

Tropical Urbanism: Cairns a City in a Rainforest

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Introduction

The natural environment of the Cairns region is unique in that it features the meeting of two World Heritage areas of Great Barrier Reef and the rainforest of the Wet Tropics World Heritage Area and attracts visitors from around the world. The natural environment is also one of the main drivers for people choosing to live in the region. With the Cairns economy's largest sector being tourism, protecting and enhancing this asset through planning and innovative urban design is paramount for the continued success of the region.

Cairns Regional Council in conjunction with experts in the fields of architecture and urban design has, since 2009, been defining Tropical Urbanism through master planning and policy. This paper looks at the origins of Tropical Urbanism in Cairns and how the elements that define Tropical Urbanism have been translated into planning provisions and built form outcomes to provide a framework to facilitate Biophilia and the 'City in a Rainforest' concept.

Cairns – A growing regional city in the Tropics

Cairns is a tropical city located in Far North Queensland. As a tropical city, Cairns is home to a diverse range of flora and fauna including tropical rainforests, reef corals and fish, mangrove estuaries and crocodiles. Cairns experiences a wet season from December to April and extremes of climate including cyclonic conditions.

The tropics is defined as that region of our planet flanking the equator and bounded by the tropic of Cancer to the north and the tropic of Capricorn to the south.

'Around half of the world's population – some three billion people – and 80 per cent of the planet's animal and plant species live in the tropics. From economic and educational deprivation to disease, loss of culture and the impacts of climate change, the social, economic and environmental challenges facing the tropical zones of northern Australia and the world are immense.'¹

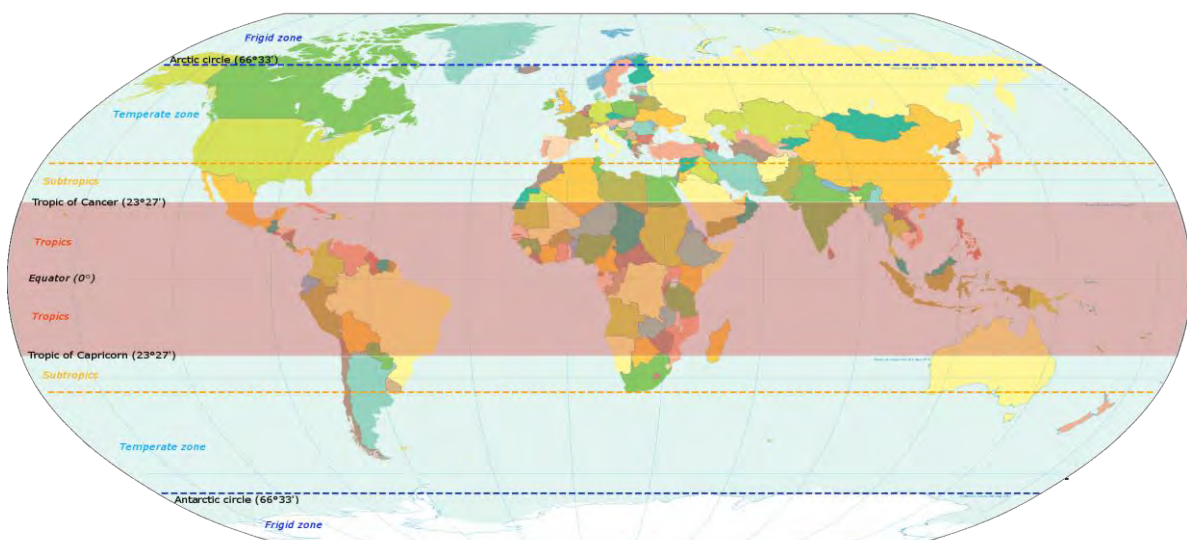


Figure 1: The Tropics²

¹ Cairns Insitute, www.jcu.edu.au/the-cairns-institute/about-the-cairns-institute/about-the-cairns-institute

² By KVDP (Own work) [CC BY-SA 3.0 (<http://creativecommons.org/licenses/by-sa/3.0>)], via Wikimedia Commons

Cairns has a diverse population with many people choosing to live in Cairns for the lifestyle benefits and its natural beauty while still having access to a large employment market and digital technologies. Although previously isolated by its location, Cairns now boasts connectivity to the rest of Australia and the world through direct international flights to over 18 countries and connections to 30 domestic locations.³

The current Cairns population is 158,000 and this number is expected to rise to 400,000 by 2050.⁴ The region is currently attracting significant international interest with many large scale projects proposed by developers from Asia including the \$8.15 Billion Aquis integrated resort and casino and several large residential towers in the City Centre.

Tourism underpins the region's economy with the sector valued at AUD\$2.8billion in 2015 and it is expected to contribute AUD\$4.15 billion by 2020. More than 2.6 million people visited the Cairns region in 2015; with China the largest source market.

'The tourism industry is primarily based on the region's unique and iconic natural features and the protection of these features must be paramount in all future plans for the city'⁵.

Biophilia

Biophilia is a term that describes the "extent to which humans are hard-wired to need connection with nature and other forms of life"⁶. It means that cities and their environment, and in particular their natural context, are inextricably linked.

This link is not only made at an emotional and oftentimes subconscious level but also in the manner by which the built environment facilitates the connection of spaces, environment and people (individually and collectively) via sensory engagement with nature. Such interaction can foster memorable and meaningful experience for both resident and visitor and in turn build civic pride and a defining identity of place.

"Biophilic cities are globally responsible cities that recognize the importance of actions to limit the impact of resource use on nature and biodiversity beyond their urban borders; biophilic cities take steps to actively support the conservation of global nature".⁷

"As the planet barrels rapidly down the path of urbanisation the need for green and nature-full cities is an ever more urgent need".⁸

Cities like Singapore are well on the way to achieving Biophilia. In Singapore a marked increase in biodiversity is being supported through a framework of innovation in urban planning, community support, government incentives and research and development.⁹ This is resulting in the city's being renowned at an international level as a Biophilic 'city in a garden'.

There is a need in Australia to move towards such a supportive approach to biodiversity and climate responsive urban design. In Australia there are currently many non-enforceable guidelines designed to address climate responsive design and building code compliance requirements in buildings however there currently exists a lack of strong policy at a State and Federal level to ensure a sustainable future for urban environments.

³ Cairns Airport, en.wikipedia.org/wiki/Cairns_Airport, accessed 25-10-15

⁴ Cummings. W.S. (2015) Cairns - Leading Population Growth In Northern Australia, Cummings Economics

⁵ Buckley and Reaston (2015) Cairns: A City in a Rainforest, QELA Conference

⁶ E.O Wilson, Harvard University, cited in Cairns Regional Council Draft Planning Scheme Policy – Tropical Urbanism.

⁷ www.biophiliccities.org/what-are-biophilic-cities, accessed 25-10-15

⁸ Imagining Biophilic Cities, Tim Beatley www.biophiliccities.org/wp-content/uploads/2012/06/CityGreen-Imagining-Biophilic-CitiesLR.pdf, accessed 25-10-15

⁹ Biophilic Urbanism: A case study on Singapore (2013) Peter Newman Curtin University

Cairns as a biophilic City

The overt presence of the natural environment and its abundant landscape makes Cairns a 'City in a Rainforest'. It is this close proximity of nature to the city that attracts tourism, energises the experience of locals, and positions Cairns as a unique tropical urban environment.

The relationship between built form, city planning and landscape is expressed as Tropical Urbanism and is a defining characteristic of the Cairns identity.

The Institute for Sustainable Futures Australia's produced an Urban Tree Canopy report was part of the 2020 Vision, a collaborative plan to increase the amount of green space by 20% by 2020 in urban areas. In this report Cairns was ranked as having the highest percentage of tree canopy of any city in Australia at 79%.¹⁰ Although Cairns is fortunate that it already boasts a high level of canopy cover there is a strong need to ensure that this feature is both protected and permeates its urban areas.

Tropical Urbanism

Tropical Urbanism is thought to have its origins in Cairns. In her thesis on Tropical Urbanism: Master Planning in Far North Queensland, Urbi Musso traces the origin of the term to the early master planning of Mount Peter (a southern suburb of Cairns) by Cairns Regional Council and consultant team DPZ Pacific and Seth Harry & Associates.

The term was developed as an evolution from the concept of New Urbanism to reflect the application of urbanism in a tropical context. New Urbanism embraces 'social interaction, walkability and enjoyment of public places'.¹¹ However in a tropical context where 'the harsh tropical climate can often impinge on the liveability and function of the urban environment'¹² there is a necessity for urban design to consider protection from the extreme tropical heat, humidity and rainfall to provide cool liveable spaces. "The Mount Peter Master Plan employs tropical urban design techniques to enhance walkability, comfort, sustainability and enjoyment of the urban environment".¹³

Musso's view is that Tropical Urbanism draws on the three broader concepts of New Urbanism, Climate Responsive Design and Critical Regionalism to create a regionally appropriate language of design specifically for the tropics. Consideration of climate at all scales of urban design has numerous benefits, and is particularly important in tropical environments.¹⁴

The Cairns City Centre Master Plan (CCCMP) completed in 2011 by Architectus for Cairns Regional Council intended to envisage and promote Cairns as an outstanding and internationally recognised exemplar of Tropical Urbanism. The CCCMP further developed the concept of Tropical Urbanism through the creation of a plan that featured the greening of the Cairns Grid pattern of broad streets and the creation of generous public places with abundant shade and vegetation.

"Cairns City Centre has the potential to be an outstanding, internationally recognised exemplar of Tropical Urbanism- creating a built environment- streets, spaces, and buildings- which is uniquely tropical- verdant, shaded, open and lush, with an architecture of deep verandas and shaded cool retreats".¹⁵

¹⁰ http://2020vision.com.au/media/7145/where_are_all_the_trees.pdf

¹¹ Musso, U (2013) Tropical Urbanism: Master Planning in Far North Queensland, Australia, James Cook University.

¹² Ibid.

¹³ Ibid.

¹⁴ Ibid.

¹⁵ Architectus Brisbane et. al. (2011) Cairns City Centre Master Plan', Cairns Regional Council



Figure 2 - Concept of Tropical Urbanism¹⁶



Figure 3: City in a Rainforest as illustrated in the Cairns City Centre Master plan¹⁷

The first stage of urban renewal of the city centre was completed in 2014 with the \$20 million upgrade of Lake Street which included over 4,000 plants and trees and the creation of a public transport interchange. Construction has now commenced on Shield Street which runs perpendicular to Lake to connect with the esplanade.

¹⁶ Ibid.

¹⁷ Ibid.

Redefining the City Image- Tropical Urbanism in the City Centre

Preparation of the Draft Cairns Region Planning Scheme (Draft Scheme) commenced in 2009 and has been over five (5) years in the making and undergone three (3) rounds of public consultation.

The Draft Scheme has a strong focus on the natural environment and city image which is reflected through the strategic framework and integrated through the suite of codes. The Hillslopes Overlay Code seeks to ensure development maintains the scenic backdrop of the City through responding to site constraints rather than adopting complex engineering solutions. The scenic value of the Cairns hillslopes is further protected through the provisions of the Landscape values overlay and the Potential landslip hazard overlay codes.

Cairns Regional Council (Council) undertook statutory consultation in late 2014. A number of the submissions sought an increase in the maximum height within the Cairns City Centre and North Cairns.

Council recognised the need to increase height to encourage urban consolidation, particularly on smaller sites, to cater for the growing population, provide for economic growth through increased opportunities for development and to create a vibrant liveable city centre. Revisions were required to the Draft Scheme that balanced tropical urbanism with economic growth to maintain the city's signature 'City in a Rainforest' image.

Council engaged a consultant team consisting of two architects with experience in local government and the design and assessment of tall buildings and a planner with extensive planning scheme experience to work with Council's strategic planning team to prepare a City Image Study.

The team engaged with the elected representatives and Council's Industry reference group (a group of individuals from varied professions relating to planning and development) to assist in providing further direction on the City Image study. Two local architects were also engaged to provide technical input and testing.

At the commencement of the City Image Study, the consultant team surveyed Cairns Regional Council Councillors, local industry and planning staff to determine, amongst other things, their favourite building in the city centre. The consultant team noted that the most referenced building was the Hilton Hotel, an iconic tropical Cairns building. A distinctive feature of this building is the verandas and podiums featuring planting and hanging vegetation (*Figure 4*). Another popular example was the Pullman Cairns International with its high volumed entrance canopy featuring hanging plants (*Figure 15*). It became apparent during this study that the interaction of nature with the built form had a positive and memorable effect on those surveyed.



*Figure 4- Tropical Urbanism in Cairns*¹⁸

¹⁸ Draft PSP Tropical Urbanism (2015) Figure SC6.16.2.2.b, Cairns Regional Council

It was also identified that the concept of a 'City in a Rainforest' remain a desired vision for future development of the city, and that the features of development that contribute to achieving this should be policy outcomes.¹⁹

The result of the study was an extensive review of the current codes relating to built form within the City Centre and North Cairns and the creation of a new Planning Scheme Policy on Tropical Urbanism.

Tropical Urbanism planning scheme policy and provisions

The Draft Cairns Region Planning Scheme Policy on Tropical Urbanism defines Tropical Urbanism as the integration of landscaping and tropical design elements into the built environment. Development that expresses Tropical Urbanism incorporates:

- (a) Shelter from sun and rain;
- (b) A contrast of light and shade;
- (c) Sufficient spaces around and between buildings;
- (d) Minimisation of radiant heat and heat island effects;
- (e) Air circulation, breeze permeation and passive cooling;
- (f) Generous outdoor living spaces with large window and balcony openings;
- (g) Generous floor to ceiling heights;
- (h) High quality landscaping;
- (i) Quality public and private spaces that proliferate and enliven the urban form; and
- (j) Passive design that responds to the tropical climate.²⁰

The following features were identified within the planning scheme policy on Tropical Urbanism as being key elements that define how Cairns expresses the 'City in a Rainforest' concept.

Articulation and Façade treatments

A key feature of tropical urbanism is variety and articulation and the interplay between light and shade on the facades of buildings. These elements not only create visual interest, but in the tropics this articulation provides essential shading to glazing and wall materials, particularly concrete which can store and radiate heat into internal areas. Articulation in the built form provides shade which acts to reduce the loads required by mechanical air conditioning on high rise buildings.

The policy recommends minimum shading of 50% provided to the containing surface of building volume at 9am and 3pm on both 21 June and 21 December. Vertical landscaping can also be used as part of the façade articulation to further reduce the façade heat load.



Figure 5- Variety in façade treatments²¹

¹⁹ Buckley and Reaston (2015) Cairns – A City in the Rainforest, Tract Consultants and Cairns Regional Council

²⁰ Cairns Regional Council, Draft Planning Scheme Policy – Tropical Urbanism, August 2015

Separation, setbacks, views and vistas

Adequate setbacks between buildings were considered essential, not only to allow for natural light and ventilation (key components of climatically responsive design) but also to provide sufficient areas for deep planting, privacy and retention of view lines. A separation distance of 16 metres was identified as the minimum distance required to retain privacy between liveable areas.

Given the location of the city centre between the two world heritage areas of reef and rainforest clad mountains, these setbacks were essential so that views to these features would be retained. The setbacks also allowed for areas of deep planting to occur between towers to facilitate the 'City in Rainforest'.

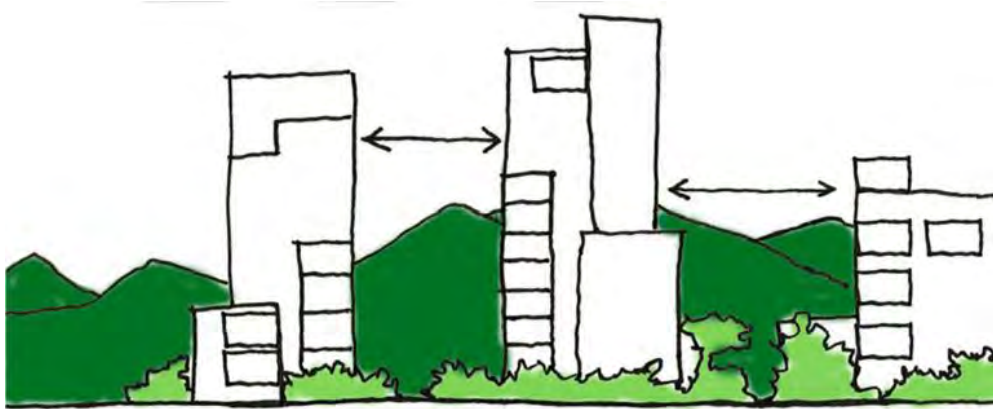


Figure 6: Separation between buildings²²

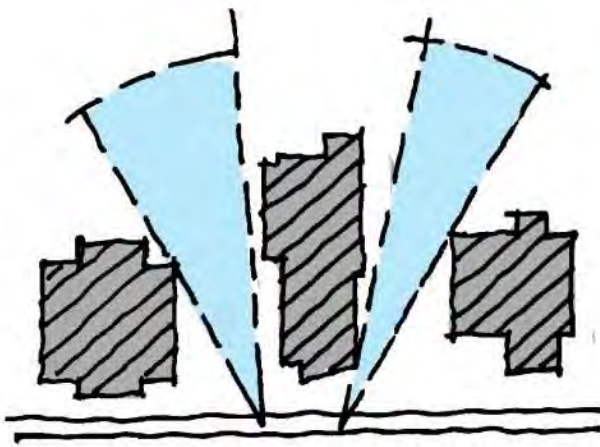


Figure 7- View lines between buildings²³

²¹Ibid Figure SC6.16.3.1.

²²Ibid Figure SC6.16.3.2.a

²³Ibid Figure SC6.16.3.5.a.

Building Width

Building width is not only important for the retention of views, but maintains the scale of the urban environment and facilitates landscaping outcomes. Excessive width of buildings impacts on outlook, views, local climatic conditions, opportunities for landscaping and penetration of light and breezes into buildings, and can create adverse effects on adjoining and nearby premises. Maximum building widths have been included within the Draft Scheme to avoid the adverse impacts of wide buildings.

In the Cairns City Centre maximum building widths can apply to adjoining developments to ensure that streetscapes maintain scale and separation. A maximum width of 30m applies to North Cairns and 40m to the Cairns City Centre.

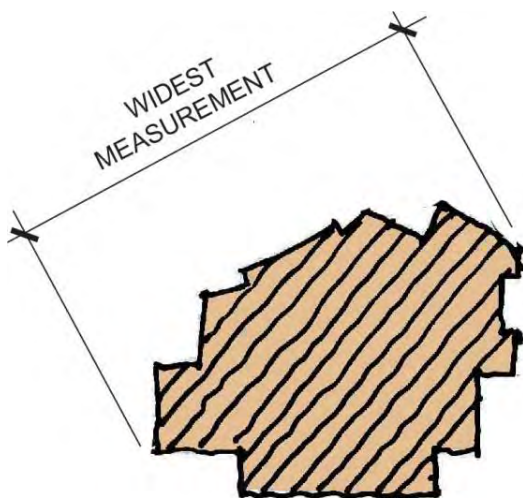


Figure 8- Measuring the maximum width of buildings²⁴

Horizontal Landscaping

The retention and addition of green landscaping was considered an important feature of Tropical Urbanism. Sufficient areas were required to allow for deep planting in the ground as well as above basements, in planter boxes and on rooftops (where there is not a risk to potential bat or bird strikes from the nearby airport). The Draft Scheme includes the requirement for corner pockets of deep landscaping in North Cairns of 5m x 5m which when joined to adjacent sites have the potential to create a pocket of landscaping up to 100m². This allows for the use of larger trees, an important feature of the 'City in a Rainforest'.

Vertical Landscaping

Vertical landscaping is increasingly being used as a method of delivering Biophilia to urban areas where a lack of opportunity for landscaping at ground level is available. Vertical landscaping softens and screens as well as reducing the heat load of building elements. Meier (1991) reports that vegetation consistently lowered wall surface temperatures by about seventeen degrees Celsius and can reduce air-conditioning costs by 25 to 80 percent²⁵.

Vertical landscaping also provides occupants at risk of a disconnection with nature due to their elevation with a tangible experience of nature. These areas can also be focal points for gathering and community interaction.

The provisions included in the Draft Scheme are a first for an Australian City with a percentage of 15% of vertical landscaping required to cover the surface of each building façade.

²⁴ Ibid Figure SC6.16.3.3.a.

²⁵ Meier (1991) cited in Plattt, Rowntree and Muick (1994) The Ecologic City: Preserving and Restoring Urban Biodiversity.

Vertical landscaping can be achieved by deep landscaping at ground level that within 5 years provides coverage to the façade, by landscaping on the tops of roofs, podiums and basements, or vertical gardens, green walls or trellis planting.

The inclusion of ground level planting in this calculation encourages the retention and future maintenance of large established trees on development sites. The figure below demonstrates vertical landscaping options and the calculation method required for measurement. Once installed, the landscaping must be retained and maintained to ensure continued compliance with the development approval conditions.



Figure 9: Vertical landscaping²⁶

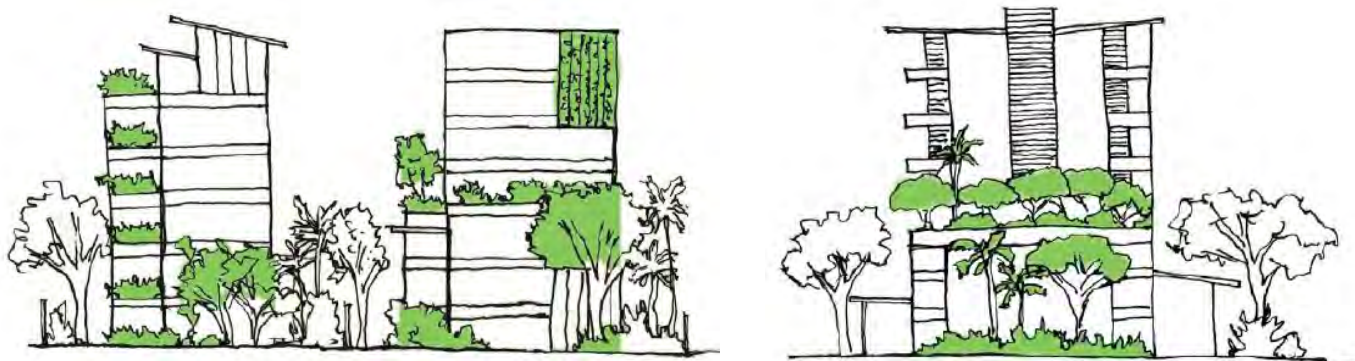


Figure 10: Areas used in calculation of vertical landscaping percentages (shown in green)²⁷



Figure 11: Cairns Hilton Hotel showing how vertical landscape creates a city in a rainforest

²⁶ Cairns Regional Council, Draft Planning Scheme Policy – Tropical Urbanism, August 2015, Figure SC6.16.3.7.a.

²⁷ Ibid Figure SC6.16.3.7.b.& c.

Street Canopy

The natural rainforest provides a dense canopy to protect those below from rain and sun and features cool deeply shaded spaces below. One of the signature design elements of the Cairns City Centre is the street canopy which is an architectural expression of the rainforest canopy and provides a tall sheltered space for protection from the elements when moving about the city.

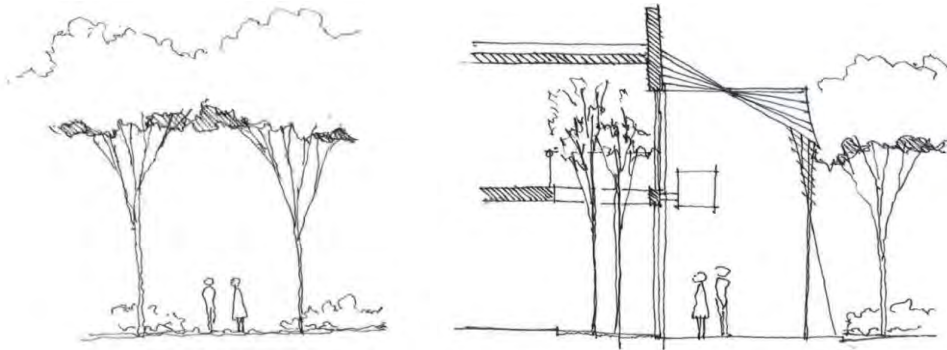


Figure 12- Rainforest canopy in its natural setting and the architectural expression of the rainforest canopy²⁸

This design element will further define how Tropical Urbanism is experienced at street level and can incorporate landscaping elements in this plane. The street canopy is expected to occupy the full frontage of the site and has been raised to a height to activate additional commercial uses on the second floor.

The canopy provides volume for breezes and additional shading for adjacent roads through deeper shadow angles. The resultant shade can reduce internal air temperatures and the urban heat island effect.

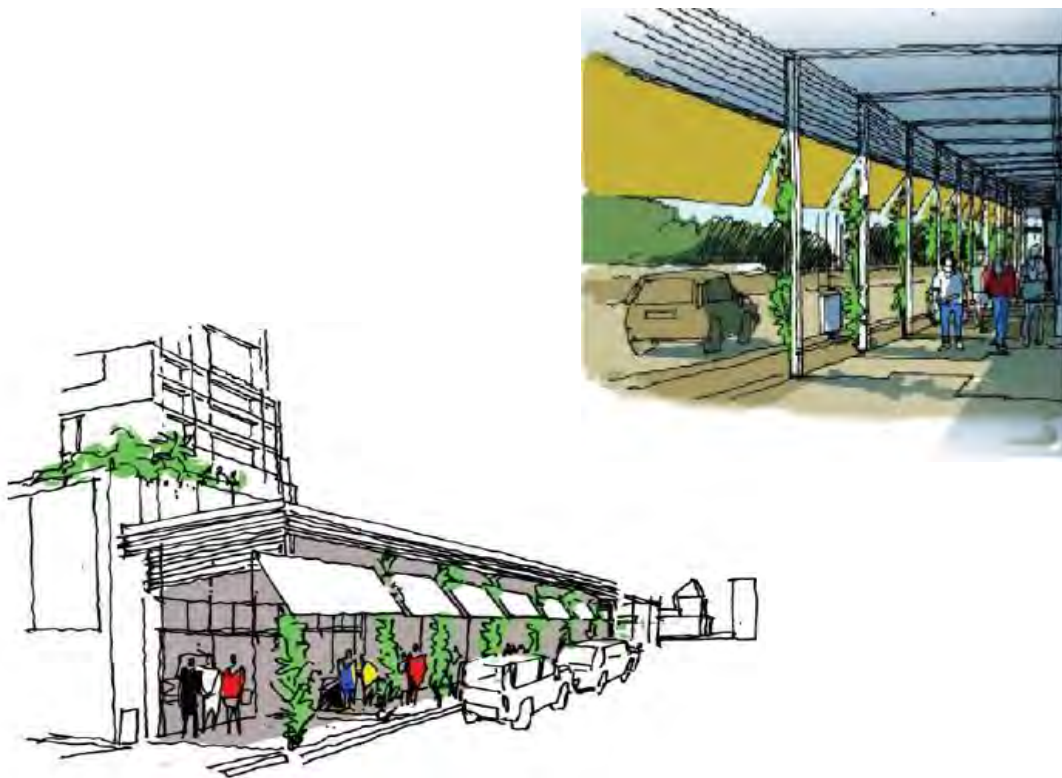


Figure 13 - Street canopy²⁹

²⁸ Ibid Figure SC6.16.3.8.b.

²⁹ Ibid Figure SC6.16.3.8.c.

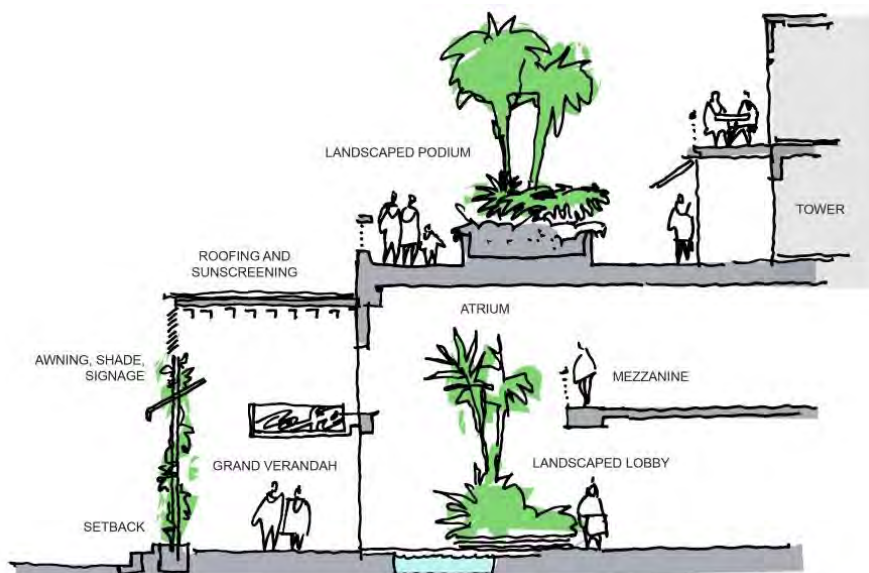


Figure 14 - Street canopy (typical cross section)³⁰

The diagrams above illustrate how the canopy interacts with the pedestrian environment and internal foyer area and demonstrates the human scale of the canopy in relation to the podium and tower behind. The canopy can also include design features that provide suitable weather and solar protection according to street orientation and exposure. The high volume canopy of the Pullman Cairns International illustrates how this feature can provide shading and increase opportunities for ventilation and light to penetrate interior spaces.



Figure 15: A high volume canopy at the Pullman Cairns International

Connectivity and walkability

The Draft Scheme encourages the use of mid-block connections to allow free pedestrian movement between blocks preferably sheltered from the elements. These through connections provide visual connectivity to other public places and can assist with wayfinding.

Quality Urban design

In addition to guidance on the elements included in the Draft Scheme the Planning Scheme Policy also includes the Qualities of Good Urban Places derived from “An agenda for Urban Quality in Queensland” prepared by Urban Design Alliance Queensland. Some of these qualities include active spaces, connectivity, sustainability, urban landscaping and human needs.

³⁰ Ibid Figure SC6.16.3.8.d.

Conclusion

Over the next 35 years to 2050 Cairns will experience growth that will result in significant changes to the Cairns City Centre. The need for urban consolidation and increased development is important to ensure the future sustainability of the region which must be provided with a balanced approach considering economic growth, environmental sustainability and social benefits.

It is through clear policy and direction that Cairns can ensure that that future development is consistent with the natural assets of the area. The unique character of Tropical Urbanism and a 'City in a Rainforest' will continue to define Cairns and ensure that the qualities that attract visitors, residents and businesses to the region are supported through policy resulting in quality urban spaces designed for the tropics.

The adoption of the Cairns Street Canopy and vertical landscaping is a bold move for local government but the commitment will make a defining mark in the urban image as the opportunities for public realm activation and landscape interaction become manifest as a tangible experience of the ethos of 'Biophilia' in a tropical city.