The Urban Road Tunnels and Some Cultural Aspects of the Contemporary City Development

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ABSTRACT

The present paper focuses on the expansion of networks of urban road tunnels as part of a broader paradigm for the contemporary city. Historically, underground expressways are likely thought as limited means for overcoming landscape natural obstacles such as elevations on the land or rivers across a route. Yet, in the last decades those traffic devices have increasingly spread out in big cities (Carmody and Sterling, 1993), even in areas which are not characterized for their especially irregular topography. A simple glance at the subject could mislead us to the deduction that tunnel boring in contemporary urban remodelling plans corresponds just to isolated initiatives. Nevertheless, a deeper investigation demonstrates that it addresses a much wider issue that comprises a set of goals that aim the adaptation of the urban space to new paradigms of city.

We deal with the matter of this research based on an interdisciplinary approach as applied in the most traditional cultural studies, considering that the changes in our environment mean a multitude of emotional, psychological, physical and financial investment. Therefore, if the landscape is going through reorganizations, significant transformations are taking place in the field of culture as well (Lewis, 1979). Some of these changes are concerned with the values originated together with the network societies, having much broader effects than the economic and technological ones, more classically studied in recent years (Castells, 1995). In order to understand the way these transformations and influences disseminate, we examine the motivations that determine the construction of the urban tunnels; we verify the role that the technological improvements play in this field turning the tunnel production into a more efficient process; and last, we attempt to establish a relationship between the two above-mentioned aspects and the diffused adoption of tunnels in urban remodeling plans.

Through computer aided modeling, we classify the most frequent road urban tunnel typologies concerning the relationship between these elements and recent morphological changes in the current city. The research concludes that motivations and techniques, as well as urban design actions, comprehend different dimensions of the contemporary culture.

1. THE IDEA OF NETWORK AS A PARADIGM FOR SYSTEMS OF TUNNEL

The present paper results from a broader research that focuses on the expansion of the network of road tunnels as a significant structural element for several urban remodeling operations in the contemporary cities. These underground traffic circulation systems fit well an updated definition of tunnel which refers to any gallery with openings in its extremities (Barles and Guillerme, 1995). From that perspective, the practice of tunnel boring in urban design during the last decades is not directly determined by the existence of natural obstacles in the topography. It is more accurately related to the consolidation of a framework of values rather based on new cultural paradigms for the city development more intensively emerged from the second half of the 20th century (fig. 1 and fig. 2).
That discussion also claims that a broader and deeper approach to the theme be established by academic studies in the field of urban design.

The issue of networks has become one of the keynotes for the comprehension of contemporary societies, particularly when the subject is addressed to the communication and transportation techniques (e.g. Tofler and Tofler 1994, Castells 1995, Ascher 1995, Santos 1996, among many others). Their flows observe spatial configurations based upon the idea of large systems well connected together allowing the movement and communication between each separate part. In that sense, the idea of network comprises dimensions such as the nature of the flows, the understanding of its consequences and the reciprocities between space/time relations and the spread of urban systems of tunnels. The notion of flows, as it has more frequently been employed by social sciences, is related to the spatiality of the transportation systems of people and goods, as well as the spatial configuration that has originated from the new technologies in remote data transmission. Based on that idea, Tofler and Tofler (1994) have proposed the term ‘telematics’ to express the merge between telecommunications and informatics as a particular phenomena in the turn of the last century. Thus, the prefix ‘tele’ which means from distant, in Greek, has been attached to a variety of words revealing all sorts of possibilities for reflection in many different scientific fields. The abusive application of these notions has induced a multiplicity of interpretations which are not always clearly defined. Networks and flows may quite often refer to the circulation of elements endowed with different substantiality, leading to imprecision and ambiguity.

Santos (1996), argues that networks are inscribed in two generic matrixes: one that considers particularly their substantiality, including its aspectual properties such as their territoriality, their possibilities of physical or virtual access, the spatial arrangement of their branch lines, and the intensity or frequency through which their data flows throughout the network. And another current that is concerned with the uneven spatial distribution of the flows, both in extension as in intensity, resulting in a heterogeneous spatiality either if we consider the territorial extension of economic influences or the subjective space readings and interpretations. Therefore, the emergence of the network paradigm tends to propagate throughout numerous daily life dimensions, reinforcing the appearance of several ‘tele-activities’ endowed by the increasingly urge for time-saving or simultaneousness. One of its most evident effects is the profound change in the space/time relations that people experience in nowadays city.

Fig. 1. Leme Tunnel, in Rio de Janeiro, constructed in 1943, to connect by expressway the area of Botafogo to Copacabana Beach. Source: Arquivo Geral da Cidade –Rio de Janeiro.*

Fig. 2. Public works to cut off a strip of Morro Azul Hill, in Rio de Janeiro, in order to clear way for the construction of Pinheiro Machado Avenue. It is an extension road from Santa Barbara Tunnel, connecting the residential area of Flamengo with the city centre. Source: Architect Alva Fagerlande’s private collection.*
2. UNDERSTANDING CULTURAL INFLUENCES

Some of the answers to how paradigmatic influences spread around the world can be understood by analysing a few aspects of these processes. Let us take a closer look at three different domains of culture: a framework of values which emerge from collective needs which may result from natural dimensions or which may be socially created; the technological developments which make it feasible to achieve previously aspired and established goals; and the urban development practices which perform changes in the landscape, operating as matrices for culture transmission. These three factors comprehend different instruments that rule the geographic and social diffusion of cultural values.

Firstly, we ought to make a brief historical recovery to evaluate the straight relationship between the tunnel boring original basis and the old aspiration of urban designers and thinkers for the separation of circulation systems from the other uses in the city. It can be noticed since the 16th century, on sketches by Leonardo Da Vinci for the city of Milan, in Italy. It is also manifested on urban design drawings, from which stand out the ones produced by Eugène Hénard in the first decade of the last century, since they would inspire a great deal of proposals in the beginning of that century. Hénard’s ideals would above all provide a set of principals which by the time could appear slightly visionary, but they were the steps empowering for the organisation of a totally new urban design movement. We certainly refer to the creation of the disciplinary current best represented by Édouard Utudjan and Gaston Bardet who would start in France in 1933 the movement known as ‘urbanisme souterrain’, and which in a few years spread would its branches internationally. Although that movement’s influences are not expressly manifested, other experiences and studies in city planning would be based on the urge for the separation between the traffic systems and other urban functions. Similarly, the Buchanan Report (1963) would point out the disconnection of the traffic flows from other collective spaces of the city. At that time, the report requested by the English government would consider the remodelling of the business district of ‘La Défense’, in Paris a paradigmatic design solution banning vehicles from city town centres to relieve congestion, particularly in uncontrollably growing metropolitan areas.

Secondly, let’s draw attention to the importance of technical improvements in comprehending its significance in how a built element can turn into a contributing factor in spreading out cultural influences. Lewis (1979) argues that it is necessary to know how things work, investigating why, by whom, where and when they were invented and only then can we thoroughly grasp the meaning of a cultural landscape and the mechanics of its diffusion. Tunnels were bored in the ancient times and they have been built according to systematic engineering proceedings since the use of the first tunneling shield in London, by Marc Isambard Brunel, in 1825 (Beaver 1973). However, it was on account of communication and transportation improvements that it became possible the spread out of tunneling boring practically all around the world in about the same period as the first tunnels were constructed in Europe, and likewise, communication means became even more significant in scientific exchange after the second half of the last century. In fact, the absolute development in tunneling boring and construction techniques have reached its incomparable achievements after communication and transportation networks have spread worldwide, disseminating information almost instantaneously. It is not by coincidence that the majority of the realizations in that field have been accomplished during the last decades.

Finally, let’s turn our attention to the role played by city remodeling plans, particularly those which have internationally become standards for urban designers and planners. As the technological developments make it feasible to achieve collective ideals, dreams and motivations such as those previously envisioned by architects and urban designers, new design solutions are idealized for restructuring the city space through urban remodeling plans. Consequently, although the motivations for separating the traffic system from other city functions were included in previous human aspirations, only with the development of modern machinery and technical know-how has it became possible to achieve this urban design principle. Despite the inclusion of underground expressways in urban remodeling plans, the contemporary city tunnels constitute elements that comprise characteristics quite different from the predominant ones observed in their previous equivalents. Nowadays, they surpass the exclusive function of overcoming topographical obstacles presenting a variety of combined objectives such as structural elements for the conservation of cultural heritage, for
the planning of parks and public open spaces; for the renovation of entire portions of the city, for example downtown areas and industrial districts which face degradation processes; and for the design of efficient traffic systems that connect strategic urban equipment, in accordance with the city current policies and with competitive globalizing parameters.

2.1 Urban design patterns as elements of cultural diffusion

By the end of the 20th century, not only would the urban design practices become increasingly globalised but their basic fundamentals would also disseminate quite rapidly. Consequently, the ideal pattern for the contemporary city and the digging of systems of tunnels maintain a straight reciprocity. This is noticeable in many recent urban remodeling plans, such as the Seattle Freeway Park, planned by Lawrence Halprin in the 1970’s. The designer turns a motorway into an urban tunnel by creating a set of parks and public squares above the busy route. An even more paradigmatic urban development remodeling is represented by the Central Artery/Tunnel in Boston, also known as the ‘big dig’. Likewise, the ‘Jardins Wilson’, whose works started in 1997, became part of a program for the regeneration of a northeastern area in the outskirts of Paris. The renovation included the creation of a public park over the so called ‘péripherique’, a ring road enclosing the city, which has been transformed in the A-1 Tunnel. Besides them, it’s worth mentioning the project of urban and regional planning called ‘Euroméditerranée’. Among other actions, it consists in converting highways and urban expressways into a network of tunnels, particularly those which run across the center of Marseille. Although these are sets of urban remodeling actions of cities located in wealthy national contexts, there are, however, other recent plans that reflect a broader picture. In fact, they illustrate quite eloquently how these urban restructuring plans have the power to operate as matrixes for the diffusion of cultural patterns. We refer to programs such as São Paulo city’s master plan, decided in 2002, which involves a set of measures aiming at modernization of the state capital, through the developing of several district’s central areas as a catalyst for new commercial establishments and private service industry. In addition, the master plan sets up the construction of thirty six tunnels, some of which have already been executed. Amazingly enough, the projected tunnels would not necessarily be located on places of rough topography, but among their objectives, they aim to speed up the transit of goods and people along important expressways which are frequently jammed by traffic lights at the crossroads. Furthermore, with the network of tunnels the municipality expects to reduce environmental pollution and social inequality for those citizens who spend long hours in the congested metropolis.

Fig. 3. Virtual 3D model of a hypothetical big city, to show environmental and morphological degradation which may eventually occur. The area crossed by an urban expressway beneath the city level. Source: Computer Modeling produced by the author, using the software AutoCad 2000.

Fig. 4. Virtual 3D model of a hypothetical of space remodeling with the construction of a network of tunnels. The expressway is covered by a new urban surface, creating parks and public open spaces. Source: Computer Modeling produced by the author, using the software AutoCad 2000.

Besides these goals, each particular tunnel envisaged for São Paulo has specific characteristics and purposes, but most of them are planned as elements that seek reconciling between conflicting needs of contemporary cities and principles prescribed by current urban design values; for instance, clearing space to widen heavy traffic roads and other concerns related to high quality standards of urban life.
(fig. 02). In other words, some of the planned or recently constructed tunnels in the city of São Paulo are projected based on the intention to protect or to create public parks, to free up area for the production of new public open spaces or, in addition, to assure the conservation of cultural heritage such as monuments, listed buildings or historical sites. That is the case of the tunnels bored in the late 1980’s, in the very ‘cuore’ of the city. The central part of the city is an area where some of the most representative cultural landscape and historical buildings of the São Paulo’s past are located.

Other tunnels yet have been executed in São Paulo as means of environmental conservation as, for instance, the ‘Ayrton Senna Complex of Tunnels’, built in the mid 1990’s which runs under one of the most important parks of the city. The legally preserved ‘Ibirapuera Park’ was arranged in the 1950’s and it was designed by the internationally recognized architect Oscar Niemeyer. The park is one of the largest green areas enclosed by the densely built city, as well as it is placed amidst the historical center and the southwest of the capital. This recently redeveloped area is also one of the most sophisticated business districts whose works started also in the 1990’s, under the designation of ‘Faria Lima’ Urban Operation. In its high tech buildings, a myriad of financial enterprises are establishing their local branches or headquarters, and elegant restaurants, convention centers, concert halls, large theatres or internationally pre-eminent hotels are opening up along their refurbished wide avenues. Furthermore, in the surrounding area several strategic collective equipments are located, such as the state government main building, some of the country’s most important technological and scientific research centers, located at the prestigious State University’s campus, the city’s luxurious horserace track, as well as the busiest airport of South America. Consequently, the whole region is crossed by some of the city’s heaviest traffic arteries and some of the most important ones, as for instance the side expressway that runs along Pinheiros River. In order to ensure an increase in traffic flow of the whole region, many of these arteries have been converted into tunnels, resulting in a two level city, implemented by a parallel underground network of tunnels.
The dissemination of communications and tunnel boring technology produces a shift in the way urban design modeling had been oriented up to now. It causes a redirection in urban space restructuring resulting in the tendency to reproduce a paradigm based on the logic of flows and the network societies. These actions express values originated in global references, which are motivated by the time contraction and the globalizing reorganization of technological spaces. The assimilation of new daily habits, constitutive of the cultures, reaches the collective imaginary resulting in the search for correspondent models and patterns in the means of transportation domain and in the field of the urban traffic systems.

**ILLUSTRATIONS**

Figures 1, 2. Either tunnel boring or cutting land elevation off to open of expressways were technical options already available in Brazil, by the middle of the 20th century. Examining the in landscape remodelling resulted from the Leme Tunnel construction (1943) and the Av. Pinheiro Machado opening (1948), it may reveal that the fact that both technology and space remodelling practices comprehend profound and symbolic components of society’s cultural dimension.

Figures 3, 4. Until recently São Paulo had just a single 1.06 km long tunnel, bored in 1938, through the city’s moderately high ridge. In the last years its tunnels have reached 15.5 km, rather concerning the standards of life quality.

Figure 5. In the remodeled ‘Nova Faria Lima’ Business District, a network of tunnels ensure the traffic flow through the renovated elegant area. The tunnel system also has allowed the creation of new public open spaces as well as it has guaranteed the conservation of important parks.

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**REFERENCES**


