Article

Transitional Morphologies. Urban forms: generation and regeneration processes. An agenda

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Abstract: Grounded on urban morphology studies, the research tries to overcome the analysis of the permanents elements of the city seeking for a transitional paradigm in urban morphology, aiming at grasping the dynamics in urban evolution and providing operative tools for urban regeneration design in an adaptive approach. A combination of four actions of urban analysis is here suggested to highlight urban dynamics: a. Sorting the transitional steps of urban morphologies (within rapid market processes), b. Underlining rules and Processes characterizing urban coding in transition, c. Mapping urban assemblages in the adaptive city and d. Reading and representing urban permutation phenomenon. The results of this multifaced and multidimensional set of analytical tools allow to outline a new design thinking paradigm moving towards a parametric approach to urban design of cities in transition broadening the extent of urban regeneration process and supporting urban policies in the framework community based approach.

Keywords: Urban morphology; Transitional morphologies; Assemblage; Urban coding; Adaptive city; Permutation; Parametric Design

1. Introduction

Every city is a complex and dynamic system: urban settlements change their form in time, as it always happened in the past and as it also happens nowadays (maybe just at an increasing speed). Approaching this kind of phenomena, urban studies mostly focus on the previous morphologic order and the transformed one, analyzing the difference between the two status. On the contrary, studying the dynamics themselves of urban form changes, the incremental metamorphosis/assemblages of urban elements and spaces, in short not only the starting and the final status, but all the phases between them, can give an important contribution to operative urban studies, looking at urban generation and regeneration design processes and supporting decision system.

The "Transitional Morphologies" Joint Research Unit, established in 2008 between Southeast University Nanjing and Politecnico di Torino researches on strategies and methods used by human settlements to incrementally change an assembly buildings and space from one period to another period, from one place to another place, from one culture to another culture.

The specific mission of the research unit is grounding urban adaptive regeneration design processes through describing the state of urban morphologies, their historical causes (by the side of economy or society and because of their symbolic value) in Asia as well as in Europe and the South of the World.

In order to describe the role and the perspectives of "Transitional Morphologies" research program, this paper will define what "transition" means and it will describe which kind of processes drive urban change (either influenced by economics' events, or oriented by code settings), also explaining how transitional forms and transitional processes can be mapped and how transitions can

be read/described/represented, in order to discover their logic and to verify automatic protocols of urban transformations, useful for urban generations and regenerations through a community based approach.

2. Materials and Methods

Adopting the paradigm of "transition" means studying urban morphologies not as the result of a process, but as the process itself. This paradigm requires an effort of conceptual clarification and at the same time the description of a general framework of tools and actions necessary to carry out transitional studies on the contemporary city.

Generally speaking, transition is the process through which a change from one state, stage, subject or place to another state, stage, subject or place happens. It comes from the Latin verb "transire", that means "passing through".

It keeps the idea that from one state to another state, there's an intermediate step/phase in which the first state already developed, but the final one is not yet caught.

In physics we can recognize (and specifically name) "transition phases": liquid to gas transition phase is known as "vaporization" and liquid to solid transition phase is known as "freezing", as well as solid to liquid phase transitions are known as "melting" and solid to gas phase transitions are known as "sublimation". However, in most cases, solids turn into gases only after an intermediate liquid state.

There is a transitional paradigm well known in political sciences and it concerns the movement of the so called developing countries towards the state of the developed ones. In anthropological studies the ecological transition is a topic, which refers to the process by which humans incorporate nature into society. Even in those cases the greater attention is normally paid to the transition phases themselves and to the intermediate state, rather than to the final state. The transitional paradigm is effective in describing any kind of process, any way to be dynamic of a determined phenomenon.

Observing transitions means considering invariants and permutations into a given process. In the field of mathematics invariant is the property of a mathematical object (or of a class of mathematical objects), which remains unchanged, after operations or transformations are applied to that object (or that class of objects). In the same field the permutation of a set is an arrangement of its members into a sequence or linear order, or if the set is already ordered, a rearrangement of its elements (in fact the word "permutation" also refers to the act or process of changing the linear order of an ordered set).

What must be considered is that permutation is a process that changes a given order (or an ordered set) in a new order: it doesn't mean an entropic pathway towards a chaotic system, but a way to find a new system, capable of answering different circumstances.

From a transitional point of view, what is fixed (invariants) is the skeleton and the framework of a phenomenon, but only the permutations can show the secrets (rules and behaviors) of the dynamic actions of change in the context of that phenomenon.

In the field of urban morphology that means that, if the role of the invariants is describing the main structure of an urban question, the numerous variations induced by permutations due to several (social, economic, climate) factors, they are driving and describing the transitional urban morphologies.

3. Results

3.1. Towards a transitional paradigm in urban morphology

Urban morphology shows to have (at least in the Italian tradition of studies) a very important background in structuralism. It is a general theory of culture and methodology, initially developed in linguistics and later transferred to many other fields related with anthropology: sociology, archaeology, history and so on. One of the main ideas of structuralism argues that there are invariant, universal, and collective structures in human thinking, expressions, products, behaviors that we can generally define as patterns.

During the Sixties of the 20th Century, because of the dominant role of the structuralist epistemology, also the city was treated as an instrument of communication filled with signs that are the meaningful structures, universal, unconscious, and invariant.

In his book The Architecture of the City (1966), Aldo Rossi spoke about ''meaningful permanencies'' about the urban elements that don't change in time: the streets overall, but also the monuments and the types of building (such as the residential blocks) [1]. That structuralist approach to the topic of urban morphology was strictly linked with the emerging debate about Italian historical centers and the looking for the existing ideal skeleton in urban forms was a strong point to let that debate turn towards the real and material constitutions of urban facts (instead of insisting in remaining at the socio-economic level).

As it was really clear to the antecedent masters of Rossi's thought, Saverio Muratori and Gianfranco Caniggia, there are no invariants without permutations. Recognizing permanent elements into the urban scenario is useful overall to better understand the dynamics of all the other elements that continuously change in shape, in configuration, in location, inside the map of a city.

If it is true that in his historic typological study of Venice, Muratori [2]made a comparison between the centuries on the internal structure of architecture, Caniggia [3]openly showed his interest for a morphogenetic approach, that is for the genesis and the development of urban forms: as it has been remarked by J.W.R. Whitehand [4], "Caniggia is trying to enunciate principles whereby cities can be transformed: his formulations tend to be (…) abstract". Being confident in recognizing the dynamics' models of urban form, the development in time of urban elements, the continuous change of urban spaces, all that means reasoning through permutations more than through invariants.

Furthermore, we cannot forget that the main goal of those studies was not the urban analysis in itself, but the urban design for urban restoration, reuse, regeneration. Saverio Muratori gave to his work on Venice (1960) the title Studi per una operante storia urbana di Venezia [5], where the adjective/present participle "operante" is full of meaning to qualify his urban history of Venice and can be translated "working" as well as "operational" [6] or even "operative", as it will be in the present paper, in order to keep together the semantic value of "working" and "operational" and to extend the Muratorian concept to any kind of urban study that is regeneration design oriented.

Transitional urban morphologies are an operative conceptual instrument to investigate the urban form of contemporary cities (in Asia, Europe, and the South of the World) in their development in history, until their present reality, and even looking at their possible future configurations in possible urban design processes: they also must be considered and studied as (possible) permutations.

"Transitional morphologies" is an expression coming at the same time from urbanism and paleontology. In urbanism "Cities in transition" is a way to describe the condition of contemporary cities, always in the process of changing into something different, because of the changes caused by the demographic indexes, by the lack or improvement of infrastructures, by the role of innovative technologies [7]. In paleontology "Transitional morphologies" is a way to describe the sequence of the development of an animal being in prehistoric times, read through fossils: the missing rings in any evolutionary morphologic chain is always a transitional question [8].

3.2. Sorting transitional steps of urban morphologies (within rapid market processes)

The complexity and dynamism of cities gave birth to a widespread tendency in urban studies: to relate them to biological organisms [9]. Their development, just like for biological entities, happens both in a slow, steady way - accomplished by small mutations - and quickly through periodic mutations caused by rapid environmental changes [10-12].

Going beyond this transdisciplinary analogy, for the studies that keep the city as an economical matter, the pace of evolution of the urban form can be understood through market forces that shape it [13]. Usually at urban scale, because of the presence of inertia linked to the existing local conditions - such as norms, property rights, communities etc. - permutation processes take a long time and the changes in built fabric occur in a relatively slow way. On the other hand, if the discrepancies in the different economic values of the use of former and later are high enough to overcome those inertias,

then rapid transitions that lead to drastic mutations in the urban fabric occur [14]. This is when the transformation of an obsolescent neighborhood becomes optimal.

One of the challenges of nowadays is gaining intuition regarding such rapid changes that characterize contemporary times, to find a way to read them in their maximum integrity.

As mentioned above, the idea of transitional forms (the missing rings in the process chain) is used in paleontology to construct a complete record of the subject's evolution [15]. The intermediate phase is used to link the persecutor and the ancestor of the same species in order to seek for hints on factors of change. The main scholars that shaped the urban morphology studies, have been using this concept to document the long-standing mutations of the built environment related to human life. Ten years after Muratori read Venice's evolution through centuries, also M. R. G. Conzen, the founder of the British school of urban morphology, observed the evolution of space through multiple periodical time frames when analyzing Alnwick's urban form [4,16].

Although these studies give perfect evidence on morphological evolution of the city with a longer steady pace, understanding nowadays the drastic transformations of contemporary spaces, requires a more tailored analysis, overall when explained under high economic value creation (profit).

The implicit argument built up to this point is that urban morphology, when described in a mono-dimension and perceived at two ended processes (just the starting and the final status), do not bring into viewing important factors of change: neither the idea of profitability (the main element in economic point of view that trigger the transformation process), nor the factor of time. Under this point of view, morphologies are seen both as conditions on which inertias are created and outcomes of a periodic change (when those inertias themselves are overcome).

A transitional morphology approach helps in identifying transitional phases of mutating physical space in relation to its economic value, allowing to sort systematically morphological and economic data for a given time frame for a given place.

Firkitepe, for example, is a neighborhood in Kadikoy district, on the Asian side of Istanbul, and is one of the earliest squatter areas of the city, now invested almost a decade (2012-2021) of gentrification's processes [17].

At first, the change in the built form and in the land prices for a given period can be observed independently (Figure 1, Figure 2). Later, different categories of information have been superimposed in chronological order in biennial intervals for the length of time where transformation occurs (Figure 3).

Figure 1. The change in built form of the Fikirtepe area between 2012 – 2018 (time 0 – time 3).

Figure 3. Construction of transitional steps of the sample under analysis between 2012 – 2018 (time 0 – time 3).
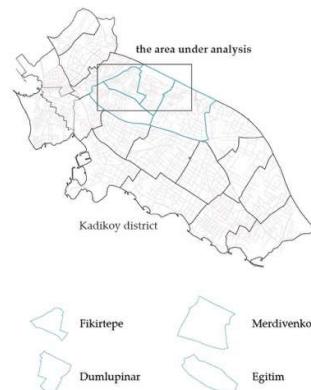

Figure 2. Land price increases in neighborhoods of the Kadikoy district between 2012 – 2018. It is calculated with real values of cadastral land prices obtained from Kadikoy municipality. The area under analysis comprises parts of Dumlupinar, Egitim, Fikirtepe, Merdivenkoy administrative neighborhood limits.

For constructing the whole image, a handful of details need to be paid attention. First, capturing widespread effects of meta trends on the local built fabric is merely possible through microscopic sampling. In this case, an urban block is taken as a molecular sample and proper information on its main urban elements (street, plot, building) is distinguishably associated. Second, usually the data for an accurate local analysis at this scale is available at local data sources. Even though morphological information may be extracted from available open sources, accurate information on property and prices likely requires field surveys or data acquisition from local administration offices. In this case morphological and economic data were acquired from the municipality records. The acquired data, later, depending on their nature and geographical context will need a normalization and elaboration process. Third, all the information collected needs to be reconstructed under a chronological order taking into account significance of each layer.

For dealing with the complexity of an area where evident transitions have been observed (as in Firkitepe) distinct categories have been identified and the relations between those aspects have been previously clarified. Given the initial premises, the main categories suggested for this reading are strictly morphological and economical. Respectively three layers can be defined: the morphology, as the form of material space [18], the property, as the form of the control [19] and the land value as the monetary price of a land [20].

This approach evidences not only the interplay between increasing land values and transforming urban form, but also highlights the processual nature that transforming urban morphologies possess. Sorting transition into its steps helps to put in order permuting elements, construct transdisciplinary relations, and see what comes before and after: what generates what, what is conditioned by the other and how it all works.

Moreover, it should be noted that the idea of profitability in urban transformation shouldn't be exclusive to the contemporary world, but it is widespread and essential more than ever. Thus, it can no longer be neglected in accurate studies which practice contemporary transformation processes. Hybrid methodologies encapsulated in a multi-level perspective that integrates different disciplines working independently can be a promising start.

3.3. Urban coding in transition. Rules and processes

If the change induced in urban morphologies by market factors happens in the way described above as a slow and steady way, with sudden rapid metamorphosis, another kind of change in urban morphologies can be planned adopting urban codes. If the market driven changes follow a kind of biological development, the codes driven changes follow a rather deterministic evolution. However, also those sets of formal rules (urban codes) that are governance tools for decision makers (in generating and regenerating cities, too) can find a deep relationship thanks to the transitional urban morphologies' paradigm.

Cities show nowadays a typical combination of homogeneity, due to the history of their development, and of diversity, induced by the application of rules. The diversity is framed by two specific kinds of order: one is due to urban plans, the other is due to urban codes [21]. In recent years the significance of urban codes has been brought into sharp focus, either as instruments suitable for urban adaptive regeneration, or as new tools for shaping the future [22].

Developing a new generation of urban planning and design rules requires a deep and maybe critical understanding of three main factors: the origin of urban codes, their historical evolution and their effects on the built environment. According to a positivistic - but still shared and alive - opinion, manipulating through rules urban patterns, uses, and forms, substantially impacts the quality of inhabitants' life. The paradigm of social sustainability is nowadays deeply pursued in urban planning.

Nevertheless, by the symmetric side, urban codes can improve their efficiency in considering the results of urban form analysis. The urban morphological studies, overall as they were originally established by the Italian School between the Sixties and the Eighties of last century, are able not only in reading the evolution of the city, but also in becoming fundamental assets in the formulation and application of codes, mostly when those codes show to have a relevant formal background.

In order to renew the connection between the activities of urban morphological studies (through mapping urban realities) and urban coding (through establishing sets of rules), the transitional morphologies approach asks to face the definition of three parameters: urban space, time (between description and prescription) and operative tools.

Even if urban mapping and urban coding are devoted to the same topic (generally speaking: urban space), they consider it differently. The Italian approach to urban morphology considers the city as a fact that can be described and classified by types and type is intended as a tool to investigate the city's architectural artefacts and their disposition/combination [2]. Traditional urban coding, on the contrary, investigates the space of the city quantitatively. The Italian modern city's advent leads the interpretation of space through national laws, starting from the urban planning law of 1942, based on the idea of zoning: describing cities as the patchwork of homogeneous areas, with clear regulatory boundaries, is the original abstraction suggested for an urban-codes-driven planning activity. As any abstraction is unable to treat differences and singularities, the zoning boundaries neglect a series of grey areas in which the urban plan stops planning and limits itself to regulating the use of the assigned building potential [23].

It is true that at the same time, the Italian tradition of studies on urban morphologies considers the ancient city as the only object of study [24]. From the Seventies on, in front of the industrial city, heavy criticisms occur because of the difficulty in analyzing the expanding city's urban fabric and hardest criticisms concerned the absence of a precise relationship between known types and the built environment of peripheries urban fabric, highlighting so the lack of typological interpretative categories for the shapes of a city in transition.

Transitions happen in time and the role of time in mapping the evolution of urban forms and in testing the efficiency of urban coding is the second main issue. Urban morphology considers time as a descriptive factor, able to let us understand the shape of things as they are in their historical becoming, so that every new territory's shape is a state of transition. Despite the high attention to urban history, the Italian approach to urban morphology shows also a strong predisposition towards urban project, that recognizes the constraint for design in the historical analysis of urban analysis: "studies for an operating urban history".

Urban coding, on the contrary, assigns time a prescriptive value, putting urban forms in a predictive perspective. Laws, rules and norms show limited efficiency in time: they begin to produce their effects from a specific moment and cease to produce them in another moment. Nonetheless, the predictive nature of urban codes, implemented according to the planning instrument, is sometimes ineffective: plans do not clearly distinguish the rules and procedures from objectives, long-term choices and short-term forecasts [25].

What can solve the aporia of the different consideration of urban space and urban time between urban morphology and urban planning, between mapping and coding, can be a main and specific operative tool, the cartography, maybe renovated in the quantity and quality of its information, as it will be explained in next paragraphs.

The map used by Muratori to map the urban space (and time) of Venice, as well as the one used by Caniggia in Como, develops a representation system, whose main medium is the typological horizontal section. The method was based on the tradition of urban archaeological surveys (the maps of Rome from Giambattista Nolli to Rodolfo Lanciani), with their strong character of abstractness and their multi-scalar analytical approach. There is no interest in buildings' height in typological maps that show urban fabrics and urban patterns.

Urban codes, as implementation of urban plans, are often a complex system of prescriptions and maps, which are different and complementary [26]: the urban plan, as an operative instrument, has to point out the forecasts and indications relating to settlements, services and the environmental system's structural contents and these goals are pursued in a perspective of quantitative approximation, also in terms of representation.

A transitional-morphologies-lead urban coding can: mapping urban space, mapping "urban time" and adopting overall the operative tool of new cartographies, able to describe the form of the

so called informal settlements, to re-sort its contents adopting innovative diagrammatic methods, looking at the perspective of parametric morphologic design.

The possible crossover between urban morphology and urban coding could be tested in the Italian historical centers of nowadays, that present a compact urban fabric and many questions not yet defined by urban planning. Here, morphological analysis is intertwined with the diachronic study of urban regulations in an experimental field. The new urban transitional code for the historical center of Rimini (Italy), for example, focuses on the formal classification of fabric and the provision of rules that consider the urban formal evolution (Figure 4) [27].

Figure 4. Rimini's historical center morphological analysis. A formal classification of the urban fabric starting from the built pattern and identification of five morphologically homogeneous intramural and extramural areas.

There is a distinct advantage in combining 'loose' analogical thinking and 'strict' systematic thinking. Combining different kinds of description provides a richer and more accessible body of knowledge **[28]**. Besides, selecting the most compelling aspects for analyzing the city makes it possible to bring about an incisive change in the urban environment's design, making it resilient.

3.4. Mapping urban assemblages (and the adaptive city)

Urban coding and urban morphology approaches (Muratori, Caniggia and also Conzen) [2,3,16] help in framing planning, urban development and change in developed regions with enduring and precise legal property declinations. Nevertheless, a vast percentage of the rapid urbanization processes of nowadays are happening in developing regions through informal settlements with processes that have ignored structured urban codes and rules. Contemporary urban conditions push towards adaptability in a context of increasing pressures such as rapid urbanization and climate

change. It is precisely in informal settlements that emblematic examples of adaptability and incremental development can be recognized [29-31].

This phenomenon constitutes a great opportunity to study the transition from one formal state to another formal state, in a framework in which the role of the market and codes is less relevant in the face of the spatial and formal characteristics of the processes of urban generation and regeneration. This is an important verification for the transitional morphologies' paradigm itself.

Informal settlements represent complex adaptive assemblages that are dynamic and unpredictable; their self-organization patterns emerge with particular resilience and vulnerability levels [30]. In an effort to go beyond the negative connotations these assemblages have, observing their morphological characteristics and understanding their spatial patterns opens an opportunity to see potential in their incremental nature.

"Assemblage" is a crucial concept in Deleuzian philosophy that has been adopted in many disciplines as a theoretical and methodological framework for exploring complexity: "the concept of an assemblage is commonly used to connote indeterminacy, emergence, becoming, processuality, turbulence and the sociomateriality of a phenomenon" [32]. In this sense, assemblage thinking works well when dealing with the urban phenomena and their socio-spatial complexities. Rather than focusing on urban environments in their final state, assemblage thinking is interested in emergence and process and multiple possibilities and temporalities. In other words, it plays an important role in better defining the transitional morphologies paradigm, showing urban spaces assemblages through their transition and evolution in time.

Since in many common urban process studies, a tool to observe, measure and understand assemblages is needed, mapping represents a potential method to explore complex urban assemblages, their processes, and adaptability. Through mapping, the urban landscape could be decomposed in overlapping layers. In an urban morphology study context, these layers could be about the morphology of the assemblages but also about the relations among the different elements and agents that frame them [33].

As useful as mapping is for the understanding of urban dynamics, there are many challenges to overcome when binding it to informal assemblages. By definition, informal settlements develop outside of the city's formal gaze [34], which means they rarely appear in official maps. Existing data on informal assemblages are not available, accurate or complete [35,36]. This lack of data represents a challenge that often complicates research on urbanization in developing countries. What is more, inaccurate data inhibit agencies, city officials' and scholars' efforts to inform appropriate policies about the phenomena [36].

Recently, available online interfaces with maps and satellite imagery can potentially solve these issues and provide a source of up-to-date geographic and satellite information to study informal assemblages and their changing morphology. In this sense, Open Street maps, Google Maps and Google Earth Pro represent widely accessible datasets that can be used across cases in mapping processes. Furthermore, the emergence and development of Geographic Information System (GIS) allow digital technologies to display complex spatial datasets [37]. Examples of automated methodologies to map informal assemblage areas can be found in the academic realm [35,38-40]. However, GIS deals primarily on a geographic scale, and its use is less prevalent for morphological information. As a result, the mapping activity here proposed uses a combination of remote sensing data and direct desktop mapping with available satellite photography in order to achieve morphological maps.

Here mapping deals with overlapping different data: demographic, cartographic, satellite imaging. This overlapping allows covering different scales from regions to blocks and to buildings, as well as different time frames, to highlight the assemblages' transitional character. The mapping process observes enclaves of urban assemblages in different scales (urban scale, and block scale) and in different time frames.

Luanda is the most populated city in Angola, which presents morphological characteristics of informality and formality at the same time. At the urban scale, the morphological analysis regards the following variables: streets and their arrangement, formal or planned morphologies and their

open spaces, and informal morphologies and their open spaces (Figure 5) [41]. On a smaller scale, samples are observed to analyze the informal sections' change in time: the aim of this approach [42] is recognizing morphogenic characteristics of the informal assemblages. For each sample, a multi-layered database that includes: building footprint, road network, and boundaries is created (Figure 6). The process is described by the aid of up to 4 aerial photographs of different intervals (ranging from 2000 - 2020). [41]
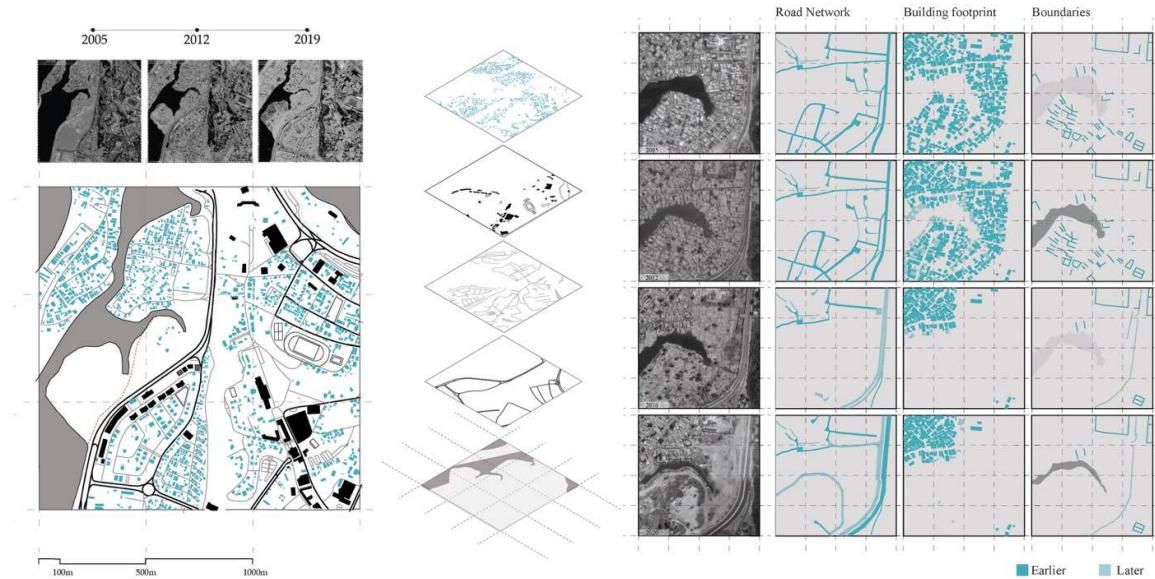
Figure 5. Example of mapping operation at a urban scale. Overlapping of layers regarding variables of analysis. Sample taken from a consolidated area in the city of Luanda, Angola.

Figure 6. Example of mapping operation at a block scale. Multilayered diachronic study regarding variables analysis. Sample taken from a consolidated area in the city of Luanda, Angola

The results of the mapping in the urban scale show an alternative contribution to not existing official information from which some considerations can be made. Signs of evictions and relocations, signs of reclaimed land, modifications due to important urban infrastructure projects can be read through the comparison of the sample's morphologies. In the block scale, critical aspects of informal processes can be observed. Street layouts and plots do not appear before buildings, but they develop together. This incremental process of co-evolvement makes the assemblages highly resilient and adaptable. Incrementality is recognized as a key characteristic of these assemblages and a characteristic that could solve some of the problems linked to their seemingly chaotic nature in a step-by-step process of upgrading [31].

In the long run, this type of mapping will be able to show the potential to create an atlas of samples that may bring a better understanding of how these assemblages work in terms of their morphologies and adaptations. In this way the morphology of an assemblage provides a consistent descriptive language for the built environment and facilitates comparison. As for the resultant maps' role, they embody spatial knowledge that is not replaceable by words or numbers [43]. In this sense, mapping becomes a medium to combine information and visualize it in order to understand complex situations in urban assemblages.

3.5. Reading and representing urban permutation

Mapping as a medium allows us to represent transitional morphologies and to understand how the city is made and how it mutates. If the study of urban morphology focuses on identifying how transitional characters can be distinguished within the city, the necessity occurs of overlapping the

operative method (mapping) with any reading tools, suitable to identify sequences of patterns, starting from their matrices and logically reconstructing the intermediate state [3].

The main aim of reading urban transition in time is discovering the "laws of continuity within a transformation process" [44]. In this sense, representing urban transition means to define a reading method of the transformation process inside the city with mapping as an operative tool.

As mentioned above, morphological maps have been developed as a tool first by Muratori and later on integrated with the typo-morphological approach on an architectural scale. He identified in surveying and mapping a method for an organic study, overlapping his method of investigation upon the city with a representation method [2]. With the approach focused on understanding how the city changes, linking past and present, maps can be seen as diagrams showing the evolution of our collective thought about a specific spatial domain.

As archival images documenting states of knowledge, they help us in appreciating those who attempted to explore the same terrain in earlier epochs with a less adequate measurement instrument [45]. Even if the evolution shown by maps is multi-perspective (they are based on different representations made by different people in a different time), maps can be studied with the purpose to represent the overall complexity of the transitional processes.

The use of maps made by Saverio Muratori and Gianfranco Caniggia follows the same principle described by Hall: an overlapping on different layers that define the evolution of a specific part of the city. Starting from the map's definition, the process of reading urban spaces developed by the Italian morphological school can be compared with a diagrammatic method. In the same way, Bernard Hillier, founder of Space Syntax theory, situated his analysis within the spatial evolution of specific urban settings and buildings. Here the matter is a location within an existing spatial order that may be approached through a diagrammatic process closer to mapping than anything else. However, it is a kind of mapping oriented towards revealing the underlying structure, a mapping that becomes a vehicle for identifying underlying principles rather than for recording what is readily manifest.

A map provides an orientation to an actual setting [46]. The attention moves with it from a spatial reading of the urban frame's existing condition to a future perspective on changes inside the city, to work with permutation in urban resilience and space adaptation. Diagrams are not merely associated with analyzing objects and patterns projected onto them. As such, an operative method may be experienced as a continuous diagramming practice to represent diachronic and synchronic dynamicity.

The diagram became a vehicle that registers a process of becoming [46] and for this reason also it is able to read permutation in a more performative way. To understand how permutation can be read through morphological study, we should start from the beginning of the analysis and address the elements deduced from typo-morphological maps: scale, space, time, structure and deviation that define the process of transition. The study of Venice by Muratori, the maps of Como by Caniggia and

Hillier analysis gives a starting point for a methodological analysis on the behavior of maps according to the study of urban morphology (Figure 7).
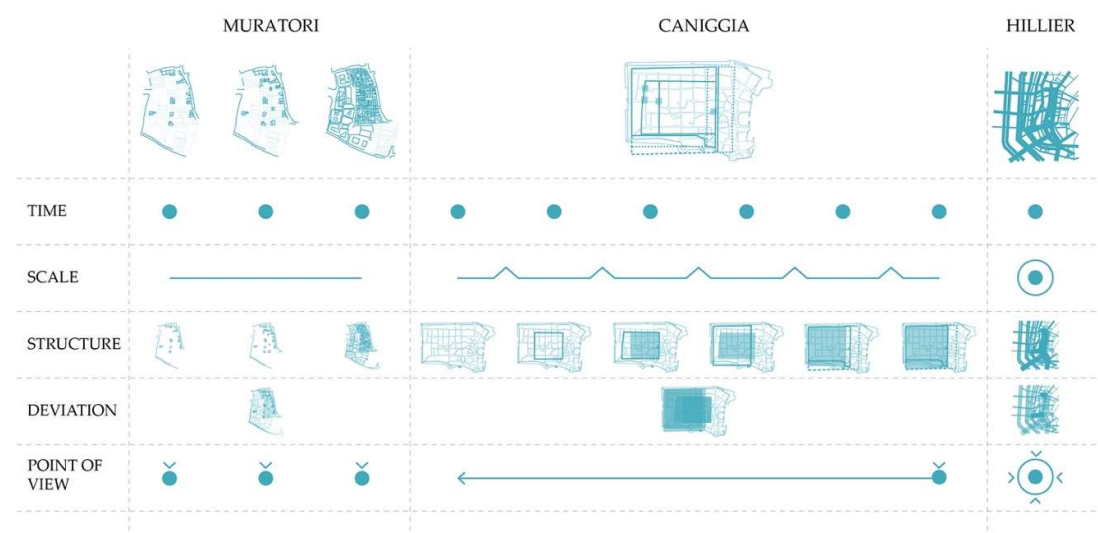

Figure 7. Comparison of mapping method from Muratori (San Bartolomio, Venice), Caniggia (Como) and Hillier (Space Syntax analysis, Amsterdam, based on Elek Pafka (2017)).

All the considered elements give specificity to the reading method of cities and can be compared in the process of diagramming. Permutation, transformation process and evolution are all characterized by a specific structure identified to define multiple scenarios. Moreover, it is necessary to provide a recognizable pattern linkable to the urban shape [47]. Implementing the diagrammatic method used by urban morphology schools in reading urban patterns can shift the attention from a historical point of view to a future perspective. The operative method of Italian school defines diagrammatic modelling principles, that allow reading single events in the city and connecting them into a whole complexity. If representing urban transition as an operative method aims to read recurrences, identifying invariants and variations aims to define a reading matrix in a permutation system [48]. That outcomes can be used for future generative approaches on urban patterns in the frame of responsive design [49].

3.6. Towards a parametric approach to urban transition. Overcoming urban regeneration

In looking for a generative approach to grasp the transitional character of urban transformation, parametric strategies are often conceived as powerful tools to set up a semi-automation of the recursively process for the definition of design responsive solutions. Nowadays, they are specifically related to technical issues, such as the actions aimed at mitigate and adapt buildings and settlements to climate conditions: the role that urban morphology plays in resisting the effects of climate change is now widely recognized [50], as well as indexes and parameters able to measure the impact of urban form as a mitigation's factor [51].

In this frame, a meaningful example is the setting of a platform for data exchange between different software, which constitutes the proof that parametric approach is able to set generative models at urban scale. Generative models are able to produce spatial solutions through processes of form finding controlled by designers, who can manage and redirect the design workflow through successive feedbacks, taking into account the change's conditions of physical and socio-economic context related to climate change.

In order to upgrade parametric generative models to be employed in regeneration processes and to use them as a tool in the frame of participatory approach in urban transformations, working on the

relationship between values and parameters becomes. By considering urban morphology as the physical outcome of community values, we need to work on the translation of formal values (as morphologic characters) into objective parameters bridging urban morphology and parametric approach (Figure 8).
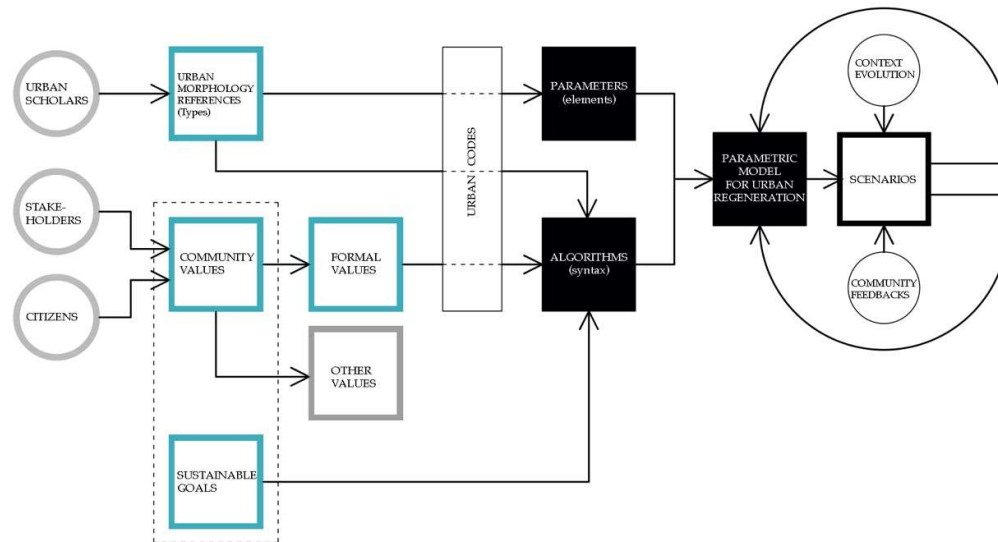

Figure 8. Parametric generative diagram for urban regeneration process

A first step in this direction has been done by Peeters and Etzion [52], setting up an automated recognition of urban objects for morphological urban analysis. Their work develops the analytical side of the questions, but recognizing elementary morphological entities and linking them to objective parameters, sounds like the promise to develop their research's outcomes for generative scope.

The further step towards generative models shall take into account the difference between the process of form finding and the concept of form shaping. Form finding process, as employed by Sergio Musmeci or Otto Frei at the architectural scale, keeps the form as something pre-existing to the design process, whose role is only to reveal the primigenial form, while form shaping process, as described in the theoretical work by Patrick Schumacher, describes the process of translation of the form into primary elements and the control of their mutual relationships. A form finding process brings the idea that an optimized configuration exists and urban designers, whose role is in this case close to a demiurge, only need to reveal it analyzing the forces (in a metaphorical sense) and determining its configuration. On the other side a form shaping process admits a multiplicity of configurations in response to the external stresses, coming from a multiplicity of recognized stakeholders, acting on the urban form as a decision-making question. Form shaping shows to be more likely to constitute a powerful tool in managing urban adaptive regeneration processes, considering the several opposing stresses engendering the transitional character of the city, established as a permanent starting condition.

4. Discussion

The term regeneration is nowadays an overused word and a new definition of the term is needed not only to better describe, but more importantly to foster and drive, urban transformations of declining areas or districts.

Even if the multidimensional concept of urban regeneration still often confused with the mainly physical phenomenon of the urban renewal [53], the term urban regeneration traditionally refers, in disciplinary literature, to area-based interventions - often publicly funded or supported - aimed at

producing ongoing improvements in the social, economic and physical conditions of places and communities, experiencing aspects of decline [54].

A new point of view introduced by Mc Guirk [55] considers regeneration as assemblage of processes centered on producing the above-mentioned improvements. In assemblage theory, assemblages (or relationships) are formed through the processes of coding, stratification, and territorialization as Deleuze and Guattari draw from dynamical systems theory, which explores the way material systems self-organize, and extend the theory to include social, linguistic, and philosophical systems in order to create assemblage theory [56]. From this perspective it is possible to assume that an assemblage-theory-based approach enables to set a relational and multiplex conception of regeneration, as subject to a range of relational effects and determinations, rather than a strategic project driven by institutional design from authoritative bodies. Assemblage's relational ontology understands the urban condition as a constellation of elements configured into dynamic arrangements of relationships and composed into "some form of provisional socio-spatial formation" [57].

In this frame, regeneration might be considered as a complex process able to preserve memory, to improve physical and social dimensions of declining areas, but also suitable to generate new values, grasping local changes and global dynamics, considering the form of the city as provisional, not forever defined, in one word: "transitional".

Urban morphology, considered as a dynamic phenomenon and not as a final configuration, embodies and displays the transitional socio-spatial formation mentioned above.

How to drive transitional urban morphology is one of the main challenges of the "Transitional Morphologies" joint research unit and it is strictly connected to the relation between urban morphology and community's values [58], as well as to their translation into parameters, able to support a new approach to urban regeneration (and generation) design, based on community values in order to effectively becoming a decision support system for urban policies.

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