchment basin, they retain a vast ecological naturalistic heritage of high conservation, environmental and archaeological value .

In the numerous graves of Massafra, from which the whole inhabited, man began his existence already from the Neolithic, leaving testimonies and signs traced through crypts and rock churches, real testimonies of pagan religiosity and Christian community that many scholars have attributed to the term "rock civilization".

The Cliffs encloses an extraordinary and unique rock ecosystem with a historical heritage found in villages and crypts with Byzantine frescoes depicting a sacred architecture excavated directly in the rock with frescoed walls of sacred icons. [6.]

The cliffs are included in the Land Cliffs Regional Nature Park established with Apulia Regional Law n. 18 of December 20, 2005 and ss. mm. ii. Land Cliffs Regional Nature Park extends over a territory of 13 communes of the Province of Taranto and a Municipality of the Province of Brindisi for a total of about 25,000 hectares representing the largest protected area of the Apulian Region.

Most churches, crypts, and shrines have sacred icons depicting the Virgin, Christ Pantocrator, Saints, and Martyrs that encapsulate religious and historical investigations of the forms, colors and symbols of iconographic tradition and iconostasis. [7.]



Figura 1 The rocky settlement of Saint Leonardo

The territory of Massafra consists of more than 30 rocky settlements, located not only in the city center, but also along the 13 territorial cliffs (the ones lying around the town are Saint Mark, Madonna of Ladder, Saint Oronzo, while the largest erosive furrow of the territory is represented by Colombato cliff from which the torrent Patemisco rushes towards the Ionian sea.



Figura 2 The rocky village of Madonna of Ladder

The complex morphological characteristics of the graves, the presence of numerous karstic caves, naturally endowed with thermal stability, and the peculiar microclimate have favored the human settlement, witnessed by the considerable presence of cave houses, neighborhoods, rocky churches and small sub-diva quarries.

The landslide along the Ionian Sea traces a large productive agricultural plain, breaking through the presence of seaside urban centers immersed in a high nature woodland system and a coastal dune system.

The building of Knowledge Frameworks in the territory of Massafra aimed at the drafting of the PUG must be done through an integrated and ecological approach to territorial planning, ensuring multidisciplinary skills, resulting in a collective fruition of the intrinsic resources present on the equally distributed territory between established communities and such that they can be guaranteed for future generations.

The knowledge system must include environmental components and its criticalities and physical vulnerabilities to conduct cognitive insights aimed at resolving conflicts and problems related to hydrogeological risks (both alluvial and instability related) already identified and contemplated in the Plan of Assets Hydrogeological (PAI), which is expressly provided for by its Technical Implementation Rules.

The Knowledge Framework will have to interpret the landscape components identified by the three structures (hydrogeomorphic structure, ecosystemic and environmental structure, anthropic and cultural history) of the Regional Territorial Planning Plan (PPTR) and interact with the Protection System and strategic vision scenarios integrated for the regional landscape.

IV. CONCLUSIONS

The cognitive survey devoted to the definition of urban planning tools should allow for a proactive and shared vision of the territory project, proposing goals and strategies useful for the reaffirmation of local identities. [8.]

The provincial programmatic choices for the Municipality of Massafra should aim to ensure the closure of natural cycles (such as the water cycle and carbon dioxide), to encourage the containment of energy consumption, contributing to minimize waste production, with the right and proper modes and

intervention techniques in tune with the identity of the sites.

The exploitation of rock habitats must aim at enhancing the role of the settlements of Massafra, by interpreting it as a dynamic area that, with its vast historical, monumental, rural and coastal heritage, relegates the premersian role, not as a limit, but as a positional positional advantage , in the vast area of Tarantina, placing this territory in a strategic position for receiving material, immaterial flows, investments and exchanges.

The urban planning tool of Massafra must read and interpret the traditional dualism between territorial and coastal areas of the territory, enhancing spatial relations along the axis Massafra - Taranto, and implementing strategies to integrate these polarities with the other fractions (Chiatona , War Park, Masonghia, Marina of Ferrara) and with the whole agro.

The Plan will have to define the methods and forms of government of the agricultural area, not to understand what an immutable reality, both in peri-urban areas and in rural areas capable of developing integrated economies that can complement the traditional primary activities (agriculture) with new multifunctional practices, already envisaged by the Operational Programming of the European Regional Development Funds and the Axes of the Rural Development Plan of the Apulian Region.

The marked characterization of the landscape matrix, the recovery of the historical agricultural fabric, ecological productivity, citizen participation consultation and the programmatic choices for the definition of territorial planning are good suggestions for a more careful planning of the conservation of the environment and nature .

Only by rediscovering new scenarios and possible itineraries it is conceivable to rebuild a natural landscape of widespread fruition, reaffirming the true and authentic identity of the sites, developed and supported by a dignified culture for respect for others and for the application of ecological sustainable tourism practices.

Conservation and protection of rock heritage will have to pursue strategic development scenarios in Massafra's administrative policies by improving networking relations with neighboring territories, revitalizing compromised settlements in full respect for environmental protection and the community's interest. Building Knowledge Skills allows you to focus on the major issues affecting the territory of Massafra and the risks to which it is exposed, as well as the strengths to build future opportunities for revival in tourism not only for its countless beauties of landscape but for the entire rock habitat.

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