

A Relational Research Approach to Urban Morphology

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Abstract: This paper presents a relational research approach to the study of urban form by using assemblage theory as a broad theoretical framework for urban morphology and the social processes that are involved in the shaping of the urban form. The argument is made that the physical and human aspects of a city are inextricably linked and should therefore be analyzed together as they jointly define the identity of a city. It is also made clear that an analysis that is devoid of historical processes or of the distribution of variations across a population cannot fully explain the emergence of cities and the processes of persistence and change.

The fact that assemblage theory is a generic, non-specific approach, should be viewed as a strength rather than a weakness. This genericity has been shown to be extremely valuable in making inferences about the causal pathways that lead to the physical and social form of cities (Charalambous and Geddes, 2015); it is also a characteristic which is advocated as beneficial when making analytical choices and providing normative guidelines (Batty, 2013; Bettencourt, 2013).

The proposed theoretical framework and its analytical requirements are matched by the main morphological approaches. Such a framework was tested for a diachronic analysis of Limassol (Geddes, 2017); the effectiveness of the framework in this research and the choice of specific methods and tools depending on the context is discussed with reference to the interdisciplinary potential of combining approaches under such a relational framework.

1. Introduction

The array of elements that make up a city, the relations between them, and the causal pathways that give a city its identity or characteristics, remain difficult to describe, map and analyze coherently. This problem is intensified in contemporary cities which may be characterized by new forms of closure and exclusion (Wacquant, 2008), increasing social, economic, political and spatial fragmentation. In particular, the modern city has seen a shift in its physical form and has moved from an urban fabric which was dense and continuous to one that is more diffused, discontinuous, open and atomized (Levy, 1999).

A key problem in our ability to understand the complexity of the urban form is the long-standing isolation of the analytical approaches developed in different countries and research environ-

ments. Such approaches are characterized by specific national trends and have seen the emergence of separate schools of thought. There are essentially four main approaches to the study of the urban form: the *configurational* approach, the *historical-geographical* approach, the *process typological* approach, and the *spatial analytical* approach. Each of these tends to be associated with a main research center or with individual researchers, and all have traditionally been applied in isolation. However, in recent years a number of studies, initiatives and events (Kropf, 2009; Oliveira *et al.*, 2014; Zhang, 2015; Scheer, 2016), have explored bridges between the different approaches to assess the viability of a common framework and of a multidisciplinary analytical approach. However, there are still limited analyses and elaborations of how the approaches are interlinked and how they can be brought together within a comprehensive framework.

Furthermore, the advancement of such comparative and multidisciplinary work is fraught with the difficulty of analyzing urban growth and the human intervention in such growth that has occurred throughout centuries of urbanizations. Attempts to embed the temporal process in theorizations and methodologies for the study of cities' transformations are discussed in theoretical debates and do exist in empirical studies, but remain limited and are still not fully developed and exploited.

This paper proposes using a relational approach, specifically assemblage theory (DeLanda, 2006), as a broad framework to construct a comprehensive analytical approach to enable the encompassing of the multifaceted elements and processes that lead to the emergence and transformation of cities. It focuses on the development and testing of a transdisciplinary methodology to understand what happens to cities' form and functioning as they grow.

Within the scope of this study is the identification of the need for enhancing the research on the relationship between the physical elements of a city and social changes that occur in the urban environment over time. The extent to which the material and social spheres, and the impact of the one onto the other, should be considered and analyzed within the field of urban morphology in the theoretical premises. A theoretical framework is then set and a methodology for analysis developed based on the key elements of the various analytical approaches. The aim is to establish an effective way of identifying the key processes that lead cities to display their common as well as their specific urban characteristics. The methodology is then applied to the case of Limassol, Cyprus, in order to identify the key features and processes of its growth.

The main findings ensuing from the space syntax analysis, the historical research and interviews are then presented. The analysis is specifically concerned with key physical elements of the city and their properties (the street network and its configuration), key socio-economic factors, and the reasoning behind planning decisions. This approach aims to produce new insights into the complex relationship between the spatial and social dimensions of the city and into the processes of change displayed in the patterns of the city through time. The results are discussed with regards to the extent to which the framework enables the identification of causal pathways of development, and how the growth process impacts on the form and functioning of the city.

2. Theoretical Premises

Cities are invariably a collection of material entities, but they are also a system of human activity and interaction. Whether the two are separate dimensions where the material and the spatial, and their organization, act as a background and a context to human relations, or whether

the two are inextricably linked and influence each other is still an open question in the scholarship on cities. Spatial organization and structuring as a reflection of social relations, cultural trends and economic factors, is a long-established idea which spans the work of urban sociologists from diverse backgrounds, such as Simmel (2004), Lefebvre (1991) and Logan and Molotch (2007). What is still highly debated is whether the organization of space and the physical form of the city has an impact on society. The analysis of the relationship between urban space and society was initiated by Charles Booth (1897). Many of the issues identified by Booth's study on the distribution of social classes in London informed urban sociological studies developed by the Chicago School in the 1920s. This body of work, analyzing the distribution of various social characteristics within cities, remains pioneering in its view of urban contexts as structured in time by habitual social practices (Charalambous, 2018). Despite the criticism of stereotyping social groups, such social approaches continue to be the foundation of socio-spatial theorizations of the city and of understanding the role of the urban environment in producing social outcomes (Tonkiss, 2005).

When analyzing cities' historical evolution, urban theorists have tended to focus on physical aspects, while sociologists have highlighted the impact of population groups on the form of the city and the significance of prosaic and routine social activities in shaping the identity of a city (Charalambous, 2018). The focus of urban scholars on physical aspects is particularly evident in the various approaches of urban morphology, which persist in setting the physical form (street, buildings, plots, areas, lines, etc.) as the key feature for analysis. While all urban morphological approaches have invariably included, to different extents, socio-economic aspects in their frameworks, analyses and interpretations, the view remains that the physical form should be used as a common reference in urban analysis (Kropf, 2009). The question remains as to whether this is enough to deliver fruitful findings and understanding of the processes of urban development. The authors takes the view that, as Hillier and Vaughan argue, the city is one single entity where the physical and the social "act conjointly to produce significant outcomes" (Hillier and Vaughan, 2007) and that a way to address this issue is to bring the different perspectives and combine the tools used by different approaches under a common framework based on relationality. This offers the opportunity to put the physical and social aspects of cities on the same par.

Relational theories, such as Actor-Network Theory (ANT) (Latour, 2005) and Assemblage Theory (DeLanda, 2006), highlight a number of key issues in the knowledge domain of urban development, in particular regarding the mechanisms of emergence and transformation of city forms. They effectively argue how both material and human elements play an 'equal' role in emergence, how the connections between these define the nature of assemblages and how multiple scales and relations determine transformation processes. Both these relational theories suggest that to develop a research approach which can respond to the challenge of analyzing the processes of urban development which shape the city, it is necessary to:

1. assess the relationships between material and human components;
2. account for historical processes;
3. analyze different scales of relationships between parts and the whole;
4. understand how groups are formed and redistributed; and
5. construct a narrative where the variety of actors is represented.

Assemblage theory is a philosophy and as such it offers a holistic understanding of the city which is able to overcome the traditional divisions of specialization of the various fields which

deal with urbanity. The points above provide the theoretical basis and general guidelines to respond to the problem of the city and its key ontological issues. However, the fact remains that relational theories tend to be highly generic in proposing analytical approaches: exactly what elements, scales and interactions should be taken into account for analysis remains open for debate. This is not necessarily a shortcoming, but something that should perhaps be viewed positively as enabling those with specific information and skills to develop analytical approaches best suited to the study of the urban form and to specific case studies (Batty, 2013; Bettencourt, 2013). In order to develop an analytical approach, it therefore necessary to draw from the specific approaches that have so far been used for the study of the urban form.

The authors maintains that looking to philosophical approaches, such as ANT and Assemblage Theory, which address ontological issues and build upon scientific and empirical facts, provides the theoretical framework to deploy a trans-disciplinary methodology to analyze cities diachronically and to make inferences about the causal pathways that lead to the physical and social form of cities and to how cities perform (Charalambous and Geddes, 2015).

All urban morphological approaches offer certain analytical benefits, but also have shortcomings, mostly relating to their ability to account for wider structural factors in their analysis of form. This is perhaps understandable as all the approaches which specifically deal with form tend to originate from the field of urban studies – more concerned with local processes – than from the field of sociology – more concerned with global processes. However, all also seem to be open to the possibility that inferences can be made with regards to wider factors influencing the evolution of form. All the approaches can be applied ‘statically’ to analyze the urban form at one specific point in time, but their basis can be used as the foundation for diachronic analysis.

To give a clearer overview of the commonalities and differences of the approaches, the key physical and social elements and the way they view relationality is summarized in table 1.

Table 1. *Components of the urban form and their relationality identified by the different urban morphological approaches. Source: Authors.*

Approach	Physical Features	Social Features	Spatial Relations	Human-Physical Relations	Temporal Relations
Historical Geographical	- Site - Town plan (Street, Plot, Building)	- Function - Land Use Pattern	- Street Pattern - Plot Pattern - Building Pattern	- Social and Economic Context	- Cyclical change
Process Typological	- Building - Urban Tissue - District - City	- Cultural Context - Historical Context	- Aggregation	- Intention - Construction	- Derivation (Cyclical Reproduction, Modification of Form)
Configurational	- Street - Open Space	- Use - Occupation - Movement	- Network Structure - Interconnectivity	- Perception - Movement Economy - Cultural context	- Cyclical Growth - Diversification
Saptia Analytical	- Plot - Parcel - Census Tract - Built up Area - Route	- Use	- Network Structure	- Flows	- Feedback (Continuous Readjustment)

Clearly, there is no single aspect of either physical form or social feature which is common to all the different approaches, although different components and relations tend to recur through two or more approaches. Function and use are clearly the social aspects that are consistently adopted for analysis. Temporal relations seem to be the most consistent across the approaches (though using somewhat different semantics): cyclical/continuous processes and change, modification, diversification or readjustment are compatible descriptions of emergence and transformation. However, different scales and degrees of determinism are clear in the variety of views of the human-physical relationality offered by each approach.

This is why an overarching theoretical framework which establishes the extent to which local and global processes should be given consideration in analytical attempts is needed: assemblage theory provides such a theoretical framework. It sustains the argument that the physical and human aspects of cities are inextricably linked and should therefore be analyzed together as they jointly define the identity of a city. It also makes clear that an analysis that is devoid of historical processes or of the distribution of variations across a population cannot fully explain the emergence of cities and the processes of persistence and change. Which physical and human elements, how to identify interactions, how to measure connectivity, what scales, variables and historical processes should be considered have to be informed by the various morphological and social approaches mentioned above.

3. Methodology

Assemblage theory affirms that social entities are constructed through very specific historical processes, which indicates the need for diachronic analysis. This need was met by building a systematic spatial history of the city, an approach concerned directly with the relationship between spatial and locational factors at specific times in the past as described by Baker (2003), and by contextualizing such history with a narrative.

The analytical requirements and the related tools selected to perform the analysis from the various sociological and urban morphological approaches are summarized in table 2.

Based on the analytical requirements mentioned in the theoretical premises and the available tools, a research strategy was developed proposing to deliver two parallel accounts of Limassol's development. On the one hand is a narrative which describes, through historical research, how the city has grown and changed; on the other hand, is a spatial history of the city, which focuses on systematically and quantitatively analyzing the development of the city's street network and its built form at specific points in time. The research strategy including methods and tools is summarized in figure 1.

Spatial History

The spatial history was composed of three layers of information relating to the material components of the city: an analysis of the spatial properties of the street network, an analysis of a physical property of the built form (block size) and an analysis of a socio-economic property of the built form (land use). The first analysis was carried out through a configurational, space syntax approach (Hillier and Hanson, 1984; Hillier, 1996; Griffiths, 2012), while the second two analyses were carried out through a historical-geographical approach (Whitehand, 2001;

Oliveira, 2016) focusing on the timeline and distribution of specific land uses of a large size. The spatial history comprises seven points in time (1883, 1933, 1960, 1974, 1987, 2003 and 2014). One further layer of information relates to the social components of the city: an analysis of distribution of social groups across the city was carried out through a geographical approach typical of the Chicago school, whereby contemporary census data (from 2011) were summarized and mapped according to administrative areas. Of the spatial history, only the configurational - space syntax - analysis is presented within the scope of this paper.

Table 2. Summary of methodological tools used for each analytical requirement. Source: Authors

Analytical Requirement	Qualitative Tools	Quantitative Tools
Historical Process and Temporal Aspect	- Historical Narrative - Review of Secondary Sources on Development	- Spatial History - Space Syntax Analysis - Block-Size Analysis - Land-use Analysis
Different Scales and Relationship of Part-to-Whole	- Illustrative Case Studies - How They Relate to the Whole City	- Space Syntax Analysis - Assessment of Fringe Belt Formation
How Material and Human Elements are Connected Together	- Fabrique Urbaine - Analytical Linkages between Historical Sources and Physical Development	- Statistical Correlations between Physical and Social Factors
How Groups are Formed and Redistributed	- Historical Analysis of Events that lead to Group Formation - Analysis of Primary Sources in Relation to Case Studies' Developments	- Basic Statistical Analysis of Historical Social Factors - Details Statistical and Geographical Analysis of Groups' Distributions
A Narrative where the Variety of Actors is Represented	- Conversations with Stakeholders	- Quantitative Information Relating to the Nature of Groups in Different Areas

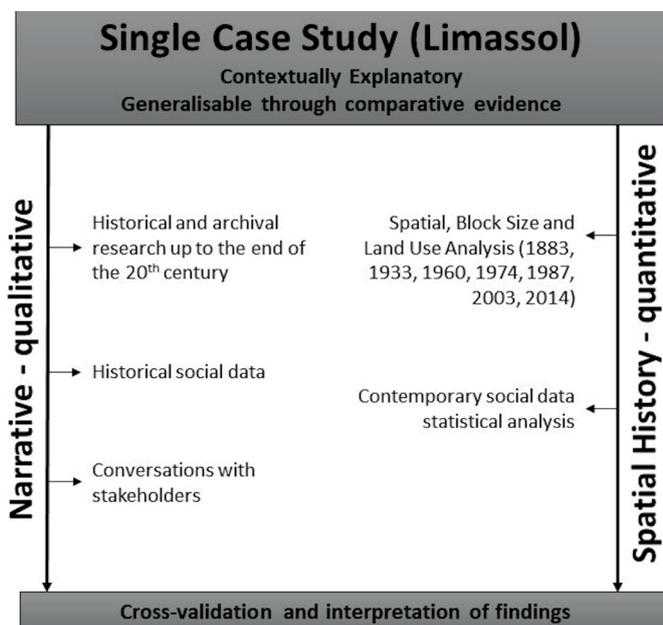


Figure 1. Research strategy Source: Authors

Space syntax methodology provides an analysis of the city at different scales and has the ability to highlight how the main structure of the city changes over time by quantitatively describing patterns of spatial layout and by measuring the accessibility level of all elements in the system. The most important measures of space syntax are *integration*, representing 'to-movement' or the accessibility of a specific element within the system, and *choice*, representing 'through-movement' or 'betweenness' (the number of times a segment falls on the shortest route between all pairs of segments within a specified radius). Measures can be calculated at the city-wide scale or at any given radius; the city-wide, 'global' measures taking into account all elements in the system and the 'local' measures taking into account all elements within the given radius. In *multi-scale* analysis (Versluis, 2013) – all the segments which have both the highest global and local values, constituting areas which are likely to have the highest levels of both vehicular and pedestrian movement, as well as the greatest mix of uses, are identified. Another property of these measures is that maximum values tend to be representative of what is known as the foreground structure of the city – the network of linked centers at all scales, while mean values tend to be representative of the background structure – the network of residential spaces (Hillier, 2002, 2012).

Narrative

Narratives are a main tool of historical research, but they are not commonly used in urban analysis, especially for contemporary times. In the context of this study's framework, the meaning of 'narrative' as a research method is taken from ANT, which requires to provide a description where all the actors involved in the process of emergence are accounted for and their actions are outlined. The aim of the narrative is to fully depict the state of affairs of an assemblage (in our case the city) by being specific and accurate while capturing the broad-ranging connections and capacities exercised by different agencies and components. In this study, a combination of tools, typical of more 'classic' social and historical research using narrative as a qualitative method is employed, researching primary and secondary sources, including photographic and cartographic material, and press archives, as well as through holding interviews with expert stakeholders.

4. Findings from the spatial history of the city

Previous spatial analyses of Limassol's growth have pointed out that uncontrolled urban development led to an uneven expansion of the city, creating a fragmented structure and leaving many gaps in the urban fabric (Kritioti, 1988). The space syntax analysis provides us with an array of information about the overall structure of the city and its development through time. Figure 2 shows that as the city develops, its core (highlighted by the thick black lines) shifts towards the ring roads and new areas of nearby villages. The core also becomes more scattered and includes more of the distant areas in the northern edge of the city. As time goes by, the seafront seems to lose its importance and at present it no longer belongs to what is deemed the 'spatial' center of the city.

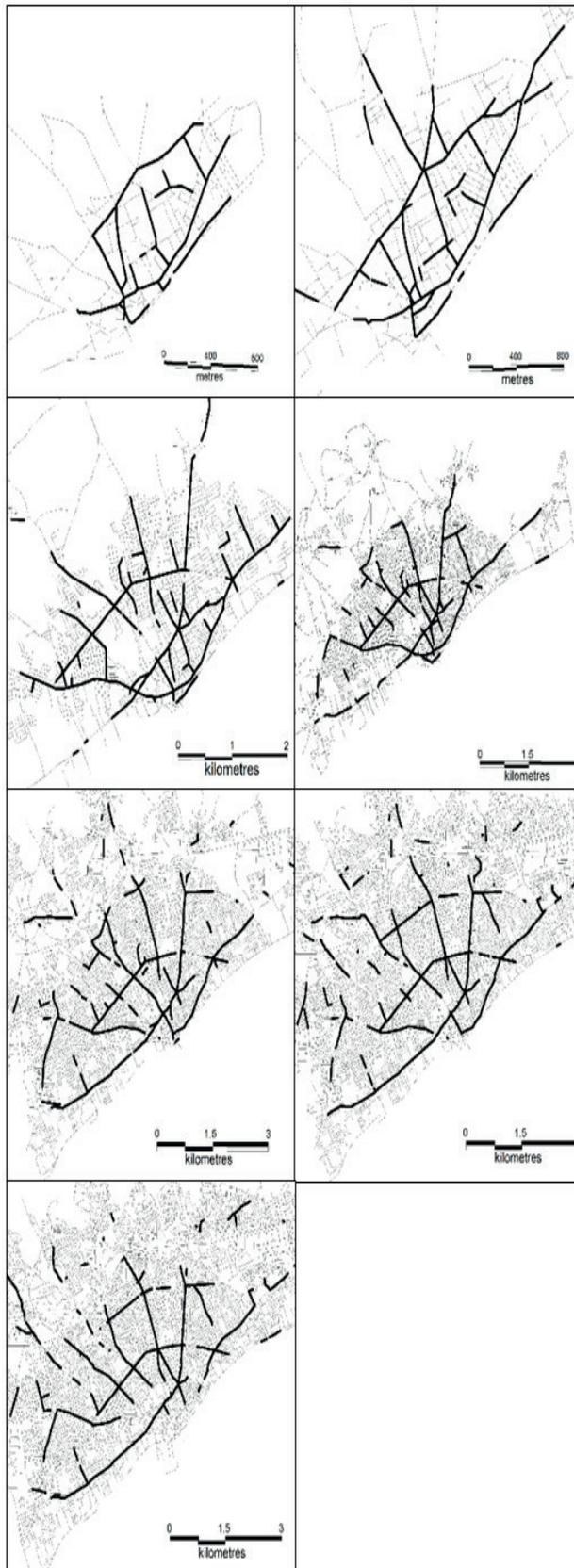


Figure 2. Multi-scale accessibility analysis of Limassol (left to right and top to bottom: 1883, 1933, 1960, 1974, 1987, 2003 and 2014). Source: Authors

This configurational analysis tells us how continuous or fragmented, and how accessible, are the foreground and background structures of the city (Hillier, Yang and Turner, 2012). These properties can be visualized as a star diagram (figure 3) (Hillier, Yang and Turner, 2012). This diagram has the capacity to compare the relative importance of the foreground, main circulation system of the city, and the background residential network. It shows that the city constantly has a longer horizontal axis, which tells us that the foreground system dominates the city. It also shows that the background, residential system loses its continuity and integration more sharply than the foreground system, and that the latter has a clear peak in integration in 1960-1974. Furthermore, it is evident that change in these properties seems to stabilize after 1987, with less dramatic changes, but a small improvement in the integration of the background network matched by a small decrease in that of the foreground network is visible in 2014.

A brief comparison of the spatial properties between the city as a whole and the historical town center (table 3) reveals that the background structure within the town center is more continuous and more resilient to change as the lower decrease in mean choice shows, while its integration has a striking continuity and is now back to the levels of the late 19th and early 20th century. The decrease in both continuity and accessibility of the town center's foreground network is much sharper than for the whole city. This indicates that its strength is more susceptible to the impact of growth and that its role in distributing and attracting long range movement is more effectively diminished by the incorporation of new routes and new areas in other parts of the city.

If we look at local to mid-range measures for the whole city and the town center (table 4) we will notice that, after initial development, integration values drop from 1933 onwards, which indicates that local neighborhoods on average become less and less integrated even within their local area. The picture is different for the town center taken as a separate unit – values here

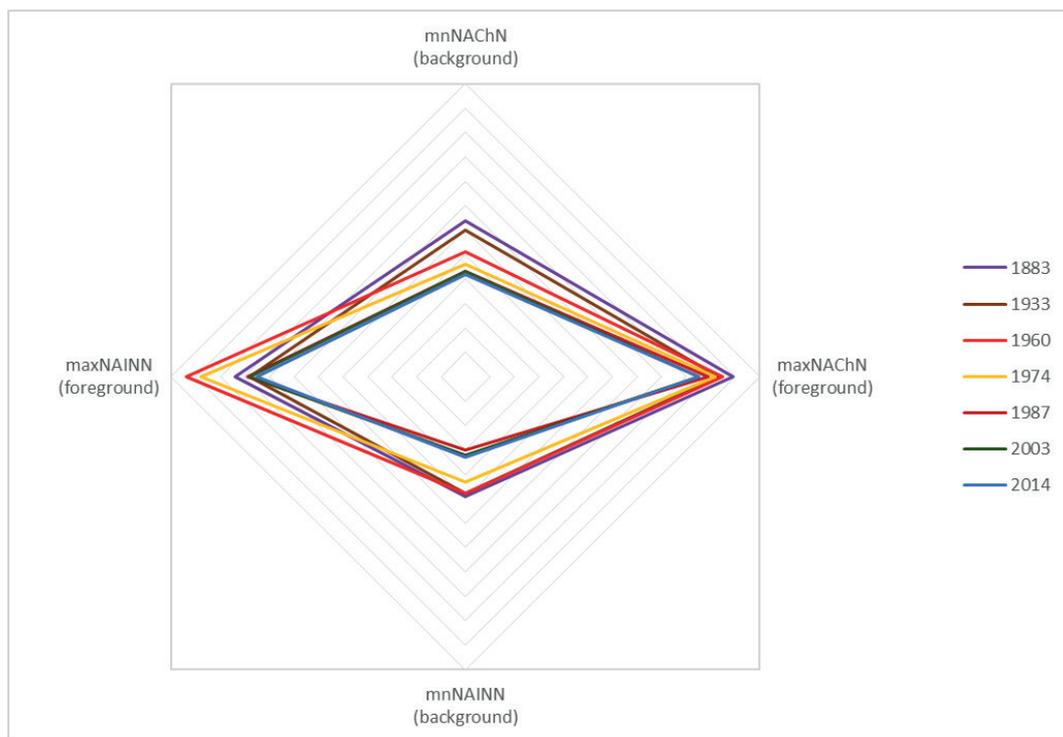


Figure 3. Star diagram of the changing properties of foreground and background structures of Limassol from 1883 to 2014. Source: Authors

are more variable over time and are generally high, meaning that while shifts do occur in its properties as an attractor of movement and a to-destination, it steadily functions well as a local neighborhood. The values drop somewhat in the years during which it is known to have decayed, but have recently risen again.

Through the historical process, the global structure of the city has shifted from the historical centre outwards. As indicated by previous studies in similar contexts (Shpuza, 2009), the city's overall integration tends to decrease with growth. The spatial analysis highlights the two key problematic patterns of the city: the domination of the foreground structure over the background one and a lack of sub-centers. More importantly, it shows that recent redevelopments on the waterfront has not reintegrated the town centre within the spatial core of the city and have not altered the dominance of the foreground structure or significantly improved city-wide accessibility. Small improvements have occurred in the localized area of the town center, but certainly, no significant positive impact has occurred across the city.

Table 3. Comparative table of mean and maximum global choice and integration values of the whole city and the town center over time. Source: Authors

	mnNACHn		mnNAInN		maxNACHn		maxNAInN	
	Whole City	Town Centre						
1883	1.24	1.26	1.09	1.10	1.69	1.70	1.54	1.54
1933	1.20	1.24	1.08	1.10	1.63	1.63	1.48	1.48
1960	1.11	1.20	1.08	1.08	1.65	1.58	1.74	1.59
1974	1.06	1.14	1.03	1.03	1.62	1.50	1.68	1.50
1987	1.03	1.11	0.90	1.07	1.59	1.45	1.49	1.34
2003	1.03	1.09	0.92	1.07	1.55	1.42	1.48	1.33
2014	1.02	1.11	0.93	1.10	1.55	1.42	1.45	1.35

Table 4. Comparative table of mean local choice and integration values of the whole city and the town centre over time. Source: Author

	mnNAIn						mnNACH					
	WC	WC	WC	TC	TC	TC	WC	WC	WC	TC	TC	TC
Year	800	1200	1600	800	1200	1600	800	1200	1600	800	1200	1600
1883	1.20	1.14	1.12	1.20	1.50	1.12	1.12	1.14	1.12	1.13	1.16	1.18
1933	1.44	1.23	1.17	1.33	1.35	1.37	1.19	1.19	1.21	1.15	1.19	1.21
1960	1.17	1.12	1.11	1.37	1.37	1.38	1.12	1.14	1.15	1.16	1.19	1.2
1974	1.10	1.04	1.03	1.43	1.45	1.44	1.11	1.12	1.13	1.16	1.19	1.13
1987	1.02	0.96	0.94	1.34	1.33	1.33	1.09	1.1	1.11	1.16	1.18	1.19
2003	0.98	0.93	0.91	1.30	1.29	1.28	1.09	1.10	1.11	1.16	1.18	1.18
2014	0.99	0.94	0.92	1.34	1.33	1.32	1.09	1.10	1.11	1.16	1.18	1.19

5. Findings from the narrative of the city

Limassol was little more than a village in 1815, when the traveler William Turner states that Limassol “is a miserable town consisting of 150 mud houses of which 100 are Greek and 50 Turks” (Turner, 1820). During the second half of the 19th century Limassol began to grow and expand substantially. This was reflected in the construction of the earliest functional spaces outside the edge of the city: the Greek cemetery of Agios Nikolaos and the Muslim cemetery at the western edge of the city.

With the end of the Ottoman period, Limassol developed as a city of proto-industrialization, as the economy benefited from the stationing of British troops in the district, with consequent development of establishments and retail facilities in the town. During Ottoman times the bazaar and the main commercial street were in the western side of the town (Severis, 2006) and on the coastal road (Serghides, 2012). However, as the British settled in, the commercial center started shifting towards the east. The reasoning – if any – behind the location of these various components of the city remains unknown and an official masterplan of any kind to refer to was not drawn by the British (Interview 1). From the beginning of the 20th century, physical and social change in the city sped up with the Government providing financial assistance to the municipality in order to support certain public works, especially those relating to improvements for the shipping industry.

At the same time, the first promenade along the coastline was constructed. The houses along the seafront that formed a ‘wall’ against the sea were removed – this is the time when Limassol first ‘opened up’ to the sea. The purpose of this was to support shipping, with loading and unloading being the main activity taking place along the promenade. However, this area was quickly turned into a social and recreational space during quiet times for the industry and during holidays (Serghides, 2012).

During the colonial period and in the years following independence up to the 1974 war, Limassol’s urban population grew ten-fold. Although there was a steady population increase in the whole island following British infrastructure works in all towns, the relative distribution of population between town and country did not change drastically until the 1920s. This was a period of depression in agricultural prices, which saw migration into towns leading to an increase in the urban population at twice the rate of the rural population between 1921 and 1946 (Kritiotti, 1988).

The increase in population in the 1920s, coupled with industrial development also led to the establishment of other uses and facilities in the city. Serghides sustains that socio-economic changes and building activities were putting pressure on local authorities to produce a comprehensive plan (Serghides, 2012). It is at this time that the by-pass (figure 4) was planned and then constructed at the beginning of World War II.

This is a key piece of road infrastructure which will permanently influence the form and further development of Limassol’s street network. The reasoning behind the development of the road is, however, unclear. It has been stated to the authors that the road was planned for military purposes during war times (Interview 1) or simply as a ring road to avoid traffic in central Limassol due to its expansion (Interview 3), or rather that it was built with the intention of avoiding having to circulate British military vehicles through the city thus causing increased congestion, but ultimately quickly became used for common traffic purposes (Interview 4).

In 1947 Sir Patrick Abercrombie took part in a planning event where he gave his opinions about the current state of the city, as well as its present and future needs. He stressed the need

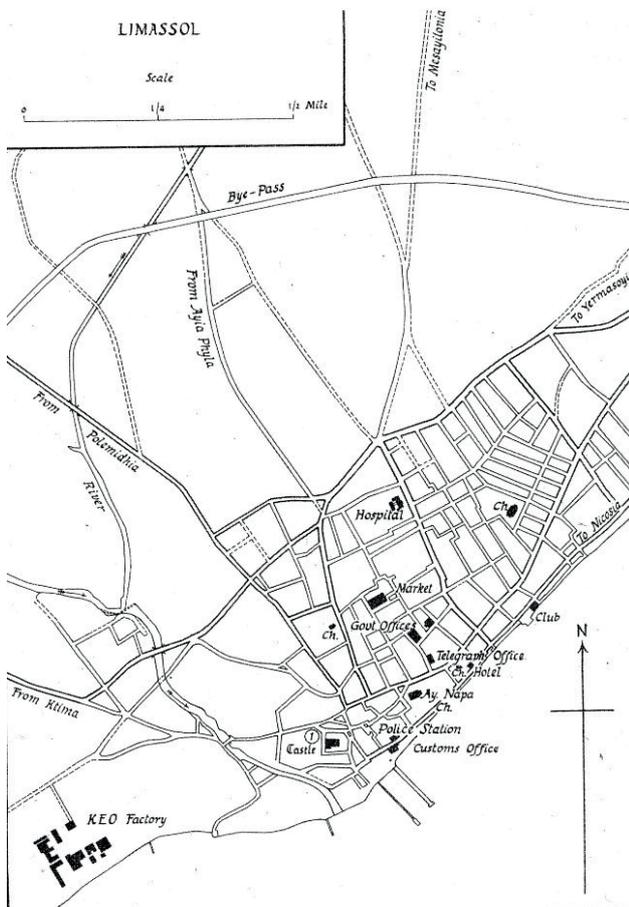


Figure 4. Tourist map of Limassol 1947. Source: Mangoian and Mangoian (1947)

to carry out a study of the city and to build up the empty areas within it; he suggested that construction should be remodeled in order to set a commercial center for the city, which should be pedestrianized. Furthermore, he stated that the road network should be reorganized with long-term views. Serghides (2012) points out that similar problems remain evident to the present day; in fact, it is not until 2014 that pedestrianization of the center is implemented, while empty areas within the urban environment remain common.

From the 1950s the expansion of the city continued radially; at this time, the road of Gladstonos, bounding the historical center had started becoming a focal point of entertainment. This seems to indicate a shift of the leisure area from the coastline towards the north as the city expanded and a new boundary was created by the new ring road. Residential densification in the took place through the development of small detached homes by the middle classes, a trend different from that taking place in contemporary Europe. A tourist map of 1974 (figure 5) poignantly shows the densification of the city following independence.

The Town and Country Planning Law was published in 1972, but it will not be enacted and local plans not drawn until 1990. Because of this, development continued to be dispersed and unregulated. At this time, the ring road (bye-pass) of Makariou starts competing with the center and coastal area as a business, retail and recreation center. This was partly because works were taking place on the coastline to construct the beach and expand the promenade, but also because of the growth of the city to the north. This indicates a further shift of the center towards the north, as commercial activities also appeared on the main routes connecting the historical center with Makariou. Residential development continued to follow a model of de-

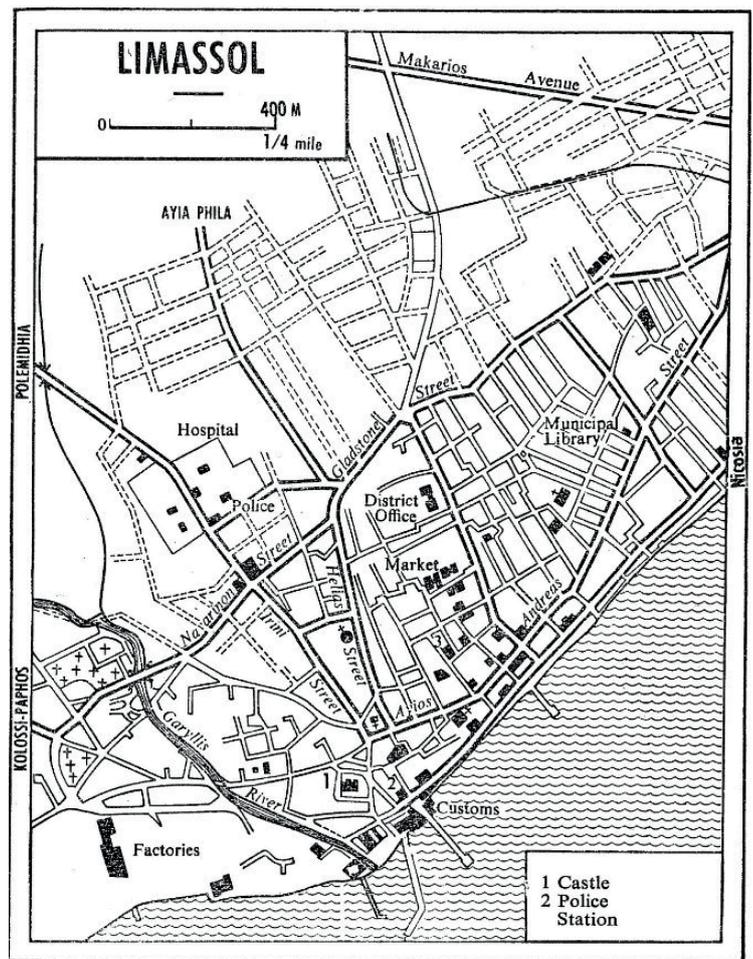


Figure 5. Tourist map of Limassol 1974. Source: *Cyprus (Cyprus, 4th edn, 1974)*

tached homes and ‘garden city’ neighborhoods, which, according to Serghides (2012), failed to acquire a specific character due to the large number of empty spaces within them.

Following the 1974 war Limassol saw an unprecedented population growth with an almost 30% increase between 1973 and 1976. The greatest portion of development during this period was constituted by residential construction to accommodate refugees, which included housing estates in peripheral areas of the city. A true building explosion commenced around 1979: the city expanded significantly and finally engulfed nearby villages – the growth of the city during the 20th and 21st centuries is summarized in figure 6.

Despite the great need for housing, density did not particularly increase; in fact, the city sprawled as housing estates were placed in peripheral areas where the Government already owned the land or was able to purchase it cheaply, while the private sector, within a loose system of building regulations, was concerned with meeting market demands for detached homes.

Road infrastructure works of the 1980s and 1990s included the construction of the motorway and the second ring road, completed by 1987 and 1990 respectively. Why priority was given to the motorway remains unclear, though national-level policy would have played a significant role; one suggestion is that it was because of the influx of refugees into Limassol and its consequent expansion (Interview 2), another that private and economic interests played a role (Interview 1).

The year 1990 was also a turning point as planning legislation was finally enacted and the first local plan was produced; attention shifted back to the town center and the coastal area,

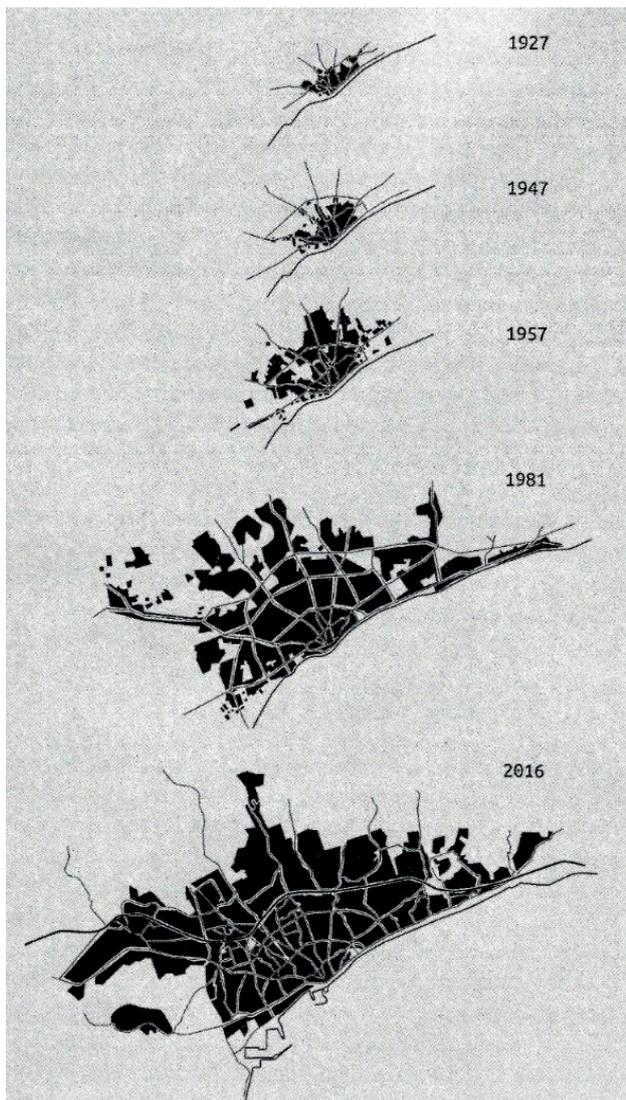


Figure 6. *Growth of the city 1927-2016. Source: Lianou and Christofinis (2016)*

which had decayed during the 1980s because of the focus put on new development in other areas of the city. During a strong local leadership from the middle of the 1990s to the middle of the 2000s, which thoroughly engaged in the regeneration of the town center, coupled with activism from local residents (Rakoczy, 2007), the city has undergone much renewal. However, there remains some criticism that this is prioritized towards temporary, visitor, recreational and tourist uses, rather than focusing on a long-term, more sustainable regeneration aimed at bringing back permanent residents into the town center.

A piece-meal system of planning was in place until fairly recently, a factor which has greatly contributed to the sprawling nature of the city and to the continued existence of large empty areas within its form. Structural factors clearly played a role in how the city developed as did the local economy and the balance of power between institutions and private interests.

Throughout the city's growth, the local administration has given priority to maintenance, improvement and widening of existing roads, as well as construction of major new routes. Certain necessary establishments, such as slaughterhouses, the hospital, markets and the like were also prioritized by the local Government at certain stages. However, while zones are designated for specific uses, the development of residential areas and their road infrastructure has been

left to the private sector, with public facilities being added on at a later stage. All this seems to have led to a situation where the creation of long routes associated to some large land uses tends to lead the expansion process. Residential developments then follow, producing 'patches' of compact grids between and along major routes.

Regeneration and development projects in the center and along the waterfront since the 1990s aimed at addressing this issue. As mentioned above, these have brought renewal and vitality to the center, but criticism to the priorities set by the recent projects has also been raised. Despite improvements made to public consultation processes in 2007, the feeling remains that a proper dialogue between citizens and planning authorities does not yet exist (Interview 1) and that often the requests and interests of land owners are met to the detriment of the public good (Interview 2).

Aside of guidelines set by local plans, there is no system in place to assess the impact of a single development on the whole city (Interview 3) and there are opinions that in many cases decisions are made which do not reflect the requirements of the plans or the views expressed in public consultations (Interview 2).

The widespread feeling about recent development in Limassol is that the flurry of activity is a highly positive trend. The redevelopment of the promenade was seen as particularly successful (Interview 5) and regeneration efforts as bringing Limassol to its best developmental phase (Interview 4) with its historic center blooming and booming once again (Interview 1). The Limassol Marina and the regeneration of the old port were also seen as positive interventions, but these were also fraught with reservations and discontent about their design, in particular the connections made between various redeveloped areas (Interview 1, 2 and 5). Regeneration of the town center also provoked mixed feelings with some seeing it as highly positive and successful (Interview 1 and 4), some thinking the effort was minimal (Interview 2).

When questioned about the balance of regeneration and development between the coastal area and other areas of the city, few were aware of any projects taking place outside the historical center or the coastline. Some thought that projects outside of the center, such as the linear park along the river, were positive (Interview 1); others thought that nothing of particular significance was taking place beyond the coastal area (Interview 2). While all expressed generally positive views about the regeneration of the coastal area, when asked about future priorities for Limassol almost all answers included the need to focus on local neighborhoods, mentioning the need to: make each neighborhood self-sufficient (Interview 1); build squares and green spaces (Interview 2), something that would make any city's neighborhood prettier and healthier (Interview 3); embellish the neighborhoods (Interview 4); strengthen other areas (Interview 5).

Cumulatively, the interviews give the impression that the recent developments were beneficial to their own local areas and that due to their central and coastal location, the wider population benefits from them. However, the general view remains that these have not addressed the broader problems of the city and have not significantly altered neither its problematic structure nor local neighborhoods' access to better facilities.

6. Discussion and conclusions

The quantitative spatial history of the city provided the basis to identify certain characteristics of change in the city through a long time span, in particular with regards to the nature and

functioning of the street network (presented here) and to the location of specific land uses at certain points in time (Geddes and Charalambous, 2017).

The centrality of cities has been shown to be a process (Hillier, 1999) and it is certainly not surprising that in Limassol this has shifted over time to ‘relocate’ to a more geographically central area characterised by higher accessibility. The decrease in the extent and continuity of the multi-scale core was also to be expected as this is in line with previous research showing that global accessibility and legibility tend to decrease over time as the city-system grows, and that this is the case for many Mediterranean port cities that have grown rapidly in recent years (Shpuza, 2009).

The configurational analysis highlighted two key problematic patterns which were validated by the qualitative analysis:

- the domination of the foreground structure over the background one, which is validated by literature and experts’ observations that the city developed radially and with a ‘fan-shaped’ pattern causing commercial uses to be dispersed along major roads;
- a lack of subcenters which have the spatial potential to sustain local activity, which is validated by experts’ comments that attention needs to be given to local neighborhoods, that local public spaces were never constructed and that a concentration of commercial uses was directed towards the center and vehicular roads.
- A small recent improvement in the accessibility of the historical town centre and in the balance between the foreground and background network, which is validated by experts’ positive views of coastal and central regeneration projects as benefiting the whole city.

The discrete benefits of developing the narrative were that it described the wider context within which the case study is set and gave an historical overview of Limassol’s development from a variety of viewpoints. Furthermore, the various tools used to build a narrative provided information where more objective data gathering was not possible or viable. However, the narrative was itself a useful tool because it revealed different perceptions of the city and different interpretations of its development.

The spatial history was clearly able to pick out a variety of problems in the functioning of the contemporary city, highlighting how these relate to the impact of growth, the nature of the expanding street network and recent interventions in the urban fabric. However, identifying the causal factors of such growth, aside of the specific spatial relations of various physical elements of the city, would not have been possible solely through quantitative analysis. Many of the characteristics and processes identified through the configurational analysis could only be contextualized through the historical narrative and verified through the interviews with expert stakeholders. In particular, the various global and local scales of causality which initiated specific phenomena of growth and development could only be identified through the narrative. On the one hand, at the global scale, is the impact of international relations and world economic changes on urbanization, population influx into the city and location of residential development; on the other hand, at the local level, is national economic resources and needs, planning legislation and policy, as well as corporate and individual private interests in real estate. The interaction of macro-level political processes with specific physical and human components, the destabilizing events of conflict interacting with other destabilizing processes of shifting land values, the national and local level planning policies, and the micro-level properties of the street network and the built fabric all conjointly led the specific form of the city.

These findings point to the fact that stark dichotomies between critical views of structural factors and the historical process being the fundamental causal determinants of urban characteristics, or, at the other end of the spectrum, the bottom-up view that urban form is shaped by everyday life and routine activities, is perhaps neither useful for the understanding of form and functioning, nor for the identification of causal factors. Using a broad framework, informed by assemblage theory, can be more productive in revealing the complexities of causal pathways. This has provided us with the ability to identify when and where structural properties and the temporal aspect influence city form. It allowed us to understand and interpret how human and physical components are connected together and it enabled us to identify the scales at which causality is initiated and mediated.

The narrative provided a baseline for reading, interpreting, validating and making inferences about the findings from quantitative analyses. Without the implementation of a comprehensive framework to understand the relationality of the city, it would have been impossible to empirically verify the existence of problems and developmental characteristics and processes identified solely through the application of an individual approach. The framework was key in understanding the contemporary socio-physical identity of the city and what caused this identity, as well as informing the identification of issues, potentials and priorities which can aid planning.

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