

VERTICAL VERSUS HORIZONTAL: THEORY AND PRACTICE OF URBAN DENSIFICATION IN EVOLVING METROPOLISES

Alice Monacelli, Master student of Architecture, TU Wien, Austria

Simona Tondelli, Full professor of Technical Urbanism, Alma Mater University of Bologna, Italy

Annarita Ferrante, Full professor of Architecture, Alma Mater University of Bologna, Italy

ABSTRACT

The urban growth, its continuous use of land and the associated problem of soil sealing force urban expansions to search for a sustainable densification.

The paper attempts to explore and compare the urban conditions' growth on the fringes of two cities in Asia and Europe - Shenzhen and Vienna - as two opposite realities defining different strategies to control the urban expansion: while Shenzhen use the verticality to create new space, Vienna works on the horizontality and the regeneration, generating a neighbor's contiguity in the urban areas.

The paper discusses and illustrates the two possibilities for dense built environments -horizontality and verticality in the metropolitan form-, as opposite yet possible strategies to achieve dense built environments qualifying urban spaces, infrastructures, buildings.

To this aim Hong Kong, and Vienna are compared, to understand differences and attempt at responding to the central research question: Is it possible to identify an optimal urban form? Buildings' and neighborhood's typologies have been observed to aim at this understanding.

Even though general conclusions cannot be drawn from specific case studies, is the authors' considered opinion that urban textures in the built environments are very much connected with and their successful evolution depends on the strict relation with humans and their activities (working, living, entertaining and dwelling). In this context, appropriate strategies for urban densification, in their different forms, might represent an effective path to meet the new conflicting challenges of sustainability and rapid urban growth.

Keywords: Densification, Vertical VS Horizontal, Urban growth

INTRODUCTION

Density is actually one of the most discussed issues when it comes to urban form. If we could sum up the concept of density in a graph, we would say that the increase of density is inversely proportional to the availability of resources. The overall estimation assumes that in the near future the global population will continue to grow, especially in the metropolis and, in general, in the already developed urban areas.

Densification is a phenomenon that is accompanied, as investigated in recent decades, with settlement dispersion. It is a common opinion on the part of many researchers who have conducted studies on the consequences of urban settlement that this phenomenon has led to an excessive consumption of land and resources. By investigating the possibilities of increasing urban density within already densified areas, it is at least possible to propose alternatives on the development of the cities of the future.

Large contemporary conurbations in the current settlement structures today have reached a critical point. The phenomenon of sprawl has been considered an evolutionary urban process for at least 25 years within European territories. Here, despite the growth of the population is not expected to increase exponentially as for example with regard to African and Asian realities, other forces of a socio-economic nature will continue to solicit densification due to the growing demand for housing. Many factors can determine this demand: the reduction of family members, the need to be able to live in contexts close to the place of study and work. These are all factors that we expect to head to a further urbanization (today 75% of the population world lives in cities).

Through a communication of 2011, the European Parliament announced that if the goal by 2050 is not to densify more areas, it is necessary to rethink the dynamics of urban settlement¹.

There are two types of definition of density: a physical and a perceived one. The physical one relates to the "concentration of individuals in a geographical unit". The second definition is related to the perceived density. It is a type of density that stresses upon the individual perception of an estimated quantity (of people, buildings) in a certain area. In architecture, we find basically two different ways to interpret density: people living in an area and the building density.

As far as it regards the different patterns of density, it is very impressive how our perception of density can change in relation to the place where we live and, in general, in relation to the context, both physical and both cultural, where we live.

In relation to the aim of architecture regarding density, it is widely acknowledged that the population growth requires, in general, a physical and spatial support together with the housing demand. For example, it includes the demand of high-density architectural forms together with a dense urban environment. Since the high-density architecture can have both negative and positive aspects (as positive: more compactness together with increasing connection networks; negative aspects: increasing of noise and lack of intimacy).

This paper will try to define possible ways to encourage the positive aspects and, at the same time, reducing the negative ones. What must be central in the process of densification is the balance between the market interests linked to the private individual sphere and the public/social/environmental requirements; generally private home owners tends to achieve independent dwellings: an individual house would be better for them in order to have less noise, more intimacy, more ways to express their own interests. Counterarguments to this general tendency are related to the fact that individuality is, of course, not the most appropriate way to minimize the lands' and the waste of sources in the territory.

What new urban strategies should try to accomplish or at least to search for is the balance point between the conflicting aspects of the homeowner's dream and the necessity of a sustainable and affordable urban environment. One of the strategies to do that is, for example, considering a collective use of the methods of transportation and the reduction of the correlated energy consumption.

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http://www.arc1.uniroma1.it/dottoratocomposizionearchitettura/Dissertazioni/29_Armandolaco_vantuonoUrbanInfill.pdf

The general criteria, in order to achieve an improvement in this direction, would be together the combination of a type of replaceable buildings and at the same time a difference and multi purpose type of space.

DENSITY IN CHINA

China has passed throughout a rapid growth in the last years together with a limited urban land space. This has lead, consequently, to different planning problems together with disparities in urban services. In fact, for example, many areas are fully constructed without a determined accuracy for the distance that they have in relation to the transport services.

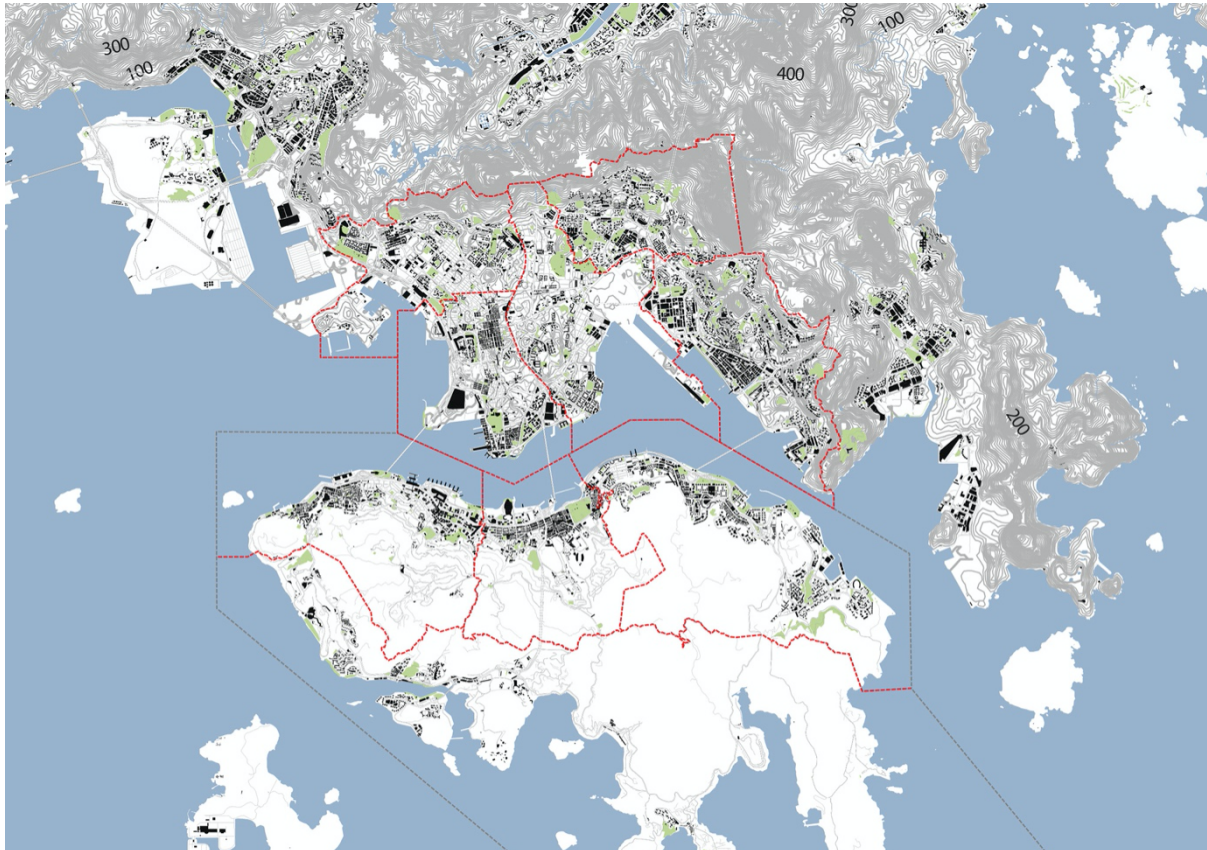


Figure 1. HONG KONG at the territorial scale

DENSITY IN HONG KONG

Hong Kong (fig. 1), as opposite to many other realities in China, shows, to a certain extent, how a good densification can work, following the concept of MILU (Multiple and Intense Land Use), that is to say of intensive land use with a mix variety of functions (source: Habi Forum Research Foundation, in Netherland). The central theme Of MILU shows the introduction of the concept of Multiple and Intense Land Use. Basing on the intensification of interconnection and mixed land uses, as it has been shown in Hong, the research is capable to carry out about the positivity of the approach in the applied context comprehending the following uses: residential, commercial, recreational, community, institutional and transportation. It was observed that the intensification of mixed land use was associated with a number of distinguishable features related to compact form, which are: verticality, compactness, convenience and sky city living (taken from the book: *Future*

Forms and Design for Sustainable Cities, Mike Jens and Nicola Dampsey). Two main strategies have been found out in Hong Kong in order to increase the density effectiveness: working with the multiple use of space and the vertical intensification. Regarding the first principle, Rowley argued that should be good having mixed uses both vertically and horizontally. In Hong Kong the mix use, both inside and outside of a building, is a common practice. For what concerns the vertical intensification, it is well known that Hong Kong is characterised by thousands of high-rise towers, the majority of them reaching 200 m in height (figures 2, 3, 4).



Figures 2 and 3. HONG KONG: high buildings (left and right) and linking passages (left)

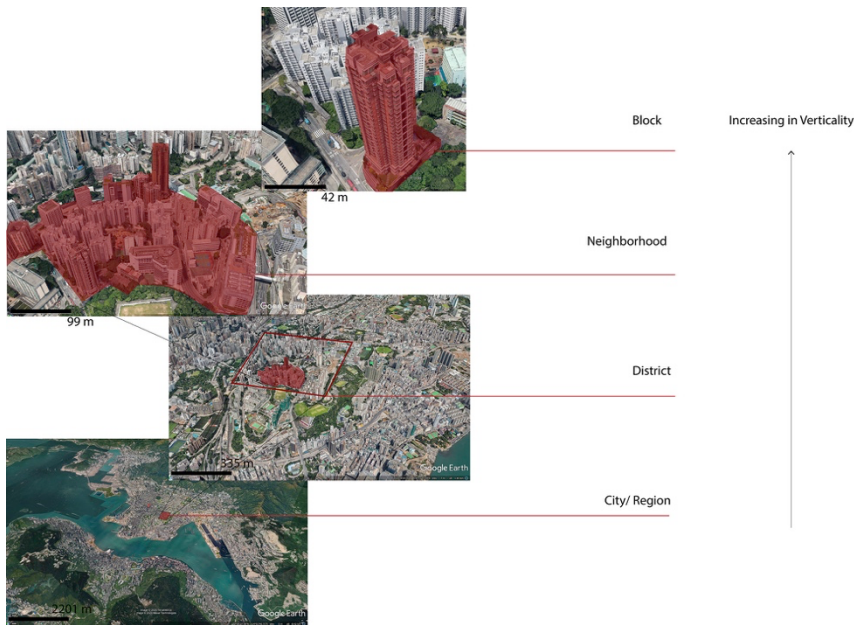


Figure 4. HONG KONG: Verticality at the different scales of the built environment

DENSITY IN VIENNA

The same principle of 'compactness' can be easily found in Vienna, where density has been achieved by tight residential buildings sticking one to another and the consequent addition on the roof that they host. A clue about how population in that sense is well distributed can be seen from the graph

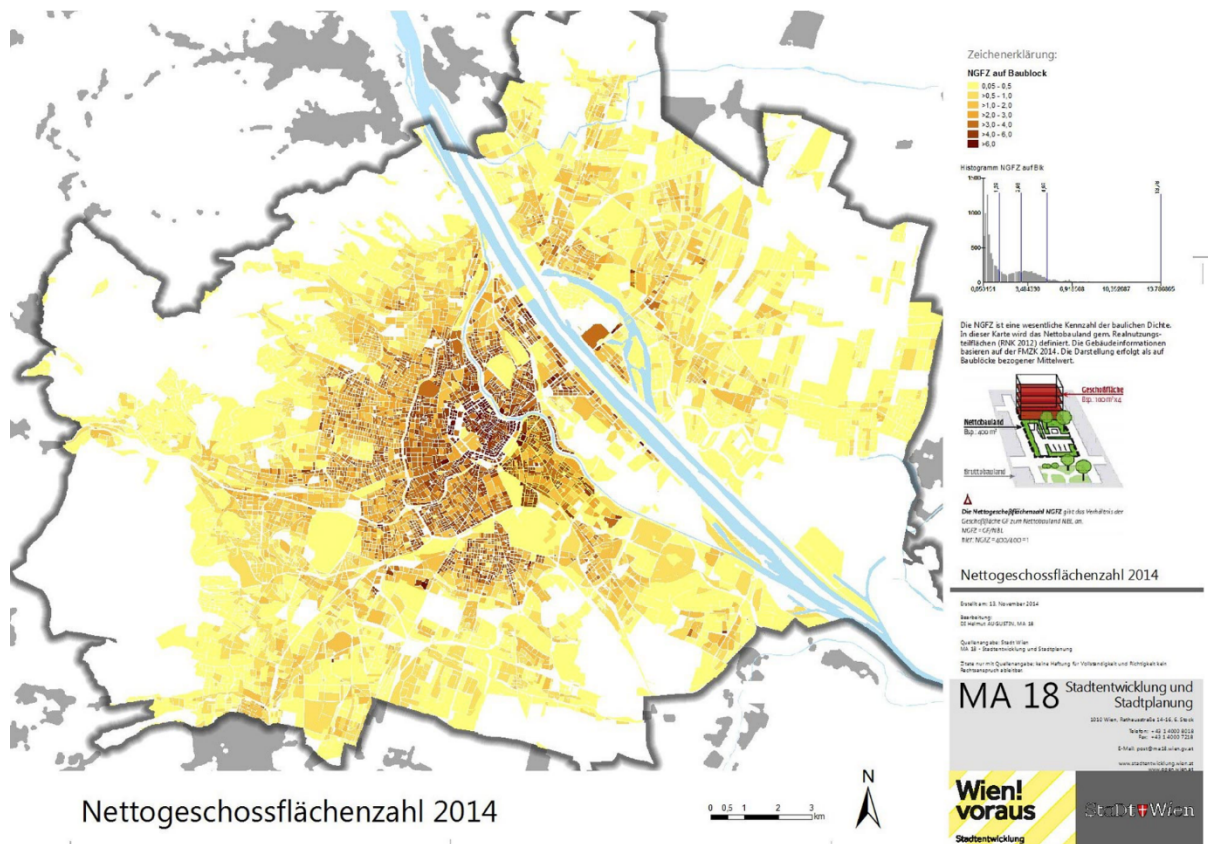


Figure 5. Floor Area Ratio in the City of Vienna Source: (<https://doodles.mountainmath.ca/blog/2017/09/08/the-vienna-model/>)

that we can see in (figure 5), which shows shows the landing consumption by the FAR (floor area ratio).

As an opposite with respect to Hong Kong, in Vienna, the urban density has been achieved by tightly built residential buildings stick one to another and the further addition on the roof that they host (figures 6 and 7). The “Vienna Model” has many components that make it work. Having been able to build up a sizable social housing bank is one important ingredient. Furthermore, Vienna has also intensified the existing building stock by increasing volumes on existing buildings, even in some historical buildings of the city center (fig. 6).



Figure 6. Top addition in the Vienna city centre

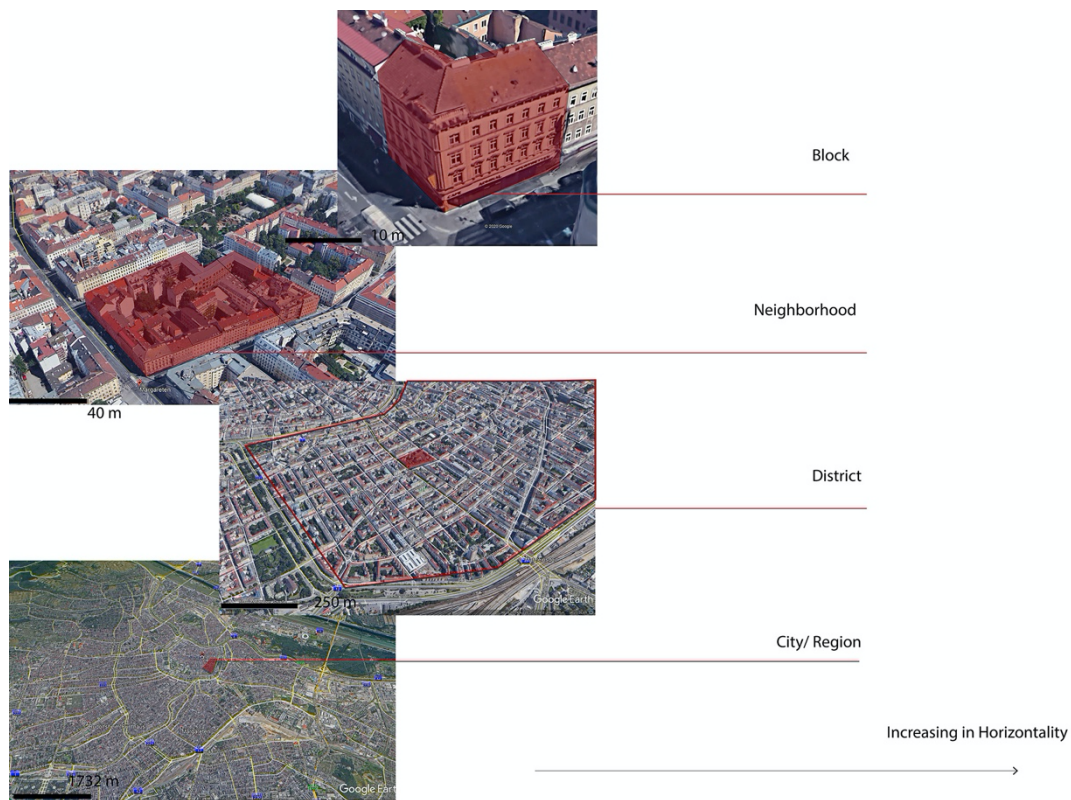
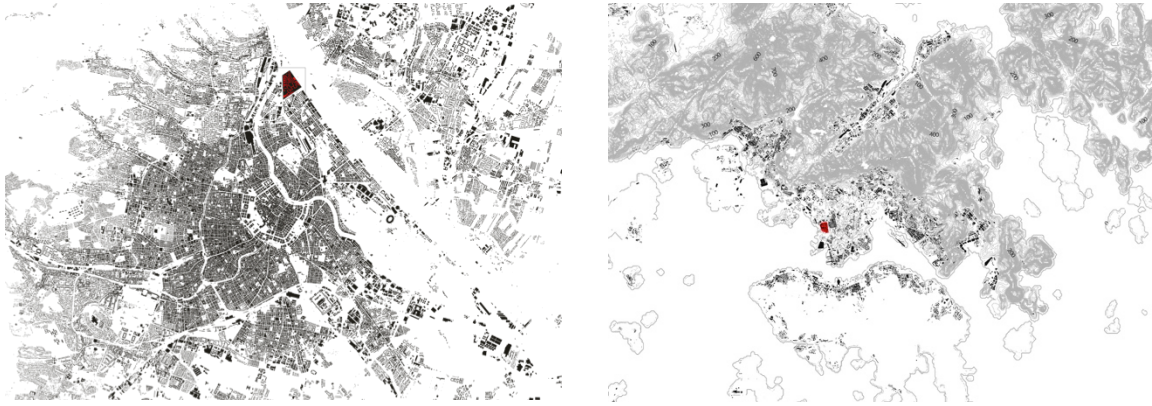


Figure 7. Vienna: Horizontality at the different scales of the built environment

To further understand the difference in the densification between Vienna and Hong Kong two different districts of the cities that have the same scale dimension have been compared. Brigittenau in Vienna and Kowloon City in Hong were considered.



Figures 7 and 8: Brigittenau, Vienna (left) and Kowloon City, Hong Kong (right)

From the mutual comparison of the two different urban realities (figure 9), it emerges that the density achievement of Hong Kong (FAR 3), considering almost the same plot area, is almost three times of that of Vienna (FAR 1, 2).

Whereas Hong Kong achieves with a little area many over ground floors, using skylines in order to supply for the space's necessity (since Hong Kong is not able to expand horizontally also due to the morphological configuration of the landscape), Vienna uses the morphology form of courtyard blocks in order to compact the urban form in repetitive and enclosed structures, as we can see, i.e., in the central Margareten district.

Brigittenau, Wien
 Area: ca. 340.000 qm
 Gross Floor Area : ca. 433301
 FAR: 1,3



- Fl: 3820 qm
6 OG
- Fl: 4344 qm
6 OG
- Fl: 23765 qm
6 OG
- Fl: 9463 qm
7 OG
- Fl: 16654 qm
7 OG
- Fl: 4189 qm
10 OG (*2)
- Fl: 8209 qm
2 OG
- Fl: 354 qm
10 OG

Kowloon, Hong Kong
 Plot Area: ca. 320.000 qm
 Gross Floor Area: ca. 960940 qm
 FAR: 3



- Fl: 550 qm
40 OG (*4)
- Fl: 10600 qm
2 OG
- Fl: 440 qm
40 OG (*5)
- Fl: 4000 qm
EG
- Fl: 800 qm
12 OG
- Fl: 430
50 OG (*18)
- 4300 qm
45 OG
- Fl: 3000 qm
5 OG
- Fl: 830 qm
40 OG (*4)
- Fl: 3200 qm
4 OG
- Fl: 2800 qm
EG
- Fl: 1180 qm
30 OG
- Fl: 743 qm
10 OG
- Fl: 1370 qm
15 OG
- Fl: 1440 qm
30 OG

Figure 9: Brigittenau, Vienna (left) and Kowloon City, Hong Kong (right)

CONCLUSIONS AND NEXT STEPS

The paper has shown two completely different responses to the need for densification in contemporary evolving metropolises. Hong Kong and Vienna represent different, opposite and somehow successful example of urban densely built environments. Probably, one common aspect may be found in the mixed use of functions that certainly occurs in both cases, confirming, once again, that urban textures in the built environments are very much connected with and their successful evolution depends on the strict relation with humans and their activities (working, living, entertaining and dwelling).

How these two situations jointly contribute to respond to the central question: Is it possible to identify an optimal urban form? The question is obviously still open and we cannot certainly forget that many responses in literature that address the issue of densification do exist: some of them, in example, analyze the optimal urban form for global and local emissions considering traffic, some others the solar orientation and other climatic components, etc. In this framework, further research developments are in progress and the next steps may consider the different climatic conditions, including solar access, optimal orientation and correlated soil permeability/availability at the neighborhood scale, as interdependent and consequential factors of the two urban forms in these opposite urban environments.

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CORRESPONDING AUTHOR

Alice Monacelli, TU Wien, Austria, alice.monacelli@gmail.com