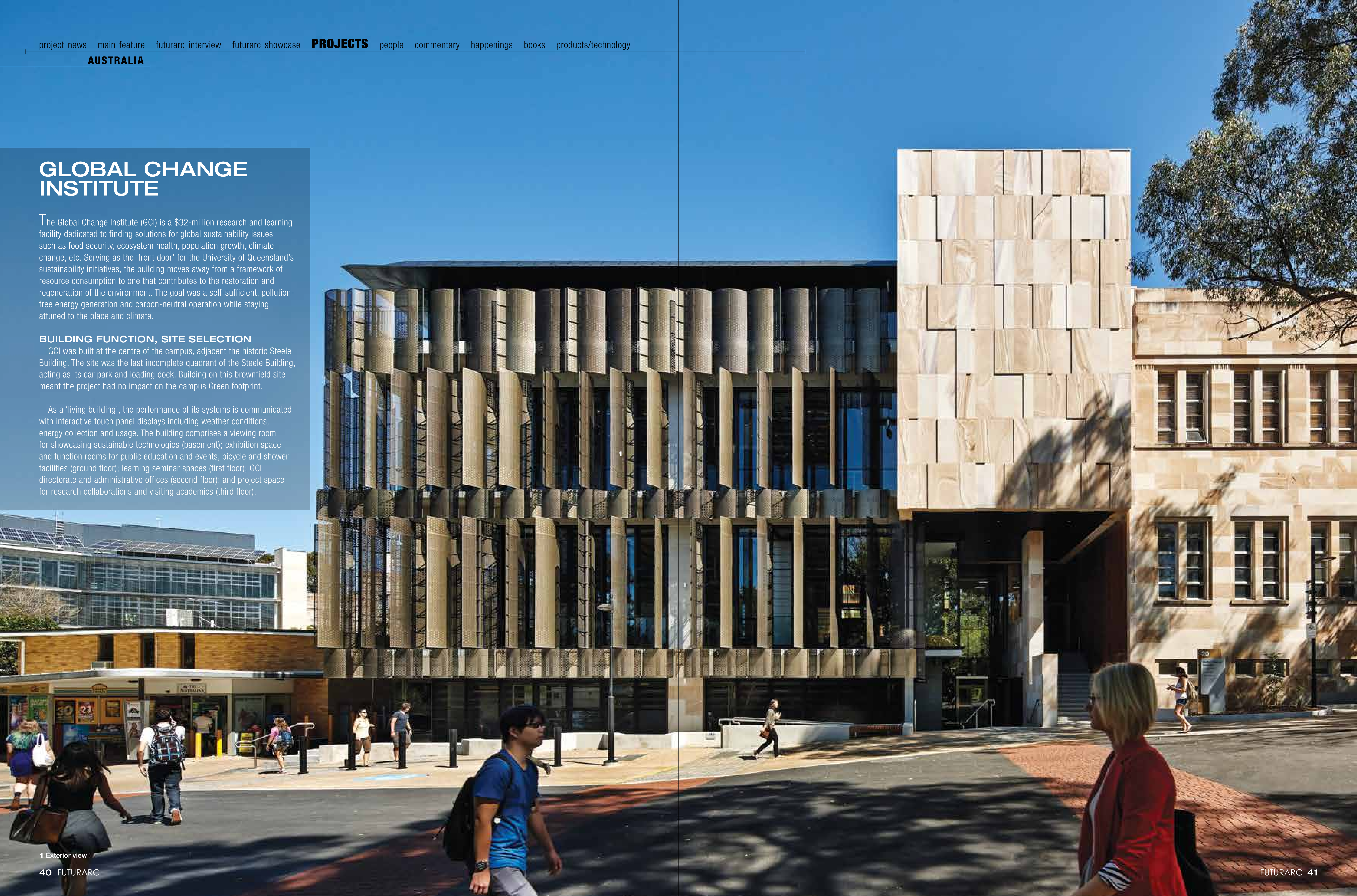
GLOBAL CHANGE INSTITUTE

The Global Change Institute (GCI) is a $32-million research and learning facility dedicated to finding solutions for global sustainability issues such as food security, ecosystem health, population growth, climate change, etc. Serving as the 'front door' for the University of Queensland's sustainability initiatives, the building moves away from a framework of resource consumption to one that contributes to the restoration and regeneration of the environment. The goal was a self-sufficient, pollution-free energy generation and carbon-neutral operation while staying attuned to the place and climate.

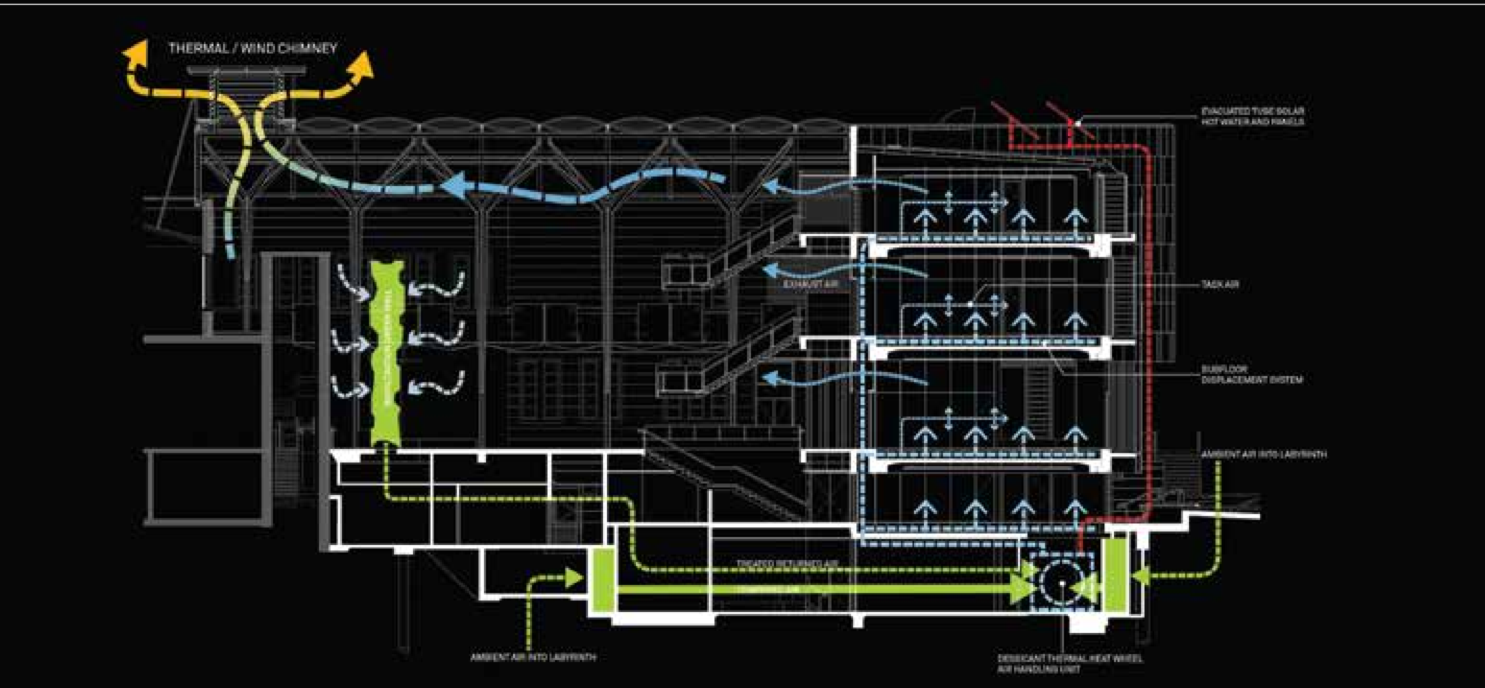
BUILDING FUNCTION, SITE SELECTION

GCI was built at the centre of the campus, adjacent the historic Steele Building. The site was the last incomplete quadrant of the Steele Building, acting as its car park and loading dock. Building on this brownfield site meant the project had no impact on the campus Green footprint.

As a 'living building', the performance of its systems is communicated with interactive touch panel displays including weather conditions, energy collection and usage. The building comprises a viewing room for showcasing sustainable technologies (basement); exhibition space and function rooms for public education and events, bicycle and shower facilities (ground floor); learning seminar spaces (first floor); GCI directorate and administrative offices (second floor); and project space for research collaborations and visiting academics (third floor).



1 Exterior view



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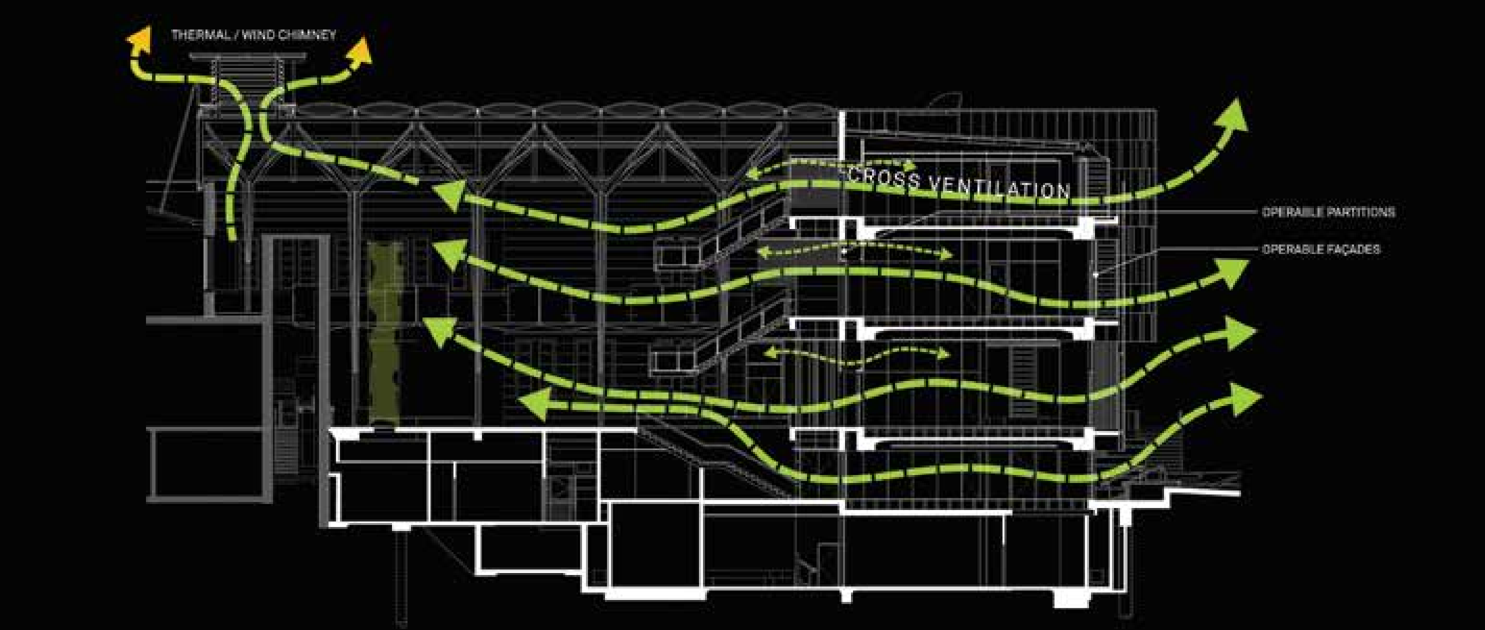

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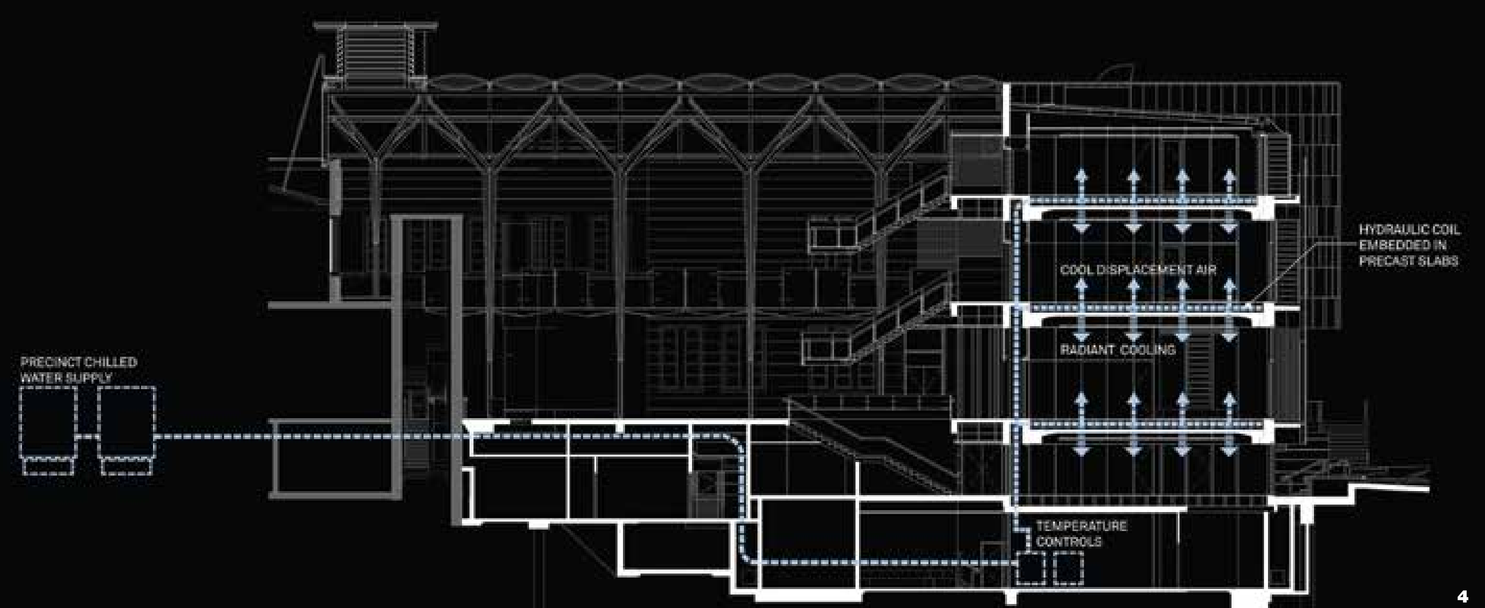

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PASSIVE AND ACTIVE DESIGN

The building was designed for Brisbane's sub-tropical climate; for most of the year (88 percent) it is naturally ventilated. Indoor temperature of 18 to 28 degrees Celsius is achieved by seven modes of thermal comfort: air temperature, radiant temperature, humidity, air movement, clothing level, activity level, and fresh air. In the hottest and most humid days, low-energy conditioning mode ensures occupants comfort while sustaining net-zero energy.

Monitoring of weather conditions together with radiant temperature, humidity and CO_2 is supported by the building management system (BMS). The external sunshade system is BMS-controlled and motorised to track direct sunlight. Perforated aluminium sunshades allow airflow and natural light into the interior, whilst animating the space with a delicate light pattern.

The translucent ETFE atrium roof allows for natural lighting while insulating from solar heat. The atrium acts as the lungs of the building with its thermal chimney generating airflow on even the most still days. Fifty percent of the façade is made up of motorised glass louvres. Air passes through an acoustic baffle into the atrium to allow the free flow of air whilst maintaining good acoustic conditions in occupied spaces. Glass louvres below the baffle further improve airflow where acoustic separation is not a concern.

Explaining the philosophy behind the building's design, principal architect Mark Roehrs said "it seeks to engage in the next paradigm shift in sustainability; to

2 Mechanical air delivery systems **3** Natural ventilation **4** Slab hydraulic and thermal comfort systems **5** Active learning space with louvred ventilation system **6** Ground floor exhibition space lobby **7** Operable sunscreen system of perforated aluminium panels

achieve comfort conditions for the occupants all year round but demands their active participation as key contributors to a holistic system."

LOW CARBON CONSTRUCTION, NET ZERO ENERGY

Extensive research and investigation was undertaken by the consultant team into the systems and technologies that could be combined to build a holistic sustainable response. Proposals were reviewed with user and facility representatives through each phase of the project.

Most of the materials used in the construction are locally sourced, such as geopolymer concrete, recycled timber, sandstone and carpet tiles. GCI represents the first Australian use of geopolymer concrete, a low-carbon product that significantly lowers greenhouse gas emissions than conventional concrete. Using geopolymer concrete saves as much as 8 tonnes of CO_2 per 10 tonnes of conventional concrete.

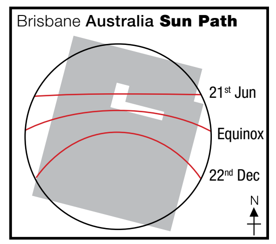
Chilled water is flushed through the geopolymer precast floor panels to cool the building. Hydronic cooling of the floor utilises a solar powered heat pump generating chilled water during the day and stored for use at night. Sensors monitor slab temperature versus outside air temp to calculate dew point with an additional surface condensation monitor as a back-up system. Rainwater storage of 60,000 litres services the hydronic cooling system, kitchen and shower.

"The suspended concrete floor system demonstrates the level of integration of structure, architecture and services in the building to achieve a low energy outcome," explained Rod Bligh, director of Bligh Tanner Consulting Engineers. "The precast panels are formed with a barrel-vaulted soffit to improve performance of the exposed thermal mass, which incorporates hydronic cooling pipes. The panels support an access floor, which distributes air directly to work stations."

To achieve net zero energy operation, the building harvests pollution-free renewable solar energy on-site. There are 479 (240Watt) multi-crystalline silicon PV cells covering an area of 948 square metres, providing a total annual yield of 175,274kWh/year. Unconsumed power is given to the national grid.

An evacuated solar tube system provides 90-degrees Celsius hot water, stored in a 20,000-litre tank for use in the energy air-handling system. Other eco-friendly features of the building include on-site grey water treatment, bio-retention basin, a Green wall, and bush tucker garden. – *Edited by Denice Cabel*

PROJECT DATA
Project Name
Global Change Institute
Location
University of Queensland, St. Lucia Campus, Brisbane, Australia
Completion Date
July 2013
Site Area
915 square metres
Gross Floor Area
3,865 square metres
Number of Rooms
26
Building Height
19.2 metres
Client/Owner
University of Queensland
Architecture Firm (Including Interior Design and Landscape Architecture)
HASSELL
Principal Architect
Mark Roehrs
Main Contractor
McNab
Mechanical & Electrical Engineer
Medland Metropolis
Civil & Structural Engineer
Bligh Tanner
Sustainability, Acoustics and Fire
Arup
Hydraulics
SPP Group
Quantity Surveyor
Rider Levett Bucknall
Heritage Consultant
Riddel Architecture
Commissioning Agent
Umow Lai
Project Management
UQ Property; Facilities Division
Images/Photos
Peter Bennett; Angus Martin



8 Atrium as public space for the university with Green wall and thermal chimney above
9 Transparency reveals activity and provides visual connection to the outside