MODERN GREEN HOMES

Sanctuary

ISSUE
65

Cool design for hot climes; tips for FireWise gardens; Australia's best bushfire zone builds; Accoya eco-timber

Tropical delights

PUBLISHED BY renew.
SUMMER 2023/24 • AU/NZ $13.95
SANCTUARY.RENEW.ORG.AU

ISSN 1833-1416
9 771833 141017

EASY BREEZY

Sustainable design for the tropics

What do you need to consider for a high-performing, energy-efficient and super comfortable home in our warmer climate zones? Four experts from across northern Australia offer their thoughts on the fundamentals of great tropical design, and tell us a little about a favourite project.

SHANEEN FANTIN

Shaneen is an architect and co-director of Cairns-based People Oriented Design (POD). She works on projects across Queensland. peopleorienteddesign.com.au

Can you tell us a little about the kind of house and the climate you grew up in?

I grew up and still live on Yidinji Country, on a farm in the wet tropics just south of Gimuy (Cairns). The farm was bought by my Italian grandfather and his brothers in 1927. Our house is a highset timber Queenslander built in 1963 by my father, his brother and a local Cairns builder. It is constructed of local rainforest hardwood, has generous 1,100-millimetre eaves, casement windows, and is an unusual V shape. It is oriented well for views and breezes, and has survived several cyclones.

What was it that triggered your interest in architecture and design, and design for the tropics in particular?

I think growing up in an unusual house and on a farm in the tropics provided an environment where I could be in nature and develop creative problem solving. At high school I excelled equally at science and art, and it was my senior art teacher who suggested I consider architecture. When I graduated from the University of Queensland with first class honours, I was lucky enough to secure a job with Troppo Architects in Darwin. I worked for Troppo for about three years, and this enhanced my training and passion for good tropical design.

What kind of projects do you love best these days?

I love working with Indigenous people and 'Designing with Country', particularly in the tropics. Over the past 25 years, I have worked closely with many First Nations peoples in the northern parts of Australia, including doing a PhD on the relationship between culture and housing design with Yolngu people in the Northern Territory's dry tropics. Designing with Country encapsulates sustainable design, because to respect and care for Country means caring for the environment, local ecology, culture and place. I'm pleased that the Designing with Country movement has gained momentum in Australia's architecture and design sector over the past five years; it's now part of the National Competency Standards for Architects (NCSA).

Our practice, People Oriented Design, undertakes a great diversity of work, from residential to commercial, health, housing, education and public buildings. My co-director Belinda Allwood is also passionate about sustainable design and has a Masters in landscape architecture, while I often lead the First Nations-related work in the office.

What do you consider to be the fundamental design principles for successful sustainable tropical design?

The main differences between wet tropical environments and temperate regions are the intensity of the sun, the small diurnal change in temperature, and the quantity and intensity of the rainfall. In the wet tropics it's important to shade spaces and promote air movement and breezes for cooling, whereas in temperate regions the focus is on capturing solar gain in cold weather and eliminating air leakage to maintain warmth.

The foundation for successful design in the tropics is good passive climatic design. Each design response will vary, depending on the location and microclimate; however, here are some key guiding points for good tropical sustainable design:

- Keep the hot sun out with big roof overhangs, verandahs and/or screens.
- Shade the walls as well as the windows, to reduce radiant heat gain.
- Maximise covered outdoor spaces that also help to shade the building.

- Capture breezes and use them to cool the building: use breezeways, large doors and windows to promote cross flow.
- Use fenestration types that maximise airflow.
- Minimise air conditioning and energy consumption.
- Keep the heavy rain out and off the walls of the building.
- Insulate well and correctly for the climate, considering condensation management.
- Build in durable and sustainable materials for the site (for example, what works for the coast may not work for the damp rainforest; steep sites may warrant a different solution to flat sites).
- Utilise green technologies, materials and energy production to enhance the foundation of good passive design principles.

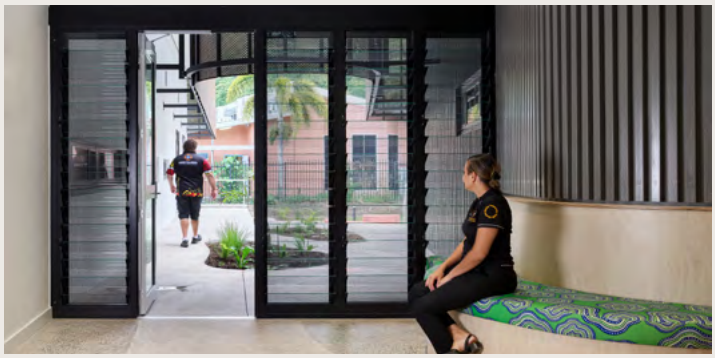
What are the main challenges facing designers and homeowners in your region when trying to achieve a successful sustainable house build or renovation?

The main challenges in far north Queensland are cost (housing affordability) and insufficient education for the public on what makes good sustainable tropical design. To help rectify this, at POD we have delivered a workshop called 'The Least House Necessary' about sound sustainable design principles to over 600 people, and presented a TEDx talk called 'Less Walls and More Life' that has had 42,000 views. However, the sad reality is that the majority of housing is provided by builder/developers whose aims are low price, high yield and high turnover, meaning the houses generally do not respond to climate, place or Country and are not sustainably designed. In addition, the cost of construction has almost doubled in far north Queensland since the beginning of the Covid pandemic. This means that creating well-designed, sustainable houses for the tropics can be an expensive process, particularly on steep or challenging sites.

What developments do you see coming in the tropical design space in the future, especially with our ever-warming climate?

We anticipate more discussions about resilience and longevity, minimising and measuring carbon, adaptive reuse of existing buildings, recycled materials, and using smart technology to tailor a building's energy use for greater efficiency. More people are concerned about extreme weather events; designing for them might mean creating a very safe space to serve as a cyclone or flood retreat, perhaps with an independent energy system.

At a town scale, there is greater interest in cooling suburbs and precincts through integrated landscaping. There is also interest in medium-density tropical housing that suits urban infill developments and provides an alternative to expanding suburbs, heat islands and large detached houses on small blocks. James Cook University and the University of Queensland have both done great research on these topics.



Gurriny Yealamucka Health and Wellbeing Centre

Completed in June 2021 on Gunggandji Country in the First Nations community of Yarrabah, the wellbeing centre provides health and community services. The design approaches sustainability from a holistic perspective and has been created to acknowledge, respect and respond to its cultural, social and climatic environment. The result is a facility that responds to Country and culture, is well designed for the climate and location, and is a non-institutional place designed to support Indigenous models of health care.

The building design uses screens to shade verandahs, external building walls and outdoor areas. The plan includes multiple entry points to respect local social structures and privacy. It contains welcoming reception, waiting and meeting spaces, and integrated artworks by local Indigenous artists that tell ancestral stories about Country and healing. The outdoor areas include a native garden (including signal plants), a yarning circle and flexible connected indoor/outdoor waiting spaces. It includes a 20-kilowatt solar system, recycled and sustainable materials, options for natural ventilation, and a backup generator to ensure the service can continue in extreme climatic events. The wellbeing centre has been embraced by the local community.

DESIGN: People Oriented Design with Coburn Architecture

LOCATION: Yarrabah, QLD (Gunggandji Country)

PHOTOGRAPHY: Scott Burrows

NATHAN LAIRD AND EDWARD TRAN

Based in Broome, Western Australia, architects Nathan and Edward are co-directors of Laird Tran Studio. They work on projects across the Kimberley region. lairdtran.com.au

Can you tell us a little about the kind of houses and climates you each grew up in?

Edward: I spent my formative years in Perth, a city known for its Mediterranean climate, though my parents hailed from tropical Saigon in Vietnam. My mother often jokes that my affinity for Broome and its climate is in my blood! Our family home was a simple double-brick structure with three bedrooms and one bathroom for our family of five. I shared a room with my younger brother, and as a kid, I perused floor plans in the newspaper, daydreaming about living in a larger house and finally having a room of my own.

Nathan: I grew up in Broome, with its subtropical climate characterised by a summer wet season and a warm, dry winter. Our house was built in the 1990s and designed to emulate the style of old pearlers' cottages. It featured deep verandahs, latticework and exposed truss ceilings.

What was it that triggered your interest in architecture and design, and design for the tropics in particular?

Edward: As a child I had a penchant for constructing intricate Lego houses. At high school, art was my strongest subject, making the creative profession of architecture a compelling choice. However, my fascination with designing in Broome goes beyond professional aspirations. It's about my deep affection for living in this region, connecting with both the community and nature.

Nathan: The world of architecture has always appealed to me. I'm inspired by designing for my home region: subtropical, coastal, prone to cyclones, and with its architectural roots in the boatbuilding trade, specifically pearl luggers.

What kind of projects do you love best or specialise in these days?

We have a passion for projects that contribute to the social and emotional wellbeing of our small community here in Broome. Our commissions typically involve commercial architecture; recent projects include the Broome Golf Clubhouse and Restaurant and the Lions Outback Vision Kimberley Eye Hub (see case study opposite). We tackle these ventures with budget constraints in mind, ensuring that they integrate harmoniously with the site conditions and meet the specific requirements of the local community.

What do you consider to be the fundamental design principles for successful sustainable tropical design?

Crucially, our designs must pay homage to the land. This involves a multitude of considerations, including the building's owners and users, Indigenous custodians, cultural aspects, community dynamics, historical significance, environmental factors, and the rich tapestry of flora and fauna.

In addition, when designing for this climate, key considerations are:

- **Managing humidity:** Effective control of humid air during the wet season is imperative to prevent condensation damage to buildings that are mechanically cooled. The correct detailing of vapour barriers and thermal insulation to prevent cold bridging is important.
- **Shading:** Effective shading year-round is essential to mitigate solar heat gain on building facades.
- **Stormwater drainage:** Embracing and managing rainfall can be a design opportunity. Stormwater drainage design and detailing, encompassing both the roof and the landscape, has to be foolproof: the simpler, the better. Our region has sporadic but intense rainfall during the wet season, requiring robust control measures to manage a substantial volume of water in a short timeframe (as much as 300 millimetres in one hour).
- **Natural ventilation:** Incorporating natural cross ventilation during the dry season can significantly reduce the need for mechanical ventilation and energy consumption. (In Broome, passive cooling comes mainly from the prevailing sea breeze from the west; buildings that are set a few metres above ground receive more than three times the cooling benefit than those at ground level, but these buildings are also exposed to higher wind loads in the event of a cyclone.)

– **Natural light:** Windows that provide natural light reduce a building's reliance on artificial lighting, and also establish a visual connection to the landscape.
– **Integration with landscape:** Buildings should be designed to connect with and complement the natural surroundings, with landscape considerations being integral from the outset rather than an afterthought.

It's important to craft designs that respond sensibly to the unique climate, recognising the distinct dry and wet seasons rather than a traditional 'summer and winter' divide. An 'esky' (insulated walls, floor and ceiling) with a 'big hat' (a large shading roof) can often be the most appropriate design in our region, as long as the building can be opened up for natural ventilation when external conditions are favourable. All openings need screening as we have so many insects.

What are the main challenges facing designers and homeowners in your region when trying to achieve a successful sustainable house build or renovation?

The main challenge is cost. Building in remote regions like ours involves cost considerations driven by both climatic factors and logistical challenges, including:

– **Climatic conditions:** Robust design features to withstand extreme weather conditions, like cyclones, are often required. A cyclone-rated building will have a much larger footprint than its equal in a more temperate climate. The additional engineered steel that goes into the buildings here impacts both their carbon footprint and their build cost.
– **Limited contractors and trades:** The small local pool of professionals can lead to increased labour costs and challenges negotiating competitive pricing, and may require bringing in specialists from afar.
– **Limited availability of materials:** Availability of certified and tested materials suitable for the local climate is often limited. This may require transporting materials from far away or using higher-cost alternatives.

What developments do you see coming in the tropical design space in the future, especially with our ever-warming climate?

We are indeed witnessing the consequences of a warming climate, with escalating temperatures and a surge in extreme weather phenomena. These include cyclonic weather patterns with their destructive winds and heavy rainfall, often leading to flooding. Simultaneously, there's a growing emphasis on conserving energy and minimising living and building costs. In this context, it's important to invest in good design that responds to the evolving climate. This commitment to sustainable and resilient design is essential for the long-term viability of buildings.

Lions Outback Vision Kimberley Eye Hub

The Kimberley Eye Hub project transformed the former Kimberley Klub backpackers' hostel into a vital hub for eye health services in Broome and the wider Kimberley region. Stage 1 involved the complete renovation of the existing dormitory building, which was turned into new consulting rooms, offices, a meeting room, and staff accommodation. Stage 2 saw the addition of an administration area, optometry, consulting rooms, and an eye health kiosk.

The design directive was to adapt the existing structures to suit the new facility's needs. The choice of colours pays homage to the region's landscape and consists of a gentle, eye-sensitive palette to create a welcoming atmosphere for patients visiting the site. The final landscape design harmonises all the facilities, fostering a stronger connection to the Kimberley's stunning natural surroundings.

This project is a commendable example of achieving sensible design outcomes within the allocated budget.

DESIGN: Laird Tran Studio

LOCATION: Broome, WA (Yawuru Country)

PHOTOGRAPHY: Edward Tran

Phyllip Street Studio

We have a great small project currently on our drawing board, in Emu Park, a small town on the Capricorn coast. The site is nestled into a steep hill with extensive views of the ocean and surrounding islands.

The small build footprint (around 90 square metres) is strategically positioned to require minimal cut-and-fill on the sloping site. A double-height entry shades half of the pool and protects the studio from the harsh afternoon sun in summer. The breezy, shaded outdoor living area is a take on the 'undercroft' of traditional Queenslander houses, and is partially enclosed with screens allowing for constant ventilation, security, and protection from insects.

Upstairs, the indoor space allows a multitude of uses, including working, sleeping and relaxing, and has unimpeded sea views.

DESIGN: Design+Architecture

LOCATION: Emu Park, QLD (Darumbal Country)

COLIN STRYDOM

Director of Design+Architecture, based in Rockhampton, Colin is an architect working mainly on Darumbal Country, encompassing coastal Central Queensland from Shoalwater Bay to Yeppoon and taking in the mouth of the Fitzroy River and Keppel Islands. designaa.com.au

Can you tell us a little about the kind of house and the climate you grew up in?

My childhood hometown was Pretoria, the administrative capital of South Africa. At an altitude of 1,000 metres, Pretoria has a subtropical monsoon climate with long, hot, rainy summers and short, dry and mild winters. I grew up in a typical South African double-brick home with concrete roof tiles and minimal windows; winters were cold and summers stuffy and hot thanks to a lack of ventilation and the day's heat radiating from the uninsulated brick walls.

What was it that triggered your interest in architecture and design, and design for the tropics in particular?

My interest in design started with the first Lego set I received as a birthday present at the age of four, opening my imagination to endless creative possibilities. I spent many hours creating castles with secret rooms and James Bond-style cars with hidden missiles.

Work opportunity brought me to Rockhampton, right on the Tropic of Capricorn, 15 years ago ... so in many ways the tropics chose me. Central Queensland could be classified as dry subtropical, providing a unique perspective on the tropics: we have long, humid summers that bring floods, cyclones and thunderstorms, and cool, sometimes cold winters with fog.

What kind of projects do you love best these days?

As a regional studio, at Design+Architecture we undertake projects in all sectors that require a bespoke approach. In particular, I love community-based projects, and residential projects with individual character.

Community projects provide the opportunity to contribute to and enhance the 'greater good', with the challenge of the 'client' (by which I mean end user) being anyone and everyone. For example, a modest public toilet block does not just provide an amenity; if designed well it can also enhance the fabric and character of the local neighbourhood.

At the other end of the scale, private residences typically focus on the quite specific needs and character of the client family, including considerations such as privacy and enhancing scenic views. I love to design for the fundamentals: connecting the indoors with the outdoors, and maximising natural ventilation and natural light.

What do you consider to be the fundamental design principles for successful sustainable tropical design?

I'd say that site selection is a fundamental factor for a great house in the tropics: a great site allows for a house orientation that avoids morning and afternoon sun in summer and makes the most of prevailing winds and views. I highly recommended engaging with a properly qualified local designer or architect throughout your whole project, including selection of the site if possible. There is no such thing as a 'bargain' site! Typically, a bargain site will have complexities that will add cost and discomfort to the overall building process.

In our region, the perfect sustainable design would be a long, narrow building with the long side facing north, and as much openable glass as possible on both the northern and southern sides. There would be a verandah along the northern side to provide shade in summer but let the lower winter sun's rays in. Both eastern and western sides of the building would be window-free and packed with insulation to shield against the morning and afternoon sun in summer. Because the summer sun also shines from the south at this latitude, the southern side of the building should also be appropriately shaded, but openable windows are important here for natural cross ventilation.

Especially on coastal sites, I always recommend creating a courtyard for outdoor living, with a great connection and flow into the house. Depending on the site, this should go on either the northern or southern side of the house – the opposite side to the prevailing winds, for shelter and comfortable use throughout the year.

What are the main challenges facing designers and homeowners in your region when trying to achieve a successful sustainable house build or renovation?

As a community we face a range of challenges when it comes to building more sustainable homes. A main one is the general perception that all homes have to be built on a flat pad, with a concrete slab on ground, brick veneer construction, and without much consideration for a connection to the outdoors. This is a disaster for passive solar design in our climate, and results in a year-round requirement for air conditioning, artificial lighting, and high energy consumption. Another is the local 'trades culture': many builders and tradies are unwilling to tackle anything out of the ordinary, and it gets a high price tag or a straight 'no'. We need to do what we can to change this general perception, and educate and foster better practices among the building industry.

What developments do you see coming in the tropical design space in the future, especially with our ever-warming climate?

Higher density development is becoming more relevant because of the growing demand for housing, and with its smaller spaces and less separation between buildings, it will require a different design approach. Orientation and passive ventilation principles will be even more important in order to avoid uninhabitable homes as the climate warms.

On a different note, smart technology should be embraced. For example, app-controlled electronic systems to manage the opening and closing of louvres for ventilation and blinds for shading can really enhance a home's performance. S

NANCY LAU'S TOP TIPS FOR SUSTAINABLE DESIGN IN THE TROPICS

A few relatively simple techniques can produce a very comfortable house in the tropics, with little need for air conditioning:

- Build small; only what you really need. The tropical climate lends itself to outdoor living.
- Understand your site and orient your house to take advantage of cooling breezes, sun paths, views and local ecology. Passive design is an easy win for a more comfortable house that's cheaper to run.
- Good ventilation with strategically placed windows and doors is critical, to take advantage of cooling breezes and prevent mould.
- Lightweight construction with insulation keeps heat out during the day and cools quickly at night.
- Shading any thermal mass in walls and floors prevents unwanted heat retention.
- Extra wide eaves shade walls and allow windows to be opened in heavy rains.
- Being close to the equator, shading is needed to both northern and southern sides of your house, as in summer the morning sun comes from the south.

Nancy is a Cairns-based architect who loves to design for easy, breezy life in the tropics. *See page 54 for one of her projects.*