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Constructing Tall Buildings in China: With a Focus on Shanghai

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Abstract This paper examines China's rapid shift from low-rise to high-rise urban development, focusing on Shanghai as a case study. It provides a detailed analysis of the rapid vertical developments over the past five decades, highlighting gradual and sudden tall building changes. The study also surveys tall building development in the ten "tallest cities" across China, including Hong Kong, Shenzhen, Guangzhou, Shanghai, Wuhan, Chongqing, Chengdu, Shenyang, Hangzhou, and Nanning, while listing the tallest ten buildings in each city. The focus is on the drivers behind these towering structures: globalization, an economic powerhouse, and finance center, urbanization and population density, architectural innovation and ambition, competition and prestige, land availability and utilization, government support and planning, and tourism. The paper critically examines the sustainability of this trend in light of new Chinese policies restricting the construction of high-rise buildings exceeding 500m and 250m in smaller cities due to safety and security concerns. This prompts a reflection on the long-term viability and implications of the predominantly high-rise trajectory in urban development.

Keywords Vertical Development, Urbanization, Government Support, New Chinese Policies, Tallest Chinese Cities, Placemaking, Sustainability

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1. Introduction

The urban expanse of China, unfolding in a mesmerizing evolution spanning the past five decades, is a captivating testament to the nation's remarkable journey from low-rise to high-rise urban development. This transformation, marked by the interplay of historical legacies and contemporary ambitions, is a multifaceted narrative embedded in its cities' skylines. In embarking on a comprehensive exploration, this paper places Shanghai at the forefront, recognizing it as a symbolic microcosm that encapsulates the intricate dynamics propelling China into the soaring realms of urban architecture. Shanghai, a city synonymous with progress, economic prowess, and modernity, serves as a focal point for unraveling the layers of complexity inherent in China's vertical ascent. Through a detailed examination of Shanghai's architectural metamorphosis, this study seeks to decipher the driving forces, cultural nuances, and socio-economic factors that have collectively contributed to the nation's rise into the towering realms of contemporary urbanity. The intricate dance between tradition and modernity, reflected in Shanghai's skyline, becomes a lens to comprehend the broader narrative of China's urban evolution (Li & Wang, 2022; Shi & Chen, 2016).

The study ventures into a comprehensive exploration, casting a panoramic gaze across the ten tallest cities in China, each serving as a distinctive chapter in the nation's transformative journey toward verticality. Delving into the urban narratives of Hong Kong, Shenzhen, Guangzhou, Shanghai, Wuhan, Chongqing, Chengdu, Shenyang, Hangzhou, and Nanning, the study seeks to unravel the multifaceted stories embedded in their evolving skylines. These cities' unique socio-economic contexts and urban development trajectories contribute to the broader tapestry of China's architectural evolution. As the lens widens to encompass each city's geographical diversity and cultural richness, their narratives unfold, depicting the dynamic interplay between tradition and modernity. The meticulous listing of each city's tallest ten buildings is a visual tableau, encapsulating the ambitious aspirations and distinctive architectural landscapes that define these urban centers. Through this expansive examination, the study aims to illuminate the diverse threads woven into the fabric of China's vertical development, offering a nuanced understanding of the complex factors shaping the nation's

[1]The primary data source for this article is the Council on Tall Buildings and Urban Habitat (CTBUH). All tables presented herein are meticulously compiled by the author, drawing from the comprehensive CTBUH database. For further clarity on the definitions of tall buildings, refer to Appendix A.

urban identity (Abbinnett, 2003; Wang, et al., 2019).

To unravel the complex tapestry behind the development of towering structures in China, this investigation meticulously identifies many critical influencers that collectively shape the nation's evolving urban landscapes. The pervasive force of globalization is at the forefront, intertwining China's architectural ambitions with international trends and influences (Habermas, 2006). The city's role as an economic powerhouse and finance center emerges as a pivotal driver, with towering structures serving as symbols of economic might and financial prowess. Urbanization and population density dynamics play a fundamental role, steering the direction of vertical development as cities grapple with the challenges of accommodating burgeoning populations within limited spatial confines. Architectural innovation and ambition propel the nation to the forefront of cutting-edge design and construction technologies, defining the skyline with structures that push the boundaries of what is architecturally achievable (Beck, 2018; Liu et al., 2017). The ever-present spirit of competition and prestige among cities and regions fuels the race skyward, with each metropolis striving to assert its prominence on the global stage. Land availability and utilization challenges necessitate inventive solutions, driving vertical growth to optimize limited urban space. Government support and planning initiatives act as catalysts, shaping the trajectory of tall building construction through strategic policies and urban development plans. Lastly, tourism emerges as a significant influencer, with iconic skyscrapers serving as attractions that contribute to a city's international allure. This comprehensive examination highlights the intricate interplay of these factors, providing a nuanced understanding of the multifaceted forces steering China's urban transformation into the vertical dimension (Auerbach & Wan, 2020; Yan et al., 2009).

However awe-inspiring the spectacle of China's towering structures may be, it prompts an essential inquiry into the sustainability of this upward trajectory. Chinese policies, strategically restricting high-rise constructions exceeding 500 m in larger cities and 250 m in smaller cities, emphasize safety and security concerns, casting a contemplative shadow over the otherwise exuberant narrative of vertical development. This regulatory juncture necessitates a thoughtful reflection on the long-term viability and far-reaching implications of the ongoing high-rise narrative in China's urban development landscape. Beyond the immediate visual impact, these policies invite a nuanced exploration of the delicate balance between aspirations for architectural heights and the imperative to ensure the well-being and safety of inhabitants. As such, this critical examination invites a broader discourse on the evolving role of skyscrapers in shaping China's urban future, contemplating the delicate equilibrium between architectural ambition and the imperatives of safety, sustainability, and the overall livability of these soaring cityscapes (Barr & Luo, 2021; Barr, 2022; Zhang, 2007a).

2. The development of tall buildings in China: a snapshot

Over the last few decades, the development of tall buildings in China has undergone a transformative journey, encapsulating the nation's dynamic urban evolution. From the iconic skylines of bustling metropolises to the architectural marvels that punctuate the horizon, this snapshot captures the essence of China's vertical ascent. The narrative unfolds against rapid economic growth, urbanization, and technological advancements, reflecting a deliberate and strategic shift from low-rise to high-rise urban landscapes. The skyline, once characterized by traditional structures, now boasts towering symbols of modernity, each building telling a story of economic prowess, global aspirations, and the complex interplay between tradition and innovation. This concise glimpse into the past five decades encapsulates the remarkable tale of China's embrace of verticality, with each tall building standing as a testament to the nation's resilience, ambition, and commitment to shaping its urban identity in the contemporary world (Al-Kodmany & Ali, 2013; Miao, 2019).

Indeed, among all Asian countries, China stands out as the epicenter of high-rise construction, a phenomenon that moved from first- to second- and third-tier cities. Quanhong Li (2017) explains, “High-density vertical urban developments are shaping the future identities of these cities by way of their strategic locations, massive scale, significant functional mix, and large social, economic, and environmental impact” (Li 2017, p. 32). Meanwhile, tall building projects have been proliferating in established skyscraper cities. Starting in the 21st century, China has built 52% of Asia’s tall buildings. The rest of Asia (31 countries) shares the remaining 48%. The CTBUH enlightens that China leads the world by far concerning the completion of 200 m+ (656 ft+) buildings. While in 2015, China counted for 58% of all world’s tall buildings in this height category (62/106), in 2016, it counted for 66% (84/ 128). Specifically, China achieved significant leaps in this height category in the past few years, where the total number of 200+ m (656+ ft) buildings more than doubled between 2000 and 2020. A recent study by CTBUH illustrates the robust growth of skyscrapers in China compared to other countries (Figure 1) [https://www.skyscrapercenter.com/year-in-review/2023].

The most succinct method to comprehensively explore the swift evolution of tall buildings in China involves a chronological tracing of their development, meticulously cataloging the tallest structures across pivotal decades. This historical journey is encapsulated by enumerating the towering landmarks in 1970, 1980, 1990, 2000, 2010, and 2020 and projecting forward to 2030. Such a structured examination allows for a condensed yet comprehensive

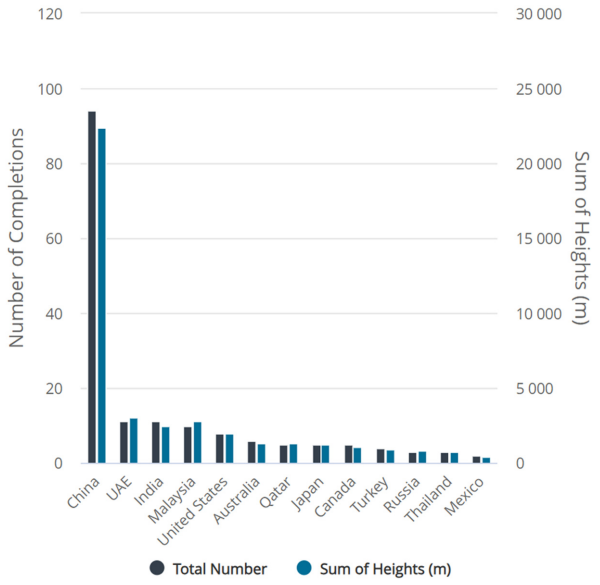


Figure 1. China continues to champion the construction of tall buildings, the example of 2023.

understanding of the temporal progression, revealing the transformative trends and architectural milestones that have defined each epoch. By systematically listing the tallest buildings within these timeframes, we gain valuable insights into the dynamic forces shaping China's urban landscape, from the early stages of economic reforms to the contemporary era marked by cutting-edge design, technological advancements, and global prominence (Tables 1-7). Note that in the 1980s and 1990s, Hong Kong experienced significant economic growth and rapid urban development, which contributed to the construction of some of the tallest buildings in China during that time (Tables 2 and 3).

3. Ten "Tallest Cities" in China

The urban skyline of China, marked by an extraordinary vertical ascent in recent decades, stands as a testament to the nation's unparalleled growth and rapid urbanization. This section explores the ten "tallest cities" in China, each delineating a distinctive chapter in the country's remarkable journey toward architectural heights. As we delve into these towering metropolises' landscape, we focus on the aggregate building height, with skyscrapers surpassing 150 meters becoming the defining criteria. That is, cities with more 150 m+ buildings are considered

Table 1. China's Ten Tallest Buildings in 1970

#	Building Name	City	Height (m/ft)		Floors	Completion
1	Shanghai Exhibition Center	Shanghai	110	361	17	1959
2	Prince's Building	Hong Kong	108	354	24	1964
3	Guangzhou Hotel	Guangzhou	103	338	27	1968
4	Military Museum of the Chinese People`s Revolution	Beijing	98	322	17	1959
5	Mandarin Oriental Hong Kong	Hong Kong	92	302	24	1963
6	The Murray	Hong Kong	89	292	27	1970
7	Shanghai Park Hotel	Shanghai	84	276	22	1934
8	Peace Hotel	Shanghai	77	253	13	1929
9	Man Hong House	Hong Kong	69	226	21	1954
10	The Cultural Palace of Nationalities	Beijing	67	220	13	1959

Table 2. China's Ten Tallest Buildings in 1980

#	Building Name	City	Height (m/ft)		Floors	Completion
1	Sun Hung Kai Centre	Hong Kong	193	633	51	1980
2	Jardine House	Hong Kong	179	587	52	1973
3	The Landmark Gloucester Tower	Hong Kong	160	525	46	1980
4	World Trade Centre	Hong Kong	152	499	40	1975
5	New World Tower 1	Hong Kong	152	499	43	1980
6	Bank of America Tower	Hong Kong	146	479	38	1975
7	Windsor House	Hong Kong	142	466	42	1978
8	Tai Tin House	Hong Kong	132	433	44	1975
9	Lai Tin House	Hong Kong	132	433	44	1975
10	Shing Tin House and Cheung Tin House	Hong Kong	126	413	42	1975

Table 3. China's Ten Tallest Buildings in 1990

#	Building Name	City	Height (m/ft)		Floors	Completion
1	Bank of China Tower	Hong Kong	367	1204	72	1990
2	Hopewell Centre	Hong Kong	222	728	64	1981
3	Jing Guang Center	Beijing	208	682	51	1990
4	Guangdong International Building	Guangzhou	200	656	63	1990
5	Conrad Hong Kong	Hong Kong	199	653	61	1990
6	Queensway Government Office Building	Hong Kong	199	653	47	1985
7	Sun Hung Kai Centre	Hong Kong	193	633	51	1980
8	Exchange Square #1	Hong Kong	188	617	52	1985
9	Exchange Square #2	Hong Kong	188	617	52	1985
10	Standard Chartered Bank	Hong Kong	187	614	42	1990

Table 4. China's Ten Tallest Buildings in 2000

#	Building Name	City	Height (m/ft)		Floors	Completion
1	Jin Mao Tower	Shanghai	421	1381	88	1999
2	CITIC Plaza	Guangzhou	390	1280	80	1996
3	Shun Hing Square	Shenzhen	384	1260	69	1996
4	Central Plaza	Hong Kong	374	1227	78	1992
5	Bank of China Tower	Hong Kong	367	1204	72	1990
6	85 Sky Tower	Kaohsiung	348	1142	85	1997
7	The Center	Hong Kong	346	1135	73	1998
8	SEG Plaza	Shenzhen	292	958	71	2000
9	Cheung Kong Centre	Hong Kong	283	928	63	1999
10	Wuhan World Trade Tower	Wuhan	273	896	60	1998

Table 5. China's Ten Tallest Buildings in 2010

#	Building Name	City	Height (m/ft)		Floors	Completion
1	TAIPEI 101	Taipei	508	1667	101	2004
2	Shanghai World Financial Center	Shanghai	492	1614	101	2008
3	International Commerce Centre	Hong Kong	484	1588	108	2010
4	Zifeng Tower	Nanjing	450	1476	66	2010
5	Guangzhou International Finance Center	Guangzhou	439	1440	101	2010
6	Jin Mao Tower	Shanghai	421	1381	88	1999
7	Two International Finance Centre	Hong Kong	412	1352	88	2003
8	CITIC Plaza	Guangzhou	390	1280	80	1996
9	Shun Hing Square	Shenzhen	384	1260	69	1996
10	Central Plaza	Hong Kong	374	1227	78	1992

"taller" than the ones with fewer buildings in this height category. This comprehensive account, presented in descending ranking order, unravels the stories embedded in the skylines of these cities, offering insights into the dynamic forces propelling China into the forefront of global urban development. From the economic powerhouses to cultural hubs, each city contributes uniquely to the rich tapestry of China's architectural evolution, showcasing the intricate interplay between tradition and modernity within the vertical dimensions of their urban landscapes (Table 8).

3.1. Hong Kong

Hong Kong, a global financial powerhouse, has

Table 6. China's Ten Tallest Buildings in 2020

#	Building Name	City	Height (m/ft)		Floors	Completion
1	Shanghai Tower	Shanghai	632	2073	128	2015
2	Ping An Finance Center	Shenzhen	599	1965	115	2017
3	Guangzhou CTF Finance Centre	Guangzhou	530	1739	111	2016
4	Tianjin CTF Finance Centre	Tianjin	530	1739	97	2019
5	CITIC Tower	Beijing	528	1732	109	2018
6	TAIPEI 101	Taipei	508	1667	101	2004
7	Shanghai World Financial Center	Shanghai	492	1614	101	2008
8	International Commerce Centre	Hong Kong	484	1588	108	2010
9	Changsha IFS Tower T1	Changsha	452	1483	94	2018
10	Zifeng Tower	Nanjing	450	1476	66	2010

Table 7. China's Ten Tallest Buildings in 2030

#	Building Name	City	Height (m/ft)		Floors	Completion
1	Shanghai Tower	Shanghai	632	2073	128	2015
2	Ping An Finance Center	Shenzhen	599	1965	115	2017
3	Guangzhou CTF Finance Centre	Guangzhou	530	1739	111	2016
4	Tianjin CTF Finance Centre	Tianjin	530	1739	97	2019
5	CITIC Tower	Beijing	528	1732	109	2018
6	TAIPEI 101	Taipei	508	1667	101	2004
7	HeXi Yuzui Tower A	Nanjing (CN)	499	XX	85	2025
8	Shanghai World Financial Center	Shanghai	492	1614	101	2008
9	Tianfu Center	Chengdu (CN)	489	1604	95	2026
10	Rizhao Center	Rizhao (CN)	485	1591	94	2028

Table 8. Ten Tallest Cities in China

City	Ranking in the Country	Ranking in Asia	Ranking in the World	Number of Buildings		
				150 m+	200 m+	300 m+
Hong Kong	#1	#1	#1	554	97	6
Shenzhen	#2	#2	#2	405	161	20
Guangzhou	#3	#3	#5	191	58	11
Shanghai	#4	#4	#6	184	63	5
Wuhan	#5	#7	#9	168	56	7
Chongqing	#6	#8	#10	145	58	5
Chengdu	#7	#9	#12	127	42	0
Shenyang	#8	#13	#16	98	30	4
Hangzhou	#9	#15	#18	85	30	2
Nanning	#10	#16	#20	82	34	6

continually shaped its iconic skyline over the past decades, weaving a narrative of architectural splendor intricately linked to its economic significance. The city's ascent into a financial juggernaut is vividly reflected in its skyline, adorned with towering structures that testify to its economic might. With their soaring heights, the International Commerce Centre (ICC) and Two International Finance Centre (IFC) are not merely architectural marvels but veritable symbols of Hong Kong's financial prowess, dominating the skyline with an aura of economic prestige. Beyond these established landmarks, ongoing construction projects (though shorter than the ten tallest buildings)

underscore the city's unwavering commitment to maintaining its status as a leading global financial hub. These projects are physical additions to the skyline and strategic investments in the city's future, signaling a dedication to staying at the forefront of global finance (Ng et al., 2009). Hong Kong's skyline thus becomes a dynamic canvas, mirroring the city's resilience, adaptability, and relentless pursuit of excellence in the ever-evolving landscape of international finance (Table 9).

3.2. Shenzhen

Shenzhen's skyline stands as a testament to a remarkable transformation, tracing its origins from a humble fishing village to evolving into a global tech and innovation hub. Once characterized by modest structures, the city's skyline now boasts iconic skyscrapers that symbolize its rapid ascent into the forefront of technological and economic prowess. The Ping An Finance Center and Shun Hing Square, among others, emerge as architectural milestones, not merely towering structures but embodiments of Shenzhen's unwavering commitment to modernity. These skyscrapers serve as beacons, signifying the city's dedication to staying at the vanguard of technological innovation and economic development. The proliferation of skyscraper construction aligns seamlessly with Shenzhen's pivotal role as a significant technological industry player, illustrating its economic growth and capacity for continual technological advancement (Deng et al., 2018). The city's skyline reflects Shenzhen's journey, narrating a compelling story of resilience, innovation, and a relentless pursuit of modernity in the ever-evolving global technology landscape (Table 10).

3.3. Guangzhou

Guangzhou, a city with a rich history, has undergone a profound transformation marked by significant skyscraper development, exemplified by iconic structures like the majestic Guangzhou CTF Finance Centre and Guangzhou International Finance Center. Their architectural marvel has become synonymous with Guangzhou's skyline as towering structures and symbols of the city's forward-looking aspirations. The Zhujiang New Town area, a vibrant district adorned with modern high-rise buildings, is a testament to Guangzhou's economic and cultural growth. This bustling urban landscape is not merely a collection of buildings but a reflection of the city's dynamic position as a significant economic and cultural center in southern China (Li et al., 2005). As Guangzhou

Table 9. Ten Tallest Buildings in Hong Kong

#	Name	Status	Height
1	International Commerce Centre	Completed	484 m / 1,588 ft
2	Two International Finance Centre	Completed	412 m / 1,352 ft
3	Central Plaza	Completed	373.9 m / 1,227 ft
4	Bank of China Tower	Completed	367.4 m / 1,205 ft
5	The Center	Completed	346 m / 1,135 ft
6	Nina Tower	Completed	320.4 m / 1,051 ft
7	One Island East	Completed	298.1 m / 978 ft
8	Cheung Kong Centre	Completed	282.8 m / 928 ft
9	Victoria Dockside	Completed	272.5 m / 894 ft
10	The Cullinan I	Completed	269.9 m / 886 ft

Table 10. Ten Tallest Buildings in Shenzhen

#	Name	Status	Height
1	Ping An Finance Center	Completed	599.1 m / 1,965 ft
2	KK100	Completed	441.8 m / 1,449 ft
3	Shenzhen Bay Super Headquarters Base Tower C-1	Under Construction	394 m / 1,293 ft
4	China Resources Tower	Completed	392.5 m / 1,288 ft
5	CITYMARK CENTRE	Completed	388.3 m / 1,274 ft
6	Shum Yip Upperhills Tower 1	Completed	388.1 m / 1,273 ft
7	China Merchants Bank Global Headquarters Main Tower	Under Construction	387.4 m / 1,271 ft
8	Shun Hing Square	Completed	384 m / 1,260 ft
9	Shenzhen Luohu Friendship Trading Centre	Under Construction	379.9 m / 1,246 ft
10	Dabaihui Plaza	Completed	375.6 m / 1,232 ft

Table 11. Ten Tallest Buildings in Guangzhou

#	Name	Status	Height
1	Guangzhou CTF Finance Centre	Completed	530 m / 1,739 ft
2	Guangzhou International Finance Center	Completed	438.6 m / 1,439 ft
3	CITIC Plaza	Completed	390.2 m / 1,280 ft
4	Guangdong Business Center	Structurally Topped Out	375.5 m / 1,232 ft
5	The Pinnacle	Completed	350.3 m / 1,149 ft
6	Baolixian Village Old Reform Project Main Building	Under Construction	350 m / 1,148 ft
7	Guangjian Financial Center	Under Construction	333 m / 1,093 ft
8	Jiulong Lake Knowledge Tower	Under Construction	330 m / 1,083 ft
9	Huijin Center 1	Completed	320 m / 1,050 ft
10	Junchao Plaza	Structurally Topped Out	320 m / 1,050 ft

continues to evolve, its skyline becomes a canvas that mirrors the intersection of tradition and modernity, highlighting the city's pivotal role in shaping the socio-economic landscape of the region (Table 11).

3.4. Shanghai

Shanghai's skyline is an indomitable testament to its unparalleled status as a global financial and economic powerhouse. Dominated by architectural marvels like the Shanghai Tower, Jin Mao Tower, and the iconic Oriental Pearl Tower, the cityscape is nothing short of awe-inspiring. Each structure serves a functional purpose and contributes to the city's visual narrative, reflecting a harmonious blend of modernity and innovation. The Lujiazui financial district in Pudong emerges as a focal point, a concrete symbol of Shanghai's rapid economic ascent and urbanization. This district, adorned with skyscrapers reaching for the sky, encapsulates the city's transformative journey into a vibrant metropolis. Shanghai's skyline signifies economic prosperity and embodies the dynamic spirit of urban development, positioning the city at the forefront of global commerce and innovation (Shi et al., 2016). The architectural landmarks etched against the skyline tell a story of Shanghai's resilience, ambition, and unwavering commitment to shaping the future (Table 12).

3.5. Wuhan

Situated in central China, Wuhan has become a focal point for urbanization and infrastructure development, catalyzing the construction of high-rise buildings that define its evolving skyline. While Wuhan may not boast the towering structures of some megacities, ongoing construction projects with remarkable heights signify the city's steady growth and urban transformation. These high-rises are not mere structures; they are tangible reflections of Wuhan's commitment to modernization and the changing dynamics of central China. As the city continues to forge ahead, its skyline becomes a canvas, illustrating the intersection of tradition and progress (Tan et al., 2014). Wuhan's urban landscape, characterized by these rising structures, contributes to its economic vitality and the broader narrative of central China's metamorphosis into a hub of modernity and growth (Table 13).

3.6. Chongqing

Chongqing, nestled amid its unique mountainous terrain, has witnessed a distinctive expansion of its skyline that sets it apart in the panorama of Chinese urban

Table 12. Ten Tallest Buildings in Shanghai

#	Name	Status	Height
1	Shanghai Tower	Completed	632 m / 2,073 ft
2	Shanghai World Financial Center	Completed	492 m / 1,614 ft
3	North Bund Tower	Under Construction	480 m / 1,575 ft
4	Jin Mao Tower	Completed	420.5 m / 1,380 ft
5	Shanghai International Trade Center Tower 1	Structurally Topped Out	370 m / 1,214 ft
6	Shimao International Plaza	Completed	333.3 m / 1,094 ft
7	Jinqiao Sub-Center Block C1 Tower 1	Under Construction	330 m / 1,083 ft
8	Sinar Mas Center 1	Completed	320 m / 1,050 ft
9	Zhangjiang Science Gate Tower 1	Architecturally Topped Out	320 m / 1,050 ft
10	Zhangjiang Science Gate Tower 2	Architecturally Topped Out	320 m / 1,050 ft

Table 13. Ten Tallest Buildings in Wuhan

#	Name	Status	Height
1	Wuhan Greenland Center	Completed	475.6 m / 1,560 ft
2	Wuhan CTF Finance Center	Under Construction	475 m / 1,558 ft
3	Wuhan Tower	Completed	443.1 m / 1,454 ft
4	Great River Center	Under Construction	400 m / 1,312 ft
5	1 Corporate Avenue	Completed	376 m / 1,234 ft
6	Minsheng Bank Building	Completed	331 m / 1,086 ft
7	Yuexiu Fortune Center Tower 1	Completed	330 m / 1,083 ft
8	Yuexiu Global Financial Center	Structurally Topped Out	330 m / 1,083 ft
9	Wuhan Yangtze River Shipping Center	Completed	330 m / 1,083 ft
10	Heartland 66 Office Tower	Completed	320.7 m / 1,052 ft

Table 14. Ten Tallest Buildings in Chongqing

#	Name	Status	Height
1	International Land-Sea Center	Architecturally Topped Out	458.2 m / 1,503 ft
2	Raffles City Chongqing T3N	Completed	354.5 m / 1,163 ft
3	Raffles City Chongqing T4N	Completed	354.5 m / 1,163 ft
4	SUNAC A-ONE Tower 4	Under Construction	349 m / 1,145 ft
5	Chongqing World Financial Center	Completed	338.9 m / 1,112 ft
6	Beibin Lu Main Tower	Under Construction	320 m / 1,050 ft
7	Chongqing IFS T1	Completed	316.3 m / 1,038 ft
8	International Commerce Financial Centre T1	Completed	301.2 m / 988 ft
9	Jiefangbei Book City	Under Construction	300 m / 984 ft
10	Concord International Centre	Completed	290 m / 951 ft

development. The city's skyscraper development is not merely a response to economic demands but is also intricately woven with the influence of its natural surroundings. The convergence of natural features and modern urban planning has endowed Chongqing with a skyline that harmonizes with its mountainous topography, creating a functional and aesthetically compelling cityscape. This integration has played a pivotal role in shaping Chongqing as a significant economic and urban center in western China (Liu et al., 2017). The vertical growth of the city's skyline becomes emblematic of its regional importance, reflecting its economic dynamism and the harmonious coexistence between nature and urbanization, a defining characteristic of Chongqing's identity in the Western Chinese landscape (Table 14).

3.7. Chengdu

Chengdu, the capital of Sichuan province, has emerged as a notable player in China's urban development and skyscraper construction. Among the skyline-defining structures, the Tianfu International Financial Center stands out as a symbol of Chengdu's remarkable economic progress. This towering landmark is not merely a high-rise but a testament to the city's ambition, innovation, and growing prominence in western China's economic landscape. As Chengdu's skyline continues to evolve, it mirrors the city's transition from a regional hub to a critical player in the broader economic tapestry of western China (Miao, 2019). The skyline becomes a visual narrative of Chengdu's journey, portraying its economic vitality, urban vibrancy, and strategic vision, which is a significant contributor to the ongoing narrative of China's economic and urban development (Table 15).

3.8. Shenyang

Shenyang, an industrial and economic hub in northeastern China, has undergone a transformative phase of urban redevelopment, notably characterized by the construction of taller buildings that redefine its skyline. Although not as globally recognized as some megacities, Shenyang's increased vertical development signifies a profound commitment to modernization and economic growth. The city's skyline, adorned with these rising structures, becomes a tangible manifestation of Shenyang's aspirations for a dynamic and contemporary urban landscape. Beyond the architectural metamorphosis, this commitment

Table 15. Ten Tallest Buildings in Chengdu

#	Name	Status	Height
1	Tianfu Center	Under Construction	488.9 m / 1,604 ft
2	Tiantou International Business Center 1	Completed	284 m / 932 ft
3	International Commerce Center Tower 1	Completed	280 m / 919 ft
4	La Cadiere Center Block C	Under Construction	266.5 m / 874 ft
5	Yongli Star City	Under Construction	260 m / 853 ft
6	Unicorn Island Tower 1	Under Construction	250 m / 820 ft
7	La Cadiere Center Block B	Completed	249.6 m / 819 ft
8	Fosun International Finance Center Tower 1	Under Construction	248 m / 814 ft
9	Fosun International Finance Center Tower 2	Under Construction	248 m / 814 ft
10	Chengdu International Finance Square Tower 1	Completed	247 m / 810 ft

Table 16. Ten Tallest Buildings in Shenyang

#	Name	Status	Height
1	Forum 66 Tower 1	Completed	350.6 m / 1,150 ft
2	Golden Corridor 22-1 Project Tower 1	Under Construction	330 m / 1,083 ft
3	Huaqiang Golden Corridor City Plaza Main Tower	Completed	327 m / 1,073 ft
4	Baoneng Shenyang Global Financial Centre Tower 2	Completed	318 m / 1,043 ft
5	Moi Center Tower A	Completed	311 m / 1,020 ft
6	Shimao Wulihe City T3	Under Construction	270 m / 886 ft
7	SunnyWorld Center	Completed	260 m / 853 ft
8	Longemont Asia Pacific Center Tower A	Completed	245.2 m / 804 ft
9	Longemont Asia Pacific Center Tower B	Completed	245.2 m / 804 ft
10	Shimao Wulihe City T4	Under Construction	240 m / 787 ft

aligns with Shenyang's role as a regional economic powerhouse, contributing significantly to the broader narrative of China's changing urban fabric (Wang et al., 2019). As Shenyang continues to evolve, its skyline stands as a local emblem of progress, echoing the city's determination to play a pivotal role in the nation's ongoing economic and urban transformation (Table 16).

3.9. Hangzhou

Hangzhou, celebrated for its natural beauty, has undergone a metamorphosis spurred by urbanization, marked notably by the construction of high-rise buildings. The city's skyline, once dominated by natural landscapes, is now evolving with the integration of modern structures, particularly in areas like Qianjiang New Town. These rising landmarks contribute significantly to the changing skyline, serving as tangible indicators of Hangzhou's economic growth and development. Beyond their architectural significance, these high-rises are pivotal in positioning Hangzhou as a cultural haven and an economic hub. The evolving urban landscape reflects the city's dynamic identity, where traditional beauty harmonizes with contemporary aspirations (Liu et al., 2011). Hangzhou's skyline becomes a visual testament to its commitment to striking a balance between progress and preservation, showcasing the city as a flourishing center that seamlessly blends modernity with its rich cultural heritage (Table 17).

3.10. Nanning

Nanning, nestled in southern China, has undergone substantial urban development marked by the construction of high-rise buildings, signaling a transformative phase in the city's skyline. While not yet achieving international renown, Nanning's vertical growth is a testament to the overarching urbanization trends shaping the Chinese landscape. The city's ascent reflects the broader narrative of regional cities playing a crucial role in contributing to China's dynamic and evolving skyline. In the grand tapestry of the nation's development, regional hubs like Nanning emerge as vital players, adding layers of diversity and complexity to China's urban narrative (Wang et al., 2018). The vertical landscape of Nanning, though not as prominent on the global stage, showcases the multifaceted nature of China's development, demonstrating how cities beyond the mega centers contribute significantly to the nation's evolving skyline and urban character (Table 18).

Table 17. Ten Tallest Buildings in Hangzhou

#	Name	Status	Height
1	Hangzhou West Railway Station Hub Tower 1	Under Construction	399.8 m / 1,312 ft
2	Hangzhou West Railway Station Hub Tower A	Under Construction	320 m / 1,050 ft
3	Greenland Center 1	Completed	310 m / 1,017 ft
4	Greenland Center 2	Completed	310 m / 1,017 ft
5	Hangzhou West Railway Station Hub Tower 2	Under Construction	300 m / 984 ft
6	Hangzhou West Railway Station Hub Tower B	Under Construction	300 m / 984 ft
7	Hangzhou Centre Tower A	Completed	292.8 m / 961 ft
8	Hangzhou China Resources Liangzhu MixC	Completed	285 m / 935 ft
9	Hangzhou R&F Center Tower 1	Under Construction	280 m / 919 ft
10	Hangzhou Wangchao Center	Completed	280 m / 919 ft

Table 18. Ten Tallest Buildings in Nanning

#	Name	Status	Height
1	Guangxi China Resources Tower	Completed	402.7 m / 1,321 ft
2	Nanning Logan Century 1	Completed	381.3 m / 1,251 ft
3	Guangxi Financial Investment Center	Completed	330 m / 1,083 ft
4	Guangxi Finance Plaza	Completed	321 m / 1,053 ft
5	Jiuzhou International Tower	Completed	318 m / 1,043 ft
6	Guangxi Wealth Financial Center	Completed	310.8 m / 1,020 ft
7	Logan International Headquarters Tower 1	Completed	278 m / 912 ft
8	Diwang International Commerce Center	Completed	276 m / 906 ft
9	Boland World Financial Center 1	Completed	268 m / 879 ft
10	Hangyang Sino Plaza 1	Completed	231.7 m / 760 ft

4. Shanghai: Case Study

4.1. Background

Located near the mouth of the Yangtze River, the coastal city of Shanghai has become China's largest metropolis and is home to numerous skyscrapers. Over 25 million people called the city home as of 2020. The city's open-door policy in 1978 sparked a commercial renaissance, allowing it to take significant steps toward becoming a megalopolis. A need for banking services was met as the city developed into a considerable commerce center. In just twenty years, Shanghai went from being a magnificent remnant of colonial ambition to one of the world's most aggressive international commerce cities.

The Pudong district east of the Huangpu River, where most of Shanghai's physical development has occurred, was declared one of China's Special Economic Zones in 1990, granting its residents various tax breaks to attract foreign direct investment. As of the close of 2010, Shanghai had drawn investment from 149 nations and districts (including Hong Kong, Macau, and Taiwan), and it was home to the headquarters of 305 MNCs and 213 IICs. Shanghai attracted FDIs worth $15.1 billion in 2010 (Roskam, 2019; Zhang 2007b).

4.1. Why Examine Shanghai

Examining Shanghai as a case study provides a valuable lens for understanding the broader dynamics of excessive skyscraper construction in Chinese cities. Shanghai stands out as "complete and mature" from its tallest rival cities, Hong Kong, Shenzhen, and Guangzhou. It has a deep history and a more significant population and has long been China's financial hub and a global economic powerhouse. With a rich history of international trade and finance, Shanghai boasts a diversified and robust economy. Remarkably, Shanghai has outpaced traditional financial powerhouses such as Hong Kong, Singapore, and Tokyo, emerging as the preeminent financial hub in Asia. This significant shift in the financial landscape is evidenced by a series of influential studies, including works by Zhang et al., 2019, Denison and Ren 2013, and Gandelsonas et al. 2002. Shanghai's ascent to financial prominence is marked by its robust economic growth, strategic geographical positioning, and a concerted effort to attract global business and investment. The city's skyline, adorned with iconic skyscrapers like the Shanghai Tower and Jin Mao Tower, symbolizes its economic might and is a tangible testament to Shanghai's successful endeavors in positioning itself as the new epicenter of finance in the dynamic and

competitive Asian market. The surpassing of established financial hubs underscores Shanghai's resilience, adaptability, and strategic initiatives, making it a focal point for international business and a key player in shaping the region's future trajectory of financial activities.

Hong Kong's historical reputation as a preeminent global financial center is irrefutable, with its skyline adorned by architectural marvels such as the International Commerce Centre (ICC) and the iconic Bank of China Tower. As a Special Administrative Region of China, Hong Kong benefits from a high degree of autonomy, solidifying its unique status as a central international business hub. Nevertheless, the skyscraper race depicted in Tables 1-8 reveals a compelling narrative of competition and transformation within the Chinese urban landscape. Despite its towering achievements, Hong Kong faces robust competition from emerging skyscraper cities in mainland China, including Shanghai, Shenzhen, and Guangzhou. These dynamic metropolises have embarked on ambitious urban development ventures, erecting structures surpassing Hong Kong's erstwhile tallest buildings. This trend underscores a seismic shift in skyscraper construction and economic influence, with other Chinese cities taking the lead in shaping the vertical development narrative.

Shenzhen, frequently called China's Silicon Valley, has undergone remarkable economic expansion, particularly within technology and innovation. Evolving from a modest fishing village into a bustling metropolis, Shenzhen has become a pivotal center for tech companies and startups, propelling itself into the global forefront of technological advancements. The city is renowned for its crucial role in manufacturing and stands as a hub for the worldwide electronics industry. However, while Shenzhen stands as a vibrant and rapidly developing metropolis, it grapples with a historical deficit that distinguishes it from the rich historical tapestry of Shanghai. With its centuries-old legacy, Shanghai enjoys a cultural depth and historical significance that shapes its unique identity. Moreover, in terms of economic diversification, Shanghai's economic landscape surpasses that of Shenzhen, which, while a technology and innovation hub, is still evolving. Shanghai boasts a more extensive and varied economic portfolio, encompassing finance, trade, manufacturing, and cultural industries. Another notable distinction lies in the population dynamics. While burgeoning with growth and dynamism, Shenzhen harbors almost half the Shanghai population. This demographic variance significantly influences the scale and complexity of urban challenges faced by each city. Given these factors, Shanghai emerges as a more comprehensive and representative case study, offering a nuanced perspective on the intricate intersections of history, economy, and demographics, collectively contributing to its status as a global city. The comparative analysis underscores the multifaceted nature of urban development in these two prominent Chinese cities.

With its historical roots as a vital trading port, Guangzhou has seamlessly evolved into a central economic hub and a pivotal player in the dynamic Pearl River Delta region. Like its neighbor Shenzhen, Guangzhou has undergone rapid urbanization and remarkable economic development, marking its ascent to prominence. Guangzhou is key in connecting southern China with the global landscape as a critical nexus for transportation and trade. Its economic tapestry is woven with manufacturing, trade, finance, and technology threads, creating a diverse and resilient economic foundation. However, Shanghai, nestled along the coast and enriched by over a century of continuous modernization, has burgeoned into a dynamic metropolis that encapsulates economic vibrancy and is a testament to China's global allure. The city's multifaceted modernization journey, spanning decades, has endowed it with a unique blend of historical charm and contemporary sophistication, attracting a steady stream of robust tourism. In contrast, while a significant economic hub, Guangzhou lacks the same historical depth and sustained modernization as Shanghai. This discrepancy in the timeline of urban evolution plays a crucial role in shaping each city's appeal to tourists. Shanghai's rich tapestry of historical landmarks, architectural marvels, and a skyline that narrates the story of China's progress serves as a compelling draw for visitors. On the other hand, Guangzhou, while contributing to China's economic prowess, doesn't boast the same extensive historical narrative and, consequently, doesn't attract tourism on a comparable scale. In essence, Shanghai's coastal charm, coupled with a century-long narrative of modernization, creates a compelling destination for tourists, distinguishing it from Guangzhou in the realm of cultural and historical appeal.

In conclusion, examining Shanghai as a case study provides a profound perspective on the overarching dynamics of excessive skyscraper construction in Chinese cities. Shanghai, surpassing its tallest rivals - Hong Kong, Shenzhen, and Guangzhou, emerges as a “complete and mature” metropolis with a deep history, a larger population, and a longstanding status as China's financial and global economic power-house. Its resilience and strategic initiatives are evident in its ability to outpace traditional financial hubs like Hong Kong, Singapore, and Tokyo, establishing itself as the preeminent financial hub in Asia. Shanghai's ascent is marked by robust economic growth, strategic geographical positioning, and a commitment to attracting global business and investment. The comparative analysis with other cities highlights Shanghai's comprehensive and representative nature. It offers insights into the intricate intersections of history, economy, and demographics, making it an invaluable case study for understanding China's urban development dynamics.

4.2. Examples of Shanghai's Distinctive Skyscrapers

4.2.1. Shanghai Tower

The Shanghai Tower, the third tallest building in the world and the tallest skyscraper in China, is located in the Pudong District of Shanghai. Gensler performed the

tower's design, and Thornton Tomasetti did its engineering. Both companies worked closely with the Architectural Design and Research Institute of Tongji University in Shanghai. The structure was finished in 2015 and reached a height of 632 meters (2,074 feet) (Figure 2).

The Shanghai Tower is a mixed-use structure housing commercial office spaces, hotels, shops, public spaces, sky gardens, and rooftop gardens. The tower's curtain wall spirals upward, rotating about one degree around the floor plates at each level. The atrium, which features gardens, cafes, restaurants, retail space, and panoramic city views, is just one of the nine open interior zones. Adding this new tower to the skyline of Shanghai is unquestionably adding a new landmark to the city. It serves as the focal point of Lujiazui and boosts it as a global financial hub (Zhang et al., 2022). Due to the disparity in their various architectural styles, the Jin Mao Tower and the Shanghai World Financial Center (SWFC), both of which are close to the Shanghai Tower, combine to create a potent focal node in the city's skyline (Figure 3).

4.2.2. Shanghai World Financial Center

This mixed-use tower was designed by Kohn Pedersen Fox (KPF) and erected in 1997 (Figure 4). It wasn't finished until 2008 because of several difficulties, the most noteworthy of which was the Asian economic crisis. The skyscraper has a total of 101 stories and reaches a height of 492 meters (1,614 ft). The tower's design exemplifies a sophisticated "single object," recalling a sculpture with lighthearted geometric forms. Its glass and steel exterior highlights its stark minimalism, with no decorative or architectural details. A trapezoidal window at the top of the skyscraper boosts the tower's aerodynamic efficiency and gives it a more distinctive appearance. Offices, conference rooms, and shopping malls occupy the lower levels of the building. The Park Hyatt Shanghai Hotel occupies the upper floors. Many architectural organizations have recognized this tower. For example, the Council on Tall Buildings and Urban Habitat awarded the Shanghai World Financial Center as the "Best Tall Building Overall" in 2008 (Lepik, 2008).

4.2.3. Jin Mao Tower

The 421-meter (1,380-foot) Jin Mao Tower was completed in 1999 (Figures 5 & 6). SOM (Skidmore, Owings & Merrill) - designed the tower, hosting various functions, including offices, a hotel, shops, a plaza, and parking, and has earned a status as a "culturally sensitive" structure. It is one of several supertall skyscrapers that



Figure 2. Shanghai Tower in Pudong, Shanghai. The tower soars 632 meters (2,074 feet) over the city. Its curved façade and swirling form represent the dynamic evolution of contemporary China. (Photo by author)

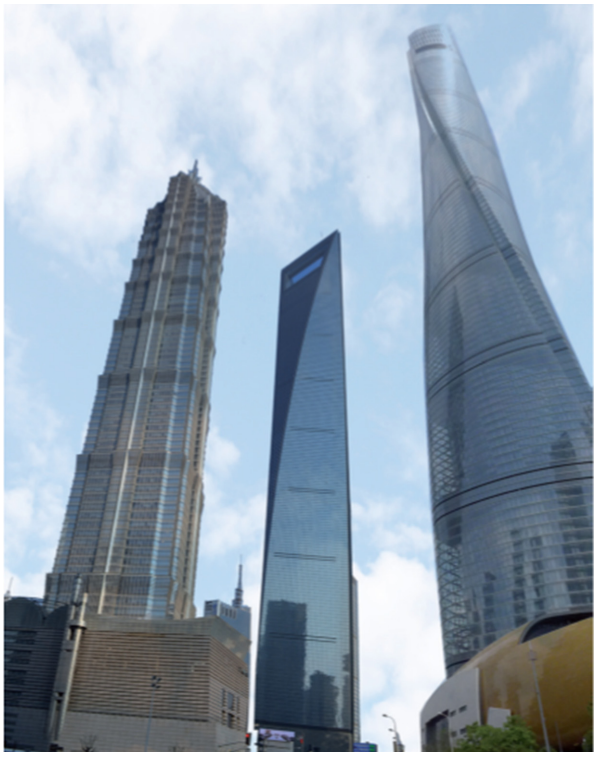


Figure 3. Shanghai Tower (right). It is accompanied by two prominent skyscrapers, the Shanghai World Financial Center (center) and the Jin Mao Tower (left). Their unique architectural designs and distinctive height combine to create a potent focal node in the city's skyline. (Photo by author)



Figure 4. Shanghai World Financial Center (Middle) in Pudong, Shanghai. It resembles a gigantic square column with two sides beveled from opposing corners (beginning about one-third up) and gradually tapering closer until they nearly touch and form a trapezoidal window at the top. (Photo by author)

emerged rapidly in Asia around the turn of the century, including Taipei 101 in Taipei and the Petronas Towers in Kuala Lumpur. The Jin Mao Tower is quite similar to Taipei 101 in many ways by adhering to the oriental revivalist style of architecture. At every tower level, the spectacular inversion of traditional pagoda forms demonstrates how deeply Jin Mao draws from the local culture.

With 88 stories, Jin Mao embodies the auspiciousness of the number "eight," which has come to symbolize success, wealth, and fortune in Chinese culture. The first six stories of the skyscraper house have various amenities, including a movie theater, a conference center, an exhibition hall, and a retail space measuring 20,749 square meters (226,000 square feet). A steel pinnacle resembling a crown sits atop the tower, a design element inspired by Art Deco architecture (Figure 7). It also features an exotic atrium (Figure 8). The Jin Mao Tower has become an iconic new symbol of China's architectural achievements and an example for other Asian cities to follow. It is considered one of mainland China's top architecture design projects, alongside I.M.Pei's Xianshan Hotel in Beijing (Beedle et al., 2007), for its skillful fusion of contemporary and traditional Chinese aesthetics (Sarkisian, 2022).



Figure 5. Jin Mao Tower in Pudong, Shanghai. When completed, the 420-meter-tall Jin Mao Tower was the highest skyscraper in China. The 88-story building has become a national role model for its innovative take on the traditional pagoda form by incorporating setbacks to create a rhythmic pattern. (Photo by author)

5. Factors Contributing to Spikes in Skyscraper Construction

The rise of skyscrapers is affected by many different aspects of globalization, both material and immaterial.



Figure 6. Jin Mao Tower in Pudong, Shanghai. In addition to the tower's shaft, the tower's entrances draw on Chinese vernacular architecture. Their innovative designs are crucial to placemaking. (Photo by author)

Globalization has made people more open to "outside" influences, notably Western culture. Wealth creation, the public display of skyscrapers as symbols of success, international tourism, and political perspectives that view skyscrapers as a means of promoting locations are among the prominent factors that promote vertical developments. Shanghai aimed to build iconic and tallest skyscrapers to be recognized again as a global power (Binder, 2015; Yan et al., 2009). What are some of the underlying factors that contributed to the growth of Shanghai into a large city dominated by skyscrapers? The following discussion will illustrate how their emergence was propelled by a complex network of cultural, political, and economic variables operating at regional and international scales. It's crucial to highlight that these factors often overlap and intertwine, leading to instances where certain information may be reiterated, potentially sounding redundant.



Figure 7. Jin Mao Tower in Pudong, Shanghai. The building's top is a crown-like steel pinnacle, evocative of the Art Deco style. It is beautiful during the daytime (left) and nighttime (right). (Photo by author)



Figure 8. View of Shanghai's Jin Mao from the bottom up; its atrium is the second-tallest after that of the Burj Al Arab. The atrium is unique due to its exceptional height and peculiar spiral shape. The barrel-vaulted atrium provides an uninterrupted views for more than 100 meters (328 feet) from the 56th floor to the 87th floor. (Photo by author)

5.1. Economic Powerhouse and Finance Center

Standing prominently as one of China's foremost economic and financial hubs, Shanghai has earned its reputation as a global financial powerhouse. The city's robust economic strength empowers it to invest substantially in critical infrastructure, particularly tall building construction. These towering structures, spanning commercial, residential, and business domains, represent more than architectural feats—they are tangible manifestations of Shanghai's economic prowess and global significance (Croll, 2006).

In the competitive landscape of major global financial centers, Shanghai continually races to attract businesses and investors. Its strategic positioning as a dynamic economic hub places it in direct competition with other international cities vying for attention on the global stage. In response, the city strategically channels its economic resources into infrastructure projects, including constructing tall buildings, ensuring it remains an attractive destination for businesses and a magnet for international investment.

The Lujiazui financial district, a focal point of Shanghai's economic activities, is a testament to this commitment. The construction of tall buildings in this district goes beyond mere urban development; it symbolizes Shanghai's economic prominence on the world stage. The skyline, punctuated by iconic skyscrapers such as the Shanghai Tower, Jin Mao Tower, and the Shanghai World Financial Center Financial Center, represents the city's global standing.

These tall structures in Lujiazui house thriving businesses and commercial enterprises and contribute to the city's narrative of progress and modernity. Each skyscraper becomes a part of Shanghai's skyline, a skyline that is carefully curated to showcase the city's economic might and international influence. The architectural prowess displayed in these tall buildings becomes a source of pride, symbolizing economic success and the city's resilience in navigating the complexities of the global financial arena.

In international business and finance, constructing tall buildings is more than a physical manifestation of economic strength—it is a strategic move to shape perceptions and attract attention. Shanghai's skyline, evolving with each new high-rise, becomes a dynamic canvas reflecting the city's determination to lead in the global economic landscape. The competition to build taller and more iconic structures isn't merely about reaching new heights but about asserting Shanghai's role as a critical player in the interconnected world of global finance and commerce. As the city continues to redefine its skyline, it reinforces its position not only as a Chinese economic hub but also as a global force that shapes the future of international business (Ford, 2021).

5.2. Urbanization and Population Density

Shanghai's rapid urbanization and population growth trajectory have reshaped its urban landscape, prompting a strategic shift toward vertical development. The city, propelled by its ascent as a global financial and economic hub, has witnessed an influx of people seeking opportunities and a modern urban lifestyle. This surge in population has created an escalating demand for residential and commercial spaces.

In response to the spatial constraints of a densely populated metropolis, Shanghai has embraced vertical construction as a pragmatic solution. Building upward rather than outward has proven instrumental in efficiently utilizing limited urban space. The city's skyline, dominated by iconic skyscrapers like the Shanghai Tower and Jin Mao Tower, attests to this deliberate choice of vertical expansion.

Vertical development optimizes land use and addresses the pressing need to accommodate a growing population within the city's geographical boundaries. In central business districts like Lujiazui, high-rise structures serve as multi-functional hubs, integrating offices, residential units, and commercial spaces within the same building. This vertical integration fosters a dynamic and interconnected urban environment, reducing the strain on transportation infrastructure and promoting a more sustainable lifestyle.

Moreover, the trend toward vertical construction aligns with modern urban planning principles, emphasizing mixed-use developments and comprehensive community planning. By incorporating residential and commercial functions in vertically designed spaces, Shanghai seeks to create vibrant and self-contained neighborhoods that cater to the diverse needs of its residents.

Pragmatic considerations do not solely drive the city's commitment to vertical development but are also a symbol of Shanghai's ambition and adaptability. The towering skyscrapers, characterized by innovative designs and cutting-edge technology, signify the city's determination to stand at the forefront of global urban development. Shanghai's skyline, constantly evolving with new high-rises, communicates a narrative of resilience, progress, and a forward-looking approach to urban living in the face of rapid urbanization and population growth.

5.3. Architectural Innovation and Ambition

Shanghai's commitment to architectural innovation and ambitious urban planning is vividly reflected in its skyline, adorned with iconic skyscrapers that testify to its technological prowess and design excellence. The metropolis has become a playground for cutting-edge architecture and engineering, aiming to meet the demands of its rapidly growing urban population and establish itself as a global leader in modern city development.

The Shanghai Tower, the tallest building in China and one of the tallest in the world is a prime example of the city's dedication to pushing architectural boundaries. Completed in 2015, this spiraling engineering marvel rises to 632 meters, showcasing a unique double-layered glass façade and an innovative twisted form. The tower's

sustainability features, including wind turbines and rainwater harvesting, underscore Shanghai's commitment to eco-friendly urban development.

The Jin Mao Tower, completed in 1999, is another jewel in Shanghai's skyline. Blending traditional Chinese architectural elements with modern design, this 88-story skyscraper symbolizes the city's fusion of past and present. Inspired by ancient Chinese pagodas, the tower's intricate exterior demonstrates Shanghai's ability to integrate cultural heritage into contemporary urban architecture seamlessly.

The Oriental Pearl Tower, an iconic and futuristic structure, exemplifies Shanghai's embrace of bold design. Completed in 1994, this TV tower stands out with its distinctive spherical and pagoda-like structures. It is a prominent broadcast tower and symbolizes Shanghai's embrace of the avant-garde. The tower's observation decks offer panoramic views, contributing to the city's appeal as a global tourist destination.

Shanghai's commitment to architectural innovation extends beyond individual skyscrapers to encompass holistic urban planning. The Lujiazui financial district, where many of these iconic structures are concentrated, is a testament to the city's strategic approach to development. The district's harmonious blend of high-rise buildings, green spaces, and waterfront areas reflects Shanghai's vision for creating vibrant, livable urban environments.

The construction of these skyscrapers underscores Shanghai's technological advancements in construction and engineering. From advanced materials and structural design to energy-efficient systems, the city has embraced the latest technologies to ensure its tall buildings are symbols of stature and sustainable and smart urban living.

The presence of these iconic structures has elevated Shanghai's global recognition as a city at the forefront of architectural and engineering achievements. The city's skyline, punctuated by these landmarks, has become synonymous with modernity and progress, attracting worldwide attention from architects, engineers, and urban planners. Shanghai's influence in shaping the discourse on contemporary urban development is evident in the international recognition these structures garner.

In conclusion, Shanghai's embrace of architectural innovation and ambitious urban planning is manifested in its iconic skyscrapers. The Shanghai Tower, Jin Mao Tower, and the Oriental Pearl Tower stand tall as symbols of the city's progress and serve as beacons of inspiration for the global urban development community. Shanghai's commitment to pushing the boundaries of architecture and engineering has established it as a leader in the quest for sustainable, technologically advanced, and aesthetically captivating cityscapes.

5.4. Competition and Prestige

The race to build the tallest and most impressive skyscrapers has become a defining feature of urban development in major global cities. Shanghai is a prominent participant in this competition. The city's pursuit of constructing tall structures is fueled by a multifaceted drive to assert its status, enhance prestige, and compete globally with iconic metropolises such as Dubai, New York, and Hong Kong.

Shanghai's quest to build tall structures symbolizes the city's economic strength and modernity. As a global financial and business hub, Shanghai aims to position itself as a leader in the international arena. The construction of towering skyscrapers, exemplified by landmarks like the Shanghai Tower and the Jin Mao Tower, is a tangible representation of the city's economic prowess and capacity for innovation.

In global competition, major cities vie for attention and recognition through architectural achievements. The tallest buildings often become symbols of a city's ambition and resilience, contributing to its narrative on the world stage. Shanghai's skyline, punctuated by impressive structures that pierce the clouds, is a testament to the city's commitment to standing shoulder-to-shoulder with other global powerhouses.

Dubai, New York, and Hong Kong represent formidable rivals in this international competition for architectural supremacy. Each city has its iconic skyline, featuring structures like the Burj Khalifa in Dubai, One World Trade Center in New York, and the International Commerce Centre in Hong Kong. Shanghai's pursuit of building tall structures partly responds to the global dialogue in architectural achievements, where cities strive to outdo each other in height, design, and engineering prowess.

In summary, Shanghai's pursuit of building tall structures is intricately tied to its desire to assert its status and compete globally. In the race for the tallest and most impressive skyscrapers, Shanghai solidifies its place among the world's leading cities. It contributes to the ongoing narrative of architectural excellence and urban innovation in the international arena.

5.5. Land Availability and Utilization

The scarcity and exorbitant land cost in major metropolitan areas, particularly in Shanghai, have been vital drivers for emphasizing vertical development in the city. Shanghai's economic and demographic dynamics and its status as a global financial center have created intense competition for available land, making efficient land utilization a critical consideration in urban planning.

Shanghai's skyline, notably in the Lujiazui financial district, directly responds to the imperative of maximizing land use. The district, situated on the eastern bank of the Huangpu River, has become a symbol of the city's economic prowess and modernity. Recognizing the premium on space, city planners and developers have strategically opted for vertical expansion by constructing tall buildings.

The concept of mixed-use functionalities is crucial in this context. Many of the tall buildings in the Lujiazui

financial district serve multiple purposes, integrating offices, retail spaces, hotels, and sometimes residential units within the same structure. This approach maximizes land efficiency and creates dynamic, self-contained urban environments where people can live, work, and engage in leisure activities without requiring extensive commuting.

Additionally, the vertical development strategy aligns with the principles of sustainable urban planning. By concentrating development vertically, Shanghai can preserve green spaces, reduce urban sprawl, and minimize the environmental impact associated with horizontal expansion. The city's commitment to sustainability is evident in its efforts to balance economic growth with environmental considerations, promoting a harmonious coexistence between urban development and ecological preservation.

In summary, the scarcity and high land cost in Shanghai's major metropolitan areas have necessitated a strategic focus on vertical development. The Lujiazui financial district is a testament to the city's ingenuity in maximizing land utilization by constructing tall buildings with mixed-use functionalities. This approach addresses practical space constraints, fosters sustainable urban environments, and reinforces Shanghai's position as a leading global city (Tan, et al., 2014).

5.6. Government Support and Planning

Government policies and active support for urban development have been instrumental in Shanghai's remarkable transformation and its standing as a global city. The municipal government of Shanghai has played a crucial role in shaping the city's skyline through strategic planning and visionary projects.

Shanghai's municipal government, recognizing the city's potential as an economic powerhouse and international hub, has implemented policies encouraging ambitious construction projects. These policies are aligned with broader national goals, emphasizing economic growth, innovation, and global competitiveness. The government's proactive approach has created an environment conducive to large-scale and groundbreaking developments in the urban landscape.

The support for ambitious projects goes beyond mere endorsement; it often involves allocating resources, streamlining bureaucratic processes, and collaborating with private enterprises. This partnership between the public and private sectors has been a driving force behind the successful implementation of transformative projects that have defined Shanghai's skyline.

One example is the Pudong New Area development, a focal point of the city's urbanization efforts. Government-backed initiatives in Pudong, including the creation of the Lujiazui financial district, have propelled Shanghai onto the global stage as a significant financial and business center (Moor, 2006).

Strategic urban planning initiatives are at the core of Shanghai's tall structure construction. The city's skyline is not a result of haphazard development but rather a carefully orchestrated plan to optimize land use, manage population density, and create a sustainable urban environment. The government's emphasis on sustainable urban planning reflects a commitment to balance economic growth with environmental considerations, ensuring that Shanghai remains a livable and resilient city.

Additionally, the government's role in integrating various functions within these tall structures contributes to creating mixed-use developments. This approach aligns with modern urban planning concepts, promoting vibrant, walkable communities where residents can live, work, and socialize nearby.

Furthermore, the municipal government's support for cultural and recreational spaces within the cityscape demonstrates a holistic vision for urban development. Parks, green spaces, and cultural landmarks complement the towering skyscrapers, fostering a balanced and aesthetically pleasing urban environment.

In conclusion, Shanghai's rise as a global metropolis with a distinctive skyline is intricately tied to the proactive role played by its municipal government. By fostering ambitious projects, implementing strategic urban planning, and prioritizing sustainability, the government has not only contributed to the city's economic growth. Still, it has also elevated Shanghai to international acclaim and recognition as a dynamic and modern urban center (Lepik, 2008).

5.7. Tourism

The presence of iconic skyscrapers in Shanghai plays a pivotal role in shaping the city's international image and is a powerful magnet for global tourists. Tourists worldwide are drawn to Shanghai by the allure of its towering structures. The Shanghai Tower, with its unique twisting design and cutting-edge sustainable features, has become an emblem of the city's commitment to modernity and progress. Visitors are often captivated by the panoramic views of the cityscape from the tower's observation decks, offering an unparalleled vantage point to appreciate the vastness and complexity of Shanghai's urban landscape.

Beyond the Shanghai Tower, other architectural marvels, such as the Jin Mao Tower and the Oriental Pearl Tower, further contribute to Shanghai's appeal as a global destination. These structures, each with its distinct design and significance, collectively create a skyline that is aesthetically pleasing and representative of the city's economic vibrancy.

These iconic skyscrapers have become must-visit attractions, drawing tourists who seek the thrill of ascending to great heights and a deeper understanding of Shanghai's role as a global financial and cultural hub. Integrating these landmarks into the city's tourism narrative enhances Shanghai's image on the world stage, showcasing its ability to blend tradition with modernity and embrace architectural and technological innovation.

Moreover, the economic impact of these structures extends beyond their architectural significance. Tourism fueled by the allure of these skyscrapers contributes to the local economy, supporting businesses in hospitality, retail, and other related sectors. The city's commitment to maintaining and expanding its skyline reflects Shanghai's ongoing dedication to positioning itself as a dynamic and progressive metropolis, welcoming visitors from far and wide to experience its unique blend of tradition, innovation, and urban splendor (Hsu, et al., 2009).

The factors contributing to the surge in skyscraper construction in Shanghai are not isolated to the city alone; they resonate across China's tallest cities. Globalization, marked by an openness to external influences, particularly Western culture, plays a pivotal role. Chinese major cities' aspiration to assert themselves as global powers led to the construction of iconic skyscrapers, symbolizing success and attracting international attention. The economic powerhouse status of these cities, driven by robust financial activities, fuels investments in tall buildings, showcasing the city's economic prowess on the global stage. Urbanization, population density, and the need for efficient land use drive the vertical development strategy seen in major Chinese cities. Architectural innovation, a commitment to sustainability, and government support are not unique to Shanghai; these elements are integral to the ambitious urban development initiatives shaping skylines across the country. Furthermore, the prestige and global recognition competition through tall structures is a shared narrative among major cities. Lastly, tourism, boosted by iconic skyscrapers, is a common trend as tall structures become symbols of economic strength and tourist attractions, contributing to the overall narrative of modernity and progress in China's urban development.

6. Will cities continue constructing very tall buildings?

Following the rising concerns about public safety, some countries have set new rules to limit the height of new skyscrapers. For example, China has set new policies restricting the height of buildings. In June 2020, China's National Development and Reform Commission prohibited the approval of any new buildings taller than 500 meters (1,640 feet) and limited buildings taller than 250 meters (820 feet) in smaller cities (cities with a population of less than three million). The new policies also require that any building taller than 100 meters (328 feet) match the spatial scale of the city and comply with local fire and rescue capabilities (Wood, 2023).

Are new policies good for urban development? Some scholars claim that this transition is not necessarily bad because urban and architectural projects have gone out of hand. The urban context and local culture in which the tall buildings were erected were often not considered during China's construction boom as cities competed to attract attention worldwide. The new guidelines may slow down the industry's recent breakneck speed. "It's not necessarily going to mean a cessation of tall building activity or urban density; it just means they're going to be better thought out" (Wood, 2021). Hypothetically, if the policies had been enacted three decades ago, they would have profoundly impacted Chinese cities' skylines. Many of the tallest buildings erected in the last ten years would not have been built (Figure 9).

Implementing a ban on highly tall buildings is

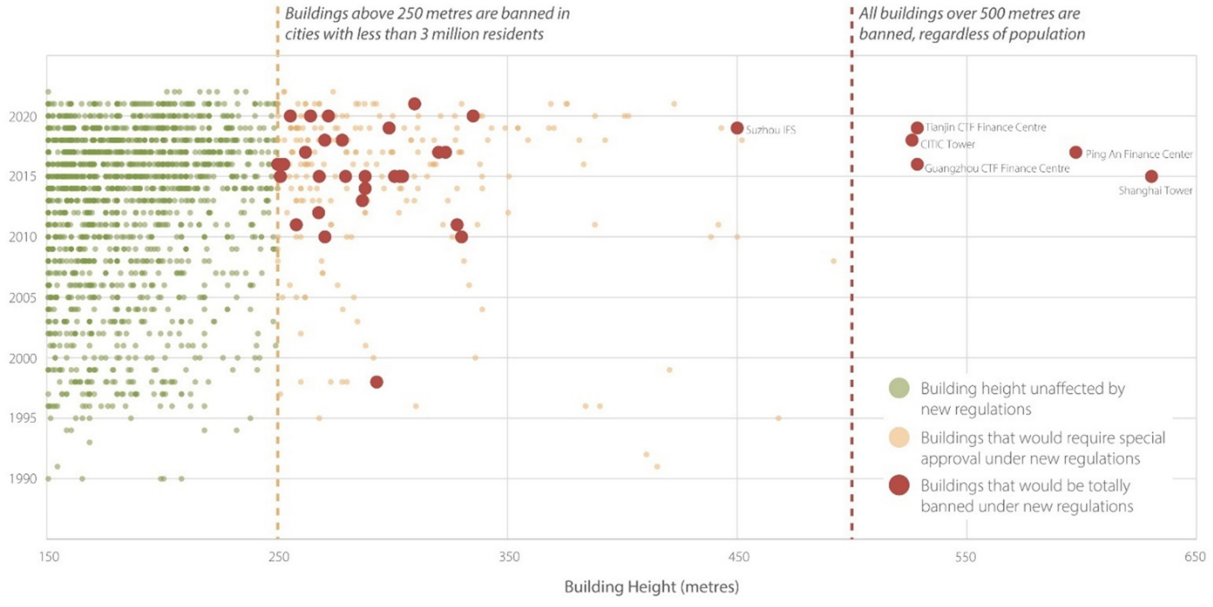


Figure 9. Graph illustrates the profound impact on Chinses cities would have had if policies had been enacted three decades ago. Many tallest buildings built since 2010 would not have been created (Source: CTBUH).

anticipated to have a limited impact, affecting only a select number of projects. This expectation is substantiated by the assertion that cities do not necessarily require an abundance of towering structures exceeding 500 meters in height. A noteworthy example is drawn from China, the focus of this paper, where only six buildings surpassing the 500-meter mark have been erected. This statistic underscores the relatively low prevalence of such exceptionally tall structures, emphasizing that they are not a ubiquitous solution for urban development.

The uniqueness of these highly tall buildings is underscored by the recognition that they do not seamlessly integrate into all urban landscapes. Various factors contribute to this, highlighting the need for a discerning approach in their implementation. The argument implies that the characteristics of these towering structures, such as their distinct design, engineering requirements, and environmental impact, render them unsuitable for every location.

One of the critical considerations emphasized is the role of economics in shaping the landscape of tall building development. The high costs associated with constructing and maintaining buildings of such stature, including investments in specialized elevators, wind bracing, construction staging spaces, and cranes, present significant financial challenges. This economic perspective adds a layer of complexity to the decision-making process, suggesting that the feasibility of highly tall buildings hinges on a delicate balance between economic viability and the unique demands of the urban environment.

6.1. Economic Height

In 1930, W.C. Clark and J.L. Kingston published "The Skyscraper: A Study in the Economic Height of a Modern Office Buildings," aiming to determine the height of a Manhattan office skyscraper that maximized return given rents, land, and construction costs. They detailed the various elements of erecting such a building, including floor plans and the costs a builder must pay. They chose a large lot across the street from Grand Central Station in Manhattan's midtown business district. The goal was to demonstrate that the supertall towers in Manhattan during the late 1920s were based on reasonable economic foundations. They found that the height that maximized return was 63 stories when comparing income to costs. This is similar to today's construction of the 59-story Vanderbilt office building in Manhattan, completed in 2020.

As per the CTBUH, a total of 4,162 skyscrapers were constructed from 1960 to 2017. Interestingly, a significant proportion of tall buildings, specifically 68.3%, have a height of less than 200 meters. There are just 23 structures that have a height of 400 meters or more. From a statistical standpoint, if we randomly choose a skyscraper built after 1960, the likelihood of selecting a building taller than 400 meters is approximately 0.5%. Most buildings are classified as "regular-talls" with less than 50 stories, although the number of "supertalls" is extremely small in comparison. Although frequently highlighted in media reports and prominent in city skylines, the megatalls constitute only a minuscule proportion of the world's skyscrapers (Wood, 2021).



Figure 10. Premium for height. As buildings become taller, wind forces govern the behavior of the structure, and the demand on the structural system dramatically increases (Source: Adapted from Khan, 1969).

The available research indicates that most skyscrapers worldwide align with the concept of Economic Height. Not all skyscrapers achieve an optimal balance between costs and benefits, but most of the world's skyscrapers are economically rational as they cater to the desire for tall buildings (Wood, 2023).

6.2. Premium for Height

In the pivotal years of the late 1960s and early 1970s, Fazlur Khan, a distinguished structural engineer affiliated with Skidmore, Owings & Merrill (SOM), conducted a groundbreaking analysis that would significantly influence the field of high-rise construction. Khan meticulously examined the hypothetical escalation in steel usage as buildings extended to greater heights. His seminal work sought to understand the intricate relationship between building height, gravity, and the formidable influence of wind forces (Figure 10).

Khan's calculations, a testament to his analytical prowess, demonstrated a crucial distinction when gravity alone was considered. In this scenario, the increased quantity of steel required exhibited a gradual and proportional pattern as buildings ascended to greater altitudes. However, Khan's innovation lay in his insightful consideration of the impact of wind forces on tall structures—an aspect often overlooked until then.

Upon introducing the variable of wind into his calculations, Khan's findings took a transformative turn. The required quantity of steel, instead of following a linear progression, now escalated exponentially with increasing building height. This revelation was a paradigm shift in understanding the structural dynamics of tall buildings, highlighting the critical importance of addressing wind forces in their

design and construction (Ali and Moon, 2007).

Fazlur Khan's work not only advanced the field of structural engineering but also laid the groundwork for the development of innovative design solutions to counteract the challenges posed by wind in the construction of skyscrapers. His pioneering insights continue to reverberate in the principles and practices of modern high-rise architecture, emphasizing the holistic consideration of various forces to ensure the structural integrity and safety of tall buildings.

6.3. Economic Growth

Economic growth and urbanization are crucial for the efficient production of goods and services in modern economies. Central locations become vital for people and businesses to cluster, leading to a “battle for place” where more people want to be in a central location than can be accommodated. As land values rise, so does economic height, leading to the rise of skyscrapers. The ability of a country to build skyscrapers is directly related to its economic size. Once a country hits a threshold in terms of its gross domestic product, there is a strong relationship between the number of skyscrapers and the height of its tallest building. The number of highrise buildings and the size of the economy are the greatest predictors of the number of tall buildings (Barr, 2022).

Skyscraper technology has evolved over 130 years due to innovations in design, materials, and engineering, along with lower labor costs in developing countries. Although no systematic research exists on the evolution of marginal costs over the 20th and early 21st centuries, evidence suggests a decline. In Manhattan between 1900 and 1920, the marginal cost of adding another floor averaged about 7%, but dropped to about 3% between 1921 and 1931. This led to builders adding more floors, partly explaining the building boom of the era (Barr, 2022).

6.4. Construction Costs

In the 21st century, Asian countries can afford to build taller buildings at lower costs. The Burj Kalifa, the world's tallest building, was completed in 2010 with a total construction cost of only $1.5 billion, or $9 million per floor. The Shanghai Tower, completed in 2015, cost $2.4 billion, or $18 million per floor. The Bank of America Tower in Manhattan cost $1.76 billion, or $37 million per floor in 2009. In the U.S., technological progress offsets rising labor and material costs. In Asia, rapid economic growth, urbanization, lower building costs, and a desire for design and construction innovations are driving building booms in their cities.

It rarely makes sense to construct the tallest buildings only to do so. Very few private developers are driven by something other than the bottom line. China's cities may already be at their limit in accommodating such enormous structures. The city skyline can be compared to a chessboard, with many smaller buildings that resemble pawns and only a few massive king and queen skyscrapers. It's now the case in China that the major cities have their own kings and queens (Barr, 2021).

In summary, the proposed ban on highly tall buildings is expected to selectively impact a subset of projects. The realization that cities do not inherently demand an abundance of 500-meter towers, illustrated by China's limited construction of such structures, underscores their uniqueness. The multifaceted reasons behind their restricted applicability, coupled with the crucial role of economics, contribute to a nuanced understanding of the challenges and considerations associated with developing extremely tall buildings.

7. Conclusions

In conclusion, the journey through China's urban evolution, as encapsulated by the captivating skyline of Shanghai and echoed in the narratives of the nation's tallest cities, reveals a complex tapestry of historical legacies, contemporary ambitions, and global influences. As a luminous case study, Shanghai symbolizes the city's impressive trajectory and mirrors the broader metamorphosis across China. The skyline, an ever-changing tableau of architectural marvels, illustrates the nuanced interplay between tradition and modernity, economic prowess, and global aspirations.

The exploration of the ten tallest cities in China unveils distinctive chapters in the nation's transformative journey toward verticality. Each city, from Hong Kong to Nanning, contributes a unique thread to China's architectural evolution narrative. The tallest ten buildings in each city serve as visual milestones, showcasing ambitious aspirations and contributing to the diverse architectural landscapes that define these urban centers. This comprehensive examination illuminates the multifaceted forces shaping China's vertical development, including globalization, economic strength, urbanization, innovation, competition, land utilization, government support, and tourism.

Yet, amid the awe-inspiring spectacle, the sustainability of China's upward trajectory comes under scrutiny. Stringent policies restricting the height of high-rise constructions underscore the imperative of safety and security, prompting a contemplative reflection on the long-term viability and broader implications of the ongoing high-rise narrative. This critical examination invites discourse on the delicate balance between architectural ambition and the imperatives of safety, sustainability, and livability in these soaring cityscapes.

The captivating journey through China's vertical landscapes reveals a rich synthesis of historical contexts, policy dynamics, and global influences. The intertwining threads of history, policy considerations, and cross-cultural interactions collectively shape the thematic backdrop of China's evolving urban identity. Beyond the concrete and

steel of skyscrapers, this exploration delves into the layers of history, the intricacies of policy, and the echoes of global dialogues, contributing to the multi-faceted mosaic that defines China's urban future.

References

Abbinnett, R. (2003). *Culture and identity: Critical theories.* SAGE Publications Ltd.: London, UK.

Ali, M. M., & Moon, K. S. (2007). Structural developments in tall buildings: current trends and future prospects. *Architectural science review*, *50*(3), 205-223.

Al-Kodmany, K. & Ali, M.M. (2013). *The future of the city: Tall buildings and urban design*. Southampton, UK: WIT Press.

Auerbach, J., & Wan, P. (2020). Forecasting the urban skyline with extreme value theory. *International Journal of Forecasting*, *36*(3), 814-828.

Barr, J., & Luo, J. (2021). Growing skylines: The economic determinants of skyscrapers in China. *The journal of real estate finance and economics*, *63*, 210-248.

Barr, J. (2022). Skyscrapers and Global Connectivity: Which Causes Which? *Building the Skyline,* March 28. https://buildingtheskyline.org/skyscrapers-and-globalization/ (Accessed, March 20, 2023)

Beck, U. (2018). *What is globalization?* John Wiley & Sons.

Beedle, L., Ali, M. M. & Armstrong, P. J. (2007). *The Skyscraper and the city: Design, technology, and innovation*. Lewiston, NY: Edwin Mellen Press.

Binder, G. (Ed.). (2015). *Tall buildings of China*. Images Publishing.

Clark, W. C., & Kingston, J. L. (1930). The skyscraper: a study in the economic height of modern office buldings. (No Title).

Croll, E. (2006). *China's new consumers: Social development and domestic demand*. London: Routledge.

Denison, E., & Ren, G. Y. (2013). *Building Shanghai: the story of China's gateway*. John Wiley & Sons.

Deng, Y., Fu, B., & Sun, C. (2018). Effects of urban planning in guiding urban growth: Evidence from Shenzhen, China. *Cities*, *83*, 118-128.

Ford, L. R. (2021). Skyscraper competition in Asia: New city images and new city form. In *Imaging the City* (pp. 119-144). Routledge.

Gandelsonas, M., Abbas, A., Abbas, M. A., & Boyer, M. C. (2002). *Shanghai reflections: Architecture, urbanism, and the search for an alternative modernity* (Vol. 3). Princeton Architectural Press.

Habermas, J. (2006). *The divided West*. Oxford: Polity Press.

Hsu, S., Dehuang, N. & Woodside, G. (2009). Storytelling research of consumers' self-reports of urban tourism experiences in China. *Journal of Business Research*, 62, 1223-1254.

Khan, F.R. Recent Structural Systems in Steel for High-Rise Buildings. In Proceedings of the British Constructional Steelwork

Association Conference on Steel in Architecture, London, UK, 24-26 November 1969.

Lepik, A. (2008). *Skyscrapers*. Munich, Germany: Prestel Verlag.

Li, Q., & Wang, L. (2022). Is the Chinese skyscraper boom excessive? *Journal of Urban Affairs*, *44*(8), 1117-1135.

Moor, B. (2006). *On the skyscraper as a building type in an era of uncertainty, globalization and environmentalism*. A thesis presented to the Graduate School of the University of Florida in partial fulfillment of the requirements for the degree of Master of Science in Building Construction. http://ufdcimages.uflib.ufl.edu/UF/E0/01/77/02/00001/moore_b.pdf, retrieved June 1, 2013.

Li, Y., Yeung, S. C. W., & Seabrooke, W. (2005). Urban planning and sustainable development under transitional economy: A case study of Guangzhou. *The International Journal of Sustainable Development & World Ecology*, *12*(3), 300-313.

Liu, Y., Yue, W., & Fan, P. (2011). Spatial determinants of urban land conversion in large Chinese cities: a case of Hangzhou. *Environment and Planning B: Planning and Design*, *38*(4), 706-725.

Liu, Y., Yue, W., Fan, P., Zhang, Z., & Huang, J. (2017). Assessing the urban environmental quality of mountainous cities: A case study in Chongqing, China. *Ecological Indicators*, *81*, 132-145.

Miao, J. T. (2019). Planning particularities: Reinterpreting urban planning in China with the case of Chengdu. *Planning Theory & Practice*, *20*(4), 512-536.

Ng, E. (2009). Policies and technical guidelines for urban planning of high-density cities–air ventilation assessment (AVA) of Hong Kong. *Building and Environment*, *44*(7), 1478-1488.

Roskam, C. (2019). *Improvised city: architecture and governance in Shanghai, 1843-1937*. University of Washington Press.

Sarkisian, M. P. (2022). The impact of Jin Mao Tower on life-cycle civil engineering of tall buildings. *Structure and Infrastructure Engineering*, *18*(7), 895-932.

Shi, Y., & Chen, Y. (2016). New city planning and construction in Shanghai: Retrospective and prospective. *International Journal of Urban Sciences*, *20*(1), 49-72.

Tan, R., Liu, Y., Liu, Y., He, Q., Ming, L., & Tang, S. (2014). Urban growth and its determinants across the Wuhan urban agglomeration, central China. *Habitat International*, *44*, 268-281.

Wang, H., Newman, G., & Wang, Z. (2019). Urban Planning as an Extension of War Planning: The Case of Shenyang, China, 1898-1966. *Journal Of Contemporary Urban Affairs*, *3*(1), 1-12.

Wang, Q., Li, R., & Cheong, K. C. (2018). Nanning–Perils and promise of a frontier city. *Cities*, *72*, 51-59.

Wood, A. (2023). *The World's 118 Tallest Buildings*, Edited. Council on Tall Buildings and Urban Habitat, Chicago, IL.

Wood, A. (2021). China is the capital of supertall skyscrapers. Why is it banning them? 22 JULY, https://www.ctbuh.org/ctbuh-news/beijing-22-jul-2021

Yan, G. & Santos, C.A. (2009). China, Forever tourism discourse and self-orientalism. *Annals of Tourism Research*, 36(2), 295-315.

Zhang, Q., Luo, X., Ding, J., Xie, B., & Gao, X. (2022). Dynamic response evaluation on TMD and main tower of Shanghai Tower subjected to Typhoon In-Fa. *The Structural*

Design of Tall and Special Buildings, *31*(9), e1929.
Zhang, T. (2007a). Innovation in Chinese urban governance: The Shanghai experience, in Hambleton and Simone (eds.), *Governing cities in a global era* (113-124). New York: Palgrave.
Zhang, T. (2007b). Urban development patterns in China, in Song and Ding (eds.) *Urbanization in China* (3-28). Cambridge: Lincoln Land Institute.
Zhang, Z., Liu, J., & Gu, X. (2019). Reduction of industrial land beyond Urban Development Boundary in Shanghai: Differences in policy responses and impact on towns and villages. *Land Use Policy*, *82*, 620-630.

Appendix A

Basic Definitions of Tall Buildings

Tall buildings

There is no universally accepted definition of a "tall building." Governments around the world differ in how they define "tall buildings." For example, German regulations define a "tall building" as a building higher than 22 m (72 ft) with room for people's permanent accommodation. City officials derived this limit from the length of ladders used by the firefighters. Leicester City Council in the UK defines a tall building as any structure over 20 m/66 ft in height, and/or a building of any height that is substantially higher than the predominant height of the buildings in the surrounding area, and/or a building that would make a significant impact on the city's skyline. In Ireland, Cork City defines tall buildings as 10 stories and higher buildings. The ASHRAE (American Society of Heating, Refrigerating, and Air-conditioning Engineers) Technical Committee for Tall Buildings defines them as buildings higher than 91 m/ 300 ft.

Importantly, the CTBUH (Council on Tall Buildings and Urban Habitat) seeks to resolve the confusion by providing a framework for the definition. It sets three attributes required to qualify a building to become "tall:"

1. Height relative to context,
2. Proportion, and
3. Building technologies.

Per the first criterion, the building should significantly exceed the general building heights of its surroundings. This criterion is crucial because it contextualizes the perception of tallness. Whereas we may not consider a 10-story building tall in the urban cores of U.S. cities or high-rise cities such as Hong Kong, a predominantly low-rise suburb, a 10-story building is distinctly taller than the norm. The second criterion for tallness implies verticality and states that the building should be slender enough to give it the appearance of a tall building. Numerous large-footprint buildings are tall, but their spatial composition of size/footprint/height prevents them from being classified as tall buildings. This means that tall buildings are higher than neighboring buildings, but they tend to have a much larger footprint and bulkier appearance. The third and relatively weakest criterion—height-related building technologies—suggests that a building may be considered tall if it contains technologies attributed to tallness (e.g., structural systems and building materials). Importantly, the CTBUH makes a distinction between two tall building categories:

- A "supertall" is a 300+ m (984+ ft) building; and
- A "megatall" is a 600+ m (1,967+ ft) building.

High-rise buildings

As with tall buildings, there is no universal agreement on when we can call a building a high-rise. The public often considers a building consisting of many floors a high-rise. In the U.S., with some exceptions, cities define high-rise buildings as structures with occupied floors measuring 23 m (75 ft) or above the lowest level of fire department vehicle access. The Emporis (a global database for building information) defines a "high-rise" building as a multi-story structure between 35-100 meters tall.

Skyscrapers

Similarly, there is no universally accepted definition of a "skyscraper." The Oxford Dictionary defines it as a tall building with many stories. The CTBUH does not set a height threshold for a tall building to be called a skyscraper, while Emporis defines a skyscraper as a 100 m+ (328 ft+) building.

Working definitions

This research embraces the following definitions:

- A tall building, a high-rise, or a tower is a 50 m+ (164 ft+) building.
- A skyscraper is a 150+ m (328+ ft) building.
- A supertall or ultra-tall is a 300+ m (984+ ft) building.
- A megatall is a 600+ m (1,967+ ft) building.

Appendix B

Ten Tallest Cities in China: Population, Area, and Density

Rank	City	Population	Area	Density
#1	Hong Kong	7,547,652	1,104 km² 426 mi²	6,837 people per km² 17,707 people per mi²
#2	Shenzhen	12,356,820	1,748 km² 675 mi²	7,069 people per km² 18,309 people per mi²
#3	Guangzhou	13,301,532	3,843 km² 1,484 mi²	3,461 people per km² 8,965 people per mi²
#4	Shanghai	27,058,480	6,341 km² 2,448 mi²	4,267 people per km² 11,052 people per mi²
#5	Wuhan	8,364,977	1,528 km² 590 mi²	5,474 people per km² 14,179 people per mi²
#6	Chongqing	15,872,179	5,473 km² 2,113 mi²	2,900 people per km² 7,511 people per mi²
#7	Chengdu	9,135,768	2,129 km² 822 mi²	4,291 people per km² 11,114 people per mi²
#8	Shenyang	7,220,104	3,658 km² 1,412 mi²	1,974 people per km² 5,112 people per mi²
#9	Hangzhou	7,642,147	8,260 km² 3,189 mi²	925 people per km² 2,396 people per mi²
#10	Nanning	3,859,608	6,559 km² 2,532 mi²	588 people per km² 1,524 people per mi²