Lessons learnt and Government of Nepal initiatives for reconstruction after 2015 Gorkha Earthquake in Nepal

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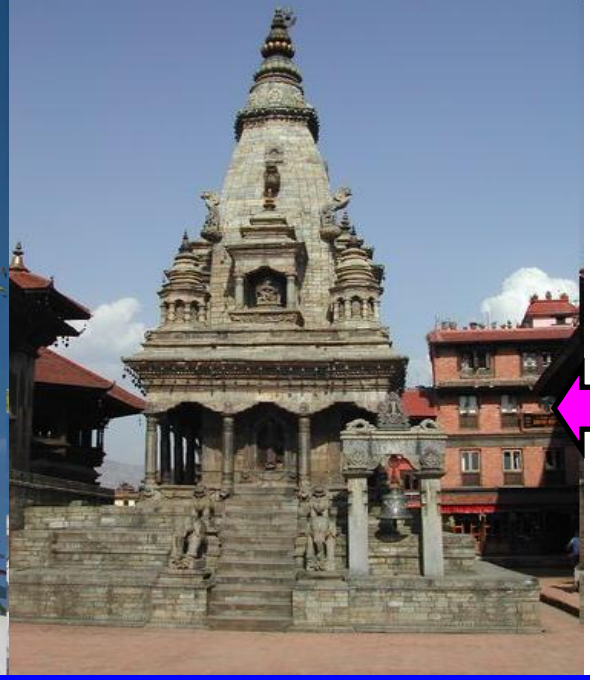
July 2017

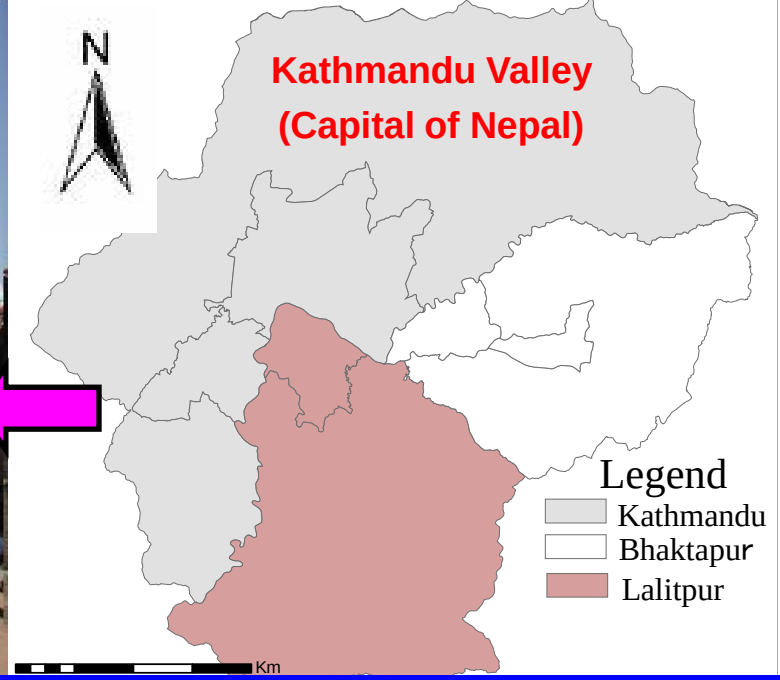
Outline of Presentation

- Introduction
- Loss and Damage by 2015 Gorkha Earthquake
- Lesson Learnt from the earthquake
- Government initiatives for reconstruction of houses
- Challenges
- Way Forward

Background


KAZAKHSTAN
MONGOLIA
JAPAN
N. KOREA
S. KOREA
UZBEKISTAN
TURKMENISTAN
KYRGYZ
TAJIKISTAN
AFGHANISTAN
CHINA
NEPAL
PAKISTAN
NEPAL
BHUTAN
BANGLADESH
INDIA
SRI LANKA
CHINA
GREAT HIMALAYA RANGE
Brahmaputra
Kathmandu Valley
Mahendranagar
Dhangarhi
Terai
Karnali
Kali
Pokhara
Nepālganj
Butwāl
Bhairāhawā
Nārāyani
Bharatpur
KATHMANDU
Bhaktapur
Pātan
Hetaudā
Bīrganj
Janakpur
Dharān Bāzār
Birātnagar
Mount Everest
INDIA
Indo - Gangetic Plain
Ghaghara
Gandak
Trisuli





Renowned for its Historical and Cultural richness

Nepal's vulnerability to natural hazards; ...The Reality

- **Nepal Ranks 11th- in terms of Earthquake Risk (DRR Portal Nepal)**
- **4th in terms of climatic hazards (UNDP Report)**
- **30th in terms of floods (UNDP / Bureau for Crisis Prevention & Recovery-BCPR, 2004)**
- **Natural Disaster: HOT SPOT (World Bank 2005)**

Why Earthquakes in the Himalaya?

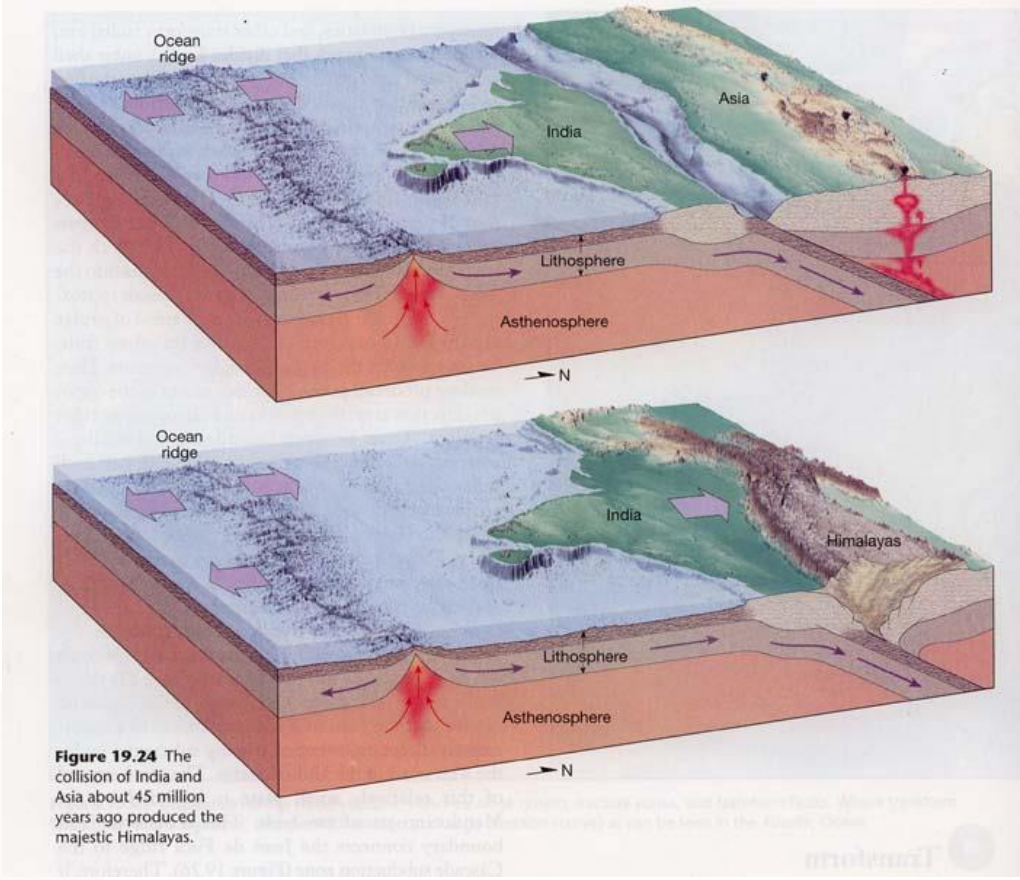
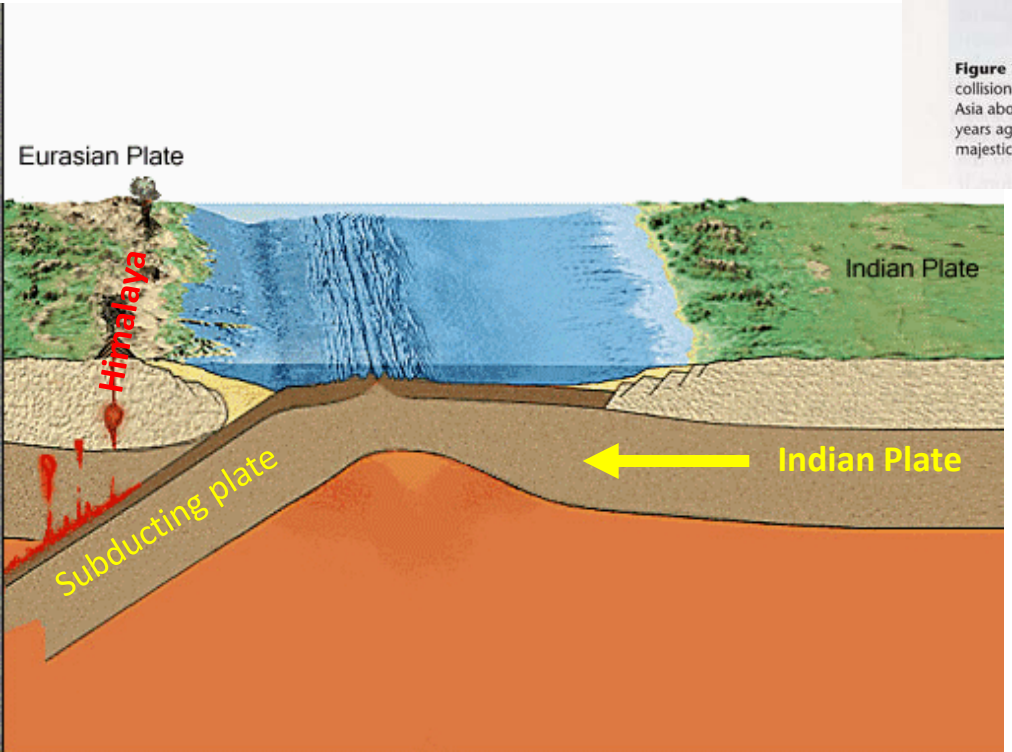
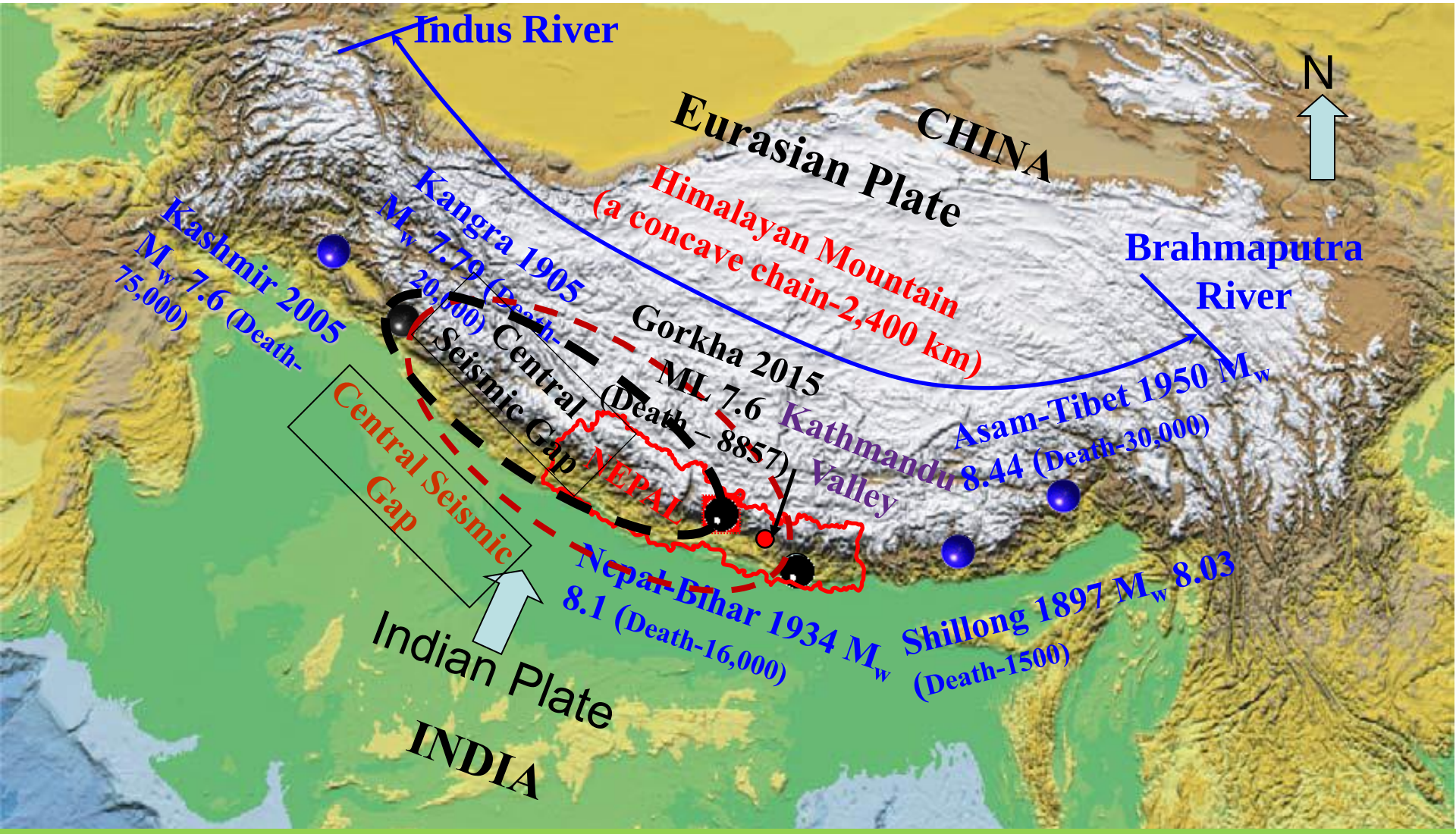


Figure 19.24 The collision of India and Asia about 45 million years ago produced the majestic Himalayas.



- **Himalayas were formed by the collision of the Indian and Eurasian plates that started about 55 Ma years ago**
- **The mountain building process continued from this collision and is still ongoing**

Major Earthquakes in Nepal Himalayan Region and Zone of Seismic Gap

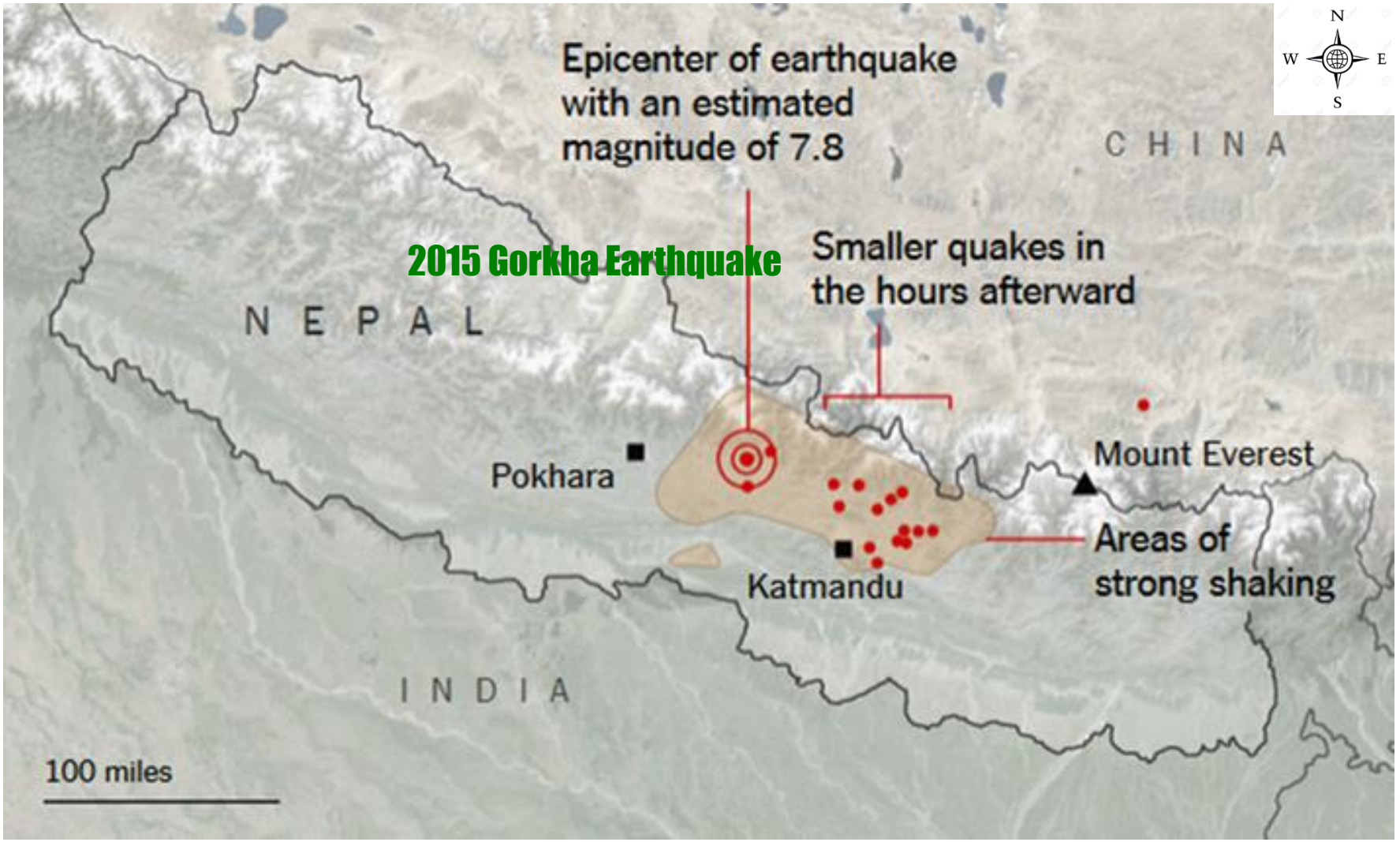


- Indian plate moving toward north at a rate of 2 to 5 cm per year and the occurrence of frequent seismic activities along the Himalaya and its surroundings
- During past 120 years, Six Great Earthquakes occurred along the Himalayan front

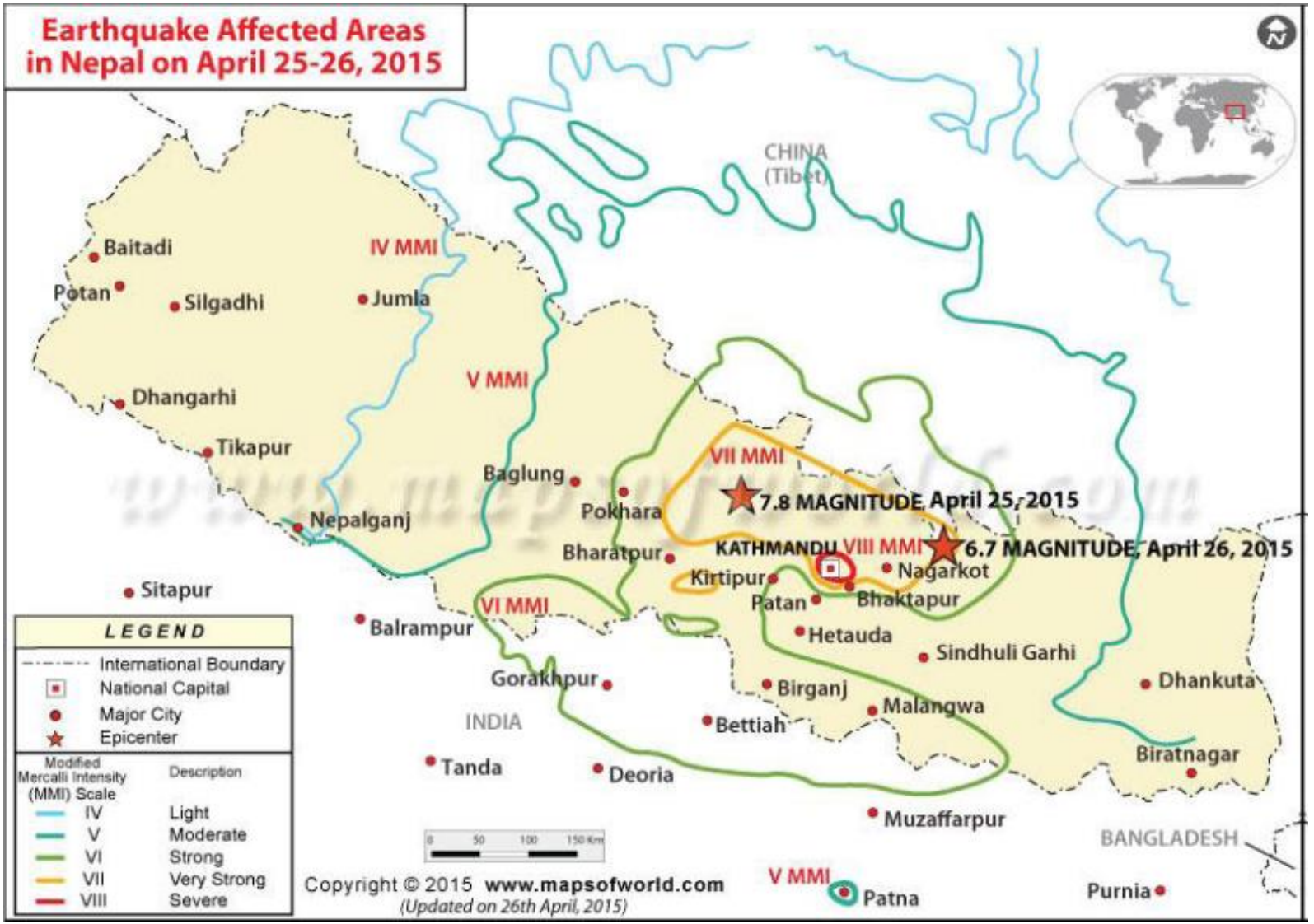
2015 Gorkha Earthquake: Basic Facts

- 25 April 2015 Saturday 11:56 am Local time (6:11 GMT)
- Magnitude: 7.8 (M_w)
- Depth: 8.2 Km
- Epicentre: Near Barpak Village, Gorkha (78km North West from Kathmandu, similar distance to the East from Pokhara)

2015 Gorkha Earthquake:
Eastward Rupture Propagation



2015 Gorkha Earthquake:
Seismic Intensity Contours



Total Impact

Out of 75 districts 14 districts were mostly affected

- Total Death – 8857
  - Male – 3952
  - Female - 4899
  - Unknown - 6
- Total injured - 22309
- Houses Fully Damaged – 604930
  - Government – 2673
  - Private - 602257
- Houses Partially Damaged -288856
  - Government - 3757
  - Private - 285099

Total Impact

Out of 75 districts 14 districts were mostly affected

- **Helath Facilities Fully damaged - 462**
  - Public - 446 (five hospitals, 12 Primary Health Care

Imagine the scenario of losses/damages

- **Night Time**
- **School Hour**
- **Low PGA- less than 200 gal in comparision to 1990 earthquake (350 gal)**

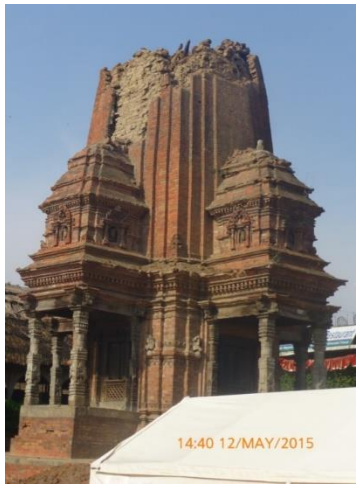
damaged health facilities are in the 14 most-affected districts.

Most of poorely constructed Houses collapsed

Hilly settlements were hit harder: Ridge effect

Severe Impact on Educational Facilities

Severe Damage to Heritage Sites



Buildings were affected also by poor performance of soil and foundation

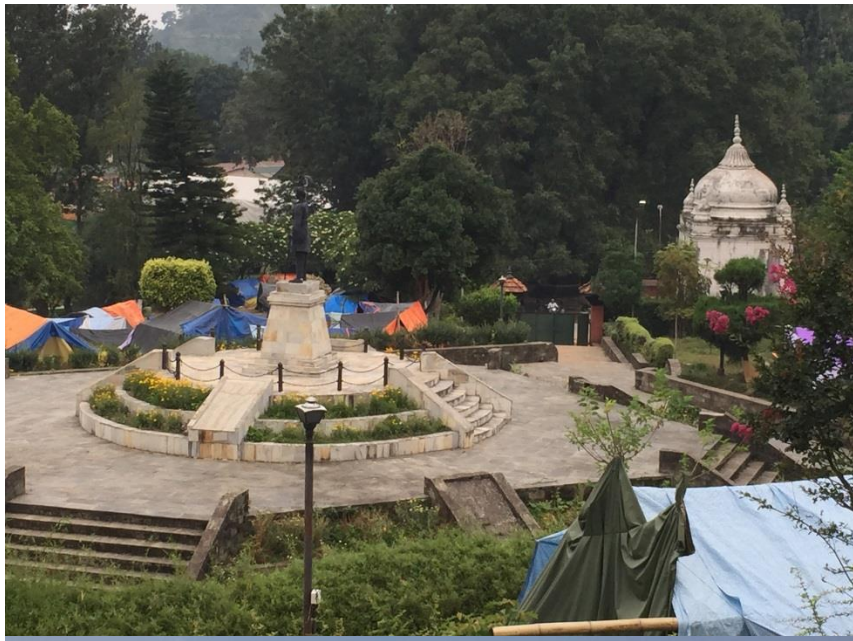
Damage to Walls: A Common Sight in Tall Buildings

People too Scared to go inside Home

- Lack of trust on buildings
- Crack-phobia among public

Town/Hospital functioning in Tents

Many Families Living in Temporary Shelters



Cause of Loss and Damage Identified

- **Weak physical infrastructures/ poor design, construction techniques, and construction practices**
- Plans (Building Regulations, Bye-Laws, Building Code Enforcement etc.) were not well formulated/ Implemented. Updating of existing Natural Calimaty Act 1982 is still under discussion.
- **Foucused on response activities only**
- Very limited preparedness activities
- **Lack of community awareness regarding disaster**
- **Absence of Disaster Risk Reduction plans at the local level**
- **DRR was not mainstreamed in development activites**

Government of Nepal Initiatives after 2015 Gorkha Earthquake in Nepal

Building Safety

- Safety of Buildings is of priority

  Main aims to build **earthquake resilience** through construction, retrofitting, training, raising awareness and safety measures to ensure that these buildings are **life safety/immediate occupancy/ operational** during after a major disaster depending upon the type of buildings.

Building safety should be everyone's priotiy

Towards Build Back Better "BBB"

- Reconstruction of infrastructures is done with better planning
- Government has given a priority to use **International Experience/Practices** in Reconstruction (Though resources are limited).
- Reconstruction and Recovery Plan (RRP) has been finalized with the technical support from Development Partners (DPs), which integrates BBB principle.
- **RRP** is expected to be Milestone for the Recovery and Reconstruction for earthquake affected districts.
- **Formulation of Local Disaster Risk Management Plan (LDRMP) is ongoing activities**

Initiative for Housing Construction after 2015 Gorkha Earthquake

1. Structural safety of buildings

- Design and construction as per National Building Code
- Construction supervision by qualified Engineers/Sub-Engineers.
- Construction through skilled masons

2. Environment-friendly design & construction

» Preparaton of environmently friendly design

» Use of Local Materials and Masons as far as possible

Initiative for Housing Construction

3. Community contribution in facility development

- » Incourage to promote Public Private Partnership model in DRR and ceonomize the reconstruction cost
- » Creates ownership feeling
- » Ensures sustainability of the created facilities
- » Ensures regular repair & maintenance

4. Collaboration with I/NGOs

- ➢ Harmonization and quality
- ➢ Involvement of social mobilizers and effective in awareness Raising
- ➢ Better Transparency (Public Audit)

Working areas of Ministry of Urban Development

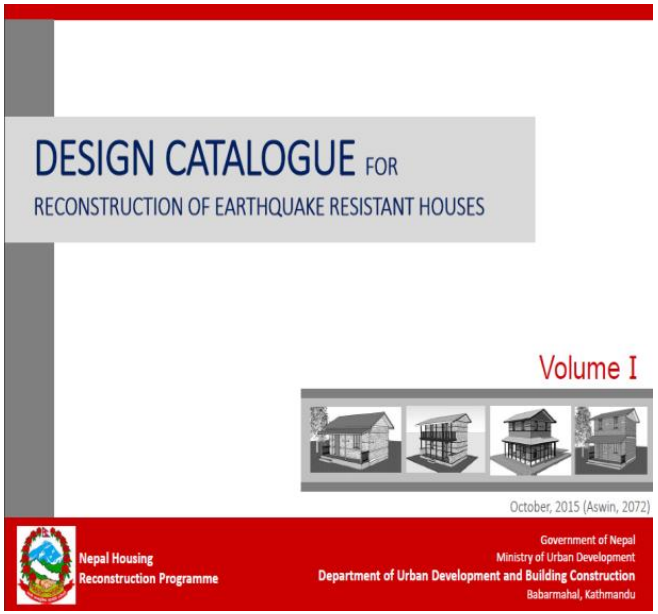
- Technical Support for private houses construction
- Construction of Government Office Buildings
- Resettlement Planning for the vulnerable areas
- Construction of Earthquake Memorial Park

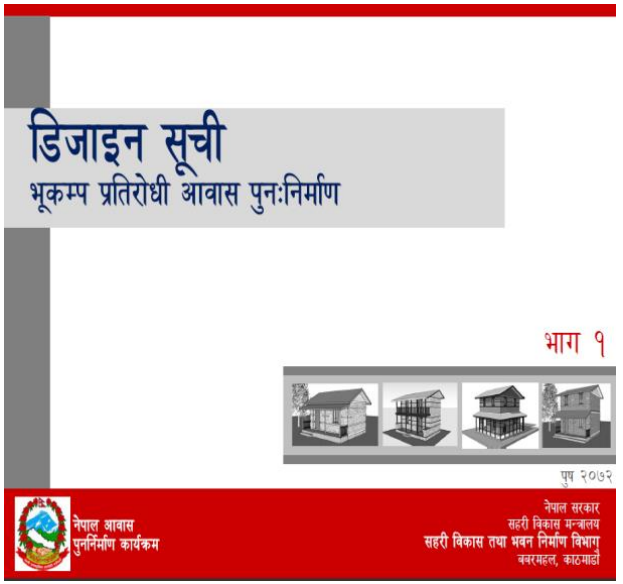
Private houses construction

- **Owner built system** (i.e.House owners need to construct their own houses by themselves)
- Government provides NRs. 300,000 as a Grant money in three installment
- House owner can use Government prepared design or their own design, however the design and construction must full-fill the minimum requirements of the Nepal National Building Code (NNBC)
- Technical supervision and recommendation for the Grant/Installment will be done by the engineer
- House owners need to use skilled/trained masons for the construction

Design Catalogue For Reconstruction Of Earthquake Resistant Houses

- **Ministry of Urban Development has published the First Volume of Design Catalogue in English on September 2015**
- **Nepali Version published on December 2015**





Introduction to the Design Catalogue

- The Design Catalogue developed to support Rural Households to commence the reconstruction of their homes
- Compliance with the Nepal National Building Code and all designs are approved by Ministry of Urban Development

Introduction to the Design Catalogue

Structural Type	No. of Floor	Model No.
Stone masonry in cement mortar SMC (8)	1	SMC-1.1
	1	SMC-1.2
	2	SMC-2.1
	2	SMC-2.2
	2	SMC-2.3
	2	SMC-2.4
	2+ATTIC	SMC-2.5
	2+TERRACE	SMC-2.6
Brick masonry in cement mortar BMC (7)	1	BMC-1.1
	1	BMC-1.2
	2	BMC-2.1
	2	BMC-2.2
	2	BMC-2.3
	2+ATTIC	BMC-2.4
	2+TERRACE	BMC-2.5
Stone masonry in mud mortar SMM	1	SMM-1.1
Brick masonry in mud mortar, BMM	1	BMM-1.1

SMC (Stone Masonry in Cement Sand Mortar) -8 types

SMC 1.1

SMC 1.2

SMC 2.1

SMC 2.2

SMC 2.3

SMC 2.4

SMC 2.5

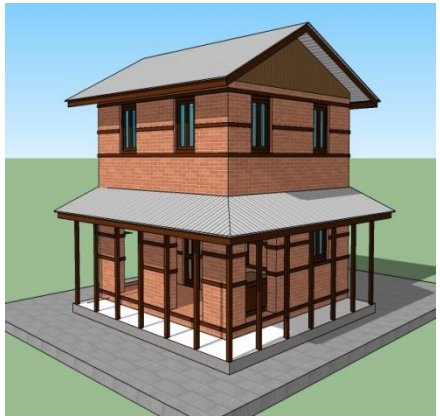
SMC 2.6

BMC (Brick Masonry in Cement Sand Mortar) - 7 types

BMC 1.1

BMC 1.2

BMC 2.1



BMC 2.2

BMC 2.4

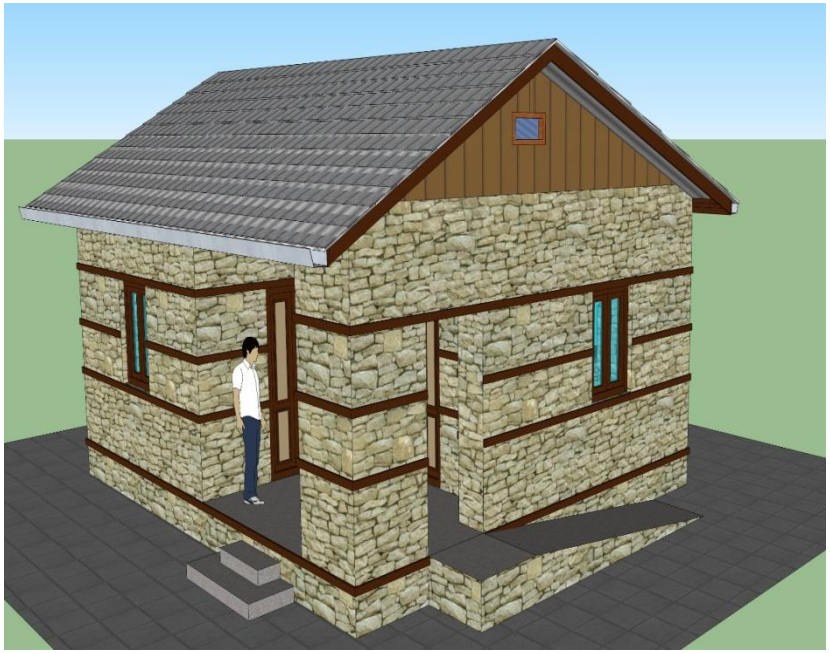
BMC 2.5

BMC 2.6

SMM

(STONE MASONRY IN MUD MORTAR)

- Designs for one-storey houses
- Based on parameters as set out in Nepal National Building Code (NBC) 203



BMM

(BRICK MASONRY IN MUD MORTAR)

- Designs for one-storey houses
- Based on parameters as set out in Nepal National Building Code (NBC) 203

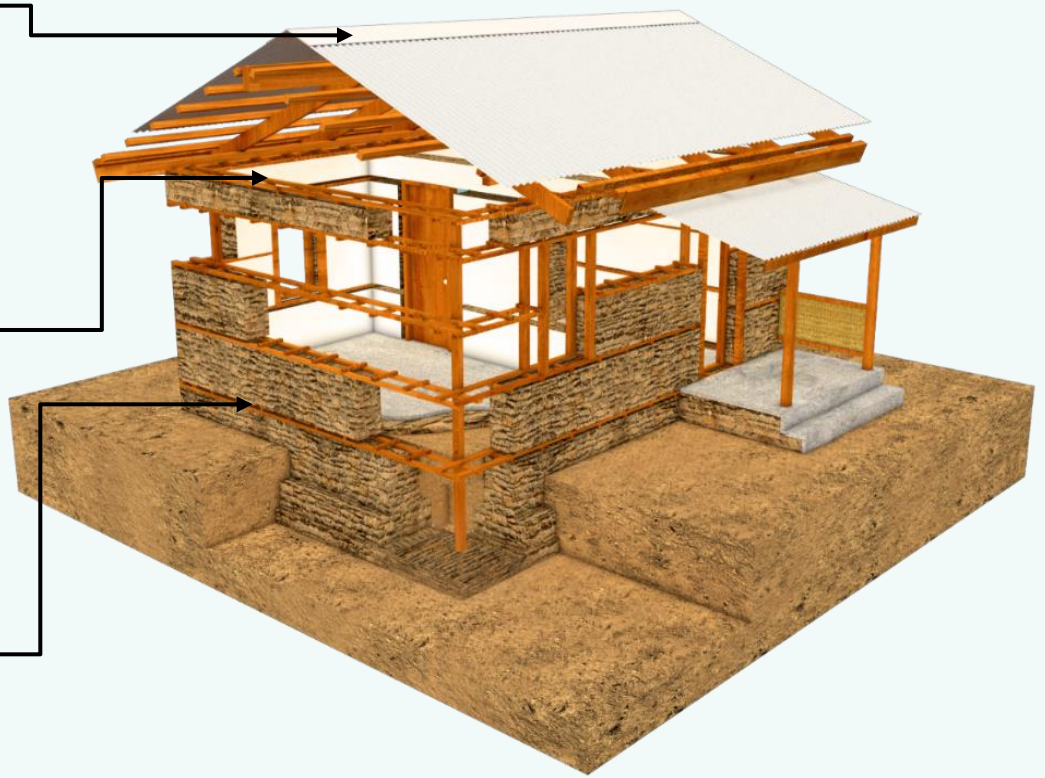
Technical Inspection and recommendation for Grant

First Installment NRs. 50,000 is given after completion of the agreement with the house owner

Final Inspection
After completion of all works (final finshing)

Second Inspection
- After Completion of Roof Band
- Recommend for Final Installment (100,000)

First Inspection
- After Completion of Damp Proof Course (DPC)/Plinth Level
- Recommend for Second Installment (150,000)



One Story Masonry Building

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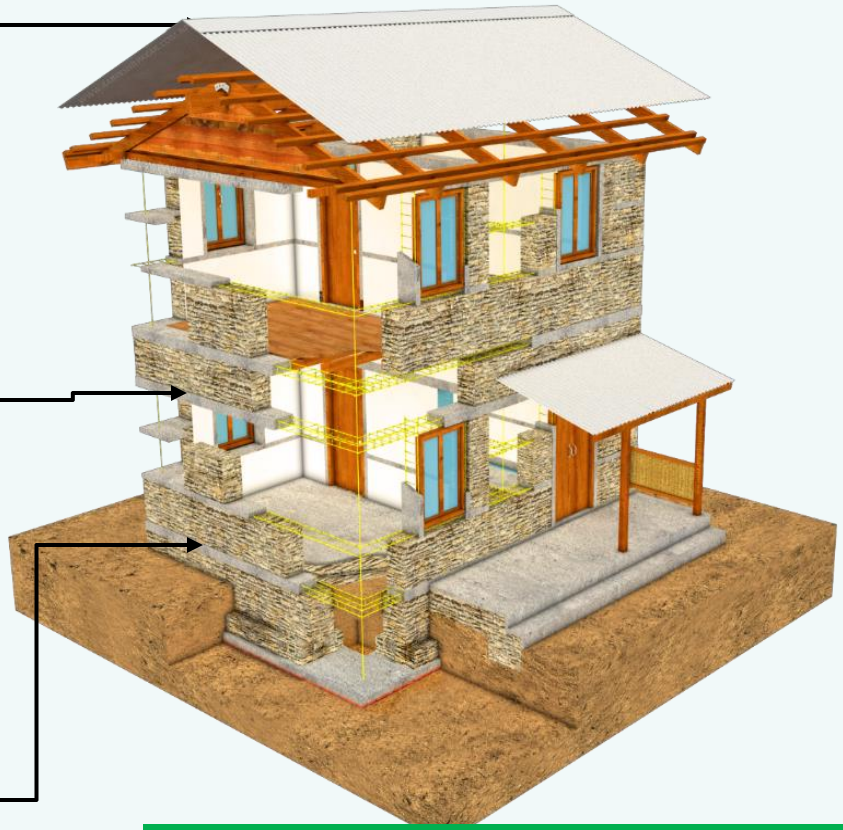
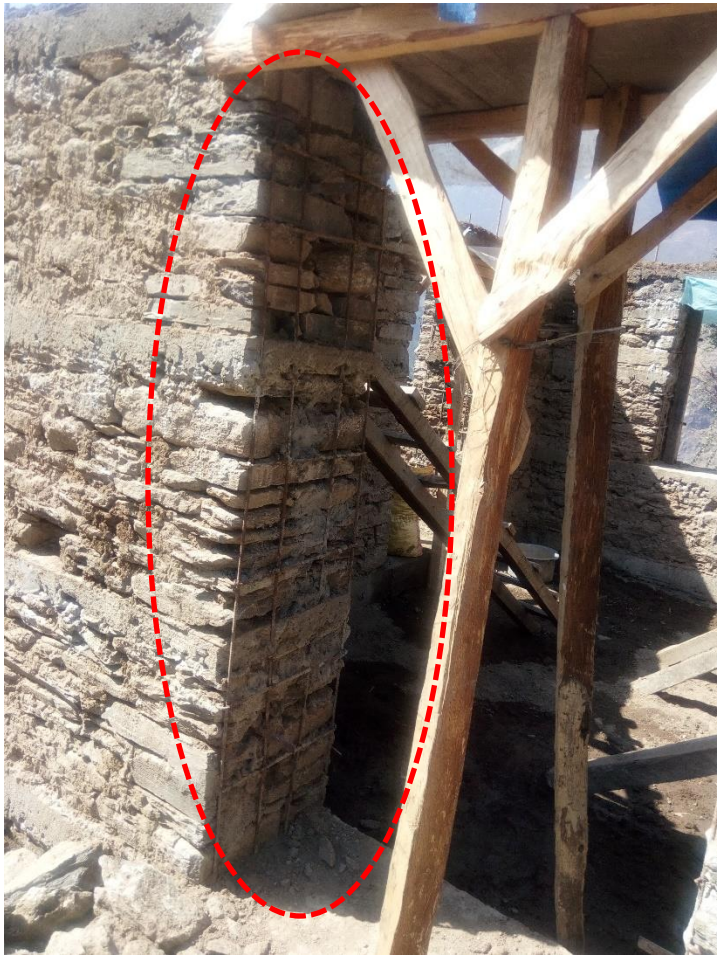


Two-story Masonry Building

Mason Training

- Supported by the different agencies (I/NGOs for mason training
- Supported from the WB/ADB/UNDP/Government of Japan

Some glimpses from the field



Stone masonry in mud mortar with wooden band

Some of the good practices

Stone masonry in mud mortar with wooden band

Some glimpses from the field

Stone masonry in mud mortar with wooden band

Stone masonry in mud mortar with wooden band

Some glimpses from the field

Brick masonry in cement mortar with concrete band

RCC building

Construction of Office Buildings

New Construction of the office buildings is goining on through specialized contractors

Settlement Planning

Most vulnerable locations are locations are identified through geological survey

Settlement Planning

1. **Resettlement to safe location**
2. **Settlement planning with some preventive measures**
3. **Supporting for development of infrastructures (such as life-line facilities)**

Earthquake Memorial Park

Conceptual Master Plan for

"Earthquake Memorial Park"

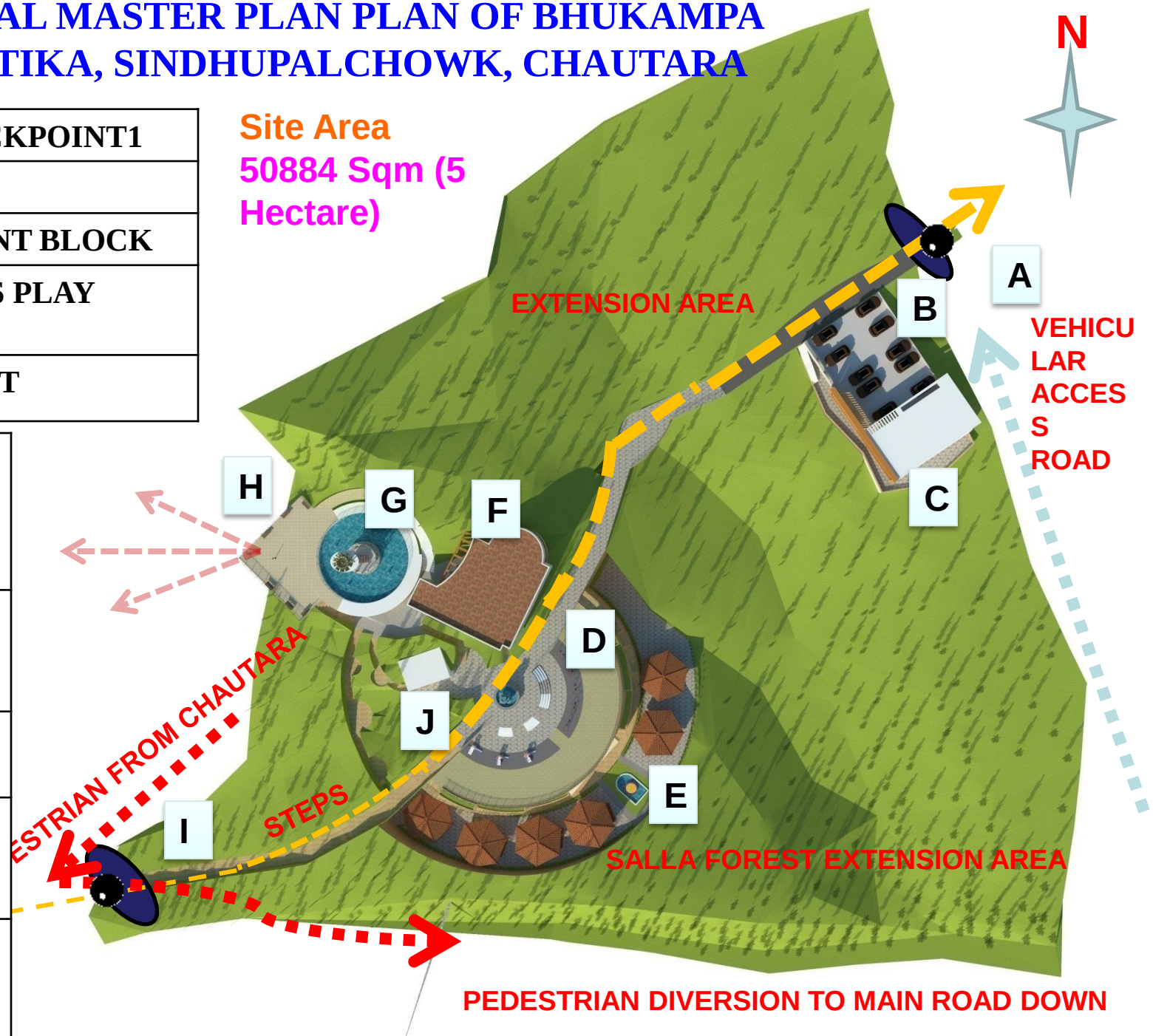
at

Sindhupalchowk, Chautara

CONCEPTUAL MASTER PLAN PLAN OF BHUKAMPA SMRITI BATIKA, SINDHUPALCHOWK, CHAUTARA

A	GATE CHECKPOINT1
B	PARKING
C	RESTAURANT BLOCK
D	CHILDRENS PLAY AREA
E	PICNIC SPOT

F	MUSEUM & EQ LEARNING CENTRE
G	VUKAMPA SMARAK STHAMBA
H	VIEW DECK
I	GATE CHECK POINT 2
J	EXISTING DAMAGED Blgd



Bird's Eye View

A	GATE CHECKPOINT1
B	PARKING
C	RESTAURANT BLOCK
D	CHILDRENS PLAY AREA
E	PICNIC SPOT

F	MUSEUM & EQ. LEARNING CENTRE
G	VUKAMPA SMARAK STHAMBA
H	VIEW DECK
I	GATE CHECK POINT 2
J	EXISTING DAMAGED BUILDING

Site Area

50884 Sqm
(5 Hectare)

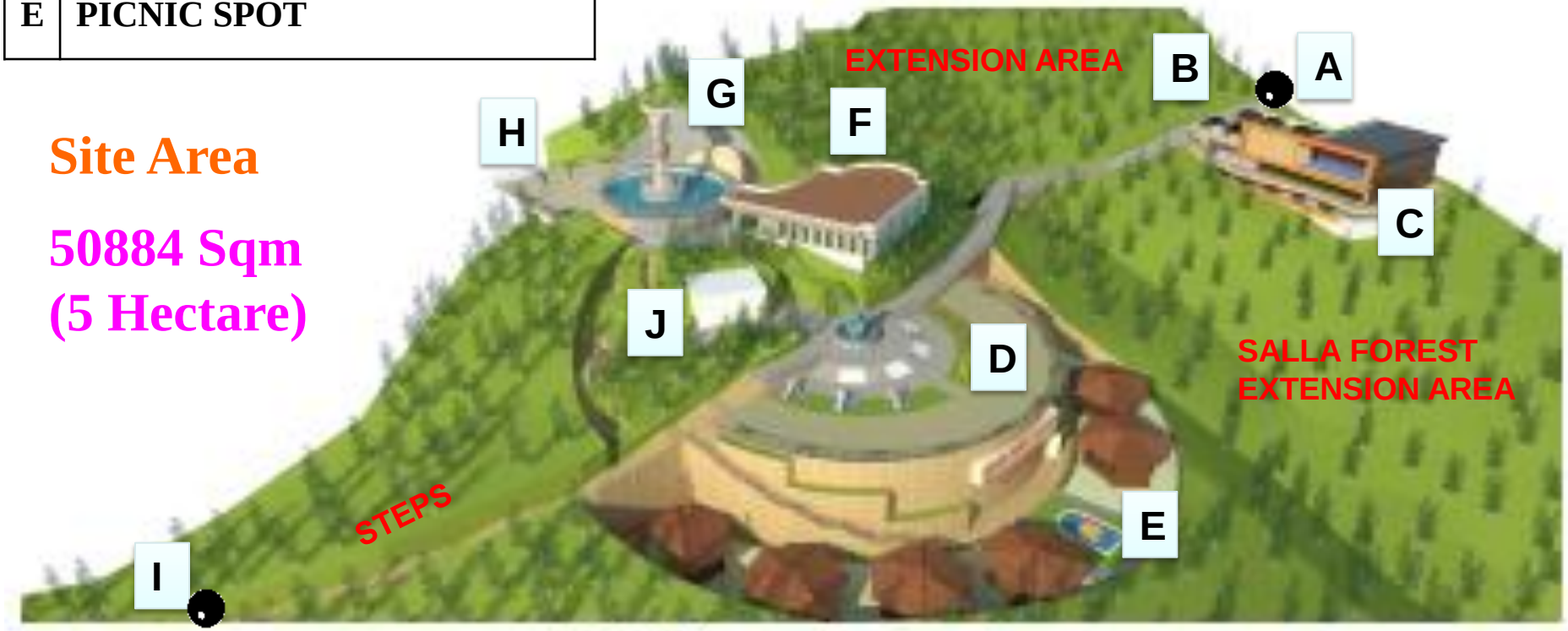


Fig: Bird's eye view of complex

Major Issues and Challenges in housing construction

- Institutional Mechanism in the change context (federalism)
- Difficult terrain, weak geology and weak management resulting in delayed response in the local level
- Implementation of National Building Codes, Plan, Program, Guidelines, and Designs (Technical Support Centre/Correction Manual)
- Long Term Financial Assistance for SM, MM, Mason refreshment
- Role of Stakeholders (I/NGOs: Collaboration/Coordination and Implementation)
- Technical Manpower, Masons Quantity and Quality
- Quality assurance through community

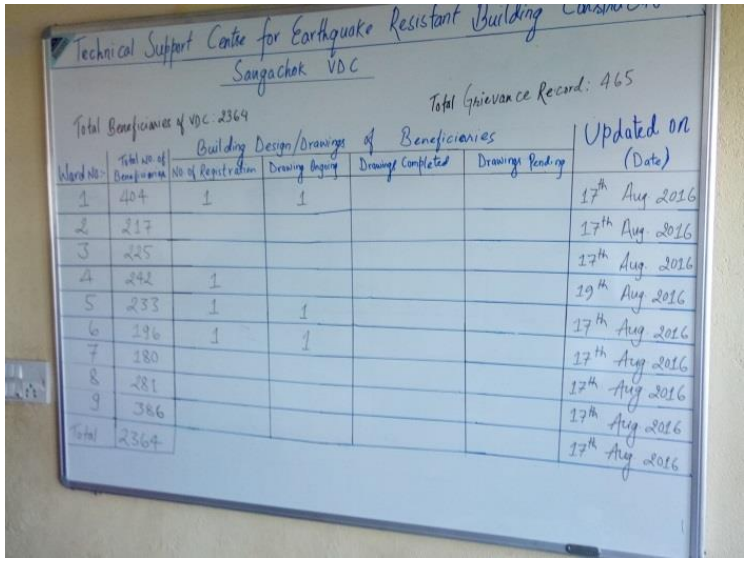
Collaboration and Coordination with Partners (I/NGOs)

Collaboration and Coordination between the partners for effective Implementation in the local level

- **Collaboration in preparation of design and technical support**
- **Collaboration and coordination in supervision of the construction**
- **Community Awareness and Mobilization**
- **Mason Training through close coordination with Government Engineers**
- **Collaboration in houses construction and recommendation for the grant**

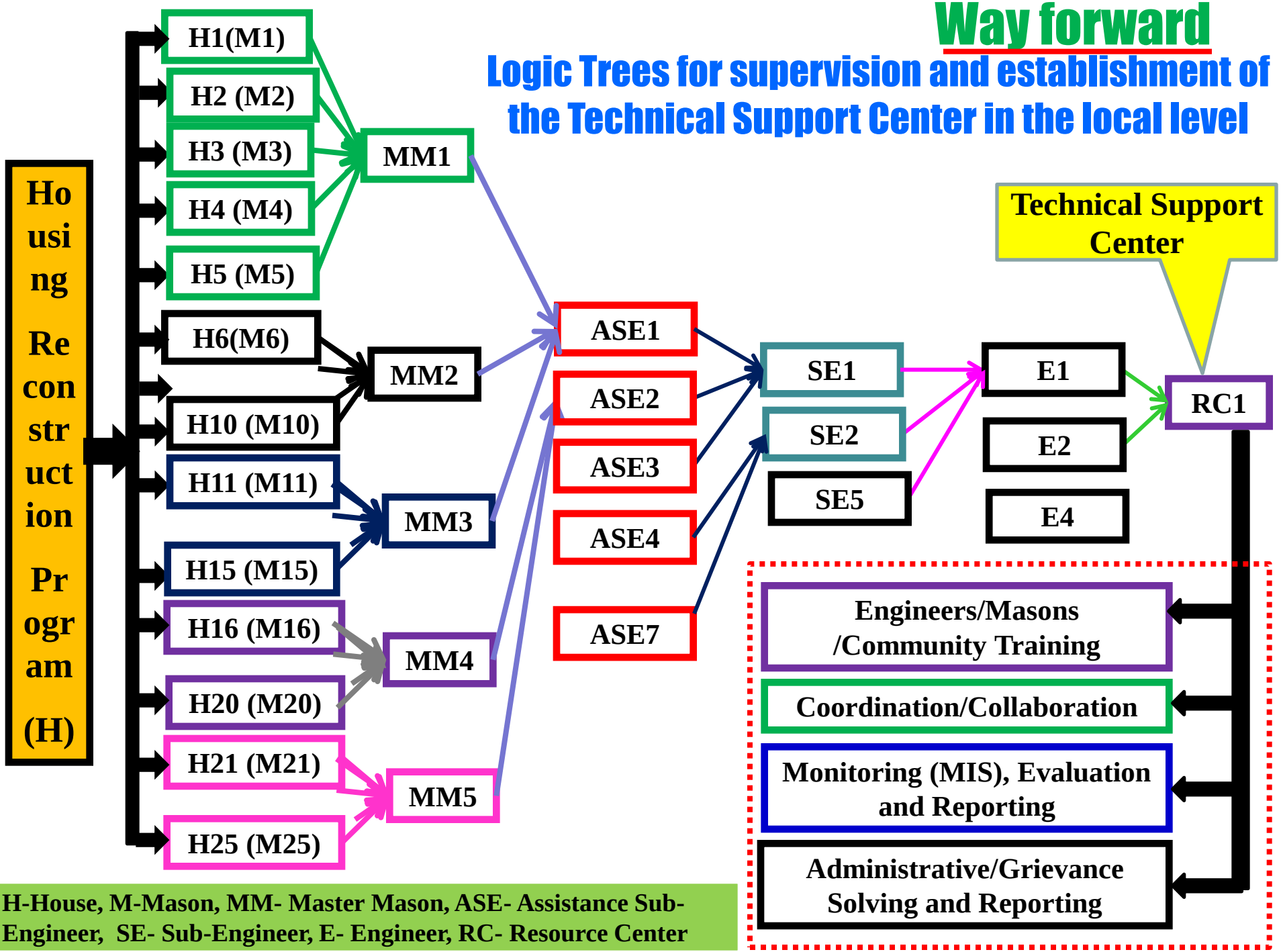
Example

Collaboration and Coordination between DUDBC/DLPIU Sindhupalchowk and Build Change



Way forward

Logic Trees for supervision and establishment of the Technical Support Center in the local level



H-House, M-Mason, MM- Master Mason, ASE- Assistance Sub-Engineer, SE- Sub-Engineer, E- Engineer, RC- Resource Center

Way forward

Strong
Collaboration
Coordination
and
Implementation
mechanism

3. DRM Education (Training & awareness program to Community, Teachers, Students etc.)

Housing Platform

Safer and aware community

1. Structural Component (Implementation of Building Code- Engineers)

2. Training to Masons through construction

Disaster Resilient Society

If there is an any disaster

1. **Minimum Loss**
2. **Well prepared & aware to mobilize resources**
3. **Recovered with in short period**

Thank you