The Iconic Language in Reading and Interpretation of the Cognitive Map

The Case Study of Individual Rural Housing Lemzara, Setif

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Abstract- The graphic representation of the "vision" of the land planner in identifying rural communities entails several cognitive mechanisms. This first step of establishing a basic degree of environmental awareness is critical. The assignment requires the capacity to embody a complex visual world and convey it graphically in a simple and illustrated manner. This article examines an intervention in a rural agglomeration's space. It is a set of ordered functions endowed with meaning. The article aims to scientifically explain the process of creating a participatory habitat and investigate the experience of the occupants by developing a scientific language with graphomotor capabilities around the concepts of vision, space, and representations. The method used is the collection and interpretation of twelve cognitive maps created by the designer and residents of Douar Lemzara, Setif, Algeria. The concepts and models of cognitive mapping point to the conclusion that the cognitive map is an effective method for reading the environment's actual information. Cognitive map analysis enables a better understanding of the most prominent physical characteristics of urban areas. Based on the analysis of respondents' cognitive maps, it is recommended to prioritize the treatment of Algeria's urban environment and engage residents in land use and planning. This opportunity to investigate and approach cognitive representations of space represents a novel mode of investigation and enrichment of the toolkits of various stakeholders in space, as well as an opportunity to improve inhabitants' experience.

Keywords-vision; rural; mind map; inhabitant experience; cognitive mechanism; representation

I. INTRODUCTION

The cognitive map has been defined as a collection of mental representations and ideas that are constructed in order to visualize and process data. Mental maps and mind maps are used interchangeably. They are tools that enable strategists to transcend the limitations of short-term memory and analyze information over extended periods of time [1]. Authors in [2] elaborated the explanation of cognitive maps: Cognitive maps are mental representations of the world in which we live. Human cognitive maps examine how individuals define their personal experiences and views, which determines their decision to live in and continue to live in certain locations [3].

In the same vein, authors in [4] have elaborated that the role of images in a metropolis's environment is meditative. A global image language establishes connections between the residents of new types of cities, as well as between words and physical elements. Authors in [5] have advocated for the use of mental maps by architects and planners to gain a better understanding of the considerations that must be made before beginning to visualize a successful public space. They have further elaborated that the effectiveness of cognitive mapping will be determined by the users' involuntary association with the space. The positioning of blocks, the structure's significance, the degree to which it is used, the user interface, and natural factors all contribute to cognitive mapping. Authors in [6] conducted a study in cognitive maps as correspondence associated with specific locations or spatial images that people have of their physical environment and that primarily influence spatial behavior. People's cognitive maps of a location form as a result of regular interactions with the neighborhood [3]. The experiences will result in the formation of memories and the development of conscious representations. Each representation, experience, and memory is unique and specific to each individual in a variety of settings and circumstances [7].

The investigation of the encoded mental maps focuses on the cognitive representations of the rural agglomeration space. The cognitive representations of space are examined in their functional and social dimensions [8]. The experience of the constructor of the mental map of the physical location lends the map a metaphorical significance. Thus, the mental map transforms into a cognitive map [9]. This step is critical for architects since it establishes the site's identity where environmental data are gathered, and post-sketch analysis is conducted. This is a challenging phase to analyze throughout the project design process, which the current study attempts to clarify via the development of an analytical grid. Authors in [10] proposed to begin by reexamining the urban framework of the Algerian cities and their evolution in response to the changing trade circumstances imposed by globalization, rather than just the metropolitan area. Similarly, studies have been conducted to illustrate how visualization and simulation approaches might aid planners in maintaining urban areas [11].

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In this regard, the current study examines the methodology of using cognitive maps as an effective planning tool. The current research attempts to uncover information about the users' relationships with their surroundings via iconic language. Specifically, it investigates the effect of affectivity and memory on the identification and orientation of locations and the mobility and imageability of belonging contexts.

II. METHODOLOGY

A. Context of the Study

Algerian public authorities sought to bring constructions into compliance, striking a balance between the interests of the residents and their demands for housing and the public interest in urban planning on economic, social, cultural, environmental, and aesthetic aspects [12]. Accordingly, in 2000, the Ministry of Housing and Spatial Planning launched a program of "500 aided rural housing units" in the Wilaya of Setif, as a part of a process of "aid to the stone" recommended by Algeria's housing policy (1 million aided social housing units). This initiative was designed for residents of rural agglomerations on the upper plateaus. One of these regions is the state of Setif, which concretized a significant portion of the program by analyzing a sample of 150/500 rural housing units.

The mental maps developed collaboratively by the operational actors, i.e. the urban subdivision's technical service, prospective buyers, and the architect in charge of the operation all contribute to making the position of each land base geographically recognizable and fully apparent. One hundred and fifty mental maps have replaced many site designs in the construction permit files. The corpus of the research was utilized to create a unique (personalized) scenario plan for each construction permit graphic file. The replacement of the project's scenario plan for the term and subsequently for the mental map legitimized the application for a construction permit and enabled the commencement of the complex process of "dwelling" as an existential position. This resulted in the automatic acquisition of a slew of rights, including financial assistance, access to the property, development of premises via various connections (gas, water, electricity, sanitation), and structuring of neighborhood facilities (schools, health care rooms, mosques, and administrative offices), among others, depending on the size and scope of the actions established. In situ, the real-size operation ensures new information in an environment, resulting in modifications in environmental knowledge [13]. This quantifiable knowledge is concerned with the collective memory of incidental information encountered along simulated routes and represented by cognitive maps [14]. The measures of knowledge are concerned with the accuracy of the route maps, the memory of scene displacement encountered along the simulated routes, the frames of reference or spatial references, and the coherences of these representations [15]. This operation aims to create innovative hypotheses about suburban and rural agglomerations on the outskirts of Setif. By providing access to everyday requirements, public transportation contributes significantly to maintaining and boosting urban wellbeing [16]. Hence, the bus shelters were examined more closely: their visibility, their usage, their usefulness, and their environmental

importance were determined through the decoding and deciphering of a representation of the area in question [9]. Additionally, this inquiry conjures the growth of individualism and the disintegration of a social framework as a result of the territory's expanding urbanization. The whole process is formalized and agreed upon in advance within the same group via the introduction of new forms of employment based on allocation in place of the family domain as a symbol of progress and modernity. This research opportunity necessitates a close examination of its substratum's social morphology and way of thinking via observation of its development and a real-time survey of its active region [17].

B. Mental Maps as a Planning Tool

The use of field experiences in the professions responsible for urban morphology has nowadays become more than necessary. The focus is on maximizing the project's effect, not only of the project itself but also of the actions and procedures that resulted in it. Consequently, tracing a collection of buildings is straightforward: All that is required is field surveys, rights-of-way mapping, or a topographic survey. However, comprehending the synergy of these buildings in terms of neighborhood unity, socio-spatial organization, or any behavior is quite different. This means that the architect or planner uses the location map or site plan to demonstrate the apparent spatial phenomena of location and the unseen features that underpin these visible spatial phenomena in structure and process. Thus, cognitive mapping develops into a field for identifying the unseen mental map, which serves as a decision-support tool [15]. This analytical technique is based on a detailed understanding of the visual components of the mental maps that are the simpler to read, perceive, learn, and comprehend. It is primarily concerned with the shape and logic of the connections between its components. Second, it delves into the logic and organizational mechanisms of the habitat in rural agglomerations by examining the residential space's physical configurations and social representations.

C. Purpose of the Study

The purpose of this study is to re-examine the questioning of orientation, followed by the taking of position and reconstruction of the inhabitant's reference markers in space, specifically, to understand how its cognitive representations are constructed through the query. As a result, the paper discusses how these sites were physically represented and how the urban subdivision's technician identified the establishment plates for rural residences.

D. The Sample of the Study

The following criteria were used to choose representative samples: The peri-urban region was chosen because the eastern portion of Setif is experiencing significant changes in terms of expansion and urban growth. These changes entailed the assistance for housing development programs, the new city of Ouled Saber, and rural housing. The density of the mental maps located in the same place is another factor for selecting this setting. Moreover, the location of the study has a unique geographical position in respect to the pairs Setif - Constantine and Setif - Batna. This is reflected in the mobility and growth polarity of the region in regard to road networks and mobility.

TABLE I.   ENCODING OF 12 MENTAL MAPS OF LAMZARA CITY (OFFICE OF ARCHITECTURE "CARRÉ D'ART", 2002)

To develop the 150 files for rural housing purchase, building licenses were required. The project owners in many administrative districts (Daira of Guedjel, Ouled Saber, and Setif) requested that the engineering offices (project managers) create requests in both graphic and textual form in order to generate the administrative file required to get the building permit. The decree of the building permit is critical in releasing the first tranche of financial assistance for the realization of the projects. This study opportunity was critical for the researchers since it allowed them to create meaningful syntheses of such operational experiences. The designers and residents collaborated to create scenario plans, which revealed previously unnoticed spatial features. These constructions disclose living areas that are unique to natural surroundings, as opposed to urban ones, while current urban planning tools such as the Regional Spatial Planning Scheme and the Master Plan

of Land Use and Urbanism analyze the situation of these rural agglomerations solely in terms of excess land reserves for city production or flows and economic exchanges.

Twelve mental maps are used in this context to address how the people of these rural agglomerations' living spaces are socio-spatially organized, and how the projection and localization of their future habitat facilitate access to their territory's "mental map" in terms of representation and social organization [6].

E. Objectives

The purpose of this strategy is to elicit common qualities among the mental maps gathered, as well as those that are unique to each person and those that form groupings. Additionally, the following questions are tackled:

- Is it required to build cognitive maps of a certain social group before developing development plans for the rural agglomerations in question?

- Can the mind map be used as a planning tool at the meta-design phase of development plans?

The collection of 150 location graphics depicts skewed spatial maps of numerous rural villages. The fundamental objective is to determine the approximate location of evolving housing cells and to provide information about the spatial distribution of localized content [15]. This stage pertains to the research's mechanical component. It elucidates the fundamental properties of the spatialized experience by providing an explanation for phenomenological cognitive mapping study. For architects and urban planners, the map as an exploration and communication tool facilitates a better understanding of the space under consideration, "the agglomeration," and its conceptual meaning. As a result, it is necessary to assume responsibility for future expectations of occupants about the design and spatial development of their living surroundings.

F. Data Collection

The data collection phase has undergone several stages: The temporal encoding of the pre-project phase between 2000 and 2001 entailed the establishment of the cognitive maps. Afterwards, from 2002 to 2003, the phase of submitting requests for building permits was formed of textual components and traditional documents, which include the scenario plan, the mass plan, numerous section plans, the elevations, and the details of execution. The data were collected from the architecture company "Carré d'Art's" written and digital archives between 2000-2005, the Cadastre of Setif, the Regional Spatial Planning Scheme and the Master Plan of Land Use. Then, 35 mechta and douar locations were selected as representative samples of rural villages. Twelve mental maps were collected and used as the primary tool for analysis and classification (Table I).

III. METHODS OF ANALYSIS

A. Classification of Mental Maps according to Rob Kitchin

Before analyzing the corpus of the study, it was necessary to conduct a classification of the corpus by relevance to the research issue: the geographical location of the agglomeration according to common or particular criteria. This categorization follows the logic of exploration and decoding, rather than just validating the accuracy of localization. In accordance, the current research deployed the approach of typological categorization of Rob Kitchin [18]. This method enabled the treatment and categorization of the corpus's numerous spatial representations according to their appearance and functional aspects. This classification technique analyzes and categorizes the various spatial representations found in the research corpus based on their apparent shapes. Kitchin suggested the following classification of mental maps:

- The fundamental method (free drawings without constraints).

- The conventional method (focusing on specific aspects of an environment and the representation of certain elements).

- The framed method (by proposing a background map or imposing a scale).

- The transverse method (representing the evolution of the stages of successive representations).

- The method of visual language.

- The overlapping technique: verbal and pictorial information.

B. Rob Kitchin Technique

Using Kitchin's technique, the mental maps were grouped according to the most effective and direct manner of easily locating intervention spots [18]. The traditional approach is focused on the unique characteristics of an area, and the depiction of certain features since the mind map incorporates both verbal and pictorial information (the cross technique). By combining the sensory input from the surroundings, the creator of each mind map created an ideal course of travel-oriented toward a goal or objective from a starting point. These data are filtered, consolidated, and sometimes forecasted. This structure is, in reality, a spatial encoding [14]. Therefore, the identified and evaluated mental maps are functional representations of the geographical space. They are constructed by geographical experiences on two levels, one functional and one social [8]. It appears that these mental maps are primarily envisioned as information constructs. Each map is a unique and single creation [19], created immediately in response to the specific location of the displacement and indirectly via a tailored translation of ambient spatial information.

C. Study of the Shape of the Mental Maps

1) Classification of the Cognitive Maps and the Encoding of Space

Various strategies have been deployed to read the mental maps to uncover cognitive representations of space, to decipher the hand drawings (mental maps of situations) in their iconographic forms and to arrive at a recognizable and collective level of scientific reading and interpretation through the analysis of shared and disparate features and the iconic message created by each of the analyzed maps.

a) The Technique of Rothwell

This approach allows the competency of the map designer to articulate his or her depiction of the place inside the metropolitan region to be evaluated [20]. The purpose is to orient oneself in sparse space using a spatial reference and to find and position the plot of the project land in respect to property boundaries and permanent landmarks to optimize the itinerary. This approach infuses the drawing with the dimension of mastery of spatial size and proportions.

b) The Technique of Canter

This is a technique that provides information about the shape and nature of spatial structures when selecting the land for the realization of a project by moving to the site with the future buyer and establishing the exact location of the project and determining the parcel's metric dimensions. By incorporating four cognitive tasks, this technique explains and

categorizes the phases of elaboration and generation of spatial mental maps [21]:

- Spatial orientation by the designation of geographic north.

- The reduction of a large-scale extended space to the size of a white A4 sheet of paper.

- The implementation of geometrical projections according to their organizational logic and the identification of components according to their perceptual appearance rank.

- The portrayal of the mental picture's constituents symbolically and customarily.

c) The Technique of Byrne

This approach is founded on the premise that the outcome of the graphic output is contingent upon the designer's starting point for completing the work at hand and the desired outcome. Additionally, the skills of the designer to project himself into geographical space and his mastery of measurement, scale, and plane geometry were considered.

d) Downs and Stea Technique

As an analytical tool, it entails creating a correlation between the drawing (the freehand sketch) and the spatial representation: the result of the internalization of environmental information, its codifications, and externalizations [16]. This operation aims to communicate information about the project's location and status to the responder and interviewer by presenting technical expertise via standard visual language.

e) Cross Reading through the Different Techniques

The application and intersection of all of these methodologies resulted in cross-reading of the various maps of the Lamzara area. This reading was carried out in order to extract as much useful information as possible from the majority of the representations to determine the common characteristics of this rural agglomeration. It is an activity for the expectations of a population while predicting its living environment. The purpose is to create an analytical grid that enables the maps to be classified and sub-groups using common criteria derived from the various research approaches outlined above and to determine the iconic message included within each mind map (Table II).

IV. RESULTS AND ANALYSIS

A. The Structure and the Nature of the Link between the Mental Maps

According to Table III, about 80% of mental maps are on a territorial scale: (between Batna, Setif, and Ras -el -maa) (N°01C3/03C3/04C3/05C3/06C3/07C3/08C3/09C3/09C3/10C 3/11C3), while 20% are on a more local scale: (Guedjel centre, R'mada, and Ras -el-ma (02C3 and 12C3).

This demonstrates the critical nature of the regional size of the agglomeration. This territorial inscription is explained by the gravitational and boundary location of the agglomeration concerning the very active vehicle flow along the National Road (NR) 75. This road axis becomes a structuring axis and a major reference for the entire population of Lamzara, especially if the dwellings are located near this flow, implying the significance of the shape of the building, distance, course geometry, orientation, morphology, and time of exposure concerning the mobility and displacements in this environment [7]. This latter is constructed according to a perceptual logic, which results in the perception mechanism along a route. The quality of the connection is determined by this logic [14]. It is characterized by the existence or absence of relationships between closed and open geometric shapes and the rest of the natural world. Thus, the legibility of the environment contributes to the accessibility and location of goals through a clear view and route across a loosely constructed framework. This clarity results from the inherent simplicity of interactions and the nature of the connections between the built and unbuilt areas.

B. Spatial and Social Representations

The examined mental maps exhibit several typologies. They are classified according to the routes and geometrical structure of spatial representations and the functional quality of the connections that constitute social representations. The aim of the cognitive maps is to represent beliefs about the relationship between concepts [13]. In contrast, the analysis of the mental maps (Table II) reveals the presence of an iconic message that facilitates the location of intervention sites and provides information about the degree of mastery of knowledge about the perceived physical environment and its associated social behavioral practices.

The resultant picture of the Lamzara agglomeration is a fluid region with a high level of daily mobility inside the territorial geographical unit. The latter is traversed by NR 75, which facilitates heavy road traffic which, due to its regularity, divides the area into two entities: Lamzara - East and Lamzara - West.

The repeated appearance of schools, mosques, and bus stops in all mental maps indicates the presence of a cognitive-behavioral routine [22], which is detected using an indirect technique that calculates the frequency of appearance of elements associated with the target (the housing project) in the study corpus. The social practice of neighborhood equipment contributes to the intelligibility of the agglomeration.

It has been observed that the route diagram evolves in response to "directed navigation" [16], with the ultimate objective of sketching a clear ideal path for the location of the project.

The examination of the graphic criteria found in a sample of Lamzara's rural settlements, namely orientation, lines, surfaces, shapes and symbols and their linkages has revealed the significance of each graphic criterion category to its analogical spatial counterpart. Each mental map is composed of graphic elements that form the basis for the construction of meaning by their configuration and disposition. The presence of similar meanings in the bulk of the Lamzara sample is due to the environment itself but to the representations of the social group that developed them just by encompassing a shared culture and environment over a certain period [23].

TABLE II.   STRUCTURING OF THE ICONIC MESSAGE OF THE MENTAL MAPS OF THE LAMZARA AGGLOMERATION

Spatial unit: Lemzara agglomeration C3	Reading the shape of the mental maps using the cross method				Iconic message, Downs and Stea index: - Environment not known. - Known environment, but not mastered - Known and mastered environment
	Category of graphic criteria				
	Orientation, Rothwell and Canter index: Geographic North in the direction of the sheet A4 and the writing.	Spatial scale ratio by Rothwell and Byrne index: Local /territorial/ communal /inter-wilaya in relation to the A4 sheet	Symbols and transcriptions, Canter's index: Line, curve, polygon, surface, signs, words, toponyms, the path.	Byrne's index : (the link or junction) perceptual logic according to the target: focal, direct, indirect, hierarchical.	
Map 01C3	Arrow to the right	From Batna to Setif centre /A4 Inter-wilaya	6 lines 7 polygons 9 words	Indirect Hierarchical	Known environment, but not mastered
Map 02C3	Arrow to the right	Center of Guedjel and R'mada/A4 Inter -communale	2 lines 15 polygons 6 curves 16 words	Direct	Known environment, but not mastered
Map 03C3	Arrow to the left	From Setif centre to Batna/A4 Inter-wilaya	6 lines 6 curves 9 polygons 1 ovoid surfaces	Indirect Hierarchical	Known environment, but not mastered
Map 04C3	Arrow to the right	From Setif centre to Batna/A4 Inter-wilaya	2 lines 1 curve 6 polygons 1 cross	Direct	Known environment, but not mastered
Map 05C3	Arrow to the right	From Batna to Setif centre /A4 Inter-wilaya	8 lines 5 polygons 1 circle	Direct	Known environment, but not mastered
Map 06C3	Arrow to the right	From Batna to Setif centre /A4 Inter-wilaya	8 lines 2 curves 9 polygons 1 cross	Indirect	Known and mastered environment
Map 07C3	Arrow to the right	From Setif centre to Batna/A4 Inter-wilaya	2 lines 1 Surface 6 polygons	No junction registered	Known and mastered environment
Map 08C3	Arrow to the left	From Setif centre to Batna/A4 Inter-wilaya	7 lines Multi curve 4 polygons	Indirect Hierarchical	Known environment, but not mastered
Map 09C3	Arrow to the right	From Setif centre to Batna/A4 Inter-wilaya	7 lines Multi curve 4 polygons	Indirect Hierarchical	Known environment, but not mastered
Map 10C3	Arrow upwards	From Setif centre to Batna/A4 Inter-wilaya	2 lines 5 polygons	No junction registered	Known environment, but not mastered
MAP 11C3	Arrow to the right	From Batna to Setif centre /A4 Inter-wilaya bipolar	19 lines 2 curves 9 polygons	Direct	Known and mastered environment
Map 12C3	Arrow to the left	Multipolar : Batna /Setif /Ras el maa	8 lines 1 cross 5 polygons	Direct	Known and mastered environment
Significance	NR 75 is an axis of geographical orientation and divides the agglomeration into right and left parts, and gives importance to residential mobility	The importance of territorial registration of the agglomeration is due to its gravitational position in relation to the NR 75.	The morphology of the urban fabric is easily apprehended due to the clarity of the visibility of the spatial referents of the perceived environment.	The legibility and intelligibility of the space participates in the accessibility and the location of the targets following the clarity of vision and path through the loose built framework. This clarity is due to the simplicity of the relations and the nature of the legible links between the built and the unbuilt environment.	The representation of the Lamzara agglomeration is strongly known and mildly mastered due to the presence of a simple and explicit structural logic. This controlled environmental knowledge is reflected in the majority of the cognitive maps.

TABLE III.   SYNTHESIS OF THE READING OF THE MENTAL MAPS

	Rothwell and Canter index			Rothwell and Byrne index		Symbols and transcriptions, Canter's index		Byrne's index			Iconic message, Downs and Stea index		
	Left	Right	Upward	Local	Territorial	Closed built	Open, not built	Direct link	Indirect link	No junction	Known and mastered	Known and not mastered	Not known and not mastered
Synthesis of the 12 mental maps of Lamzara	2	9	1	02	10	25%	75%	06	04	02	04	08	00

TABLE IV.   INFORMATION CONSTRUCTION AND PRODUCTION OF MEANING

Maps	Iconic message	Spatial representation	Social representation
01C3/02C3/03C3/ 04C3//05C3/08C3/ 09C3/10C3	Known and mastered environment	-The legibility of the paths is materialized by the presence of geometric links between the closed structures (polygons and spots) and the open structures (points and lines). -The links in the majority of the maps are direct, indirect or combined (hierarchical, in the form of loops, branches, ramified). -The maps in this case become illustrated maps thus rich in information. They become cognitive maps. -The existence of several levels of construction in the same map reflects the graphic ability of the constructor or draftsman to elucidate a complex environmental reality in a simple and understandable iconic message.	The representation of the Lamzara agglomeration is strongly mastered as a result of the presence of a simple and explicit structural logic. This mastered environmental knowledge is reflected in the majority of the cognitive maps (85%). The inhabitants of Lamzara consider the NR 75 as a major spatial reference and give it socio-economic importance because this axis raises the rank of this small village to that of a structured and compact village agglomeration by the introduction of the semi-detached along the NR 75 axis. This situation introduces the notion of street in a rural environment with sparse morphology. -The proximity of the NR 75 is for the agglomeration of Lamzara a lever and gives potentiality for future development.
11C3/12C3/07C3	Known and not mastered environment	-Ambiguity of pathways: absence of links between closed and open structures. -They are deduced maps or simple constructions by linking to one or two spatial referents at most, making a total abstraction of the rest of the environment. -They are generally maps of clear and recognizable geographical location.	The consideration of a smaller scale and the disparity with the rest of the agglomeration is mainly due to the clarity of the situation and its location by the majority of residents and visitors of Lamzara.

C. Examination of the Morphic Structure of the Mental Map

1) Techniques Used to Study the Morphic Structure

The morphic structure analysis approach was utilized in the context of a Ph.D. dissertation and offered the identification of a typology of place morphic structures via the reading of developing representative cognitive maps [24]. This analytical method is a necessary basis to comprehend the logic and structure of the complete system portrayed and examined.

2) Morphic Structures of Mental Maps

This categorization aims to denote the various morphic structures inside the researched agglomeration using Lamzara's 12 maps. The cognitive maps are provided as typological structures. Table V identifies two prominent morphological structures: Structure resembling an itinerary and structure resembling axiality. This demonstrates the focus of the designers on mobility and spatial navigation inside the Lamzara agglomeration region. Throughout the diagram's creation and examination, the 12 mental maps interact with their environment.

The findings indicate the presence of two prominent morphological patterns in the form of routes and axiality. As observed, 80% of the analyzed maps are sequential, indicating

the agglomeration's importance for mobility. They establish causation between the NR 75 and the project by using the locative verbs find oneself, locate oneself, and position oneself in connection to the NR 75. The quality and quantity of features in the mental maps are also very informative in terms of transferring information on the morphic arrangement and structure of the various paths. Consider the following behavioral routine [21]: The map 06C3 informs of an alternate route for the target's localization in order to minimize the error factor and accessibility time. The map implicitly implies the person who constructed it and the person who transmitted the information in the route to be borrowed, which is a matter of behavioral routines.

As a result, it may be concluded that each diagram or mind map formed linkages between the designer's memories, the environment's facts, and the conducted interviews with the occupants.

D. Coherence Measures for Spatial Representations

The correspondence approach entails retracing the routes, finding reference points, assessing the physical legibility of space (the quality of the forms), and presenting them with a novel experience. This may be accomplished in situ via the researchers' comments or photos or through the use of an aerial

snapshot of the location (as is the case in this study). The purpose of this approach is to highlight the distinction between perception and representation of measurable geometric space and assess the degree of similarity between the mental map and geographic reality. The approach enabled the assertion of the constructor of the cognitive map's degree of expertise and his capacity to embody and visually portray the experienced world at a reduced size. This approach allows the precise assessment of the degree of similarity between the picture viewed and perceived with the associated mental map.

TABLE V.   TYPOLOGIES OF THE STRUCTURES OF THE SPATIAL REPRESENTATION AND CONFIGURATION OF COGNITIVE MORPHIC STRUCTURES OF LEMZARA [24]

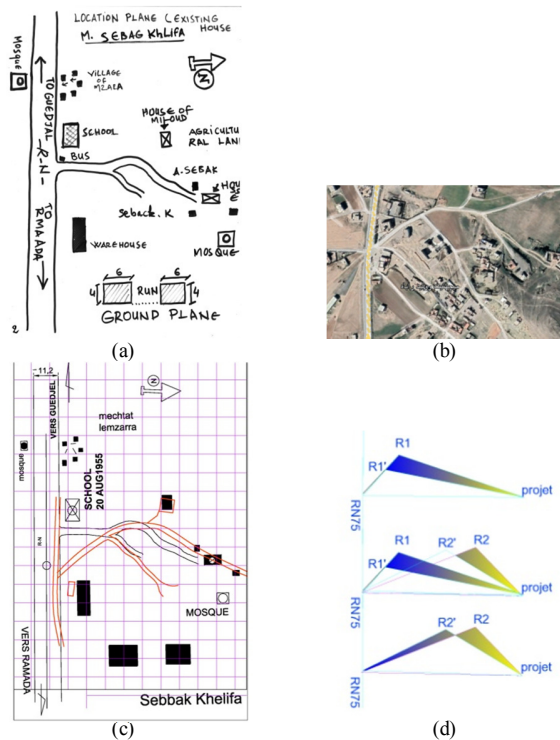|			Configuration of morphic structures [24]								
			S1	**S2**	**S3**	**S4**	**S5**	**S6**	**S7**	**S8**	**S9**
			Structure in the form of a route	Structure in the form of axiality	Structure in the form of a cross	Structure in the form of a double crossing	Structure in the combined form of centrality and axiality	Structure as a sequential plan	Structure in the form of topological centrality	Structure in the form of a spot	Structure as a fragment
			Sequential maps					Spatiale maps			
Typology of spatial categories			**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Map name											
05C3	12C3	07C3	XXX	XXX							
03C3	02C3	09C3	XX							X	
11C3	04C3	08C3	XXX	XXX							
01C3	06C3	10C3	X					XX			
		12	9	6	/	/	/	2	/	1	/

(a)   (b)

(c)   (d)

Fig. 1.   Application of the technique of [25] in the calculation of spatial regression-map 02/C3: (a) Digital mind map: Superimposition of the digitized mental map on a grid representing a spatial unit, (b) Aerial view (Google maps): Overlay of the Geographic Image G on a grid representing a spatial unit, (c) The superposition of A on B perception by correspondences, (d) The spatial regression percentage rate of accuracy: By triangulation, the degree of similarity between the geographical reality and the mental representation is close to 70% of the general criteria.

The approach in [25] entails superimposing the scaled planar representations on the same reference frame, with a minimum of 3 reference points. This approach was applied on a small sample (1 map), since most of the assessed maps are sequential maps showing the agglomeration's relevance for movement (Figure 1). This map will be used as a starting point for analysis to simulate constructing a cognitive location model in rural areas. The purpose of this analysis is to develop a cognitive reading tool for spatial regressions and to calculate the rates of accuracy for correspondences in terms of closeness or distance between cognitive distances.

The processing of the cognitive picture enabled the quantification of the variations between the two locations for each constituent while also emphasizing the individual variances. Consequently, it is possible to differentiate between distortion and coherence in the cognitive image, which is unavoidably wrong beforehand. Spatial distortion, therefore, indicates abnormalities in the cognitive representations of space that are inaccurate. This is why freehand sketching techniques and concurrent consideration of the direction and distance between parts are of paramount importance.

V.   DISCUSSION

Various evaluations of cognitive maps using different techniques reveal that their schematic consistency is saturated with particular knowledge and data. The analysis and collection of mental representations through schematic data connected with items and their physical reality counterparts provides a valuable tool to access valuable information. These data cannot function independently of their socio-spatial environments because each of them emits one or more iconic messages. The purpose of the iconic messages in this study is to develop a grid for deciphering and analyzing spatial representations by starting with the individuals' graphic productions or mental maps. Consequently, the data creation process enables the establishment of a conductive environment for initiating the design process. This relates to the conceptual idea phase for architects and to the stage of gathering and organizing data that enables the development of a scenario, including the stretching

or tightening of urbanistic logic for urban planners. The phase of data creation is critical for interpreting and comprehending the underlying structures of mental maps. This stage entails drawing paths for the tool's successful engagement in architecture, urbanism, and territorial planning at the appropriate scale. The purpose is to create new methods to search for design tools at various architectural, urban, and even territorial sizes that are vision-based and allow for the establishment of linkages between environmental data, the designer's memory, and the client's needs.

VI.   CONCLUSION

The purpose of this research is to examine the mental map as a tool for efficient urban planning. Individuals design their own maps using this approach, based on a series of questions on orientation, lines, surfaces, forms, and symbols. The cognitive representations of space are examined in their functional and social dimensions. In accordance, the current research deployed the approach of typological categorization of [18]. This strategy allowed for the treatment and classification of the various spatial representations of the corpus on the basis of their appearance and function. Four different methods for examining and classifying mental maps were utilized to analyze and interpret these maps. Additionally, the morphic structure of the mental representations was deployed to comprehend the logic and structure of the complete portrayed and examined system. Additionally, the coherence structure of the mental maps was examined to emphasize the distinction between perception and representation of quantifiable geometric space and allowed the assessment of the degree of resemblance between the mental map and the geographic reality. To increase the collective representation of space, the most frequently used technique is freehand drawing or graphic production of a vision of a physical environment saturated with social significance synthesized on external support, typically a white A4 sheet of paper. The advantage of this technique is that it is adaptable and usable in a variety of contexts. The mental map transmits a structured message and is necessary for architectural projection and urban planning. However, the accuracy of the physical information is secondary to its cognitive capacity, which reflects other structures in the interpretation of socio-spatial representations beyond physical reality.

This study attempted to elevate the image and its associated iconic language. The cognitive picture of space representation in rural and sparse settings is primarily a decision support tool for spatial concerns, such as housing programming and planning. As a result, it is greatly influenced by the interaction of the individual with the environment, and it serves as a valuable indication of this relationship throughout the inhabitant's experiences with the rural housing program's implementation.

Throughout the research, various strategies were used to elicit patterns of cognition and orientation in the geographical environment of the individual in connection to his group of belonging and his residential trajectory. This has allowed for an understanding of the integration process of the individual (beneficiary) and his role in establishing his own space within his constrained social group and geographical and territorial

surroundings. This is true from the procedural step of site selection through the reconfiguration of wthat was originally offered as an evolving template for rural-dwelling units.

This experience allowed a deeper understanding of the environmental knowledge and its configurations by collecting a diverse range of data that allows the simultaneous collection of physical components and social representations. It was discovered that the names and rankings assigned to this information throughout the map's development and their spatial relationships affect the overall spatial structure that creates them. Environmental information has been supported, including physical visibility of the environment, subjective accessibility to locations, cognitive hurdles, activity and daily mobility, location choices, residential strategies, and perceived suburban polarity. At the same time, it externalizes social representations, allowing the social legibility of the studied environment, the affective appropriation of places and physical elements, and social relationships within the space. In this situation, the map takes on the role of an exploratory research tool.

It can be used to assess the impact of integrating the same rural housing prototype through a variety of different configurations of interior and exterior land bases within pre-existing urbanisable perimeters on its current and future morphological evolution and within its anchorage location and immediate environment.

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