ReBuMat
German-Vietnamese Collaborative Project on Resource-efficient Construction using Sustainable Building Materials

CAMaRSEC
Climate-Adapted Material Research for the Socio-Economic Context of Vietnam
Enabling Research and Development for Sustainable Buildings in the socio-economic context of Vietnam

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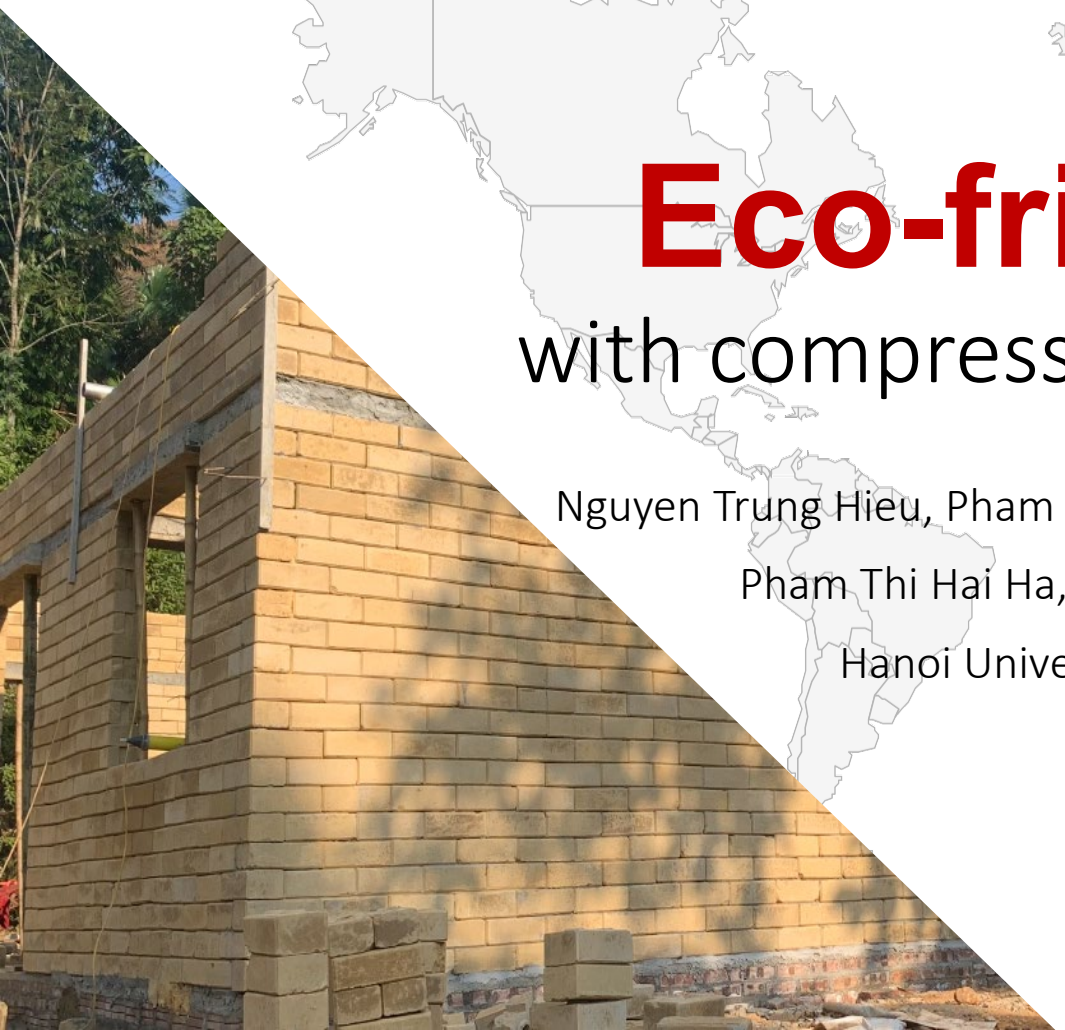
Federal Ministry of Education and Research



Eco-friendly house

with compressed stabilized earth blocks

Nguyen Trung Hieu, Pham Xuan Dat, Nguyen Van Tuan, Nguyen Cong Thang

Pham Thi Hai Ha, Nguyen Duy Thanh, Nguyen Tien Dung

Hanoi University of Civil Engineering, Vietnam

Lübeck, Sept. 2024

Inspiration

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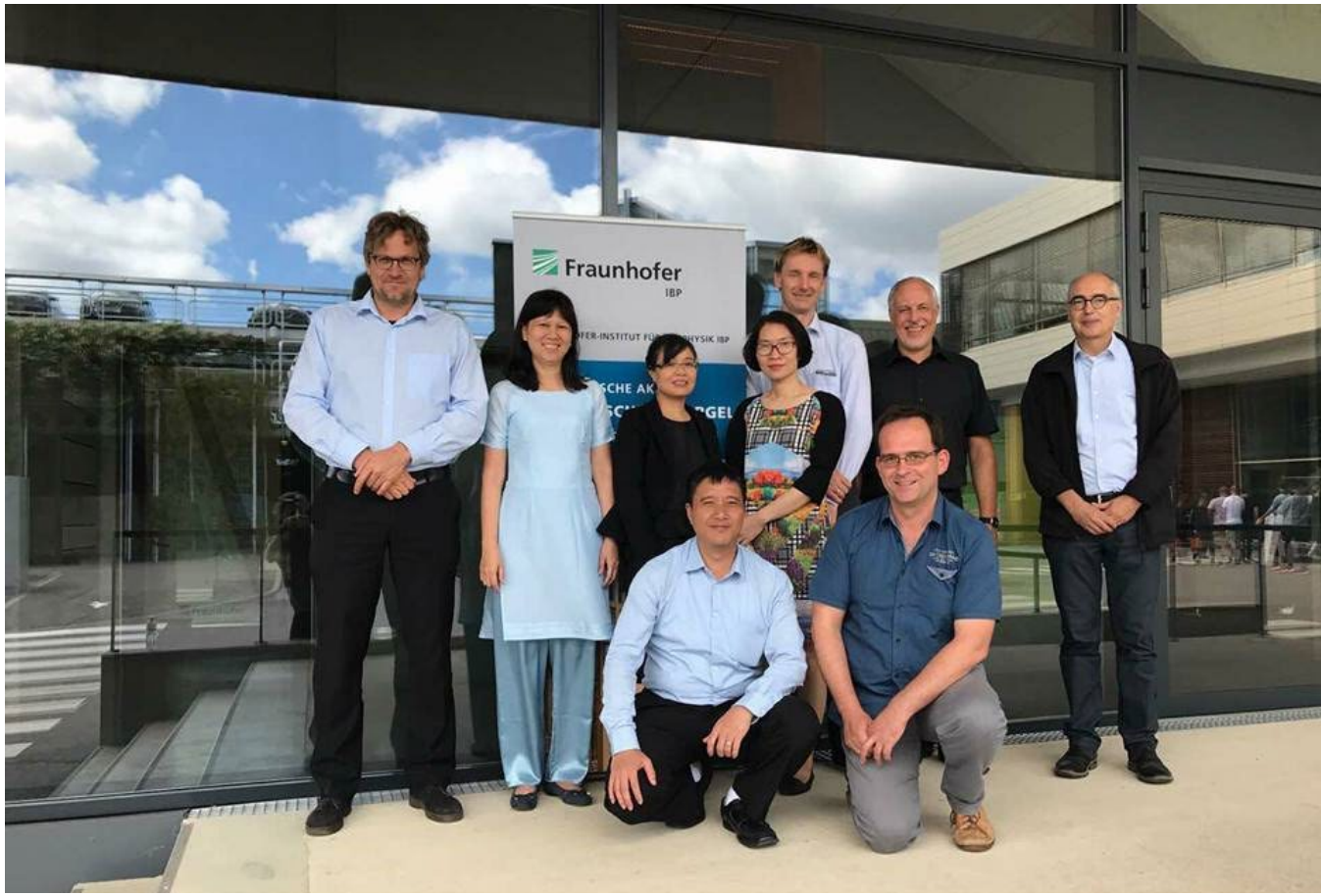
CAMaRSEC project (2019-2023) → **ReBuMat project (2020-2024)**



Inspiration

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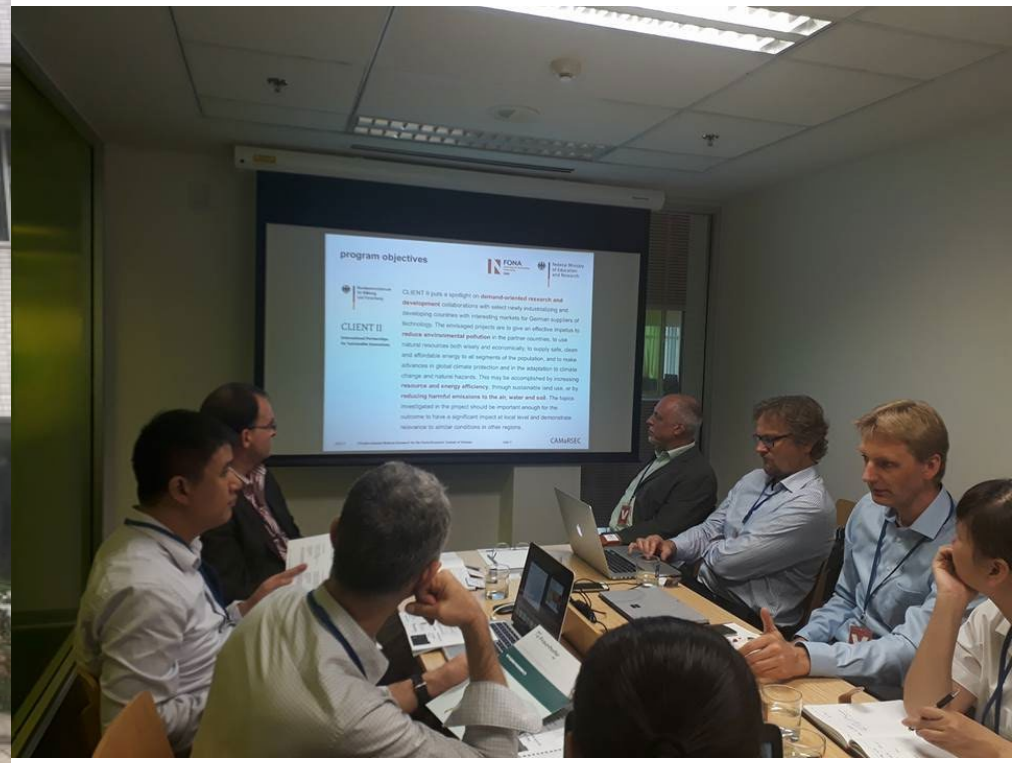
IFC

MoC

Inspiration

UNDP



Inspiration

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VNCC

Inspiration

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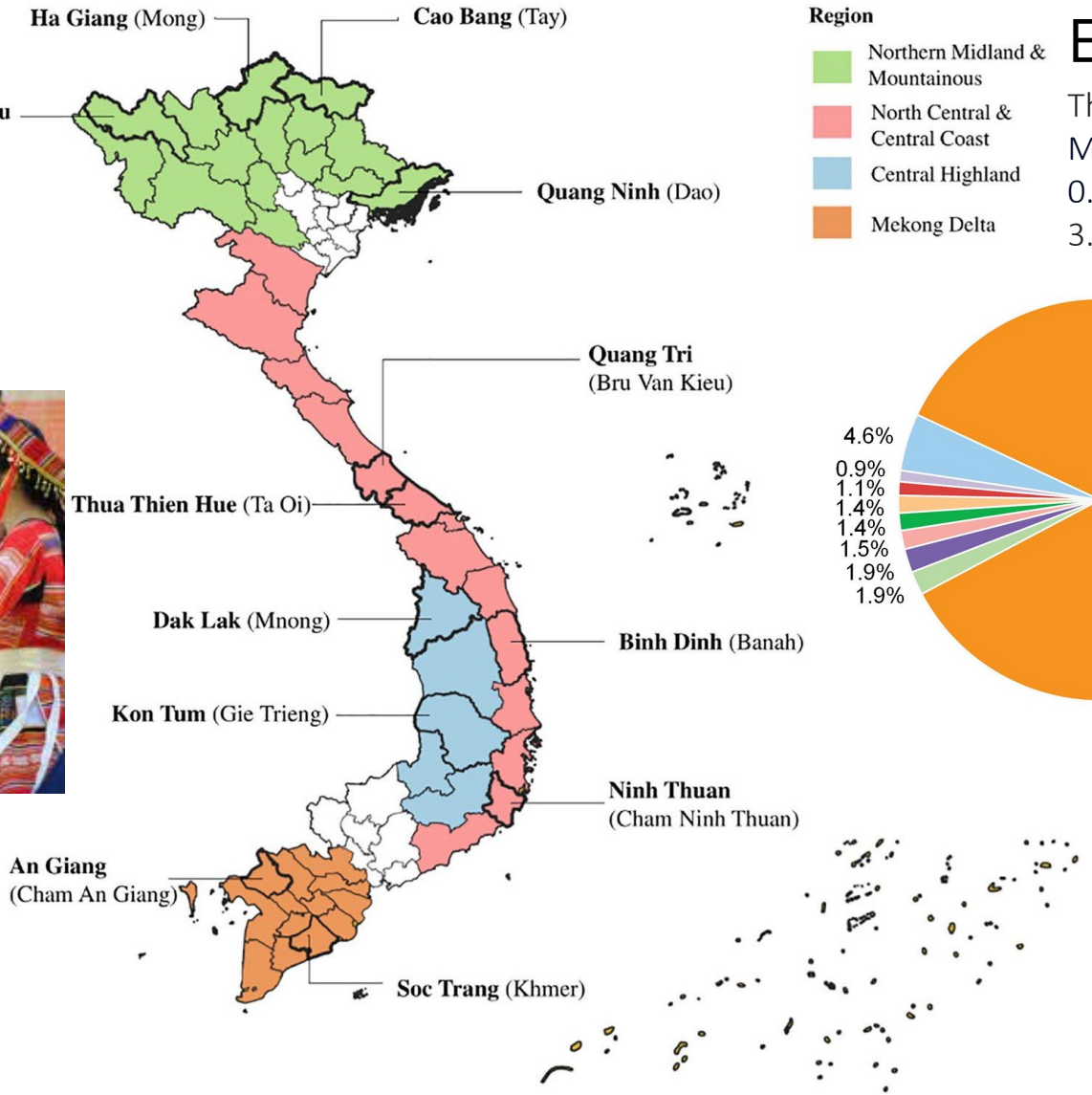
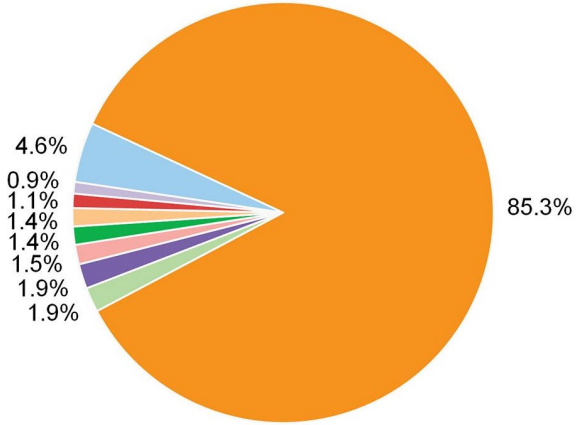
Lubeck Uni.

Inspiration



Ethic minorities

The largest ethnic groups are: Kinh 85.32%, Tay 1.92%, Thái 1.89%, Mường 1.51%, Hmong 1.45%, Khmer 1.37%, Nùng 1.13%, Dao 0.93%, Hoa 0.78%, with all others accounting for the remaining 3.7% (2019 census).



14.119.256 people (2019)

20.8% unstable or simple house

7.037.246 (Northern Midland & Mountainous)

Inspiration

In many difficult areas of the Northern mountainous region, people's houses are dilapidated and temporary

Tân Minh, Đà Bắc (2022)

Tân Minh, Đà Bắc (2022)

Hòa An, Cao Bằng (2022)

Đồng Văn, Hà Giang (2021)

Mường Tè, Lai Châu (2021)

Mường Tè, Lai Châu (2021)

Inspiration

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Difficulties in transporting materials is one of the reasons limiting people's housing construction

Inspiration

In addition to solutions to support housing construction costs, using on-site materials (non-fired clay bricks) in house construction overcomes difficulties in transporting materials, taking advantage of available materials is the basis for building houses for the poor

Hill land (no farming features) is very abundant

Palm leaves are used for roofing…

Bamboo supports the palm roof

Ideas and Implementation

Survey

H’Mông

Thái, Tày

Ideas and Implementation

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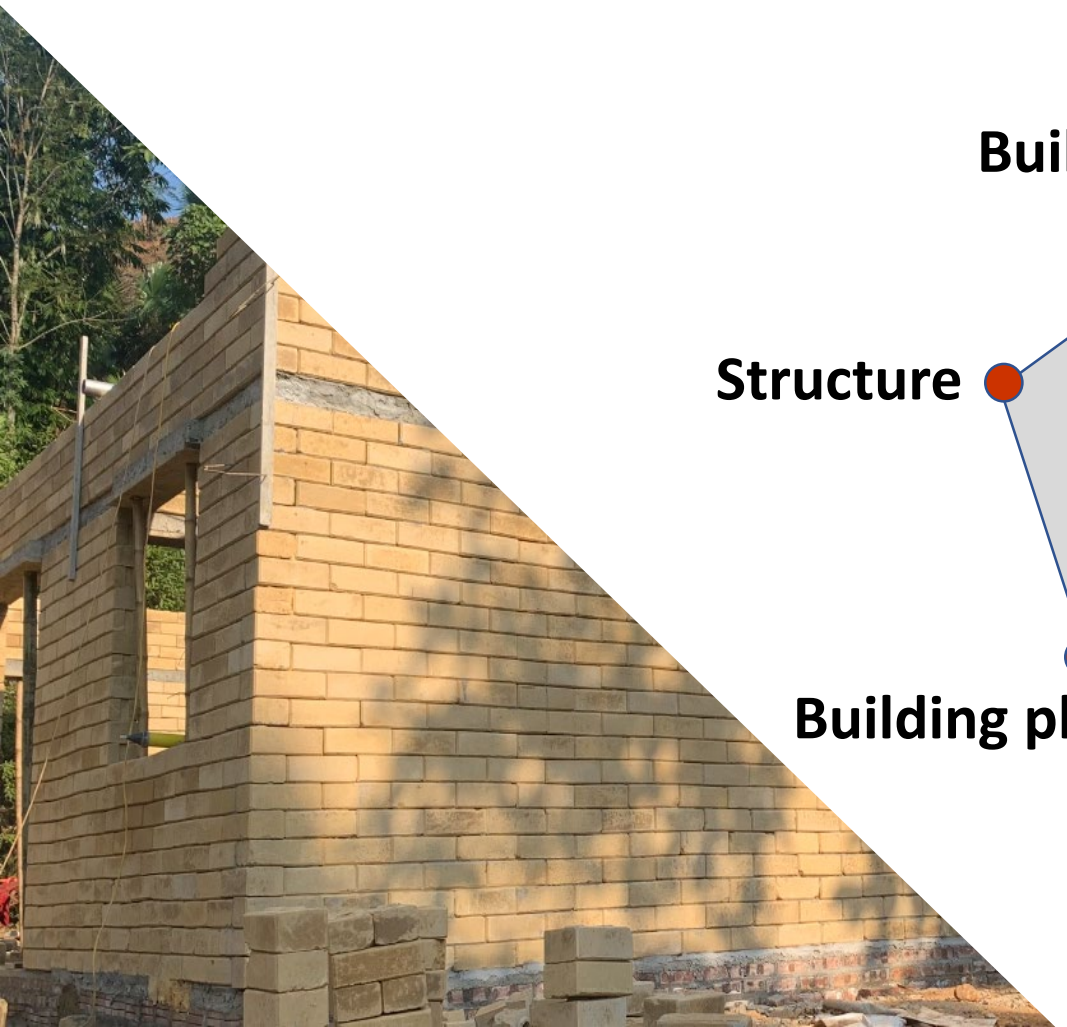
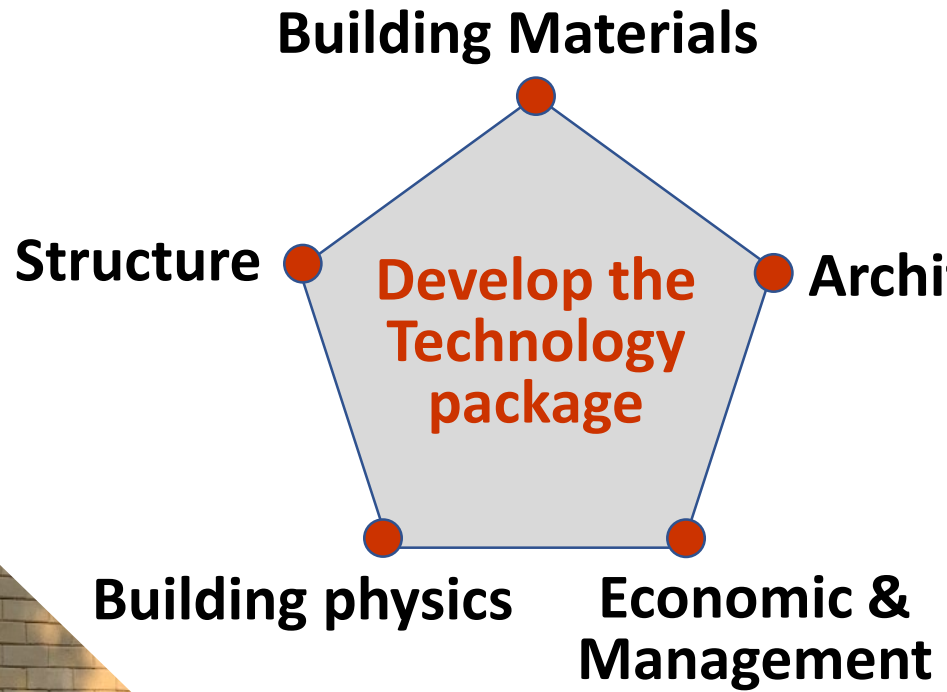
Develop the Technology Package to build the house for the poor



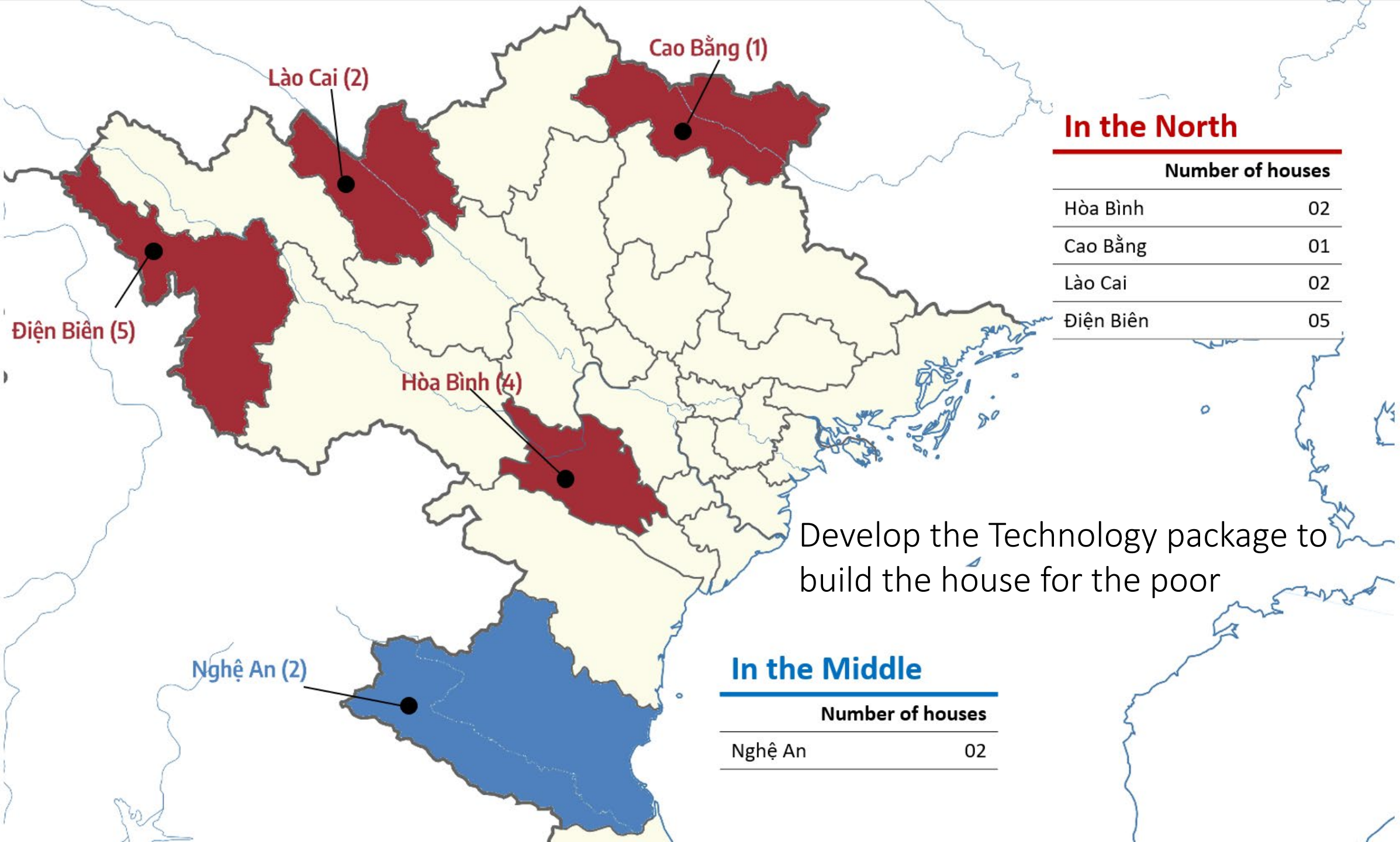


Ideas and Implementation

Production of compressed stabilized earth blocks (CSEB)

Property	Compressed stabilised earth blocks	Fired clay bricks	Calcium silicate bricks	Dense concrete blocks	Aerated concrete blocks	Lightweight concrete blocks
Wet compressive strength (MN/m^2)	1 - 40	5 - 60	10 - 55	7 - 50	2 - 6	2 - 20
Moisture movement (%)	0.02 - 0.2	0.00 - 0.02	0.01 - 0.035	0.02 - 0.05	0.05 - 0.10	0.04 - 0.08
Density (kg/m^3)	1700 - 2200	400 - 2400	1600 - 2100	1700 - 2200	400 - 950	600 - 1600
Thermal conductivity W/m°C	0.81 - 1.04	0.70 - 1.30	1.10 - 1.60	1.00 - 1.70	0.10 - 0.20	0.15 - 0.70
Durability against rain	good to very poor	excellent to very poor	good to moderate	good to poor	good to moderate	good to poor

Develop the Technology package to build the house for the poor



In the North

	Number of houses
Hòa Bình	02
Cao Bằng	01
Lào Cai	02
Điện Biên	05

Develop the Technology package to build the house for the poor

In the Middle

	Number of houses
Nghệ An	02

Ideas and Implementation

Ideas and Implementation

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Develop the Technology package to build the house for the poor (**Hoa Binh province**)

(1)
Design the house

(2)
Production of non-fired earth bricks

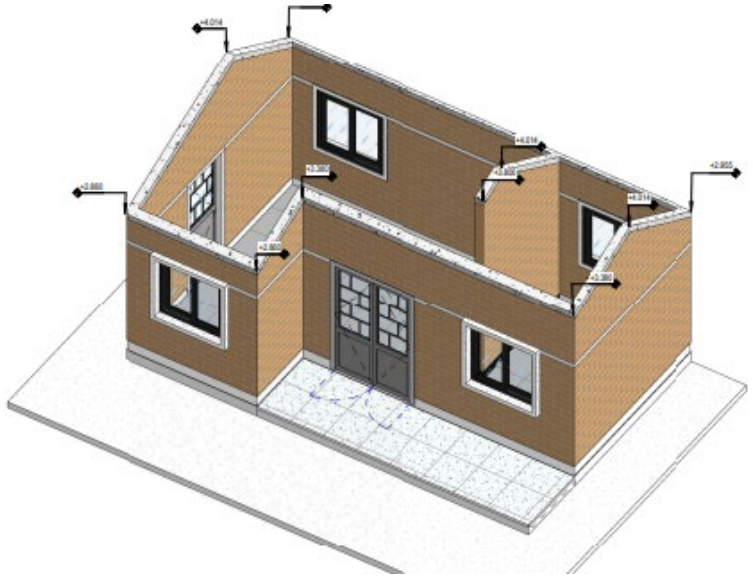
(3)
Guide the poor to produce bricks

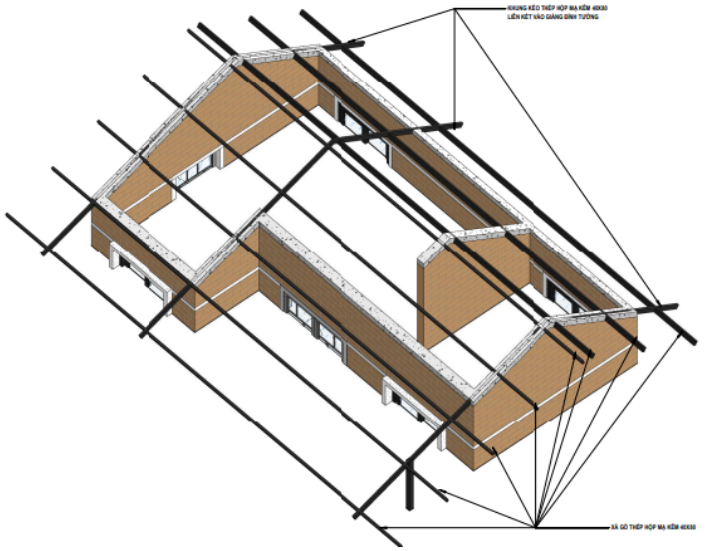
(4)
Build the house

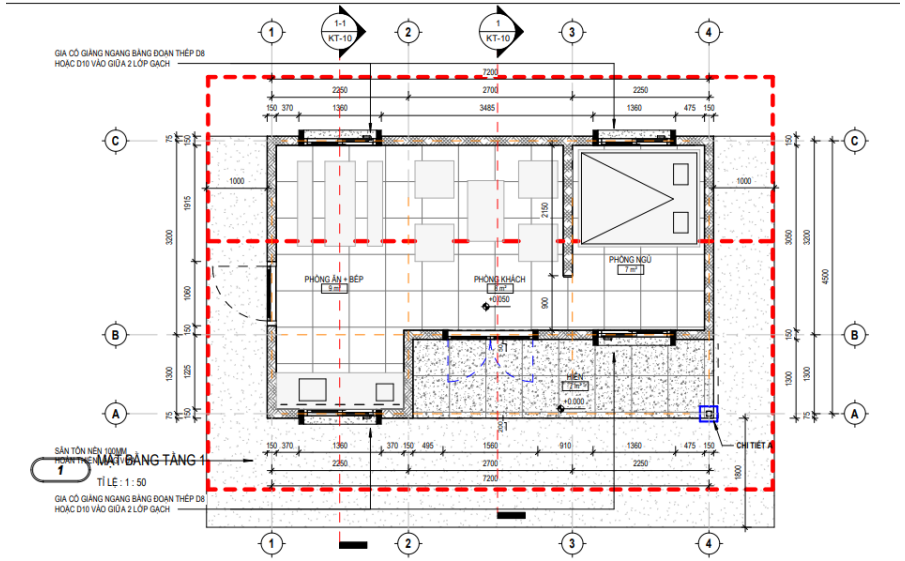
(5)
Finishing

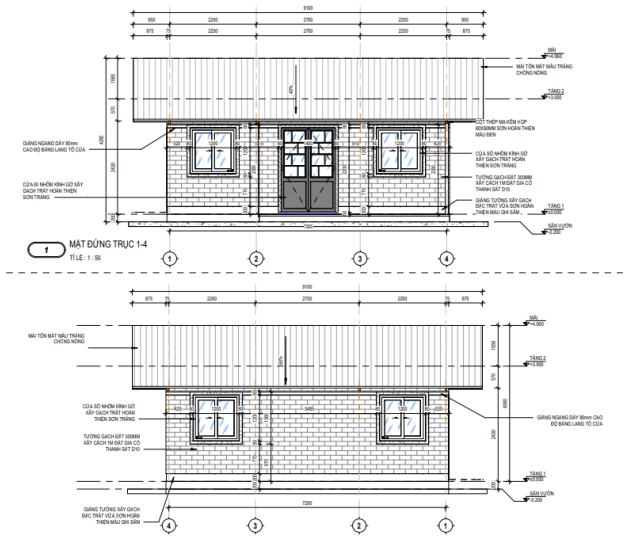
(1) Design the house

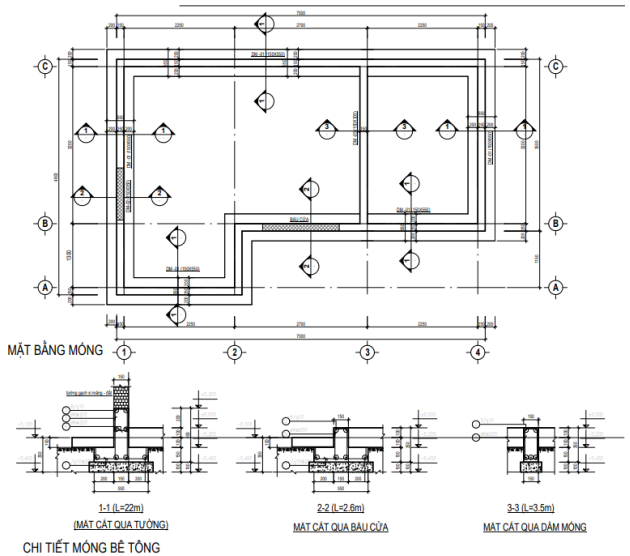
Typical house with a square of 40 m^2











(2) Production of non-fired earth bricks

Making the samples in the laboratory

Collecting the earth

Drying

Crushing

Seiving

Weighting the earth+cement+water

Mixing

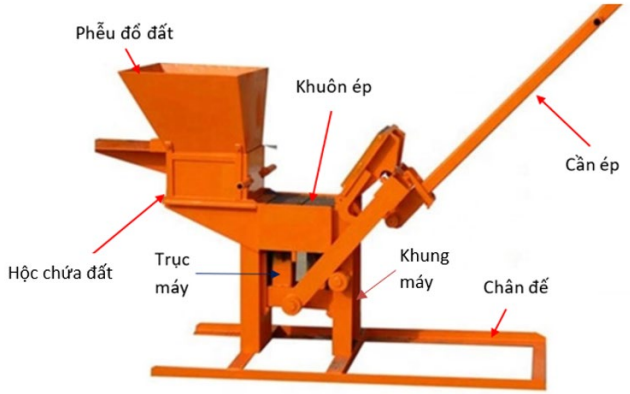
Pressing to make the sample

The samples

(2) Production of non-fired earth bricks

Experimental results in the laboratory

Manual pressing machine



CSEB with a size of 300×150×100 mm

Hydraulic pressing machine

Make the machine

Modify the Chiness machine

(3) Guide the poor to produce bricks

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Technology transfer

(4) Build the house

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Roof with palm leaves

(5) Finishing

The house has a corrugated iron roof

(5) Finishing


RELATIONSHIP
STATUS
Single

(5) Finishing

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The house has a palm leave roof

(5) Finishing

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House sign

(5) Finishing

Green product and house certifications

Vietnam Green Building Council

hereby certifies that

Eco-Friendly House using Interlocking Compressed Cement Stabilized Earth Blocks

Tan Minh Commune, Da Bac District, Hoa Binh Province

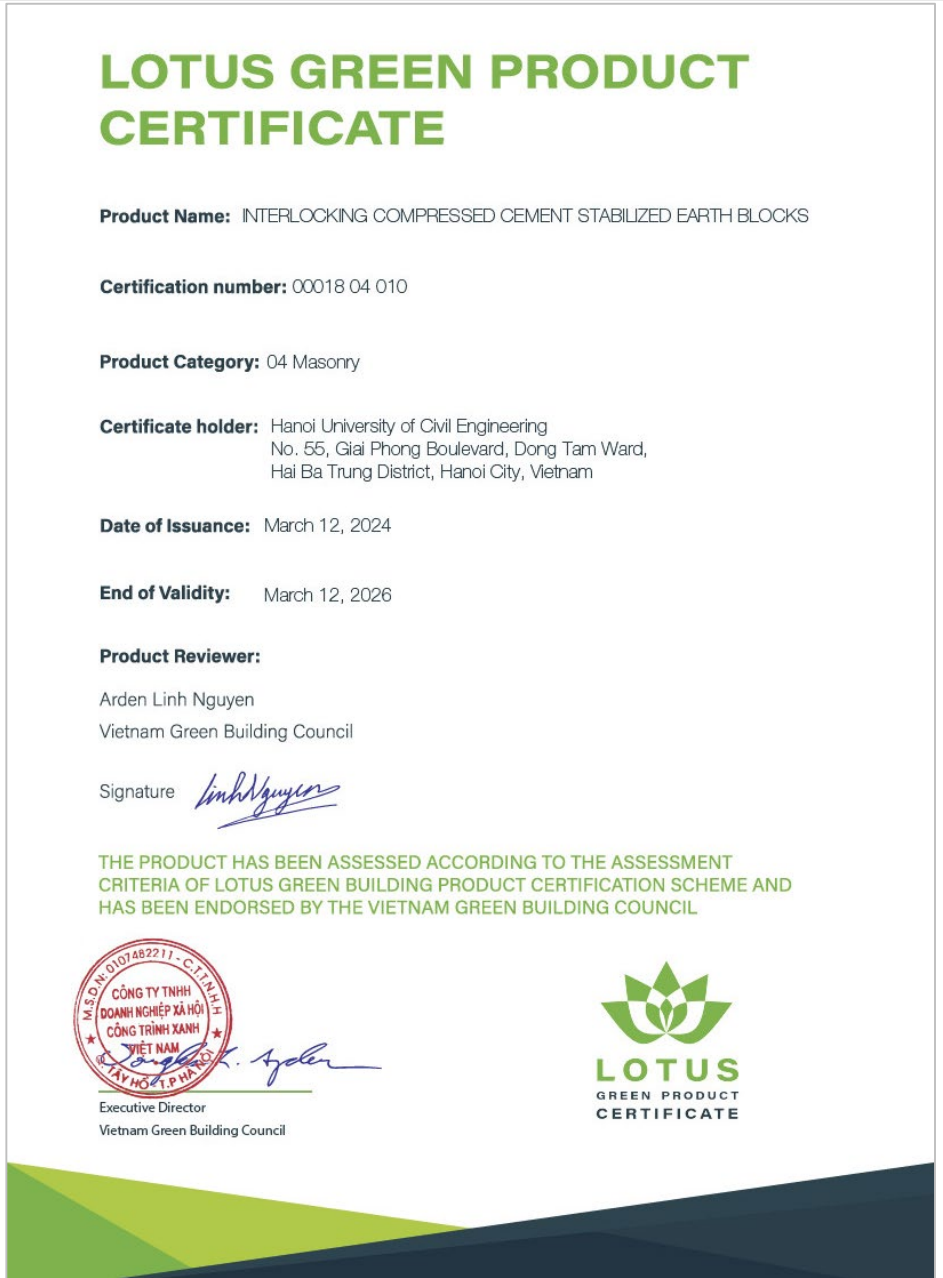
has been designed and constructed to meet the requirements of LOTUS Homes V1 green building certification program and successfully achieved the rating of

LOTUS CERTIFIED

on March 14, 2024

Douglas Lee Snyder

Executive Director, Vietnam Green Building Council



LOTUS GREEN PRODUCT CERTIFICATE

Product Name: INTERLOCKING COMPRESSED CEMENT STABILIZED EARTH BLOCKS

Certification number: 00018 04 010

Product Category: 04 Masonry

Certificate holder: Hanoi University of Civil Engineering
No. 55, Giai Phong Boulevard, Dong Tam Ward,
Hai Ba Trung District, Hanoi City, Vietnam

Date of Issuance: March 12, 2024

End of Validity: March 12, 2026

Product Reviewer:

Arden Linh Nguyen
Vietnam Green Building Council

Signature

THE PRODUCT HAS BEEN ASSESSED ACCORDING TO THE ASSESSMENT CRITERIA OF LOTUS GREEN BUILDING PRODUCT CERTIFICATION SCHEME AND HAS BEEN ENDORSED BY THE VIETNAM GREEN BUILDING COUNCIL

CÔNG TY TNHH DOANH NGHIỆP XÃ HỘI CÔNG TRÌNH XANH VIỆT NAM

Executive Director
Vietnam Green Building Council

LOTUS GREEN PRODUCT CERTIFICATE

After **6 months**

(5) Finishing

After **9 months**

Ideas and Implementation

(6) Some other provinces

Cao Bang province (5 hrs driving from Hanoi)

(5) Finishing

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Cao Bang province (5 hrs driving from Hanoi)

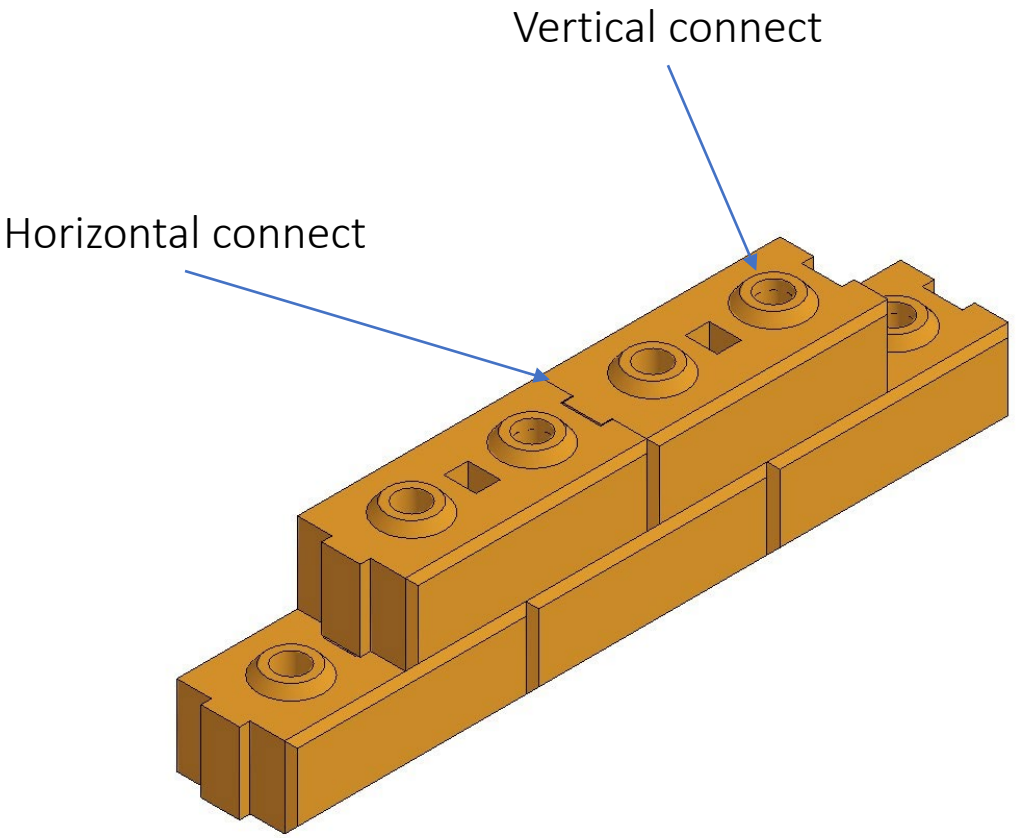
(5) Finishing

Cao Bang province (5 hrs driving from Hanoi)

Ideas and Implementation

Ideas and Implementation

Modification of brick shape → no mortar needed between bricks



Ideas and Implementation

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Ideas and Implementation

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Nghe An province (~8 hrs driving from Hanoi)

Ideas and Implementation

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Nghe An province (~8 hrs driving from Hanoi)