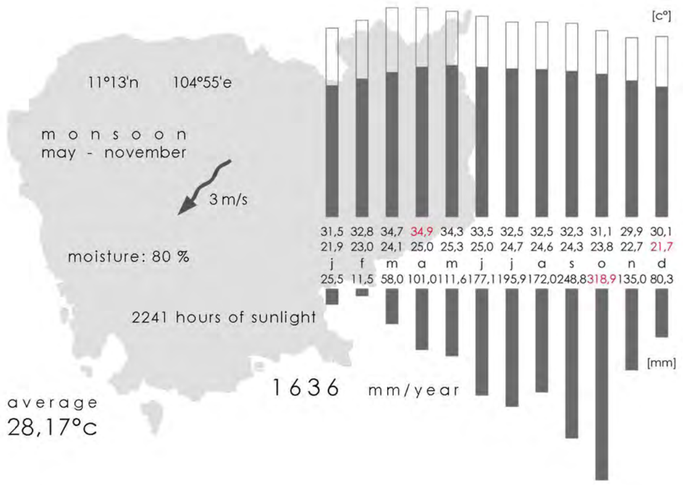
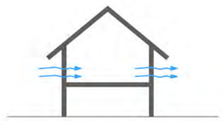
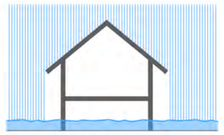
C61910
cambodian sustainable housing concept

design environment



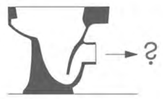

shadow, indirect light


natural ventilation


rainy season


nature

According to a 2007 study, hygienic toilet solution is available only for 16% of the population of Cambodia. Wastewater threatment is not solved in most parts of the country, faeces goes directly into the soil or water.



The solution could be a dual chamber passive processing composting toilet. One chamber is used for about a year while the other is composting. Compost material (eg. sawdust) has to be added regularly. Greywater (from shower, washing, etc.) can be threated by biological cleaner system (works with dense roots and bacterias) if place is available around the site.

Electricity and water connections are available on site, however for other sites solar panels can be installed on the roof and rainwater can be collected from the four exits of the gutters. Annually about 120 m^3 water can be collected from the roof.

Traditional khmer houses were objects for social distinction. Certain dwelling types were reserved for a specfic class in Khmer society. For example house keung was used by high-ranking individuals, kantaing is associated with migrants originating from China. However for today these buildings changed their owners many times and their social role is not important anymore.

The common in these houses is the solution for natural ventilation either by simple openings or by 'umbrella-effect' (the roof shields the house against direct heat radiation, whilst the continuous opening between the roof and the top of the walls allows a constant flow of air in and out, which prevents an accumulation of warm air beneath the roof).

typical house types of traditional khmer architecture

"Pteah peth vi mien hoor-naing, pteah kantaing vi mien knong, ber bong sra-laing oun, bunn ba'opp bnong kaaw oun ouy dale... bunn da'opp knong kaaw oun ouy dale"
"Pet houses have hor-naing (verandah)
Kantaing (cantonese-style) houses have three
if you love me, i'd give to you four or ten houses..."
(khmer folk song, Srey na praujun pdey)

"Ivèng chan" - unit of moon dining room, pantry, mother's bedroom

"Ivèng chey" - unit of victory entrance area, family altar, men's bedroom

The floor plan of a traditional khmer home is based on the strict separation of two main units by a north-south oriented partitional wall.
The eastern part is the public (also referred as exterior) and the western unit is the private (interior). These main parts are subdivided into sectors by various (mobile) partitioning elements, such as woven mats, furniture which blocks the field of vision, or simply curtains stretched between the columns.

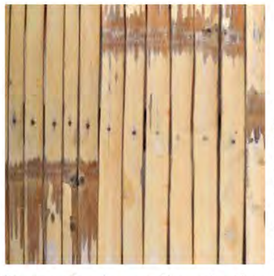
The division of the public and private units is made by using different wall materials. The public unit is open, bordered only with bamboo poles with some gap in between. This part is used during the day when natural ventilation is important. The private parts are closed with continous wall and floor, providing more intimacy and insulation during the nights when temperature can drop even under 22°c. The toilet is placed in the southwestern corner of the house where the prevailing wind direction (from northeast) most effectively helps to remove any undesirable smell.

materials de

The most sustainable local material is bamboo. It grows very fast and can be harvested in every 5-6 years. Bamboo poles are much stronger than wooden ones and their energy balance (energy required to produce a unit of a building material with a certain level of load-bearing capacity) is 30 $(MJ/m^3)/(N/mm^2)$, much less than concrete (240), steel (1500), or even wood (80).
The bamboo resources in Cambodia is under the management of the Department of Forestry and Wildlife but people are free to collect it for home consumption. This fact makes bamboo also the most affordable building material.
At the age of 30 days, the sprout of bamboo is eatable, tasty nutrition full of vitamins. Six months later baskets and other woven products can be made of its stem. One year old bamboo reach final length, 3-35 meters depending on the species. After two years it can be sliced longitudinally, the slices are weavable. For construction purpose at least three, rather 5-6 years old bamboo is the most suitable, after the strength dwindles.

The main loadbearing structure is a bamboo frame with bamboo poles (diameter around 12 cm) placed each 74 cm. In the public part of the dwelling they are standing alone and the intermediate part is filled with thinner standalone bamboo poles with 5-8 cm gap in between.

Connections are the most challenging part of bamboo building. With metal sheets, pipe clamps and some screws durable, precisely adjustable and easiliy installable joints can be made.



The private units of the dwelling are enclosed with a wall made of bamboo slices installed on both sides of a wooden frame which is fixed on the structural bamboo poles. Doors and windows installed in these walls are fixed to the wooden frame.

The flooring of the public part is 3-4 cm wide bamboo lattice with 1-1,5 cm gap left in between, providing additional indirect light for the interior. The floor in the bedrooms is continously covered with the same technology to provide better insulation.

Manpower is available and fairly affordable in Cambodia. Using manual technologies instead of prefabricated materials can be slower but saves money and provides jobs for the local people.

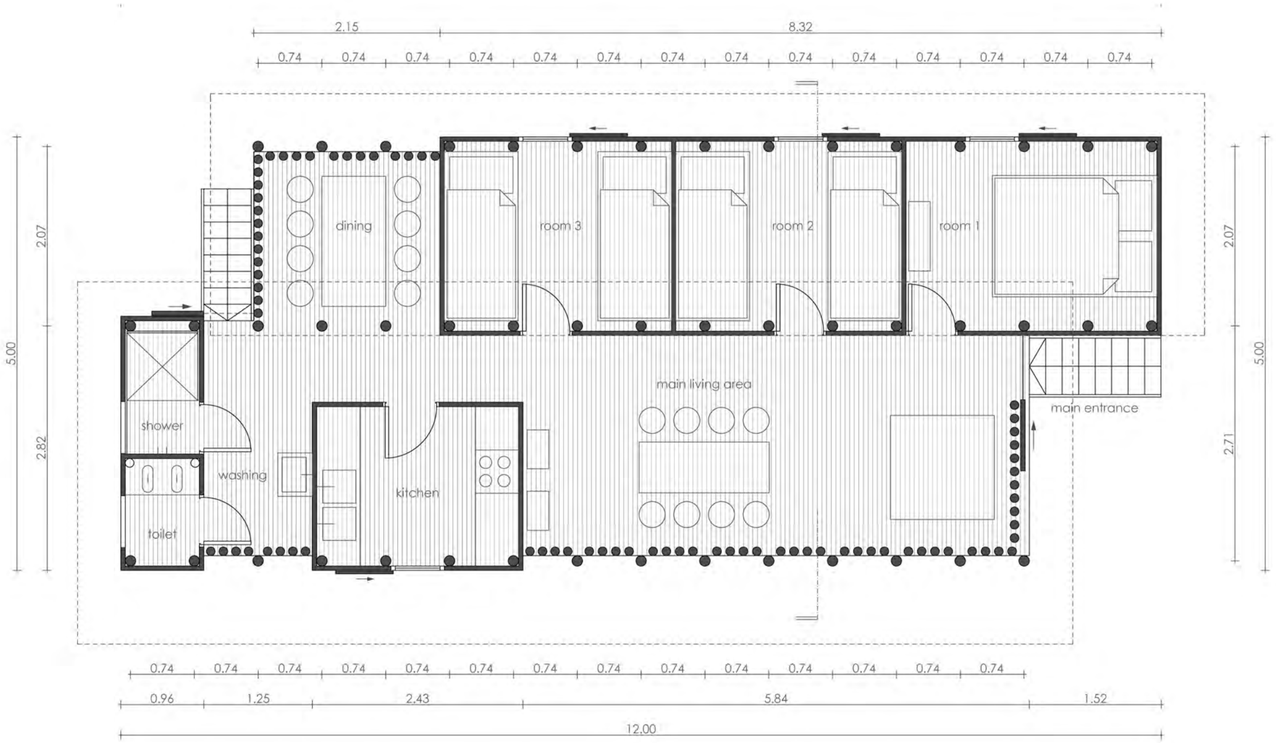
The roof is covered with cleaned bamboo half-stems turned into each other. The internodiums must be cut out to ensure smooth flow of water. This roof is much more durable than leaf roofing and not warmed up by the sun as metal covering. Bamboo gutters provide the possibility of rainwater collection.

C61910

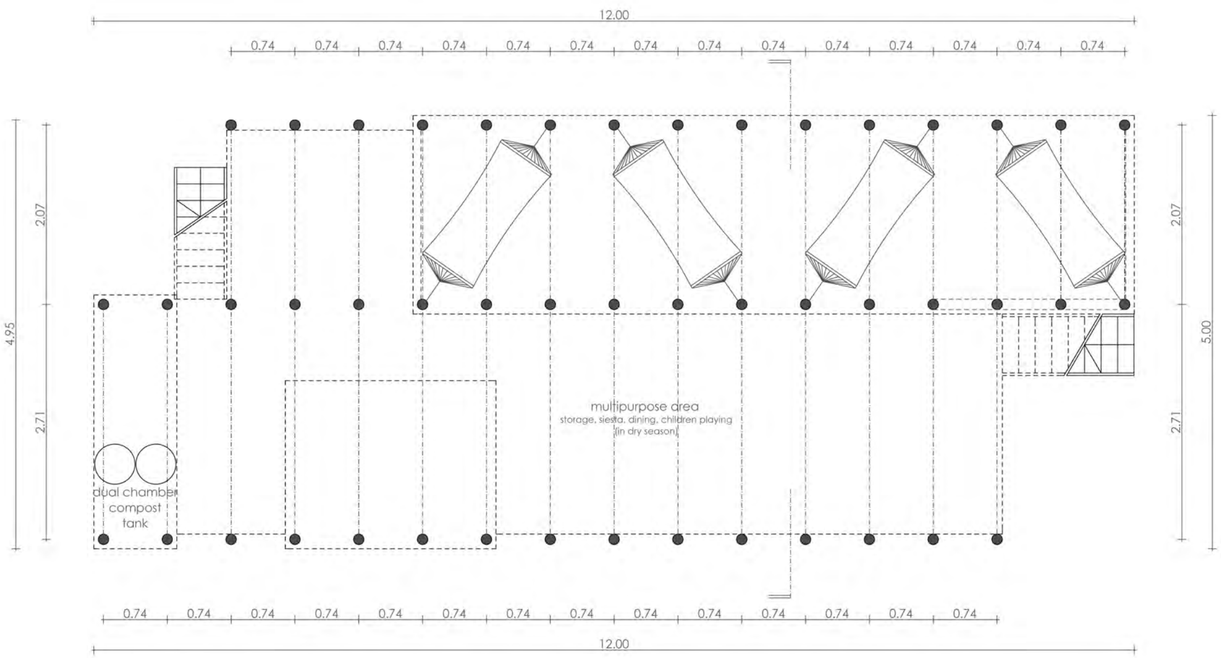
cambodian sustainable housing

plans scale 1:50

upper floor



ground floor



C61910

cambodian sustainable housing

section 1:50
facades 1:100
details 1:10