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Theory: Emergence, Relational Theories,
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Urban Fabrics Change and City Boundaries: Comparing Urban Form

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Keywords: urban, fabrics, boundaries, form, enclaves.

Abstract: Usually, a boundary produces differences, it considers the duality of the inside and the outside. Limits have the potential to mark the transition between different modes of existence. The dynamics of urban evolution make the limits of cities change according to its social, economic and morphological evolution and recognizes the city as a mixture of communities, interactions, places, and commons. In this sense, a morphological development review evidences that changes of urban form within a city are accentuated when boundaries are exceeded or modified. For this work, Borgo Dora in Turin serves to exemplify how urban form is linked to the city's old boundaries and urban history. A morphological comparison of three enclaves taken from different sides of the city's historical and natural boundaries brings to light how urban fabric changes as the city grows and how the morphology of the city changes depending on the context constraints. The first extract refers to an enclave located within the historic consolidated city center. The second enclave comes from the area developed after the historic Roman wall. The last enclave analyzed is a piece of the city overcoming the natural boundary marked by the river. These three extracts become a manifestation of the urban form of different periods and a guideline of the city's morphological evolution.

1. Introduction

The transition from city to countryside has always been an important interface of human existence. Boundaries have always defined urban. A boundary in general terms produces differences, it considers the duality of the inside and the outside. This ambivalent role of dividing and connecting make limits or boundaries fascinating to study. Limits transmit and control exchange between territories and have the potential to mark the transition between different modes of existence (Longley, 1994). The dynamics of urban evolution make the limits of cities change according to its social, economic and morphological evolution and recognizes the city as a mixture of communities, interactions, places, and commons.

In the specific context of the city of Turin, the process of producing and transcending boundaries is central to understand the city's morphological development. This paper recognizes one area of the city that exemplifies the relation between urban form, boundaries, and context. It also presents three enclaves in the city to exemplify how urban form is linked to a city's old

boundaries and urban history. The limits in the city of Turin recognized for this study can be classified into three types: Historical ones, Natural ones and administrative ones. Each one of these boundaries influence in diverse ways the morphology of the city. The first set of boundaries refers to the historical Roman wall and the two toll walls or customs barriers (1856 and 1912 respectively). The Natural boundaries recognized refer mainly to the rivers that cross the city: Po, Dora, and Stura. Within this classification, it should be noted that hills in the city represent another type of natural boundary. The last type of boundary refers to the administrative one, that divides an area of 130.01 km² into 8 boroughs or circoscrizioni and 92 statistical zones (Figure 1). What happens to the morphology of the city when a boundary marked by its historic walls and rivers is overcome? How does this morphology change?



Figure 1. *Boundaries in the city of Turin*

2. City boundaries

Roman wall: The construction of the first city walls is part of the planned urban arrangement of the Roman military settlement established in the area where now the city of Turin stands. This plan also foresaw the internal layout of the city with regular blocks. The first part of the wall was constructed between 15 and 30 AD and was located on the north side of the settlement. In the following decades, the eastern sections of the wall were built, and by the end of the first century AD, the erection of the wall was completed. The Roman walls in the city of Turin enclose a quadrangular space of about 700 x 750m divided into relatively similar blocks. On each side of the wall, a door was placed where the two main road axes: (Cardo Maximus and Decumanus) ended. The thickness of the wall was about two and a half meters in the base and it reduced its dimensions progressively as it went up. The wall was characterized by the presence of octagonal towers. This wall influenced the development of the city since it worked as a physical limit to urban growth and a divider between urban and rural zones.

First Toll wall: The first belt was designed as part of the plan of Enlargement of the city in 1853 for defensive reorganizational urban purposes. The Toll wall was more than 3 meters high and contained toll booths or barriers. The wall closed to the east side of the Po river and did not enclose the entire municipal area. The Toll wall created a tax regime that favored the development of external areas regarding construction costs and land prices. The productive, industrial and commercial development of the city during the years that followed the implementation of the wall taxes was located outside the wall. Beyond the Po river, the barrier continued for about 4.5 kilometers not as a wall but as an iron gate over a masonry base. The wall was dismantled completely in 1912 and replaced with a new one that englobed almost all the massive urban development of the previous decades.

Second Toll wall: This boundary was created as part of the General Regulatory Plan of 1906. The wall was proposed as a response to a need for control of duties. The territory it enclosed doubled the first one and in this case, the boundary created is not only material but also administrative since its construction was approved by the law in 1912.

Interesting guidelines of a place's history can be expected when areas near the recognized boundaries are studied. A review of historical maps proves that changes of urban form within the city of Turin are accentuated when boundaries are exceeded or modified. Borgo Dora serves to exemplify how urban form is strictly linked to the city's old boundaries and urban history. The terms Borough or "Borgo" and township or "Borgata" refer to settlements external to the oldest center of a city. In Turin, the "Borghi" refers to ancient settlements formed in rural contexts while the "Borgata" have their origins in the 19th century as a response to the first toll wall (Davico, 2014). Borgo Dora belongs to the type settled outside the historic wall and inside the first toll wall, in the north side of the city. This side of the wall developed later than the south, east and western sides due to royal orders. The proximity of river Dora facilitated the placement of production activities and channels for many agricultural and industrial uses. These conditions had a repercussion in the urban form that came as a result of the aforementioned circumstances. What is more, the urban form of the settlement was affected by three specific structures found in the area: Cottolengo complex, Arsenale Militare and the Railway station. In this case, boundaries represent historic-spatial products of the relationship between urban and non-urban activities (Keil & Shields, 2013). It is evident that the channels used for industrial and agricultural activities left a mark that can still be appreciated today in the morphology of the Borgo. This area became a space of negotiation between history, context, and new morphologies when the wall left behind its role of hard-line divider (Figure 2).

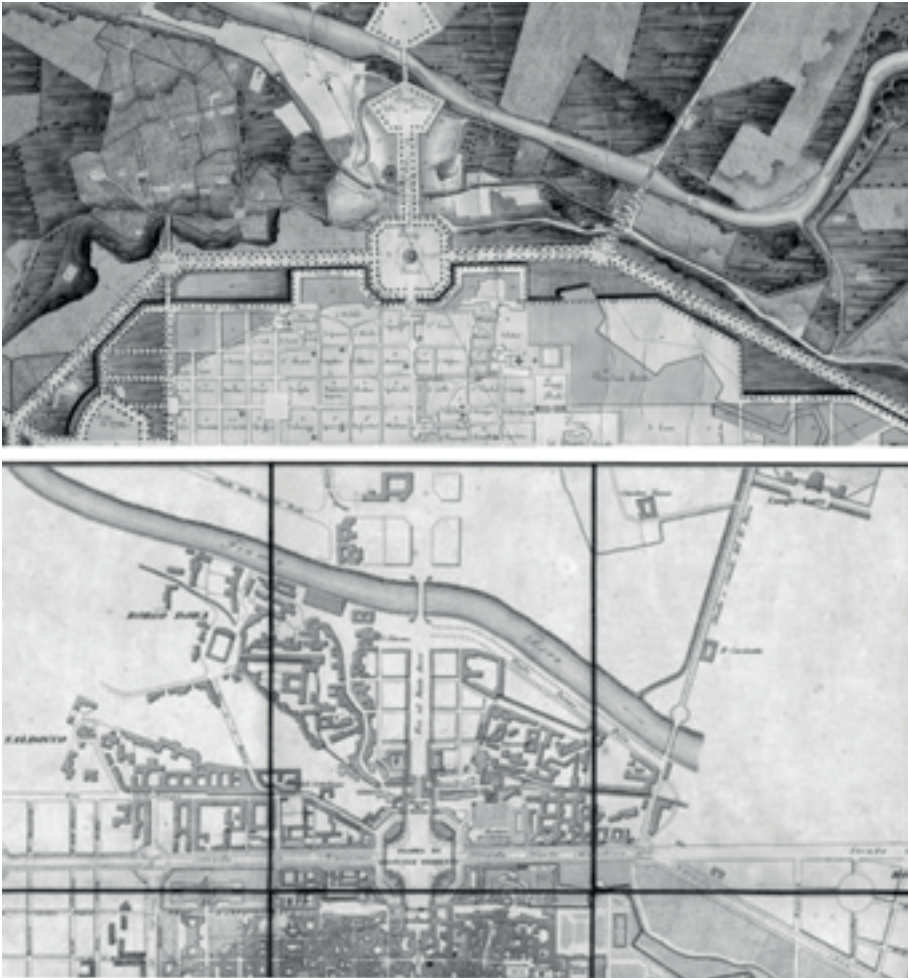


Figure 2. Extract from *Piano regolatore della città di Torino, 1817*; extract from *Pianta della Città e Borghi di Torino, 1852*.

3. Methodology

The study uses an area of the city located between the recognized and defined borders to exemplify and prove the correlation between urban fabrics and city boundaries. An analytical approach and deductive observation of historical maps helped defined the area used to exemplify the phenomena. In the second stage of the study, a comparative study of three enclaves taken from different parts of the boundaries helped understand the differences in urban form and their relation to the boundaries. In the context of urban analysis, cartographical images are crucial for the analytical deconstruction of urban formation (Conzen, 1960; Caniggia and Maffei, 2001). A comprehensive representation of the chosen pieces of the city as the first and fundamental step employed for the morphological analysis. Later, the deconstruction of the maps compositional variables helped the interpretation. The approach chosen for the morphological analysis regards the following variables:

- *Streets and their arrangement in a street system*: The characters of streets are influenced by other urban elements: by the plots on both sides of them, by the height, placement in the lot and uses of the buildings, by the presence or absence of vegetation elements, by the space given to pedestrians and the space given to cars. Streets represent the most stable element of urban fabrics since they show more resistance to urban transformation than plots or building systems.

- *Plots & open spaces in them; the patterns they generate and their aggregation to the street blocks:* The plot systems in cities separate public realm and private domain and are defined by streets. In an urbanization process, the definition of plots and large division of territory have tangible repercussions in the urban form because they condition the cities future developments in terms of building types, open spaces, and urban landscapes. The process of subdivision and incorporation of plots in cities is rarely regular and they depend greatly on existing conditions. Generally, the dimensions of street blocks and plots increases as the city grows from its confines of the historical center. This characteristic can be perceived in the comparison done for this study.
- *Buildings found in the chosen enclaves:* Building systems constitute the most visible and recognizable element of urban morphology. A city is made of different types of buildings that could be classified depending on the variables taken into consideration. For this work, the typical and atypical buildings were recognized.

The distinct layers of elements identified in the variables compose the urban built-up area of each enclave selected. All these elements represent an integral part of the city plan where they evolved. The methodology employed a comparative analysis of the variables aforementioned to grasp an understanding of how the chosen fabrics changed when a boundary marked by historic walls or rivers was overcome. Through the study of the historical development of the enclaves and their borders and limits, effects in the urban form of the city can be deduced. The study aligns with Conzen's use of plans as a source for historical morphological research. An effort to look at the buildings and plots as an integrated entity defined by the streets was made. The circumstances of the development of the chosen enclaves are explicable through their period and context of development (Conzen, 1960). In this sense, a place's current conditions and structure is explained by examining its development.

4. Analysis/Results

The comparison of the three enclaves of 500 m x 500 m taken from different sides of the found boundaries brings to light how urban fabric changes increase as the city grows and how the morphology of the city changes depending on the context constraints. All three enclaves are taken from the north side of the city, an area where natural and historical boundaries convene.

The first extract refers to an enclave located within the historic consolidated city center (Figure 3). In this map, the regular street grid is evident and the high number of possible intersections and connections within the different blocks facilitate social interactions (variable a). The position of the buildings inside their plots define the conditions of the other elements of urban form. The continuous alignment was a common morphological composition that defined many historical centers, including Turin's one, but in the twentieth century, an increasing number of questionings to these alignments generated infinite variations that can be perceived in the second and third analyzed enclave. The amount of open spaces in this enclave is mainly constrained within the inside courtyards of the building system and some open spaces for permanence can be recognized. Public spaces system combines street systems with open spaces. In this enclave, elements recognized as piazzas appear as part of the morphology. Morphological diversity in these elements can be found and their character is defined by the formal conditions of its surroundings and its internal composition. The presence of these open spaces in the urban tissue has a morphological and social repercussion in the context. These spaces become focal points for social interactions

(variable b). The building types that relate and define the compact morphology share the typological characteristics of the specific area. One of the most distinctive aspects of the city of Turin that deals with typology is its circuit of arcades. This system does not only link streets and important squares but also contributes to the city's character and unity. The use of this type of architectural element has a significant unifying effect in the urban image; linking and blending different architecture styles (variable c).

The second enclave comes from the area developed after the historic Roman wall. In this area, the grid in the street system begins to mutate into a less rigid system. As a consequence, the hierarchy of some streets change and a marked axis becomes evident (variable a). The presence of organically shaped streets in the enclave is a response to the use the area had in the past; a historic water channel located in the area generates amorphous plots. The open areas in this enclave are not limited to the courtyards in the buildings but appear as open public spaces used for market purposes and parking spaces (variable b). The presence of atypical buildings that start to take distance from the historic typologies is more evident in this area.

The last enclave analyzed is a piece of the city overcoming the natural boundary marked by the river Dora. In this area, the street system presents one hierarchical axis and the open spaces appear as big empty voids; many of these voids do not have a specific function but are used informally as common spaces. The lots are remarkably bigger than in the other enclaves analyzed (variable a, b). The end of the 1970s brought radical changes to the city due to the dismantled of many industrial sites. The General Plan of Development in force foresees urban regeneration projects for abandoned industrial spaces that create some of the recognized voids in the enclave. The current spatial situation has made the place dispose to deal with many problematic situations like delinquency and perception of insecurity. Some elements of the buildings in the area follow the typical arcades typology. However, the later arcades show some variants to the typology as the arcade modules are broken and the use of flat ceilings became popular. The last attempts to replicate and follow this typology were unsuccessful, especially in these areas outside the city center since its use does not respond to the context (Hinse, 2014) (variable c).

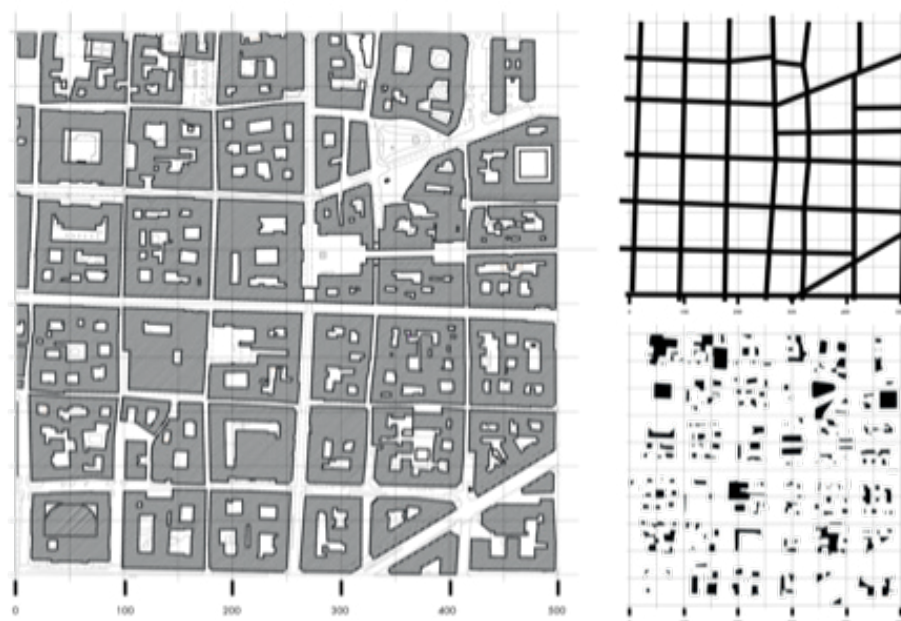


Figure 3. *Enclave 1.*

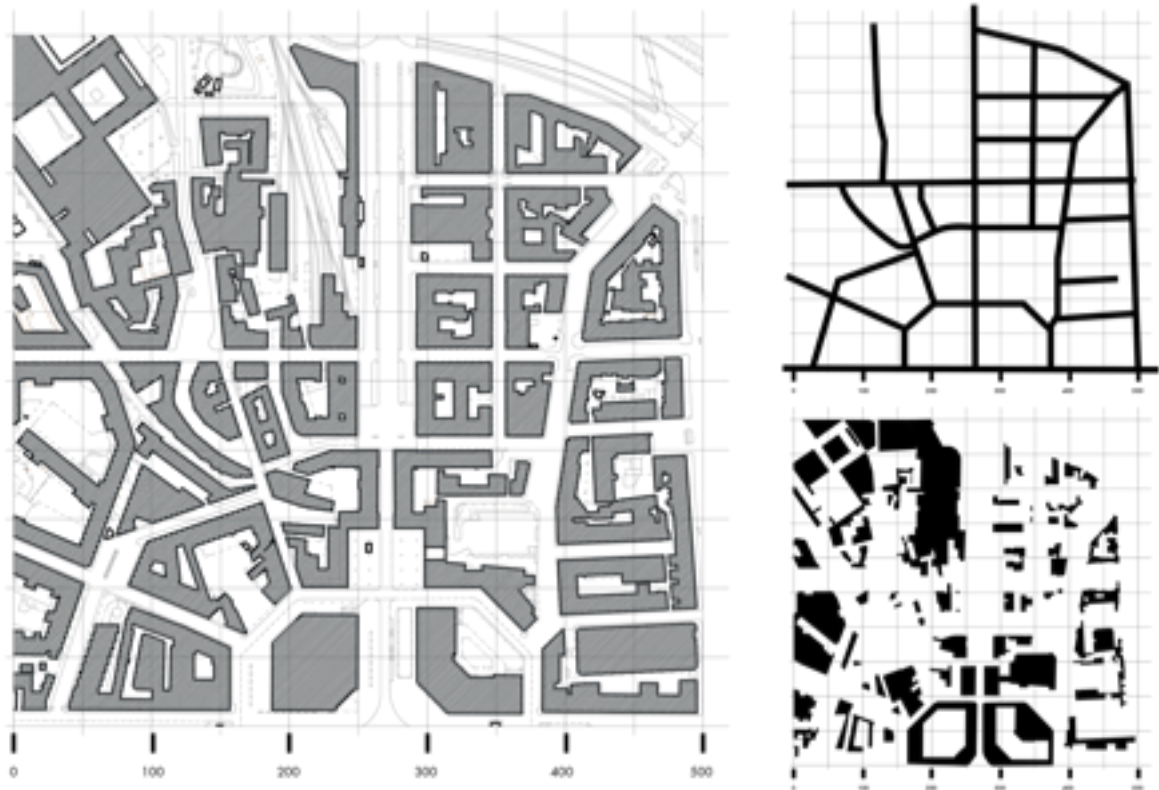


Figure 4. *Enclave 2.*

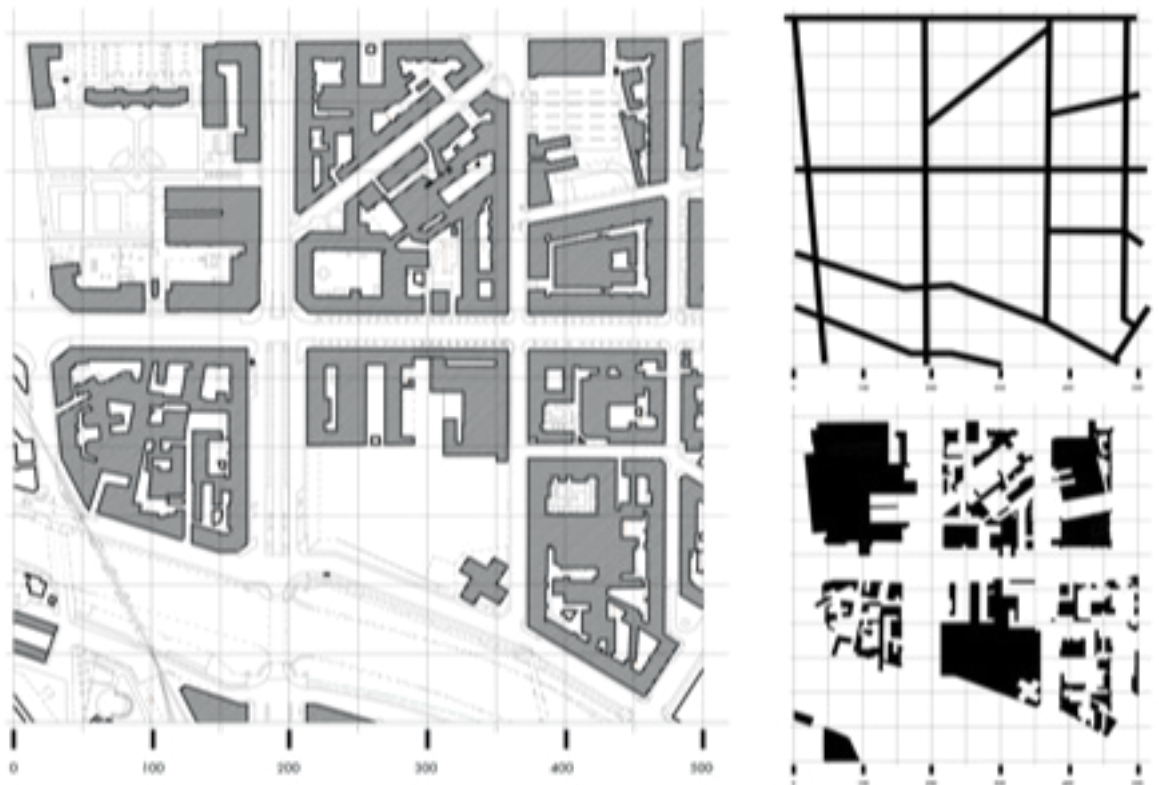


Figure 5. *Enclave 3.*

5. Discussion/Conclusion

As exemplified, limits or boundaries have the potential to mark the transition between different modes of existence in terms of time and terms of space. In all the analyzed enclaves, the relationship between plots and the block plans of buildings assumed a fundamental role that defined the area and in more general terms, the city. Developments that respond, morphologically and socially, to the conditions of a limit are a positive way of overcoming the spatial or segregate aspects that come with the definition of a boundary. The current physical conditions of the city are the result of various events that changed its morphology in time. The reconstruction of these changes is evident when historical maps are compared. The urban redevelopment projects carried out in the studied example at the beginning of this paper made exactly this. Borgo Dora was subject to redevelopment projects in the first years of this century, the goal of these projects was to rebuild the urban fabric torn in the 60s and 70s and to potentiate the commercial activities in the area, creating successful social encounters. Nowadays the character of the Borgo is still popular and its morphology is easy to read and recognize. As for the analyzed enclaves, the variables used for the analysis decomposed the layers of the urban form in pieces to get a general understanding of how these systems work individually and collectively. The morphological features of the studied urban places can be reduced to a logical system of explanation, which can lead to an understanding of the relationship between urban communities, recognized boundaries and the physical fabric they create as social needs transformer over time (Conzen, 2009). The physical consolidation process of development in cities relies on temporal and social terms, which means it takes them time to develop and consolidate. In this sense, boundaries represent an important element that links the physical dimensions of cities to the temporal and social ones. Limits have always defined the urban and when these limits are overcome, the modifications that come to the urban fabric are accentuated.

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Cities as Assemblages

These three volumes contain the proceedings of the XXVI International Seminar on Urban Form, Cities as Assemblages, which took place from the 2nd to the 6th of July 2019 in Nicosia, Cyprus. The conference explored how different theories and approaches can be embedded within the methodologies analysing the urban form. These theories provide a relational perspective for the analysis of the physical and social processes underpinning the shaping of cities, and address the inherent complexity of the urban form. The Cyprus Network of Urban Morphology (CyNUM), which organised on behalf of ISUF the XXVI International Seminar on Urban Form, was founded in 2015 as a bicommunal organisation involving actively researchers from both sides of the divide.

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