

Arkitrek 



D E S I G N + B U I L D

B o u n d a r i e s , B e a r s , & B i o c r e t e

Date : 29th June - 30th August 2015

[www. Arkitrek.com](http://www.Arkitrek.com)  
Internship and Scholarships are available

## Boundaries

Tabin Wildlife Reserve is one of the key protected areas of primary lowland rainforest in Sabah. Approximately 1,225 km<sup>2</sup>, the area is home to a rich biodiversity.

The Reserve is bounded by oil palm plantations. Plantations have very limited resident biodiversity, but they do provide a lot of fruit, and animals are often seen crossing the boundary at night to feed. As the distance from the boundary increases

though, human influence is dramatically reduced. This area of untouched forest has been identified as large enough to accommodate rehabilitated orang utans, elephants and sun bears. The Bornean Sun Bear Conservation Centre was established in 2008, but as yet, has not been ready to reintroduce bear to the wild. This project will set in place the vital infrastructure at Tabin to allow this reintroduction programme to begin.



## Building Requirements

Living Quarters for 4 rangers

The forest is a tough climate to live in, with high humidity and a lot of rainfall. The site is also difficult to access, a long way on dirt track roads from the nearest town. The building must be a durable construction that allows a lot of ventilation, while also keeping its occupants comfortable and dry. The quarters will need to be fitted with a water supply, an electrical supply and a sewage treatment system.

A small pre-release holding enclosure for bears

Once the bears arrive at the site, they will have to be settled in an enclosure before being let out into

the forest. This will allow for them to settle after the journey and for medical checks to be done. The enclosure will be made from wire fencing.

An exploration of biocrete

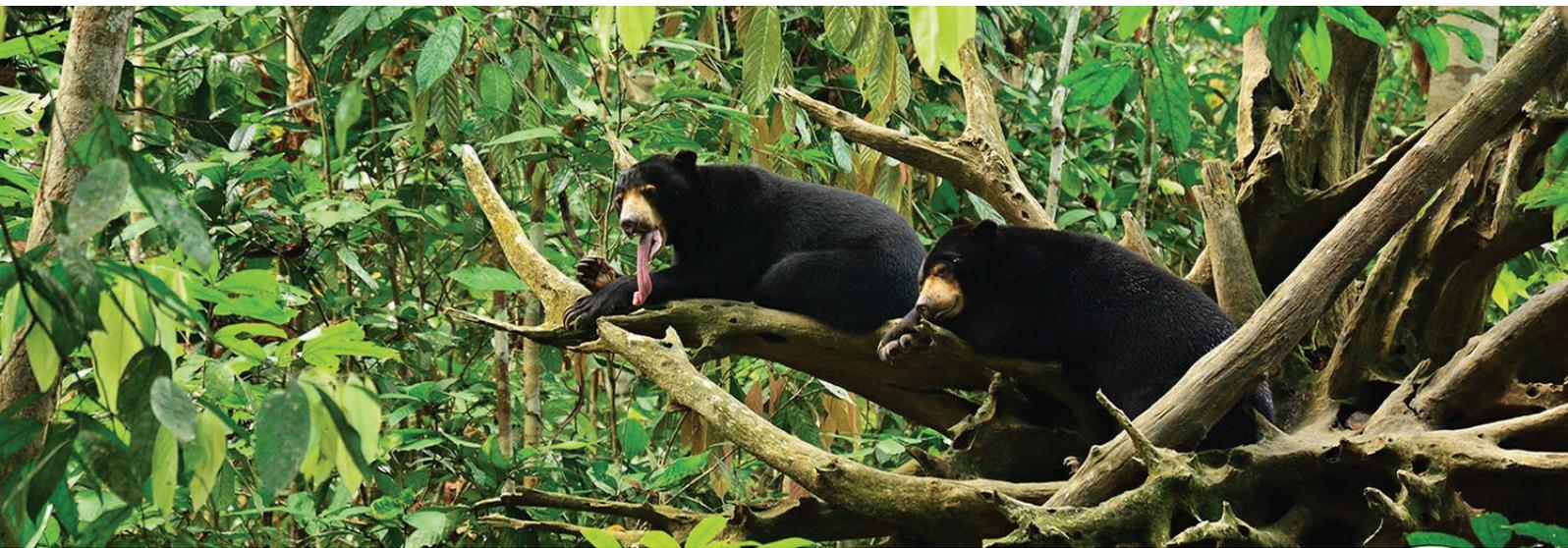
Arkitrek is a regional leader in the development of fiber and lime composite wall construction, however, our use of the material so far has been fairly basic, and so the design of this project should aim to explore all the possibilities of this material.

## Bears

The Malayan sun bear (*Helarctos malayanus*) is the smallest bear in the world, with a distinctive yellowish-white patch on the lower throat and chest.

This species is seriously threatened, if not extinct, in many areas of mainland Asia, including India, Bangladesh, China, Burma and Vietnam. In Borneo, the main threat to their survival is

forest degradation and destruction (Wong 2006). However, sun bears also continue to be hunted illegally and the small cubs captured as pets (Wong 2006). This has led the Malayan sun bear to be classified as "Vulnerable" in the IUCN Red Book Listing of Endangered Species. It is also illegal to kill or hunt these bears in Sabah (1997 Sabah Wildlife Conservation Enactment).



The Bornean Sun Bear Conservation Centre is the only centre in Sabah dedicated to looking after sun bears rescued from captivity. The aim of the centre is to house captive and orphaned sun bears in Sabah, as well as to provide a proper environment for rehabilitation of suitable bears for release back into the wild.

Arkitrek has been working with the centre since 2008 to design all of the bear and visitor amenities; including the bear houses, visitors centre, observation decks and forest enclosures.

Now it is time for the long awaited release camp to cater for the reintroduction stage. This stage is crucial not only for the welfare of individual bears but also for the long-term conservation of the species. This stage will not be suitable for all the bears, some of whom have been in captivity for too long to adapt back to the wild. However, after careful evaluation, some bears have been deemed

suitable. Bears that are reintroduced back to the forest by 'soft release'; meaning they are monitored for a minimum of one to two years by trackers, along with radio collars and camera traps. Given the limitations of the technology available, this means that in practise, the bears will be followed for 2 years by a team of rangers. The rangers will monitor the health of the bears, as well as their capacity for survival in the wild.



## Biocrete

Biocrete is a concrete-like material; a mixture of natural fibre and hydrated lime or calcium hydroxide (hereinafter referred to as lime). In Europe hemp fibre is often used. In Malaysia, where hemp is hard to come by, we've developed a similar material with coconut coir, oil palm kernel fibre or rice husk. Often these fibres are found as agricultural waste and by using them we can make an industrial process a little bit more efficient.

### How Does it Work?

In biocrete, natural fibre is used as aggregate and lime is used as a binder. A little sand is added to increase density, workability and drying time. Sand increases the load bearing capacity but at the cost of the thermal insulating properties. The lime binder hardens by reacting with carbon dioxide to form calcium carbonate.

### Properties of Biocrete

1. It is hygroscopic or moisture permeable, helpful to regulate temperature and humidity within a building.
2. Lime is weaker than cement, so lime-based construction can expand and contract with less risk of cracking.
3. Natural fibre in biocrete creates a lightweight insulating material.
4. A lime binder takes longer to cure so it takes longer for the bags to go hard, meaning that there is less wastage during construction.

### Low Carbon & Environment Friendly?

Biocrete is believed to be a carbon neutral as:

- Making lime can be less energy intensive than making cement.
- Plants sequester carbon dioxide in the natural fibres.
- Using locally sourced lightweight natural fibres reduces the embodied energy of quarrying and transporting stone aggregate.

It should be noted that limestone quarrying is destructive to nature. We feel that biocrete only goes some way to mitigating environmental damage, rather than avoiding it altogether. However, this is an area we would like to quantify.

### Applications of Biocrete

The mixes of biocrete that we have experimented with are suitable for infill walls, not structural elements, but we would like to explore the boundary of possibilities more fully.

This project is ideal for biocrete use as the site is close to oil palm plantations. There is a local movement to start making better use of agricultural waste streams and this project has the potential to be a flagship for oil palm biocrete. With this project, we would like to fully explore the possibilities of biocrete, further than we've even explored it before.



## DESCRIPTION

Arkitrek Biocrete is a low carbon, locally produced building material. It is primarily used in the production of freestanding non-loadbearing walls or wall infills.

Popularising and showcasing biocrete can help phase out the energy intensive, environmentally harmful and non-renewable quarrying for cement. Even though lime must also be produced, the performance benefits to buildings and the value added to agricultural waste and rural communities make bio-crete worth pursuing.



TINANGOL



HEMPCRETE, UK

## MATERIALS



SAND



PALM OIL FIBRE



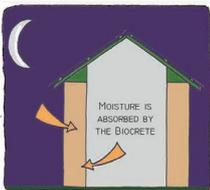
LIME

## How to Create

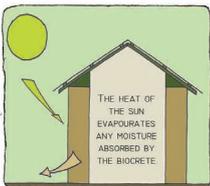


# Biocrete

## Reasons to Use



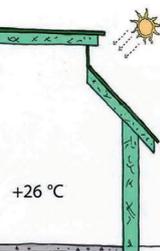
MOISTURE IS ABSORBED BY THE BIOCRETE



THE HEAT OF THE SUN EVAPORATES ANY MOISTURE ABSORBED BY THE BIOCRETE

THE INSULATIVE PROPERTIES CAN KEEP THE BUILDING COOLER

+30 °C



+26 °C

BIOCRETE HAS HYGROSCOPIC PROPERTIES



CREATES A USE FOR THE WASTE BY PRODUCT OF THE PALM OIL INDUSTRY

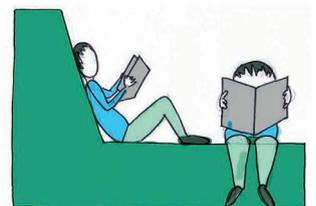
LABOUR INTENSIVE WORK CREATES MORE JOBS AND MONEY FOR SABAHANS



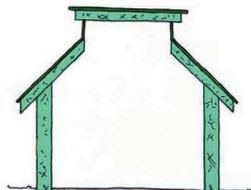
## Uses



ALTERNATIVE TO CONCRETE INFILL



BENCHES



INSULATION



WALLS

# Arkitrek

## Programme Details

Set in the enchanting rainforests and exotic coral islands of Borneo, the Arkitrek Camp is an exciting new look at architectural education that builds on years of experience of hands-on learning. Participants are immersed in diverse tropical environments and asked to design and build beautiful, practical and sustainable buildings.

An Arkitrek Live Design programme aims to:

- Better align architects with the construction industry.
- Promote positive environmental and social impacts through the resource intensive process of procuring a building.

### The Programme

Arkitrek is a peer-led learning experience, not a master-class, and all design proposals will be generated by the group. Qualified architects and engineers will facilitate, guiding the team through the entire building procurement process from generation of design concepts, through construction planning to the build itself.

The team will take responsibility for meeting the requirements of the client, other stakeholders and building users. Day to day management of the team will be led by experienced designers / builders. These leaders will assume responsibility for managing health & safety risks and will keep the team on track during the demanding programme.

### Induction Week

Week 1 will be off-site and include welcome, team-building, tours, architectural studies and training sessions in locally relevant construction techniques, and environmental and social considerations for working in Sabah.

### Planning & Preparation

Weeks 2 and 3 will involve further training, brief writing, client consultations, surveying and both group and individual design workshops. Each participant will be expected to prepare and deliver at least one training module in an area where they



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have skill and experience. This stage will culminate with construction sequencing and logistical planning for the build.

## Build

The meat of the design + build program and where you see your designs become reality. You will be up against a very tight deadline and will work hard every day. You will learn to depend on your team mates and the skilled local craftsmen who are working alongside you. During the time spent on site, the accommodation will be in dormitories that are fairly basic. The toilets and showers may be different from what you're used to, and the food will be local cooking; lots of rice and noodle dishes.

## Exhibition

After completion of the build the group will return to the Arkitrek office in Kota Kinabalu where there will be as-built drawings to finish, photos to edit and reports to prepare. Every arkitrekker will be asked to reflect on the process, making the experience relevant to the rest of your career. The final event of the Arkitrek design + build program is the public exhibition for which each arkitrekker will contribute at least one piece of work. The exhibition opening will be a great celebration of all of your achievements.

