

TGBN

TROPICAL GREEN BUILDING NETWORK

An Initiative For
Tropical Australia

Sponsors & Supporters



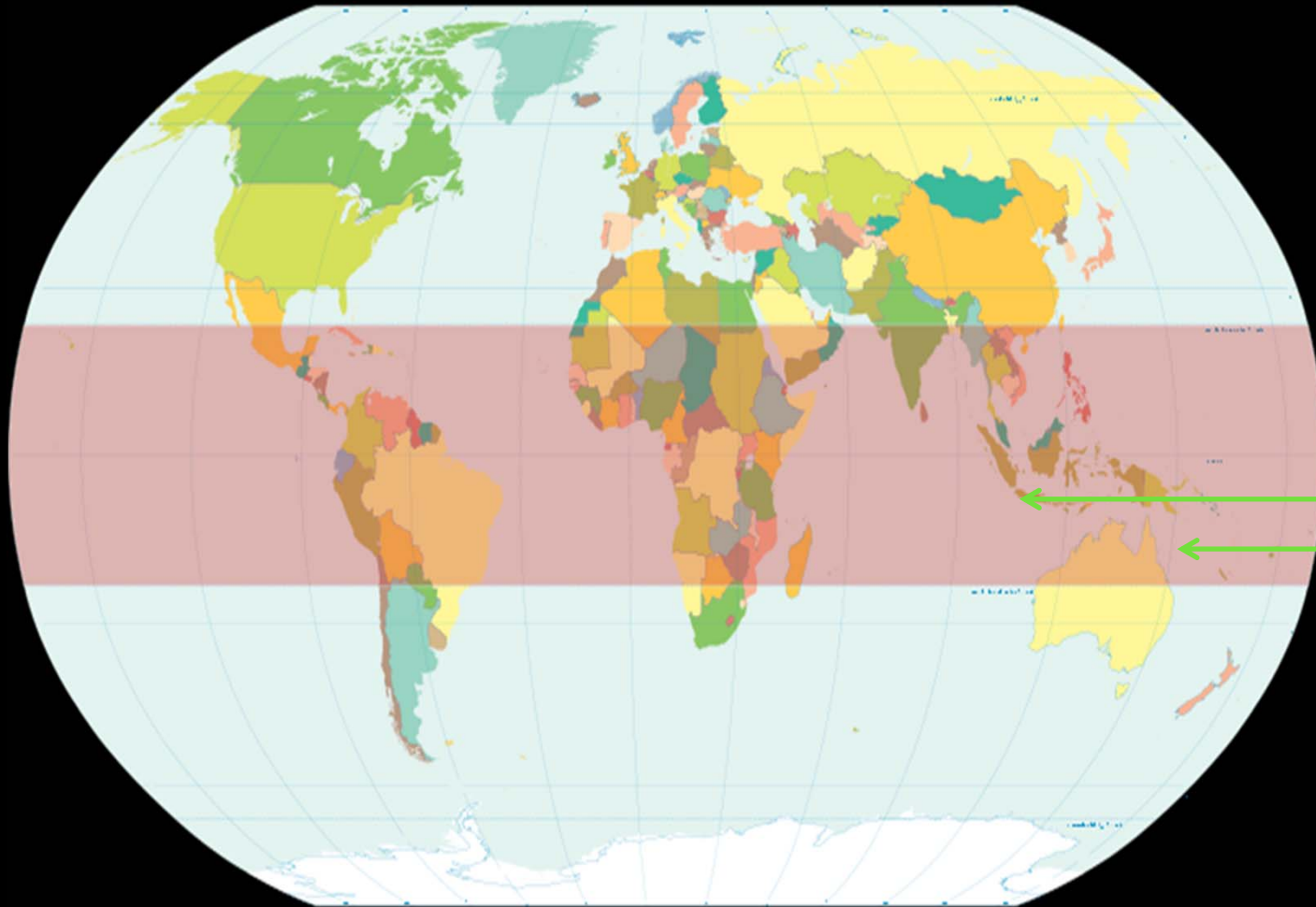
TradeStart – an international business initiative of the Australian Government delivered in partnership with Trade and Investment Queensland.



Trade&InvestmentQueensland



The Tropics

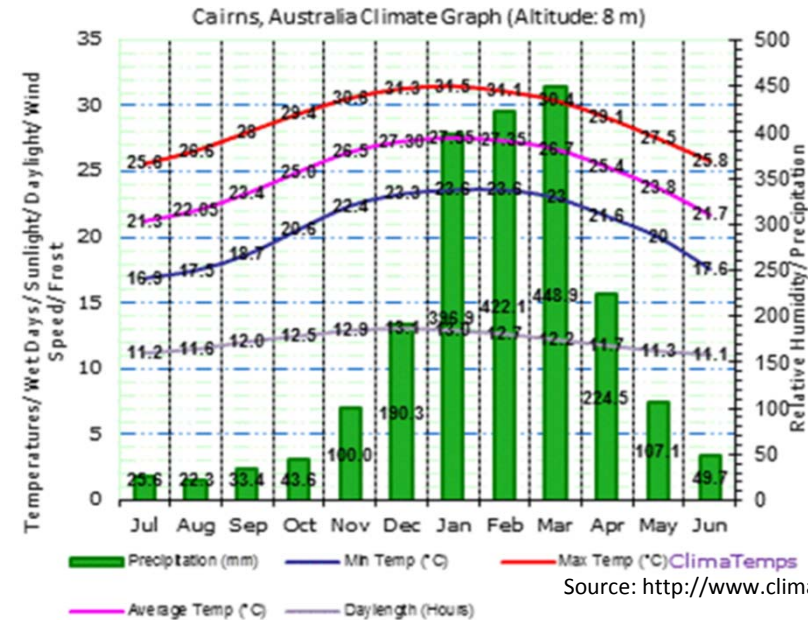
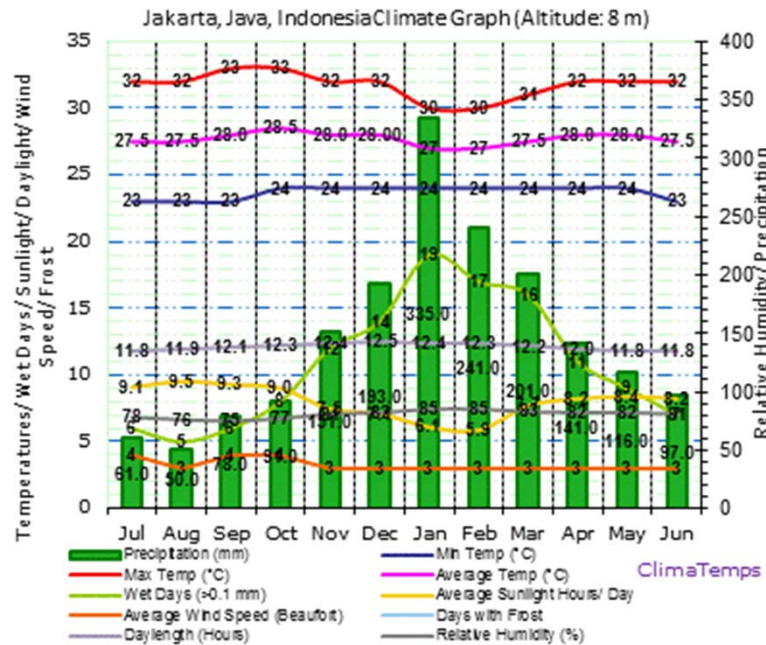


Jakarta, Indonesia
Cairns, Australia



The Cairns region has the largest population in tropical Australia. It was founded in 1876, services a hinterland rich in agriculture and mining and has an international sea and airport . It is the gateway to World heritage listed rainforests, the Great Barrier Reef and hosts 2.4 million tourists a year.

Our tropical climate sets us apart from the rest of Australia and in this regard, we have more in common with countries like Indonesia.



Source: <http://www.climatemps.com/>

Climate of Jakarta, Java, Indonesia

- Jakarta, Java has a tropical monsoonal climate (Köppen-Geiger classification: Am) with a dry season and a heavy monsoon the rest of year, no cold season.
- According to the Holdridge life zones system of bioclimatic classification Jakarta, Java is close to the **subtropical moist forest biome**.
- The mean annual temperature is 27.7 degrees Celsius (81.9 degrees Fahrenheit).
- Total annual Precipitation averages 1755 mm (69.1 in).

Climate of Cairns, Australia

- Cairns has a tropical monsoonal climate (Köppen-Geiger classification: Am) with a dry season and a heavy monsoon the rest of year, no cold season.
- According to the Holdridge life zones system of bioclimatic classification Cairns is close to the **subtropical moist forest biome**.
- The annual mean temperature is 24.8 degrees Celsius (76.7 degrees Fahrenheit).
- Total annual Precipitation averages 2064.4 mm (81.3 in).



A Cairns street in flood although drains away quickly.



A Bandung street in flood.



Rafting in the Palayangan River, Bandung



Rafting in the Tully River south of Cairns

Behind the beauty is tropical expertise where a growing number of our businesses are already producing products and services tailored to tropical climates.



Photo: Kenick Constructions Team

Our Business Directory promotes over 200 businesses and over 400 products and services and is found at:

greenbuild.com.au
tropical eco-building & living

The grid contains the following logos:

- rpmenviro
- VISION ARCHITECTS
- CA ARCHITECTS
- Kilfoy Cabinets (discover YOUR kitchen)
- GILBOY HYDRAULIC SOLUTIONS (Building Hydraulic Services Design)
- THE OMEGA GROUP
- Andy's Sheetmetal Home of the ROOF VENTILATOR "Cool Your Home"
- GHD
- WSP
- THIRKELL CONSULTING ENGINEERS
- eco Splash (Living Water)
- green INSULATION
- environment & energy systems
- Tropical Energy Solutions (CLEAN > RELIABLE > AFFORDABLE)
- EFFECTIVE ENERGY SOLUTIONS
- ROCKCOTE (COLOURED RENDERS - PAINTED FINISHES Naturally Beautiful)
- SUSTAINABLE SOLUTIONS (Environmental & Community Consultants)
- FLANAGAN CONSULTING GROUP
- WORKING VISIONS (Sustainable Community and People Development)
- Solar-Fish (Sustainable for Life)
- Total Project Group Architects
- JACKSON & JACKSON REFRIGERATION PTY LTD (sustainable cooling solutions)
- NRA Environmental Consultants
- ARUP
- SOLARCOOL
- PeddleThorp Far North
- evolve energy (ENGINEERING + SUSTAINABILITY)
- OzPoly (water products)
- POD (PEOPLE ORIENTED DESIGN)
- themissinglink (resource coordinators pty ltd)
- Innovative Facility Solutions Pty Ltd (ABN: 94 151 72 593)
- ASTEC (PAINTS)
- Naked Energy (go natural)
- Hempcrete Australia (energy saving eco building)
- BRYANT
- chris vandyke designs
- KENICK Constructions

James Cook University Cyclone Testing Station advice has been incorporated in design codes and building standards in Australia and overseas. It has influenced Government policy on storm tide mitigation and contributed to the prevention of catastrophic loss of life and property.




Photo: Thirkell Consulting Engineers, Swallow Street Social Housing Units

Tropical Australia is not just a beautiful place to live and visit. It is delivering some of the worlds best practice in construction.

The collage includes the following logos and documents:

- qbcc** (Queensland Building and Construction Commission)
- Member Australian Institute of Architects
- STANDARDS Australia
- Certified Product logo
- Australian Standard logo
- Model Work Health and Safety (WHS) Regulations (October 2011)
- Department of Justice and Attorney-General, Queensland Government
- CSIRO logo
- ABSA (Association of Building Sustainability Assessors) logo
- greenstar logo
- CAIRNS REGION PLANNING SCHEME logo
- Australian Government Department of the Environment logo
- State Planning Policy 3.1 Residential Design Codes
- CONSTRUCTION INSURANCE: A GUIDE FOR ATTORNEYS AND OTHER PROFESSIONALS
- FNOROC logo
- Planning for a stronger, more resilient North Queensland (Part 1: Rebuilding in storm tide prone areas: Tully Heads and Mull Heads)
- State Environmental Planning Policy (General and Complying Development Codes) 2008
- Professional Indemnity Insurance logo with a gavel icon



We share a desire to vastly improve buildings codes, standards, assessment tools and ratings as they are applied to the tropics and our unique environments.

We believe a concerted effort amongst tropical countries can adapt and develop our own unique ratings to suit our tropical climate.

Photo: TAFE BLOCK J HEALTH and
SUSTAINABILITY PRECINCT
Total Project Group Architects

DEFINING TROPICAL GREEN BUILDING EXPERTISE:

Tropical sustainable design expertise plans, designs, specifies and builds to deliver :

- The design and construction of sustainable, resilient communities and infrastructure for tropical climates.
- The development and application of building materials and technologies for extreme heat, cyclones, humidity and heavy rainfall.
- Sustainable environmental practices through the efficient use of renewable natural resources and protection of natural assets.



MARINA POINT, CAIRNS
CA Architects and
Cox Rayner Architects
Photographs: Christopher Frederick Jones



Designing sustainably for a tropical climate is different.

A project that is a joint initiative of the Tropical Green Building Network (TGBN) and James Cook University (JCU) aims to capture and share the knowledge of best practice tropical expertise in our built environment through a series of case studies produced by the construction industry for the university.



TROPICAL SUSTAINABLE DESIGN CASE STUDIES GUIDE DOCUMENT

Contents

1.0	INTRODUCTION	pg 2
2.0	DEFINING TROPICAL EXPERTISE:	pg 3
3.0	PLANNING AND MANAGEMENT	pg 3
4.0	SITE	pg 4
5.0	DESIGN	pg 5
6.0	MATERIALS	pg 6
7.0	ENERGY	pg 7
8.0	WATER	pg 8

Photo courtesy of Tony Lawson, Building Designer.

A Guide document was produced to enable the case study compilation. It outlines six primary focus areas of sustainable tropical design that our working group deemed critical to best practice.

- Planning and management
- Site
- Design
- Materials
- Energy
- Water



PLANNING AND MANAGEMENT

In addition to the general considerations tropical climate construction is considering:

- Managing construction sequencing.
- Procuring materials to manage delays or damage.
- Durability of materials, seasoning for humidity & detailing to minimise condensation, moisture traps and mould.
- Researching new products.
- Sharing successful and poor project outcomes.
- Managing the workforce in difficult site conditions.
- Tropical health considerations.
- Planning for safe and resilient buildings.
- Appropriate design response to cultural imperatives.



Moore's Gully catchment size is 730ha flowing 150m³/sec in a 100yr ARI event. Hydraulic modelling proved modifying the alignment, profile and overbank works, resulted in the best flood mitigation and environmental outcomes. Reflecting a natural gully, it incorporates sinuosity, low velocities, and landscaped revegetation for scour protection and improved water quality. It flood proofed surrounding neighbourhoods, increased the lot yield for the Brookfield residential development and will be a multi-functional urban ecological corridor.

SITE: In addition to the general considerations, tropical climate construction is considering:

- Minimising site disturbance and controlling volume and quality of wet season stormwater run-off to minimise erosion and sediment/nutrient loss to waterways.
- Expertise and understanding of micro-climates relating to coastal, rainforest, highland and savannah locations.
- Selection of site location to maximise resilience and to minimise isolation, disruption and loss of property during floods, storm surges and cyclones (typhoons).

The Cairns Convention Centre was Australia's first environmentally planned public building.



DESIGN

In addition to the general considerations, tropical climate construction is considering:

- Passive design minimising solar heat gain, maximising natural ventilation
- Light colours to reflect heat.
- Design to facilitate comfortable outdoor living and work for all building types.
- Design to reduce mould, condensation, pests and insects.
- Doors and windows that maximises cross ventilation when open, protects the opening from rainfall, provides a good seal when closed, has glass that minimises conduction and radiant heat transfer and is designed and installed to meet high cyclonic (typhoon) wind speeds and storms.
- Land subdivision design to support the correct orientation of buildings to allow for optimal passive design reducing reliance on non-renewable energy sources for building cooling.
- Building envelope design supporting resilience, adaptability, safety and security in severe tropical weather events assisting with swift recovery from disaster.

Photo: Cyclone Yasi approaches the Cairns coastline in 2011

MATERIALS

In addition to the general considerations tropical climate construction is considering:

- Materials that absorb moisture.
- Materials and finishes that minimise corrosion, deterioration and maintenance .
- Appropriate use of insulation to minimise condensation and moisture traps.
- Cladding and glass that is resistant to cyclonic (typhoon) wind and impact from flying debris.
- Careful use of rubbers, adhesives, sealants, silicones, resins and binders, as these products may deteriorate faster.
- Avoiding VOC's, as high humidity and heat may accelerate its release.
- Technologies for condensation & mould control, heat & UV light resistance.



Barron Gorge Hydroelectric Power Station produces 66 MW of clean green energy powering 660,000 light bulbs. A refurbishment project was completed in 2011.

ENERGY

In addition to the general considerations tropical climate construction is considering:

- **Passive Design to minimise the need for mechanical cooling.**
- **Careful design of efficient mechanical ventilation, dehumidification and air-conditioning.**
- **Ceiling fans to increase evaporative cooling.**
- **Taking advantage of tropical latitudes with PV energy**
- **Innovative use of technologies such as hydroelectricity , wind turbines & chiller plants**
- **Heat transfer technology i.e. geothermal heating for steam and energy generation.**





WATER

In addition to the general considerations, tropical climate construction is considering:

- Water supply and management for up to 1:8 dry/wet season volumes .
- Rain water harvesting technology.
- Condensation collection and re-use.
- Very large gross pollutant traps.
- Vacuum sewerage systems.
- Reticulated recycled water systems.
- Bio-mimicry and retention ponds.
- Management of tropical pests and water borne disease.
- Innovative use of water related technologies or applications suited to tropical climates i.e. hydro electricity, chiller plants & geo-thermal uses .

Photo: TAFE BLOCK J HEALTH and
SUSTAINABILITY PRECINCT
Total Project Group Architects

Total Project Group Architects &
Arkhefield Architects in Association
CAIRNS CRUISE TERMINAL

Photographer : Scott Burrows

We are attuned to appropriate environmental design and deliver world-class expertise in the development and use of materials that will deliver energy efficiencies and withstand the force of extreme weather events.

We support a subsistence approach to buildings that may 'stand-alone' lessening their dependence on non-renewable resources and state developed infrastructure.

Our capacity to design and engineer green buildings are supported by experience in applying new technology that suits tropical climates.



A photograph of a modern, multi-story office building with a dark blue facade and large glass windows. The building features a prominent entrance with a covered walkway supported by columns. In the foreground, a paved walkway leads towards the building, with several people walking. A sign on the right side of the walkway reads "WILLIAM MCCORMACK PLACE". The sky is clear and blue.

WILLIAM MCCORMACK PLACE STAGE 2

CA Architects and
Cox Rayner Architects
Photographs:
Christopher Frederick Jones

Star Gazing

6 Star *Green Star*
First office building in
regional QLD and first
in tropical climates!

6 Star Green Star Office Design v2;
6 Star Green Star Office As-Built v2;
6 Star Green Star Office Interiors v1



CA ARCHITECTS

COX RAYNER



CA

CA ARCHITECTS

COX RAYNER



CA

CA ARCHITECTS

COX RAYNER



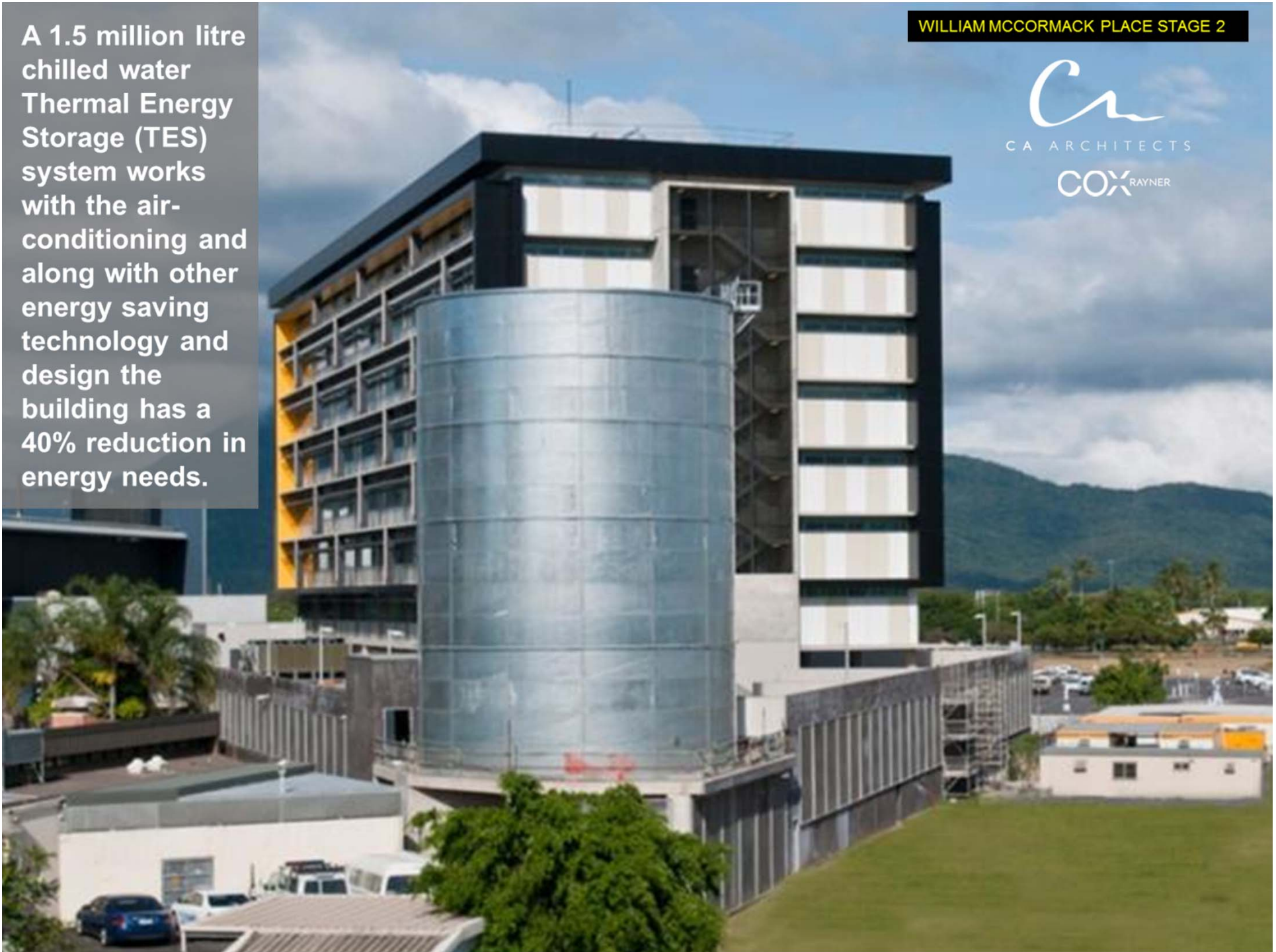
Cox
ARCHITECTS
COX RAYNER



CA ARCHITECTS

COX RAYNER

A 1.5 million litre chilled water Thermal Energy Storage (TES) system works with the air-conditioning and along with other energy saving technology and design the building has a 40% reduction in energy needs.




Tropical North QLD Institute of Technical and Further Education BLOCK J HEALTH and SUSTAINABILITY PRECINCT

Total Project Group Architects

- First educational building in Queensland to be designed to achieve a 5 star *GreenStar* rating in a tropical/ hot humid zone.
- 5 star rating recognises and rewards “Australian Excellence”



- 
- The water saving strategies used in J Block is estimated to reduce water usage by 49%.
 - Swales are shallow open vegetated channels that act as an alternative to storm-water pipes.

Total Project Group Architects
CAIRNS TAFE – Block J

Photographer : Scott Burrows



J Block has been designed as a mixed mode building which means it works efficiently and comfortably either with air-conditioning or with natural ventilation. It uses existing buildings and materials have been recycled.

Total Project Group Architects
CAIRNS TAFE – Block J

Photographer : Scott Burrows

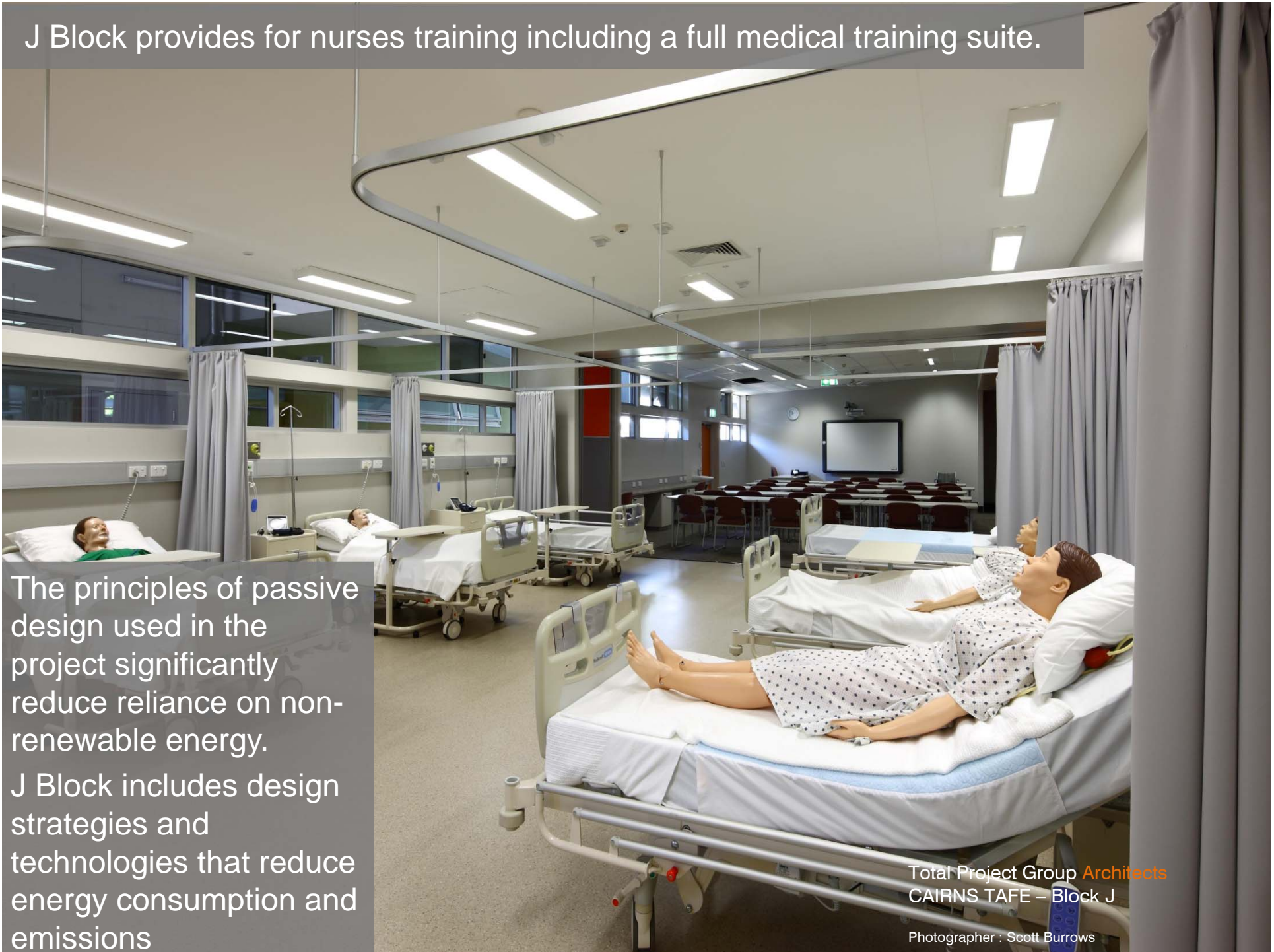
J Block provides for nurses training including a full medical training suite.

The principles of passive design used in the project significantly reduce reliance on non-renewable energy.

J Block includes design strategies and technologies that reduce energy consumption and emissions

Total Project Group Architects
CAIRNS TAFE – Block J

Photographer : Scott Burrows



Gab Titui is the keeping place for Torres Strait cultural artefacts, some of which were returned from the British Museum.

The tropical humid climate immediately posed a threat to the precious artefacts which had been kept in a controlled environment for many decades.

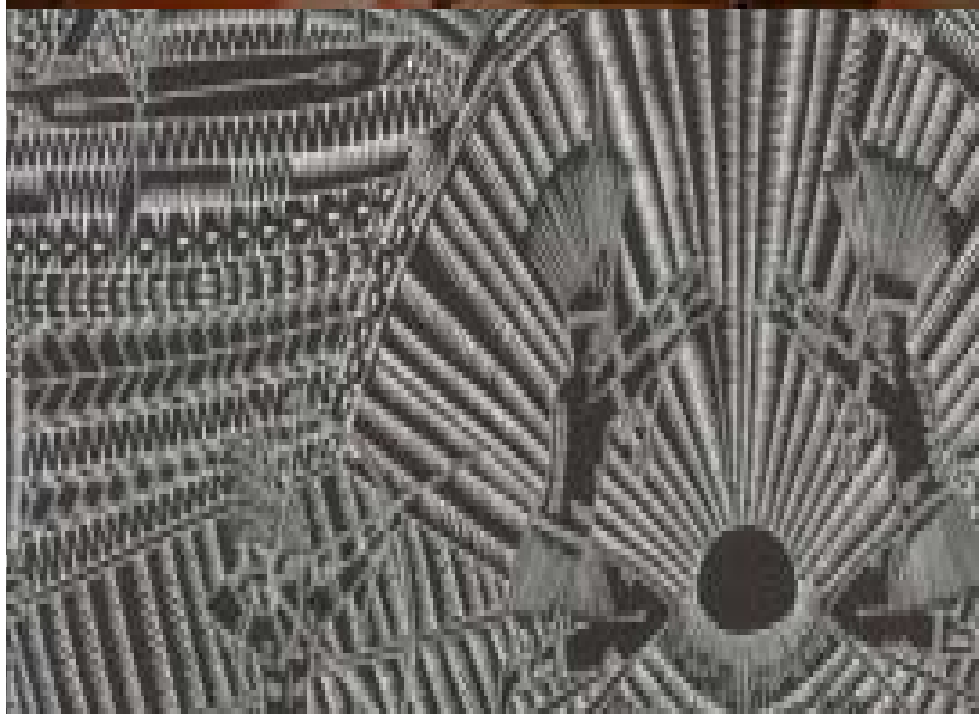


Cultural symbolism was the most prominent driver of this project.





Michael Ferris
Architect





MARINA POINT, CAIRNS
CA Architects and
Cox Rayner Architects
Photographs:
Christopher Frederick Jervis

CONCLUSION

There are multiple challenges associated with sustainable buildings and infrastructure in tropical environments as compared to other climatic environments.

Cairns is one of the few developed tropical regions in the world and is sharing its expertise