International Journal of
High-Rise Buildings
www.ctbuh-korea.org/ijhrb/index.php

International Journal of High-Rise Buildings
June 2025, Vol 14, No 2, 97-108
https://doi.org/10.21022/IJHRB.2025.14.2.97

Reimagining the Tall Building as a Vertical City

Paul J. Armstrong

Illinois School of Architecture, University of Illinois at Urbana-Champaign

Abstract Vertical cities are multi-functional tall buildings, building complexes, and megastructures that integrate virtually every aspect of the horizontal city vertically to create livable and sustainable urban habitats within a single tower or high-rise conurbation. Consequently, they transpose the physical and social patterns of the horizontal city into a sustainable and fully integrated vertical domain. The relationship between living and working is also changing with remote work. Postindustrial cities have been undergoing major transformations where vertical cities are being designed with spaces and amenities to facilitate productivity, innovation, sociability, and sustainability. As living and working become more integrated with daily life, architects, planners, and developers are reimagining living, working, commerce, and leisure within a vertically integrated city.

Keywords: Tall Buildings, Vertical Cities, Supertall, Megatall, Conurbation, Megastructure, Visionary Towers

†Corresponding author:
Paul J. Armstrong
E-mail:
parmstro@illinois.edu

1. Introduction

1.1. Rise of the Vertical City

Vertical cities are often associated with densely populated mega cities. However, during the 1990s and 2000s, multi-functional supertall towers or complexes of several buildings were constructed throughout the world comprising a "city within a city combining shopping, entertainment and recreational facilities, offices, restaurants, hotels, and residential units (Japan Guide, 2023) .These vertical cities are located near major public transportation hubs and, when properly designed, create a thriving and sustainable urban micro-economy integrating all aspects of the metropolis.

Between 1880 and 1900, cities in the United States grew at a dramatic rate. Owing most of their population growth to the expansion of industry, U.S. cities grew by about 15 million people in the two decades before 1900 (Library of Congress, 2025). Industrial expansion and population growth radically changed the face of the nation's cities. Noise, traffic jams, slums, air pollution, and sanitation and health problems became commonplace. Mass transit, in the form of trolleys, cable cars, and subways, was built, and skyscrapers began to dominate city skylines.

With the advent of new building technologies and materials during the 19th, the concept of the skyscraper emerged. Structural steel and the invention of the safety elevator by Elisha Otis in 1852 enabled buildings to reach unprecedented heights (Illustarch Team, 2024). After World War II, other innovations included fluorescent lighting, modern heating, ventilation and cooling (HVAC) systems, and advances in curtain wall design and glass manufacturing technologies. Dropped ceilings and raised floors integrated structure, MEP, communications, and lighting into efficiently designed "power membranes that freed valuable floor area and reduced floor-to-floor heights (Ábalos and Herreros, 2005). As a result, modern office buildings rose to greater heights with increased efficiency in space, materials, and advanced building systems.

The introduction of skyscrapers into cities also necessitated advancements in urban infrastructure. Cities developed stronger foundations, sewage systems, and more robust water supply networks to support these towering structures. This led to more comprehensive urban planning, ensuring that supporting systems could handle the increased demands of taller buildings.

The emergence of tall buildings influenced urban mobility patterns. Centralized workspaces increased reliance on public transportation, prompting development or expansion of transit systems. Efficient transportation networks became essential for connecting the workforce to the CBDs, addressing the mobility challenges posed by vertical urban landscapes.

Higher floors in skyscrapers became synonymous with luxury, significantly impacting social hierarchies. Affluent residents and businesses sought premium upper-floor spaces, altering urban social dynamics. Vertical living also began to shape social stratification. Higher floors,

once less desirable due to accessibility issues, became premium locations offering better views and air quality. This shift influenced urban lifestyles and residential patterns, with affluent residents moving to higher floors, leaving lower levels for commercial use or less affluent occupiers. This vertical stratification reflected broader changes in societal structures during the industrial age, emphasizing distinct divisions in urban living and working environments.

2. Vertical Cities

In recent years, the concept of vertical cities has emerged as a response to the challenges posed by rapid urbanization and population growth. Vertical cities are characterized by their self-contained ecosystems within a single high-rise complex, offer a holistic approach to urban living. These cities integrate residential, commercial, educational, and recreational facilities, creating self-sustaining communities that minimize the need for extensive commuting and reduce the strain on urban infrastructure (RMJM, 2024; Kilinc, 2025).

Vertical cities are mixed-use super tall towers, building complexes, or megastructures. A mixed-use building contains two or more functions (or uses), where each of the functions occupy a significant proportion of the tower's total space. Support areas such as car parks and mechanical plant do not include mixed-use functions. As a rule, more than 15 percent of a mixed-use tower is dedicated to another use (CTBUH, 2025).

Vertical cities have the potential to address urban sprawl, optimize land use, and foster sustainable living environments, while also promoting a sense of community and social interaction (RJMJ, 2024). Technological advancements such as robotics and artificial intelligence are likely to play an increasingly significant role in the design and construction of high-quality high-rise communities that meet a wide variety of needs. Sustainable practices, including the incorporation of green spaces and the utilization of renewable energy sources, will become even more vital in creating environmentally conscious vertical structures.

A conurbation of high-rise towers, whether supertall towers or modestly scaled high-rises, may constitute a vertical city. But another potent analogy can be drawn between the city and the multi-functional tall building when we consider its overall scale, diversity of usages and people, and the integration of complex infrastructures of vertical transportation, technical, and cladding systems with its structure, and the large number of people who live and work within, it becomes clear that a tall building functions as a vertical a city.

2.1. Plan Voisin to Habitat

In many respects, the tall building is a microcosm of the city. Due to its large scale and technical requirements, it must be functionally designed for efficiency and performance with adequate vertical transport, infrastructure for services, a robust structural system, and comfortable interior spaces and safe, sustainable exterior environments for human occupation and enjoyment.

Originally designed as commercial buildings with retail space and lobbies on the ground floor and offices above, there was little concern for their social impact. In his Plan Voisin proposed for Paris in 1925, Le Corbusier envisioned living in high-rise towers surrounded by green parks, which he called "the lungs of the city". His aim was to provide residents more access to natural light and ventilation supported by a modern infrastructure of transportation and services. Plan Voisin was never realized, but his dream of a "city-within-a-city" did with the construction of the Unite d'habitation in Marseilles, France completed in 1952. It was designed as a mixed-use concrete-framed building with retail space and residential units with amenities including a school, roof terrace, and streets in the air to encourage sociability.

The 22-story Promontory Apartments in Chicago and completed in 1949 were one of the first post-war residential high-rise towers in the U.S. Designed by Mies van der Rohe, they featured an expressed structural concrete frame (Mies van der. Rohe Society, 2024).

Bertram Goldberg designed two vertical cities in Chicago: Marina City, completed in 1964 and River City, completed in 1986. At River City, Goldberg originally envisioned a high-density site of mixed-use skyscrapers 72-stories tall, with the towers uniquely linked in "triads, connected by skybridges and containing everything from schools to shopping centers. The design was modified extensively over a ten-year planning period and resulted in a serpentine structure (River City II), described by Goldberg as unfolding the towers and laying them on end (Temko, 1985)

Megastructures were built in cities such as London, Montreal, and Tokyo where Metabolism became the most substantive subdivision of the megastructure movement. The most ambitious Metabolist plans such as Kikutake's Ocean City and Kenzo Tange's Tokyo Bay Project of 1960 were never built. But some were including Moshe Safdie's Habitat in Montreal, which became "the most immediately accepted of all the…megastructures because it was least radical (Banham, 1976).

2.2. Transect Planning

To visualize a vertical city, one may apply the concept of the transect, a narrow yet long swath of land cut through an entire city encompassing its high-density urban core outwards to low-density suburbs and rural landscape. New Urbanists Andrés Duany and Emily Talen (2002) define a transect as "a geographical cross-section of a region used to reveal a sequence of environments. For human environments, this cross-section can be used to identify a set of habitats that vary by their level and

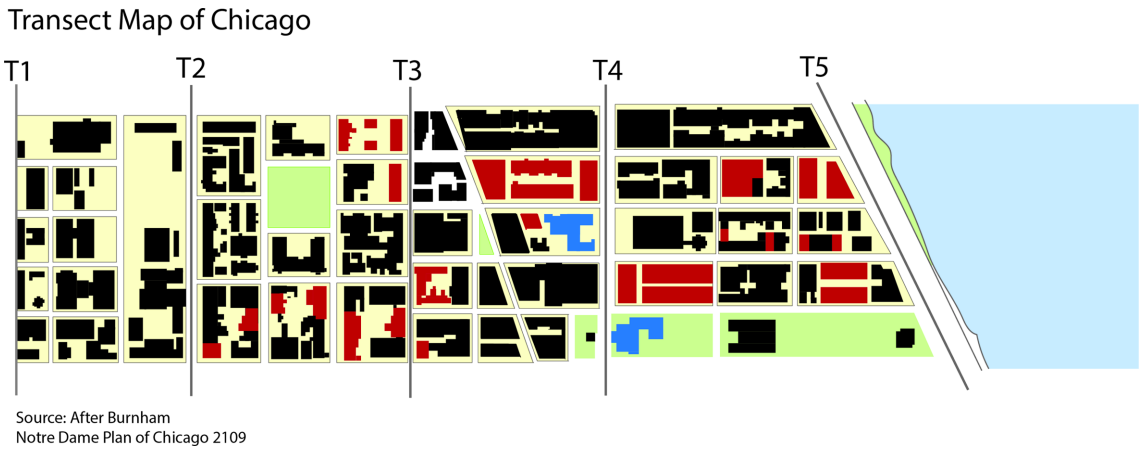


Figure 1. Transect Map of City of Chicago. Each zone of the transect represents transitions in density, building heights, and usages. (Illustration by Paul J. Armstrong)

intensity of urban character, a continuum that ranges from rural to urban. In transect planning, this range of environments is the basis for organizing the components of the built world: building, lot, land use, street, and all other physical elements of the human habitat.

Transect planning begins with the idea that planning must be based on finding the proper balance between human-made and natural environments. Finding the connection between the living world and the world of cities, is necessary to achieve good urban form—one that is ecologically, socially, and economically sustainable (Van der Ryn & Cowan, 1995).

A city may be represented in plan as a solid/void figure-ground diagram of buildings (typically represented in black or other colors) surrounded by space (white) such as streets and public squares, parks, and undeveloped land (green). Applying the transect, a more complete picture is rendered when we consider the vertical scale and multiplicity of building types and densities organized by zoning into districts, neighborhoods, and urban blocks interconnected with a network of transit, public streets, and parks forming distinct urban and social patterns (Fig. 1). Transposing the transect to the vertical domain of a skyscraper allows designers to visualize it as an urban phenomenon analogous to the horizontal city. While the transect cannot literally be translated to the tall building it still serves a useful function, providing architects and urban planners an empirical tool to analyze the physical and social structure and complex articulations of an urban habitat to re-create a vibrant and sustainable vertical city-within-a-city.

How can architects and planners design tall buildings for this new paradigm of living and working in a vertical city? While the question is rhetorical, we can consider a few case studies for examples.

3. Case Studies

We may consider vertical cities in four distinct categories: 1) Supertall and megatall skyscrapers comprising multiple functions including living units, office floors, commercial floors, supported by a variety of services and amenities; 2) conurbations of high-rise complexes with shared podiums or public plazas that incorporate multiple uses in separate buildings; 3) multi-functional "city-within-a-city interconnected buildings or towers integrating living, working, shopping, recreation and leisure with urban services, transportation, and public parks, plazas and gardens both vertically and horizontally; and 4) Visionary megastructures.

3.1. Supertall and Megatall Towers

Tall buildings that achieve significant heights are classed in two additional sub-groups: A "supertall is a tall building 300 meters (984 feet) or taller, and a "megatall is a tall building 600 meters (1,968 feet) or taller. As of today, there are 173 supertalls and only 3 megatalls completed globally (CTBUH, 2025).

As global cities strive for sustainable development and iconic architecture, cities such as Shanghai and Kuala Lumpur have emerged as leading hubs for vertical urbanism. In response to limited land availability and rapid urbanization, cities are pushing the boundaries of skyscraper design to create efficient, mixed-use developments that integrate seamlessly into dense urban environments (Japan Guide, 2023).

3.1.1. Supertall Mixed-use Skyscrapers

The Council of Tall Buildings and Urban Habitat (2025) defines a mixed-use skyscraper that has at least 15% of its net floor area dedicated to another function. Typically, the mix includes office space on the lower third or more of the tower, where the floor plates are larger to accommodate many employees and office equipment. Middle sections often contain serviced apartments. And the most common use of upper floors is luxury hotels, with semi-public restaurants, bars, and often observation

decks. As the tower rises, the floor plates become smaller with setbacks or in a sculpted form that give it a distinct profile (Willis, 2025).

3.1.2. 1414 Brickell

Designed by Arquitectonica, the proposed 81-story supertall mixed-use skyscraper will rise 1,010 feet (308 m) above Mami, Florida's skyline and comprise 560 residential units, 84 hotel rooms, 145,950 square feet (13,559 m^2) of office space, and 6,038 square feet (561 m^2) of retail to the Brickell corridor. A multi-level podium with a glass façade at the base will accommodate 1,226 parking spaces (Fig. 2) (Nunez, 2025).

Renderings depict a glass-clad supertall tower featuring a stacked, offset design punctuated by open-air sky gardens. The tower's rectilinear form is softened by illuminated terrace cutouts, which alternate from one side to the other as the structure rises. These cutouts, framed in white stucco or paneling, provide outdoor spaces with greenery and contrast against the darker façade. A prominent cutout at the very top acts as a subtle crown-like element, distinguishing the tower's peak within the skyline.

A multi-level podium with a glass façade forms the base, accommodating retail and parking. As the tower ascends, horizontal bands of balcony glass railings mark each floor, creating a rhythmic pattern that emphasizes the building's verticality. The combination of solid massing, recessed voids, and linear detailing defines the tower's overall form within the high-rise corridor.

3.1.3. Megatall Towers

Like supertall towers, megatall skyscrapers often have a mix of functions zoned vertically as the tower rises. Due to their enormous height and floor area, these "super towers have even higher populations making them vertical cities in the most complete sense. They often incorporate sky lobbies with amenities located above mechanical floors that divide functions. They often include sky gardens and atria that bring people together in a variety of social and sustainable spaces.

3.1.4. Shanghai Tower

The megastall Shanghai Tower is the world's third tallest tower and rises to 631.85m (2,073 feet) combining Class-A office space, luxury hotel, an exhibition center, retail, and cultural venues within a single superstructure (Fig. 3). (Gensler, 2025) Its spiral design minimizes wind load, while the double-skin façade improves energy efficiency. The tower integrates public spaces and green technologies, offering a sustainable model for future high-density urban environments. Gensler applied the organizational concept of Chinese communal "lane houses to vertical neighborhoods, each with its own "sky garden to encourage social interaction and create a sense of community (Xia et al., 2010).

3.1.5. Merdeka 118.

In Malay, Merdeka means "independence and, at 2,227 feet (679 m) the 118-story megatall Merdeka 118 in Kuala Lumpur, Malaysia is the second tallest building in the world. (Skyscraper Center, 2025) Designed by Fender

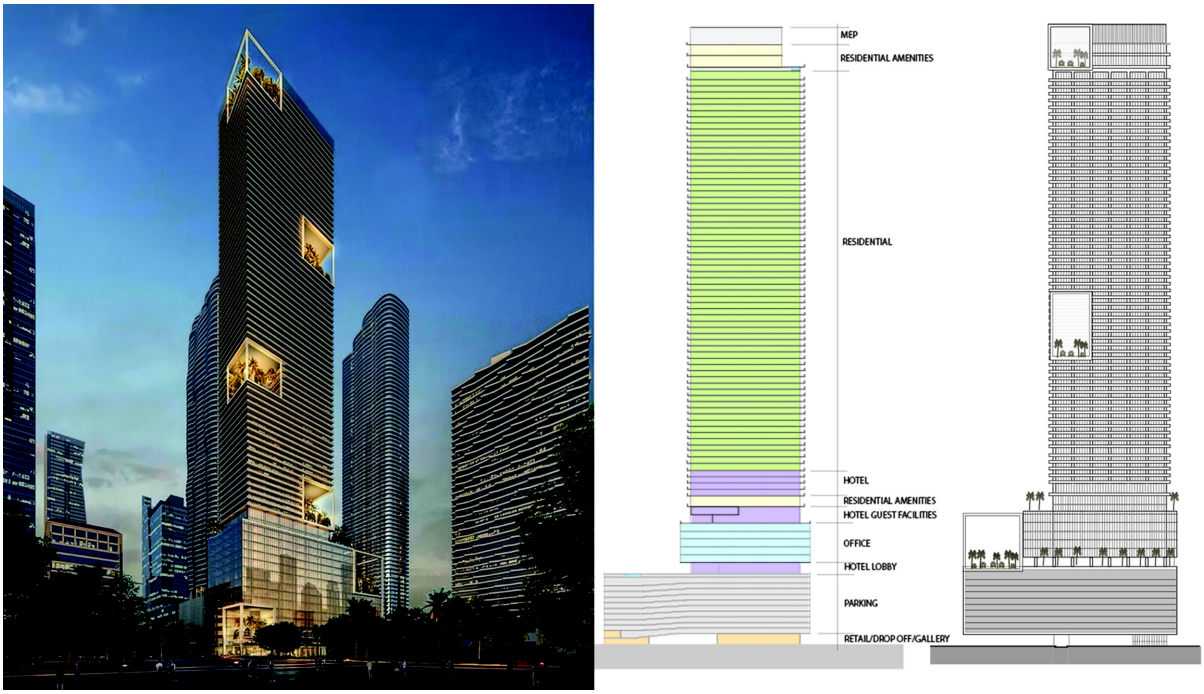


Figure 2. 1414 Brickell is a proposed for an 81-story supertall vertical city in Miami FL designed by Arquitectonica. (Rendering: Arquitectonica; Illustrations: Paul J. Armstrong)

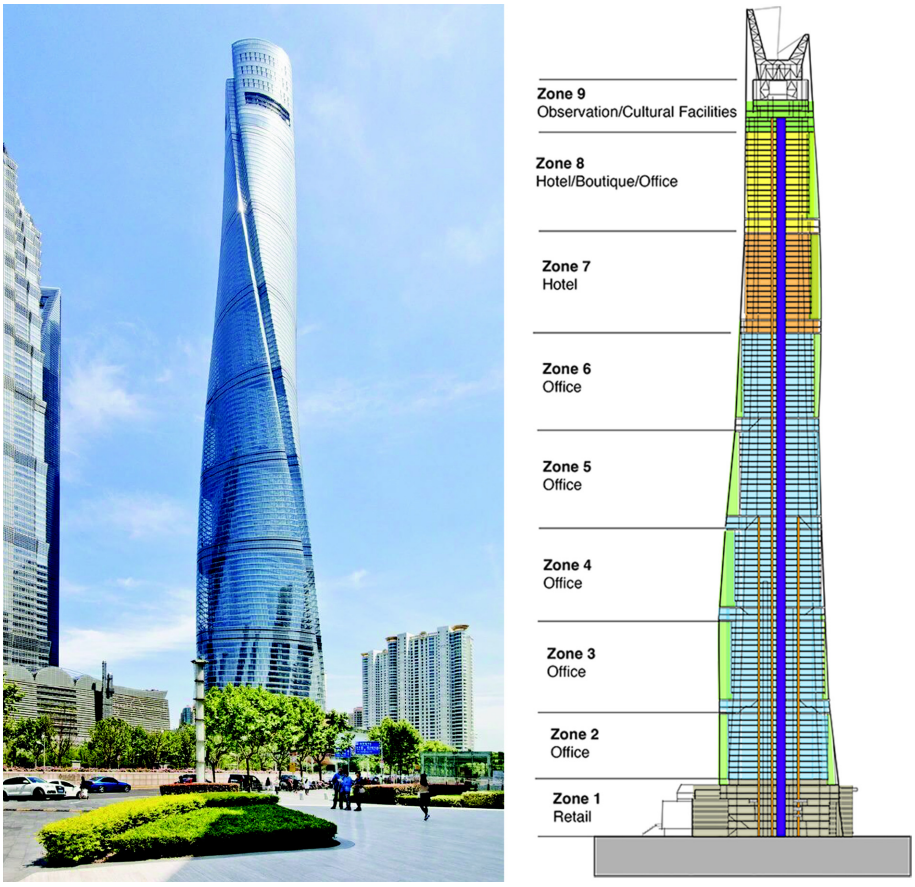


Figure 3. Shanghai Tower, Shanghai, China, Gensler. (Illustration courtesy of Gensler. Diagram by Paul J. Armstrong

Katsalidis, the multi-functional super tower is divided into five vertical zones including a retail podium, office floors, hotel, and a restaurant and observation floors (Fig. 4). The 19-hectare Warisan Merdeka complex integrates the tower with two historic stadiums in mixed-use development for 3,000 residents (Fender et al., 2013).

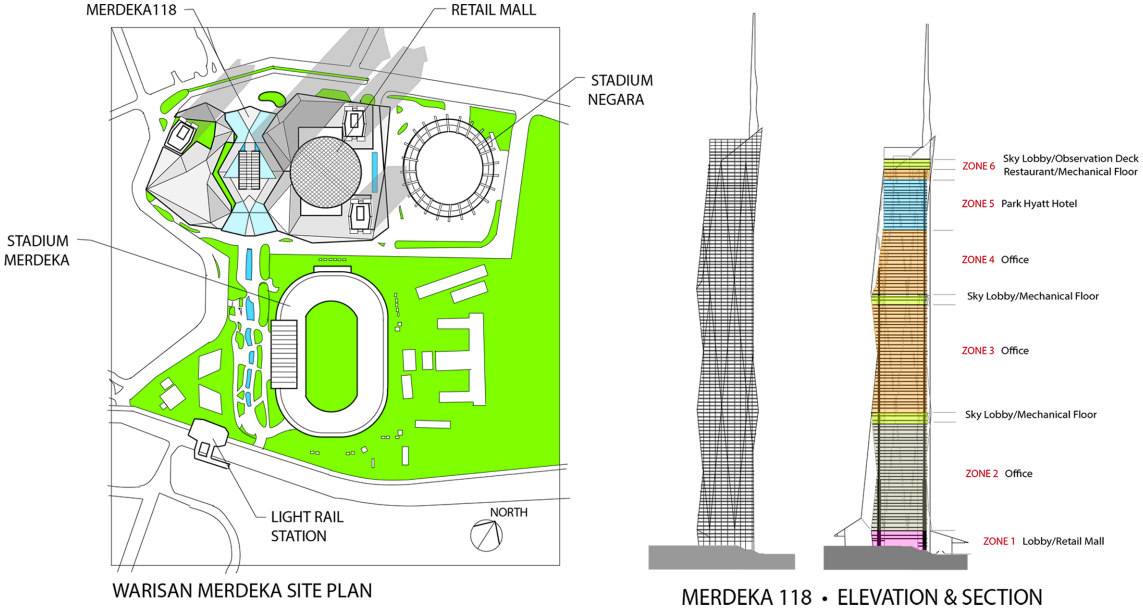


Figure 4. The Warisan Merdeka complex in Kuala Lumpur includes the Merdeka 118 tower, a retail mall, three residential high-rises, and two historic stadiums. The site is accessed from a light rail station. (Illustrations by Paul J. Armstrong)

3.2. Conurbations

Vertical cities can be created from conurbations of multiple buildings often joined by a commercial podium, plaza, or park-like space. These "cities-within-a-city form complexes or urban conurbations connected to transportation hubs and transform large urban areas into vibrant epicenters of living, working, commerce, and leisure.

3.2.1. The Grand.

The Grand (Fig. 5.) is a mixed-use complex designed by Frank Gehry Associates in the Bunker Hill cultural and civic neighborhood of Los Angeles, CA. The 1-million-square-foot (92.903 m^2) landmark mixed-use project comprises 30 percent retail shops, a 450-seat luxury movie theater with in-seat dining, a 39-story tower with 113 condos and 323 rentals and a 314-room Equinox Hotel (Sagar, 2018).

The Grand is sited on a block immediately south of Gehry's Disney Concert Hall, which complements the Dorthy Chandler Pavillion to the east and The Broad Museum and The Museum of Modern Art to the west. It brings residents and visitors directly into the heart of the cultural district and downtown Los Angeles.

3.2.2. Hudson Yards.

Hudson Yards (Fig. 6) is Manhattan's first LEED Gold Neighborhood development and the largest private real estate development in New York City since Rockefeller Center where 125,000 people daily are expected to live, work, dine, shop, study, or sightsee (HYDC, 2014). The 28-acre (11-hectare) neighborhood is encompassed by the Hudson Yards Financing District, including the area of Manhattan bounded by 42nd and 43rd Streets, Seventh and Eighth Avenues, West 28th and 30th Streets and Hudson River Park. It includes 18 million square feet (1,672,255 m^2) of commercial and residential space, 14 acres of public open space, a public school, and the Edge, the Western Hemisphere's highest observation deck.

3.3. Multiple Interconnected Towers

Linking multiple towers together provides greater density and, depending on how they are composed, can create a variety of exterior green terraces on the ground as well as on roof tops. Circulation with elevator cores, stairways, corridors and ramps facilitate movement and knit the buildings together with a continuous thread encouraging occupants to interact socially withing the network of buildings and semi-public gathering spaces.

While some interconnected buildings, such as Montreal's Habitat, are successful, many others are not. Consequently, architects and developers tend to avoid interconnected schemes. The examples below illustrate how designers can achieve sustainable and livable solutions by weaving buildings together.

3.3.1. Linked Hybrid

Stephen Holl designed the 220,000 m^2 (2.4 million ft^2) Linked Hybrid complex in Beijing in 2009 to counter the privatization of urban developments by creating a porous and inviting public urban space (Fig. 7) (Binder, 2015). It enhances human experience through multifaceted spatial layers and multiple passages. The pedestrian-oriented ground level contains "micro-urbanisms of small-scale shops augmented by green space and roof gardens creating a "social condenser and make the Linked Hybrid an "open city within a city" (ArchDaily, 2025a). The project promotes interactive relations and encourages encounters in the public spaces that vary from commercial, residential, and educational to recreational. The entire complex is a three-dimensional urban space in which buildings on the ground, under the ground and over the ground are fused together. Higher floors are linked by skybridges with amenities including a swimming pool, fitness room, caf, and gallery.

3.3.2. The Interlace

The Interlace is located on an elevated twenty-acre (8 hectare) site amidst the verdant Southern Ridges of

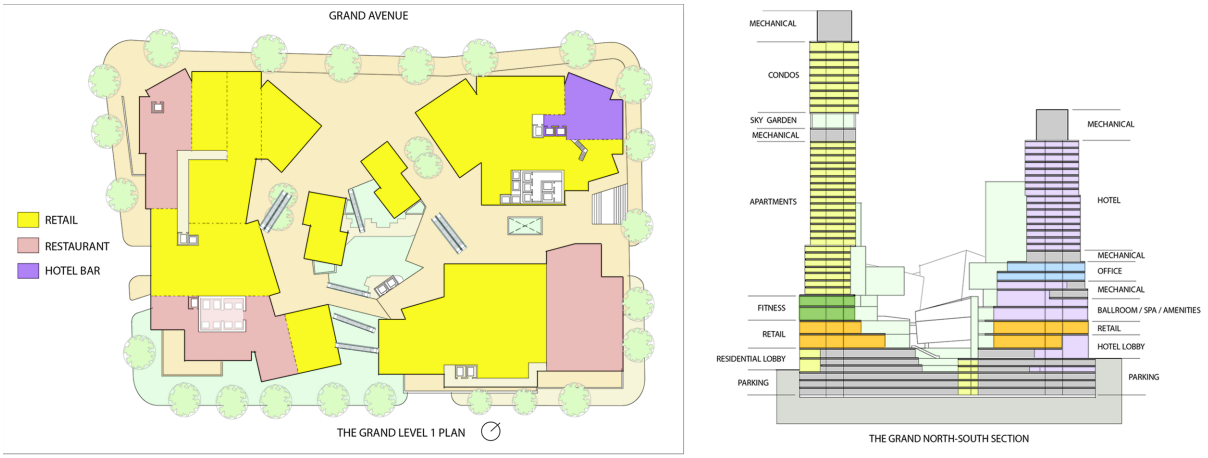


Figure 5. The Grand is a mixed-use skyscraper complex occupying an entire city block in the Bunker Hill neighborhood of Los Angeles, CA. (Illustrations: Paul J. Armstrong)

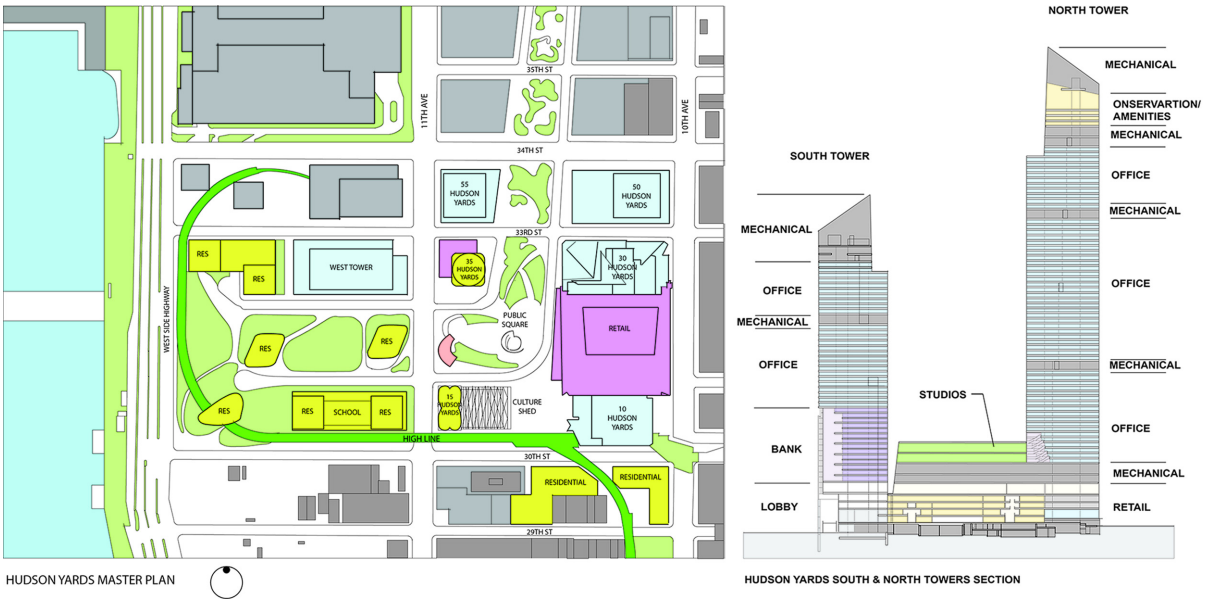


Figure 6. Hudson Yards repurposes a post-industrial area in Manhattan into high-density mixed uses. (Illustrations: Paul J. Armstrong)

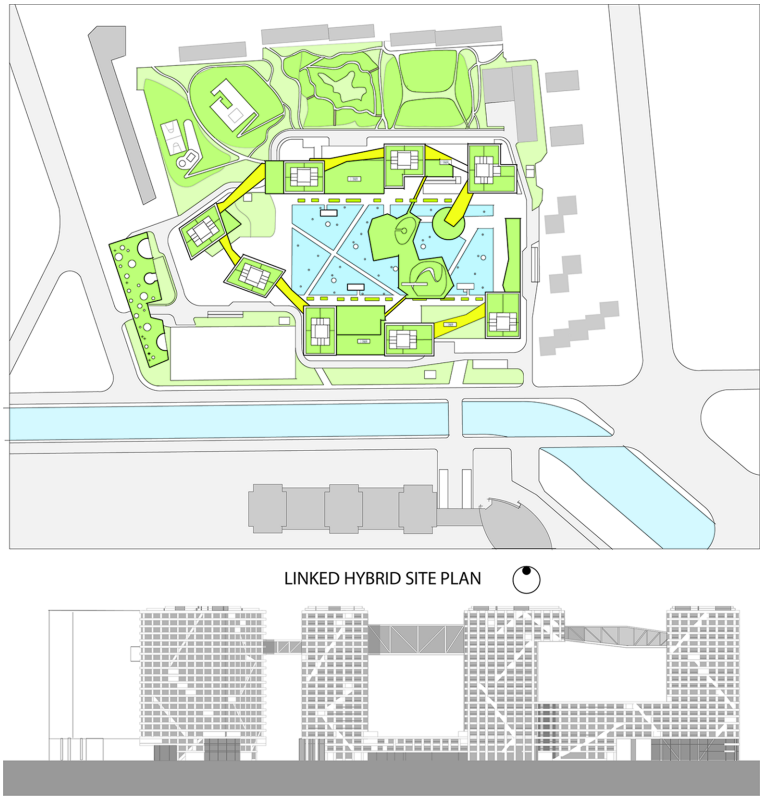


Figure 7. Linked Hybrid, Stephen Holl Partners, Beijing, China, 2009, Elevation. (Illustrations: Paul J. Armstrong)

Singapore. With about 1.8 million square feet (170,000 m^2) of gross floor area, the development provides 1,040 apartment units of varying sizes with extensive outdoor spaces and landscaping (Fig. 8) (ArchDaily, 2025b). Designed by Ole Scheeren, partner of the Office for Metropolitan Architecture (OMA), The Interlace breaks away from Singapore's standard typology of isolated, vertical apartment towers and instead explores a dramatically different approach to tropical living: an expansive interconnected network of living and communal spaces integrated with the natural environment. Thirty-one apartment blocks, each six-stories tall and identical in



Figure 8. The Interlace, Singapore, Malaysia, 2013, OMA. (Illustrations: Paul J. Armstrong)

length, are stacked in a hexagonal arrangement to form eight large-scale open and permeable courtyards. The interlocking blocks form a vertical village with cascading sky gardens and both private and public roof terraces.

The design capitalizes on the generous size of the site and further maximizes the presence of nature by introducing extensive roof gardens, landscaped sky terraces and cascading balconies. Above- ground vehicular circulation is minimized, liberating large green areas within the development. The Interlace incorporates sustainability features through careful environmental analysis of sun, wind, and micro-climate conditions on site and the integration of low-impact passive energy strategies such as natural ventilation and passive shading. The acceleration of wind between the blocks, with its shadows, water features and cooling breezes, benefits Singapore's tropical climate (Moore, 2015).

3.4. Visionary Megastructures

The exercise of architecture on a very large scale bridges the gap between the single building and its urban context. Megastructures expand buildings to a point where they encompass a range of functions well beyond that of even the most versatile of structures to bring the outside world inside the building and permit residents and users to make their own stamp on the result. (Banham,

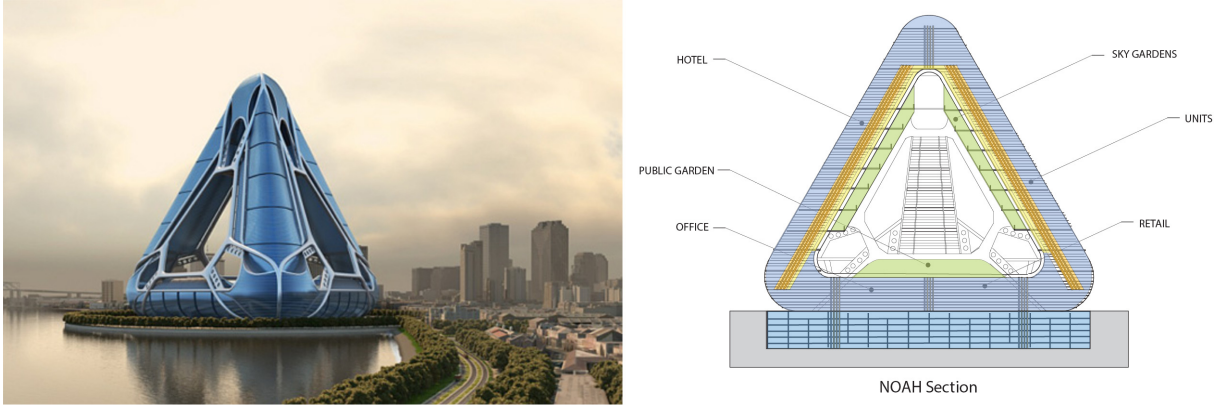


Figure 9. NOAH, visionary megastructure proposal by Kevin Schopfer for New Orleans, 2009. (Rendering: Medium; Illustration: Paul J. Armstrong)

1976; Paletta, 2020) Although many visionary towers and megastructure proposals are not economically feasible at present, they often provide models for possible cities of the future (Beedle et al., 2007).

3.4.4. NOAH

Visionary skyscrapers often take the form of megastructures that are directly linked to megacities where large populations are contained within dense cities or urban conurbations (Al-Kodmany, 2011). In response to flooding, Architect Kevin Schopfer proposed a floating structure to be built off the banks of the Mississippi River in New Orleans in 2009. The New Orleans Arcology Habitat or NOAH is a city-within-a-city, a 1,200-foot-tall (366-meter) triangular framed megastructure that integrates architecture with sustainability (Fig. 9) (Zubair, 2023).

NOAH was intended to be a metropolis for 40,000 inhabitants, with 20,000 residential units and three hotels. The pedestrian-oriented triangular structure includes a school system, health care facilities, and casinos connected vertically by electric train carriers and elevators. Its open triangular frame would help the structure to dissipate hurricane wind gusts allowing them to blow directly through the building.

4. Discussion

4.1. Critical Assessments

The world's population is projected to continue growing for the next 50 to 60 years, peaking at approximately 10.3 billion by the mid-2080. Currently, 55 percent of the world's population lives in urban areas, a proportion that is expected to increase to 68% by 2050 (United Nations, 2024). As cities grow in density, there will continue to be a need for tall sustainably designed buildings. However, building taller does not necessarily translate into building better.

In 1924 Le Corbusier presented Villa Radieuse (Radiant City), a vertical city with 1,200 inhabitants per acre, as a way of extending the primary Garden City concepts – the super-block, regimented neighborhood planning, easy automobile access, and the insertion of large grassy expanses to keep pedestrians off the streets – into the city itself, with the explicit goal of reinventing stagnant downtowns (Merin, 2013). Jane Jacobs criticized the suburban Garden City and especially the Radiant City for presenting modern urban planning concepts that were applied ubiquitously in U.S. cities without concern for the actual needs of residents and contributing to the decline of pedestrian-oriented streets and neighborhoods (Jacobs, 1961).

Tall buildings have long been criticized as anti-urban for their enormous scale and contributing to a sense of social isolation in their dependence on elevators and repetition of stacked floors resulting in a lack of social interaction and environmental amenities for occupants. Firley and Gimbal (2011) point out that poorly placed tall buildings, whether singly, in clusters, or as vertical districts, can also prevent meaningful connection between activities at street level.

Furthermore, they consume copious amounts of embodied energy in materials and construction and during their life-cycle operations. However, when evaluated comparably with low-rise, low-density housing, for instance, increasing efficiency by as little as 10 percent in a residential high-rise building can be equivalent to the energy consumed by100 single-family residences (Frisch, 2024).

Alotaibi and Sinclair (2016) contend that too much emphasis has been placed on energy consumption of tall buildings and that a broader understanding of sustainability must be considered regarding ecology and social well-being. Tall buildings are constructed on brownfield sites and, because of their relatively small footprints, use less urban space than other building types that contribute to urban sprawl.

Ada Louis Huxtable (1982) identified four skyscraper ages beginning with earliest tall office buildings during the Commercial Age and ending with the post-modern towers of the Age of Pluralism. Her classifications are based primarily on styles versus today's tall buildings, which are even more efficient and sustainable than their predecessors. Today, we are experiencing a fifth skyscraper age of High-Performance tall buildings in which aerodynamic forms, embodied energy of materials and construction, life-cycle costs, and health and wellbeing of occupants have become important determinants of skyscraper design.

David Mallot, Principal at Kohn Pedersen Fox (KPF) and former Chairman of the Council of Tall Buildings and Urban Habitat, posits that tall buildings are inherently sustainable when they are compact in form and connected visually, physically and culturally with their urban environments (Malott, 2015).

Architect Ken Yeang argues for applying bioclimatic principles to tall buildings to make them operate more compatibly with their physical environments. He has shown how the tall building can be conceived as an environmentally sensitive mechanism by creating vertical assemblages of spaces that are naturally lit and ventilated, linked to terraces, and interspersed with lush vegetation. (Foster, 2006) These spaces bring nature and the ground plane upwards into the building providing ecological "parks in the air for human interactions and well-being. Yeang (2006) contends that by imitating the ecosystem, our built environment should produce no waste, and all emissions and products would be continuously reused or recycled and reintegrated with our natural environment.

Large-scale high-rise redevelopment projects such as Hudson Yards require enormous, high risk capital investments, which are often financed through public/private partnerships. In 2002, New York City invested $3 billion to extend the No. 7 subway line from its current end at Times Square to 34th Street and Eleventh Avenue and create Hudson Boulevard, a new street spotted with public parks running between Tenth and Eleventh Streets from 33rd to 42nd

Streets. However, as opposed to a private investor choosing to engage in high risk for high reward, PILOT (Payment in Lieu of Taxes) financing was used to pay these upfront costs for future reward exposed taxpayers to the consequences inherent in TIF projects (Fisher, 2015). Because they do not appear in the city's budget (Campion, 2013), these funds also skipped the city's democratic budget-making process. TIF's have been frequently used by municipalities to incentivize development but are controversial because they are financed by existing businesses and landowners in the district.

Redevelopment often leads to gentrification displacing long-time residents. To offset inequities, many U.S. cities are now mandating that a certain persentage of all new residential construction includes affordable housing units. One of the most major challenges in Downtown L.A. are the vast numbers of homeless people living on the streets. The 2023 Greater Los Angeles Homeless Count results show a 9 percent rise in homelessness on any given night in Los Angeles County to an estimated 75,518 people and a 10 percent rise in the City of Los Angeles to an estimated 46,260 people (Yee, 2023). 20 percent of the Grand's apartments is available to low-income residents.

5. Conclusion

As cities grow in population, urban habitats need to develop sustainably. Tall buildings are constructed on brownfield sites and have relatively small footprints thereby enabling greater density of people and usages on less land area. Conceiving the tall building as a vertical city comprising the essential components of the urban transect allows architects, planners, and developers to integrate a variety of functions with sustainable technologies and spaces to create social microenvironments for living and working.

Today tall building architects are integrating green spaces and other amenities with innovative structural systems, environmentally responsive curtain walls, and high-efficiency MEP systems complemented with renewable energy technologies to increase operational efficiency, enhance thermal comfort, and provide social spaces for occupants. Sky gardens and atria are more than aesthetic additions. They are integral and essential functions contributing to more sustainable and livable habitats by bringing the ecology of the landscape vertically into the building skyward and closer to occupants. Le Corbusier's analogy of urban green spaces functioning as the "lungs of the city can now be applied to vertical sky gardens that also function environmentally as the "lungs of the building.

The relationships between living and working are changing throughout the world. With advances in communications technology, working has become increasingly flexible and portable. As the needs for office space changes, designers are reimagining how we live, work and socialize in tall buildings. This also means that architects and planners will have to develop new paradigms for how future tall buildings and urban complexes can be designed as sustainable and livable vertical cities that synthesize all the necessities and amenities of the horizontal city

References

Ábalos, I., Herreros, J. (2005). *Tower and office: from modernist theory to contemporary practice,* MIT Press, New York, USA.

Al-Kodmany, K. (2011). "Tall buildings, design, and technology: visions for the twenty-first century," *Journal of Urban Technology,* 18:3, pp. 115-140. https://www.tandfonline.com/doi/full/10.1080/10630732.2011.615573 Accessed 2/27/2025.

Alotaibi, F. & Sinclair, B.R. (2016). "Tall buildings, high expectations, towering responsibilities: critically considering skyscrapers, urbanism and sustainability, June 15. DO - 10.1201/9781315226255-82. https://www.researchgate.net/publication/306314218_Tall_Buildings_High_Expectations_Towering_Responsibilities_Critically_Considering_Skyscrapers_Urbanism_and_Sustainability, Accessed, 4/29/2025.

ArchDaily (2025a). "Linked Hybrid / Stephen Holl Architects," ArchDaily website. https://www.archdaily.com/34302/linked-hybrid-steven-holl-architects, Accessed 3/12/2025.

ArchDaily (2025b). "The Interlace/OMA?Ole Sheeren," ArchDaily website. https://www.archdaily.com/627887/the-interlace-oma-2, Accessed 4/30/2025.

Banham, R. (1976). *Megastructure: Urban futures of the recent past,* Monacelli Press, New York, USA.

Beedle, L., Ali, M.M., and Armstrong, P.J. (2007). *The skyscraper and the city: design, technology and innovation.* The Edwin Mellen Press, Lewiston, New York, USA.

Binder, G. (2015). *Tall buildings of China*, Council of Tall Buildings and Urban Habitat, Images Publishing, Mulgrave, Victoria, Australia.

Campion, S. (2013). "City's spending on Hudson Yards project has exceeded initial estimates." Fiscal brief: New York City Independent Budget Office, April. http://www.ibo.nyc.ny.us/iboreports/hudsonyards2013.html. Accessed 5/11/2025.

CTBUH (2025). Tall building criteria, Council of Tall building and Urban Habitat, Chicago. https://www.ctbuh.org/resource/height#:~:text=Tall%20buildings%20that%20achieve%20significant,only%203%20megatalls%20completed%20globally. Accessed 4/29/2025.

CTBUH Newsletter (2025). "Trends & forecasts," Council of Tall Buildings & Urban Habitat, Chicago, February 4. https://www.skyscrapercenter.com/trends-and-forecasts/2025?_zs=n1qTn&_zl=r0KG3, Accessed 3/7/2025.

Duany, A.and Talen, E. (2002), "Transect planning," *Journal of the American Planning Association*, Vol. 68, No. 3, Chicago, IL, pp. 245-266.

Fender, K., Mahmud, A, Tengku, R. and Terenzio, D. (2016). "Next generation large-scale mixed-use developments," Proc. CTBUH Shenzhen-Guanzhou-Hong Kong Conference, Hong Kong, China, October, pp. 528-537. https://global.

ctbuh.org/resources/papers/2918-Pg528_Fender.pdf, Accessed 3/32025.

Firley, E. and Gimbal, J, (2011). *The urban towers handbook*, New York: John Wiley & Sons.

Frisch, M. (2024). "Introduction to sustainable design of tall buildings," Presented at Solomon Cordwell Buenz, Chicago, September 13.

Fisher, B. (2015). "The myth of self-financing: the trade-offs behind the Hudson Yards redevelopment project, working paper no. 4, July, New York: The Scwartz Center for Economic Policy Analysis, The New School for Social Research. chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.economicpolicyresearch.org/images/docs/research/political_economy/Bridget_Fisher_WP_2015-4_final.pdf, Accessed 5/10/2025.

Foster, N. (2006). "Ken Yeang's architecture," *Ken Yeang: on green design*, Plym Distinguished Professor in Architecture, B. Bognar, D. Chasco, and J. Stallmeyer, eds., Champaign: University of Illinois at Urbana-Champaign.

Gensler (2025). "Shanghai Tower: a symbol of China's ascension," Gensler Website, Projects. https://www.gensler.com/projects/shanghai-tower, Accessed 3/2/2025.

Global Height Bank (2025). "Criteria for defining and measuring tall buildings," Council of Tall Buildings and Urban Habitat chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://store.ctbuh.org/PDF_Previews/Posters/Criteria_2010_Preview.pdf, Accessed 1/20/2025.

Huxtable, A.L. (1982). "The tall building artistically considered," republished in *The New Criterion,* vol, 43, no. 9, May 2025. https://newcriterion.com/article/the-tall-building-artistically-reconsidered/, Accessed 5/1/2025.

HYDC (2024). "The Hudson Yards project," Hudson Yards Development Corporation. https://www.hydc.org/hudson-park-boulevard-phase-i-and-ii, Accessed 5/10/2025.

Illustarch Team (2024). "How 19th century skyscrapers revolutionized urban architecture and economic growth," September 29. https://illustrarch.com/articles/34139-skyscaper-in-19th-century.html?srsltid=AfmBOorVlTkeymq47NBlLX0TFixl9l6L-o8cTKX5Lce0SMI92go-FLvV, Accessed 1/20/2025.

Jacobs, J. (1961). *The death and life of great American cities,* Random House, New York.

Japan Guide (2023). "Cities within the city," December 7. https://www.japan-guide.com/e/e3027.html, Accessed 3/3/2025.

Kilinc, E.I. (2025). "Designing with purpose: Ecem Irem Kilinc on growth, collaboration, and contextual innovation at RMJM," Interviews, RMJM Architects. https://rmjm.com/designing-with-purpose-ecem-irem-kilinc-on-growth-collaboration-and-contextual-innovation-at-rmjm/, Accessed 5/11/2025.

Mallot, D. (2015). "Supertall: reshaping our vertical habitat," Skyscraper Seminars, The Skyscraper Museum, New York, July 21. https://skyscraper.org/programs/supertall-reshaping-our-vertical-habitat/, Accessed 5/1/2025.

Merin, G. (2013). "AD classics: Villa Radieuse/Le Corbusier," *ArchDaily,* August 11. https://www.archdaily.com/411878/ad-classics-ville-radieuse-le-corbusier, Accessed 5/11/2025

Mies van der Rohe Society (2024). "Promontory Apartments," MvdR Society website. https://www.miessociety.org/mies-buildings/blog-post-title-one-nw8cp, Accessed 1/22/2025.

Moore, R. (2015). "The Interlace in Singapore by OMA/Ole Scheeren," The Architectural Review, March 19. https://www.architectural-review.com/today/the-interlace-in-singapore-by-oma-ole-scheeren, Accessed 4/30/2025.

Nunez, O. (2025). "Supertall 81-story tower at 1414 Brickell submitted for zoning review in Miami," *Florida YIMBY*, February 26. https://floridayimby.com/2025/02/supertall-81-story-tower-at-1414-brickell-submitted-for-zoning-review-in-miami.html, Accessed 5/1/2025.

Paletta, A. (2020). "With the reissue of Reyner Banham's classic, tracing the megastructural moment," *Metropolis*, June 17. https://metropolismag.com/viewpoints/reyner-banham-megastructure/, Accessed 2/272025.

RMJM Architecture, "From skyscrapers to vertical cities," Insights, 2024. https://rmjm.com/vertical-cities/, Accessed 1/21/2025.

Sager, R. (2018). "Grand Avenue, Frank Gehry and a 314-Room Equinox Hotel," The Commercial Observer, May 21. chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.relatedcalifornia.com/news-articles/2018/05/21/grand-avenue-frank-gehry-and-314-room-equinox-hotel/Commercial-Observer-The-Grand.pdf, Accessed 5/10/2025.

Skyscraper Center (2025). "Merdeka 118," Council of Tall Buildings & Urban Habitat, https://www.skyscrapercenter.com/building/merdeka-pnb118/10115, Accessed 3/3/2025.

Temko, A. (1985). "Bertrand Goldberg" in *150 Years of Chicago architecture 1833-1983*, Glibota, A. and Glibota F.E., Musee Galerie de la Seita, Paris, France.

Willis, C. (2025) "Supertall! World towers above 380 m," Mixed-use Towers, The Skyscraper Museum. https://old.skyscraper.org/EXHIBITIONS/SUPERTALL/mixed_use_model.php, Accessed 5/1/2025.

United Nations (2024). World population prospects 2024: Summary of results, Department of Economic and Social Affairs, UN DESA/POP/2024/TR/NO. 9, New York. chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.un.org/development/desa/pd/sites/www.un.org.development.desa.pd/files/files/documents/2024/Jul/wpp2024_summary_of_results_final_web.pdf Accessed 4/29/2025.

U.S. Library of Congress (2025). "City life in the late 19th century," U.S. history primary source tmeline: Rise of industrial America. https://www.loc.gov/classroom-materials/united-states-history-primary-source-timeline/rise-of-industrial-america-1876-1900/city-life-in-late-19th-century, Accessed 1/20/2025.

Van der Ryn, S., and Cowan, S. (1995). *Ecological design.* Island Press, Washington, DC, USA, p.3.

Xia, J., Poon, D., and Mass, D.C. (2010). Case study: Shanghai Tower," *CTBUH Journal,* Issue II, pp. 12–18. https://global.ctbuh.org/resources/papers/download/12-case-study-shanghai-tower.pdf, Accessed 3/2 2025.

Yeang, K. (2006). "On green design," *Ken Yeang: on green design*, Plym Distinguished Professor in Architecture, B. Bognar, D. Chasco, and J. Stallmeyer, eds., Champaign: University of Illinois at Urbana-Champaign.

Yee, C. (2023). "LAHSA releases results of 2023 greater Los Angeles homeless count," Los Angels Homeless Services

Authority, June 30. https://www.lahsa.org/news?article=927-lahsa-releases-results-of-2023-greater-los-angeles-homeless-count, Accessed 5/10/2025).

Zubair, A.J. (2023). "NOAH: the grand dream of a floating city that never quite sailed," *Medium,* November 4. https://medium.com/@aydin.j.zubair/noah-the-grand-dream-of-a-floating-city-that-never-quite-sailed-5ee681b647b4, Accessed 2/27/2025.