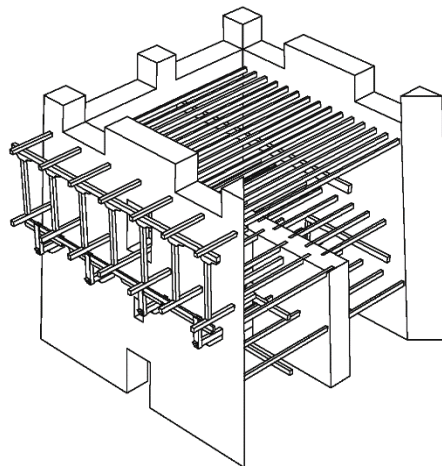


Networking Core Centres for International Cooperation  
on Conservation of Cultural Heritage Project  
“Conservation and Utilisation of Historic Buildings in Bhutan”

- Examination of Restoration Plan and Utilisation Plan of Farmhouses—
- Examination of Value Evaluation of Farmhouses as Cultural Heritage—



March 2020



Tokyo National Research Institute for Cultural Properties

Networking Core Centres for International Cooperation  
on Conservation of Cultural Heritage Project  
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1. Introduction .....	1
1-1. Background	
1-2. Objective	
1-3. Target and Method	
1-4. Participants and Schedule	
2. Previous Projects .....	5
2-1. Outline	
2-2. Selection of Candidate Farmhouses	
2-3. Chronological Index of Farmhouses	
3. Examination of Restoration Plan and Utilisation Plan of Farmhouses .....	15
3-1. Restoration Plan for Lham Pelzom house (Kabesa)	
3-2. Conservation and Utilisation Plan for Tandin Zam house (Punakha)	
3-3. Conservation and Utilisation Plan for Phub Lham house (Haa)	
4. Examination of Value Evaluation of Farmhouses as Cultural Heritage .....	26
4-1. Case Study in Punakha (Sopsokha, Yuwakha, Changjokha)	
4-2. Case Study in Haa (Longlo, Tshenkar)	
5. Conclusion .....	41
5-1. Restoration and Earthquake Resistance Measures Appropriate for Cultural Heritage (Developing Practical Techniques in Conservation)	
5-2. Conservation and Utilisation Plan with a Balance between Conservation as Cultural Heritage and Utilisation based on the Intention of the Owners (Developing Utilisation Strategies)	
5-3. Value Evaluation Method as Cultural Heritage (Developing Survey Methods for Designation)	

# 1.Introduction

## 1-1. Background

The Kingdom of Bhutan is a constitutional monarchy, endowed with rich nature and the unique cultural traditions of the Himalayas. Bhutan is also known as a country that is particularly committed to the protection and continuance of its traditional culture from the viewpoint of Gross National Happiness (GNH), positioning it as a pillar of its national policy. Regarding the conservation of historic buildings as cultural heritage sites, there is virtually no legal framework except high-quality architecture, given that traditional architectural customs are still relevant, as part of daily life, and it has not received much attention in international cooperation and academic research.

However, when many historic buildings were damaged across the country by earthquakes that occurred in 2009 and 2011, it exposed the deficiency in structural safety of those buildings, especially farmhouses, which account for the majority, and the conservation of traditional farmhouses has emerged as a critical issue. Ever since, the Department of Culture (DOC) has undertaken various studies for the conservation of different types of historic buildings and cultural landscapes, under the Ministry of Home and Cultural Affairs.

## 1-2. Objective

A legal basis for the designation of different types of historic buildings and cultural landscapes can be established if the first ever comprehensive law on cultural heritage, which the government of Bhutan has been examining, is enacted. It is imperative to analyse and organise how to deal with conservation and the utilisation of various types of historic buildings, especially private farmhouses, for promoting heritage conservation specifically. Similarly, it is necessary to consider what value evaluation criteria should be employed to proceed with the designation of these buildings. To achieve this, the DOC should prepare in advance, before launching the operation, a new legal framework to recognise what types of property are meant to be protected and how many properties are expected to be included. However, considering that the human resources owned by the Division for Conservation of Heritage Sites (DCHS) is limited, it is challenging to conduct the research required for such studies.

Based on the current situation in Bhutan as mentioned above, and Japan's experience in the field of heritage conservation, this project aims to contribute to the progress of Bhutanese heritage conservation by proposing the following recommendations to DCHS.

- ( 1 ) Restoration and earthquake resistance measures appropriate for cultural heritage (Developing Practical Techniques in Conservation)
- ( 2 ) Conservation and utilisation plan that balances between conservation as cultural heritage and utilisation based on the intention of the owners (Developing Utilisation Strategies)
- ( 3 ) Value evaluation method as cultural heritage (Developing Survey Methods for Designation)

## 1-3. Target and Method

Three farmhouses designated as cultural heritage candidates and the surrounding areas are set as pilot sites for the project. These candidate houses were identified through ‘Research on the Typology and Chronology of Rammed Earth Buildings in Bhutan’ (see ‘2. Previous Projects’), conducted by the Tokyo National Research Institute for Cultural Properties (TNRICP) in 2016-2017. Field surveys at each pilot site regarding ① consideration of appropriate restoration and conservation plans for candidate houses, and ② selection of other potential farmhouses for cultural heritage designation in the pilot area are required for achieving the objective outlined in the previous section. Regarding ②, it is also important to remember to extract the general implementation issues since it is necessary to

use a simple survey method that can be carried out by local government officials who do not have sufficient specialised knowledge and expertise.

### ( 1 ) Field survey in Kabesa

Kabesa is a village in Dazhi Zhoshuel Chiwog, located north of the capital Thimphu. Lham Pelzom house, situated in this village, is a candidate building. The condition of the members, the state of damage and structural features are analysed, and an appropriate restoration plan as cultural heritage is examined.

### ( 2 ) Field Survey in Punakha

Punakha Dzongkhag is located in central Bhutan, and on the west side of Thimphu Dzongkhag. It was the capital of Bhutan until 1955. The Tandin Zam house situated in the village of Changjokha on the eastern side across the river from the Punakha Dzong is a candidate building. The condition of members, the state of damage and structural features were analysed, and conservation and utilisation plans were examined on the premise of diversion for tourism use, based on the intentions of the owners and the characteristics of the surrounding area.

In addition, a case study was conducted to select candidate houses for designation as cultural heritage in Changjokha, Sopsokha and Yuwakha. Sopsokha and Yuwakha are situated about 10 km south of Punakha Dzong.

### ( 3 ) Field Survey in Haa

Haa Dzongkhag is in the alpine region area at the western end of Bhutan. Phub Lham house located in the Longlo village of Talung Chiwog along the left bank of the Haa river in the eastern part of Dzongkhag territory is a candidate building. The condition of members, the state of damage, and structural features were analysed, and conservation and utilisation plans for private residential use were examined, based on the intentions of the owners.

Besides, a case study was conducted on select candidate houses that could be designated as cultural heritage in Longlo and a neighbouring village Tshenkar.

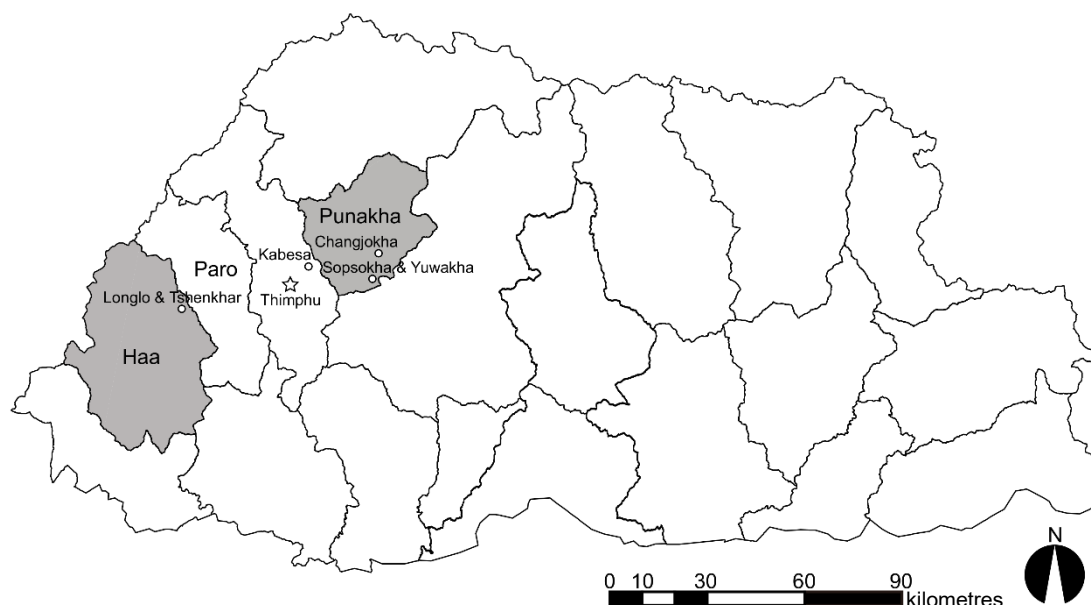


Fig 1. Field Survey Map

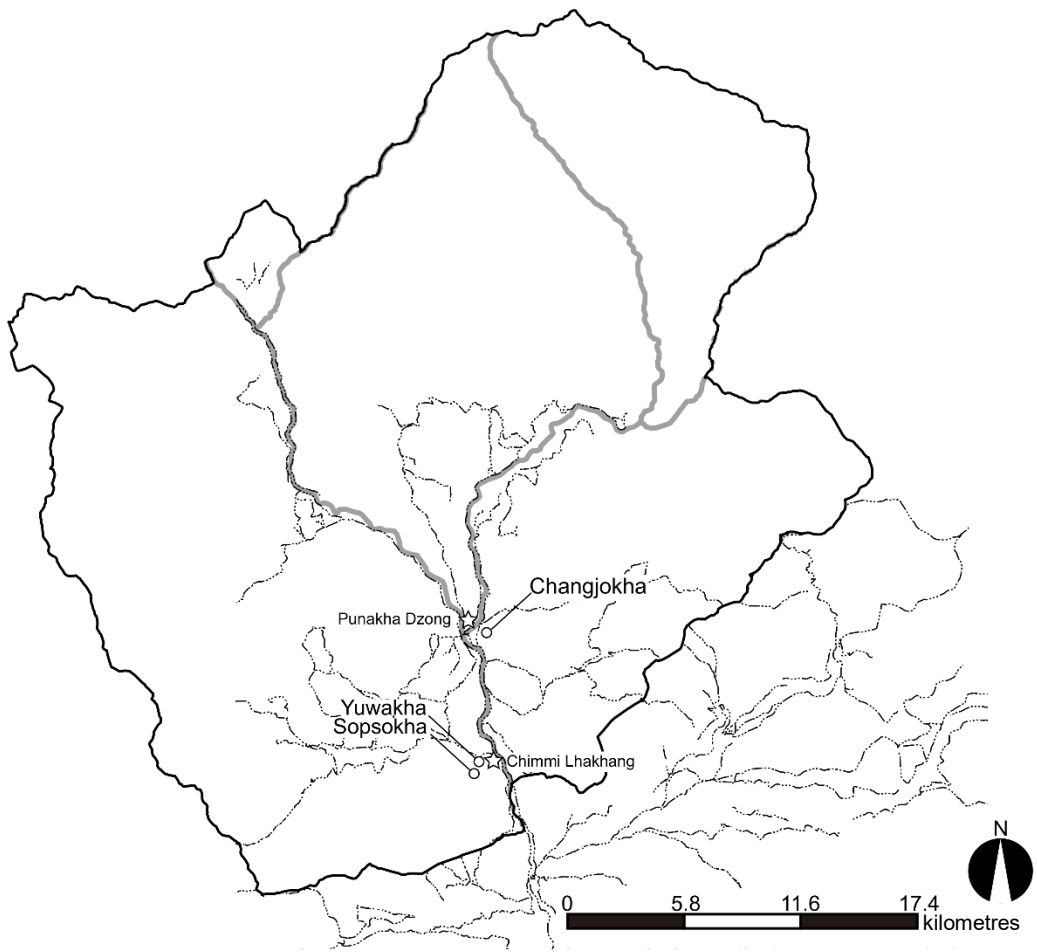


Fig 2. Field Survey Map (Punakha Dzongkhag)

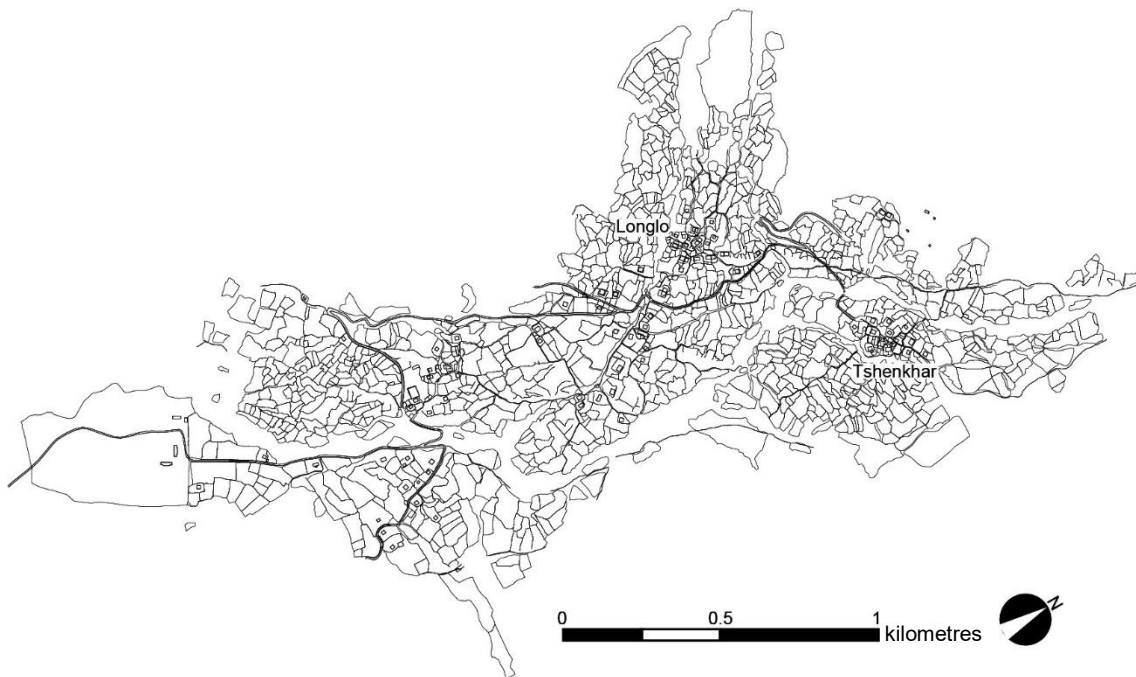


Fig 3. Field Survey Map (Talung Chiwog, Haa Dzongkhag)

#### 1- 4. Participants and Schedule

TNRICP conducted field surveys with the following participants and the schedule was under the scheme of the International Cooperation Program for Cultural Heritage, commissioned by the Agency for Cultural Affairs, F.Y.2019.

##### • Participants

TOMODA Masahiko (Director, Japan Center for International Cooperation in Conservation, TNRICP)

NISHI Kazuhiko (Head, Resource and Systems Research Section, TNRICP)

KANAI Ken (Head, Conservation Design Section, TNRICP)

ASADA Natsumi (Research Fellow, TNRICP)

EZURA Tsuguto (Professor, Okayama University of Science)

TSUMURA Yasunori (Associate Professor, Conservation Architect, Nagaoka Institute of Design)

UNNO Satoshi (Associate Professor, University of Tokyo)

MARTINEZ Alejandro (Lecturer, Kyoto Institute of Technology, former Research Fellow, TNRICP)

SUGASAWA Shigeru (Former Conservation Architect, Kyoto Prefectural Government)

KANADE Michiru (Former Conservation Architect, Japanese Association for Conservation of Architectural Monuments)

MUKAI Junko (Former Architect, DCHS)

Yeshi SAMDRUP (Architect, DCHS)

Pema WANGCHUK (Architect, DCHS)

Ugyen DORJI (DCHS)



Photo 1. Survey Scene (Tshenkhar)

##### • Schedule

20 August 2019 Departure to Bhutan (Transit in Bangkok)

TOMODA, NISHI, KANAI, MARTINEZ, ASADA, EZURA, UNNO, SUGASAWA, KANADE, MUKAI

21 August 2019 Arrival in Bhutan

Exchange of MOU and Meeting with DCHS (Thimphu)

22 August 2019 Field Survey in Kabesa

23~24 August 2019 Field Survey in Punakha/Field Survey in Haa

(TSUMURA) Arrival in Bhutan, (UNNO) Departure to Japan

• Punakha Team: KANAI, MARTINEZ, EZURA, SUGASAWA, MUKAI, Yeshi/Ugyen

• Haa Team: TOMODA, NISHI, ASADA, TSUMURA, KANADE, Pema

25 August 2019 Case Study for Adaptive Use of Historic Buildings in Paro

26 August 2019 Tentative Survey Report and Discussion with DCHS (Thimphu)

(EZURA, SUGASAWA) Departure to Japan

27 August 2019 Departure to Japan

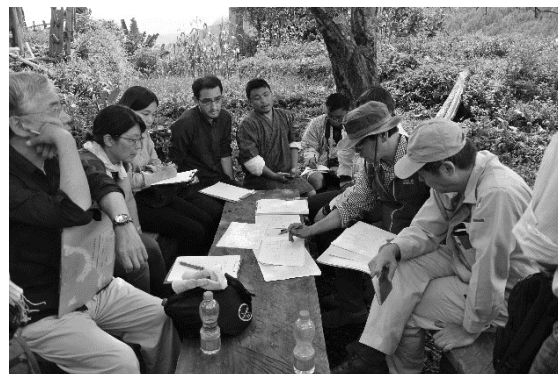


Photo 2. Survey Scene (Kabesa)

## 2. Previous Projects

### 2-1. Outline

The cooperation projects between Bhutan and Japan regarding the conservation of built heritage began with the ‘Conservation and Restoration Cooperation Project for Historic Buildings in Bhutan’, conducted by the Agency for Cultural Affairs from 1992 to 2002. During this period, the Tokyo University of the Arts (Prof. SAITO Hidetoshi) conducted the ‘Fundamental Research for the Preservation of Historical Buildings and Villages in Bhutan’, a Grant-in-Aid for Scientific Research from 1996 to 1998, with positive results. The earthquakes that occurred in 2009 and 2011 have increased the momentum for stricter structural safety standards for existing buildings in the government of Bhutan, mainly the Ministry of Works and Human Settlement. Meanwhile, the Ministry of Home and Cultural Affairs needs to take immediate action to reduce the impact of such regulations on traditional architectural culture, including general houses and cultural landscape.

In response to a request for assistance from Bhutan through the Japan Consortium for International Cooperation in Cultural Heritage (JCIC-Heritage), TNRICP implemented technical support and human resource development for the conservation of rammed earth buildings with regard to the ① establishment of structural evaluation and reinforcement methods, ② value evaluation methods as cultural heritage and understanding of conservation targets, under the system of international cooperation projects by the Agency for Cultural Affairs from 2011 to 2014. The results have been published as ‘Surveys on the conservation of rammed earth structures in the Kingdom of Bhutan’ (2015). Since 2016, the remaining issues on cultural heritage have been carried over to the ‘Research on the Typology and Chronology of Rammed Earth Buildings in Bhutan’ under the Grant-in-Aid for Scientific Research by TNRICP. The International Cooperation Program for Cultural Heritage, including this survey, is an extension of this research. The remaining issue on structural matters has been continued as ‘Earthquake Risk Assessment of Masonry Buildings and Development of Mitigation Technology in Bhutan’ under the Science and Technology Research Partnership for Sustainable Development (SATREPS) by Nagoya City University (Prof. AOKI Takayoshi).

Meanwhile, from 2015 to 2017, Kyushu University (Prof. KONO Toshiyuki) implemented the ‘Cultural Exchange Project for Heritage Conservation enhancing Human Resource Development and Heritage Education System in Bhutan’, under the aegis of international cooperation projects by the Agency for Cultural Affairs. Bhutan’s first comprehensive law on cultural heritage was drafted as part of the project. The bill is expected to be deliberated in the National Assembly shortly. If enacted and implemented, a legal basis for the designation of different types of historic buildings and cultural landscapes will be established.

### 2-2. Selection of Candidate Farmhouses

Through joint surveys and research in the cultural heritage field mentioned above, it has become possible to estimate the age of private farmhouses from architectural style. Accordingly, it is evident that private farmhouses that retain the original form of construction are limited in Bhutan, even though there are still many traditional private farmhouses all over the country. It is because those buildings generally underwent renovation and expansion several times. In particular, there are very few houses that seem to have been built more than 100 years ago, which still retain their original form.

The old private farmhouses, which retain their original form, are considered to be particularly valuable for understanding the unique culture and history of the country. Also, renovation and expansion should not be denied from the viewpoint of heritage conservation because those are carried out according to traditional standards, and can be regarded as part of the development process

of traditional culture. Therefore, as part of the results of the survey, TNRICP proposed to DCHS the following three old farmhouses which need urgent protective measures at the ‘Workshop on the Conservation of Rammed Earth Buildings in Bhutan’ held at DCHS in March 2018.

All those buildings have massive rammed earth walls with a few small windows, some indications of renovation and expansion by later generations, although they still retain their original architectural forms. Furthermore, each building has its location and historical background such as (1) located near Thimphu is an example around an urban area, (2) located near Punakha Dzong suggests it is in the old capital area, and (3) located in Haa means a rural village in a mountainous region.

#### ( 1 ) Lham Pelzom house in Kabesa

It is one of the two oldest houses in the village, located in the north of Pangrizampa Lhakhang, built on the former residential site of Ngawang Namgyal. Another house is said to have been built at the end of the 17th century. However, it has now been converted into a school facility of the Choki Traditional Art School in 1999 and wholly renovated. Meanwhile, the Lham Pelzom house has almost no modification made by the later generations, and it still retains its original form. It is also believed to be built at the end of the 17th century considering the similarity of the processing of wood and style of window frames. It is considered to be one of the oldest private houses in Bhutan, which retains its original form even today. Besides, it appears very similar to a private farmhouse depicted in the Samuel Davis sketch of 1783, and is likely to represent a typical style of traditional farmhouses in the region.

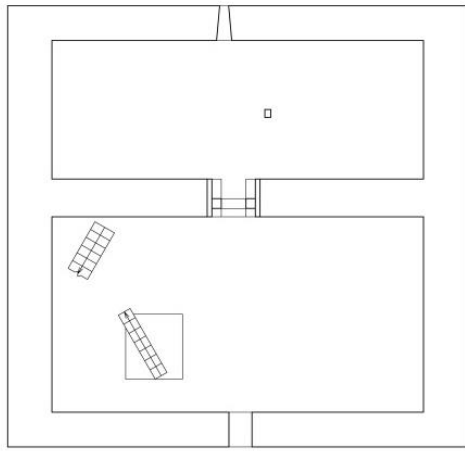
The building faces the west and is composed of a three-storey rammed earth wall, a wooden gable shingle roof and a wooden veranda protruding from the front of the third floor. The outer wall is relatively thick, about one metre at the bottom, and the four corners are largely tilted inward (each corner has a tapering). The appearance is very closed with almost no window except in the front. The first and second floors are bisected into the front room and the rear room by an inner rammed earth wall, and the third floor comprises one room with no inner wall. It is believed that the first floor was used for livestock huts, the second floor for storage and the third as residence. The openings on the third floor are only a narrow doorway in the centre of the front and a small window at the top of the ridge, and it is very different from the traditional houses often seen today. It is believed to convey the characteristics of the primitive living space of Bhutan.

The building has been unoccupied from around 2008, and the deterioration over time was significant with a partly collapsing roof and veranda at the time of the survey in 2013. The inner wall and the wooden structure collapsed, leaving the outer wall in 2017, but it is still retained at a level where it can be restored as a cultural heritage site because the collapsed timbers have been recorded, collected and stored in a temporary shed through first aid work, as part of joint research in 2018.

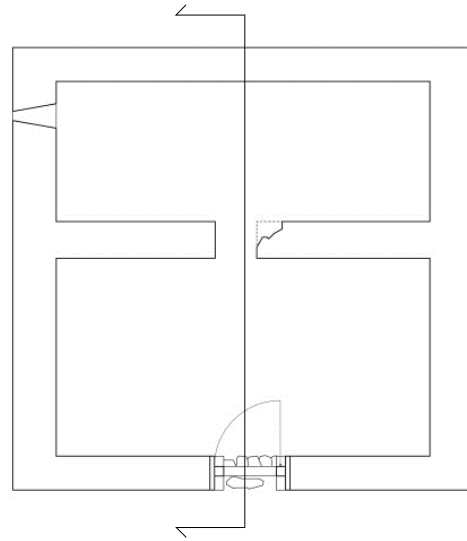


Photo 3.,4. Lham Pelzom house in June 2013 (left) and in August 2019 (right)

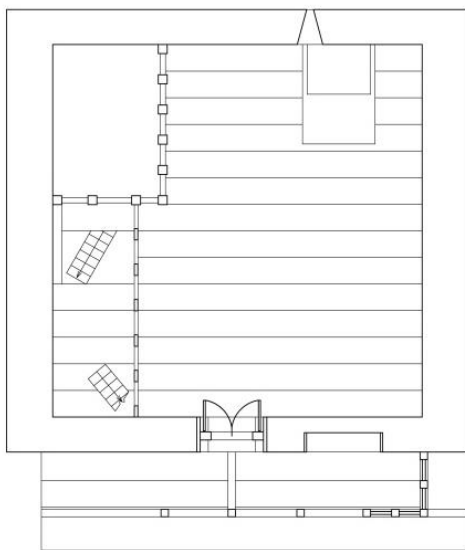
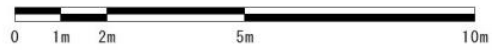




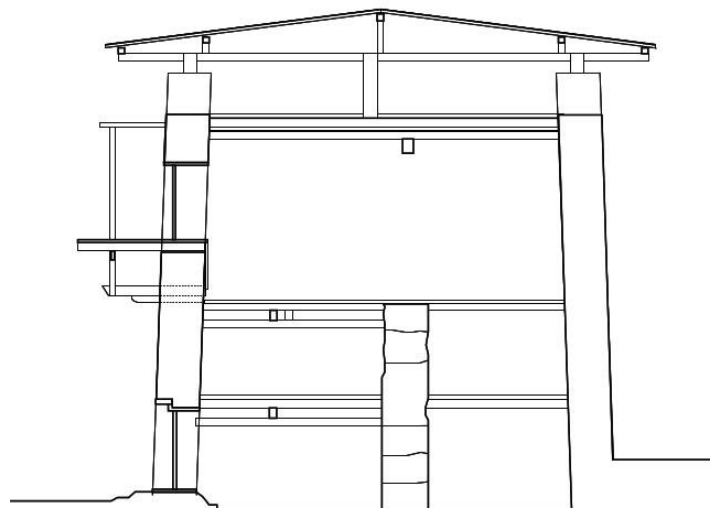
Second floor



First floor



Third floor



Cross section

Fig 4. Drawings of Lham Pelzom house

## ( 2 ) Tandin Zam house in Punakha

This building is situated in the village of Changjokha, overlooking Punakha Dzong across the river. Changjokha is one of the villages that moved seasonally following the monk group, and its location indicates a close relationship with Punakha Dzong. The construction of Punakha Dzong is considered to date back to around 1638, and this is the upper limit for the establishment of Changjokha. Besides, the landscape of Punakha Dzong's opposite hill depicted in Samuel Davis' sketch of 1783 is very similar to the current landscape of Changjokha, and the building is considered to have likely been built before the 19th century.

The building faces the west and is composed of a three-storey rammed earth wall, a wooden gable steel roof, and it has a front yard that is surrounded by the rammed earth wall from the front to both sides. It has a tower-like appearance with a height relative to the building area, and the outer wall has a standard thickness of about seventy-five centimetres at the bottom, and the four corners are largely tilted inward (each corner tapers). There is an entrance on each floor in front of the building and it is connected with an external staircase. It can be understood from the remaining traces, that an internal staircase connected with the second and third floors, and later the south window on the western side of the third floor was added to the entrance, while the north window was enlarged. A veranda was initially set up on the window on the south side, but it was removed later and then renovated to a large window. The first and second floors are bisected into the north room and the south room by an inner rammed earth wall, and the third floor is also divided into two rooms by a wooden inner wall. It is believed that the first floor was meant for livestock huts, the second floor for storage, and the third floor as a residential area. The grain storage on the northern side of the first floor is a unique component where entry is only from the second floor, and it is believed to be a feature that houses of leading members exclusively have.

The building has a partial modification of later generations, but still effectively retains its original form considered to date back to the 18th century. Such tower-like closed farmhouses are often depicted in Samuel Davis' sketch of 1783, and is considered to be one of the typical architectural styles of farmhouses in western Bhutan in the 18th century. It is also worthy of being well managed by the owner and is in good condition despite the current non-resident situation.



Photo 5.,6. Tandin Zam house, whole view (left), front (right)

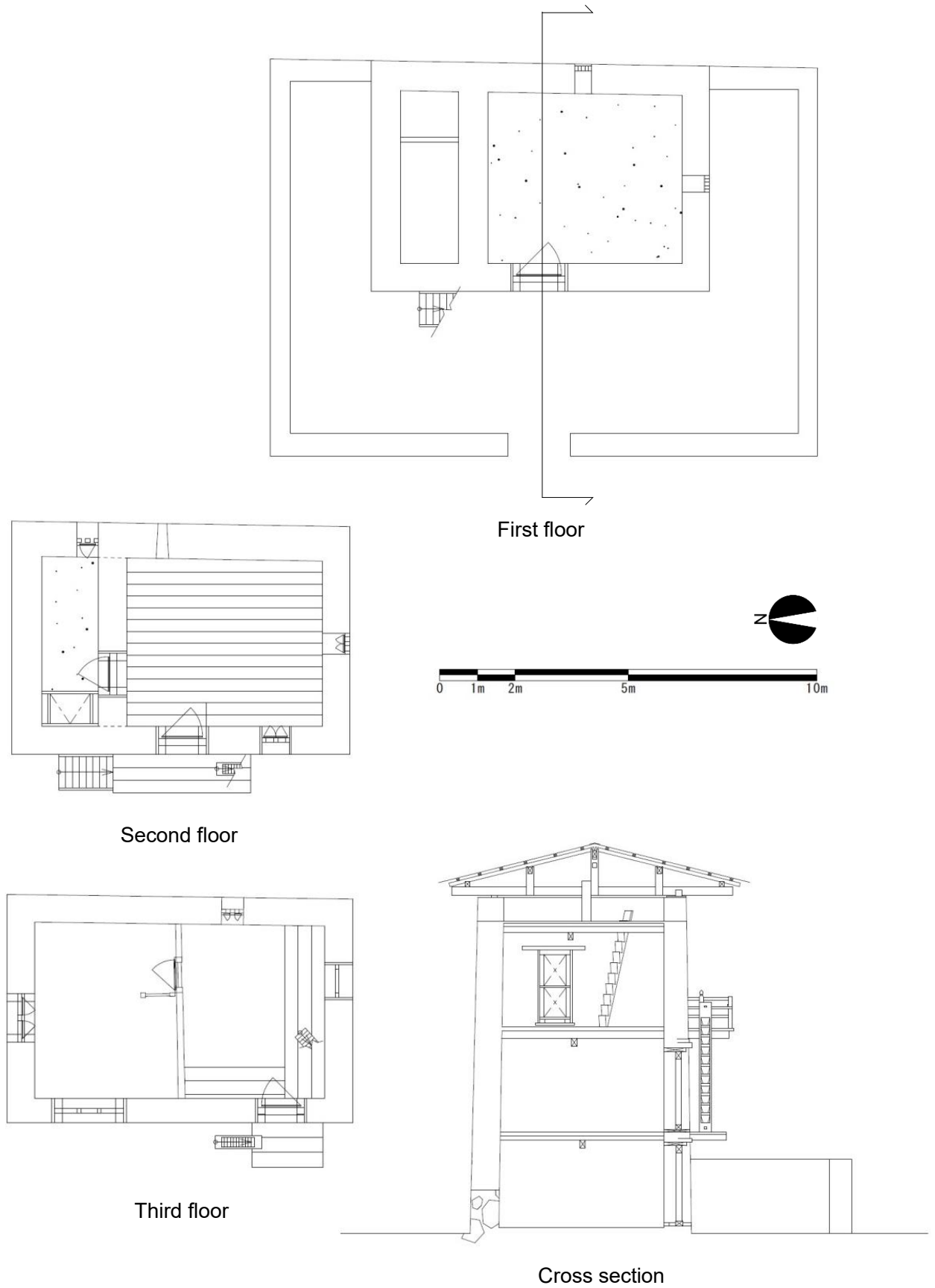


Fig 5. Drawings of Tandin Zam house

### ( 3 ) Phub Lam house in Haa

The building is on a gently sloping land at the end of the village of Longlo, located in the innermost part of the left bank of the Haa River. Longlo is one of the standard types of villages in the mountain area of Haa Dzongkhag. Although the time of construction is unknown, it is considered to be the oldest of all existing houses in Haa Dzongkhag, as it closely resembles the characteristics of old houses estimated from the ruined houses left in abandoned villages in the neighbourhood.

The building faces the south and it comprises a two-storey rammed earth wall, a wooden gable shingle roof, and a front yard that is surrounded by a stone wall. There is no trace of expansion or renovation on the outer rammed earth wall, and the four corners are largely tilted inward (each corner tapers). The entrance and windows also seem to be very old-fashioned and are considered to have retained their original form. The first floor is a livestock hut, and the second floor is divided into the east room and west room by a partition. The west is a living room with a kitchen, and the east is a Buddhist altar room. The partition also appears old-fashioned, but it is considered that each floor was initially a single room because the floorboard stretches beyond the partition, and oven ash covers the entire ceiling. The floorboard is thick and directly stretches on the log structure. It is believed to convey the old technique before extending the method of soil sandwiching the soil (heat insulation layer) between the floorboard and the structure. The entrance is on the western side of the second floor with an attached lower shed. It is understood from the remaining traces that the two windows that opened to the southern side of the second floor were both originally entrances with pairs of swing doors. A veranda is now only on the western half of the southern side, but it is said that it originally extended to the east and connected to the overhanging toilet at the end of the eastern side, and part of those traces remains on the corner of the outer wall. The roof has deteriorated over time, and the plastic seat uses some parts instead of traditional materials. However, the original materials, including the structural frame, are in good condition and convey the original specifications such as laths tied with bamboo twigs and roofing boards.

The building was used as a residence until recently, and well maintained in a healthy state as a whole. Also, there are minor defects in certain parts of the outer wall. It is a valuable existence that effectively retains the old standard architectural style of farmhouses in the mountain villages in the western part of Bhutan.



Photo 7.,8. Phub Lam house, front view (left), side and back (right)

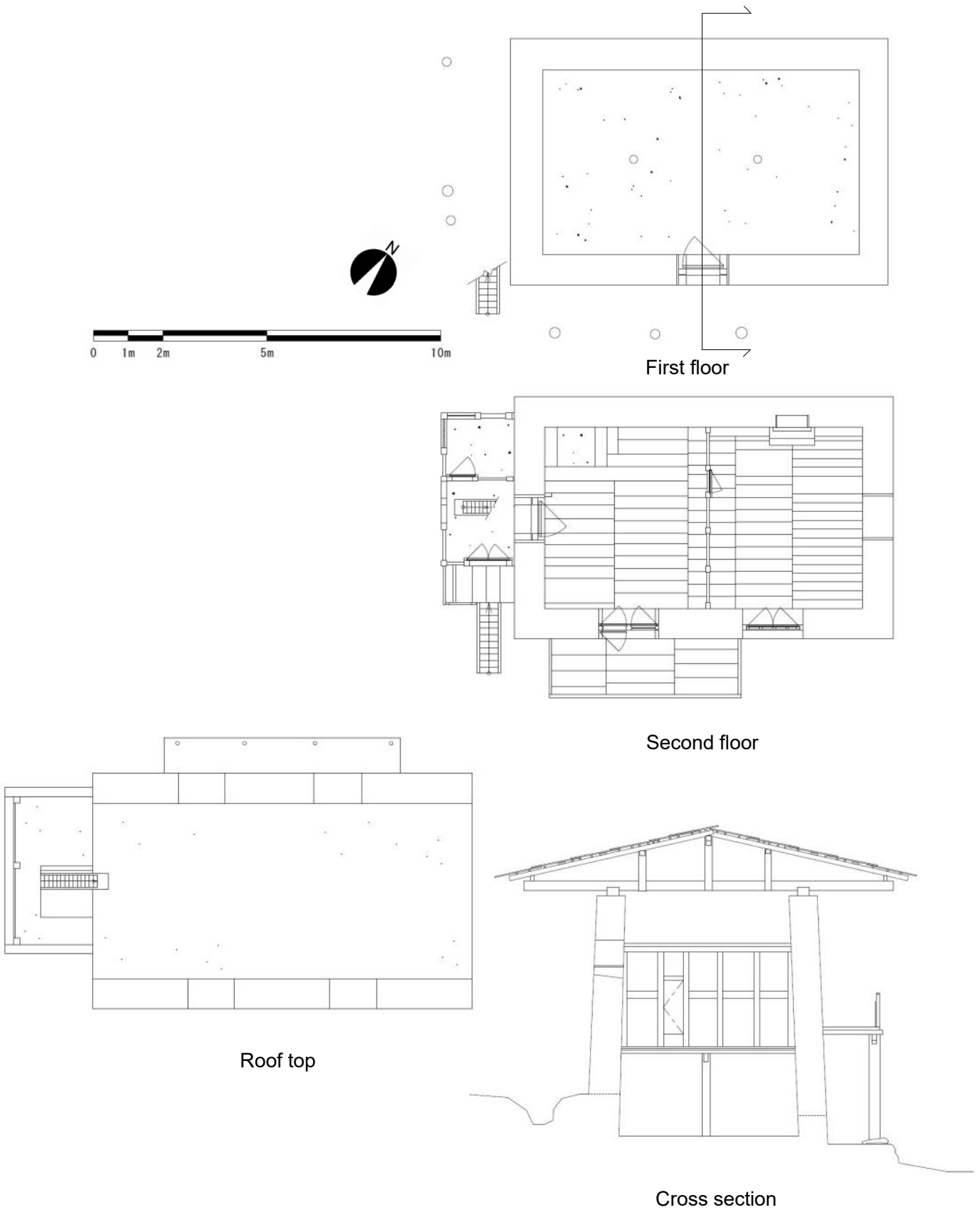


Fig 6. Drawings of Phub Lam house

## 2-3. Chronological Index of Farmhouses

### ( 1 ) Analysis of Remaining Traces and Examination of Original Condition

Traditional farmhouses in Bhutan are composed of the main portion and attached parts, which are mainly made with the rammed earth wall, with wooden parts such as roofs, flooring, entrance and windows. Two-storey or three-storey is standard, and the first floor is usually used as a livestock shed.

Traditional farmhouses generally have made many modifications later, and it is understood that they have expanded their scale by adding the rammed earth wall. In many cases, it expands the building area to the depth direction and sets a living room on the front side for daylighting. In some cases, it further expands behind the area. In the mountainous region with a few flat fields, it is possible to expand the direction sideward, because of the difficulty of expansion in the depth direction. In such cases, there is an unusual example to form an L-shaped plan because the depth of the extended part is larger than the existing part. Besides those, there are some examples of stacking the rammed earth wall and expanding the height direction.

In relatively new farmhouses, it is common to secure lighting of the living space by using wooden walls and windows on the upper floor. Also, there are many cases of renovation where the rammed earth wall is replaced with walls and windows made of wood. The roof is particularly easy to modify, and regularly replaces roofing materials and rafters, but old materials sometimes remain on beams and bundles linked to those.

The aforementioned work is part of the method of modification of farmhouses, understood from the traces both on the rammed earth wall and the wooden part. For example, in the case of the addition of the rammed earth wall, the foundation construction method beneath the wall may differ, and the width of the wall itself and the unit of the rammed earth may vary depending on the construction period. In the case of the wooden portion, the holes of the door bearing may remain at the place where it used to be the entrance, and the retrofit partition may be recognisable since the floorboard passes under the partition.

These are examples of analysis of the remaining traces, and it is essential to confirm the development process and original form of traditional farmhouses.

### ( 2 ) Typology of Traditional Farmhouses

There are various types of traditional farmhouses in Bhutan. As mentioned above, it is structurally composed of the rammed earth wall and the wooden part, and can be classified into Types A to D, based on the rammed earth wall as the main structure.

Of course, the classification based on other indicators such as the position of the entrance may be possible, but the classification based on the rammed earth wall indicates the structural transition of farmhouses and matches the chronological index, which is mentioned later.

#### A. Full Wall Type

A-1. Full Rammed Earth Type (no window)

A-2. Full Rammed Earth Type (niche window)

A-3. Full Rammed Earth Type (wooden frame window)

#### B. Sleeve Wall Type

B-1. Sleeve Wall Type (non-bay window on the front)

B-2. Sleeve Wall Type (bay window on the front)

C. Three-sided Window Type

C-1. Three-sided Window Type (non-bay window)

C-2. Three-sided Window Type (bay window)

D. Types other than the above

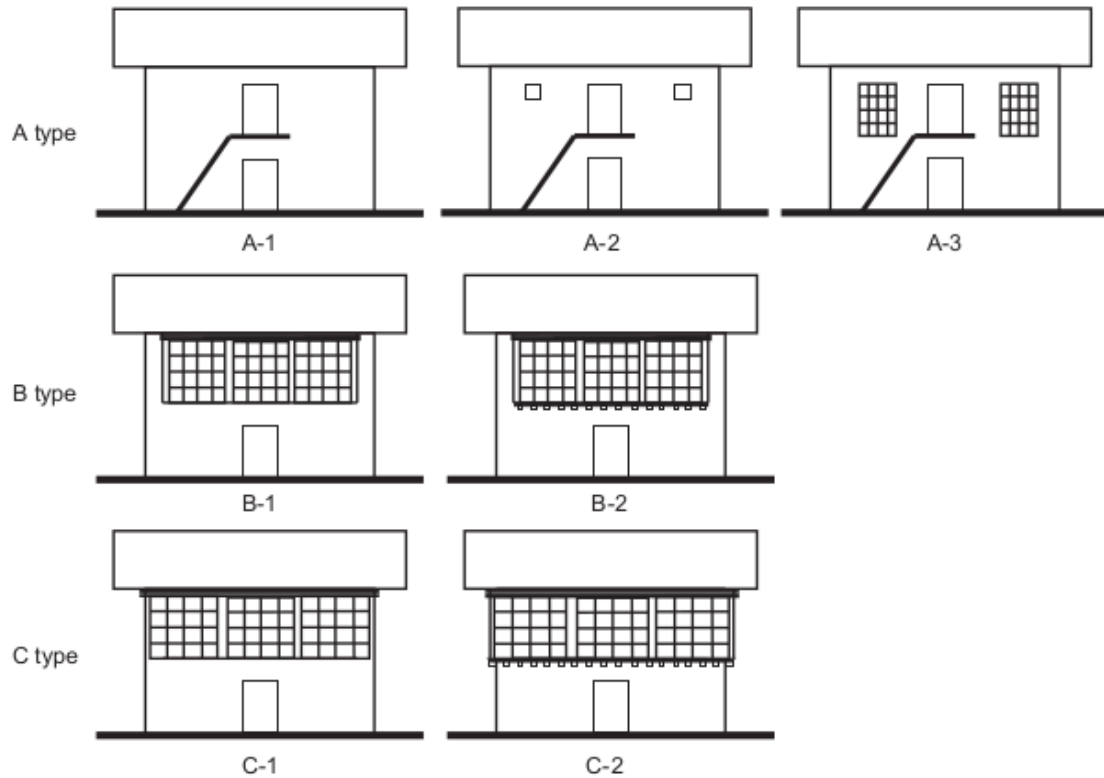


Fig 7. Building types of traditional farmhouses

In Type A, the outer wall extends to all four sides, including the upper layer, and the openings are limited to entrances and a few windows. It can be divided into (A-1) those that do not have windows, (A-2) those that use small windows with wooden lintels and (A-3) those that have relatively large windows with wooden frame.

Type B has a large wooden window frame on the front of the upper layer and sleeves on both sides. Classified by the type of window, it can be divided into (B-1) the window including sleeves that does not overhang from the wall and (B-2) the window overhangs from the wall with brackets and makes it a bay window. Type B farmhouses are widespread, especially in Haa Dzongkhag, and there is a possibility of showing regional characteristics.

Type C has windows on the front side and the front half of both sides of the upper layer. Classified by the type of windows, it can be divided into (C-1) the windows do not overhang from the wall and (C-2) the windows overhang from the wall with brackets and make it a bay window.

Meanwhile, Type D cannot be classified into A to C, and includes a bay window on both the front and the rear, and it has a type of L-shaped plan. It should be noted that those types may be the result of a modification, and the original form may be classified as Type A to C.

### ( 3 ) Chronological Index

When considering the building date of traditional farmhouses, it is preferable to determine with historic written materials, but it is not possible to make a chronological index on an absolute scale because the existence of such materials for farmhouses has not been confirmed yet in Bhutan. On the contrary, as mentioned in the previous section, it is possible to prepare a chronological index on a relative scale from the transition of the building type.

Considering the chronology of Type A to D, it is understood that there is a tendency to increase the number of openings in the wall for daylighting from a closed configuration, and the time-series changes from small windows to large windows and bay windows. Subsequent changes are related to the timing of the bay window invention. It is thought to be transformed to B1⇒B2 or B1⇒C 1 in the first phase, then transitioned from B2 · C1 to C2, and eventually developed into a three-sided window type. It is organised, as shown in Figure 7.

Besides, the chronology based on the building types and the features of rammed earth wall, wooden materials, design details and colouring may also be possible. In particular, concerning the rammed earth wall, it can be seen that the more significant the inward inclination (taper) and the thicker the width of the wall, the older the construction date. The height of the construction unit and the thickness of each layer of the rammed earth wall (about three to five millimetres) may show the difference in the construction date, but it is not clarified to function as a chronological indicator at present. It is a subject for future analysis.

The building types based on the rammed earth wall can be a specific chronological index, but the features of the rammed earth wall, wooden materials, design details and colouring have yet to become clear indicators. However, those are possible elements that can function as the chronological index in the future, and the following are the characteristic points of those.

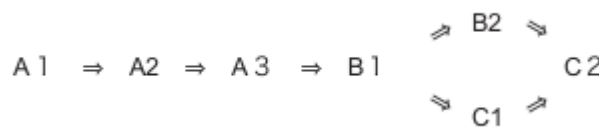


Fig 8. Chronology of building types

As for the wooden materials, there are generally traces left skilfully on pillars and floorboards, and the ones completed with hatchets appear to be relatively old, although there is a possibility to use second-hand materials. Also, it is still unclear to gauge the difference in the era by the shape of the hatchet blade. The difference in the thickness of the wooden material is a possible feature that it may serve as an indicator, although it is also unclear at present that there was technical development to reduce the cross-section of wooden structural materials in history. The economic situation of the owner and the regional environment of timber supply are supposed to influence the choice of timber for the construction greatly. After all, it is still difficult to become a precise chronological index for now.

It appears that the newer design details and colouring tend to be more complex shapes and patterns. It should be noted that the decorations are reused from other buildings or often modified, and may not match the construction date.

The provisional chronological index clarified from the previous surveys is as above. Further development of research on chronology, including methods for determining an absolute scale is expected from now on.



### 3. Examination of Restoration Plan and Utilisation Plan of Farmhouses

#### 3-1. Restoration Plan for Lham Pelzom house (Kabesa)

According to an interview with the owner by DCHS, Lham Pelzom house was accommodated by the owner's family until mid-2011. They moved to another house within the plot after the 2011 earthquake, and the building has been lying vacant since then. The abandonment of this building may not be directly due to the damages caused by the earthquake, but due to skepticism about stability of stone masonry and rammed earth buildings generated by the series of earthquakes occurred in 2009 and 2011, and the dissemination of the engineered buildings by the Ministry of Works and Human Settlement. The building has deteriorated over time due to leakage caused by rains. In 2017, The rammed earth wall of this building that divides the interior space collapsed, as did the wooden part and roof supported by the wall. At this time, the owner wanted to rebuild the house, but the local government had temporarily banned the removal of all existing buildings in the area. This was because the government was in the process of developing the local area plan since Kabesa was designated as a satellite town of Thimphu Thromde. However, the plan is still in the review stage because the public consultation hasn't reached consensus. This building still exist as of today, not only because of the process of the urban development administration but also due to continuous communication initiated by DCHS.

In order to protect the building as cultural heritage, it is essential that stakeholders share a consensus, clarifying what policy and methodology of restoration is appropriate. Besides, private farmhouses are individual property and part of the community. When trying to preserve private farmhouses as cultural heritage sites, it is necessary to consider not only its historical value but also the owner's benefits from the point of utilisation.

#### ( 1 ) Objective

The goal to restore the healthy state of the building before damage due to ageing has progressed because the building has still retained an extremely high historical and cultural significance as the oldest existing private traditional house in Bhutan.

Regarding utilisation after restoration, TNRICP proposes measures that can most effectively return its cultural value to users, reflecting the opinions of owners and local governments through future discussion. From the viewpoint of respecting cultural value, it is desirable not to involve the addition of modern facilities, such as the traditional house museum that contributes to educational use.

#### ( 2 ) Methodology

##### • Rammed earth structure

Each corner falls slightly inward, and cracks and defects are partly generated, but because it is structurally stable, it is limited to the minimum partial reinforcement as much as possible. The collapsed portion of the inner wall will be rebuilt using the traditional method. The joint with the existing part should be tightly embedded with timbers. In terms of structural reinforcement, ① tightening with large L-shaped hardware inside each corner, and ② locking with anchor bolts at major cracked parts, are considered adequate. It is effective to use ① L-shaped hardware also on the outside and sandwich each corner of the wall with anchor bolts, if sufficient axial tension cannot be expected for bolt tightening on the rammed earth wall. However, since the strength and engineering characteristics of rammed earth are unknown, it is necessary to confirm its effectiveness through construction tests and experiments before deciding concrete reinforcement methods.

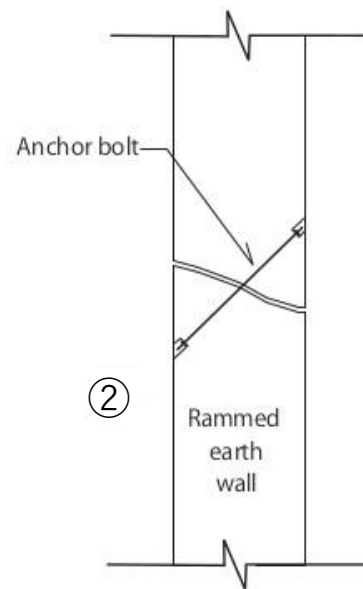
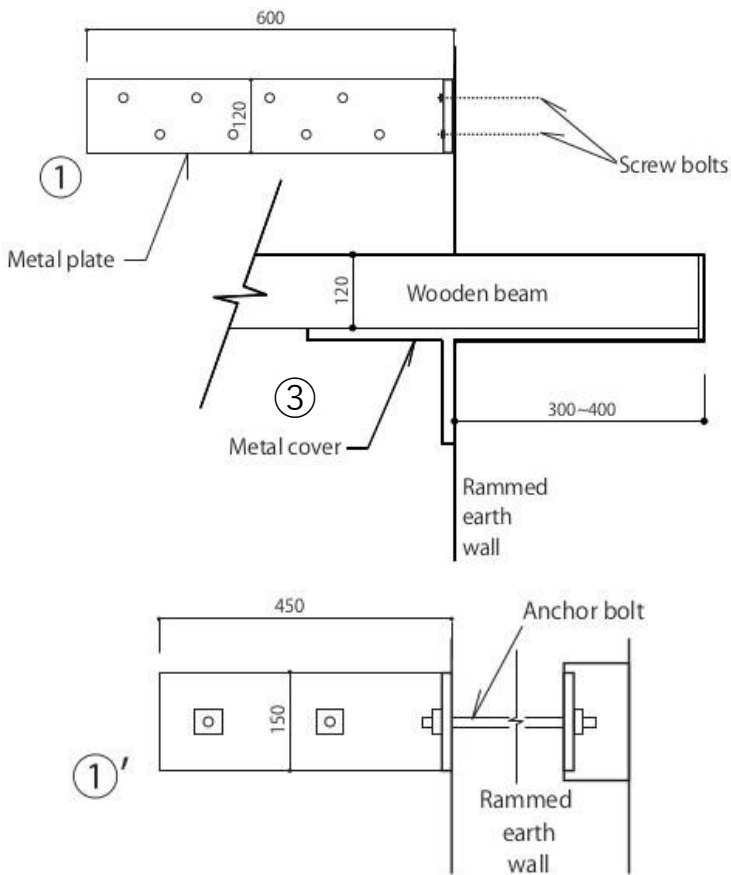
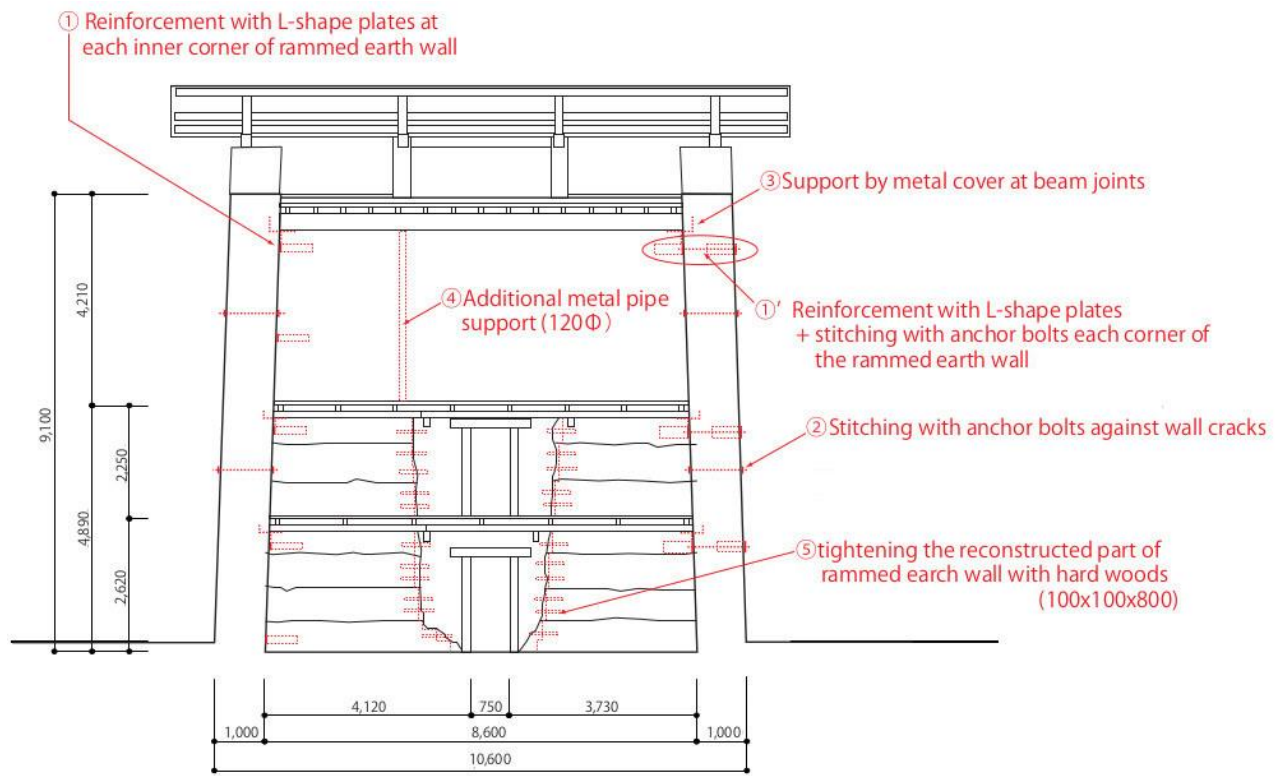


Fig 9. Restoration methods of rammed earth structure and wooden structure

- Wooden structure

In principle, the existing timbers will be reused. It is imperative to minimise partial repairs of decayed and missing parts, and try to retain existing timbers as much as possible. Items that are decaying or missing and have not retained their original shape anymore will be renewed using materials of the same quality. In terms of structural reinforcement, ③ curing with a metal plate or wooden support at the joint holes of the rammed earth wall, and ④ adding supporting columns in the middle of the third floor (top floor) room are considered adequate. However, it is necessary to add further reinforcement materials depending on the expected usage situation, such as the number of people remaining indoors at all times.

- Structural reinforcement

The method of integrating the rammed earth wall through ① the core member such as a steel rod in the in-plane direction near each floor height of each wall is considered to be the simplest and most effective. However, this method requires a high-level drilling technique and special tools that can penetrate the wall straight in the longitudinal direction over 10 metres. An alternative method of consolidation by ② tightening a wire or a band around the exterior of each floor is conceivable. In this method, a wide range of materials such as steel wire, carbon fibre and polypropylene band can be selected, it is technically simple and can be used to develop a general method for reinforcing traditional farmhouses.

Another method of reinforcement by constructing an independent steel frame structure inside is also plausible. The advantage of this method is that stability can be certainly secured, and it can eliminate the need for direct reinforcement to the original materials, not only by minimising interference in its cultural value, but also ensuring reliable structural stability in engineering. Besides, it is possible to flexibly cope with various usage situations by adjusting the design of the independent steel frame. Meanwhile, it is necessary to make a design that does not harm the characteristics of the internal space and to ensure reversibility in construction, since unusual and unessential materials are inserted inside.

- Management

From the management point of view, it is conceivable to rebuild the roof with a new structure and materials instead of restoring the original roof, as an alternative method to increase the durability of the material against ageing and reduce the labour of daily repairs.

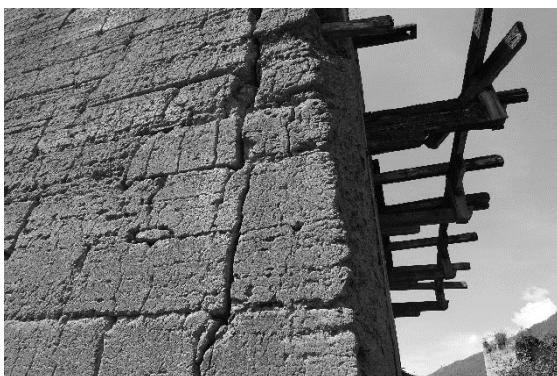


Photo 9. Distraction at the corner of rammed earth wall (left)  
Photo 10. Temporary storage of wooden parts (right)

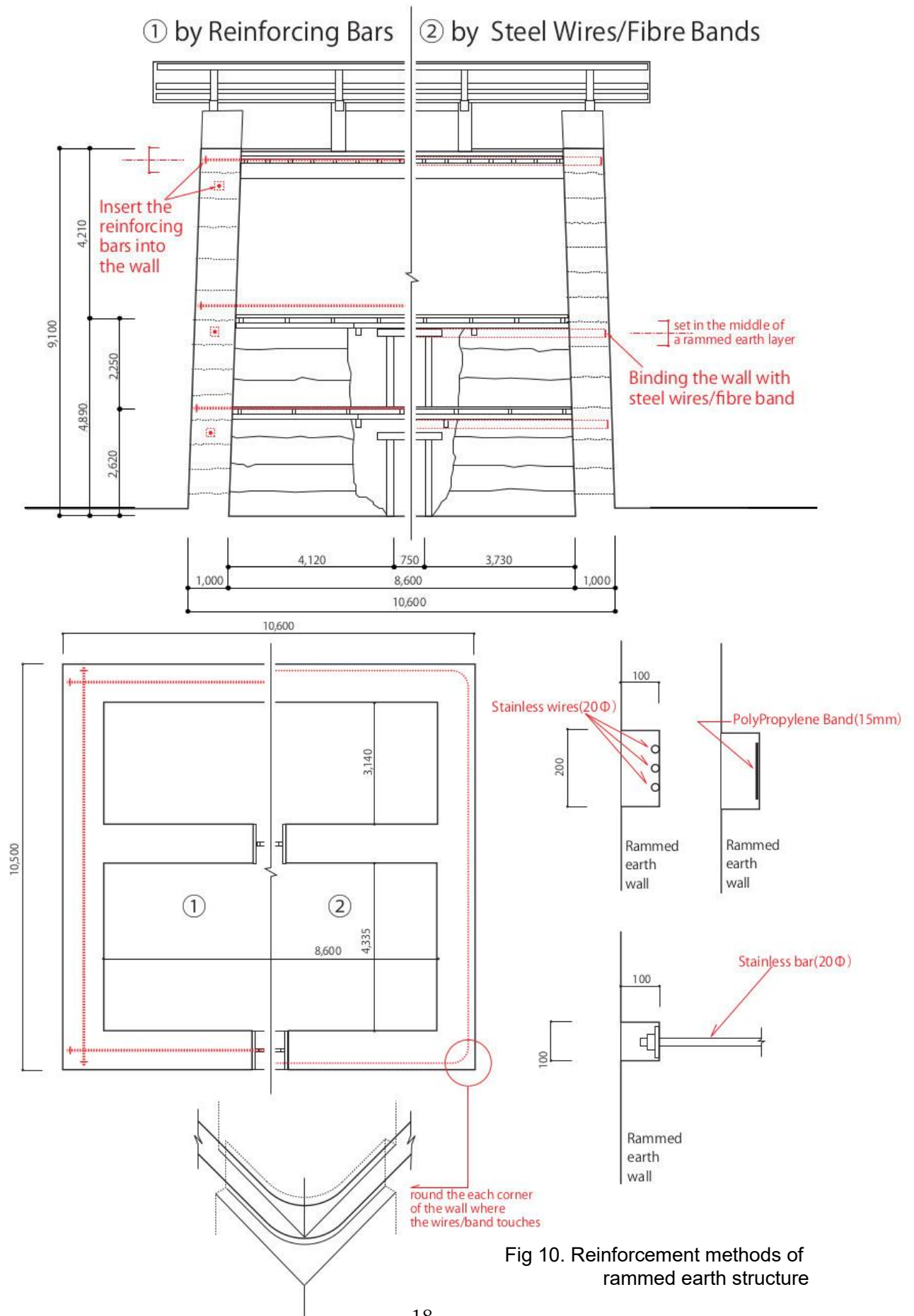


Fig 10. Reinforcement methods of rammed earth structure

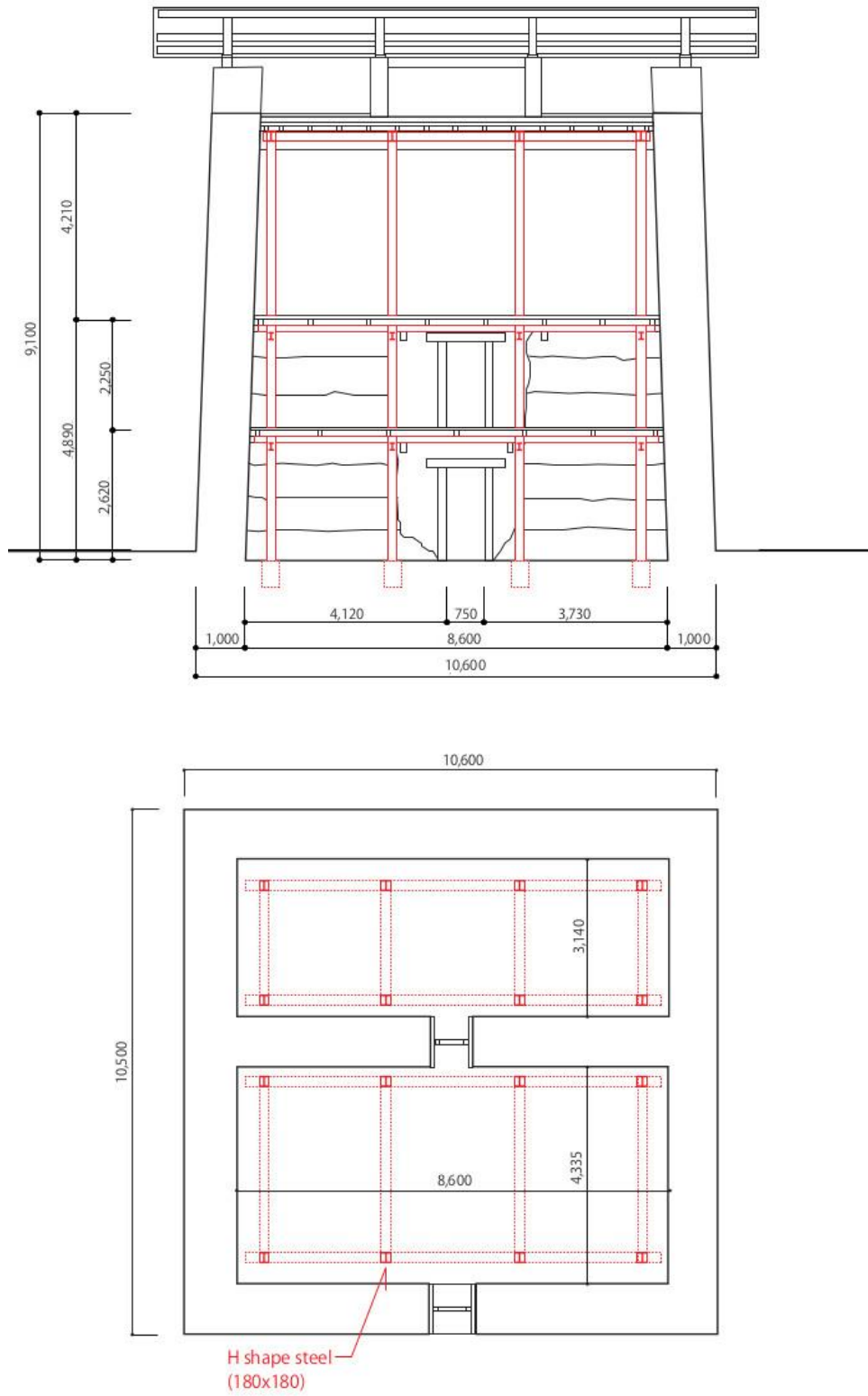


Fig 11. Reinforcement by independent structural frame

### ( 3 ) First Aid Action

The rammed earth wall of the building is in relatively good condition given its excellent construction accuracy. However, after the collapse of the roof and the wooden portion, it has been exposed to wind and rain over four years, and there is a possibility that it will take several years more to commence restoration work. It is strongly recommended that effective countermeasures are taken as soon as possible.

#### • Installation of Temporary Roof

In order to maintain the rammed earth wall, it is essential to protect it from rain, and it is conceivable to install a temporary roof that covers the existing wall as an effective measure. The temporary roof preferably has a structure that can withstand the wind and rain until the start of restoration work, and it is desirable it is completed before the rainy season (around June). The National Center for Hydrology and Meteorology (NCHM) monitors the meteorological data in Thimphu, but the information is not accessible to the public, and it is necessary to request the data from NCHM. In addition, from the standpoint of feasibility, it is also necessary to determine the specifications in consideration of the reality of the construction circumstance, including the budget and standard technology in Bhutan.

The following three proposals A to C, are shown for comparison. In any case, it is appropriate to use a CGI (Corrugated Galvanised Iron) sheet that is the most commonly used roofing material in Bhutan. It is inexpensive, readily available and reusable.

#### A. Housetop Roof with External Scaffolding

The plan is to install a scaffolding around the outer wall from the ground, and a temporary roof covering the entire building. It is the most desirable structure considering that it can be installed without applying load to the rammed earth wall and it can protect it completely. However, the high installation cost is considered to be a hinderance (BTN 1,300,000 estimated by DCHS).

#### B. Housetop roof

The plan includes placing a large temporary roof on the wall covering the entire building. It is possible to replicate the original shape of a farmhouse, and preferably from the point of view of maintaining the landscape. However, it is necessary to fix the temporary roof to the ground anchor with a wire in order to protect it from the wind. In some cases, it may be necessary to bind it directly to the rammed earth wall. Problems such as the load of the temporary roof and the wind pressure applied to the temporary roof sustained by the rammed earth wall could destroy the wall itself.

#### C. Wall-top Roof

The plan is to place a temporary partial roof that covers only the top of the rammed earth wall, similar to a small roof over the top of the boundary wall. However, the wall surface cannot be protected sufficiently since the eaves cannot be projected out enough, but the advantage is that the installation costs can be minimized (BTN 100,000 estimated by DCHS).

For the present, it is practical to consider the installation of a simple temporary roof that protects only the top of the existing wall as in Plan C by around May 2020. The installation of a temporary roof with the external scaffolding as in Type A shall be considered if the commencement of the full scale restoration work would not materialized soon. Regarding the cost burden of the temporary roof installation, it is crucial to explore the possibilities extensively while discussing with DCHS.

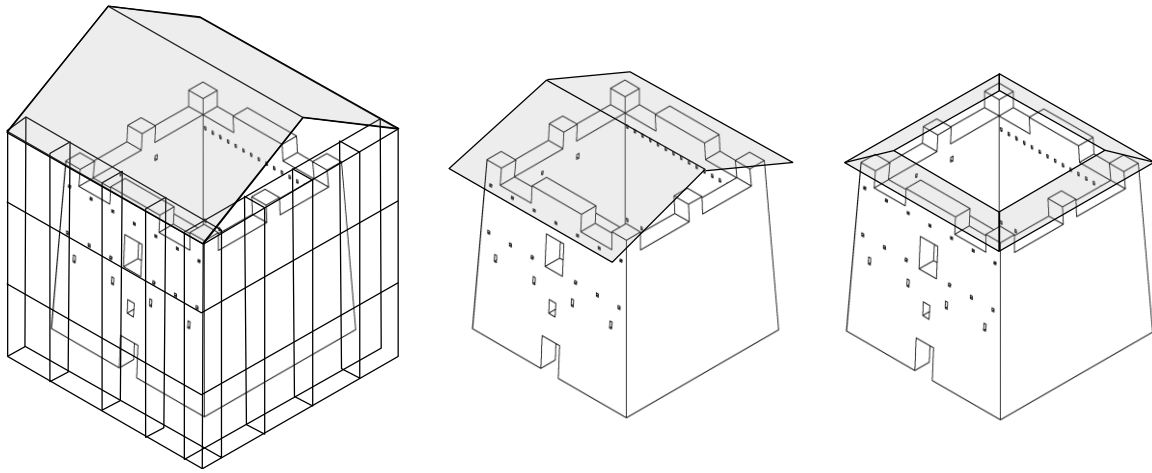


Fig 12. Temporary roof options  
Housetop roof with external scaffolding (left), Housetop roof (middle), Wall-top roof (right)

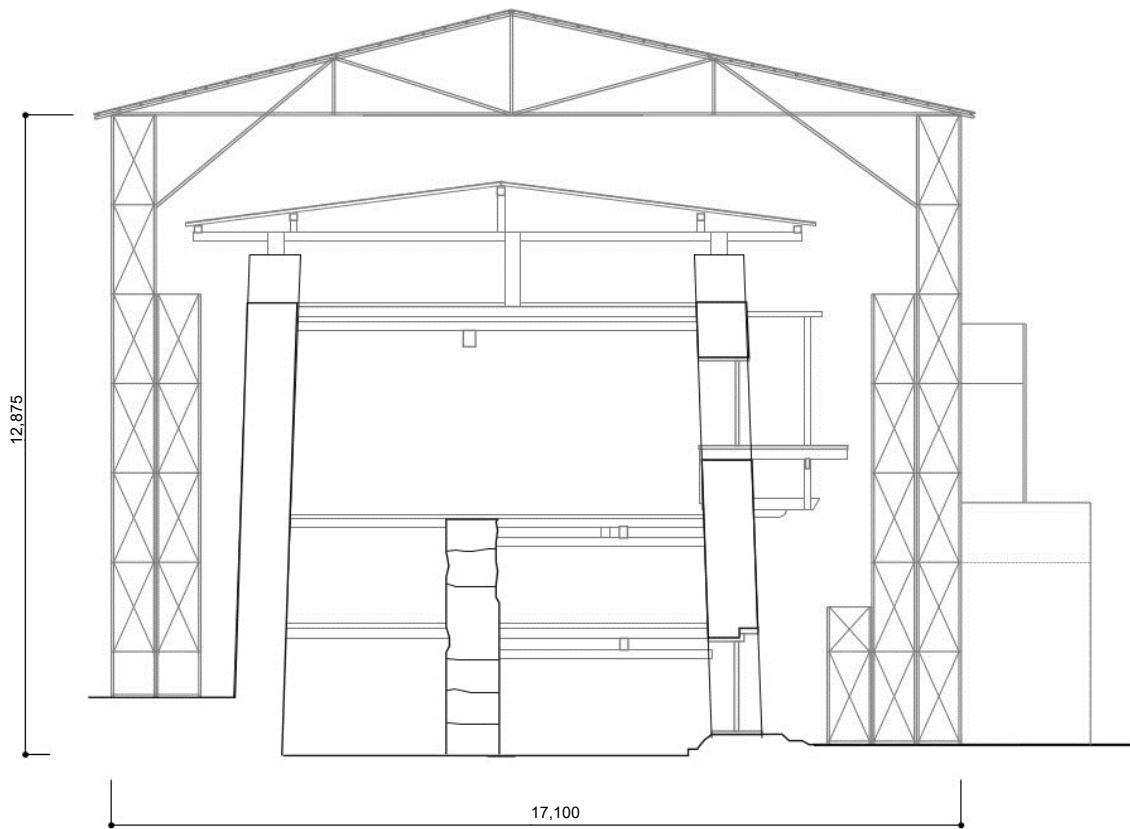


Fig 13. Detail Section of temporary roof with external scaffolding



### 3-2. Conservation and Utilisation Plan for Tandin Zam house (Punakha)

The owner of the Tandin Zam house is currently considering converting it into a restaurant in order to promote tourism, and a concrete renovation plan was proposed to the owner by an architectural consultant in August. It can be appreciated that this proposal is a relatively modest plan that takes advantage of the characteristics of a historic building. Conversely, in order to ensure the cultural value, it is essential to clarify what has to be preserved, and what kind of maintenance and management is required before creating a concrete renovation plan, and ensure that all stakeholders share a common understanding of the conservation policy.



Photo 11., 12. Example of private development utilising a traditional farmhouse into a small lodging facility and restaurant (Thimphu)

#### ( 1 ) Objective

This building has a high historical and cultural value as an existing traditional Bhutanese farmhouse, which remains relatively old style with minimal extension and renovation. Therefore, intervention for existing materials should be avoided as far as possible from a conservation perspective, and it is desirable to provide the necessary utilisation facilities in the outer vacant space so that they do not significantly interfere with the appearance of the existing building.

This building is in a generally healthy condition and it is not in an urgent need for restoration. From the standpoint of visualising the cultural value, it is important to use not only the wooden part, including beams, pillars and flooring, but also the built-in shelves, oven and ash stains on the ceiling and wall, as part of interior decoration. Similarly, it is essential not to install new entrances and windows or remove the inner wall in order to maintain the cultural heritage value.

It is also necessary to recognise the newly installed design when adding new equipment, and also ensure reversibility in installation work.

#### ( 2 ) Methodology

##### • Site plan

The front portion of the building should be set as a preservation area where no new buildings can be constructed in principle since the premises facing the wide open space on the front (west) are well maintained. The inside of the boundary wall should also be preserved in principle, while the outside area of the boundary wall on the south side of the building could serve as a utilisation area for facility development, considering a vista from the northwest approach.



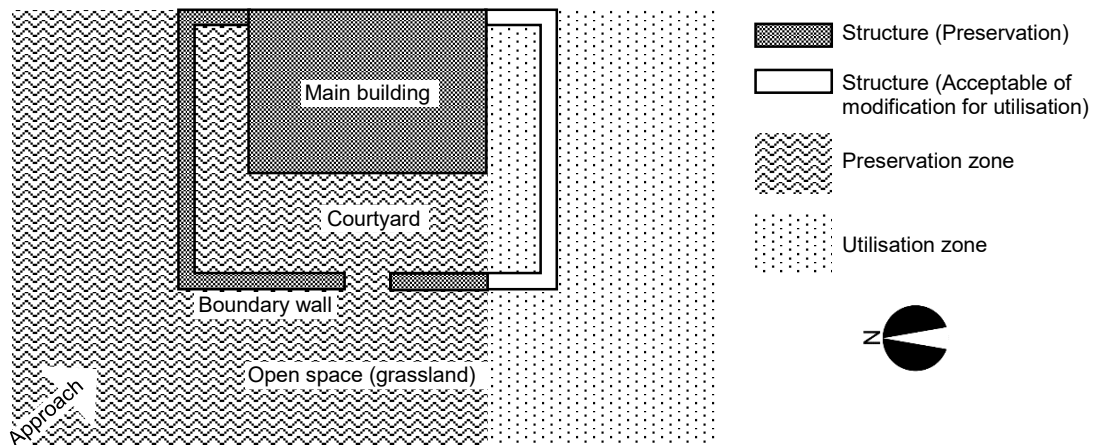


Fig 14. Zoning of the site

• Conservation management

All structures and materials except the roof should be preserved since the buildings have retained the original shape and materials, although the roof has been altered to steel roofing. It is viable to renew the roof while focusing on preservation. It is also possible to renovate the external staircase and the handrail on the front since they have already been renewed from time to time. The floorboards and the cantilever of the balcony should be preserved because they still retain the original materials. The boundary wall should also be conserved in principle, but regarding the south wall, which is in contact with the utilisation area, the minimum alteration necessary for utilisation could be accepted.

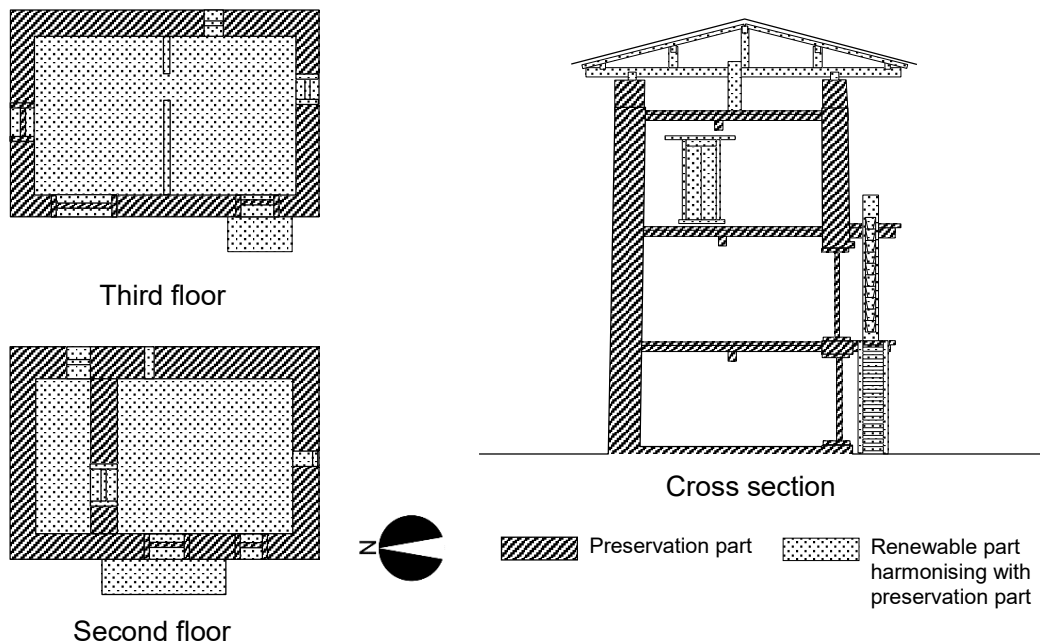


Fig 15. Zoning of the main building

• Facility installation

Necessary facilities for utilisation need to be concentrated in the utilisation area. Those should not be designed only to harmonise them with the existing buildings, but also clearly understood to have been installed for utilisation. It is necessary to use the current doorway of the building for utilisation

purposes, but it is possible to change the external staircase and handrail to a safer one from the point of view of convenience for users. As an alternative idea, it is conceivable that the staircase direction to approach the opening in the southern wall of the third floor has been newly built, as a part of the utilisation facility, and the front staircase could be restored in the original form.



Fig 16. Image sketch of an external staircase on the southern wall

### 3-3 Conservation and Utilisation Plan for Phub Lham house (Haa)

The Phub Lham house has been left uninhabited by the administrative guidance after the earthquake, but the owner's family continues to live on the premises, revealing their intention to continue to use the building as a residence. According to interviews with the owner's family, the concerns of the subjects, can be categorised as (1) ensuring the structural safety of the building, (2) subdivision of the second-floor room which currently has two rooms, (3) repair of the roof, and (4) securing lighting by increasing the number of windows.



Photo 13. Interior as living space

It is considered appropriate to consider the restoration and utilisation plan of this building from the four subjects as a starting point since those subjects are considered to be reasonable.

The following are summaries of the current situation and the direction of coping with the four subjects.

#### ( 1 ) Ensuring the Structural Safety of the Building

After the earthquake, at the request of the Ministry of Works and Human Settlement that was concerned about the lack of seismic performance of the building, the owner's family lived in an adjacent temporary building but was willing to return to their house. In order to make it habitable, it is indispensable to ensure structural safety, but there is a range of criteria for determining the target level. It is also necessary to carefully consider the balance between maintenance of value as cultural heritage and contemporary usage required by the owner. The primary direction for ensuring structural safety can be summarised as follows.

- As far as visual inspection is considered, the outer rammed earth wall is believed to be strong because the wall on each side appears healthy and thick. From the viewpoint of improving structural stability, it is considered most effective to ensure the integration of each wall.
- In order to ensure the unification described in the first point, various engineering solutions can be

considered, such as joining the ends of each surface of the rammed earth wall with anchor pins or embedding bolts. Meanwhile, since there is little knowledge regarding the strength of the rammed earth wall against the force in the pulling direction of bolts and pins, the effectiveness of specific methods needs to be confirmed through test construction and experiments.

Irrespective of what method is adopted, costing is expected to become the biggest block for its realisation since it is a private house. In any case, it is desirable to expand administrative support for measures necessary to ensure the structural safety of traditional private houses, given that residing in a temporary housing follows a request from the government.

## ( 2 ) Subdivision of the Second-floor Room which Currently Has Two Rooms

It is most feasible in terms of maintaining cultural value and cost among the four subjects. Currently, it is composed of the left room and the right room as seen from the front. The left (entrance side) is a place for activities such as cooking, dining and sleeping, and at the right is a Buddhist altar room. The owner wants to divide both the rooms into two rows, the right with the dining and the sleeping, and the left with the altar and the monk's chamber. As for partitioning, various methods from simple curtains to wooden boards can be considered based on the cost. Any method can be adopted for the easy installation and removal of structures and it is extremely feasible from the perspective of maintaining cultural value. However, it is necessary to sufficiently communicate with the owner before installation because each room could become extremely small after the division, and it is closely related to the way of life.

## ( 3 ) Repair of the Roof

It is a subject for ensuring the necessary performance of a house, as well as ensuring structural safety in (1). The cost issue is expected to be the biggest obstacle (1) because financial assistance from the government is considered to be equivalent to the emergency measures in the plastic sheet, although it is the most urgent issue among the four subjects at present. It is effective to use the metal sheet instead of the bark as the roofing materials to make it cost-effective, but it is necessary to carefully consider the selection of the materials and construction methods, since it is closely related not only to cultural value but also to the maintenance of the traditional landscape.

## ( 4 ) Securing Lighting by Increasing the Number of Windows

The owner is considering adding a bay window on the second floor, which is the living space, similar to that of a newly constructed house nearby, and the request itself is a reasonable idea from the angle of the resident. On the other contrary, it is not desirable to introduce new openings on the rammed earth wall from the point of maintaining cultural value since this building is considered to be the oldest in the village, and the closed structure represents its significant feature. Besides, the structural stability of the rammed earth wall is greatly spoiled depending on its size and location, so it is necessary to carefully consider how to install it.

The following methods can be a reasonable way to proceed, based on the current situation and the direction of coping.

- Clarification of the whereabouts of cultural value, and parts and range of preservation
- Future perspective on the owner's lifestyle
- Confirmation of usable funding and necessary procedures
- Judgement of feasibility based on the above three points, and priority order of the four subjects
- Consideration of concrete methods and technical details for addressing the subject

## 4. Examination of Value Evaluation of Farmhouses as Cultural Heritage

### 4-1. Case Study in Punakha (Sopsokha, Yuwakha, Changjokha)

It targets two hamlets, Sopsokha and Yuwakha, located in Yuwakha Chiwog of Barp Gewog, Punakha Dzongkhag, and a hamlet of Changjokha, where the Tandin Zam House is situated. Sopsokha and Yuwakha are rural hamlets on the gentle hills in the southern part of Punakha Dzongkhag. Those from Yuwakha village, including a new hamlet in the east of Yuwakha. Chimmi Lhakhang, built at the end of the 15th century, is on the hill to the northeast of Sopsokha and Yuwakha, and is closely related to the living culture of both hamlets. Changjokha is a relatively small rural hamlet along the Pho Chhu River on the eastern side of Punakha Dzong.

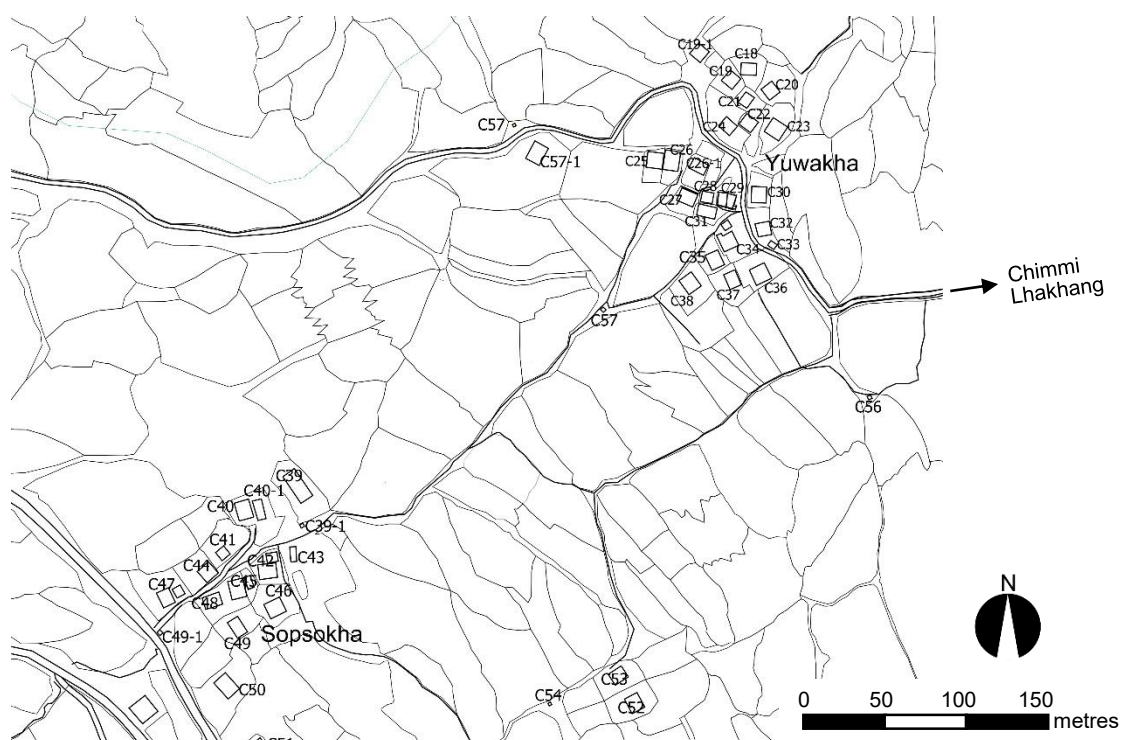


Fig 16. Base map of Sopsokha and Yuwakha

#### (1) Methodology

DCHS has implemented a preliminary survey of historic sites in Sopsokha and Yuwakha. TNRICP conducts a case study to categorise traditional houses as candidates of cultural heritage designation, based on the inventory of the DCHS survey and the chronological index of traditional houses that have been examined in previous surveys. The fieldwork is implemented by visual inspection of the exterior of all buildings, and the interiors of some buildings which permitted entry.

#### (2) Results

There are nine farmhouses in Sopsokha and 18 in Yuwakha. According to interviews conducted by DCHS, three farmhouses in Sopsokha and eight in Yuwakha are reported to be over 100 years old. However, all farmhouses have been built in the traditional form up to the present, regardless of the age of the building, and it is quite common that old buildings have been customarily remodelled and extended using the traditional form. The period of extension and renovation is expected to be around

40 years per generation, and private houses that retain the original form are limited to those 40 years old or earlier. In this manner, in the Bhutanese society where traditional lifestyles are still inherited, including architectural habits, it is challenging to extract typical traditional houses as candidates for preservation based on the architectural chronological index.

Under such circumstances, it is considered to be a reasonable idea to give criteria for candidates for cultural heritage designation based on the following,

- A. Among the old houses, those with a right balance of extension and renovation, and a good stack of formal features of each era,

This standard applies to one farmhouse (C42) in Sopsokha and two farmhouses (C19, C25) in Yuwakha.

C19 is supposed to have renewed the wooden portion about 18 years ago, and it is believed that the bay window (rabsel window) on the second floor was renovated at that time. But there is no other major expansion or renovation, and the outer wall and doorway have retained the original form. It is estimated that it was built about 100 years ago, since there is almost no inclination (taper) of the rammed earth wall, and there is a possibility that it has the rabsel window from when it was built.

C25 is considered to have been renovated on a large scale about 40 years ago, and it is believed that the rabsel window was remodelled like C19. There are also many small-scale renovations, such as adding a hut on the front side of the building. However, the outer wall has retained the old shape perfectly, and shows an apparent inclination (taper) at the four corners. It is considered that the farmhouse is the oldest in the village.

C42 is a farmhouse that claims to be the most massive in the village and was originally two storeys high, with the third storey added about 30 years ago. On the third floor, not only the front side but also the posterior is equipped with a thick rabsel window providing a perfect finish. It is considered that the building has undergone several expansions and renovations from the current condition of the rammed earth wall and the attached lower shed. This building is also an interesting example to learn the process of changes in the traditional farmhouses.



Photo 14. Farmhouse no.C19 in Yuwakha



Photo 15. Farmhouse no.C25 (left) in Yuwakha



Photo 16. Farmhouse no.C42 in Sopsokha

However, as mentioned earlier, it is not easy to distinguish the difference between these farmhouses and other houses in the current village environment. There is a strong possibility why the preservation of these buildings as cultural heritage is not comprehensible to the general public, at the current stage, where the preservation of private farmhouses has yet to start.

Meanwhile, there are eight houses in Changjokha, and three of them, including the Tandin Zam house, are expected to be more than 150 years old based on the taper and thickness of the wall and wind erosion difference. It is worth noting that Changjokha has generally undergone slow modification than other hamlets, and retains a stable historic environment. Except for the Tandin Zam house, one has many changes, such as combining the two original buildings into one, and another is an empty house, so it appears somewhat difficult to preserve.

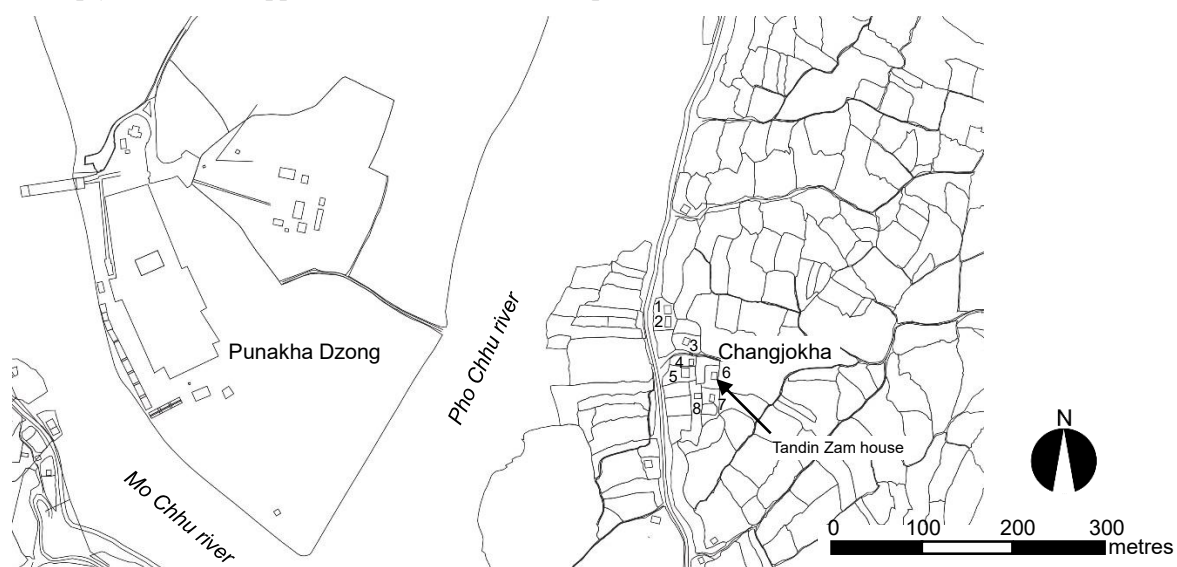


Fig 17. Base map of Changjokha

As a result of the case study on three hamlets, Sopsokha, Yuwakha and Changjokha, it is considered appropriate to list traditional houses that meet the following criteria as candidates for designation, as the first step towards preservation.

- A. More than 150 years old, which extends beyond four generations,
- B. There are few extensions and renovations, and the original state of the building is well maintained,
- C. Those that are well managed on a daily basis and retained in good condition.



Photo 17.,18. Old style farmhouses in Changjokha, no.4 (left) and no.2 (right)

**Table 1. Yuwakha and Sopsokha; Inventory of buildings and structures**  
 from 'Yuwakha village, Punakha Tangible Cultural Heritage Mapping and Documentation'  
 by DCHS 2016

**1. Yuwakha**

no.	Type of building	Built Year	Shape of building; roof design	No. of storeys	Type of wall	Year of last major renovation/reconstruction; and change
C6	Shop	2014	Rectangular in plan. Gabled roof with corrugated metal sheet roofing.	One	Rammed earth wall.	
C6-1	Farmhouse	15 years back	Rectangular in plan. Gabled roof with corrugated metal sheet roofing.	One	Rammed earth wall.	
C7	Residence (staff quarter of Agriculture ministry)	2014	Rectangular in plan. Gabled roof with corrugated metal sheet roofing.	One	Mud brick with mud mortar.	
C8	Shop	2013	Rectangular in plan. Gabled roof with corrugated metal sheet roofing.	One	Rammed earth wall.	
C8-1	Farmhouse	50 years back	Roughly square in plan. Gabled roof with corrugated metal sheet roofing.	Two	Rammed earth wall.	
C9	Farmhouse	10 years back	Rectangular in plan. Hipped roof with corrugated metal sheet roofing.	Two	Ground-rammed earth wall; first floor level- adobe	
C9-1	Farmhouse	2015	Rectangular in plan. Gabled roof with corrugated metal sheet roofing.	One	Rammed earth wall	
C9-2	Farmhouse	2 years back	Rectangular in plan. Gabled roof with corrugated metal sheet roofing.	One	Adobe brick wall	
C9-2	Farmhouse	2 years back	Rectangular in plan. Gabled roof with corrugated metal sheet roofing.	One	Adobe brick wall	
C10	Farmhouse	39 years back	Roughly square in plan. Gabled roof with corrugated metal sheet roofing.	Two	Rammed earth wall.	
C10-1	Farmhouse	2 years back	Rectangular in plan. Gabled roof with corrugated metal sheet roofing.	One	Timber framed wattle and daub	



C11	Farmhouse	2 years back	Rectangular in plan. Gabled roof with corrugated metal sheet roofing.	One	Rammed earth wall.	
C11-1	Farmhouse	2014	L-shape in plan. Gabled roof with corrugated metal sheet roofing.	One	Mudplastered adobe brick wall	
C12	Farmhouse	2013	Rectangular in plan. Gabled roof with corrugated metal sheet roofing.	One	Rammed earth wall.	
C12-1	Farmhouse	2013	Rectangular in plan. Gabled roof with corrugated metal sheet roofing.	One	Rammed earth wall.	
C12-2	Farmhouse	35 years back	Roughly square in plan. Gabled roof with wooden shingle roofing.	Two	Rammed earth wall.	
C12-3	Farmhouse	2 years back	Rectangular in plan. Gabled roof with corrugated metal sheet roofing.	One	Adobe brick wall	
C13	Shop	2013	Rectangular in plan. Gabled roof with corrugated metal sheet roofing.	One	Rammed earth wall.	
C13-1	Shop	2014	Rectangular in plan. Gabled roof with corrugated metal sheet roofing.	One	Timber board wall	
C13-2	Farmhouse	40 years back	Rectangular in plan. Gabled roof with wooden shingle roofing.	Two	Rammed earth wall.	
C14	Farmhouse	2009	Rectangular in plan. Gable roof with mixed wooden shingle and corrugated metal sheet roofing.	One	Rammed earth wall.	
C15	Farmhouse	35 years back	Rectangular in plan. Traditional hipped roof with corrugated metal roofing.	Two	Rammed earth wall.	
C16	Farmhouse	6 years back	Rectangular in plan. Gable roof with corrugated metal sheet roofing.	One	Rammed earth wall.	
C16-1	Kitchen of C16					
C16-2	Farmhouse	2 years back	Rectangular in plan. Gable roof with corrugated metal sheet roofing.	One	Adobe brick wall	



C16-3	Farmhouse	1 year back	Rectangular in plan. Gabled roof with corrugated metal sheet roofing.	One	Rammed earth wall.	
C16-4	Farmhouse	2 years back	Rectangular in plan. Gabled roof with corrugated metal sheet roofing.	One	Rammed earth wall.	
C17	Shop	2007	Rectangular in plan. Gabled roof with corrugated metal sheet roofing.	One	Mudplastered adobe brick wall	
C17-1	Farmhouse	2009	Rectangular in plan. Hipped roof with corrugated metal sheet roofing.	Two	Rammed earth wall.	
C18	Farmhouse	2010	Rectangular in plan. Traditional gabled roof with corrugated metal roofing.	Two	Rammed earth wall; top front-adobe brick	Original was built in 2003. It was destroyed by an earthquake in 2009.
C19	Farmhouse	More than 100 year back.	Rectangular in plan. Traditional gabled roof with corrugated metal roofing.	Two	Rammed earth wall	Timber changed during renovation 18 years back.
C19-1	Stupa-Nyep cheoten					
C20	Farmhouse	2000	Rectangular in plan. Hipped roof with corrugated metal roofing.	Two	Rammed earth wall	A single storey building existed earlier on the site.
C21	Farmhouse	2 years back	Rectangular in plan. Gabled roof with corrugated metal roofing.	Two	Rammed earth wall	A single storey built of adobe brick existed on the site.
C22	Farmhouse	2008	Rectangular in plan. Gabled roof with corrugated metal roofing.	Two	Rammed earth wall	A single storey building existed earlier on the site.
C23	Farmhouse	More than 100 year back.	Rectangular in plan. Hipped roof with corrugated metal roofing.	Two	Rammed earth wall	Timber components replaced 18 years back. Extension on east 7 years back.
C24	Farmhouse	20 years back.	Rectangular in plan. Hipped roof with corrugated metal roofing.	Two	Rammed earth wall	
C25	Farmhouse	More than 100 year back.	Rectangular in plan. Gabled roof with corrugated metal roofing.	Three	Rammed earth wall	A major renovation was carried out 40 years back.

C26	Farmhouse (owned by sister of C25 owner)	More than 100 year back.	Rectangular in plan. Gabled roof with corrugated metal roofing.	Three	Rammed earth wall	Stand only few centimetres apart from C25 on the east. It was renovated more than 25 years back.
C26-1	Cowshed of house C25-1					
C27	Farmhouse	25 years back	Rectangular in plan. Hipped roof with corrugated metal roofing.	Two	Rammed earth wall	Extension on the east was carried out 4 years back.
C28	Farmhouse	5 years back	Rectangular in plan. Gabled roof with corrugated metal roofing.	2 plus attic floor used for living	Rammed earth wall	25 years back, it was a single storey building, timber framed with wattle-daub infill wall.
C29	Farmhouse	More than 100 year back.	Rectangular in plan. Gabled roof with corrugated metal roofing.	Three	Rammed earth wall	A major renovation was carried out 40 years back replacing mainly timber. Geysers were replaced by the existing structure. The cowshed structure on the front is now a store room and kitchen. Flat roof of the structure which was mud is now concrete and is used for threshing paddy. Structure consisting of kitchen and living space adjoining on the east was built 20 years back.
C30	Farmhouse	3 years back	Rectangular in plan. Gabled roof with corrugated metal roofing.	One	Rammed earth wall	
C31	Farmhouse	More than 100 year back.	Rectangular in plan. Gabled roof with slate roofing.	Two	Rammed earth wall	40 years back- replaced all timber. 20 years back- extended with two storeyed structure built of brick and cement on the west.
C32	Farmhouse	2003	Rectangular in plan. Hipped roof with corrugated metal sheet roofing.	Two	Rammed earth wall	
C33	Farmhouse	2001	Rectangular in plan. Hipped roof with slate roofing.	Two	Rammed earth wall.	Extension from the east one year back.
C34	Farmhouse	More than 100 years back.	Rectangular in plan. Hipped roof with corrugated iron sheet roofing.	Three	Rammed earth wall	24 years back- 3 storey extension on the south. Original was reduced to 3 from 4 storey. Bathroom with RCC column and brick wall

C35	Farmhouse	15 years back	Rectangular in plan. Hipped roof with corrugated iron sheet roofing.	Two	Rammed earth wall	10 years back- added toilet structure.
C36	Shop	2014	Rectangular in plan. Hipped roof with corrugated iron sheet roofing.	Two	Rammed earth wall	
C37	Farmhouse	More than 100 years back.	Rectangular in plan. Hipped roof with corrugated iron sheet roofing.	Three	Rammed earth wall	15 years back- added another structure facing west. It was also extended to 3 storeys from 2.
C38	Farmhouse	25 years back	Rectangular in plan. Hipped roof with corrugated iron sheet roofing.	Two	Rammed earth wall	8 years back- added toilet, kitchen structure built of brick and cement.

## 2. Sopsokha

no.	Type of building	Built Year	Shape of building; roof design	No. of storeys	Type of wall	Year of last major renovation/ reconstruction; and change
C39	Restaurant	2008	Rectangular in plan. Gabled roof with corrugated metal roofing.	Two	Ground floor-rammed earth wall; first floor-timber frame	
C39-1	Water turned prayer wheel					
C40	Farmhouse	35 years back	Rectangular in plan. Two-tiered gabled roof with corrugated iron sheet roofing.	Three	Rammed earth wall	Present structure was reconstructed 35 years back. Ground floor currently converted into restaurant.
C40-1	Restaurant	2014	Rectangular in plan. Hipped roof with corrugated iron sheet roofing.	One	RCC framed brick wall	Cowshed structure stood at the site before.
C41	Farmhouse	More than 100 year back.	Rectangular in plan. Gable roof with corrugated iron sheet roofing.	Two	Rammed earth wall	50 years back- Extended house mainly from SE retaining the original. 2000- kitchen and toilet structure added on NW. 2008- cowshed replaced by one storey residence which is rented.
C42	Farmhouse	More than 100 year back.	Rectangular in plan. Gabled roof with corrugated iron sheet roofing.	Three	Rammed earth wall	30 years back- Original 2 storey building was rebuilt into 3 storeys; added 3 storey structure from south side.
C43	Shop		Rectangular in plan. Gabled roof with corrugated iron sheet roofing.	One	Rammed earth wall	
C44	Shop	2012	Rectangular in plan. Hipped roof with corrugated iron sheet roofing.	One	Rammed earth wall	

C45	Ground floor- shop; First floor- residence	1999	Rectangular in plan. Two-tiered gabled roof with corrugated iron sheet roofing.	Two	Rammed earth wall	
C46	Farmhouse	35 years back	Rectangular in plan. Two-tiered gabled roof with corrugated iron sheet roofing.	Three	Rammed earth wall	
C47	Ground floor- shop; First floor- hotel	2000	Rectangular in plan. Two-tiered gabled roof with corrugated iron sheet roofing.	Two	Rammed earth wall	2014- Addition of two-storey structure on NE for guide accommodation.
C48	Shop	2008	Rectangular in plan. Hipped roof with corrugated iron sheet roofing.	Two (split)	Rammed earth wall	2014 - Addition of two-storey structure on NE for guide accommodation.
C48 -1	Shop	2015	Rectangular in plan. Gabled roof with corrugated iron sheet roofing.	One	Rammed earth wall	
C49	Farmhouse	2011	Rectangular in plan. Hipped roof with corrugated iron sheet roofing.	2 plus attic floor	Adobe brick wall. RCC framed brick wall structure for toilet and kitchen.	
C49 -1	Stupa					
C50	Farmhouse	20 years back	Rectangular in plan. Hipped roof with corrugated iron sheet roofing.	3 plus <i>jamtho</i> floor	Rammed earth wall	
C51	Hotel	1994	Rectangular in plan. Hipped roof with corrugated iron sheet roofing.	Two	Rammed earth wall	
C52	Farmhouse	More than 100 year back.	Rectangular in plan. Hipped roof with corrugated iron sheet roofing.	Three	Rammed earth wall	2006 - Converted to 3 storeys from 4; 3 storey structure attached on SW. 2007- RCC frame staircase, kitchen and toilet built.
C53	Single storey house- part of C52					
C54, C55, C56, C57, C58	Stupa					
C57 -1	Farmhouse ruin	More than 100 year back.				

## 4-2. Case Study in Haa (Longlo, Tshenkhar)

It targets two hamlets, Tshenkhar and Longlo, located in the most upstream part (the outback of the valley), of the ten hamlets in Talung Chiwog of Bji Gewog, Haa Dzongkhag. However, Tshenkhar Goenpa, located away from the hamlets, was excluded. Both the hamlets have their temples, and each has a unit for performing festivals. Also, both hamlets are collectively called as Talung Toed. The Talung Valley was once located on the road from Sikkim to the Paro Valley, and presently, it is considered as the starting point for trekking routes to Drukgyal Dzong and Chele La.

### (1) Methodology

The buildings located within the case study areas are classified as follows. For clarity, simple ancillary facilities such as barns and toilets and structures such as fences and stone walls are excluded from the classification.

- A. Candidate Buildings for Cultural Heritage Designation
- B. Traditional farmhouses with relatively older style
- C. Traditional farmhouses with relatively younger style
- D. Farmhouses without traditional style
- E. Buildings with traditional style other than farmhouses
- F. Buildings without traditional style other than farmhouses
- G. Ruins

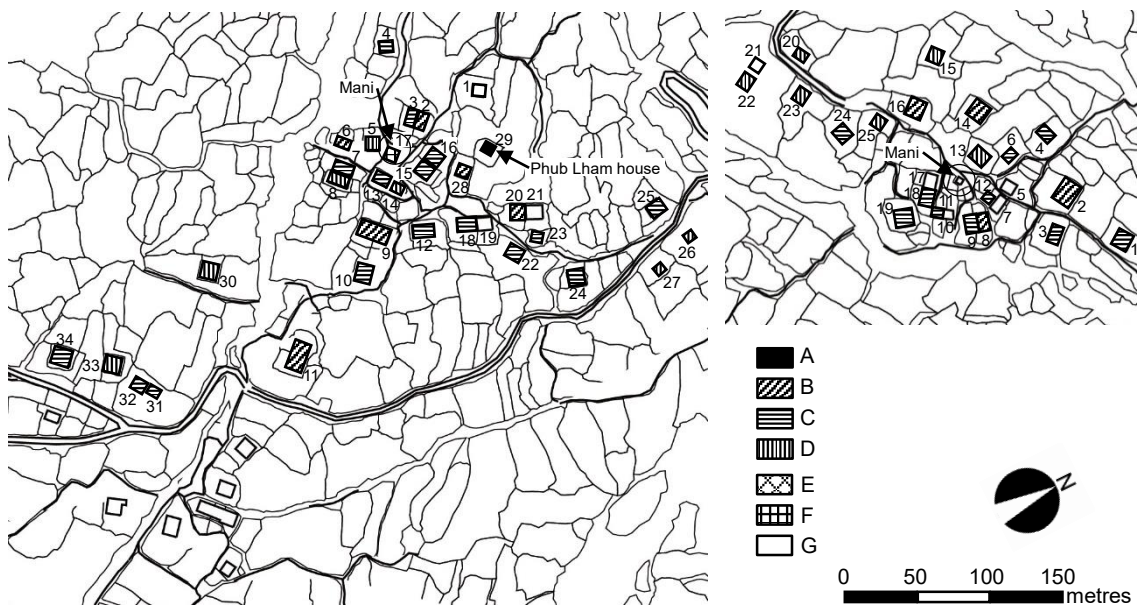


Fig 18. Base map of Longlo (left) and Tshenkhar (right)

The fieldwork is implemented by visual inspection of the exterior of all buildings, and the interiors of some buildings which permitted entry. Besides, even when the buildings are connected to each other in terms of structure, they are considered as multiple buildings if they are separated as dwelling units due to the presence of external facilities.

While distinguishing between B and C and E and F, the degree of inclination (taper) of the outer rammed earth wall is set as an indicator, since the outer wooden part cannot be expected to

function as an indicator because it is often remodelled. In other words, buildings with the rammed earth wall with a clear taper are considered to be older. Noticeable younger buildings comprising one-storey and two-storey houses that do not have the bay (rabsel) window are classified as D. In this classification, evaluations other than building features are not taken into consideration, because interviews needed for multifaceted assessments are not included in the fieldwork.

## ( 2 ) Results

The results are summarised in Table 2. Overall, there were 35 buildings, including two religious facilities in Longlo, and 25 buildings in Tshenkhar. Those are almost all farmhouses. In Longlo, two houses ran homestays, and there are two other religious facilities. Only Phub Lham House is categorised as A with significant cultural value, of the 60 buildings. There was another significant older style house (Lham Tshering house) in Longlo as of the survey in August 2017, but it was completely rebuilt. Classified as B are seven buildings in Longlo and four buildings in Tshenkhar. Those are considered to have the potential to be evaluated as cultural heritage buildings, and it could be classified as A depending on the results of further detailed surveys. There is a large and imposing house in Longlo, and it could be considered a strong candidate for detailed surveys.

Classified as C are 16 buildings in Longlo and nine buildings in Tshenkhar, and there is no significant difference in the ratio to the total number of buildings. On the other hand, classified as D, are five in Longlo and four in Tshenkhar, and classified as G, are three in Longlo and five in Tshenkhar. In both cases, the number in Tshenkhar, which has a smaller number of buildings, was larger than Longlo. It is because Tshenkhar was the most severely damaged structure in the 2011 earthquake, which caused the ruined private houses and, at the same time, relocated and newly built houses in the neighbourhood.

The number of buildings (A + B) with a temporary value that considered to be preserved was twenty-three percent for Longlo and sixteen percent for Tshenkhar.



Photo 19. Farmhouse no.28 (class B) in Longlo



Photo 20. Farmhouse no.8 (class B+) in Tshenkhar



Photo 21. Farmhouse no.16 (class B) in Tshenkhar

Table 2. Longlo and Tshenkar; Inventory of buildings and structures

1. Longlo

no.	Class	Story	Roof	Structure	Wall	Window	Side	Memo
					Inclination of wall	Type		
1	G	two	-	Rammed earth structure	S	Trace of Rabsel	3	
2	C	two	Half-hipped roof	Rammed earth structure	S	Rabsel		
3	C	two	Half-hipped roof	Rammed earth structure	S	Rabsel		
4	C	two	Gabled roof	Rammed earth structure	S	Rabsel	3	
5	D	one	Half-hipped roof	Rammed earth structure	S	Window		
6	B	two	Gabled roof	Rammed earth structure	L	Rabsel	2	-Rabsel seems to be added later -Sleeve wall type -Extension and alteration
7	C	two	Gabled roof	Rammed earth structure	S	Rabsel		Built in 2015
8	D	one	Half-hipped roof	Rammed earth structure	S	Window		-Built later than 2017 -Connected to No.7
9	B+	two		Rammed earth structure	L	Rabsel		-Possibly class A -Consists of 2 houses -Extension and alteration
10	C	two		Rammed earth structure	S	Rabsel		
11	B	two	Gabled roof	Rammed earth structure	L	Rabsel	3	- Modified more than 5 times - Possibly class A in original part
12	C	two	Half-hipped roof	Rammed earth structure	S	Rabsel	2	Surface of eastern wall looks new
13	C	two		Rammed earth structure	S	Rabsel		Possibly class B
14	D	one	Gabled roof	Rammed earth structure		Window		-Rammed earth wall masonry added -Storage?
15	C	two	Half-hipped roof	Rammed earth structure	S	Rabsel	3	
16	C	two	Half-hipped roof	Rammed earth structure	S	Rabsel	3	
17	F		Hipped roof + Shed roof	Rammed earth structure	S	Rabsel		

18	C	two	Half-hipped roof	Rammed earth structure	S	Rabsel		
19	G	two	Gabled roof	Rammed earth structure		Trace of Rabsel		Storage?
20	C (B?)	two	Half-hipped roof	Rammed earth structure	S	Rabsel	2	Sleeve wall type?
21	G							
22	C	two	Half-hipped roof	Rammed earth structure	S	Rabsel		
23	C	two	Half-hipped roof	Rammed earth structure? C-brock masonry?	S	Rabsel+ Steel frame window		
24	C	two	Gabled roof	Rammed earth structure	S	Rabsel	3	
25	C	two		Rammed earth structure	S	Window		
26	D	one	Half-hipped roof	Stone or C- brock masonry? RC?	S	Window		
27	D	one	Half-hipped roof	Stone or C- brock masonry? RC?	S	Window		
28	B	two	Gabled roof	Rammed earth structure	L	Rabsel		
29	A	two	Gabled roof *Single roof	Rammed earth structure	L	Window+ Veranda		
30	C	two	Half-hipped roof	Rammed earth structure	S	Rabsel	3	
31	C	two	Half-hipped roof	Stone or C- brock masonry? RC?	S	Rabsel	3	-Home stay
32	C	two	Half-hipped roof	Stone or C- brock masonry? RC?	S	Rabsel	3	-Home stay -Connected to No.30
33	D	one	Half-hipped roof	Stone or C- brock masonry? RC?	S	Window		
34	C	two	Half-hipped roof	Rammed earth structure	S	Window		-Home stay



## 2. Tshenkar

no.	Type	Storey	Roof	Structure	Wall	Window	Side	Memo
					Inclination of wall	Type		
1	C (B?)	two	Half-hipped roof	Rammed earth structure	S	Rabsel	3	-Huge damage by the earthquake -Modification after the earthquake
2	B	two	Gabled roof	Rammed earth structure	L	Rabsel	3+	-Huge damage by the earthquake -Modification and extension 16 after the earthquake
3	C	two	Gabled roof	Rammed earth structure	S	Rabsel	3	-Rebuilt around 15 years ago -Partial reuse old windows and walls estimated 200-300 years old
4	C	two	Gabled roof + Shed roof	Rammed earth structure	S	Rabsel	3+	Modification and extension
5	C→G	two→one	Gabled roof	Rammed earth structure	S	Trace of Rabsel		-Storage, originally residential use -Downsizing of upper structure and reroofing
6	C→G	two→one	Gabled roof	Rammed earth structure	S			-Storage, originally residential use -Downsizing of upper structure and reroofing
7	B→G	two→one	Gabled roof	Rammed earth structure	L	Trace of Rabsel		-Storage, originally residential use -Downsizing of upper structure and reroofing -Sleeve wall type
8	B+	two	Gabled roof	Rammed earth structure	L	Rabsel		Sleeve wall type
9	C	two	Half-hipped roof	Rammed earth structure	S	Rabsel		Connected with no.8, recently rebuilt
10	B→G	two→one	Gabled roof	Rammed earth structure	L			-Downsizing of upper structure and reroofing
11	C	two	Gabled roof	Rammed earth structure	S	Rabsel		Newly built
12	C	one	Gabled roof	Stone Masonry	S	Window		
13	D	one	Half-hipped roof	Stone or C- brock masonry? RC?		Window		
14	B-	two	Gabled roof	Rammed earth structure	L	Rabsel	3	
15	D	one	Half-hipped roof	Stone or C- brock masonry? RC?		Window		
16	B	two	Half-hipped roof	Rammed earth structure	L	Rabsel+ Veranda	3	

17	C→G	two→ one	Gabled roof	Rammed earth structure	S	Trace of Rabsel	3	Storage
18	C (D?)	two	Gabled roof	Stone or C- brock masonry? RC?		Rabsel	3	Newly built in traditional style
19	C-	two	Half- hipped roof	Rammed earth structure	S	Rabsel Window		
20	D	one	Half- hipped roof	Stone or C- brock masonry? RC?		Window		
21	D	one	Gabled roof	Rammed earth structure		Window		-Relocation from upper part of the hamlet after the earthquake, reusing of old structural materials -Cow shed, originally residential use
22	D	one	Half- hipped roof	Stone Masonry+S		Window		-Residence of the community leader -Relocation from upper part of the hamlet after the earthquake -Cow shed (no.21) and toilet attached
23	D	one	Gabled roof	Stone or C- brock masonry? RC?		Window		
24	C	two	Gabled roof	Rammed earth structure	S	Rabsel		
25	D	one	Half- hipped roof	Stone or C- brock masonry? RC?		Window		

## 5. Conclusion

### 5-1. Restoration and Earthquake Resistance Measures Appropriate for Cultural Heritage (Developing Practical Techniques in Conservation)

The Lham Pelzom house in Kabesa is highly valued as the remains of the oldest existing private farmhouse in Bhutan, and it is possible to choose a preservation method that does not alter the current condition as a first-class historical archive, like a museum collection.

While the rest of the conditions vary, the remains of the private farmhouses converted into ruins by leaving the rammed earth wall can be seen in various places all over the country, and some of them have retained the original form, such as the remains in Yuwakha (C57-1). These are historical entities that convey a variety of information today, and there is no doubt that they should be protected as cultural heritage, but there are many missing parts and in an incomplete state as buildings. It is appropriate to preserve those as archaeological sites. However, it is also necessary to solve specific issues, such as what kind of evaluation, what should be preserved and how are those utilised, same as in the case of the private farmhouses.



Photo 22., 23. Farmhouse remains C57-1 in Yuwakha

The Lham Pelzom house is a precious case that it has a record before it collapses and emergency protective measures for the collapsed wooden part, although it is currently in ruins. Therefore, it is considered that the most appropriate method for maintaining and improving its value is to reuse the existing structure and members to the maximum and restore it to a healthy state as a building.

As a first-aid measure, DCHS recognises the need to install a temporary roof on the existing rammed earth wall, but there is no way to grant subsidies for private property at the present stage, where a bill on cultural heritage conservation including private farmhouses is still under deliberation. In addition, the owners want to build a new house primarily, and there is no blueprint showing what they can gain substantially from preserving the building so that voluntary responses should not be expected from owners who are economically vulnerable. From these facts, it can be considered that there is almost no expectation to realise the restoration work as well as the installation of a temporary roof without external funding.

Basically, conservation of cultural heritage is a process that gradually develops through practice, repeating various attempts according to different circumstances. It is expected that the Lham Pelzom house plays a role in developing a new path as a pioneer in the preservation of private houses in Bhutan, taking on unprecedented challenges, based on ideas not confined to existing concepts.

## 5-2. Conservation and Utilisation Plan with a Balance between Conservation as Cultural Heritage and Utilisation based on the Intention of the Owners (Developing Utilisation Strategies)

This survey, which focussed on the Tandin Zam house in Punakha and Phub Lham house in Haa, reveals how best to incorporate the intention of utilising the owners on the premise of preserving value as cultural heritage. The owner of the Tandin Zam house is considering converting it into a restaurant, and the owner of Phub Lam House hopes to continue using it as residence. Although both of them have different intentions for continuous use, they have an understanding of conservation as cultural heritage. So, this time, it is examined on the premise of preservation, however, in general, there are likely many conflicts between the ideal preservation required by the administration and the requirements for the use desired by the owners. There also may be a situation where the preservation requirements and the utilisation requirements are conflicting, when the conservation and utilisation plan are actually made for the Tandin Zam house and the Phub Lam house.

In Japan, clarifying various issues related to conservation and utilisation, and obtaining a common understanding of stakeholders about the possible countermeasures is one of the main objectives of creating a conservation and utilisation plan. It is particularly important for private buildings with stakeholders of different interests to make the plan, and it is necessary to take sufficient time and effort, such as holding participatory workshops through the making process.

In recent years, around Paro near the international airport, there are some cases of private farmhouses being renovated as tourist accommodations or modern facilities. Also, in Bhutan, the conservation and utilisation plan is considered to be an effective method for securing a certain level of conservation of cultural heritage, while promoting the diverse utilisation of historic buildings.



Photo 24., 25. Example of renovation of a farmhouse to a high-style tourist facility (Paro)  
Accommodation on the third floor (left), restaurant on the first floor (right)

## 5-3. Value Evaluation Method as Cultural Heritage (Developing Survey Methods for Designation)

Regarding the establishment of value evaluation methods for farmhouses as cultural heritage, there are still many issues to be resolved. None of the farmhouses with precise building dates are found in this survey, and in conjunction with previous surveys, there are still no farmhouses with an accurate building date that could function as an absolute indicator. Therefore, such as the dating of a farmhouse performed only from the form attempted in Haa has to be quite arbitrary and ambiguous. Moreover, for farmhouses classified as B, there remains a problem that it is not possible to determine without a survey whether a major portion of the building is old or only a visible part of the wall is old. These problems underscore the need for a little more detailed classification, and there is a possibility that

some buildings are appropriate to be classified as B+ or B-. Furthermore, although it has been determined from the survey results so far that the inclination of the outer rammed earth wall has a specific link with the age of the buildings, there is currently no sufficient confirmation that this indicator is valid in other regions. For example, in the eastern region, which mainly consists of a masonry structure, research to find a useful regional index is necessary before implementing a field survey for value evaluation.

One of the effective measures is to find the oldest farmhouses in each region, as proposed in Punakha, and prioritise those protections as urgent, as a role model of heritage conservation. In this case, referring to the results of the survey so far, it is assumed that about one private farmhouse in each Dzongkhag and a maximum of 20 farmhouses in the country will be covered.

In Bhutan, a newly built building is required to adopt traditional designs around the windows, so basically, there is no building with a wholly contemporary design. In other words, it is desirable to give a legitimate evaluation to newly built buildings, such as those classified as C or D in Haa, as an important element for maintaining the cultural landscape in the future. Meanwhile, when proceeding with the preservation of farmhouses as cultural heritage, it is necessary to pay sufficient attention so that the selection method does not distract the resident's willingness to comply with the traditional style.

As mentioned above, this survey does not take into account the history and traditions of individual buildings and owners. However, it is not hard to imagine that intangible cultures, such as relationships with historical greats and local masters, are going to be emphasised on the value evaluation in the operation of cultural heritage conservation of Bhutan. It will be the most challenging and vital issue to consider how to finally organise a comprehensive value evaluation with objectivity, while making a distinction between the value evaluation as a historic building as tangible cultural heritage and the value evaluation from the aspect of intangible cultural heritage.



Photo 26. Whole view of Yuwakha in paddy field (Punakha)



Photo 27. Whole view of Longlo in a deep valley (Haa)

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on Conservation of Cultural Heritage Project  
“Conservation and Utilisation of Historic Buildings in Bhutan”

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DEPARTMENT OF CULTURE  
MINISTRY OF HOME AND CULTURAL AFFAIRS

## **Impression report for fiscal year 2019 cooperation between Tokyo National Research Institute for Cultural Properties and Department of Culture**

The cooperation project in F.Y. 2019 was in continuation of earlier collaboration to study traditional Bhutanese buildings with the aim to realize comprehensive approach in preservation of traditional Bhutanese houses through identification of houses and determining preservation and utilization methods, together with capacity building of officials in Department of Culture.

The first part of the cooperation project was on case study of preservation and utilization of farmhouses in Japan in June, 2019. The sites for the case study were all relevant to ones in Bhutan not only from heritage perspective but also from socio-economic context, whereby the rural-urban migration has impacted the farmhouses resulting in disrepair and abandonment. The continuation of this important heritage aspect through utilization focused in community revitalization and mitigating rural-urban migration were main essence of the preservation approach in the case sites. The case study also facilitated the capacity building of relevant officials in the Department. It was learnt that the preservation of farmhouses was carried out not only in singular site but also in group of traditional buildings through unique system of preservation district for group of traditional buildings. Such approach was acknowledged through the case study to be compatible in Bhutanese context.

The main outcome of the previous collaboration was that we were able to identify three houses, each from Kabesa, Changjokha and Talung Toed in Thimphu, Punakha and Haa Dzongkhag respectively to be of earliest typology of rammed earth structure without much or no structural interventions. The outcomes and findings of this research were also disseminated to various government agencies, stakeholders and private house owners on 13<sup>th</sup> March 2018. In continuation of earlier work, the survey for evaluation of traditional farmhouses as cultural heritage and determining restoration methods was carried out August, 2019. The joint team surveyed three identified houses and also surveyed Changjokha village, Sopsokha and Yuewakha in Punakha and Talung gewog in Haa for the examination of value evaluation of farmhouses as cultural heritage. The survey was carried out to determine the restoration method of each identified houses and also considering the aspect for collective recognition of farmhouses as group of traditional buildings or cultural sites, as reflected in cultural heritage bill. The joint effort of the experts and officials of Department of Culture were beneficial in deliberating common understanding of significance of heritage and utilization methods as per the site and social context. The engagement of owners in the process was also crucial to disseminate the importance of such farmhouses not only from governmental perspective but from the international context.

The findings of the survey were disseminated in a consultative meeting with private house owner (Lham Pelzom), local government, Ministry of Work and Human Settlements and Tourism Council of Bhutan on 19<sup>th</sup> January, 2020. The main theme of the workshop was to deliberate the restoration methodology of the Lham Pelzom's house which is the first of its kind. The meeting was a success and we could come to an agreement for the restoration method of the house respecting both house owner's aspiration and expert's recommendations. Further, the Department of Culture can foresee that the acquired knowledge in this field can then be reciprocated in other heritage sites and structures in future.

Apart from successfully achieving approach in identification, restoration and utilization methods of farmhouses, and capacity building in Department of Culture, the significant contribution of this cooperation project is that the private house owners came forward and showed interest to restore and rehabilitate their houses instead of dismantling them. Therefore, the cooperation has successfully achieved the objectives and the Department highly look forward to continued cooperation to cover the central and eastern part of the country. Further, the Department would like to propose for hands on training of the officials of Department of Culture in an actual restoration site to enhance the practical knowledge to contribute in restoration work of farmhouses in Bhutan.

**Director General  
Department of Culture**