

APPLYING INFORMATION TECHNOLOGIES IN MEASURING THE CHANGING QUALITY OF LIFE “FROM NOMAD TO URBANISM”

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Abstract—Integrating advanced and modern surveying systems using information technologies with conventional urban surveying systems on conventional communities raises some crucial questions; what are the possibilities of bringing modern technology and conventional communities together? Which of them needs to change? To modernize the communities or to conventionalize the technology, Tackling the above issue is being examined in the semi urban, originally nomad community at Al-Huseiniah, Ma`an, South of Jordan. It is obvious that under the current circumstances, that the pace and trend of change in both systems is taking a different direction

Index Belonging, Continuum Model, Facilities, Human-Environment, Human- Needs, People-Urban Dimensions, Resources, Safety

I. INTRODUCTION

A conventional Survey synchronized with service campaigns in health, education, urban life and building maintenance followed by data management, ascertained that reasonable and progressive development in the type and quantity of services did not improve the quality of life Al- Huseiniah’s people. On the contrary, statistics indicated wide spread complaints and unsatisfactory attitudes towards Al-Huseiniah’s standards of living. The conventional survey stop short from giving answers or providing solutions for the people who are looking for quality in their urban life and environment. Reaching the conclusion that conventional methods of surveying Al- Huseiniah as a matter of needs and services could not provide ways of covering qualitative measures that includes complementary resources that induces safety, security and hazards or facilities that develop esteems and belonging. Information technology data classifies and covers all physical, social aspects, development from nomadic to urban life, adaptation to open built environments and last but not least, a positive transformation in the social and economical structure.

A. The Symptoms

Quality of life in Al-Huseiniah region is widely affected by the community standards of living. Although all living needs, services and commodities are attainable to them, yet that prove, that the community is a self-sustained community when it deals with recourses of, and belongings to, nomad life, and a heavily dependent community, when it is related to services and utilities of urbanism.

Providing the old nomad, newly urban community congregated at Al- Huseiniah, in the mid sixties, with all planned services, utilities and environment, considered being, by the strategies planners, a key issue in the development and evolution at the newly settled community.

Anyhow, on the one hand, running and maintaining the built environment of the new community over in the past forty years prove to be very costly and expensive, on the other hand the evolving nomad community to urbanism reduced its productivity and raised its dependency.

B. The Region

Al-Huseiniah region (named after its founder later king Husein ben Talal) includes in addition to Al-Huseiniah town another town (Al-Hashemiah) and three small villages. The region covers about 420 km² and is part of Ma`an government, which considered to be the largest, about 33163km², 37% of the kingdom, with the lowest population 110,000 people about 2% of the kingdom population.

C. The Challenge

Beside the existing challenges of Ma`an region, considered the largest with the lowest population, the less developed, the highest poverty, the harshest region, and the driest climate, the new community of Al-Huseiniah was faced with new challenges coming first of all from transforming a mobile community into settled one and that includes; changes in their habits and traditions; type of habitats, commodities, and accommodations; perception and mental map; self adaptation in behavior, conduct and territoriality; post occupancy environmental and urban adaptation. Latest challenge came out from high male out migration, highest rate of unemployment and drugs addiction and trafficking.

D. The Natural and Built Environment

The town endowed with an ambitious modern garden city type layout. Planned and implemented with wide two ways streets with block loop type streets, serving 1000m² residential lots on one side, and a spacious park on the other. Internal and peripheral blocks were designated for public building and facilities. Shops and small markets were allowed on the main inner streets. All streets are asphalt paved with tiled sidewalks and column lighting. The town is well infrastructured with full electricity, telephone, domestic water, and waste networks. The town is nearly located in the mid distances of the desert Amman-Aqaba highway. Like many towns located o the

Desert highway, Al-Huseiniah is to benefit from serving commuters transport, vehicle maintenance, and supplies.

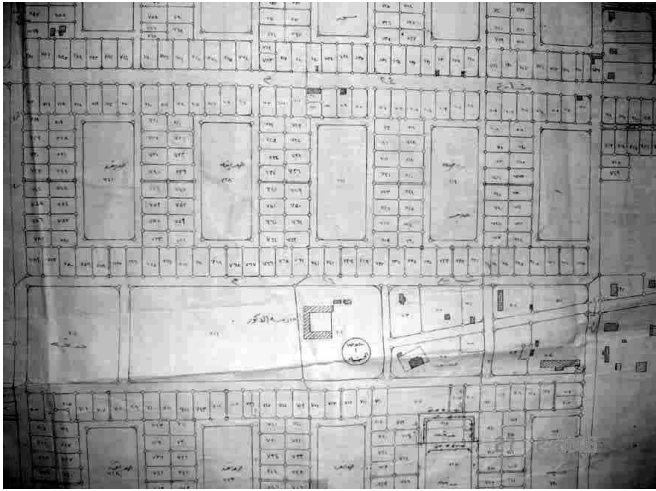


Figure1. Ambitious Garden City Type Layout

The Department statistics surveys and other independent institutional surveys showed that despite all services utilities provided to Al-Huseiniah region it remains one of the poorest, undeveloped and most challenged communities not only in Ma'an Government but also in all of Jordan.



Figure2. Al-Huseiniah on the Dessert Highway

E. *The university role*

Those challenges and a change in the university policies in serving the community encouraged the university in targeting Al Huseiniah as a model and a pilot project in integrating teaching and studies with community services.

In the university curriculum, all students and as a part of their graduation requirements, have to do 20 hours of community services. Even with the big man-hour invested in these services, the scattered contribution did not reveal any effect or difference in the Jordanian community in general. Hence Al-Huseiniah project is intended to concentrate and to group all

efforts, studies, manpower, and disciplines in one comprehensive Endeavour. However there were no specific or separate terms of reference to each discipline including the engineering faculty, yet each contributed, as part of its field of specialization, to Asses the needs of Al-Huseiniah community. In the course of the study and survey each JU. Discipline writes down questions and inquiries needed to assess the community conditions and requirements in health, education, agriculture, environment, nutrition, socioeconomics and urban services.

Sample households comprising 16% of all families living in the region was selected. A conventional designed questioner was conducted. Data covers different aspects of Al-Huseiniah was collected and analyzed using SPSS package. Analysis was both descriptive and analytic, at the end it was concluded that further surveys and analysis could be done for comprehensive investigation of certain issues.

II. THE ENGINEERIG INITIATIVE

A. *The Dilemma*

It was clear even before conducting the general survey and data collection (from the architectural engineering point of view) that Al-Huseiniah does not lack services, and challenges are coming from the absence of the quality of life, rather than the standards of living.

Both the survey and the data collection and on site observation showed that services in Al-Huseiniah reached an accepted local and regional standard level, therefore certain but limited quality questions were included in the original interview. Results asserted that reasonable number, nearly 50% of the targeted sample are not satisfied of their living conditions and think, if they can, to move out to other regions.

That tentative response encouraged the architectural and the engineering team to redirect its contribution to develop the research and the study of Al- Huseiniah in a way to benefit and to utilize the architectural engineering distinctive way of thinking and potentials.

B. *Precepts and Concepts*

Architectural Engineering (AE) integrates Humanities with Sciences and Arts.

AE depends mainly and widely on project oriented thinking, studies and applications.

AE directly deals with all sustainable development components that are environment, community, and economy.

AE uses the latest and advanced tools, technologies, systems, and programs in education and practice.

AE considers creative, conceptual, perceptual thinking as a prelude to all mental oriented thinking and studies.

C. Dimensions

Integrating all AE precepts and concepts of studies, research, and way of thinking, with Al-Huseiniah needs and challenges was materialized and implemented into one correlative equation. In simple words an equation which integrates the qualitative and quantitative dimensions available and required in the community with the qualitative and quantitative dimensions available and required in the environment and urbanism. Studying mankind behavior, conduct and psychology, by several scientists, revealed that human dimensions hierarchically move from need to safety to belonging to self-esteem and self-actualization. In many AE courses and studies it is evident that space-environment conditions and properties enhance or inhibits such human dimensions, behavior and conduct.

Although that was theoretically tested and elaborated on micro scale examples, either on buildings or defined parts of the environment yet that was not tested and evaluated on the community level and on the macro scale urban environment.

D. Questions

Certain master and under graduate courses were tailored to cover this study, the issue of correlating human dimensions with urban environment zones was first tackled by raising three simple questions; what are the urban components and properties of the environment that contribute, enhance, or inhibit human needs, safety, and belonging? In the human-environment dimensions where and when basics of standard of living and the quality of life are attained, achieved, and implemented? How can we write a simple question, equation or answers and reach solutions when they all contain numerous attributes and variables?

E. Answers

An answer to the first question could be formed directly from understanding and defining the environment-human related dimensions. Needs forms the basics of human in and out body requirements of nutrition, hygiene, and conditioning, and that can be attained from services and utilities provided and attained form shelter, networks of water, sanitations, sewage, electricity, telephone, and streets.

On the second level, people feel safe or not safe by using his/her senses and that related to urban environment properties and components, which endanger or safeguard his/her senses. Negative or positive resources are the effect of certain natural or manmade environment components, control and manipulation such as pollution, hazards, income, education, information, health, and development.

Belonging lie on a higher, third level in the human pyramid. It conforms to human Attachment, Participation, Interaction, and above all admiring the urban and environment qualities provided and furnished to him. At the urban level belonging comes from facilities, which add and raise interaction and make peoples life easier, happier, healthier, and more enjoyable.

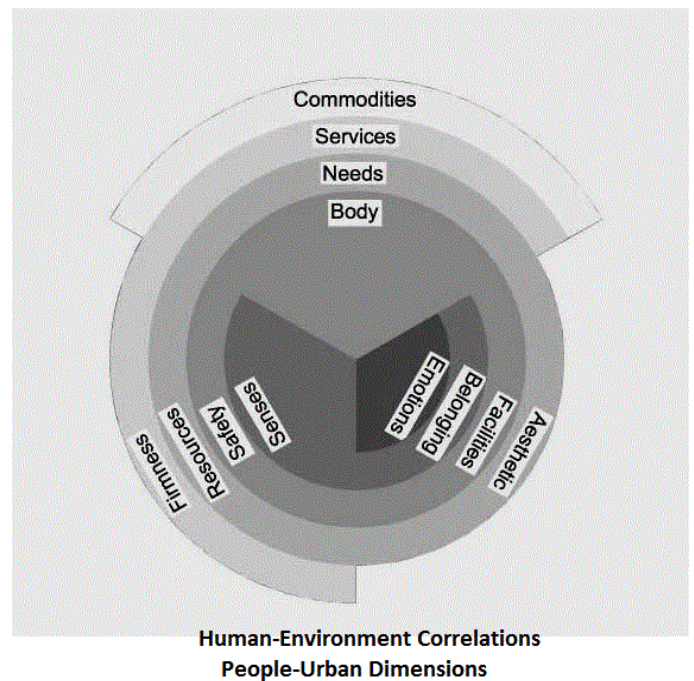


Figure3. Human-Urban-Environment Dimensions and Colorations

Since the second question deals with, when and where the human environment dimensions coexist and materialize, it is of a big importance to examine and to know its interrelations with the; changes and evolution of Al-Huseiniah community from nomad to urban life, change in their needs, safety, and attachment when they were in the open and variable environments, and when they became settled in the constants of the urban components.

In the service-needs level no change or adaptation was made, as all plans, networks, and services were set to conform to the basic urban needs. No considerations, if any, were given to the fact that the targeted community was of a mobile nomad community origin. Anyhow from the point of view of the services provider's services were presented to the new community as a privilege, which supposed to make them satisfied and attached to their new environment. On the contrary services from the point of view of new the community, is a bounty or a duty or compensation from the decision makers for changing their environment. Statistics show that water and electricity bills of Al-Huseiniah are not paid and running high.

The resources-safety relation is the most affected and adapted dimension in the whole equation. Available natural resources in both its positive and negative presence and influences where not taken or incorporated in the urban and environmental planning of Al-Huseiniah, also neither related to the fact that the target community supposed to settle there is of a nomad origin. Many changing and evolving natural and manmade resources in Al- Huseiniah resulted in producing new trends of pollution and hazards, or aggravating existing ones. No resources were incorporated in any sustainable development studies, managements or strategies, yet local and disperse personal initiatives, produced seeds of self-supporting

income or environmental friendly solutions, which if organized and grouped could form a large-scale endeavor in developing the community and the urban environment.

Concept of facility-belonging correlation seems to have nearly no effect or presence in the human-environment dimension at Al-Huseiniah. Certain interactive cooperation facilities such as athletic clubs, religious mosques and social associates or societies either in buildings or zones have been dispersed with no concept or theme within the town layout.

All buildings and urban components were integrated in the layout and presented to the community into the form of supportive facilities, rather than interactive places with potentials of participation, attachment and celebrations. Again, scattered and personal or communal Bedouin type initiatives commemorate their ongoing traditions and conventions. Festive type Siwans (Bedouin tents) of permanent or occasional setting can be seen all over Al-Huseiniah. Madafas (Bedouin receptions either tents or buildings) annexed from either private or public space manifest their interactive generosity and their spontaneous understanding of the external spaces of the urban-environment as a living place. They replace the lost quality of the new urban life, by regenerating the essence of their nomad way of life.

F. Adoption and Adaptation

In the sequence of the urban transformation and evolution at Al Huseiniah, it is clear that the adopted strategy (if any) and the town planning left no margin for communal-environmental adaptation. Nearly all-communal and urban changes came in the form of a hybrid or mutated adaptation, which lack the essence of the sustainable development strategy and parameter, which is continuity and progress.

G. Simple and Complex

After forty years of its formation, it is now clear that the conception of the planners and the strategy leaders of Al-Huseiniah, was to find a stable, firm, lavish, settled and durable urban environment and community.

Also it became obvious that in order to achieve these objectives, they adopted a constant and dependable approach in their plans, concepts and implementations.

It was not clear if in their minds, approaches and way of thinking that they considered or neglected the many related variables and attributes of both the environment and the community themes and precepts.

In the course of the study, survey and observation we have become faced with numerous variables and attributes much of which was never been taken into consideration or even noticed and that include genuine and basic variables and parameters of environment before the town formation, variables and parameters needed for and during the process of planning and implementation, finally, post occupancy variables and parameters resulted from the community-environment adaptation.

III. A SEARCH FOR A MODEL

Model defined as representation of reality or representation of a form style or pattern parameters. A search for a model, which while interrelate human-environmental data and people-urban dimensions, it must reduce the volume of data and information to a level we can perceive and read at a glance.

That means not to neglect or eliminate other information but rather keeping them available to another projected view. The model here uses information system capabilities in geography, environment and community with other digital abilities and digital data. It transforms quantities into values and values into qualities. So the model is a digital representation of real conditions generated by the process of collecting and evaluating the quality of the environment themes.

The model is to refer to data from many diverse sources, with a wide variety of attributes and values. It has the ability to bring all together in a single medium, where everything can be viewed and evaluated at the same time.

The model is the Study and the Answer of the Third question.

A. Implementation

After revising, the properties and the parameters of the searched model, it is not the intention of the study to design a model but rather to search between available models and digital programs for the best fit one with the study objectives. Even though that do not deny that the study originally and basically took into consideration the advantages, potentials, properties and parameters of the GIS software and applications. Within the GIS software there are more than three models or methods, but the software is very flexible that one can develop his own model, and that is one at the main objectives of the study. It is a two way two trip study tour, one way is to reach the dimensions, correlating communities with urban environment, and the other way is to find tools and means to measure these dimensions and correlations.

On the second trip, the go or depart is to reach the properties, attributes, features and characteristics that best relates and form the dimensions, on the return is to interpret and represent the attributes etc, into the model form or pattern. Anyhow within the limits of this paper we are to travel within the process of finding the urban dimensions and the model pattern and relating them together. Anyhow, results and solutions of the study model will be presented in later studies, when and where the full data and information are fully processed.

B. Digitizing Data

Methodology and process in the course of the second part of Al-Huseiniah study was tailored in undergraduate and master courses. Beside the GIS, and GPS, theoretical input, the involved students were thoroughly trained on how to collect and to manage digital data on site and in the GIS lab especially established for that purpose.

Ten research assistants specially trained in the Royal Geographic Center and the Department of Statistics, took the

lead with twenty students in conducting a full and thorough digital survey. 2400 man-hours spread over ten working days prove sufficient in collecting full digital and analog data.

Data was classified and categorized in accordance with study theme that is urban services, resources and facilities and the community needs, safety and belonging.

Under services all houses, domestic water, electricity, telephone, sewage, streets and lighting networks were recorded digitally in coordinates and photos for condition evaluation. Resources were recorded as urban and natural components which conduces either positive or negative effects on people safety and that include, resources of pollution such as the cement factory dust, more dust produced from land and sand of earth plough. More pollution recorded from local factories of blocks and vehicle maintenance workshops, other pollution comes from malpractices of sewage and garbage near and opens dumping. Hazards are wide spread in Al-Huseiniah and they are mainly recorded from construction sites, open septic tanks, excavation and cuts of land, power communication towers, incomplete or damaged sidewalks, streets, components of networks such as manholes and gutters, floods and fires. Resources of income, health, information, education, food represent the positive side of safety dimensions, and that recorded from clinics, schools, municipal and governmental offices, consumer and environmental societies. Al-Huseiniah is rich with natural resources and that include five natural water wells, one of them is used by Nestle, Ghadeer natural water industry, one for the town domestic water network and the other three for private cultivating farms. Private gardens for food and vegetables is available in nearly all houses of Al-Huseiniah, which presents another source of road supply and income. Raising life stocks, camels, sheep and goats in annexed cote is wide spread use and practice in Al-Huseiniah. Also that presents another successful source of income and food supply. The spread of house cultivation, raising livestock and the presence of the three large-scale farms and the abundant water resources, not necessarily present a feasible or a sustainable development at Al-Huseiniah. However that is under study and investigation in a resources management and strategy studies conducted in another master course under my supervision. A major successful source of income is coming from a weekly open market that offer all type of supplies including food, dressing, equipment and vehicles. That market became well known in the southern region and is developing on the regional level. Local and minor small shops present chances of employment, which are scarce at Al-Huseiniah. Most employment chances are either coming from military personnel or governmental employees or private self employed practices. Professional practices, craftsman ship and specialized industrial workmanship seem not to be favored and appreciated in the semi nomad-urban community.

Facilities-belongings interpreted in the study by digitally recorded places and facilities, which make people life happier, easier enjoyable and livable. Under that definition places at Al-Huseiniah includes one athletic club, two mosques and two communities, one male, one female center. Beside that all other facilities are of personal s and communal initiative expressed in form of Madafas and festival Siwans

occasionally and permanently disperses in and around the houses of Al-Huseiniah.

Measuring different attributes that resides in the urban services, resources and facilities and contributing to the community variables concerning needs, safety and belonging is the next step. However and since that is not a recordable matter and can be only deduced by reasoning and analytical means, hence this step cannot stand-alone and has to be incorporated directly in the model.

C. *The Continuum Model*

The four-dimensional continuum having three spatial coordinates and one time coordinate that together completely specifies the location of a particle or an event. Defined also as the graded sequence of differences. It is usually a state of space-time continuum and that represent three dimensions of space processing in time.

The continuum is not a new device neither new software. It is an adaptive method of models used in geographic information system. GIS defined as computerized decision support systems that integrate specially referenced data. These systems capture, store retrieve, analyze and display spatial data. GIS is a binary (0, 1) 2D flat multi layers spatial data. What makes the Continuum model advanced to other models is the introduction of the third coordinate (making it real space) and the time dimension.

D. *The New Model Properties, Planes and Layers*

Instead of having one plane multilayer spatial pattern of the regular GIS model, here we have three planes each with multi layer pattern. The first X-Y plane deals with networks, utilities and services mostly from underground data and information or below surface. The X-Z plane deals with natural and built urban components and resources part of which is below the ground surface and other part above it and that can be also presented as mentioned before with the positive and negative effects of resources. The third Y-Z plane and layers is concerned with buildings, landscape hard and soft, also natural and built facilities. Here all elements and components are above ground surface and above the X-Y plane, as it deals directly and basically with people's emotions, activities, interactions, participations and above all belonging. Time dimension travel freely between the three planes and presented mostly into 3D surfaces that is space-time events. The difference between plane and surface is that plane is always flat and abstract while surface could be a 3D theme with meanings and relatives.

E. *Interface storage*

Here all the three space –time dimensions, planes and surfaces are data interface storages. However not all the four interfaces and storages are of the same properties? Surfaces interface is of a net, grid and matrix layout and that conform essentially to network type of services and needs. Attributes and variables related to needs are indicated into nodes, points, dots and spots

etc. Resources interface and storage is of the shaded type plane and layers and that include tones of attributes and variables presented into opaque, transparent, translucent and color shades.

Facilities interface and storage is of a cellular type special pattern. Cell types are of primitive shapes that include triangles, squares, circles and octagons. They present catchments, participations, interactions and celebration attributes. Events interface and storage is of a contour and terrain type surfaces. Vertices and Nurbs will control attributes of events on surfaces.

F. Analysis and Synthesis

Data analysis and synthesis will mainly interrelate and integrate data attributes, features and characteristics within the one interface or in between the three interfaces. Data processing will depend on the type and properties of the information when spatially handled and that include layers overlay, overlaps, imposed, superimposed, matrix, grid, nets and spatially elaborated by intersect, pattern, motives, geometry and circuits. Tones and shades are spatially juxtaposed, ranked, graded, and degraded. Cells spatially handled as linear, radial, serial and parallel arrangements. Properties imbedded in certain attributes and variables will form the basis for choosing which type of spatial analysis or synthesis theme can best correlate the data with the continuum model.

IV. CONCLUSION

At the end, data output will be presented into a wireframe spatial trip, where results, conclusions and analysis can be perceived rather than read. Also data and results will be revealed rather than displayed. However hard copies can either produced in maps and photos or into portraits and images. In simple words and conclusion, results and data will be presented in a live sequential 3D spatial tour.

Digitally surveyed data were downloaded and classified in accordance with the three proposed levels, below, at and above ground surface, also according with the urban services, resources and facilities. The above categorization prove spatially, physically and socioeconomically very efficient in providing on the one hand a 2D linear information and data for the one discipline studies or projects, on the other a matrix 3D data for a multi disciplinary studies or projects.

The model implemented at Al-Huseiniyah produced not only an effective process of reading and reaching full urban and socioeconomic information of the town and region but gave a better and rather a clear understanding of the town formations and transformations and of what we called a hybrid nomad-urban community. Also in time it can monitor and update the town urban and communal evolution and possibly a far future

prospect of transformations. It simplified both the ways of reading and reaching the data and provides practical and sustainable urban and communal solutions.

V. GLOSSARY

ATTRIBUTE(s)

1. Set or collection of data that describes the characteristics of the real world conditions.
2. Single element of nongraphic data assigned to a spatial feature either as an imbedded data element within the spatial database or located in a linked DBMS data record.

CAD/GIS refers to integrating geographic information system technology with that of computer aided design systems.

CELL the location of a single value in a database defined by intersecting a row or record with a field or column.

DATA

1. Attributes describing the substance characteristics, variables, values, and similar qualities of the datum.
2. Geographic information describing the position of the datum in space relative to other data.

Data base management system (DBMS) a computer based system or application software that enables users to build and maintain a non-spatial database.

DIGITAL DATA anything in computer readable format.

DEM Digital Elevation Model digital cartographic representation of terrain surface or a subsurface feature as defined by a series of three-dimensional coordinate values.

GIS geographic information system, an organized assemblage of computer hardware, software, spatial data and operating instructions designed for capturing, storing, updating, manipulating analysis and displaying all forms of geographically referenced information.

GRID CELL MAP A map displaying spatial information in the form of color-coded equal-sized rectangles, squares, equilateral triangles, or hexagons.

INFORMATION SYSTEM Computer system that have the ability to perform data collection, assembly, interrogation, visualization, and communication.

MATRIX

1. Rectangular array of numeric or algebraic quantities subject to mathematical operations.
2. Something resembling such an array as in the regular formation of elements into columns and rows.
3. Network of intersections between input and output leads in a computer functioning as an encoder or a decoder.

MODELING

1. Applying structured rules and procedures to one or more spatial database overlays to conduct spatial and/or network analysis to derive new information to aid in problem solving and planning.
2. Schematic description of a system, theory, or phenomenon that accounts for its known or inferred properties and may be used for further study of its operational characteristics.
3. Process of simulation, prediction, and description involving changing the parameters and generating/communicating new model results. Using spatial or network overlays to simulate a process to predict outcomes to what-if scenarios.

SURFACE

Boundary of a three-dimensional figure.

THEME

Set of related geographic features such as streets, parcel, rivers and their attributes (characteristics of those featured).

INTERFACE

Components of software that expedite its intuitive and computer use.

VIRTUAL REALITY

Spatial computing environment that enables users to interface with a spatial database in an intensive manner, either produced in maps and drawings or into images and portraits. In simple and short words and conclusions, results in the Continuum model will spatially presented into live data tour.

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