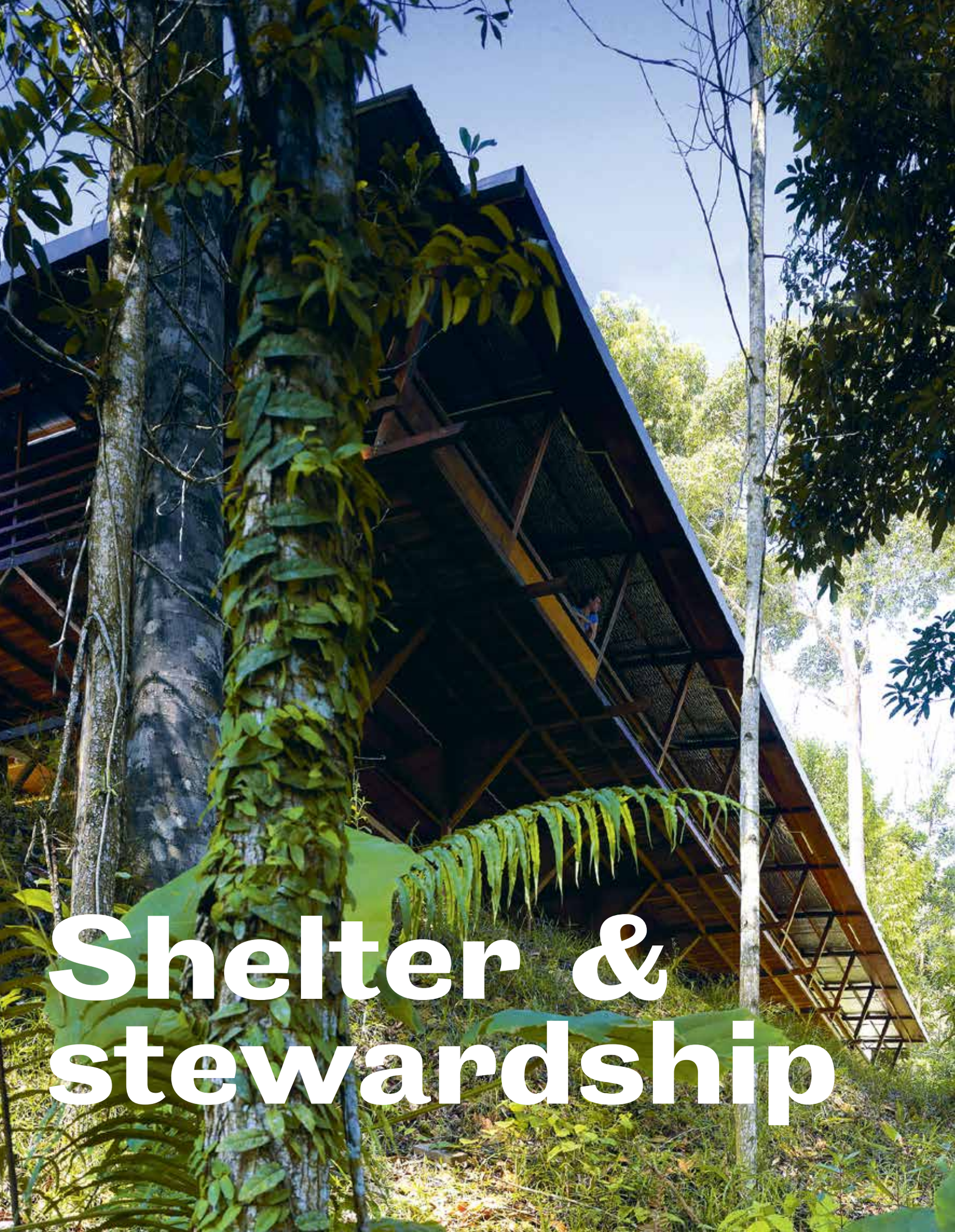

Shelter & stewardship

The bench is made up of derivatives of sheets of plywood designed so people can sit comfortably looking out or in. Taking their cue from local building design, architects Carol Marra and Ken Yeh oriented the building east–west and angled the walls at 22 degrees to prevent sun entering the house.

A residential dwelling in Sabah, on the island of Borneo in Malaysia, is a challenging ecological design and cultural change project.

WORDS Sarah Robertson
PHOTOGRAPHY Brett Boardman

Shelter@Rainforest sits in a remote part of tropical Sabah, Malaysia. Architects Ken Yeh and Carol Marra spent four years working on-site to develop a master plan and this prototype for a village of workers.

The forestry company who commissioned the plan is currently seeking certification through the Forest Stewardship Council. Its current obligations include replanting on average 30 wild trees for each tree that's harvested. The area has been logged about three times already, explains architect Carol. "This is not by any means a virgin area. It looks wonderful when you look at the tree canopy, but it's actually secondary growth from 50 years ago that's been logged before."

SHELTER@RAINFOREST IS PART OF A master plan. It's the prototype home for a series of new buildings for a community of workers in a logging concession in the Malaysian state of Sabah. The plan, by architects Marra + Yeh, is about much more than designing climate sensitive buildings. As architects committed to sustainable design, for Ken Yeh and Carol Marra it's also a project in ecological education and responsible living.

Shelter is located in a remote inland location five hours' drive from the state's capital, Kota Kinabalu. The local climate is highland tropical, with hot humid days and cool nights, torrential rains, and a rugged and difficult terrain. The project was commissioned by a private forestry company that controls 100,000 hectares of forest for a period of 99 years under a system of sustainable reforestation.

Forestry in Borneo remains a controversial issue, with little land area left covered by intact virgin forest. However, forestry in Malaysia is managed at the State level and Carol explains that in Sabah, the German government, through its Agency for Technical Cooperation GTZ, the UNDP and the Sabah Forestry Department established the current system of forest management (the Forest Management Unit or FMU), improving the industry's practices.

"The objective [of the FMU] is to apply ecologically and scientifically accepted forest management for Sabah's cutover forest production reserves," says Carol. The intent is to manage the reserves "in a way that mimics natural processes in order to achieve production of low volume, high quality, high value timber products".

For two architects committed to designing communities and buildings that create opportunities for more ecologically sustainable living, the project was particularly challenging but important. "Unless we are willing to stick our necks into a complex situation we cannot drive the ecological agenda, especially in places where our expertise is simply not available," says Carol. →

From the beginning, this project was about how to create a new, environmentally aware community culture that better values and makes the most of local resources. A building is just a building, says Ken, what's important is giving people the skills and knowledge to change their ways.

The existing housing for company employees was built 35 years ago and had mostly become shanty housing. Leading a team of experts, including an anthropologist, a botanist and a structural engineer, Ken and Carol borrowed from local wisdom to design new dwellings, a school and community buildings. Traditional buildings in the region are long, dormitory-style houses placed on ridges to make the most of cooling winds that run up the ridge and "explode" in the house, explains Ken. He adds that walls are inclined 22 degrees and buildings are always oriented east–west so that no direct sunlight penetrates.

Shelter is designed as two similar-sized units linked by a dog run, which connects to the verandah. All the services, including an indoor kitchen, outdoor kitchen, water tanks and battery bank for the solar PV system are grouped together.

At its core, Shelter is an exercise in zero waste. "I guess the building was a way of changing their mindset at a slow pace," says Carol, referring to the team of local workers who would build, live in and maintain the village over years to come. "They get the idea that everything has value and you don't waste it so you have to think of what you're doing with it."

Locally harvested and milled timber was used as the main building material. This was constrained to just two sizes, 100 x 50mm and 50 x 50mm, to maximise the yield of usable timber per tree and solve logistical challenges such as the necessary manual handling of all building materials. Locally made plywood was used as cladding for the walls and floors and to create a diaphragm for the building.

To keep the build process simple for the unskilled building team, the dwelling is made up of modular designs that use only full, half or quarter sheets of ply. "By being hands-on throughout the project we were able to select timber from particular sources knowing how it had been harvested and processed," says Carol.

The project involved more than clever architectural solutions. Part way through, the team built charcoal kilns to make use of the

The dwelling sits on the top of the ridge to make the most of breezes that run up it and through the house, says architect Ken. Locally made plywood was used as a cladding for the walls and floors and as a diaphragm for the dwelling. The two lightweight steel roofs are tied together with tension rods.

waste branches discarded from logging operations. Combined with human waste as a fertiliser, the charcoal nourishes the nutrient-poor soil in food gardens and excess charcoal is used in rocket stoves for cooking. Rainwater is also harvested and reused and a blackwater system feeds a biogas plant to produce methane that's piped into the kitchens as fuel. The biogas and solar panel systems were important to reduce the community's reliance on LPG and diesel that has had to be trucked into the village in the past, says Ken.

With their prototype and a few more dwellings complete after four years on the ground, has their master plan to create a more ecologically aware community been successful?

Carol and Ken are unsure when or whether all the planned buildings will be constructed but the project continues. Botanist Dr Francis Ng is working with the company and its community to encourage more sustainable food production. Locals are also being taught to identify seed-providing 'mother trees', which germinate only every seven years, to prevent them from being logged.

"You never know whether in the long term [your project is] going to work but they've definitely started," says Carol with measured optimism. "Sustainability is not something we talk about, it is something we do, not in perfect circumstances but in spite of the circumstances.

"The client was committed to following the principles we set out for the project and the proof is in the building," she says. As an example of what is possible, therefore, Shelter@Rainforest is a symbol of craft, care and environmental stewardship.