Global Alliance for Buildings and Construction

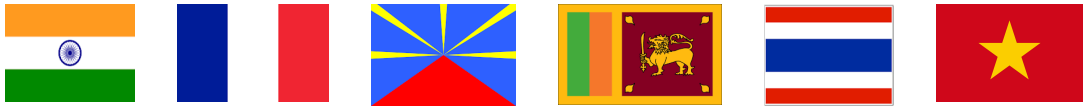
ADEME

Agence de l'Environnement et de la Maîtrise de l'Energie

EXPERT GROUP MEETING

LETCHI INTERNATIONAL PROJET
Low Energy in Tropical Climates for Housing Innovation

30 June - 05 July 2016
Saint-Pierre, La Réunion



F. Garde

Université de La Réunion

Retour d'expérience sur les case studies. LETCHI international joint Project.

4 juillet 2016
CAUE, Saint-Denis

Global Alliance for Buildings and Construction

ADEME
Agence de l'Environnement et de la Maîtrise de l'Energie

Towards a Global Alliance for Buildings and Construction
BUILDINGS DAY, COP 21
3 December 2015

Conception bioclimatique en milieu tropical : UN SAVOIR FAIRE FRANCAIS

Développer l'action internationale en zone tropicale

Flagship for sustainable construction in tropical zones

Expertise – sharing best practices and know-how between member countries and experts

Training - Support national and regional new construction programmes to strengthen skills of decision makers and professionals

Finance - Collaborate with funding agencies to raise their awareness and support project preparation and funding

Special focus on : construction of new buildings / bioclimatic buildings / housing sector

Programme LETCHI (2016-2017)
Low Energy in Tropical Climate for Housing Innovation

Pays impliqués : Inde, France, Sri Lanka, Thaïlande, Vietnam

17 experts internationaux

4 “Tasks” :

Task 1 : Etudes de cas (10 par pays) et site web

Task 2 : Cadre réglementaire

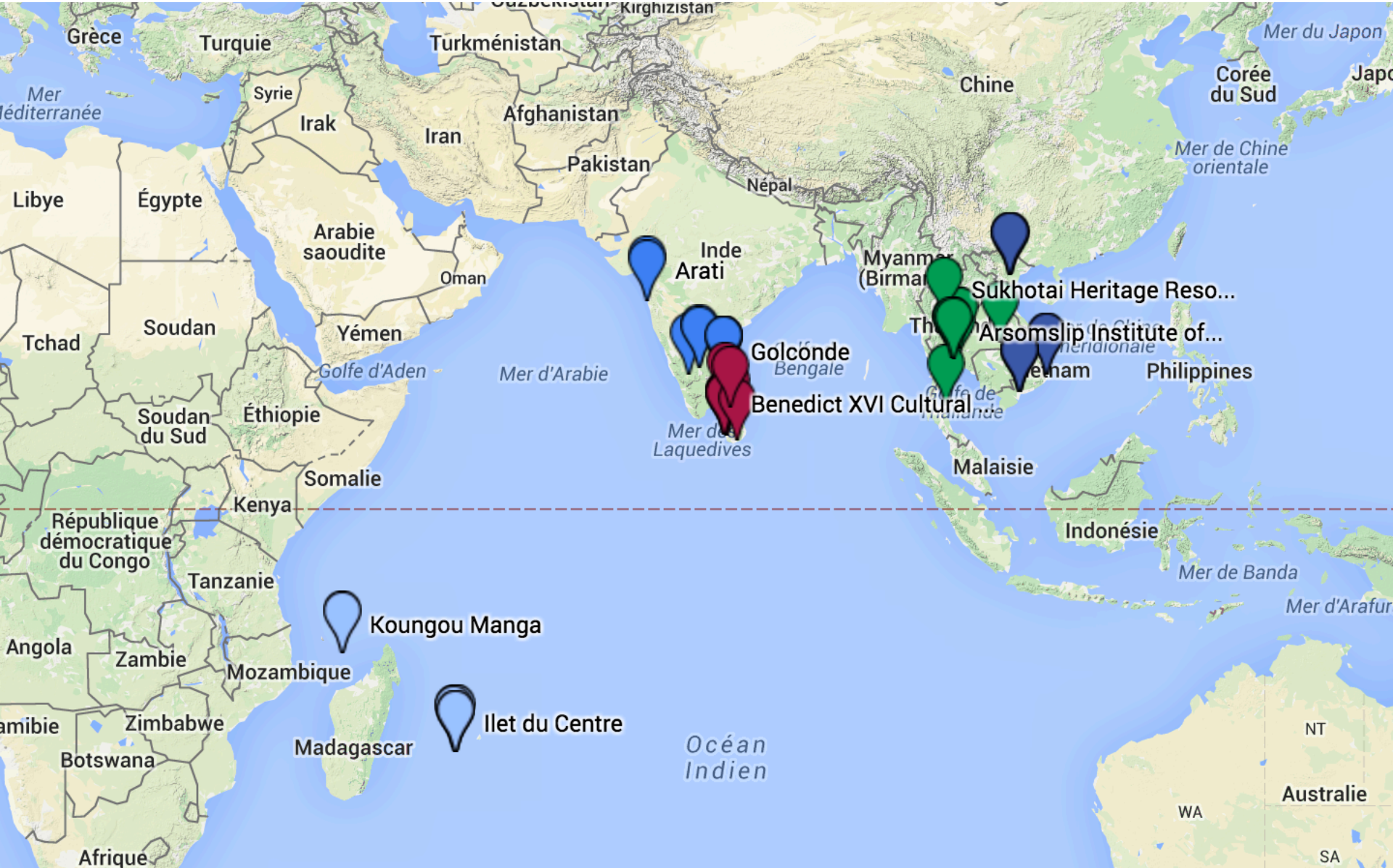
Task 3 : Solutions passives et Bonnes pratiques

Task 4 : Promotion des solutions passives

Experts group meeting, La Réunion (30 Juin-5 juillet)

Restitution des travaux : COP 22 (Maroc)

LETCHI Team


Grèce
Turquie
Turkménistan
Kirghizistan
Mer du Japon
Mer
Syrie
Irak
Iran
Afghanistan
Pakistan
Chine
Corée du Sud
Mer de Chine orientale
Népal
Libye
Égypte
Arabie saoudite
Oman
Inde
Arati
Myanmar (Birmanie)
Sukhotai Heritage Reso...
Arsomslip Institute of...
Golconde
Bengale
Tchad
Soudan
Yémen
Golfe d'Aden
Mer d'Arabie
Benedict XVI Cultural
Philippines
Soudan du Sud
Éthiopie
Mer des Laquedives
Malaisie
Somalie
Kenya
Indonésie
République démocratique du Congo
Tanzanie
Mer de Banda
Koungou Manga
Angola
Zambie
Mozambique
Ilet du Centre
Zimbabwe
Madagascar
Océan Indien
Botswana
NT
Australie
WA
SA
Afrique

TEMPLATE COMMUN

13/07/2016

Geocoordinates

Latitude Longitude

North West

14.58193 101.2211

Living center of AGLC / Thailand

BUILDING FEATURES

Construction type :

- [x] New Building pr.
- [ ] Renovated pr.

Programming :

- [x] Social
- [ ] Private
- [ ] Mix

Typology :

Type	Nb	Area (m²)
Studio	-	-
1 bed.	-	-
2 bed.	-	-
3 bed.	-	-
4 bed.	-	-
≥ 5 bed.	-	-

Total number of units : ?

Number of storeys : 2

Total Net Floor Area :

263 m²

Performance Standards :

None

Total Cost of the project :

N/A

Cost Per m² :

N/A

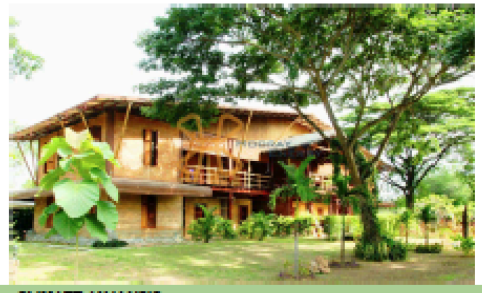
Date of completion :

N/A

BUILDING DESCRIPTION

The objective of this project is to emphasize personal development in sustainability initiatives and ideas by creating a society that lives "in balance" with nature through efficient use of resources, encouraging the use of low-environmental impact technologies and promoting renewable energy. Project aims to be a center of sustainability learning, network creation and technology showcasing in order to spread ideas and to provide proof that green technology really does work.

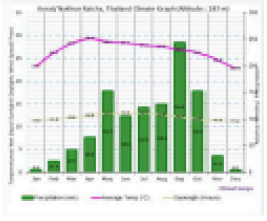
Bamboo, rapidly renewable material, is mainly used.



Constructed wetlands system for leisure and wastewater treatment

CLIMATE ANALYSIS

Pak Chong District has the average annual temperature of 25.8 °C. The summers are much rainier than the winter. The precipitation here averages 1150 mm. an average of 28.0 °C, May is the warmest month. The lowest average temperatures in the year occur in December, when it is around 22.1 °C.



BUILDING TEAM

Building Owner :

N/A

Architect :

N/A

General Contractor :

N/A

Mechanical Engineer :

N/A

Energy Modeler :

N/A

Lighting Design :

N/A

Structural, Civil Engineer :

N/A

Environmental Consultant :

N/A

SITE PLAN

Please insert a plan view of the site with the North indicated.

BUILDING ENVELOPE

ROOF

Type : Gable roof

Materials (ext to int):

Asphalt shingle roof with OSB (Oriented strand board) ceiling

WALLS

Materials (ext to int) :

Rammed earth on the first floor and interlocking block on the second floor

Glazing Percentage :

N/A

WINDOWS SOLAR SHADING

Simple overhang

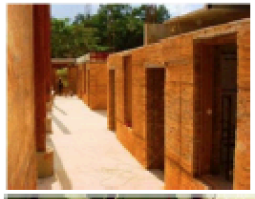
NATURAL VENTILATION

Cross natural vent.

- [x] Yes
- [ ] No

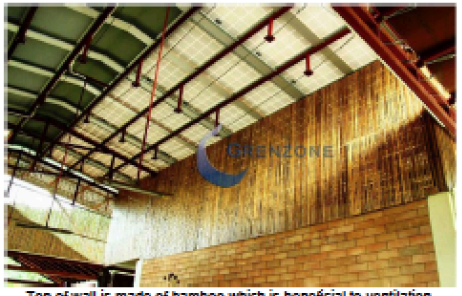
Porosity : 30%

PASSIVE APPROACHES



Rammed earth wall during construction

Rammed earth and interlocking block is selected as exterior wall thermal mass to reduce heat gain through the wall. Natural ventilation and daylight are utilized. Use photovoltaic cells as roof material to minimize material use and harvest energy to use in the project site Climbing plant e.g. garlic vine (Mansoa alliacea) is planted as building shade. There are plenty of perennial plants and shrubs near building to cool surrounding air.



Top of wall is made of bamboo which is beneficial to ventilation.

The building is 100% natural ventilation which is supported by building raised floor system and roof ventilation.
As the building is residential and mainly used in nighttime, lighting in daytime is not needed.

Some area of eaves is transparent for accessibility of daylight.

DESIGN TOOLS

Please describe here the design tools that have been used : Regulatory level ?
Solar diagram ?
Tools used for Dynamic thermal simulation (Energy Plus, etc.) ?
...

SITE INTEGRATION

AGLC is located at the fringe of Kao Yai National Park in Nakorn Ratchasima, Thailand. Since it is remote area, project tends to consume less energy and produce energy by itself.

ENERGY SYSTEMS

- ☐ Interior lighting
  Installed by the occupants
- ☑ Exterior lighting
  Type : fluorescent
  Controls : timer switch
- ☐ Air-conditioning
  Type :
- ☐ Mechanical vent.
  Location ?
- ☐ Ceiling fans
  Type / Number per rm
- ☐ Lift
- ☐ Plug loads
  Controls ?
- ☐ Energy analysis

ENERGY EFFICIENCY SYSTEMS

Insert pictures of the energy efficient systems (A+ Split Systems units, ceiling fans, light bulbs, LED etc.)

Picture 2

Picture 3

Picture 4

Natural approach is applied as well as technological approach. Natural ventilation and daylight are utilized to reduce building energy consumption. Constructed wetland is used for water treatment instead of electric wastewater treatment system. High efficiency lighting fixture, such as LED bulb, is equipped more than 70%. BIPV roof is installed as energy source for the building in the daytime.

OTHER STRUCTURAL ISSUES : materials used in the project

All materials used in the project are eco-friendly and locally extracted. Bamboo as a rapid growth plant is used as a common furnished material.

ENERGY FEATURES

- ☑ DWH
  Type :Solar panel
  total area of Solar thermal panels installed ?
- ☑ Photovoltaics
  Peak power installed
  Type of mounting : roof mounted ? solar shading ? Etc.

RENEWABLE ENERGY SYSTEMS

Project building has low energy consumption as no air condition was equipped and use photovoltaic cells as roof material to harvest energy for daytime using.

LESSONS LEARNED / FEEDBACK

Design team (Architect, energy consultancy) :
Insert if possible the feedback from the design team

Insert picture

Users :
Insert if possible the feedback from the users. Do they feel comfortable in their unit ? Has a Post Occupancy Survey been conducted ?

Maintenance
Insert if possible the feedback from the maintenance team. How does the building operate ?

Insert picture

Others :
Insert here other comments that are not listed above.

Contact person :
Dr. Atch Sreshthaputra

Institution :
Chulalongkorn University

Website :
N/A

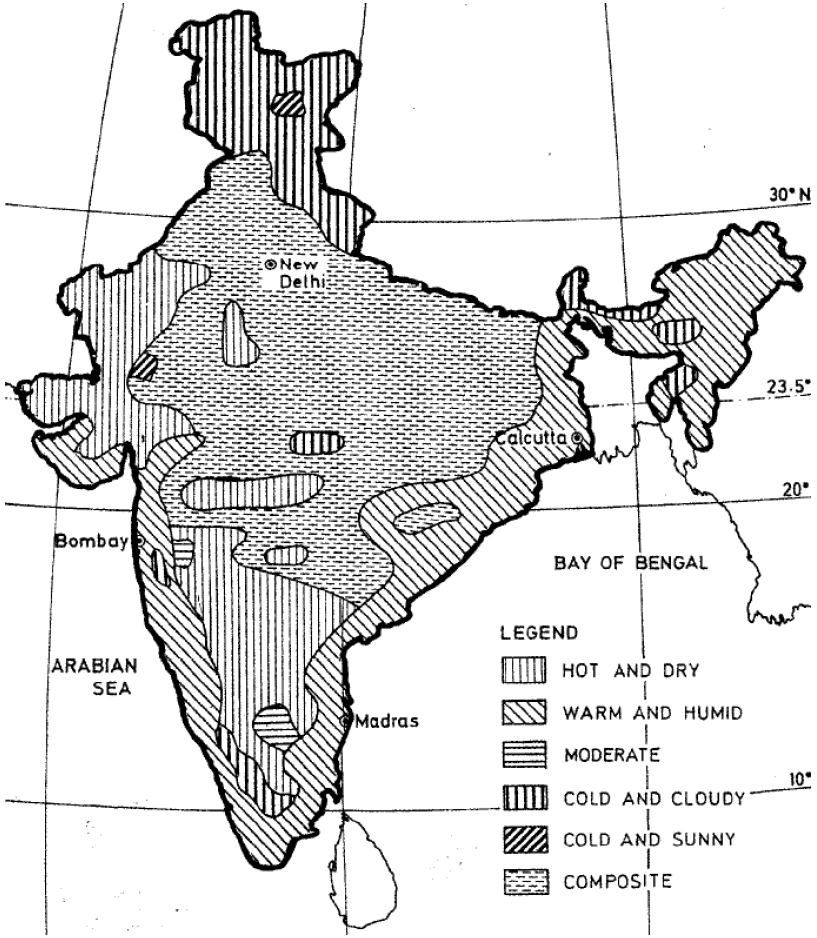
Photos credits :
GreenZone

Example(s) of Indian Case Studies

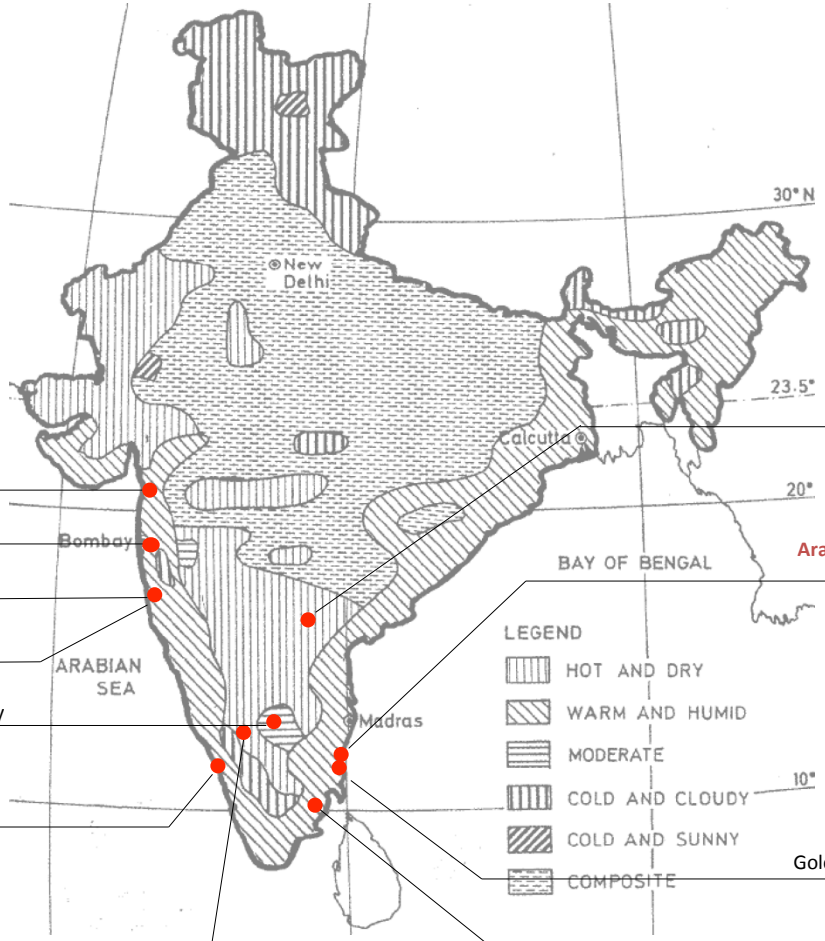
Auroville Consulting

June 2016

Climatic zones



Climatic zones



Bamboo Outhouse
Surat

Brick Kiln House,
House of Stream
Alibaug

Beach House
Devgad

Farm House
Nadhawade

House of 5 elements, Mallikarjun, Bamboo Symphony
Bengaluru

Shakira Residence
Kannur

House of Bhooshan Family
Mysuru

Fort House
Hyderabad

Arati 3, Humility, Realization, Vikas Community
Auroville

Golconde, Marianna's House, Growing Towards
Puducherry

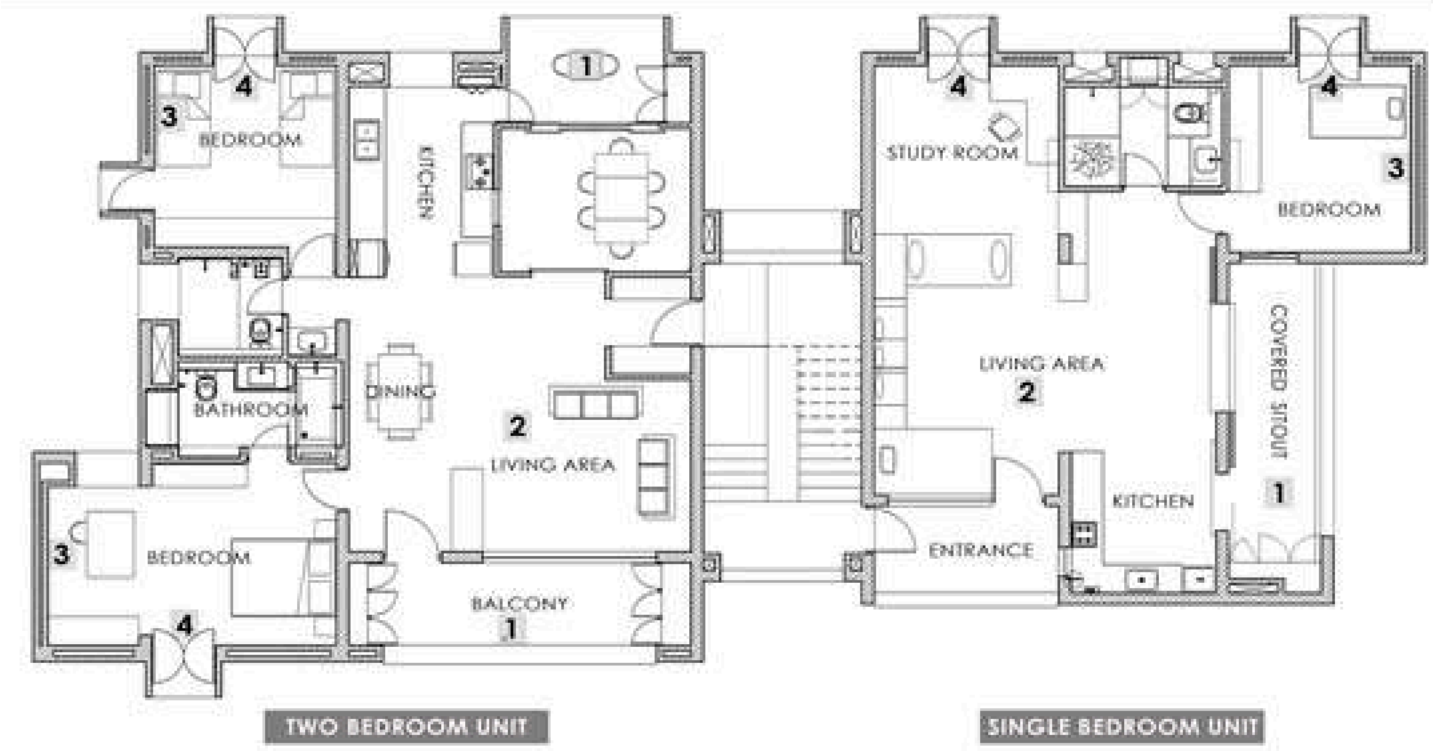
Centre for Hope
Tiruchirapalli

Arati 3, Auroville (lat :

- Open terraces surfaced with reflective ceramic tiles to reduce heat island effect and exhibit high reflectivity
- Inset balconies and verandas provide self shading

Arati 3, Auroville

- Cross natural ventilation



Dr. Atch
Sreshthaputra
AFRICUS Co., Ltd.

Example(s) of case Studies in Thailand.

July 2016

ARSOMSILP INSTITUTE OF THE ART (lat : 13°N)

- 1,100 m^2 Architecture school with a concept of learning by doing. Community improvement projects.
- Located in suburban Bangkok
- Sustainability is a core
- Materials and construction methods of Thai traditional architecture

ARSOMSILP INSTITUTE OF THE ART

- Raised floors provide natural ventilation.
- Low-heat capacity reduce heat absorption.
- Green area & water pond at 80% of site provide microclimate adjustment and stormwater retention.
- Reused old timber.

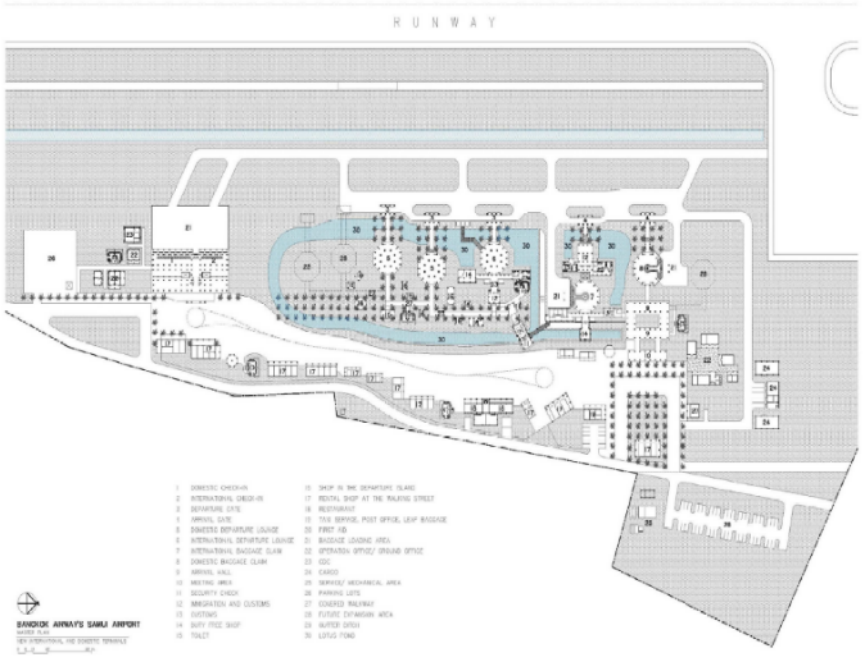
ARSOMSILP INSTITUTE OF THE ART

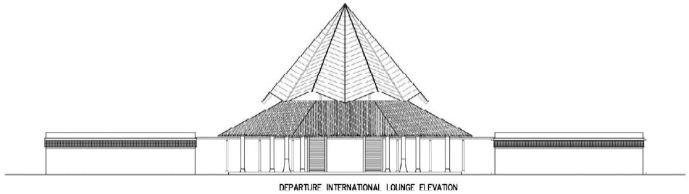
- Split-type A/C for flexibility of use with natural ventilation.
- Maximize solar shading.

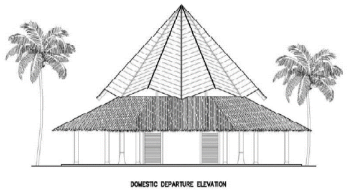
SAMUI INTERNATIONAL AIRPORT (lat : 9°N)

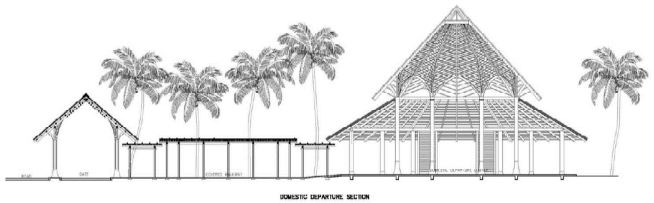
- 9,600 m² on Samui island
- Shallow ponds as stormwater retention, recycled water collection, evaporative cooling

SAMUI INTERNATIONAL AIRPORT



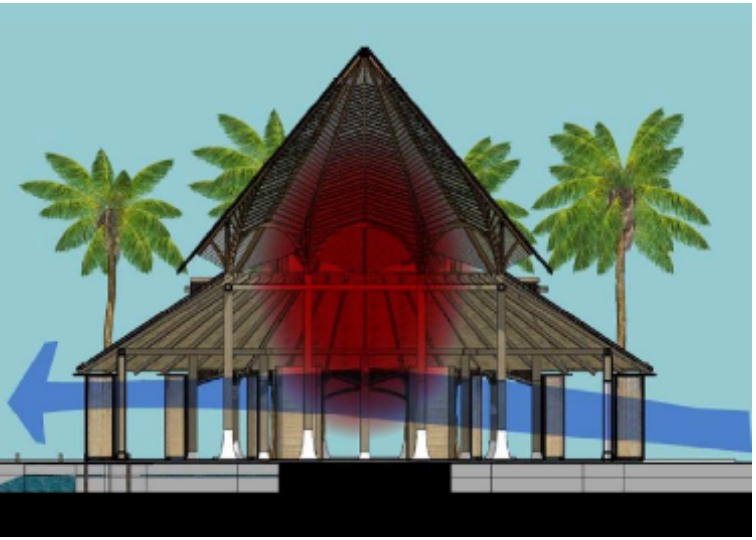


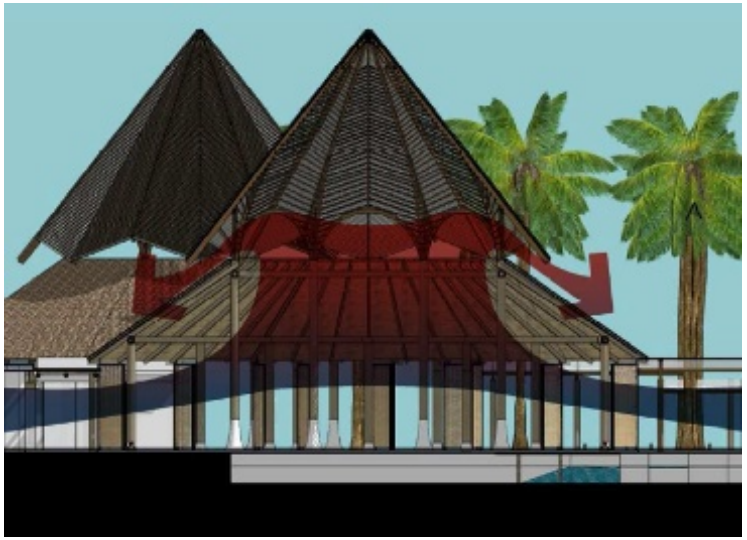




- Rapidly renewable and regional materials
- Thatch and Bamboo roof
- Coconut trunk for column cladding

SAMUI INTERNATIONAL AIRPORT





- Natural ventilated with high roof
- Minimize wall to allow cross ventilation
- Daylight is utilized

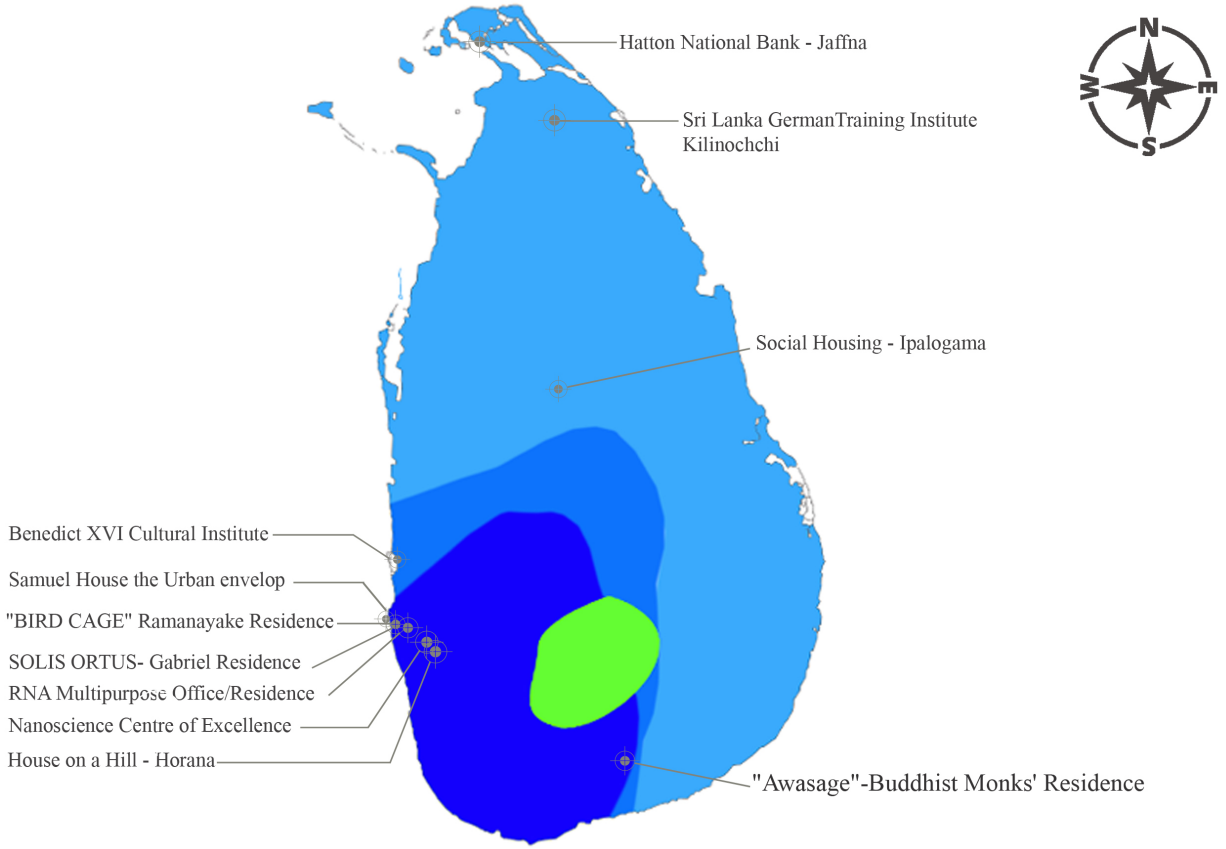
Rahula Attalage
Deputy Vice Chancellor /
Senior Professor
&
Narein Perera
Chartered Architect /
Senior Lecturer

University of
Moratuwa
Sri Lanka

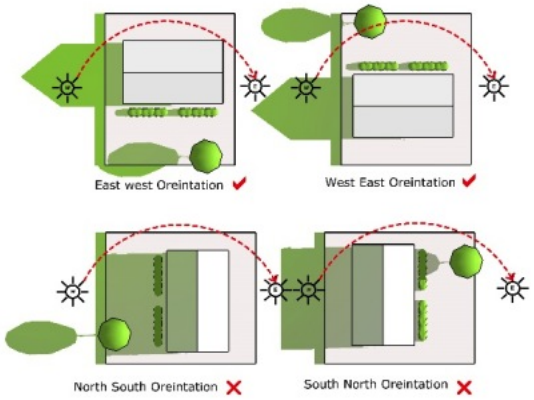
Example(s) of Case Study in Sri Lanka

July 2016

Climatic Zones and Selected Case Studies



Synthesis of passive design strategies



Strategy One- Start at the Neighbourhood ,Site

Strategy Two- Shade (Avoid Sun)

Strategy Three-Ventilate thoroughly

Strategy Four- Choose materials wisely

Social Housing for War heroes : Ipalogama (lat : 8°N)

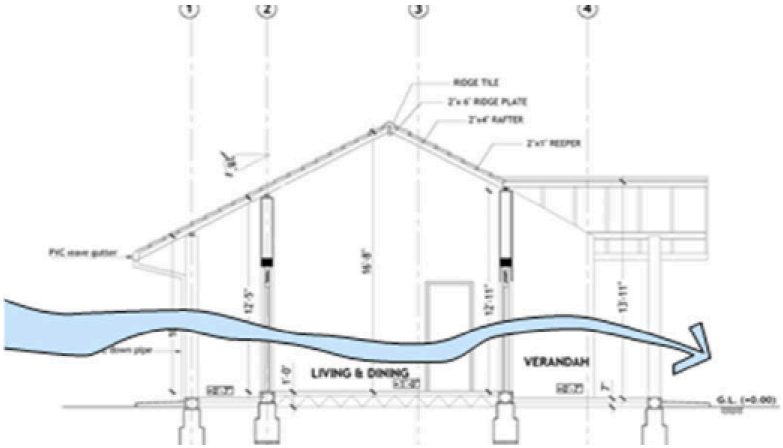
Neighbourhood scale –

Street canyon is oriented northeast-southwest while houses are coupled and staggered.

Roof : Terracotta tiles

Walls : 22,5 cm thick brick walls

Natural cross ventilation

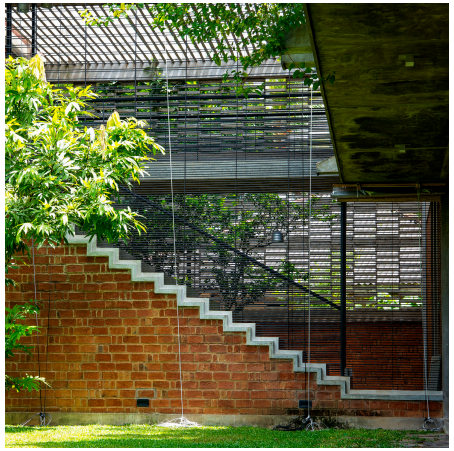


Case study - ‘Solis Ortus’ - Gabriel Residence

- to connect to the environment, in sites deeply embedded in the urbanised and rapidly urbanising “grid” of Colombo
- integrating the environment without the heat, humidity of the tropical context
- the building envelope is cognizant of its immediate function of sheltering the internal spaces, as well as their impact on future usage patterns.
- Cavity walls that ease the heat gain - left bare, freed of the need to paint over reducing life-cycle cost, inviting to the touch, changing colours and how it is perceived with the rhythm of the sun
- insulated roofs, with PV panels that render the naturally lit, naturally ventilated house a net-zero energy entity

Case study - ‘Solis Ortus’ - Gabriel Residence

- The shaded building envelope is the strongest element in the design
- Screens and extensive vegetation use enhance and facilitate the approach
- The focus is on life cycle cost, with materials and finishes that need little maintenance and no need for periodic painting etc.



ENERTEAM
Ma Khai Hien
Vice director/Energy efficiency expert
&
Nguyen Ngoc Tu
Architect/urban designer

EXAMPLE(S) OF CASE STUDIES
VIETNAM

1 CLIMATIC DATA

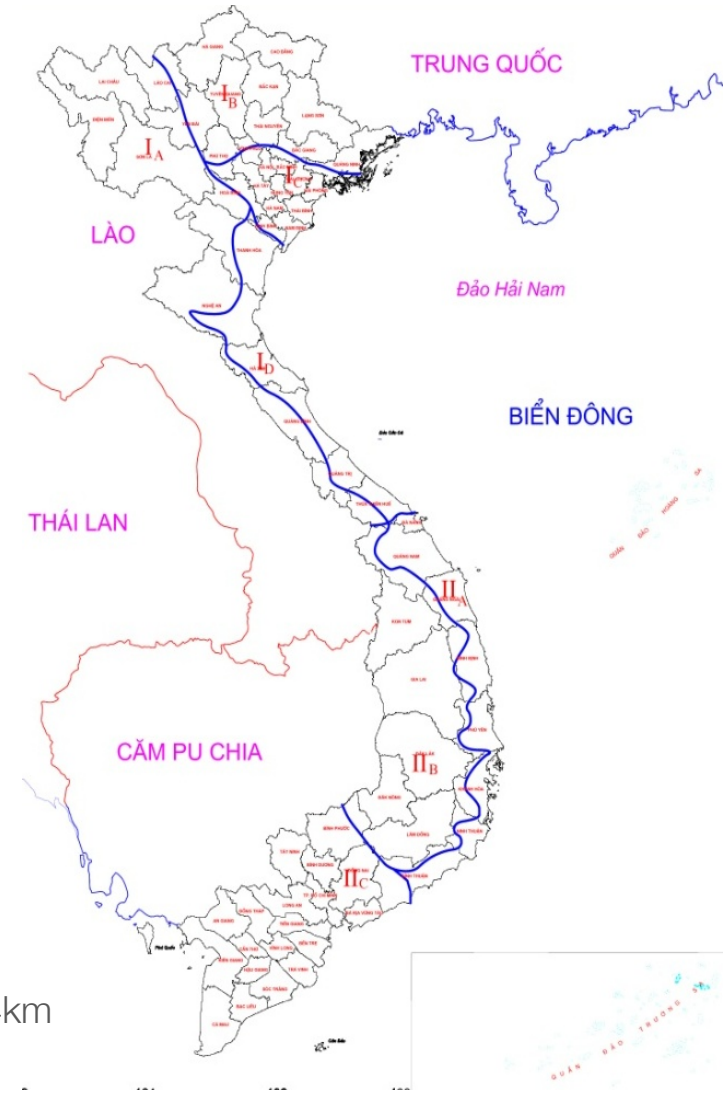
LOCATION & NATURAL PHYSICAL DATA

LOCATION

In the easternmost country on the Indochina Peninsula in South East Asia Latitudes 8° and 24°N, and the longitudes 102° and 110°E.

The climate includes subtropical to tropical climate. With 02 main regions

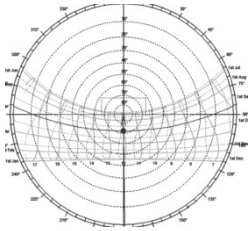
- Northern region Climate zone: From 16°N latitude (HaiVan mountain) to the North
- Southern region Climate zone: From 16°N latitude (HaiVan mountain) to the North.



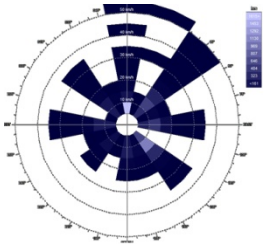
Area 331,210km^2
Its coastline is 3444km

CLIMATIC DATA

HANOI

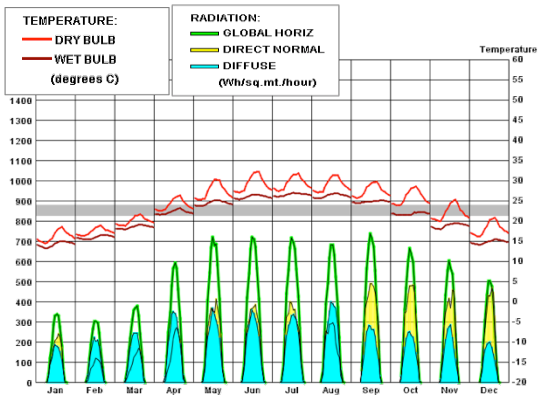


21°1'42''N
105°51'12''E



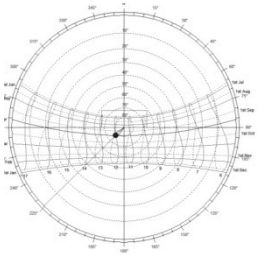
.
Prevailing wind is from SE, S in summber; N- NE in Winter

HOURLY AVERAGES

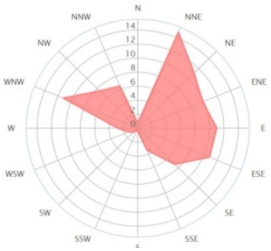


The aver. rainfall is 1,680 mm/yr
Aver. temperature: 23.6°C
Mean RH of 79%.

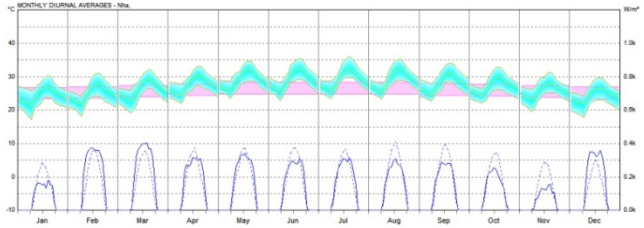
NHATRANG



12°17'16''N
109°11'16''E

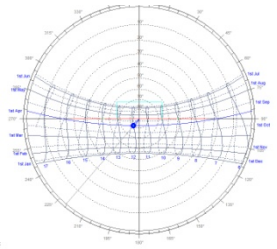


Wind in whole year
West wind is hot
E, NE Wind is cool.



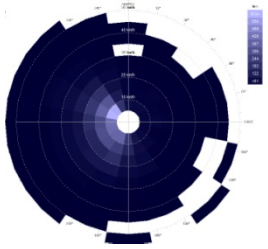
The average rainfall is 1,280mm/yr
Aver. temperature is 26.3°C
Mean RH 79.5%.

HCMC



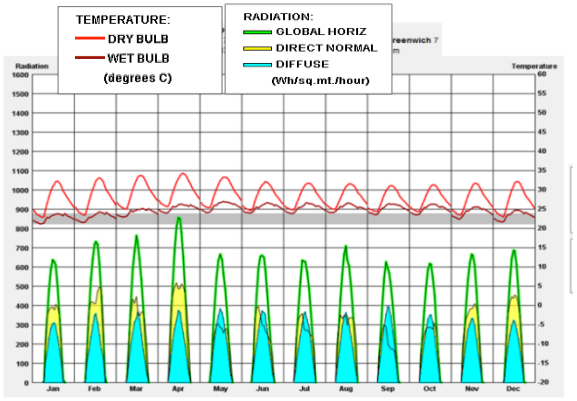
10°46'10''N
106°40'55''E

The wet season: May-Nov
Dry season: Dec to Apr.



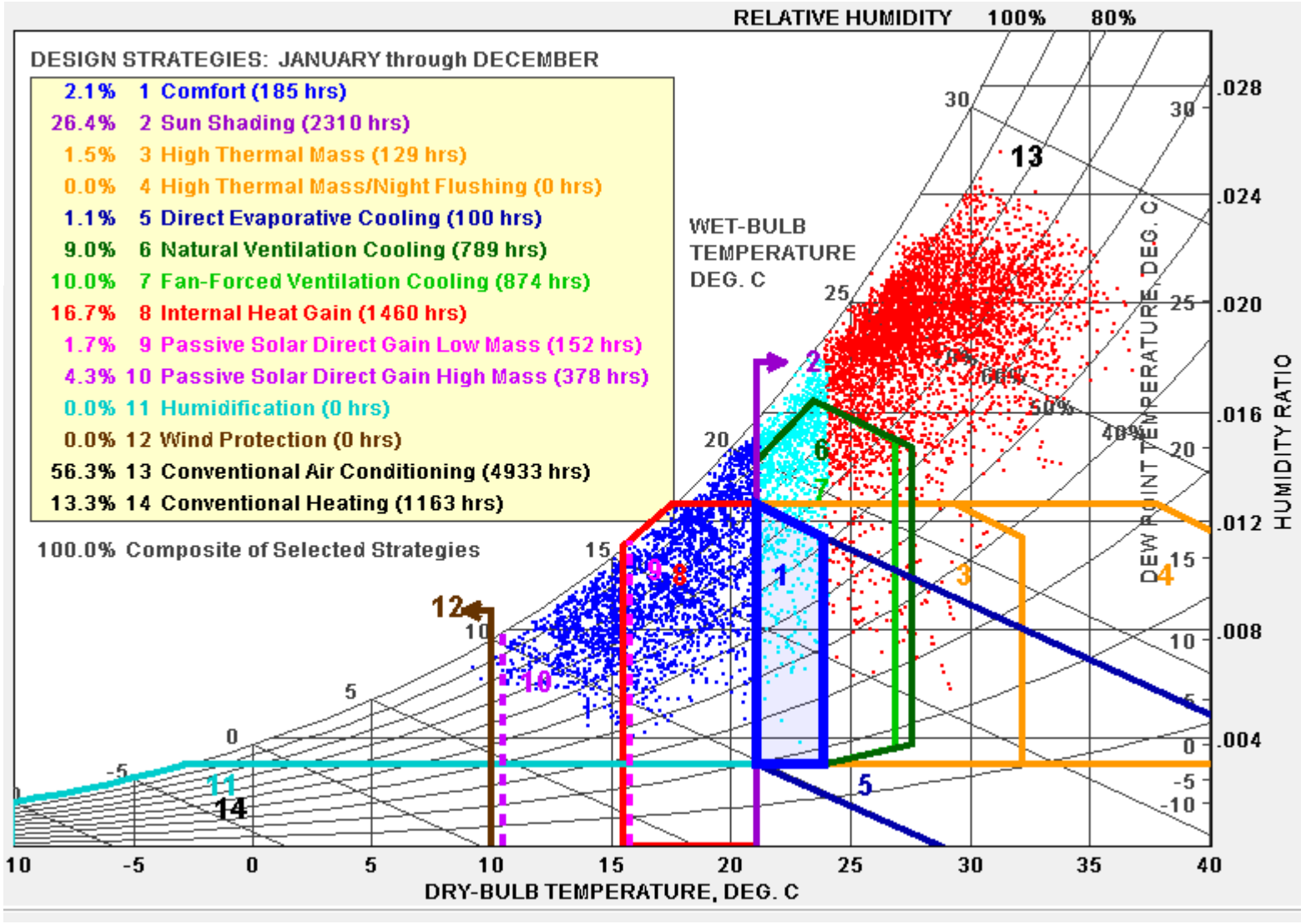
Prevailing winds
W & SW wind (Jun to Oct);
N & NE wind (Nov to Feb);
Also S &SE wind (Mar to May).

HOURLY AVERAGES



Aver. temperature is 27°C
Mean RH is 79.5%

HANOI CLIMATIC DATA/PSYCHROMETRIC CHART



2

CASE STUDIES

2.1. BUILDING DESCRIPTIONS

No 1 Dang Xa

Palm tree 21°N

Trung Yen Plaza

Mulberry Lane

An Thinh Apartment

CT7A Vinh Diem Trung

Residential buildings for low and medium income people in 03 cities of Vietnam: Hanoi, Nha Trang, HCMC

Lotus Apartment

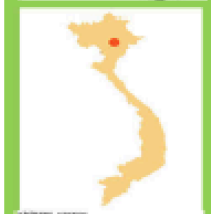
Le Thanh B1

Le Thanh Twin Tower

First home, Thanh Loc

PALM TREE RESIDENTIAL AREA / Hanoi, Vietnam

13/07/2016



Geocoordinates

Latitude	Longitude
Nouth	East
21°1'42"N	105°51'12"E

BUILDING FEATURES

Construction type :

- [x] New Building pr.
- [ ] Renovated pr.

Programming :

- [ ] Social
- [ ] Private
- [x] Mix

Typology :

Type	Nb	Area (m²)
A		70.9
B		83.3
C		91.8
Penhouse		163.3-178.8
Sky villa		154.2

Total number of units : 13

Number of storeys : 19-22-25

Number of apartments: 1500

BUILDING DESCRIPTION

Project: Palm Tree Residential Area, Ecopark, Hung Yen
Building investor: Viet Hung Company (VIHAJICO)
Architecture designer: Kume Sekkei
Total land area: 40,100m2
Ecopark blocks were designed in accordance with the functional city model with full utilities. The buildings are covered by trees surrounding and water ponds, which are combined harmonizing between citizends and nature.
The investor also create new bus lines for citizens and visitors. So that the distance between ecopark and city center may be not a trouble for citizens to come.

BUILDING ENVELOPE

ROOF

Type : Technical roof with non-HVAC system

Materials (ext to int):

Concrete + insulation+ plaster void+ plasterboard/ And technical roof without HVAC

WALLS

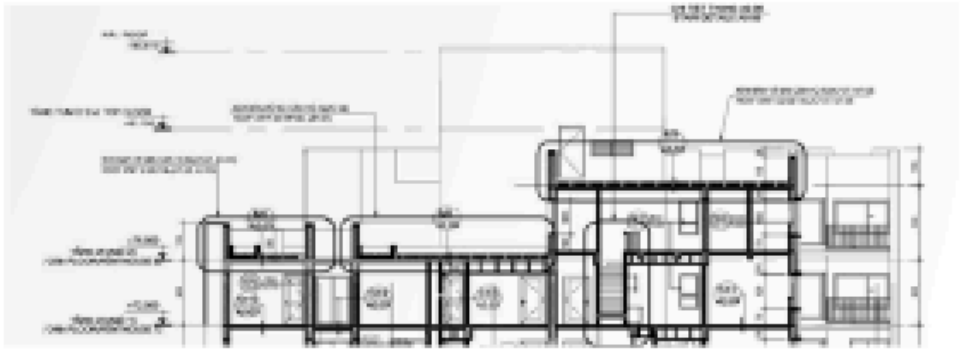
Materials (ext to int) :

Non-baked brick, low U-value for better insulation

concrete (light coloured painting) + Glazing Percentage :

about 30%

PASSIVE APPROACHES



Non-baked brick, Which just complies with EEBC 09:2013/BXD Energy efficiency building codes

1 - Technical roof for insulation

2- Non-baked brick from recycled material with low U-value for better insulation, (mova motar)

3 - Balcony as solar shading in some spaces

4 - Vegetalisation of the surroundings

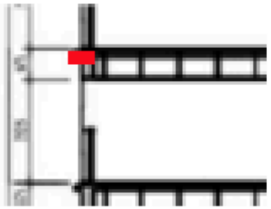
5 - Water Efficient equipment

6 - Evaporated cooling

7 - Natural ventilation for all main function spaces/auxiliary spaces

8 - Daylighting for all main function spaces/auxiliary spaces

WINDOWS
SOLAR SHADING
Using balcony as sheding, and some short horizontal sheding



NATURAL VENTILATION

Cross natural vent.

☑ Yes ☑ No

Porosity :

To avoid the use of air-conditioning, several passive strategies are used : insulation roof, cross ventilation by ventilation clefts/gaps, reduce heat, orientation according to prevailing winds. The large and dense garden and vegetalisation of building access permit to limit heat accumulation. Artificial lights are reduced to accurate requirement. And water ponds for evaporate cooling.

The buildings with ventilation gaps/clefts surrounding can get more daylighting and ventilation into auxiliary space (restroom, kitchen...). Therefore most of spaces have natural ventilation and daylighting.

LA SUITE ? ANALYSE DES PROJETS

Analyse en cours des projets en terme de :

- Solutions passives
- Systèmes à haute efficacité énergétique
- Energie renouvelables
- Retour d'expérience. Suivi, POE

MERCI