

HIGH-RISE DEVELOPMENT REGULATIONS
Case Studies of Da Nang, Frankfurt am Main and Monterrey

Master Thesis
Master of Science Urban Agglomerations

Presented by
Carlos Eduardo Guerra Bustani

Advisors:
Prof. Dr. Michael Peterek
Prof. Dr. Kathrin Golda-Pongratz

University of Applied Sciences Frankfurt am Main
Faculty of Architecture, Construction Engineering and Geo-Informatics

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Abstract

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In a world which is experiencing an unprecedented urban growth, the compact city model with denser housing typologies has become an alternative for creating mixed, intense and diverse urban environments, which contribute to the development of efficient urban systems. More than being just a matter of tallness or bulkiness, increasing residential densities through the use of different housing typologies can directly contribute to improving the citizens' quality of living. However, unlike other typologies, high-rise buildings have a great potential of both positively or negatively affecting their surroundings. In this regard, the objective of this research was to address the lack of comprehensive high-rise regulations in the existing planning systems which commonly associate a series of negative urban impacts to the high-rise typology. For doing so, a qualitative applied exploratory and descriptive research was employed through four different data collection stages to answer two research questions. Firstly, to identify the existing high-rise regulations being implemented in the most representative cities around the world, which were then integrated into three main categories, for developing, for incentivizing and for implementing and monitoring high-rise buildings. Secondly, to explore if there is a relationship between the implementation of high-rise regulations and the reduction in the negative urban impacts commonly associated with high-rise buildings. For that matter, through the provision of several policy recommendations for high-rise-related gaps identified in the three case study cities of Da Nang, in Vietnam, Frankfurt am Main, in Germany, and Monterrey, in Mexico, it was possible to validate a relationship between the policy implementation and the urban impact reduction. At the end, more than a matter of promoting one housing typology over the others, developing a sustainable growth strategy for a city is about creating mixed, intense, and diverse urban environments which improve both the existing and the future citizens' quality of living. With proper infrastructure systems, adequate high-rise regulations or plans and the political will to enforce them, cities can set the bases for a better urban future. By doing this, it will be possible to find alternatives to grow our cities in a more organized, efficient and human way.

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List of Acronyms

AIA	American Institute of Architects
BMBF	German Federal Ministry of Education and Research
BRT	Bus Rapid Transit
CABE	Committee of Architecture and Built Environment
CBD	Central Business District
CFEZ	Central Focal Economic Zone of Vietnam
CTBUH	Council of Tall Buildings and Urban Habitat
DOC	Da Nang's Department of Construction
DONRE	Da Nang's Department of Natural Resources and Environment
DPI	Department of Planning and Investment
ECB	European Central Bank
FAR	Floor Area Ratio
GDP	Gross Domestic Product
GIS	Geographical Information System
HDI	Human Development Index
HKPSG	Hong Kong Planning Standards and Guidelines
IHP	Inclusionary Housing Program
ITESM	Instituto Tecnológico y de Estudios Superiores de Monterrey
JICA	Japanese International Cooperation Agency
LURC	Land Use Right Certificates
POPS	Privately Owned Public Spaces
PTAL	Public Transport Accessibility Level
SPG	London View Management Framework Supplementary Planning Guidance
SPGG	San Pedro Garza García
TDR	Transfer of Development Rights
TOD	Transit Oriented Development
TIF	Tax Increment Financing
UPI	Urban Planning Institute of Da Nang

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HIGH-RISE DEVELOPMENT REGULATIONS
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1 Introduction.

The world is nowadays experiencing an unprecedented urban and population growth. With more and more people migrating from the rural to the urban areas, the need for affordable housing with adequate access to basic services is forcing the cities to expand and develop in ways they have never seen before. This situation is creating immense challenges for the local governments regarding the provision of infrastructure, improvement of people's quality of living, securing access to natural resources and protecting the environment (Rapid Planning Consortium, 2015).

The urban sprawl development model, with the disperse and continuous expansion of the peri-urban and informal areas, the greater need of commuting and its higher costs of implementing basic infrastructures and public services, has proved to be an unsustainable type of approach. Therefore, the compact city model, with denser housing typologies and the interaction of different functions to reduce the need of commuting, is now being considered as a more sustainable growth model (a+t research group, 2015; Rapid Planning Consortium, 2015).

Often confused with overcrowding, the compact and dense urban forms are not related to the volumetric exploitation of a city, but rather to the creation of mixed, intense and diverse environments, which contribute to the development of more efficient urban systems. In this regard, density should not be associated only with characteristics such as tallness or bulkiness but rather with other aspects such as land use and coverage area. While a tall office high-rise building might seem to be a compact and dense environment because of its job density, if it is not accompanied by the housing component it can't be said that is helping reduce the need for commuting or improving the city's quality of living. Instead, this might be more related to other aspects such as status, reputation or even real estate speculation (a+t research group, 2015).

Even within the same area, it is possible to have different levels of residential densities depending on the urban forms or typologies which are employed. Varying regarding their floor area ratio, their coverage area and their heights, single-family houses, row houses, slab buildings, closed blocks and towers are all typologies which could be used to increase the residential density in a particular area. Since all the cities present different sets of topographic, social and economic characteristics, amongst others, not all urban forms are applicable in all contexts (a+t research group, 2015).

From all of these different urban forms, "tall buildings, high-rises and skyscrapers have the ability, like no other building typology, to polarise the public debate on architecture and the built environment, to evoke a sense of urban identity or alienation, to represent the economic growth or decline of a city, and even to become the symbolic target in armed conflicts or acts of terrorism" (Van der Hoeven & Nijhuis, 2011, p.278). For that matter, the high-rise typology can produce some extra value. Whether it is economic value for the project investors, green value for its generation of energy or efficient use of resources, or urban value for the incorporation of public spaces on ground floors or rooftops, it all depends on the perspective through which it is addressed. However, not only because a project is successful in economic terms or because it incorporates the latest green technologies available, it is possible to say that this building will also

be successful in urban and social terms (Al-Kodmany & Ali, 2013; Hodyl, 2015; Short, 2004, 2012)

Since every city has its own urban planning systems and regulations, these types of buildings are being carried out in different ways around the world. In any case, if the construction of new high-rise buildings is done without any form of control or not planned accordingly to a particular context, it can trigger a series of urban issues, including functional, contextual, environmental, safety, economic and social problems. Functional problems are commonly related to a wrong location of the high-rise building in areas where there is either no public transport available - increasing the vehicular traffic-, where the land uses introduced are not complementary with the existing ones, or where the basic urban infrastructure, public spaces and public services are either not available or not enough to cover the increase in density. Contextual problems, on the other hand, are related to a disruptive behavior of the high-rise building either because of its height - blocking the views towards the city's landmarks-, or because of its aesthetic characteristics - changing the character of a historical heritage area-. Environmental problems include the blockage of sunlight, air flows, views or even access to the main natural elements such as rivers, parks, hills and mountains. Safety aspects range between not achieving structural and constructive reliability, to human casualties due to fires, natural disasters and human negligence. Economic issues vary between real estate speculation and lack of affordability. And lastly, social problems could include from tensions, disagreements and conflicts between the existing residents and the developers, to displacements, gentrification, loss of privacy, privatization of the open spaces and even a general reduction in the quality of living in the cities (Al-Kodmany & Ali, 2013; Hodyl, 2015; Short, 2004, 2012)

In this regard, the main problem to be addressed in the current work is the lack of comprehensive high-rise regulations in the existing planning systems, because the main hypothesis of this research is that it is not the typology itself which causes these negative urban impacts, but rather its lack of regulation and planning. Therefore, it is the implementation of high-rise regulations in cities, which allows them to benefit from all of the advantages that this urban typology offers without creating the negative urban impacts commonly associated with it. The experiences of some pioneer cities around the world like New York, London, Vancouver, Hong Kong and Frankfurt am Main, which have already been developing instruments and regulations for several decades, will be taken as a reference.

For that matter, the current work will try to answer two research questions. Firstly, which are the existing high-rise regulations that are being implemented in the most representative high-rise cities? And secondly, is the implementation of these regulations related to a reduction in the negative urban impacts commonly associated with high-rise buildings?

For doing so, a qualitative applied exploratory and descriptive research will be conducted, dividing the data collection methodology into four different stages, as it will be further explained. Within these stages, first, a review of the different high-rise-related regulations in several representative reference cities around the world will be performed. Then, by describing and analyzing the three case study cities of Da Nang in Vietnam, Frankfurt am Main in Germany and Monterrey in Mexico, each city's main high-rise related gaps or opportunities will be identified to be able to further provide some policy recommendations.

For the extent of this work, and even if all the different perspectives in high-rise regulations are an essential part to prevent further problems and even save lives, the focus would be on the regulations from the planning perspective, because of its potential to directly or indirectly impact the other fields. For that matter, aspects regarding the construction or building code regulations -like materials, structure, energy efficiency, foundations, elevators, wind protection, universal accessibility-, the security or safety issues -like fire prevention and emergency exists-, the economic or real estate issues, or even the symbolism and aesthetics of the buildings, will not be taken into consideration.

To present the previously described topic, the chapters of this work will be structured in the following way. Chapter 2 will describe the methodology to be followed in the current work. In chapter 3, a theoretical and historical background of both high-rise buildings and early high-rise regulations will be presented. For chapter 4, the existing high-rise regulations in different reference cities around the world will be presented and categorized. Chapter 5 will describe the current situation of the selected case study cities, making an emphasis on the city's current high-rise regulations and main problems. In chapter 6, the results of different expert interviews from the three case study cities will be presented. For chapter 7, an assessment for each case city will be conducted and several high-rise policy recommendations will be provided. Finally, chapter 8 will include the conclusions of this work and answer the previously mentioned research questions.

2 Methodology

In this chapter, the methodology to be followed by the current work will be presented based on three main sections. The first part will address and describe the strategies for the different research stages to be implemented in this work. The second part will justify the reasons behind the selection of these research strategies. And lastly, the third part will present and describe the limitations of the methodology that these strategies have faced.

2.1 Strategies

Based on the hypothesis that it is not the high-rise typology itself which causes the previously described negative urban impacts, but rather its lack of regulation and planning, the current work will try to answer two research questions. Firstly, and through the use of a qualitative applied exploratory research, which are the existing high-rise regulations that are being implemented in the most representative high-rise cities? And secondly, through the use of a qualitative descriptive research, is the implementation of these regulations related to a reduction in the negative urban impacts commonly associated with high-rise buildings?

In this regard, the process for collecting data was divided into four different stages. For the first stage, the theoretical and historical backgrounds of the high-rise building typology and its early regulations were explored through the use of a literature review. The objectives of this stage were to examine the definition and origins of modern high-rise buildings, as well as to describe early high-rise-related regulations from the planning perspective.

For the second stage, and also through the use of a literature review, different high-rise-related regulations in several representative reference cities throughout the world were described and categorized. The main objective of this stage was to be able to identify the existing high-rise regulations in the world to define a categorization system which allows to describe and review the regulations of specific cities in a more systematic way.

For the third stage, the three case study cities of Da Nang in Vietnam, Frankfurt am Main in Germany and Monterrey in Mexico were further explored and analyzed, employing methods such as direct and indirect observation, previous personal experiences, as well as literature reviews. By understanding the current situation, regulations and the future projects to be developed in each city, the main objective of this stage was to be able to identify the cities' main gaps or high-rise related opportunities for implementing new policies.

Finally, for the fourth stage, an elicitation process with semi-structured interviews was conducted with experts of each of the case study cities. Whereas in the case of Monterrey the interviews were addressed with experts directly related or responsible for the elaboration of the particular urban or high-rise development plans, in the case of Da Nang, and because of its different political structure, the interviews were addressed to specific city departments or agencies, rather than to particular individuals. For the case of Frankfurt, a combination of both approaches was followed. In this regard, the main objective of this stage was to validate and complement the results of the previous stages by receiving further and more detailed information from the experts involved in these issues.

With this, and by using a deductive type of analysis, the relationship between the implementation of high-rise regulations and the reduction of the negative urban impacts in the case study cities was explored. Additionally, some regulation recommendations were provided for each one of the case cities, to be able to draw some final conclusions.

2.2 Justification of the Approach

For a multi-disciplinary topic such as high-rise development, the design of the research was based on the objectives that each of the research questions presented. On one hand, the applied exploratory research provides a general overview and approach to a particular topic, such as high-rise development, with the main objective of clarifying the existing concepts or ideas. One of the main characteristics of this type of research is that the results obtained have the potential to be later applied either for a second research stage or other practical purposes. The descriptive research, on the other hand, has the main objective to describe either the characteristics of a determined population group or phenomenon or the relationship between different variables. In this sense, it helps understand the current state of the art of a specific topic (Gil, 1989).

Since these two methodologies are commonly used by social researchers who are interested in transferring this knowledge into recommendations or practical applicable aspects, they often take into consideration data collection methods such as literature reviews, interviews and case study analysis for the following reasons (Gil, 1989).

For the case of the literature review, this data collection method allows researchers to cover a greater range of topics through the analysis of different documents such as plans, books, reports and articles. This represents a very significant advantage when it comes to the collection of data that is spatially dispersed around the world like it is in this work with the several reference and case study cities (Gil, 1989).

With regard to the case study analysis, through a deeper review of few specifically selected cases or units, this method allows for a better understanding of broader topics or groups that otherwise would be impossible to cover completely. For that matter, even if it could be assumed that all the elements in a group would present some characteristics in common, one of the limitations of this method is that it is not possible to guarantee that the specific cases selected would be the most representative of a particular group (Gil, 1989).

Concerning the interviews, this method is considered as one of the most important techniques in social studies for the series of advantages it presents. Firstly, it can provide precise information from a big range of aspects and topics in a very efficient way. Secondly, compared to other methods such as surveys it is more flexible to be adapted to particular circumstances. Thirdly, its results can be classified or quantified. And lastly, it usually allows for a direct personal interaction with the interviewee (Gil, 1989).

To complement the information obtained by these methods, and since high-rise developments are noticeable elements which can be publically observed in cities, direct and indirect observation methods were also employed in this work. By doing so, it was possible to collect, analyze and verify further information without the need of intermediaries (Gil, 1989).

2.3 Limitation of the Methodology

For being a research project which is addressing several reference and case study cities from different parts of the world, the current work was faced with some limitations that could have influenced the scope or the results of this research. On the first place, and based on some personal limitations, the work was conducted from the city of Frankfurt am Main, therefore the analysis and interviews related with the cities of Monterrey and Da Nang were done remotely. In the case of Monterrey, for being the author's home city and for being Spanish the author's native language, there was a clearer understanding of its current situation and the possibility to conduct the interviews with the respective experts via a teleconference call. In the case of Da Nang, and because of its different political system, the interviews were translated to Vietnamese and conducted through representatives of the Da Nang Institute for Socio-Economic Development –DISED-. Therefore, during the development of this work for Monterrey's and Da Nang's research, the person-to-person contact with the experts during the interviews and a direct observation or direct photographic documentation processes were not possible.

Secondly, for dealing with cities with diverse socio-cultural and political backgrounds, differences in the existing levels of openness and transparency for sharing information, as well as in the documentation or availability of information in general, were identified. Thirdly, because of the author's lack of proficiency in all of the languages of the case study cities selected, there was a language barrier limiting in some occasions the access to original sources. In this regard, official sources available in other languages like Spanish or English, or translations and interpretations by third parties were required. For the case of Frankfurt, although a basic level of mastery of the German language allowed for a better understanding of the sources in their original language, the interviews were conducted in English.

And lastly, since high-rise regulations cover different fields, for the limited amount of time of this research the scope was defined only within the planning perspective. On one side, because the regulations regarding the construction or building codes are regularly more context-based, depending on aspects such as the city's vulnerability to specific natural disasters, the topographic or climatic conditions, the availability of materials or building technologies, etcetera. On the other side, both the economic and the social aspects of high-rise buildings are not within the author's field of study or expertise, therefore the results obtained from these knowledge fields could have presented a greater degree of inaccuracy as well as a lack of representativeness.

In the next chapter, the first stage of the data collection process, the theoretical and historical backgrounds of the high-rise building typology and its early regulations will be explored.

3 Theoretical and Historical Background

In this chapter, to conduct the theoretical and historical review of high-rise buildings and its early regulations, the results of the literature analysis will be divided into six main sections. In the first section, the concept and general characteristics of high-rise buildings will be defined and compared with other similarly used concepts. For the second section, a brief historical background of the first modern high-rise building will be presented. Subsequently, in a third section, a definition and a historical background of the early high-rise regulations will be presented. Sections four and five of this chapter will then proceed to describe in more detail the 1916 and 1961 New York City Zoning Resolutions, as key reference regulations which influenced other cities. Finally, the last section of this chapter will summarize the most representative conclusions obtained during this analysis.

3.1 Defining a High-rise

When reviewing the literature regarding tall buildings, one of the first things to stand out is the variety of terms that are being used by the different authors. Towers, skyscrapers, high-rises and tall, super- or megatall buildings, are among the most frequently used concepts. However, do all of these terms have the same meaning?

According to the Council of Tall Buildings and Urban Habitat -CTBUH-, an international non-profit organization that facilitates the exchange of knowledge on tall buildings around the world, there is no official or absolute definition to describe this specific type of construction since it is a very relative term that depends on three different factors: height relative to context, proportion and the use of building technologies relevant to height (CTBUH, 2017b, 2017c).

The first factor to define the so-called tallness of a building is its relation to the urban, cultural and societal context in which it exists. A building will be considered tall when it is higher than the city's average height or surrounding constructions. Whereas a 22-meter-tall or a seven-story-high building in a European context is considered as a high-rise, a 14-story-high building might not be seen as a tall building in an already very dense city like Hong Kong -Figure 1- (CTBUH, 2017c; Deutsches Architekturmuseum, 2014, p. 64; Short, 2012).



Figure 1: Height relative to context.
Source: (CTBUH, 2017c)

High-rise Development Regulations

The second factor to define a tall building is its height-width proportion. Even if a building is not exceptionally high, when it is slender enough in terms of its width, it can be perceived as tall. On the contrary, a very high building with a large footprint and width, may not be considered tall -Figure 2-. The third factor is the use of specific building technologies, if a building employs technologies which may be qualified as a result of being tall, such as vertical transport technologies, structural wind reinforcements, among others, then this building can be classified as tall -Figure 3- (CTBUH, 2017c).

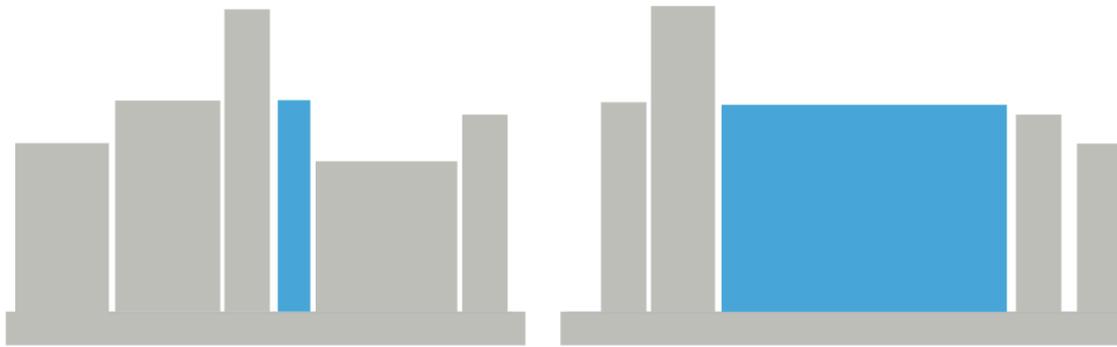


Figure 2: Proportion.
Source: (CTBUH, 2017c)

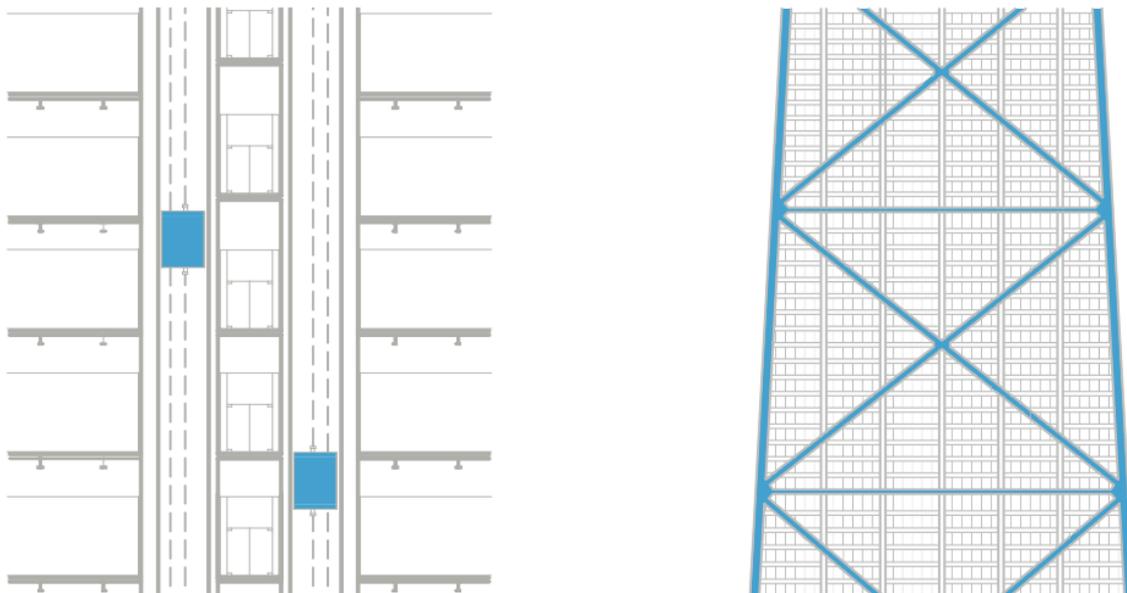


Figure 3: Tall building technologies.
Source: (CTBUH, 2017c)

One last criterion often not taken into consideration for the definition of a tall building is the security and the fire life safety systems. Depending on the specific fire and building codes of a country, state or city in which a building is located, an exact height above which a building is considered a high-rise will be specified. This height is equivalent to the maximum reach from the outside of the available fire-fighting equipment in that particular place -fire hoses and ladders-, after which fire must be controlled from the inside by the fire personnel. In this regard, and depending on the slab-to-slab distance between floors, a high-rise is generally defined as a building above 23 or 30 meters in height, or above five to ten stories (Craighead, 2009, pp. 1–2).

The former then poses the questions, how is the height of a building measured? And what does it include or consider? In this matter, the CTBUH, which measures building height in number of floors or meters, distinguishes three building height categories. Whereas the starting point for all measurements is defined as “the level of the lowest, significant, open-air, pedestrian entrance” (CTBUH, 2017c) to a building, the highest point could vary between the architectural top -the top of the building including spires but excluding functional-technical equipment-, the highest occupied floor, or the height to the tip -to the highest point of the building regardless of its function- -Figure 4- (CTBUH, 2017c).

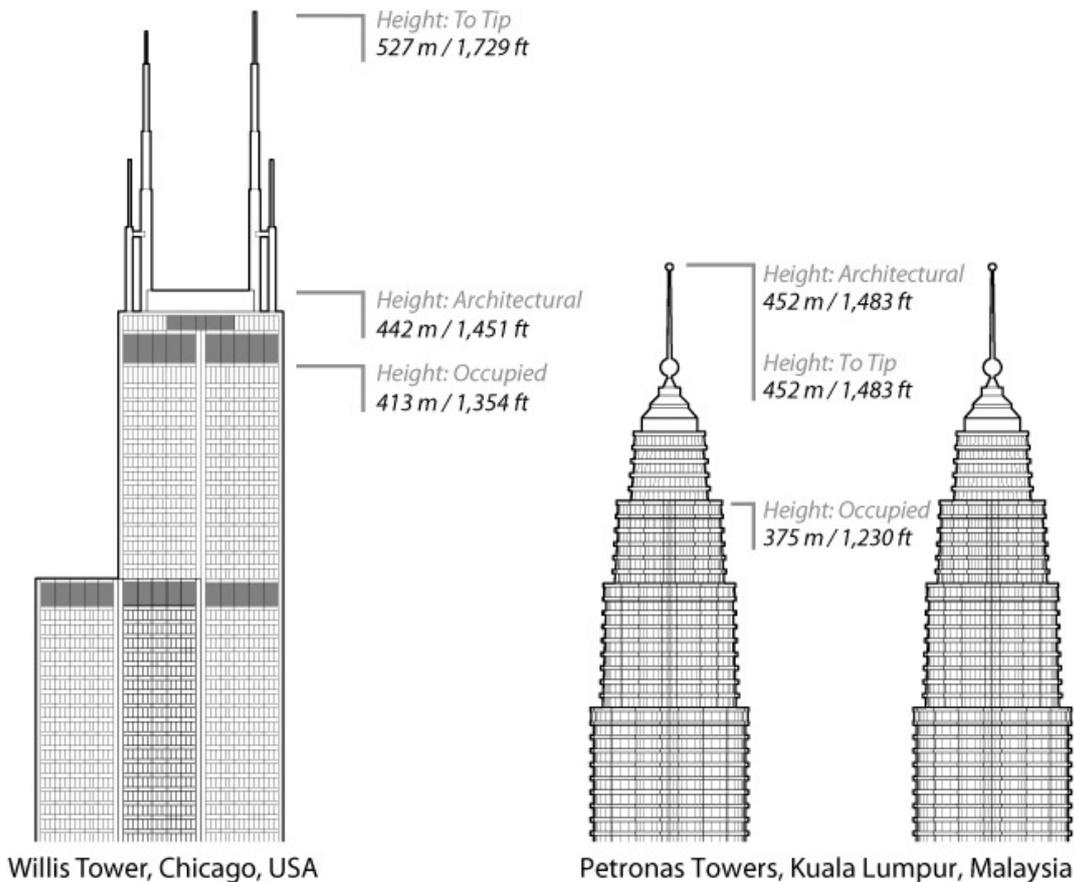


Figure 4: Different height categories.
Source: (CTBUH, 2017c)

Based on the preceding, and to establish a concept to be used for the extent of this work, a further analysis was conducted for the different terms present in the existing literature. The objective was to select a concept which was neither too broad nor too specific, to be able to use it for this type of constructions when addressing urban regulations.

The first and more general term is ‘tower’. Coined to refer to any tall structure with significantly greater heights compared to their widths regardless of their land-use, towers are usually built to stand alone or as a part of other larger structures (Al-Kodmany & Ali, 2013). For that matter, the CTBUH differentiates between a tower and a building from the occupiable space, stating that a tower can’t be called a building unless at least 50 percent of its height is occupiable space -Figure 5- (CTBUH, 2017c).

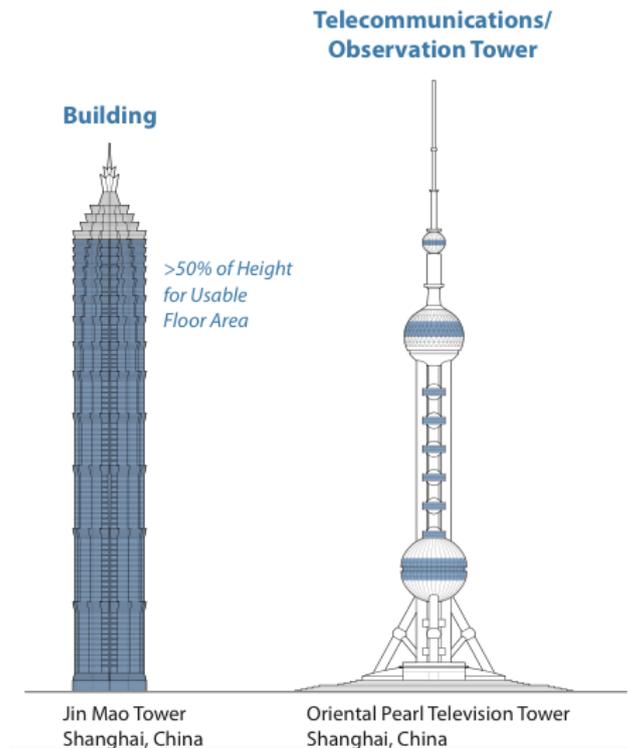


Figure 5: Difference between building and tower
Source: (CTBUH, 2017c)

Then, there is a set of more specific definitions based on the heights of the particular buildings. Varying depending on the source, the term ‘skyscraper’ is used to refer to any multi-story building with an architectural height of at least 100 meters (Emporis, 2017b). ‘Tall building’, on the other hand, can be used to describe any building with a minimum height of 14 floors or 50 meters, however, when they surpass some height thresholds they can be further classified into two sub-groups, ‘supertall buildings’, when they are higher than 300 meters, and ‘megatall buildings’, when they go over 600 meters –Figure 6- (CTBUH, 2017c).

In this regard, the term ‘high-rise’ was found to be the most adequate. First, because it refers to any building which is higher than 22 or 23 meters, a height that is not related to a particular context but rather to safety and security reasons (CTBUH, 2017c; Deutsches Architekturmuseum, 2014, p. 64). And second, because even if some few sources establish a 100-meter height limit for this concept, it usually doesn’t have a maximum height, being able to include the other previously described building concepts (Emporis, 2017a).

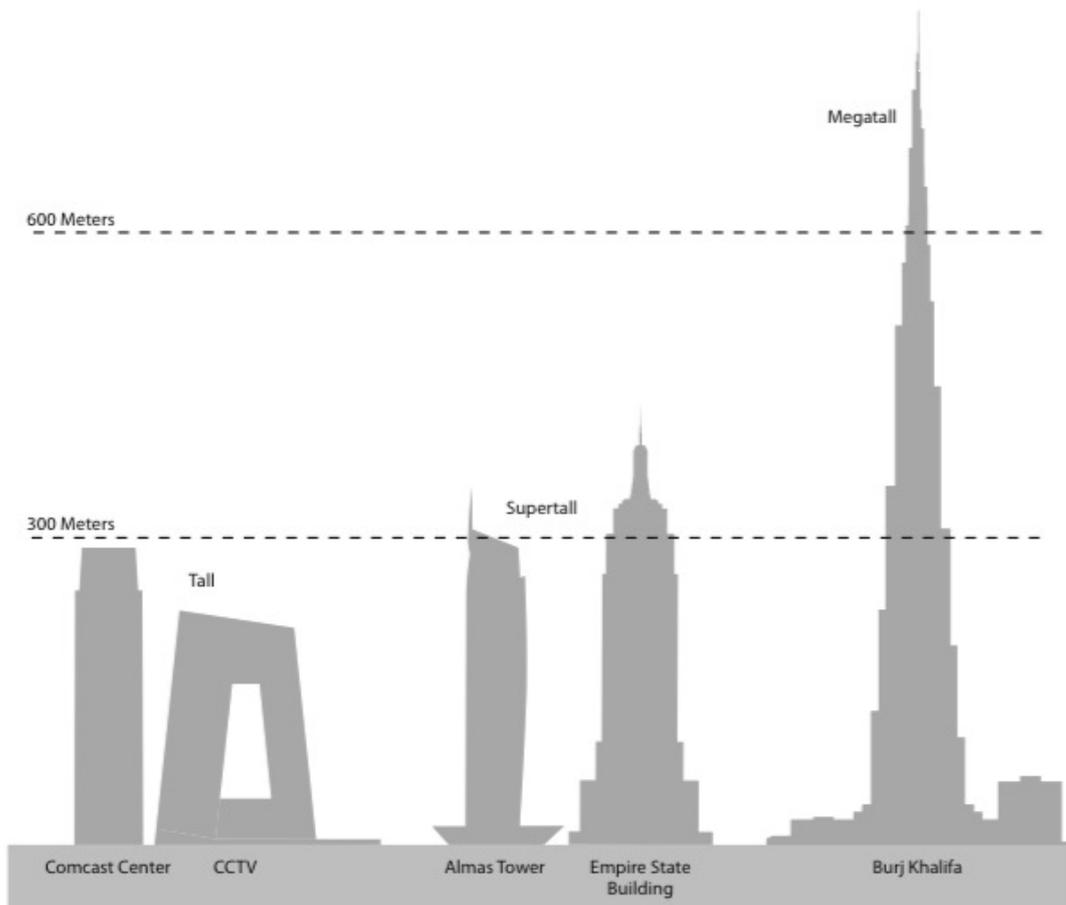


Figure 6: Tall, supertall and megatall buildings.
Source: (CTBUH, 2017c)

3.2 Origins of the First Modern High-Rise

Even if tall constructions have been present throughout the history of civilizations for religious or political purposes, it wasn't until the second half of the 19th century with the implementation of new technologies and building techniques that the concept of a modern high-rise building was born (Saint-Pierre, Becue, Teller, & Diab, 2010, p. 6). Although this modern idea of the high-rise was not the result of a single breakthrough but rather of a series of contributions from different actors over time, the 42-meter-tall, 10-story, Neo-Renaissance Home Insurance Building by William Le Baron Jenney built with an iron- and steel-framed structure in Chicago in 1884, is often considered as the first skyscraper in the world –Figure 7- (Al-Kodmany & Ali, 2013, p. 14; Deutsches Architekturmuseum, 2014, p. 13; Glaeser, 2011)



Figure 7: Home Insurance Building, 1884, Chicago.
© (Chicago Architectural Photographing Company, 1884)

A combination of the architectural know-how with the space made available after the Great Chicago Fire of 1871, and the increasing demand and prices for inner-city office building space, made Chicago the ideal birth place of the modern high-rise (Deutsches Architekturmuseum, 2014, p. 13). But in this early 19th-century phase, Chicago was not the only city that embraced this new type of construction. After building techniques and technologies were tried and tested in Chicago, they were brought to New York City, which used them to increase its role as a commercial capital of the United States (Short, 2012).

3.3 Definition and Early High-rise Regulations

According to Al-Kodmany and Ali (2013), a regulation can be defined as a rule created by an authority “to maintain order and avoid conflicting outcomes. In the context of urban planning, regulations define the rules of urban development by empowering the city and planners to implement policies and plans, and to manage change for the purpose of protecting the public good and private rights. They provide a policy framework to monitor space production to protect the well-being of the city and its citizens” (p. 208).

The idea of regulating the heights of buildings in a city is even older than the construction of the first modern high-rise. Some first rules regarding the proportion of the height of a building in relation to the width of the street can be already found in Paris between 1783 and 1784, and

especially during the 19th century with the urban re-modelling of the city carried out by Haussmann (Saint-Pierre et al., 2010, p. 2).

However, with the spread of high-rises at the beginning of the 20th century, urban planners started to face a series of new challenges regarding the still unknown impacts of high-rises in cities. Buildings and townscapes with historical and architectural significance began to be threatened by this new type of tall constructions, pushing the planners to update their regulatory tools, incorporating these issues in the planning and decision-making processes (Short, 2012).

The concept of zoning as an instrument to set limits on the land uses and sizes of plots, began in the United States, as an exclusionary system to protect property values by directing unwanted land uses to other locations (Short, 2012). In this regard, the first citywide land use zoning law in the United States was enacted by the City of Los Angeles in 1908 (Weiss, 1992, p. 47). In terms of height, beginning in the late 19th century many US cities like Boston and Washington D.C. imposed different height limits from 30 to 60 meters -100 to 200 feet- for various zones of the city, being Boston's regulations legally endorsed by the U.S. Supreme Court in 1909 (pp. 47, 56).

3.4 1916 New York City Zoning Resolution

As part of these series of urban regulations in the United States, the 1916 New York City Zoning Resolution became a milestone in the country due to the particular context and circumstances under which it was enacted (Weiss, 1992). First of all, before this Zoning Resolution, the city was already built up, quickly surpassing the scale and the number of high-rises in Chicago whose regulations kept a 22-story height limit until 1923 (Firley & Gimbal, 2011, p. 222). By the end of 1912, there were already 1,510 buildings in Manhattan between nine and 17 stories in height, and 91 buildings between 18 and 55 stories, being mainly office and commercial high-rises (Weiss, 1992, p. 49).

Secondly, several sectors of the society started to group to demand some specific requests regarding the impacts of high-rises. The Fifth Avenue Association, a group of retail merchants, hotel operators, property owners, investors, lenders, and real estate brokers, demanded the stabilization and reinforcement of the image of a section of Fifth Avenue as a high-class shopping district (Weiss, 1992, p. 51). Additionally, a group of concerned citizens who called themselves the Committee on Congestion of Population in New York, lobbied with the City Building Commission for a report on the perceived impacts of high-rises, which was issued in 1913 and that would later become the blueprint for the Zoning Resolution of 1916 (Short, 2012, p. 8).

Furthermore, and unlike what latter happened with other US cities, in New York the corporate-commercial and real estate sectors also decided to support further regulations. Even if the 1901 Tenement House Law had already imposed some height and lot coverage restrictions on multifamily dwellings, commercial and industrial buildings, which had become very popular as a publicity method for large firms, were still only regulated by building codes (Weiss, 1992, p. 52). The construction of many new tall and bulky projects like the Equitable Building -Figure 8-, started to block the sunlight to the older and smaller neighbor buildings, not only causing the affected property's value to drop but also driving away their tenants. This led to the creation of a political lobby to organize the chaos and protect new investments while promoting the construction of even higher buildings (Short, 2012; Weiss, 1992).



*Figure 8: Tinted photograph of the Equitable Life Assurance Company's Building, New York City.
Source: (Columbia University, 2003)*

Lastly, this 1916 law was passed during a moment in which the real estate market was in a cyclical slowdown. In this regard, zoning regulations were considered as a way to stabilize the city's economy, incentivizing and encouraging new investments and developments while attempting to achieve several important public goals, like a better illuminated and ventilated public space (Weiss, 1992).

What made New York's Zoning Resolution such a breakthrough was not the residential regulation or the creation of height restrictions or height districts in the city but rather the use of public regulations to promote the growth and development of modern commercial, services and retail buildings in the city's central areas (Weiss, 1992). This Resolution regulated the height and volume of the buildings concerning both the width of the fronting street and the size of the parcel, allowing high-rises in certain areas to build taller by progressively stepping-back the buildings according to specific setback angles, thus preserving open-air space. Five typologies of streets were defined according to their width with different setback angles, creating the so-called 'ziggurat' or 'wedding cake' profile which became characteristic of the city's high-rises -Figure 9- (Firley & Gimbal, 2011, p. 222).

New York's idea that the use, height and volume of privately owned buildings could be legally regulated by the local planning authorities was so innovative that it fostered the development and enactment of several zoning laws in other US cities during the 1920's. However, and under different circumstances, most of them were strongly opposed by the property owners and real estate groups that even sponsored and published research studies that argued against this type of regulations (Weiss, 1992).

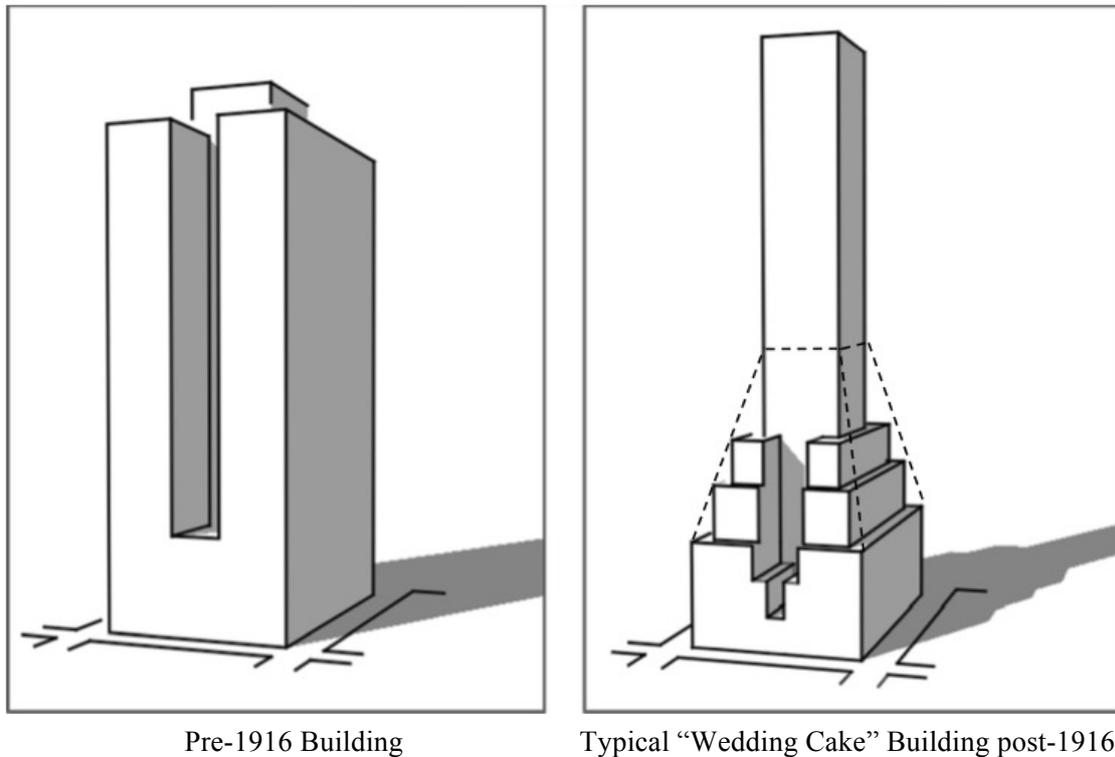


Figure 9: Building's shape before and after 1916 New York City Zoning Resolution.
Source: (Al-Kodmany & Ali, 2013, p. 226).

3.5 1961 New York City Zoning Resolution

The first phase of experimentation and construction of high-rise buildings in US cities was followed by a second phase of international promotion and development by the modern movement. Especially felt after the Second World War, when there was a significant need for housing and reconstruction in European cities, high-rises were stimulated and adopted throughout the world. However, the impacts of incorporating high-rises in contexts with older or already existing fabrics were clearly different than what was happening in US cities (Short, 2012).

In the case of New York City, the 1950's brought and extreme density growth, making it necessary to update the existing zoning resolutions. One of the main challenges was the lack of public open spaces in several sectors of the city, which due to the increase in population had become insufficient for the new number of inhabitants. For this reason, in 1961 a new zoning resolution was enacted (Firley & Gimbal, 2011, p. 223).

Two main ideas were incorporated into this law, the concept of floor area ratio -FAR- to all new developments and the concept of incentive zoning, both of which will be explained in the next chapter (Firley & Gimbal, 2011, p. 223; Weiss, 1992, p. 64). The idea of incentive zoning, of allowing bigger or greater development potentials in exchange for the provision of public benefits, was also not invented in New York City. Already in 1927 Henry Wright, the chair of the Committee on Community Planning of the American Institute of Architects -AIA-, suggested that high-rises should provide public open spaces in proportion to their cubic capacity (Weiss, 1992, p. 64). Additionally, this concept was also first introduced as a regulation in Chicago in the late 1950's (Short, 2012, p. 38).

High-rise Development Regulations

As a result of the 1961 Zoning Resolution, the ‘wedding cake’ setback buildings were replaced by the modern ‘tower-in-the-plaza’ glass boxes like Mies Van der Rohe’s Seagram Building – Figures 10 and 11- (Weiss, 1992, p. 48). The new regulations allowed for the construction of 20% larger buildings in exchange for street level public open space around them, allowing access to sunlight and views on all floors (p. 69).



Figure 10: Seagram Building, 1958.
© Carlos E. Guerra B., 2014



Figure 11: Seagram Building's plaza.
© Carlos E. Guerra B., 2014

In spite of being criticized, incentive zoning was a clear success. Just between 1961 and 1973 over 9.3 hectares of plaza space were constructed in New York alone, which were more than the total area of all the other US cities combined (p. 69). The city government even later expanded the density bonus trade-offs with a variety of amenities which included arcades, indoor public atriums, pedestrian passageways, museums, theaters, subway improvements, affordable housing units, among others.

3.6 Conclusions

As it was explained in this chapter, although there is no official or universal definition to describe a high-rise building, there are four factors which help determine its key features, which include a higher height relative to its context, a vertical proportion of its dimensions, the use of building technologies relevant to height and the incorporation of fire prevention or safety systems for the impossibility of the available fire-fighting equipment to control fire from the outside. In this regard, the term ‘high-rise’ with a minimum height of 22 or 23 meters, was found to be the most adequate to be employed in this research, because it relates to safety aspects and englobes other definitions which deal with different minimum heights.

In terms of its origins, if well the first modern high-rise building was built in the city of Chicago, in the United States, it was in New York City where it gained a different scale and played a fundamental role in turning this city into the commercial capital of the country. For that matter, even if the concepts of urban regulations -or the rules of urban development for maintaining order, preventing conflict and managing change- are older than the first modern high-rise building, it

was in the city of New York where two of the most representative zoning resolutions regarding this topic were enacted. Unlike what had been done before in terms of zoning and height regulations, New York City's 1916 and 1961 Zoning Resolutions focused on a proactive and encouraging type of approach, which allowed development but at the same time also contributed to the creation of several public benefits. In this regard, rather than following a restrictive approach, the value of these Zoning Resolutions rests in the incorporation of the private sector as a key actor for the mitigation of the negative urban impacts of high-rise development, thus, favoring both the private and the public interests.

Once the basic concepts regarding high-rise buildings and its early regulations have been defined, the next chapter will present the second stage of the data collection process, which includes a literature review on the different high-rise-related regulations in several representative reference cities around the world.

4 High-Rise Regulations

Once the theoretical and historical aspects of high-rise buildings have been presented, this chapter will generally address and describe the current existing high-rise-related regulations on some of the most representative reference cities around the world including New York City, Hong Kong, London, Tokyo, Paris, Vancouver, Seoul, among others. For doing so, the chapter was divided into three sections. In the first section, a review on the importance of regulating high-rise buildings and its potential urban impacts if left unregulated, will be carried out. Then, section two will categorize and describe the main regulations identified after conducting the literature review. Finally, section three will summarize the most representative conclusions obtained during the development of this chapter, including a way of analyzing specific high-rise regulation systems, to be further employed in the case study analysis of the next chapter.

4.1 Importance of Regulation

Regardless of their location, as a consequence of their height and scale, high-rises not only have an impact on their immediate surroundings but also at a wider city scale -Figure 12-. Since they demand an immense amount of resources to be built, they should be designed to the highest available standards to maximize their positive outcomes and moderate their impacts. In any case, failure is not an option (Al-Kodmany & Ali, 2013; Short, 2004).

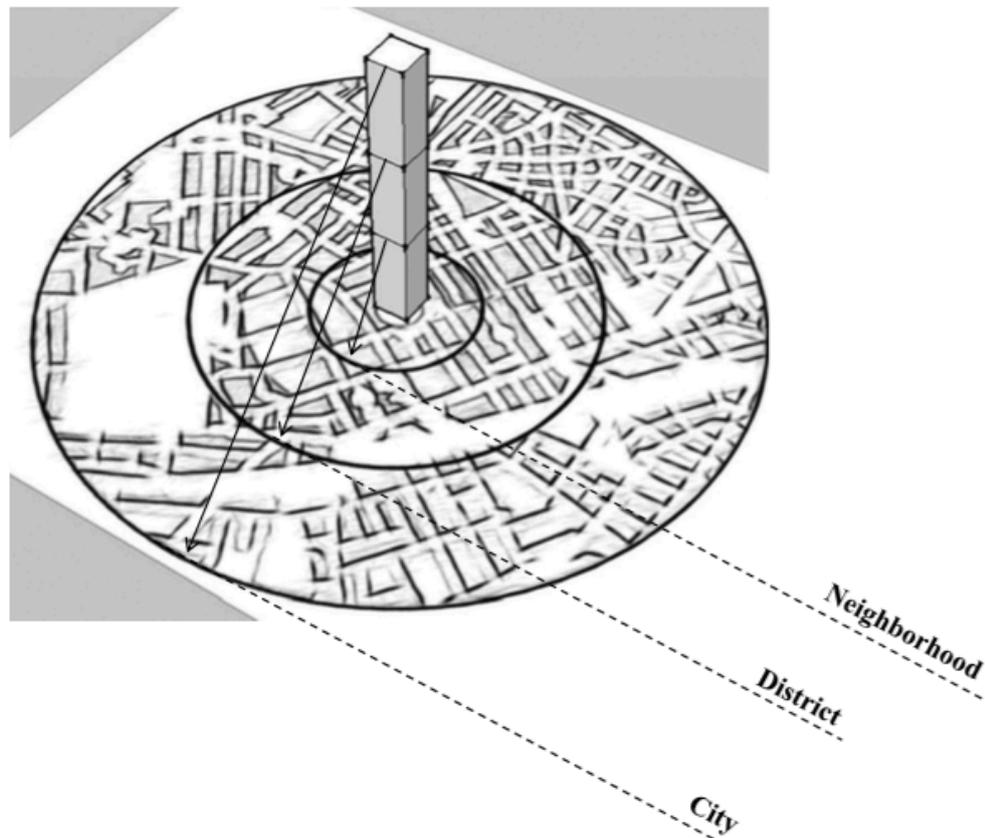


Figure 12: Tall buildings and their increasing area of influence with height.
Source: (Al-Kodmany & Ali, 2013, p. 3).

As it was previously described, an example of these impacts is evident when it comes to the public services and infrastructure. Even if an owner pays for the land, the construction and the maintenance of the high-rise building, the costs of the additional traffic, water, gas and sewage capacity, among others, are usually covered by the municipality. In this regard, an adequate high-rise planning regulation will efficiently integrate the new buildings into the city's infrastructure and minimize the negative costs and externalities. On the contrary, or with a planning system that is either ignored or over-ruled by different government levels or private actors, the city will most likely become a collective chaos (Al-Kodmany & Ali, 2013; Short, 2004).

When a city lacks effective high-rise regulations or when it allows for all type of high-rise developments, its quality of living and urban environment are immensely impacted. As already documented in some cases, not having density or height limit controls results in a substantial increase in land values. As the value rises, developers enter a cycle of increasing densities to compensate for the higher costs of land, either by increasing the number of apartments in a building or decreasing their size (Al-Kodmany & Ali, 2013; Hodyl, 2015).

Worst natural light and air provision inside the apartments combined with higher prices, not only affect the tenants' quality of life and affordability, but also the government, which is unable to purchase land to support them with the provision of community facilities or affordable housing units. For that matter, it could be said that implementing high-rise regulations also benefits developers and land owners, protecting their land value by giving them certainty that their adjacent sites will less-likely be overdeveloped or overcrowded (Hodyl, 2015).

It is important to highlight, that when it comes to urban regulations the unique characteristics of a place, the local dynamics between actors, the political environment and the city's attitude towards profit, affect the way in which the decision-making processes are conducted. This is why, while in North American and Australian cities most high-rise regulations emphasize safety aspects, European cities mainly focus on the impacts on the built heritage. While Middle Eastern cities especially highlight the environmental aspects, other Asian cities mainly emphasize the economic ones. And lastly, this is the reason why African cities stress the visual impacts of the high-rises as means to regenerate and beautify the decayed neighborhoods (Al-Kodmany & Ali, 2013; Short, 2004, 2012).

Instead of being regarded only as isolated and disconnected architectural icons that appeal to the architect's and client's ego, governments should consider high-rises as urban renewal and regeneration tools that help limit urban sprawl. As cities are constantly changing, so should their planning policies, always looking to reach a balance between liveability and economic success. Development and progress to serve the city's current conditions should not be at the expense of the city's liveability, sustainability and long-term prosperity (Al-Kodmany & Ali, 2013; Hodyl, 2015).

4.2 Types of Regulations

Considering the previously described contextual differences on high-rise regulations, and after conducting an overall analysis on the existing regulations in cities around the world which concentrate a considerable number of high-rise buildings, a general categorization system was proposed to be able to further describe them. In this regard, three main categories were established. The first one is for developing high-rises, which includes all the criteria that address the aspects of spatial strategies for determining the building's location or defining its form, volume, spacing and land use. The second one is for incentivizing high-rises, which include the aspects of transferability of rights, incentive zoning and tax increment financing. The last one is for high-rise implementation and monitoring, including the features of public participation, evaluation, monitoring and enforcement.

It is important to highlight that since in most of the cases these aspects are interlinked in the regulations - for example, the location according to the height and the incentive zoning with the maximum height of a building-, the creation of these categories and sub-categories are just to provide a more clear and structured approach to list the existing high-rise regulations, and not to describe how these laws operate in practice.

4.2.1 For Developing High-rises

In the case of the first category, for developing high-rises, the aim was to integrate all of the regulations that address the questions of the building as an individual element: where should a high-rise be located? How should it be located? How should its relationship with the existing context be? And how should its form, volume, land use and height be defined? Therefore, the focus of this category is both on the spatial or location strategies and on the form-based codes or zoning regulations.

Location

Often being considered as one of the leading causes for public rejection, the location of a high-rise is a critical factor and a significant challenge that should be addressed and discussed between all the different stakeholders involved, to reach an agreement upon the best location criteria. One of the reasons why it is such a challenge is because of the uncertainty of both the current and the future variables that are involved in the decision-making process. Therefore, when defining the possible high-rise locations, the main objective should always be to find places which foster healthy socioeconomic relationships with the city (Al-Kodmany & Ali, 2013; Saint-Pierre et al., 2010).

One of the first decisions to be made by the planning authorities is whether the high-rises are going to be grouped in clusters or spatially dispersed in the city. In this regard, while dispersed arrangements become more car-dependent, clustered and compact arrangements generate a socioeconomic synergy which improves and diversifies public amenities. Additionally, clustering also preserves more open spaces, fostering the presence of active pedestrian environments (Al-Kodmany & Ali, 2013).

A tool which can guide urban planners in deciding where should a high-rise be located in a city is the overlay analysis technique. This tool conforms a map with the most suitable high-rise areas by eliminating all the areas in a city which are identified as unsuitable or least suitable for high-rises, according to a set of different layers of urban criteria. The elimination criteria include the following areas, high-security zones, protected natural conservation areas, zones without any infrastructure, environmentally sensitive land, earthquake-prone areas, areas with poor soil and ground water conditions, areas with a steep terrain or already fully saturated and protected heritage sites, amongst others (Al-Kodmany & Ali, 2013).

After filtering the city through further layers like land use, utilities infrastructures, social services, its relation to the natural and historical contexts, as well as other factors like economics, the outcome of the overlay analysis tool is a map which categorizes the city in areas according to their high-rise development potential as prohibited, allowed with caution, permitted, encouraged and special for supertall or iconic buildings (Al-Kodmany & Ali, 2013).

- ***Land Uses, Utilities Infrastructures and Social Services***

With regard to the existing land uses, utilities infrastructures and social services or facilities, and based on the capacity of the areas to support high-rise developments, planners could choose to locate this type of buildings in the city centers, city edges, suburbs, around transit hubs and along main corridors. As previously mentioned, not to think about the immediate surroundings and existing conditions and functions of a high-rise can actually compromise the city's and neighborhood's local resources (Al-Kodmany & Ali, 2013; Saint-Pierre et al., 2010).

City centers such as primary and secondary downtowns are usually natural areas to locate high-rise buildings. The economic and agglomeration implications of the central areas, such as having direct access to corporate headquarters, banks and service companies, are what typically make them so attractive. However, problems like the risk of higher traffic congestions, of overloading the existing infrastructure, of dealing with a more complicated construction process due to the heavy machinery and crane capacity in the narrow streets, as well as fewer available open public spaces, are among the challenges that a high-rise building located in these areas will most likely have to address. Additionally, in the case of abandoned or aging city centers, the construction of new high-rises could trigger the beginning of a re-urbanization and rejuvenation process (Al-Kodmany & Ali, 2013; Frenkel, 2007).

When the existing city's infrastructure is either irreparably damaged or overloaded, building new high-rises and infrastructure on the less expensive land of the city edges to meet the increasing demand, could be one solution. This increasingly popular decentralization trend, can in fact generate some economic and morphological consequences on the areas and urban fabric selected, being the increase of its land values the most evident one. One extra factor to take into consideration is that it is complicated for the new areas to equalize the central area's public life and activities, making them less attractive for the investors when deciding where to build a new project. In any case, the ideal areas should be the ones which are already close to existing infrastructure and transportation networks -Figures 13 and 14-, otherwise, the associated costs of extending these networks to serve the new developments should be considered (Al-Kodmany & Ali, 2013; Frenkel, 2007; Wynne Rees, 2013).

High-rise Development Regulations



Figure 13: La Défense, Paris.
© Carlos E. Guerra B., 2013



Figure 14: La Défense, Paris.
© Carlos E. Guerra B., 2013

Even if the idea of introducing high-rises in suburban detached single-family residential areas might seem counterintuitive, there is a growing belief that the use of high-rises could be a solution for overcoming suburban sprawl—Figures 15 and 16-. By offering the opportunity to have a more efficient land use through a more compact development, high-rise buildings could contribute to overcoming the lack of mass transit in these neighborhoods by creating walkable and bikeable communities. Certainly, building tall in these communities would represent a shift and a reexamination of this type of suburban lifestyle (Al-Kodmany & Ali, 2013).



Figure 15: White Flint metro station in the suburb of North Bethesda, Maryland. Source: (Flood, 2016) © Kheir Al-Kodmany



Figure 16: Aerial view of the White Flint metro area surrounded by the suburban North Bethesda area. © Google Earth, 2016

Especially when locating high-rise buildings in both the city edges and the suburban neighborhoods, a height transition between the urban and rural areas or between the low- and high-density districts is required. Placing mid-rise buildings between the high-rise and the low-rise areas is a good way to smooth this transition and create an attractive skyline. In places like Hong Kong and South Korea, regulations or projects have already been developed to introduce the concept of gradation of densities -Figure 17-. This is also why in Hong Kong lower public buildings like schools and the city halls need to be built near to the lower historical villages so that the contrasting differences of scale are avoided (Al-Kodmany & Ali, 2013; Firley & Gimbal, 2011).



Figure 17: Height transition in the New Songdo City in South Korea.
Source: (KPF, 2017).

Lastly, in terms of mobility, high-rises are often clustered around main transit hubs or along main corridors. Locating tall constructions around major transport nodes is desirable because of the public gains entailed. The increase in efficiency in travel times and distances, as well as in transportation access not only reduces the traffic congestion and its environmental implications but also provides an economic gain, encouraging the developers and the public authorities to improve the existing transportation systems and public spaces rather than building more roads (Al-Kodmany & Ali, 2013).

On the other hand, linear planning along corridors improves the city's legibility by creating a street hierarchy, emphasizing some points or the urban fabric while creating different recognizable corridor segments. Height gradation should also be applied to the parallel streets of the tall constructions corridors like in the city of Curitiba, in Brazil -Figure 18-, otherwise, it can also create a wall effect and intrusive differences of scales -Figure 19-. Nonetheless, in some contexts the disconnection between the high-rise tenants' socioeconomic conditions and its actual use of the public transport system, has made cities which have already implemented linear arrangements, like Curitiba, to start to move towards the implementation of clusters around transit hubs -Figure 20- (Al-Kodmany & Ali, 2013; Prefeitura Municipal de Curitiba, 2016).



Figure 18: Curitiba's height gradation strategy along the main Bus Rapid Transit corridors.
Source: (IPPUC, 2017)



Figure 19: Dubai's linear high-rise development along the Sheikh Zayed Road, creating a wall effect. © (Spotmatik Ltd, 2017)

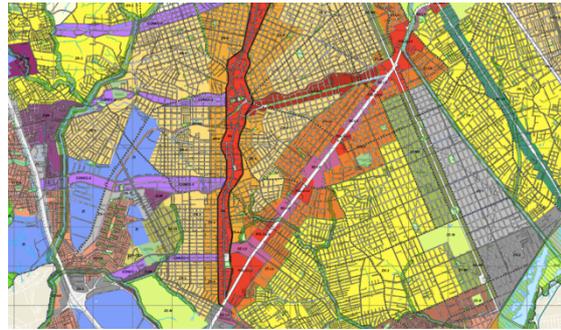


Figure 20: Curitiba's new zoning and land-use plan showing a transition from the density along corridors (vertical in red) to the density in corridors focused by poles in the main transit stations (diagonal in red) surrounded by transition areas (orange and pink). Source: (Prefeitura Municipal de Curitiba, 2016)

• *Natural Environment*

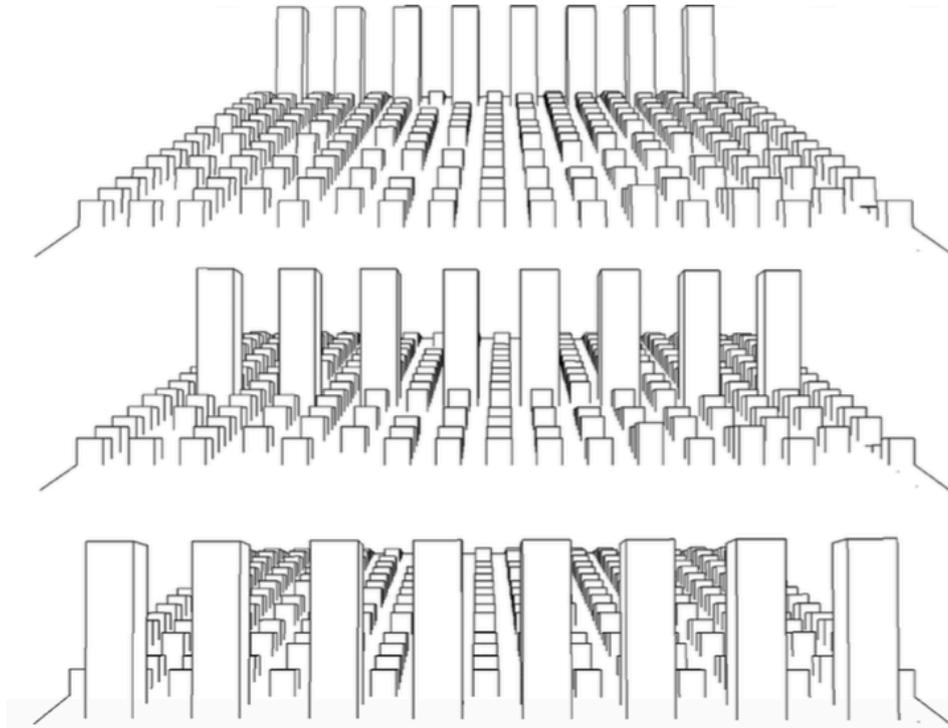
High-rise buildings have a significant impact on the natural environment and the landscape, reason why they should be planned according to their particular place and site in a way in which they don't diminish the nature's beauty and the character of a place. Problems mainly arise when high-rises are introduced in a way in which they visually or physically interrupt the rhythm or access to a natural setting, competing with the surrounding landscape. For this matter, two main relationships will be addressed, the one between high-rise buildings and the views towards the main natural features and the one between these buildings and the air flows (Al-Kodmany & Ali, 2013; Short, 2012).

When locating high-rises based on the natural criteria, one of the most important aspects to be avoided is the creation of a wall arrangement which blocks the access or views to the city's desirable natural features. Water bodies like lakes, seas, oceans and rivers, green areas like parks and gardens, and topographical elements like hills and mountains are amongst these desirable natural views (Al-Kodmany & Ali, 2013).

In 1997, the city of Vancouver published the Downtown Vancouver Skyline Study, a report which recommended some principles regarding the city's views towards the natural setting (Short, 2012, p. 172). On the first place, it was established that the backdrop of the northern city mountains 'The Lions' should be kept as the most predominant element in the skyline. Then, protection view cones were implemented from several points south of the False Creek area to avoid high-rises from blocking the views towards these mountains. Thirdly, and also to minimize the view blockage, all the buildings which exceeded a certain height limit would be only allowed in the Central Business District. And lastly, it was decided that buildings must step down their heights as they get closer to the water. Rather than being contested, the consensus around these view cones, their protection and management, has been well accepted by the public (Short, 2012).

As previously mentioned, in some cases, the allowed location of a building is also related to its maximum allowed height. The former is particularly relevant when it comes to the proximity of the high-rises to mountains and hills. In the first case, tall constructions should respect the

ridgeline of the mountains as the natural backdrop of the city, not blocking its visibility or going above its height. On the second case, high-rises should not be located on top of a hill to avoid the creation of a podium effect which will over-expose them -Figure 21-. Thin and height graduated buildings should then be implemented at the bottom of the hill, allowing light and air to access their surrounding buildings, benefiting from public transport routes and avoiding the block of views of the buildings behind them (Al-Kodmany & Ali, 2013; Saint-Pierre et al., 2010).



*Figure 21: Different possibilities of locating high-rises on a hill.
Source: (Al-Kodmany & Ali, 2013, p. 222).*

An example of the former can be seen in Hong Kong's high-rise regulation, whose urban design guidelines recommend that at least a 20% building-free zone in height must be sustained, taking as a base the Victoria Harbor ridgeline profile from different viewing points -Figure 22- (Al-Kodmany & Ali, 2013, p. 79). Furthermore, its View Corridor system also regulates the volumes and heights of the buildings along the waterfront to arrange and guarantee a visual permeability towards the internal sectors (Firley & Gimbal, 2011).

High-rise Development Regulations

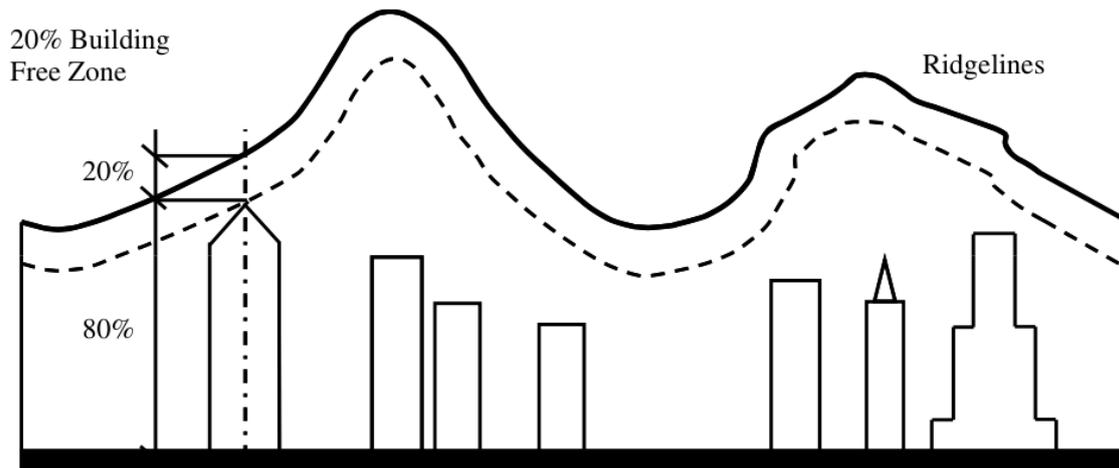


Figure 22: Hong Kong's design guideline to protect the Victoria Harbor's ridgeline.
Source: (Al-Kodmany & Ali, 2013, p. 81).

Another main aspect to be considered when locating high-rises is that to guarantee a healthy environment, the building's layout, massing and individual design should ease the natural ventilation between buildings. Just like with the views, the wall effect disturbing the fresh air coming from the waterfronts of going down mountains and hills must be avoided, without creating the so-called wind tunnels -Figure 23- (Al-Kodmany & Ali, 2013; Firley & Gimbal, 2011).

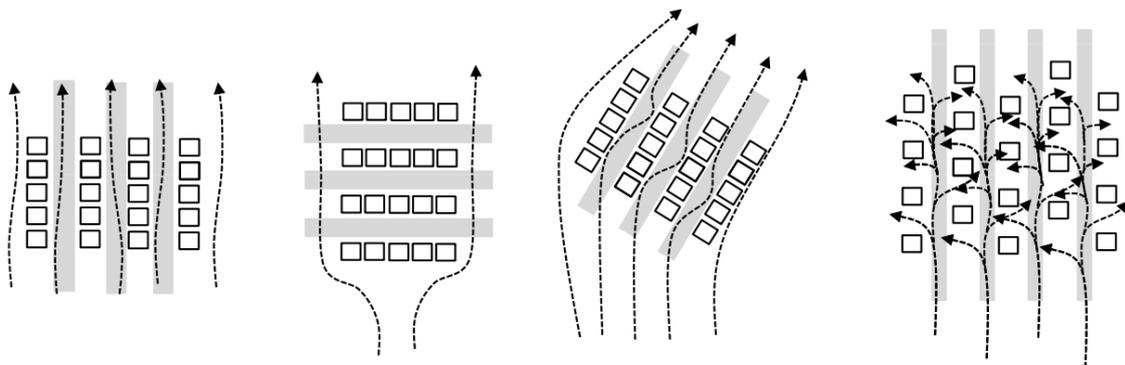


Figure 23: Wind in relation to tall buildings' layout and street orientation.
Source: (Al-Kodmany & Ali, 2013, p. 290)

Once again, the city of Hong Kong provides a good example on how to regulate on this issue. The Building Disposition chapter of the Honk Kong Planning Standards and Guidelines -HKPSG- stipulates what is a suitable disposition to generate an adequate airflow around buildings (Firley & Gimbal, 2011). First of all, taller buildings are located inland, arranging low-rises and open spaces in the direction of the dominant winds, close to the waterfronts. Where possible, wide gaps between buildings are created to maximize air flows and minimize wind corridors. Heights between high-rises are graduated to improve air circulation, and building's axis are arranged within 30 degrees of the prevailing wind direction to capture indoor natural ventilation (p. 232). Lastly, when the high-rises have a podium, the upper section of the building must, if possible, be aligned with the podium's edge -Figure 24-.

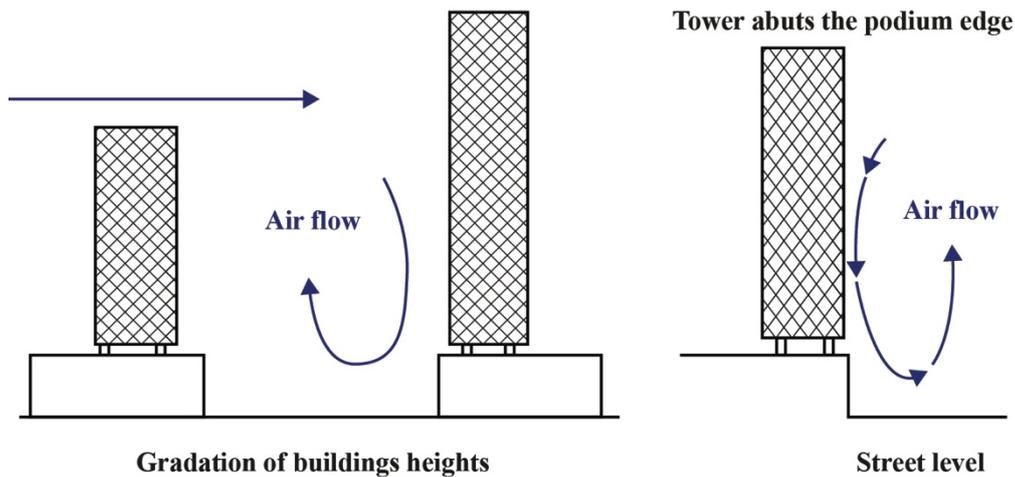


Figure 24: Honk Kong's planning strategies to provide airflow between buildings.
 Modified by the author from: (Firley & Gimbal, 2011, p. 233).

- **Historical Heritage**

When addressing the relationship between built heritage and high-rises, it is important to acknowledge that there are two divergent positions regarding this topic, the conservation and pro-development approaches. On one hand, protected areas and buildings like archeological sites, ruins and monuments help strengthen the city's identity, history and culture, while creating an attractive tourism economy. On the other, their high repair and maintenance costs, as well as the loss of opportunity of needed alternative developments, are sometimes seen as a burden that holds back the city's progress (Al-Kodmany & Ali, 2013; Short, 2012).

Historically speaking, the debates around high-rise developments have varied depending on each city's socio-political and cultural values on the built heritage. Factors like the local decision-making context, the negotiation mechanisms, political support and trade-offs, existing development controls, economics, the proximity to a sensible or major site and the public's perception and opinion, all impact on the way in which new proposals are either accepted or completely banned from some areas (Al-Kodmany & Ali, 2013).

In any case, since high-rises undoubtedly have a visual and bioclimatic impact on the adjacent buildings, the surrounding townscapes and the existing historic fabric, regulations should take into account both the property owner's development rights and the public interests. Therefore, the aim of these type of regulations should be towards managing urban change in a way in which adverse impacts on the historic fabric and built heritage are minimized, not only retaining the city's identity but also further enhancing and complementing it through proper planning processes –Figure 25- (Al-Kodmany & Ali, 2013; Short, 2004, 2012).



Figure 25: London's Skyline. Source: (Al-Kodmany & Ali, 2013, p. 70).

One of the first things to be done to achieve the former is to define what is to be considered as built heritage. In this regard, a characterization study, or a method which examines and understands a particular area's fabric, form, topography and design to establish its character, is one way to recognize what makes a place unique so that an effective plan for its protection can be developed (Short, 2012).

Once the concept of heritage has been defined and all the different historic buildings or areas have been identified and listed, the next step in determining the new allowed high-rise location is to evaluate the scale of the new buildings. Tall constructions should not be overexposed in relation to their surrounding cityscapes because otherwise, they will surely appear to be out of scale. Clustering high-rises into specifically designated areas, has then become a way to address this scale issue, because by concentrating and diverting development pressure away from the heritage sites, a new contemporary and continuous skyline with different focal points can be created (Al-Kodmany & Ali, 2013; Short, 2012).

Clustering, however, must also ensure an adequate visual access to and from protected monuments, buildings, areas, main gateways, as well as the city's overall skyline, without creating a wall effect. These views and view corridors are not only part of the city's identity, visual character and pride but also play a fundamental role in assisting the citizens to orient and guide themselves through the different street layouts of the city (Al-Kodmany & Ali, 2013; Short, 2012).

Examples of this type of view protection regulations include defining viewing cones where high-rise buildings, or development in general, are not allowed, establishing protected city panoramas to be appreciated from a distance and regulating specific local corridors that define main areas, among others. All of these measures can then be incorporated into a particular view protection plan for the city, to make them legally binding (Al-Kodmany & Ali, 2013; Short, 2012).

Perhaps the most representative example in this regard is London, a place where historically height regulations have been based on particular views of main monuments and places along the city. These regulations, however are the result of a multi-scale multi-actor negotiation process which includes UNESCO, the British government, English Heritage -the country's heritage protection institution-, UK's Committee of Architecture and Built Environment -CABE-, the

London mayor and Greater London Authority, as well as each of the 33 London municipalities (Short, 2012, 2014).

Already since 1989, and based on the planning framework established in the Downtown District Official Development Plan of 1975, a View Protection Guidelines document was developed (Short, 2012, p. 172). This report, defined 26 protected view cones towards historical buildings, like Saint Paul's Cathedral, from different perspectives (p. 172). Instead of implementing strict height and location limits, these criteria were meant to be reviewed and decided individually for each high-rise project depending on its proposed location, topography and distance from the view point. The quality of the designs, as well as the possible insertion of attractiveness and dynamism into an area, were also considered as arguments into this process (Saint-Pierre et al., 2010; Short, 2004, 2012).

Subsequently, in 2010 these guidelines were integrated into the London View Management Framework Supplementary Planning Guidance -SPG-, a document which complements the high-rise building policies of the London Plan (Short, 2012, p. 21). By 2012, the now 27 designated views –Figures 26 and 27- were divided into four main categories: panoramas -6-, linear views of landmarks framed by objects in the landscape -3-, townscape views -5- and views integrating the Thames -13- (Greater London Authority, 2012, p. 4). Additionally, other 11 view corridors stretching to landmarks were also included, extending the visual protection not only to the background but also to the surroundings of the landmarks (Firley & Gimbal, 2011, p. 201). As it will be further explained, these guidelines also require the developers to present a series of requirements like accurate visual representations and reports to get the building permit (Short, 2012).

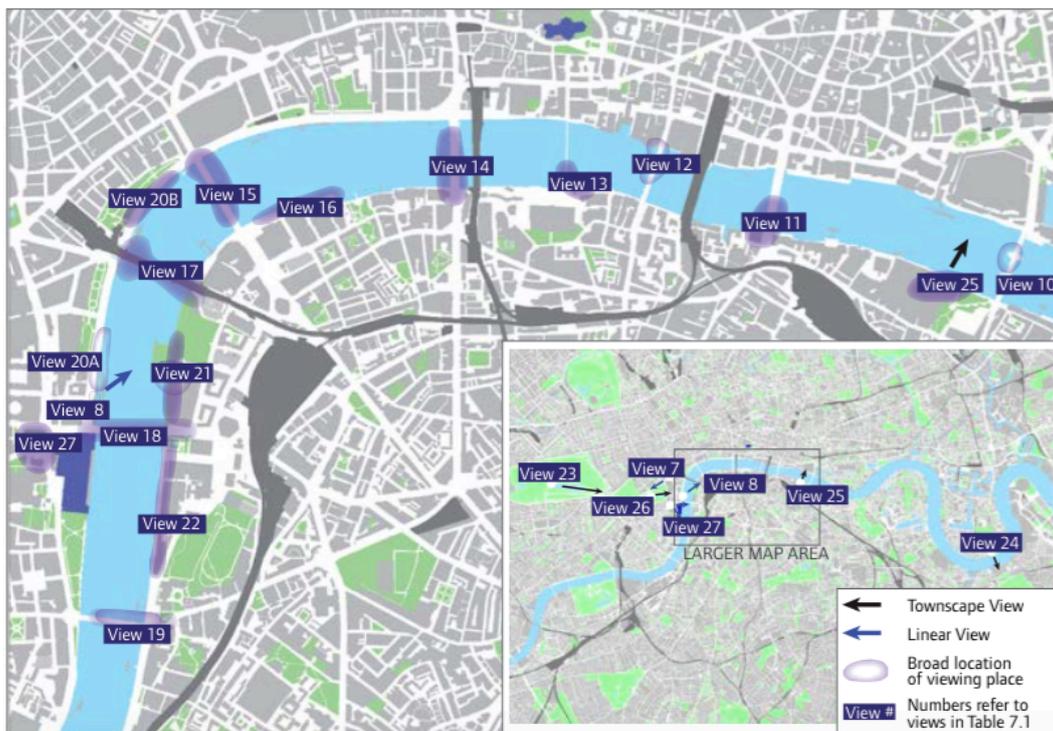


Figure 26: London's View Management Framework
Source: (Greater London Authority, 2016, p. 303)

High-rise Development Regulations

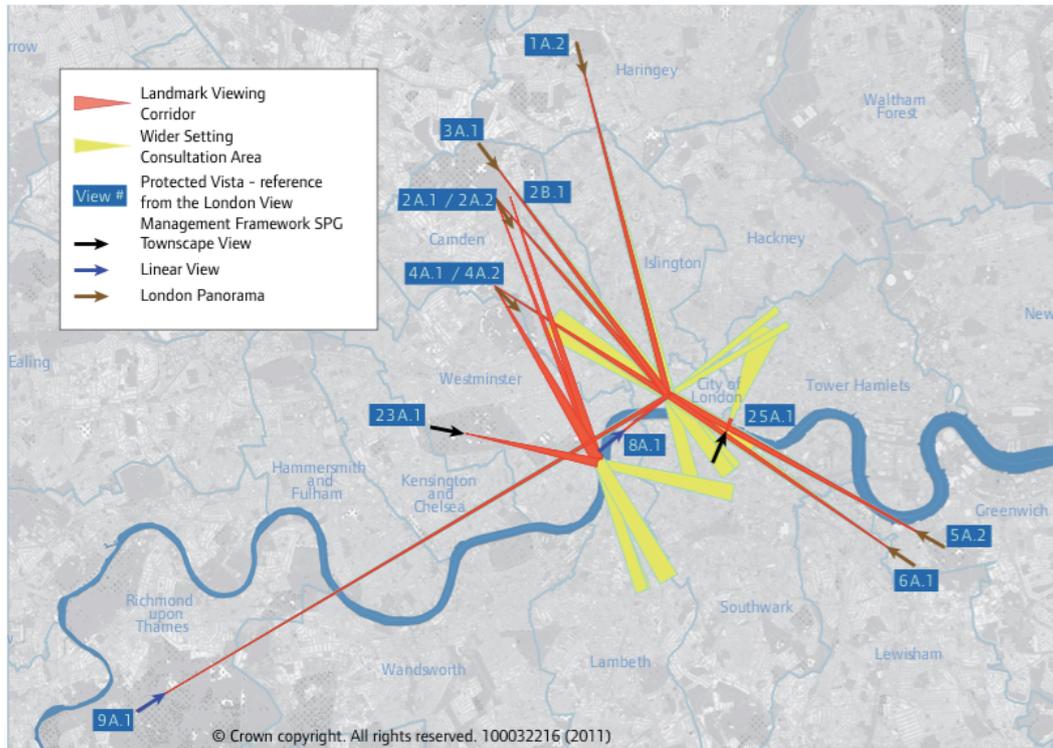


Figure 27: London's protected vistas.
Source: (Greater London Authority, 2016, p. 303)

- **Economics**

One last factor that influences the location of a high-rise is the economic or market conditions of a city. When developers are deciding on where to build a new project, they consider aspects like land values, possible tenants, levels of occupancy in the area, among others. In the same way, local planning authorities should take into consideration both the existing real estate market conditions and the future possible economic impacts on the surroundings that a new authorized or built high-rise project could have (Al-Kodmany & Ali, 2013).

Costly and centrally-located land, is usually where high-rise buildings are justified in terms of profitability, because building vertically in very attractive and valuable places with an existing demand, is the only way to reduce the cost per unit of land. In this regard, there is a direct relationship between the cost of land and the optimal height of a building, so that if a high-rise spatial distribution map of a city was to be developed, it could until a certain extent, reflect the city's land-rent gradient (Al-Kodmany & Ali, 2013; Frenkel, 2007).

Controlling Density

After the location criteria, the other important aspects that could be regulated for the development of a high-rise are its form, shape, height, volume, relation with the ground floor and neighbor buildings, as well as the parking needs. If well not all the planning systems regulate all of these elements, there are two main approaches on how to include them into each city's regulations. The first one is the implementation of a zoning system, which assigns specific sets of development criteria for each of the different land uses present in the city. For the extent of this work, when addressing the features of zoning, nine aspects will be taken into consideration: building height, FAR, setbacks, separation controls, building widths, floor plate sizes, coverage area, open space requirements, parking requirements and the mixing of land-uses. The second one is the development of a Form-based code -FBC-, a relatively new approach to zoning which focuses less on the land-uses and more on the physical design aspects (Al-Kodmany & Ali, 2013).

One of the main reasons for needing to regulate the form or volume of a high-rise building is the impact that it could have on the microclimate of its surroundings, affecting their neighboring buildings. High-rise buildings do not only have the potential to change the wind patterns of an area but also to modify the quality and quantity of daylight inside other buildings throughout the day. Furthermore, they can also create problems of loss of privacy, of glare -because of the refraction of sunlight on large glass surfaces-, or even light pollution at night (Short, 2012).

- ***Height Limits and FAR***

As described in chapter 3, height has historically been one of the first aspects to be regulated about high-rises. If well, the mitigation of the microclimate impacts of the immediate surroundings is one of the main reasons for wanting to control height, there are other aspects which should also be taken into consideration. The preservation of a city's imageability or historical character, market-driven real estate competitions, and practical considerations like aviation factors¹, fire safety, elevators, structure and energy demand, as just some of them. In the end, more than just being a matter of the building's impacts on its surroundings, height also influences the way in which a city addresses aspects like density, mix of uses, housing and even quality of public spaces (Al-Kodmany & Ali, 2013; Saint-Pierre et al., 2010).

However, is there an ideal height which could be implemented for all cities consistently over time? And the answer is no because height is strongly related to each city specific conditions at a certain moment in time. Even if at the beginning, building height was only related to the width of the street, over time the increasing spatial demands have constantly been changing cities' average heights. Just in Hong Kong, the typical height went from 30 stories in the 1970's to 40 stories in the 1980's, from 50 stories in the 1990's to far more than that in the 2000's. (Al-Kodmany & Ali, 2013, p. 224; Short, 2012).

¹ In the United States, the Federal Aviation Administration through the Federal Aviation Regulations Part 77 requires all structures above 61 meters in height near an airport to give notice. Subsequently, an aeronautical study for determining the structure's effects on the surrounding airspace is conducted (Al-Kodmany & Ali, 2013, p. 229).

High-rise Development Regulations

Furthermore, this concept of the ideal height could also be questioned from an economic perspective. Generally speaking, an economic height limit occurs when the costs of adding an extra level to a building exceed the revenue or the return from rent that it will generate. Nonetheless, it is not the economic or practical reasons but rather the prestige and the projected image which could explain the existence of the super- or megatall buildings (Al-Kodmany & Ali, 2013).

There are two main ways to regulate a building's height. The first one is to define different zones in the city and to establish maximum height limits -measured in meters, feet or number of floors- for each one of them. In some cities, if the building presents some setbacks from the site's boundaries or street frontages greater heights could be allowed, as it will be further explained. The second approach is through the use of Floor Area Ratios -FAR-, a relationship between the building's total allowed floor area and the plot's area -Figure 28-. Depending on the building's coverage area, these ratios have a direct relationship with the building's height, because the lower the ratios, the less allowed or potential floor area for development, and the less area, the lower the building is. In this regard, an appropriate FAR can be used, for example, to enforce a predominant height in a protected heritage district. Additionally, extra FAR could also be offered as a bonus for developers in exchange for some public benefits, as it will be further explained (Al-Kodmany & Ali, 2013; Short, 2012).

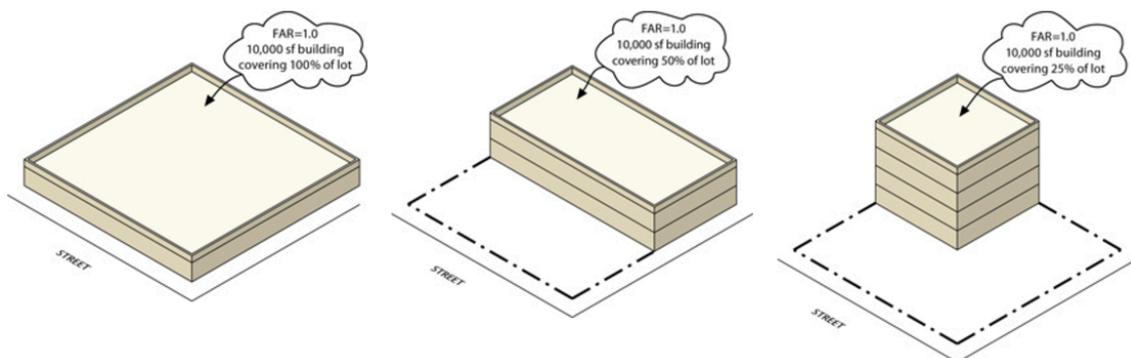


Figure 28: FAR of a building with different percentage of covered area.
Source: (NYC Department of City Planning, 2016a)

Tables 1 and 2 show the different maximum allowed heights and as-of-right FARs in several cities around the world. As it was previously mentioned, height regulations vary depending on each city's particular context. While some cities give more emphasis to specific height limits, other focus more on the maximum allowed FAR to control height. Other aspects like topography, proximity to either heritage areas, mountain regions or to the city center, access to sunlight, view corridors, land uses and the plot's number of street frontages, were also found to be related to the height and FAR criteria for these reference cities.

In the specific case of the city of Hong Kong, comprehensive urban renewal strategies have been implemented to create a system of three different residential density zones with their own maximum as-of-right FARs -Table 2-. Additionally, and based on the plot's proximity to public transportation stations and public spaces, its topographic conditions and its number of street frontages, different FARs were assigned (Firley & Gimbal, 2011).

Furthermore, for cities like Tokyo and Seoul maximum heights are not only related to the width of the adjacent street but also to the size of the plot. To protect sunlight access to both, the streets and the apartments inside each block, solar sky planes have been implemented. In Seoul, regulation states that a minimum of two hours of sun must reach the inside of the apartments between 9:00 am and 3:00 pm at the equinox. This is also why the buildings on the southern side of a block should be lower than those on the northern side of it (Hodyl, 2015, p. 32).

Table 1: Maximum height limits in different cities.

CITY	Paris		London	Vancouver		
	15	Montmartre	No pre-defined height limits. To be determined by the London View Management Framework SPG.	90	Typically in the city	
18	Butte-aux-Cailles	137		Specific high zones		
25	Central zones	187		Specific downtown areas under certain conditions		
31	Intermediate zones	Additional height restrictions apply on view corridors to mountains.				
37	Outlying districts					
53	Italie sector					
345	La Défense district					
MAX. HEIGHT LIMITS (Meters)	New York City		Tokyo	Hong Kong		
	<ol style="list-style-type: none"> 1. No pre-defined height limits. To be determined by individual assessments. 2. Related to setbacks and coverage area of the building. 3. Towers on a podium require 55% of floor area to be located under a 46m height threshold. 		<ol style="list-style-type: none"> 1. No pre-defined height limits. To be determined by sky plane angles that protect sunlight reaching the streets. 2. Related to the size of the site and adjacent street width. 	<ol style="list-style-type: none"> 1. No pre-defined height limits, with some exceptions. 2. Towers should be 20% below the height of the adjacent mountains. 		

Elaborated by the author from: (Firley & Gimbal, 2011, pp. 218, 220, 225; Hodyl, 2015, pp. 30, 32; Saint-Pierre et al., 2010, pp. 3, 6; Short, 2012, pp. 34, 172, 173, 176)

High-rise Development Regulations

Table 2: As-of-right maximum FAR in different cities.

CITY	Vancouver	New York City	Tokyo
AS-OF-RIGHT MAX. FAR (Ratio)	Varies depending on district and subsection. For Downtown area:	10:1 Residential	5:1 Residential
	11:1 Commercial. Without residential.	15:1 Commercial.	13:1 Commercial.
	7:1 Residential. Most common 5:1	Also allows mix-use with residential.	Also allows mix-use with residential.
	Hong Kong		
	High density residential (R1) Lower grounds	Medium density residential (R2) Higher grounds	15:1 Commercial. Also allows mix-use with residential.
10:1	Existing areas with 3 street frontages	6.6:1 With 2 or 3 street frontages	
9:1	Existing areas with 2 street frontages	5:1 With 1 street frontage	
8:1	Existing areas with 1 street frontage	Low density residential (R3) Steep sites	
6.5:1	For new development areas	3:1 Regardless of street frontages	

Elaborated by the author from: (City of Vancouver, 2016, pp. 7, 15; Firley & Gimbal, 2011, pp. 228, 229, 231; Hodyl, 2015, pp. 24, 30, 32; NYC Department of City Planning, 2017, Article III, Chapters 3-5).

- **Setbacks and Separation Controls**

The idea of the 1916 New York City Zoning Resolution that the volume of privately owned buildings could be legally regulated through a series of setback angles, completely changed the way in which high-rise buildings were planned. Since then, regulations to control the building's distance away from the streets, sidewalks, or from other neighbor buildings have been evolving to meet the ever-increasing demands, like the previously described Seoul case (Al-Kodmany & Ali, 2013; Weiss, 1992).

The main goal of these types of regulations is the creation of space between buildings for the quality improvement of both the building's interior spaces and the public realm. Depending on the building's side of the setback, is the type of benefit that is achieved. A front setback, or the distance between the building's facade and the street frontage, is mainly introduced to improve the pedestrian conditions in the public spaces. By creating a lower building form at the street edge, not only the visual dominance of the building's real height is reduced, with a scale more relatable to the pedestrians, but also the sunlight access to the street is protected, thus reducing the overshadowing. Moreover, front setbacks also lessen the impacts of the downward wind draft on the building's facades (Hodyl, 2015).

Perhaps the most famous front setback regulation is the 1916 New York City Zoning Resolution. As it was previously mentioned in chapter 3, originally five zones were devised based on the relation of the width of the street and the building's frontal wall at the street level -1, 1 ½, 2, 2 ½

and 3- (Al-Kodmany & Ali, 2013, p. 224). For example, if a plot was located in zone two, the developer could have a building's frontal wall of maximum two times the width of the street. Therefore, a theoretical inclined plane, or sky exposure plane, was created from the center of the street through the maximum allowed height of the building's frontal wall, forcing the building to setback to avoid going beyond or penetrating this plane –Figure 29-.

Nowadays, these front setbacks are defined not only based on the width of the street but also for each land use, setting specific heights above the street line, depth of front open areas, as well as vertical and horizontal distances of the slope –Figure 29-. Contrary to what it is usually assumed, the wedding cake profile is not a formal obligation, because the requirements allow buildings that only touch the sky plane on one point. Furthermore, these regulations vary depending is the building is a tower on a podium, a slender high-rise with a coverage area equal to or smaller than 40%, or if the plot is lined by two or more streets (Firley & Gimbal, 2011; Short, 2012, p. 34)

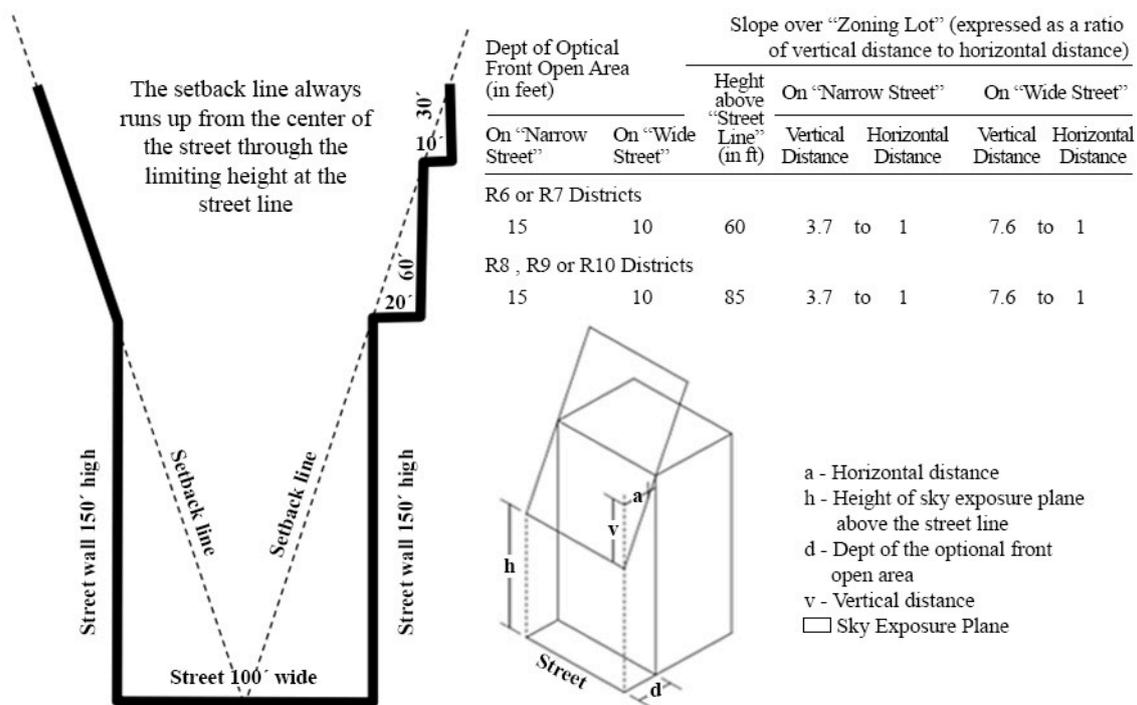


Figure 29: Examples of the sky planes and front setbacks in New York City according to the Zoning Resolution. Modified by the author from: (Al-Kodmany & Ali, 2013, p. 226; Short, 2012, p. 35)

On the other hand, side and rear setbacks, or the distances away from their respective plot boundaries, are also known as separation controls, because they define the distance that a building must be away from another building or window. These types of setbacks are mainly introduced to allow an adequate access of natural light, sunlight and air flow both between the buildings and into their interior spaces. Open spaces within the plot like gardens, plazas and courtyards are also benefited from these type of regulations, improving the pedestrian access to the building. In the case of residential high-rises, these separation controls result in a better protection of the tenants' privacy and views. Depending on the building's shape, generally speaking, distances between buildings should increase as the buildings' height increases –Figure 30-. Finally, in the case of property owners, these setbacks also represent a way to protect their developments, ensuring that the adjacent plots won't built out in the future (Al-Kodmany & Ali, 2013; Hodyl, 2015).

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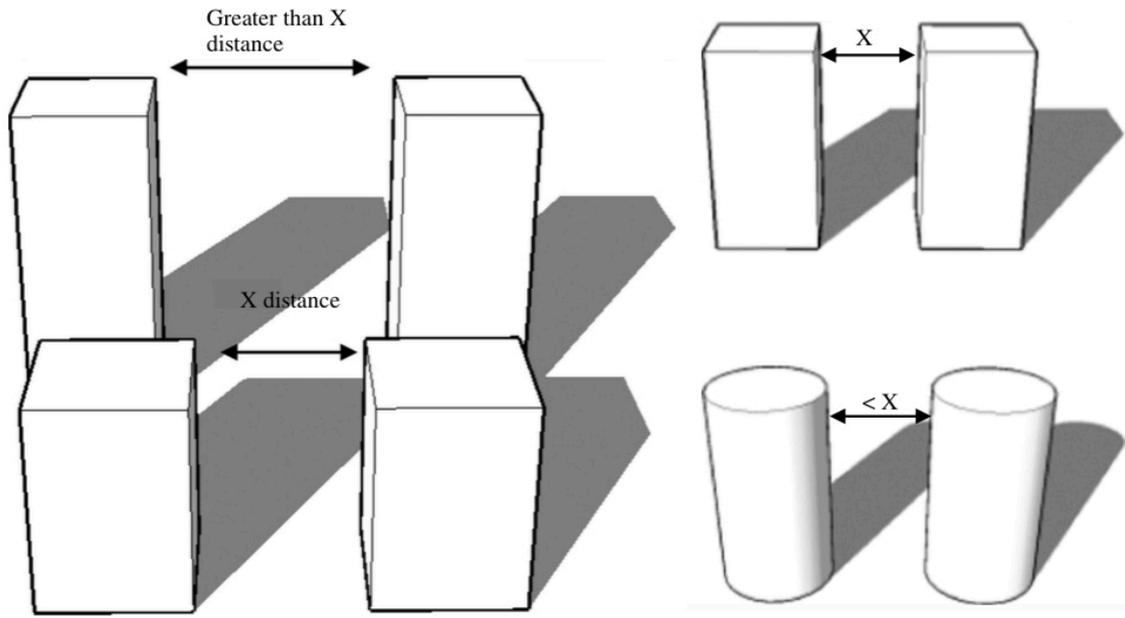


Figure 30: Distance between buildings changing based on the buildings height and shape.
 Source: (Al-Kodmany & Ali, 2013, pp. 291, 292)

If well some separation controls indicate 25 meters as the minimum distance between buildings, the reality is that regulations vary a lot depending on the city, as seen in Table 3 (Al-Kodmany & Ali, 2013, p. 291).

Table 3: Side / rear setback distances in different cities.

CITY	Vancouver		New York City		Tokyo
	12	To boundary (24 between buildings)	9	To boundary (18 between buildings)	No policy in place
SIDE / REAR SET-BACKS (Meters)	Hong Kong		Seoul		
	7.5	To boundary (15 between buildings). Wind impact assesment required.	6	To boundary if no windows (12 between buildings). Else proportional.	The distance is a proportion of the height of the building, with ratios between 0.8 and 1.2. For example if a building is 100m tall, the adjacent one (to the north) must be a minimum of 80m away.

Elaborated by the author from: (Hodyl, 2015, pp. 31, 32)

- **Building Width, Floor Plate Sizes and Coverage Area**

Another way to control the volume or dimensions of a high-rise building is through the implementation of regulations concerning the maximum width, floor plate sizes and coverage area ratios. While the first one is the maximum allowed dimension of a side of the high-rise building –measured in meters or feet-, the second and third ones are indicators of occupation measuring either footprint areas -in square meters or square feet- or ratios between the total footprint area of a building and the whole plot area. Besides the benefits for the view corridors, the natural light and the air flow between and inside high-rise buildings, smaller footprints and coverage areas also led to the creation of more open spaces, as it will be further explained (a+t research group, 2015; Al-Kodmany & Ali, 2013).

Just as with the other regulations, for these criteria there is no ideal dimension or area to be implemented for all of the different contexts, particularly because the high-rise dimension changes according to the plot's size and proportions –Table 4-. This explains why while in Vancouver the maximum allowed width dimension for a high-rise building is 27 m, in Seattle it is a range between 36.5 and 44 m (Al-Kodmany & Ali, 2013, p. 224; Hodyl, 2015, p. 31).

Table 4: Maximum floor plate size and site coverage area for different cities.

CITY	Vancouver	New York City	Hong Kong
MAX. FLOOR PLATE SIZE (M²)	604 Gross area (27 m maximum width)	Varies depending on the city district.	No policy in place
SITE COV. AREA (%)	For residential multiple dwelling uses: 55% Maximum For commercial uses: Not applicable	For residential uses: 30% Minimum 70% Maximum For commercial uses: 55% Maximum	Related to the height and street frontages. For example: 37.5% Max. for sites with 2 street frontages and height above 61m

Elaborated by the author from: (City of Vancouver, 2017; Hodyl, 2015, p. 31; NYC Department of City Planning, 2017, Article II, Chapter 3, Article III, Chapter 3)

- **Open Space Requirements**

Some cities place further regulations on the lot usage by demanding a minimum area of the plot to be used for open spaces. These areas could be either public open spaces, accessible to all citizens, or communal open spaces, accessible exclusively for the users, tenants or residents of a particular building or complex. These requirements are usually expressed as a ratio of the total open space area required to that of the total plot. To ensure enough green or permeable areas within the site, some regulations do not take into consideration paved areas, such as parking lots, into these requirements (Al-Kodmany & Ali, 2013; Hodyl, 2015).

As Table 5 shows, while some cities base these open space requirements on the total number of residents or apartments per plot, others calculate these areas based on the plot's size or in the relationship between the total floor area and the plot's area, also known as height factor. In this regard, it is important to highlight that by taking the plot's area as a reference of the open space requirements the minimum area per tenant will not necessarily be guaranteed, especially when more residents move into the plot. Additionally, these areas could be required to be either specifically within the plot or as an improvement of already existing and neighbor public areas (Hodyl, 2015; NYC Department of City Planning, 2016a).

Table 5: Minimum open space requirement in different cities.

CITY	Vancouver		New York City	
	MIN. OPEN SPACE REQ. (M ² - %)	4.6	Per apartment. On-site communal open space.	On-site open space for high buildings is based on the height factor. Height factors 1- 21: 9 - 37.5% Of plot area. After height factor 21: 0.3 - 0.5% Per additional height factor
Hong Kong				Melbourne
1.0		Per person. On-site public open space.	5%	Of plot area (or equiv. cash value). Not required on-site Public open space.

Elaborated by the author from: (Hodyl, 2015, pp. 31, 32; NYC Department of City Planning, 2017, Article II, Chapter 3)

- **Parking Requirements**

Usually differing by land use, parking regulations dictate the required number of regular or universal accessible parking spaces that a building must include per each tenant, visitor or service area. Requirements vary depending on the location and the nature of the parking, this is, if it is close to a transit station, if it is on the surface, underground, in upper floors as a podium, etcetera. For residential buildings, parking regulations generally require two places per each housing unit. This, however, may be reduced for housing typologies with a lower degree of car ownership like affordable housing and student dormitories. For improving the livability and walkability of the streetscapes, locating parking underground or concealed behind high-rise buildings is usually desirable (Al-Kodmany & Ali, 2013, p. 227).

Table 6 shows a sample of New York's parking regulations for the residential, commercial and community facility uses. Based on the type of zoning district the plot is located in, some parking reductions apply, including when the parking facilities are grouped, when the plots have an area smaller than 15,000 square feet -1,393.5 m²-, when the buildings are located within a transit zone or when they include income restricted housing units (NYC Department of City Planning, 2017, Article II, Chapter 5).

Table 6: Parking requirements for New York City.

REQ. PARK. SPACES	New York City (No.)		
	Single-family detached residences, or low density districts (R1 - R5): 1.5 - 3 per residence, based on type of district	For high density districts, other than single-family detached residences, based on plot area: R6, R7: 1/300 sqf (1/27.9 m ²) R8-R10: 1/225 sqf (1/20.9 m ²)	For community facilities and commercial uses based on plot area: 1/400 sqf (1/37.2 m ²)
REQ. PARK. SPACES	Reductions (%)		
	When group parking facilities are provided: 40-70% of the total number. Based on type of district	For plots with an area smaller than 15,000 sqf (1,393.5 m ²): 20-50% of the total number. Based on type of district	For income-restricted housing units: 0 per unit, within transit zone. 12-50% of the total number outside transit zone. Based on type of district

Elaborated by the author from: (NYC Department of City Planning, 2017, Article II, Chapter 5)

One important factor to consider is that generally parking requirements increase the cost of housing, especially in high land value areas. According to some studies, in Los Angeles parking regulations can raise the cost of each apartment by up to \$104,000 USD (Ikeda & Washington, 2015, p. 13). In this regard, it is likely for low-income residents to prefer less-expensive apartment

rents than parking spaces if the minimum legal parking requirements allowed the developers to do so.

Another recent example of parking reductions can be found in Mexico City, where in 2017 the city government enacted a new regulation to reduce the required number of parking spots by half, arguing that the current 6.5 million parking spots occupying an area of around 200 million m² only increased the prices of housing and pushed the population towards the periphery (NOTIMEX, 2017). Additionally, this new regulation specifies that per each additional parking spot provided new developments would have to pay a fee which will be destined to the improvement of the public transportation system.

- ***Mixing of Land-uses***

High-rise guidelines can not only regulate the physical characteristics of a building but also its functional aspects, as the land-uses included. As stated earlier, since high-rise buildings are not isolated objects within the urban fabric, they have the potential to impact their immediate surroundings. For that matter, while positive impacts include enhancing the livability of depressed residential neighborhoods, negative ones include the endangering of local resources, the deterioration of public spaces, the creation of traffic and thus the triggering of neighbors' opposition. This is why to think about the compatibility of the proposed urban functions within the existing surroundings is fundamental to achieve a more successful high-rise project (Al-Kodmany & Ali, 2013; Saint-Pierre et al., 2010).

In this regard, the mixing of functions in proposed high-rise buildings is a great way to properly connect with the local communities to link the building with their place. Multifunctional buildings have the capacity to provide and complement a wide variety of services and activities to cater the specific needs of a local community. At the same time, with the building's future tenants and users, they can also support and make use of the neighborhood's current services, even stimulating the creation of new jobs. Work, live, shop, play, all of the different mixed-use schemes have the potential to create a more attractive way of living, helping to move a district towards a more sustainable type of development (Al-Kodmany & Ali, 2013; Saint-Pierre et al., 2010).

One of the main ways to include this type of regulations in a zoning system, typically involves modifying the land-use compatibility criteria, so that in some areas the mixing of uses is not only allowed but also encouraged. This is why in Hong Kong, high-density residential areas allow commercial uses to be distributed within four levels, and not only on the ground floors (Firley & Gimbal, 2011, p. 231). Another way to regulate this is through the creation of development incentives, specifying a minimum percentage of the development area to be destined to a particular land-use to get more FAR or height, as it will be further explained (Al-Kodmany & Ali, 2013).

Perhaps one of the cities that has been more acknowledged for supporting the mixing of uses in high-rise buildings is Vancouver, because already since the 1980's the city started to implement its ideology or model now called Vancouverism -Figure 31- (Short, 2012, p. 169). Tall, slender, widely separated buildings are intermingled with public spaces and low-rise buildings, or placed over podiums with commercial uses on the ground floors to create and retain lively and pedestrian-friendly streetscapes, looking to mitigate the impacts of a high-density type of living.



Figure 31: Vancouverism high-rise development model. Source: (The Mike Stewart Realty Network, 2017)

- **Form-based Codes**

Unlike conventional zoning regulations, a form-based code -FBC- is a relatively new approach to zoning which focuses less on land uses and more on prescribing physical design aspects for a particular area to reach a specific urban form. Detailed design-oriented rules for the relationships between buildings and the streetscape are aimed at creating good quality, compact and mixed-use urban developments with attractive and walkable pedestrian environments. By doing so, the expectation is that all of the different actors involved like residents, property owners and developers, will exactly get their predicted private and public urban form outcomes (Al-Kodmany & Ali, 2013; DPZ Partners, 2016).

Regulation plans, street sections and urban and architectural regulations, are all part of this integrated system of form-based coding. Therefore, the building's height, shape, setbacks, layout and the streetscape and parking design criteria, are all graphically and verbally described exclusively for an individual project, aiming to establish a distinctive character for the different streets, squares and other public spaces. For that matter, the scale of this type of regulations ranges from simple design guidelines for a specific street or district to urban design regulation plans for complete municipalities (Al-Kodmany & Ali, 2013; DPZ Partners, 2016).

One type of FBC is a SmartCode, a regulatory document which seeks to supplement or replace conventional zoning standards like the Traditional Neighborhood Design Ordinances from the United States, from which it emerges. First developed by the US-based New Urbanist firms Duany Plater Zyberk -DPZ- and PlaceMakers, this instrument integrates matters such as regional organization, rural-to-urban transition, zoning, subdivision regulations, urban and sometimes architectural design guidelines into one document –Figure 32-, aiming towards a sustainable growth and re-development processes (Al-Kodmany & Ali, 2013; DPZ Partners, 2016).

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Figure 32: Different urban and architectural design criteria based on the rural-to-urban transect.
Source: (DPZ Partners, 2016)

If well this type of regulations don't have universally applied rules or dimensions for high-rise buildings, one of the most important principles which is constant in most of them is the build-to lines. Unlike the frontal setback approach, FBCs suggest that high-rises should have a base which must be located within three meters of the property line or right at the edge of the plot, creating a sort of street wall which contains and defines the space at the ground floor -Figure 33- (Al-Kodmany & Ali, 2013, p. 231). To support a vibrant and healthy street life, distinguishable bases –of around 20 meters in height for buildings up to 88 meters- should include commercial and services uses, such as retail, public or customer services, entertainment, cultural offers, amongst others (p. 231). Furthermore, to reduce the negative impacts of parking on the streetscape, if a lot is located within a 0.8 km radius of a main public transportation hub, FBCs allow a 30% reduction of the total amount of parking required (p. 231).

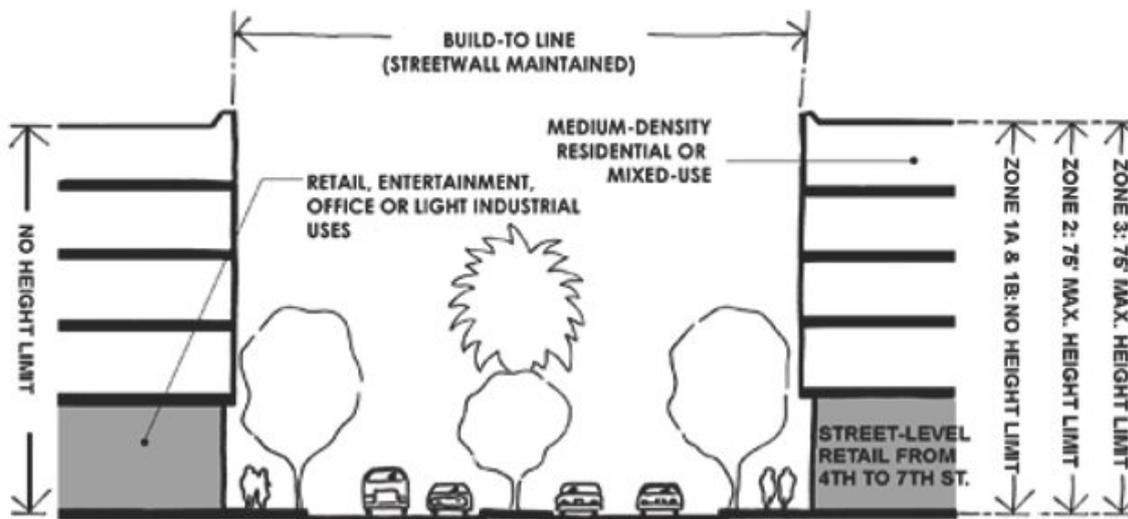


Figure 33: Example of a FBC for National City, California.
Source: (PlaceMakers, 2017)

4.2.2 For Incentivizing High-rises

In this second category, for incentivizing high-rises, the aim was to group all of the regulations that allowed and fostered greater densities or building heights in exchange for some public contributions for the benefit of the city. Three main instruments were further identified, transfer of developments rights, incentive zoning and tax increment financing.

Transfer of Development Rights

Based on an idea that started to be used along Park Avenue in New York around the 1900's, the Transfer of Development Rights -TDR- is a system that has been operating in the city since it was officially introduced into the Zoning Resolution in 1968 (Firley & Gimbal, 2011, p. 223; Short, 2012, p. 229). The main elements of this system are the development rights, which refer to the maximum amount of floor area or envelope of air space which is as-of-right allowed to be built or filled by a building on a particular plot. When an existing building is not entirely using the total amount of floor area permitted, the unbuilt area difference is called unused development rights, or air rights (NYC Department of City Planning, 2016a; Short, 2012).

The key driver of this system is the possibility of one plot to utilize unused floor area from another neighbor property to achieve a greater development. Initially, air rights were used to allow developers to build over transportation facilities, which did not need to grow so much in height or were mainly built underground. However, this was later expanded to allow high-rise buildings to develop over adjacent shorter buildings, or to permit the transfer of unused floor area of one plot into another under limited circumstances (NYC Department of City Planning, 2016a; Short, 2012).

The transfer is only allowed in two ways. The first one is through a lot merge. When joining two or more adjacent plots into a new one, the unused development rights of one of the original plots can be as-of-right shifted to any of the other now merged plots. When the transfer is not possible through a lot merger or when the plot with the unused air rights is listed by the Landmarks Preservation Commission, the developments rights can then be sold to another plot –Figure 34- (NYC Department of City Planning, 2016a).

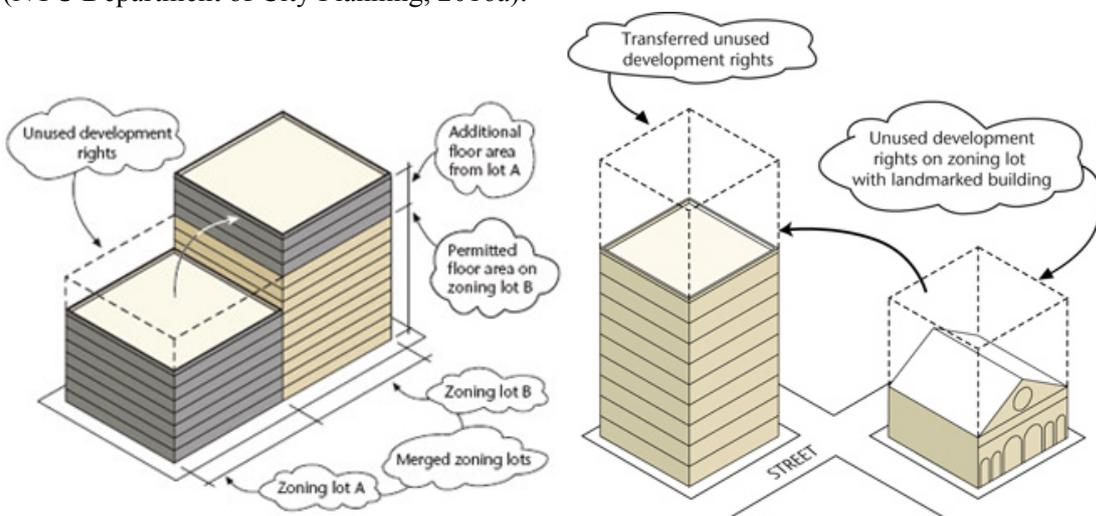


Figure 34: Transfer of Development Rights.
Source: (NYC Department of City Planning, 2016a)

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Since this instrument is usually implemented to promote the retention and preservation of landmark buildings, generally underdeveloped when located in central areas and vulnerable to other high-rise buildings in dense environments, some restrictions apply (NYC Department of City Planning, 2016a; Short, 2012). First of all, the building has to be listed as a landmark, excluding statues, commemorative monuments and bridges. Second, the receiving plot must be adjacent, directly across the street or -if a corner plot- in the same intersection than the one selling the unused development rights. Third, as part of the sale, the developer from the receiving plot, which can only increase its building by up to 20%, must prepare an acceptable proposal to maintain, restore and preserve the landmark building that does the transfer (Firley & Gimbal, 2011, p. 224). Finally, and if all the conditions specified in the Zoning Resolution are met, the City Planning Commission needs to issue a special permit that goes through a public review process for its final authorization (NYC Department of City Planning, 2016a).

As part of this regulation, which seeks to balance the need of preservation with the owners' right to obtain an economic gain from their properties, more than 700 historic low-rise buildings have been listed in New York City alone (Firley & Gimbal, 2011, p. 224). However, the risks of not successfully achieving this previously described balance, are the huge impacts that these types of incentive instruments can have upon the protected built heritage, completely altering or destroying their character and context. In addition to New York, other cities like Vancouver, Tokyo and Mexico City have already incorporated this instrument in their high-rise regulations (Hodyl, 2015; Short, 2012; Zabala Corredor, 2015).

Incentive Zoning

As it was previously described in chapter 3, the concept of incentive zoning -even if it was not invented in New York- was one of the most important ideas introduced in New York's 1961 Zoning Resolution. This instrument offers the developers the opportunity to earn additional buildable benefits by making a public contribution that compensates or reduces some of the impacts created by the construction of the high-rise building itself. Therefore, through a negotiation process between the different parties involved, a legal agreement is reached that grants a bonus, usually in the form of additional floor area to a development, in exchange for a particular amenity required or needed by the community. In this regard, it could be said that this is a mutually beneficial type of regulation, because by allowing some flexibility to the existing zoning resolutions, the increase in value that helps maximize the developer's profit is somehow reflected in both the provision of the infrastructure needed to support this high-rise building and in the improvement of the immediate community's quality of living (Al-Kodmany & Ali, 2013; NYC Department of City Planning, 2016a; Short, 2012; Weiss, 1992).

Even if originally these contributions mainly included the increase of ground floor open spaces to offer privately owned parks or plazas, the list of benefits has diversified since then, to now include the following (Al-Kodmany & Ali, 2013; NYC Department of City Planning, 2016a; Weiss, 1992):

- Plazas, parks, arcades, pedestrian passageways or any other type of attractive outdoor and indoor public space on the ground floor;
- rooftop amenities like observations decks, parks, gardens and play spaces;
- museums, live theaters, dance studios and visual or performing arts spaces;

- the preservation of protected landmark buildings, like theaters;
- a percentage or number of affordable housing units within or in another development;
- social facilities like child-care centers;
- the provision or improvement of transit station facilities, access easements or pedestrian connections to existing stations;
- walking and cycling infrastructures, like cycle lanes, biking stations and pedestrian bridges;
- needed utility infrastructures for the increased demand;
- and urban agriculture initiatives like local fresh foods full-line grocery stores

If well all of these contributions are necessary to mitigate the impacts of the high-rise buildings, the ones related to mobility, open spaces and affordability are particularly relevant because they require some additional considerations. One of which, is the assurance of compliance with the conditions previously agreed upon, as it will be further explained.

Since high-rise buildings have the potential to attract a significant number of tenants or users, when they are located in areas with no available public transportation or designed only to receive users and goods by car traffic, they can have a major impact on the existing mobility infrastructure, both by increasing the private vehicle traffic and by discouraging the use of public transport systems. On the contrary, statistics show that when densities increase, ridership on public transport also significantly increases (Al-Kodmany & Ali, 2013, p. 211). A resident of a medium- or high-density area is about 30% more likely to use the public transportation system than someone who lives in a low-density neighborhood, furthermore, it is also more likely for someone to choose transit over driving when the employment densities of an area reach around 50 to 75 employees per acre -124 to 173 employees per ha- (p. 211). For that matter, a proper assessment of how the proposals will impact the capacity of the mobility systems will help to identify where the potential improvements could be made, integrating the building into the surrounding transportation network and improving the way in which the city is navigated and used (Short, 2012).

With regard to the public spaces, an increase in the urban population of an area usually leads to a more intense use of them, requiring an equal increase in the amount of public spaces around and within the different levels of the building, to meet this new demand. Research shows that the success in high-rise buildings is correlated with the incorporation of lively activities at the ground floor, providing with opportunities for strolling, sitting, relaxing and playing throughout the year (Al-Kodmany & Ali, 2013, p. 118). When this is not achieved, the building and the site become a barrier, breaking the continuity and legibility of the city. For that matter, when granting an incentive in exchange of open spaces, some special considerations need to be made (Al-Kodmany & Ali, 2013; Short, 2012).

First of all, these spaces need to be kept public. It is often common that over time and under the argument of safety, their access becomes restricted, thus privatizing an area that was negotiated to function as public. In an analysis conducted for 320 projects in New York City, nearly half of them restricted the public access to these spaces, disrespecting the legal agreement reached by incentive zoning (Short, 2012, p. 38). Secondly, especially when it comes to indoor spaces at the street level, they must be designed to include all the different socio-economic segments of the society to blend into their neighborhood. When these spaces are only directed to the upper socio-

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economic segments, they segregate the rest by acting like exclusive or gated private plazas. And lastly, they need to have an adequate design and maintenance for their comfortable use, regulating at the same time the possible commercial activities within them such as cafes and kiosks (Al-Kodmany & Ali, 2013; NYC Department of City Planning, 2016c; Short, 2012).

To address these challenges, New York City incorporated the Privately Owned Public Spaces -POPS- zoning tool –Figures 35 and 36- (NYC Department of City Planning, 2016c). All of the outdoor and indoor spaces constructed and maintained by a property owner/developer for public use as part of incentive zoning regulation are included within this program. The specifications for these areas are incorporated in the section 37-70 of the city's Zoning Resolution, including design aspects such as the dimensions, location, accessibility, seating, planting, signage, artworks, permitted kiosks and open air cafes, as well as maintenance requirements (NYC Department of City Planning, 2016c).



Figure 35: POPS in New York City.
© Carlos E. Guerra B., 2014



Figure 36: POPS logo placed close to the entrance to identify the space.
© Carlos E. Guerra B., 2014

Depending on the different contexts, other types of specific regulations for incentive-zoning-driven open spaces can apply. In cities like London and Singapore, public authorities can require and even oblige the developers to grant public access to observation decks and other areas at the upper floors. Furthermore, in Honk Kong, incentives to incorporate pedestrian bridges between buildings and podiums to improve access and create a pedestrian network, have also been drawn up by the government (Firley & Gimbal, 2011).

And finally, with regard to affordability, mixing is one of the main factors in the rehabilitation and development processes of districts. When high-rise buildings include affordable housing units along with other housing typologies, not only social integration and diversity are being encouraged but also a fight against inequality is being carried out. This is the reason why, according to some experts, all of the residential or mixed-use developments should ideally include an element of affordable housing. How to do so, is then the main challenge. Some regulations propose that a fixed percentage of affordable housing units of the total provided is implemented. Others say it should be based on the scale, either by the number of apartments –being mandatory for all the developments containing 25 or more new dwellings- or by the lot area –being

compulsory for the developments exceeding one hectare- (Al-Kodmany & Ali, 2013, p. 304; Saint-Pierre et al., 2010).

In this regard, one of the cities that has been regulating affordability in high-rise buildings for almost 30 years is New York (NYC Department of City Planning, 2016b). The Inclusionary Housing Program -IHP- is a zoning tool which offers two types of incentives as floor area bonus in exchange for the rehabilitation or creation of affordable housing units either on-site, as part of the new developments, or off-site, in the same community or within one-half mile of the benefited building. Its specifications are contained in Section 23-90 of the city's Zoning Resolution (NYC Department of City Planning, 2016b).

The first type of incentive is the R10 program, created in 1987 for high-density R10 zoning districts (NYC Department of City Planning, 2016b). Mainly focused in Manhattan, developers can increase their maximum FAR from 10 to 12 depending on the number of square feet of affordable housing they include, on whether the units are on-site or off-site, on whether it is a new construction, rehabilitation or preservation of an existing building, and on whether public funding is used for their construction (NYC Department of City Planning, 2016b).

The second incentive is the Designated Areas program, created in 2005 for some specially selected and mapped medium and high-density neighborhoods throughout the city (NYC Department of City Planning, 2016b). These areas, which usually have a lower allowed FAR compared to the regular FAR criteria, offer new developments or enlargement projects –of more than half of the existing area- the opportunity to increase their buildability. By allocating at least 20% of the floor area to affordable housing, these developments can increase in 33% their maximum allowed floor area -Figure 37- (NYC Department of City Planning, 2016b). This bonus can later be also further combined with other housing subsidy programs.

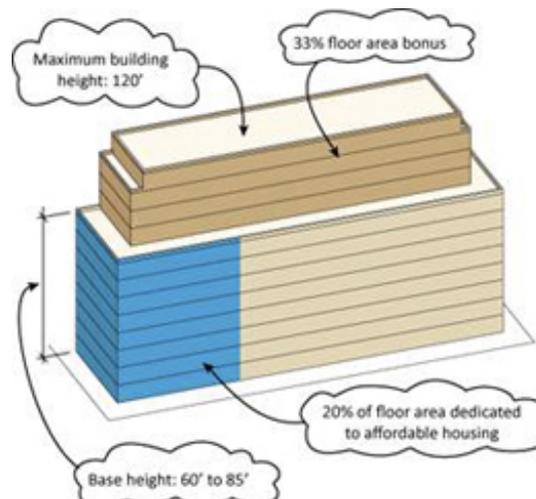


Figure 37: Example for the Designated Areas Program in New York City.
Source: (NYC Department of City Planning, 2016b)

Some cities in other parts of the world, besides the so-called countries of the global north, have also incorporated this type of regulations. In Colombia, according to Bogotá's 2012-2016 Urban Development Plan, some districts of the city can elaborate partial development plans to enforce that at least 85% of all of the housing units within the new developments of that specific district

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are affordable housing units (Gómez Sandoval, Niebles Alba, de los Río España, & Villamizar Arturo, 2015, p. 68). Furthermore, through the implementation of a concept called associated management, when a high-rise building is part of a redevelopment strategy of an already built neighborhood, the existing tenants are presented with several options to avoid being gentrified (Acero, 2015). These options include the exchange of their currently owned square meters of floor area for the same number of square meters of the new developments, the exchange or their current properties for other new or used ones of the same value in other parts of the city, and to become an investor for the new project, contributing with the value of their properties and pre-negotiating the level of risks for their return of investment (pp. 213-215).

Unlike the contributions, which can be somehow flexible, depending on what is negotiated and agreed upon between all parties involved, the density bonus that the developers will receive in exchange need to be regulated beforehand. As Table 7 shows, the final maximum FAR values that can be achieved after the density bonus of incentive zoning have been received varies depending on each city's context (Hodyl, 2015).

Table 7: Maximum FAR as a result of the incentive zoning in reference cities.

CITY	Tokyo		New York City	
	MAX. FAR (Ratio)	Residential: 7.5:1	From original 5:1	Residential: 12:1
Commercial and mixed-use: 19.5:1		From original 13:1	Commercial and mixed-use: 18:1	From original 15:1 Residential component contained to 12:1
Hong Kong		Vancouver		
Residential: 11:1		From original 10:1	Residential: 5:1	From original 3:1

Elaborated by the author from: (Hodyl, 2015, pp. 20, 22, 30, 32)

Tax Increment Financing

The last of the incentives identified for this category is the Tax Increment Financing tool -TIF-, a local funding mechanism whose first practices date back to 1952 in the state of California, United States (Dye & Merriman, 2006, p. 3). This tool, which didn't become popular until the 1980's and 1990's, when the US federal and state grants for municipalities were reduced, allows cities to promote local economic development by earmarking expected future property tax revenues within a specific district (pp. 2-3). By doing so, cities can finance or subsidize needed developments or infrastructures for the construction of high-rise buildings, that otherwise would not be feasible. For that matter, it can be used as a way of incentivizing and encouraging developers to build high-rises in areas that under over circumstances would not take place (Al-Kodmany & Ali, 2013; Dye & Merriman, 2006).

With rules varying depending on the state in which it is authorized, examples of TIF applications can be found throughout the United States (Dye & Merriman, 2006). The City of Evanston, in Illinois, has been since 1997 implementing TIF to encourage the construction of high-rise buildings in its downtown area (Al-Kodmany & Ali, 2013, p. 229). The 24-story mixed-use Park Evanston development and the 26-story residential Sherman Plaza tower –Figure 38–, are just two examples of projects where Evanston’s City Council implemented TIF to provide parking infrastructures to assure the construction of these developments (p. 229).



Figure 38: The Sherman Plaza (2006) in Evanston, Illinois, heavily depended on TIF for its financing. Source: (Al-Kodmany & Ali, 2013, p. 230).

Since TIF is a tool which is based on tax revenue expectations, policy makers should carefully analyze the possible externalities of applying TIF to specific areas before putting it into practice. Especially when it comes to commercial developments, evidence shows that TIF districts tend to reduce the property value growth of the non-TIF properties of the same city. By subsidizing development in one particular area, commercial uses like retail stores are more likely to choose these locations over others in nearby non-TIF areas (Dye & Merriman, 2006).

4.2.3 For Implementing and Monitoring High-Rises

In this last category, for implementing and monitoring high-rises, the aim was to group the most representative regulations which address the methodological and procedural aspects of granting the building permit to high-rise buildings. In this regard, three main aspects were identified, the different possibilities of public participation in the authorization process, the government's evaluation mechanisms for granting the permit, and the ways to monitor that the agreements reached for high-rise buildings between the city and the developer are followed.

Public Participation

Since high-rise buildings have the potential to impact both the built environment and the quality of living of its inhabitants, active public participation and community involvement in the decision-making processes are fundamental to engage people in thinking, deciding and planning things that will directly or indirectly affect their lives. If well urban experts should have the technical skills and knowledge to plan a city, citizens can complement and enrich the planning and design solutions by providing different types of local, cultural or historical expertise foreign to the planners. Furthermore, when it is carried out transparently and democratically, public participation can enhance the citizens' sense of commitment, increase their levels of satisfaction, create more realistic expectations of the outcomes and build trust between them and the government (Al-Kodmany & Ali, 2013).

However, no matter how necessary public participation is, it still faces some challenges that need to be addressed by urban regulations. First of all, and since it is very complex to get every citizen's opinion about a particular project, it is fundamental to correctly identify who are the stakeholders involved that need to take part in the dialogues and discussions. Secondly, being this a time-consuming activity, it is important to find adequate times or means for their active involvement. Thirdly, and once the stakeholders are motivated to participate, they need to have a guarantee that their opinions can actually have an impact on the final decisions. And lastly, since some private developers or governments may consider public participation as something that complicates matters, there is a need to overcome the government's lack of interest in implementing a suitable procedure to allow public feedback and input (Al-Kodmany & Ali, 2013).

When addressing the issue of high-rise buildings, public participation could mainly be incorporated in two ways, deciding on general aspects regarding this topic for the whole city and reviewing particular proposals, seeking to support or oppose their construction. The definition of master plans or view protection corridors, design reviews and code amendments, are then just some of the alternatives to incorporate public participation in this issue (Al-Kodmany & Ali, 2013; Short, 2012).

With regard to the first way, for involving the community to express their points of view on the general aspects of high-rise buildings, each city has its own approach. The Borough of Hackney, in London, decided to involve its citizens since the early stages of their master plan update. Instead of reviewing specific projects, a consultation feedback, or master plan scoping process, was conducted with the town center users to learn about their views regarding opportunities and constraints related to high-rise developments. Results were then summarized and taken into consideration for the final document (Al-Kodmany & Ali, 2013).

In Vancouver, on the other hand, the city government hired experts to conduct a survey about the public attitudes towards view protection. Through defining, evaluating and negotiating with the public what did they consider as desirable views in the city, regulating procedures and view corridors were adopted –Figure 39-. This way, the city focused on protecting what the community considered as important to remain unblocked to base on that the areas where the highest buildings in the city could be located. And lastly, other cities like Tel Aviv have decided to directly invite citizens to participate in the development of new master plans, receiving a strong opposition, controversy and dispute when addressing sensitive topics like the authorization of high-rise areas in low-rise or historical neighborhoods (Al-Kodmany & Ali, 2013).

View Location Map 1 (False Creek)

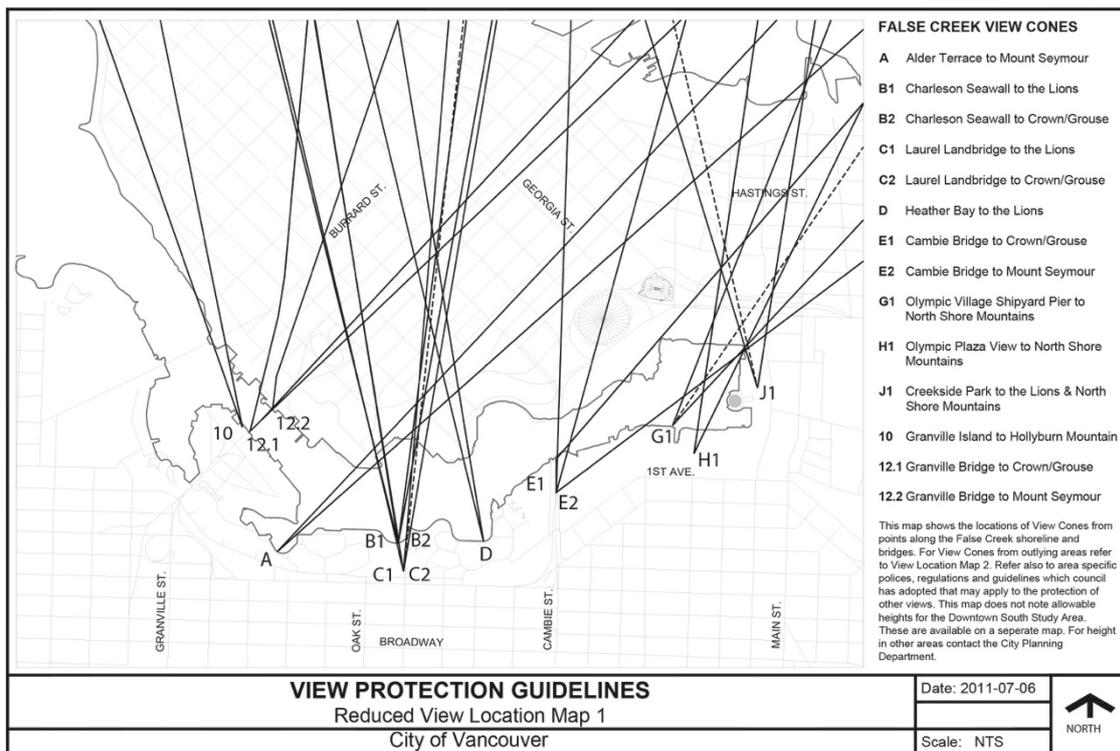


Figure 39: Example of some of Vancouver's View Protection Guidelines.
 Source: (City of Vancouver, 2011, p. 4)

The second approach to this topic focuses on individual high-rise proposals once a general plan or legal land-use plan is in place. When a new high-rise project is presented to the city planning department for its approval, an administrative mechanism called design review can be put into effect. Although the evaluation mechanisms will be further explained in this chapter, design review is a part of a series of advisory panels -like architecture panels, heritage evaluation panels and community panels-, which seek to invite individuals representing a specific social group or actor to have an advisory role in the development control process, generating a series of design recommendations that the planning authorities could later adopt (Short, 2012).

Since panels incorporate representatives, like community members, that may or may not have a planning or design background, this mechanism has been considered controversial. Subjective points of view inside the meetings with ever-changing dominant interests can produce a range of

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extreme reactions of both rejection or approval, needing a lot of negotiation and bargaining skills to reach an agreement. However, and unless the panel has a formal role recognized by a regulation, the planning authorities will still have the discretion to accept or ignore these recommendations provided by the panel. In the city of Vienna, any proposal with a surface of at least 25,000 m² or over 35 meters in height is subject to the citizen's validation during the last phases of the administrative procedure, right before allowing the land-use change request (Firley & Gimbal, 2011, p. 212; Short, 2012).

One last alternative for participation, which could be considered in between the first and the second approaches, is a code or regulation amendment. When a new proposal, which fulfills all the current legal requirements according to a general plan or a zoning plan, could potentially generate some unforeseen negative impacts on its surroundings, community members can also ask the planning authorities for an update or amendment of the existing codes or zoning regulations. In this way, not only the construction of one particular project is avoided but rather all future developments under those specific circumstances. In Chicago, a neighborhood group called Friends of Wolf Point complained that new proposals on Kinzie Street –Figure 40–, that according to the 1973 zoning code were permissible, would block the views from the residential west side of the Chicago River to its main branch. To address this issue, the city called for a public review to amend the city's zoning code, which was later approved by Chicago's Planning Commission (Al-Kodmany & Ali, 2013, p. 323).

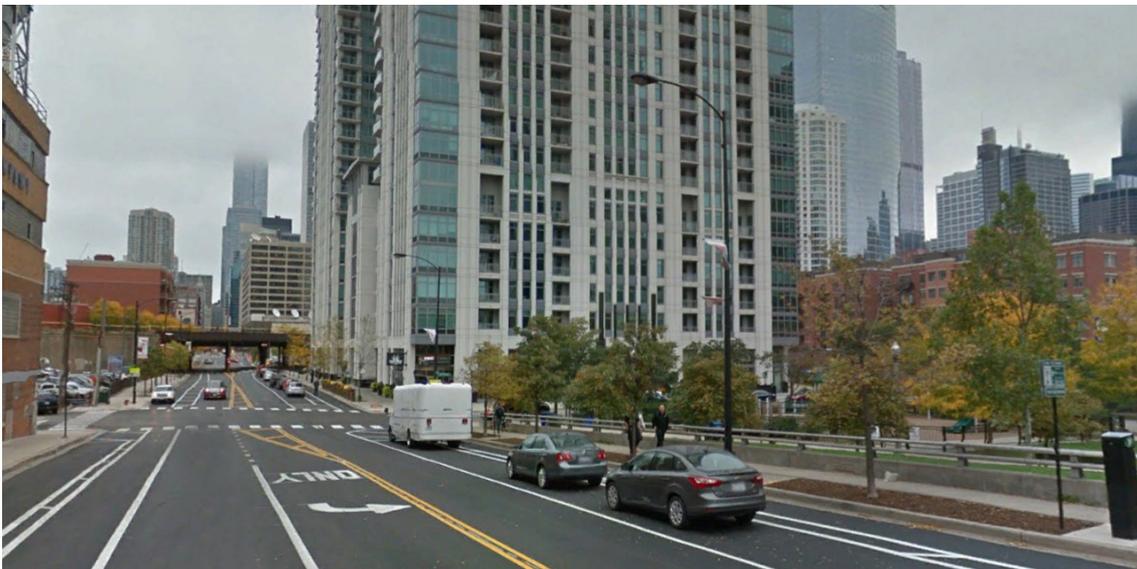


Figure 40: Existing high-rise buildings over West Kinzie Street in Chicago blocking the view to the River.
© Google Earth, 2016

High-rise Evaluation

When a new high-rise proposal is presented to the city, there are several things to be considered before granting the building permit, being the compliance with the existing regulations generally the first must to be fulfilled. Overall, evaluating high-rise proposals requires some degree of flexibility. While too strict regulations may avoid any new high-rise building to be authorized, too lax regulations can allow the construction of projects with bigger negative impacts. In any case, while evaluating new proposals, projects with good architectural and engineering qualities or projects with contributions to their community should be encouraged and even rewarded with some bonus or case-by-case special concessions by the planning authorities (Al-Kodmany & Ali, 2013).

Based on the spatial planning system of each city, there are two main procedures to grant a permit, through a zoning ordinance or development planning. Zoning, on one hand, is a more rigid, prescriptive and detailed type of instrument which began in the United States to control the use and characteristics of different buildings and areas in the city. By imposing detailed legal restrictions on the right to build, zoning usually directly allows any development in accordance with the regulations to proceed. Development planning, on the other hand, is a more flexible and discretionary decision-making instrument which prevails in many of the Commonwealth countries like UK and Australia. Less detailed development plans only indicate permissible building types and uses, but unlike zoning ordinances, compliance with them not necessarily imply a building permit. To be able to get this permit, further detailed proposals aligned with the development plan have to be submitted to the authorities for their evaluation and approval (Short, 2012).

In this regard, one of the main differences between these two procedures is the ease of obtaining the building permit, either as something as-of-right when fulfilling a fixed and detailed number of criteria or through a more flexible evaluation which can more easily modify or update the criteria to assure an adequate result. In both cases, to be able to overcome several limitations of knowledge, experiences, communication and cultural traditions or habits that decision-makers usually have along the process, several assessment tools have been implemented to help them make objective and better-informed decisions (Short, 2012).

Due to the fact that applications are usually drafted by experts hired by the developers to get a permit, it could be the case that these assessment tools are prepared intentionally to favor a high-rise project. Therefore, a critical analysis on who produces the information, for which purpose, what is included in it and with which precision, are fundamental for supporting an objective decision-making process. For the extent of this document, six main assessment categories or requirements will be generally described: impact assessments, design reviews or guidance, feasibility studies, contributions, visualizations and public participation (Short, 2012).

Firstly, impact assessments are part of a systematic and integrative process designed to identify the possible impacts or consequences of developments before their approval, not to stop them from happening but rather to establish some mitigation requirements to their developers. This analytical tool can be used to measure impacts on the environment and microclimate, on the views and heritage buildings, on the mobility systems and traffic, on the building services and

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infrastructure, on the public spaces, on privacy, amongst other issues (Al-Kodmany & Ali, 2013; Short, 2012).

As part of the mobility and traffic impact assessment, the city of London developed the Public Transport Accessibility Level –PTAL-, a map for the entire London territory which classifies all the areas on a scale from 1 to 6 based on estimations and statistics of the distance to a transport hub –bus or underground- and to the connecting time between points –Figure 41- (Firley & Gimbal, 2011, p. 201). In this way, depending on the site’s accessibility to the existing public transport, an appropriate density can be determined for a new proposal.

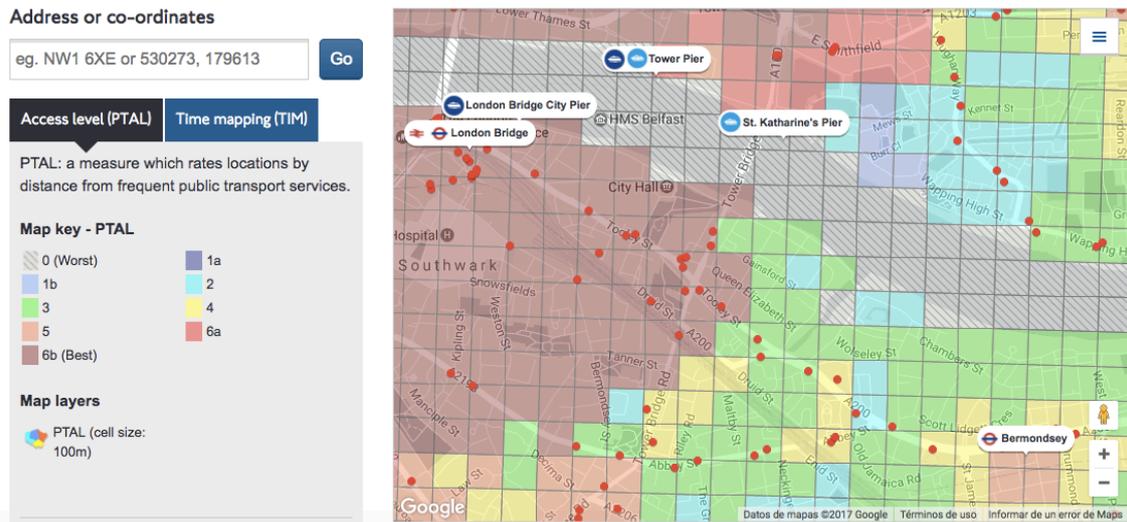


Figure 41: Example of the WebCAT planning tool to display the PTAL levels for London.
Source: (Transport for London, n.d.)

Along with the analysis of the impacts, high-rise evaluation also typically assesses the design of the proposal. These design assessments can be either proactive, creating a design guidance with a detailed set of criteria on how should a new proposal be designed for a particular place, or reactive, going through a design review process in which a panel of experts make several suggestions over the already finished proposal, to make it acceptable in design terms. Either way, the legal status of these assessments is crucial because otherwise, the amount of discretion and the potential abuse of the process by the different actors can lead to avoidance and disregard of the guidance and review regulations. To evaluate the proposal, a design statement needs to be handed in explaining the project’s objectives, urban design principles, scale, volume, density, details, materials, land uses, roof and ground floor treatment, universal accessibility criteria, public space strategy, etcetera (Al-Kodmany & Ali, 2013; Short, 2012).

An example of the former can be seen in Vancouver, a city that starting from 2002 adopted the Special Review Process for Higher Buildings in Downtown, a methodology for individually evaluating high-rise proposals which want to exceed the city’s maximum height limit of 137 meters (Short, 2012, p. 172). This process requires the establishment of a Higher Building Advisory Panel integrated by professionals who are appointed by the City Council for each proposal. Focusing on achieving architectural excellence for a building that will stand out in the city, this panel supplements the more generic review of the Urban Design Panel to directly give impartial professional advice to the Planning Office, the City Council and the Development

Permit Board. Even if this panel only has an advisory role in the proposal's approval, the meetings are public. Since the review process is conducted as a result of a special request from the developer to get a height concession, the developer must cover a fee for the review which costs around \$25,000 Canadian dollars (p. 172).

After reviewing the proposal's impacts and design, other frequently required assessments include aspects regarding its adequate functionality or operation once implemented, as well as its potential contributions or benefits to the city. Feasibility studies are then conducted to analyze the proposal's capacity of being successfully used, dividing it into three subcategories: market feasibility, financial feasibility and fiscal feasibility. At the same time, a potential contribution statement is required, indicating the possible economic, social and environmental benefits, such as urban regeneration, architectural excellence or energy efficiency, that the proposal could contribute with if approved (Al-Kodmany & Ali, 2013).

And lastly, high-rise assessments also include some requirements, like public participation and visualizations, which are both instruments and sources of information for conducting the design reviews and for determining the impacts of the proposals. By providing photomontages, 3D models, geographical information system –GIS– maps or virtual reality images of what the proposal will look like on site, decision-makers are not only able to evaluate different proposed scenarios but also to understand the accumulation of impacts of various developments in a particular area. On the other hand, and as described before, public participation is crucial for engaging a community in complementing and enriching the planning process and solutions with their local, historical, cultural or practical expertise (Al-Kodmany & Ali, 2013; Short, 2012).

If well the list of evaluation requirements or assessment tools varies from country to country and from city to city, the United Kingdom, through the English Heritage and the CABA, is among the leading countries in providing high-rise building evaluative criteria. Table 8 shows a comparison between the topical criteria for evaluating high-rise buildings in the United Kingdom and the ones defined by the city of Toronto, in Canada (Al-Kodmany & Ali, 2013).

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Table 8: Topical criteria for high-rise evaluation in the United Kingdom and Toronto, Canada.

CITY	English Heritage and CABE	Toronto
TOPICAL HIGH-RISE CRITERIA	- Relationship to context	- Master plan for larger sites
	- Effect on the historic context	- Transition in scale
	- Effect on world heritage sites	- Prominent sites, views and vistas
	- Relationship to transport infrastructure	- Building placement and orientation
	- Architectural quality of the building	- Tall building address
	- Sustainable design and construction	- Site servicing and parking
	- Credibility of the design	- Open space
	- Contribution to public space and facilities	- Heritage buildings
	- Effect on the local environment	- Scale of the base building
	- Contribution made to the permeability	- Tall building floor plates (articulation, size and orientation)
	- Provision of a well-designed environment	- Spatial separation (light and privacy)
	- Additional issues of access, escape and public safety requirements	- Streetscape and landscape
		- Weather protection
		- Sun, shadow and sky view
	- Pedestrian level wind effects	

Elaborated by the author from: (Al-Kodmany & Ali, 2013, pp. 318–320)

Monitoring and Enforcement

As it was previously mentioned for incentive zoning, once an agreement has been reached between the city planning department and the developer to get a building permit, it is important to guarantee that it will be followed as agreed. By having certainty that the developer is building according to the design reviewed, that it is respecting the height and FAR limits, or that is providing and keeping the amenities as arranged, it will be possible to assure that a successful high-rise project is being developed. Fines and penalties for not following these conditions should be clear for the developers since the beginning, and to be able to enforce them, especially with regard to the public contributions, legally binding rather than verbal agreements should be made (Deutsches Architekturmuseum, 2014; Short, 2012).

Once again, the monitoring and enforcement mechanisms for high-rise development vary depending on each city's particular system. However, for the extent of this work, two main cases will be briefly described, Frankfurt am Main and Hong Kong.

As it will be further described in chapter 5, Frankfurt's high-rise regulation has been improving over more than five decades (Deutsches Architekturmuseum, 2014). After the unfulfilled promise of the Messeturm, Europe's temporarily highest building and early 90's development, to install a publicly accessible café at its top, the way in which high-rise buildings were authorized in the city changed (p. 30). Nowadays the city has a High-rise Development Plan or *Hochhausentwicklungsplan*, which determines through a series of feasibility studies specific plots where high-rise buildings are recommended to be located (Stadtplanungsamt Frankfurt am Main, 2008). Within these feasibility studies, which are developed for every particular plot selected, a

series of development criteria are defined to act as guidelines for the future developments. Aspects like the type and level of building use, materials, colors and an approximate volume of the construction, are just some of the criteria defined to assure an adequate integration to the existing surroundings. Therefore, when a new developer is interested in a project, a contractual legally binding agreement, taking as a base the feasibility study, is negotiated and signed between the developer and the city planning department, to get a building permit. Aspects of energy efficiency, amenities required and the need to conduct an architectural competition judged by independent experts, are then included in this contract, giving the city certainty about its enforcement (Deutsches Architekturmuseum, 2014; Firley & Gimbal, 2011).

In the city of Hong Kong, on the other hand, a complex leasehold land system has been implemented. Therefore, instead of only asking for a planning permission from the Planning Department, developers must also request a land lease modification from the Lands Department and a building plan approval from the Buildings Department. For granting a land lease for a new construction, the Lands Department defines a set of lease conditions that the developer must respect to get the lease. These conditions include the allowed FAR, height restrictions to air corridors, provision of communal areas, creation or access to public transport stations, among other things. Only after the development has received the authorization of all of these three Departments, it is possible to start the construction. For that matter, since the developers are not owners of the land, any breach of the agreed conditions can mean the cancellation of the leasehold (Firley & Gimbal, 2011).

4.3 Conclusion

For being a type of project that not only have an impact on their immediate surroundings but also at a wider city scale, if the construction of new high-rise buildings is done without any form of control or not planned accordingly to a specific context, it can trigger a series of urban issues, including functional, contextual, environmental, safety, economic and social problems. Therefore, more than being an isolated and disconnected architectural icon that appeals to the architect's and client's ego, governments should consider high-rise buildings as urban renewal and regeneration tools that help prevent the negative consequences or impacts of urban sprawl.

In this regard, after an overall analysis of the existing high-rise regulations in different reference cities was conducted, and based on the context-based variations that these cities presented in their regulations, it could be concluded that there is no ideal or universal high-rise regulation system. Therefore, this overview showed that when evaluating a regulation system in a specific context, the focus on high-rise buildings should be in determining how comprehensive this system is, this means, if the system includes regulations not only for controlling the density and location of a building but also for incentivizing, evaluating, monitoring and enforcing their construction.

In the next chapter, the third stage of the data collection process of the case study analysis of the cities of Da Nang, in Vietnam, Frankfurt am Main, in Germany and Monterrey in Mexico will be conducted. Based on the previously described literature review and to be able to analyze their respective high-rise regulation system, Table 9 of the degree of comprehensiveness of a city's high-rise regulation system will be employed. By using this table, the objective will be to identify which high-rise-related policies are currently in place and which are the main existing high-rise regulation gaps for each city.

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Table 9: Table analysis for the degree of comprehensiveness of a city's high-rise regulation system.

CATEGORY						
FOR DEVELOPING HIGH-RISES	Defines a location according to					
	Land-use	Public Transportation	Utilities Infrastructure	Social Services		
	Natural environment	Historical heritage	Views	Economic criteria		
	For controlling density it regulates					
	Max. Height	Max. FAR	Setbacks	Max.Width	Floor Plate Sizes	
	Coverage area	Open Space Req.	Parking	Mixing of uses	Form-based codes	
FOR INCENTIVIZING HIGH-RISES	Type of incentive considered					
	Transferable Devel. Rights		Incentive Zoning	Tax Increment Financing		
	Type of amenity considered					
	Public Space on Ground Floor	Public Access on Higher Floors	Visual/Performing Arts Spaces	Landmark Build. Protection	Affordable Housing Units	
Social Facilities	Public Transport Infrastructure	Walking/Cycling Infrastructure	Utilities Infrastructure	Local Fresh Food Stores		
FOR IMPLEMENTING AND MONITORING HIGH-RISES	Public participation: Scale					
	For General Criteria			For Individual Projects		
	Public participation: Type					
	Access Information	Comment and/or Define Plans / Reg.	Define View Protection Corridors	Review Individual Proposals	Report on Ongoing Projects	Amend Plans / Regulations
	Type of evaluation process for granting permit to developers					
	Through Zoning: Prescriptive			Through Devel. Planning: Discretionary		
	Type of evaluation requirement requested (besides plans and structural calcs.)					
	Impact Assessments	Design Review /Guidance	Feasibility Studies	Contributions Statement	Visualizations	Architecture Competition
	Monitoring and enforcement process for permit includes					
Creation of Legal Agreement		Defined Monitoring Process	Clear Penalties / Sanctions			

LEGEND  Policy in place identified  No policy in place identified

Elaborated by the author based on the literature review.

5 Case Study Cities

To address the description of the three case study cities, chapter 5 will be composed of three main sections. In the first part, the criteria for selecting the study cases will be presented. Then, for the second part, each city will be introduced, including for all of them a general overview, a brief historical review of their high-rise evolution, their current high-rise situation, as well as some of their most representative developments to happen in the foreseen future. With all this information, the main urban gaps related to existing high-rise developments and regulations will be identified for each one of them. Finally, in section three, a summary of the most representative conclusions obtained during the development of this chapter will be presented.

5.1 Selection Criteria

As previously described in chapter 2, rather than comparing or contrasting different case study cities with each other, one of the main objectives of this work is to explore the contextual differences of high-rise regulations. For that matter, and based on four main criteria that will be explained below, the cities of Da Nang, in Vietnam, Frankfurt am Main, in Germany and Monterrey, in Mexico were selected.

The first criterion for the selection was based on both, personal experiences and interests, and on existing urban collaborations. Being Monterrey the author's home city, there is an interest in understanding how does the high-rise phenomenon, which is already under way, can impact or contribute to its urban development. In the case of Frankfurt am Main, on the other hand, the city is not only a very interesting and relevant reference regarding this topic but also a place where the author has had the opportunity to live, study and work for some time. And lastly, with regard to Da Nang, the city is part of a collaborative applied research project called Rapid Planning, of which the author has had the opportunity to be part. This project, which is sponsored by the German Federal Ministry of Education and Research -BMBF-, focuses on achieving infrastructure sustainability through a trans-sectoral urban planning methodology (Rapid Planning Consortium, 2015). Aimed to highly dynamic metropolises, the project includes four partner cities which are Da Nang in Vietnam, Kigali in Rwanda, Assiut in Egypt, and Frankfurt am Main as a German reference city. For that manner, Da Nang's selection was mainly based on the potential to use an existing communication and research channel for the exchange of knowledge.

Secondly, all of these cities exhibited a different set of socio-economic, political, geographical and cultural characteristics while being among the 16 more populated countries in the world in 2015 (The World Bank Group, 2017). These cities are not only culturally diverse by being located on three different continents, America, Europe and Asia, but they are also part of countries with different government types or economic systems, like the Federal Parliament Republic, in Germany, the Federal Presidential Republic, in Mexico, and the Communist State with a socialist-oriented market economy, in Vietnam. With regard to the city's natural and topographic conditions, while Monterrey is an open plain located between several high mountains, Frankfurt and Da Nang are mainly located in flat areas, being the second one surrounded by some highlands, mountains areas and the sea. And lastly, regarding their social development, these three cities show different ranks in their Human Development Index -HDI-, being Germany very high,

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Mexico high and Vietnam medium (BTU-CS Research Team, 2017; Central Intelligence Agency, 2017; City of Frankfurt am Main, 2015; IMPLANc, 2014; UNDP, 2016, pp. 259–261).

Thirdly, although these three cases are non-capital cities, they all have significant national and international relevance, being attractive centers with real high-rise development potential for their global aspirations. Frankfurt is not only an important international transportation and logistics hub, but it is also a main European financial, telecommunications, informatics, chemical and pharmaceutical center. Monterrey, on the other hand, is a national and international manufacturing, construction, trade, financial and services center, because of its strategic location at the intersection of the corridors connecting Mexico's main Pacific and Atlantic ports, with the ones connecting Mexico City with the United States and Canada through the central and east coast corridors –Figure 42-. Furthermore, and in collaboration with their recognized universities, the city has also been investing in becoming a main research, development and innovation hub. And lastly, the city of Da Nang is an industry, agriculture, services, tourism and trade hub which also gains international significance for its location in the East West Economic Corridor –Figure 43- connecting the countries of Laos, Cambodia, Thailand, Vietnam and Myanmar. Additionally, Da Nang is also focusing on becoming one of Asia's main sustainable tourism and services destination (BTU-CS Research Team, 2017; FRA-UAS Research Team, 2017b; Secretaría de Desarrollo Sustentable, 2012).

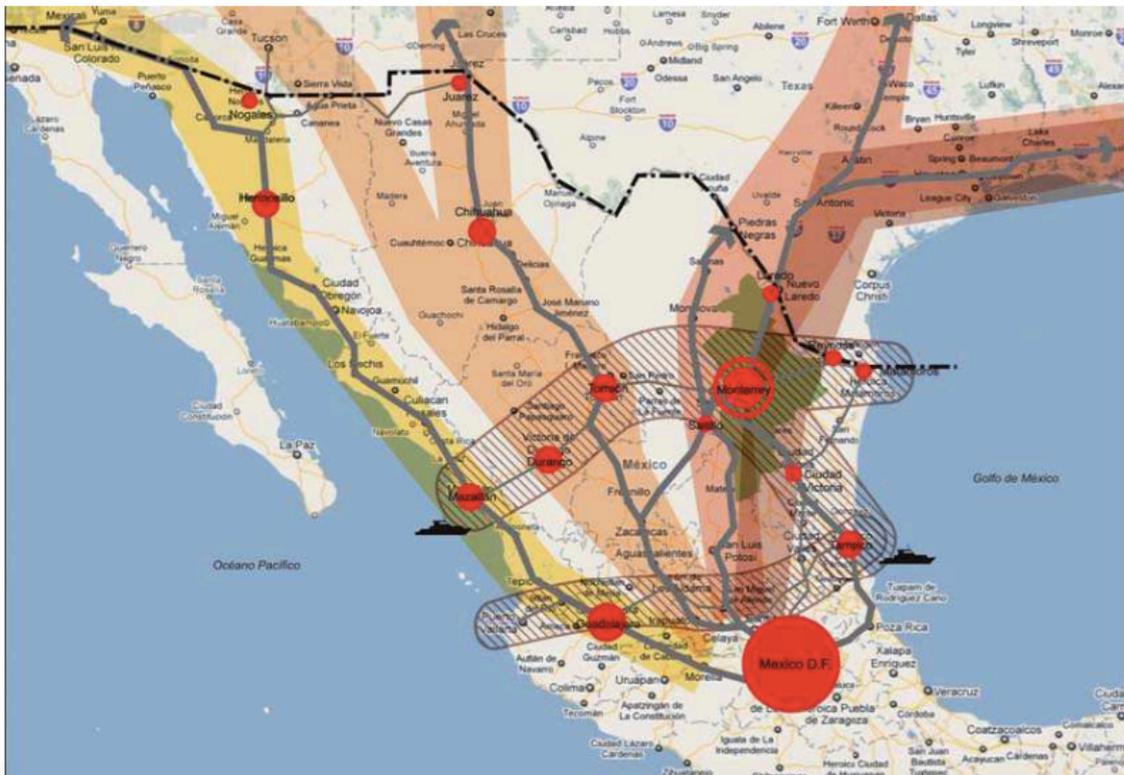


Figure 42: Monterrey's strategic location in the international corridors.
Source: (Secretaría de Desarrollo Sustentable, 2012, p. 78).



Figure 43: Da Nang's strategic location in the East West Economic Corridor (In red).
Source: (BTU-CS Research Team, 2017, p. 35)

And finally, based on the cities' high-rise development process or evolution as it will be further explained in this chapter, it could be said that each city is currently at a different maturity stage. In this regard, Frankfurt, which is Germany's high-rise capital, seems to be at a consolidated phase. After being developing high-rise buildings for more than five decades, the city appears to want to consolidate their existing building stock, rather than wanting to break a new height record, which they already own for Germany (CTBUH, 2017e; Deutsches Architekturmuseum, 2014). In the case of Monterrey's metropolitan area, even if it is second in number of tall buildings, just after Mexico City, it is currently at the peak of its development phase, expecting to finish in 2017 Mexico's new highest building and projecting to even built Latin America's new tallest building (CTBUH, 2017i, 2017j, 2017k). Da Nang, on the other hand, it is still in an emerging phase. Although most of the high-rise buildings in Vietnam are located in Ho Chi Minh City and Hanoi, Da Nang is third regarding height aspirations (CTBUH, 2017d, 2017f, 2017g). Additionally, the city already has some projects under construction, especially from the tourism industry, which once finished will locate Da Nang in the list of the country's 12 tallest buildings (CTBUH, 2017d).

Once the case cities were selected and since they are physically and functionally integrated into bigger metropolitan areas, further criteria had to be taken into consideration to determine whether the research would focus only on the main municipality, or whether if it would integrate other municipalities of their respective metropolitan areas. In this regard, three additional aspects were

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incorporated, the number of inhabitants, existing high-rise oriented regulations from the planning perspective and the volume or concentration of existing high-rise buildings. For that matter, while in the cases of Frankfurt am Main and Da Nang it was clearer that the focus would only be on the main municipality, in the case of Monterrey, the neighbor municipality of San Pedro Garza García –SPGG- was also considered relevant for this study. As it will be further explained, even if SPGG has a significantly lower population compared to Monterrey, it concentrates a higher number of high-rise projects, being both historically and economically linked regarding high-rise developments while having their own particular high-rise regulation approach (BTU-CS Research Team, 2017; CTBUH, 2017e, 2017j, 2017k; INEGI, 2016; Regionalverband FrankfurtRheinMain, 2015).

In the following sections of this chapter, the current situation of each of the case study cities will be presented.

5.2 Da Nang

5.2.1 General Overview

The city of Da Nang is located in the central part of Vietnam, 764 km away from the country's capital, which is Hanoi, and 964 km away from the country's economic center, which is Ho Chi Minh City –Figure 44- (JICA & Danang People's Committee Vietnam, 2010, part I, p. 1). Together with these two cities, it is one of the five centrally-controlled municipalities in Vietnam that along with the other 58 provinces make up the country (BTU-CS Research Team, 2017, p. 8). As the largest urban, economic and cultural center of Vietnam's Central Focal Economic Zone –CFEZ- Da Nang is a crucial link for the integration between the north and south of the country, the two-major development and growth poles. (JICA & Danang People's Committee Vietnam, 2010, part I, pp. 3, 5)



Figure 44: Da Nang's location within the CFEEZ and Vietnam.
Modified by the author from: (Dedering, 2013)

Da Nang has a total area of 1,284 km² with a population of 1,028,838 inhabitants by 2015, of which 897,993 are located within the six urban districts of 241 km² on the east -Figure 45- (BTU-CS Research Team, 2017, p. 45; Da Nang's People's Committee Vietnam, 2017). With mainly

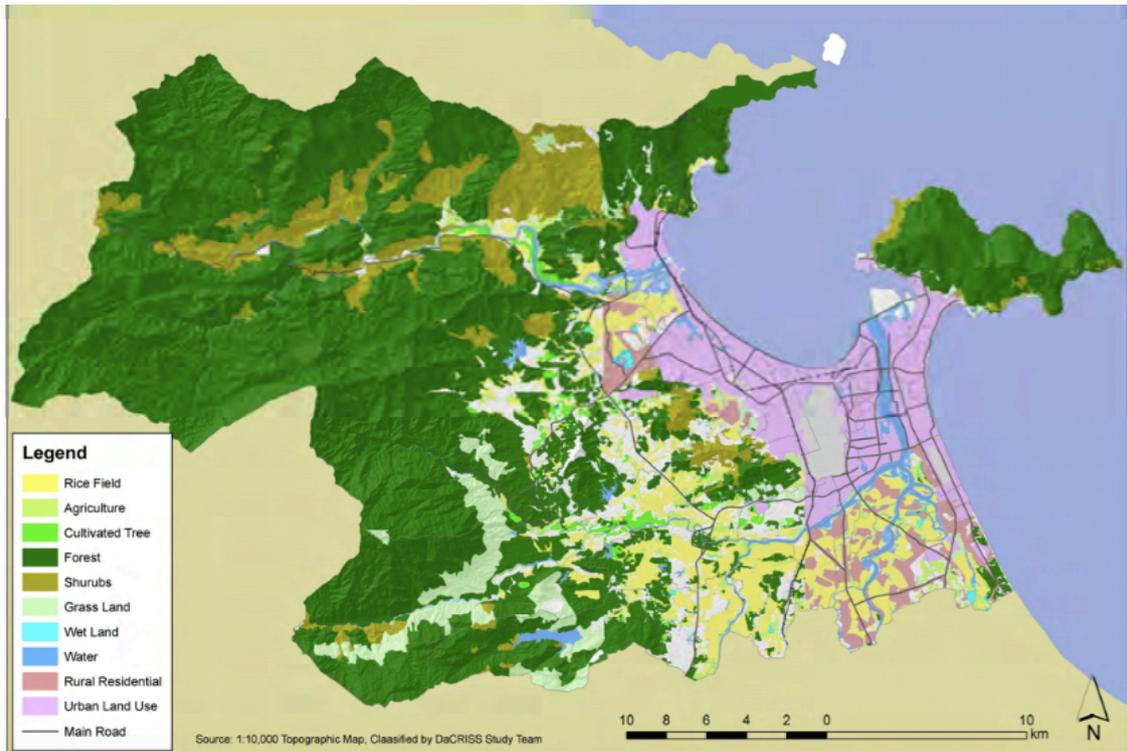


Figure 46: General land-uses in Da Nang in 2006. Source: (JICA & Danang People's Committee Vietnam, 2010, part I, p. 8)

If well during the 16th century Da Nang was just a small port for selling goods and repairing ships, during the Vietnamese War -1960 to 1975- it experienced a boom in basic infrastructure for logistic and military purposes that turned it into a military urban metropolis (BTU-CS, 2017, p. 39; JICA & Danang People's Committee Vietnam, 2010, part I, p. 6). After the war and as a consequence of the Doi Moi reform in 1986, which turned the country from a centrally planned to a market-based economy with socialist orientation, both Vietnam and Da Nang experienced a rapid and stable economic growth (BTU-CS Research Team, 2017, p. 8). While between 1990 and 2012 Vietnam's economy grew at an average rate of 7%, the growth of Da Nang's Gross Domestic Product –GDP- was even higher than the national average, growing at an average rate of 10.51% between 2006 and 2010 and of 8.97% between 2011 and 2015 (p. 40).

In the case of Da Nang, these modernization and industrialization processes have been directly supported by the central government which in 2003 emitted Resolution No. 33-NQ/TW which indicated the vision of “building Da Nang into a major city, a socio-economic, industrial, trade, tourism, service, scientific and technological, banking and financial, sport and cultural, education and training center in Central Vietnam” (p. 28). Furthermore, as it was stated earlier, the fact that the city is located on the gate to the South China Sea along the East West Economic Corridor, connecting the countries of Laos, Cambodia, Thailand and Myanmar, makes it a key national and international location for commercial, logistics, tourism and transportation purposes –See Figure 43- (p. 34).

Today Da Nang has a diverse economy where in 2015 the industry-construction sector represented almost 54% of the total GDP, followed by the services sector with around 44% and the agriculture, forestry and fishing one with just slightly above 2% -Figure 47- (p. 40). Additionally, for the periods 2008-2010 and 2013-2015, the city has been recognized with the

highest Provincial Competitive Index, leading the country in terms of the quality of the economic governance and providing the most favorable environment for private investments (p. 41).

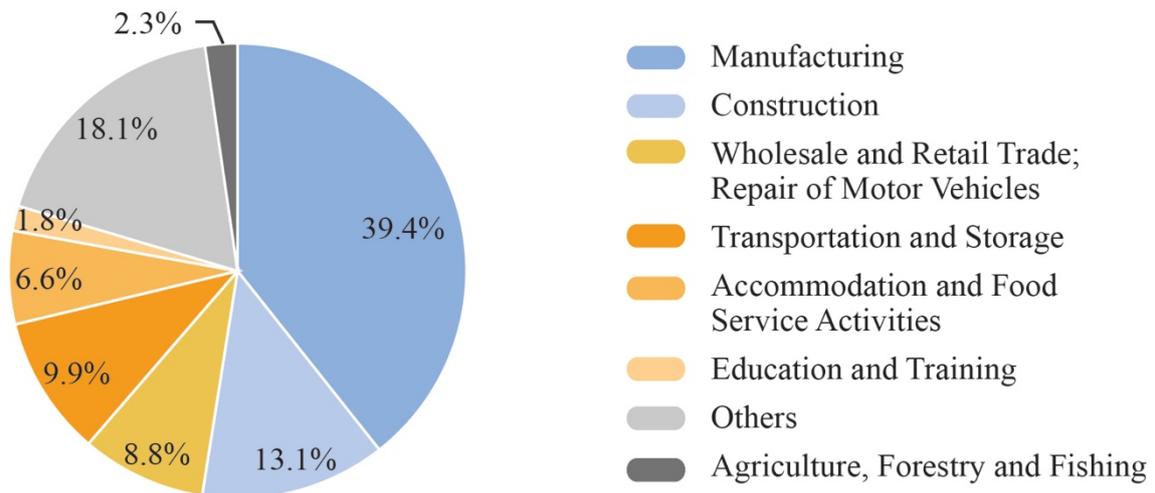


Figure 47: Da Nang's structure of gross output at current prices by kinds of economic activity in 2015. Elaborated by the author from: (BTU-CS Research Team, 2017, p. 41)

With more than 140 hotels, 3,8 million foreign and domestic tourists, 14 universities, new industrial parks under construction or already operating like Da Nang Hi-Tech Park and the IT Park, the city is trying to shift from a manufacturing economy to a services and knowledge-based one (DISED, The Seoul Institute, UN HABITAT Vietnam, & Sungkyunkwan University's Smart Green City Lab, 2016, pp. 9, 10; JICA & Da Nang's People's Committee Vietnam, 2016, p. 5.17). Additionally, it is currently the third largest international airport and the eighth largest international harbor in Vietnam (DISED et al., 2016, p. 9). It's rich natural environment, improving living and educational infrastructure, as well as its reputation for being a clean and quiet city for national standards, is turning Da Nang into an attractive city to live in.

The panorama for the city's future is even better. Da Nang has adopted the Environmental City concept, which aims at becoming "an Internationally Competitive Environmental City Beyond being Pollution-free" (BTU-CS Research Team, 2017, p. 48). This concept was later amended by the city to "Construct and develop Danang City to become specialized city at national level, with orientation to become a sustainable developed urban center at international level" (JICA & Da Nang's People's Committee Vietnam, 2016, p. 5.4). Together with the CFEZ, the city's objective is to become an Eco-Tech region, promoting a balance between economic development and natural environment through the use of technology (JICA & Da Nang's People's Committee Vietnam, 2010, p. 3).

5.2.2 High-rise Evolution and Current Situation

In the case of Vietnam, the armed conflicts and foreign occupations delayed the mass scale introduction of the modern high-rise buildings. After the country gain its complete independence in 1975 and with the country's reunification several years after, it took around ten years with the introduction of the Doi Moi reform in 1986, for the country to start an urban development and renovation process (JICA & Danang People's Committee Vietnam, 2010, part I, p. 6). Other important contextual aspects to consider are the land use rights, which until the enactment in 1986 and further revision in 1993 and 2003 of the Land Law, were not considered in the country, being all land property of the state, as it will be further explained (part III, p. 6.2).

If well some areas of Da Nang were already used to a compact mid-rise mix-use type of development –Figure 48–, it was not until the late 90's with the commission of the Furama Resort in 1997 that a new type of touristic developments along the coast started to take place (part V, p. 3.11). These new projects, however, began as villas or low- and mid-density buildings, not tall hotels.



Figure 48: Mid-rise mixed-use areas in Da Nang. © Michael Peterek, 2016.

The first buildings over 100 meters in height in Vietnam appeared in Ho Chi Minh City around 1997, with projects like the Sunwah Tower and the Saigon Center, of hotel or office uses (CTBUH, 2017g). But it was the Saigon Trade Center from 1997 that kept Vietnam's height record until 2010, with 145 meters (CTBUH, 2017g). Buildings over 100 meters would appear in Hanoi until 2007 with the conclusion of the 136-meter-tall Hanoi Trung Hoa Nhan Chinh residential tower (CTBUH, 2017f).

In the case of Da Nang, the first high-rise buildings would start to appear in the first decade of the 21st century with the construction of government-owned apartment blocks. Between 2000 and 2005 around 14 apartment blocks of up to five stories were developed in different part of the city

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by the municipal government, being the publicly-owned housing units in 2003, 42% of the total existing units in Da Nang (JICA & Danang People's Committee Vietnam, 2010, part III, pp. 9.2, 9.7). Further projects of up to seven stories were built for 2010 (part III, p. 9.3).

In 2007, with Vietnam's accession to the World Trade Organization, a huge amount of foreign direct investment started to flow into the country, triggering the construction of new high-rise projects in other parts of Vietnam different than Ho Chi Minh City (Olt & Choi, 2014, p. 120). According to the CTBUH, the first building over 100 meters to start construction in Da Nang was the Novotel Da Nang Premier Han River Hotel in 2005 –Figure 54- (CTBUH, 2017d). However, it was the 32-story and 122.5-meter-tall Azura residential tower the first one to be concluded in 2012, on the eastern riverfront of the Han River by the Han River Bridge –Figures 49 and 50- (CTBUH, 2017d).



Figure 49: Azura Tower. © T.Ngoc, 2012. Source: (Ictdanang, 2012)



Figure 50: Azura Tower from the other side of the Han River. © Michael Peterek, 2016.

By then, several high-rise buildings like hotels and office towers between seven and 20 stories were already occupying areas along the Han's riverfront, in the old city center of the Hải Châu district -which started to become the city's Central Business District (CBD)- and along the eastern coast in the Sơn Trà and Ngũ Hành Sơn districts –Figures 51 and 52- (Ictdanang, 2012).



Figure 51: View to the Central Business District of Hai Chau in 2012 with the Novotel Da Nang Premier Han River Hotel under construction (right). Source: (Ictdanang, 2012) © T.Ngoc, 2012.



Figure 52: Hotel buildings in the Son Tra district in 2012. Source: (Ictdanang, 2012) © T.Ngoc, 2012

In 2013 with a total height of 155 meters, the Novotel Da Nang Premier Han River Hotel would be finally finished in the CBD close to the Han River (CTBUH, 2017d). However, it would not take long for this building to lose its height record, because just one year after, in 2014, the neighbor 166.8-meter-tall Da Nang City Administrative Center was inaugurated –Figures 53 and 54- (CTBUH, 2017d). This tower is as of today the city’s tallest building (CTBUH, 2017d).

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Figure 53: Da Nang City Administrative Center (left) and Novotel Da Nang Premier Han River (right). © Michael Peterek, 2016



Figure 54: Da Nang City Administrative Center (left) and Novotel Da Nang Premier Han River (right) seen from the river. © Thomas Sterr, 2014

Nowadays, with more than half of the foreign direct investment in the city being in the real estate and tourism sectors, several high-rise projects are under construction either in the existing CBC, along the 10-kilometer-long eastern coast designated for tourism and on both fronts of the Han River –Figures 55, 56 and 57- (JICA & Da Nang’s People’s Committee Vietnam, 2016, p. 3.3; JICA & Danang People’s Committee Vietnam, 2010, part IV, p. 4.27, part V, p. 3.11). Even if there are still several vacant plots along the coast, the tourism related developments have been spreading towards the south, with around 30 different projects under construction in 2010 alone (JICA & Danang People’s Committee Vietnam, 2010, part III, pp. 6.1, 11.3). Other high-rise areas in the city include the urban communes of Nại Hiên Đông in the Sơn Trà district at the north, Hòa Thọ Đông in the Cẩm Lệ district at the south and the Nguyễn Tất Thành Avenue in the Thanh Khê and Hải Châu districts –Figures 58 and 59-. This last corridor is part of a larger future project, as it will be further explained.



Figure 55: Location of the main high-rise areas in the city of Da Nang. 1. Old City Center and CBD, 2. Han Riverfront, 3. Eastern Coast, 4. Nại Hiên Đông, 5. Hòa Thọ Đông, 6. Nguyễn Tất Thành Avenue. Elaborated by the Author from Google Earth.

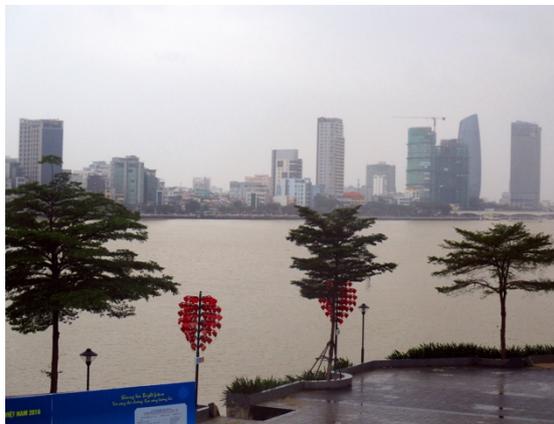


Figure 56: View towards the CBC in 2016. © Michael Peterek, 2016



Figure 57: Eastern coast new tourism developments. © Michael Peterek, 2016



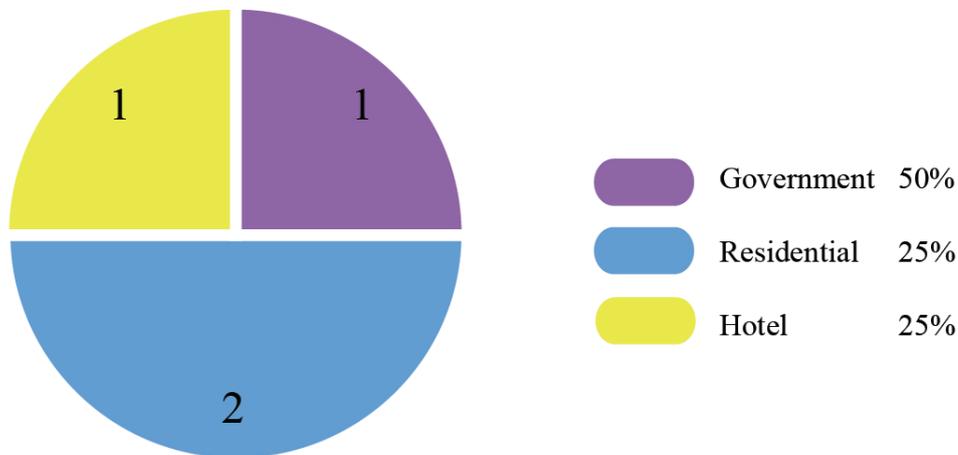
Figure 58: High-rise buildings in the Nại Hiên Đông in the Sơn Trà district. © (Trần văn, 2016)



Figure 59: High-rise buildings in the Hòa Thọ Đông in the Cẩm Lệ district. © Thomas Sterr, 2014

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According to the database of the CTBUH as of August 2017, the city has four buildings equal to or above 150 meters, with two buildings finished and two more under construction (CTBUH, 2017d). Of these high-rises two will have a residential use, one is hosts government offices and the other one is a hotel –Figure 60-. In this regard, and based on the number of buildings above 150 meters, a height threshold commonly used by the CTBUH to compare different cities, Da Nang is ranked number three in Vietnam –after Hanoi and Ho Chi Minh City-, number 85 in Asia and number 163 in the world (CTBUH, 2017d).



*Figure 60: Land-use of Da Nang's high-rise buildings above 150 meters.
Elaborated by the author from: (CTBUH, 2017d)*

The timeline presented in Figure 61 summarizes Da Nang's high-rise development over the last 120 years, as exposed in this chapter.

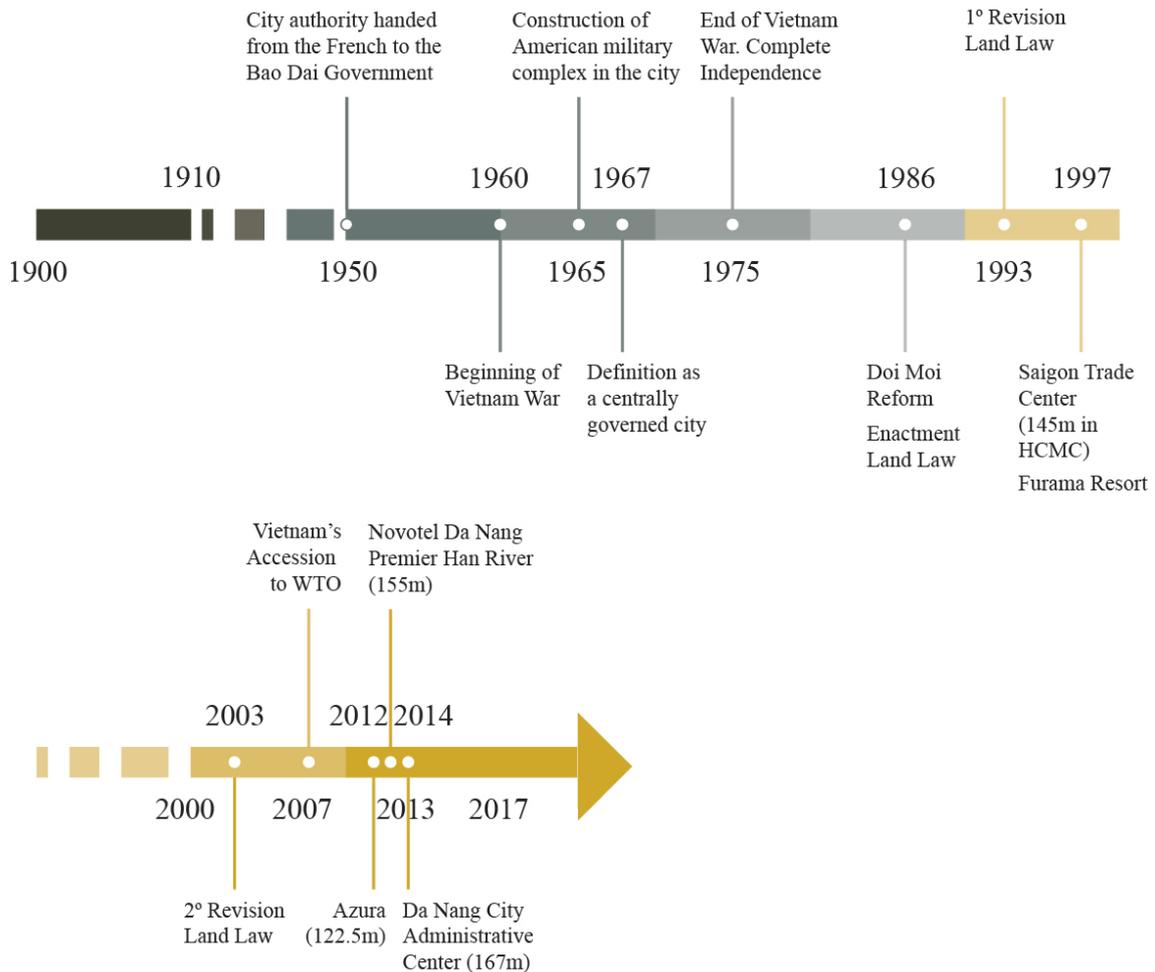


Figure 61: Da Nang's High-rise Development Timeline.

Elaborated by the author from: (CTBUH, 2017c; JICA & Danang People's Committee Vietnam, 2010, part I, p. 6, part III, p. 6.2, part V, p. 3.11; Olt & Choi, 2014, p. 120)

5.2.3 Current Regulation Review

According to article 13 of Vietnam's Law of Construction from 2014, urban planning in the country is divided into three different scales, general planning or master planning for complete cities and new urban centers, zoning planning, for particular areas within cities, and detailed planning, to define the specific urban development requirements for a particular area (BTU-CS Research Team, 2017, pp. 9–11).

Being Vietnam a unitary country, the central agencies are the ones responsible for the activities related to urbanization. In this regard, the Ministry of Construction is the one in charge of the spatial planning construction policies and plans at the national, provincial and district level. For the case of a centrally controlled city like Da Nang, city planning processes are conducted by their respective Department of Construction –DOC-, which in cooperation with the Department of Planning and Investment –DPI- and the Department of Natural Resources and Environment –DONRE-, develops the Master Plan. Nonetheless, for its final approval and further execution, any plan, program or policy is subject to acceptance and approval by the respective Provincial People's Council (BTU-CS Research Team, 2017, p. 19).

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Just like the Master Plan, the Zoning Plan is also prepared by the DOC, after a consensus between the different associated organizations is achieved. Detailed plans, on the other hand, are usually responsibility of the developers, who need to take into consideration the criteria established in the Zoning Plan for developing their respective Detailed Plans for a project, to be granted a construction permit by the DOC. Larger projects like factories or resort complexes with foreign direct investments require an additional approval from the DPI and the DONRE. However, according to article 14 of the Decree No.37/2010/ND-CP of the Government on the formulation, evaluation, approval and management of urban planning, if a project is developed by a single investor for an area smaller than five hectares, or smaller than two hectares for residential apartment projects, the construction may be elaborated without a detail planning, as long as the proposal complies with the respective zoning plan, ensures technical infrastructure connectivity and suits in the surrounding space (BTU-CS, 2017, pp. 13, 14, 19; JICA & Danang People's Committee Vietnam, 2010, part I, p. 6.4).

Although according to articles 19 and 20 from the same Decree No.37/2010/ND-CP the zoning and detailed plans must identify and define the criteria for land use regarding aspects like density, land coefficients, maximum number of floors, setbacks and other landscape aspects of the public realm like organization of trees and gardens in the planned zone, there is a gap between the plans and their actual implementation, with a zoning framework which has not been effective to fulfill the plans (BTU-CS, 2017, pp. 16, 18; JICA & Danang People's Committee Vietnam, 2010, part III, p. 6.3).

Another aspect to consider in Vietnam is land tenure. As it was mentioned before, even if in the 1980 Constitution it was determined that in Vietnam all land was property of the state, the adoption of the 1993 Land Law introduced the concept of the Land Use Rights Certificates – LURC- as a right of tenure similar to ownership in that it can be exchanged, transferred, leased, inherited and mortgaged (JICA & Danang People's Committee Vietnam, 2010, part III, p. 6.2). These LURC, which are issued and administered by the DONRE, are limited to 50 years for industrial and commercial uses and unlimited for residential uses (part III, pp. 6.2, 6.4).

The currently approved Master Plan is the General Masterplan for Construction of Da Nang City to Year 2030, Vision to Year 2050, which was amended by the Prime Minister's Decision No. 2357/QD-TTg on December 2013 –Figure 62- (BTU-CS Research Team, 2017, p. 28)

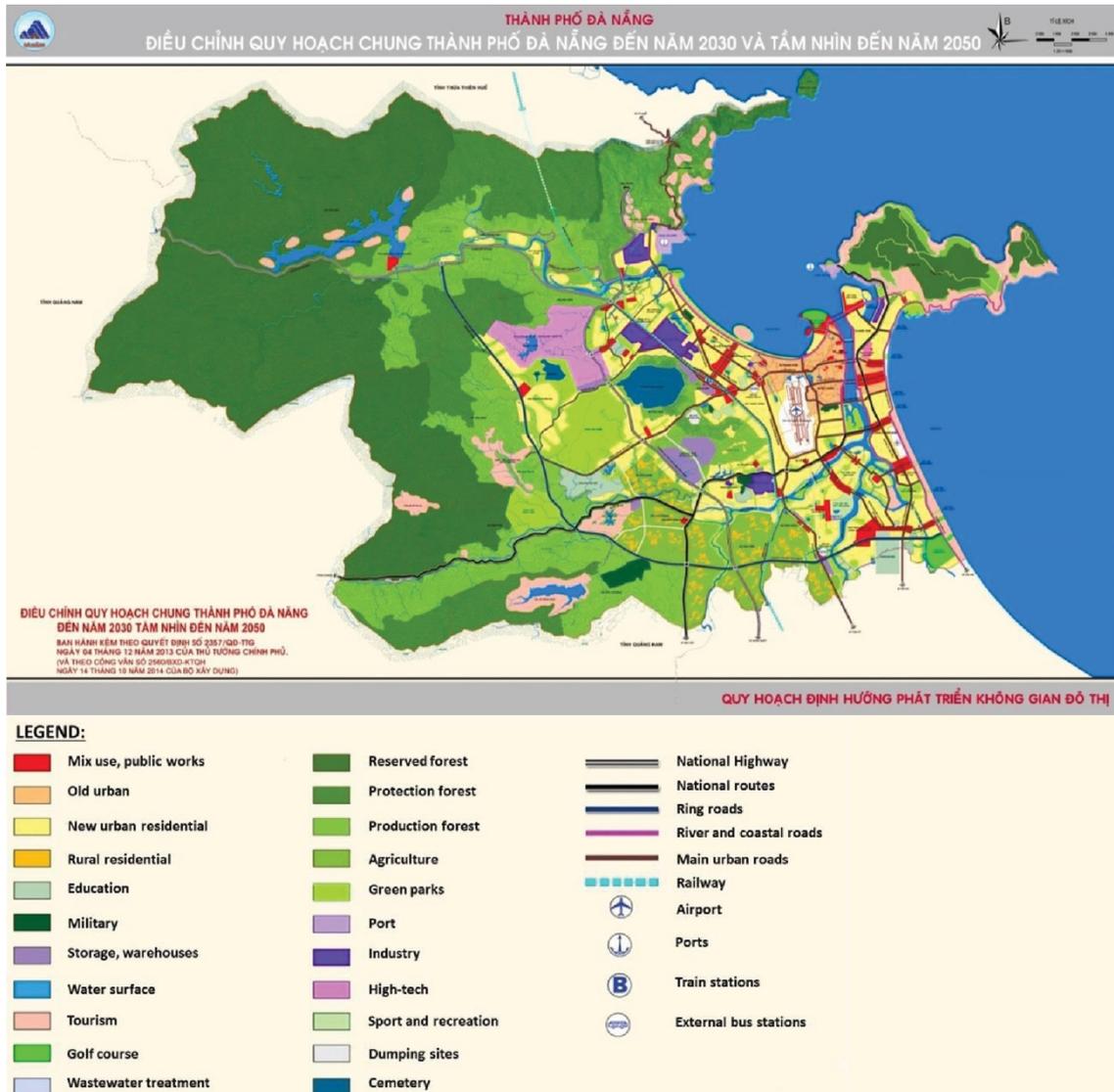


Figure 62: General Masterplan for Construction of Da Nang City to Year 2030, Vision to Year 2050.
 Source: (BTU-CS Research Team, 2017, p. 56)

As it was mentioned before, one of the main challenges of the urban development in Da Nang is the effective implementation of plans and regulations. According to a report issued in 2010 and further extended in 2016 by the Japanese International Cooperation Agency –JICA- in collaboration with Da Nang’s People’s Committee, the city of Da Nang lacks planning tools (JICA & Danang People’s Committee Vietnam, 2010, part IV, p. 8.52). As a result, a broad classification of land uses combined with a lack of guidelines on building specifications such as heights, setbacks and FAR, allows the authorization of building permits for projects that could potentially worsen their immediate surroundings –Figure 63- (part I, p. 6.4).



Figure 63: Lack of high-rise guidelines and specifications in Da Nang. © Michael Peterek, 2016

In terms of the high-rise location, it seems that the private real estate market is the one deciding where is the best site to build their commercial and touristic high-rises, selecting the places with already available infrastructure, amenities and services. However, with a city infrastructure system still under development, most of the projects have been concentrated in the CBD of the Hai Chau district and along the coast, increasing the potential risks of overcrowding, traffic and activities saturation, as well as the height conflicts because of the airport's proximity to the city center (part IV, p. 4.26). Additionally, with regard to the definition of heights and locations of high-rise buildings based on the natural environment, the historical patrimony and the views, reality also shows that there might not be an effective policy in place –Figures 64 and 65–.



Figure 64: High-rise buildings increase in height as they approach the coast. © Michael Peterek, 2016



Figure 65: High-rise building behind Da Nang's cathedral. © Michael Peterek, 2016

With regard to the public apartment blocks, public facilities and transportation are not fully considered to define their location, and public infrastructure and services are just considered partially. According to a survey conducted in 2005 for low-income housing in Da Nang, only 50% of the households of the public apartment blocks had access to medical centers and primary schools within a radius of 500 meters from their houses, and 62.5% indicated they didn't have any parks within the same walking distance, with a lack of street lights, benches or children's playgrounds in their immediate surrounding areas (part III, p. 9.9). For the matter of public transport, 90% of the respondents rarely or never used the bus system, being its unavailability in new urban development areas one of the main reasons for this (part III, p. 9.9). Even if 100% of the apartments had running water, electricity, drainage and sewerage systems, the solid waste collection service and the road infrastructure were not efficient or completely planned (part III, p. 9.8).

In terms of the available incentives for high-rise buildings, Vietnam has recently introduced a build-transfer system, which has been adopted nationwide (JICA & Da Nang's People's Committee Vietnam, 2016). According to JICA, this system grants the developer a planning permission in exchange for the provision of an amenity, which for this system usually means the development of an off-site infrastructure to support large-scale developments (p. 5.35), however there was not enough information to determine if this instrument actually operated for incentivizing high-rise development. Additionally, since there are no written standards about the role and responsibility of the different public and private actors involved, according to JICA sometimes the previously negotiated amenities have not been developed as agreed (p. 5.35). On the other hand, the implementation of TIF has also been suggested to Da Nang for the development of projects like the Da Nang High-Tech Park, without being clear if whether or not this instrument has actually been included in the regulation. (DISED et al., 2016, p. 26).

And finally, concerning public participation in the high-rise development process, it is also unclear which is the type of the public participation included in the regulation, seeming to be more on the general aspects of planning rather than on specific projects. On one side, the City's People's Committee Decision 1349/QD-UBND states their intention of "creating conditions for residential people to participate and supervise the process of planning, management and implementation of the master plan after being approved by competent authorities" (BTU-CS Research Team, 2017, p. 93). But on the other hand, the 2016 JICA report highlights the importance of strengthening the city's capacity in terms of public participation and information (JICA & Da Nang's People's Committee Vietnam, 2016, p. 5.29)

Table 10 shows the city's main high-rise policies identified after the literature review.

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Table 10: Da Nang's current high-rise regulation system.

CATEGORY						
FOR DEVELOPING HIGH-RISES	Defines a location according to					
	Land-use	Public Transportation	Utilities Infrastructure	Social Services		
	✓	✗	✓	✗		
	Natural environment	Historical heritage	Views	Economic criteria		
	✗	✗	✗	✗		
	For controlling density it regulates					
	Max. Height	Max. FAR	Setbacks	Max.Width	Floor Plate Sizes	
	✗	✗	✗	✗	✗	
	Coverage area	Open Space Req.	Parking	Mixing of uses	Form-based codes	
	✗	✗	✗	✗	✗	
FOR INCENTIVIZING HIGH-RISES	Type of incentive considered					
	Transferable Devel. Rights		Incentive Zoning	Tax Increment Financing		
	✗		✗*	✗*		
	Type of amenity considered					
	Public Space on Ground Floor	Public Access on Higher Floors	Visual/Performing Arts Spaces	Landmark Build. Protection	Affordable Housing Units	
	✗	✗	✗	✗	✗	
Social Facilities	Public Transport Infrastructure	Walking/Cycling Infrastructure	Utilities Infrastructure	Local Fresh Food Stores		
✗	✗	✗	✓	✗		
FOR IMPLEMENTING AND MONITORING HIGH-RISES	Public participation: Scale					
	For General Criteria			For Individual Projects		
	✓			✗		
	Public participation: Type					
	Access Information	Comment and/or Define Plans / Reg.	Define View Protection Corridors	Review Individual Proposals	Report on Ongoing Projects	Amend Plans / Regulations
	✓	✓	✗	✗	✗	✗
	Type of evaluation process for granting permit to developers					
	Through Zoning: Prescriptive			Through Devel. Planning: Discretionary		
	✓			-		
	Type of evaluation requirement requested (besides plans and structural calcs.)					
Impact Assessments	Design Review / Guidance	Feasibility Studies	Contributions Statement	Visualizations	Architecture Competition	
✗	✗	✗	✗	✗	✗	
Monitoring and enforcement process for permit includes						
Creation of Legal Agreement		Defined Monitoring Process	Clear Penalties / Sanctions			
✗		✗	✗			

LEGEND ✓ Policy in place identified ✗ No policy in place identified

(*) Extra specifications, see section 5.2.3. Elaborated by the author with information from: (BTU-CS, 2017, p. 93; DISED et al., 2016, p. 26; JICA & Da Nang's People's Committee Vietnam, 2016, p. 5.29, 5.39; JICA & Danang People's Committee Vietnam, 2010, part I, p. 6.4, part III, pp. 9.8, 9.9, part IV, p. 4-26, 8.52).

5.2.4 Future Projects to be Developed

To be able to understand the tendency of high-rise development in the city of Da Nang is important to consider some contextual factors. On one side, on 2009 the Prime Minister issued the Decision No.445/QĐ-TTg on the adjustment of Urban Master Plan orientation of cities system in Vietnam to 2025 and vision to 2050, where the need for increasing the density of existing urban areas to prevent uncontrolled urban sprawl was established (BTU-CS Research Team, 2017, p. 20). Other aspects of this document included the integration of the new modern identity with the traditional architecture, the enhancement of the urban image, the improvement of the quality of the space, architecture and landscape for each municipality, with particular interest in their central areas. Additionally, on its Urban Master Plan until 2030 and vision to 2050, Da Nang define its focus on tourism and high-tech industries as strategic economic sectors, while expanding the existing public spaces, urban services and environmental protection measures (BTU-CS Research Team, 2017, p. 30).

Parallel to this, during the last decade the city of Da Nang has been establishing cooperation agreements or memorandums of understanding with foreign institutes or cooperation agencies in Japan and South Korea, among others, through intermediate institutes like the Da Nang Institute for Socio-Economic Development -DISED- and UN Habitat Vietnam. In this regard, the JICA in collaboration with Da Nang's People's Committee, developed in 2010 and further updated in 2016 a proposal for a spatial development plan and a public transportation plan for the city (JICA & Da Nang's People's Committee Vietnam, 2010, 2016). In this proposal, a mass-transit backbone corridor connects the existing CBD -to be renovated and better regulated to maintain historical values and increase its livability- with two new CBD on the northeast and the south, which will accommodate a new administrative center with transportation projects and a new commercial, business, medical and resort center respectively –Figure 66- (JICA & Da Nang's People's Committee Vietnam, 2016, p. 5.22, 5.24; JICA & Danang People's Committee Vietnam, 2010, part IV, p. 5.30).

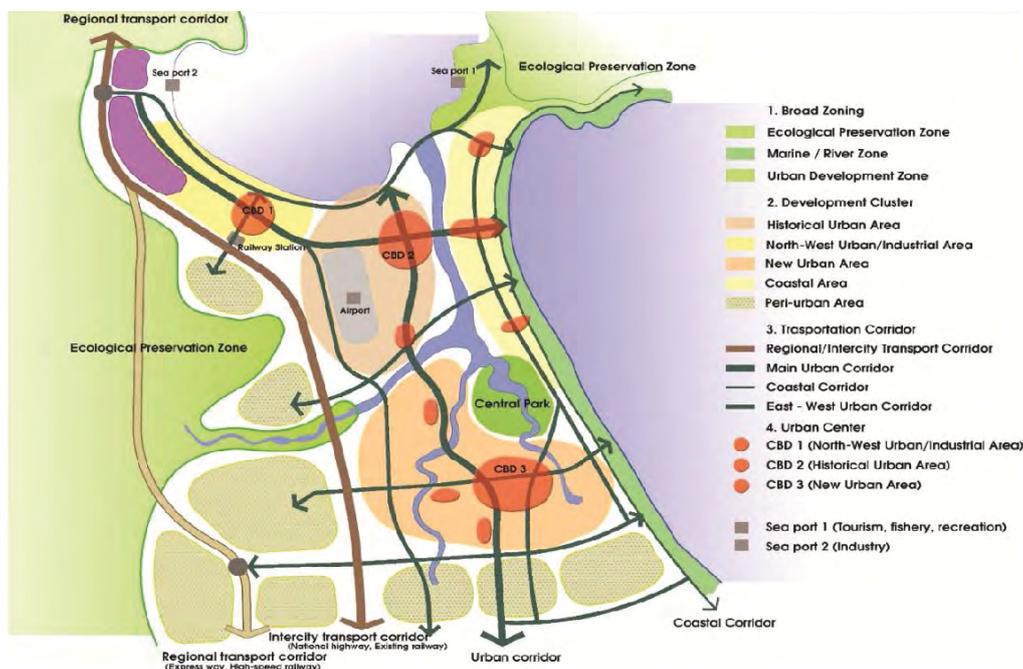


Figure 66: JICA spatial and public transportation proposal for Da Nang.
Source: (JICA & Da Nang's People's Committee Vietnam, 2016, p. 5.25)

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Other recommendations from these cooperation agreements include the enhancement of the waterfronts for the protection of coastal and flood-prone areas, including My Khe Beach and the Han River, and the creation of the Da Nang Hi-Tech Park as a mixed-used and high-density area with educational, medical, commercial and residential facilities, as well as public transportation and open recreational spaces (DISED et al., 2016, pp. 25, 26; JICA & Danang People's Committee Vietnam, 2010, part I, p. ES.5).

From all these recommendations, it seems that only related to the riverfront enhancement has been taken into consideration. In 2016, Da Nang City People's Committee launched an international landscape design competition for the Han River which aimed, amongst other things, to connect both spatially and functionally the proposal to the existing important urban element like high-rise buildings (Vietnam Institute of Architecture, 2016). However, it is still not clear whether or not the winning proposal from OMGEVING Landscape Architecture will have an impact on the city's future high-rise regulation and development, since apparently only one of the city's new tall projects under construction, the 121-meter-tall Marriot Da Nang, is connected to this project –Figures 67 and 68- (CTBUH, 2017d; OMGEVING, 2017).



Figure 67: OMGEVING winning proposal for the International Landscape Design Han River Competition. Marriot Da Nang project is showed on the right, in front of the Novotel Da Nang Premier Han River. Source: (OMGEVING, 2017).



Figure 68: Current state of the Han Riverfront Park. © Thomas Sterr, 2015

If well, the high-rise tendency indicates that the city is still trying to break new height records, with the construction of the 199-meter-tall residential and hotel Soleil Da Nang Wyndham Towers on the eastern coast, Da Nang is still behind in the national height competition –Figure 69– (CTBUH, 2017d). Hanoi, which now holds the country’s height record with the 328-meter-tall mixed-use Keangnam Hanoi Landmark Tower, is now building the 363-meter-tall VietinBank Business Center Office Tower, which is expected to be finished by 2019 (CTBUH, 2017f). Ho Chi Minh City, on the other hand, is also trying to retake the height record with the construction of the 461-meter-tall Vincom Landmark 81 mixed use tower, which is expected to be finished until 2020 (CTBUH, 2017g).



Figure 69: Soleil Da Nang Wyndham Towers.
Source: (CTBUH, 2017) © PPC An Think Da Nang

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One additional project which is worth mentioning is the Da Phuoc International Urban Area. Started in 2006 by the Korean developer Daewon, the Da Phuoc project consists of a 210-hectare area reclaimed from the sea on the northern coast of the Hải Châu district, which once completed is expected to host a new mixed-use district with several high-rise buildings –Figure 70- (Hao, 2017). The project, which is divided into different reclamation phases, has faced different political and financial problems, lasting longer than initially expected. As part of the negotiations with the city of Da Nang, it has already agreed to give to the city free or charge 29 hectares of the new land for a sports and cultural center and is currently in the process of negotiating 10 more hectares for a new technology center (Hao, 2017). While there are still around 100 hectares of land to be filled in the sea, the first buildings have already started to be built in the area of Phase 1, along the Nguyễn Tất Thành Avenue, as it was previously described –Figure 71- (Hao, 2017).



*Figure 70: Da Phuoc International Urban Area project.
Source: (Hao, 2017).*



Figure 71: Reclaiming process from the sea of the Da Phuoc International Urban Area between 2009 and 2017. Elaborated by the Author from Google Earth.

5.2.5 Main High-rise Related Gaps

Based on the information previously described four main gaps or opportunities were identified regarding high-rise development in Da Nang. These gaps include the inadequate law enforcement and monitoring of the existing regulations, the lack of specialized high-rise-oriented regulations or plans, the lack of incentivizing instruments and the lack of an adequate infrastructure system for high-rise development.

With regard to the existing regulations, the Government's decisions or decrees on urban development and high-rise buildings don't seem to be adequately enacted or implemented, creating a gap between the regulations and the actual construction. The former is particularly evident on the volumetric results of the existing and projected high-rise buildings at the CBD, where a study indicated that some proposals above the 53-meter height threshold recommended by the International Civil Aviation Organization ensure a safe aircraft operation, will eventually rise in the airport's proximity (JICA & Danang People's Committee Vietnam, 2010, part IV, p. 5.34).

For that matter, although according to the existing laws, decisions and decrees, both the volumetric criteria and the building's relationship with the ground floor and open spaces should

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be defined by their respective zoning and detailed plans, the reality shows otherwise –Figures 72 and 73-. Additionally, the city’s current unclear zoning system has also not been effective in fulfilling the plans, leaving a lot of the decisions concerning high-rise development to the real estate market (JICA & Da Nang’s People’s Committee Vietnam, 2010).



Figure 72: High-rise building under construction in Da Nang.
© Thomas Sterr, 2014



Figure 73: Slender high-rise hotel in Da Nang.
© Thomas Sterr, 2014

Other features that have been mentioned in the regulation but seem to not be happening in practice include public participation throughout the whole process, the provision of infrastructure by the developers as part of the agreements of the build-transfer system, as well as some aspects regarding climate change and environmental protection in the city (BTU-CS Research Team, 2017; JICA & Da Nang’s People’s Committee Vietnam, 2016).

On the other hand, there seem to be several aspects of high-rise development that are apparently not taken into consideration within the existing regulations. One of them, is the location of high-rise projects, with a lack of policies relating their height with aspects such as the natural environment, the historical heritage and the views. This situation, is further compounded by Da Nang’s vulnerability to different natural disasters like typhoons, floods and landslides that occur at least between two and four times per year (JICA & Danang People’s Committee Vietnam, 2010, part III, p. 11.1, part IV, p. 8.22).

Mainly tourism-related high-rise buildings are approved individually along the seafront and riverfront without any type of integration and consideration of the cumulative and adverse environmental impacts they cause. These impacts include the creation of a wall effect that blocks views and air flows coming from the waterfronts, the affectation of coastal forests, flood-prone areas, riverbank stability and marine ecosystems, and the further deterioration of coastal and lateral erosion by river flow. Besides the environmental criteria, other aspects like securing public access of the coast to all residents should also be regulated, avoiding the privatization of beaches by the resorts (JICA & Da Nang’s People’s Committee Vietnam, 2010).

For that matter, and since tourism is a growing industry in the city, there is a great need of improving high-rise evaluation requirements, like the environmental impact assessments, to protect the natural resources. Other aspects that seem to be currently unregulated in Da Nang include housing affordability, clearly defined incentivizing mechanisms that give options for the developers to contribute to the improvement of their city, as well as instruments for monitoring and enforcing the developments. (JICA & Da Nang's People's Committee Vietnam, 2010). Evaluation, monitoring and enforcement should already be fundamental issues for the development of the Phuoc International Urban Area project.

One last aspect which doesn't seem to be taken into consideration with regard to high-rise development projects is the existing land use right system. If well on one hand, this system could potentially contribute in the mitigation of other problems like the real estate speculation and housing affordability, on the other hand, and since most of the existing high-rise buildings are currently destined for governmental, commercial and touristic purposes, the potential advantages for high-rise developments that this system could bring to residential and mixed-use areas, are yet to be explored.

In terms of the incentive zoning instruments, it is not clear if whether the previously mentioned build-transfer system is more an instrument for the establishment of public-private partnerships, or if it is actually a regulation for incentivizing the mitigation of the urban impacts created by high-rise projects. In any case, with the presence of a growing touristic real estate market, there is great potential in incorporating mechanisms of this type for the benefit of the inhabitants.

And finally, the last problem identified in this research was the lack of an adequate infrastructure system for high-rise development. With only around 20% of the city's total households connected to the drainage system, 65% of the roads paved with asphalt or cement concrete and with an undeveloped public transport system that has an average bus ridership of around 540 to 1750 passengers per day, high-rise developments are either constrained to be located in the already congested city center with already available infrastructure or in other locations of the city without it (BTU-CS, 2017, p. 78; JICA & Danang People's Committee Vietnam, 2010, part III, p. 7.1).

From these inadequacies in infrastructure systems, perhaps the most significant one is public transportation. For a city that mostly relies both locally and inter-regionally on motorcycles as its main mode of transportation with 64% and 72% of the total trips respectively, the improvement of public transport, which is only carried out by five bus lines and corresponds to less than 2% of the local modal share, is fundamental for the successful integration of high-rise projects –Figure 74- (DISED et al., 2016, p. 34; JICA & Danang People's Committee Vietnam, 2010, part III, p. 7.11, 7.37) For that matter, even if car use is till somehow limited, the combination of several aspects like the concentration of more commercial and business high-rise buildings in the city-center, the construction of touristic towers by the coast without an integration to a public transport network, the urban sprawl of residential low-density developments and the gradual shift from motorcycles to cars, promises a very conflictive future in terms traffic management, air pollution and land consumption –Figures 75 and 76- (JICA & Da Nang's People's Committee Vietnam, 2010, 2016).

It is important to highlight that regarding the utilities and mobility infrastructures as well as the access to parks and green spaces, which are also insufficient in inner core areas such as the Hai

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Chau CBD, the incorporation of high-rise incentive mechanisms in the city's regulation could significantly contribute to the mitigation of the urban impacts via the developer's contributions (JICA & Da Nang's People's Committee Vietnam, 2010).

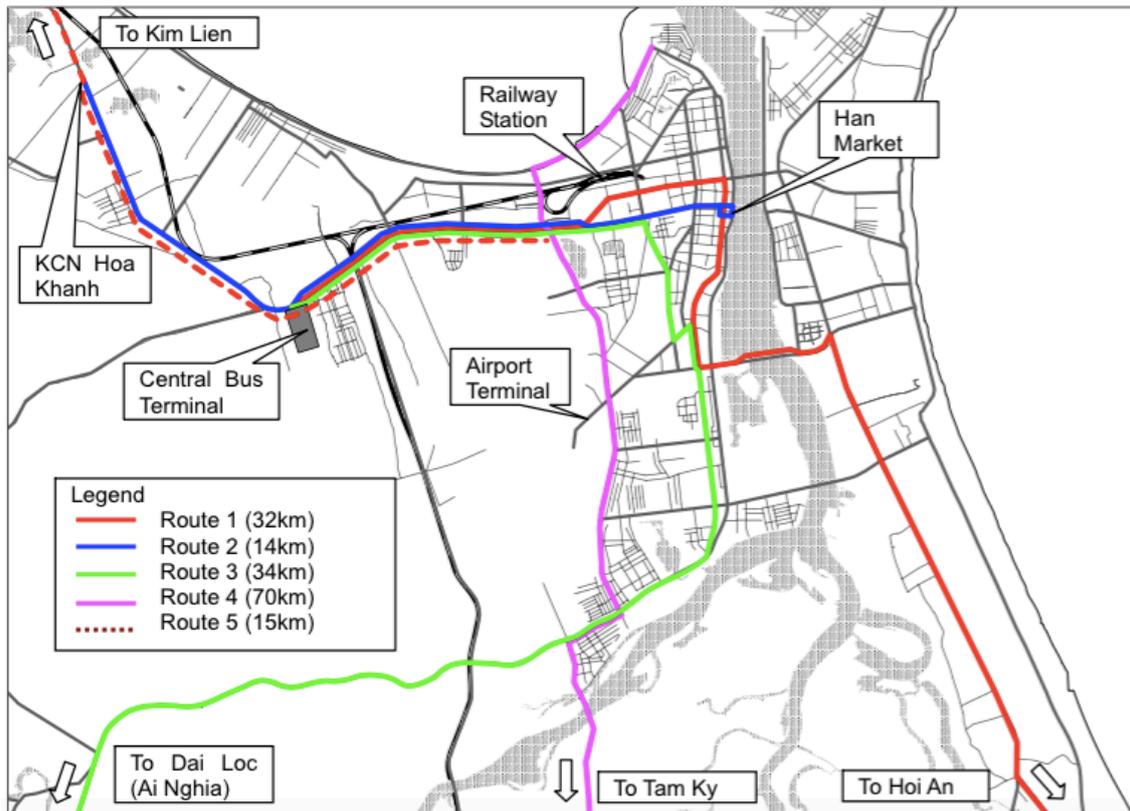


Figure 74: Urban bus network in Da Nang.

Source: (JICA & Danang People's Committee Vietnam, 2010, part III, p. 7.37)



Figure 75: Motorcycle as the main mode of transport in Da Nang. © Thomas Sterr, 2012



Figure 76: Motorcycle traffic in Da Nang. © Thomas Sterr, 2015

5.3 Frankfurt am Main

5.3.1 General Overview

The city of Frankfurt am Main is located in the central part of Germany in the Federal State of Hesse, by the Main river where it gets its name from. It is part of the Frankfurt Rhine-Main Metropolitan Region, which is one of country's 11 main population centers established in 2005 for political and territorial management reasons -Figure 77- (Regionalverband FrankfurtRheinMain, 2015). With a total population of 5.6 million inhabitants in 2014, this region occupies parts of the States of Hesse, Rhineland-Pfalz and Bayern (Regionalverband FrankfurtRheinMain, 2015). However, in terms of the area's functional integration, the city of Frankfurt along with other 74 mostly suburban municipalities make up Frankfurt's metropolitan area, with an extension of 2,458.5 km² and a total population of 2.3 million inhabitants in 2015 – Figure 78- (Regionalverband FrankfurtRheinMain, 2015).

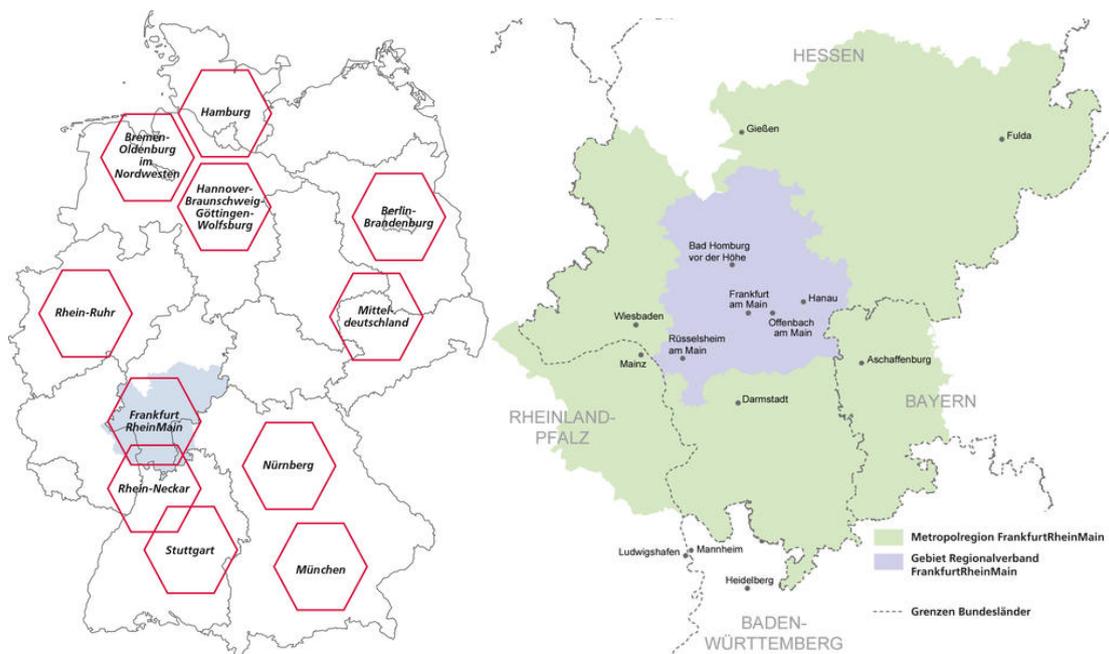


Figure 77: Frankfurt Rhine-Main metropolitan region in relation to Germany and to Frankfurt's metropolitan area. Source: (Regionalverband FrankfurtRheinMain, 2015)

Within this metropolitan area, the city of Frankfurt by itself has an extension of 248.3 km² concentrating 732,688 inhabitants in 2015 (City of Frankfurt am Main, 2015; Hessen, 2015). Being a mainly flat city, Frankfurt is contained by a Green Belt Park of natural and recreational spaces which connects the Nidda and Main rivers, the City Forest –*Stadtwald*- to the south and some hilly forest areas in the northeast, in the Seckbach and Bergen-Enkheim areas -Figure 79- (City of Frankfurt am Main, 2015; Department for Environment and Health, 2010).

As one of the most attractive centers in Germany and Europe, Frankfurt's population has been growing at a rate of 7.14% compared to 2008, expecting to reach 810,000 inhabitants by 2030 (FRA-UAS Research Team, 2017b, p. 8). Most of these new inhabitants, however, are not so much related to new births of the current residents but rather with foreigners coming into the city, estimating that around one-third of the existing population comes from other parts of the world (p. 9). For a city which keeps attracting new inhabitants but is at the same time contained within a Green Belt, a tension between increasing the existing affordable housing offer and becoming a greener and more sustainable city is created (FRA-UAS Research Team, 2017b).

With regard to its economy, even if 10.8% of its activities are still based on manufacturing, the other almost 90% is now based on services –Figure 80– (Frankfurt Green City- Umweltamt, 2017). As it was previously mentioned, Frankfurt is a main international transportation and logistics hub, being the third biggest airport in Europe by number of passengers, a well-integrated part of the European high-speed train network and also a key hub for regional and national railway and motorway connections (FRA-UAS Research Team, 2017b, p. 11). For that matter, being a city that statistically offers nine jobs for every ten inhabitants, more than 300,000 people commute to Frankfurt every day (pp. 12, 16).

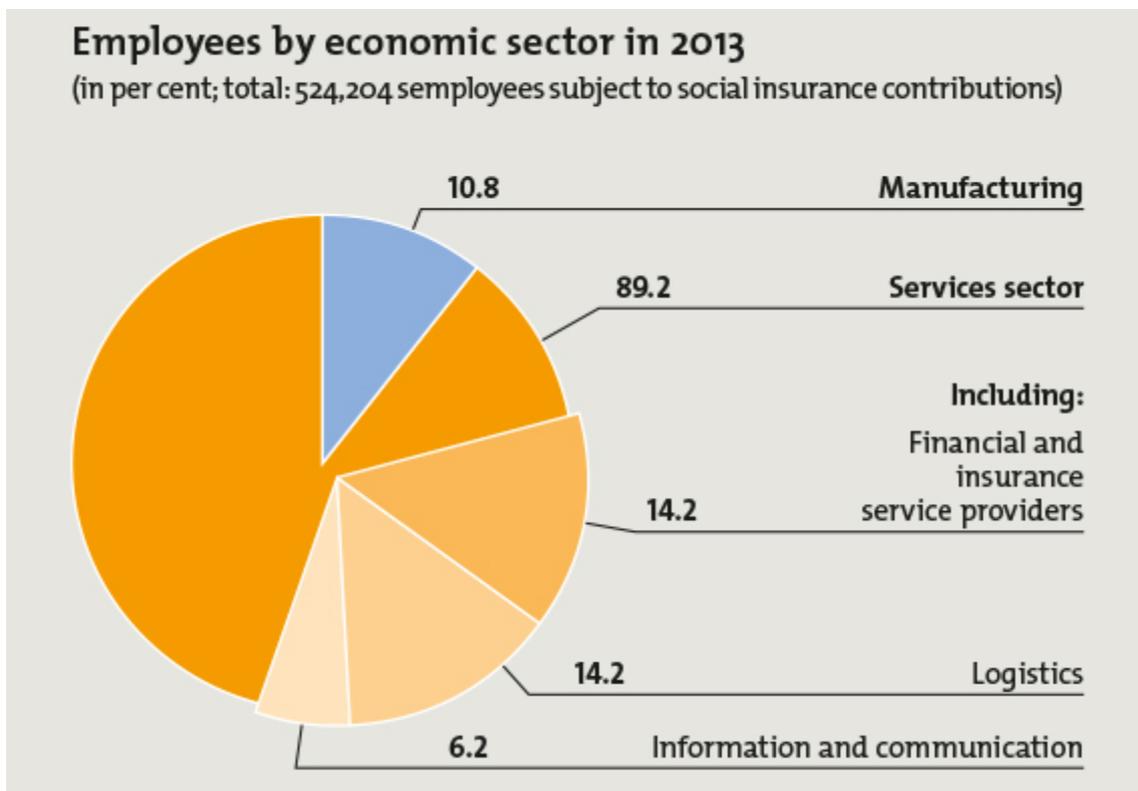


Figure 80: Frankfurt's economic activities.
Source: (Frankfurt Green City- Umweltamt, 2017)

Along with the logistic activities, the financial and insurance sectors are the ones that employ the biggest number of workers. Frankfurt is the seat of the European Central Bank, the German Central Bank, the German Stock Exchange and the Federal Institute of Financial Performance and Supervision (p. 12). Additionally, it also hosts 190 credit institutions and around 100 insurance companies' headquarters or branch offices (FRA-UAS Research Team, 2017b, p. 12; Frankfurt Green City- Umweltamt, 2017). Other types of services present in the city are the

informatics, telecommunications, creative and cultural sectors. The chemistry and pharmaceutical industries, on the other hand, complement this mix by offering jobs in research, development and production of goods mainly for medical purposes (FRA-UAS Research Team, 2017b, p. 13; Frankfurt Green City- Umweltamt, 2017).

5.3.2 High-rise Evolution and Current Situation

The modern high-rise history in Germany started at the beginning of the 20th century, with the construction in 1905 of an almost 40-meter-high office building for a pharmaceutical company at the city of Darmstadt, around 30 km away from Frankfurt (Deutsches Architekturmuseum, 2014, p. 14). During this period, if well some local construction regulations were enacted in cities like Frankfurt -1918- to control these new type of high buildings, not so many projects were actually built, and the few ones that did still tried to conceal their vertical character (pp. 14, 63).

The first real height ambitions came between 1925 and 1930 when Frankfurt's Chief Mayor Ludwig Landmann developed the Greater Frankfurt plan (p. 15). This proposal, designed by Martin Elsaesser, aimed to unite the whole Rhine-Main area through the construction of a series of large projects, including a 90-meter-high new town hall in Frankfurt, which would have become the country's highest building (p. 15). As such, it only remained a vision, and in fact only three high-rise buildings above 30 meters were actually built in Frankfurt before the Second World War, the Mousonturm -33m, 1926, Figure 81-, the Gewerkschaftshaus -31m, 1931- and the I.G. Farben Building -35m, 1931, Figure 82- (pp. 14-15).



Figure 81: Mousonturm (1926), Frankfurt's first modern high-rise building built as planned. © Carlos E. Guerra B., 2017.
Figure 82: I.G. Farben Building (1931), now part of the Goethe University. © Carlos E. Guerra B., 2017.

Once the Second World War was finished, several high-rise buildings were constructed in Frankfurt, especially in the heavily damaged locations in the business center, aiming to support its candidacy for the provisional capital of the new Federal Republic (p. 15). Mainly of steel-framed structures and almost all owner-occupied, these buildings were mostly not higher than 50 meters (p. 24). In 1949, when Frankfurt lost, the city decided to change their focus to re-establish

itself as the country's banking capital, a position which it had lost to Berlin during the 19th century (pp. 15, 23).

After issuing some fire safety building regulations in 1951, the city's first plan to regulate the location of high-rise buildings came until 1953, when the Head of Planning Herbert Boehm designated 26 parcels of land along the Anlagenring, or the path of the old city wall, as well as at other additional plots at bridges and noticeable inner-city areas, as the only allowed places to locate detached high-rise buildings of a maximum height of 14 stories –Figure 83– (pp. 15, 24, 25, 63). Nonetheless, due to real estate speculation and blackmail from companies threatening to go to other cities, local politicians ended up disregarding this plan, allowing by 1964 the construction of around 50 high-rise buildings with at least eight stories and at locations that were not originally designated by the plan (p. 26).

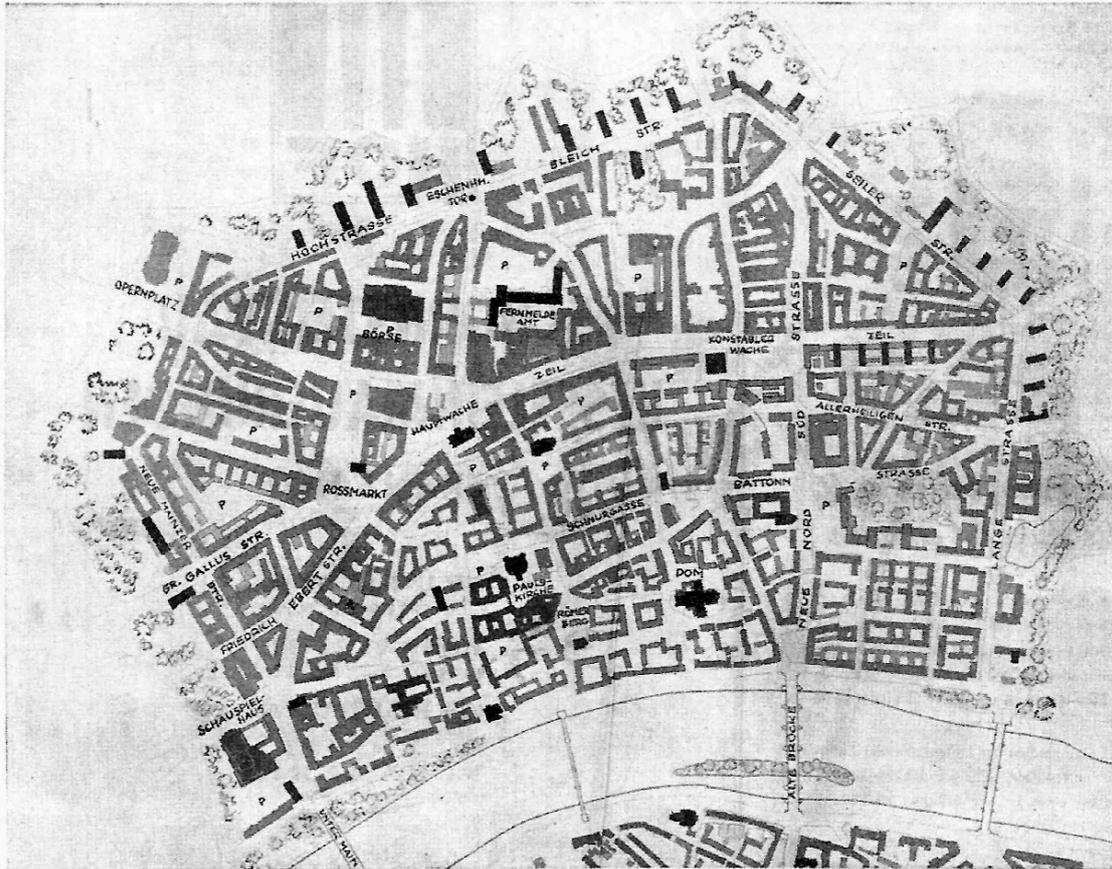


Figure 83: Frankfurt's 1953 high-rise location plan along the Anlagenring.
Source: (Deutsches Architekturmuseum, 2014, p. 25)

Beginning in the 1960's, when the city started to become Germany's financial center with banks and insurance companies building their headquarters in areas like Westend and Taunusanlage, Frankfurt decided to have a more efficient and active role in the high-rise development process (p. 16). Since granting exceptions to the land-use plan for high-rise buildings became the rule, in 1962 the city council determined that all decisions regarding modifications in the existing land-use plan were exclusive responsibility of the council's building committee (p. 27). Furthermore, to try to restrict high-rise developments, it also defined a minimum lot size of 2,000 m² and increased their FAR from 1.1 to 2.5 (p. 27).

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Opposite to what the city planned, the former resulted in a growing demand and a real estate boom which forced the city to make even more plots available for high-rise buildings in three main areas (pp. 26-27). The first one was the city center, which gradually became the banking quarter. By 1955, 15 banks had already settled here building edifices up to 10 stories (p. 26). The second one was Niederrad, a greenfield land on the southern side of the Main River planned in 1962 as a skyscraper city (p. 26). As such, Niederrad was built for the administrative headquarters of trading and production companies. And lastly, there was Westend, a middle-class residential district which was thought to become the insurance quarter, as a natural expansion to the west of the city center (p. 26).

Under the concept of urbanity through density, between 1965 and 1966 the city of Frankfurt allowed the Dutch architects J.H van den Broek and J.B. Bakema to develop a new city concept including high-rise developments as one of the structural elements in the city (Jourdan & Müller PAS Freie Architekten, 1998, p. 22). Their proposal included linear density bands along corridors such as Reuterweg and Bockenheimer Landstraße, which pretended to increase density in the areas surrounding the city center, thus, potentially increasing the car traffic –Figure 84- (p. 22). Even if their proposal was not implemented as such, it would directly influence and become the basis for later plans (p. 23).

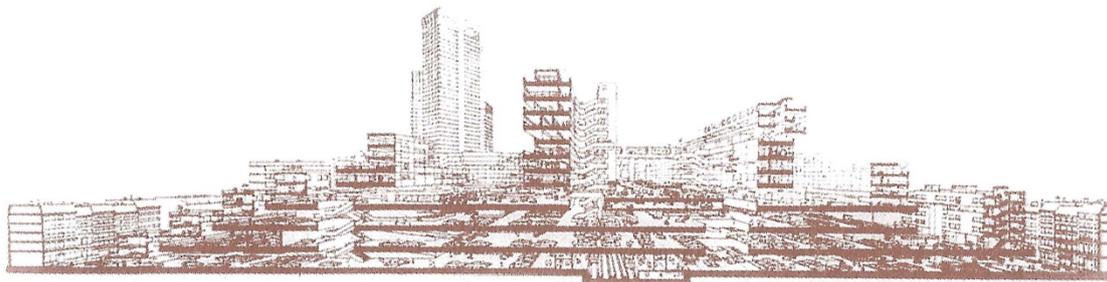


Figure 84: J.H van den Broek and J.B. Bakema high-rise concept, section through 3 traffic level sitting 8- to 10-story buildings. Source: (Jourdan & Müller PAS Freie Architekten, 1998, p. 21)

Since high-rise buildings started to push out Westend's residents by replacing existing nineteenth-century villas with office buildings, in 1968 the city decided to make another attempt to regulate and relieve the investment pressure to protect the existing residential areas (Deutsches Architekturmuseum, 2014, p. 26). The Fingerplan, drafted by Hans Kampffmeyer and Hans-Reiner Müller-Raemisch, designated several streets between the Anlagenring and the Alleenring as high-density corridors in which vertical constructions were permitted –Figure 85- (pp. 26-27). Eckenheimer, Eschersheimer, Bockenheimer and Mainzer Landstraße, as well as Kettenhofweg where the streets where office high-rises were encouraged not only to concentrate the developments but also to increase jobs and trade tax revenues for building new underground or over ground mobility infrastructures, as well as other public facilities like childcare centers (pp. 27-28). Because it brought some urban improvements for the common good and it was publicly discussed, the Fingerplan was the city's first attempt to regain the citizens' trust on their city council (p. 40).

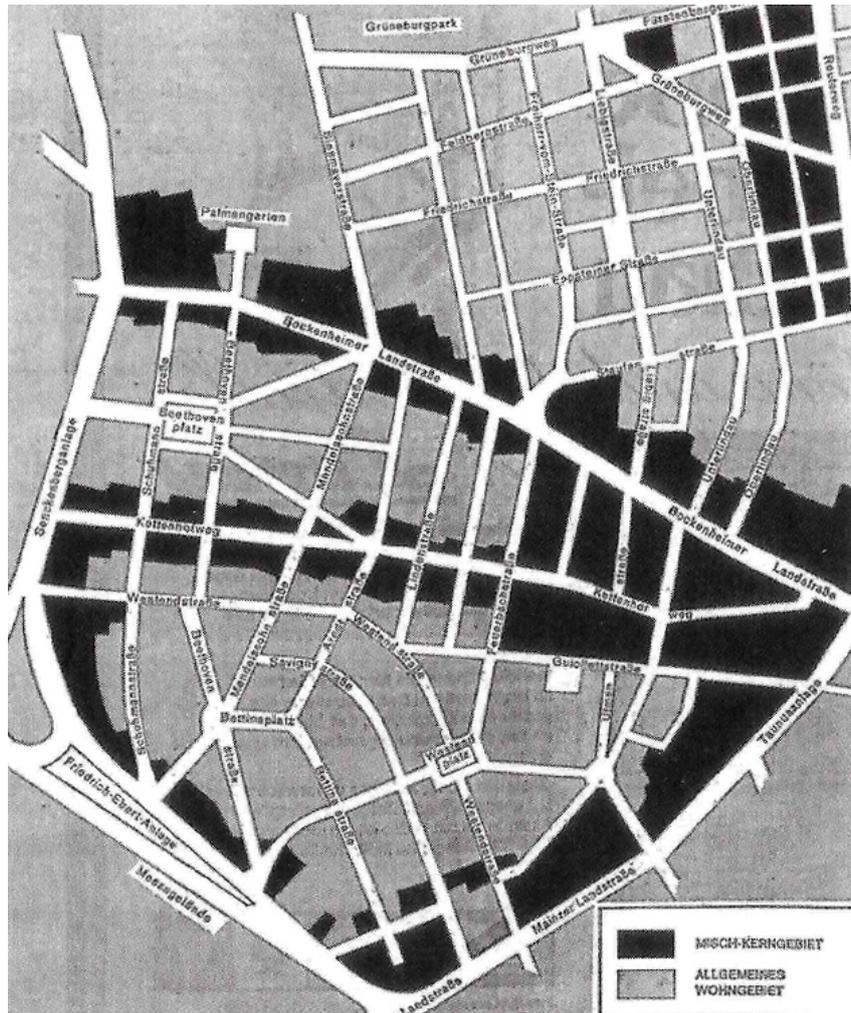


Figure 85: Detail of Frankfurt's Fingerplan 1967-1968.
Source: (Deutsches Architekturmuseum, 2014, p. 40)

In spite of the city efforts, including further plan updates or complements like the Bankenplan in 1973 for the banking district and a new binding land-use plan for Westend in 1975, residential displacements continued on a massive scale, heavily damaging the neighborhood's social fabric (pp. 16, 28, 29). In the case of the Bankenplan, for the area defined by the Rathenauplatz, Weserstraße, Theaterplatz and Taunusanlage, towers between 20 and 38 stories were envisioned to concentrate greater commercial density (Jourdan & Müller PAS Freie Architekten, 1998, p. 24).

To complicate this even further, during the 1970's Frankfurt's buildings were even allowed to go over the 95-meter height limit of the city's cathedral, being perceived by the citizens as negative symbols of profit and power that didn't have any concern for their context (Deutsches Architekturmuseum, 2014, pp. 26, 28). In 1976, the 159-metre Westend Gate building by Siegfried Hoyer—Figures 86 and 87—became Germany's highest building, taking the title that had belonged to the industrial Rhine area during the first decades after the war (pp. 15)

High-rise Development Regulations



Figure 86: Westend Gate, 1976.
© Rolando Robledo, 2017



Figure 87: Westend Gate, 1976.
© Rolando Robledo, 2017

All of this social unrest was reflected in the 1977 local elections when people voted for the opposition party after around 30 years of no alteration in power (pp. 17, 28). This new government decided to follow a different approach on high-rise developments. Unlike 1953's high-rise plan, the Fingerplan and the Bankenplan, which aimed to give coherence to an already existing development process, the 1983 City-Leitplan by Albert Speer wanted to anticipate and guide urban development –Figure 88- (p. 29). Just like the Fingerplan, high-rise buildings were to be concentrated along corridors connected to the main railway station, like local rail and tram lines along Mainzer Landstraße on the west and Hanauer Landstrasse on the east. However, unlike the other plans, there were supplemented by large former industrial zones to be redeveloped, like the fair –Messe- and Bockenheim Süd areas (pp. 42, 43).

High-rise Development Regulations



Figure 89: Deutsche Bank Twin Towers, 1984.
© Carlos E. Guerra B., 2017



Figure 90: Messeturm, 1991.
© Rolando Robledo, 2017

With the German reunification in 1990, the city government decided that keeping existing banks and bringing new ones into the city was not only vital to keep the German Central Bank from moving to the new capital in Berlin but also to become the seat of the European Central Bank -ECB-, position which the city was competing for against Paris, London and Amsterdam (p. 31). In 1990, the city commissioned Novotny, Mähner and Associates to draft a framework for a new land-use plan for the Banking Quarter, which was enacted until 1994 (Jourdan & Müller PAS Freie Architekten, 1998, p. 29). This new binding land-use plan arranged high-rises in clusters to allow further densification and set a maximum height of 160 meters (Deutsches Architekturmuseum, 2014, p. 32). Further efforts to support this competition included the first Skyscraper Festival celebrated in 1996 to promote the new Main Tower and the completion in 1997 of the Commerzbank Tower by Foster + Partners, which with 259 meters kept for several years the title of Europe's highest building and still remains being Germany's highest building –Figures 91 and 92- (pp. 32, 108).



Figure 91: Commerzbank Tower, 1997
© Carlos E. Guerra B., 2017



Figure 92: Access to Commerzbank Tower from Kaiserplatz. © Carlos E. Guerra B., 2017

When the city finally got to be the seat of the ECB in 1998, the city council decided to prepare a new high-rise development plan to control the new wave of demand that they were expecting. Drafted by the firm Jourdan & Müller PAS, the first *Hochhausentwicklungsplan* was approved in 1998 and complemented with a binding land-use plan (p. 32). As it was previously described, this strategic plan determined 15 specific plots in three main areas where high-rise projects could be allocated, defining for each one of them a particular set of development criteria to act as guidelines for future developments (Deutsches Architekturmuseum, 2014, p. 51; Firley & Gimbal, 2011; Jourdan & Müller PAS Freie Architekten, 1998, pp. 47, 48). An update of this plan by the same architectural firm was done in 2008 –Figure 93–, providing 25 additional sites for high-rise projects (Deutsches Architekturmuseum, 2014, p. 51). However, unlike the first version, a binding land-use plan was not developed for this plan, aiming to grant development rights only to projects economically viable with serious investors (p. 34).

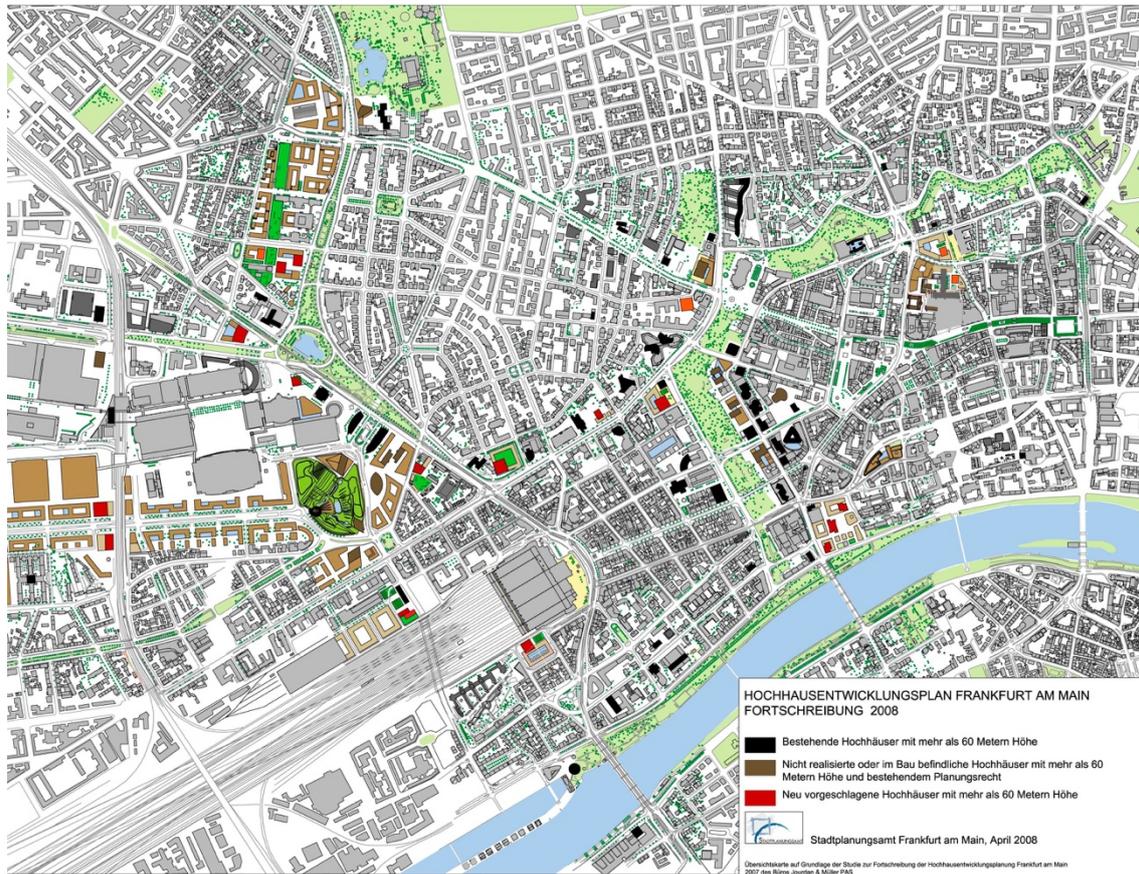


Figure 93: 2008 Hochhausentwicklungsplan from Jourdan & Müller PAS.

Source: (Stadtplanungsamt Frankfurt am Main, 2008) © Jourdan & Müller PAS.

Today Frankfurt is considered to be the high-rise capital of Central Europe, not only in terms of the number of high-rises –around 530- but also because of their height (p. 63). Even if the city still has some projects under construction, they seem to be more modest and down-to-earth, like if the city’s desire to break new height records had become less important than the project’s return on investment –Figure 94- (pp. 19, 34). The supply of sites for high-rises has even exceeded the demand for new construction, with only two of the original 40 sites contemplated by the *Hochhausentwicklungsplans* actually being occupied by buildings as of spring 2014 (p. 51). The former, however, is also directly related to the fact that one of the original clusters envisioned on the first *Hochhausentwicklungsplan*, the *Parkviertel am Hauptbahnhof* over the central train station’s railways, was never developed and later disregarded in the 2008 plan (Jourdan & Müller PAS Freie Architekten, 1998, p. 48; Stadtplanungsamt Frankfurt am Main, 2008, p. 19)

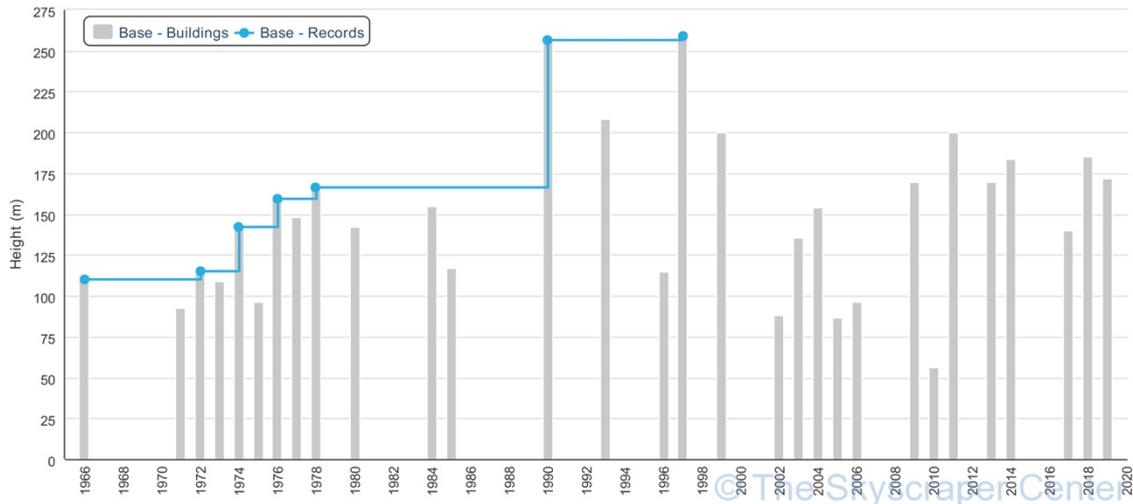


Figure 94: Tallest finished and proposed to be finished building per year in Frankfurt.
Source: (CTBUH, 2017e)

The refurbishment or replacement of existing buildings, as well as the case-by-case negotiations to develop in sites initially not considered by the 1998 or 2008 plans in exchange of different public amenities, have then become some of the other alternatives for new high-rise projects in the city. Examples of this include the replacement of the Zurich Insurance building by the 170-meter-tall Opernturm in 2010 -Figure 95-, the 135-meter-tall Nexttower and the 99-meter-tall Hotel Jumeirah buildings in the city center in 2010² and the 185-meter new European Central Bank headquarters in the eastern part of the city in 2014³ -Figure 96- (Deutsches Architekturmuseum, 2014, pp. 33, 51, 82, 245). Considering the fact that the high-rise development plans in Frankfurt appear to change approximately every 10 years, a new version of the *Hochhausentwicklungsplan* might be under development, especially after Great Britain's 2016 Referendum to leave the European Union, also known as BREXIT, as it will be further explained (Jourdan & Müller PAS Freie Architekten, 1998, p. 34; Manus, 2017b)

² In exchange of the reconstruction of the disappeared 18th century Thurn and Taxis Palais (Deutsches Architekturmuseum, 2014, p. 83).

³ In exchange of the preservation of the modernist building *Großmarkthalle* as well as the provision of some other public open spaces and infrastructures (Deutsches Architekturmuseum, 2014, p. 245).

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Figure 95: Opernturm, 2010.
© Carlos E. Guerra B., 2017



Figure 96: European Central Bank Tower, 2014.
© Rolando Robledo, 2017

Nowadays most of the high-rise buildings in the city are distributed along 11 main areas or corridors which include the Banking Quarter, Westend, Messe or Frankfurt Trade Fair Quarter and Europaviertel, Niederrad Office City, the Innenstadt or city center, the River Main Embankment, the City West, the Alleenring, Sachsenhäuser Berg, Ostend and around Frankfurt Airport –Figure 97- (Deutsches Architekturmuseum, 2014, pp. 72–285). In addition to these areas, there are at least some other six locations in Frankfurt like Bornheim, Sechbach, Eckenheim, Bonames, Nordweststadt and Niederereschbach which for only having four or less high-rise buildings have not been taken into consideration.



Figure 97: Location of the main high-rise areas in the city of Frankfurt.
1. Innenstadt / City Center, 2. Banking Quarter, 3. Main Embankment, 4. Westend, 5. Alleenring, 6. Messe / Frankfurt Trade Fair Quarter and Europaviertel, 7. City West, 8. Ostend, 9. Sachsenhäuser Berg, 10. Niederrad Office City, 11. Frankfurt Airport (Not in the map). Elaborated by the author from Google Earth and (Deutsches Architekturmuseum, 2014)

According to the database of the CTBUH as of August 2017, the city has 17 buildings equal to or above 150 meters, with 14 buildings finished and three more under construction (CTBUH, 2017e). Of these high-rises 82% are occupied only by offices, 12% are mixed-use and only 6% are exclusively residential –Figure 98- (CTBUH, 2017e). In this regard, and based on the number of buildings above 150 meters, a height threshold commonly used by the CTBUH to compare different cities, Frankfurt is ranked number one in Germany, number four in Europe –after Moscow, Istanbul and London- and number 58 in the world (CTBUH, 2017e).

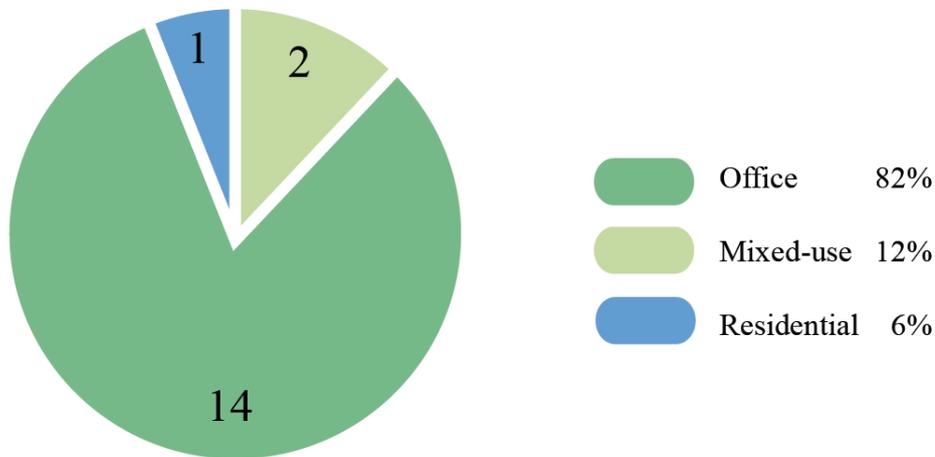


Figure 98: Land-use of Frankfurt's high-rise buildings above 150 Meters.
Elaborated by the author from: (CTBUH, 2017e)

The timeline presented in Figure 99 summarizes Frankfurt's high-rise development over the last 120 years, as exposed in this chapter.

High-rise Development Regulations

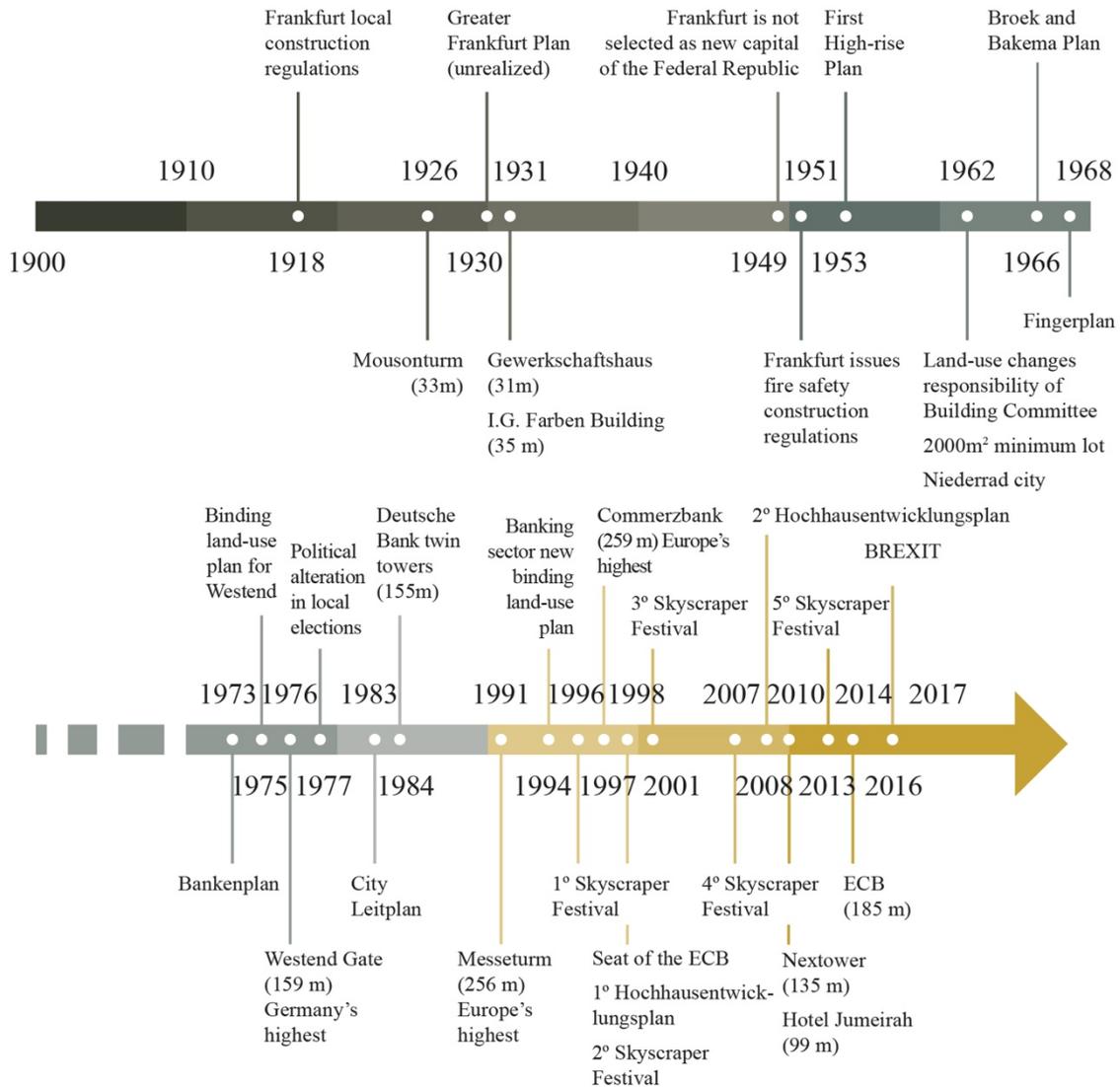


Figure 99: Frankfurt's high-rise development timeline.

Elaborated by the author from: (Deutsches Architekturmuseum, 2014, pp. 14–19, 23–34, 40–43, 51, 63, 69, 82, 108, 245; Jourdan & Müller PAS Freie Architekten, 1998, p. 22; Manus, 2017b).

5.3.3 Current Regulation Review

To evaluate Frankfurt's high-rise regulation the 2008 *Hochhausentwicklungsplan* was reviewed (Stadtplanungsamt Frankfurt am Main, 2008). One of the first characteristics to stand out about this plan is that it is a strategic non-formalized document, which is not legally binding for individuals. Since this document was adopted by the city council, the public sector must consider it for the city's future developments. However, private actors, on the other hand, require to further develop a legal zoning plan or *Bebauungspläne* to obtain a building permit (FRA-UAS Research Team, 2017b).

In terms of defining a location, land-use, public transportation, utilities and services infrastructure, the natural environment, historical heritage, views and economic criteria are all taken into consideration for authorizing a new project. High-rise buildings can be located both in clusters or as individual projects in particular areas. In the case of historical heritage, high-rise criteria would not prevent a new building from being built close to an existing heritage building but rather would

try to ensure that the heritage building is protected and even integrated into the new project. (Pützenbacher, 2017; Stadtplanungsamt Frankfurt am Main, 2008, 2017)

Even if the plan clearly suggests specific plots for high-rise development, projects that are not listed in this plan can also be considered if they are identified as potential plots to be added to an update of the plan or if they are promoted by special investors. Furthermore, buildings with less than 60 meters in height could also be considered in areas not listed in this plan, being subject to an individual assessment (Pützenbacher, 2017; Stadtplanungsamt Frankfurt am Main, 2008, p. 1)

With regard to the criteria for controlling density and its relation to the ground floor, the *Hochhausentwicklungsplan* clearly mentions that instead of defining general volumetric criteria for the whole city, each proposal has to be defined based on the shadow projection, daylight and air flow assessments on its immediate context and then included in their respective binding land-use plan (Stadtplanungsamt Frankfurt am Main, 2008, p. 3). For that matter, each binding land-use plan would normally define for their plot aspects such as maximum height, FAR, setbacks, maximum width or floor plate size, coverage area, open space requirements, parking and mixing of uses. This is why in terms of height, if well there is no fixed maximum building height for the whole city, the plan determines on a case-by-case basis the maximum height that best suits each plot's specific characteristics. While in the Banking area some buildings are allowed to reach up to 210 meters in the city center buildings can only reach up to 60 meters (Firley & Gimbal, 2011, pp. 208, 209; Stadtplanungsamt Frankfurt am Main, 2008).

Within these criteria, there are some extra aspects to take into consideration. In terms of the open space requirements, the binding land-use plans regularly determine a percentage of the plot's area to be left free of construction (Pützenbacher, 2017). With regard to the adequate ratio of mixing of uses, in order for a new office high-rise proposal to be approved, a minimum of 30% of the total gross surface area needs to be ensured as residential space, that can be located either on the plot or in a near plot (Stadtplanungsamt Frankfurt am Main, 2008, p. 2). Additionally, to promote a more successful integration of the building into its immediate urban context, developers are required to reserve the ground floor for public, communal, gastronomic, cultural, sports and health uses (p. 2). And lastly, since the City Planning department is under no obligation to develop binding land-use plans for the whole city but rather only for the specific plots or areas where urban development is needed, form-based codes are not really an alternative, since any new volumetric regulations would be directly incorporated into the respective binding land-use plan (FRA-UAS Research Team, 2017a, pp. 11, 12).

With regard to the incentivizing mechanisms, no instruments were identified in this system. One of the main reasons behind this is that the amenities which are usually asked in return for granting greater development rights are regularly considered as a fundamental element in the negotiations to grant a building permit, this is, they are until a certain extend the requirements for the mitigation or urban impacts that the city negotiates with the developers in order to grant a permit. For that matter, is it mainly the definition of a different location than the ones considered in the plan, what could actually be granted to a developer. Within the amenities which they frequently include are the provision of public space on the ground and/or upper floors, landmark building protection, social facilities and infrastructure related to streets, public transportation, utilities, walking and cycling. Aspects such as affordability, provision of visual or performing arts spaces and urban

agriculture initiatives seem not to be included within these type of amenities as of now (Deutsches Architekturmuseum, 2014; Pützenbacher, 2017).

In terms of public participation, the regulation includes the neighborhood's concerns both for defining general criteria and for individual projects. Citizens not only are informed about the new proposals, but they can also influence the building's design if they consider that they are being affected in any way. For that matter, in some cases developers need to achieve neighborhood agreements signed by the neighbors involved to be able to get a building permit. Additionally, some volumetric restrictions could be ignored if the developers reach an agreement with the affected neighbors and give them an economic compensation in return. Since this document is not legally binding, code amendment is not really necessary, because even if a plot is listed for a high-rise development it doesn't necessarily mean that a high-rise project will take place. Additionally, since high-rise plans are periodically updated, citizens are always welcome to participate in the development of the new plans and strategies. Finally, and because German Federal Law does not consider views as a right of a land owner, defining view or protection corridors is not really a subject of public participation, but rather an aspect that the experts in the City Planning Department need to take into consideration (Pützenbacher, 2017).

For what concerns the evaluation requirements, impact assessments, design reviews, feasibility studies, contribution statements, visualizations and architecture competitions are all requested (Stadtplanungsamt Frankfurt am Main, 2008). In terms of the feasibility, before starting the construction of a new office building and as a part of each proposal's evaluation process to receive a building permit, the developer needs to show evidence to the City's Planning Department that confirms having a tenant willing to lease at least 50% of the office space for a minimum period of time of 10 or 12 years (Deutsches Architekturmuseum, 2014, pp. 20, 47). The former, to be able to reduce the possible financial risks of the new building while ensuring a greater degree of feasibility. While some aspects like energy efficiency and renewable energies are required for all new projects, additional studies could also be requested for particular projects depending on its specific characteristics (Stadtplanungsamt Frankfurt am Main, 2008).

And lastly with regard to monitoring and enforcement, since the city signs a legally binding contract with the developer to get a building permit, as it was previously mentioned, the building conditions and penalties are clearly indicated in this contract. While there are aspects that are non-negotiable, like the 30% residential area on new office building proposals which has to be provided by the developer in order to get the final authorization to use the new office building, there are other non-compliance aspects whose penalty could be negotiated (Pützenbacher, 2017; Stadtplanungsamt Frankfurt am Main, 2008). In any case, the monitoring process is specified in the State Building Code –*Hessische Bauordnung* or HBO-, and it is the responsibility of the State's Building Department to suspend any construction that is not fulfilling the building conditions previously established until the project is back in order (Landesrecht Hessen, 2010).

Table 11 summarizes Frankfurt's main high-rise policies identified.

Table 11: Frankfurt's current high-rise regulation system.

CATEGORY						
FOR DEVELOPING HIGH-RISES	Defines a location according to					
	Land-use	Public Transportation	Utilities Infrastructure	Social Services		
	✓	✓	✓	✓		
	Natural environment	Historical heritage	Views	Economic criteria		
	✓	✓*	✓	✓		
	For controlling density it regulates					
	Max. Height	Max. FAR	Setbacks	Max. Width	Floor Plate Sizes	
	✓	✓	✓	✓	✓	
	Coverage area	Open Space Req.	Parking	Mixing of uses	Form-based codes	
	✓	✓	✓	✓	✗	
FOR INCENTIVIZING HIGH-RISES	Type of incentive considered					
	Transferable Devel. Rights	Incentive Zoning	Tax Increment Financing			
	✗	✗	✗			
	Type of amenity considered *					
	Public Space on Ground Floor	Public Access on Higher Floors	Visual / Performing Arts Spaces	Landmark Build. Protection	Affordable Housing Units	
	✓	✓	✗	✓	✗	
Social Facilities	Public Transport Infrastructure	Walking / Cycling Infrastructure	Utilities Infrastructure	Local Fresh Food Stores		
✓	✓	✓	✓	✗		
FOR IMPLEMENTING AND MONITORING HIGH-RISES	Public participation: Scale					
	For General Criteria		For Individual Projects			
	✓		✓			
	Public participation: Type					
	Access Information	Comment and/or Define Plans / Reg.	Define View Protection Corridors	Review Individual Proposals	Report on Ongoing Projects	Amend Plans / Regulations
	✓	✓	✗	✓	✓	✗*
	Type of evaluation process for granting permit to developers					
	Through Zoning: Prescriptive		Through Devel. Planning: Discretionary			
	-		✓			
	Type of evaluation requirement requested (besides plans and structural calcs.)					
	Impact Assessments	Design Review / Guidance	Feasibility Studies	Contributions Statement	Visualizations	Architecture Competition
✓	✓	✓	✓	✓	✓	
Monitoring and enforcement process for permit includes						
Creation of Legal Agreement		Defined Monitoring Process	Clear Penalties / Sanctions			
✓		✓	✓			

LEGEND ✓ Policy in place identified ✗ No policy in place identified

(*) Extra specifications, see section 5.3.3. Elaborated by the author with information from: (Al-Kodmany & Ali, 2013, p. 353; Deutsches Architekturmuseum, 2014, pp. 20, 47, 245; Firley & Gimbal, 2011, pp. 208, 209; Landesrecht Hessen, 2010; Pützenbacher, 2017; Stadtplanungsamt Frankfurt am Main, 2008, 2017)

5.3.4 Future Projects to be Developed

After Great Britain’s 2016 Referendum to leave the European Union, also known as BREXIT, in which the leave option prevailed, many companies, especially from London’s financial sector, have started to look for possible cities within Europe where to relocate in case they need to, being Frankfurt one of the strong candidates (Manus, 2017b). If well there are currently around 1.2 million square meters of free office space in Frankfurt, this potential new wave of demand combined with the need to include housing in the for years almost exclusively office district, has been reflected in a new construction phase in the city (Manus, 2017b). Around 20 projects are currently either under construction or planned particularly for areas like Europaviertel, Westend and the city center –Figure 100- (Göpfert, 2017b, p. F2).

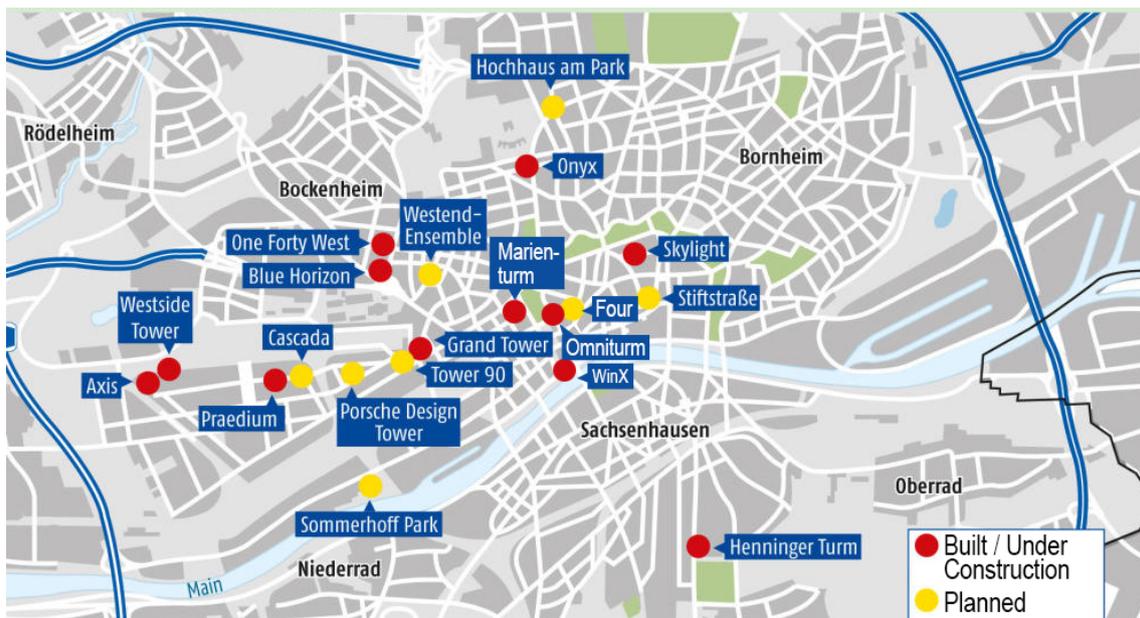


Figure 100: High-rise Projects Planned or Under Construction in Frankfurt. Modified by the author from: (Göpfert, 2017b, p. F2).

One of the projects which stands out the most is the one known as Four, to be located right next to the Commerzbank Tower –Figure 101-. Planned to start by the end of 2017 and to be finished until 2023, this project is a mix-use complex of four towers which, when completed, is expected to host around 3,000 workers and 1,000 residents (Göpfert, 2017a, p. F1). A 228-meter-tall office and hotel building, a 172-meter-tall and a 120-meter-tall apartment buildings, as well as another 100-meter-tall office building, are all combined over a common retail and commercial platform to create a new small city district (p. F1). This will be further complemented with two public plazas, 1,000 underground parking lots, some medical facilities and childcare centers (p. F1). To create a socially diverse environment, 80 out of the 600 new housing units will be offered as affordable units (p. F1).



Figure 101: Four project as viewed from Hauptwache.
Source: (Göpfert, 2017a, p. F1) © Groß & Partner

Other significant projects currently under construction are the 185-meter-tall office and residential Omniturm, the 172-meter-tall residential Grand Tower, the 155-meter-tall office Marienturm –Figures 102 and 103- and the 110-meter-tall office and residential Winx Tower –Figures 104 and 105- (CTBUH, 2017e). Additionally, since 2006 a 35-hectare site next to the Frankfurt Airport called Gateway Gardens has been under construction hosting different supplementary offices and commercial uses (Deutsches Architekturmuseum, 2014, p. 280). With some towers like the Alpha Rotex already built and with some others planned or under construction, this area estimates to have around 18,000 people working at this district when finished (p. 280).



Figure 102: Marienturm under construction.
© Carlos E. Guerra B., 2017



Figure 103: Render of Marienturm.
Source: (CTBUH, 2017h) ©Marienturm



Figure 104: WinX Tower under construction.
© Rolando Robledo, 2017



Figure 105: Render of WinX Tower.
Source: (CTBUH, 2017o) © KSP Jürgen Engel Architekten

5.3.5 Main High-rise Related Gaps

Based on the information previously described, five main gaps or opportunities were identified regarding high-rise development in Frankfurt. These gaps include real estate speculation over specific plots, the provision of sufficient open or publically accessible spaces, housing affordability, the lack of incentivizing instruments and the lack of strategies for the existing aging high-rise buildings.

If well for the second version of the *Hochhausentwicklungsplan* the new sites identified were not complemented with a binding land-use plan, the fact that only few of the originally planned sites have been actually occupied by new high-rise buildings raises some questions regarding the effectiveness of this approach. Some experts argue that once a site has been selected as an ideal location of a high-rise it automatically gains certain value in the market, making it hard for the owners in financial terms to accept any development which is smaller in size compared to the plot's maximum potential development. Therefore, when the demand for a particular site is not fulfilling the owner's expectations, it is common that this site remains vacant for years. As it has already been implemented for some projects, case-by-case evaluation, rather than the definition of specific plots, seems to be one of the ways to avoid these type of real estate speculations (Deutsches Architekturmuseum, 2014).

Even if the new high-rise proposals seem to start addressing one of Frankfurt's historical problems, which is the lack of mixing of uses in high-rise areas, some further questions arise regarding the way in which these new inhabitants will be integrated into the existing city. The first one is the provision of sufficient open or publically accessible spaces. If well new projects in the congested banking area like the Four towers contemplate the creation of two publically accessible plazas in the ground floor, it is still not clear whether the provision of these new open spaces will be directly proportional to the increase in the number of users in the area. On the other hand, regarding publically accessible spaces in upper floors and rooftops, even if this concept has

been mentioned in the *Hochhausentwicklungsplan* and events like the Skyscraper Festivals have made temporarily accessible some iconic high-rise buildings to all citizens, attempts to guarantee permanent public access to these areas have been dodged by investors and tenants claiming concerns over safety and economic viability. Failing to address these issues on time could have serious consequences for these future residential high-rises, including the decline of the tenant's quality of living (Deutsches Architekturmuseum, 2014; Göpfert, 2017a; Stadtplanungsamt Frankfurt am Main, 2008).

Another factor to consider regarding the residential high-rises is the housing affordability. According to some reports, housing prices in Frankfurt have constantly been increasing since 2006 reaching almost a cost of 5,000 euros per square meter in new apartments for sale and 14.45 euros per square meter in apartments for rent (Manus, 2017a). Since some of these new projects are mainly capital-market-oriented investment vehicles, even if already some projects like Four have announced the inclusion of some affordable housing units, it could be questioned if the city is currently making enough efforts to regulate or if it could further incentivize this aspect in the near future (Deutsches Architekturmuseum, 2014).

For what concerns the fourth gap, the lack of incentivizing instruments, if well the amenities which are usually asked in return for granting greater development rights are regularly considered as a fundamental element in the negotiations to grant a building permit, as a new high-rise development phase could be located in Frankfurt as a consequence of BREXIT, new scenarios could be explored. For that matter, even if an evaluation of the compatibility of these types of incentive mechanisms with the German law would have to be conducted, as of today, the lack of these type of instruments in the city's high-rise regulations is one of Frankfurt's gaps.

And lastly, the recent demolitions and replacements of the Zurich Insurance building and the Henninger Turm bring into discussion the relationship between the aging process of the city's existing buildings and their value as historical heritage architecture. As it was previously mentioned, for a city that lost most of its built heritage during the war, high-rise buildings gradually became part of its new identity. Since the 1998 *Hochhausentwicklungsplan* this concept of Frankfurt's high-rise buildings as heritage architecture has already been indicated as an aspect in which the city had to get more involved with, not being clear how much has changed since then (Jourdan & Müller PAS Freie Architekten, 1998, pp. 90, 95).

On one side, the State's Department for Historic Monuments - *Landesamt für Denkmalpflege Hessen*- has already incorporated into the protected building catalog high-rise projects from before the war and of the 1950's that have been either refurbished or integrated into new projects like the I.G. Farben-Hochhaus, the Gewerkschaftshaus, the Flemings Deluxe Hotel, the Junior Haus, the NEFF Appartmenthaus, the Ehemaliger Bundesrechnungshof, among others (Landesamt für Denkmalpflege Hessen, 2017).

However, on the other side, as some companies move out from the old skyscrapers from the late 1960's and 1970's into new towers, the question of what will happen to these buildings of more than 20 floors arises. One example of this can be seen in the former Commerzbank headquarters, finished in 1973 with 28 stories and 109 meters in height –Figure 106– (Deutsches Architekturmuseum, 2014, p. 104). After the company moved to the new Commerzbank Tower in 1997, this building started to be gradually unoccupied until 2004, when it was rented to

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institutions like the European Central Bank, which emptied it once again when they finally inaugurated their own building (Frankfurter Neue Presse, 2016). After being unused for some time, the building was acquired by the German Estate Group, which planned to refurbish and modernize it. Nonetheless, since this building represents of the city's first examples of architecture of the international style, the State decided to include it in its catalog for historical monuments, representing further architecture and construction preservation measures for the new project (Frankfurter Neue Presse, 2016). What will be the final result of this project is still to be seen, however, with the construction of new projects like the Four towers, other high-rise buildings from the same decade, like the former Deutsche Bank headquarters, might not have the same fate –Figure 107-.



Figure 106: Former Commerzbank Headquarters, now Global Tower, 1973. © Rolando Robledo, 2017



Figure 107: Former Deutsche Bank Headquarters, 1971 © Carlos E. Guerra B., 2017

In this regard, even if the city has already negotiated the preservation and even reconstruction of historical and modern buildings in exchange for a building permit, there is still a great area of opportunity in also recognizing high-rise buildings as heritage architecture to be protected or maybe refurbished instead of being only replaced for newer investment vehicles. Nonetheless, and since maybe not all buildings could be recognized as heritage material, the city could also further develop a strategy for determining what to do and how to evaluate when a building has already reached its optimal useful life.

5.4 Monterrey

5.4.1 General Overview

The city of Monterrey is located in the northeast part of Mexico, in the State of Nuevo León, around 200 km away from the southern border of the United States of America and more than 900 km away from Mexico City, the country's capital –Figure 108- (IMPLANc, 2014, p. 11). The explosive demographic and urban growth that the city experienced after the 1940's has integrated new municipalities into the metropolitan area, multiplying by more than 20 times the population that the city had in 1940 (IMPLANc, 2014, p. 36). As a consequence of this growth and since there is no official metropolitan authority between the state and the municipal levels, there are different definitions of the current number of municipalities that make up the metropolitan area. Whereas the National Population Council –CONAPO- recognizes 13 municipalities, the State of Nuevo Leon only nine and Monterrey's municipal government 10 (CONAPO, 2010; Consejo Nuevo León para la Planeación Estratégica, 2016, p. 70; IMPLANc, 2014, p. 7).



Figure 108: Monterrey's location within Nuevo León and Mexico.
Modified by the author from: (TUBS, 2011).

In this regard, taking into consideration Monterrey's definition of its metropolitan area, it is composed of 10 municipalities, including Monterrey, Guadalupe, San Nicolás de los Garza, San Pedro Garza García, Santa Catarina, Apodaca, General Escobedo, García, Juárez and since 2013 Cadereyta Jiménez, occupying a total urban area of more than 800 km² and with a total population of 4,341,044 inhabitants in 2015 –Figure 109- (Consejo Nuevo León para la Planeación Estratégica, 2016, p. 226; IMPLANc, 2014, p. 7; INEGI, 2016). If well the metropolitan area as a whole represents about 85% of the total State's population, the city of Monterrey with an urban area of around 213 km² has only 1,109,171 inhabitants (CETYV, Secretaría de Desarrollo Sustentable, SEDATU, Banco Mundial, & BANOBRAS, 2014, p. 75; INEGI, 2016). SPGG, on

the other hand, has an urban area of 46.5 km² and a population of 123,156 inhabitants (CETYV et al., 2014, p. 75; INEGI, 2016). With this, Monterrey's metropolitan area is ranked as the third most populated area in Mexico, just after Mexico City and Guadalajara (CONAPO, 2010).

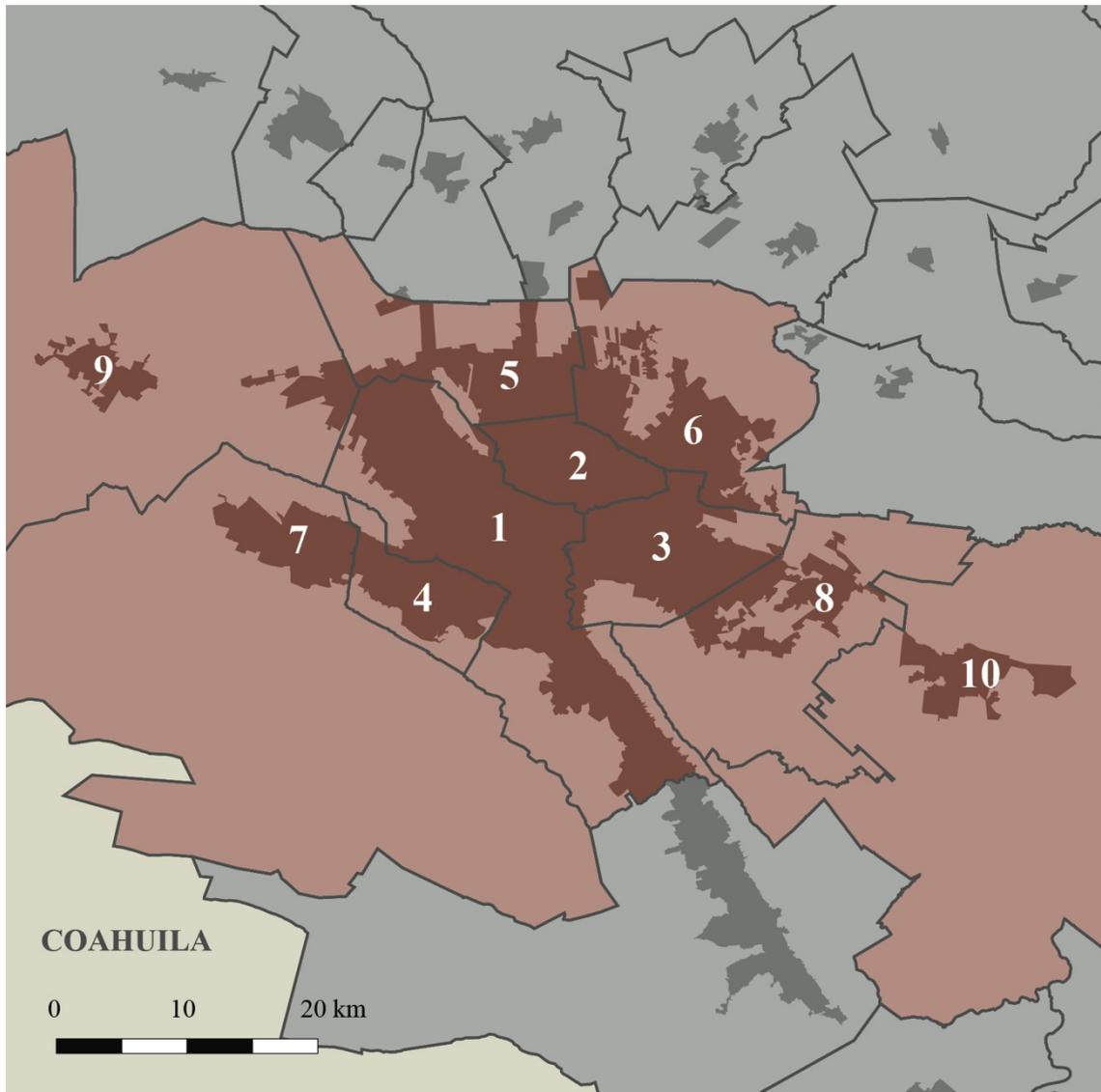


Figure 109: Monterrey's metropolitan area by municipalities. 1. Monterrey, 2. San Nicolás de los Garza, 3. Guadalupe, 4. San Pedro Garza García, 5. General Escobedo, 6. Apodaca, 7. Santa Catarina, 8. Juárez, 9. García, 10. Cadereyta Jiménez. Elaborated by the author from GIS Data from INEGI.

One of the main features that has strongly defined the identity and physical structure of the city is its relation to the region's topography and hydrology. Located on the edge of the Eastern Sierra Madre mountain range Monterrey's metropolitan area is bordered by mountains to the South and West and extends through plains towards the North and East –Figure 110-. Since the metropolitan area occupies the space in between these mountains, Monterrey is commonly referred to as the city of the mountains (IMPLANc, 2014).

One of the main challenges of Monterrey's topographic conditions is the city's slope, which commonly causes problems like floods, surface run-offs and landslides. With a height above the sea level of more than 2000 meters at the top of the mountain range, in less than six kilometers

the city's elevation drops to 600 meters above the sea level, producing rivers which have a very low river flow during the dry months and a very strong and fast flow during the rainy days (IMPLANc, 2014, p. 16). From one edge of the metropolitan area to the other, the Santa Catarina River, which crosses the city right through the center, goes down around 522 meters (p. 29).

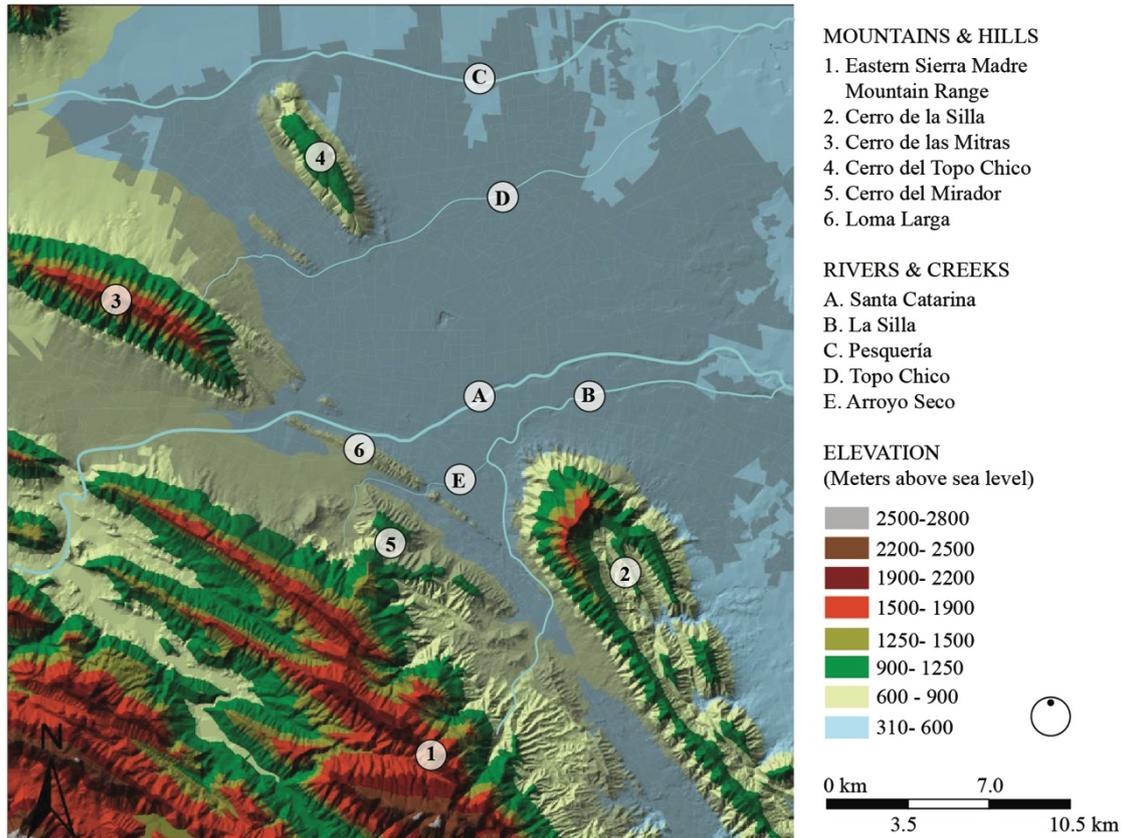


Figure 110: Monterrey's topographic and hydrologic conditions.
Modified by the author from: (CETYV et al., 2014, p. 55).

According to some estimations from Monterrey's municipal government, by the year 2030, the metropolitan area will have a total population of between 4,907,714 and 5,727,767 inhabitants, a 13% or 32% population increase respectively if compared to 2015 data (p. 91). Just the city of Monterrey is expected to grow between 152,599 and 256,322 inhabitants in the next 13 years, reaching to a maximum population of 1,365,493 inhabitants by 2030 (p. 91). These scenarios, however, are only taking into consideration the current number of municipalities, in this sense, the population expectations can even be higher if the city continues to sprawl and integrate neighbor municipalities into its metropolitan area.

In this regard, this expected growth presents serious challenges for a metropolitan area that suffers from a disconnection between urban development and public transport systems, as it will be further explained. The former, combined with the predominance of the single-family housing units, has not only reduce the residential densities in the central areas but also increased both the citizens' need of displacement and the environmental pollution caused by vehicular traffic (Consejo Nuevo León para la Planeación Estratégica, 2016, pp. 109–111; INEGI, 2011, p. 25).

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One of the main causes of this population growth is the city's economic attractiveness. As it was previously mentioned, Monterrey's strategic location between Mexico City and the United States of America has made it a key economic actor in the country. In 2014, Nuevo León was the third state that contributed the most to the country's GDP with 7.4% of the total, having only 4.3% of the country's population (Gobierno del Estado de Nuevo León, 2016, p. 70). With 98% of the state's GDP being concentrated in Monterrey's metropolitan area, the economic activities that contribute the most to the metropolitan area's GDP are manufacturing, commerce, trade, construction, logistics and services like real estate, financial, insurance, among others –Figure 111- (Consejo Nuevo León para la Planeación Estratégica, 2016, p. 130; INEGI, 2015, pp. 344–346).

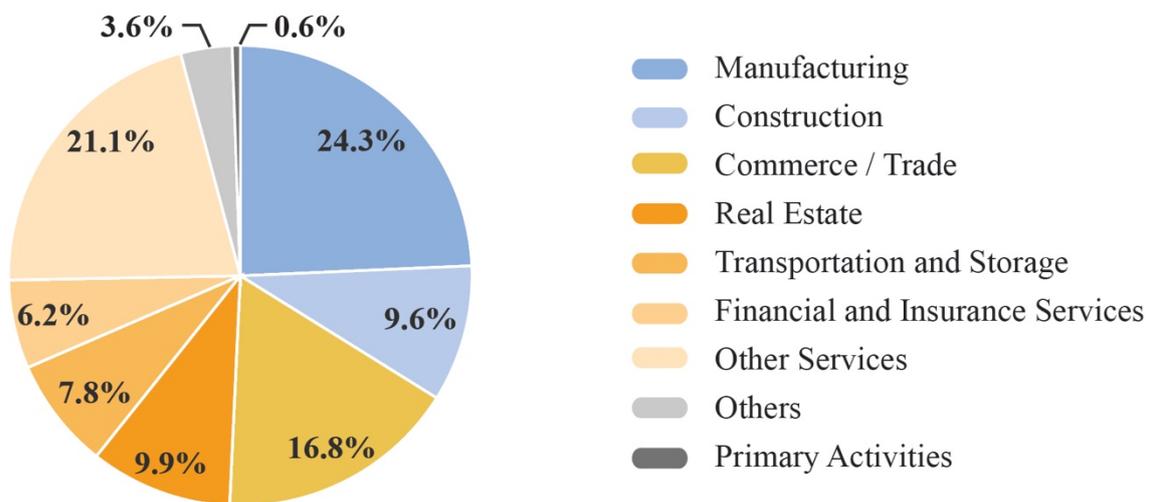


Figure 111: Nuevo León's GDP per Economic Activity, 2013.
Elaborated by the author from: (INEGI, 2015, p. 344)

This economic attractiveness has also been reflected in the city's quality of living. Nuevo León not only has income levels which are 74% higher than the national average, but also a higher HDI of 0.79 compared to the country's 0.76 in 2013 (Consejo Nuevo León para la Planeación Estratégica, 2016, p. 67; Gobierno del Estado de Nuevo León, 2016, p. 71). For that matter, the municipality of SPGG, where most of the CBD's are located, further stands out with a HDI of 0.87, a level which resembles some European countries like Spain (Consejo Nuevo León para la Planeación Estratégica, 2016, pp. 67–68).

As a main trade, business and entertainment destination, the city received 2,091,330 foreign and national visitors in 2014, organizing 233 national and international events in 2015 alone (Gobierno del Estado de Nuevo León, 2016, p. 80). According to some estimations, if Nuevo León was evaluated as a country, it would have been ranked in 2014 as the 31st best country to do business with in the world, above the biggest Latin American economies –Figure 112- (Consejo Nuevo León para la Planeación Estratégica, 2016, p. 142).

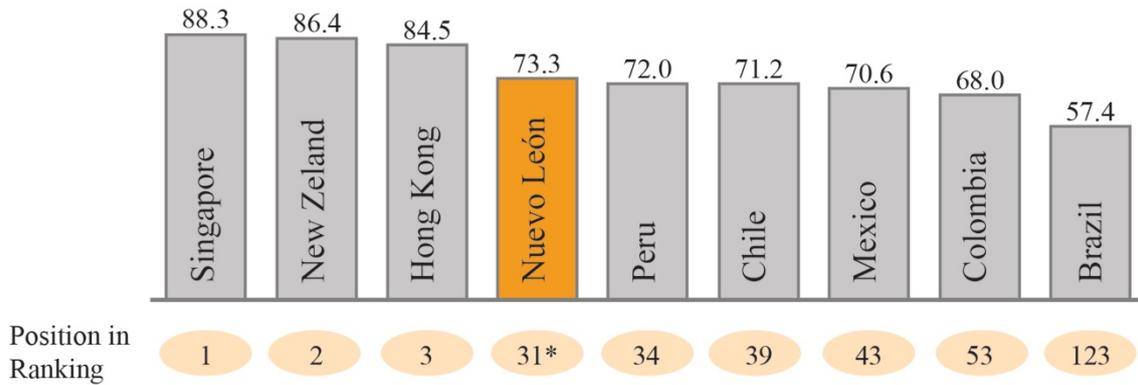


Figure 112: Ease of Doing Business Ranking from the World Bank in 2014. Evaluated from 0 to 100.

* If Nuevo León was a country. Elaborated by the author from: (Consejo Nuevo León para la Planeación Estratégica, 2016, p. 142).

Since 2009, Nuevo León has been investing in implementing an innovation ecosystem in the state, aiming to turn Monterrey into an international knowledge city (Gobierno del Estado de Nuevo León, 2016, p. 84). Just in 2011, the state destined 0.7% of its GDP to research and development, being almost twice the value of the national average and among the highest in Latin America (Consejo Nuevo León para la Planeación Estratégica, 2016, p. 138). Aiming towards areas like nano- and biotechnology, aeronautics, health, automotive, household appliances, information technologies, software, agribusiness among others, the state already has 103 public and private research centers, 16 middle and high technology incubators and a research and technological innovation park (Gobierno del Estado de Nuevo León, 2016, p. 84). Additionally, more than 300 colleges and technical, polytechnic, public and private universities are located in the state, of which the *Instituto Tecnológico y Estudios Superiores de Monterrey –ITESM-* was considered in 2016 as the 7th best in Latin America, according to the QS University rankings (Gobierno del Estado de Nuevo León, 2016, p. 84; QS Quacquarelli Symonds Limited, 2017).

5.4.2 High-rise Evolution and Current Situation

As a city that practically remained isolated from the country's main events for more than 200 years, it was not until the second half of the 19th century, with the establishment of the first textile manufacturing industry in the neighbor municipality of Santa Catarina, that things started to change (IMPLANc, 2014, p. 7). The creation of a closer border as a consequence of the country's loss of territory in the Mexican-American war, turned the city into a strategic link between Mexico City and the state of Texas (Landa Ruiloba, 2012, p. 86). Additionally, thanks to the support of the state government issuing some tax exemption laws to attract capital and to the city's connection to the national railway system in the 1880's, by the end of the 19th century Monterrey had already emerged as an important industrial pole (Burian, 2015; Landa Ruiloba, 2012, p. 87).

If well the debate upon Mexico's first modern high-rise building usually focuses on the constructions completed in Mexico City in the first three decades of the 20th century, Mexican anthropologist Pablo Landa disagrees, arguing that the Cuauhtemoc Brewery building finished in Monterrey in 1892, should be considered as Mexico's first modern skyscraper –Figure 113- (Landa Ruiloba, 2012, p. 27; Villasana & Gómez, 2017). Designed by the U.S. architect Ernest C. Janssen, this five story building was erected with a steel structure covered by bricks in a neoclassical way, similar to what was happening in Chicago and New York at the time (Burian,

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2015, p. 59). At the center of the building rises a tower crowned by a cupola, which made this the tallest building in the city for several years (Landa Ruiloba, 2012).

Little by little, the industrial development in Monterrey became part of the city's identity and collective imaginary. As an example of this, at the beginning of the 20th century the tallest landmark in the city was not the recently finished tower of the city's Cathedral but rather the 50-meter-high chimney and the 40-meter-high ovens of Monterrey's Iron and Steel Smelter Company, which started operations in 1903 and would later become part of Nuevo Leon's coat of arms –Figure 114- (Burian, 2015, p. 56; Calderón Hinojosa, 2009).



Figure 113: Cuauhtemoc Brewery building, 1892. © Carlos E. Guerra B., 2015



Figure 114: Monterrey's Iron and Steel Smelter Company oven one, 1903. © (Téllez, 2012c)

Although other neoclassical buildings up to five stories like theaters, banks, hotels and public buildings were built in the late 19th and early 20th century, with the beginning of the Mexican Revolution in 1910 constructions in the city stopped for more than a decade (Burian, 2015, pp. 61–64; Landa Ruiloba, 2012, p. 51). It would not be until the late 1920's and the 1930's, that a new series of now art-deco high-rise buildings would start to appear, including the nine-story-high Federal Palace, which became the city's new tallest building –Figure 115- (Burian, 2015, p. 66). Other buildings of this phase include the five-story-high stepped Muguerza Hospital of 1934 and the eight-story-high Civil Hospital of 1943 –Figure 116- (p. 65).



Figure 115: Former Federal Palace, 1930.
Source: (Kiro, 2010)



Figure 116: Civil Hospital, 1943.
Source: (Kiro, 2010)

At the beginning of the 1940's, and thanks to a massive economic and industrialization growth in the city as the consequence of the increased demand for raw materials and products from the United States during World War II, Monterrey became the third largest city in the country (pp. 67-68). With this new era of growth, modern architecture was finally brought into the city, however, unlike what could have been predicted, it was through religion. The Purisima Church with parabolic concrete ribs concluded in 1946 and designed by Mexican architect Enrique de la Mora, would not only inspire future projects of architect Felix Candela with whom he collaborated but also become Mexico's first modern church –Figure 117- (Landa Ruiloba, 2012, pp. 13, 32). Furthermore, this project would also give De la Mora the opportunity in 1945 to design Mexico's first university campus of the ITESM in Monterrey, as well as to other architects to introduce a new phase of mix-use streamlined edifices -still not significantly tall- like the Zambrano apartment building -1947, Figure 118-, several cinemas and other commercial or light industry constructions like the Gyro S.A. building -1957- (Burian, 2015, pp. 69–70; Landa Ruiloba, 2012, p. 32).



Figure 117: Purisima Church, 1946.
© Carlos E. Guerra B., 2014



Figure 118: Zambrano Apartment Building, 1947.
© (Téllez, 2012a)

Finished in 1950, the 12-story-high Chapa building –Figure 119- became the first of a series of vertical mix-use condominium towers to be built in the city, especially after the enactment in

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1955 of the Condominium Form of Ownership Law⁴ by the state's Congress (Flores Salazar, 2016, p. 24; Landa Ruiloba, 2012, p. 89). If well this building broke Monterrey's height record, for a moment where Mexico City was finishing its 45-story and 204-meter-tall Latin American Tower, it would not take too long for Monterrey to build even higher (CTBUH, 2017i; Landa Ruiloba, 2012).

With the aim of consolidating modernity in the city, Manuel L. Barragán, a board member of Monterrey's Smelter company started to promote the idea of constructing a tall building with the city's distinctive industrial materials like concrete, steel and glass. As a result of this, in 1959 the 22-story and 87-meter-tall Acero Condominium –Steel Condominium-, design by Mexican Architect Mario Pani, was concluded –Figure 120- (Flores Salazar, 2016, p. 24). Two underground parking levels, three commercial floors, a social club, 16 office floors and a penthouse with a panoramic lookout where all part of this building (p. 24). Other high-rise towers which followed include the Monterrey building -1960-, the PH building -1962- and the Northern Condominium -1962-, among others (Burian, 2015, p. 72).



Figure 119: Chapa Building, 1950.
© (Ivirreal, 2009)



Figure 120: Acero Condominium, 1959.
© Carlos E. Guerra B., 2014

While this was happening in Monterrey, SPGG was at a different development stage. Being a relatively young municipality, it was not until the 1950's and 1960's that SPGG started to face a considerable urbanization process, becoming the residential area for mid- and high-income families who were abandoning Monterrey's central area (Aparicio Moreno, Ortega Rubí, & Sandoval Hernández, 2011, pp. 191–193). By the 1970's, some companies like ALFA and CYDSA started to identify SPGG's potential not only for residential but also for commercial

⁴ Translated by the author. Original: *Ley de Régimen de Propiedad en Condominio*

uses, establishing some of the first corporative buildings in the Gomez Morín corridor and the Valle del Campestre area, which still were not significantly tall (Landa Ruiloba, 2012, p. 90).

Along with these changes, came perhaps the first modern high-rise building in SPGG, with the completion in 1978 of the Centro Cultural Alfa –Alfa Cultural Center-, a museum of science and technology sponsored by the ALFA Industrial Group (Burian, 2015, p. 74). As a fundamental part of this museum, a tilted reinforced concrete cylinder with a diameter of 39 meters and a height of 34 meters was built, including five stories of galleries, exhibitions and an IMAX theater –Figures 121 and 122- (p. 74). SPGG would officially join Monterrey’s metropolitan area until 1980 (IMPLANc, 2014, p. 7).



Figure 121: Front View of the Alfa Cultural Center, 1978. © Carlos E. Guerra B., 2014



Figure 122: Side View of the Alfa Cultural Center, 1978. © (Téllez, 2013)

It would not be until the 1980’s, during the administration of Governor Alfonso Martínez Domínguez, that the first high-rise-oriented urban project was developed (Prieto González, 2011, pp. 171–172). Complaining that the city felt inferior compared to other big neighbor U.S. cities from Texas, Governor Martínez Domínguez determined that the solution to the city’s problems was to stop being a predominantly horizontal and short city. (Prieto González, 2011).

The Governor’s response was of Hausmannian proportions, 31 blocks of the city center with an area of around 40 hectares would be torn down to make room for a Great Plaza, commonly known as Macroplaza, which would connect Monterrey’s and Nuevo Leon’s governmental palaces while being bordered by mix-use tall buildings on both sides to configure a new CBD, like in the U.S. cities (Prieto González, 2011, p. 172). Started in 1982 and finished in 1984, the Macroplaza project, which replaced around 427 buildings including some considered as historic-artistic patrimony, could not be completed as intended –Figure 123- (Landa Ruiloba, 2012, p. 90; Prieto González, 2011, p. 172). The 1982 crisis and the higher land values compared to other areas in the city, made the private sector look for more attractive places to establish its CBD, leaving the Macroplaza with mainly public high-rise buildings (Prieto González, 2011, p. 172). It did, however, provide a new landmark to the city, with the construction of the Lighthouse of Commerce, a red 70-meter-tall concrete monument equipped with a green light laser designed by the award winning Mexican architect Luis Barragán to commemorate the centennial of Monterrey’s Chamber of Commerce –Figure 124- (Burian, 2015, p. 76).

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Figure 123: Macroplaza project before (1955) and after (1983).
Source: (Téllez, 2012b)

Figure 124: Lighthouse of Commerce, 1984. © (Eleventy, 2015)

Even before the beginning of the construction of the Macroplaza, some of the first commercial high-rise buildings started to be completed in SPGG. In 1982, the Moll del Valle project, the first American-style commercial center of the whole metropolitan area was inaugurated close to the Gomez Morín corridor, including an 11-story-high office tower –Figure 125- (Landa Ruiloba, 2012, p. 90; Moll del Valle, 2012). Between 1982 and 1990 several office and hotel towers of between 12 to 15 stories were completed along the Gomez Morín corridor and in the Valle del Campestre district, changing the urban image of SPGG and becoming icons of progress (Castillo Ramírez, 2004, p. 22; Skyscraper Source Media, 2017). From this decade, the Torre Alta Condominium of 1983 was the highest with 15 stories –Figure 126- (Skyscraper Source Media, 2017).



Figure 125: Moll del Valle, 1982.
© (J. L. Rodríguez, 2017)

Figure 126: Torre Alta, 1983.
© (Granados, 2017)

Even if the Macroplaza project didn't create the expected CBD, it did trigger a long planning process between the private sector and the municipal government of SPGG to develop a new CBD in a 126-hectare area that belonged to Monterrey's Brick Company (IMPLAN, 2014, pp. 85–86; Landa Ruiloba, 2012). After establishing the Fidevalle Trust to urbanize the area and defining the polygon as a specific development district to be integrated into San Pedro's Urban Development Plan, in the early 1990's the Valle Oriente development started –Figures 127 and 128- (IMPLAN, 2014; Landa Ruiloba, 2012, p. 91). Additionally, the 8.7-hectare Rufino Tamayo public park and the Loma Larga tunnel, connecting this area with Monterrey's city center through the Loma Larga hill, further complemented this zone's attractiveness (IMPLAN, 2014, pp. 85–86).



Figure 127: Valle Oriente district with the Rufino Tamayo Park on the right. © (Documentación Arquitectónica, 2017)



Figure 128: High-rise buildings at the Loma Larga Hill. © (Documentación Arquitectónica, 2017)

It was precisely in this area that the city finally crossed the 100-meter threshold with the conclusion in 1994 of the 35-story 130-meter-tall Commercial America Tower (CTBUH, 2017k). Just six years later and right next to this building, the formerly called Dataflux Tower and now Avalanz Tower quickly broke that height record with its 43 stories and 182 meters (CTBUH, 2017k). In this regard, one of the main criticisms of the high-rise buildings produced in this decade, is their lack of originality, with towers that resemble projects built in other cities. If well some of these buildings do raise some suspicious, like the similarities between the Commercial America Tower and the 60 Wall Street Building finished in New York five years earlier –Figures 129 and 130-, others like the Avalanz Tower were actually built before their more famous versions like Foster's Cepsa Tower in Madrid which started to be built until 2004 –Figures 131 and 132- (CTBUH, 2017a, 2017m; Prieto González, 2011, p. 188).

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Figure 129: Commercial America Tower, SPGG, 1994. © (Martínez, 2006)



Figure 130: 60 Wall Street Building, New York City, 1989. Source: (CTBUH, 2017a) © John W. Cahill/CTBUH



Figure 131: Avalanz Tower, SPGG, 2000. Source: (KTLG, 2016)



Figure 132: Cepsa Tower, Madrid, 2008. Source: (CTBUH, 2017m) © Thomas Jaehndel

With the beginning of the 2010's and while new high-rise projects started to spread out in the Valle Oriente district and other parts of the metropolitan area, the city's current highest buildings were completed. The first one was the Government Center Civic Square building in 2010, a 36-story 180-meter-tall tower in Monterrey's central area that gathered most of Nuevo Leon's public offices –Figure 133- (CTBUH, 2017j). Five years later, in 2015, Monterrey crossed the 200-meter threshold with the conclusion of the 205-meter-tall mix-use Pabellón M project, in the city center by the Santa Catarina river –Figure 134- (CTBUH, 2017j). With offices, a hotel, commercial areas and an auditorium, Pabellón M seems to have revived the real estate interest in the city center. And lastly, as part of the VAO Complex project in Valle Oriente the 69-story 279-meter-tall residential and office Koi tower has already been topped out and is expected to be finished later this year –Figure 135- (CTBUH, 2017k). When completed, Koi tower will not only be the highest tower in Mexico but the fourth highest tower in Latin America (CTBUH, 2017k).



Figure 133: Government Center Civic Square, Monterrey, 2010. © (Eleventy, 2016)



Figure 134: Pabellón M, Monterrey, 2015. Source: (Pabellón M, 2017)



Figure 135: Koi Tower, SPGG, 2017 (To be concluded). © (Torres, 2017a)

Nowadays high-rise developments are not only located in the city center and Valle Oriente areas, but throughout the city. Taking into consideration both Monterrey's and San Pedro's latest land-use plans as well as the cities' actual situation, 29 different corridors or clusters of more than three high-rise buildings higher than five stories were identified –Figure 136-. For identifying these areas, besides the previously mentioned criteria other aspects like the tower's proximity, the separation by main road corridors, as well as the character of the area based on the author's personal experiences, were taken into consideration. In the case of SPGG, a total of ten locations were identified, including four corridors and six clusters. In the case of Monterrey, a total of 19 locations were identified, including five corridors and 14 clusters.



Figure 136: Location of the main high-rise areas in Monterrey and SPGG. Elaborated by the author from Google Earth. Notes: Corridors are shown in red indicating the section of the avenue or street where the high-rise buildings are mostly located, without having a continuous density. SPGG: 1. Colorines, 2. Loma Larga–Fuentes del Valle, 3. Loma Larga–Valle Oriente, 4. Valle Center, 5. Valle del Campestre, 6. Valle Oriente, 7. Alfonso Reyes, 8. Jiménez, 9. Manuel Gómez Morín, 10. Roberto Garza Sada. MONTERREY: 11. Alfonso Reyes Sur, 12. Monterrey Center (including the Macroplaza area and the corridors José María Pino Suárez, Cuauhtémoc and Benito Juárez), 13. Dinastía, 14. ITESM, 15. Las Brisas, 16. Nuevo Sur, 17. Obispado, 18. Purísima-Alameda, 19. San Jerónimo, 20. San José Medical Area, 21. Santa Lucía-Fundidora, 22. Santa María-Miravalle (including Antonio L. Rodríguez corridor), 23. Topo Chico, 24. UANL Medical Campus, 25. Anillo Periférico, 26. Camino de las Águilas-Camino de los Ibis, 27. Eugenio Garza Sada, 28. Francisco I. Madero-Cristóbal Colón, 29. Fundadores.

Besides the 29 previously mentioned areas, for both Monterrey and SPGG there were at least other seven locations where a single or a pair of towers are currently built, indicating a clear dispersion of this typology in the cities. Furthermore, even if the rest of the metropolitan area is not within the scope of this research, it is also important to mention that at least other four municipalities already have either individual towers or high-rise clusters like the Via Cordillera cluster in Santa Catarina and the Airport’s cluster in Apodaca.

According to the database of the CTBUH as of August 2017 and considering the two buildings which are already architectural topped out as if they were finished, Monterrey and SPGG have together 12 buildings equal to or above 150 meters, with nine buildings completed and three more under construction (CTBUH, 2017j, 2017k). From these buildings SPGG has nine, five finished buildings, two architecturally topped out -which are expected to be finished this year- and two more under construction, of which six are located in Valle Oriente (CTBUH, 2017k). Monterrey, on the other hand, has only three, two buildings finished and one more under construction (CTBUH, 2017j). Of these high-rises half are mixed-use projects, one-third are exclusively residential towers, one is a government building and the other one is an exclusively office tower—Figure 137- (CTBUH, 2017j, 2017k). In this regard, and based on the number of buildings above 150 meters, a height threshold commonly used by the CTBUH to compare different cities, together Monterrey and SPGG are ranked number two in Mexico, number five in Latin America

–after Panama City, Mexico City, São Paulo and Buenos Aires- and number 80 in the world (CTBUH, 2017j, 2017k).

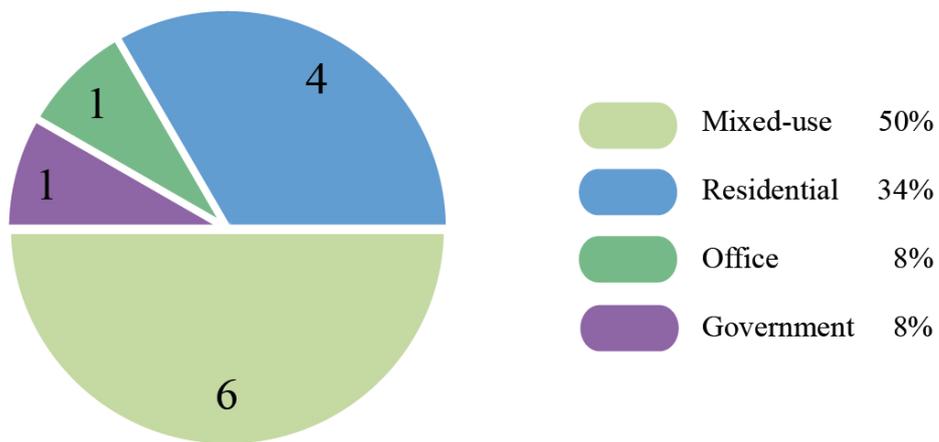


Figure 137: Land-use of Monterrey's and SPGG's high-rise buildings above 150 Meters. Elaborated by the author from: (CTBUH, 2017j, 2017k)

The timeline presented in Figure 138 summarizes Monterrey's and San Pedro's high-rise development over the last 120 years, as exposed in this chapter.

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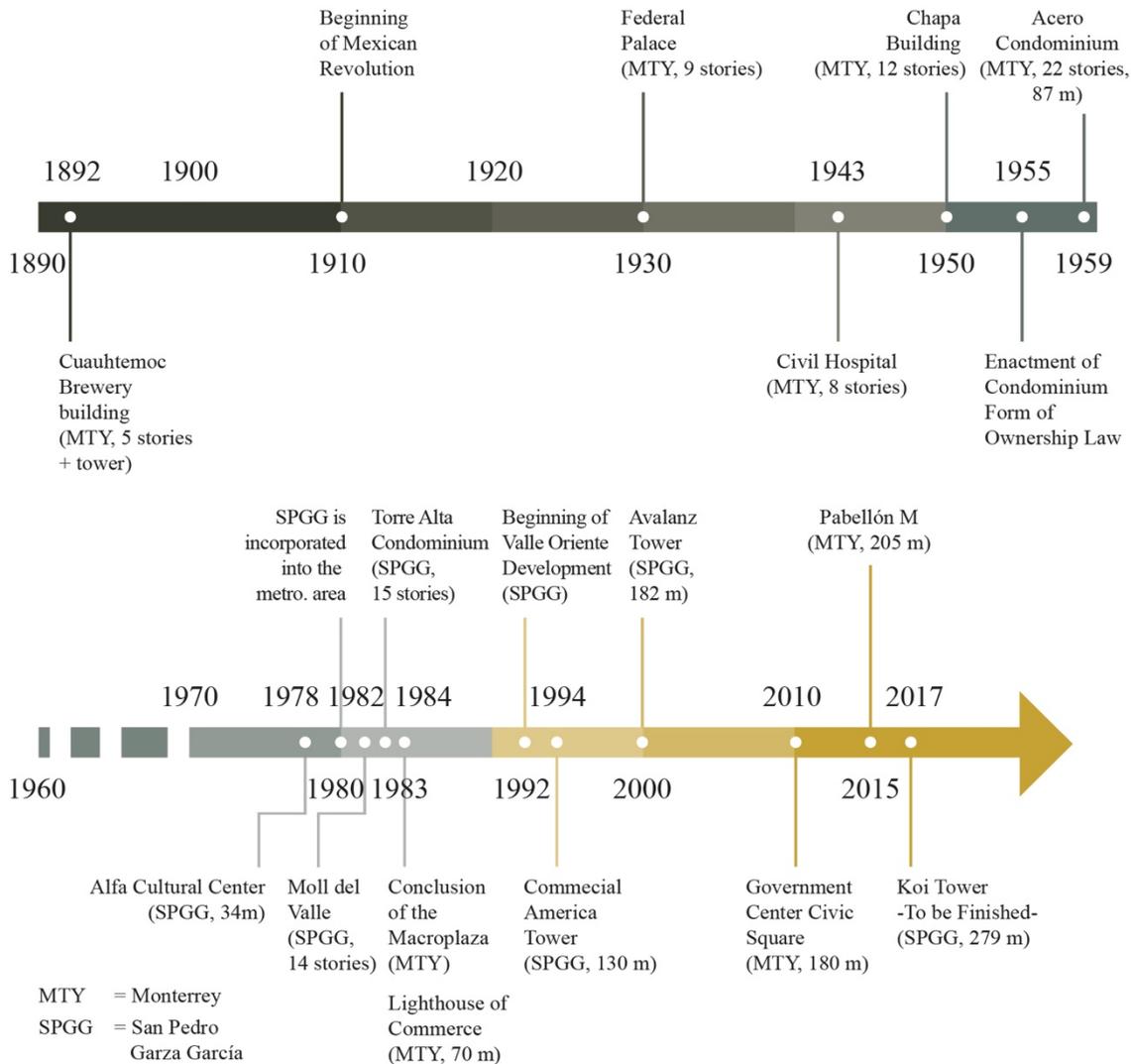


Figure 138: Monterrey's and SPGG's high-rise development timeline.

Elaborated by the author from: (Burian, 2015, pp. 59, 65, 66, 74, 76; CTBUH, 2017j, 2017k; Flores Salazar, 2016, p. 24; IMPLANc, 2014, p. 7; Landa Ruiloba, 2012, pp. 27, 89–91; Skyscraper Source Media, 2017)

5.4.3 Current Regulation Review

For analyzing SPGG's and Monterrey's high-rise regulations, several contextual aspects need to be taken into consideration. The first one, is the National Congress' enactment in November 2016 of the General Law of Human Settlements, Land-use Planning and Urban Development⁵ (Cámara de Diputados del Honorable Congreso de la Unión, 2016), which clearly states the goal of promoting the mixing of uses in the cities, favoring a more flexible approach on the heights and densities of the buildings and avoiding the imposition of parking requirements (Art. 71°, Section III). Another concept introduced by this Law are the obligations on mobility, utilities and services infrastructures that promoters or developers must comply with when their proposals exceed the existing capacity, in order to be granted higher densities and a broader mixing of uses (Art. 59°). All of these measures, need to be updated in all of the regulations of the three government levels

⁵ Translated by the author. Original: *Ley General de Asentamientos Humanos, Ordenamiento Territorial y Desarrollo Urbano*.

by November 2017 and in all urban development plans and programs of the municipalities with more than 100,000 inhabitants by November 2018, meaning that in the near future both SPGG and Monterrey will have to incorporate these concepts into their regulations (Transitory Third and Fifth).

Another important aspect of the spatial planning in Mexico is the lack of a metropolitan authority that leaves the responsibility of land-use planning with the municipalities, complicating inter-municipal coordination by having different regulations or being ruled by various political parties (Cámara de Diputados del Honorable Congreso de la Unión, 2016, Art. 11°). Furthermore, according to the Urban Development Law of the State of Nuevo León⁶ (Honorable Congreso del Estado de Nuevo León, 2014, Art. 27°) it is up to the municipalities to decide whether or not they establish a city planning institute, which is the main reason behind the fact that not all of the municipalities in Monterrey's metropolitan area have one. As a matter of fact, while Monterrey's planning institute was established until 2013, SPGG's planning institute was dissolved in 2015 (IMPLANc, 2017; Mendieta Sánchez, 2015).

The last important aspect to consider is that both SPGG's and Monterrey's urban development plans recognize the instrument of the special developments polygons or districts⁷, as clearly defined areas within the city in which through the enactment of partial developments plans or programs it is possible to establish particular guidelines or regulations which may differ from the rest of the municipality –Figures 139 and 140- (IMPLAN, 2014, pp. 70–71; IMPLANc, 2014, pp. 130–131). From the 2014 urban development plans of both municipalities, as of August 2017 only one partial plan has been approved, the DistritoTec polygon in Monterrey (IMPLANc, 2015).



Figure 139: Special development polygons in SPGG (detail). Source: (IMPLAN, 2014, p. 71)

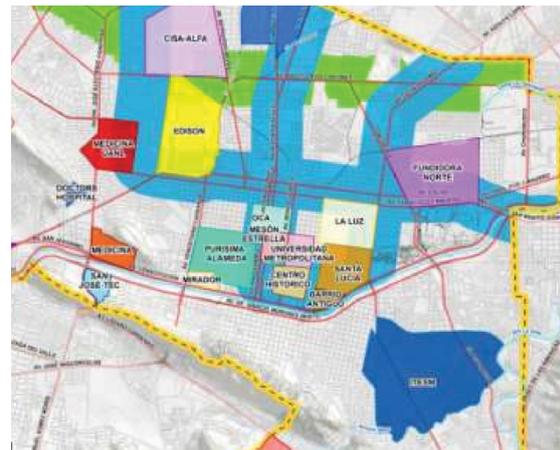


Figure 140: Special development polygons in Monterrey (detail). Source: (IMPLANc, 2014, p. 130)

When addressing the concept of high-rise buildings in SPGG's and Monterrey's regulations one of the first things to stand out is the lack of an official definition or concept that describes high-rise buildings. If well the concept of vertical multi-family housing was incorporated into the regulation after the enactment of the 1955's Condominium Form of Ownership Law, a multi-

⁶ Translated by the author. Original: *Ley de Desarrollo Urbano del Estado de Nuevo León*.

⁷ Translated by the author. Original: *Polígonos de Actuación*.

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family housing building not necessarily is a high-rise building, being able to have less than five floors and still being part of this definition (Flores Salazar, 2016, p. 24). Just when addressing safety or civil protection related measures, the municipalities seem to define special requirements for constructions above a certain height, being above 25 meters in the case of Monterrey and above five stories or 15 meters in the case of SPGG, which even requires a helipad in all buildings above 60 meters in height (Secretaría del Republicano Ayuntamiento de Monterrey, 2016, Art. 308°; Secretaría del Republicano Ayuntamiento de San Pedro Garza García, 2016, Art. 67°).

With regard to the definition of the location of high-rise buildings, according to their respective zoning and land-use regulations both Monterrey and SPGG mainly take into consideration land-uses and the availability of utilities infrastructure (Secretaría del Republicano Ayuntamiento de Monterrey, 2017; Secretaría del Republicano Ayuntamiento de San Pedro Garza García, 2016). In terms of the historical heritage areas, whereas SPGG strictly restricts tall buildings in its historic center, Monterrey's regulations allow unlimited FAR and heights in a significant part of its historic center, being right next to its heritage and cultural value areas (IMPLAN, 2014, pp. 72–77; IMPLANc, 2014, pp. 144–149). For this last aspect, for the cultural and heritage value areas Monterrey also specifies that even if the development criteria are defined by the zoning and land-use regulations, any intervention in these areas must obtain the approval of the respective Protection and Preservation Board (Secretaría del Republicano Ayuntamiento de Monterrey, 2017, Art. 76°).

For that concerns public transportation, whereas SPGG concentrates a great amount of the metropolitan area's high-rise buildings without being connected to the mass public transit system, Monterrey promotes the densification of already regulated Transit Oriented Development –TOD- corridors along the existing metro and Bus Rapid Transit –BRT- lines, receiving so far a weak response from the real estate market (Secretaría del Republicano Ayuntamiento de Monterrey, 2017, Art. 73°).

Neither of the two municipalities seem to consider the offer of social facilities, main views or view corridors, economic criteria and the natural environment for defining acceptable high-rise locations (Secretaría del Republicano Ayuntamiento de Monterrey, 2017; Secretaría del Republicano Ayuntamiento de San Pedro Garza García, 2016). Regarding this last aspect, even if SPGG has defined some special development criteria for mountain areas, both cities have usually allowed or not been able to control the real estate market when it comes to building residential or mix-use towers at the top of hills and elevated heights of the mountains, as it will be further explained (Secretaría del Republicano Ayuntamiento de San Pedro Garza García, 2016, Arts. 52°, 56°, 63°, 66°, 67°).

For controlling density both municipalities consider height and FAR restrictions, the building's coverage area, open space and parking requirements, and don't present regulations regarding the building's maximum width or floor plate sizes (Secretaría del Republicano Ayuntamiento de Monterrey, 2017; Secretaría del Republicano Ayuntamiento de San Pedro Garza García, 2016). Especially for defining the maximum allowed height, FAR and residential density –concept which will be further explained-, both SPGG and Monterrey divide the whole municipality in precisely defined polygons with different density and height criteria –Figures 141 and 142- (IMPLAN, 2014; IMPLANc, 2014)

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Monterrey, 2017, Art. 36°; Secretaría del Republicano Ayuntamiento de San Pedro Garza García, 2016, p. 227).

Minimum frontal, side and rear setbacks are considered only in SPGG, which vary depending on the size of the plot; in the case of the Valle Oriente polygon depending on the sub-district the high-rise building is located it is required to have a frontal setback between five to ten meters, a rear setback between three to ten meters and side setbacks between one to ten meters (Secretaría del Republicano Ayuntamiento de San Pedro Garza García, 2016, Art. 203°).

In terms of the coverage area for the Valle Oriente district SPGG allows depending on the size of the plot a maximum of between 70% and 90% of plot coverage for residential uses and 60% for non-residential uses (Secretaría del Republicano Ayuntamiento de San Pedro Garza García, 2016, Arts. 39°, 199°). In the case of Monterrey, depending on the density area the plot is located in, the maximum coverage area for the plots with five or more stories ranges between 75% and 80% for residential uses and 80% for commercial uses (Secretaría del Republicano Ayuntamiento de Monterrey, 2017, Art. 36°).

Open space requirements in both SPGG and Monterrey are measured as an area ratio or percentage of the plot that has to be left as green spaces and rainwater infiltration areas. Whereas in the Valle Oriente polygon the open space requirement is between 20% and 30% of the plot's area depending on the sub-district in which the building is located, in Monterrey the requirement for residential plots with five or more stories and commercial uses ranges between 10% and 15% of the total plot's area (Secretaría del Republicano Ayuntamiento de Monterrey, 2017, Art. 36°; Secretaría del Republicano Ayuntamiento de San Pedro Garza García, 2016, Art. 200°). Additionally, in the case of SPGG for all the land-uses different to single-family housing, it is possible to destine 50% of the required open spaces as green roofs (Secretaría del Republicano Ayuntamiento de San Pedro Garza García, 2016, Art. 12°).

Concerning parking, even if the requirements are higher in SPGG, both cities define a specific number of spaces per housing unit or profitable floor area –plus some additional spaces for visitors in some cases- that have to be provided by the developer inside the plot regardless of its location or the income levels of its users. While for multi-family residential buildings SPGG specifies between 1.5 and four parking spaces per housing unit, depending on its size, for office uses it requires one parking space per every 25m² of floor area (Secretaría del Republicano Ayuntamiento de San Pedro Garza García, 2016, Art. 500°). Monterrey, on the other hand, requires between one and 2.3 parking spaces per every multi-family housing unit and one per every 30m² or 45m² of office floor area, depending on the city district the plot is located in (IMPLANc, 2014, pp. 157, 161).

In SPGG to be allowed to have less parking spaces than what is required is complicated, typically being asked to present traffic impact assessments to be granted a reduction (Secretaría del Republicano Ayuntamiento de San Pedro Garza García, 2016, Arts. 105°, 109°). Monterrey is slightly more flexible, applying some exceptions like for heritage buildings in the city center and allowing to have 50% of the required parking spaces in other plots only when it comes to new developments in Monterrey's central area or along the TOD corridors (Secretaría del Republicano Ayuntamiento de Monterrey, 2017, Arts. 50°, 51°, 73°). Furthermore, DistritoTec's partial plan reduces these requirements even more for its polygon, specifying one parking space per housing

unit for multi-family houses, one per every 45m² or 50m² of office floor area, as well as by offering the possibility of having 100% of the required parking spaces on the different plot located at a maximum distance of 200 meters (IMPLANc, 2015, pp. 108, 112, 113, 118).

With regard to the mixing of uses, even if the mix itself is not regulated in either of the municipalities, meaning that you could have either entirely commercial or residential high-rise buildings, the fraction of the FAR that can be intended for residential uses is limited in both cities by a concept defined as residential density⁸, which defines for every plot -according to their respective density polygon- a maximum number of housing units per hectare that it could host (Secretaría del Republicano Ayuntamiento de Monterrey, 2017, Art. 36°; Secretaría del Republicano Ayuntamiento de San Pedro Garza García, 2016, Arts. 36°, 37°). If the mix of uses is allowed by the plan for a particular plot, the rest of the FAR which has not been used for residential and its respective parking uses can be then destined to complementary commercial or services uses.

In the case of Monterrey, whereas the maximum residential density allowed which is assigned in the plan is 150 units/ha -going down to 83 units/ha in the lowest high-rise area-, TOD corridors have an unlimited residential density (Secretaría del Republicano Ayuntamiento de Monterrey, 2016, Arts. 36°, 73°). In the case of SPGG, if well the maximum multi-family residential density level considered in the plan is one housing unit per every 50 m² of plot area -or 200 units/ha-, the maximum density actually assigned in the plan is one unit per every 85 m² of plot area -or 117 units/ha-; in the Valle Oriente district residential land-uses are only limited by the total FAR and not by the residential densities (IMPLAN, 2014, p. 227). It is important to highlight that this residential limit of 150 units/ha has been set to the whole state by Nuevo León's Urban Development Law (Honorable Congreso del Estado de Nuevo León, 2014, Art. 125°).

Unlike what happens in SPGG and Monterrey, DistritoTec's Partial Plan introduced in 2015 a form-based code to be implemented in the main corridors defined as complete streets, including aspects such as heights -which are limited to a maximum of 22 meters-, setbacks, building alignments, active ground floors, parking, cantilevers, rainwater drainpipes, sidewalks, street furniture, signage as well as other architectural and environmental aspects -Figure 143- (IMPLANc, 2015, pp. 120-123).

⁸ Translated by the author. Original: *Densidad Habitacional*.

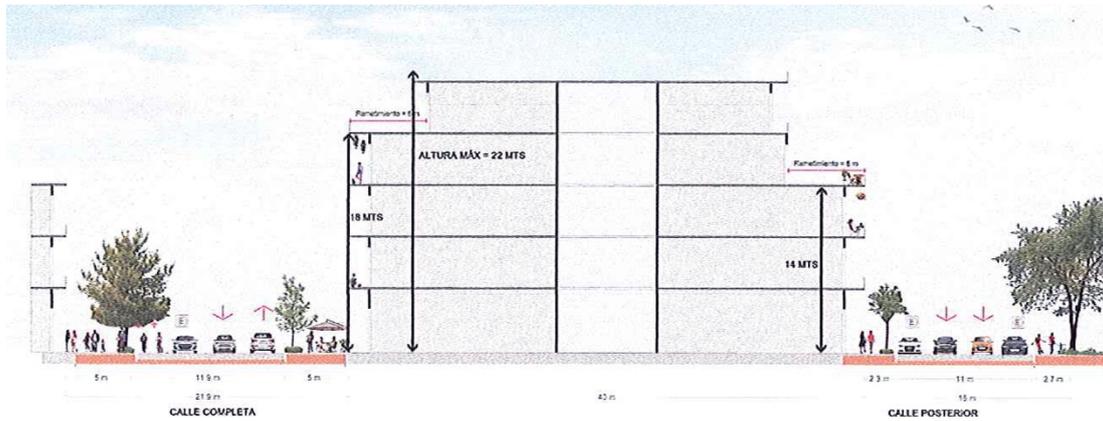


Figure 143: Form-based code for the complete streets in the DistritoTec polygon.

Source: (IMPLANc, 2015, p. 122)

When it comes to regulations for incentivizing high-rise buildings, both municipalities exhibit a lack of instruments for applying TDR, incentive zoning or TIF (Secretaría del Republicano Ayuntamiento de Monterrey, 2017; Secretaría del Republicano Ayuntamiento de San Pedro Garza García, 2016). In the case of SPGG, zoning and land-use regulations clearly state that FAR and residential densities are non-transferable between different plots, and can only be distributed within the same plot, group of plots or urban blocks if they are authorized as an urban complex with a minimum area of 10,000 m² for plots and 5,000 m² for blocks (Secretaría del Republicano Ayuntamiento de San Pedro Garza García, 2016, Arts. 9°, 145°). In the case of Monterrey, even if the zoning and land-use regulation mentions the importance of establishing instruments of mix participation for the implementation of density incentives aimed at improving infrastructures, public facilities and public spaces, it delegates this responsibility to the different partial plans to be approved in the future (Secretaría del Republicano Ayuntamiento de Monterrey, 2017, Art. 73°-BIS 8).

Regarding this aspect, DistritoTec's Partial Plan already introduced a new concept called conditioned density (IMPLANc, 2015, p. 92). With the aim of increasing the district's density without increasing its heights, for the plots adjacent to the corridors defined as complete streets it is possible to acquire extra FAR and residential density to a maximum of 3.5 FAR and 150 units/ha (p. 92). In order to be allowed to do so, the plots need to have a minimum surface of 1,000 m² and developers are required to pay a contribution to the municipality for the extra development rights acquired to counteract the urban impacts and the public, social and environmental costs that the increase of these development rights might bring into the district (pp. 95-97). These contributions are then deposited into a public trust which labels these resources exclusively for the improvement of the district's public spaces, social facilities as well as walking, cycling and utilities infrastructures (pp. 93-94).

Furthermore, it is also important to highlight that the existing regulation for both municipalities, as it is specified by the state's laws, imposes a series of obligations for the developers which have to be fulfilled without getting any incentive in return. These obligations, if well are mostly address for the projects to be developed in non-urbanized areas, can also applicable to urban areas under some circumstances. One of these requirements for urbanized areas is the provision of rainwater infrastructure, in which all new constructions are obliged to economically contribute to the provision of rainwater infrastructure to compensate for the risk that the new project might bring to its respective basin (Honorable Congreso del Estado de Nuevo León, 2014, Art. 172°). Another

obligation for urbanized areas comes when an urban complex is established, being understood as a polygon in which different types of land-uses are authorized while being constituted as a condominium form of ownership or another type of common management (Art. 5°). In these polygons, which could be either large urban plots or former industrial plots to be converted to other uses, developers are required to give to the municipality free or charge, conditions or limitations, a specified amount of surface area to be used for public open spaces and social facilities (Art. 201°).

In the case of residential urban complexes, this area should be either 17% of the total profitable area or 22 m² for every housing unit to be built, whichever is greater (Art. 201°). From the total area transferred to the municipality, 60% must be destined to gardens, parks and public plazas – which could also be of private or collective use within the urban complex- and 40% to the provision of educational, sports and public assistance facilities, as well as post offices, surveillance booths among other things –which must be of public access- (Art. 201°). For non-residential urban complexes, the surface given to the city must be equivalent to 7% of the area that results from subtracting all the public and private roads, as well as other affected areas to the total area of the polygon (Art. 201°).

For what concerns the evaluation of high-rise proposals, both SPGG and Monterrey present a prescriptive type of approach, mainly focusing on the environmental, hydrological and road impact assessments, as well as some visualizations, to be able to evaluate the proposals and grant a building permit (Secretaría del Republicano Ayuntamiento de Monterrey, 2016, Art. 20°; Secretaría del Republicano Ayuntamiento de San Pedro Garza García, 2016, Arts. 111°, 295°, 299°, 340°, 404°, 427°, 428°, 429°). Furthermore, the existing regulations don't include the requirements of architecture competitions, feasibility studies, contribution statements and design reviews. For this last aspect, both SPGG and Monterrey even clarify the fact that the building permits don't evaluate the proposal's materials or construction methods, being responsibility of the owner or developer to review these aspects with their respective experts (Secretaría del Republicano Ayuntamiento de Monterrey, 2016, Art. 17°; Secretaría del Republicano Ayuntamiento de San Pedro Garza García, 2016, Art. 337°). In this regard, even if the evaluation of the urban impacts of a development is considered within the state's regulation, with aspects such as the provision and mitigation of the adverse effects on infrastructure and public facilities, they seem not to be commonly required for high-rise proposals (Honorable Congreso del Estado de Nuevo León, 2014, Arts. 179°, 184°).

Public participation in SPGG and Monterrey is mainly incorporated in the definition of general criteria or plans and not in the evaluation of individual proposals. If well the existing regulation indicate the citizens' right to have access to information, to participate in consultation processes for defining and approving new plans, as well as their right to propose amendments to the existing ones, regarding individual projects citizens are basically only allowed to file a complaint or to report if a new construction is affecting them directly, therefore, in a retroactive way (Secretaría del Republicano Ayuntamiento de Monterrey, 2017, Arts. 170°, 174°, 175°; Secretaría del Republicano Ayuntamiento de San Pedro Garza García, 2016, Arts. 481°, 484°, 498°). Since the definition of view protection corridors is not incorporated into the existing regulations, there is no public participation in this regard.

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There are, however, some very particular exceptions. In the case of SPGG, all the decisions regarding the authorization of constructions above 1,000 m² with a use different to single-family housing or of a condominium form of ownership need to be discussed by an Advisory Council to give some comments and recommendations to the city government without being legally binding (Secretaría del Republicano Ayuntamiento de San Pedro Garza García, 2016, Arts. 331°, 396°, 433°). This council is integrated not only by city officials and representatives of economic sectors but also by three presidents of different neighborhood associations in the municipality (Art. 434°). In the case of Monterrey, if a plot is located in front of a park or plaza in a residential area, it could completely be exploited for the complementary uses authorized in the plan to that particular type of residential use if the owner gets the approval of both the neighborhood association and the direct neighbors to the sides and rear (Secretaría del Republicano Ayuntamiento de Monterrey, 2017, Arts. 25°, 189°). Additionally, as part of the civic engagement activities of DistritoTec's Partial Plan, a commitment was included to receive from the municipality -upon request- all of the proposals for new projects submitted for approval in the District, so that the neighbors can be informed of the conditions in which the projects were approved for their more active involvement in the monitoring process during the project's construction (IMPLANc, 2015, pp. 141, 147)

And finally, with regard to the regulations for monitoring and enforcing the authorized high-rise projects, if well the developers are not required to sign a legal agreement with the municipalities to be granted a building permit, the monitoring process and sanctions in case of non-compliance -like fines, suspensions, demolitions and even administrative arrest- are clearly defined both by the state's and the cities' regulations (Honorable Congreso del Estado de Nuevo León, 2014, Title XII; Secretaría del Republicano Ayuntamiento de Monterrey, 2017, Title VIII; Secretaría del Republicano Ayuntamiento de San Pedro Garza García, 2016, Title XIII). In addition to the former, in SPGG it has also been reported the establishment of agreements between developers and the municipality for the maintenance of public garden areas along avenues without much information available about the conditions of the faculties that the city actually has to enforce them (Hernández, 2017c).

In this regard, it is also important to highlight that if well in Nuevo León there is already a law defining the conditions for establishing public-private partnerships or associations for the development of specific projects, including the requirements to sign a legally-binding agreement with the private developer and to conduct public competitions, this regulation has yet not been taken into consideration for the development of high-rise projects (Honorable Congreso del Estado de Nuevo León, 2010).

Tables 12 and 13 summarize SPGG's and Monterrey's main high-rise policies identified.

Table 12: SPGG's current high-rise regulation system.

CATEGORY						
FOR DEVELOPING HIGH-RISES	Defines a location according to					
	Land-use	Public Transportation	Utilities Infrastructure	Social Services		
	✓	✗	✓	✗		
	Natural environment	Historical heritage	Views	Economic criteria		
	✗	✓	✗	✗		
	For controlling density it regulates					
	Max. Height	Max. FAR	Setbacks	Max.Width	Floor Plate Sizes	
	✓	✓	✓	✗	✗	
	Coverage area	Open Space Req.	Parking	Mixing of uses	Form-based codes	
	✓	✓	✓	✓	✗	
FOR INCENTIVIZING HIGH-RISES	Type of incentive considered					
	Transferable Devel. Rights		Incentive Zoning	Tax Increment Financing		
	✗		✗	✗		
	Type of amenity considered					
	Public Space on Ground Floor	Public Access on Higher Floors	Visual / Performing Arts Spaces	Landmark Build. Protection	Affordable Housing Units	
	✗	✗	✗	✗	✗	
Social Facilities	Public Transport Infrastructure	Walking / Cycling Infrastructure	Utilities Infrastructure	Local Fresh Food Stores		
✗	✗	✗	✗	✗		
FOR IMPLEMENTING AND MONITORING HIGH-RISES	Public participation: Scale					
	For General Criteria			For Individual Projects		
	✓			✗*		
	Public participation: Type					
	Access Information	Comment and/or Define Plans / Reg.	Define View Protection Corridors	Review Individual Proposals	Report on Ongoing Projects	Amend Plans / Regulations
	✓	✓	✗	✗*	✓	✓
	Type of evaluation process for granting permit to developers					
	Through Zoning: Prescriptive			Through Devel. Planning: Discretionary		
	✓			-		
	Type of evaluation requirement requested (besides plans and structural calcs.)					
Impact Assessments	Design Review / Guidance	Feasibility Studies	Contributions Statement	Visualizations	Architecture Competition	
✓	✗	✗	✗	✓	✗	
Monitoring and enforcement process for permit includes						
Creation of Legal Agreement		Defined Monitoring Process	Clear Penalties / Sanctions			
✗		✓	✓			

LEGEND ✓ Policy in place identified ✗ No policy in place identified

(*) Extra specifications, see section 5.4.3. Elaborated by the author with information from: (Honorable Congreso del Estado de Nuevo León, 2014; IMPLAN, 2014; Secretaría del Republicano Ayuntamiento de San Pedro Garza García, 2016)

High-rise Development Regulations

Table 13: Monterrey's current high-rise regulation system.

CATEGORY						
FOR DEVELOPING HIGH-RISES	Defines a location according to					
	Land-use	Public Transportation	Utilities Infrastructure	Social Services		
	✓	✓	✓	✗		
	Natural environment	Historical heritage	Views	Economic criteria		
	✗	✗*	✗	✗		
	For controlling density it regulates					
	Max. Height	Max. FAR	Setbacks	Max. Width	Floor Plate Sizes	
	✓	✓	✗	✗	✗	
	Coverage area	Open Space Req.	Parking	Mixing of uses	Form-based codes	
	✓	✓	✓	✓	✓*	
FOR INCENTIVIZING HIGH-RISES	Type of incentive considered					
	Transferable Devel. Rights	Incentive Zoning		Tax Increment Financing		
	✗	✓*		✗		
	Type of amenity considered					
	Public Space on Ground Floor	Public Access on Higher Floors	Visual/Performing Arts Spaces	Landmark Build. Protection	Affordable Housing Units	
	✓*	✗	✗	✗	✗	
Social Facilities	Public Transport Infrastructure	Walking/Cycling Infrastructure	Utilities Infrastructure	Local Fresh Food Stores		
✓*	✗	✓*	✓*	✗		
FOR IMPLEMENTING AND MONITORING HIGH-RISES	Public participation: Scale					
	For General Criteria			For Individual Projects		
	✓			✗*		
	Public participation: Type					
	Access Information	Comment and/or Define Plans / Reg.	Define View Protection Corridors	Review Individual Proposals	Report on Ongoing Projects	Amend Plans / Regulations
	✓	✓	✗	✗*	✓	✓
	Type of evaluation process for granting permit to developers					
	Through Zoning: Prescriptive			Through Devel. Planning: Discretionary		
	✓			-		
	Type of evaluation requirement requested (besides plans and structural calcs.)					
Impact Assessments	Design Review / Guidance	Feasibility Studies	Contributions Statement	Visualizations	Architecture Competition	
✓	✗	✗	✗	✓	✗	
Monitoring and enforcement process for permit includes						
Creation of Legal Agreement		Defined Monitoring Process	Clear Penalties / Sanctions			
✗		✓	✓			

LEGEND ✓ Policy in place identified ✗ No policy in place identified

(*) Extra specifications, see section 5.4.3. Elaborated by the author with information from: (Honorable Congreso del Estado de Nuevo León, 2014; IMPLANc, 2014, 2015, Secretaría del Republicano Ayuntamiento de Monterrey, 2016, 2017)

5.4.4 Future Projects to be Developed

For a city that once felt inferior to others for being too short, a more vertical future is already starting to emerge, becoming an opportunity to change the way in which its citizens live, work and move around the city. As some projects like the Koi tower and the Metropolitan Center Tower II in the Valle Oriente district are expected to open this year, others are already under construction like the 230-meter-tall office and hotel Metropolitan Center Tower III –Figure 144- (CTBUH, 2017k). Even in terms of clusters, while some already announced projects in the Valle del Campestre area are being completed, like the Saaqara Residences Tower II and other buildings of the Arboleda center –Figure 146-, new sub-clusters in the Valle Oriente district are being announced or proposed without a clear notion of whether they will be actually built or not (CTBUH, 2017k). One of these sub-clusters is the mixed-use Armida District, which once completed is expected to have nine towers and around 600,000 m² of construction –Figure 147- (Distrito Armida, 2017). Another one is the Del Valle City Center, a proposal which includes the 330-meter and 77-story-tall mixed-use Insignia Tower, which if built could even become Latin America’s highest tower, placing SPGG among the list of the only 49 cities in the world with buildings above 300 meters –Figure 145- (CTBUH, 2017n).



Figure 144: Metropolitan Center Complex with Tower III (left) under construction and Towers II and I (center and right) either completed or to be completed this year. © Patricia Céspedes, 2017.



Figure 145: Proposal for the Insignia Tower in the Del Valle City Center in SPGG (not yet approved). Source: (CTBUH, 2017n) © HKS



Figure 146: Valle del Campestre District with several projects under construction. © (Eleventy, 2016)



Figure 147: Visualization of the masterplan for the Armida District in SPGG.
Source: (Distrito Armida, 2017)

Monterrey, on the other hand, doesn't want to be left behind either. While the 267-meter- and 138-meter-tall T.O.P towers in the San Jerónimo area are already under construction –Figure 148- for the Santa María-Miravalle area three 180-meter-tall towers have been proposed –Figure 149- (CTBUH, 2017j). Also in terms of districts, while the Distrito Tec area is expecting to consolidate by increasing its density, in the central Purísima-Alameda area and the Madero corridor new mixed-used towers of smaller scale have already started construction –Figures 150 and 151- (KoiNOX Developers, 2017a, 2017b). High-rise buildings are even starting to appear in new areas of the city at the north, like the Luz Tower in the Mitras Norte neighborhood, and at the south, like the Esfera City Center residential towers in the Estanzuela area (Torre Luz, 2017; Zaha Hadid Architects, 2017).



Figure 148: T.O.P. Towers in Monterrey (under construction). Source: (Pozas Arquitectos, 2017)



Figure 149: Proposed 678 Towers in Monterrey. Source: (Vidal Zuazua & Barroso Morales, 2016) © Vidal Arquitectos



Figure 150: Kyo Midtown Project (under construction) in the Purisima-Alameda central area. Source: (KoiNOX Developers, 2017a)



Figure 151: Kyo Radiant Project at the Madero corridor (proposed). Source: (KoiNOX Developers, 2017b)

Also in other municipalities of the metropolitan area mixed-use clusters with high-rise buildings are either starting to consolidate like the Via Cordillera project in Santa Catarina or being proposed, like the Canada City Center in Escobedo (Desarrollos Delta, 2017; Grupo Inmobiliario Monterrey, 2016). In the near future, this high-rise phenomenon might even spread further away in the metropolitan area, with the establishment of foreign Chinese and South Korean companies in the peripheral municipalities of Salinas Victoria and Pesquería which already have proposals for industrial parks with their respective residential and mixed-used areas with some high-rise buildings (D. García, 2015; Herrera, 2015).

5.4.5 Main High-rise Related Gaps

Based on the information previously described, four main gaps or opportunities were identified regarding high-rise developments in SPGG and Monterrey. These gaps include the inadequate law enforcement and monitoring of the existing regulations, the lack of specialized high-rise-oriented regulations or plans, the lack of incentivizing instruments and the abandonment or deterioration of historical high-rise buildings.

Mexico has a problem with corruption, and the construction industry has proven to be one of the most vulnerable sectors. According to Transparency International in 2014 Mexico was evaluated with 35 points out of 100 in the Corruption Perceptions Index, being ranked 103 out of 175 countries (Arteaga, 2015). In this regard, if well the lack of municipal planning institutes and the different zoning and land-use regulations in metropolitan areas make urban management more complex, the bureaucratic obstacles that municipalities sometimes impose to developers for obtaining building permits or the developers' interest to get their projects approved without properly fulfilling all of the specified requirements, end up promoting a very corrupt environment (Arteaga, 2015).

Combined with the former, the municipalities' lack of capacity to develop the respective partial plans or to adequately monitor and enforce the correct development of high-rise proposals, has also directly affected the implementation of the existing regulations. On top of that, the participation of irresponsible developers who take advantage of these situations has promoted a clear disconnection between what is regulated in the development plans and what is actually being built. In the case of Monterrey, several of the high-rise locations previously identified like the Fundadores Avenue, the Camino de las Águilas-Camino de Los Ibis street and the Dinastía cluster, are all located in areas marked as single-family residential uses in the plan –Figure 152- (IMPLANc, 2014). In the case of San Pedro, even if most of the projects were located in the designated areas or corridors, in some cases they are higher than the maximum allowed height (IMPLAN, 2014) –Figure 153-. As a result of the former, and since public participation is not considered in the evaluation of individual projects, there has been a rise in the tensions between the neighborhood associations and high-rise developers (S. García, 2014).



Figure 152: High-rise buildings in the *Dinastia* cluster. Source: (Levant *Dinastia*, 2015)



Figure 153: High-rise building in the *Valle Center* cluster with a height limit of four stories. © (Torres, 2016a)

In this regard, perhaps two of the most representative examples of this inadequate monitoring and enforcement are the Tanarah and the Las Terrazas projects. As part of a mixed-use project started around 2008 and composed of a commercial plaza and a hotel tower in SPGG, the Tanarah project became the center of attention in 2013 when during the construction of its tower a crane collapsed due to overweight, forcing the authorities to temporarily close one of the city's main avenues and evidencing the construction of around 27 meters in height above the authorized limit (Mendoza, 2013). Besides the different fines and suspensions, the city of SPGG decided to proceed with the demolition of the unauthorized stories starting a litigation process with the developer that concluded in 2015 with the demolition of five floors and the regularization of the rest of the illegal stories, ending up with a height of 89.7 meters of the 76.9 originally authorized -Figure 154- (Ochoa, 2015).

On the other hand, Las Terrazas is project of five residential towers of around 10 stories in the Colorines area in SPGG, which has already been in litigation for eight years for being built in an area listed in the plan as natural preservation area, for illegally occupying 2,000 m² of municipal property, for allegedly building without a valid building permit and for exceeding the maximum allowed height -Figure 155- (Hernández, 2017a). With projects of such kind being built specially in residential areas, it is then no surprise that neighborhood associations in SPGG have openly declared themselves against the authorization of new high-rise buildings, in occasions even symbolically closing or suspending their constructions -Figure 156- (S. García, 2014).

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Figure 154: Tanarah Tower before (August 2014) and after (September 2015) the demolition of its floors.
Source: (E. Rodríguez, 2015)



Figure 155: Las Terrazas project in a natural preservation area (under construction).
© (Documentación Arquitectónica, 2017)



Figure 156: Symbolical closure of the Las Terrazas project by neighborhood associations in SPGG. Source: (S. García, 2014) © Leonel Rocha

In addition to the former, the fact that there are no specifically-oriented high-rise development plans or high-rise regulations for the evaluation and location of proposals creates even further problems. As the historical reviewed showed, most of the high-rise related issued in Monterrey's metropolitan area, have usually been determined by the real estate market. In terms of the evaluation instruments, the existing regulations currently address all high-rise proposals of all heights as if they had the same urban impacts. In both SPGG and Monterrey the maximum allowed heights go from 10 and 12 stories to unlimited, not requesting any transition or additional requirements for buildings that go over their second maximum defined height (Secretaría del

Republicano Ayuntamiento de Monterrey, 2017; Secretaría del Republicano Ayuntamiento de San Pedro Garza García, 2016). The former gains particular importance if one considers that neither of the urban development plans clearly take into consideration height transition areas for high-rise buildings.

For that matter, and specifically in terms of authorizing their location, additional problems arise. In the first place, there is a clear disconnection between the location of high-rise buildings and the massive public transport system in the city, thus, creating a lot of traffic and need of displacement. While clearly according to the origin-destination studies most of the private car trips are going towards the CBDs in SPGG –Figure 157-, it is mainly in Monterrey’s city center and slightly in the northern part where existing high-rise buildings are actually connected to the metro and BRT systems –Figure 158- (CETVY et al., 2014, p. 99). In this area, however, high-rise projects could create a conflict or even replace the remaining heritage buildings. In this regard, even if plans to connect the Valle Oriente district with Monterrey’s city center through public transportation are currently under evaluation, there is still a disconnection between high-rise building approvals and existing public transport infrastructure (Hernández, 2017b). The excessive parking requirements as well as the lack of instruments to negotiate a reduction, are clear examples of this issue –Figure 159-.

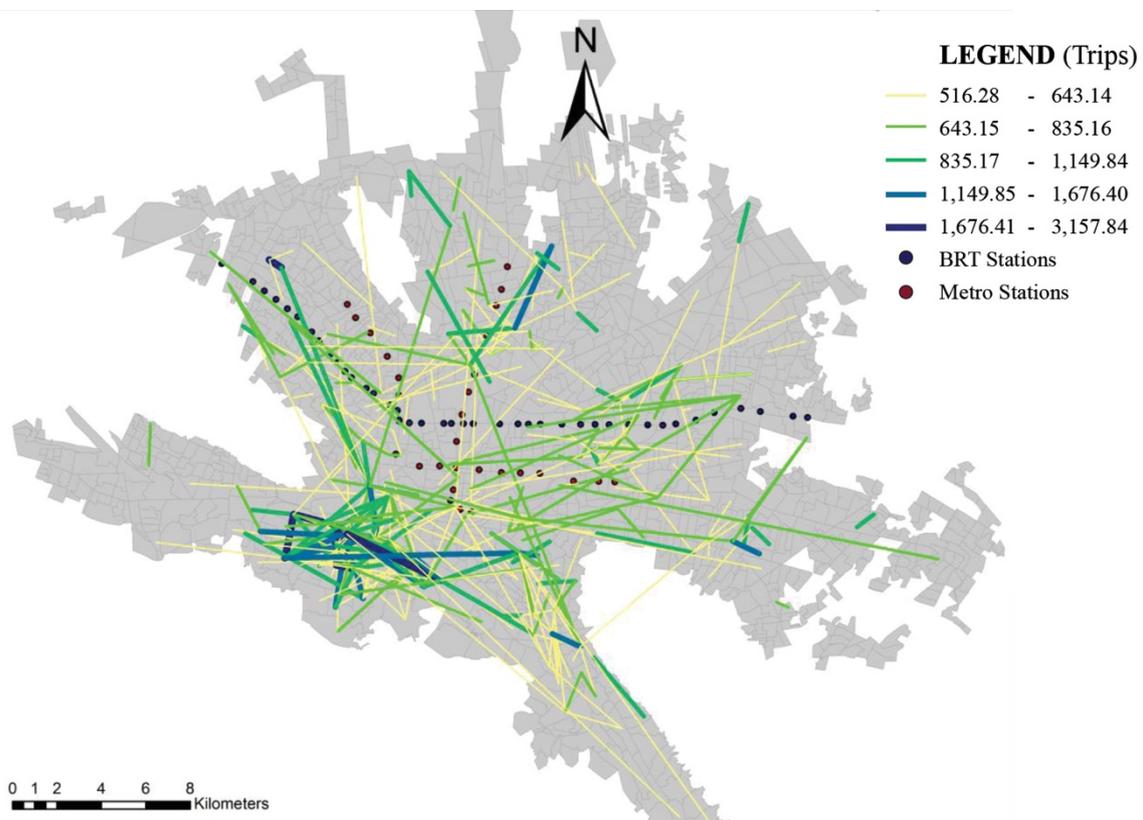


Figure 157: Main origin-destination trips done by private means in Monterrey's metropolitan area. Modified by the author from: (CETVY et al., 2014, p. 99).

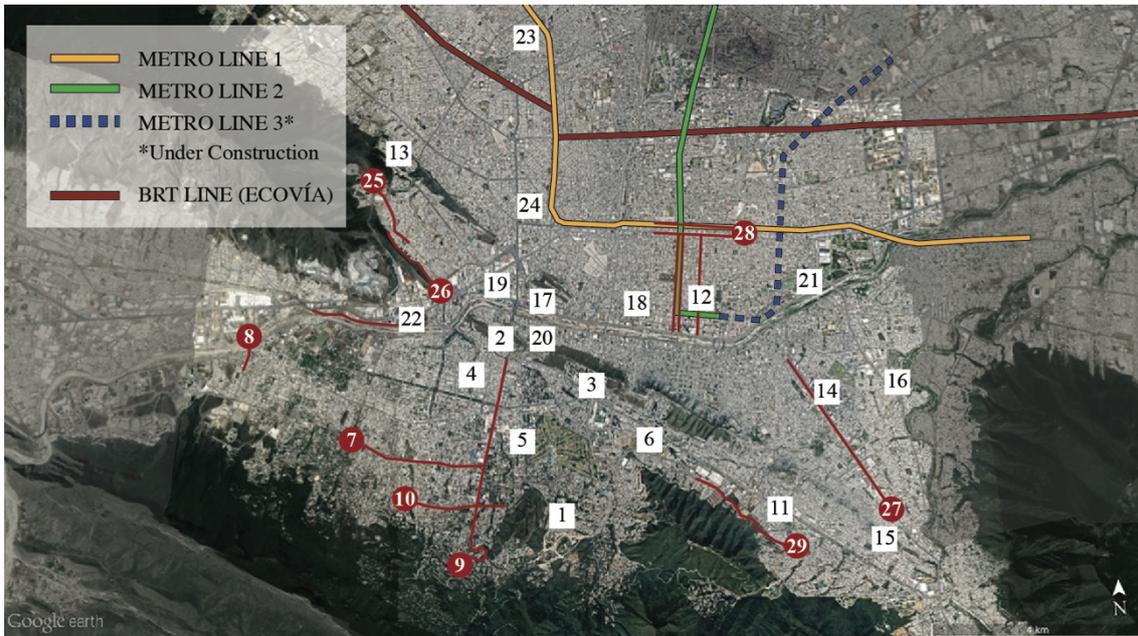


Figure 158: Disconnection between the existing high-rise locations in SPGG and Monterrey and the massive public transport lines. Elaborated by the author from Google Earth.



Figure 159: Car-oriented developments in the Loma Larga Hill, between Monterrey’s center (left) and SPGG’s Valle Oriente district (right). © (Eleventy, 2016)

Another existing problem with the location of high-rise buildings in SPGG and Monterrey is their relationship with the city’s natural environment and topography. If well, elevated areas are more attractive to both residents and the real estate market for the views that they offer towards the city, if they are kept unregulated they don’t only increase the risk of overexposing buildings and blocking views towards the mountains –the city’s natural icons- because of the pedestal effect, but also the chance of blocking the fresh air from going down the mountains and hills to refresh the inner city (Al-Kodmany & Ali, 2013; Firley & Gimbal, 2011). Projects in the Roberto Garza Sada, Gomez Morín and Fundadores corridors, as well as the Colorines, Loma Larga, Valle Oriente and Dinastía clusters, are just some examples of the existing environmental high-rise affectations in the city that will hardly be restored –Figures 160 and 161-.



Figure 160: High-rise construction on top of the Loma Larga Hill in SPGG. © (Torres, 2016b)



Figure 161: High-rise building over a hill in the Valle Oriente area. © (Torres, 2017b)

In addition to the preceding, the existing high-rise regulations are not really presenting mechanisms to incentivize developers to contribute to the mitigation of the city's high-rise related urban impacts which they have contributed to create. On one side, not only the transfer of development rights and densities are not allowed in SPGG but also FAR and heights are unlimited for several land-uses in Monterrey, making it almost useless to exchange development rights in return of contributing with public amenities (Secretaría del Republicano Ayuntamiento de Monterrey, 2017, Art. 36°; Secretaría del Republicano Ayuntamiento de San Pedro Garza García, 2016, Art. 9°). On the other side, the fact that residential density is limited to 150 units/ha in the whole state, creates several problems (Honorable Congreso del Estado de Nuevo León, 2014, Art. 125°). First, it promotes a surplus of commercial and services areas that the market most likely won't be able to absorb. Second, it restricts the possible incentives that the city could exchange with developers. And third, it pushes the market towards the development of larger and less affordable housing units.

With an inadequate monitoring system and no incentives or additional high-rise-oriented requirements to contribute to the city, some developers are not only not fulfilling the existing underexploited requirements like the percentage of the transferred areas in urban complexes, but also purposely building beyond what they had been authorized, knowing that eventually their buildings most likely could be regularized just by paying some fines that could even be destined for a public good. An example of the former is the Helicon Tower, in Valle Oriente, a project that ended up regularizing 2,222 m² of construction outside the norm by paying a fine of around \$18.7 million pesos which were destined to the improvement of the Rufino Tamayo Park (El Horizonte, 2015).

And lastly, particularly in the city of Monterrey, there is an evident deterioration and abandonment of its early high-rise buildings. Even if Monterrey did not keep constantly developing high-rise buildings in the second half of the 20th century, like Frankfurt did, in the 1950's and 1960's it already had streamlined buildings and condominium towers, some of which were even taller than what was being built in Frankfurt at the same moment (Burian, 2015; Deutsches Architekturmuseum, 2014). As urban sprawl contributed to the abandonment of Monterrey's central area, some of these buildings were left vacant, and as the real estate market gets interested once again in this area, the questions of what to preserve and how to do it, gain particular importance.

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With most of this modern or contemporary heritage architecture usually not being perceived as such, there is a great opportunity for the refurbishment and preservation of high-rise buildings both in Monterrey's central district and in SPGG's early corporative and office towers. In this regard, perhaps one of the most recognized example of a building refurbishment already done in Monterrey was the conversion of the late 1950's 15-story-high Monterrey Insurance Condominium into the mixed-use Urbania apartment tower, in 2009, which even added four additional stories clearly differentiating between the existing and the new architecture –Figures 162 and 163- (GLR Arquitectos, 2017). As SPGG's early 1990's high-rise buildings start to age, it could also be a good opportunity for the municipality of SPGG to start planning ahead concepts of this kind.



Figure 162: Side view of the Urbania refurbishment project, 2009. Source: (GLR Arquitectos, 2017) © Jorge Taboada



Figure 163: Front view of the Urbania refurbishment project, 2009. Source: (GLR Arquitectos, 2017) © Jorge Taboada

It is important to highlight, that if well real estate speculation and housing affordability in high-rise buildings are two important aspects which are gradually becoming a pressing issue in Monterrey's metropolitan area, for the extent of this research they were disregarded as gaps for the following reasons. In terms of the real estate speculation, since both cities don't define or recommend individual plots where high-rise projects should be constructed, but rather determine larger areas according to the respective zoning and land-use plans, this aspect was considered as part of a broader problem of real estate speculation and not as an issue particularly related to a specific high-rise regulation or policy. On the other hand, for being these cities part of a continuously expanding metropolitan area in which more than 90% of the total population live in single-family housing units, and the concept of living in high-rise buildings has still not been socially embraced, housing affordability in high-rise buildings is still in the process of becoming a more significant issue (INEGI, 2011, p. 25). In any case, both aspects are being taken into consideration as part of the lack of specialized high-rise-oriented regulations.

5.5 Conclusion

After the analysis of the three case study cities was conducted, it was evidenced that since high-rise development is regularly an aspect not included in the city's urban regulations, in some cases there was not enough documentation or official sources addressing this issue. Therefore, the information presented in this chapter and some of the decisions taken on the way of how to analyze the cities were based on the availability of information. Furthermore, being this research done remotely, even if some policies of the case study cities were able to be identified, it was still complicated to evaluate their degree of effectiveness.

In the case of Da Nang, the city experienced a rapid economic growth in the last decades that has promoted the construction of high-rise buildings for commercial and touristic purposes mainly along the eastern coast, the Han River and the CBD. This growth is being contrasted with a slower development process of the infrastructures systems in the city, creating for high-rise development four main gaps. These gaps include an inadequate law enforcement and monitoring of the existing regulations, the lack of specialized high-rise-oriented regulations or plans, the lack of incentivizing instruments and the lack of an adequate infrastructure system for high-rise development.

For the case of Frankfurt am Main, which has been addressing and regulating high-rise development for several decades, the city appears to enter into a consolidated phase, where a balance between urban growth and sustainable development is wanted to be achieved, creating an urban tension. For that matter, this analysis identified five high-rise related gaps which need to be addressed. These gaps include real estate speculation over specific plots, the provision of sufficient open or publically accessible spaces, housing affordability, the lack of incentivizing instruments and the lack of strategies for the existing aging high-rise buildings.

And lastly, in the cases of Monterrey and SPGG, a disconnection between the development of market-driven high-rise projects and the public transportation systems, combined with a predominance of single-family housing units in a poorly coordinated metropolitan area, has led to a series of urban-sprawl-related problems, among which the abandonment of the central districts, the dependency on the automobile, the increase in need of displacement and environmental pollution are the most representative. In this regard, four high-rise-related gaps were identified, including an inadequate law enforcement and monitoring of the existing regulations, a lack of specialized high-rise-oriented regulations or plans, a lack of incentivizing instruments and the abandonment or deterioration of historical high-rise buildings.

In the next chapter, the results obtained for each of the case study cities will be further explored, complemented and validated through the implementation of the four stage of the data collection methodology, the elicitation process. This process will incorporate the perspectives of both city departments and individual experts directly related to these issues.

6 Expert Interview Validation

In this chapter, the results of the elicitation process of the semi-structured interviews will be presented, organized both by case study city and by the particular expert or city department interviewed, depending on the case. For that matter, the answers will be presented in a summarized way organized by the main gaps identified per case study city in the previous chapter. Since several ideas could have been repeated between interviewees, this chapter will mostly focus on most representative feedbacks obtained.

6.1 Da Nang, Vietnam

For the case of Da Nang, two interviews were conducted for the public sector. Based on the same structure of questions for all the interviewees, 15 main topics were discussed, including aspects such as the location criteria for high-rise buildings, the recommendations done by the Japanese and South Korean cooperations agencies or institutes, the results of the International Han River Landscape Competition, the volumetric regulations of high-rise buildings, Vietnam's land-use right system, the existing build-transfer system, incentive zoning, monitoring and enforcement, public participation, amongst others. As it was previously mentioned, for the case of Da Nang, the interviews were addressed to specific city departments and institutes rather than to particular experts.

In this regard, the answers will be organized by the four main gaps identified in the previous chapter for Da Nang, which include the inadequate law enforcement and monitoring of the existing regulations, the lack of specialized high-rise-oriented regulations or plans, the lack of incentivizing instruments and the lack of an adequate infrastructure system for high-rise development.

6.1.1 Da Nang's Department of Construction, Planning Management Division

For what concerns the first gap, the inadequate law enforcement and monitoring of the existing regulations, the DOC was not asked directly about this issue, but rather on the regulations which were identified as existing by the literature review, like the definition of the volumetric, ground floor and public participation aspects, which either the photographic documentation demonstrated to be poorly enforced or where it was complicated to confirm their proper enforcement.

For the case of the volumetric and open space regulations of high-rise buildings, the DOC did not comment on the effectiveness of the regulations identified, but rather on further regulations which are allegedly covering these aspects. The DOC particularly mentioned the Decision No.47/2012/QĐ-UBND of Da Nang People's Committee approved in 2012, which addresses several high-rise aspects, including building height and its authorized locations in the city based on the airport's requirements. For the open space requirements, the DOC indicated that the maximum allowed coverage area ratio is 80% of the plot, meaning that the rest 20% should be destined to green permeable spaces. Parking, on the other hand, is specified as a requirement to get a construction permit from the city in the Vietnam Construction Code 01/2008-BXD and on the Official Letter No. 1245/BXD-KHCN of 2013.

In terms of public participation, the DOC indicated that direct public participation it is being considered for general criteria but is only being applied in cases of crucial planning or architecture projects. For that matter, public participation is mainly incorporated through either exhibitions, to communicate results or competition proposals, or through consultation processes, with direct or online voting. No additional comments regarding the monitoring and enforcement processes of high-rise buildings in Da Nang were provided.

With regard to the second gap, the lack of specialized high-rise-oriented regulations or plans, the DOC addressed three main aspects. Firstly, for defining the location of a high-rise project and being the airport located inside the city, the DOC indicated that it is basically the height of the building and its constructive criteria which define if the location of a high-rise project is authorized or not, being very much subject to the demand of the investors. Even in terms of defining specific areas, the DOC claims they are not aware or were not informed about the recommendations of creating two new CBD in the city of the JICA reports. With regard to the natural environment, particularly the results of the International Han River Landscape Competition, at the moment the chosen proposal is being evaluated by the different specialized city agencies, including aspects such as its relationship with high-rise buildings. However, as of now, no potential regulation results can be predicted.

Secondly, in terms of the evaluation of high-rise proposals, the DOC clarified the typical process which has to be followed, indicating that there actually are high-rise evaluation regulations in place. On a first stage, the developer needs to submit to the City People's Committee a construction plan of the area, including aspects such as the land-uses, construction scale, building exterior design, building description, etcetera. Once this plan is approved, the developer is required to make a detailed plan on scale 1:500 to be able to get an authorization in terms of land use and investment regulations, according to the Land Law 2013 and the Investment Law 2014. Next, and based on the detailed plan, the developer will be required to present specific aspects such as a technical design report, an environmental assessment report and fire protections and safety systems. Finally, if everything is accepted by the relevant city departments, the DOC will issue a construction permit. Additionally, for larger high-rise projects, according to the DOC, the developer would also be required to provide some landscape specifications of the areas surrounding the plot as well as to cover the costs of the implementation of some public infrastructure to ensure the project's suitability on its area. For the case of residential high-rise buildings, this requirement of provision of services infrastructure is specified under the Vietnam Construction Code 01/2008-BXD.

There is, however, one exception. As it was previously described in section 5.2.3, if a project is developed by a single investor for a smaller area than five hectares or two hectares for residential apartment projects, the construction doesn't require a detailed plan, just a validation of compliance with the master and zoning plans and a revision of the design proposal. In this regard, even if the DOC clarified that in practice this only applies to projects which are smaller than 0.5 ha, this might be the case for most of the single-tower projects.

The third aspect mentioned was the land use right system, which also seems to be not adapted for high-rise buildings. As it was previously described, the land use certificate is issued after the authorization of the detailed plan but before the construction permit. In this sense, the issuance of the certificate currently does take into consideration the detailed specifications of the building

itself, which are evaluated in later stages. Additionally, while it is clear that the land use right system has specifications for residential and for commercial uses, the interviewee of the DOC could not answer how would this system address a mixed-use building.

For what concerns the third gap, the lack of incentivizing instruments, the DOC agreed that as on now, Da Nang's planning system doesn't contemplate instruments of this kind. On one side, the built-transfer system was described as an aspect more related to the development of infrastructure rather than the transfer of development rights. On another side, the DOC was not aware if the recommendation of incorporating the TIF in Da Nang had been taken into consideration. And lastly, not as incentive instruments but rather as a negotiation requirement, it indicated that in the case of larger high-rise projects some infrastructural upgrades in fields like wastewater, are commonly requested for the developer to get a construction permit.

And lastly for the fourth gap, the lack of an adequate infrastructure system for high-rise development, although the topic was also not directly addressed with the DOC, the other answers previously described in terms of the negotiations with the developers for larger high-rise projects or the existence of the built-transfer system, showed an insufficient infrastructure system in the city which has a need of improvement.

To conclude, the DOC expressed its high-rise expectations for the future, arguing that since most of the existing high-rise buildings in Da Nang are now destined for touristic and accommodation purposes, this trend will continue in the future, focusing especially along the Han River and the eastern coast. The DOC sees a degree of engagement into the tourism development by the city so high, that it even foresees a relocation of the existing residential areas on the eastern part of the city towards the west, emptying some space for touristic purposes.

6.1.2 Da Nang's Urban Planning Institute, Planning Design Division

For what concerns the first gap, the inadequate law enforcement and monitoring of the existing regulations, the Urban Planning Institute of Da Nang -UPI- was not asked directly about this issue, but rather on the regulations which were identified as existing by the literature review, like the definition of the volumetric, ground floor and public participation aspects, which either the photographic documentation demonstrated to be poorly enforced or where it was complicated to confirm their proper enforcement.

With regard to the volumetric and open space regulations of high-rise buildings, the UPI did not comment on the effectiveness of the regulations identified, but rather on the Decision No.47/2012/QD-UBND of Da Nang People's Committee from 2012, which is allegedly covering aspects such as authorized location of a high-rise, the frontal width of the building, the dimensions of the plot, parking requirements, coverage area, amongst other. Besides these requirements, which vary depending on the area of the city, according to the UPI developers will be requested to commit to improving other aspects such as the landscape of the areas surrounding the plot. Even if the UPI did not comment on the effectiveness of the Decision No.47/2012/QD-UBND, it did however indicate that it is currently being revised by the DOC, who is drafting a more detailed version which will clarify aspects such as construction density, FAR, maximum number of floors depending on the type of building, amongst other features.

While regarding the monitoring and enforcement instruments and regulations not much information was provided, for the public participation in high-rise development the UPI only indicated that all citizens are allowed to supervise the implementation of the projects and give their feedbacks to the People's Council's representatives for them to discuss these matters in their regular meetings.

In terms of the second gap, the lack of specialized high-rise-oriented regulations or plans, the UPI addressed three aspects. Firstly, for defining the location of a high-rise project, the UPI indicated some existing regulations in this regard which consider characteristics such as the building's height and the plot's conditions. Once again, because of the location of Da Nang International Airport at the city center, the height clearance is indicated as the first issue to be considered for authorizing its location. The second aspect is the characteristics of the plot, including its location, size and topographic conditions. Both aspects are specified in the Decision No.47/2012/QĐ-UBND, as previously described. Nonetheless, these regulations could be said to be evaluating individual proposals without having a general high-rise plan or strategy. For that matter, for the recommendations to create two new CBD in the city of the JICA reports, the UPI indicated that as of now, there has not been any official information in this regard. Additionally, just like the DOC, the UPI stated that the results of the International Han River Landscape Competition are currently under evaluation, and no potential regulation results can be predicted.

Secondly, in terms of the evaluation of high-rise proposals and without going into detail into the evaluation process, the UPI corroborated similar requirements to the ones provided by the DOC. These requirements include alignment with the guidelines of higher planning documents, environmental impact analysis, technical and safety requirements, landscape proposal, aesthetic criteria, amongst others. With regard to this last aspect, the UPI indicated that the city of Da Nang issued a plan of highlight architecture buildings defining certain areas. Therefore, any high-rise proposal presented within these previously selected areas has to be evaluated and approved by the City Architecture Planning Council. Finally, regarding the exemption of detailed plans for the projects smaller than five or 0.5 hectares, the UPI considered that this aspect is related to a matter of saving time or easing the evaluation process for the developers, as well as to give more importance to the master and zoning plans in the development of the city.

The last aspect mentioned for this gap was the land use right system, to which the UPI provided a more detailed description. In the first place, it indicated that there are only two types of land use right certificates for private users which vary depending on the land-use and time limit, to be exploited for 50 years in the case of commercial uses and to be exploited permanently for residential uses. Even if this shows a gap for the concept of mixed-use towers, it also indicates that it is basically the commercial uses which are changing in long periods of time, meaning that most of the land use right certificates have already been granted. If a plot has never been given a land use certificate before but an individual submits all the documents proving his or her ownership of the property to the relevant local authorities, this request will be evaluated by the higher-level authorities and if approved, the certificate will be issued.

If an investor is interested in developing on government-owned land, the process to obtain a land use right certificate is the following. First, all the interested parties are invited to participate in a bidding process. If the investor wins the bidding or if it is nominated by the government, then it should solve some financial aspects of the procedure with the DONRE. Once these aspects are

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addressed, the investor will be required to develop a detailed plan to be evaluated both by the DONRE and the DOC. If the detailed plan is in accordance with the zoning and master plans, the land use right certificate will be granted. For that matter, even if the UPI recognized a potential in the utilization of the land use right system for high-rise oriented regulations, like in the reference city of Hong Kong, it argued that because of the difference in population and urban scales, this type of mechanisms could not be implemented now, but studied and applied for the future, particularly in Da Nang's CBD.

For what concerns the third gap, the lack of incentivizing instruments, the UPI also agreed that as on now, Da Nang's planning system doesn't contemplate instruments of this kind. On one side, the UPI confirmed that not only the build-transfer system but also the build-operate-transfer system, are instruments design by the government to save public budget by collaborating with the private sector in the provision of infrastructure projects for the benefit of the community. In this regard, these instruments are more related to a structure of public-private-partnerships than to incentive zoning. On another side, just like the DOC, the UPI was not aware if the recommendation of incorporating the TIF in Da Nang had been taken into consideration. And lastly, the UPI argued that if well the incorporation of incentivizing instruments into Da Nang's planning system could be for sure a good solution, they are to be applied in the future, because Da Nang's still has enough available land for development.

Just like with the DOC, the fourth gap of the lack of an adequate infrastructure system for high-rise development was also not directly addressed with the UPI but rather indirectly addressed from other topics, particularly its future high-rise expectations for the future. As the trend of high-rise development seems to focus on the areas which are more attractive for the real estate market and which can assure a better return on investment for the developers, the UPI believes that in the near future, the city will suffer from an asynchronous type of development. This means, by leaving most of the responsibility to the market and by only focusing on the basic regulation standards of high-rise buildings without creating specifically designed high-rise development areas and buffer zones, different cities within the same city will be built, with impacts not only in the aesthetics of the urban fabric but also in the environmental, functional and infrastructural criteria.

6.2 Frankfurt am Main

For the case of Frankfurt am Main, two interviews were conducted, one for the private sector and one for the public sector. For the private sector 10 main topics were discussed, including aspects such as the real estate speculation, the challenges of the new residential or mixed-used high-rises in the central districts, housing affordability, the preservation of green public spaces, the mitigation of the urban impacts, the protection of the high-rise patrimony, public participation, the potential impact of BREXIT on Frankfurt, future high-rise development trends, amongst others. For the public sector, and since most of the questions of the previously described structure could not be answered, as it will be further explained, the interview was directly focused on the main gaps identified.

As it was previously mentioned, the answers will be organized by the five main gaps identified in the previous chapter for Frankfurt am Main, which include real estate speculation over specific plots, the provision of sufficient open or publically accessible spaces, housing affordability, the lack of incentivizing instruments and the lack of strategies for the existing aging high-rise buildings.

6.2.1 Interview with Jochem Jourdan

Jochem Jourdan is a founding partner of Jourdan & Müller Steinhauser PAS, an architecture, urban planning and urban design office established in Frankfurt am Main in 1979. As an architect, Jourdan has a long international experience in working for projects of different scales for both the public and private sectors in various parts of the world. At the same time, he also has academic experience working as a professor at the University of Kassel. Together with his founding partner, Bernhard Müller, he was commissioned by the city of Frankfurt to develop the urban studies and recommendations for the *Hochhausentwicklungsplans* of 1998 and 2008.

With regard to the first gap, real estate speculation over specific plots, Jourdan was asked about Frankfurt's approach which gives plot recommendations rather than evaluating proposals individually, to which he pointed out the time gap that it took the real estate market to integrate the first high-rise development plan. As he found out while developing the second plan, one of the reasons why most of the plots recommended in the first plan were not built by the time of the second plan was the number of proposals which were approved prior its publication. According to Jourdan, as these projects were concluded, for the second high-rise development plan some of the plots initially recommended started to be built.

Taking this into consideration, and preventing what BREXIT could represent for Frankfurt, Jourdan believes that the city should continue with its approach of recommending specific plots but now diversifying the catalog with the possibility of plots for even higher scales as the new investors might require. In any case, he considers very important for the city of Frankfurt to be aware and alert to prevent corrupt practices from happening, as these new investments come into the city.

In terms of the second gap, the provision of sufficient open or publically accessible spaces, Jourdan considers that the real estate market has already embraced public spaces on the ground

floors as a fundamental part of high-rise development. For that concern, when addressing the issue of the total amount of open public spaces to be required and negotiated with the developers, he likes the possibility of relating it to a ratio based on the number of inhabitants or apartments in the project, as in other reference cities. In any case, he sees the open spaces on the rooftops and upper floors as fundamental elements for the acceptance of new high-rise buildings and the creation of a community with the general public, and claims that the City Planning Department of Frankfurt has not been strong enough with its requests to the investors regarding this aspect. As new mixed-use or residential high-rise buildings are coming into the city's central districts, he expects more open public spaces to start to be considered, contemplating that the real estate market has to create attractive living environments for new inhabitants to come.

For what concerns the third gap, housing affordability, Jourdan described the evolution of the relationship of the concepts of affordability and high-rise buildings from the after-war until now. In the 1950's the government-owned social housing high-rise projects had a bad connotation among the population for being associated with a lack of maintenance or to a series of social problems of the inhabitants that occupied them. As the high-rise typology evolved and got accepted and as those 1950 residents created social links and a community around them, he believes that one of the main challenges today is that Frankfurt doesn't own enough projects to offer housing units under rent-control programs, like in the case of the city of Vienna, in Austria.

When talking about the fourth gap, the lack of incentivizing instruments, Jourdan considers that for the case of Frankfurt perhaps it is not necessary to include new instruments but rather to ensure the continuity of the plans and strategies by also giving continuity to city officials who make sure these plans are monitored and implemented as agreed. In other words, by providing predictability and accountability to the different actors involved and ensuring that the officials in charge are experts in their field rather than just politicians, it would be possible to incentivize a better high-rise development process.

And lastly, for the fifth gap, the lack of strategies for the existing aging high-rise buildings, Jourdan considers that the institutes or city departments which are in charge of the preservation of the city's heritage are mostly integrated by experts in the fields of the arts and history and not so much in architecture or urban planning. In this regard, he believes that there is a lack of architects in these areas to integrate new visions or concepts like high-rise preservation.

6.2.2 Interview with the City Planning Department of Frankfurt am Main

In a first approach with the City Planning Department, the previously described questions of the 10-topic structure were presented, focusing on the regulations, plans or policies that the department was considering to implement for each one of these topics. However, and since it was confirmed that the City Planning Department has just started to work on the development of a new update of the *Hochhausentwicklungsplan*, they were not able to answer these questions as much of these aspects are still to be defined. In this regard, they agreed to share some additional perspectives or information regarding the five main gaps identified.

For what concerns the first gap, real estate speculation over specific plots, they confirmed it as one of their major challenges in the inner-city districts. In addition to what Jourdan mentioned regarding the time gap of the real estate market and the first plan, they suggested that after the

attacks on September 11 in New York City and the economic crisis of 2008, several of the plot owners which had already agreed with the municipality on developing several high-rise projects as part of the plan either couldn't do them anymore or change their minds. Even in terms of the requirement they introduced of needing to secure a tenant for the next years in office high-rise proposals to be granted a permit, this represents the best-case scenario that is not always achievable. For that matter, the most important goal for them is not to assure that the market will absorb the office spaces or the apartment units as investment instruments but rather that the users of these spaces will actually occupy them and contribute to the creation of an active community.

With regard to the second gap, the provision of sufficient open or publically accessible spaces, if well they recognize that with the increase of the residential density in the inner-city districts there is a risk of reducing the ratio of green spaces per inhabitant, they also consider the scale of the city to be a positive aspect, since it is possible to get to the Green Belt Park, the Main River Park or to the Taunus area by public transportation in a relatively short time. For that matter, regarding the open spaces on the ground floors, they consider fundamental the creation of attractive public environments for a better integration of the project into the city. For the publically accessible spaces on the upper floors, even if they are also important, they consider that rather than being requested for every project that it is built, they could be strategically located in different districts of the city to provide diverse and interesting perspectives of the city for the whole population.

In terms of the third gap, housing affordability, they mentioned that it is one of the aspects which they are already addressing and which was successfully negotiated with the Four project. As such, this issue seems to be one of the focus that the new high-rise development plan will include, particularly with regard to the 30% residential area requirement for office buildings. Nonetheless, one great challenge when addressing the problem of affordability is to answer the question affordable for who? As the city of Frankfurt already has different operating programs to support rent affordability and even housing acquisition for families and seniors⁹, for the lower-income groups¹⁰ and for students¹¹, there seems to be a socioeconomic gap between the people who would be interested and could actually afford living in high-rise buildings considering the rent support, and the ones that the current programs are covering. In addition to the former, also the question of which percentage of the affordable housing units requested to the developers should be destined to each of these different social groups is something to be taken into consideration.

For the fourth and fifth gaps, not much additional information was provided, as these are both aspects that the City Planning Department is currently in the process of evaluating.

⁹ In German: *Frankfurter Programm für familien- und seniorengerechten Mietwohnungsbau.*

¹⁰ In German: *Frankfurter Programm zur sozialen Mietwohnungsbauförderung*

¹¹ In German: *Frankfurter Programm zur Wohnraumförderung für Studierende*

6.3 Monterrey and SPGG

For the case of Monterrey and SPGG, three expert interviews were conducted. Even if all of the interviewees are currently working for the private sector, all of them have had experiences working either for or with the public sector with regard to high-rise-related issues. Based on the same structure of questions for all the interviewees, 11 main topics were discussed, including aspects such as the metropolitan functioning of the city, the challenges of the special development polygons, the strategies for determining the volume and location of high-rise buildings, the incentivizing mechanisms, corruption, evaluation and monitoring of high-rise projects, public participation, the impacts of the new General Law of Human Settlements, Land-use Planning and Urban Development, amongst others.

As it was previously mentioned, the answers will be organized by the four main gaps identified in the previous chapter for Monterrey and SPGG, which include the inadequate law enforcement and monitoring of the existing regulations, the lack of specialized high-rise-oriented regulations or plans, the lack of incentivizing instruments and the abandonment or deterioration of historical high-rise buildings. It is important to highlight, that since the fourth gap of these case study cities was identified after these interviews were conducted, it will not be addressed in this chapter.

6.3.1 Interview with Jaime Ortiz

Jaime Ortiz is a founding partner of Arista, a planning, urban design, architecture and landscape firm, based in Monterrey, Mexico. As an architect and urban planner, he has worked at the New York City Department of City Planning and at the Municipal Planning Institute of SPGG, where during his last year he worked as the interim director. During his time at SPGG's Municipal Planning Institute, he participated in the development and publication of the existing Urban Development Plan and zoning regulations.

With regard to Monterrey's and SPGG's first gap, of the inadequate law enforcement and monitoring, Ortiz mentioned several aspects. Firstly, that municipalities in Mexico are used to addressing all urban issues through the use of urban development plans, but since cities have been growing at a very rapid rate, this instrument has become very inefficient. Municipalities are currently responsible of much more attributions than what they can actually cover, creating the opportunity for corruption because of its low capacity for supervising and monitoring urban development. Nonetheless, not all of the apparent irregularities are caused because of corruption. In some circumstances, some projects which are approved under former development plans take too long to be developed, that even if the maximum allowed height changes, like in the Valle Center area, the city government can't restrict development rights which have already been approved.

Acknowledging the former, during his work as part of SPGG's Planning Institute they tried to give much more attributions to the partial development plans, however, the lack of political will to actually develop these specialized plans, the lack of budget destined exclusively for planning, the short 3-year municipal terms and now the absence of a Planning Institute to ensure some level of continuity, has affected these efforts.

For what concerns the second gap, the lack of high-rise-oriented regulations or plans, Ortiz points out that the main reasons behind this issue are the lack of institutional strength and technical sophistication of the planning institutes in Mexico. Developing districts and designing the instruments for the partial development plans requires a certain degree of expertise, detail and work, which the current institutes are not able to fulfill. The fact that the cities keep developing along corridors, without a connection to public transport, disregarding the natural environment or the historical heritage are examples of the continuation of ideas from previous decades which they haven't been able to change. He even suggests that in some cases the existing development coefficients are not well matched, meaning that they specify a maximum height which the maximum allowed FAR is not enough to fill, situation which creates confusion among the developers and even fosters irregularities.

In terms of the evaluation of high-rise proposals, Ortiz argues that Monterrey's and SPGG's regulations are still under development and entering a maturity phase. To support this idea, he points out that the fact that Mexico City's high-rise regulations are currently more elaborated or specific is because they have been addressing the issues of density since earlier decades.

For this same reason, as part of societies which are not used to living in high-rise buildings, the current regulations are still not fostering the development of a medium type of density. For example, the concept of limiting the residential density to 150 units/ha was initially focused for granting and adequate access to services to the peri-urban low-income housing units, but now is currently affecting inner-city areas. In this regard, perhaps the only successful case is the Valle Oriente district because is the only area in both cities where the residential density is not limited by a specific number of units per hectare, but rather by the maximum allowed FAR.

In terms of the third gap, the lack of incentivizing instruments, Ortiz indicates one again the weaknesses of current planning institutes. In the case of SPGG the transfer of development rights was prohibited because around 15 years ago, when it was a legal, the city was not able to control where were these rights been transferred to, situation which one again, promoted corrupt practices. However, since they have been already successful cases of public-private partnerships for the maintenance of big scale public parks in both Monterrey and SPGG, like Fundidora and Chipinque, there is a significant potential to explore for these types of collaborations in a different scale. For that matter, public participation is also fundamental, because even if citizens can participate in the development of the plans, the fact that the Monterrey's regulation allows for unlimited FAR and heights in certain areas, is not only affecting the possibility for incentivizing mechanisms but also the citizens' predictability of what could or would happen in their neighborhoods.

Lastly, Ortiz mentioned that if well the new General Law of Human Settlements, Land-use Planning and Urban Development has already introduced very progressive concepts, it seems to be that their implementation is still not very clear. This means, since it doesn't clarify if only certain areas of the city or the complete city should have mixed-uses, it could be taking these concepts to an unwanted or a potentially conflictive extreme. In this regard, he believes that in the future decades the tendency or high-rise development will be towards the consolidation and integration of different districts in the cities, as well as the adaptation of new norms or regulations which would help to mitigate the increasing urban impacts or urban development.

6.3.2 Interview with Eduardo Aguilar Valdez

Eduardo Aguilar is the Citizen-focused Urban Planning Manager –*Gerente de Urbanismo Ciudadano*- of the program DistritoTec of the ITESM. As an architect, urban planner and landscape designer he has worked as Urban Project Director of Nuevo Leon’s Planning Agency for Urban Development¹², as Head of Mexico City’s Public Space Authority¹³, as Management Director of Mexico City’s Historical Center Authority¹⁴, as counselor for several Municipal Planning Institutes of Monterrey’s metropolitan area, amongst other positions. In terms of urban regulations, he has participated in the publication of several documents, including DistritoTec’s Partial Development Plan.

For the case of this interview, if well some of the topics were generally discussed for both municipalities, others were specifically addressed to DistritoTec’s polygon. In terms of the first gap, of the inadequate law enforcement and monitoring, Aguilar pointed out three main aspects. Firstly, there is a lack of transparency in some of the government functions, which opens the opportunity for corrupt practices. Secondly, the municipalities are commonly too saturated with the day to day activities, that they are not able to monitor all building activities or to develop long term visions or plans. And thirdly, most municipalities don’t have enough economic resources, which is also one reason for the lack implementation of partial development plans.

With regard to the partial plans, on one side, politicians at the municipal level have short 3-year administrations and either don’t want to commit or to take risks approving plans that might not be socially accepted or simply don’t have enough time to assure some degree of continuity. On the other side, since most of the federal funds are labeled for projects and not for planning, municipalities have had to depend on the private sector to pay for the development of partial plans, which as a result, end up promoting some private interests. In the case of the DistritoTec, it was thanks to the support of the ITESM that the partial plan was developed and approved.

For what concerns the second gap, the lack of high-rise-oriented regulations or plans, and because DistritoTec’s Partial Plan has already included some regulations which are covering these aspects, Aguilar mainly addressed three main topics. With regard to the definition of the volumetric and public space aspects of the high-rise projects, during the different meetings that the ITESM had with the neighborhood associations of the DistritoTec polygon they identified that while neighbors opposed an increase in building heights in general for the potential impacts on their residential areas, they favored an increase in residential densities, since they could be able to subdivide their houses and rent the extra housing units to students or young professionals. As these aspects were included in the guidelines and the FBC of the plan, one of the biggest challenges has been the acceptance of this new pedestrian-friendly type of building guideline by the real estate market. As a car-oriented city, among the aspects most criticized by the developers and are the obligation of having commercial or active land-uses on the ground floors and no parking lots in front of their properties.

¹² Translated by the author. Original: Agencia para la Planeación de Desarrollo Urbano de Nuevo León

¹³ Translated by the author. Original: Autoridad del Espacio Público del Gobierno de la Ciudad de México.

¹⁴ Translated by the author. Original: Autoridad del Centro Histórico de la Ciudad de México.

The second topic was the public participation in high-rise development, where Aguilar suggested that since the role of the authority is to safeguard the interests of both the neighbors and the developers, public participation should be focused on the definition of the criteria or guidelines of the development plan, phase where all actors are invited to represent their particular interests. Once an agreement is reached and a plan is published, it is once again a matter of transparency - where and how are the resources used-, monitoring and enforcement. When asked about the lack of predictability that unlimited height and FAR are currently producing to all actors in the city, Aguilar mentioned the importance of defining a height threshold in which further possibilities of public participation or evaluation could be adapted.

And for the third topic, the definition of the location strategy of high-rise buildings either along corridors or by clusters, in the DistritoTec both strategies have been considered simultaneously for the next reasons. Leaving aside the ITESM campus, high-rise clusters have been taken into account in the part of the district where the size of the plot allowed for the development of bigger projects, since plot fragmentation in other parts of the district complicates the development of a desired type of density. Large plots with current light industry uses were the ideal for these locations because they have the potential to be redeveloped into mixed-use areas. With regard to the corridors, and considering that the DistritoTec focuses on a local scale with several single-family residential areas, the complete streets were defined as a strategy to concentrate the efforts in specific corridors which allow to connect different points, to permeate the benefits throughout the district and to promote mixed-uses in places which help preserve residential areas from being converted into commercial uses. Therefore, it could be said that in this case both high-rise strategies were envisioned to complement each other for the interest of both the existing and the expected residents and users.

In terms of the third gap, the lack of incentivizing instruments, Aguilar briefly indicated that perhaps one of the biggest challenges for the implementation of instruments like the conditioned density in Mexico is the consistency with the regulations at the different government levels and branches to avoid the filing of protective claims by interested actors. In the case of DistritoTec's instrument, it hasn't been implemented yet because it first needs to be included and specified in the state's urban development and treasury regulations. If there are not clearly defined procedures and rules or if it is left to the discretion of the municipality, the lack of transparency might once again endorse corruption. Based on his experience working in Mexico City where some instruments like TDR are already being implemented, Aguilar mentions that some of their early challenges faced by the city were how to define the value of the extra development rights that were previously not priced or how to determine particular measures like number of trees to be planted that would be required to the developers as a public space contribution. Lastly, he emphasized the importance of conducting a market research when exploring instruments and alternatives of this kind, because otherwise there is also the risk of enacting regulations that make the possible development incentives too expensive for the market, discouraging the real estate market from investing in a particular district.

Additionally, when talking about the incentivizing mechanisms, if well according to Aguilar, the new General Law of Human Settlements, Land-use Planning and Urban Development has already introduced the possibility to increase the residential density to 300 units/ha, since it doesn't specify in which areas, through which instruments, or if it's going to be granted for free or under

certain conditions, it still leaves open several of their most fundamental implementation aspects for the states to further regulate.

To conclude, and when asked about his expectations of future high-rise development trends for Monterrey and SPGG, Aguilar believes that in the coming decades the central areas with existing infrastructures and services will most likely start to densify. Their level of success will be directly related to the involvement of the municipalities in defining ways to make the developers be part of the mitigation of the urban impacts they contribute to create. In the end, one of the main elements will be transparency, because it is this which creates trust between the authorities and the real estate market to ensure that the contributions provided by the private sector will be directly reinvested in their immediate context and for the benefit of their communities.

6.3.3 Interview with Patricio Garza Garza

Patricio Garza Garza is the President, CEO and founder of Capital Natural, a company which develops strategies for a better management of the environment, for a systemic real estate development, for investment funds and for businesses who seek to enhance their communities. With studies in the fields of business administration and architecture Garza is also the founder of One Development Group, Grupo Metro Aluminio, Property Development Company Vertex among other companies. He is a council member of different companies and institutions, including the Real Estate and Construction boards of the ITESM. As President and CEO of Capital Natural, he coordinates and administers the development of the Arboleda project, as well as the implementation and consolidation of the Valle del Campestre district, a polygon in which he has supported the implementation of a partial development plan.

For the case of this interview, if well some of the topics were generally discussed for both municipalities, others were specifically addressed to Valle del Campestre district. With regard to Monterrey's and SPGG's first gap, of the inadequate law enforcement and monitoring, Garza pointed out four main aspects. The first one is regarding the autonomy of the planning institutes, in which he suggests that since granting building permits and licenses is one of the main income sources for the municipalities, local governments want to control them and not to give them complete independence. This control could be related then to either a matter of power or as an opportunity to cover for corrupt practices. As a result, he considers that the cities in Monterrey's metropolitan area don't have a unified long-term vision.

The second important aspect of this topic is the lack of clarity or the vagueness of the existing regulations and rules, which not only create uncertainty for the developers but also difficult law enforcement for the municipalities. As such, this environment, once again, fosters corruption. For that matter, he believes that harsh but flexible governments are required not only to enforce the existing regulations but also to negotiate ways to achieve the desired public benefits.

In this regard, and as a third aspect, he considers that the creation of legally-binding contracts between the city and the developers could be a good idea to solve this issue. On one hand, because it forces both actors to set things clear and assign responsibilities. On the other hand, because it also defines obligations and clear benefits for both sides. Ultimately, what an instrument of this type could provide is accountability for both parties.

As a fourth and last aspect of this gap, and regarding the partial plans, Garza describes the lack of political will as one of the main obstacles towards their implementation. In the case of the DistritoTec Partial Plan, where he was also involved as a council member, he considers that the plan was approved in spite of the local government, which showed a lack of knowledge and only presented legal obstacles. For what concerns the partial plan for the Valle del Campestre district, a similar scenario has prevented this regulation from happening, with a lack of interest from the local authorities and a slow process.

In terms of the second gap, the lack of high-rise-oriented regulations or plans, Garza believes that in Monterrey's metropolitan area the lack of a long-term vision is reflected in a complete unawareness of the problems and their possible solutions, which have resulted in a rejection of density. As a counselor of Nuevo León's Strategic Planning Council, he argues that he hasn't been able to convince other experts to address the issues of urban development, mobility and environment in a parallel or a trans-sectoral way. In addition, the private sector who is also on some occasions unaware of their negative urban impacts, is not forced to contribute or doesn't have any incentives to see beyond its own interests, keeps building or asking for building permits in places where they shouldn't. In this regard, Garza believes that the existence of good examples in the city that other developers could try to follow, or the creation of development incentives rather than fiscal ones, could promote a better type of urban growth.

As an example of the former is the limitation of the residential density to 150 units/ha in Nuevo León and the existing parking requirements, with which he disagrees. As a developer, he knows that if uses the complete FAR of a project and follows the current land-use and parking regulations, he would end up having to use much of his FAR in commercial and office uses, creating bigger traffic problems to an existing area. In this sense, half of this potential total number of new cars could disappear with the exact same FAR just by increasing the number of housing units to be included in a project. Housing units which he claims not necessarily mean more profit for the developers, especially because the current citizens are still not used to living in apartments and that the square meter of housing usually is sold cheaper than the square meter of commercial uses.

Related to this point, for what concerns the third gap, the lack of incentivizing instruments, Garza recognizes that instruments of this kind are great ideas to be considered in the case of Monterrey, provided that they are part of the city's comprehensive long-term vision. As it was previously mentioned, new regulations would have to be clear and transparent, or they would only create more opportunities for corrupt practices. In terms of the existing obligations, like the transferred areas to the municipality of the urban complexes, he believes there is great potential for improvement because these types of areas usually end up being residual or unused spaces. As a developer, he assures that the private sector in Monterrey's metropolitan area can contribute a lot to the mitigation of the urban impacts of their projects. However, for them to do that, not only the implementation of incentivizing mechanisms is necessary but also the creation of clear rules that guarantee and protect their land ownership.

To conclude, and when asked about his expectations of future high-rise development trends for Monterrey and SPGG, Garza considers that the global tendency is towards the development of clusters or sub-centers in the city. Clusters in which all different activities complement each other,

where there is less need of displacement, where all the elements are accessible and interconnected, and above all, that are designed based on the human scale and not the automobile.

6.4 Conclusion

In general terms, in spite the fact that some of the limitations of this research didn't allow the experts to describe in more detail certain aspects of the topics addressed, the results of the interviews contributed in the clarification and validation of most of the gaps previously identified. The semi-structured interviews also provided additional information of each of the case study cities.

For the case of Da Nang, even if the interviewees did not provide a critical perspective on the effectiveness of the existing regulations, they further clarified different aspects including the requirements for the location of high-rise buildings, the evaluation process of high-rise proposals, the process of issuing land use right certificates, the focus of the built-transfer system in infrastructure development, the confirmation of the lack of incentivizing instruments, the existing types of public participation, as well as the future high-rise development trends towards the consolidation of the tourism industry at the expense of the residential areas.

In the case of Frankfurt am Main, and since the city is currently in the process of defining the new high-rise development plan, the interviews were not able to reflect the final aspects what will be incorporated into the new regulations but rather the concepts that the City Planning Department is taking into consideration. In this regard, the results showed that if well some of the gaps are starting to be addressed, as the housing affordability and provision of sufficient open spaces, the real estate speculation is perhaps one aspect that goes beyond what the high-rise regulations can address.

And lastly, for the cases of Monterrey and SPGG, the interviewees mentioned two issues which could also be considered beyond the reach of the high-rise-related regulations, which are the lack of political will and corruption. In this regard, any efforts to regulate high-rise buildings under these two conditions will most likely not reach its expected outcome. Another aspect mentioned in these results was the lack of authority, capacity, expertise and instruments with which planning institutes in Mexico are currently operating. However, the recent creation of several high-rise related regulations, laws and plans, show that the Mexican urban regulation system is starting to go through a sophistication process, which seems to be concentrated in the consolidation of sub-centers or clusters to achieve better urban results.

In the next chapter, the analysis of the results obtained of the four stages of the data collection will be taken into consideration for the generation of several policy recommendations for the case study cities.

7 Case Study Assessment and Recommendations

Once the four stages of the data collection process have been conducted, the current chapter will provide an assessment of each of the three case study cities to be able to generate some policy recommendations. For doing so, this chapter will be divided into four sections. While the first section will assess several general aspects of the results of the three case study cities, sections two, three and four will provide policy recommendations for each of gaps of the cities.

7.1 General Assessment

As it was previously mentioned, one of the first aspects to take into consideration when analyzing high-rise regulations systems, are the broader issues which can't be fully solved only by implementing urban planning. These issues which act as general limitations include real estate speculation, corruption and lack of political will. In this regard, the research showed that for a successful high-rise development, cities should have the next three fundamental aspects, adequate infrastructure, the political will to address this issue and instruments or regulations to enforce it. In the case of Da Nang, the city showed the political will to address different issues, including sustainable development. However, the existing infrastructure systems and high-rise regulations are still insufficient or under development. In the cases of Monterrey and SPGG, infrastructure systems if well disconnected in some cases, like with massive public transportation, are already existing. Nonetheless, because of the lack of political will and high-rise-oriented regulations, the real estate market is the leading actor driving high-rise in these cities. Finally, in the case of Frankfurt am Main, its functional high-rise regulation and development systems could be attributed to the existence of all three aspects, adequate infrastructure, the political will to participate in this issue and instruments or regulations to enforce it.

When analyzing the gaps that each of the three case study cities presented, it was evident that even if Da Nang and Monterrey could be said to be in different high-rise development phases, both cities shared most of the same high-rise related gaps. Additionally, it was also evident that the only gap which was shared by all three case study cities, and perhaps one of the biggest areas of opportunity around the world, was the lack of incentivizing instruments for high-rise development. For that matter, if well for a city like Frankfurt, which fulfills all of the three fundamental aspects previously mentioned, the lack of incentivizing instruments is not necessarily translated into great urban impacts because of the incorporation of the amenity provision as part of the building permit negotiations, for cities with weaker instruments or regulation systems, this could encompass greater consequences for their citizens' quality of living.

One last general aspect which is worth mentioning is the counterintuitive argument that the city which presented the most detailed high-rise regulation system, which is Frankfurt, was the one with the biggest number of gaps identified. In this regard, the research indicated that as a city further specifies its high-rise-related regulations, it is possible to evaluate them in a greater degree of detail, and thus, to find more specific gaps or areas of improvement. Otherwise, like in the cases of Da Nang and Monterrey, most of the aspects are integrated into a greater gap, which is the lack of high-rise regulations. Nonetheless, and taking into consideration that most of the cities are going through this high-rise development process, it is of fundamental importance for them to prevent and regulate in advance issues like affordability and aging of high-rise buildings which they already know they will most likely face in a foreseen future.

7.2 Recommendations for Da Nang

For that concerns the first gap, inadequate law enforcement and monitoring of the existing regulations, Vietnam's land use right system can play a more active role in guarantying better high-rise developments. In this sense, more than just evaluating the accordance to the master and zoning plans, as well as leaving the responsibility of detailed planning to the investor, the DONRE could define, like in the case of Hong Kong, a series of location, volumetric, public space and amenity conditions to the investor, in order to get the certificate. In this sense, the land use right certificate will be more linked to the future building that it will host than to broader general aspects. If well this could pose some challenges for the residential certificates which have already been granted, it could be a great opportunity for the new certificates that the touristic industry is bidding to get from the government. For the case of the residential certificates, clearer high-rise regulations could give more certainty and predictability for the owners, as it will be further explained.

With regard to the second gap, the lack of specialized high-rise-oriented regulations or plans, three general recommendations can be given. In terms of defining the location of the buildings, the city should develop a strategic high-rise location plan, which is linked to both the land use right system and the update of the Decision No.47/2012/QD-UBND for volumetric and location aspects of buildings. This strategic plan, should then focus on the creation and consolidation of high-rise clusters, including and defining the two new CBD recommended by the reports. This cluster approach could then be a key strategy for developing infrastructure and mobility systems more efficiently. Additionally, this strategic plan should also include the natural and social aspects of locating high-rise buildings. On one side, the touristic and commercial buildings along the Han River and the eastern coast should be arranged in a way in which they preserve the coastal environments and prevents the creation of a wall effect for air flows, illumination and views towards the city's natural and historical landmarks. On the other side, the prevention of this wall effect will also be linked to the importance of ensuring access to the local residents to the natural recreational areas, like river and coastal parks, so that they are not privatized for the exclusive use of the tourism industry.

The second recommendation for this gap is the definition of clear high-rise volumetric and public space rules for urban development, in which the Decision No.47/2012/QD-UBND is of vital importance. Within this decision or in further decisions, aspects of maximum FAR, number of floors, setbacks, maximum width or floor plate size, coverage area, open space and parking requirements must be clearly specified for the different parts of the city. Furthermore, in addition to relating these aspects to the location of the building, this regulation should also incorporate aspects of mixing of uses, to promote a more compact and efficient type of development.

The third recommendation for this gap is related to the public participation in high-rise development. It is recommended that particularly for the development of touristic projects, that the city incorporates public participation for the evaluation of individual projects of particular scale. The former, with the objective of integrating rather than displacing the local residents into the urban or economic benefits of the tourism industry, promoting a socially sustainable type of tourism. By conducting meetings or public consultation processes, residents could either comment if they consider that a project is affecting them in any way or vote and decide on the

type of amenities like parks or social infrastructures that the developer could contribute with to mitigate its urban impacts.

In terms of the third gap, the lack of incentivizing instruments, the recommendation of this research is towards the implementation of incentive zoning and TIF. For a city which is in the process of developing its infrastructure systems, the land use right or building permit requirements for investors can contribute to the development of the immediate infrastructures but might not be enough to solve greater infrastructural needs. In this sense, the implementation of incentive zoning and TIF, combined with a clear strategic high-rise location plan, an updated land use right system and clear volumetric regulations, could directly contribute to the planning and construction of long-term infrastructure projects or systems, addressing the fourth gap identified. Table 14 summarizes the recommendations done for the city of Da Nang.

Table 14: Policy Recommendations for Da Nang.

High-rise Related Gap Identified	Recommendation
Inadequate law enforcement and monitoring of the existing regulations	<ul style="list-style-type: none"> - Use of the land use right system for the establishment of conditions for the issuance of the certificate - Clear definition of the high-rise regulations
Lack of specialized high-rise-oriented regulations or plans	<ul style="list-style-type: none"> - Development of a strategic high-rise location plan which includes the definition of the two new CBD, a cluster approach, costal preservation and the prevention of the wall effect - Clear definition of the high-rise regulations including aspects of volume, public space and mixing of uses - Public participation for evaluating individual high-rise proposal of certain scale, particularly in the touristic sector.
Lack of incentivizing instruments	<ul style="list-style-type: none"> - Implementation of incentive zoning and TIF - Integration with land use right system and the strategic high-rise location plan.
Lack of an adequate infrastructure system for high-rise development	<ul style="list-style-type: none"> - Implementation of incentive zoning and TIF - Integration with land use right system and the strategic high-rise location plan.

Elaborated by the author.

7.3 Recommendations for Frankfurt am Main

For a city which has been improving for more than five decades its high-rise-related strategies or regulations, giving policy recommendations on gaps which haven't been identified before or which aren't already been addressed it's quite complicated. As it was previously mentioned, the interview with the City Planning Department already revealed that some of the aspects identified as gaps in this research like housing affordability and the provision of sufficient open spaces are among the concepts taken into consideration to be integrated into the new update of the *Hochhausentwicklungsplan*. Nonetheless, how will these aspects be included in the new plan is yet to be seen.

In this regard, for the case of Frankfurt am Main, more than only giving individual recommendations for each one of the identified gaps, the recommended approach moves towards the integration of the existing policies and the collaboration between the different city departments. For that matter, this research identified only one policy recommendation which could contribute towards this integration, which is the implementation of incentive zoning.

If well, the *Hochhausentwicklungsplan* clearly defines the strategies and obligations which the high-rise projects must fulfill to get a building permit, there seems to be an area of opportunity for the buildings with a height between 22 and 60 meters, which are not considered significantly tall. As it was previously described in the New York City example, incentive zoning does not only apply to the construction of new projects, but also to the refurbishment of existing ones. For that matter, an opportunity for Frankfurt could be the adaptation of New York's Designated Areas program.

As explained in chapter 4, this program, allows existing residential developments in several specially selected areas in the city to increase their maximum buildability by 33% in exchange for the provision of at least 20% of the original floor area to affordable housing units. For the case of Frankfurt, and combined with other existing programs such as the housing Modernization Program¹⁵, the city could condition the granting of additional building potential to several possibilities. On the first place, and based on aspects such as the air flows and shadow projection in the city, Frankfurt could determine which areas in the city could be subject to participate in this program, and even include them in the high-rise development plan as strategic recommendations. Then, if a developer is interested in participating, the city could determine or let the neighbors decide between a series of amenities which the developer could provide in exchange for a buildability bonus. These amenities could include affordable housing units according to the existing or new programs, publically accessible spaces either on the ground floors or the rooftops, artistic, visual and performing arts spaces, local fresh food stores connected to other urban agriculture initiatives, etcetera. It is important to highlight, that negotiations of this kind between the city and the developers would need to take into consideration certain measures to prevent the displacement of the existing tenants. As a result, existing buildings of up to six stories could end up having between eight to nine stories. Furthermore, this program could also represent an opportunity for the city to promote the refurbishment of existing buildings in terms of energy efficiency.

¹⁵ In German: *Modernisierungsprogramm*

In this regard, new affordable housing units and publically accessible open spaces could be provided in the city regardless of what the negotiations with the developers for the building permits can achieve. Therefore, Frankfurt’s gaps two, three and four identified in this research could be addressed simultaneously. In terms of the interdepartmental coordination and to improve the aspect of affordability, the adaptation of the Designated Areas Program could also represent an opportunity to improve the coordination and collaboration between the city departments responsible for the acquisition of new properties and the City Planning Department.

For what concerns the fifth gap, the lack of strategies for the existing aging high-rise buildings, this research recommends the elaboration of a high-rise building heritage catalog. In collaboration with Hesse’s heritage department, the city could define a series of criteria for selecting high-rise projects as protected buildings to integrate a heritage catalog which is periodically updated. While the buildings selected as heritage architecture would be required to follow certain regulations in case of an intervention or refurbishment project, the buildings not considered within this category could then be listed as potential high-rise projects to be replaced in the future.

And lastly, for what concerns Frankfurt’s first gap of real estate speculation over specific plots, this research could not provide any policy recommendation. Table 15 summarizes the recommendations done for the city of Frankfurt am Main.

Table 15: Policy Recommendations for Frankfurt am Main.

High-rise Related Gap Identified	Recommendation
Real estate speculation over specific plots	- No policy recommendations identified
Provision of sufficient open or publically accessible spaces Housing Affordability Lack of incentivizing instruments	- Implementation of incentive zoning through the adaptation of the Designated Areas program. For buildings lower than 60 meters in specifically selected areas in the city offer a buildable area bonus in exchange of the provision of public amenities such as affordable housing units, publically accesible spaces on the ground floors and rooftops, visual and performing arts spaces, local fresh food stores, etc. Oportunity for promoting the refurbishment of existing buildings in terms of energy efficiency
Lack of strategies for the existing aging high-rise buildings	- Elaboration of a high-rise building heritage catalog with clear selection criteria which is periodically updated

Elaborated by the author.

7.4 Recommendations for Monterrey and SPGG

For what concerns the first gap, the inadequate law enforcement and monitoring of the existing regulations, if well no regulation can disappear the problem of corruption from one day to the other, the recommendation of this research is towards increasing the existing high-rise evaluation requirements to be able to take more informed decisions prior the granting of building permits. For a metropolitan area which is still not used to living in high-rise buildings, regulations should promote the development of a lower type of high-rise buildings which can contribute to the creation of compact and pedestrian-oriented type of communities. In this regard, the evaluation requirements for granting a building permit could gradually increase along with the height of the proposal to include aspects such as energy efficiency, the need for an architecture competition, design reviews by experts and the community, market feasibility studies, among others. The message should be clear, the higher the building, the better it should be. Additionally, and for promoting accountability and predictability, it is also recommended that more than just a request of a building permit developers should sign with the city a legally-binding agreement in which the terms, conditions, obligations and benefits negotiated are clearly stated. For doing so, the existing regulations for Nuevo León's public-private-partnerships could be taken as a reference.

With regard to the second gap, the lack of specialized high-rise-oriented regulations or plans, the recommendations address mainly three aspects. Firstly, in terms of the relationship between high-rise buildings and public transportation, the existing urban development plans should base the maximum allowed density of areas based on the accessibility to the existing or future public transport offer. For doing so, the cities could take London's Public Transport Accessibility Level map as a reference, in which on a scale from one to six based on estimations and statistics of the distance to a transport hub –bus or underground- and to the connecting time between points, the whole city is divided into quadrants which determine the appropriate density that new proposals could get.

Secondly, in terms of the maximum heights of the high-rise projects and the views towards the natural landmarks of the city, which are the mountains, this research recommends the development of View Protection Guidelines. In these guidelines, the maximum heights of the buildings could be restricted by a series of view cones which protect several important views from different points of the city. Like in the case of Vancouver, citizens should be incorporated in the definition of these protection corridors.

And thirdly, to both promote the development of a better public transport system and reduce the degree of car dependency, it is recommended that for the land-use regulations a reduction of the minimum parking requirements is implemented. For that matter, Mexico City's recent parking regulation represents a good example of how to do so, especially concerning the payment of fees of additional parking lots, destined for the improvement of the public transportation system. Another set of regulations which could be taken into consideration as a reference is New York City's parking reduction policies, which considers the size of the plot and the socioeconomic level or its users.

And lastly, for what concerns the third and fourth gaps identified, the lack of incentivizing instruments and the abandonment or deterioration of historical high-rise buildings, this research recommends the implementation of incentivizing instruments. Especially for the case of

Monterrey's central district, the implementation of a TDR system can help preserve lower heritage buildings by exchanging a certain amount of their development potential in return of resources for their maintenance and refurbishment, aiming at giving these buildings a public use for the benefit of the whole community. Among the regulations of this instrument, and since the heritage projects would be interacting with the new high-rise buildings, height graduation requirements should be incorporated particularly for the plots in direct contact with the heritage building.

On the other hand, and as a way of obtaining both additional residential density or FAR if it is not assigned as unlimited, incentive zoning could be implemented in different districts of the metropolitan area as a way of consolidating high-rise clusters. In this regard, if well the definition of the amenities could be left open to be negotiated between the city and the developers, this research recommends for the particular cases of Monterrey and SPGG to specially focus on the improvement of the public transport system, the creation of open spaces on ground floors and upper floors and the provision of cultural facilities like visual and performing arts spaces. It is also recommended that Monterrey reviews and perhaps incorporates their existing TOD regulations into the incentivizing policies, focusing on limiting residential density to the maximum CUS rather than granting unlimited residential density. Another aspect which perhaps could to be linked with this set of policies is the requirement of the transferred areas of urban complexes, aiming at developing better public amenities. And lastly, considering the fourth gap, incentive zoning could also be applied for offering density bonus in exchange of the preservation or refurbishment of existing high-rise buildings in current state of abandonment.

In a metropolitan area where corruption and an inadequate law enforcement have deeply affected the citizens' trust in the local government and in the high-rise development process, it is of fundamental importance to include and promote public participation as a way of restoring this trust and improving both the developers' and the government's accountability. In this regard, their inclusion in the definition of the View Protection Guidelines, in the evaluation of individual proposals of a certain height, in the definition of the desired amenities to be provided by the developers in the case of incentive zoning and in their access to open spaces on rooftops and upper floors, are just some of the ways through which regulation could contribute to change their perspective on high-rise buildings while improving their quality of living. Table 16 summarizes the recommendations done for the cities of Monterrey and SPGG.

After the recommendations for the three case study cities have been presented, in the next chapter, the general conclusions of this research project will be addressed.

High-rise Development Regulations

Table 16: Policy Recommendations for Monterrey and SPGG.

High-rise Related Gap Identified	Recommendation
<p>Inadequate law enforcement and monitoring of the existing regulations</p>	<ul style="list-style-type: none"> - Gradual increase in existing high-rise evaluation requirements according to height: energy efficiency, architecture competitions, design reviews and market feasibility studies - Creation of a legally binding agreement between the city and the developer - Inclusion of public participation in the definition of View Protection Guidelines, in the evaluation of individual proposals of certain height, in the definition of the amenities of incentive zoning, in their public access to spaces in upper floors
<p>Lack of specialized high-rise-oriented regulations or plans</p>	<ul style="list-style-type: none"> - Relating the maximum allowed density with a Public Transport Accesibility Level map - Development of View Protection Guidelines - Reduction of minimum parking requirements and inclusion of additional parking lot fees for improving public transport
<p>Lack of incentivizing instruments</p> <p>Lack of an adequate infrastructure system for high-rise development</p>	<ul style="list-style-type: none"> - Implementation of a TDR system for Monterrey’s central district - Implementation of incentive zoning through extra residential density and FAR. Emphasis on the improvement of public transportation, the provision of open and cultural spaces, and on the refurbishment of abandoned high-rise buildings - Integration of Monterrey’s TOD policies with incentive zoning regulations

Elaborated by the author.

8 Conclusion

In a world which is experiencing an unprecedented urban growth, the compact city model with denser housing typologies has become an alternative for creating mixed, intense, and diverse urban environments, which contribute to the development of more efficient urban systems. More than being just a matter of tallness or bulkiness, higher residential densities can directly contribute to the reduction of the need of displacement in cities, thus, improving the citizens' quality of living. In this regard, from all the different urban forms which can increase residential density high-rise buildings have particular qualities which differentiate them from the rest. On one side, they have the potential to produce some additional value for both private and public interests. On the other side, if left unregulated they can generate a series of functional, contextual, environmental, safety, economic and social issues.

Taking this into consideration, and addressing the problem of the lack of comprehensive high-rise regulations in the existing planning systems, the main hypothesis of this research was that it is not the typology itself which causes these negative urban impacts, but rather its lack of regulation and planning. For that matter, and through the use of a qualitative applied exploratory and descriptive research methodologies, the current work tried to answer two main research questions. Firstly, which are the existing high-rise regulations that are being implemented in the most representative high-rise cities? And secondly, is the implementation of these regulations related to a reduction in the negative urban impacts commonly associated with high-rise buildings?

With regard to the first question, the research was able to identify a series of regulations in different reference cities around the world which were then integrated into three main categories, for developing, for incentivizing and for implementing and monitoring high-rise buildings. The first category groups all the regulations regarding the definition of the location, form, volume, land-uses and relationship with the ground floor of high-rise buildings. The second category integrated the regulations regarding three main instruments, transfer of development rights, incentive zoning and tax increment financing, including the types of amenities which are typically requested to the developers in exchange for additional development potential. And lastly, the third category incorporated regulations regarding types of public participation, evaluation processes and requirements, as well as monitoring and enforcement mechanisms.

One of the key findings of this first research question was that the different context-based variations of the reference city review indicated that there is no ideal or universal high-rise regulation system. For that matter, when evaluating a system in a particular context, the focus should be on determining how comprehensive this system is, this means, if it includes regulations not only for controlling the density and location of a building but also for incentivizing, evaluating, monitoring and enforcing their construction.

Once these regulations were identified, explained and categorized, and to be able to answer the second research question, a case study analysis of the cities of Da Nang, in Vietnam, Frankfurt am Main, in Germany, and Monterrey, in Mexico was conducted. This research, which included a general overview of the cities, a historical analysis of their high-rise development process, a regulation analysis and a description of their future projects to be developed, identified for each city a series of high-rise-related gaps or problems, which were later validated through a series of

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expert interviews. Examples of these gaps included the inadequate monitoring and enforcement of existing regulations, the lack of specific high-rise-oriented regulations, the provision of sufficient open or publically accessible spaces, housing affordability, real estate speculation over specific plots, the abandonment or lack of strategies for aging or historical high-rise buildings, amongst others. For that matter, the lack of incentivizing instruments was the only gap which was present in all three case study cities, being identified and perhaps one of the biggest areas of opportunity around the world.

Based on the feedback and validation obtained by the experts of each case study city and taking into consideration the policies identified through the literature review, a series of policy recommendations were given to the cities, to address the identified gaps. In this regard, through the generation of these recommendations which could potentially improve these cities' conditions and based on the experiences of the other reference cities, this research was able to identify a relationship between the implementation of high-rise-related regulations and the reduction in the negative urban impacts commonly associated with high-rise buildings, therefore, positively answering the second research question.

Examples of the former include the integration of transport accessibility and maximum allowed densities to define adequate high-rise locations, the definition of view protection guidelines to restrict heights and protect natural or historical landmarks, the granting of additional density potential in exchange for improving the existing infrastructure systems or providing affordable housing units, the inclusion of public participation in the evaluation of individual proposals to improve the citizens' trust in the system and the creation of legally-binding agreements or land use right certificates to increase the monitoring and enforcement capacities, amongst other.

In this regard, the importance of these findings lies in the fact that it identifies an existing gap in most of the cities' urban development plans or policies. As cities keep growing, and if they want to develop sustainably, they need to define strategies to plan the way in which they want to grow and allocate future inhabitants, otherwise, and if this responsibility is left to the real estate market, there is a serious risk of suffering from the consequences of gentrification, urban sprawl and overcrowding. For that matter, by implementing a series of regulations and guidelines for developing typologies which increase residential densities by addressing the third dimension, it could be possible not only to prevent a series of negative urban impacts but also to benefit the community from the additional value produced by high-rise buildings. It is important to highlight, that since high-rise buildings can both positively and negatively affect their surroundings as a consequence of their scale if a city doesn't regulate the way in which these building can contribute to their neighborhoods, it might be missing a unique opportunity for improving their quality of living.

Additionally, for the particular situation of the three case study cities selected, the findings of this research were also relevant because they provided context-based alternatives for addressing the high-rise regulation gaps previously identified.

This research, however, was also faced with a series of limitations. In terms of the methodology and for being this a project in which several reference and case study cities from different parts of the world were addressed, some parts of the research had to be conducted remotely. Other limitations included a language barrier when reviewing original sources and different levels of

openness and transparency because of the diverse socio-cultural and political backgrounds of the cities. For what concerns the availability of information, and since high-rise development is regularly an aspect not included in the city's urban regulations, in some cases, there was not enough documentation or official sources addressing this issue. In terms of the results obtained, being this research project conducted remotely, it was complicated to evaluate the degree of effectiveness of the policies identified in the case study cities. There were, however, three main aspects which were identified as impossible to be fully solved only by implementing high-rise regulations, which include the real estate speculation, corruption and the lack of political will to address this issue.

If well these limitations could have conditioned the results obtained, they also contributed to identifying a series of opportunities for developing further research projects. In the first place, an evaluation of the effectiveness of the high-rise development policies identified could be conducted. Secondly, and even if the scope of this project was not to compare the three different case study cities with each other, the fact that they appeared to be in different high-rise development stages opened the possibility for analyzing and further defining the particular strengths, weaknesses, opportunities and threats that each one of these stages has. For that matter, aspects such as the existence or not of a minimum urban scale for the implementation of the incentivizing instruments could contribute to a better understanding of high-rise development policies. And lastly, a deeper analysis of the three broader problems affecting high-rise regulations such as real estate speculation, corruption and the lack of political will, could also be further explored.

It the end, more than being a matter of promoting one housing typology over the others, developing a sustainable growth strategy for a city is about creating mixed, intense, and diverse urban environments which improve both the existing and the future citizens' quality of living. With proper infrastructure systems, adequate high-rise regulations or plans and the political will to enforce them, cities can set the basis for a better urban future. In this regard, and since the high-rise building has already become a globalized typology, the exchange of experiences and knowledge, as well as the development of capacities between different cities around the world, will gain fundamental importance as the world's population keeps expanding. By doing this, it will be possible to find alternatives to grow our cities in a more organized, efficient and humane way.

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