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Special 2017 Conference Themed Issue: Australia

Council on Tall Buildings and Urban Habitat

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"The safeguarding of airspace in a region of Sydney that has historically seen limited potential for major residential projects and tall buildings has now become a key issue for developers, councils, and aviation regulatory authorities to manage."

Amin Hamzavian, page 54

Americas

The largest real estate development in the United States has provided an appropriately high number of news items of late. Hudson Yards in New York in quick succession announced the beginning of leasing for One Hudson Yards, the topping out of KPF's 237-meter 55 Hudson Yards, and released new renderings of the 300-meter 50 Hudson Yards, still under design by Foster + Partners. Elsewhere in the city, a team including Handel Architects floated a unique plan to develop vertical factory space in towers in Long Island City. The Anable Basin Towers proposal would require alteration to city codes separating industrial and residential uses.

The long-neglected center of Detroit got another shot in the arm recently, with the announcement of plans for a multi-building complex called Monroe Blocks. The 35-story office tower and 26-floor residential block will be accompanied by three mid-rise buildings of between six and 15 stories, containing additional apartments.

The Council's headquarters city of Chicago was abuzz with news about the Lakeshore East development, which contains Studio Gang's supertall Vista Tower, now under construction. A community meeting revealed that the US$4 billion development will feature 1,000 fewer residences than previously advised, to about 1,400 units total, but the towers could grow in height to as much as 267 meters. Meanwhile, the 363-meter Vista itself received a substantial design change in the form of a "blow-through" floor on level 83, so as to admit strong winds and lower the potential for uncomfortable swaying motions.

Los Angeles has thoroughly asserted itself on the radar of tall building cities in North America. At least four significant projects have received planning permission or been proposed in recent months. A 70-story apartment building at 1045 Olive Street has been proposed. The mid-century-modern-inspired tower is to rise to 247 meters and contain 754 apartments. The tower's midsection is interrupted by a multi-story amenity complex that features large corner openings several stories in height. One of the large cutouts along this area contains an outdoor pool and deck, overlooked by glass-clad amenity spaces that include an indoor gym.

On the opposite end of downtown, the latest proposal for the Frank Gehry-designed Grand Avenue Project, which has been on the table for well over a decade, calls for the construction of two high-rise buildings at 100 South Grand Avenue, replacing an infamous "tinker-toy" parking structure. A 39-story residential tower would rise at the corner of 2nd and Olive Streets, featuring 128 condominiums, 214 market-rate apartments, and 86 units of subsidized affordable housing. The second tower, slated for the 1st Street side of the property, would be a 20-story hotel featuring 305 guest rooms. Equinox, a luxury fitness company owned by Related, will operate the hotel. Completion is targeted for 2022.

Between the 100 South Grand Avenue and 1045 Olive Street, new renderings have been revealed for a 45-story pixelated residential tower at 525 South Spring Street. The

55 Hudson Yards, New York – recently topped out. © Geoff Butler

1045 Olive Street, Los Angeles. © ODA Architecture

1,000 Trees, Shanghai. © Noah Sheldon

proposal calls for 360 residential units and 2,300 square meters of retail space to be contained within a canted tower on a square-shaped base. A few blocks away, documents filed with the city planning department call for a 66-story hotel/condo and retail building called **Figueroa Centre.** Designed by CallisonRTKL, the 297-meter project at James M. Wood Boulevard and Figueroa Street is scheduled to complete by 2023, and would be the city's third-tallest building.

Asia & Oceania

In **Beijing,** the **China Zun Tower,** the city's tallest, structurally topped out. The 528-meter tower, an amalgamation of a design by TFP Farrells, KPF, and BIAD, is being developed by CITIC HEYE Investment as part of the massive new 30-hectare central business district under construction along the city's Third Ring Road. The office tower will house the headquarters of CITIC Group and CITIC Bank. Elsewhere in the city, construction photos tantalizingly anticipated what may become the world's tallest atrium, which is to run the full height of the **SOHO Li Ze Tower** by Zaha Hadid Architects, which twists through 45 degrees as it rises to a height of 207 meters. Completion is set for late 2018.

China has shown a commitment to a green future by embracing vegetated skyscrapers. In **Shanghai,** a "mountain" near the Moganshan arts precinct was seen via drone footage to be in an advanced state of construction. Set to complete in 2018, the **1,000 Trees** project is to contain 300,000 square meters of mixed-use program, with an undulating topography of concrete structural columns, each topped by a tree. Meanwhile, ground has been broken for **Forest City** outside **Liuzhou,** which is to open in 2020 and eventually house 30,000 people. Occupying a 175-hectare plot along the Liujiang River, the project will support 40,000 trees, and will absorb almost 10,000 metric tons of CO_2 annually.


SOHO Li Ze Tower, Beijing – under construction August 2017. © Yicheng Yang, courtesy of Zaha Hadid Architects

Further south in **Zhuhai,** a proposal was launched for twin dragon-themed towers near the foot of the bridge to Macau. The design for the two **Zhuhai Hengqin Headquarters** towers, and the small banquet building in between, references the motif of two dragons chasing a pearl – an image that symbolizes good fortune and happiness in ancient Chinese mythology, according to architect Aedas. Across the water, the **One** and **Two Chinachem Central** complex completed in **Hong Kong.** The project, consisting of connected 26- and 22-story buildings, comprises a three-story retail podium, food and beverage facilities, and office space. It was designed by DLN Architects & Engineers and P&T Group.

Further south, Atkins was appointed architect of the twin **Cocobay Towers** complex in **Da Nang,** Vietnam. Designed to put Da Nang, Vietnam's third largest city, on the world tourism map, the 200-meter-tall towers will be the focal point of Cocobay – a 31-hectare entertainment and hospitality hub. The planned development has a total gross floor area of 145,000 square meters, and each tower will accommodate both a luxury hotel and a condominium for the


Liuzhou Forest City, Liuzhou. © Stefano Boeri Architetti


Cocobay Towers, Da Nang. © Atkins

Shaping Australia's Tall Tower Design And High Livability Standards

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The projects featured in this paper will be discussed in **Philip Vivian**'s presentation in Session 3C: *Tall Timber* and in **Guy Lake**'s presentation in Session 3I: *The Residential Experience,* both on Monday 30 October at 1:45 p.m.

Abstract

With nearly 90% of its population expected to live in its state-capital cities by 2053, Australia is on track to become one of the world's most urbanized nations. Cities such as Sydney, Melbourne, and Brisbane are world-renowned for their livability ratings, but this is not a guaranteed constant. As density increases, more inventive tall building designs will be needed. This case study examines tall building developments in each of the three largest Australian cities, each of which exemplifies a different aspect of sustainable design, supporting the ultimate objective of maintaining and enhancing livability into the future.

Keywords: Livability, Sustainable Design, Urban Planning, Mass Timber

Introduction

Since the mid-20th century, unprecedented growth has characterized city development in countries all across the globe. In 2008, the world's population was evenly split between urban and rural areas; by 2050, it is expected that 70% of all people will live in cities (Population Reference Bureau 2017). Architects, engineers, and urban planners have broadly responded to this growth by pushing for the design and construction of tall towers that can accommodate high population densities.

Tall tower projects have proliferated in Australia over the past 20 years, and Bates Smart has been behind many of their designs, especially in Sydney, Melbourne, and Brisbane. The practice's design ethos is underpinned by efforts to deeply understand the context of each project and create designs that, once built, enhance amenity and holistically improve their surroundings.

However, when designing and constructing tall towers, it is difficult to assess exactly how a building will change the city in which it sits. Increasingly, the architecture, engineering, and construction industries are utilizing quantifiable livability measures to better understand the strengths and weaknesses of existing cities. These measures can be used to inform the design of tall towers to ensure that they contribute to the improvement of everyday living conditions.

Australia's Livability Standards

Livability indexes often determine a city's living conditions at a global scale by assigning a quantitative score to social measures, such as health care, education, sustainability, stability, and infrastructure. On the aggregate, major Australian cities achieve superior performance in the rankings from year to year. Australia is renowned for its lifestyle, which is reflected in its high livability standards and expectations. In 2017, Melbourne was named the most livable city in the world for the seventh year in a row, and Sydney, Adelaide, and Perth all ranked in the world's top 11 cities (The Economist Intelligence Unit 2017).

While architecture is not explicitly evaluated in most livability indexes, there is little doubt that the built environment greatly impacts how daily life plays out in cities. This holds true in Australia's largest cities, where architecture contributes to high livability scores.

Architecture's Impact on Australian Livability

Bates Smart has been an integral force in shaping major Australian cities – especially Sydney, and Melbourne – over the past 165 years. The firm's designers, engineers, and planners have been prolific, working across many different sectors and designing seminal large-scale buildings, such as the State Library of Victoria (1856) and the MLC Centres (multiple commercial towers constructed in

Sydney and other Australian cities throughout the 1950s and 1960s), as well as countless others.

The firm's designs have endured in large part because they respond to specific complexities that contribute to overall livability. Today, this work continues with the design of some of Australia's most innovative tall towers, including 35 Spring Street in Melbourne (see Figure 1), 25 King in Brisbane, and four of Sydney Olympic Park's first residential towers. The final designs of these projects vary greatly, but they were all spurred through the multidisciplinary approach of the practice that integrates urban design, architecture and interior design in order to enhance both the built environment and daily life.

As Australia's population continues to urbanize – 89% of all people in Australia are expected to live in its state-capital cities by 2053 (Australian Bureau of Statistics 2014) – it is essential that the design and construction of tall towers maintain the country's high livability standards. The current body of work, much like its historic portfolio, upholds these standards. A closer examination of three contemporary projects demonstrates how thoughtful Australian architecture sustains high-quality livability and contributes to responsible urban growth. The lessons from these buildings can be applied to design projects all over the world, helping to elevate livability standards at a global scale.

35 Spring Street: Placemaking and Densification in Melbourne

Melbourne's skyline has changed dramatically over the past 20 years. The forms of its skyscrapers read powerfully, but the city has retained an architectural delicacy, derived from its lasting Victorian aesthetic heritage. The distinct aesthetic helps define Melbourne's sense of place. It's an important characteristic that the authors are trying to preserve and reinterpret through the firm's contemporary skyscraper projects, recently completed and currently under construction in the city core.

Figure 1. 35 Spring Street, Melbourne. © Peter Clarke & Impress Air

"While architecture is not explicitly evaluated in most livability indexes, there is little doubt that the built environment greatly impacts how daily life plays out in cities. This holds true in Australia's largest cities, where architecture contributes to high livability scores."

Connecting the City: People, Density & Infrastructure

Abstract

The future of humanity on this planet relies on the collective benefits of urban density; reducing both land consumption and the energy needed to construct and operate the horizontally dispersed city. Tall buildings must now be the vehicles for creating increased density, not just through sheer height, but by connecting multiple layers of the city. Physical urban infrastructure, circulation, greenery, and urban functions traditionally restricted to the ground level would all, ideally, continue up and into the building, such that the buildings themselves become an extension of the city: a part of the two-dimensional horizontal urban plane flipped vertical.

The 2017 CTBUH Conference explores these, and many other, ideas in the fertile ground of Sydney, Melbourne, and Brisbane, Australia; all of which are lauded worldwide for their high quality of life, but nevertheless are grappling with contemporary global-city challenges: density vs. suburbanization; modernity vs. historical preservation; infrastructure vs. urban life, etc. The following pages contain highlights of the Conference program which represent the incredible diversity of practitioners and thinkers coming together for five days, spurring discussions that will last much longer.

Keywords: Connectivity, Urban Planning, Vertical Urbanism, Density, infrastructure

Quay Quarter Tower, Sydney

The unique and iconic Quay Quarter Tower is a highly innovative new building, to be built at the Circular Quay area in Sydney. The tower, set to open in 2020, comprises five shifting glass volumes stacked upon each other, rotating away from the base, creating "working villages" more intimate in scale. This rotation will enhance views over the Opera House and Sydney Harbour, and helps self-shade the northern façade from intense afternoon sun, while creating significant outdoor sky garden terraces. Critically, the new project will preserve and restore some of Sydney's signature laneways that had been obscured or interrupted by earlier projects, allowing pedestrians to pass through its base on a public right of way. Perhaps most remarkably, the Quay Quarter Tower is not a fully new-build project; rather, it is a radical renovation of an existing 1976 building, the AMP Centre, reusing 60% of its structural system but rendering the building almost unrecognizable.

Completion Date: 2020 (expected)
Height: 216 m
Stories: 54
Area: 102,000 m²
Primary Function: Office

Quay Quarter Tower, Sydney. © 3XN

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Quay Quarter Tower will be discussed in depth in Session 2B: *Quay Quarter Tower Sydney,* Monday 30 October at 11:15 a.m., chaired by **Eve Clark,** Design Director of AMP Capital Investors

The Role of Tall Buildings in the Sustainable Sydney 2030 Plan

Plenary 1: Connecting the City
Monday 30 October, 9:00 a.m.

Monica Barone, *CEO, City of Sydney*

Adopted in 2007, after 18 months of extensive consultation, the ***Sustainable Sydney 2030*** plan describes how the City Council will achieve a compact city that is "green, global and connected." The plan's narrative describes the nexus between environmental performance, economic prosperity and social well-being. It provides the overarching framework for everything that is undertaken at the City of Sydney and every resource that is allocated. It is obviously critical to the plan that tall and dense development be implemented intelligently and strategically along transport corridors. With so much investment occurring in that network today, and the price of housing at historic highs, now is the time to reconcile the plan's vision with the reality happening on, under, and high above the ground.

Architectural Agency

Session 3B: Connecting the City: A Global Perspective
Monday 30 October, 1:45 p.m.

Joshua Prince-Ramus, *Founding Principal, REX Architecture*

No building typology has so radically ruptured the status quo of the urban environment as the skyscraper. And none has so quickly been enslaved by convention, its rote universality leveling context. Tower design is predominantly a normative reaction to *a priori* development concerns. However, if architectural agency is acknowledged and engaged in the definition of first development principles, design can be proactive. It can salve/solve financial exposure, contractual tensions, schedule constraints, limited local building capabilities, and even difficult cultural norms. Exploring these root challenges with a critical naiveté yields designs that are so strategically and functionally specific – so effectively unconventional – that they also offer profoundly unique aesthetic experiences. While not "looking like their surroundings," such designs are nonetheless enablers of new, tailored opportunities for their built and social environs, and hence deeply contextual. With these factors in mind, architectural agency can turn conventional high-rise development on its head, and for the better.

Beyond Tall: The Living Building

Session 2G: Future Technologies
Monday 30 October, 11:15 a.m.

David Malott, *CTBUH Chairman /Founder & CEO, AI.*

In a world that is rapidly urbanizing, we need innovative approaches that not only sustain, but actively adapt and respond. Technology has the power to augment architecture: to turn an inherently static system into one that is responsive. Spaces, buildings, and even cities will have the ability to communicate with each other and with us. The advent of faster, cheaper, and smaller computing powered by 4G/5G connectivity allows flexible and rapid deployment in both new and existing buildings. Machine learning platforms such as IBM Watson's Cognitive IoT enable a next generation of architecture of not only form, space, and material – but of responsiveness, empathy, and learned behavior. The role of the architect will be transformed from designing core-and-shell to programming of user experiences in digitally augmented buildings. The pairing of real-world environments with digitized versions of themselves will create new ways to interact with the physical world via tangible and intuitive interfaces. These emerging technologies can be "tamed" and put to great use at both the urban and the human scale.

International Towers, Sydney. © Lendlease

International Towers, Sydney

The three-building International Towers complex is the first major project in the redevelopment of Barangaroo South into a new waterfront extension of Sydney's CBD. International Towers was conceived as three sibling buildings with varying heights and specific design features, to provide each building with its own identity. One of the identity markers is in the arrangement and color of the vertical solar shades applied to the exterior façades, improving the thermal performance of the buildings. The elevator cores were positioned to the northern edge of each building footprint, providing for expansive office floor plates while also further reducing energy consumption through a reduction of glazing on each building's northern exposure.

Designing workspaces around social interaction was a key part of the design process. It was important to provide communal meeting areas beside the elevator cores interlinking workers throughout each building. The entirety of the roofs, both at the podium and uppermost levels, are also available as open-air terraces, courtesy of utilizing a centralized mechanical plant to efficiently provide services to all three buildings. At street level, all three buildings share a common basement and single entry point for vehicles, in order to enhance the pedestrian-friendliness of the towers' intersection with the ground.

Completion Date: 2016
Height: 217 m (Tower 1)/178 m (Tower 2)/169 m (Tower 3)
Stories: 51 (Tower 1)/43 (Tower 2)/40 (Tower 3)
Area: 118,000 m² (Tower 1)/98,658 m² (Tower 2)/90,105 m² (Tower 3)
Primary Function: Office

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Ivan Harbour of Rogers Stirk Harbour + Partners, architect of International Towers, will speak in Plenary 3: *The Future of Connected Cities and Skyscrapers,* Tuesday 31 Oct at 3:45 p.m. The building will also host the **Day 1 Networking Reception,** on Monday 30 Oct at 6:00 p.m.

Rethinking CTBUH Height Criteria In the Context of Tall Timber

Robert M. Foster

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Robert Foster will present this paper and provide an update on the results of the **"Pre-Conference Workshop on Tall Timber"** in Session 3C: *Tall Timber,* Monday 30 October at 1:45 p.m.

Abstract

Recent developments in the design and construction of progressively taller buildings using engineered timber as a structural material raise important questions about the language that is used to describe tall buildings. This paper discusses the role of the CTBUH Height Criteria in classifying tall buildings and the challenges raised by the emergence of engineered timber as a contemporary structural material alongside steel and concrete. The paper concludes by presenting a proposal for updating the existing terminology to accommodate the use of timber and other new materials in the design of tall buildings. This paper will be used as a basis for discussion at the ***CTBUH Workshop on Tall Timber,*** *held in conjunction with the 2017 Conference, with a view towards the future revision of the CTBUH Criteria to include timber.*

Keywords: Height Definitions, Building Criteria, Timber, Materials

Introduction

Between 1885 and 1913, the development of steel-framed structural systems permitted the heights of skyscrapers to leap from the 10-story Home Insurance Building in Chicago, to the 60-story Woolworth Building in New York. Only 18 years later, the Empire State Building was completed at a height of 102 stories. Between 2008 and 2016, the height of modern buildings using engineered timber increased from the nine-story Stadthaus building in London to the 17-story TallWood at Brock Commons building in Vancouver (see Figures 1 and 2) (CTBUH 2017). Designs have also been presented for timber skyscrapers at heights up to 80 stories, including the River Beech Tower, Chicago and Oakwood Tower, London (see Figures 3 and 4) (Green & Karsh 2012, SOM 2013, Foster & Ramage 2016). Although it is impossible to know what heights tall buildings using engineered timber might ultimately reach, the historical precedent and the potential identified in recent design proposals suggest that genuinely tall timber buildings are likely to become a reality in the very near future.

The opportunities for better, more sustainable tall buildings afforded by new materials, new construction technologies and new architectural forms bring with them a range of

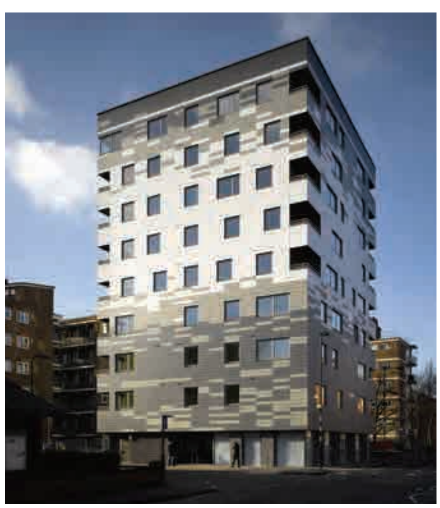

Figure 1. Stadhaus, London. © Will Pryce

Figure 2. TallWood at Brock Commons, Vancouver. © Acton Ostry Architects & University of British Columbia

new challenges. Among these is the need to update the language that is used to describe tall buildings; to move beyond descriptors suited solely to a palette of materials limited by the historical duopoly of steel and concrete. A proposal addressing this challenge was presented previously by the authors for discussion within the structural engineering community (Foster et al. 2016). This version of the paper provides a summary of the supporting discussion to the wider tall building community.

The generally accepted terminology for the classification of tall buildings is set out by the CTBUH Height Criteria and this has been shown to be highly appropriate for the tall buildings of the last century. However, in order to encourage productive discussion and ensure that meaningful comparisons can be made between a wider range of emerging building systems and materials, it is useful to revisit and perhaps clarify these criteria. The basis for this clarification is both the historic and commonly understood thinking behind the existing terminology and definitions, and also an understanding of the future directions of tall building construction.

Tallness

Definitions of "tallness" are subjective and dependent on context. In historical terms, a building that is taller than previous buildings of a particular material or type might be said to be "tall," in the sense of "tall for a timber or unreinforced-masonry building." Tallness in this sense is important to the design community, because the practice of design must draw on both experience and theoretical understanding. Buildings that exceed the height of precedents using similar materials or systems thus present additional challenges to designers.

Another contextual consideration that has historically played a role in the technical definition of a building's tallness is that of fire. A building has often been considered "tall" in this sense if its height is such that a fire cannot be fought using ground-based equipment. This has constituted an historical "basic height limit" in North America and elsewhere (Calder et al. 2014).

The CTBUH identifies three further qualities that can be used to define tallness: height relative to context, proportion, and use of tall building technologies.

Height relative to context acknowledges that a building's surroundings play an important part in assessments of tallness. A 14-story residential building sited in a suburban neighborhood might be described as tall, while the same building situated in a high-rise cityscape might not be.

Figure 3. River Beech Tower, Chicago. © Perkins + Will

Proportion can be thought of as considering a building in the context of its own geometry and massing. A 14-story building on a small footprint might be slender and thus appear tall, in a way that a 14-story building covering an entire city block might not. An indicative characterization of tallness with respect to *height relative to context* and *slenderness* is shown in Figure 5.

Tall building technologies are features such as advanced vertical transportation and enhanced lateral force-resisting and damping systems that are particular to the design of tall buildings. Enhanced lateral force-resisting and damping systems are closely related to the slenderness of a building. This aligns with the structural engineer's definition of "high-rise

Figure 4. Oakwood Tower, London. © PLP Architecture

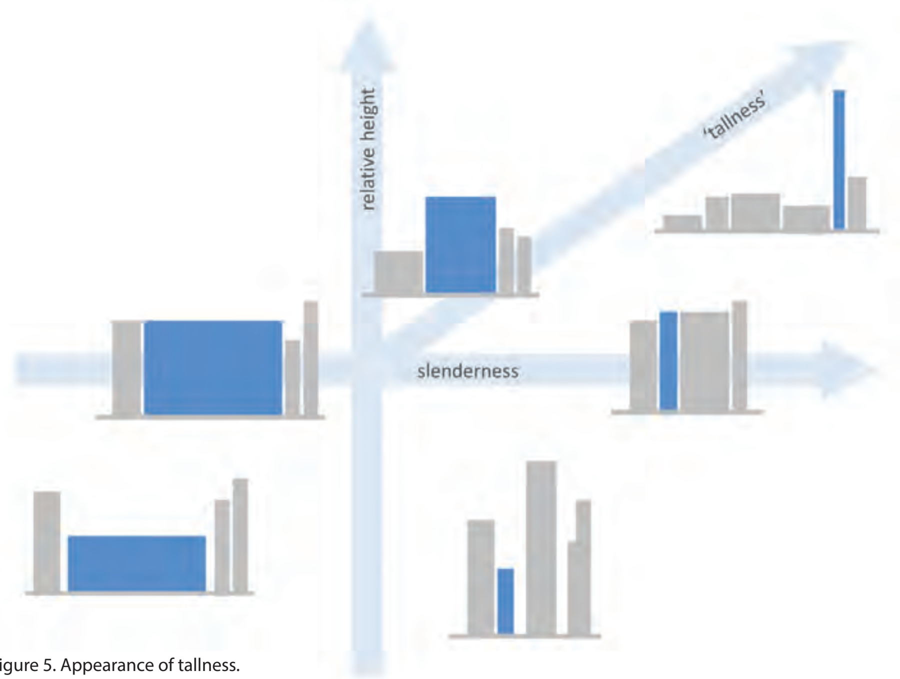

Figure 5. Appearance of tallness.

The Role of Design Competitions In Shaping Sydney's Public Realm

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Prof. Helen Lochhead
Prof. Helen Lochhead is an architect, landscape architect, and urbanist, who combines teaching, research, practice, and advisory roles. Her career has focused on the inception, planning, design, and delivery of complex multidisciplinary projects, ranging from a city-wide improvements program for Sydney to major urban regeneration and waterfront projects, both in Australia and the United States. She led the development of the 30-year plan for the transformation of Sydney's waterfront, and was instrumental in setting a new strategic vision for Sydney Harbour. Her projects have received numerous awards, including AIA Urban Design, AILA Urban Design, and Sustainability Awards.

Dr. Philip Oldfield
Philip Oldfield leads the Architecture + High Performance Technology stream in the MArch Program. Prior to UNSW, he was an Assistant Professor at the University of Nottingham, serving as Course Director of the MArch in Sustainable Tall Buildings – the world's only course and qualification dedicated to high-rise architecture. Dr. Oldfield is a British Science Association Media Fellow and author of the upcoming book *The Sustainable Tall Building: A Design Primer*.

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Prof. Helen Lochhead will present this paper in Session 2A: *Urban Policy,* Monday 30 October at 11:15 a.m. **Dr. Phil Oldfield** will join the panel in Session 2H: *The Tall Australian Office Building: In Conversation,* at the same time.

Abstract

Since 2000, through the City of Sydney's Competitive Design Policy (CDP), the quality of major projects in the city has been improved significantly, mediating the competing tensions of public and private interest. The most successful of these developments demonstrate not only design excellence and technical innovation, but respond to the urban condition by contributing to the life of the city through the addition of new public spaces and program that enliven its fabric. This paper will profile recent tall building exemplars influenced by the City of Sydney CDP. In doing so, it suggests this policy has fostered greater design excellence in the creation of the public realm in major projects in the city. It seeks to demonstrate how these common spaces are fundamental to the vibrancy and success of high-density developments, highlighting that, despite their differences, these spaces share traits that can provide useful lessons for others.

Keywords: Architecture, Code Compliance, Ground Floor, Urban Planning, Public Space

Tall Buildings and the Public Realm: The Need for Generous Skyscrapers

We are constructing more towers in Australia than ever before. Fueled by growing city populations, increasing land costs and a general acceptance of higher densities, there has been a rapid and noticeable increase in tower completions in Australian cities in recent years (see Figure 1). This, understandably, has sparked considerable discussion and debate in the media, and elsewhere, about the impact that greater numbers of high-rises will have on our future cities.

However, while form and skyline are the primary *foci* of debate, the impact of tall buildings on the public realm at ground, and the pedestrian experience in, around, and through towers is even more important. High-rises are regularly accused of exacerbating local environmental conditions in the public realm, overshadowing streets and public spaces, creating wind tunnels and impacting the social life of streets by replacing diversity with monocultures. But it doesn't have to be this way. Correctly guided, building vertically can create higher densities and free up more space and volume for the public at the ground plane – the key place where the public can interact, experience and occupy the building. It is the key place that most impacts the vibrancy of the city, the connectivity of its urban spaces and the quality of its streetscape. In sum, the way in which tall buildings meet the ground is as important, and even arguably more so, than how they meet the sky (Goettsch 2012). There is a need for more generosity in tall building public realm design at the ground plane – urbanistically, environmentally, and programmatically.

Sydney's "Competitive Design Policy": History, Control, and Impact

Sydney's first generation of tall buildings, emerging in the 1950s, took inspiration from the Miesian model of tower design proliferating at the time, with the skyscraper dominating as an object, and public space defined in open plazas at ground. While exemplary public realm did emerge from this period, most notably Harry Seidler's Australia Square (see Figure 2), many inferior examples led to disrupted streetscapes and the loss of historic city fabric and activated street fronts (Brown 2012). To rectify this, a new Development Control Plan (DCP) was enacted in 1996, with the primary objectives of reinforcing Central Sydney's definition of

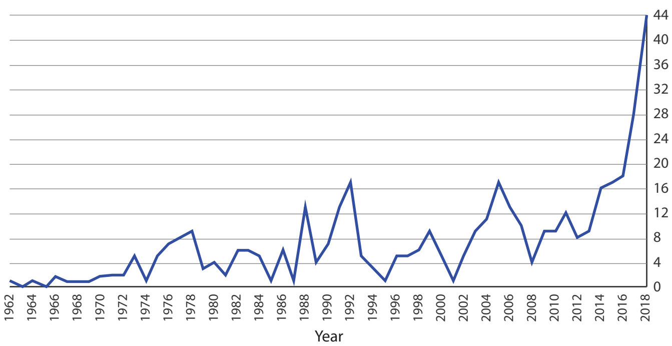

Figure 1. Building construction in Australia, 1960–2018, showing buildings 100 meters or higher. Source: CTBUH Skyscraper Center

Figure 2. Australia Square, Sydney (1967). © Antony Wood

streets and public spaces and improving the quality of public domain (City of Sydney 1996). Provisions focused on prescriptive moves such as mandating street wall podiums with heights between 20 and 45 meters, combined with setbacks in new towers, providing a continuation of streetscape at ground and mediating the impact of a tower's bulk on the public realm.

In the lead-up to the Sydney 2000 Olympics, with a new Independent Mayor and an agenda focused on quality urban design and livability, the City of Sydney underwent a significant shift in mind-set and regulation. This was in step with many cities where global competitiveness was increasingly being recognized as a combination of related agendas – new sustainability imperatives, revitalization and enhanced public realm – as a means to attract economic investment and growth (Punter 2007). Other motivations for policy reform also included an ambition to break the perceived dominance of a small number of large architectural firms that had monopolized the market and were no longer innovating. Additionally, there was the imperative to provide more certainty for developers through a more transparent and predictable two-stage approval process. Design competitions were seen as key to achieving these goals.

The major amendment to the City's Local Environment Plan (LEP) and DCP in 2000 saw the introduction of provisions that required all major development to undergo a competitive design process to demonstrate design excellence. This effectively means that no major public or private project can be granted approval until a minimum of three different designs have been proposed and a jury has decided which is best. In no other city are such competitions mandated for public and private development through the statutory planning processes (Davidson et al. 2017). The triggers for a competitive design process are any one of three criteria: a building height over 55 meters, a site area over 1,500 square meters, and capital project value over AU$100 million (US$79 million), effectively meaning all tall buildings in central Sydney now go through this process. This codified and strengthened design excellence and the competitive processes, which were further strengthened with greater statutory force in a subsequent amendment in 2012.

Developer buy-in to the process is incentivized through a number of mechanisms. A two-stage process mitigates risk. The Stage 1 development application determines the building envelope and the key economic drivers of the development, total floor space, maximum height and parking, thus mitigating uncertainty and risk. The Stage 1 approval provides the framework and brief for the Stage 2 design competition, which then deals with the more detailed and public-interest considerations. Secondly, the process can also be waived if it does not have significant adverse impacts on adjoining development or the public realm. Lastly, a development bonus of up to a 10% increase, in either height or floor space, and a discount on the amount of heritage floor space that must be allocated to the site, is available for developments that participate in a competitive design process and demonstrate design excellence. This is intended to compensate developers for the costs of holding a design competition, but also provides significant uplift in development value.

The overarching objective of the Competitive Design Policy (CDP) is to deliver the highest standard of architectural, urban, and landscape design (City of Sydney 2012). It aims to achieve this through a range of predictable considerations, such as land use and mix, setbacks, street frontage heights, bulk, massing and modulation of buildings. However, it also emphasizes public interest concerns, such as environmental impacts, ecologically sustainable design, and improvements to the public domain and pedestrian network, including excellence in landscape design. The emphasis on not only the design dividend, but the public benefit quotient defines this policy.

Since 2000, through more than 100 design excellence competitions, the quality of major developments in Sydney has improved significantly, mediating the competing tensions of public and private interests. For example, a recent study by UNSW colleagues of 25 projects subjected to the CDP process examined the quality of urban design outcomes, through qualitative analysis and semi-structured interviews with stakeholders. Interviewees said without exception that they believed CDP raised the general standard of urban design in the city. Analysis also shows that the CDP projects deliver significant public benefit at ground, including active ground-floor uses and through-site pedestrian access (Davidson et al. 2017).

Importantly, the CDP process has raised urban design quality by redistributing

Empirically Evaluating the Livability Of Local Neighborhoods and Global Cities

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SUPERSPACE is a multi-disciplinary design team with 17 years' experience in design computation having pioneered many models of AI and AL, spatial analysis and data visualization in architectural and urban design. All algorithmic models are developed in-house via stand-alone programming environments for processing speed and easy adaptability, and are curated in an award-winning framework for spatial simulation.

CTBUH 2017
International Conference

Christian Derix will discuss this paper in the presentation **"Global Cities Brand versus Local Neighborhood Operations"** in Session 4F: *Branding the City,* Monday 30 October at 11:15 a.m.

Abstract

CIVITAS is a search engine for urban conditions, developed to allow stakeholders to identify qualities of livability and urban experiences that suit their tacit desires and explicit requirements. While using CIVITAS to study three global cities for bespoke end users in 2015–16, the authors interpreted the metric of "accessibility to amenities" to suggest that, while the global profile of cities varied, the local neighborhoods preferred by certain end users turned out to be very similar. Further studies were initiated across more cities and neighborhoods, with more diverse metrics in order to validate the initial suspicion. Metrics pertaining to urban structure and demographics were added to "amenity provision," and two types of comparative profiles were produced for insights. The findings are not as unambiguous as the initial data suggested for the initially targeted category, but another pattern emerged that supports assumptions in planning guidance for "livable" cities, and relates urban structure to density.

Keywords: Urban Planning, Big Data, Urban Design, Connectivity

Introduction

In 2008, the authors developed a proof-of-concept model to simulate sustainable urban densification. The two cities of Dubai and London were used as cases to demonstrate the difference of densification when a new tall building is inserted into the urban fabric. Two dependencies formed the basis for the simulation: land-use provision for commercial buildings and accessibility to the predominant transport mode. Dubai was then primarily using a vehicular transport system, while London primarily then relied on the underground transport system for commuting. The model would then generate the amount of area required to accommodate additional land uses that would support a new tall building with a set floor area. The multi-layered feedback model clearly illustrated the difference in levels of sprawl and densities seen in cities with either a (dense) public underground transport system like London or a car-dependent transport system like Dubai (see Figure 1).

Since that time, open-source urban data has become widely available. From 2014 onwards, the discourse about socio-spatial sustainability of cities has shifted from its design to its assessment, quantifying conditions and scrutinizing governance through the analysis of big urban data. Indicative of this transition are the growing numbers of online city indices that attempt to rank global cities according to "livability", "governance" or "economic opportunity," based on an ever-increasing mix of metrics. However, no notable new urban design guidelines have been established since then. Such indices of "livability" include the Mercer's Quality of Living Cities Index, The Economist's Global Livability Ranking, and Monocle's Quality of Life Survey. For "economic opportunity" there are annual reports, such as PwC's Cities of Opportunity, Knight Frank's Prime Global Cities Index, Savills' Tech Cities, JLL's City Momentum Index, the Global Innovation Index (GII) and ATKearney's Global Cities, to name but a few. Reports by UN Habitat, such as the ***Urban Patterns for a Green Economy*** series, have become nearly the single source that attempts to balance economic performance with livability and to deduce design objectives for sustainable cities, such as ***A New Strategy of Sustainable Neighborhood Planning: Five Principles*** (UN Habitat 2014).

The authors developed the first digital design chain for urban planning, called Smart

Solutions for Spatial Planning (SSSP) (Derix 2012), and began to complement their computational urban design and planning framework (based on SSSP) by starting a big urban data analysis and visualization platform called CIVITAS (Derix 2017). The purpose behind the initiative is to attempt to quantify otherwise discursive concepts of "vitality" and "liveability" in order to assess and design urban interventions that blend into the city or enhance socio-spatial sustainability.

CIVITAS: An urban search engine

CIVITAS aims to assess the nature of, and potential locations for development within a city. To generate a brief for a site and test the best symbiosis for development or use case that benefits both the land-owner as well as the community, one has to reveal the dynamics that inform the profile of a location. While there are many qualitative dynamics that are difficult to quantify, one can compute a series of spatial performances that correlate to social sustainability, such as those identified by urban planning guidelines of CABE's ByDesign or UN Habitat. Dynamics are expressions of the urban systems that define cities, and hence, the city has to be understood as a much larger organism than solely the site and its immediate context: "Places do not make cities. It is cities that make places" (Hillier 1996).

City to floor level

The platform is composed of three scales: metropolitan region, neighborhoods, and blocks (down to buildings and floors where feasible). Data from larger scales is passed to lower scales for integration; this allows for persistent investigation and a test-fitting of KPIs across scales that are not limited to zoned planning legislation. The composition of publicly available to proprietary data shifts with each scale towards more self-computed metrics. Despite the general perception of big data being ubiquitous, only 20–30% of data used in CIVITAS stems from public sources or client sources; most requires computation by SUPERSPACE.

Metropolitan scale

Most open-source data is found at the citywide scale, for which city governments have started to provide curated databases, such as NYC Open Data or the London Datastore. Three core categories of data at this scale include urban structure, land use density, and accessibility to amenities. For each category, there are some basic and site-specific metrics. A set of metrics is selected that represents the objectives of project briefs or client requirements, and is made available in the graphical user interface (GUI) of the online urban search engine, linked to the authors' proprietary urban database called "Urban Archive." The metrics within each category can now be weighted in accordance with the objectives, and an urban map visualizes the locations that comply with the weighting in real time. The model can also reverse-engineer location weightings for strategic planning and project briefing, and also allows the user to predict locations for future end-user allocation (see Figure 2).

Neighborhood scale

The metropolitan-scale model classifies sites and neighborhoods based on relationships of metrics. When neighborhoods have been

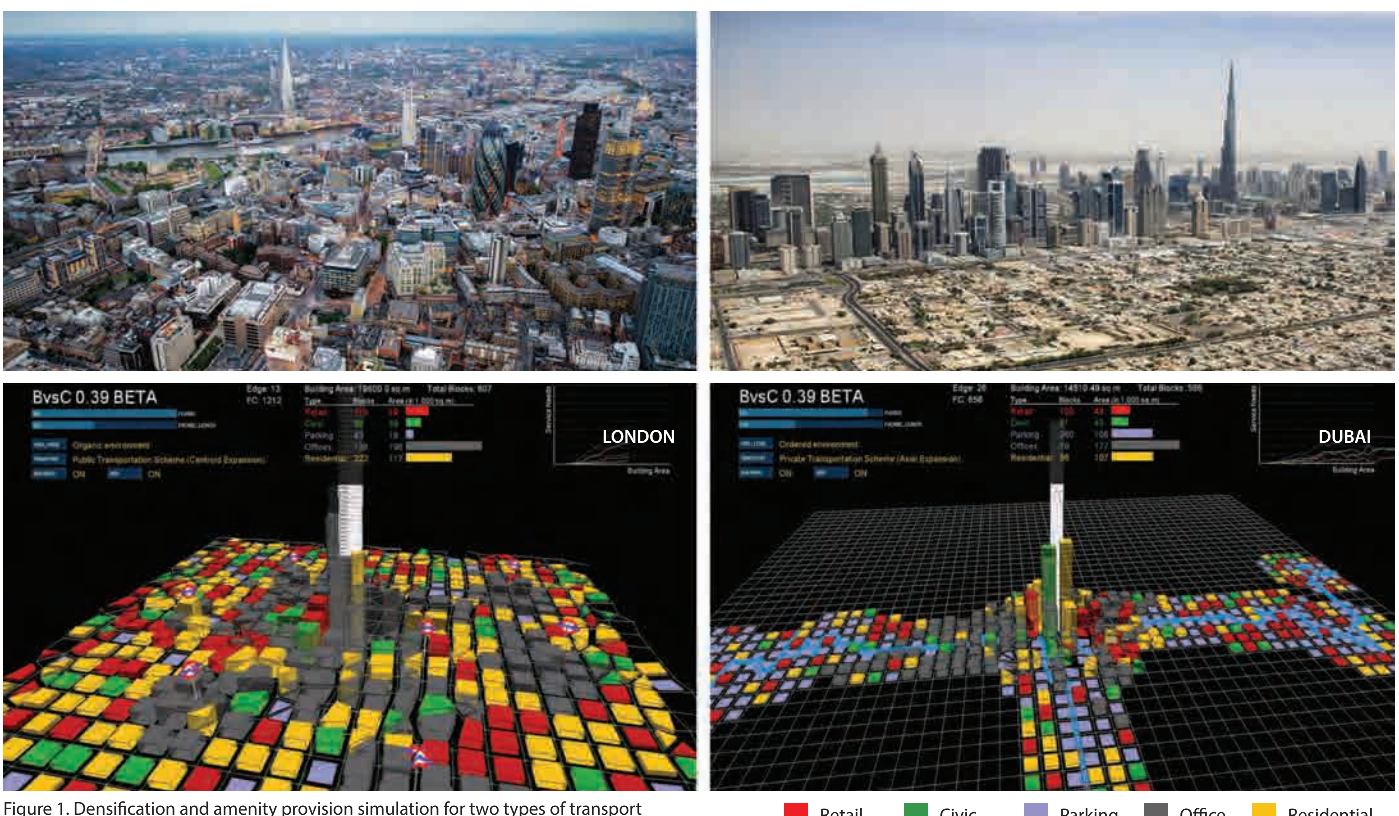


Figure 1. Densification and amenity provision simulation for two types of transport models – public (left) and private (right).

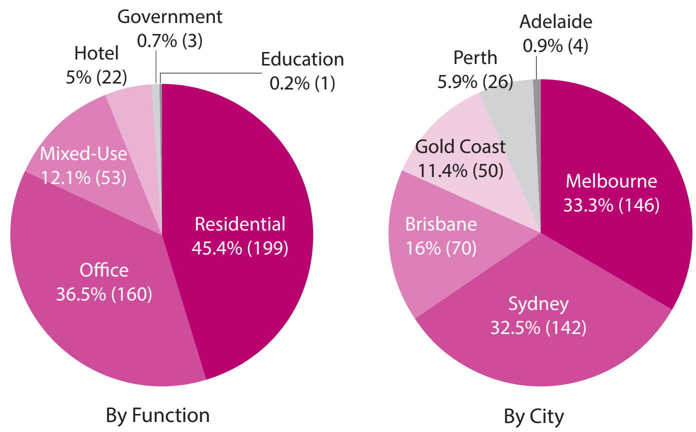
Australia: Rising Up Down Under

Australia is one of the world's least densely-populated countries, and yet it has one of the highest proportions of urban dwellers, a figure that is increasing. A boom in tall building construction is underway, paralleled by several significant transportation projects, particularly in the three CTBUH 2017 Conference cities of Sydney, Melbourne and Brisbane. This study examines the timeline, composition, and location of buildings 100 meters and taller (complete or under construction), set against the backdrop of new public transportation projects that are "connecting the city" and aligning towards a denser, more sustainable future.

Note: The six cities in this study are Australia's six largest in terms of population, and all contain at least one 100-meter or taller building. "City" in this study is identical to a "metropolitan area," as defined by the Australian Bureau of Statistics. All population data is from the Australian Bureau of Statistics, 2016 Census. All tall building data is from the CTBUH Skyscraper Center: www.skyscrapercenter.com.

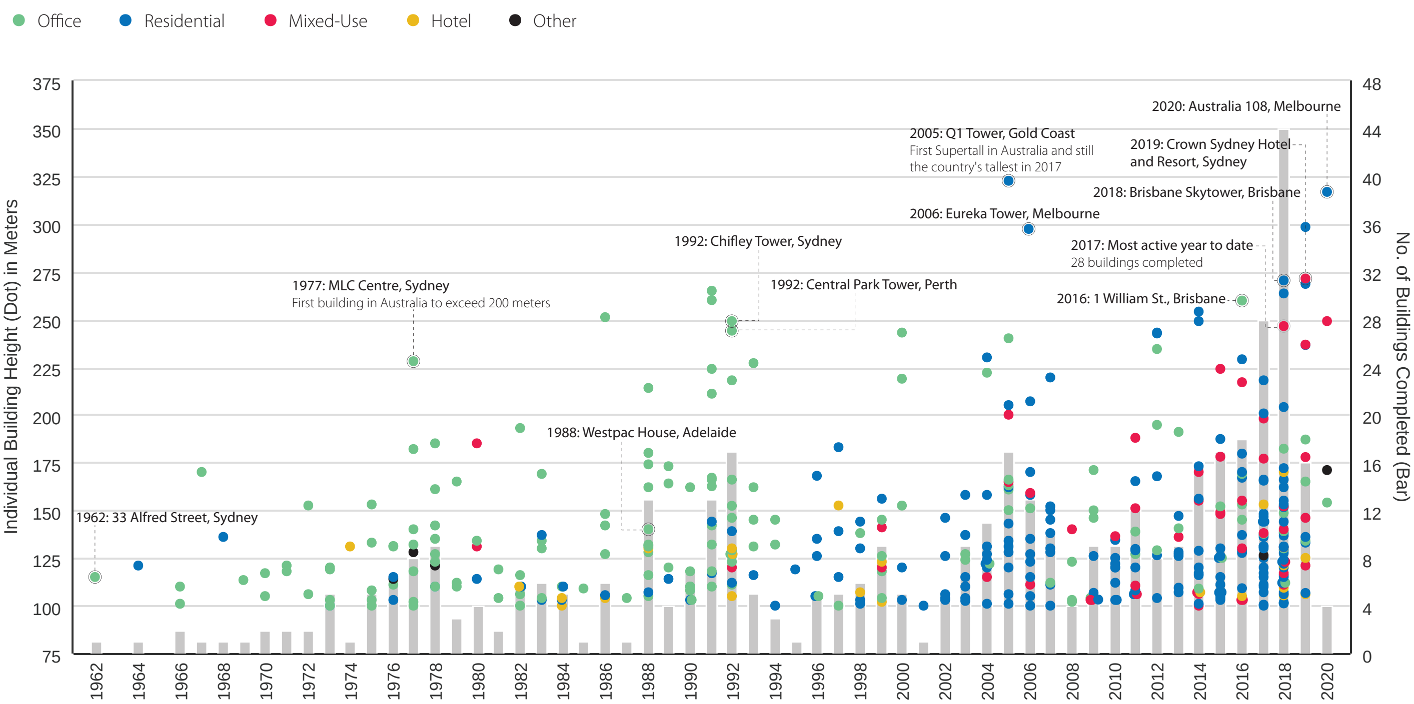
Study of 100m+ Buildings in Australia

356 Completed; 82 Under Construction; 438 Total



Timeline of Buildings over 100 Meters in Australia

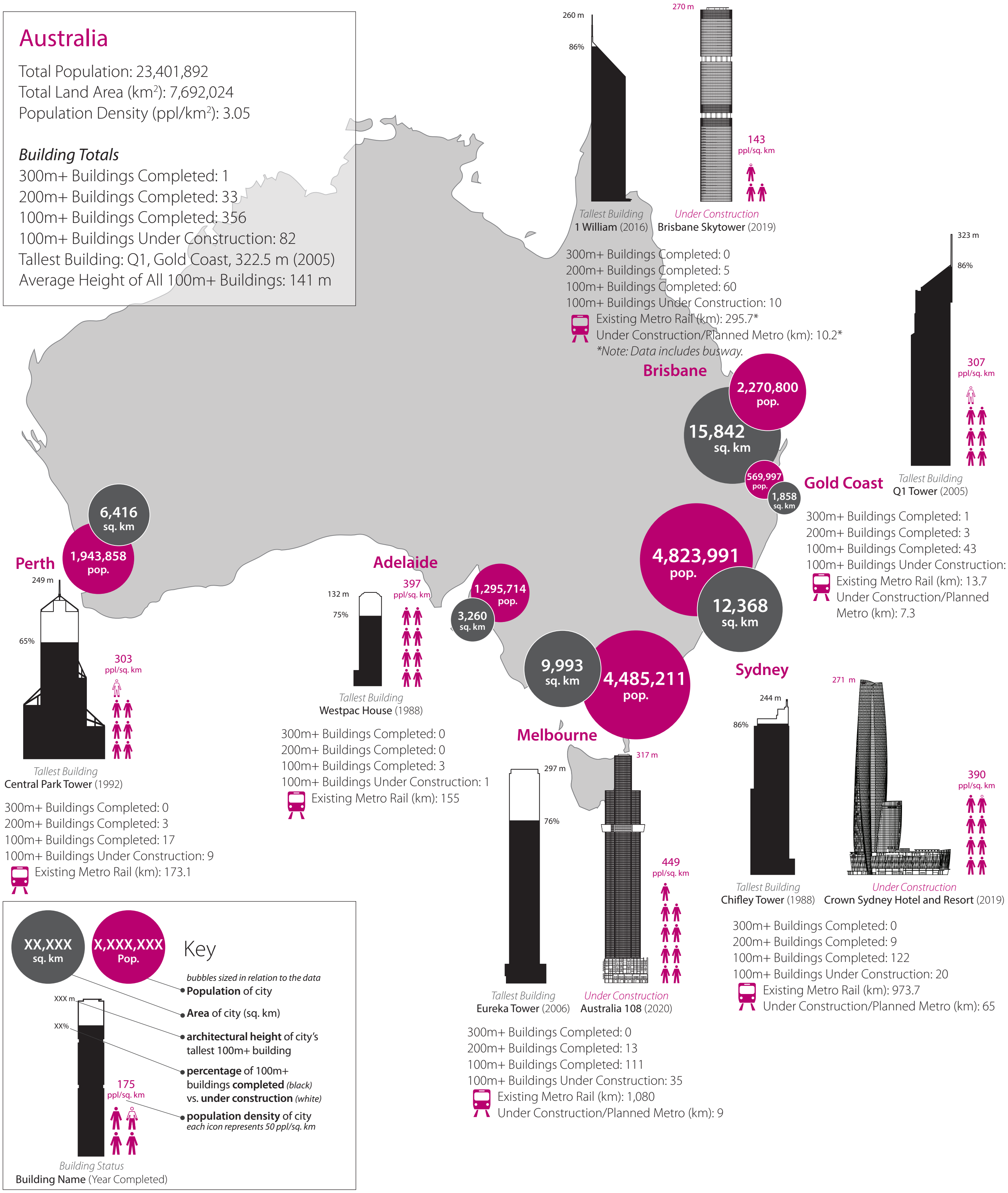
Bars represent the total number of buildings completed or under construction each year. Dots represent a specific building and its height and function. *Note: chart begins in 1960 as the AWA Tower, Sydney (1939), was Australia's first and only building over 100 meters until 1962.*



The proposed **Orion Towers (South Tower)**, Gold Coast, would become Australia's tallest building at 328 meters, overtaking the 323-meter Q1 Tower, Gold Coast.

The Sydney Metro project's first stage, due in 2019, will deliver 16 new stations and increase train frequencies to every four minutes at peak hour.

Eureka Tower, Melbourne, hosted "air plants" on its roof, in a cross-disciplinary art/science collaboration to determine the potential of greenery at height.



Three major floods hit Brisbane – in 1893, 1974, and 2010–11, causing 87 deaths and more than AU$9 billion in damage. **The Somerset Dam**, completed in 1953, mitigated the effects of the two later events.

One Central Park, Sydney, winner of CTBUH's 2014 Best Tall Building Worldwide Award, supports a cantilevered heliostat that directs sunlight optimally.

Queensland's **Western Corridor Recycled Water Scheme** recycles black (effluent) water for drinking water in times of drought.

Humanizing the High-Rise

Kim H. Nielsen

Interviewee

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Kim H. Nielsen
Kim H. Nielsen is founder and principal of 3XN. Since the start of the company in 1986, Nielsen has been the creative driving force behind 3XN. Nielsen directs the group with a high degree of personal involvement in each project. He has been involved in all of the practice's major projects, including the Sydney Fish Market, Quay Quarter Tower in Sydney, Copenhagen Arena, the Blue Planet Aquarium, Museum of Liverpool, Ørestad College in Copenhagen, IOC Headquarters in Lausanne, and the UN City HQ in Copenhagen.

CTBUH 2017
International Conference

Kim H. Nielsen will present **"Quay Quarter Tower: Humanizing the High-Rise"** in the Opening Plenary: *Connecting the City: Sydney,* Monday 30 Oct at 9:00 a.m. and is also involved in Session 3F: *Density and Urbanity in the Sydney Context* at 1:45 p.m.

The under-design Quay Quarter Tower will create a stunning new building on the Sydney skyline that sets new benchmarks in office tower design globally and creates an exemplary international commercial address. The antithesis of the prevailing belief that high-rises are generic and non-contextual, Quay Quarter Tower is the key to a newly activated public domain at Circular Quay – the front door to Sydney's CBD. Comprising a stack of vertical villages, breaking down the scale into smaller, more intimate social environments for social interaction and collaboration, the project is a transformation of an existing 1970s office block into a vision of the future of contextual skyscraper design. CTBUH Editor Daniel Safarik spoke with the lead designer, Kim Nielsen, of 3XN Architects.

Your scheme for the Quay Quarter Tower was selected through an international competition. What kinds of concerns or challenges from the committee needed to be addressed before the project was awarded?

It was a two-stage competition, with six teams selected. We had a mid-term review where they went through our sketches and models. Today the north side of the tower (facing Sydney Harbour) is a bus station with a series of lay-bys, and not much of anything else is happening there. What was important for the client and for the city even more so, was the notion that this would not only be a tower landing on the ground and leading us back to the city. It should also activate and animate the whole area. That was a key point in our design from a master plan point of view.

What do you think was the main selling point of your design?

There were a number of things. In the kickoff meeting for the competition, where there were 20 to 30 teams in the room, the client showed us pictures of several buildings that they liked. We recognized some of our own in the group, so we had some idea of the direction to take. We took the client around to some of the buildings we have done.

One of the buildings we showed was Saxo Bank in Copenhagen, which is not a tall building, but has many characteristics the client was looking for in a head office, such as an open atrium and big staircase that unites several parts of the building together (see Figure 1). We thought about taking that concept and stacking it up into a high-rise [for the Quay Quarter project]. Then, we twisted the five stacked sections so that each had the best view for its height, and so that each has its own six-floor atrium. This was a unique aspect of the design (see Figure 2).

What was the reasoning behind the atria, and what were the challenges?

I don't think it could be done in the United States, due to the fire codes. But it can be done in Australia. It gives the possibility of giving the users a more intimate interior, and a community feeling up in the air, where you have visual contact among the floors in each of these villages. It gives an opportunity of getting better views from more positions in the building. The views are important from this building, as it opens out to the Opera House and the water and the bridge (see Figure 3).

It also allows you to have a view straight to the outside when you exit the elevator. Normally, when you exit into an elevator lobby in a high-rise, you don't know where you are in the building – you may as well be in the basement, because it's really just a

> "This is a reuse that is very sensible. We use as much of the core as we can – instead of pulling the whole thing down and building up a new structure in its place – and then we add 100% more area to the tower."

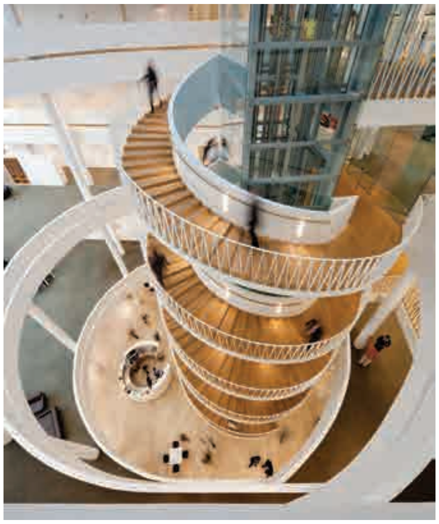

Figure 1. Saxo Bank HQ, Copenhagen – open atrium.

corridor. But here, you have a view to an atrium, and from there to the surroundings. The client called that the "million-dollar view," it was one of the reasons they chose us.

We had several different concepts, but we got some positive feedback on the "vertical village" concept at the mid-term. So we went back and developed that further.

The most radical aspect of the design is that it's a complete remodeling of an existing 1976 office building. Was that proposal unique to 3XN or was it always in the client brief that this was to be a renovation?

I would not call it a "renovation" so much as an "upscaling" of a high-rise. This is a reuse that is very sensible. We use as much of the core as we can – instead of pulling the whole thing down and building up a new structure in its place – and then we add 100% more area to the tower. So it is doubling in size. From a sustainability point of view it is a good choice, and it really makes sense from an economical point of view.

The client wanted us to consider reuse, and we took it very much into our own hands. The design of the new building is fairly rigid and rectilinear toward the southeast side, and very sculptural in the way of the Opera House toward the opposite corner. The entrance of the building is where the old building stands today, and then the corners are pulled outward in a sculptural way. So when you walk around the building, it looks different from every side and angle.

What were the structural engineering requirements for this series of cantilevered wedges spiraling off the original core?

We have a good client. They never saw the idea as a big problem. It is a challenge, of course, but one that is fairly easily resolved, by an angled beam running from the bottom to the top. It is cantilevered, but in a very pragmatic way. When we won the project, they gave us eight weeks to value-engineer out AU$50 million from the design. So went through that process – most of the expense, and thus the savings, was in the construction – and came up with an under-budget scheme in seven weeks.

When you have a building like this, you really have to consider everything. It's not that complicated, but the extrusion had to make economic and construction sense, in that you have more square meters at the top, where rent is higher, than at the bottom. The building increases from 188 to 216 meters, and from 46 to 54 stories. That pays for itself.

What is the programmatic breakdown of the building, and how does that work in terms of the vertical villages?

The client/owner, AMP, is occupying a little bit less than half of the building in terms of floor area. They are subletting the rest. They have taken three of the lower sections and let out the two upper sections. The very top section is reserved for the most exclusive, smaller firms that can afford the highest rents, such as law firms.

Figure 2. Quay Quarter Tower, Sydney.

There was an interest in people from both AMP and the other tenants mixing in the common areas. Moreover, in a big company like AMP, people need to meet frequently. When we took the client on a tour of our work, we also stopped at Swedbank in Stockholm, which is 45,000 square meters, built as one long, 10-story building, with five intermediate atria (see Figure 4). The communicating stairs inside the building cause people to interact more. We took this idea into the high-rise in Sydney. We think the future is about working together, interacting and getting inspired by your fellow colleagues, and of course, by other businesses as well.

The other part of the story is what happens at the street level. Can you talk a little about that?

The building has to animate the streetscape. There is a horizontal village as well as vertical ones; it involves retail and markets, built into

Figure 3. View from Quay Quarter Tower sky lobby.

About the Council

The Council on Tall Buildings and Urban Habitat (CTBUH) is the world's leading resource for professionals focused on the inception, design, construction, and operation of tall buildings and future cities. Founded in 1969 and headquartered at Chicago's historic Monroe Building, the CTBUH is a not-for-profit organization with an Asia Headquaters office at Tongji University, Shanghai, a Research Office at Iuav University, Venice, Italy, and an Academic Office at the Illinois Institute of Technology, Chicago. CTBUH facilitates the exchange of the latest knowledge available on tall buildings around the world through publications, research, events, working groups, web resources, and its extensive network of international representatives. The Council's research department is spearheading the investigation of the next generation of tall buildings by aiding original research on sustainability and key development issues. The Council's free database on tall buildings, The Skyscraper Center, is updated daily with detailed information, images, data, and news. The CTBUH also developed the international standards for measuring tall building height and is recognized as the arbiter for bestowing such designations as "The World's Tallest Building."

Council on Tall Buildings and Urban Habitat

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