

The morphological approach in the reading of the territorial city

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Abstract. *The crisis of the traditional city, with its morphological characteristics, has been largely debated. The new urban phenomenon has almost always been described as antithetical; on the contrary this article explores the possibility of reading continuity between the traditional and the contemporary city. The paper brings forth the concept that the territory can be described as an urban phenomenon resulting from a change of scale of the city, and offers the definition of the contemporary city as Territorial City (Città-Territorio). The article recovers this term introduced in the 70's by the Italian morphological school, to emphasize the continuity with the European traditional morphological schools, taking advantage of its learning, to compare the traditional city with the contemporary city. The relevance of a morphological approach in the study of the contemporary Territorial City is discussed through a summary of the main European schools' contributions, with a particular schematization due to geographical areas. From the synthesis of these references emerges a basis for the definition of a taxonomy organized around three main elements that constitute the urban grid. Moreover, the article proposes a methodology for the analysis of the Territorial City that uses the taxonomy as a reading tool describing its aggregation logics and decomposing the historical-procedural continuum. This method is illustrated through experimentation on the Metropolitan Region of Barcelona, which is of particular relevance for the interpretation of the processes that have characterized the morphology of the current urban phenomenon.*

Keywords: Territorial City, territorial grid, auto-similarity, relief of elements of innovation.

Introduction

In this paper I present the theoretical framework of the research I developed collaborating with both the University ° my study is the morphological relationship between the current urban scale phenomenon and the traditional city, with its aim being the deepening of the aspects of continuity and characteristic invariance of anthropological settlements. Moreover, the study underlines the relevance of a morphological approach for the understanding of the territorial scale, opening up to the possibility for a description of the contemporary phenomena of territorialization in an 'urban frame'.

With this aim, I chose to recapture the term Territorial City (personal translation of 'Città-Territorio', term that was introduced by the Italian morphological school in the 1970's) to describe the present territorial scale's urban phenomenon. This term reconnects the concept of 'city' with the spatial domain of anthropological settlement which today coincides with the territorial scale. The use of the term also serves to establish a clear link with the traditional morphological readings and to justify research in the study of the territorial grid ('trama territoriale') as the physical outcome of anthropic appropriation of the territory.

Concerning the morphological relationship that exists between the traditional urban phenomenon and the present one, according with the synthesis of Monclus (Monclús, 1998) there are some interpretations that explain contemporary transformations as the break which starts the beginning of a new urban cycle, while other interpretations consider those transformations the result of a reorganization of the city to a new scale.

On the one hand, the 'break interpretation' which relates the emergence of new territories to the end of the fordist period, highlights the break in the production process and organization of territories. On the other hand, the 'continuity interpretation' explains the new decentralization processes and the reorganization of the city to a new scale as a continuity of the classic expansion mechanisms of the cities since the industrial era.

The first interpretation uses to focus on a minute scale analysis corresponding to a morpho-typological approach which highlights the breaking of the traditional forms of territorial occupation and the new ones which have arisen in the '70s. The second 'geographical scale' interpretation corresponds to a morpho-structural approach which explains the transformation process as a historical continuum, allowing us to define the Territorial City as the natural evolution of the traditional city and representing its scale leap on the territorial scale.

Considering this inter-scalar and auto-similar relationship between the traditional city and the Territorial City, it is possible to hypothesize that even in the new territorial configuration, aggregation logic (which has conditioned the formation of the urban organism from its' origins) can be found.

Caniggia and Maffei (1979) have extensively argued for the auto-similarity phenomenon in urban structure. More recently, fractal vision (Batty & Longley, 1994) has introduced a new development in the analysis of this phenomenon: the city, like a fractal system, observed through several scales, shows shapes that re-appear as if the parts were the result of the aggregation of self-contained parts.

In my research I argue that considering this auto-similarity we can use the knowledge we possess in relation to the aggregation logics and generalizable characteristics of the traditional urban form as an interpretative key for the comprehension of the new territorial configuration.

This analysis will highlight the elements of continuity in the historical-process dynamics of the formation of the territorial grid.

With all this in mind, we can see there is a clear interest in the revival of the traditional morphological school and the rise of a renewed morphological approach, continuing with the traditional approach but adapting to the new object of study, the Territorial City.

In the research, after an introduction of characteristics of Territorial City, I focused on a review of the main contributions of the European morphology schools with the aim of redefining a theoretical framework for the morpho-structural description of the territorial grid.

Through a synthesis of these contributions I propose a taxonomy of the invariant elements of the urban grid. The taxonomy is both an inter-scalar analysis tool for the urban phenomenon at the traditional and territorial scale and also a diachronic analysis tool, capable of describing invariant processes.

As well the taxonomy has been proved by its experimental application on a sector of the Metropolitan Region of Barcelona in the time line from the 1950's until today.

The material of the MUC2 by Generalitat de Catalunya was essential for the drawing of the cartographic bases and to extrapolate the classifications of the built fabric, of the land use and the hierarchy of the roads.

Other essential resources for the collection of data on land use were the AMB work (Area Metropolitana de Barcelona) collected in the publication 50 anys de transformacions territorials (Carreras Quilis, Ruiz i Almar, & Otero, 2012) and the extensive urban studies of the ETSAV Escola de Arquitectura de el Vallès, which recently join in the publication directed by Llop, in particular Vol II: Ciudades, territorios y regiones urbanas eficientes (Font Arellano, Maristany Jackson, & Mas Artigas, 2016).

A new urban phenomenon: the Territorial City

Some characteristic aspects of the contemporary territory justify its interpretation as an urban phenomenon. In particular, those aspects concern: The perpetuation of a large-scale stratification process.

As the research *Territori post-metropolitani come forme urbane emergenti* directed by Balducci (2011) points out, the regionalization process follows a slow evolutionary path, strongly marked by 'path-dependency' (Paba & Perrone, 2016) both from the spatial and socio-economic point of view.

The study remarked that the structural grid of the territory is not located indifferently on the ground but arises around locational inertia: historical settlements, ancient traffic lines and agricultural paths. The new grid would thus overlap with the previous one, as a result of a large scale stratification, that in the last century has invested all levels of the Christallerian hierarchy (Christaller, 1933) by inducing a progressive filling of the grid's mesh.

As shown in the book *Il Territorio che cambia : ambiente, paesaggi e immagini della regione milanese* (Boeri, Lanzani, & Marini, 1993) this stratification process is the result of the superposition of two time lines of evolution: the long time of the invariants and the faster overlaps related to the elements of the contemporary urban phenomenon.

The presence of a matrix organizational structure: a large scale grid (territorial grid), which represents the support structure of the spatial urban phenomenon.

According to Dematteis (1996), this large-scale grid emerged as result of the growth of the middle and lower levels of the urban hierarchy. From this general growth a pattern has arisen which is characterized by a generalized indifference of the localization's interests. This pattern of reticles is the result of a long-term structural trend which is linked to irreversible transformations that took place from the 1970's both in the forms of productive organization and in the infrastructural organization of the territory.

From recent studies (Font Arellano,

Maristany Jackson, & Vecslir Peri, 2012; Garavaglia & Pennati, 2016;) we can see how this territorial grid tends to assume a 'corridor' configuration. The configuration of these 'corridors' is of large bands along territorial connected axes. They share some common characteristics and tendencies: a densification phenomenon which mainly affects middle size cities, dense exchange areas of commuter flow and a diffused economic growth because of new location competitive advantages

A hierarchical allometric organization.

In the territorial grid, the typical location indifference which characterizes the matrix organizational structure affects just the reticle level while the centrality of the traditional urban cores is preserved thanks to the retaining of a higher yield due to their administrative and directional nature of super-centrality.

The traditional divide between the city and the countryside in our day has become a growing detachment between the metropolitan level, which focuses administrative city functions, and the rest of the urbanized territory of which urban reticles constitute the functional infrastructure (Dematteis, 1999).

In addition, Dematteis has found that after the earlier urban explosion phase that characterized the city growth from the 1990's, there is a new phase of 're-centralization' toward the main centers of territorial systems.

Continuity in contributions from schools of urban morphology

The morphological approach has been particularly relevant in the 70's and 80's. In those years, urban-based studies focused on finding explanations for the formation of urban areas based on the idea that the study of form could generate specific knowledge about their physicality and spatiality.

Moudon in her article *Urban morphology as an emerging interdisciplinary field* (1997) provides a comprehensive summary of the main contributions of traditional urban morphology studies and identifies three schools of morphology which have defined the foundational basis for the field. In her article, Moudon summarizes the contribution

of the French school of Panerai and Castex, the English school of MRG Conzen and Whitehand and the Italian school of Muratori, Caniggia and Rossi.

In my research I kept forth the schematization by geographic areas to highlight the link between the traditional studies of the city and the new urban studies about contemporary territories; this helps us to understand how a certain analytical approaches have been applied to the two scales.

The first analytical approach from the Italian school is heavily focused on build type, identifying the artifacts that represent the historical trend in production of urban fabric. In the last thirty years, we can observe a new 'Elementarism' (Viganò, 1999) in the study of urban phenomenon at the territorial scale, which recover the heritage of the traditional school through the analysis of 'urban materials', of 'primary elements' and of new architectural types (Boeri et al., 1993; Isola, 2003; Munarin & Tosi, 2001). Those parts of the elementary analysis and their localization within the grid are not neutral, but they affect the polarization process as well as the reiteration of architectonic types.

In the second analytical approach from the French school, the common link between traditional and contemporary thought concern the study of the city through the social dynamics that are used to influence city transformations as the result of the dialectic relationship between 'urban theories' and the real city construction. In this perspective both the contemporary and the traditional cities have to be interpreted as a social phenomenon (Mangin, 2004; Panerai, 2008).

The Anglo-Saxon analytical approach uses the concepts of configuration analysis.

Conzen's (1960) geographic approach had already given a particular interpretation about the configuration of the edge elements along the fringe belt in relation to the evolution of the city due to the dynamics of transformation in land uses. With similar scientific beliefs, some Anglo-Saxon authors (Batty, 2013; Hillier & Hanson, 1984) further developed the analysis of the reconfiguration processes determined by how demographic movements impact the definition of centrality and transformation in land use.

As well as the research from these three schools, in my own research I have also included the contributions of the Spanish school which main topic concerns the study of urban and territorial transformations as a process strongly related to changes in land use (de Solà-Morales, 1972; Font Arellano, Llop, & Vilanova Claret, 1999; Font Arellano et al, 2005). In my research this contribution has been very useful for the definition of 'morphological territories', polarization processes and localization of central and productive elements.

A new taxonomy

From the review of the contributions of the schools of morphology, after studying the common elements of the urban form we can identify the primary elements that make up the urban grid.

I used the following three elements to focus my analysis into three macro groups that make up the main structure of taxonomy:

routes
build fabric
special emergences

The first is the routes layer which reflects the growth and the gradual integration of the grid and the transportation technology which use to determine the morphology of the connections. The second macro group is the build fabric, which is characterized by the reiteration of common architecture showing the original city concept of the different periods. The last group shows especial elements which have emerged from specific human activities.

The three macro categories are further schematized by sub-categories (Figure.1) representing the invariant processes of development of the primary elements and describing the stages of formation and progressive integration of the urban grid.

These sub-categories can be read in chronological order as successive phases, it should also be noted that they respect a

| TRACCIATI-PERCORSI | TESSUTO COSTRUITO | EMERGENZE SPECIALISTICHE |
|--|--|---|
| 1) Permanenza e trasformazione delle giaciture | 1) Crescita incrementale- trasformazione per frammenti | 1) Processi di centralizzazione |
| 2) Intersezioni come generatrici nella trama | 2) Allineamento e consolidamento intorno alle direttrici della trama | 2) Modularità degli elementi primari |
| 3) Crescita a ragnatela e integrazione della trama | 3) Reiterazione del tipo- processo tipologico | 3) Regole prospettiche - sequenze visive |
| 4) Regole di minimo movimento e gerarchia dei percorsi | 4) Fringe belt- territori morfologici provvisori | 4) Dinamiche localizzative degli elementi funzionali antinodali |

Figure 1. Taxonomy of invariant processes of formation of urban grid (Gagliardi, 2016, p.81)

‘circularity’, meaning that each cycle will repeat itself at a higher level of scale and complexity.

The first phase of formation of the routes layer coincides with the first interaction with a territory and represents the physical result of the anthropization processes within the topographical and the morphological elements of the environment. This result which is usually a territorial road is a first element of permanence or invariance that will undergoes future transformations.

In the basic configuration of the first territorial route there are nodes which represent the main points of tension where the highest localization interests cause a strong demand for the space occupation. The second phase of the process of grid formation is represented by the morphogenetic changes that the nodes imprint on the formation of the grid.

At a later stage around the main nodes and axes, grid integration dynamics create a more homogeneous mesh network that makes the grid more permeable. The third stage illustrates the formation and consolidation of the grid itself through the progressive integration and filling processes that takes place until the spatial structure of the grid is complete.

The fourth stage, with the completion and saturation of the settlement, usually begins with the advent of new technologies in transportation or new social dynamics. This phase is characterized by the emerging of

‘restructuring elements’ which overlap the previous ones creating new hierarchies, new territorial connections, and new nodes and mesh in a bigger scale.

From this we can see that the creation of new ‘restructuring elements’ also redesign the elements of strong permanence (phase one) at this new scale. These ‘reconstructing elements’ represent a new linear connection (‘corridor configuration’) where new polarities appear at the main nodes, expressing its morphogenetic value at a new territorial scale.

The second primary element of taxonomy uses the concept of build fabric which refers to the physical volumetric dimensions of urban tissue. Build fabric can be classified with respect to its’ different forms of density and saturation. It is made of homogeneous parts that we can call ‘morphological territories’(Font Arellano et al., 1999); among these, there are a number of uncertain spaces that we will define as ‘provisional morphological territories’ where new processes of transformation appears. We can also describe the forming of the build fabric through the circular sequence of the sub-categories of the taxonomy.

In the first phase we can see a fragmented building occupation in the adjacent areas of the aggregated buildings or in more isolated positions depending on the localization needs.

In the second phase, the previously fragmentation assumes a linear form consolidating the adjacent areas or ‘lateral bands’ of the main connective road.

Once the build fabric is consolidated as an urban settlement, we move to the third phase where its expansion can be described through the recurrence and repetition of architectonic types which define homogeneous morphological territories.

In the fourth phase, which corresponds to the system's saturation, the urban settlement begins a new phase of fragmented colonization at a larger scale occupying new 'provisional morphological territories' on the fringe belt. Lastly, the third element of taxonomy is related to special emergences. These emergences refer to the hierarchy of the urban structures where we can recognize nodalities as well as anti-nodalities.

While the study of nodality has great significance for the cultural dynamics of a particular society, the analysis of the processes of the dismantling and relocating of the anti-nodal elements gives us information on productive trends and clarifies the dialectical relationship that exists between residential settlement and productive areas.

Once again, the taxonomy sub-categories emphasize the circularity of the centralization processes with the progressive auto-similarity of the nodality's location at the urban and territorial scale.

The first subcategory describes the emergence of central elements within the build fabric that starts the process of centralization as a result of their morphogenetic power.

The second sub-category describes the emergence of a modularity in the system of central localization both at a urban scale then at the territorial scale. This modularity expresses the 'domain fields' of the central elements which depend on the catchment area of users. The third category explains the consolidation of the system with the appearance of sequences of central elements within the urban settlement. The last phase refers once again to the dialectical process that appears when the urban settlement reaches its saturation point and exceeds its geographical limits. In this case we will see how the anti-nodalities are pushed toward new territories and replaced by new nodal elements.

In my research nodalities are considered elements that have a particular role in centrality

related to social activities. For example, in the traditional city, the main centrality is represented by the system church-city hall. On the other hand in the contemporary city the centrality is related to the quaternary and tertiary functions within the central city and leisure-tourism dynamics in the metropolitan territory. Therefore it is difficult to define what has a nodal or anti-nodal value in the Territorial City because we can often find a mix of functions that are both production and leisure. That for I want to underline that the aim of my taxonomy is not to give a definition of central and anti-nodal elements but to understand their localization and how they moved within the urban grid influencing the configuration of the grid itself.

Particularly, anti-nodal elements are traditionally those elements that lie on the edge of the urban settlement in a dialectical position with respects to the main aggregation. In the contemporary city, this edge is not unique or easy to recognize which is why describing the shift of localization of anti-nodalities proves to be an important contribution to the understanding of the urban boundary reconfiguration in the new territorial grid.

Finally, looking at the taxonomy and its cycles of urban transformations, it is also possible to relate the three macro-categories of the elements of the territorial grid in a horizontal manner.

Meaning, it is possible to recognize a first phase of fragmentary configuration, represented by an elementary structure, organized on a simple mesh of infrastructure and a fragmented build fabric grown around a singular centrality. The second phase could be described as axial consolidation. In this phase some sections of the territorial main connection which unites the main nodes, pass through a further consolidation with the axial aggregation of build fabric and the modular distribution of central elements that defines the modular dimension of the emerging pattern.

In the third phase, the urban settlement assumes its final configuration through the recurrence of road connections, build types conforming morphological territories and central elements with complex organizational articulating sequences.

Lastly, the fourth phase describes the saturation process and a leap in scale, which is represented through restructuring paths, the emergence of new provisional urban territories and the expulsion and relocation of anti-nodal elements.

Experimentation on a sector of the Metropolitan Region of Barcelona

In testing the taxonomy as a tool for analyzing the formation of the territorial grid, first I drew three series of cartographic maps (Figure. 2-3-4) representing each of the three macro-categories of taxonomy. Each series of cartographic maps consisted of five frames corresponding to the years 1952, 1970, 1990, 2000 and 2013.

Using these I drew another series of five maps (Figure. 5), which correspond to the five years mentioned earlier. In these five maps, I described the process of formation/transformation of the territorial grid representing the sub-categories of the taxonomy. In particular 'the innovation elements' are represented by only showing the changes from the previous year. This experiment highlights the morphogenetic process of formation of the territorial grid and also underlines the localization logics and hierarchies within elements of territorial grid.

In this paper I report some final observations arisen from the reading of the five maps that I found were capable to describe the emergence of the generalized configuration I described in the first part of this paper.

In the first two maps we see the changes which occurred between the 50's and the 70's and detect the expansion that has been concentrated around the traditional driving axes. In this phase, the changes consolidate the traditional territorial 'implantation' (impianto territoriale) (Caniggia, 1976) between the two urban poles (Barcelona and Matarò) by filling the spaces between the mountains and the coastal area. In this phase of strong increase in land occupation, the highway has not yet resulted in significant changes in the territorial system which preserves its structure as a strong element of permanence.

Therefore we can say that the permanence laws affecting the grid at the traditional urban scale occur in the same way as on the big scale with the permanence of the traditional territorial 'implantation' reflecting the maintenance of path-dependence phenomena. In the map showing the 90's transformations, the highway, as a restructuring axis, caused the location of new settlements with a modular character occupying new mountain spaces. This type of graft pattern intersecting the new axis can be compared to the graft implantation pattern in the urban scale. Therefore a 'corridor' appears in the territorial scale with a modular structure articulated along the edges and characterized by the recurrence of connective axes and new urban tissues. Similarly the urban scale settlements are consolidated around the structuring axis through the modular recurrence of connective roads and the reiteration of architectural types. The maps of 2000 and 2013 show a further phase of consolidation of the 'corridor'. While in the previous phase the main affected area was around the edge of the axis, in the later phases where it is probably closer to the saturation point of the system, we see how the transformations are mainly affecting the main poles of the territorial system in a progressive process of re-centralization. These dynamics suggest an impending leap in scale which could be linked to the new super-centrality reached from the main cities, and to the locational interests related to their international competitiveness.

Conclusion

By establishing a new taxonomy the research has defined a new tool which can be applied to different territories, demonstrating the relevance of a renewed morphological approach in the study of the urban phenomenon at a territorial scale.

The graphical experimentation of my taxonomy demonstrated the hypothesis of auto-similarity and highlights aspects of the circular recurrence found in the process of the formation/transformation of the territorial grid. In addition it was useful to recognize and describe the generalized phenomena that

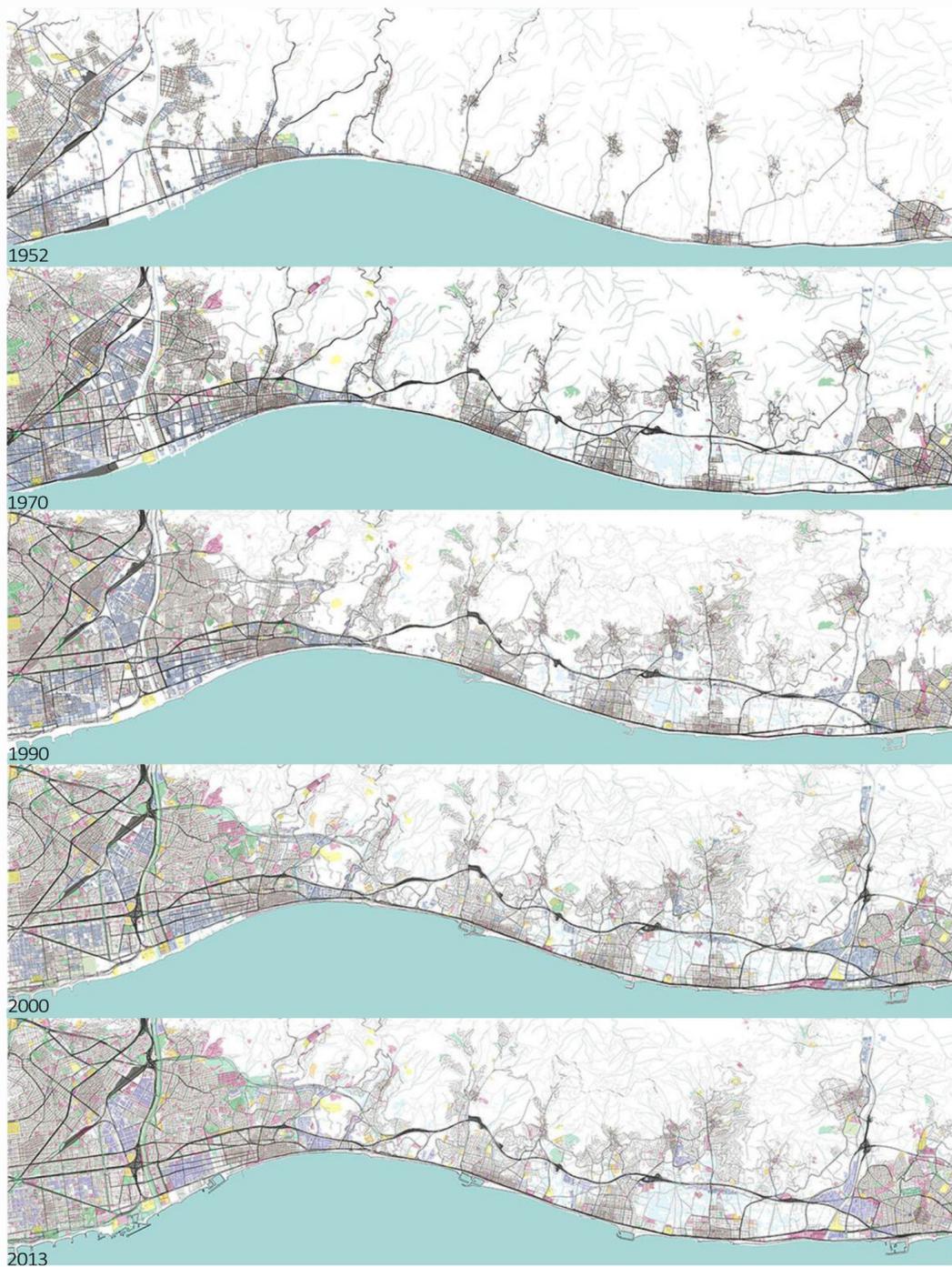


Figure 2. Routes: 1950-1970-1990-2000-2013 (Gagliardi, 2016, p.195)

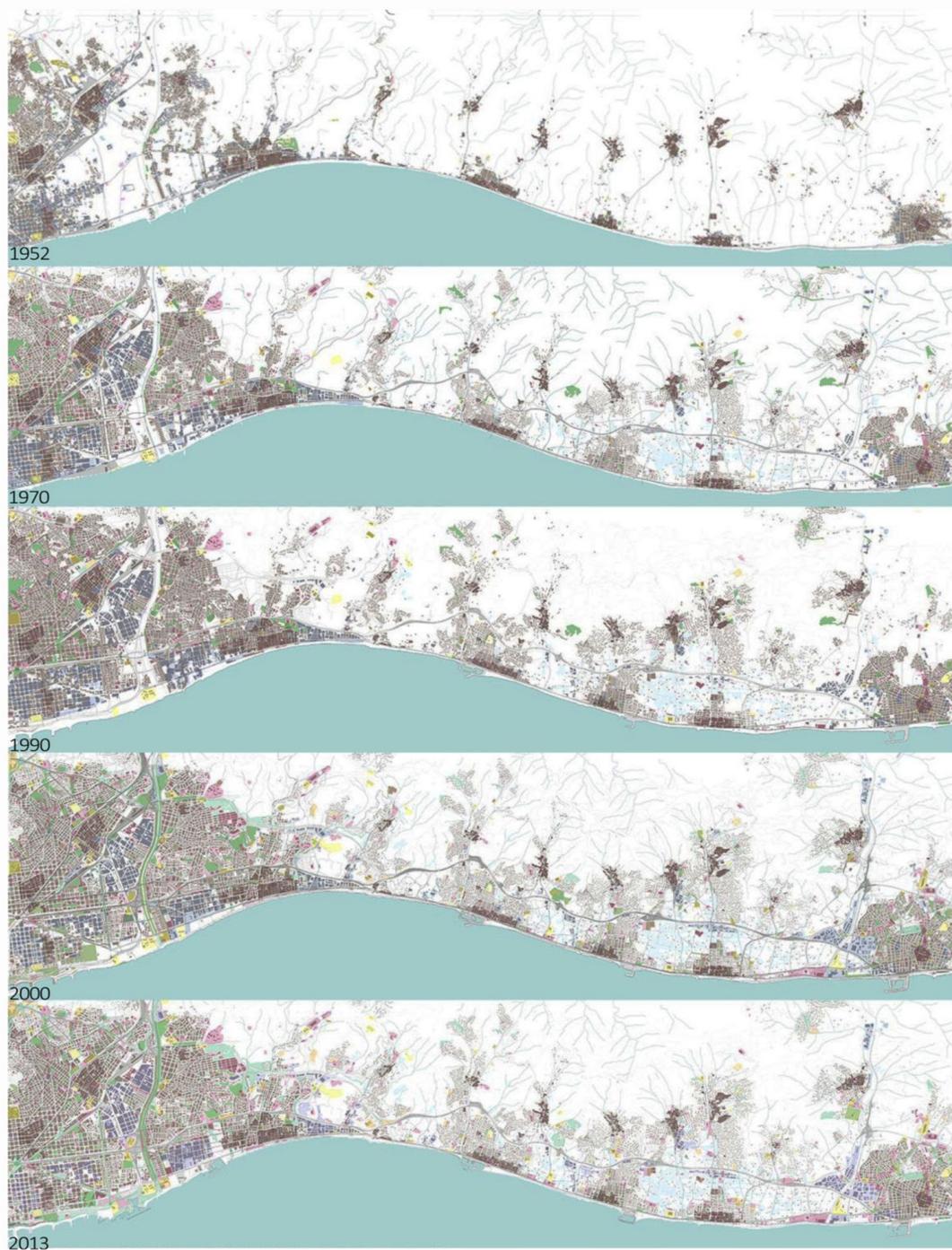


Figure 3. Build fabric: 1950-1970-1990-2000-2013 (Gagliardi,2016, p.196)

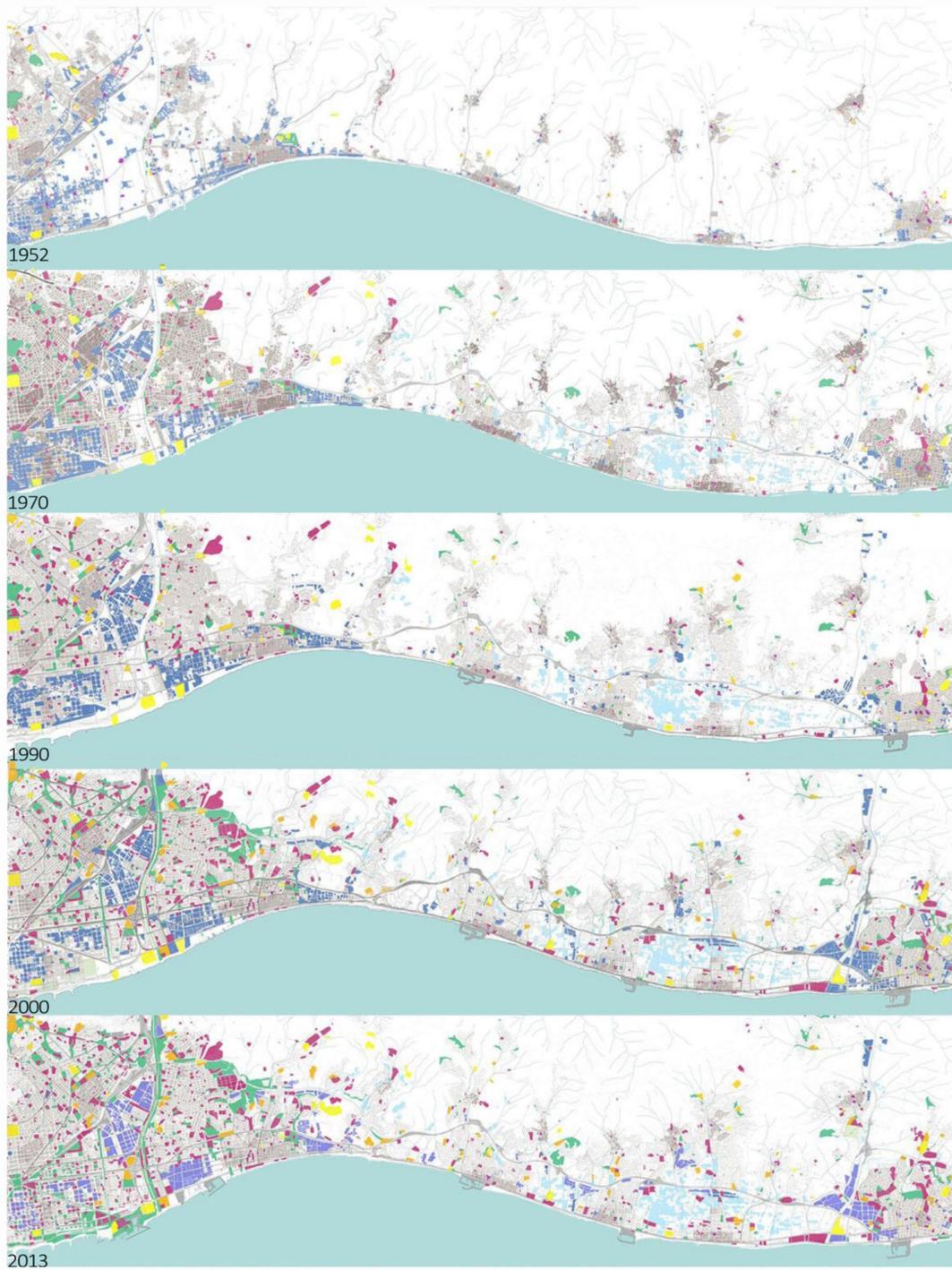
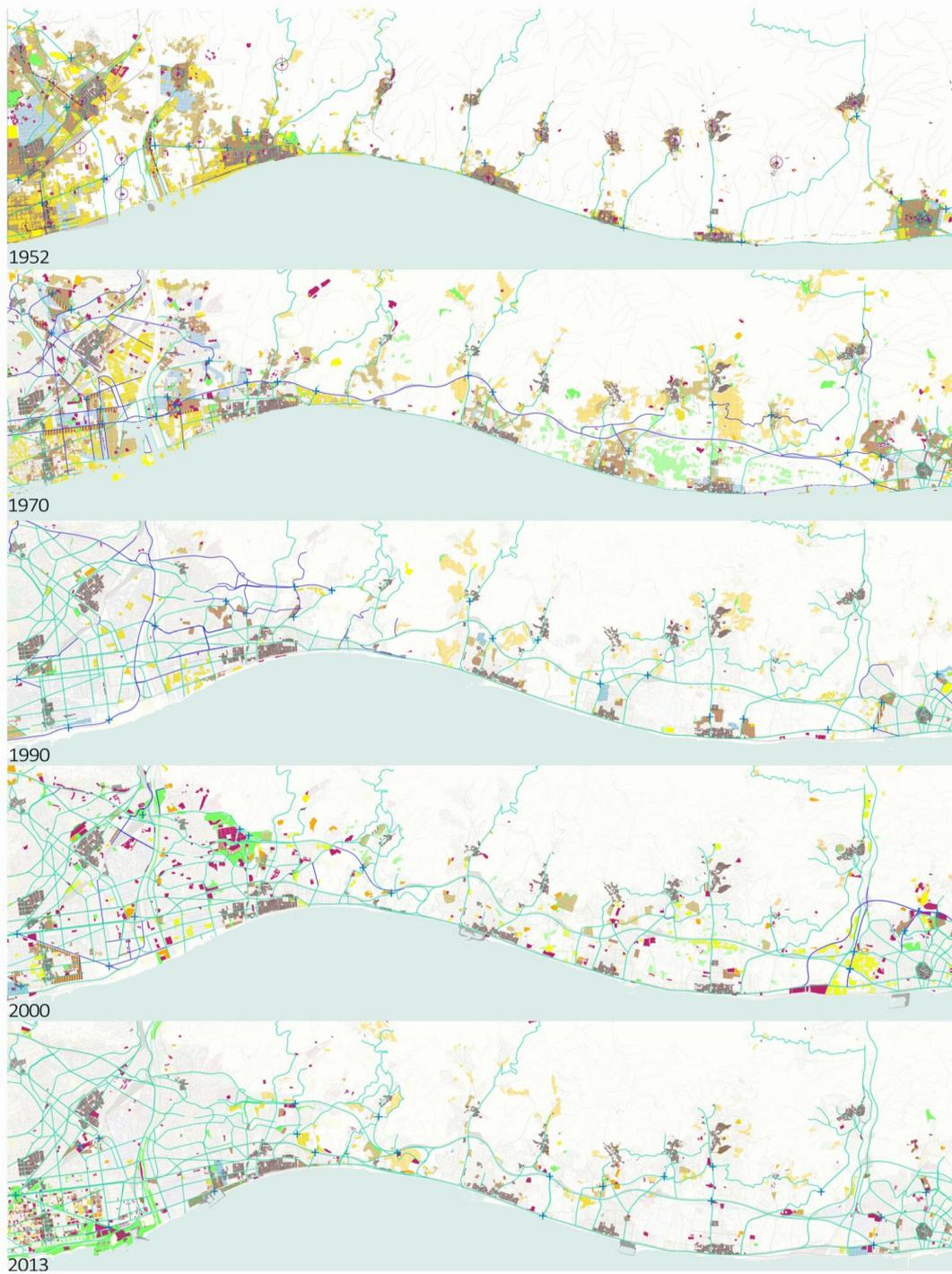


Figure 4. Special emergencies: 1950-1970-1990-2000-2013 (Gagliardi,2016, p.197)



**Figure 5. Permanences and ‘elements of innovation’: 1950-1970-1990-2000-2013
(Gagliardi,2016, p.200-209)**

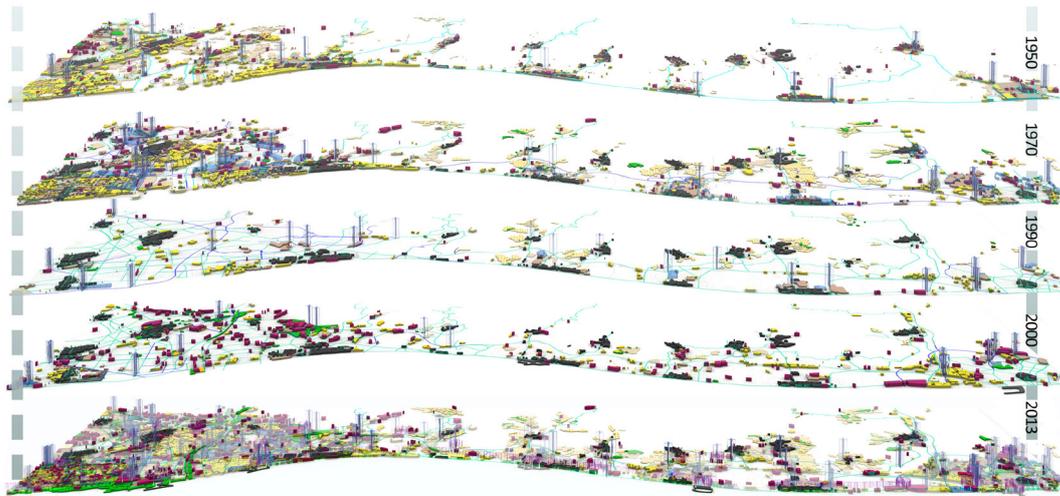


Figure 6. Allometric transformations. (Gagliardi, 2016, p.227-228)

characterize the development of contemporary the urban territory (Dematteis, 1999; Garavaglia & Pennati, 2016; Paba & Perrone, 2016), verifying the theoretical framework and the academic value of the concept of Territorial City and territorial grid in the current urban phenomenon.

The method of representation by 'elements of innovation' was useful in relation to a possible deepening of morphogenetic power of new elements of transformation, new hierarchies and centralization dynamics. Therefore further research with the test of the taxonomy through GIS technology would be an interesting step for the field of morphology.

The following figure (Figure. 6) represents the first attempt of an allometric dimensional representation of the centralization processes that take place within the territorial grid. To make this graph I assigned different heights to each element of taxonomy according to its function, morpho-genetic power and its central role within the urban grid. In the diagram, nodes have a greater height than the other elements, followed by central elements, and so on, until the anti-nodal elements which are the lowest.

Notes

The research ended with the publication of my PHD Thesis. (Gagliardi, 2016)

<http://dtes.gencat.cat/muc-visor/AppJava/home.do>

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