Combining Syntactic and sensitive analyses Case study of a waterfront district in Sousse.

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ABSTRACT

Through this paper, we suggest that crossing Space syntax and Sensitive approaches (ambience study) may enhance the effectiveness of the syntactic analysis to predict and guide the conceptual choices of architects and planners. It allows, as a design tool, to test different hypotheses during the process of planning design. It also makes it possible to establish a diagnosis and a detailed analysis of the different visual configurations characterizing an urban or architectural space. It focuses on the degree of visibility, on the fluidity of the traffic, on the accessibility of the place and on the connectivity between one space and another ... Once this diagnosis is carried out, it is possible to improve visual, urban or architectural characteristics of the designed artefact.

The syntactic analysis focuses on the visual dimension of the built space However, it carries limitations in forecasting precisely the space uses and the sensations provided by the built space. The case study that we put forward combines syntactic and sensitive analyses in order to lead to the implementation of a conceptual model and lead to development guidelines.

Our study area is the district of Bhar Ezzebla. It is located in the centre of the city of Sousse, Tunisia. It forms a point of intersection between the sea, the Medina or the historical centre and the tourist zone. The district in its current state is an obstacle to the opening of the city centre on the sea and in particular the Medina and the Farhat-Hached Square. It is at this point that we have introduced the syntactic analysis. At first, it enabled to establish a diagnosis of the current state of the urban fabric of the district. In particular, it gave a clear idea of the degree of visibility and connectivity with the sea and the immediate urban environment. In a second step, we used the method of "commented journeys" or trips (in French: "Parcours commentés") to report on the uses as well as the ambient characteristics of the neighbourhood in question. We have been able to draw up a map of the ambient environments highlighting the relationship between the built form and the sensitive characteristics of each area of the neighbourhood.

Once the analysis was made, we sketched out a proposal for development trying to fit in with the guidelines chosen for the first phase of the work. We then proceeded to verify by syntactic analysis whether the conceptual choices retained in the conceptual process do or do not meet the desired objectives.

KEYWORDS

Space Syntax, ambience, sensitive analysis, syntactic analysis, urban planning

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1. INTRODUCTION

The proposed case study combines syntactic analysis and sensitive analysis in order to lead to the implementation of development guidelines leading to a project proposal.

Our study area is the district of Bhar Ezzebla. It is located in the centre of the city of Sousse inTunisia. It forms a point of intersection between the sea, the medina or the historic centre and the tourist zone. Currently, the district is a hindrance to opening the city centre on the sea border and in particular the medina and the Farhat-Hached square. The aim is to give this district its entire place in the urban fabric.

The objective of our methodological experiment is to determine at what stage of the conceptual process we can involve syntactic and sensitive analyses. It is also a question of bringing to light what can be done by both methods in the shaping of the urban project. How can these combined methods help to guide the conceptual choices of the architect or the planner ? And finally in which way could the designer evaluate and take decisions in shaping up the project?

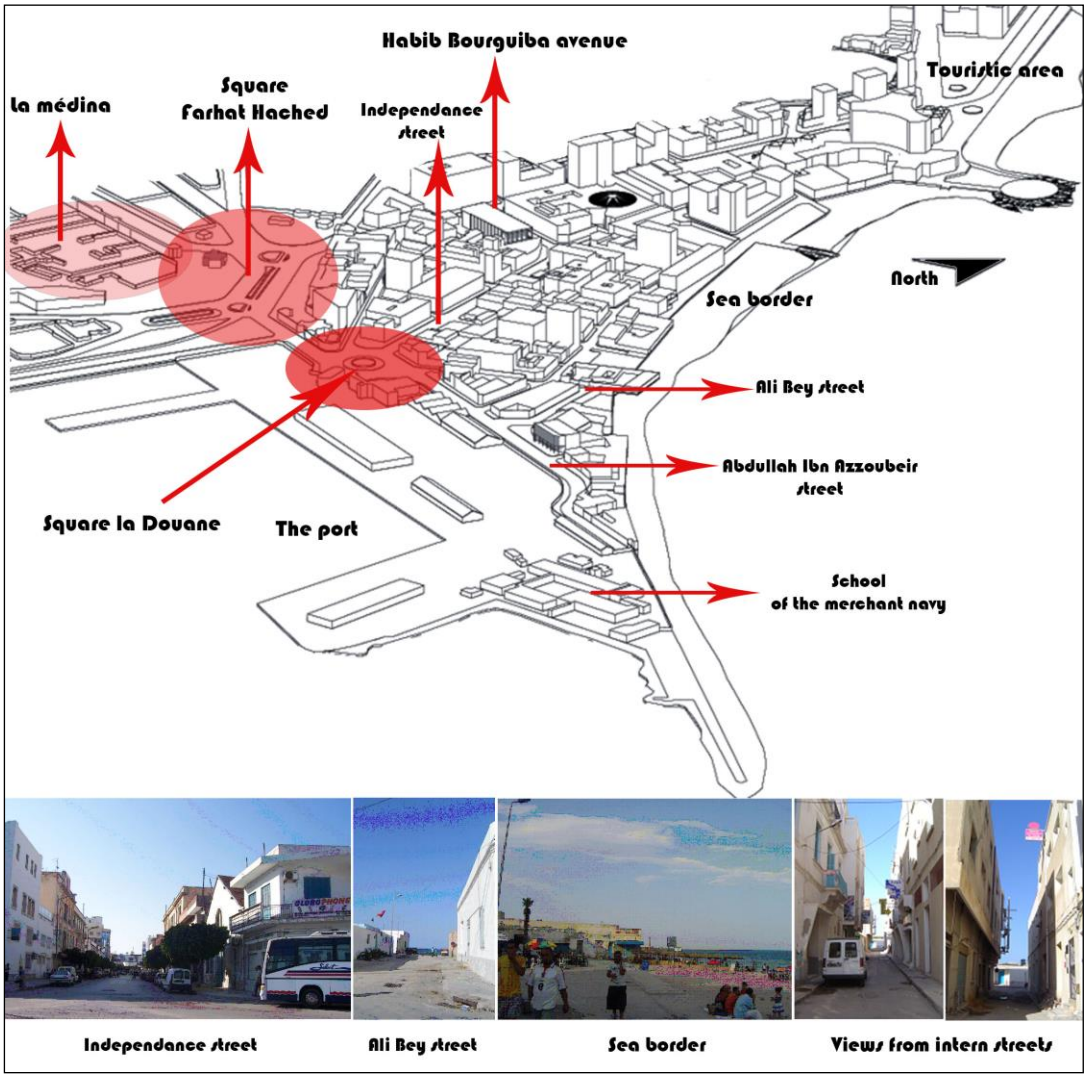

Figure 1 Views of the district of Bhar Ezzebla

2. DATASETS AND METHODS

The adopted approach combines two complementary methods: Space Syntax analysis strives to model the visual dimension of built space whereas the sensitive approach to urban and architectural public space allows for the depiction of the experiences and uses of space as well as the sensitive modalities produced by the interaction of individuals and their living spaces. Ambient is defined as "time-tested in sensitive terms" (Thibaud, 2013). It is of the order of emotion. It is felt and lived inwardly in time and space.

In a first stage, the syntactic analysis enabled to establish a diagnosis of the current state of the neighbourhood's urban fabric. In particular, it gave a clear idea of its degree of visibility and connectivity with the seaside and the immediate urban environment. In a second stage, the method of the "commentated journeys" was used to report on the uses and ambient characteristics of the above mentioned neighbourhood. This enabled to draw up a map known as "ambient environments" (Thomas, 2005). The commented journeys engage the moving perception of the interviewed people. An ambient environment highlights the fact that all public actions involve both the pedestrian's perception and the physical environment (Thomas, 2005).

The results of the two methods are then cross-examined in order to define the guidelines for the potential restructuring project. Once the project is in shape, the conceptual choices were then tested to find out whether they comply or not with the previously defined guidelines by reiterating the syntax space measurements.

The detailed description of the methodological process is as follows.

"In general, Space syntax analyses examine the relationships between components of space; each analysis starts with a representation of the spatial components, and then makes a graph of these components, and finally analyses this graph using, for the most part, conventional graph theoretical measures" (Turner, 2004).

To make Space syntax analyses, we use Depthmap. Depthmap is a computer program to perform visibility analysis of architectural and urban systems. It is able to create a map of visually integrated locations, permeability and to qualify different urban connexions. "The original concept behind Depthmap developed from two strands of thought. One was isovist analysis (Benedikt, 1979), and the other space syntax (Hillier and Hanson, 1984)." (Turner, 2004).

The main syntactic measures used in this work, are the global measures such as connectivity, integration, visual Entropy and visual Mean Depth; and local ones including the Clustering Coefficient, visual Control; Isovist; axial analysis and second-order measures such as intelligibility.

The "commentated journeys" method integrates space into its sensitive dimension. It touches the feeling given by the interaction between the material and immaterial data of places. It gives an account of the perceptive activity of city dwellers and gives access to the way space is lived by them.

Before starting any journey, it was necessary to identify and calibrate them. The recommended duration of a journey (Thibaud, 2008) is twenty minutes, the time necessary for the collection of a verbal corpus sufficient from the point of view of the ranges of words relating to the environments and whose transcription does not exceed, on average, two hours. Each journey is recorded and then transcribed faithfully.

The journeys were drawn on a map and then timed on site. Determining the exact duration of each of them was essential to avoid being with too long or too short or unbalanced courses. Three of them were defined. Nevertheless, the consistency of verbal data from one individual to another does not depend solely on those parameters set beforehand. The speed of the respondent's approach, his field of knowledge as well as his ease of language, influence the speech. Some respondents were solicited in situ others belong to our network of acquaintances. It was easier to speak on the first course that borders the waterfront than on the courses inside the neighbourhood. The people interviewees seemed more available, and they were much more ready to follow in our inquiry. They took the time to listen to us and seemed interested in the problematic of our subject as well as our interest in this place. Inside the neighbourhood compound and on its peripheries, people were more suspicious. They said they were in a hurry and refused categorically without even having the trouble to listen to our explanations To put them in confidence we showed them the route to follow drawn on a map of the neighbourhood, and we explained to them that it was just enough to walk the path and describe all that could appeal to their senses. Those who accepted seized the map as if they were afraid of getting lost or as if it was the first time they visited the place. On the seashore, potential interviewees were easier to question.

The transcriptions of the courses were carried out in two stages. The first is a faithful transcript of the interview. In a second step, these obtained texts were classified in a double-column table. The first contained the texts collected and the second was illustrated by plans and photographs highlighting the places described as the progress of the course. The photos were taken during the impregnation and observation periods that coincided with the period during which the urban surveys were conducted. During the transcription, we talked about the downtime of the speech and the silence.

At the end of the transcription of the courses, the verbal data were extracted and classified before being analysed. The descriptive formulas have been listed in a table highlighting spatial-sensory association[4] (Thibaud, 2008, p.86), perceptual transition[5] (Thibaud, 2008, p.86), the verbal field of appearance [6] (Thibaud, 2008,p.86,87) as well as reflexive formulations[7] (Thibaud, 2008,p.87) emitted by each individual in the context of speech.

The analysis done in the second phase came in continuity with the classification carried out previously, a classification that facilitated the extraction of information. We were able to recognize some behavioural clues and detect sensitive referents. We were also able to identify the feelings of the respondents inspired by the places and identified from some sentences the relation between the descriptions relating to the public and the spatial devices and the descriptions relating to the sensitive space and the feeling.

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[4]« Passers often use their perceptual memory and associations to describe the atmosphere of the site in which they are located. […] The association of a perceived atmosphere in situ […], gives indications on the acoustic, luminous or thermal qualities of the crossing place"(Our own translation)

[5]« […] By claiming intensity differentials or variations in quality, the observer describes the ambiences in their temporal spatio dynamics, depending on the paths and circumstances. Whether they are localized and: or events, these perceptual transitions make it possible to characterize the articulation of places at the sensitive level » (Our own translation)

[10]« Describing what one perceives does not consist solely in making an inventory of facts or evidence within ear or sight. The use of verbs such as "look", "appear" or "look" expresses some uncertainties and ambiguities of perception. […] By listing the circumstances in which these verbs are used, we can demonstrate problematic situations from a perceptual point of view ». (Our own translation)

[7]« They make more explicit the two main activities involved in the experiment: on the one hand, the perceptual orientation of the perceiving subject […]; on the other hand, the mobility of the walker." (Our own translation)

We have mapped a map of the various environmental environments within the neighbourhood through the mapping of definitions developed by Rachel Thomas to the synthesis of verbal data analysis.

We then confronted the results obtained from each method and synthesized this cross. We ended up establishing the major concepts needed to restructure the urban fabric in question. Once the project was formatted, we used the space syntax calculations to check the relevance of the proposed redevelopment proposal and whether our concepts were translated into the project.

3. RESULTS

GLOBAL MEASURES

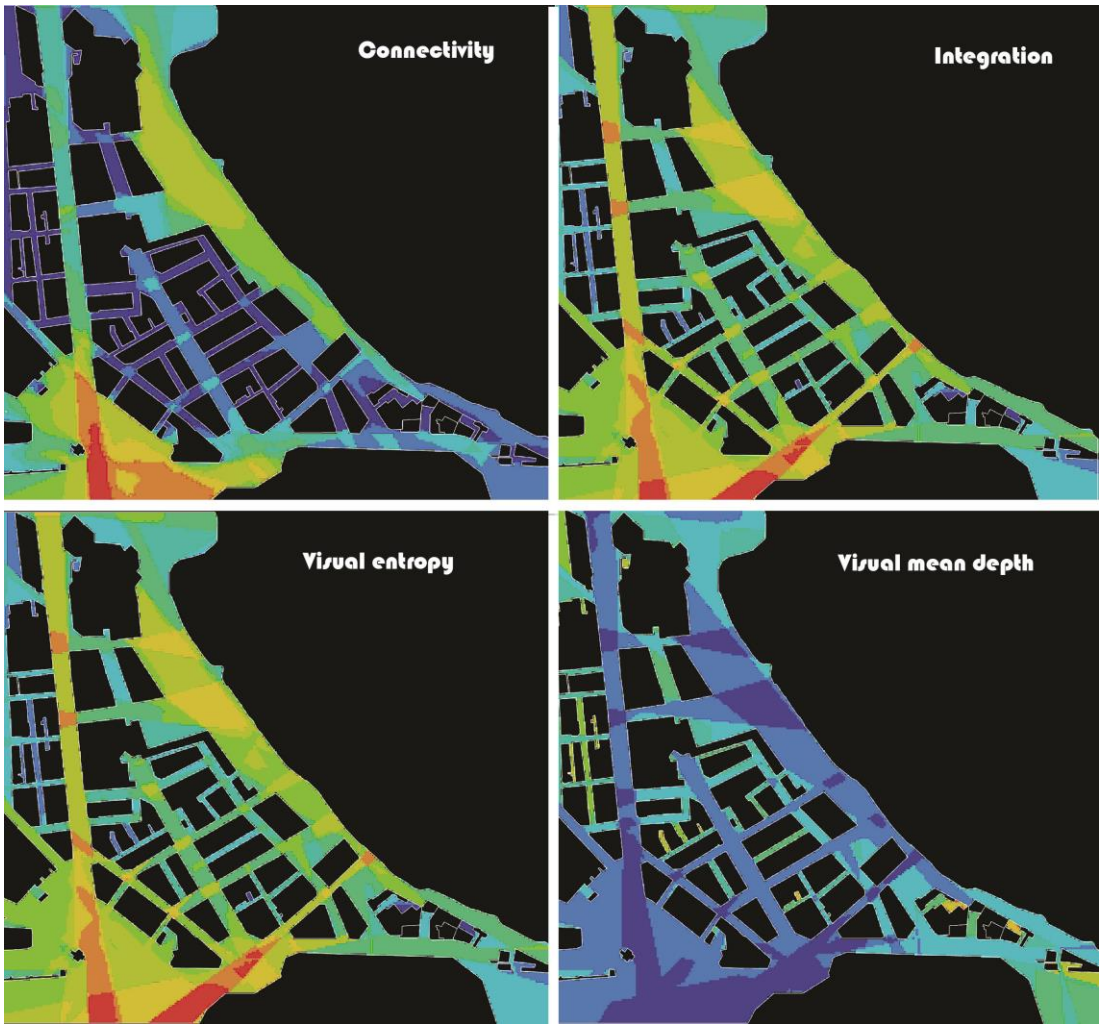

Figure 2 Global measures

CONNECTIVITY & INTEGRATION

The connectivity analysis allowed to identify the spaces that are characterized by the highest level of connectivity, that is, those that are directly or indirectly related by visual depth to the entire neighbourhood. Connectivity shows that "Farhat Hached square" is the most connected space. The Customs square as well as the eastern area of Hadrumete Beach represent average connectivity.

Integration tells about the average depth of a space relative to all other spaces in the system. The values given by the calculation of Visual Integration vary between 3 and 16. We note that "Farhat Hached Square" and "Customs Square" (spaces in red), are the most visually integrated by contribution to the whole neighbourhood. The most segregated area is the western part of the beach.

VISUAL ENTROPY & VISUAL MEAN DEPTH

The values given by the graph of the Visual Entropy tell about the distribution of the system of values in space. The values measured vary between 0.99 and 1.99 with an average of 1.634.

Visual mean depth is a measure that refers to the type of spaces and the relationships they have with each other. It is a measure that informs about the fabric as a whole. It determines its depth level. It tells if it is deep or superficial. In our case, we noticed a very important visibility of the Farhat Hached Square, the Customs square, and the axis of Habib Bourguiba Avenue.

LOCAL MEASURES

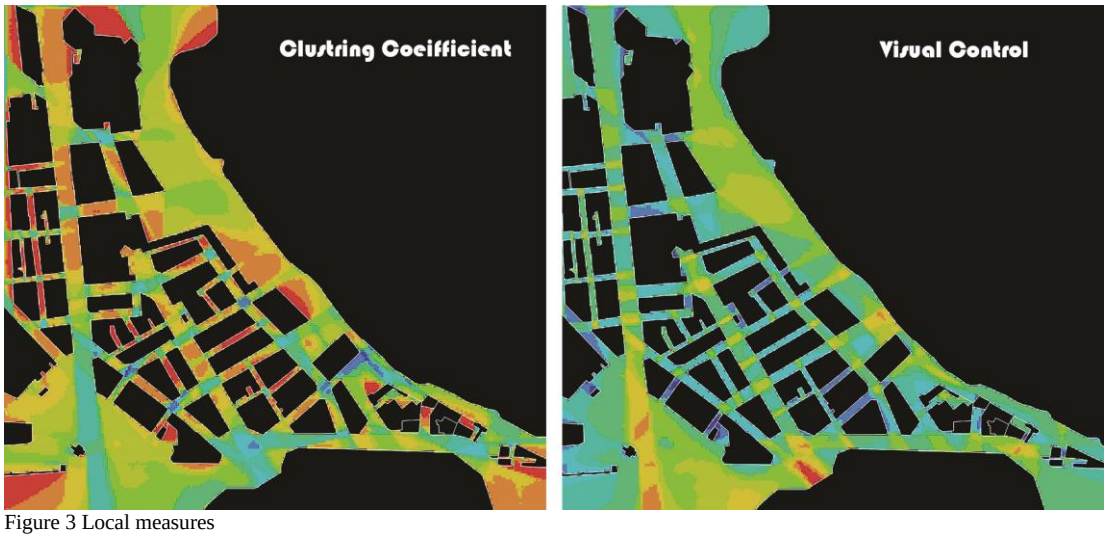

Figure 3 Local measures

CLUSTERING COEFFICIENT & VISUAL CONTROL

The clustering coefficient tells about the convexity of spaces. It informs whether the majority of spaces are convex or rather axial. The district in its current state is characterized by a convexity existing between the buildings, inside the district. Axiality is noticed at Habib Bourguiba Avenue.

The study of visual control gives information on the degree of use of one space compared to another. In the same system, and in parallel, one can determine the degree of control of a space with respect to other spaces. In the district of Bhar Ezzebla, it is clear that the two places together with a part of the beach are the most accessible spaces.

ISOVISTS

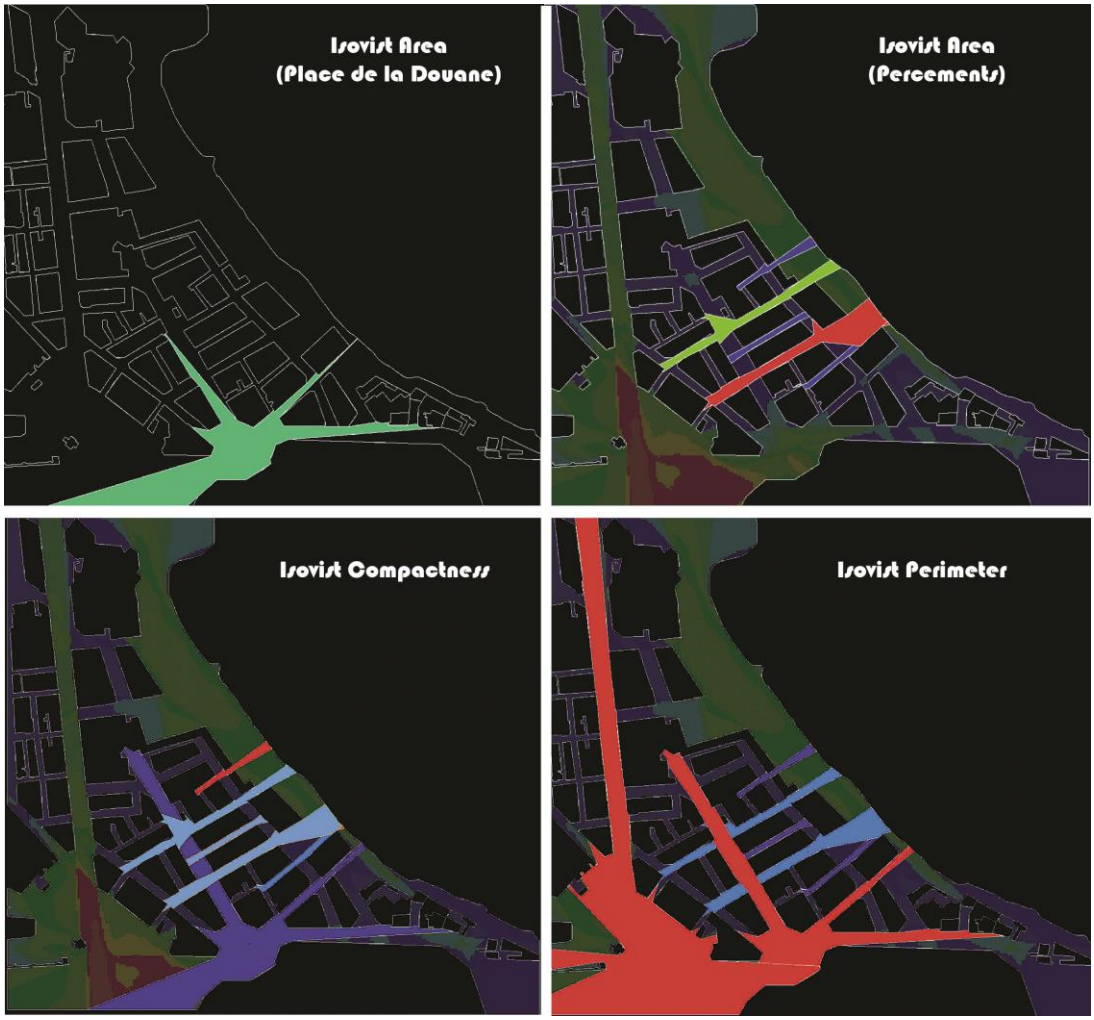

Figure 4 Isovist measurements

The Isovist analysis allows seeing from a previously chosen point of view, the visual potentialities of a person in situ (over 360 °).

The chosen point for the first test is positioned at the level of the "Customs place". The field of visibility and perception of the sea is very limited. We can only observe it from a very small angle. Independence Street and Medina are partially visible.

We also made the choice to work on visual breakthroughs in order to discover if the seaside is perceptible from a few points as the graph above shows. The visual field seems just as small and the seaside is not visible enough from inside the neighbourhood.

In the first graph (Isoviste compactness), we can notice that the Farhat Hached Square is more important than the area facing the sea. The visual link between the Customs Square and "Farhat Hached square" is much more important as the one between the Customs Square and the sea. Connectivity and visibility go hand in hand here. We can see that at a given point a certain number of fallow buildings constitute a visual obstacle and do not allow in this way the connection with the seaside from the "Customs Place" in the East direction. The restructuring of the space currently occupied by my hangars should be designed to create a direct visual link with the seaside.

In the second graph (Isovist Perimeter), we notice that the seaside is not visible from Farhat Hached Square in the East direction. The square is a point of passage between the fabric of the medina and the colonial plot.

AXIAL ANALYSIS

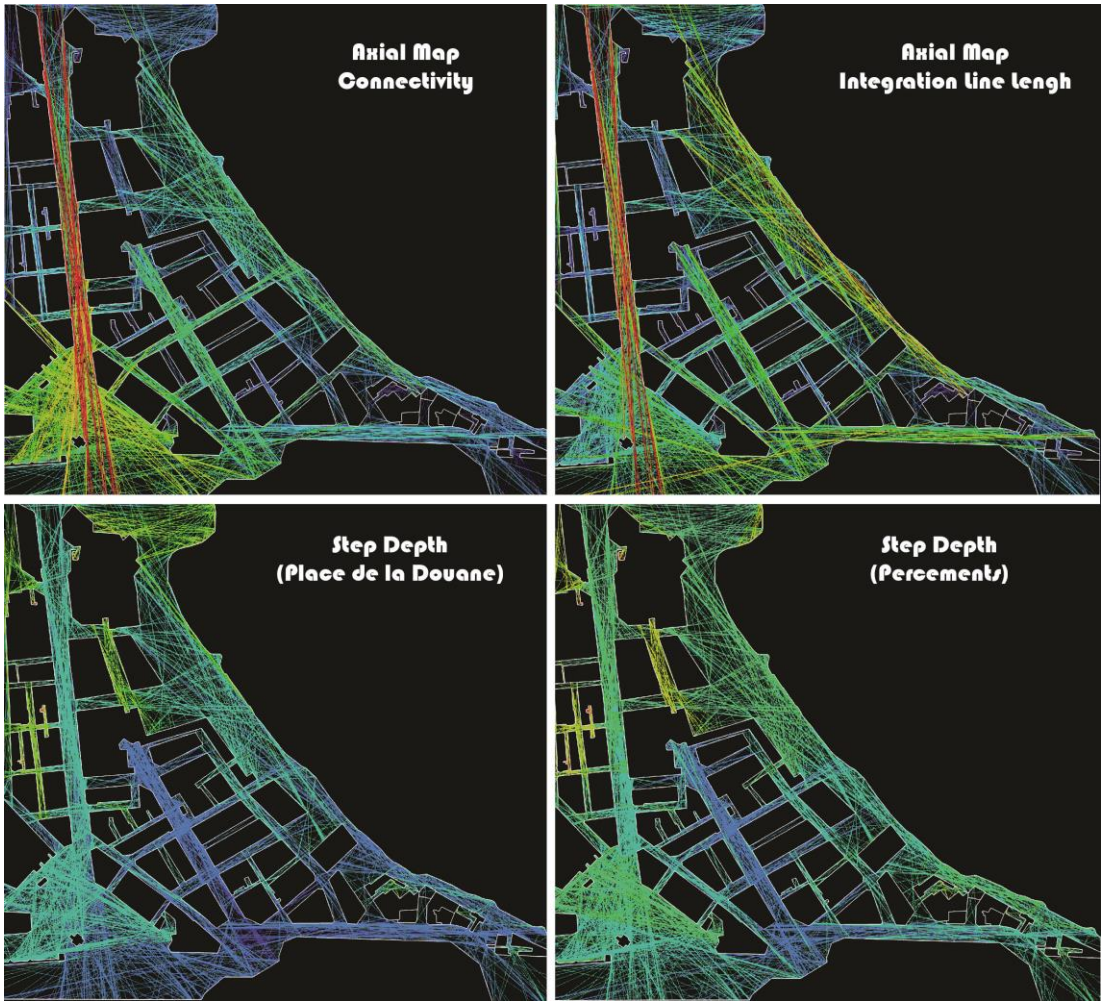

Figure 5Axial analysis

CONNECTIVITY & INTEGRATION

In the first graph Habib Bourguiba avenue is the dominant axis. All other axes are of less importance than this avenue which holds a connectivity value equal to (214).

Integration is a static global measure. It describes the average depth of a space relative to all other spaces in the system. The spaces of a system are classified from the most integrated to the most segregated. For example, Habib Bourguiba Avenue (710) is the most integrated space compared to others.

STEP DEPTH

The calculation of the Step Depth makes it possible to determine the depth of all the spaces with respect to a previously considered space.
Step Depth calculations allowed to obtain the degree of depth of each space in the first place compared to the "Customs Square" and secondly compared to the middle way of the neighbourhood, which is just in the middle.

Regarding the calculation that is related to the "customs place" we obtained 5 levels of depth. Most of the spaces have a depth varying between 1 and 3.
The calculation of the depth referring to the middle channel gave a result corresponding to 6 depth levels.

Habib Bourguiba avenue and "Farhat Hached Square" have the same depth value which can be considered as low and which is equal to 2 for the two calculations carried out.

DEFINITION OF THE AMBIENT ENVIRONMENTS

TEMPERATE AMBIENT ENVIRONMENT

According to Rachel Thomas, a temperate ambient environment is defined as a space with the features of a reserve with resting virtues (Thomas, 2005, p.90). It fosters the act of wandering and presents itself as a place for loving, childish and friendly encounters, a playground for children and a meeting point for adults. It shows a decrease in the intensity of the noise level and identifies itself as “a parenthesis of urban life” (Thomas, 2005, p.91). By this definition, the waterfront has the distinctive features of the temperate environment. It is a place that is frequented and appreciated for its landscaping and ambient qualities. It offers an environment that combines well-being, relaxation. Pedestrians by their way of acting in space seem predisposed to open up to the other and to exchange with him. This attitude thus explains the ease of access to the way the seaside users take in relation to other areas of the neighbourhood.

Behavioural Indices	space users
Fishing, to play,to stand, chatting, walks, to rest, to sit in the sun, sitting, contemplating, to take a bath, walk, eat, revise, to have fun, changing air.	Couples, Students, young boys, women, tourists.

ATTRACTIVE AMBIENT ENVIRONMENT

An attractive ambient environment (Thomas, 2005, p.93) is generally detected within smaller neighbourhoods or interconnected streets. The space that has been identified on the map as an attractive ambient environment has multiple activities and uses.

The diverse olfactory universe of this environment reflects the multiplicity of activities within it. In her account of the smells that can be felt in this type of environment, Rachel Thomas evokes cooking smells as a source of contentment. In our case, the smell of kitchens, referred to as “frying odours” show a feeling of discontent. But a smell having as its source, an edible element, coffee, as well as that of the smell of kitchens which is representative only of the smell of food, is very appreciated by the investigative.

AMBIGUOUS AMBIENT ENVIRONMENT

At the neighbourhood level, this area covers the network of streets and alleys that serve the interior of the islands. By their spatial configuration they appear as corridors of services inside the islets. Space tests the mode of visual perception. The sliding effect, the ripples, the succession of vertical planes, participate in a part of a cache-cache between pedestrians and review in the image of a maze.

SATURATED AMBIENT ENVIRONMENT

On the basis of the descriptions of the investigative team we have retained that Habib Bourguiba Avenue is defined as a saturated environment. First of all, it is characterized by a metabolic sound environment. Added to the effect produced by the condition of its

constructions, it arouses a feel projecting of uneasiness among the respondents. The presence of the crowd is clearly detectable there. It increases considerably during the summer. The pace of travel along this avenue is equally variable. There is a sense of loss of reference, access to space is blunt (Thomas, 2005, p.100). Behavioural indices and the use of certain space devices accentuate the saturation of this public road.

TRANSIENT AMBIENT ENVIRONMENT

The locations defined on the map as corresponding to transient environmental, are not very frequent at certain times of the day, they are almost empty. Most of them serve services, administrations and apartment buildings. They all lead to the waterfront. They are a place of forced passage to reach the waterfront. They also represent a transition space from a noisy sound environment to a calm sound environment. The sound level in these places depends on the distance between them and the sea or the Farhat Hached Square. It is higher on the Farhat Hached Square. These places are also distinguished by a rather dense presence of cars. These transient lanes are mostly treated in parking lots.

NEGLECTED ENVIRONMENT

A neglected environment (Thomas, 2005, p.105) is a place to flee, to avoid. It is a sordid space, neglected and isolated from urban life despite the fact that it occupies a central location in the city. This type of place is characterized by the absence of noise. At the map level, this medium appears in the southern zone of the neighbourhood.

MIXED AMBIENT ENVIRONMENTS IN ONE SPACE

The street Abdoullah Ibnou Ezzoubeir includes, two types of ambient environment. It is at the same time a passing ambient environment and an abandoned ambient environment. It is a passing environment for two reasons. The first one is the fact that it serves for the greater part administrative activities and that it is not a place of stay. The second amounts to the fact that it is a stopping-off place obliged towards the school of the merchant navy. It is an abandoned environment due to the silence, to its isolation and its marginalization.

The portion the South of the sea front also includes two types of ambient environment. It is at the same time a moderate ambient environment and an abandoned ambient environment. She can be qualified as such following one a type of users. It is a space appreciated by certain people, depreciated and runs away by others. The current situation meets the needs of certain users and pushes away those who do not find what they are for what they look there. For the first ones the presence of the sea, and its appreciated and sought sensitive attributes erase the mediocre image of the built space. This involves the fact that "the urban mobility bases less on the qualities constructed and fitted out by the space than on its ambiantal qualities» (Thomas, 2005, p. 106).

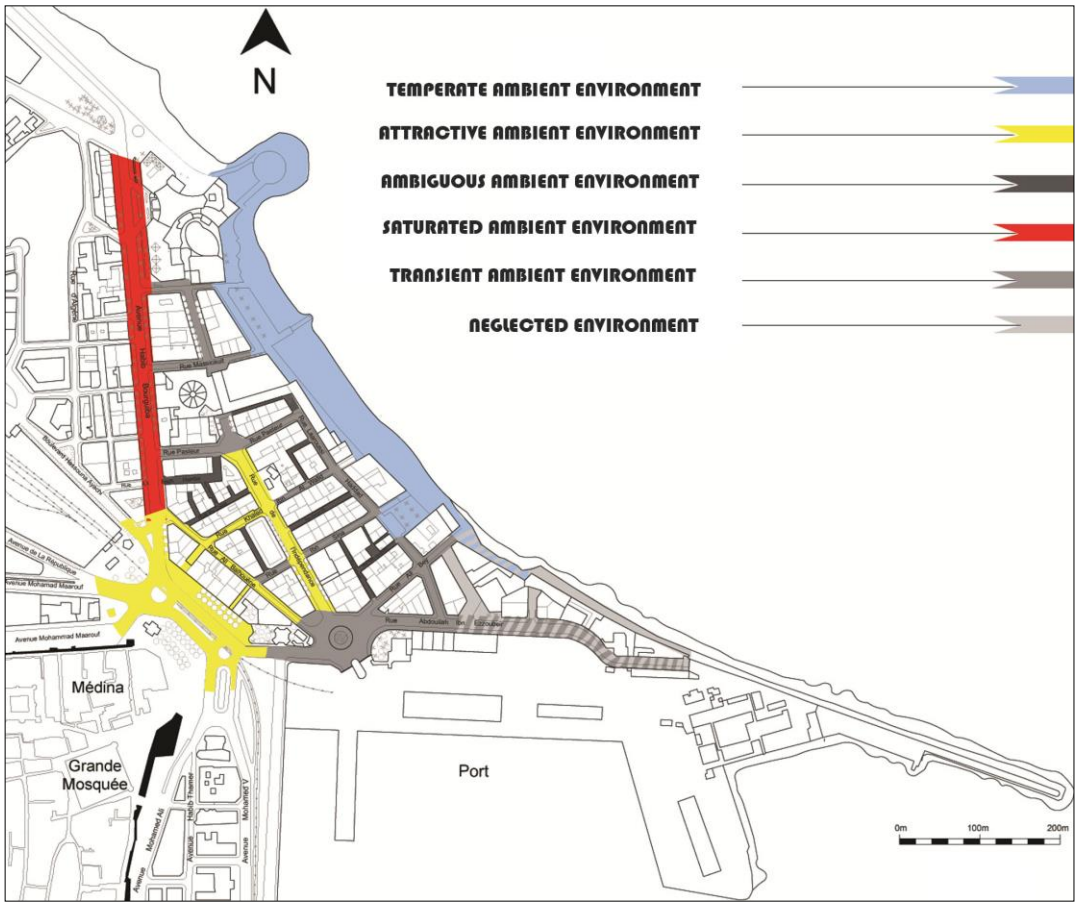

Figure 6 Map of the ambient environments

CROSSING OF THE METHODS

The Farhat Hached Square is characterized by an attractive environment. This goes hand in hand with the results of the VGA analysis: It represents the most integrated and connected space. Similarly, the connectivity at the waterfront level seems to be in line with the use of space and its ambient characteristics. It is a temperate environment. The connectivity of the waterfront decreases as it heads south. This area covers two types of ambient environments: temperate and neglected. The central area of the neighbourhood, characterized by an attractive environment, has a low connectivity value. The transient ambient environment also has a low connectivity value. Habib Bourguiba Avenue has a weaker connectivity despite being distinguished by a saturated, heavily frequented environment.

Saturated and temperate environments are characterized by greater visual integration. At the level of the Customs square there is a superposition between a transient ambient environment and a fairly significant level of integration.

Visibility decreases in the direction of the southern area that is shared between transient ambient and ambiguous environments. Uses and visibility diverge at the Customs square and converge on the Abdullah Ibn Ezzoubeir street, towards the school of the merchant navy and in the other direction towards the Habib Bourguiba avenue, passing through the Farhat Hached square.

The convex spaces are superimposed on the ambiguous ambient environment. There is coherence with the sensitive characterization of these spaces that correspond to the network of streets and alleys serving the interior of the islets.

The accessibility of the Farhat Hached Square (attractive ambient environment) as well as that of the upper area of the waterfront (temperate environment) goes hand in hand with their sensitive characteristics. They are environments that welcome walkers and loafers. The Habib Bourguiba avenue, although it was defined as a saturated ambient environment, appears on the map of the visual control as a medium frequented space. So there is a gap between the two analyses results. This would involve other parameters such as primarily commercial activities and functions along this avenue. Likewise, for the central area of the neighbourhood which is considered an attractive ambient environment.

Service routes within the neighbourhood are shared between transient and ambiguous environments. This goes hand in hand with the Isovist analysis, which shows limited visibility at the level of its spaces, one way or the other, towards the waterfront or the medina. This area is understood as an ambient environment that is both neglected and transient. These spaces are very unfrequented. It will therefore be necessary to work on the visual opening but also on the transformation of these environments, into temperate (on the waterfront side) or attractive ambient environments.

We deduce that there is a clear sensitive disconnection between the different ambient environments. The restructuring of the project should highlight the transition from one environment to another in order to focus on the boundaries between the different environments. The Habib Bourguiba avenue is the dominant axis of view activities, animations, visibility, and presence of crowds. The valorization of the waterfront and the restructuring of the axis through the Customs Square would reduce the saturation effect at the Habib Bourguiba Avenue. The axis of the Customs Square and the waterfront will gain in visual and sensitive integration.

SHAPING UP THE PROJECT

Before we began our urban project shaping, we began by making an urban diagnosis by conducting a survey of the condition of the buildings actual state. Some buildings are in very poor condition, others were to be restored and kept.

To achieve success, we fixed to:

• Balancing the degree of integration between Habib Bourguiba Avenue, the axis through Customs Square and the waterfront.
• Connecting the waterfront to all waterways: structuring, service and secondary.
• Expanding the waterfront, increasing its connectivity and visibility with the entire neighbourhood, accentuating its temperate character through the development of a cornice and the insertion of green spaces.
• Transforming transient and neglected ambient environments by increasing visibility to the waterfront.

We also considered:

• Reconfiguring the structuring, secondary and island routes.
• reconfiguring building volumes and public spaces
• Rethinking pedestrian accessibility through pedestrian spaces (sidewalks, walking, etc.)
• densifying green belts
• Valorizing the three axes perpendicular to the waterfront, and extending them to the sea with the creation of pedestrian accessible ears and in continuity with the adjoining streets.
• Widening the beach
• Respecting DMP limit

SYNTAX ANALYSIS OF THE DEVELOPMENT PROPOSAL

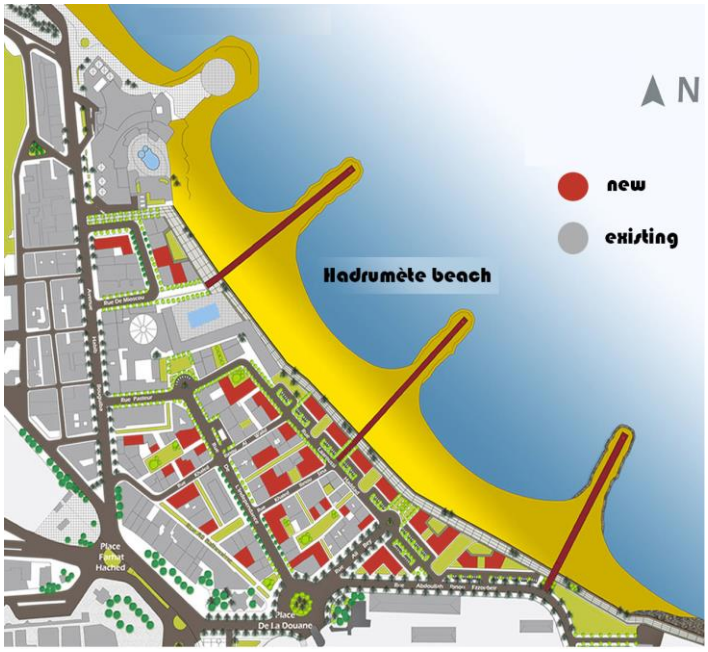

Figure 7 The project

GLOBAL MEASURES

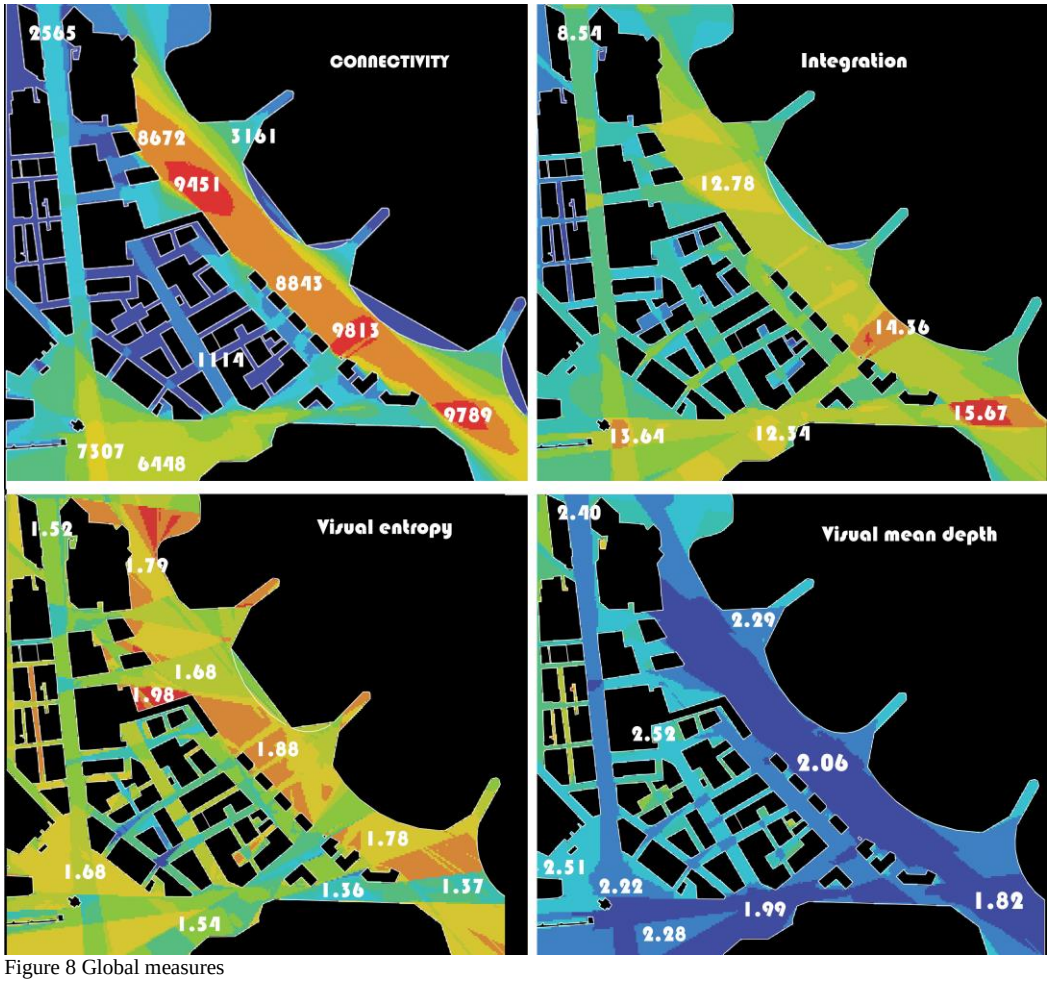

Figure 8 Global measures

CONNECTIVITY & INTEGRATION

We note that the transformations have produced very interesting results. Indeed, Hadrumète Beach has become the most connected space, especially at the level of the windings created (spaces in red). The Farhat Hached square and the Customs square have, in their entirety, a weaker connectivity. This part becomes highly integrated (value 13). There is also a good visual integration for the entire range (values between 9 and 14). The two places become less integrated in relation to the existing state.

VISUAL ENTROPY & VISUAL MEAN DEPTH

There is a difference between before and after the intervention, the distribution of the value system changed in a very remarkable way. In fact the buildings created on the cornice as well as the piercings helped to generate spaces (in orange colour-visual entropy) with a value of 1.88.Visibility is higher at Hadrumete Beach. We also note that the transformations have linked visually the two places to the eastern part of the beach.

LOCAL MEASURES

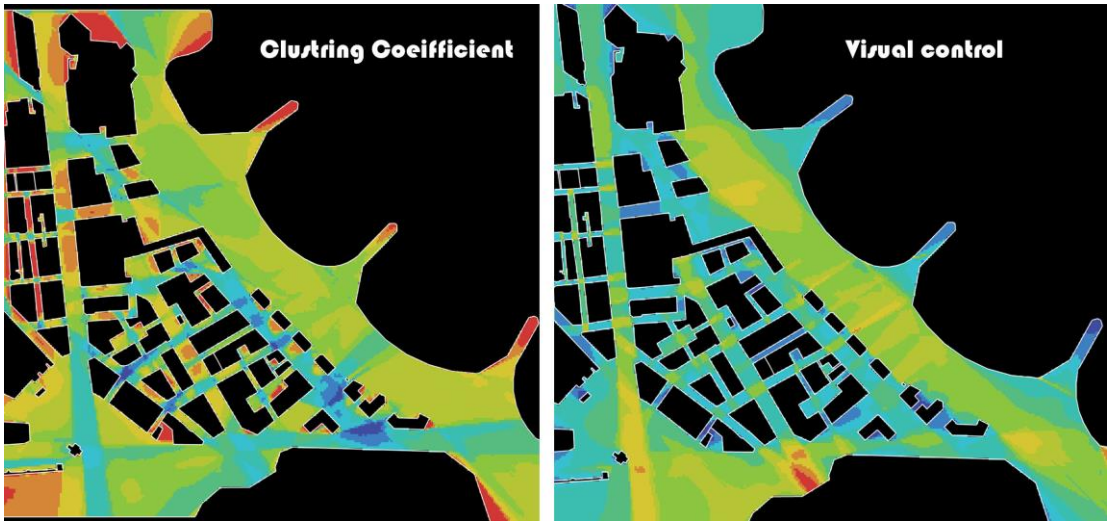

Figure 9 Local Measures

CLUSTERING COEFFICIENT AND VISUAL CONTROL

Axiality is affirmed by the creation of openings, particularly in the extension of the Customs square and at the level of the series of buildings located at the edge of the cornice. It should also be noted that the almost total absence of convex spaces is caused by the total opening of the new neighbourhood projected on the seafront (the convexity is signalled in the courtyards, the surroundings of some buildings, as well as the green spaces and the projected playgrounds). The whole beach becomes the predilection space of the entire fabric. It guarantees visual control over a fairly large number of spaces.

ISOVISTS

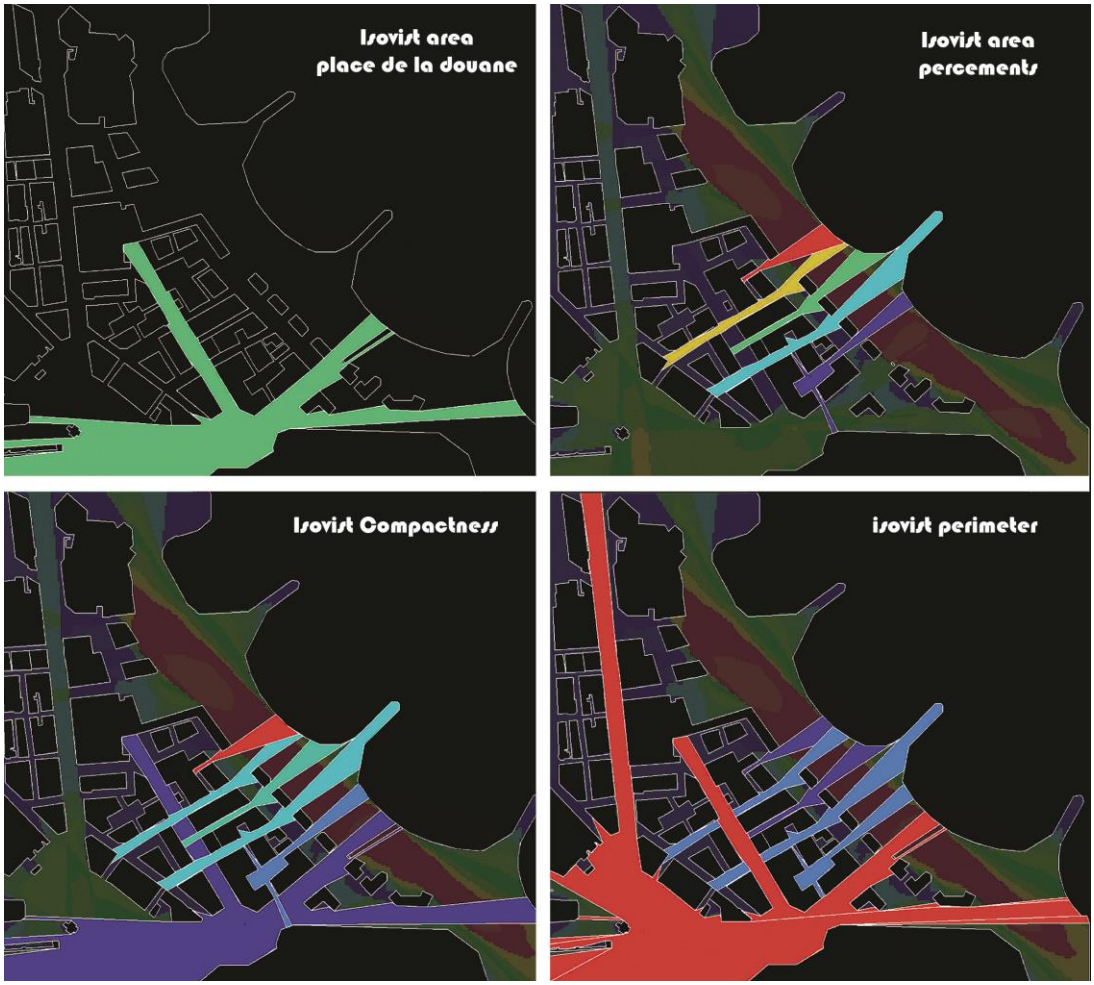

Figure 10 Isovist

After the transformations, more precisely the widening of Ali Bey Street (perpendicular to the street of independence), the demolition of the hangars and unsanitary buildings, and then the shaping of the urban frame, we managed to enlarge the field of visibility. The second graph entitled Isovist Area (the Customs square); shows clearly that the angle of perception of the seaside has become more important. It is completely visible from the Customs Square and from two arteries of different circulations. The street of Independence and the medina have become much more perceptible. From now on the field of visibility crosses the city easily. The sea has become more visible. So the neighbourhood now seems more open to the seaside.

There is a clear improvement in visibility and therefore in openness to the sea. The breakthroughs are more affirmed and wider. The axes are more confirmed and no more timid and unclear. The Farhat Hached square is now in direct relation with the seaside through two imposing axes and is dimensionally important. The opening on the seaside became more important, the area along the beach reached a much higher level of connectivity (10468) and is now much more imposing than in the initial state (6430). The Farhat Hached squarehas lost its importance compared to the new cornice.

AXIAL ANALYSIS

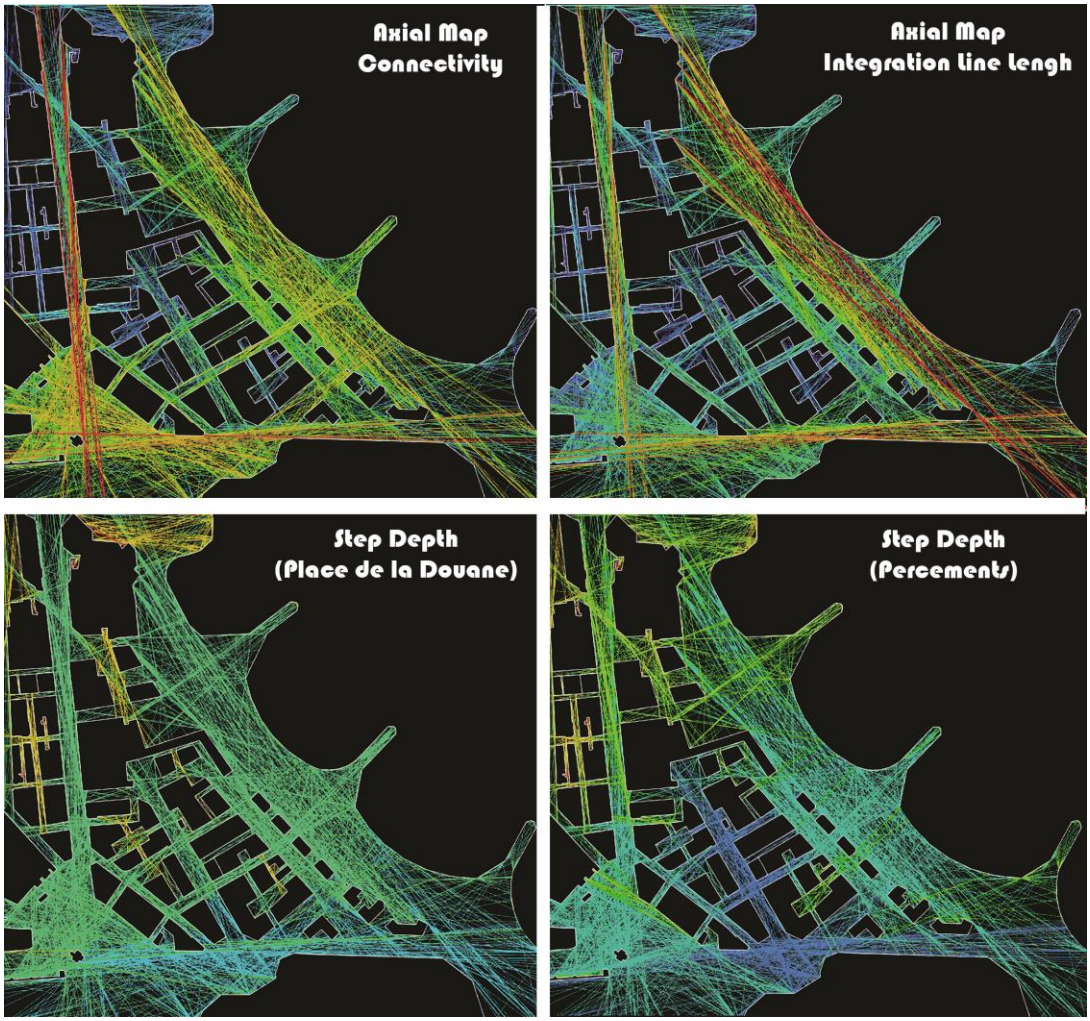

Figure 11 Axial Analysis

CONNECTIVITY

We note here a big difference in the hierarchy of axes and spaces. A new axis crosses the place of the Douane. An intersection is created between the Customs square and the axis passing through Habib Bourguiba Avenue. The Hadrumete beach became more important. Now the space of the new cornice has a connectivity value equal to (358) compared to the first value of (225).

INTEGRATION

The Habib Bourguiba avenue (754), the axis passing through the Customs square (691) arriving to the sea, the cornice or the beach Hadrumète (893) are now the most integrated spaces. The restructuring proposal has led to an increase in the value of the integration of these three axes, which have now become major and at almost equal depth.

STEP DEPTH

Depth levels have decreased. For those who are linked to the Customs Square, they are now equal to 4 and those who are calculated relative to the breakthrough have become equal to 5.

If the depth levels have decreased, it is because the spaces have become more connected to each other.

INTELLIGIBILITY

The intelligibility is a second order measure and it represents the correlation between connectivity and integration. It allows to judge the outcome of a project and demonstrates whether it is well connected and well integrated, that is possessing local and global dimensions. Intelligible spaces spaces are those in which can easily navigate.

In its current state, the neighbourhood has a coefficient greater than 0.5, R^2= 0.62257. The system here is said to be moderately intelligible. With regard to our development proposal, we note that the second curve has a higher coefficient value (after the intervention) R^2= 0.77502. The system becomes highly intelligible.

We can say that the project is well in line with the guidelines laid down beforehand, because the cloud of values is approaching the correlation segment and the value of intelligibility has greatly increased.

3. CONCLUSION

Through our work, we confirm that Space syntax analysis helps to define the conceptual choices of the architect or planner. It allows them to position themselves and check their biases in the making of their projects. It thus becomes a tool to help urban, architectural and landscape design. It also enables a detailed diagnosis and analysis of the different visual configurations characterizing an urban or architectural space. It focuses on the degree of visibility, the fluidity of traffic, the accessibility of the place, the connectivity between one space and another … Once this diagnosis has been developed, and it is possible to intervene to improve the visual characteristics of the urbanistic / architectural fabric / building in question.

In the context of our study, the cross sensing of the sensitive approach and syntax analysis was of great interest for the project formatting. The three urban axes became more integrated and the cornice became more connected to the urban fabric.

We validate the hypotheses made at the beginning and our cross-analysis model could be applied to any other case of urban intervention study.

We therefore propose the insertion of this approach into the conceptual process; its impact on the new proposals of the development plans. It could only be positive and awaiting the aspirations of urban dwellers. A survey of user behaviour would be envisaged, once the project has been carried out, to verify compliance or to measure any discrepancies between the impact of the new urban structure and, on the one hand, the perception of users of the place and their behaviour in the urban area.

It was therefore discussed in this work to develop a specific methodology to the design process with the existing included as a heritage object. The objective of this cross-analysis of the physical and sensitive environment was to produce a synthesis that opened up the potential for restructuring and upgrading. The approach followed is initially understood as a pre-project study to develop the most appropriate intervention strategy. The diagnosis is the basis for the project. It authorizes the deployment of various postures in the project. Second, it gives the possibility to experiment and test the level of success of the project. It is indeed upstream and downstream of the conceptual process.

4. *REFERENCES*

Augoyard J.F and Torgue H., (1995) A l'écoute de l'environnement, Répertoire des effets sonores, Edition Parenthèses.
Dubois D., (2009) Le sentir et le dire, concepts et méthodes en psychologie et linguistique cognitives, L'Harmattan.
Gall, Françoise. Le développement durable à découvert, CNRS, p. 120-121,
Grojean M. and Thibaud J-P., L'espace urbain en méthodes, Collection Eupalinos, série architecture et urbanisme, éditions Parenthèses 2001,2008.
Hillier B., Hanson J., (1984) The social logic of space, Cambrige University Press
Hillier, B. (1996) Space is the Machine, Cambridge University Press, Cambridge.
Hillier, B. and Lida, S. (2005) 'Network effects and psychological effects: a theory of urban movement', in A.G. Cohn and D.M. Mark (Eds.) COSIT 2005, LNCS 3693 : Springer-Verlag Berlin Heidelberg, 475–490; accessed from http://www.springerlink.com/content/ 10853tquj1mpf95j/fulltext.pdf on 06/17/2009.
Hillier, B. and Hanson, J. (1984) The Social logic of space, Cambridge University Press, Cambridge
Mazouz S. and al., (1999) The Derivation and Re-Use of Vernacular Urban Space concepts, Architectural Science Review, Vol. 42, Number 1, March, 1999.
Mazouz S., Outils pour une nouvelle lecture du patrimoine, 2009, pp 1-19. http://www.umc.edu.dz/vf/images/patrimoine/axe1/MAZOUZARTICLE.pdf
Mazouz S., Fabrique de la ville en Algérie et pérennisation d'un modèle : le cas de la nouvelle ville Ali Mendjeli à Constantine, Courrier du Savoir – N°15, Mars 2013, pp.23-30
Thibaud J-P., (2002) Regards en action, ethnométhodologie des espaces publics, Collection Ambiances, Ambiance, A la Croisée.
Thibaud J.P., (2013) Ambiances urbaines, écologie sensible. Euzen, Agathe and Eymard, Laurence and Turner, A., (2004), "Depthmap 4 — A Researcher's Handbook", Bartlett School of Graduate Studies, UCL, London. http://www.vr.ucl.ac.uk/depthmap/handbook/depthmap4r1.pdf
Thomas R., (2005) Les trajectoires de l'accessibilité, éditions A la croisée.