

Case study

SHELTER@RAINFOREST ECOVILLAGE



Designing with Country

Ecovillage House 4
Image: Brett Boardman
Photography.

Quick facts

Project type:
Holistic planning, design
and architecture from
Country / autonomous
sustainable community

Location:
East Malaysia (island of
Borneo) state of Sabah
(known as British North
Borneo in colonial times)

**Aboriginal language
landscape group:**
Murut People

GOVERNMENT
ARCHITECT
NEW SOUTH WALES



Located in a remote tropical rainforest in East Malaysia, this ecovillage provides a model of sustainable development that successfully applies design-from-Country principles. Local materials, environmental and biophilic design, cultural knowledge and practices have been combined to create architecture that benefits the whole system.

Key outcomes

Healthy Country

The project supports a self-sufficient live-in community on site, operating as a socio-ecological production landscape (SEPL) providing access to food, goods and services needed for the community's wellbeing.

Healthy community

The ecovillage construction is community-led and community-owned. Where possible, the private company responsible for work on the site, including ongoing reforestation work, employs local staff.

Better places

The design of the individual project elements supports resilience and ongoing sustainable practices. Ongoing construction projects do not require the involvement of outside professionals.

Spatial implications / tips for designers

Consider whole-of-life outcomes throughout the design and realisation of the project. For example, consider sustainable and locally resourced building materials, construction methods and waste management.

Think long term, considering how the ongoing operation of the project will be resourced sustainably.

Establish robust links between social, economic and environmental sustainability.



Ecovillage House 1

Image: Brett Boardman Photography.



Aerial view of Sabah Ecovillage

Image: MYA.



Forestry staff

Image: Brett Boardman Photography.

Sabah is the only state in Malaysia to operate under Malaysia's Forest Management Unit system, with a defined policy of sustainable forest management. The Country that holds this holistic design project is 100,000 hectares of ecologically sensitive rainforest in Borneo.

Positioned in difficult terrain and with limited access, the forest had been logged 2 to 3 times since the arrival of the British. A private forestry company now controls the rainforest for a period of 99 years under an agreement to undertake sustainable reforestation. The focus is to plant native species of high value such as red, yellow and white seraya, merbau, selangan batu and belian. For every tree removed from the forest, the company is required to plant 30 seedlings in its place.

Establishing the reforestation project demanded an increase in staff numbers, requiring on-site services, housing, offices, a classroom and a health clinic, while considering all the challenges of building and living in a tropical climate. In 2012, the company contracted Marra+Yeh Architects to masterplan and design an autonomous village. The difficulty of the climate was compounded by the challenges of shortages of materials and skilled labour and the non-existence of specialist trades and construction systems, water, sewer and energy supply.

Designing with Country

Designing with Country was an important consideration due to the site's proximity to local tribes and the sensitive ecology of the area. The design had to be holistic in its concept and operational in its design. The planning included creating a socio-ecological production landscape (SEPL) enabling the live-in community to have ready access to food. By definition, SEPLs refer to dynamic mosaics of habitats and land uses that have been shaped over the years by interactions between people and nature in ways that maintain biodiversity and provide humans with goods and services needed for their wellbeing. SEPLs promote sustainable use of forests, agricultural land, pastoral land, and other types of ecosystems as well as enhancing their resilience in the face of natural disasters, climate change and other challenges¹.

The project was initiated a decade ago and is now an autonomous community that generates its own electricity, harvests rainwater and processes its own waste on site. Soils in the immediate vicinity have been improved through carbon capture to allow residents to establish small farming plots.

The challenge in working with Indigenous peoples globally is how their cultures have been devastated by post-colonial contact.

— Carol Marra, Registered Architect,
Marra+Yeh Architects



Local community
Image: MYA.

Ecovillage House 2
Image: Brett Boardman Photography.



Not drawing or designing anything until we talked to everyone, from the forestry company to the Indigenous community, and were pretty confident in our understanding of the people and place. Going in with an open mind and an open heart.

—Carol Marra and Ken Yeh

Taking a holistic design approach

The architects used a design approach that explored and considered the biocultural dimensions of the site, factoring in ecological functions, community dynamics and architectural function, and incorporating a micro economy, sustainable architecture, forestry, food production, botany and epistemology from the local peoples.

Systems were designed at both village scale and for the capacity of individual buildings to incorporate resilience into the project. The buildings were designed around the availability of local materials and to ensure minimal intrusion to the immediate landscape. They were designed to be modular and to be constructed using skills and labour from the local community. The outcome provides zero-energy prototypes for village housing, their design based on the longhouses typical of the area, and of the vernacular and climate-adaptive Asia-Pacific architecture generally.

Passive design ensures the elemental factors of heat, sun, wind and water are priority considerations in the positioning and design of buildings, maintaining indoor temperatures at 26°C while outdoor temperatures are at 34°C. The low-cost prototypes have achieved zero-energy operations through solar electricity and passive cooling, using large overhangs and verandahs to protect inner areas from heat gain, providing cross-ventilation with the use of protected and screened openings, and using light that is bounced indirectly into the interiors to provide light without heat. The houses also incorporate biogas units, waste recycling and rainwater collection.

Further resources

1. H Gu and SM Subramanian (2014) 'Drivers of change in socio-ecological production landscapes: implications for better management', *Ecology and Society* 19(1): 41, <https://www.jstor.org/stable/26269501>.

Credits

Research and writing:

Chels Marshall, Flying Fish Blue

In collaboration with:

Carol Marra, Registered Architect, Marra+Yeh Architects

Drawing innovation from people and Country

The project used local labour (when possible) and local materials, and employed environmental and biophilic design. Cultural knowledge and practices were combined to create architecture that benefits the whole ecosystem of human and Country dynamics.

Involvement of the Indigenous community, the Murut People, from the start of the project ensured intimate knowledge of the place, space and time was captured from the beginning –somewhat being the DNA for how the seed of design would incubate. Also key was bringing together, from the onset of the project, a diverse team of experts (with as many local experts as possible) including botany, silviculture, cultural anthropology and engineering disciplines.

Making all buildings out of locally sourced materials, and specifically timber, the design approach also considered other aspects of the place. For example, only the trunk of a tree has commercial value as sawn timber, and the branches are left to rot on the forest floor. Charcoal kilns were built to convert the tree branches into charcoal to be used as cooking fuel for rocket stoves and as biochar to improve the local infertile clay soils for agriculture, which then improves nutrition by supporting localised food production.

The modular design allows for incremental and expandable building, and minimises waste of materials. Because of the consideration of time, space and Country, over time the project has not required the involvement of professionals, and has become community-led and community-owned.

We designed not only individual buildings but the system of construction which can be modified to suit various building typologies (four housing types, offices, community facilities). Once the system is learnt by the work team the construction process is sped up, logistics are simplified, and production of standardised timbers happens locally in a forest sawmill.

— Carol Marra and Ken Yeh