

THE SPACE SYNTAX FOR POSITIVE CONTAMINATION PROCESSES AND URBAN REGENERATION

113

Andrea Gonçalves

Universidade Técnica de Lisboa
e-mail : andrea.goncalves@ist.utl.pt

Ana Tomé

Universidade Técnica de Lisboa
e-mail : anatome@ist.utl.pt

Valério Medeiros

Universidade de Brasília
e-mail : medeiros.valerio@uol.com.br

Abstract

This paper discusses the use of Space Syntax for the positive contamination processes in human settlements. It is intended to explore the contamination processes inherent to urban phenomenon and its potential to magnify the effects of given punctual intervention actions. Positive contamination means the interrelation of urban elements or factors that allow the effects propagation of a particular action resulting in a continuous transformation affecting an ever broader context of the urban system with impact on that system's regeneration.

Nowadays, intervening in the city is associated with sustainable development and urban regeneration concepts, in a reinterpretation of the dense and compact canonical city. Projects are implemented through a planned logic which evokes the interrelationship effectiveness between global strategy and local intervention. In parallel, it is argued that the city shape is the result of a "natural evolution" process, similar to a living system with self-regenerating capabilities. It is widely accepted that intervening in urban settlements triggers changes in corresponding dynamics and promotes a dissemination process in that system (contamination). Though, this perspective is for assessing, there are not yet appropriate methodological tools to achieve this goal.

In view of these assumptions, this paper evaluates the Ecopista of Évora intervention (Portugal), a recycled railway that started a transformation process in the environment. Considering a diachronic and relational approach of place morphological characteristics, applied to the case study, an evaluation and evolution preliminary model of positive urban contamination was drawn, identifying, qualitatively and quantitatively, the changes promoted by the intervention as well the factors at the origin of the triggered transformation process. Assuming that the dissemination of intervention effects in space comes from its inherent social relations, the reading of urban contamination generated by Ecopista intervention was assessed under the perspective of Space Syntax, proposed originally by Hillier and Hanson (1984), and place attractiveness evaluation, consolidated preliminary by Whyte (1980).

In Syntax perspective, the performances are investigated in three modelling levels: axial, segments and visibility/isovists. Topometry variables are explored and correlated with land use data, space use intensity and socio-economic profiles. In Whyte's view, public space is evaluated by four key attributes: access/linkages, uses/activities, comfort/image and sociability which, in turn, are subdivided into qualitative and quantitative aspects. The two approaches are complementary and were discussed together.

The findings highlight the robustness of configurational tools related to Space Syntax to measure the positive contamination process in a complementary bias. The research points to the need of a rigorous registration of the intervention scenarios (before, during and after) to produce a solid database, which allows more accuracy in the systematic comparison of the time periods in order to qualify corresponding performances.

This paper is part of wider research that aims to extend this experience to other cases and contribute to the creation of a strategic model of urban regeneration boosted by contamination processes. Once these processes demonstrate ability to enlarge the effects radius of punctual actions, they will help to achieve improvements in the environment, maximizing resources and reducing investment, crucial factors in the current conjuncture.

Keywords: Ecopista of Évora; Punctual interventions; Positive contamination processes; Urban Regeneration; Space Syntax.

Theme: Urban Space and Social, Economic and Cultural Phenomena

1 URBAN REGENERATION AND POSITIVE CONTAMINATION PROCESSES

Cities are the centre stage for human activities. Their obsolescence is debatable since places are constantly changing and adapting to contemporary requirements. Nowadays, policies of urban intervention emerge alongside the question of sustainable development, based on built heritage reuse and profitability of energy and resources in a reinterpretation of the dense and compact canonical city (Rogers 1997). The need of reducing the urban sprawl, recycling the run-down areas and reusing the inherited city (Fernandes 2007) lead to the need of rehabilitation to reverse declining situations (Edwards 2001) and to the necessity of reurbanization in order to structure fragmented and precarious settlements (Champion 2001; Portas et al. 2011). These are prime topics that entered the discussion about the city. This leads to the debate about intervening in the city under the urban regeneration concept, interpreted as

comprehensive and integrated vision and action that leads to the resolution of urban problems and which seeks to bring about a lasting improvement in the economic, physical, social and environmental condition of an area that has been, or is, subject to change (Roberts and Sykes 2000, 296).

Several urban regeneration initiatives are implemented through urban projects, punctual and surgical interventions or short-term tactical actions, evoking the interrelationship effectiveness between global strategy, local intervention and long-term changes (Frampton 2002; Lerner 2003; Vassal 2006; Geuze and Sola-Morales 2008). Simultaneously, it is argued that the city shape does not result exclusively from the intended action but also from urban dynamics which understood to be part of a “natural evolution” process, similar to a living system capable of self-regeneration (Jacobs 1961; Saunders 2001; Hamdi 2004; Peres and Polidori 2010; Batty 2012).

It is assumed that any intervention in city triggers urban dynamic changes and promotes a prosperity atmosphere that radiates into the system, expressing a positive contamination process. This process is here understood as the combination and interrelation of urban elements or factors that allow the effects propagation of a particular action, resulting in a continuous and positive transformation affecting an ever broader context of the urban system, with impact in that system regeneration. According to Portas et al (2011), this process still requires a refined evaluation, and there are not yet significant methodological tools to reach this objective.

In view of these assumptions, this paper evaluates the Ecopista of Évora intervention (Portugal), a public space that results from a recycled railway and started a transformation process in the environment, beyond its own scale. This intervention aimed to provide the deactivated old railroad with the essential conditions for sustainable mobility, with impact on valuation and animation of natural, historical and cultural environment as well as the quality of life of surrounding residents. From the methodological approach applied to the case study, the aim is to identify, qualitatively and quantitatively, the changes promoted by the intervention and the factors in the origin of the triggered process of urban transformation and contamination. Through the obtained results, it is also intended to draw an evaluation and evolution preliminary model of positive urban contamination. Finally, this paper is intended to start a reflection about the extension of the methodological approach applied to Ecopista to other cases, in order to adjust it for a generalized applicability.

This study is part of a wider research that discusses the role of positive contamination processes for urban regeneration. The subsidiary premise establishes that urban contamination processes have the ability to magnify the scope and impact of punctual actions and will help achieve improvements in the environment, maximize resources and, simultaneously, reduce the need for large investments. It is also expected that the research will be a contribution to the agents' qualification in favour of urban regeneration interventions that are intended to be implemented in the future. It is estimated that this way of reading the built environment and weighting the corresponding performance will be able to contribute for the transformation of deleterious urban conditions, i.e., of jeopardized quality of life and urbanity, by boosting the practices and scopes of interventions in the city.

2 METHODOLOGY

Methodological approach (Figure 1) is based on a diachronic and relational analysis of the place morphological characteristics, comparing three different moments of the case study life cycle: “yesterday”, in which a characterization of the situation at the moment before the intervention will be developed; “intervention”, where we will look at the railway structure reconversion into Ecopista, a place for leisure activities; “today”, by interpreting the current situation. The research will cover physical, spatial, functional and social place dimensions, which rely on site survey, involving: (a) direct observations and place experience, including photographic record, informal conversations with significant entities (City Hall and University), Ecopista users and urban surroundings residents; (b) indirect observations, including consultation of documents, plans and papers relating to the case study.

Assuming that intervention effects dissemination in space comes from its inherent social relations, the information gathered will be processed according to two theoretical and methodological frameworks that are intended to be complementary.

First, by defining parameters to evaluate the effects resulting from positive urban contamination processes, using the theoretical and methodological framework for assessing the quality of public space advanced by Whyte (1980) and seeking to understand the relationship between space attributes and its attractiveness. This framework arises from the PPS-Project for Public Space organization (1975). This organization aims to create places for the local community based on the balance between physical and social space dimensions and, in this context, proposes the assessment of public space in the light of four key attributes: access/linkages, uses/activities, comfort/image and sociability which, in turn, are subdivided into qualitative and quantitative aspects.

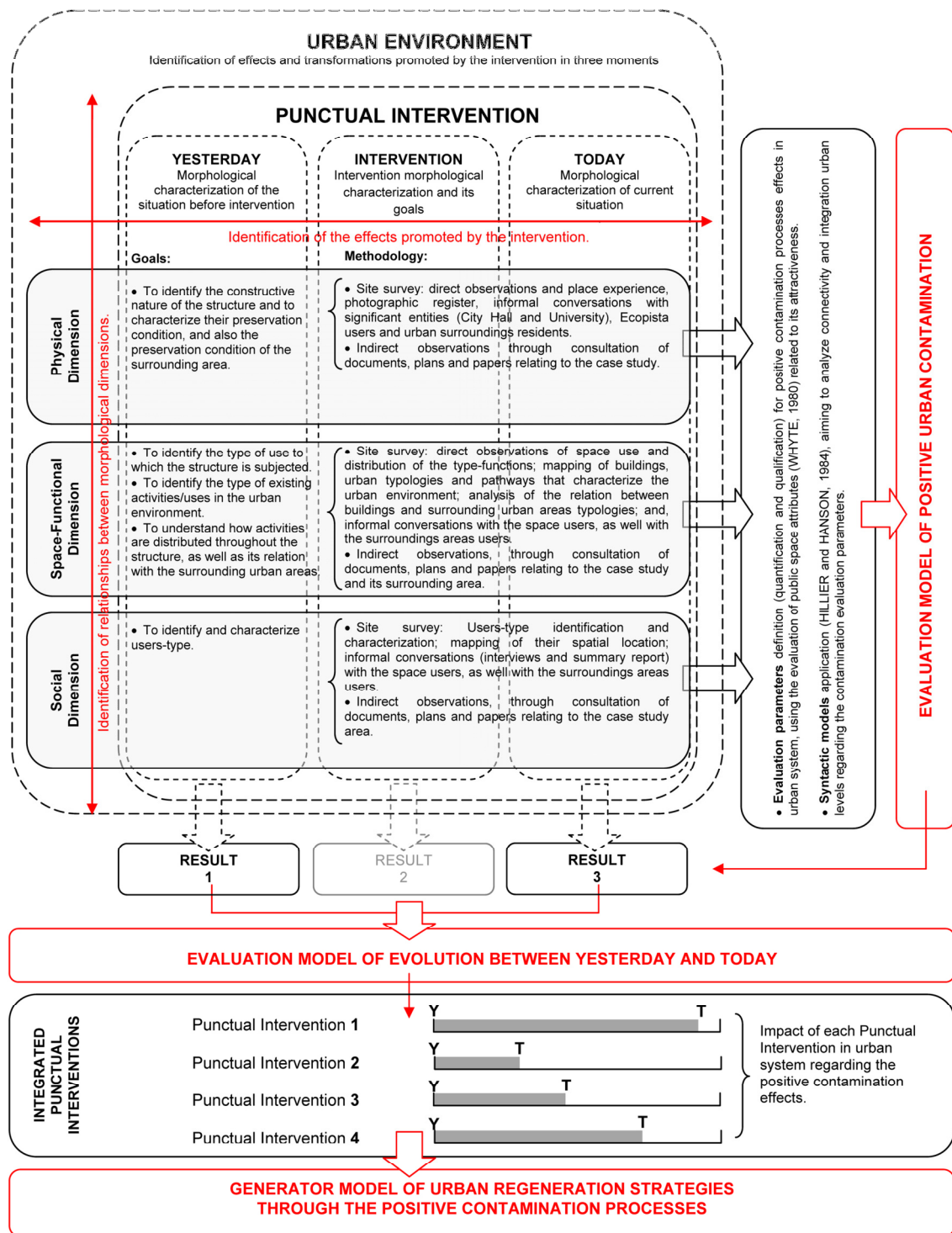


Figure1 Methodological approach to the case study. Author's image.

Secondly, under the Space Syntax theoretical, methodological and technical framework proposed by Hillier and Hanson (1984) and which studies the arrangement and interrelationship of space systems elements, by assuming that there is a social logic underlying the space organization, and describing it especially by the topological relationships between these elements (Hillier 1996; Holanda 2002). In Syntax perspective, the performances are investigated in three modelling levels: axial, segments and visibility/isovists. Topometric variables are explored and correlated with land use data, space use intensity and socio-economic profiles. For the purpose of the present research, among the Space Syntax tools, the construction of the axial map that represents the area under study, comparing "yesterday" and "today" scenarios, i.e., before and after the intervention is important. This strategy of space representation will enable the analysis of its functional dimension, based on urban configuration reading, and will allow the quantification of spatial accessibility levels: connectivity (permeability of the urban system at local level) and integration (permeability of the urban system at the global level). The construction of the axial map consists in tracing the fewest set of the longer axis through the spaces of possible circulation/movement. Once all the possibilities of circulation/movement are covered, it becomes possible to establish the relationships of interdependence between the spatial system elements under study, as well as the potential social relations inherent to urban configuration properties. Thus the potential movement patterns are defined and the connectivity and integration levels of the structure under study are quantified. In addition, due to the case study characteristics, scale and the focus on the pedestrian movement, a map of visibilities that allows interpretations about individual behavior according to their position in space has been produced. With the described strategies, it is hoped that information is gathered that leads to a deeper analysis of the transformations in the environment produced by the Ecopista intervention.

3 ECOPISTA OF ÉVORA: METHODOLOGICAL APPROACH

3.1 Yesterday, intervention and today - urban context and morphological characterization

The city of Évora, in inland Portugal, is characterized by its confined delimitation that grew and developed through the power of attraction over the surrounding regions (Portas et al 2011). Évora presents two different realities: (1) the consolidated city, with the historical inside-walls area and adjacent urban areas; and (2) the emerging city, consisting of the discontinuous territory development, through the residential and industrial estates. It was this dual context that motivated the study of the recycled and transformed railway channel into Ecopista.

The train that connected Évora to Arraiolos became operational in 1907 and the connection to Mora was established in the following year. With a strong impact on the populations served by the railway line the train has become an integral part of their life and identity. However, the change in habits and needs and the decrease of passengers and goods dictated the line closure in 1990. Because this is a similar situation to several railway connections, which were becoming obsolete and closed, in 2001 REFER (public company responsible for the national railway network infrastructure management), as a member of the European Greenways Association, creates the National Ecopistas Plan. This plan aims for the reconversion of deactivated railways to greenways for non-motorized mobility, especially for pedestrian and cycling mobility, with a touristic and quotidian character and contributing to value the existing heritage and life quality of the local residents. The soft slopes, the continuity, the reduced number of interceptions and their autonomy from the road network gives the railway channels a high level of comfort for pedestrian and cycling mobility, providing a privileged basis for the creation of these greenways. The REFER plan was put into practice through a partnership with the municipalities crossed by deactivated railways. The objective of the plan, on the one hand, aims to recycle and reuse the

deactivated pre-existing structures reintegrating them in the landscape. On the other hand, it is hoped that it will promote the integrated development of that region, boosting the natural and cultural systems crucial to the ecological balance of the existing territory and populations' quality of life. At the same time, the objective is to preserve the historical, cultural and symbolic pre-existences according to local values, as well as, to encourage and promote rural tourism and eco-tourism in the region (URBE 2004).

Ecopista of Évora, results from partnership actions between REFER and City Council of Évora, and it was completed in 2005. Thus, in accordance with the objectives outlined in REFER plan, the Ecopista of Évora is the result of the reuse of the pre-existing deactivated infrastructure and seeks to perpetuate the site memory by preserving the continuity of this communication axis which remains an important link between different areas. Another objective of this intervention is to maintain and preserve the biodiversity and enhance the existing environment, understanding Ecopista as a potentially pedagogical tool for the interpretation of natural environment that facilitates the environmental education development, simultaneously favouring the eco-tourism and rural tourism development (URBE 2004).

The Ecopista urban stretch, as a result of its extension in the city (about 4.5 km), provides a continuous communication axis in a discontinuous urban area, linking the consolidated city and the peripheral neighbourhoods, and thus forming a structure with capacity to articulate the two "cities". The Ecopista urban context is characterized by the alternation between compact urban grid, corresponding mostly to residential areas, with low and medium density urbanscape, as well as open areas, free of buildings and characterized by panoramic landscape (Figure 2). It is also worth mentioning that the existence of noteworthy buildings, because of their function and/or history, strongly influenced the socio-functional relationship between Ecopista and surrounding areas, affecting the diverse social groups' affluence into this public space (Figure 3).



Figure2 Crossing compact urban fabric and open landscape. *Author's image (A. Gonçalves), March 2012.*

Having been open for about eight years, it has become possible to verify if the intervention objectives were achieved and to identify the existence of other effects beyond those provided for. Morphological analysis comparing the situation before and after the intervention brought together essential information to understand the interrelationships between that space and its urban surroundings, thereby contributing to the research findings.

The "yesterday" is characterized by urban "voids", with areas invaded and covered by natural vegetation and subject to degradation situations caused by the deactivation and dismantlement of the railway physical structure. What originally corresponded to a space channel typology for train circulation and constituted a barrier in the urban grid was being used for several informal uses by the population: alternative road and pedestrian access, deposit of

debris and trash and spaces used for agricultural purposes (URBE 2004). Furthermore, there is also the fact that the abandoned space constitutes a meeting point for problematic and delinquent groups, creating a focal point of insecurity and social decline.

The "today" is characterized by the channel space reconversion into the Ecopista, a public space endowed with specific physical features. The linear system and the channel type space of circulation/mobility were recovered, but now for pedestrian and cycling movement, which can be classified as "space-landscape" (Brandão 2011). Its integration into the public spaces system led to its appropriation as the preferred route between central areas and peripheral neighbourhoods. Today, Ecopista users are those who look for sports and recreation activities and those who use it in their daily journeys, being as heterogeneous as the existing activities in the surroundings (Figure 3).

Ecopista also promoted changes in its urban surroundings. The adjacent buildings show improvements in their preservation conditions and some changes in their characteristics. Some opened new doors to communicate directly with the new public space; others, increased the height of their walls in search of privacy. The old "Leões" pasta factory was the target of a rehabilitation and reconversion process and is now the School of Architecture of the University of Évora (Figure 3). New commercial activities appear where there was no economic activity before: for example the takeaway barbecue baptized with a name that is a clear allusion to the proximity of Ecopista (Figure 3).

Systematized the transformations, it is important to measure their size, to understand how they occurred and spread, in order to explore and determine the urban contamination factors.



Figure3 Ecopista location and urban context. Legend: 1.D'El Rei Inn; 2.Hospital; 3.Gym; 4.EB André de Resende School; 5.Supermarket; 6.Car garage; 7.Gabriel Pereira Secondary School; 8.Prison; 9.Day Centre/Elderly Home; 10."Leões" factory/Architecture School; 11."Leões" Station; 12.Agricultural tools factory; 13.EB 2,3 Conde Vilalva School; 14.Tennis club; 15 Takeaway barbecue "Ecofrango". In yellow, residential areas. *Author's image based on aerial photography available in: [28/03/2012]*

3.2 Parameters to evaluate the effects of positive urban contamination processes

Believing that attractive public spaces, which work and have a vibrant social atmosphere, have the ability to positively contaminate the surrounding urban areas, it is proposed to evaluate the Ecopista attractiveness using the theoretical and methodological framework launched by William Whyte (1980). In this context, is Ecopista an attractive and successful place? To what extent did the intervention promote the identified process of positive urban contamination? How to measure the degree of impact the Ecopista had over the urban environment? The answers to these questions require a synthesis of diachronic morphological analysis as well as the direct observation and informal conversations data under the four listed parameters. Only qualitative aspects complementary to the subsequent syntactic analysis of the case study will be considered.

The access/linkages parameter considers of the physical and visual links between the space being studied and its surroundings. The Ecopista is a physical connection that allows accessibility between different parts of the city and between several and distinct functional poles (Figure 3). It is noteworthy that, in many situations, Ecopista is assumed as the only route with the necessary conditions for pedestrian mobility being used by residents and users of that area in their daily journeys. However, the previously projected accesses to Ecopista weren't sufficient, as evidenced by the high number of alternative informal paths that have been created increasing the permeability of the space. In the context of visual relationships, are established connections from and to Ecopista, allowing it to be a route of choice between different destinations whilst also maintaining constant visual contact with the historic city centre, an essential orientation reference in outside-walls areas of the city.

The comfort/image parameter evaluates the impression that space creates in users. Ecopista is a comfortable and safe place by its physical image, insertion in the urban landscape and by the affluence of people. The historical and symbolic dimensions associated with its past as a railway and with some of the adjacent buildings, such as the Leões station, Leões pasta factory/Architecture School, as well as the proximity to the historic centre visible in the horizon, also contribute to the attractiveness of Ecopista image.

The uses/activities parameter intends to evaluate the activities provided by the place, being the basic reason why people use it. Successful places, in view of the confluence, flow and movement, are those where economic and social exchanges occur, where existing activities are diverse and widely participated by the population. Ecopista, because of leisure sport practice and everyday pedestrian journeys, is a place used throughout its extension. Despite this affluence of people and diversity of functions nearby, there aren't a considerable variety of activities in Ecopista space, such as outdoor cafés, seating places to read and rest or areas to play collective games. There are exceptions, as the platform next to the Architecture School and as the green space next to the fountain (at Bacelo neighbourhood) being large size enough and with the appropriate features to practice some collective activities. These two locations constitute the points where people and activities usually concentrate.

The sociability parameter depends on the interaction between people when conditioned by the place characteristics. That is, depends on the sense of belonging, which translates in search of that place by groups for social activities. Ecopista is a place where we easily find groups of friends walking, running and cycling and where strangers, sharing the same space and sports, greet each other, making this a socially attractive place.

The application of place evaluation parameters to the channel space, in both situations railway and Ecopista, shows that the intervention, by their quality features, turned that place into an

attractive public space (Figure 4). The essence of the intervention was the change of public space typology. While maintaining urban mobility characteristics, these are profoundly different in their nature: if the railway was a channel space only for train circulation, the Ecopista is a place for people. What previously was a physical barrier in the urban grid became permeable and integrated in public spaces network, changing significantly the configuration of movement pattern.

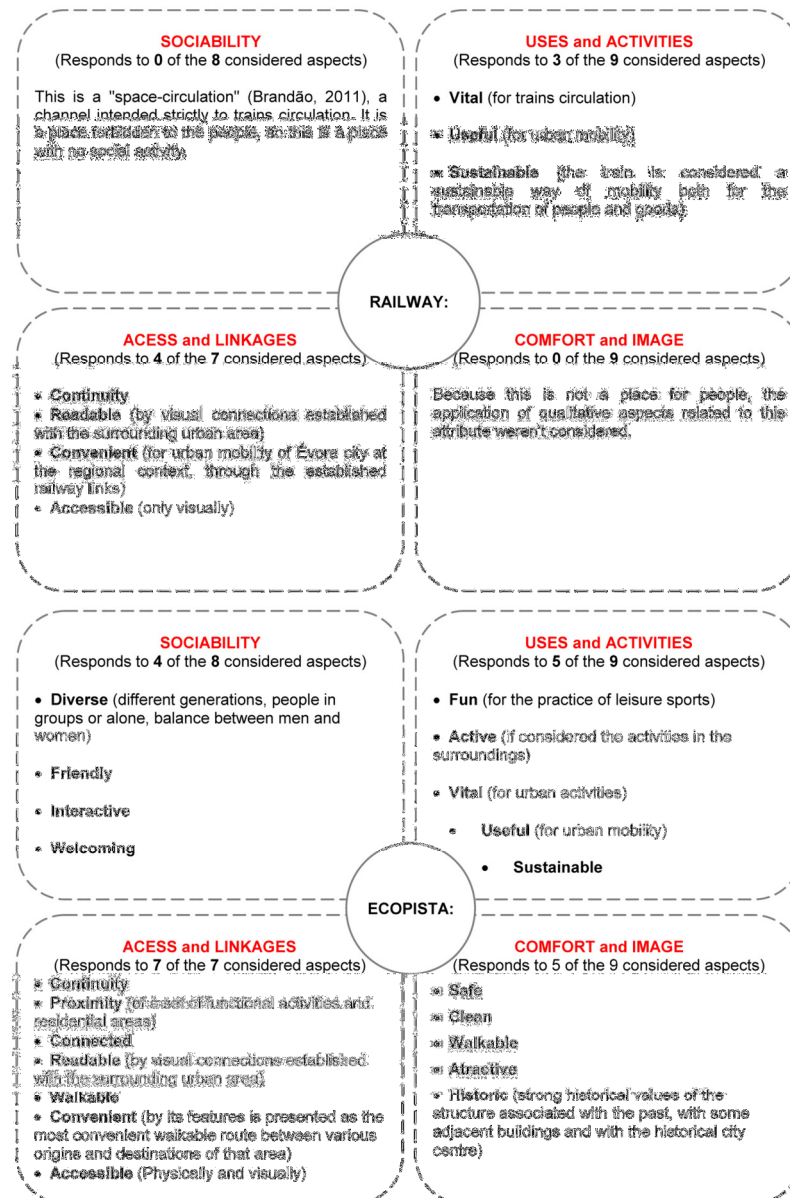


Figure4 Qualitative features of the public space as Railway (yesterday) and Ecopista (today). Author's image under the perspective of the attributes for place evaluation, proposed by PPS-Project for Public Space organization (1975).

The theoretical and methodological framework here presented, evaluates the place from the point of view of its usufruct by users. In this perspective, it becomes difficult to answer all considered aspects when studying the railway space, reason why sociability and comfort/image parameters doesn't have a direct applicability. When assessing Ecopista space, the four

considered parameters are verified. The Ecopista meets all qualitative aspects defined in the access/linkages parameter and about half of the aspects considered in the remaining attributes (Figure 4). Though, the aim of this study is not to evaluate the features of the intervention project, or make proposals for boosting the quality of Ecopista space in order to achieve all the considered requirements. The one purpose is to make a diagnosis in order to evaluate its attractiveness as public space and, together with the application of syntactic models, define the Ecopista importance for the positive contamination process, identifying the benefits promoted over the urban system and its contribution to that system regeneration.

3.3 Syntactic models to evaluate the effects of positive urban contamination processes

The analysis of the urban grid configuration was based on the pedestrian perspective considering the official paths and the informal shortcuts. The drawn axial maps, considering the case study and its corresponding surrounding areas, according to the Space Syntax strategies, made possible a confrontation between connectivity and integration variables for both situations before and after the intervention (Figure 5). The colour grading presented measures the levels of the studied variable on each axis: the red colour corresponds to the highest levels and dark blue, the lower levels.

Connectivity value of an axis corresponds to the number of other axis that are directly accessible from it. Regarding this variable [Figure 5 a) and b)], the maps show an increase of the available axis number (335 to 361) and of connectivity average values (3.185 to 3.442) for the Ecopista situation. The introduction of Ecopista into the public space system changed the urban grid configuration. It is also possible to verify that Ecopista axis have high values connectivity, boosted by informal pedestrian shortcuts. These results translate the improvement of local accessibility. Previously the channel space was closed to public access, with the consequent effects on the surrounding built environment. While it was a space for train circulation, the speed allowed an urban environment perception very different from the speed of who now circulates on foot or bicycle, turning this accessible space for recreation and leisure activities into a place for contemplation. The result is the transformation of the channel space into a new urban front. Residents started to invest more in their homes facades and yards conservation. These are small actions that accumulated end up having a visible impact on the physical environment of Ecopista front.

The integration value measures the topological accessibility of each axis integrating the system. The most integrated axis are those from which all other axis are on average less deep. The most segregated are the axes from which the average depth is higher. The axial maps that reveal the urban grid integration levels [Figure 5, c) and d)] indicate that there is a shift of the integration core (red axis) to the Ecopista channel space, adopting a more continuous shape when compared with previous situation. It's also possible to verify, quantitatively, the increase of the system integration global levels (from 0,621 to 0,813), including those pertaining to the north peripheral neighbourhoods.

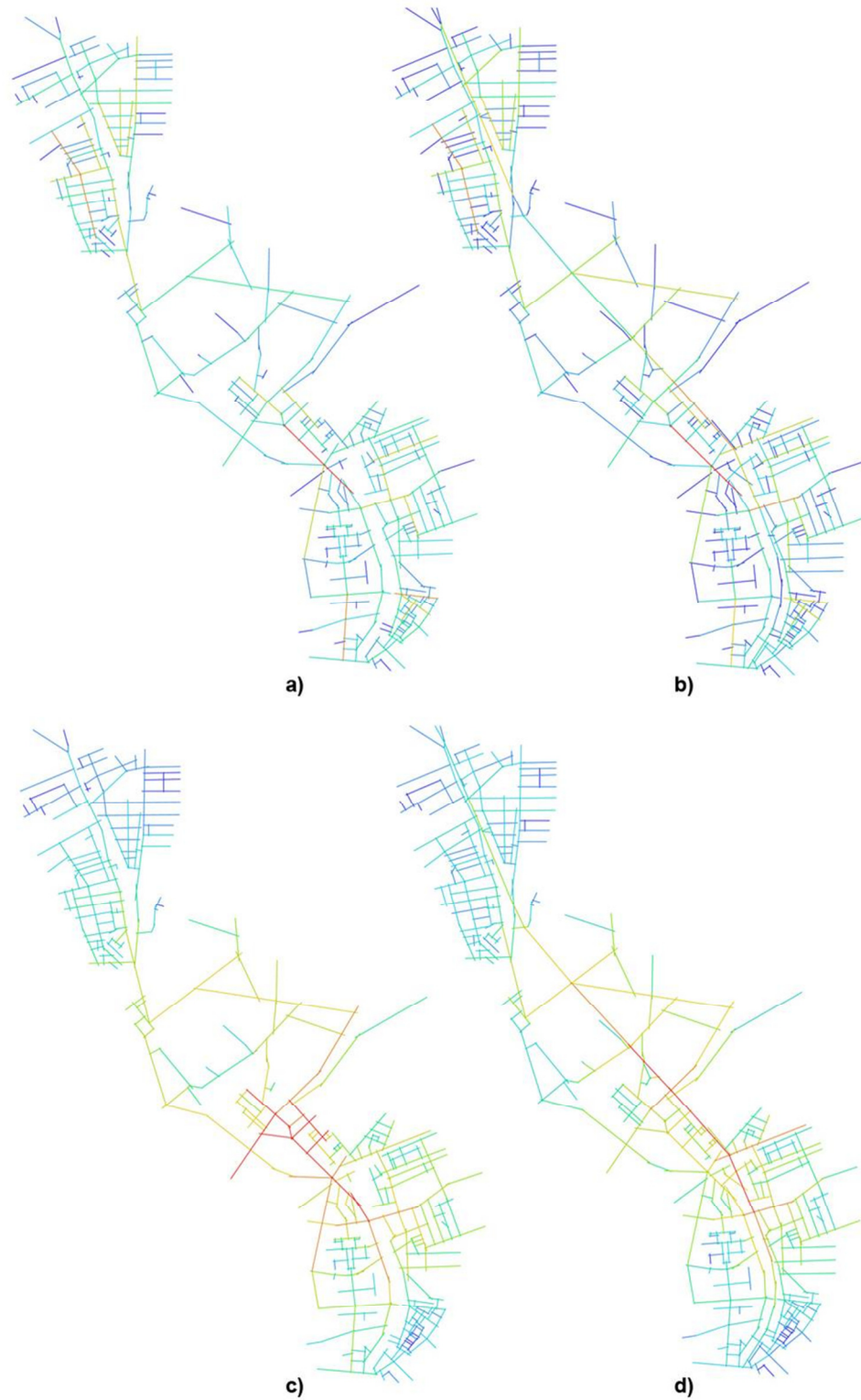


Figure5 Axial maps: Connectivity: a) yesterday and b) today; Integration: c) yesterday and d) today. Author's image using UCL Depthmap software developed by Alasdair Turner, University College London.

The change of integration values results directly from the transformation of the urban grid configuration. The urban grid is here understood as the continuous system of public spaces created by the way buildings are aggregated and aligned, thus favouring certain spaces through movement. In this perspective, the space configuration is the main factor that defines the movement pattern, as Hillier et al (1993) argued. With this approach, it is possible to confirm that potential movement was reconfigured by the new accessibility to the Ecopista channel space. This new public space, while covering part of consolidated city and fragmentary urbanizations, brings closer different urban contexts and integrates them.

Visibility maps were drawn for "today's" situation. First, the constructed maps show the visual accessibility from specific points/locations. The chosen points are located at the Ecopista main crossings with the road structure (Figure 6). Second, another drawn map analyzes the visual shortest path between each point to all other points in the system (Figure 7). In the context of visual relationships, the evaluation parameters analysis set out previously concludes that connections are established from and to Ecopista in many locations, allowing it to be a route choice between different destinations. The following maps (Figure 6) quantify the potential of this visual relationship at each intersection, point/location of both visual and physical accessibility. This quantification is obtained by studying the visual variable, called step depth, which measures the number of steps from a point to all other points in the system. The color grading presented measures the variable levels under study at each point. The red color corresponds to the closest levels of visual accessibility, and dark blue, the most distant levels. This analysis reveals that the crossings located in less compact urban grid have a greater visual range representing the points potentially more decisive for Ecopista to be a preferred route option between various origins and destinations. These are the intersections 4 and 6 (see Figure 6). Confronting this potential with collected data on site, confirms the potential for crossroad 4: physically and visually very close to the historical center, especially with significant and emblematic Évora monuments, as the Walls, the Cathedral and the Roman Temple. The intersection 6 is located in a vast visual field over an area with no significant references or landmarks. But its position in the system, corresponding to axis with high levels of integration, according to the axial analysis [Figure 5 d)], makes this intersection a privileged location to both attract and distribute movement.

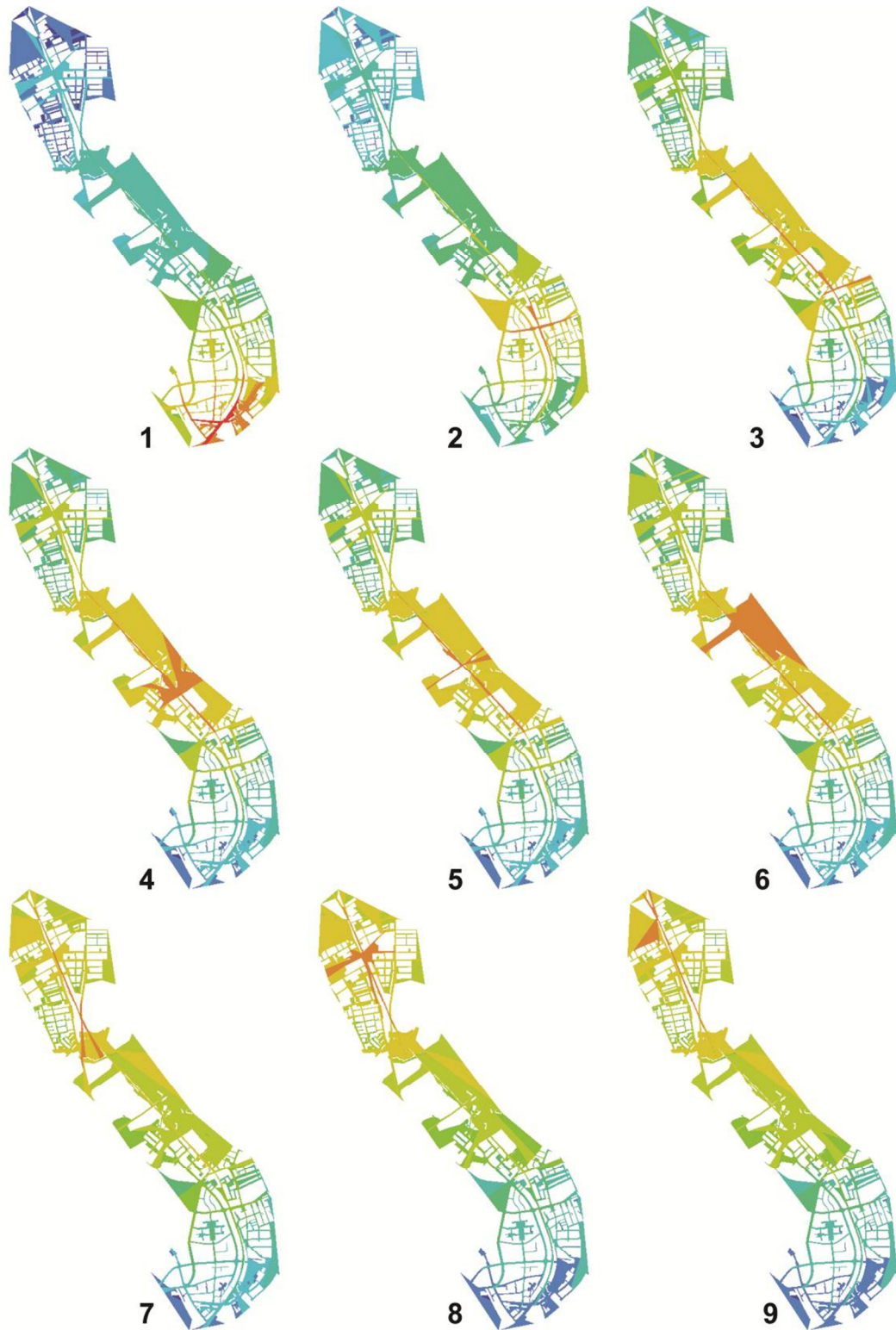


Figure 6 Visibility maps from the major intersection between the Ecopista and the road structure – **Visual Step Depth** variable. Legend: 1. D’El Rei inn; 2. EB André de Resende School; 3. Supermarket; 4. Day Centre/Elderly Home; 5. “Leões” factory/Architecture School; 6. Roundabout; 7. Peripheral neighbourhoods; 8. Bacelo/Takeaway barbecue; 9. End of the Ecopista urban section.

In order to consolidate the achieved results, an analysis of the visual relationships system was drawn, regarding the visual integration variable. This variable measures the potential of visual accessibility. The obtained results coincide with the integration values coming from the axial approach [Figure 6 and Figure 5 d)]. It is important to emphasize that points with higher visual integration correspond to positions in the system from where historical city center is visible, a landmark for the outside-walls areas.

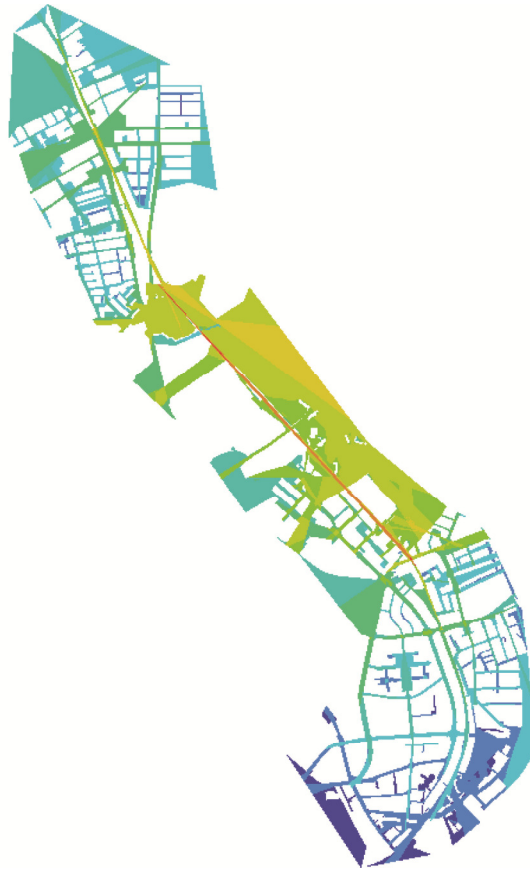


Figure7 Visual integration of the system.

However, it is required to advance in interpretation, including, for example, the functional activities existing in the surrounding areas (Figure 3). The relationship between spatial configuration and uses/activities promotes the continued people influx in Ecopista, people who use it in their daily journeys - which means that the resulting potential from configuration will actually be used as an attribute for promoting local urbanity. This appropriation, first created by the urban grid reconfiguration, is enhanced by the diversity of activities available nearby. Called as attractors, these uses/activities constitute multipliers of the basic movement pattern established by the urban grid (Hillier et al 1993). Most of these attractors were there before Ecopista intervention, so why is this structure the preferred route instead of the existing roads/streets? Space configuration with Ecopista offers more favourable accessibility conditions to the relationship between the system elements (attractors or not). Ecopista has a central position in the spatial system, as shown by the axial analysis, and is also an attractive structure, according to the place quality evaluation results.

3.4 Results and discussion

Summarizing the urban changes promoted by Ecopista in the environment, it is possible to verify that these changes derive from the relationship between social structure and spatial structure. In other words, it was due to the urban grid reconfiguration that society reorganized itself in a pattern of movement considering the new physical structure – expressing that the built environment is both a dependent and independent variable (Holanda 2002).

There is a clear influence of the physical environment in the life style adopted by society and how people interfere with the space, contributing to its transformation (Hillier e Hanson 1984). Based on this study, it was possible to identify the following factors as the principal contributors to magnify Ecopista positive effects and its urban contamination process, anticipating the definition of a methodological strategy:

a) Typology of the urban element subject to intervention:

The recycled urban element typology has a direct implication on the dimension of its impact over urban environment. On one hand, Ecopista is a public space for leisure, endowed with attractive features, regarding the evaluation parameters of place quality. On the other hand, is an urban infrastructure capable of integrating fragmented spatial contexts, as demonstrated by syntactic analysis.

b) Connectivity:

Ecopista changed the urban grid configuration. The old railway channel, a physical barrier, was changed into an accessible and permeable area, transforming profoundly the pattern of movement at the local level of the urban system, as evidenced by connectivity values measured in the axial maps. A more accessible space tends to be more used and ends providing a meeting place, for passage and usufruct, easily subjected to transformations through social proximity interactions, gradually spreading the intervention effects.

c) Integration:

The integration issue refers to the system accessibility at a global level. The most integrated axis are the most permeable, accessible and used in the urban system. While connectivity values refer to the relationship of each axis with its direct neighbour, integration values correspond to the relational position of each axis on the overall system. Thus, the movement pattern is predicted by integration levels. The integration core in the urban system will have greater ability to create movement, a fundamental factor of urban dynamics. Ecopista contains the most integrated axis.

d) Attractiveness:

The attractiveness factor provides an important contribution to the integration and use of Ecopista space. First, the attractiveness of the structure itself is interpreted, understood as the set of its qualitative characteristics at both physical and visual level. Although not constituting information that derives directly from the axial map, but from the qualitative parameters assessment, it gives answer about the relation between Ecopista axis and urban system remaining axis. This relation reveals the linear configuration and continuity characteristics, corresponding to the attractiveness of configurational nature and thus, movement generator. Configurational attractiveness leads to a non-conscious appropriation by individuals and a form of behaviour compatible with the potential movement pattern obtained through the axial study (Hillier et al. 1993).

Second, it's necessary to consider the attractiveness of the urban environment directly related to the existence of attractors, urban elements (buildings and/or activities) capable of generate and capture movement. This study identifies several urban elements with distinct activities that punctuate the Ecopista route (Figure 3) and reveal influence on users' affluence. Although, studies related to Space Syntax prove that configuration is the main factor of movement generation in urban systems, even when they are under the influence of attractors, it is accepted that the relation between movement and integration will be strengthened if the attractors are located in order to reflect the configurational logic of the system (Sailer 2007). This means that configuration structures the movement distribution and attractors are responsible for capturing part of that movement, stimulating it.

The attractors in question are prior to Ecopista intervention, so it is possible to assume that these are not the main responsible for movement attraction. In urban environment, movement flows follow the axial topology. Because Ecopista promoted the reconfiguration of urban grid permeability it is the main movement generator. The attractors location only reinforces the logic of the new spatial configuration, because they work as multipliers of movement basic pattern (Hillier 1993), as evidenced by the results obtained from the axial analysis which reveals, not a radical change of the integration core, but its relocation to the Ecopista space (Figure 5).

e) Diversity

Is the attractiveness of Ecopista and/or activities in the surrounding urban area a direct result of diversity factor? Direct observations and direct space experience allowed to verify that the existence of diversified activities in the surrounding urban area is a crucial factor for heterogeneity of Ecopista users. Cities and attractive public spaces need all kinds of diversity, an essential condition for the urban vitality and sustainability (Jacobs 1961; Whyte 1980). Thus diversity, together with attractiveness, is a multiplier of movement pattern established by the urban grid.

The described factors have a clear influence on the Ecopista impact over the respective urban environment. The intervention typology, a planned and intentional initiative, triggers natural urban dynamics and influence connectivity, integration, attractiveness and diversity. These are factors that in closely relationship have the ability to gradually increase the intervention impact, contaminating positively the surrounding urban elements and contributing to the urban system regeneration. These reasons reinforce the importance of public spaces in the new dynamics promoted by urban intervention. On one hand, Ecopista case, by promoting improvements in the accessibility conditions encourages and accelerates urban transformations through the positive contamination processes. On the other hand, by promoting sustainable mobility, plays a key role to ensure the functionality of the urban system and the urban quality of life.

The findings highlight the robustness of Space Syntax configurational tools to measure the positive contamination process in a complementary bias, especially when applied to public space structures designed to generate movement. The research points to the need of a rigorous registration of the intervention scenarios (before, during and after) to produce a solid database. This database allows more accuracy in systematic comparison of time periods for qualifying corresponding performances.

Methodological approach presented allows to draw a preliminary model for assessing the evolution of positive urban contamination, and especially, to highlight the Ecopista impact in the context in which it operates, through comparison between "yesterday" and "today" (Figure 8).

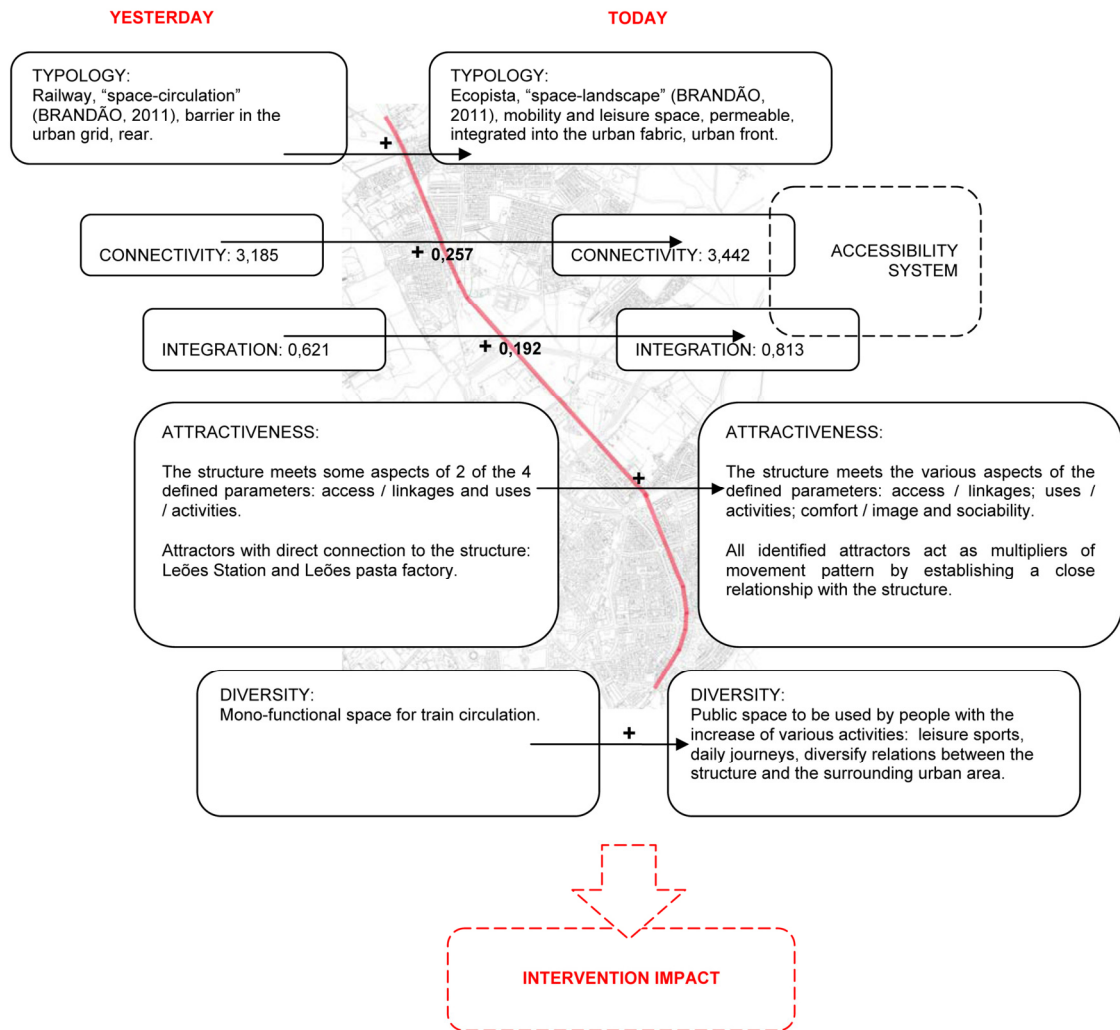


Figure8 Evaluation of positive urban contamination evolution. Author's image.

4 CONCLUSION

This study intends to analyze and synthesize the Ecopista of Évora impact in the urban system of Évora city, Portugal, where it belongs. It was concluded that there were multi-dimensional transformations that spread beyond the intervention itself through the positive contamination processes promoted by the following factors: intervention typology, connectivity, integration, attractiveness and diversity.

However, it is known that different interventions have diverse affectation over the urban system. Here is revealed the need to extend the study to other cases aiming to adjust the applied methodology in favour of its generalized applicability and to consolidate the factors in the origin of the positive contamination processes identified in the research. Future goal is to confront Ecopista intervention impact against other interventions impact implemented in the city. This confrontation will make possible a hierarchy of interventions according to their capacity to trigger the positive contamination urban processes.

Other future goal is to enhance the scope of each intervention through its integration into a comprehensive strategy previously outlined, exploring the potential of the inter-relationship and synergy between interventions in the expansion of its positive effects on the urban system. Ecopista is the result of a punctual action and is not part of urban regeneration strategies taking place at Évora city centre. Thus, by the expansion of this study to several cases in the city, it is intended the creation and validation of an urban regeneration strategic model boosted by positive contamination processes. Once these processes demonstrate ability to enlarge the impact of punctual actions, they will help to achieve improvements in the environment, maximizing resources and reducing investment, crucial factors in the current conjuncture and the increased interest on the existing city.

ACKNOWLEDGEMENTS

We would like to address the acknowledgments to the City Council of Évora for providing documents and studies related to the Ecopista, for giving permission to their use, as well as for all the support in the development of this research.

REFERENCES

- Batty, Michael. 2012. Urban Regeneration as Self-Organisation. *Architectural Design*, (82) 1: 54-59. <http://www.complexcity.info/files/2012/03/Batty-AD-2012.pdf>. (accessed February 25, 2013).
- Brandão, Pedro. 2011. *O Sentido da Cidade: Ensaio sobre o mito da Imagem como Arquitectura*. Lisboa: Livros Horizonte.
- Champion, Tony. 2001. *Urbanization, suburbanization, counterurbanization and reurbanization*. In *Handbook of Urban Studies*, edited by Ronan Paddison, 143-161. London: Sage Publication.
- Edwards, Brian. 2001. *Guía básica de la sostenibilidad*. Translated by Sandra Sanmiguel Sousa. Barcelona: Gustavo Gili, 2004.
- Fernandes, José A. Rio. 2007. *Urbanismo Sustentável: redução, reciclagem e reutilização da cidade*. *Revista da Faculdade de Letras – Geografia – Universidade do Porto*, II Série, Volume I: 163-178. . (accessed May 14, 2011).
- Frampton, Kenneth. 2002. *A cidade catalítica: entre estratégia e intervenção. Prototipo, Cidade em Performance*, nº 7, 223-235. Lisboa: StereoMatrix.
- Geuze, Adriaan and Solá-Morales, Manuel. 2008. *Manuel de Solá-Morales: A Matter of Things*. Rotterdam: Nai Publishers.
- Hamdi, Nabeel. 2004. *Small Change: about the art of practice and the limits of planning in cities*. London: Earthscan.
- Hillier, Bill and Hanson, Julianne. 1984. *The Social Logic of Space*. Cambridge: Cambridge University Press.
- Hillier, Bill et al. 1993. "Natural movement: or, configuration and attraction in urban pedestrian movement." *Environment and Planning B: Planning and Design* 20:29-65. London: Pion Publication.
- Hillier, Bill. 1996. *Space is the Machine*. Cambridge: Cambridge University Press.
- Holanda, Frederico. 2002. *O Espaço de Exceção*. Brasília: EdUnB.
- Jacobs, Jane. 1961. *The Death and Life of Great American Cities*. New York: Modern Library

Edition, 1993.

Lerner, Jaime. 2003. *Acupuntura Urbana*. Rio de Janeiro: Record, 2011.

Peres, Otávio M. and Polidori, Maurício C. 2010. "Especulando sobre a fragmentação da forma urbana: dinâmicas do crescimento e ecologia urbana." In *Proceedings of the 54th IFHP World Congress, Porto Alegre*, November 14-17. . (accessed June 28, 2011).

Portas, Nuno et al. 2011. *Políticas Urbanas II – Transformações, regulação e projectos*. Lisboa: Fundação Calouste Gulbenkian.

PPS, Project for Public Spaces. 1975. www.pps.org. (accessed May 10, 2011).

Roberts, Peter and Sykes, Hugh (ed.). 2000. *Urban Regeneration: a handbook*. London: Sage Publication.

Rogers, Richard and Gumuchdjian, Philip. 1997. *Cities for a small planet*. London: Faber and Faber Limited.

Sailer, Kerstin. 2007. "Movement in Workplace Environments – Configurational or Programmed?" In *Proceedings of the 6th International Space Syntax Symposium, Istanbul*, June 12-15. . (accessed June 18, 2012).

Saunders, P. 2001. "Urban Ecology" edited by R Paddison. *Handbook of Urban Studies*, Sage Publication, London: 256-272.

URBE, EDRV arquitectura paisagista & urbanismo. 2004. REFER EP RAMAL DE MORA (Évora, Arraiolos e Mora): Projecto de Arranjo Paisagístico de Ecopistas – Estudo Prévio. Study provided by Câmara Municipal de Évora, Departamento de Espaços Verdes e Qualidade Ambiental.

Vassal, Jean P. 2006. LACATON & VASSAL – Jean Philippe Vassal conversa com José Adrião e Ricardo Carvalho, Paris, 24 Março 2006. *Jornal Arquitectos*, nº 223, 20-63. Lisboa: Ordem dos Arquitectos.

Whyte, William. 1980. *The social life of small urban spaces*. New York: Project for Public Spaces, 2001.