INDIGENOUS PRACTICES FOR DRR

Presented by

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INDIGENOUS KNOWLEDGE

- Yokohama Strategy
  - Aim at the application of traditional knowledge, practices and values of local communities for disaster reduction
- Hyogo Framework of Action
  - The information should incorporate relevant traditional and indigenous knowledge
- Sendai Framework
  - Ensure the use of traditional, indigenous and local knowledge and practices, as appropriate, to complement scientific knowledge in disaster risk assessment

- IK refers to
  - Rural people's knowledge
  - Peasants' knowledge
  - Folk knowledge
  - Indigenous technical knowledge
  - Ethno science
  - Traditional environmental knowledge
  - Indigenous agricultural knowledge
  - Traditional knowledge

EARTHQUAKE: Houses of Jumla

INDIGENOUS KNOWLEDGE

- Take the indigenous knowledge at the point of departure
- Subject it to scientific analysis
  - IK is scientific in general
    - “Local knowledge is knowledge that is in conformity with general scientific principles, but which, because it embodies place-specific experience, allows better assessment of risk factors in production decision. This kind of knowledge arises when local people undertake their own experimentation, or where they are able to draw inferences from experiences and natural experiments.” (Richards,1994)
- Use it if found to be appropriate

DIFFERENT STAGES

FIRE DUE TO SHORT CIRCUITING

- Use of Calcium Carbonate
- Limestone Lime Carbon di oxide
- $CaCo_3 \rightarrow Cao + Co_2$
-

FIRE DUE TO SHORT CIRCUITING

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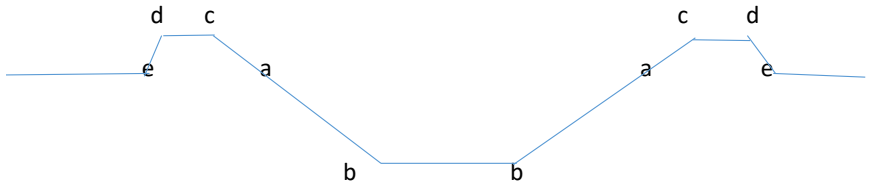
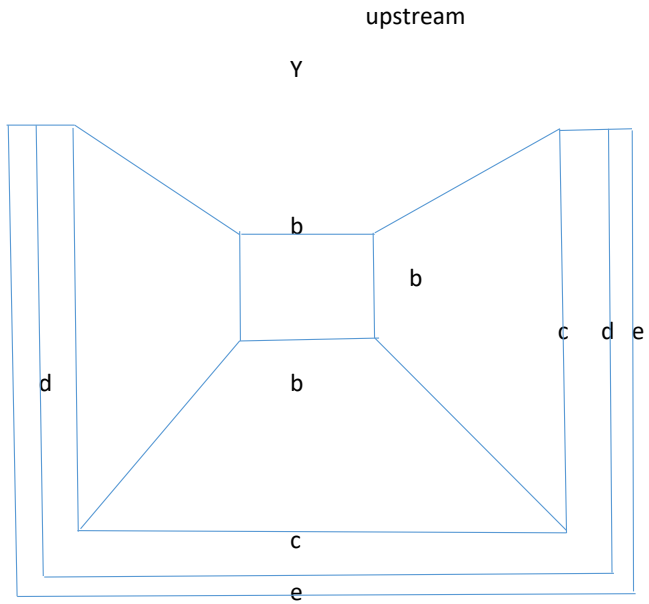
PONDS: DIFFERET SIZES

Sn	Size of excavated pond	Size of actual pond	Interior side b	Inclination ab and bc	Depth D	Excavation cu ft	Total Volume of water cft
1	20' x 20'	26'x 26'	4	2:1 and 1:1	4'	576	1300
2	18' x 18'	24'x 24'	4		3'6"	430	1030
3	16' x 16'	20'x 20'	4		3'	280	650
4	14'x 14'	18'x 18'	4		2'6"	225	420
5	12' x 12'	14'x 14'	4		2'	170	226
6	10' x 10'	12'x12'	2'		2'	76	160
7	8' x 8'	10'x10'	2'		1'6"	50	70
8	6' x 6'	8'x8'	2'		1'	22	30

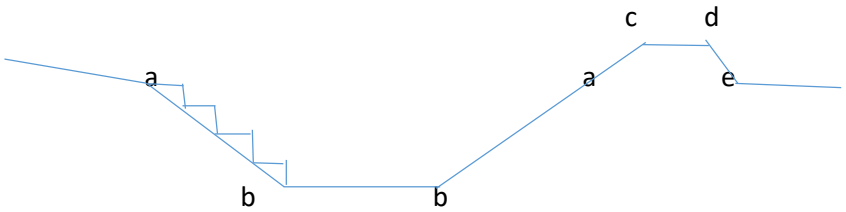


Section XX

PONDS: PLAN AND SECTION



Plan



Section YY

PONDS: WHERE TO CONSTRUCT THEM

- These should be constructed on either side of the gullies where land permits.
- 50 per cent of the rain should be allowed to drain from the gullies to maintain downstream ecology
- The overflow pipe should be connected to the gully to enable excess rainfall to flow
- These gullies may be small in the bariland and grassland

HOW TO BEGIN THE WORK

- Take a google map and find the approximate location of the pond at about 4 to 6 ropanis each
- Make a request to the Ward Chairperson in which the pond is to be dug
- The Chairperson will give permission after consulting the mayor and the stakeholders

PONDS: WHY TO CONSTRUCT THEM

- It leads to lesser floods due to the retention of rainwater in the mountains.
- It also creates lesser landslide because some of the storm water does not get to descend at high speed. It is damped by the interruption by the ponds.
- The presence of ponds in regular intervals leads to lesser temperature rise and higher humidity discouraging the wildfire.
- The wild animals do not come to the settlement because of water and fodder available in the forest.

PONDS: WHY TO CONSTRUCT THEM

- The lightning falls on the forest area due to its moist nature instead of hitting the settlements which are comparatively dry.
- The pond water dissolves the carbon dioxide of the air which later percolates into the ground taking the carbon dioxide below the ground mitigating climate change. This is very notable as no energy is expended in storing carbon dioxide in the ground.
- It helps to retain the soil due to growth of vegetation

PONDS: WHEN TO CONSTRUCT THEM

- Nepal receives 78, 5, 3, 14 per cent of rain in Monsoon, Post Monsoon, winter and Pre Monsoon Period
- Digging of ponds in the winter when it receives rain is the appropriate time.
- People are not busy in the farm
- It is easy to dig due to some rain falling on ground making it soft

PONDS: WHERE TO CONSTRUCT THEM

- Bariland should be given priority because the settlements are located in the periphery.
- Forest should be second priority otherwise the wild animals will come to the settlement
- All the land use types should be addressed for total effect and impact.
- They should be constructed on either sides of the Gullies and rain drainage channels

Sn	Lan use tye	Percentage of landslide	Connectivity %	Land Mass Cu m	Debris flow Prob %
1	Khetland	65.6	4.4	5.6	5.6
2	Bariland	9.6	10.8	59.34	
3	Landslides	4.5	28.4	376	100
4	Sal Scrub	2.6	21.4	768.6	84
5	Grass land	6.8	24	224.24	56
6	Forest	2.6	50	128.8	50

Source: Juerz Merz et al,2008

PONDS: HOW TO CONSTRUCT THEM

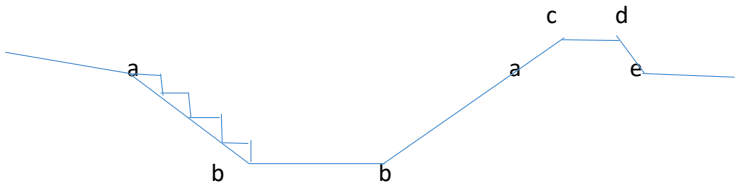
- Firstly, the location of the pond should be identified.
- These could be along the rainwater movement channel like gullies and in their either side.
- They could be also in the front and back yard of the villagers but these should be dug in settlements along the storm water channels.
- Secondly, the pond is laid out depending upon its size as given in table 1.1.1.
- The green turf is put at the side on the exterior of e as it should be put back after the construction is over.

PONDS: HOW TO CONSTRUCT THEM

- Thirdly, the central area (b x b) is first dug to the required depth as given in table 1.1.1.
- The soil is put alongside ce as shown in the plan along all three sides.
- The upstream side is left open to let the storm water flow.

PONDS: HOW TO CONSTRUCT THEM

- Fourthly, the steps 1 ft long, ab/d wide and depth 1'are dug at the center of all the four sides.
- It has been shown on the left side of the section.
- Fifth, the rise and the tread of steps are cut to obtain the slope



Section YY

PONDS: HOW TO CONSTRUCT THEM

- Eighth the embankment is made as shown with the soil which has been dumped in the three sides as shown
- The green turf is put back along the embankment from outsides covering the embankment and part of the pond.

MANTENANCE OF THE PONDS

- Every year, the top of the pond should be dredged as the top materials is a good fertilizer
- This can be sold and the maintenance can be carried out
- The local Government can give on contract to the local people for this purpose

COST OF ONE POND

- A 20’ X20’ Pond : 560 cft digging
- According to the construction norms, a man can dig 110 cft in a day but it requires throwing soil to 100 ft distance
- Here throwing is only to 20 ft distance and hence they have been found to dig 140 cft per day
- Four persons can complete the work
- The pond costs Rs 4-5000 depending upon the daily wage
- It provides local employment

SIRANCHOK , GORKHA

- VISIT TOOK PLACE ON 15 th Sept, 2021
  - Surya Bahadur Thapa- Chair DPNet
  - Dr. Meen Bahadur Paudyal Chhetry-NCDM
  - Dr. Raju Thapa, Vice Chair DPNet

Cleaning of the debris

VISIT OF SIRANCHOK SITE

- Lessons Learned
  - The crack filling was done below the drain
  - But it appears that there was yet another crack which could not be spotted
  - The crack has appeared
  - There is a need of one time a year maintenance of the drainage and crack filling site

VISIT OF SIRANCHOK SITE

- Stakeholders said
  - The draining and crack filling technique was found to be effective
  - The technology was simple and of low cost
  - It is It is a model and replicable in other landslide areas
  - It used natural material apart from cement which could also be substituted by lime mortar.

EARTHQUAKE DAMPING

EARTHQUAKE DAMPING

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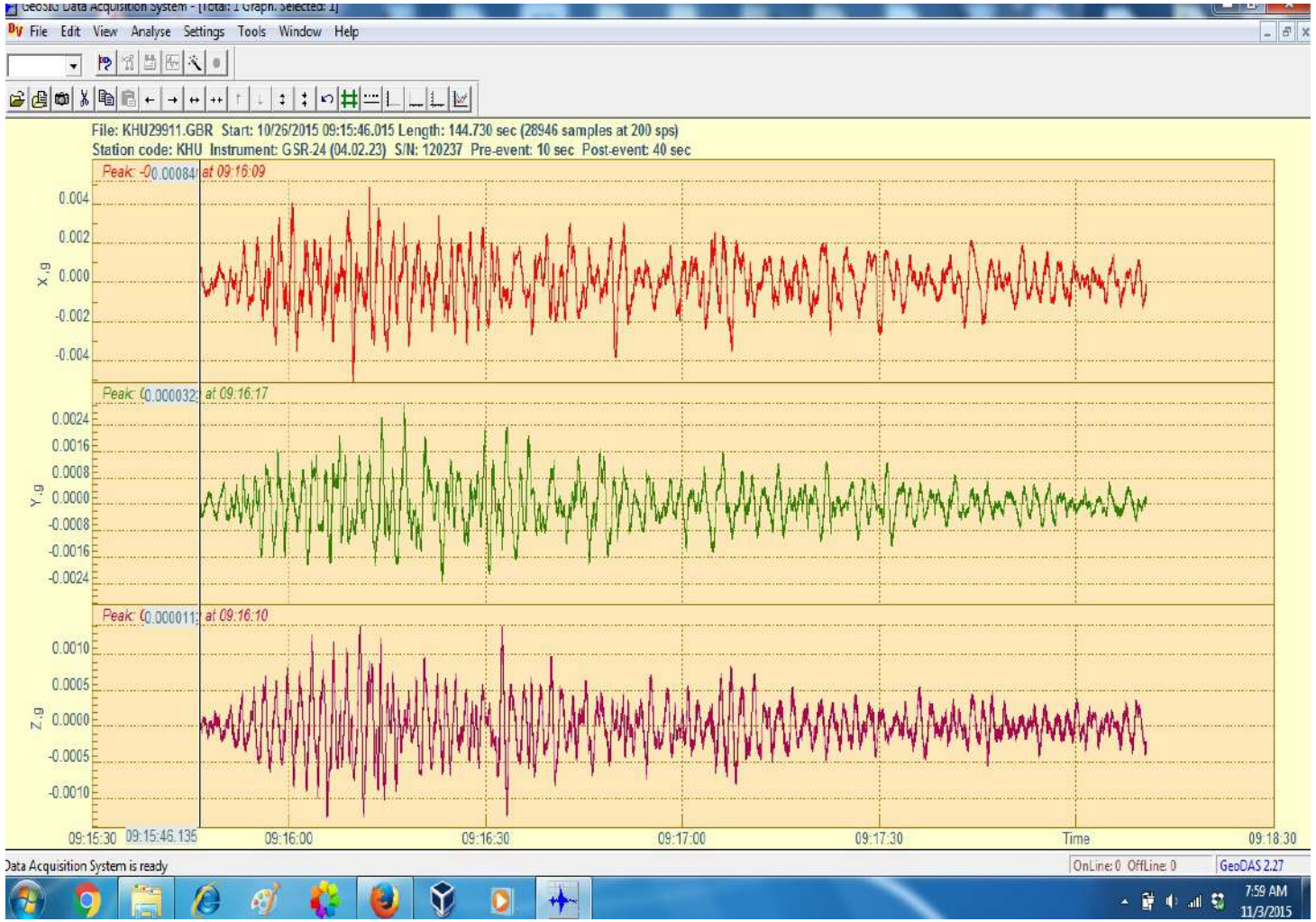
EARTHQUAKE

- A damping technology is being initiated
- Absorption of energy occurs due to imperfect elastic property of the medium

Accelometer Reading and Earthquake Damping at NAST Station, Khumaltar, Lalitpur										
S.N.	Date and Time	Epicenter and Magnitude in R.S.	KHU 1		Vector Sum (x & y)	NST2		Vector Sum (x & y)	Individual Damping in %	Vector Sum Damping in %	Remarks
			Axis	g		Axis	g				
1	2015 June 11, 16;22;27	Sindhupalchowk, 5.3	X	0.00223		x	0.00109		-51.12		
			Y	0.00141	0.002641752	y	0.00112	0.001560669	-20.92	-40.92	(--1+(0.00156/0.0026)* 100
			Z	0.00221		z	0.00112		-49.21		
2	2015 June 13, 16;22;27	Dolakha , 5.2	X	0.00202		x	0.00103	0.001233378	-49.21		
			Y	0.00125	0.002371675	y	0.00069		-44.94	-48.00	
			Z	0.0012		z	0.00067		-44.49		
3	2015 June 25, 15;22;25	Nuwakot/Dhading border, 4.3	X	0.00295		x	0.00152		-48.66		
			Y	0.00198	0.003553694	y	0.00155	0.002164551	-21.85	-39.09	
			Z	0.00159		z	0.00066		-58.54		
4	2015 June 29, 07;37;35	Kathmandu , 3.3	X	0.00501		x	0.00152		-69.76		
			Y	0.00279	0.005733988	y	0.00171	0.002283836	-38.72	-60.17	
			Z	0.00445		z	0.00099		-77.71		
5	2015 July 16, 13;51;09	Dolakha , 2.8	X	0.00279		x	0.001268		-54.56		
			Y	0.00356	0.004523636	y	0.001828	0.002224566	-48.66	-50.82	
			Z	0.00026		z	0.000109		-58.54		
6	2015 July 16, 14;22;20	Kirtipur , 3.2	X	0.00107		x	0.000442		-58.54		
			Y	0.00119	0.00159921	y	0.000542	0.000699162	-54.56	-56.28	
			Z	0.00118		z	0.000607		-48.66		
7	2015 July 16, 22;21;33	Dhading, 3.0	X	0.00084	0.001469211	x	0.000432		-48.66		
			Y	0.0012		y	0.000668	0.00079602	-44.48	-45.82	
			Z	0.00052		z	0.000467		-9.73		
8	2015 July 17, 09;06;29	Kavre, 3.9	X	0.00127		x	0.000578		-54.56		
			Y	0.00079	0.001496305	y	0.000528	0.000783051	-32.96	-47.67	
			z	0.00073		z	0.000375		-48.66		
9	2015 July 17, 13;48;34	2.7 , Dolakha	x	0.00135		x	0.000561		-58.54		
			y	0.0011	0.001741214	y	0.000857	0.001023835	-21.85	-41.20	
			z	0.00171		z	0.000680		-60.11		
	AVERAGE DAMPING		x	0.00135		x	0.000561		-54.85		
			y	0.0011	0.001741214	y	0.000857	0.001023835	-36.55	-47.77	
			z	0.00171		z	0.000680		-54.69		-48.69537

Source; DoMG

g= gal=Ground acceleration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Peak: -0 at 09:16:09
X,g
Peak: 0 at 09:16:17
Y,g
Peak: 0 at 09:16:10
Z,g
09:15:30
09:15:46.135
09:16:00
09:16:30
09:17:00
09:17:30
Time
09:18:30
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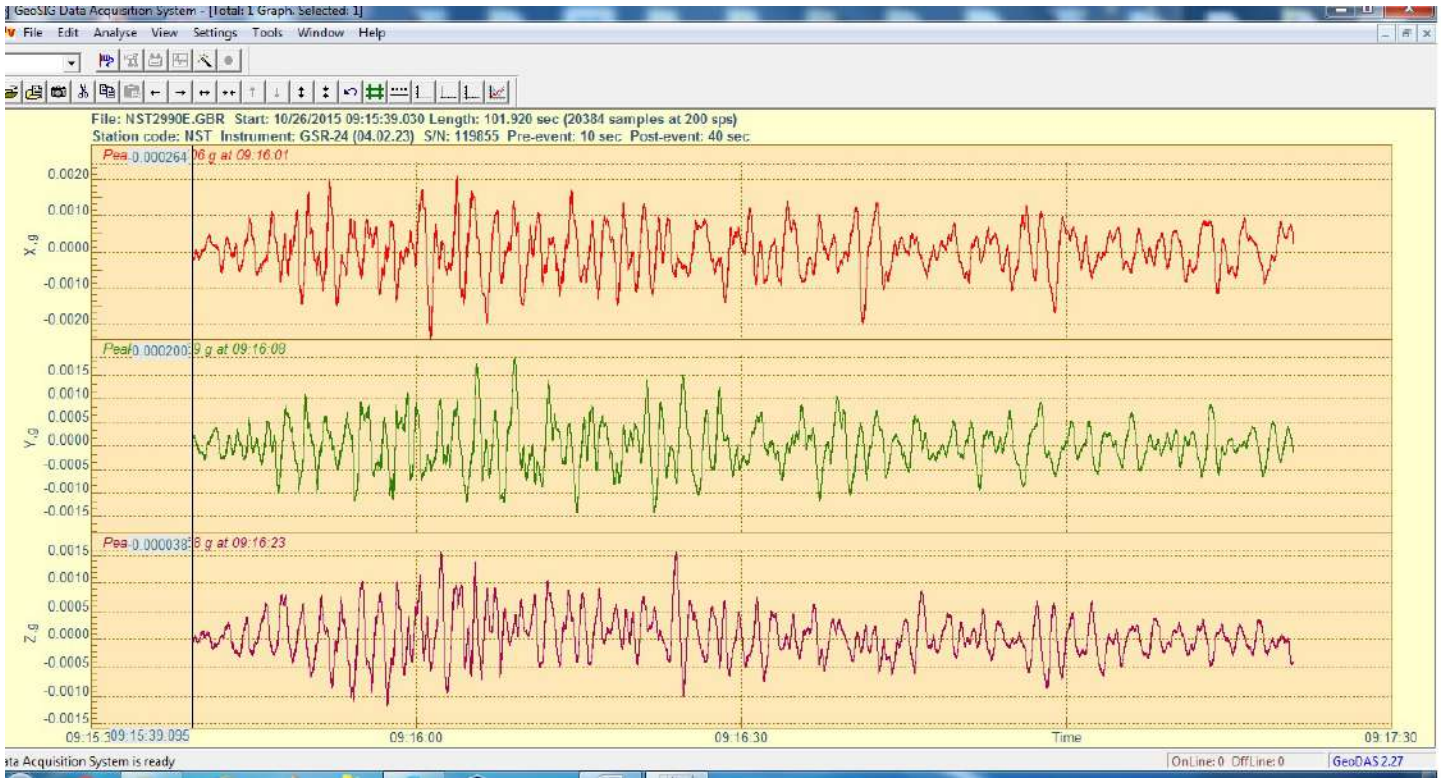
OnLine: 0 OffLine: 0
GeoDAS 2.27
7:59 AM
11/3/2015


GeoSIG Data Acquisition System - [Total: 1 Graph. Selected: 1]
File Edit Analyse View Settings Tools Window Help
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Station code: NST Instrument: GSR-24 (04.02.23) S/N: 119855 Pre-event: 10 sec Post-event: 40 sec
Peak 0.000264 g at 09:16:01
X,g
0.0020
0.0010
0.0000
-0.0010
-0.0020
Peak 0.000200 g at 09:16:00
Y,g
0.0015
0.0010
0.0005
0.0000
-0.0005
-0.0010
-0.0015
Peak 0.000038 g at 09:16:23
Z,g
0.0015
0.0010
0.0005
0.0000
-0.0005
-0.0010
-0.0015
09:15:39.095
09:16:00
09:16:30
Time
09:17:30
ta Acquisition System is ready
OnLine: 0 OffLine: 0
GeoDAS 2.27

DAMPING OF OPEN STONE JOINT (Source: Parajuli Hari et al)

Model 1
Dry joint stones laid one over other
Element size :0.30mx0.30mx0.065m

DAMPING OF OPEN STONE JOINT (Source: Parajuli Hariet al)

Damping estimate for dry joint stones

Estimate	1	2	3	4	5	Avg.
1	52.16	56.23	56.29	54.75	54.3	54.5
2	46.12	46.06	48.29	46.23	46.63	46.8
Average equivalent viscous damping (%)						51.0

TYPICAL HILLY SETTLEMENTS

EARTHQUAKE: INDIGENOUS TECHNOLOGY

KABHREPALANCHOK DISTRICT

EARTHQUAKE: INDIGENOUS TECHNOLOGY

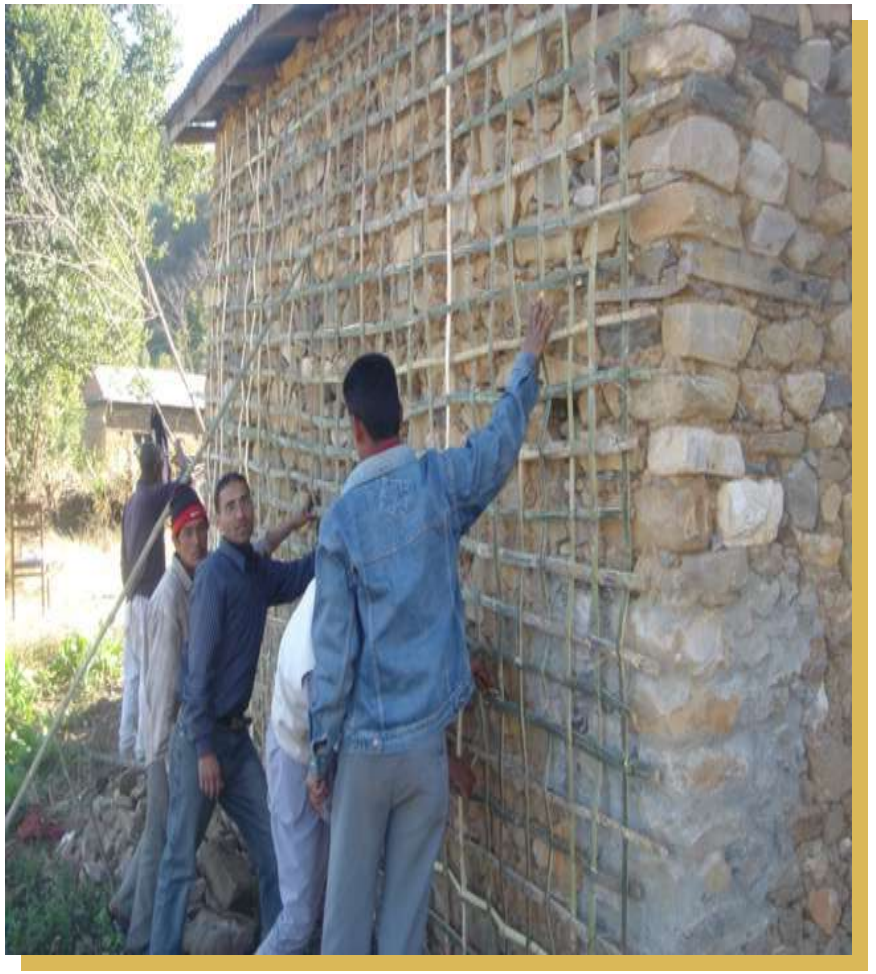
- Make holes in the walls in line with the scaffolding holes to have a grid of 3ft by 3ft

EARTHQUAKE: INDIGENOUS TECHNOLOGY

- Make a 4” x 4” jali of bamboo

EARTHQUAKE: INDIGENOUS TECHNOLOGY

- Insert the jali in the exterior of the wall



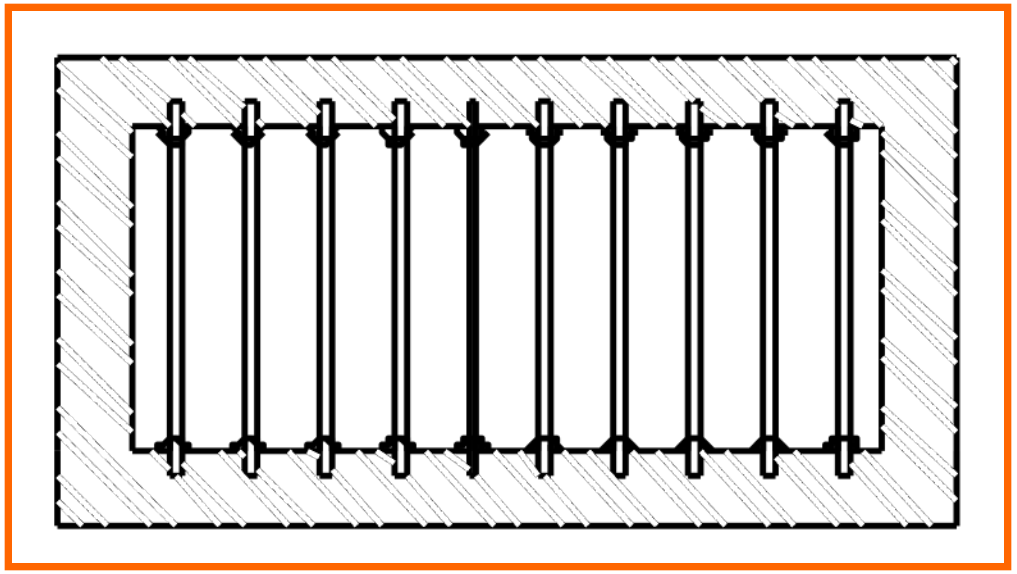
EARTHQUAKE: INDIGENOUS TECHNOLOGY

- Insert the jali in the interior wall

EARTHQUAKE: INDIGENOUS TECHNOLOGY

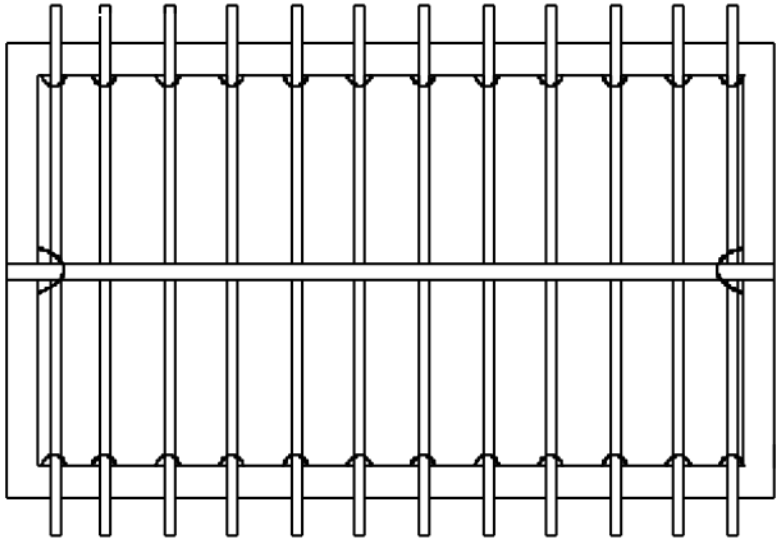
- Tie the interior and exterior bamboo jali by the gabon wire very strongly

EARTHQUAKE: INDIGENOUS TECHNOLOGY



Tie the joists with the wire

EARTHQUAKE: INDIGENOUS TECHNOLOGY



Tie the rafters with the wire

EARTHQUAKE: INDIGENOUS TECHNOLOGY

- Plaster the wall with the mud.

EARTHQUAKE: INDIGENOUS TECHNOLOGY

RAMECHHAP DISTRICT

DOLAKHA DISTRICT

EARTHQUAKE: INDIGENOUS TECHNOLOGY

RAMECHHAP DISTRICT

EARTHQUAKE: INDIGENOUS TECHNOLOGY

KASKE DISTRICT

KABHREPALANCHOK DISTRICT

EARTHQUAKE: INDIGENOUS TECHNOLOGY

KABHREPALANCHOK DISTRICT

•Thanks

- Dr Lok Bijaya Adhikari and Dr. Mukunda Bhattarai(DoM)
- Rotary Club Thamel
- Nepal Academy of Science and Technology
- Kali Das Pokharel, Ward Chairman, Kharpa, Khotang
- Any questions?