3rd International Workshop on Educational Seismology

EGU Pokhara Workshop 2023

1 - 3 May 2023

Pokhara, Nepal

An event organized by

Seismology at School in Nepal

"working together for earthquake education and better preparedness"

3rd International Workshop on Educational Seismology, 1 - 3 May 2023 Pokhara, Nepal
Organized as part of 'Seismology-at-School in Nepal' program for earthquake education- first time in Nepal.

Format of the conference:
Presentation style, demonstrations, question and answers and workshops.

Goal:
The 3rd International workshop on educational seismology for teachers in Pokhara is a main connecting event between earthquake and education specialists, and teachers of schools across the region of western Nepal. The goal of the workshop is to explain our educational aims, to show and practice the learning material, to demonstrate SISMO-BOX, do it yourself, to demonstrate the use of a low-cost seismometer, and to answer any question that may arise from the teachers. This year, we will focus on the SISMO-BOX to stimulate high and middle school students towards the understanding of the natural phenomenon of earthquakes. It will help to raise student's awareness on the consequences that earthquakes can have in the communities. We will demonstrate the application of SISMO-BOX in the classrooms. We will also cover the topic Earthquake Evacuation Drills and its protocol, which is also crucial for Nepali pupils.

Participants:
48 participants - STEM teachers from public and private schools located on western Nepal and neighbouring regions.

Dates: 1 - 3 May 2023

Event format: One full day and two-half day.

Venue: Lakeside, Pokhara

Acknowledgements

The 3rd International Workshop on Educational Seismology in Pokhara, Nepal has been organized by the Seismology at School in Nepal. This event is mainly supported by the Committee on Education of the European Geosciences Union, but has also benefited from the generous help of:

European Geosciences Union

University of Lausanne, Switzerland

International Union of Geodesy and Geophysics

And we thank all the speakers who have contributed to this educational workshop and their institutions!

3rd International Workshop on Educational Seismology
Program Schedule

DAY 1: Monday, 1st May 2023	
14h	**Arrival at the Hotel (at latest)** Mt. Kailash Resort, Lakeside Pokhara
14h30 – 15h30	**Registration and workshop materials distribution** Mt. Kailash Resort, Conference Hall
15h30 – 16h00	**Inauguration Session** Mt. Kailash Resort, Conference Hall
16h00 – 16h30	**TALK 1 (30'): Introduction, EGU GIFT info and Survey** *Speakers: György Hetényi, Shiba Subedi, Fabrice Jouffray*
16h30 – 17h30	**TALK 2 (1h): Seismic Hazard in Nepal and experiences** *Speaker: Dr. Lok Bijaya Adhikari*
17h30 – 18h30	**TALK 3 (1h): Earthquake Evacuation Drills** *Speaker: Dr. Sarah Houghton*
18h30 – 19h	**IGEO presentation + Group Photo**
19h	**Welcome Dinner** Mt. Kailash Resort

Day 2: Tuesday, 2nd May 2023	
7h – 8h30	**Breakfast** Mt. Kailash Resort
8h30 – 10h30	**TALK 4 (2h): SEISMO-BOX demonstration Session I** *Speaker: Fabrice Jouffray*
10h30 – 11h	**Coffee Break**
11h – 12h	**TALK 5 (1h): SEISMO-BOX demonstration Session II** *Speaker: Fabrice Jouffray*
12h – 12h30	**Questions and Answers**
12h30 – 14h	**Lunch** Mt. Kailash Resort

14h – 14h30	**TALK 6 (30'): Beat the Quake game: Rules** *Speaker: György Hetényi and Shiba Subedi*		
14h30 – 16h	**Hands on session in 3 groups**		
	SEISMO-BOX mounting *Speaker: FJ*	**Earthquake Location Tutorial** *Speaker: SS*	**Playing Beat the Quake** *Speaker: GH*
16h – 16h30	**Coffee Break**		
16h30 – 17h30	**Hands on session in 3 groups**		
	SEISMO-BOX mounting Speaker: *FJ*	**Earthquake Location Tutorial** *Speaker: SS*	**Playing Beat the Quake** *Speaker: GH*
17h30 – 18h30	**Hands on session in 3 groups**		
	SEISMO-BOX mounting Speaker: *FJ*	**Earthquake Location Tutorial** *Speaker: SS*	**Playing Beat the Quake** *Speaker: GH*
18h30 – 19h	**Musical Break** Mt. Kailash Resort, Conference Hall		
19h30	**Dinner** Mt. Kailash Resort		

Day 3: Wednesday, 3rd May 2023	
7h – 8h30	**Breakfast** Mt. Kailash Resort
8h30 – 9h30	**TALK 7 (1h): Seismology at School in Nepal: applications and lessons** *Speaker: Shiba Subedi*
9h30 – 10h30	**TALK 8 (1h): ASK ME ANYTHING: Question and Answer session** *Speaker: ALL keynote speakers*
10h30 – 11h	**Coffee Break**
11h – 12h	**SEISMO-BOX logistics discussion: distribution, exchange, new constructions**
12h – 13h	**Closing session** *Survey + Certificate distribution + travel allowance distribution*
13h – 14h	**Lunch**
14h	**Departure from the Hotel**

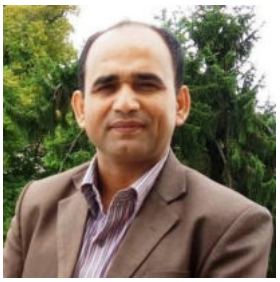
Keynote Speakers

Prof. Dr. György Hetényi
Geophysicist
Institute of Earth Sciences,
Faculty of Geosciences and Environment
University of Lausanne, Switzerland

György is a geophysicist and a professor at the Institute of Earth Sciences, University of Lausanne, Switzerland. After a geophysics and geology M.Sc. education starting at Eötvös University, Budapest, Hungary and finishing at the Ecole Normale Supérieure, Paris, France, he continued at ENS Paris with a Ph.D. which he completed in 2007, with the title "Evolution of deformation of the Himalayan prism: from imaging to modelling." After a post-doctoral stay at the University of Leeds, United Kingdom, he has worked at ETH Zurich, at the Department of Earth Sciences and at the Swiss Seismological Service for 7 years. György started in Lausanne in 2015, where the "Seismology at school in Nepal" project was initiated in 2017, related to the Ph.D. thesis of Shiba Subedi. György is actively involved in Himalayan research since 2004, including several field campaigns in seismology and gravimetry, and numerous publications on Himalayan geodynamics and seismotectonics.

Fabrice Jouffray
PhD in Earth Sciences (last year)
University Cote d'Azur, France
EGU Education committee

Fabrice is a former teacher in schools, now at the University Cote d'Azur in Nice, France where he teaches Biochemistry, Genetics Sciences, Immunology and Geodynamic processes to future teachers. He serves as an assistant director of French institute for Teaching and Education, and coordinator of curriculum for Master's degree at the University Cote D'Azur. Since 2017, he has been involved in teacher formation for seismological network at schools and related tasks as project co-creator of EduMed Observatory. He has a long experience of teaching Biology and Geology in different schools in Nice and other parts of France. Moreover, during his career, he developed competences creating educational project in seismic risk and hazard. He did Bachelor's degree in Biology and Biochemistry, Master's degree in Biochemistry and Geology, and currently he is about to complete his PhD in Earth Science. He published numerous articles in variscan orogeny and seismology at school.



Dr. Lok Bijaya Adhikari
Senior Seismologist
National Earthquake Monitoring and Research Centre (NEMRC)
Department of Mines and Geology
Kathmandu

Lok Bijaya is a senior seismologist who has been leading the Nepal Seismic Network at National Earthquake Monitoring and Research Centre, Department of Mines and Geology since more than two decades. He has completed B.Sc. in Geology from Tri-Chandra Multiple Campus in 1994. Then, he completed M.Sc. in Mathematics from Tribhuvan University, in 2002 and in Seismology from International Institute of Seismology and Earthquake Engineering (IISEE) and Tokyo University, Japan in 2003. He also completed MSc in Geology from Tribhuvan University in 2012. Recently in 2020, he has completed his PhD entitled 'Seismicity associated with the April 25, 2015 Gorkha earthquake in Nepal: Probing the Himalayan Seismic Cycle' from Paris University. Currently, he serves as General Secretary of Nepal Geological Society.

Dr. Sarah Houghton
High School Science & Outdoor Curriculum Teacher
St Michael Steiner School, London
United Kingdom

Sarah has a great interest in education and earthquakes. She has worked in education for most of her life. She loves to learn, teach and experience the natural world. She is involved with community groups supporting local initiatives and writing grant proposals. She has developed programmes to work in various areas of science teaching and communication to all ages. She is passionate about educating with care and has excellent knowledge of earthquake geology. Her thesis work was on earthquakes and marine terraces in central Greece and southern Italy at UCL/Birkbeck College. She is a first aider and a fire officer at her school. She has excellent skills in grounds & estates, health & safety, DofE, community building, planning and overseeing events. She also loves to work with herbs, dyes and is a soap maker.

Dr. Shiba Subedi

Seismologist

Ph.D. in Seismology

M.Sc. in Physics and Geophysics

Seismology at School in Nepal program leader

Shiba is a Seismologist completed Ph.D. in Seismology from the University of Lausanne Switzerland. He studied Master's degree in Exploration Geophysics at IPGP and worked as a Research Assistant internship at Ecole Normale Supérieure, Paris, France. After the completion of Master's degree in Physics from Tribhuvan University he motivated towards seismology, it was the time of 2015 Gorkha earthquake. Since 2017, he has been working for 'Seismology-at-School in Nepal' program. The purpose of the program is to evaluate the feasibility by locally testing a bottom-up approach of seismology in schools. With special lectures to students, and by installing low-cost seismometers in schools, he is working to enhance awareness and preparedness of the people, and at the same time collect useful local shaking data. Currently, more than 30 schools are equipped with a educational seismometer mostly in Western Nepal.

A quarter century of educational seismology

By Jean-Luc BERENGUER
University Côte d'Azur, GEOAZUR Lab. Education & Outreach

Potentially destructive, earthquakes fascinate people as much as they frighten them.
These are unpredictable natural events linked to the internal dynamics of our planet. This is why emphasis must be placed on raising awareness, particularly in the school system where the causes and effects of these hazards can be studied.

Twenty-five years ago, one of the oldest educational seismological networks was created in France, following in the footsteps of a nascent network in the United States (Princeton Earth Physics Project - PEPP). Many other seismology educational networks have since been created around the world.

These networks share the same objective: the installation of a seismometer at school to promote seismic risk education. The seismometer and its recordings make it possible to respond concretely to questions, hitherto quite abstract, related to seismic hazards and knowledge of the structure of the Earth: key scientific subjects for school programs.

The French educational seismic network has continued to develop over the years. Initiated in the Alpes Maritimes in 1995 with the help of local authorities, the educational program integrates national operations supported by 'Sciences à l'Ecole' from 2006. The deployment of seismometers will quickly become international with French high schools abroad.

Since 2017, the Université Côte d'Azur has taken over educational seismology with the program called Observatoire Méditerranéen Éducatif (EduMed-Obs). This observatory aims to set up an interface providing data sets recorded by sensors installed around the Mediterranean basin. The theme of this observatory is not only focused on seismology: meteorology, hydrology and sea level variations are also supported.

The French seismic educational network was particularly marked by close interaction between the teachers involved and the local researchers. Teachers were able to benefit from specific training, and were also able to share their educational experiences in the use of school seismometers and recorded data sets.

An extensive collection of classroom activities has gradually been compiled by this educational community over these many years. This collection has largely contributed to setting up many innovative practical activities in science education classes.

Recently a booklet 'SISMO Collector' was edited by the Observatory. As the name suggests, it is about re-packaging many activities for the classroom using both online data and modelling through experimentation. This booklet is already being distributed for free to schools in France. Now available in English, this booklet can be disseminated more widely across Europe and beyond.

This book aims to share this work with you.
Book:

Berenguer, J-L., (2023), Booklet, SISMO-Collector, DDTM 06, France

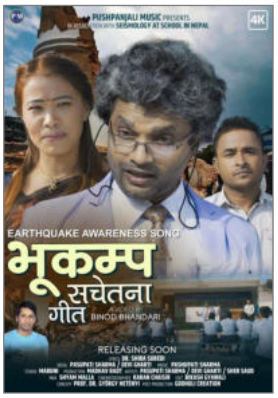
Introductory thoughts

Photos: J. Sauron

George जियोर्ज
György Hetényi गियोगी हेतेनी

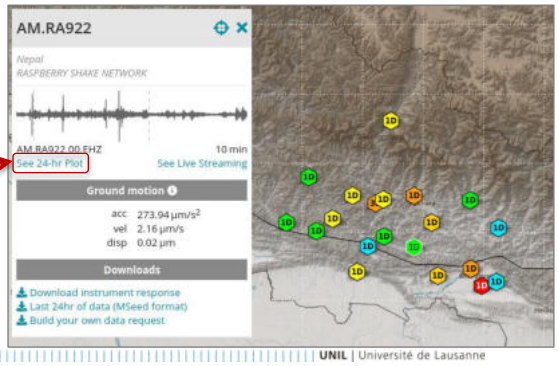
4 years after the first workshop…

- **A lot has been achieved – thank you ALL !**
- Data visualization
- Religion
- Swiss educational project
- Card game
- Funding

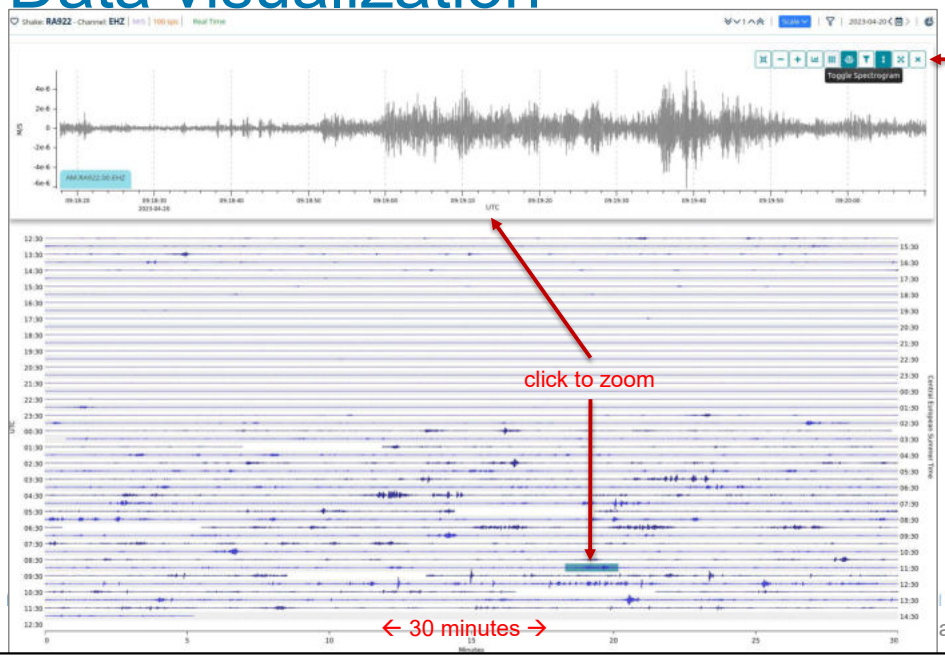


Data visualization

- Seismometers are the same
- The software has evolved
- Visualizing data has become easier
  - Go to https://stationview.raspberryshake.org/
  - Click on your preferred station
  - Click on « See 24-hr Plot »
  - A new, interactive window with data opens



Data visualization



Various handles:
- zoom in/out
- filter
- spectrum
- spectrogram

Explore and try it out yourself!

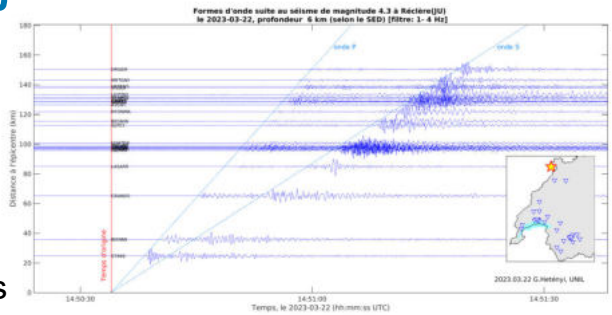
Religion

- Message in 2019

- Study in 2021: **The representation of earthquakes in Hindu religion**
- Freely accessible at http://doi.org/10.3389/fcomm.2021.668086
- भूमिकम्प and भूकम्प
- references, citations and pictures

Swiss educational project

- Switzerland follows the Nepali example
- 23 schools, 7 colleagues operate RaspberryShake seismometers
- Further schools to join in the next 2 years
- Please let me know if you would like to establish a contact between your class and a Swiss class (in English)



Card game

- BEAT THE QUAKE, a new card game has been developed
- Cooperation to improve earthquake preparedness
- Full details tomorrow

Funding

- We greatly acknowledge all financial support for the project!
- 2019 workshop

- Crowd-funding campaign

gofundme

- Annual support

- 2023 workshop

EGU European Geosciences Union

International Union of Geodesy and Geophysics (IUGG)

UNIL | Université de Lausanne

- **MANY THANKS TO ALL TEACHERS AND VOLUNTEERS!!!**

seismoschoolnp.org

Seismology at School in Nepal program

Three main goals:

- Make people more familiar with Earth Sciences
- Increase people's awareness about earthquakes
- Spread the example of your schools across Nepal

Wishing you continued success in learning and teaching!

Photos: R. Roduit

Seismology at school in Nepal

- The program initiated in Nepal first time in 2017.

György Hetényi
Concept, proposal, and director

Funding
Swiss Confederation

Shiba Subedi
Program leader

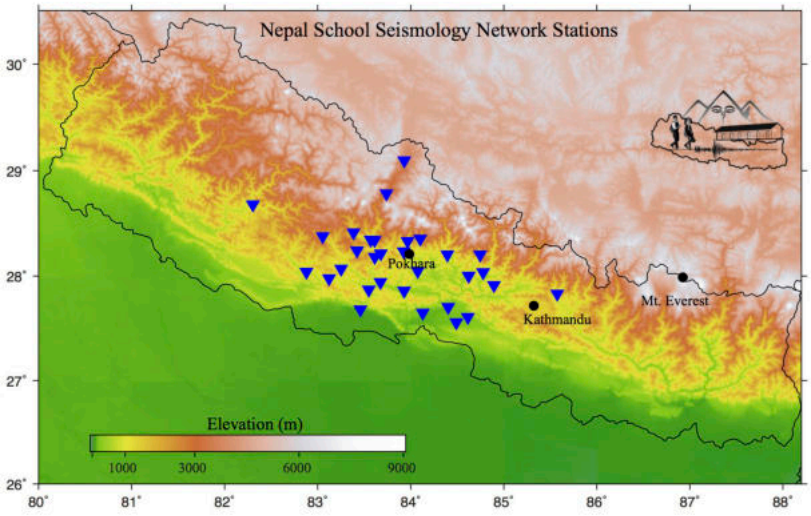
Seismology at school in Nepal

- More than 5 visits per schools by our group.
- Occasional earthquake lectures in the classroom.

२३ विद्यालयमा भूकम्प मापन प्रविधि राखिँदै

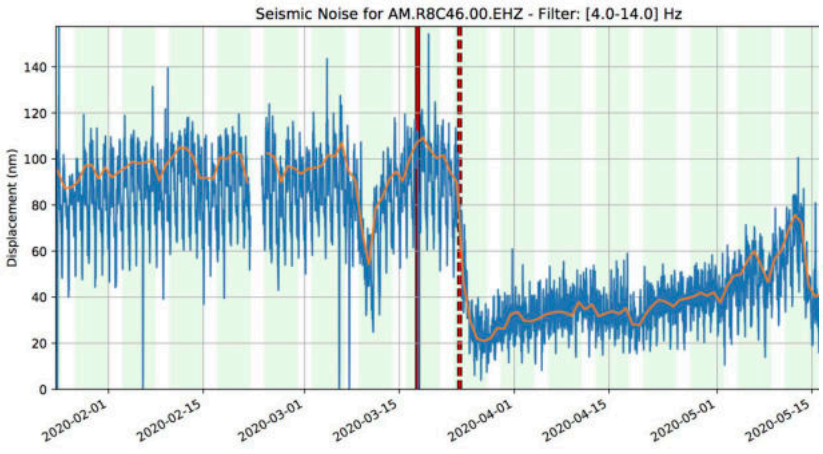
Seismology at school in Nepal

- 33 seismometers have been installed creating Nepal School Seismology Network.
- We aim at 40.



Seismology at school in Nepal

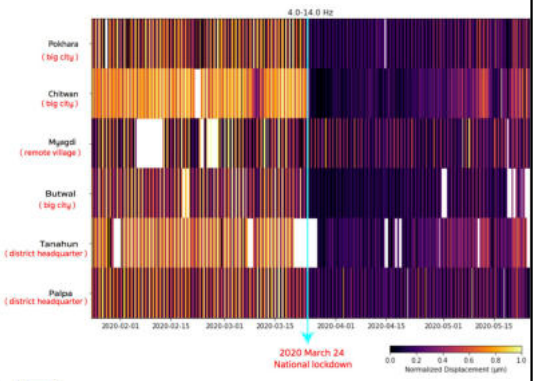
- COVID lockdown effect measure



Science REPORTS

Cite as: T. Lecocq *et al.*, *Science* 10.1126/science.abd2438 (2020).

Global quieting of high-frequency seismic noise due to COVID-19 pandemic lockdown measures



Lecocq et al., 2020, Science

Workshop 2023 Speakers


György Heténi


Fabrice Jouffray


Lok Bijaya Adhikari


Sarah Houghton


Shiba Subedi

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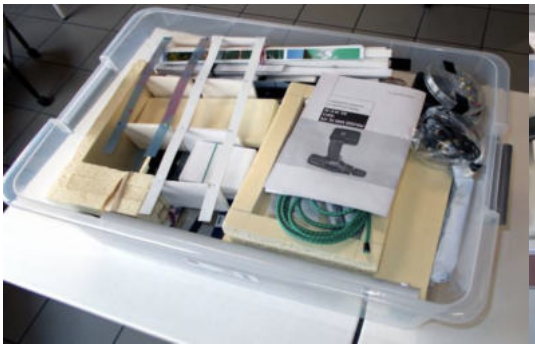
Lok Bijaya Adhikari, email: lbadhikari@hotmail.com
Sarah Houghton, email: s.houghton@alumni.ucl.ac.uk
Shiba Subedi, email: shibashibani@gmail.com

Highlights of the workshop 2023

- New tools for earthquake learning

SEISMO-BOX: DO IT YOURSELF (Supported by EGU)




Presenter
Fabrice Jouffray

Highlights of the workshop 2023

➢ Earthquake evacuation procedure guide

What Can You Do to Prepare for an earthquake?

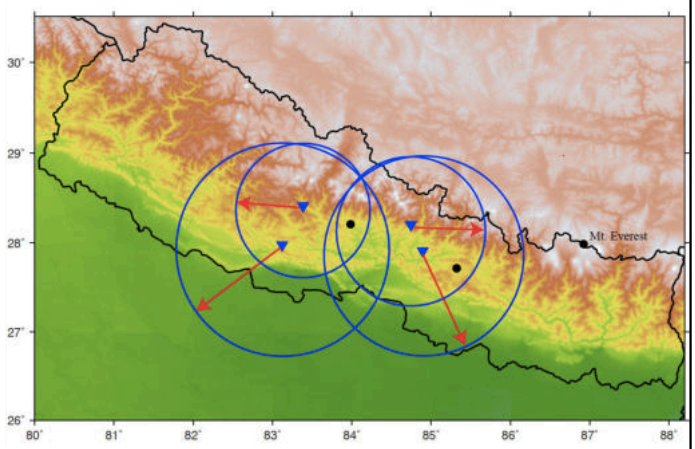
Sarah Houghton
St Michael Steiner School, London, UK

Highlights of the workshop 2023

➢ Earthquake Card Game: **Beat the Quake**

György Hetényi on 2nd May

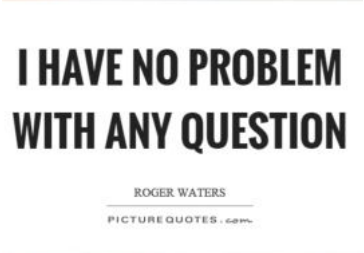
Earthquake Location tutorial



Shiba Subedi on 2nd May

Highlights of the workshop 2023

- ✓ Please consider filling a survey form seriously before and after the program.
- ✓ Actively participate the workshop, there is no silly question.
- ✓ Collect your Certificate before the end of the workshop.
- ✓ Collect your transportation cost.



Best wishes for the Workshop !

Seismic Hazard in Nepal and Experiences

Dr. Lok Bijaya Adhikari
Senior Divisional Seismologist

National Earthquake Monitoring and Research Centre
Department of Mines and Geology
Lainchour, Kathmandu
Email: lbadhikari@hotmail.com
www.seismonepal.gov.np

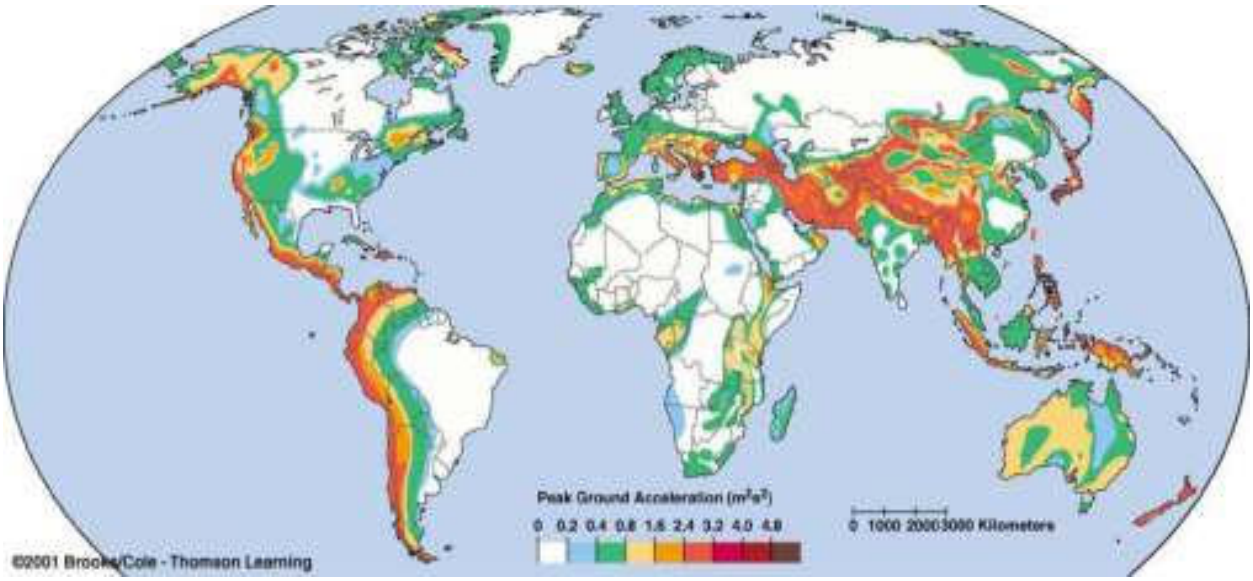
EATHQUAKE AS A HAZARD

- In the past 3 centuries over 3 million people have died due to earthquakes and earthquakes related disasters.
- The economic losses due to earthquakes are huge (Tohoku earthquake – Magnitude 9.0 – 2011 March 11 – causes US$ 365 billion economic loss)
- 2/3 of continental crust is seismically active, that means about 1 billion people are living in exposed area.

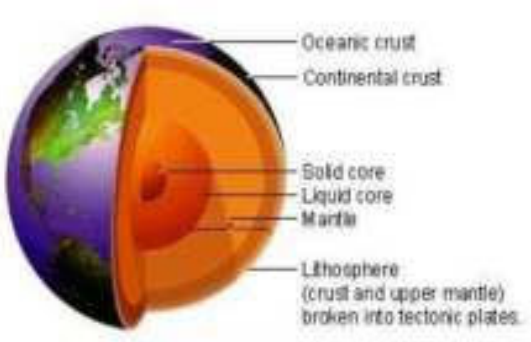
1556 AD China 8,30,000 Deaths.

In 2010 M7.0 earthquake in Haiti >3,00,000 Deaths.

Global Seismic Hazard Map

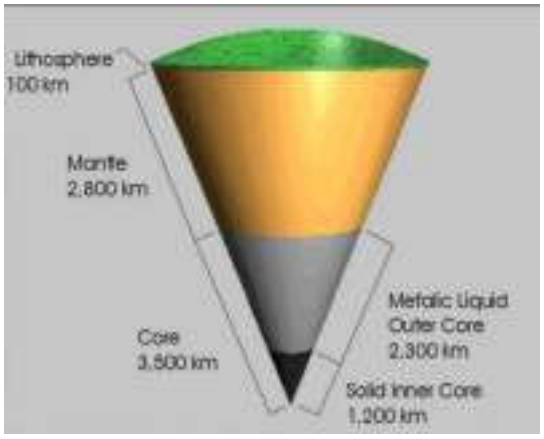


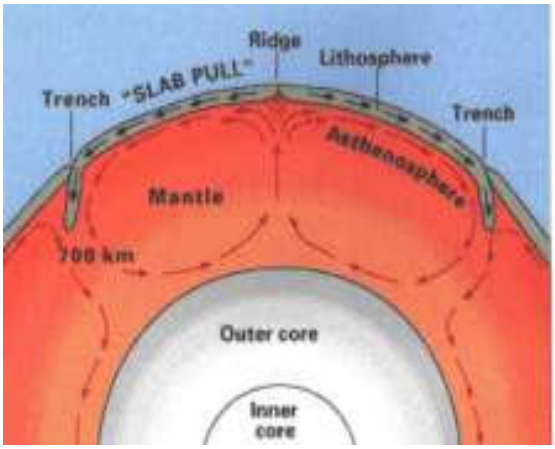
EARTH'S INTERIOR



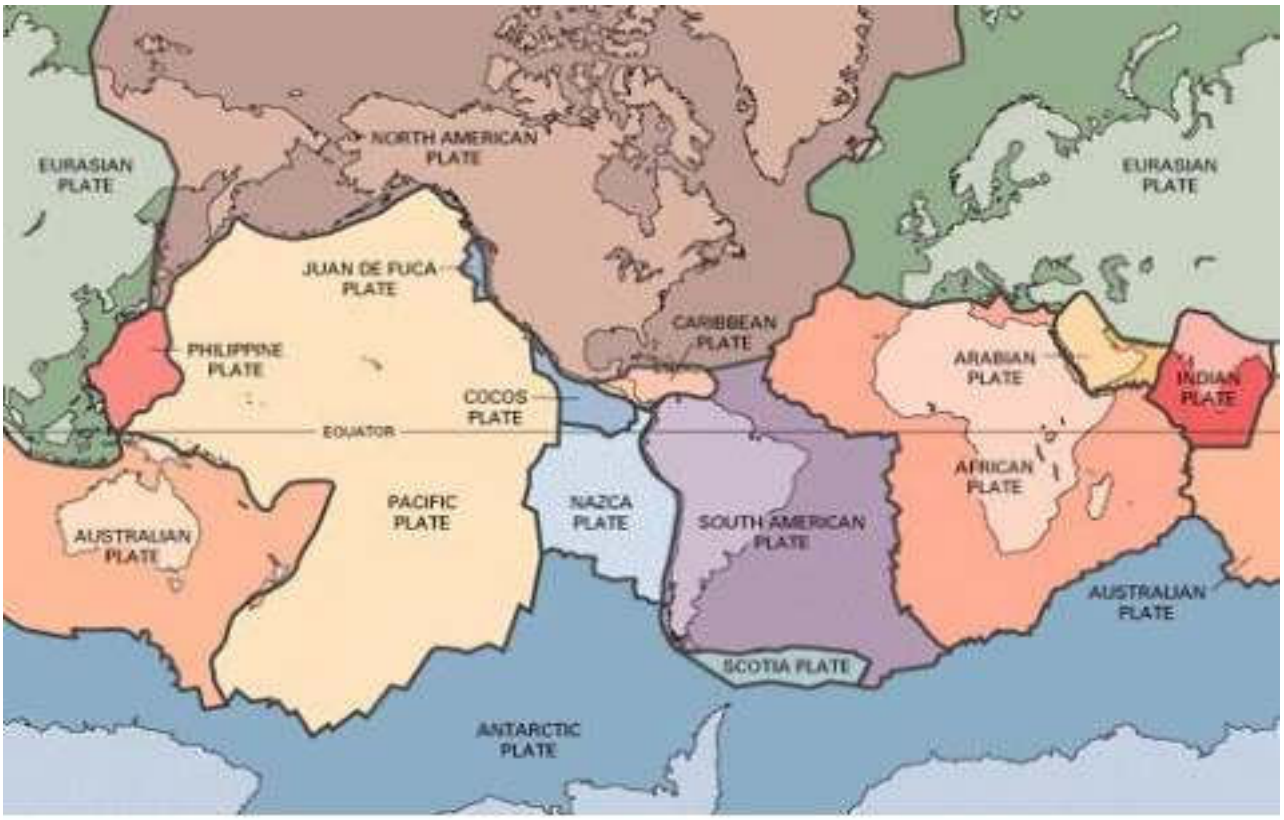
The upper 100 km thick outer part is called lithosphere.

This part is divided into a number of fragments, which are called tectonic plates.





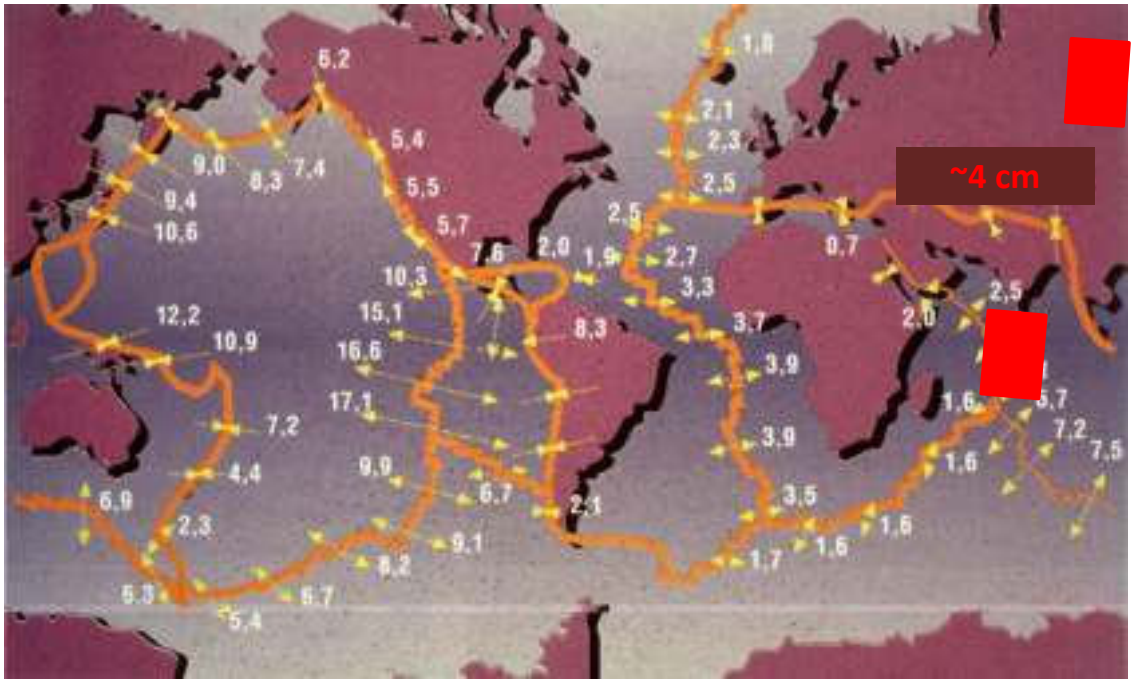
WORLD'S TECTONIC PLATES

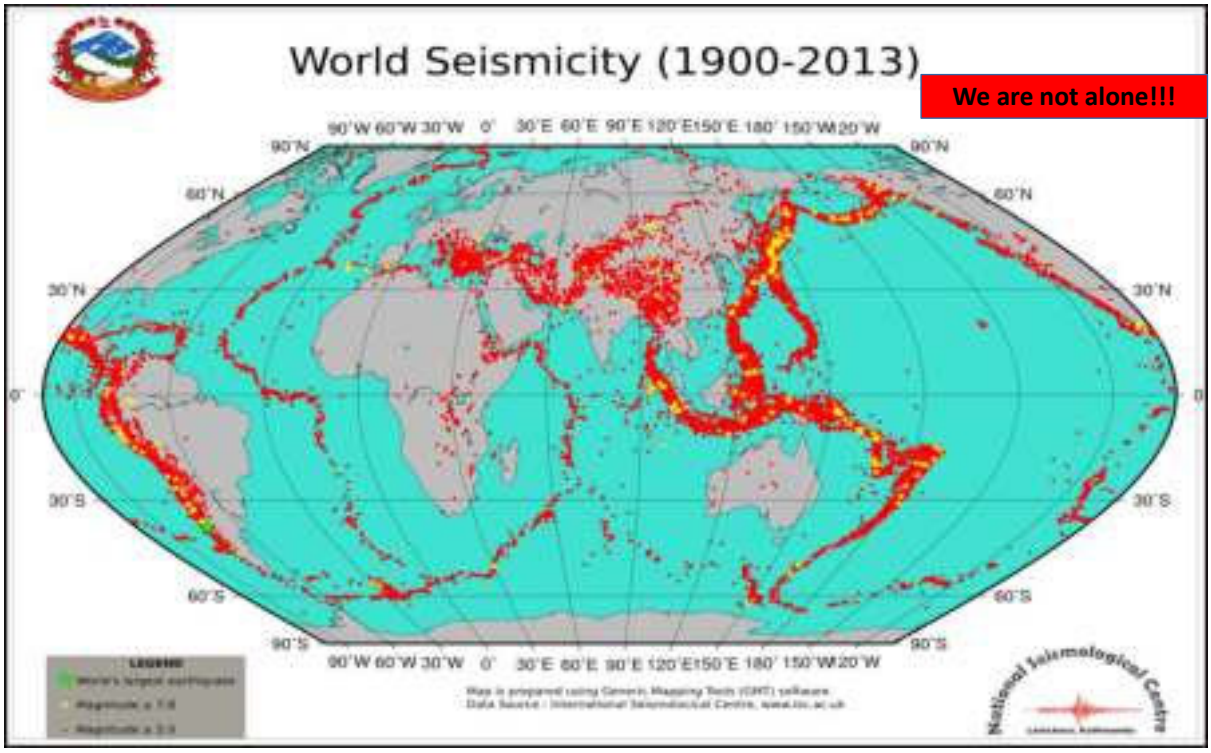


Map source: http://geology.com/plate-tectonics.shtml

The tectonic plates

Geological high speed collision between India and Eurasia



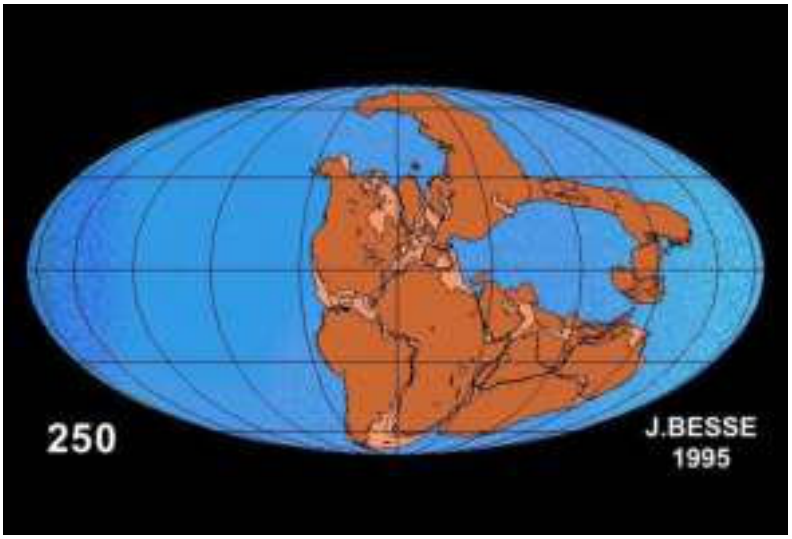


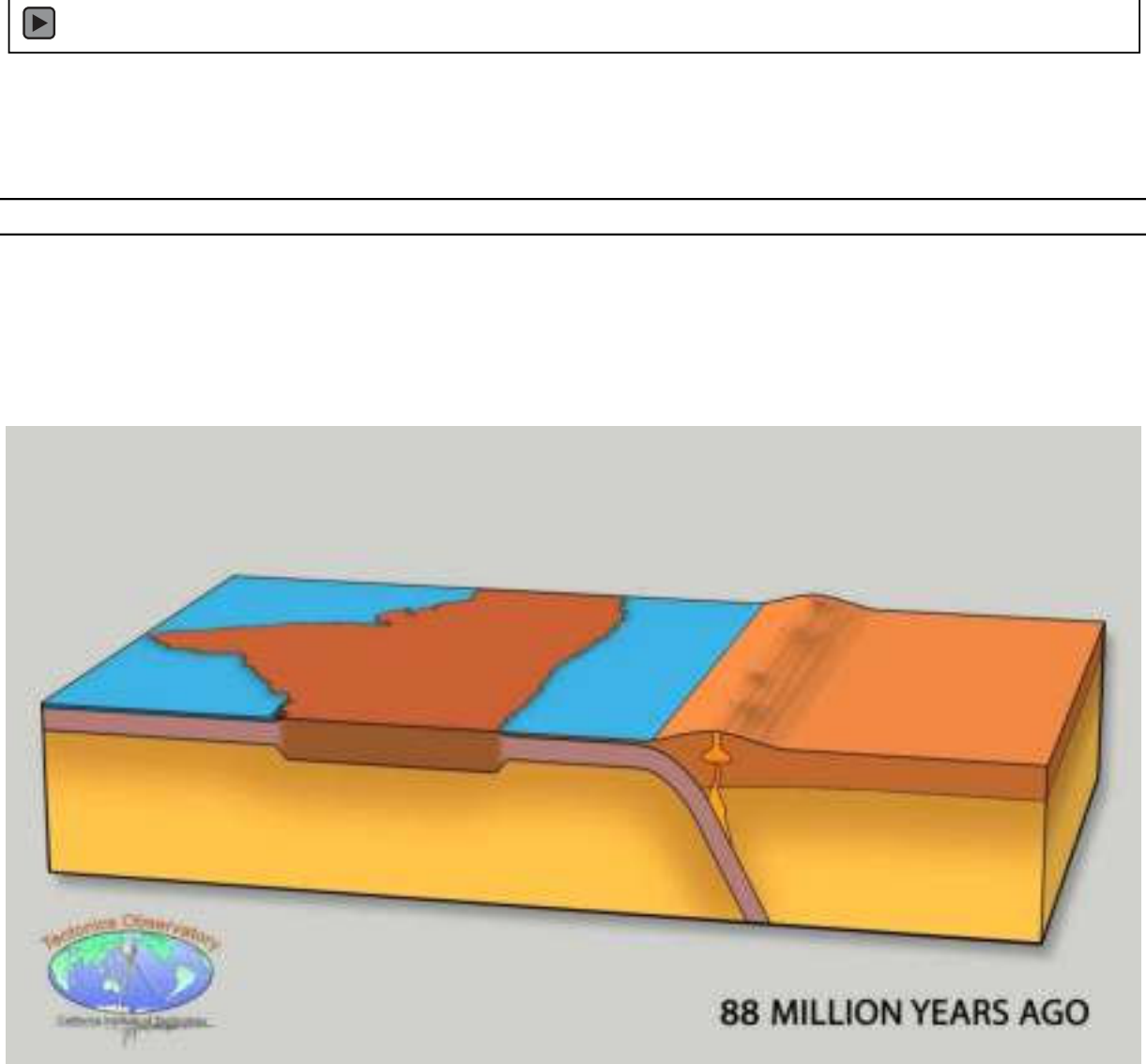
The tectonic plates

The convection makes the tectonic plates move.

Reconstitution of the last 250 million years of tectonic movements.

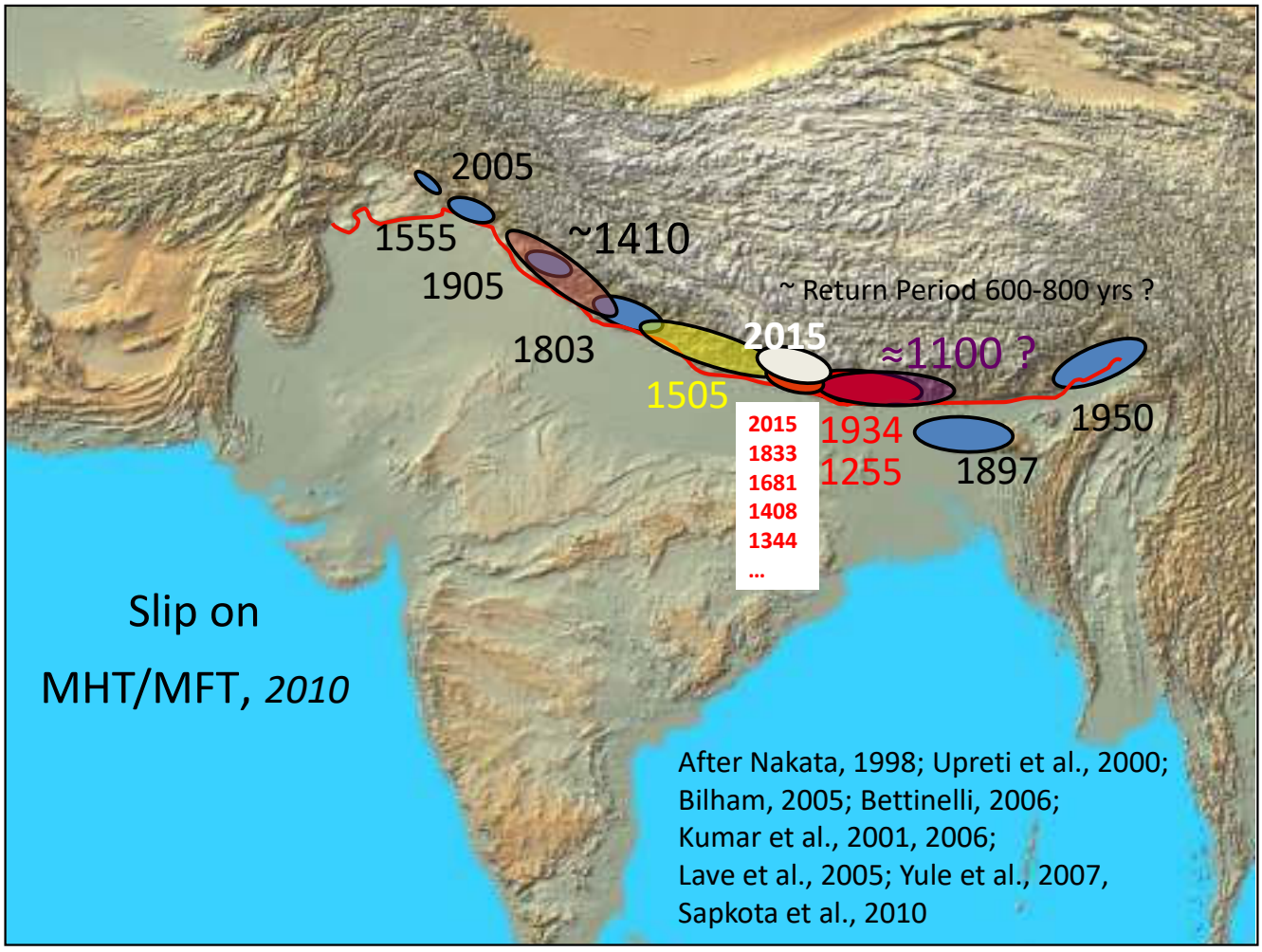
Look for the Indian continent that travels quickly up to Eurasia.

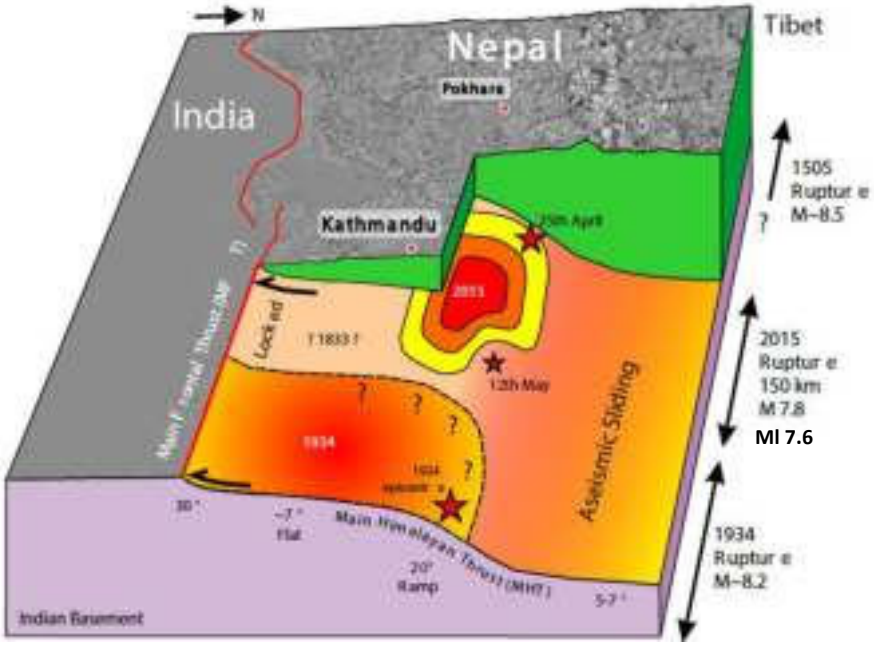



88 MILLION YEARS AGO

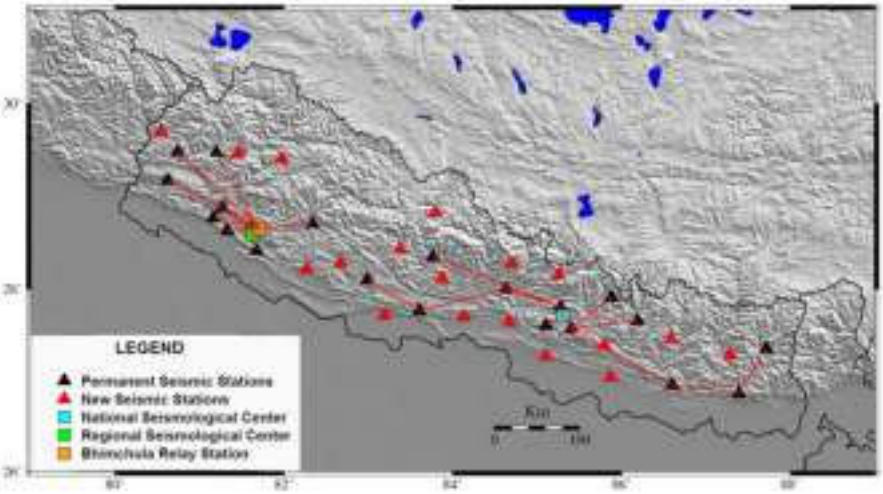
WHY EARTHQUAKES IN NEPAL?

- Nepal falls on the collision zone of the Indian Plate and the Eurasian Plate.
- The north drifting Indian Plate collided with the Eurasian Plate ~50 my before.
- The Indian Plate is still moving due north at a rate of about 4 cm/yr.
- There is accumulation of strain along the collision zone.
- This energy is released at the time of great earthquake.
- Currently the region between Terai and Higher Himalaya is locked and stress is building up at the boundary between Higher Himalaya and Lesser Himalaya at depth.
- The current seismicity is the result of strain build up in the upper part of the crust.

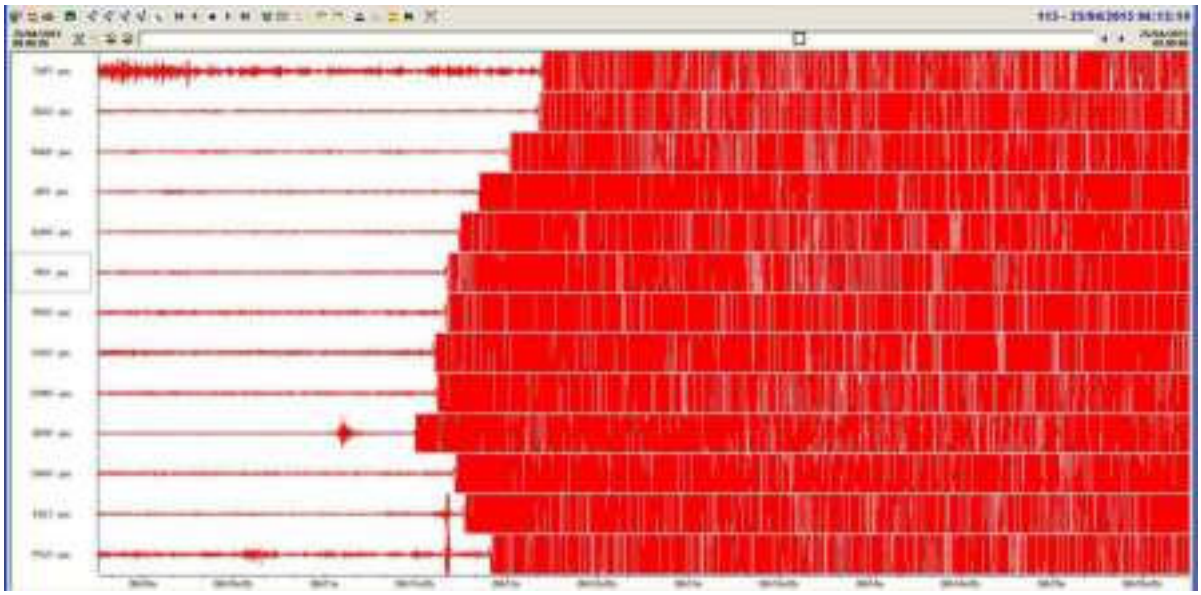




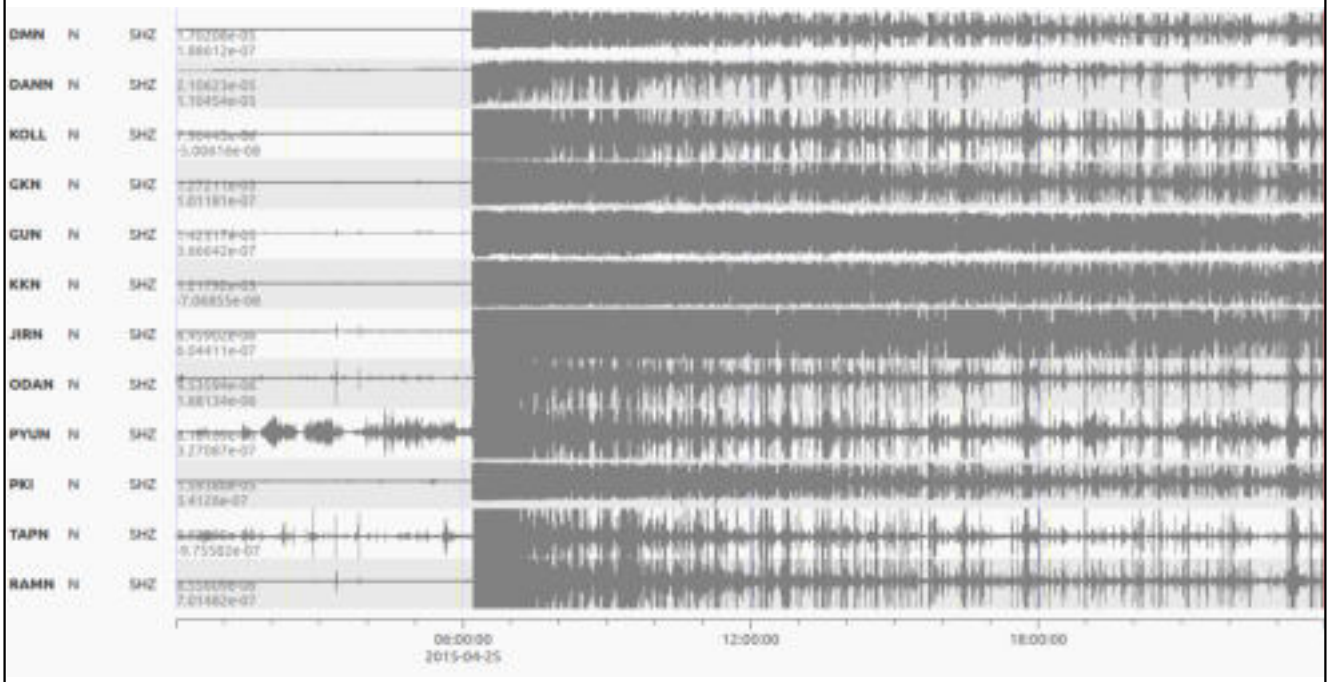
Seismic stations Seismic Vault Network



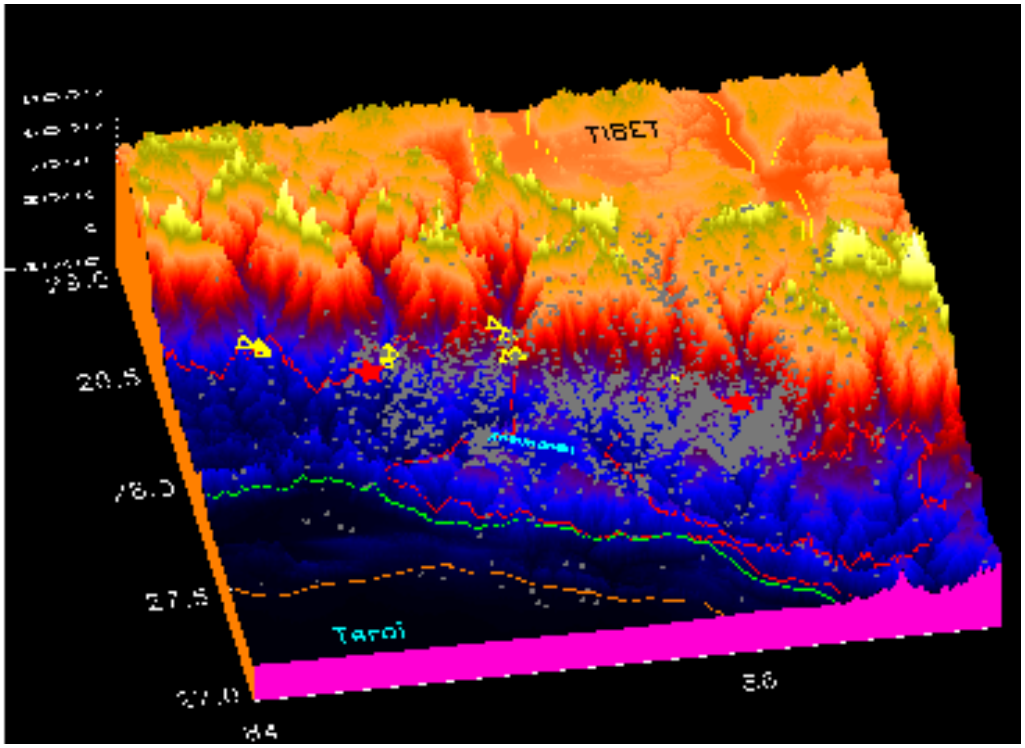
Signal of Gorkha Earthquake



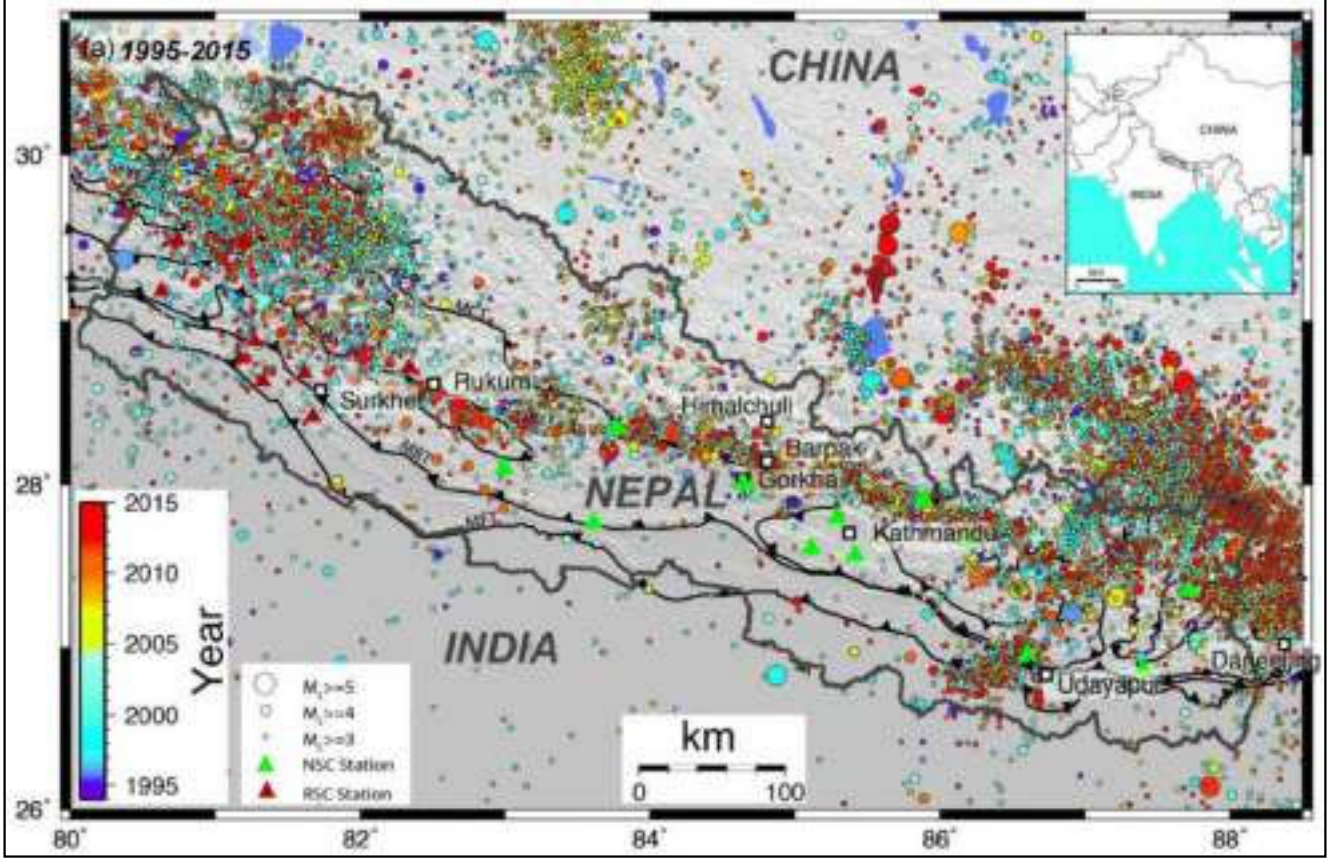
24 hours of 25 April 2015…



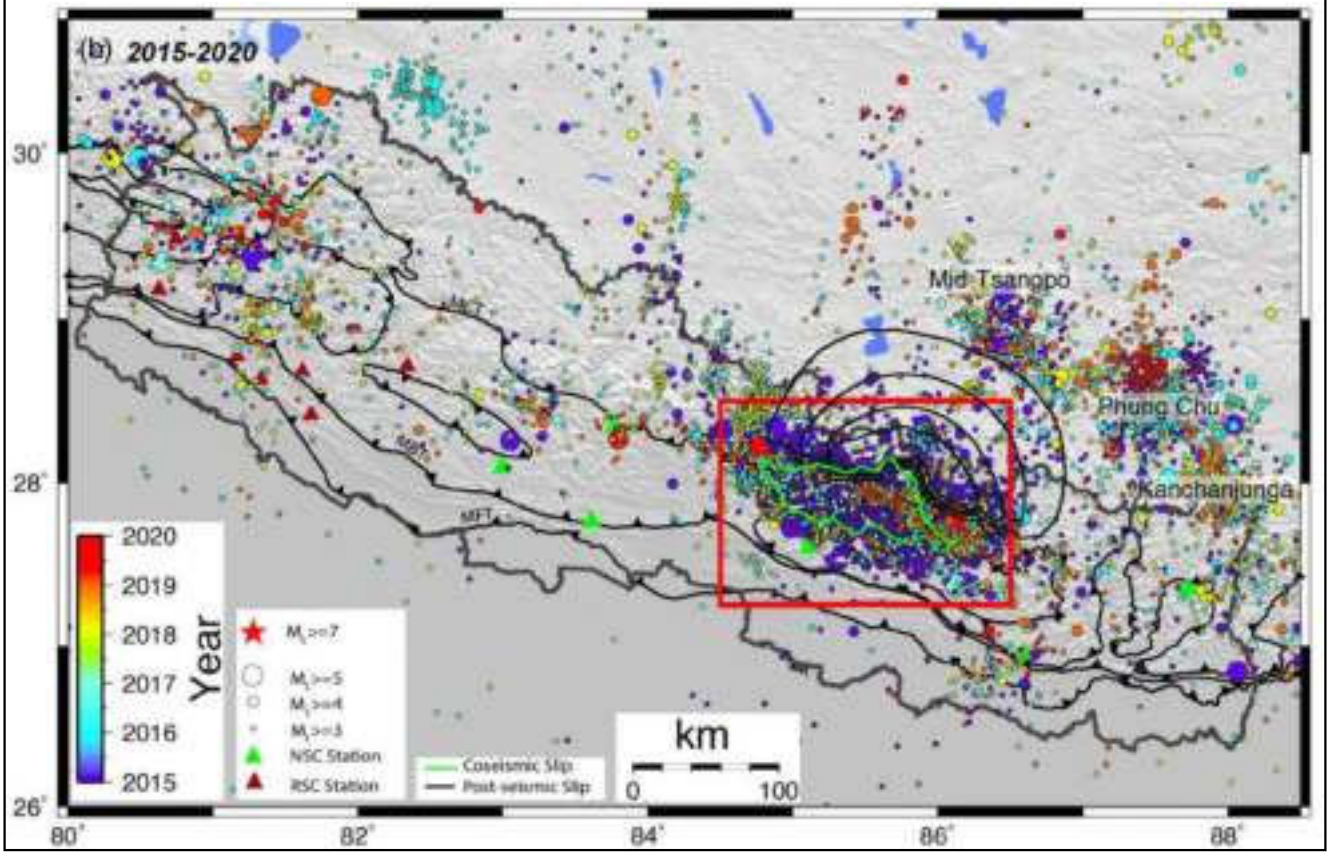
3D view of the region with main shock, largest aftershock, aftershocks and tectonic boundaries

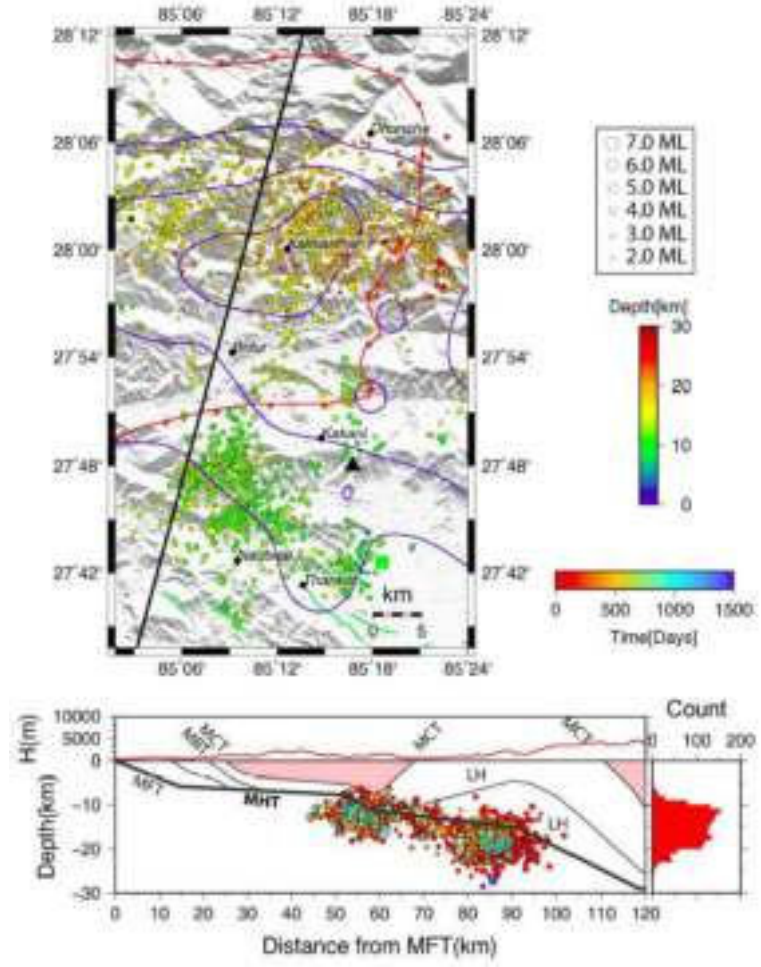


Interseismic Seismicity



Seismicity after Gorkha Earthquake

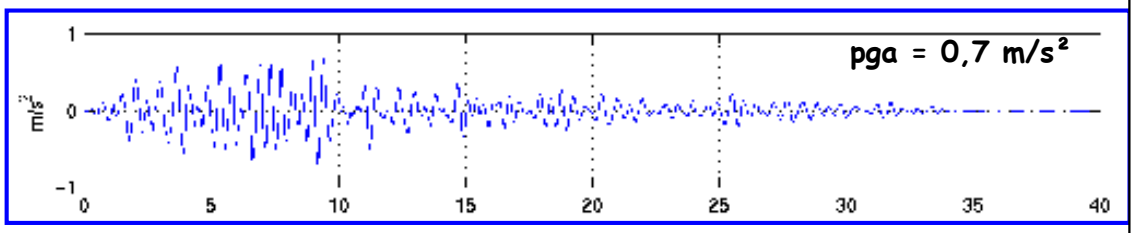




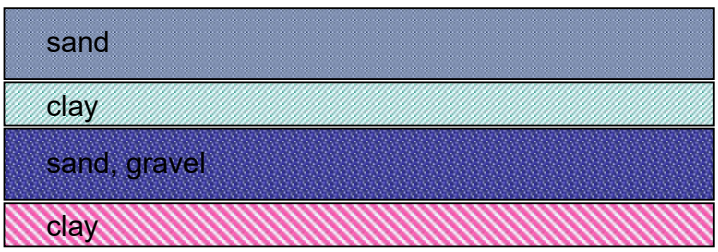
SHAKING OF EARTHQUAKE DEPENDS ON

- **Magnitude**
  - More energy released
- **Distance**
  - Shaking decays with distance
- **Local soils**
  - amplify the shaking

SITE EFFECT

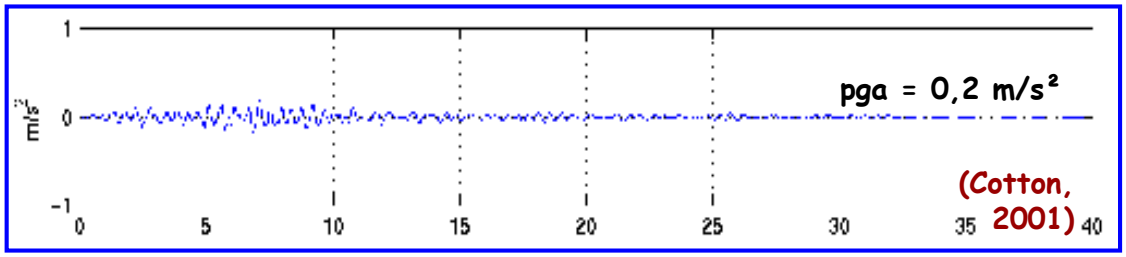


Soft/hard rocks=3.5

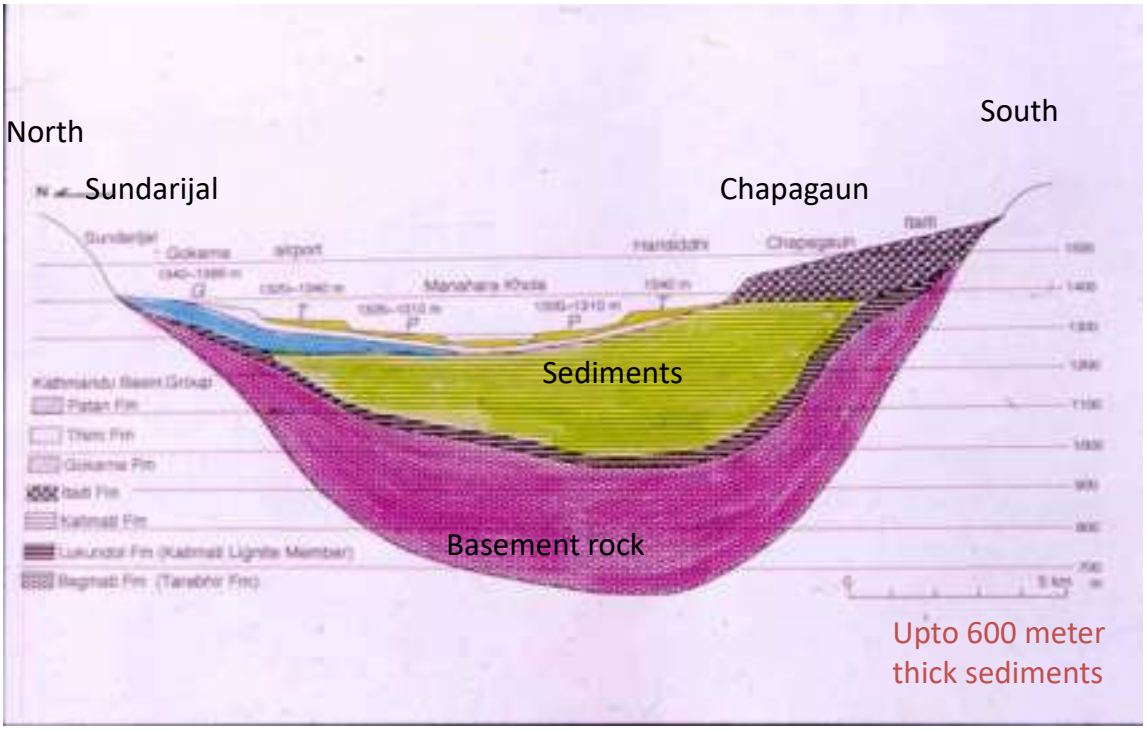


soil recor

Reference rock record



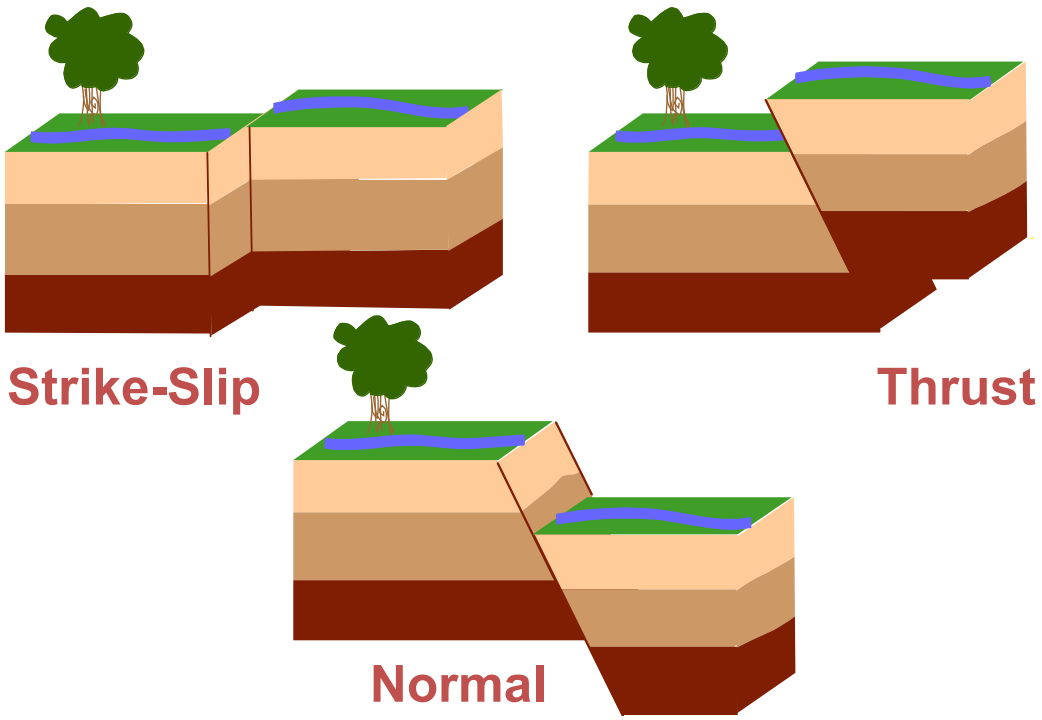
KATHMANDU VALLEY

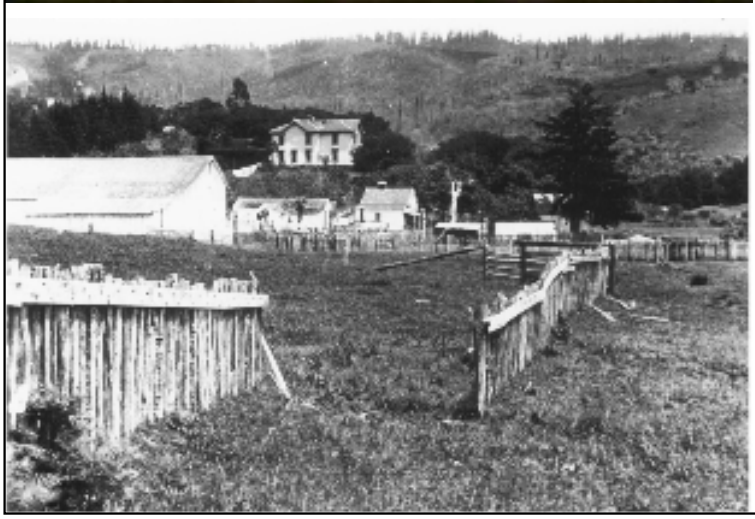


Katmandu valley is composed of soft soil (about 600 m thick in central part)
Liquefaction may be possible at several locations.

Difference in GPS site response

THREE TYPES OF FAULTS



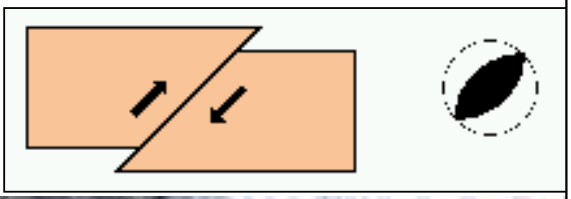


STRIKE SLIP

NORMAL FAULT

THRUST

Chi-Chi Earthquake, Taiwan



Nojima Fault, Kobe, Japan

EFFECT OF EARTHQUAKES

- Ground Shaking
- Surface Faulting
- Fire
- Landslide
- Liquefaction
- Tsunami

1/12/15

GROUND SHAKING

Ground Shaking

KOBE, JAPAN 1995

SURFACE FAULTING

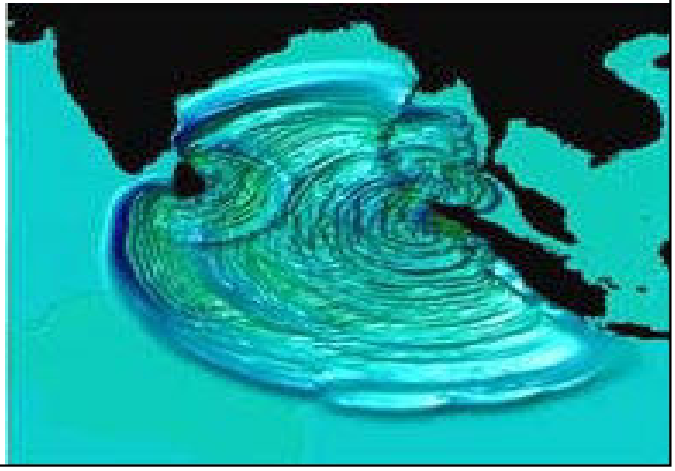
FIRE

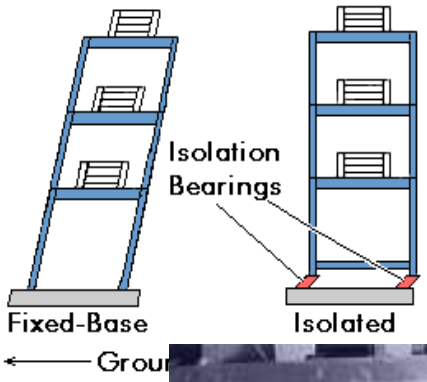
LIQUEFACTION

LANDSLIDE

1/12/1

TSUNAMI



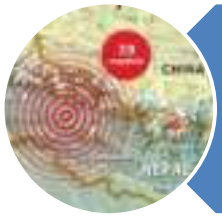


Base
Isolation

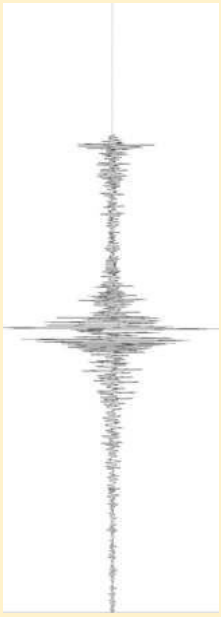
RETROFITTING

OUR ENGINEERING !!!



Thank you



Earthquake Evacuation Procedure Guide

Prepared for the Seismology at School in Nepal program (www.seismoschoolnp.org) by

Sarah L. HOUGHTON, Shiba SUBEDI & György HETÉNYI

Presentation Monday May 1st 2023

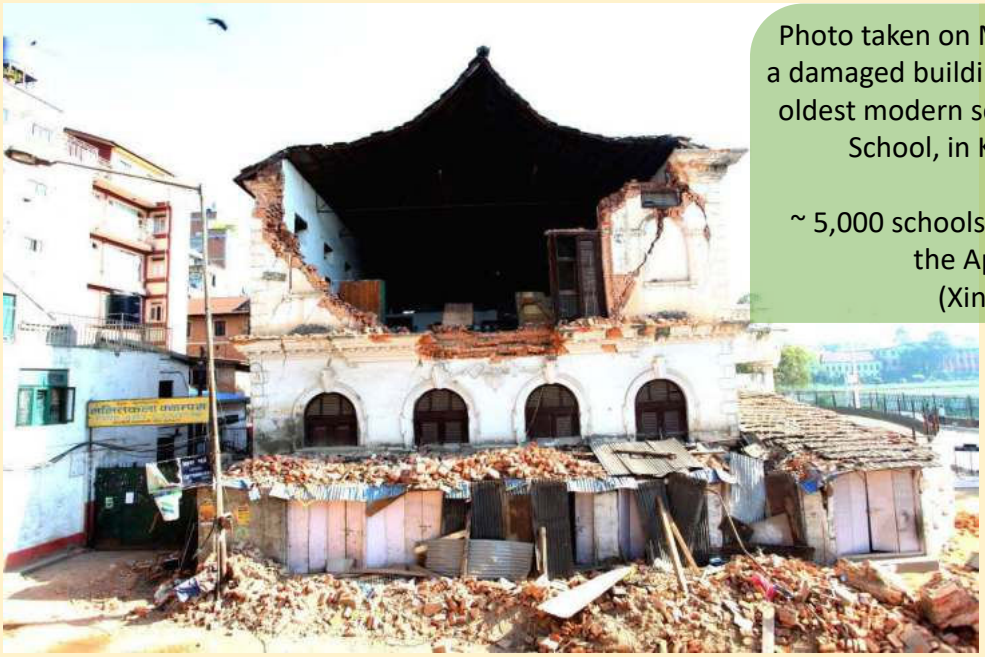
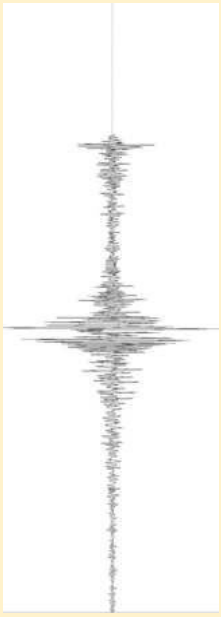
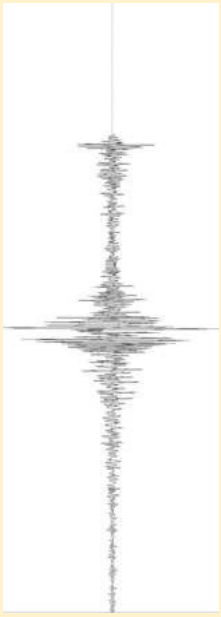


Photo taken on May 4, 2015 shows a damaged building of the country's oldest modern school, Durbar High School, in Kathmandu, Nepal.

~ 5,000 schools were destroyed in the April 25 earthquake. (Xinhua/Sunil Sharma)





'The most recent disaster fades from memory just before the next one strikes.'
– Japanese proverb[1]

'However, these technical advances are necessary but not sufficient to advance earthquake (and tsunami) preparedness. **Public education is essential**. And often the most basic lessons are the most empowering'[1]

'The findings reinforce the importance of having **individuals decide before an earthquake how they should respond in locations where they spend the most time**.'[2]

'Why is a "Drop, Cover, and Hold On" drill important? To respond quickly you must **practice often**. You may only have seconds to protect yourself in an earthquake before strong shaking knocks you down, or something falls on you'[2]

GeoHazards International Revised Version (2018, March). Developing Messages for Protective Actions to Take During Earthquake Shaking.

What Can You Do to Prepare for an earthquake?

By preparing, planning and practicing your response to an earthquake (or any disaster/fire) you are putting yourself in a better position to be able to save lives and resume normal life afterwards.

This is an earthquake evacuation procedure (EEP) guide, it is not definite. It will need adapting for your school, e.g. whether you have a 1 floored building or 2 or whether your children are primary or secondary age. **This is a starting point.**

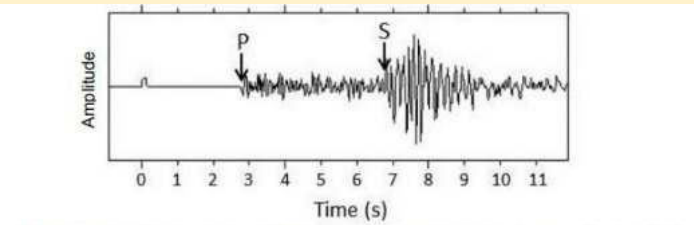
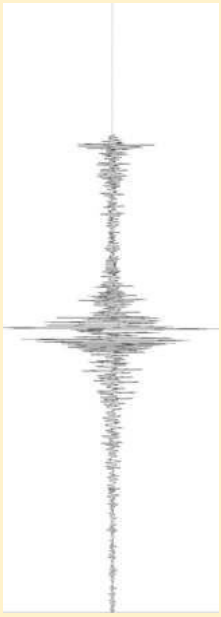


Figure 5. Illustration of a typical seismogram from a small earthquake, showing the time separation between the initial P wave and the later, larger S wave. In this example, the S-minus-P time is approximately 4 seconds.



It's important all staff are involved with your practise. Students are made aware & engaged.

So:

1. Include preparation discussions for your school's procedure in your staff meetings. Take **this document** to your meeting.
2. Formulate your **school emergency plan**, see below. Ensure all staff know their roles.
3. Do an **earthquake risk assessment for each room** to assess what you would do during an earthquake. **Practise your evacuation** and then **review** risk assessment.
4. Create an **EEP** when you get back to school. Try it out. Then **review** it.
5. It's important to **start**, remember there is no good time for an EEP, but there is a need to practise and that practise will really help save lives and limit injuries.
6. Use your classroom **lessons** to discuss your preparations for your EEP.

School in Bhotsipa, Sindhupalchok

https://www.theguardian.com/teacher-network/gallery/2015/may/15/nepal-earthquakes-shattered-schools-remain-closed-in-pictures

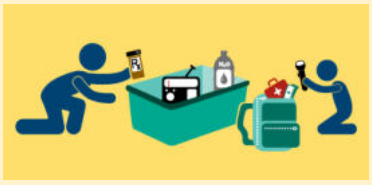
Step 1:
Secure your space **by identifying hazards and securing moveable items**

Photo: Primary school in Makwanpur district.

Step 2:
Plan to be safe by creating a school emergency plan and deciding how you will communicate.

- Have a discussion ask 'How would you react when the ground begins shaking?'
- Ask students to prepare a **poster** for an evacuation procedure.
- Prepare your **route of evacuation**.
- Where are your '**safe zones**'?
- **Practise** your evacuation procedure.
- Where is a safe place to hide? e.g., under desk, by an internal wall, face away from wall/window.
- After a disaster, who would you **contact**/where would you **meet**?
- What actions would ***you*** take to ensure the immediate **safety** of your class/school?

Step 3:
Organize emergency supplies **in convenient locations.**
Arrange an earthquake emergency safety pack (EESP) for every classroom & emergency safety box(es) for school to be stored outside.
Check every term.



EESP contents:

- whistle
- torch
- first aid kit
- bottled water
- emergency blankets
- unperishable food
- shoes
- dust masks
- register

Step 4:
Prepare and organise important documents and ***strengthen*** school building.
Ensure there is adequate outdoor evacuation space.

Check evacuation routes.

Figure 3. Fallen bricks near building from front wall collapse (left) and partial wall collapses (right), 2
earthquake (Credits: Anne Sanquini, (left), Bipin Shrestha (right), provided by Earthquake Engineeri
Institute)

Figure 1a (left). Collapsed private school in central Port-au-Prince metropolitan region; a neighboring single-family house sustained no damage; (b, right) Well-built commercial building (left side) adjacent to catastrophic collapse of neighboring structure.

When the earth shakes, what do you do?

Step 5

Where are you?

Outside:

1. If you are outside: **Stay outside! Do NOT enter a building.**
2. Go to a **'safe' zone**; i.e. away from trees/buildings/bridges/electric lines, poles, transformer.
3. Drop to the ground.
4. Make as small as possible ball with your body.
5. Cover your head and neck.

Inside, Ground floor:

1. Procedure for classrooms on the ground floor needs careful consideration, risk assessment and planning.
2. First assess your **building**, is it earthquake safe?
3. Then assess the location of your classroom; is there a **'danger zone'** outside your classroom door? i.e., an area 1-5 metres around a building where masonry can fall?
4. Is there **direct access to a 'safe zone' outside**? Can you make it outside easily, i.e., are you on the ground floor with direct access to the outdoors?
5. Then assess if you can **evacuate your whole class in about 5-15 seconds** (this is the "**window of opportunity**," the time between the first perceptible shaking and the stronger shaking that makes walking difficult). You may need to try it, yourself as a teacher first with colleagues.

As a school then assess the risk of evacuating directly outside **or** staying inside (Drop/Cover/Hold On).

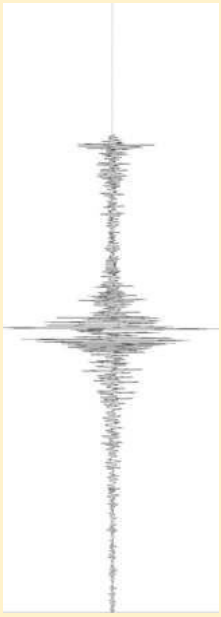
If your school building is not earthquake proof go outside as soon as possible.

Inside, 2nd and higher floor:

1. Drop. Cover. Hold on.
2. Face away from windows if possible.
3. Keep covering your head/neck with your hands or a book.

What the teacher does:

1. Evacuates (if on ground floor & assessment to evacuate has been made).
   OR
   Instructs children/students to:
   - Drop/cover & hold on.
   - Point face away from windows.
2. Stay calm and quiet.
3. Opens classroom door to avoid it getting stuck.
4. Grabs EESP



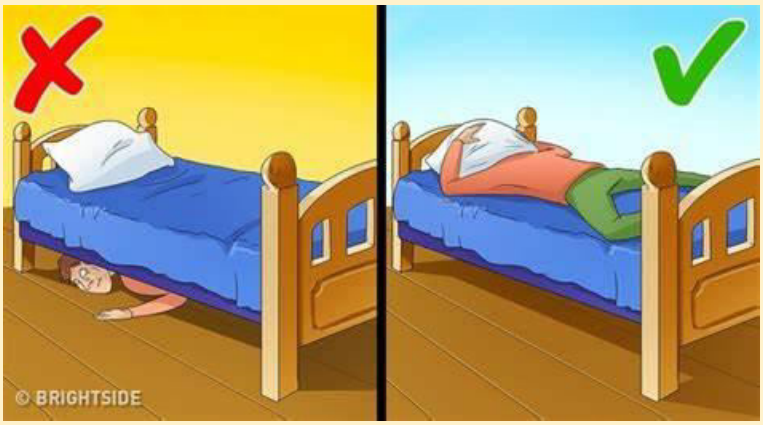
Once shaking has stopped, what to do?

1. Keep calm.
2. Check **register** – is everyone accounted for?
3. Any **injuries**/anyone **trapped**? Get student to check themselves and their neighbours for any injury.
4. If all are accounted for and you can move outside easily do. Go to a '**safe zone'**. Follow evacuation procedure below.
5. Try to minimize the use of mobile phone, to keep the lines free for those in urgent need and rescue teams.

Advice for night time

1. Stay in bed
2. Roll over to protect stomach area.
3. Cover head with pillow to help avoid falling objects.
4. Once shaking has stopped, keep calm, check your body for injury.
5. Grab your EESP (attached to your bed, put shoes on).

Evacuate to a 'safe zone'



How to improve your safety after an earthquake?

Step 6:

Improve your safety after earthquakes by **evacuating, helping the injured**, and preventing further injuries or damage. Remember there may be **aftershocks** and **buildings may be unstable**.

Evacuation will depend on where your classroom is and where you are with your class at that moment in time, as well as if your building has been affected.

1. If you are outside, **stay outside**, find a clear space. 'Drop, Cover, Hold On'.
2. If you remained inside then you will need to **evacuate to your 'safe zone'**.
3. A 'safe zone' is a space away from buildings/trees/posts. Most likely this is where the school assembly is in the mornings.
4. Be prepared for aftershocks, you may need to 'drop, cover and hold on!' If there is no solution get out of the building.
5. Take the register. Is everyone present? If not report those missing to 'Incident leader'.

6. Report those **injured** to First Aid team
7. Stay with your class unless you have set up a procedure to help others by joining classes together. If you **merge classes** some teachers are free for Disaster Response Roles, e.g., First Aid, Evacuation Team.
8. The children are best to stay at school with their teachers until somebody from their home comes to get them. It may be dangerous for them to try to go home by themselves, or something may have happened to their house or apartment building in the earthquake, and their family may be staying elsewhere. **Children can practice waiting at school as part of their earthquake evacuation exercises.**

चित्र २५: सुरक्षित स्थानमा भेला हुँदै विद्यार्थीहरु

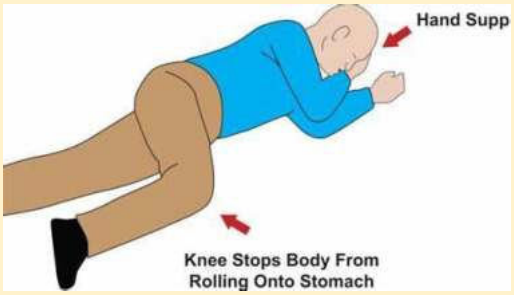
चित्र ८: सुरक्षित स्थानमा जाओ

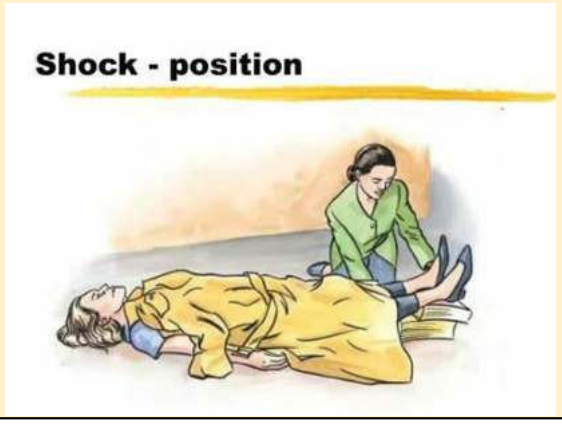
If you are trapped

1. Protect first your body and head and check yourself for injuries.
2. Protect your mouth, nose, and eyes from **dust**.
3. If you are bleeding, put pressure on the wound and elevate the injured part.
4. **Signal** for help by shouting, or with your emergency whistle or by knocking loudly on solid pieces of the building, three times every few minutes. If you have a mobile phone then try and make contact with school to help (have school phone number in your phone) or use emergency contact number 112.
5. Rescue personnel will be listening for such sounds.

May 2008 Wenchuan, China
http://news.bbc.co.uk/1/hi/world/asia-pacific/7397489.stm

Help the injured

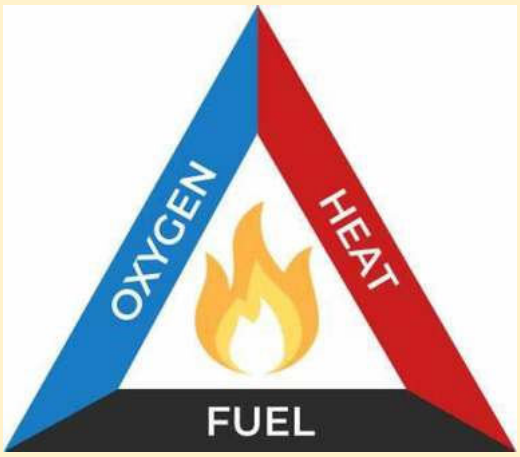


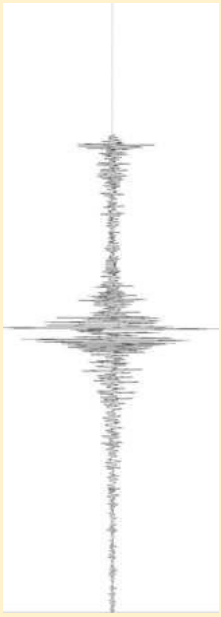


Prevent further injuries or damage

Be prepared for aftershocks and stay away from anything that looks like it may fall.

- Fallen Items
- Fire
- Gas leaks
- Electric issues
- Spills
- Falling masonry





Let people know you are OK & stay informed

1. Update your local government school liaison, tell them your status, then stay off the phone.
2. Phone service may be out or overloaded. Try **texting** main contacts of children/staff. Then avoid calls to make sure the network is free to handle emergency calls.
3. Listen to local radio.
4. Use smartphone to access rescue information or weather forecasts in your areas, if you have access to recharging facilities. If not save your battery.

After the earthquake

Step 7:

Your level of preparedness will determine what happens in the following weeks and months. For the children, some level of 'normalness' will be needed, so try to resume school if possible but allow for trauma and time to talk about the earthquake as well as recovery from physical injuries.

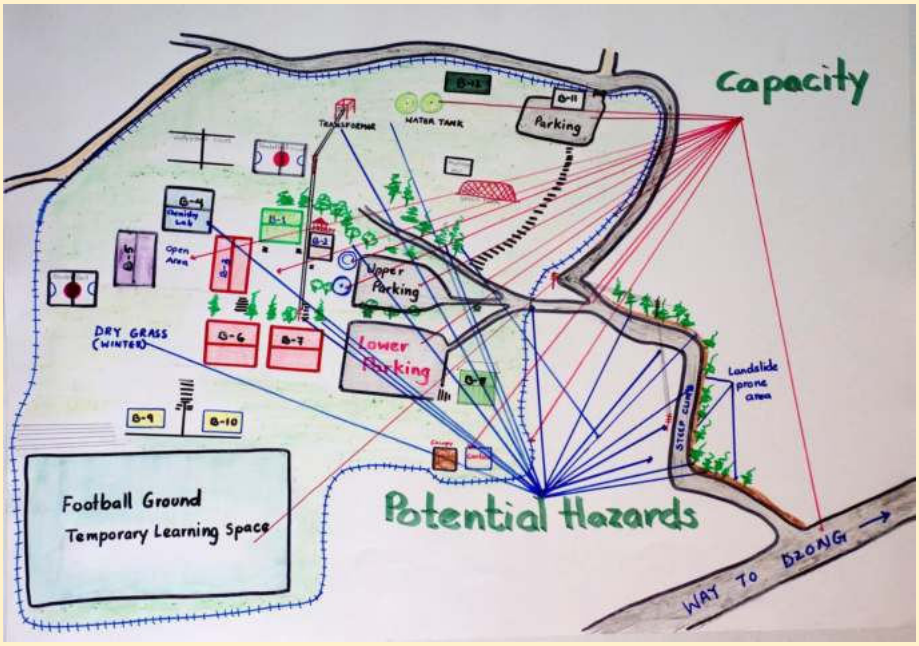
There will be a need to restore daily life by reuniting with others, repairing damage, and rebuilding community.

1. Following aftershocks, continue to check for gas leaks, chemical spills, damaged electrical wiring and broken water pipes.
2. Your school may be asked to be a hub for those who have lost their homes. Be prepared to help neighbours, especially the elderly or those who struggle.
3. Monitor local radio or television reports about where to get emergency help.
4. Use fresh food first if safe. Save canned goods for later.
5. If your water is off or unsafe, you may need to purify water or access bottled water.
6. Do not eat or drink anything from open containers that are near shattered glass.
7. Wash hands

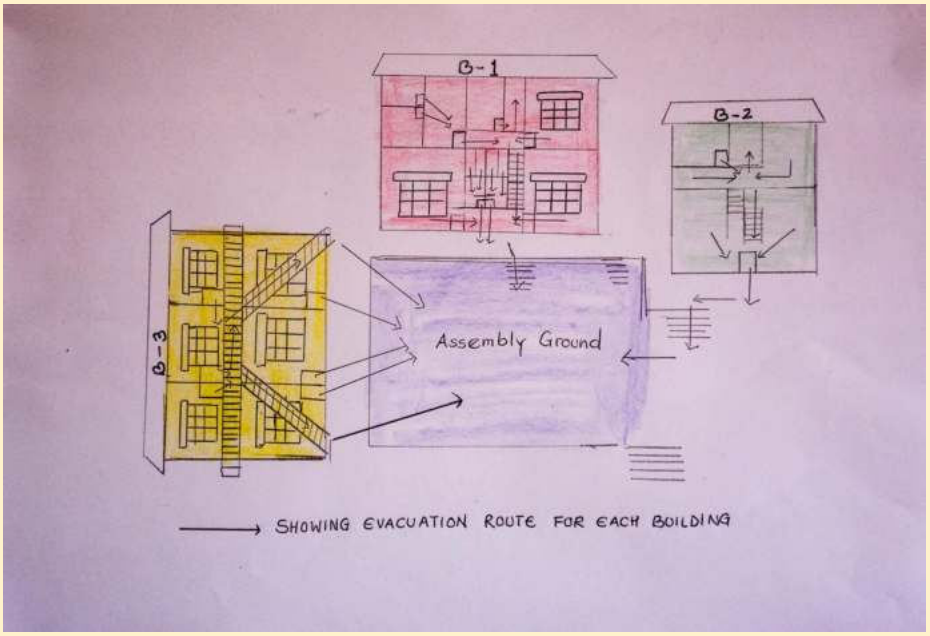
Your school's emergency management plan

Preparing for a Safe and Happy Learning Environment

- give this **guide**;
- identify '**emergency**' team, e.g. first aiders, evacuation team, planning team (those who will create your **emergency management plan**). Note: emergency incident leader may not be your head teacher;
- identify '**safe zones**' and **evacuation routes** for each classroom and **share** these with students, e.g., create a map, label routes. Note: students may change classrooms each year so they will have to learn afresh plans for new rooms;
- identify **hazards** in the school and create **awareness** of these hazards, e.g., structural problems, power lines;
- find ways to **manage** and mitigate these hazards, e.g., can walls be strengthened;
- plan **preventive** measures for identified hazards, e.g., put hazards on map;
- implement risk reduction activities, e.g. **secure** bookcase, keep evacuation routes clear;
- establish effective disaster **preparedness** and emergency **response**;
- identify **training** and capacity building needs for effective prevention, mitigation and response for disaster, e.g., send teachers to **subsequent conferences**, give fellow teachers this guide;
- arrange **dates** for practise evacuations;
- do a **'surprise**' practise, ensure staff/students know there will be one but they won't know when.



Map of school including potential hazards, e.g., landslide prone areas and capacity, e.g., open spaces



Map of evacuation routes

EXAMPLE Earthquake Risk Assessment for _____ school / site

Date: _____ **Place/Room: _____**

What are the hazards?	Who might be harmed and how?	Severity (High, medium, low)	Possibility (Very Likely, Likely, Unlikely)	What is already being done?	What further action is necessary?	Action by whom?	Action by when ?	Done
My building is unsafe	Pupil or teacher from collapsing building	H	L	Evacuate	Continue assessing			
Second floor classroom	Pupil or teacher may not evacuate in under 5-10s	H	VL	Drop, Cover, Hold On	Practise completed			
Danger zone outside classroom	Pupil or teacher by falling debris	M	U		Check danger zone	Pupil or teacher	In 5 days	

Education engagement timetable

Activity	Annual activities – earthquake education	Timing	Cooperation with other agencies
Evacuation practise	1. 25th April – **1st evacuation practise of the year** (remembering the 2015 earthquake) 2. Autumn - 10:19 am on 19th October – https://www.shakeout.org/ 3. Jan 15th/16th (remembering the 1934 earthquake – National earthquake safety day in Nepal) 4. Any date – a **'surprise'** evacuation practise – incident leader to decide date/time and instigate event.	Allow ~ 60 minutes	e.g., invite fire department
Assembly	Theme related to 'earthquakes' and 'how to keep safe'. If this is held near the **beginning** of the academic year, then the process related to **evacuation practise** and the introduction of a potential **'surprise'** evacuation can be introduced so as not to scare students.	~ 30 minutes	e.g., invite an earthquake expert to your school
Lessons	e.g., watch films, earthquake awareness song, pack EESPs – use the 'Beat the quake' earthquake card game to help you, discuss/draw 'evacuation' posters	varied	e.g., invite an earthquake expert to your school

Checklist for a Practice Earthquake Evacuation Procedure

Before 'practise' evacuation:

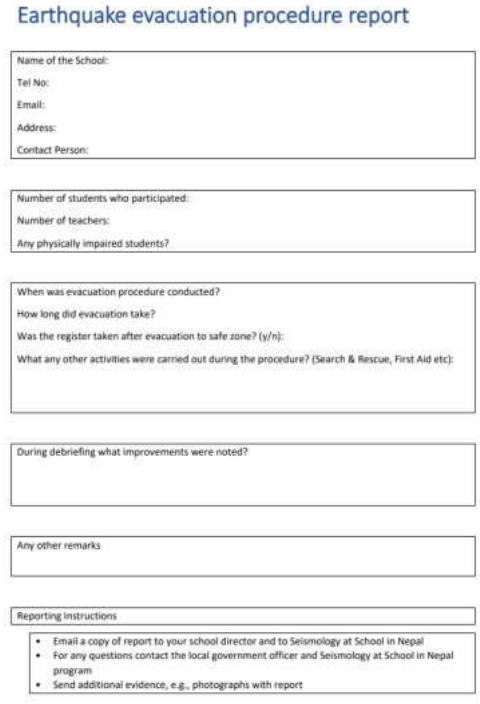
1. Give teachers/staff this **guide**.
2. Complete **school emergency management plan**, **risk assessments** and announce team.
3. Speak with students and help them plan the evacuation, e.g. posters, signage, preparing earthquake emergency safety pack (EESP), ask them to **count to 5** seconds.
4. Ask teachers/staff to do a **trial evacuation** without the students.

During 'practise' evacuation:

1. Order evacuation (**ring** the school bell?).
2. Depending on **location** some will need to 'drop, cover and hold on' and then evacuate while others will evacuate immediately.
3. Assist in evacuation to **'safe zone'**, help students with special needs.
4. Check the r**egister**, ensure all the students and staff have been safely evacuated. Report to incident leader.
5. Check who is in need of **medical** aid.
6. **Communicate** first aid and rescue needs to medical and rescue team.
7. Check students are **ok** and not traumatised by evacuation.
8. Check **timing** on how long it took for all to assemble in 'safe zone'.

Conclusion of Evacuation:

1. Incident leader to announce school re-entry/breaktime.
2. Coordinate the return of students and teachers to the school building/classes.
3. Encourage all participants to report potential improvements to evacuation procedure.
4. Record improvements in 'Earthquake evacuation procedure report form'.
5. Revise evacuation procedure accordingly and circulate to all staff.
6. Debrief staff and students.



Earthquake evacuation procedure report

Name of the School:
Tel No:
Email:
Address:
Contact Person:

Number of students who participated:
Number of teachers:
Any physically impaired students?

When was evacuation procedure conducted?
How long did evacuation take?
Was the register taken after evacuation to safe zone? (y/n):
What any other activities were carried out during the procedure? (Search & Rescue, First Aid etc):

During debriefing what improvements were noted?

Any other remarks

Reporting Instructions

- Email a copy of report to your school director and to Seismology at School in Nepal
- For any questions contact the local government officer and Seismology at School in Nepal program
- Send additional evidence, e.g., photographs with report

References

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5. Red Cross, Nepal. Handbook for Disaster Preparedness and Drills in School.
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8. Admin.Adtrak. (2021). The Fire Triangle Explained. *Asco*. https://www.asco.uk.com/latest-news/the-fire-triangle-explained/
9. Admin. (2017). Beyond 'Drop, Cover and Hold On.' *ePACT*. https://www.epactnetwork.com/corp/blog/beyond-drop-cover-hold/
10. GeoHazards International Revised Version (2015, June). Background Papers and Supplementary Technical Information Part of the Project: Developing Messages for Protective Actions to Take During Earthquake.
11. The World Bank (2016). Learning from Disaster Simulation Drills In Japan.

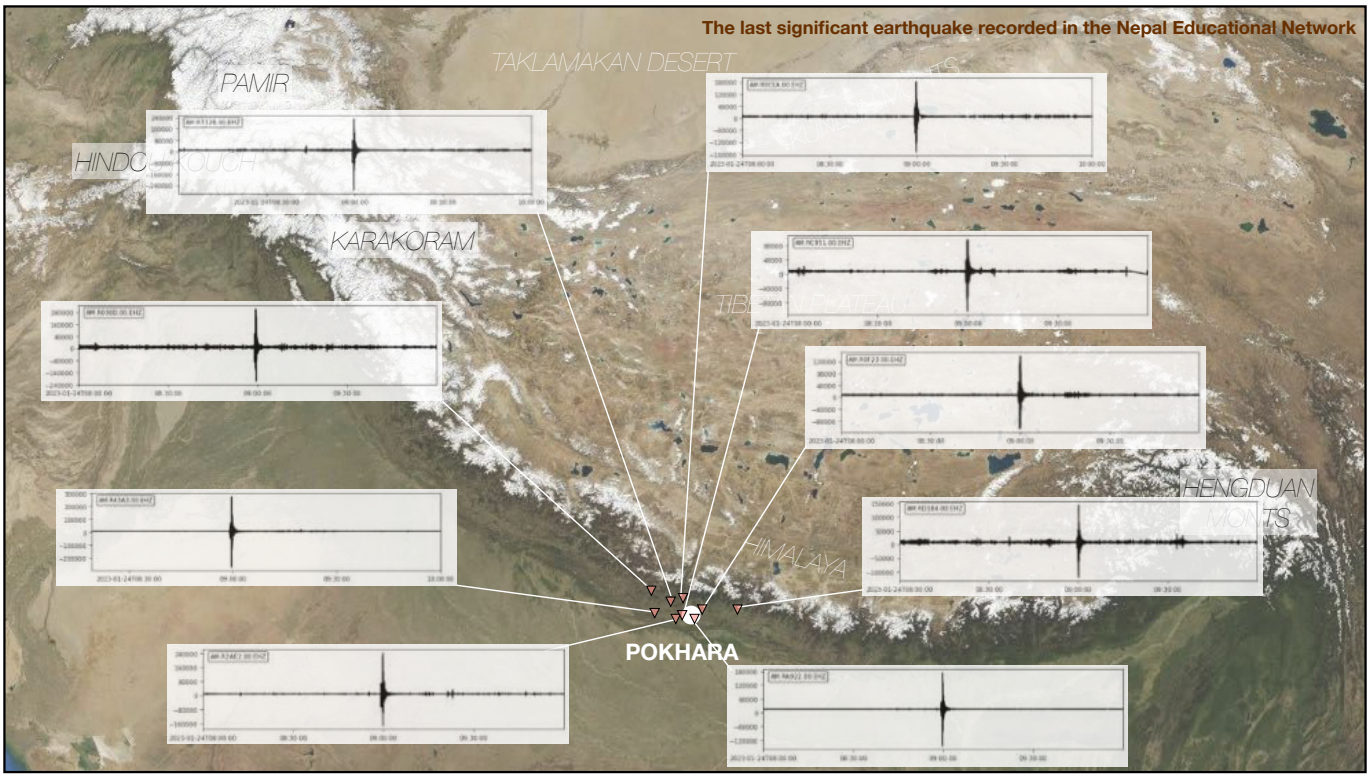
Prepared for the Seismology at School in Nepal program (www.seismoschoolnp.org)

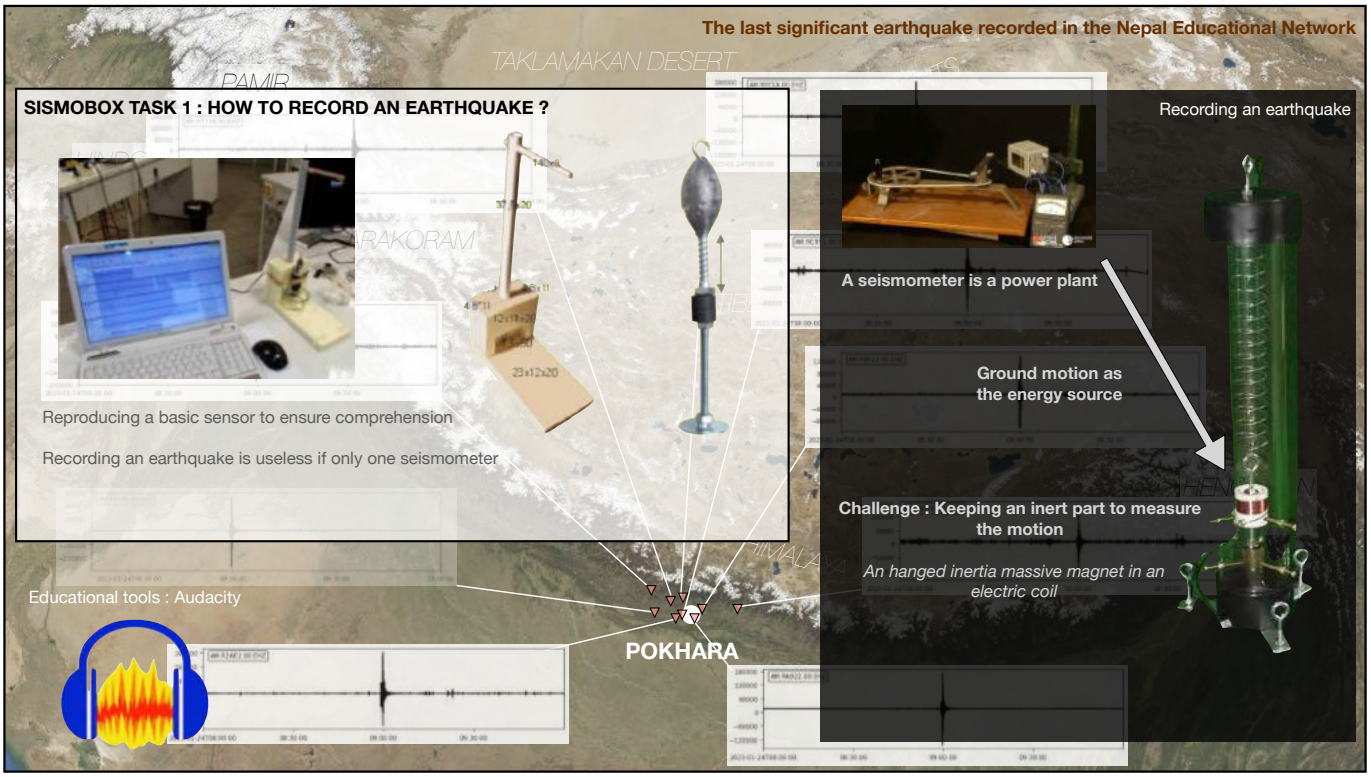
With the support of:

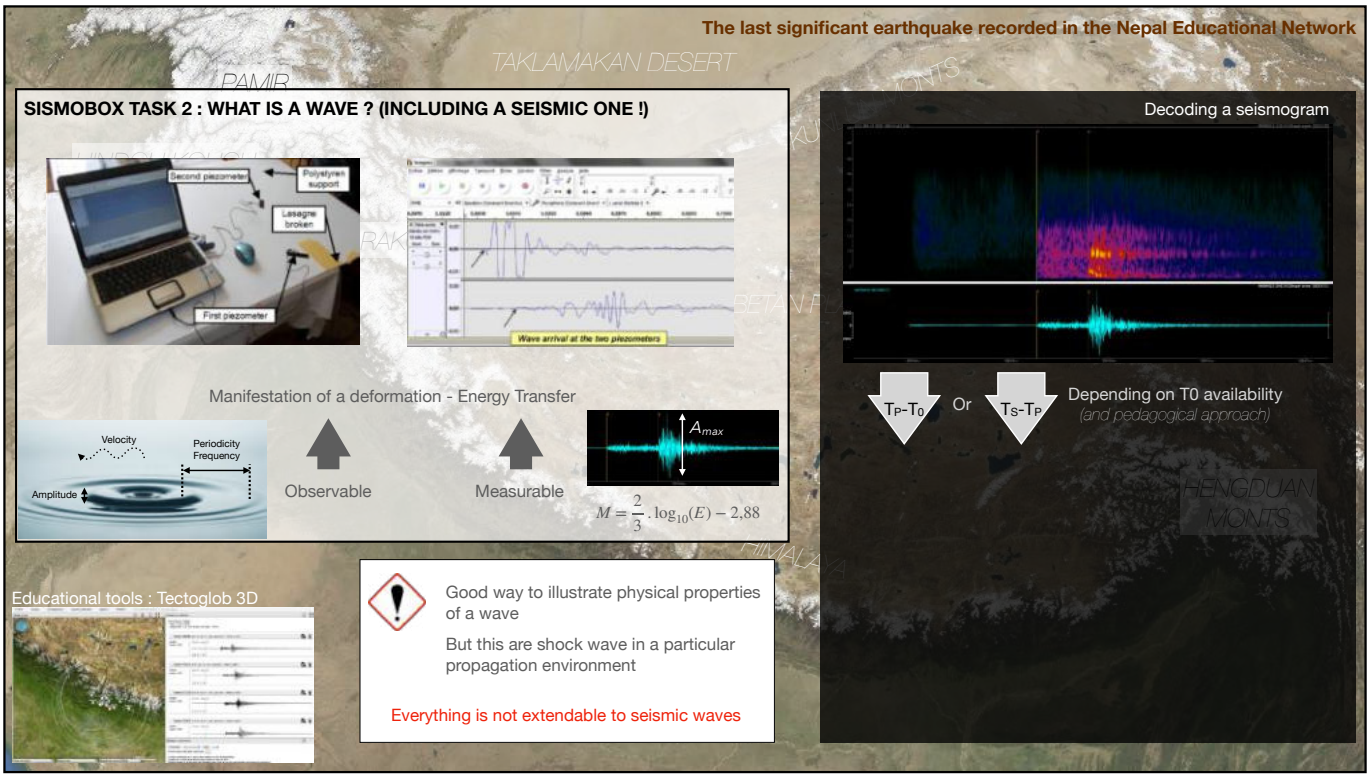
International Union of Geodesy and Geophysics (IUGG)

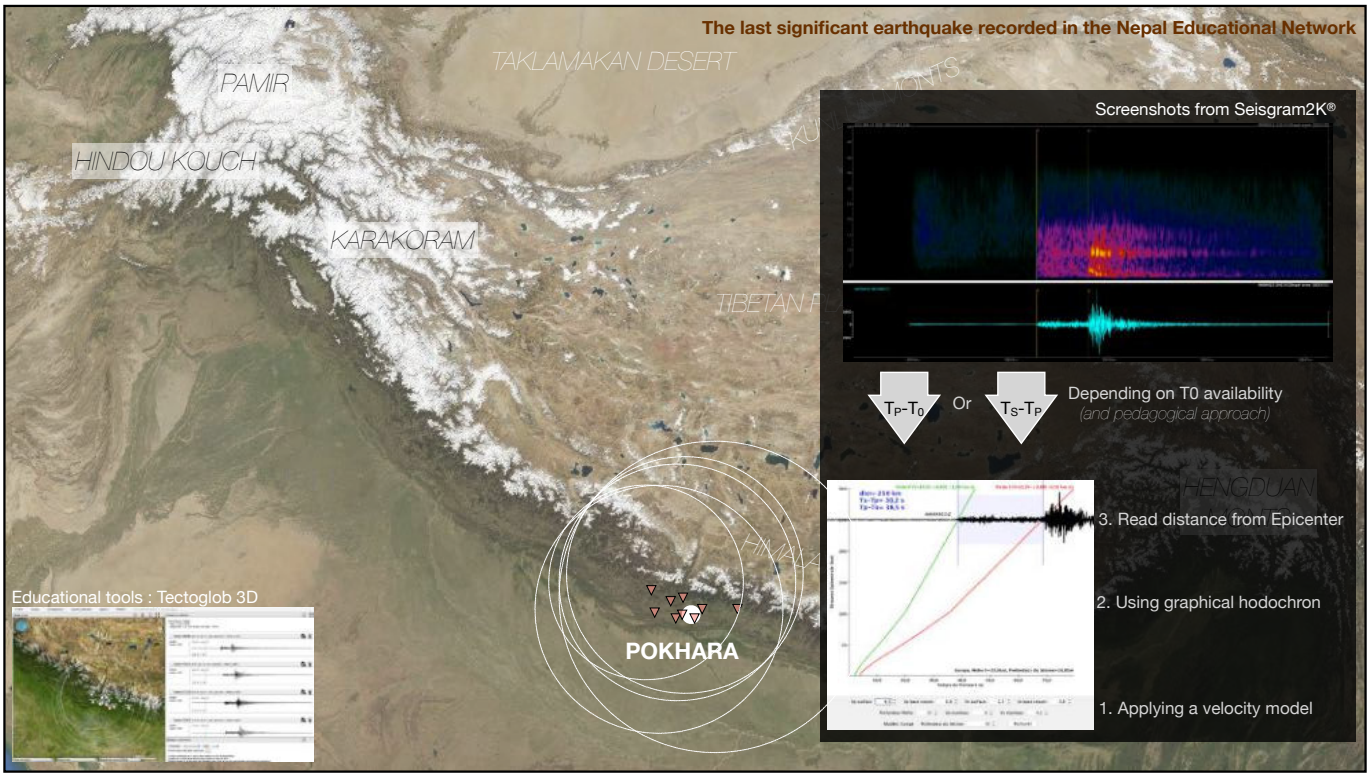
UNIL | Université de Lausanne

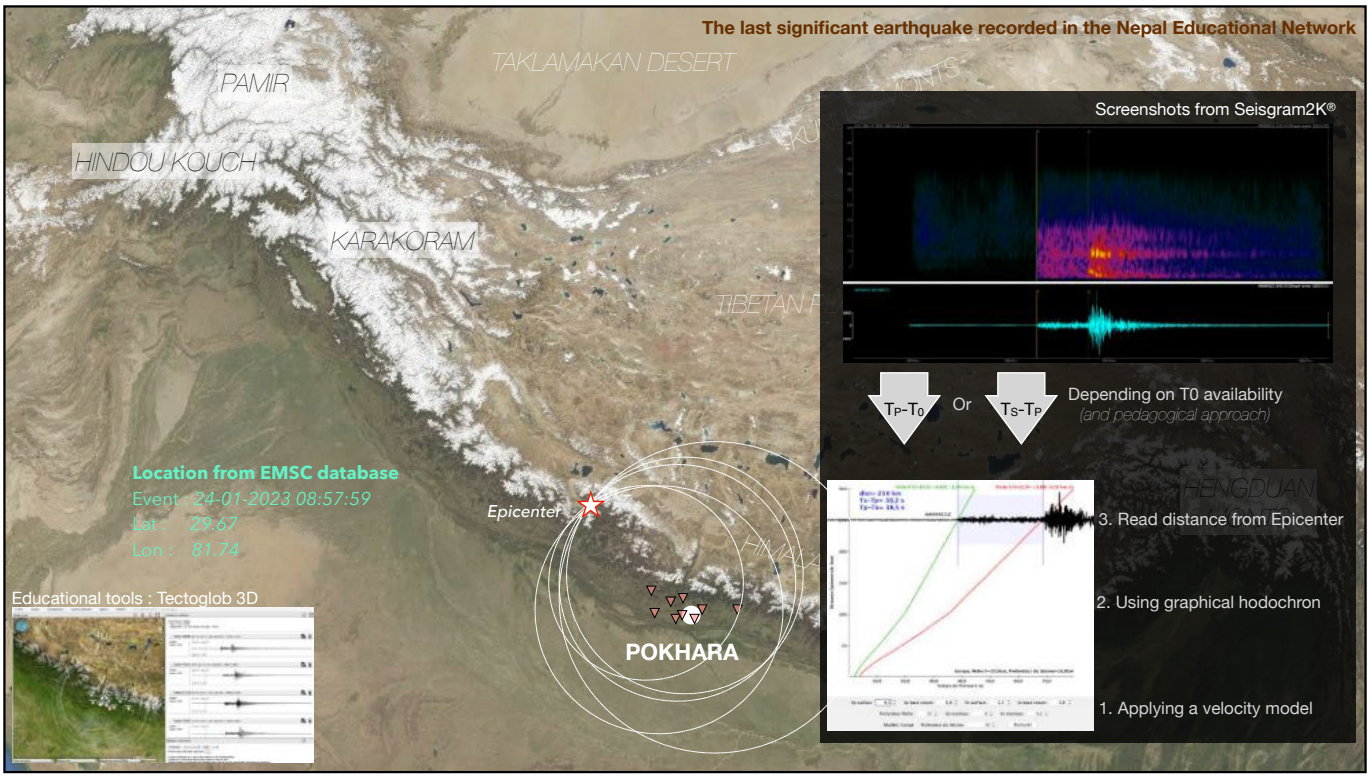

PAMIR
TAKLAMAKAN DESERT
HINDOU KOUCH
KUNLUN MONTS
KARAKORAM
TIBETAN PLATEAU
EARTHQUAKES AT SCHOOL
DATA MINING AND SISMOBOX TOOLS - A SYNERGIC APPROACH
HENGDUAN MONTS
HIMALAYA
Workshop in POKHARA - May 2023
Fabrice JOUFFRAY (Université Côte d'Azur - Nice - FRANCE)
EGU EDU

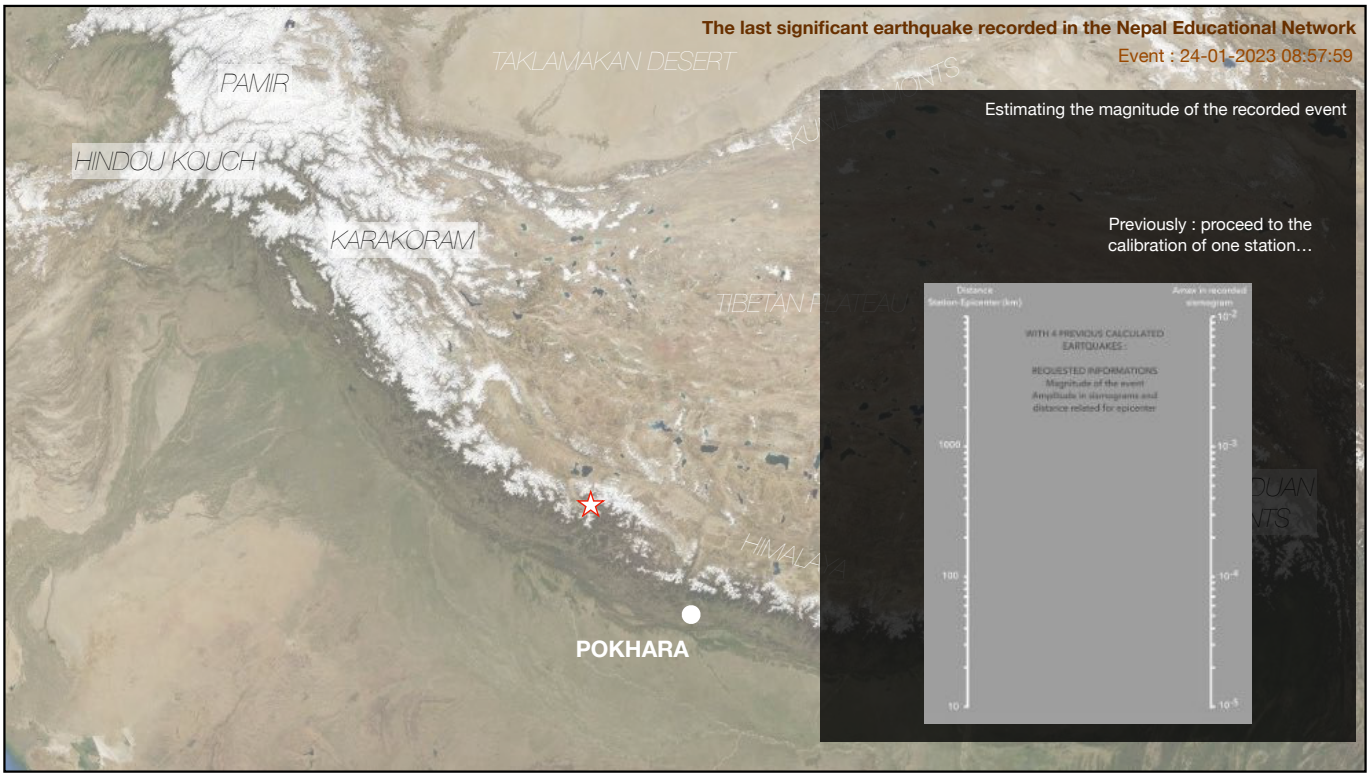

The last significant earthquake recorded in the Nepal Educational Network
PAMIR
TAKLAMAKAN DESERT
KARAKORAM
HENGDUAN MONTS
HIMALAYA
POKHARA

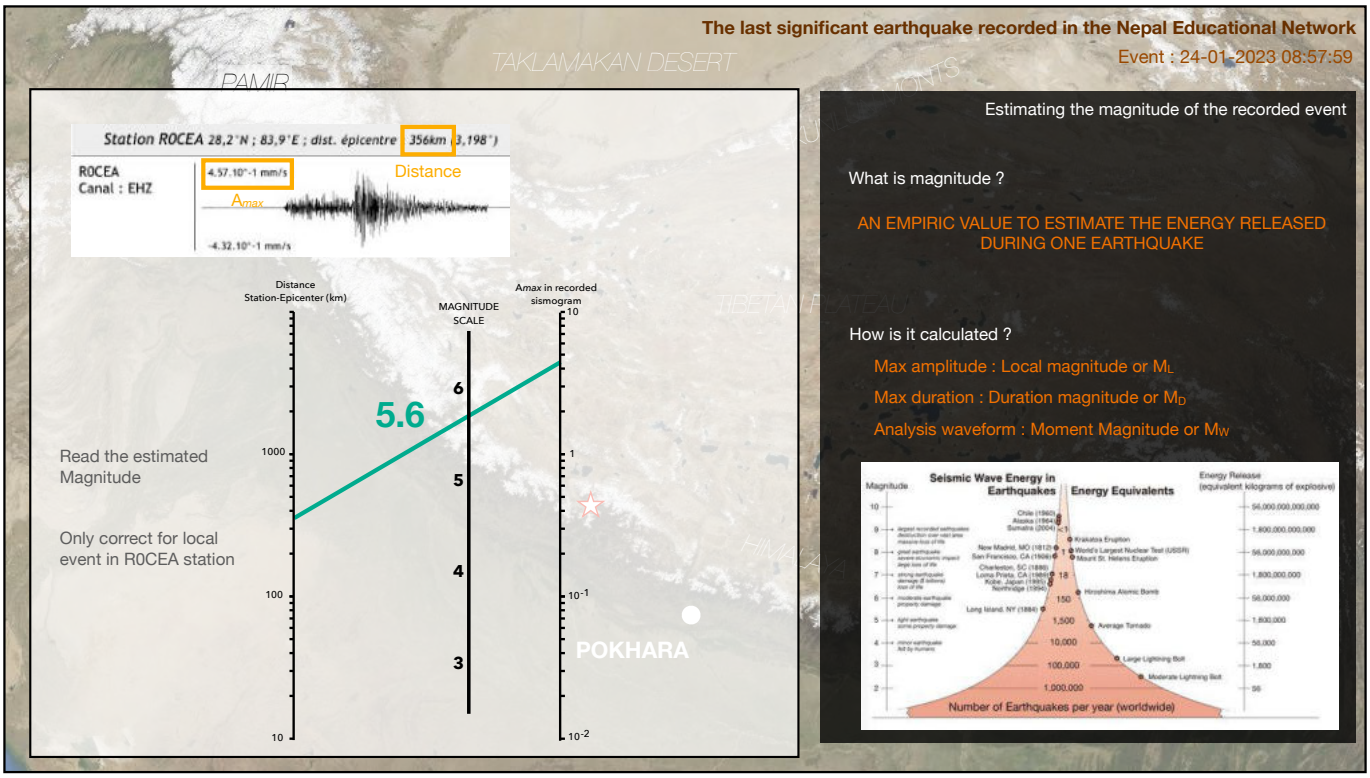

The last significant earthquake recorded in the Nepal Educational Network
SISMOBOX TASK 1 : HOW TO RECORD AN EARTHQUAKE ?
Reproducing a basic sensor to ensure comprehension
Recording an earthquake is useless if only one seismometer
Recording an earthquake
A seismometer is a power plant
Ground motion as the energy source
Challenge : Keeping an inert part to measure the motion
An hanged inertia massive magnet in an electric coil
Educational tools : Audacity
POKHARA

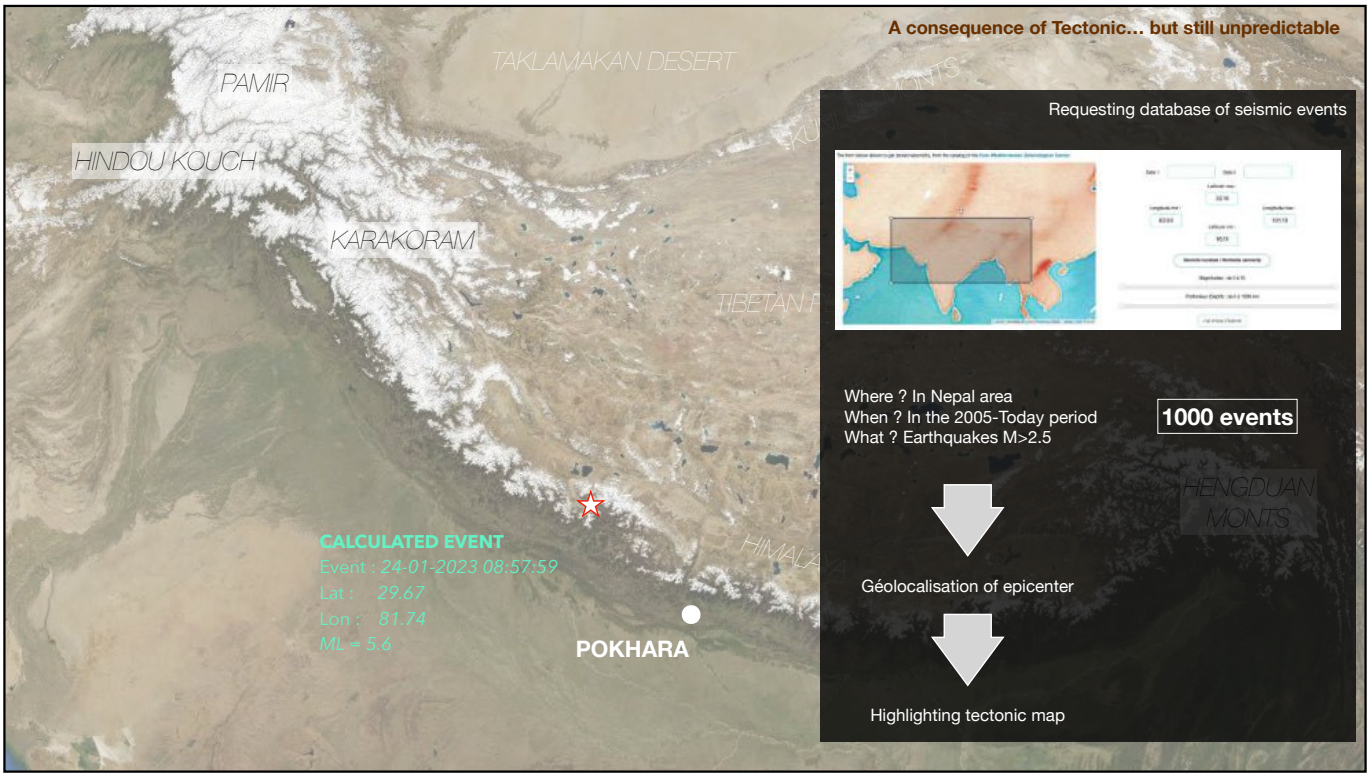

The last significant earthquake recorded in the Nepal Educational Network
SISMOBOX TASK 2 : WHAT IS A WAVE ? (INCLUDING A SEISMIC ONE !)
Second piezometer
Polystyren support
Lasagne broken
First piezometer
Wave arrival at the two piezometers
Manifestation of a deformation - Energy Transfer
Velocity
Periodicity
Frequency
Amplitude
Observable
Measurable
A_{max}
$M = \frac{2}{3} . \log_{10}(E) - 2,88$
Decoding a seismogram
T_P-T_0
Or
T_S-T_P
Depending on T0 availability
(and pedagogical approach)
Educational tools : Tectoglob 3D
Good way to illustrate physical properties of a wave
But this are shock wave in a particular propagation environment
Everything is not extendable to seismic waves

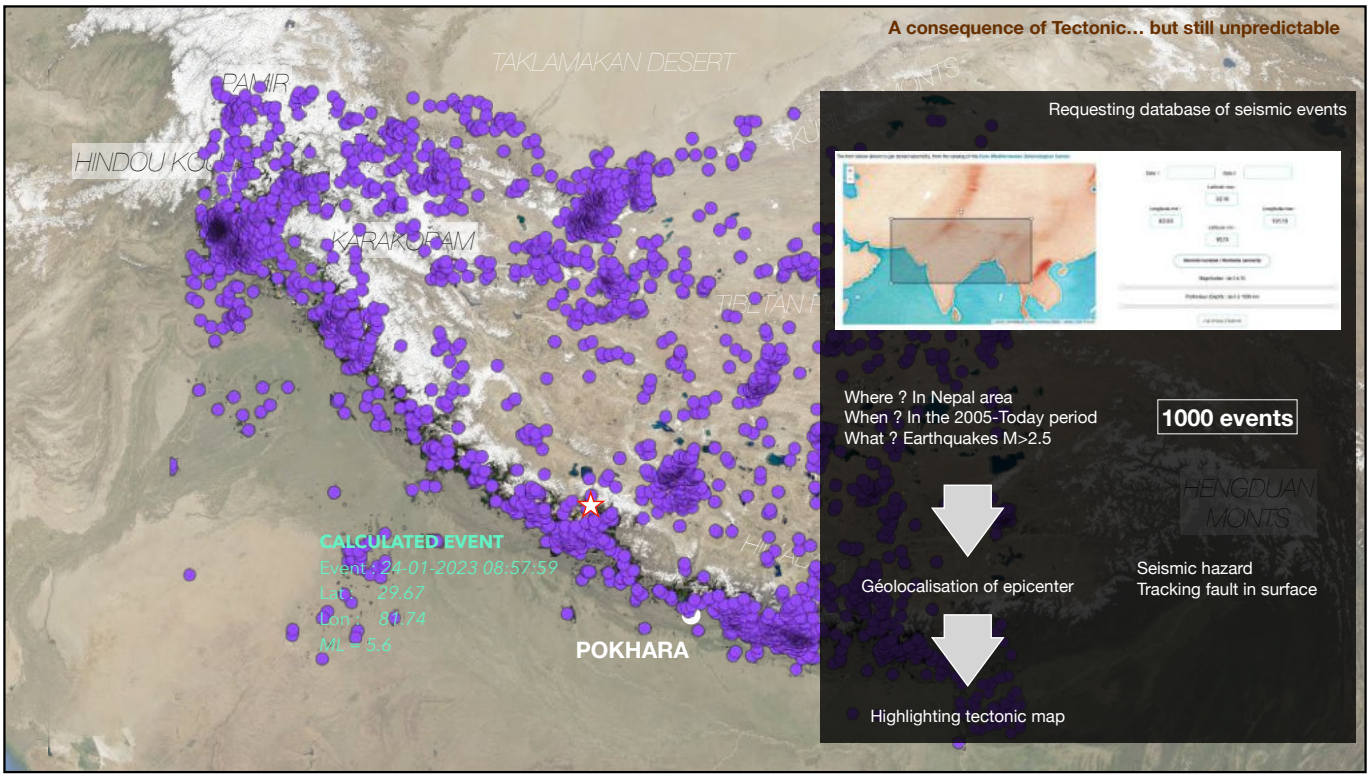

The last significant earthquake recorded in the Nepal Educational Network
TAKLAMAKAN DESERT
PAMIR
HINDOU KOUCH
KARAKORAM
TIBETAN
HENGDUAN
HIMA
Screenshots from Seisgram2K®
TP-T0
Or
TS-TP
Depending on T0 availability
(and pedagogical approach)
3. Read distance from Epicenter
2. Using graphical hodochron
1. Applying a velocity model
POKHARA
Educational tools : Tectoglob 3D


The last significant earthquake recorded in the Nepal Educational Network
TAKLAMAKAN DESERT
PAMIR
HINDOU KOUCH
KARAKORAM
TIBETAN
HENGDUAN
HIMA
Screenshots from Seisgram2K®
TP-T0
Or
TS-TP
Depending on T0 availability
(and pedagogical approach)
Location from EMSC database
Event : 24-01-2023 08:57:59
Lat : 29.67
Lon : 81.74
Epicenter
3. Read distance from Epicenter
2. Using graphical hodochron
1. Applying a velocity model
POKHARA
Educational tools : Tectoglob 3D


The last significant earthquake recorded in the Nepal Educational Network
Event : 24-01-2023 08:57:59
PAMIR
TAKLAMAKAN DESERT
HINDOU KOUCH
KARAKORAM
TIBETAN PLATEAU
HIMALAYA
POKHARA
Estimating the magnitude of the recorded event
Previously : proceed to the calibration of one station…
Distance Station-Epicenter (km)
Amax in recorded sismogram
WITH 4 PREVIOUS CALCULATED EARTQUAKES :
REQUESTED INFORMATIONS
Magnitude of the event
Amplitude in sismograms and distance related for epicenter
1000
100
10


The last significant earthquake recorded in the Nepal Educational Network
Event : 24-01-2023 08:57:59
PAMIR
TAKLAMAKAN DESERT
TIBETAN PLATEAU
HIMALAYA
POKHARA
Station ROCEA 28,2°N ; 83,9°E ; dist. épicentre 356km (3,198°)
ROCEA
Canal : EHZ
4.57.10^-1 mm/s
Amax
Distance
-4.32.10^-1 mm/s
Distance Station-Epicenter (km)
MAGNITUDE SCALE
Amax in recorded sismogram
5.6
Read the estimated Magnitude
Only correct for local event in R0CEA station
Estimating the magnitude of the recorded event
What is magnitude ?
AN EMPIRIC VALUE TO ESTIMATE THE ENERGY RELEASED DURING ONE EARTHQUAKE
How is it calculated ?
Max amplitude : Local magnitude or ML
Max duration : Duration magnitude or MD
Analysis waveform : Moment Magnitude or MW
Seismic Wave Energy in Earthquakes
Energy Equivalents
Energy Release (equivalent kilograms of explosive)
Magnitude
Number of Earthquakes per year (worldwide)


A consequence of Tectonic... but still unpredictable
TAKLAMAKAN DESERT
PAMIR
HINDOU KOUCH
KARAKORAM
TIBETAN
HIMALAYA
CALCULATED EVENT
Event : 24-01-2023 08:57:59
Lat : 29.67
Lon : 81.74
ML = 5.6
POKHARA
Requesting database of seismic events
Where ? In Nepal area
When ? In the 2005-Today period
What ? Earthquakes M>2.5
1000 events
HENGDUAN MONTS
Géolocalisation of epicenter
Highlighting tectonic map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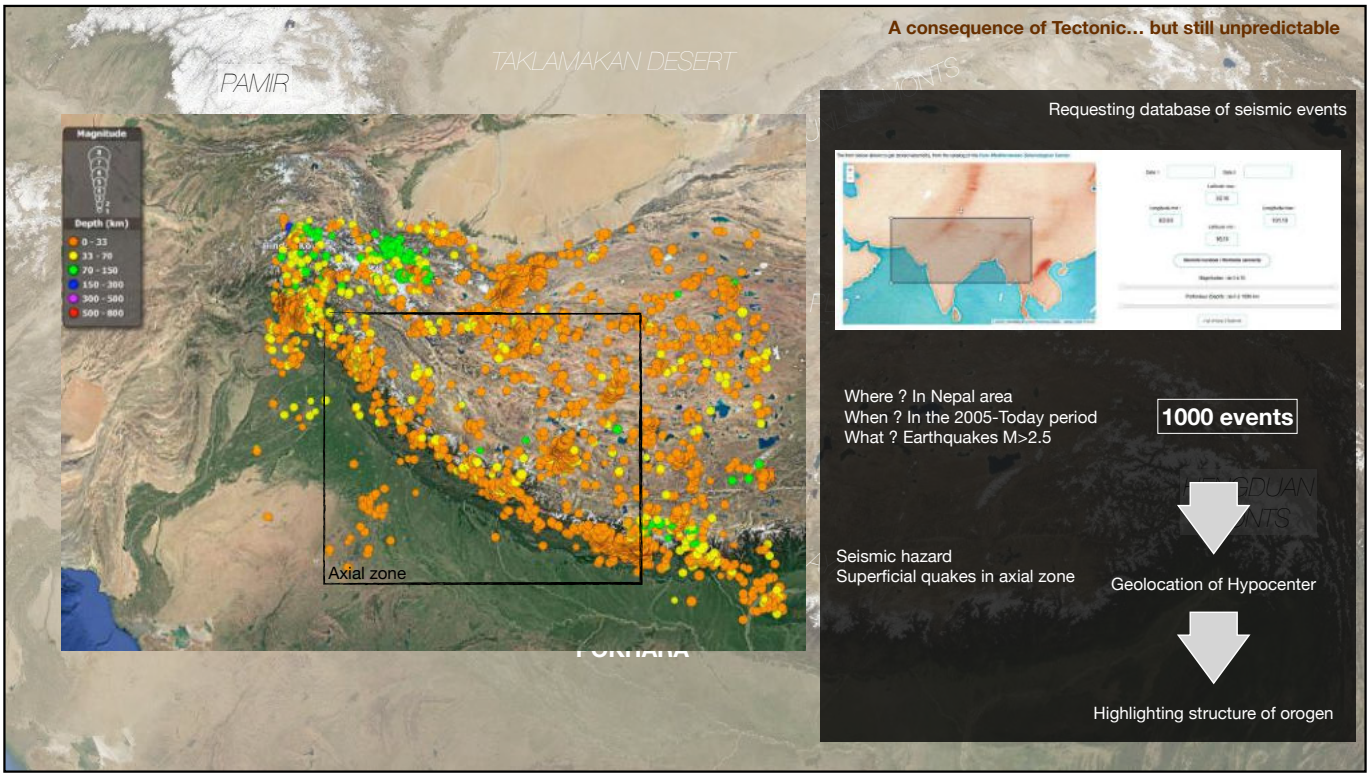
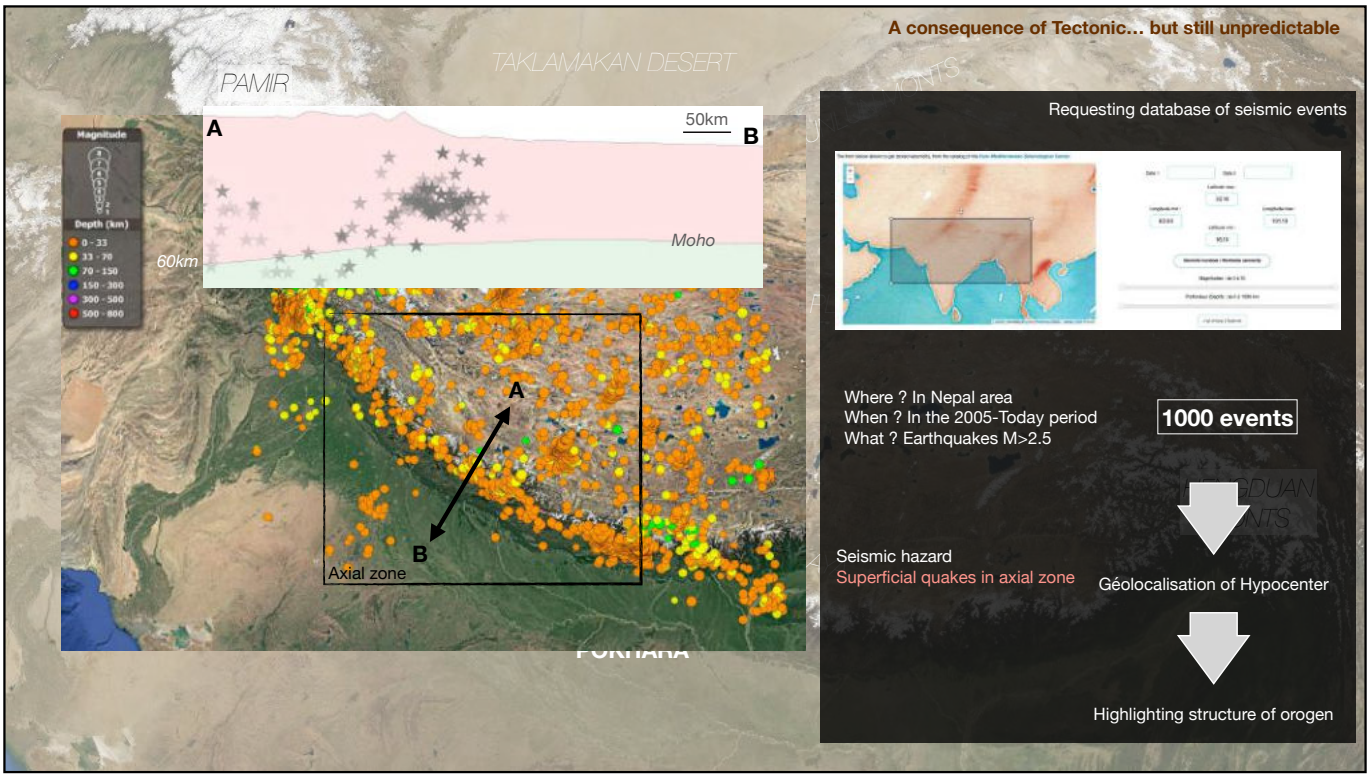
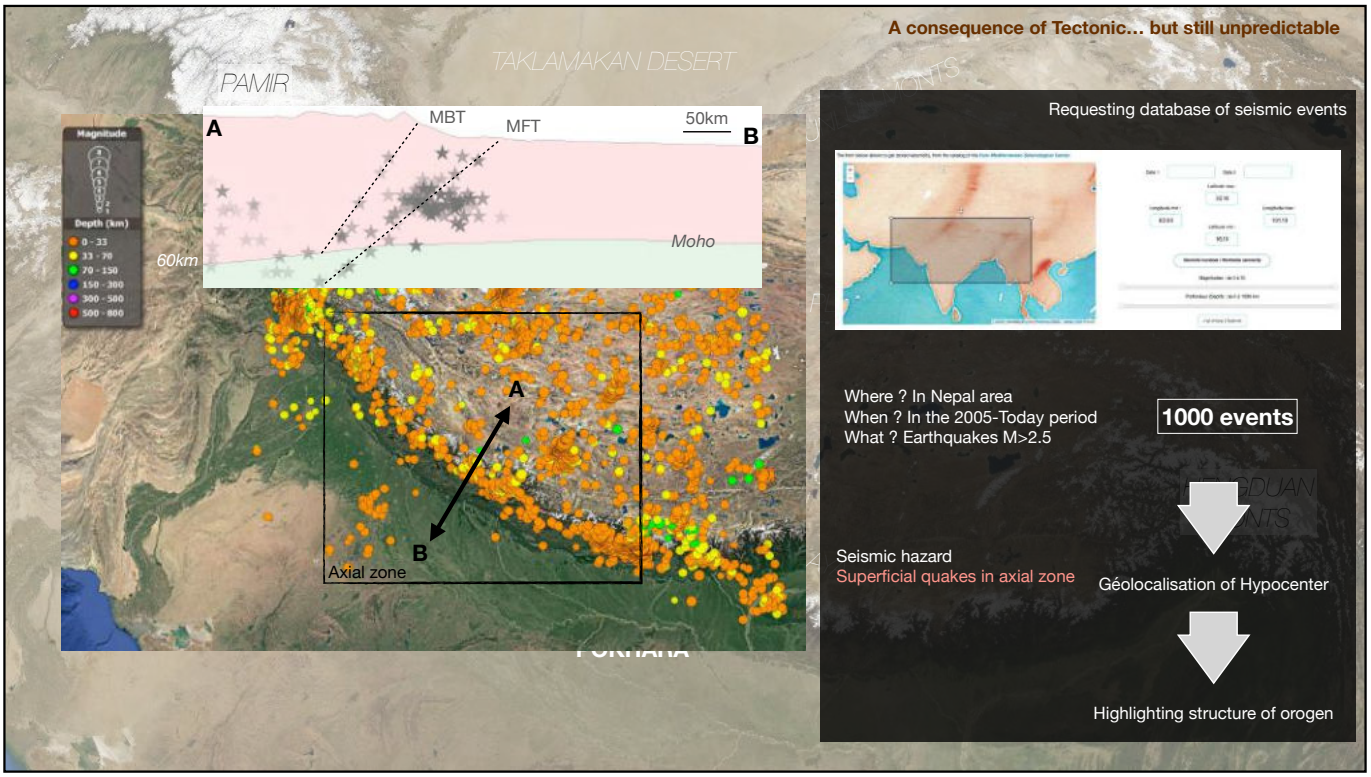
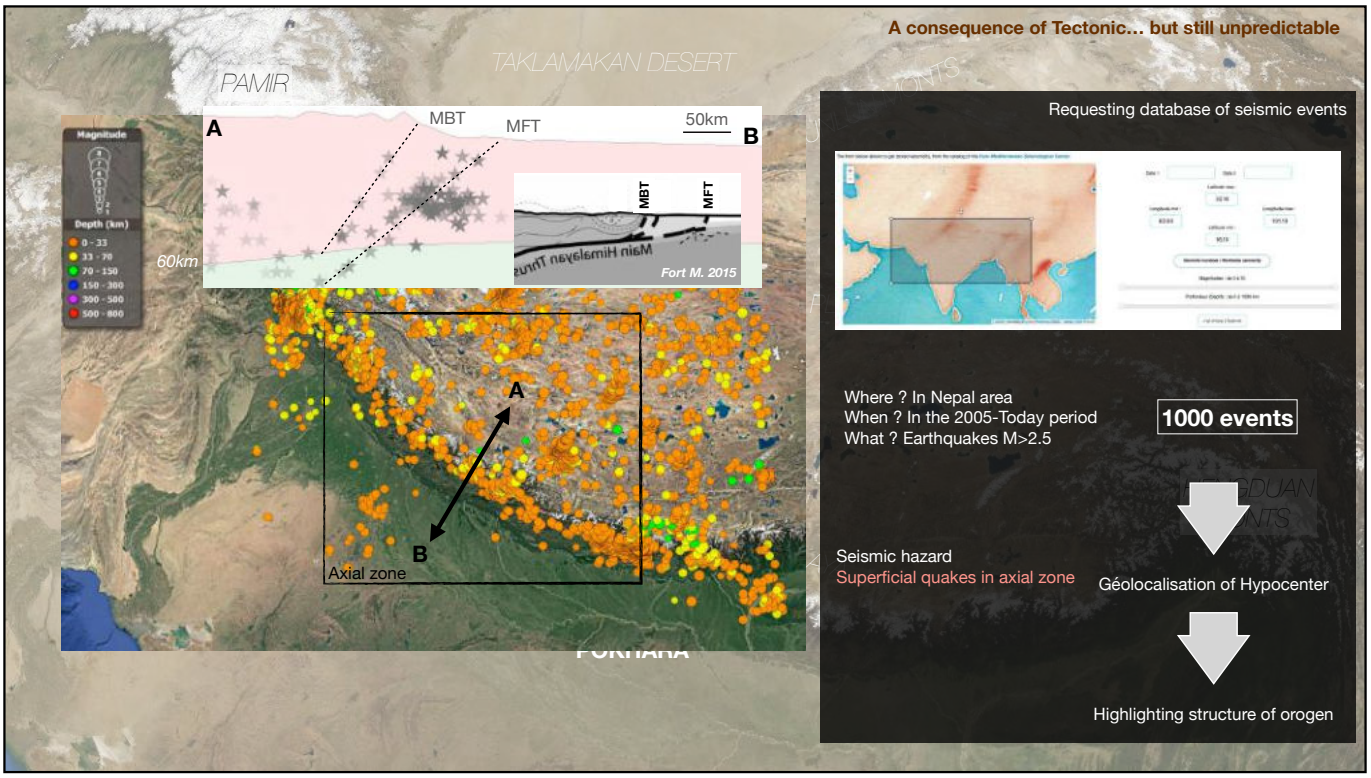
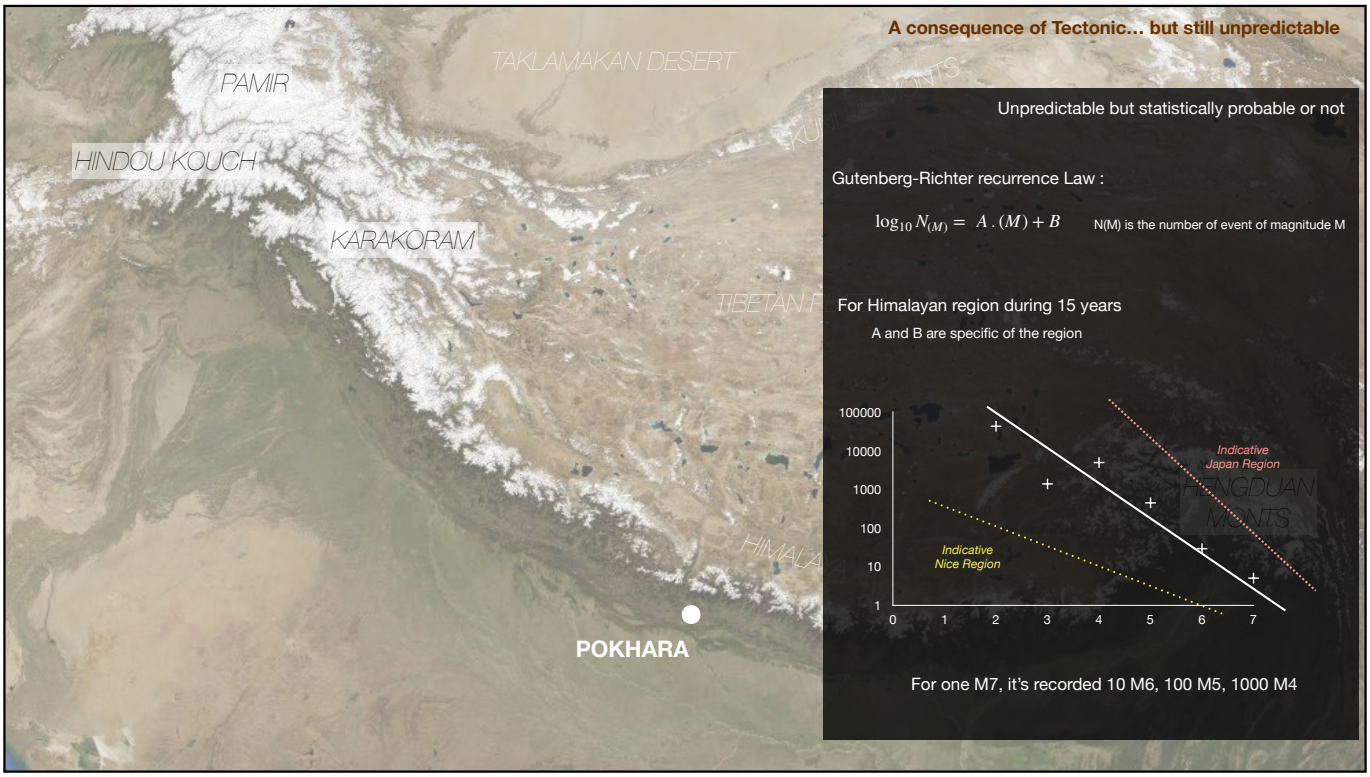
TAKLAMAKAN DESERT
PAMIR
KARAKORAM
TIBETAN
HIMALAYA
CALCULATED EVENT
Event : 24-01-2023 08:57:59
Lat : 29.67
Lon : 81.74
ML = 5.6
POKHARA
Requesting database of seismic events
Where ? In Nepal area
When ? In the 2005-Today period
What ? Earthquakes M>2.5
1000 events
HENGDUAN MONTS
Géolocalisation of epicenter
Seismic hazard
Tracking fault in surface
Highlighting tectonic map

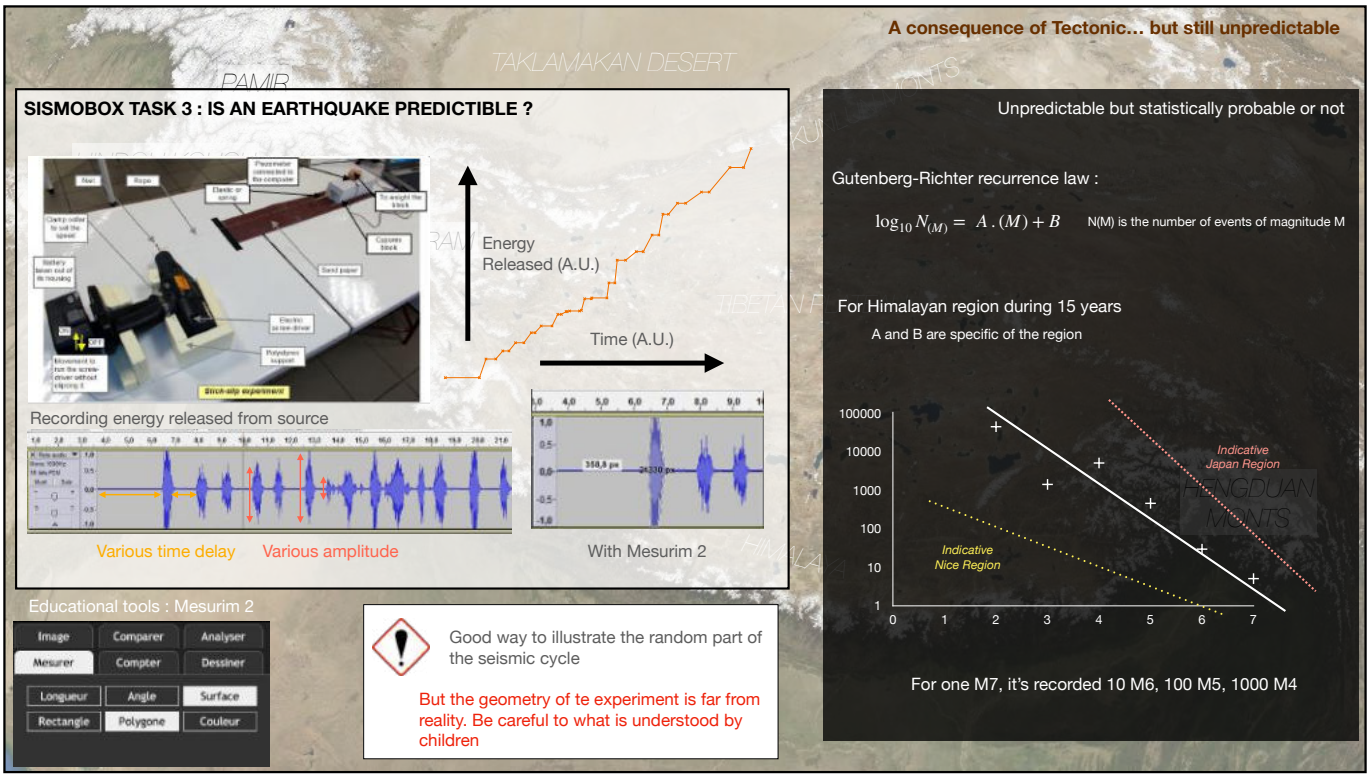

A consequence of Tectonic... but still unpredictable
PAMIR
TAKLAMAKAN DESERT
Magnitude
Depth (km)
0 - 33
33 - 70
70 - 150
150 - 300
300 - 500
500 - 800
Axial zone
Requesting database of seismic events
Where ? In Nepal area
When ? In the 2005-Today period
What ? Earthquakes M>2.5
1000 events
Seismic hazard
Superficial quakes in axial zone
Geolocation of Hypocenter
Highlighting structure of orogen

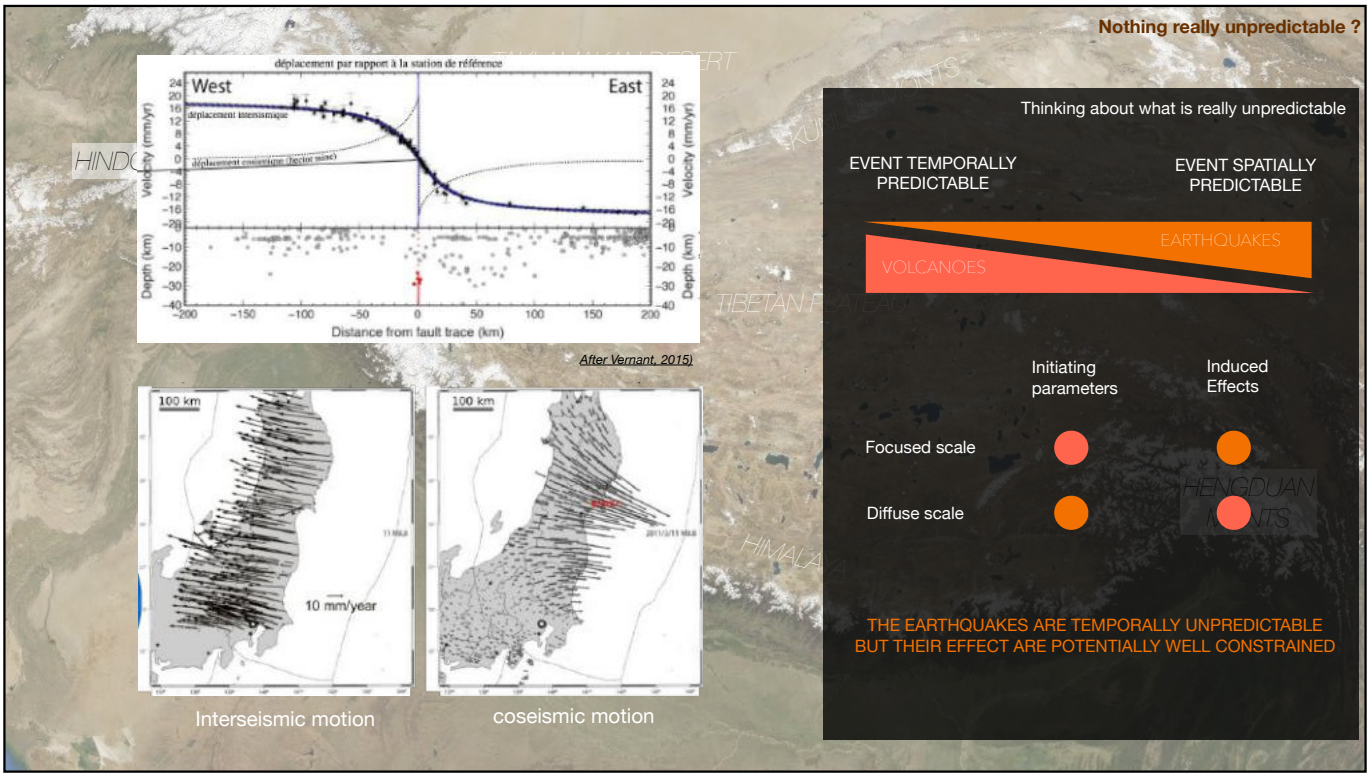

A consequence of Tectonic... but still unpredictable
PAMIR
TAKLAMAKAN DESERT
Magnitude
Depth (km)
0 - 33
33 - 70
70 - 150
150 - 300
300 - 500
500 - 800
A
B
50km
Moho
60km
Axial zone
Requesting database of seismic events
Where ? In Nepal area
When ? In the 2005-Today period
What ? Earthquakes M>2.5
1000 events
Seismic hazard
Superficial quakes in axial zone
Géolocalisation of Hypocenter
Highlighting structure of orogen

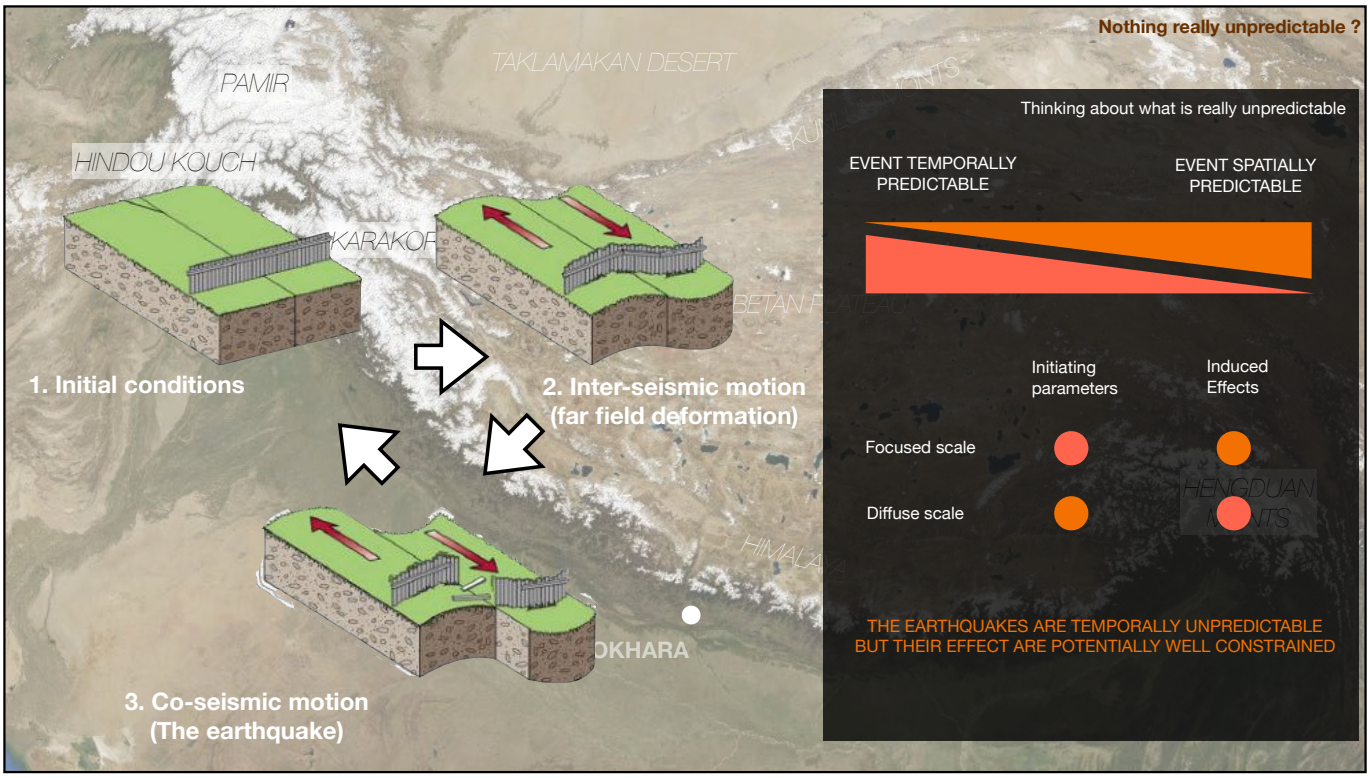

A consequence of Tectonic... but still unpredictable
PAMIR
TAKLAMAKAN DESERT
Magnitude
Depth (km)
0 - 33
33 - 70
70 - 150
150 - 300
300 - 500
500 - 800
A
MBT
MFT
50km
B
Moho
60km
A
B
Axial zone
Requesting database of seismic events
Where ? In Nepal area
When ? In the 2005-Today period
What ? Earthquakes M>2.5
1000 events
Seismic hazard
Superficial quakes in axial zone
Géolocalisation of Hypocenter
Highlighting structure of orogen

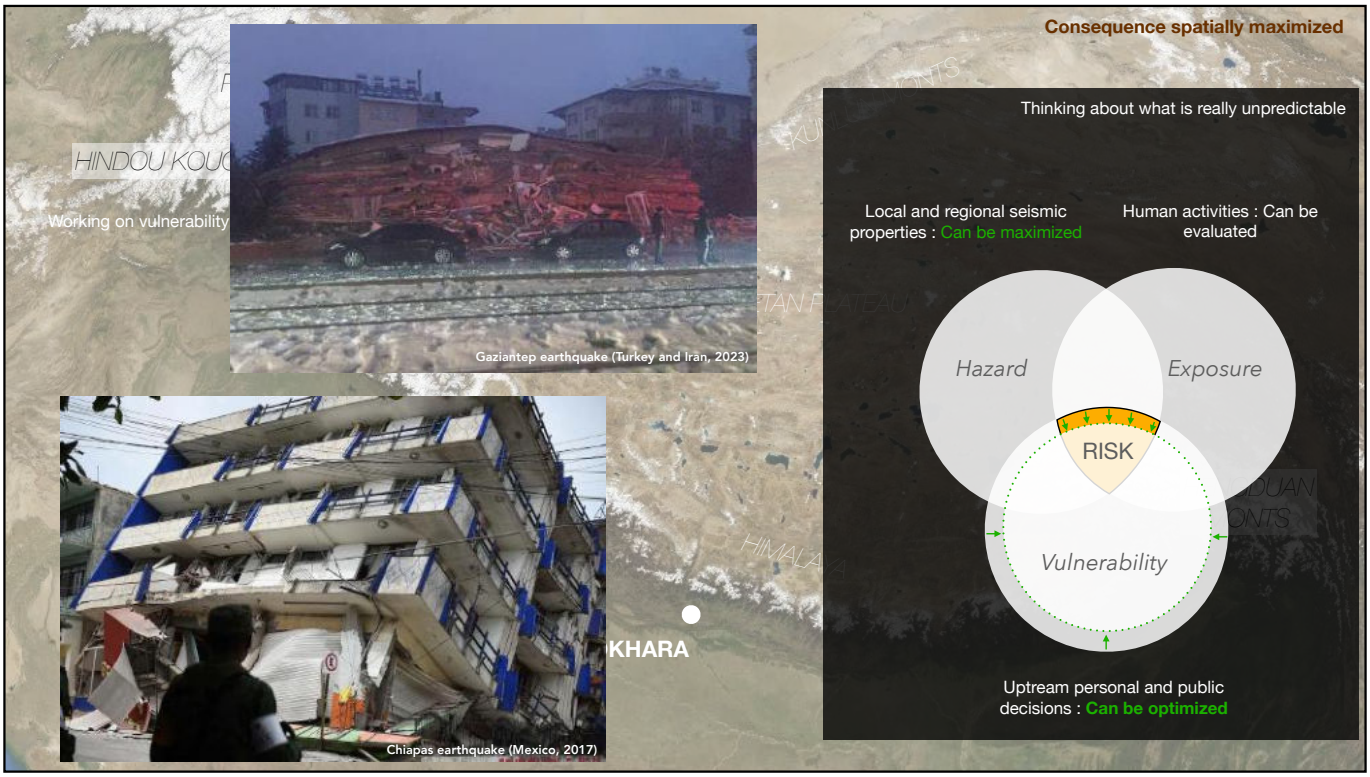

A consequence of Tectonic... but still unpredictable
PAMIR
TAKLAMAKAN DESERT
Magnitude
Depth (km)
0 - 33
33 - 70
70 - 150
150 - 300
300 - 500
500 - 800
A
MBT
MFT
50km
B
MBT
MFT
Fort M. 2015
60km
A
B
Axial zone
Requesting database of seismic events
Where ? In Nepal area
When ? In the 2005-Today period
What ? Earthquakes M>2.5
1000 events
Seismic hazard
Superficial quakes in axial zone
Géolocalisation of Hypocenter
Highlighting structure of orogen

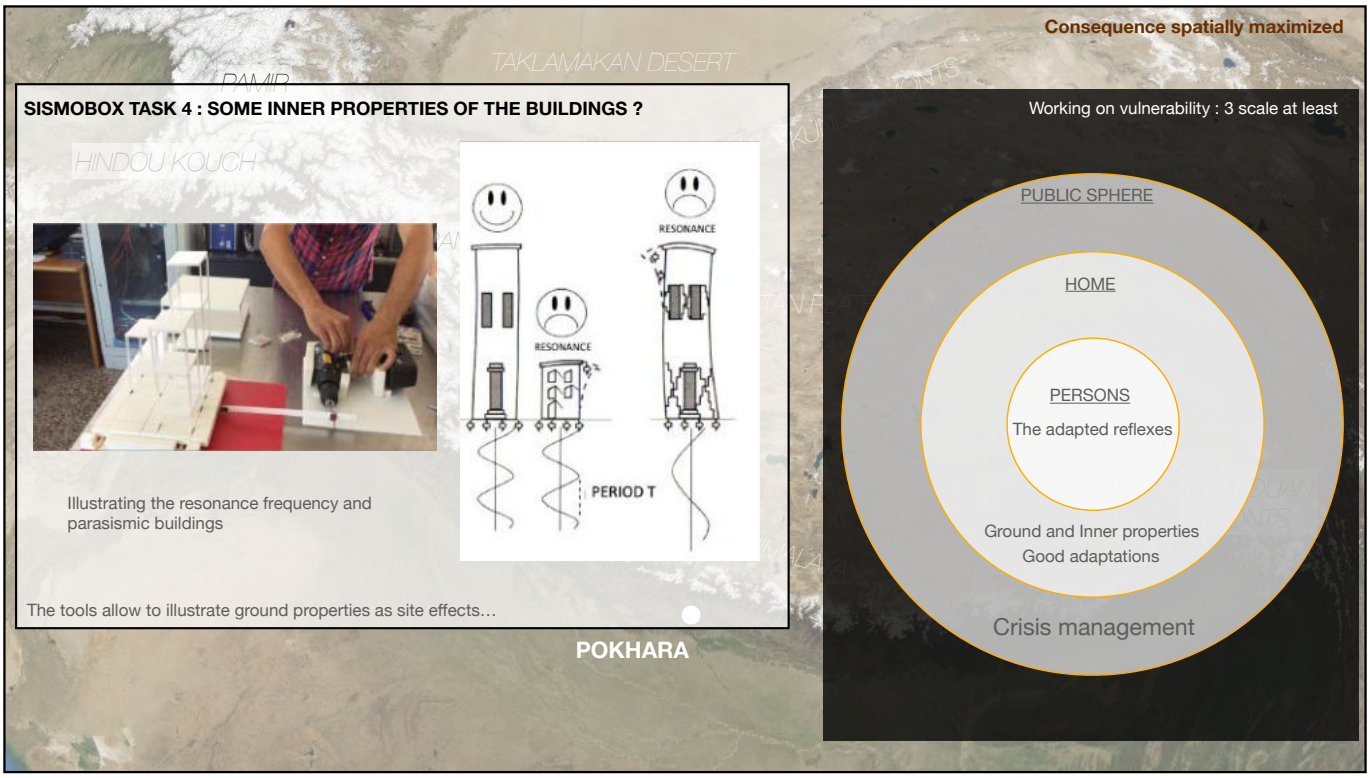

A consequence of Tectonic... but still unpredictable
TAKLAMAKAN DESERT
PAMIR
HINDOU KOUCH
KARAKORAM
TIBETAN
HIMALA
POKHARA
Unpredictable but statistically probable or not
Gutenberg-Richter recurrence Law :
$\log_{10} N_{(M)} = A.(M) + B$
N(M) is the number of event of magnitude M
For Himalayan region during 15 years
A and B are specific of the region
100000
10000
1000
100
10
1
0 1 2 3 4 5 6 7
Indicative Japan Region
Indicative Nice Region
HENGDUAN MONTS
For one M7, it's recorded 10 M6, 100 M5, 1000 M4

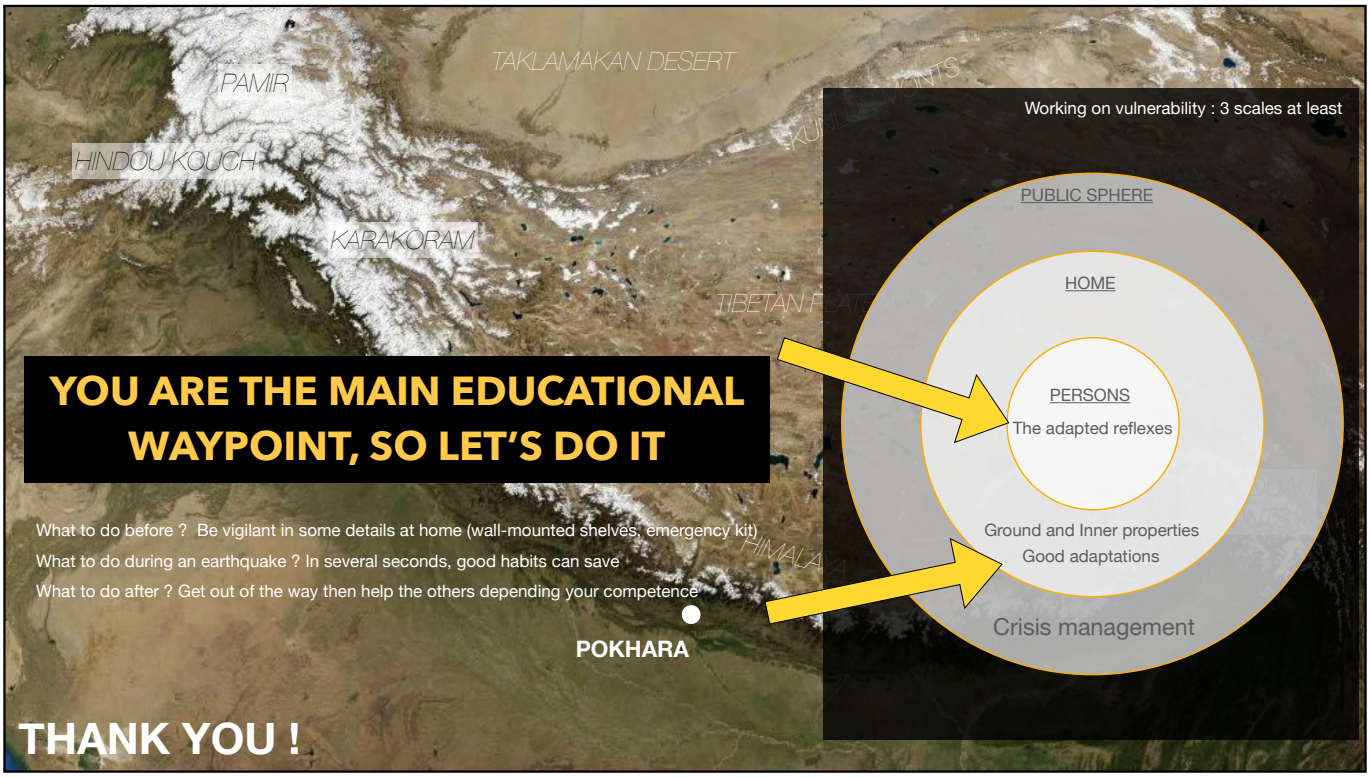

A consequence of Tectonic... but still unpredictable
TAKLAMAKAN DESERT
PAMIR
SISMOBOX TASK 3 : IS AN EARTHQUAKE PREDICTIBLE ?
Energy Released (A.U.)
Time (A.U.)
Recording energy released from source
Various time delay
Various amplitude
With Mesurim 2
Educational tools : Mesurim 2
Image
Comparer
Analyser
Mesurer
Compter
Dessiner
Longueur
Angle
Surface
Rectangle
Polygone
Couleur
Good way to illustrate the random part of the seismic cycle
But the geometry of te experiment is far from reality. Be careful to what is understood by children
Unpredictable but statistically probable or not
Gutenberg-Richter recurrence law :
$\log_{10} N_{(M)} = A.(M) + B$
N(M) is the number of events of magnitude M
For Himalayan region during 15 years
A and B are specific of the region
100000
10000
1000
100
10
1
0 1 2 3 4 5 6 7
Indicative Japan Region
Indicative Nice Region
HENGDUAN MONTS
For one M7, it's recorded 10 M6, 100 M5, 1000 M4


Nothing really unpredictable ?
West
East
Distance from fault trace (km)
After Vernant, 2015)
100 km
10 mm/year
Interseismic motion
coseismic motion
Thinking about what is really unpredictable
EVENT TEMPORALLY PREDICTABLE
EVENT SPATIALLY PREDICTABLE
EARTHQUAKES
VOLCANOES
Initiating parameters
Induced Effects
Focused scale
Diffuse scale
THE EARTHQUAKES ARE TEMPORALLY UNPREDICTABLE
BUT THEIR EFFECT ARE POTENTIALLY WELL CONSTRAINED


Nothing really unpredictable ?
TAKLAMAKAN DESERT
PAMIR
HINDOU KOUCH
KARAKOR
1. Initial conditions
2. Inter-seismic motion
(far field deformation)
3. Co-seismic motion
(The earthquake)
Thinking about what is really unpredictable
EVENT TEMPORALLY PREDICTABLE
EVENT SPATIALLY PREDICTABLE
Initiating parameters
Induced Effects
Focused scale
Diffuse scale
THE EARTHQUAKES ARE TEMPORALLY UNPREDICTABLE
BUT THEIR EFFECT ARE POTENTIALLY WELL CONSTRAINED


Consequence spatially maximized
Working on vulnerability
Gaziantep earthquake (Turkey and Iran, 2023)
Chiapas earthquake (Mexico, 2017)
KHARA
Thinking about what is really unpredictable
Local and regional seismic properties : Can be maximized
Human activities : Can be evaluated
Hazard
Exposure
RISK
Vulnerability
Uptream personal and public decisions : Can be optimized


Consequence spatially maximized
SISMOBOX TASK 4 : SOME INNER PROPERTIES OF THE BUILDINGS ?
RESONANCE
RESONANCE
PERIOD T
Illustrating the resonance frequency and parasismic buildings
The tools allow to illustrate ground properties as site effects…
POKHARA
Working on vulnerability : 3 scale at least
PUBLIC SPHERE
HOME
PERSONS
The adapted reflexes
Ground and Inner properties
Good adaptations
Crisis management


PAMIR
TAKLAMAKAN DESERT
HINDOU KOUCH
KARAKORAM
TIBETAN PLATEAU
HIMALAYA
YOU ARE THE MAIN EDUCATIONAL WAYPOINT, SO LET'S DO IT
What to do before ? Be vigilant in some details at home (wall-mounted shelves, emergency kit)
What to do during an earthquake ? In several seconds, good habits can save
What to do after ? Get out of the way then help the others depending your competence
POKHARA
THANK YOU !
Working on vulnerability : 3 scales at least
PUBLIC SPHERE
HOME
PERSONS
The adapted reflexes
Ground and Inner properties
Good adaptations
Crisis management

| le savoir vivant |

BEAT THE QUAKE

Rules of an educational card game

Gergely SZAKÁCS, Levente FORGÁCS,
Shiba SUBEDI, György HETÉNYI

What is this game?

- A card game to increase awareness and preparedness to earthquakes

What is the goal?

- To protect the community from an impending earthquake collectively, and, if you have succeeded,
- To see who has more points individually

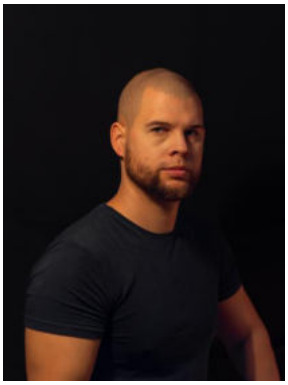
Why this title?

- BEAT: not to hit, but to win a battle, to be better in a contest, in a fight
- QUAKE: earthquake

Technical details

This game was created by:

- Gergely Szakács: concept (with input from Shiba and György), development, testing with players, fine tuning
- Levente Forgács: graphics, flyer



What is available?

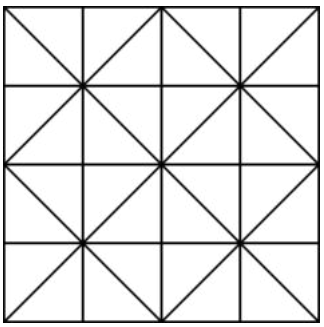
- Nepali version: 300 packs, free of charge, all for you
- English version: 50 packs, for sale (income → project)
- Game rules: in both languages
- Flyer, to advertise the game
- ~~Box for the packs~~ → rubber band, please construct a box
- **HOMEWORK 1**: take a pack with rules and rubber bands

Flyer

Game principles – comparison

Bagh Chal

- board game, 5x5 field with lines
- 2 players: 4 tigers vs. 20 goats
- play time: 10-60 minutes
- the rules are clear
- steps are deterministic



- players know the other player's options: open game
- winning depends on good strategy and learning

Game principles – comparison

Bagh Chal

- board game, 5x5 field with lines
- 2 players: 4 tigers vs. 20 goats
- play time: 10-60 minutes
- the rules are clear

Beat The Quake

- card game
- 2-5 players, 52 shared card
- play time: 5-20 minutes
- the rules are clear

Game principles – comparison

Bagh Chal

- steps are deterministic
- players know the other player's options: open game
- winning depends on good strategy and learning

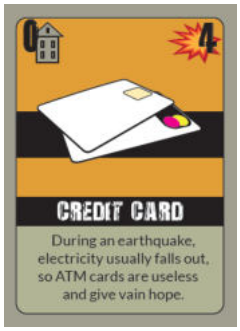
Beat The Quake

- steps are *probabilistic*, your next cards depend on luck
- some cards are not visible to other players: partly hidden game
- winning depends on strategy, cooperation, learning and luck

Cards

- 6 earthquake cards

- 2 x 23 item cards



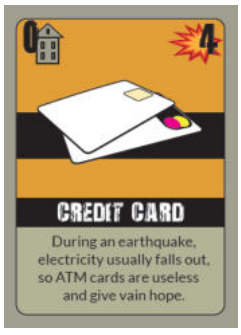
and more…

Cards

Prevention Value and Earthquake Damage

PV: level of potential help,
1 = low, 5 = high

ED: level of potential damage,
1 = low, 5 = high



- explanatory / educational text describing the item
- **PV** and **ED** are distributed for a good game, and resemble real life priorities

Rules

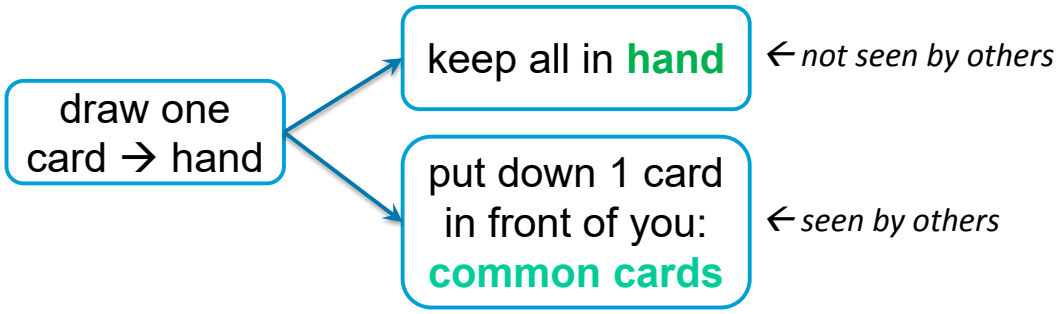
- *(1) explained now, (2) explained this afternoon, (3) please read them*
- *this afternoon: play the game in 3 groups*

STEP 1

- shuffle the cards, and set up the deck (see rules how)
- decide who starts the game

Rules

STEP 2



- Repeat a second time
- Proceed to next player in clockwise order

Rules

STEP 3: in case you draw an earthquake card!

- Show it to all players
- Add up all **ED** value in your **hand**
- Try to beat the earthquake by:

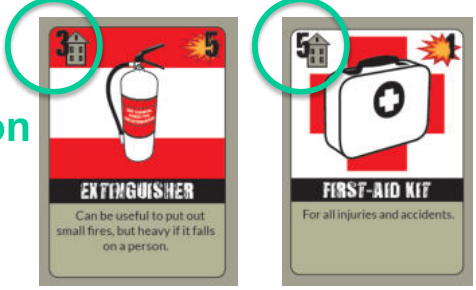
1) Protect yourself by collecting cards from your **common cards** with a total of **PV** ≥ total of **ED** in your **hand**
2) Protect yourself with the help of other players' **common cards**
3) If this is still not enough to beat the quake, all players have lost ☹

Example 1: own protection is enough

- **Hand**

Total **ED** = 6

- **Common**



Total **PV** = 8, OK!

Example 2: further help is needed

- **Hand**

Total **ED** = 4

- **Common**

Total **PV** = 3, you need help

Rules

END OF GAME

- Play until the 6th earthquake card has been countered, then stop
- Count the points for each player
  - sum of remaining **PV** on cards in **hand**
  - 2x sum of **PV** in **common cards** that other players used to counter an earthquake
  - 1 for each card in **common cards** that has not been used
  - 3 for each earthquake you have protected the community from

Rules

- If there is a tie: see the rules
- For a bit more complexity: add some difficulty for orange and more difficulty for red earthquake cards (see the rules)

Summary

- BEAT THE QUAKE is a new, educational card game
- Goal: cooperation to improve earthquake preparedness
- Your and your students' feedback is welcome!

Questions and Notes

- I will test the game in group _____ this afternoon

- **HOMEWORK 2**: play with your class !

Making seismology accessible to the public in Nepal: an earthquake location tutorial for education purposes

Shiba Subedi, György Hetényi

2 May 2023 | Pokhara, Nepal

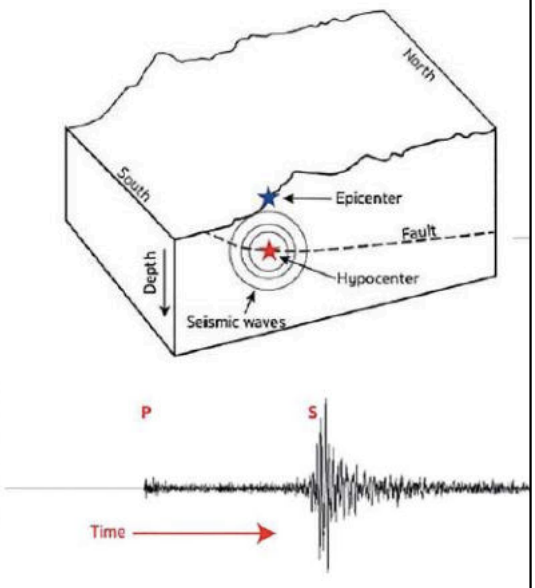
Terminology

Hypocenter: The location of an earthquake expressed in latitude, longitude and depth.

Epicenter: The location of the earthquake hypocenter projected to the surface of the Earth (latitude, longitude only, no depth information).

Magnitude: It is the quantity measuring the size of an earthquake in terms of the energy released. It is a single number for each earthquake.

Intensity: The level of shaking and damage at a given place of observation. In general, the farther this place is from the earthquake location, the lower is the Intensity.



Seismology in official curriculum

Secondary Education Curriculum

2076

Physics

Grades: 11 and 12 **Subject code: Phy. 101 (Grade 11), Phy. 102 (Grade 12)**

Credit hrs: 5 **Working hrs: 160**

1. Introduction

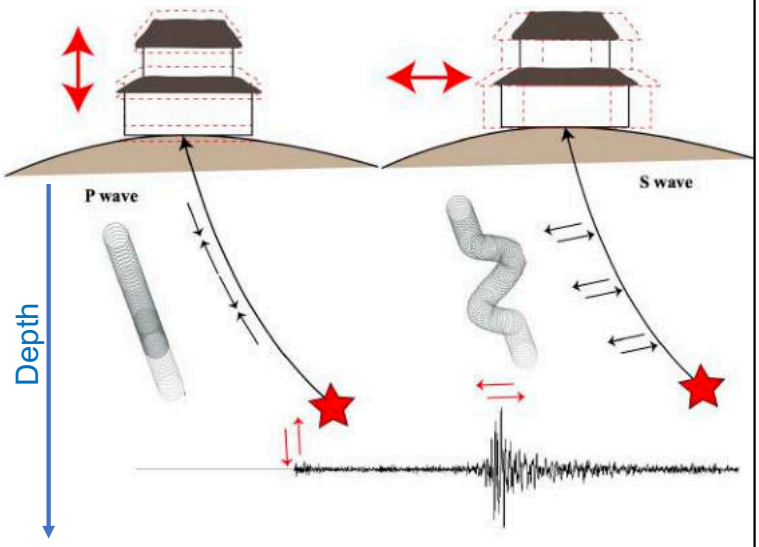
This curriculum presumes that the students joining grade 11 and 12 science stream come with diverse aspirations, some may continue to higher level studies in specific areas of science, others may join technical and vocational areas or even other streams. The curriculum is designed to provide students with general understanding of the fundamental scientific laws and principles that govern the scientific phenomena in the world. It focuses to develop scientific knowledge, skill competences and attitudes required at secondary level (grade 11-12) irrespective of what they do beyond this level, as envisioned by national goals. Understanding of scientific concepts and their application, in day to day context as well as the process of obtaining new knowledge through holistic approach of learning in the spirit of national qualification framework is emphasized in the curriculum.

constant	
24.4 Geiger-Muller Tube	
24.5 Carbon dating	
24.6 Medical use of nuclear radiation and possible health hazard.	
25. Recent trends in physics	**6**
Seismology:	
25.1 Surface waves: Rayleigh and Love waves	
Internal waves: S and P-waves	
Wave patterns of Gorkha Earthquake 2015	
25.2 Gravitational Wave	
Nanotechnology	
Higgs Boson	
	128

Seismic waves

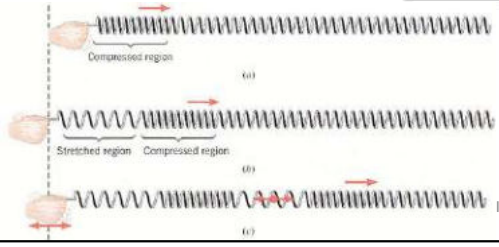
Seismic waves are generated due to the release of energy at the earthquakes' hypocenter and move in all directions traveling through the body of the Earth (body waves).

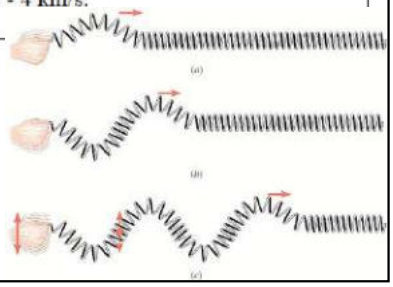
The body waves interact with the surface rock layers of the Earth and generate a new set of waves called surface waves. These waves move along the surface of the Earth.



Seismic waves

P waves	S waves
P waves travel almost twice as fast as S waves	S waves are slower than P waves
P-waves are compression waves. They can propagate in solid or liquid material.	S-waves are shear waves. They only propagate in solid material.
	S waves provide evidence for a liquid outer core
P waves are called primary or push-pull waves.	S waves are called secondary or shear waves.
P waves cause first movement that people feel in an earthquake.	S waves usually cause more building damage.
P wave oscillate the ground along the direction of wave travel.	S waves oscillate the ground perpendicular to the direction of wave travel.
P wave velocity in typical Earth's crust ranges 5 - 7 km/s.	S wave velocity in typical Earth's crust ranges 3 - 4 km/s.





Earthquake location: Theory

S wave arrival time $T_S = \frac{D}{Vs}$

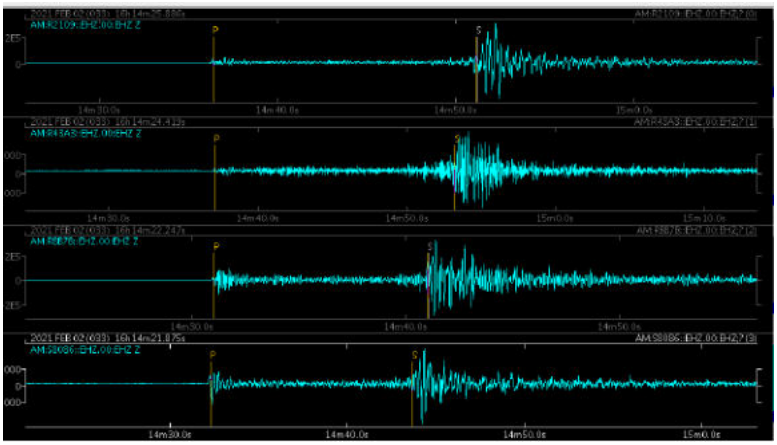
P wave arrival time $T_P = \frac{D}{Vp}$

Where D = distance in km
Vp = P wave velocity (6.1 km/s)
Vs= S wave velocity (3.5 km/s)

$T_S - T_P = \frac{D}{V_S} - \frac{D}{V_P}$

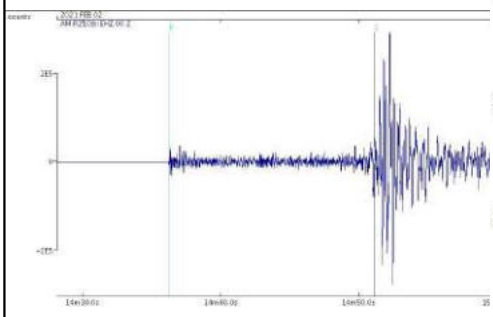
$D = (T_S - T_P)\ \frac{V_P * V_S}{V_P - V_S}$

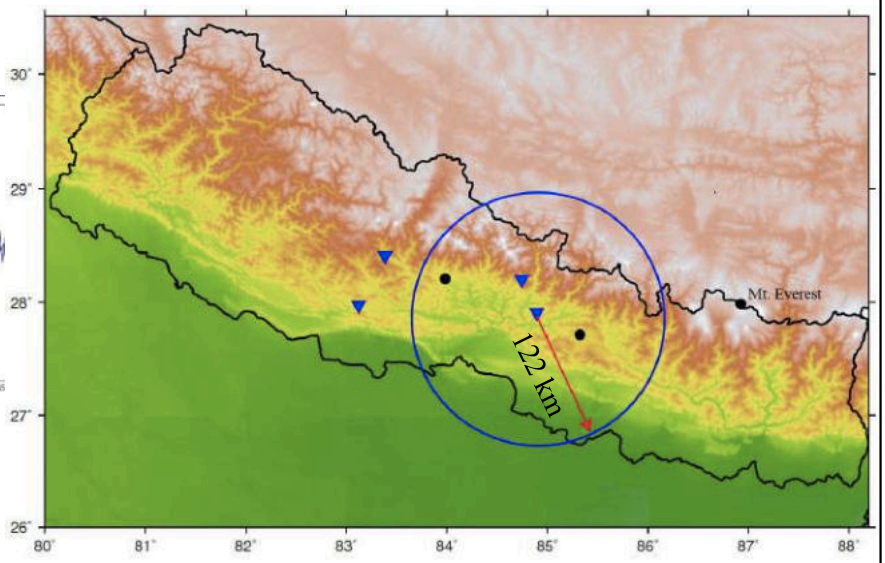
Distance (D) = (T_S - T_P)× 8.2 km



Example of P and S phases

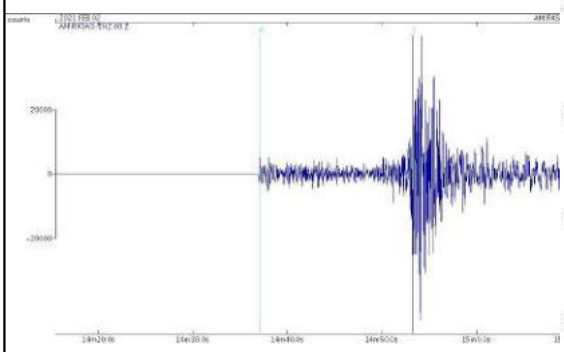
Earthquake location: Theory

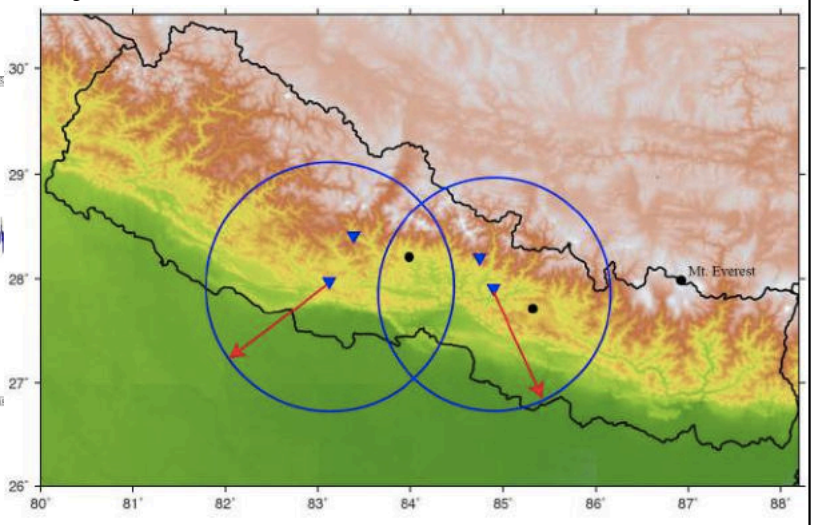




$T_S - T_P$ = 14.83 sec
Distance = $(T_S - T_P) \times 8.2$ km
Distance = 122 Km from Dhading Beshi

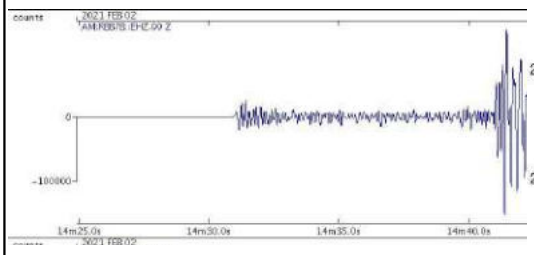
Earthquake location: Theory

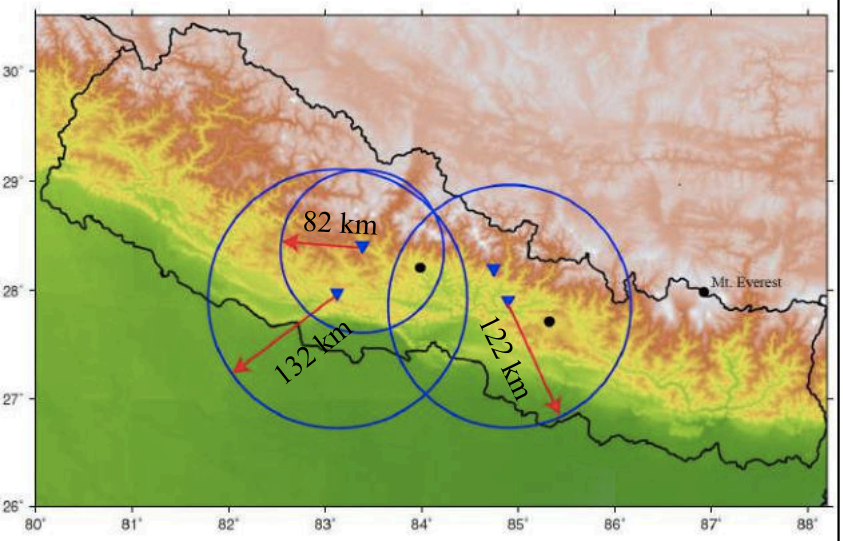




$T_S - T_P$ = 16.1 sec
Distance = $(T_S - T_P) \times 8.2$ km
Distance = 132 Km from Sandhikharka

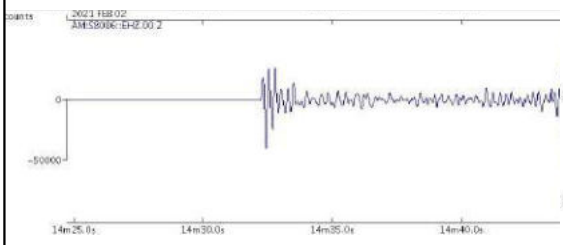
Earthquake location: Theory

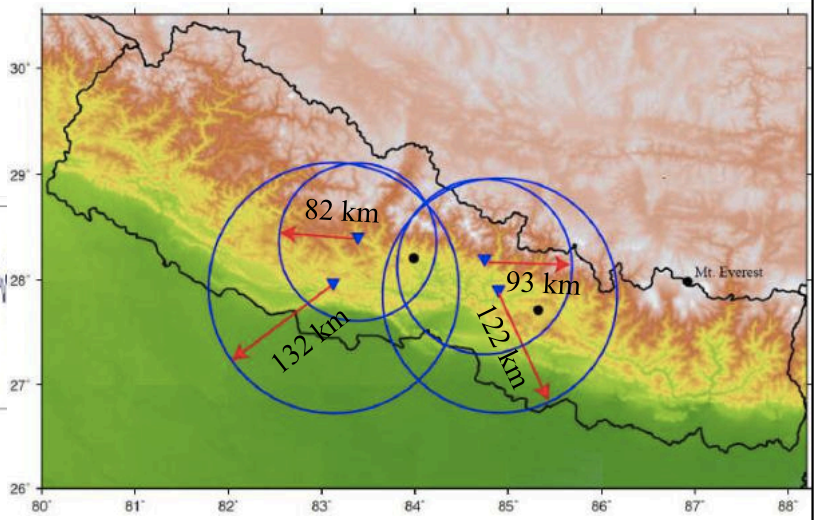




$T_S - T_P$ = 10 sec
Distance = 82 Km from Darwang, Myagdi

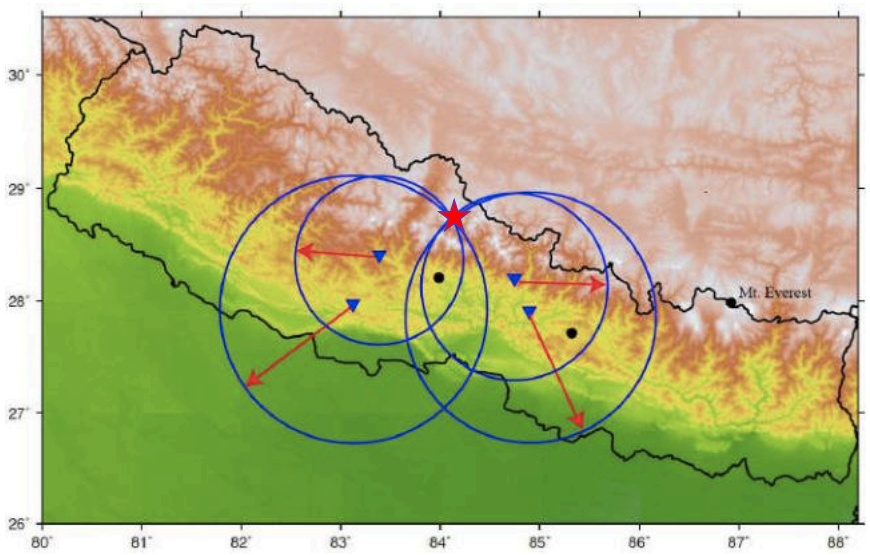
Earthquake location: Theory





$T_S - T_P$ = 11.4 sec
Distance = 93 Km from Barpak, Gorkha

Earthquake location



This earthquake location tutorial is published in *Bulletin of Nepal Geological Society, 2021, vol. 38*. The full length tutorial can be found freely at: https://rb.gy/cqalp

Earthquake location

Locate earthquake by yourself
Hands on Activity

Earthquake location Tutorial

Step 1: Software installation
Prepare an environment and install necessary software (Seisgram2K and Google Earth).

Step 2: Waveform download
Download earthquake seismograms using RaspberryShake server.

Step 3: Seismogram reading and phase picking
Read seismograms and pick P and S phases to compute the earthquake distances from a station.

Step 4: Epicenter plotting
Plot distances information obtained (step 3) on Google Earth (http://earth.google.com) and find the epicenter.

Step 1: Software installation

Seisgram2k installation

1. Java is required! Download Java for your operating system from the link https://www.java.com/en/.
2. Create the installation directories **(**for example **Desktop/Seismology)**
3. To download the software file, click the link: http://alomax.free.fr/seisgram/beta/SeisGram2K80_SCHOOL.jar.
4. Download starts automatically. Move the downloaded file to your newly created **Seismology** directory.

Google Earth installation

1. Click the link below and download Google Earth on your computer. https://www.google.com/earth/download/gep/agree.html?hl=en-GB
1. Click on "**Agree and Download**"
2. Open the downloaded file.
3. Follow instructions to install Google Earth on your device.

Step 2: Waveform download

Visit the National Earthquake Monitoring and Research Center's webpage: http://www.seismonepal.gov.np/.

Note that you need to specify the A.D. date and UTC time to download earthquake data.

B.S:2077-10-20 A.D:2021-02-02	Local:21:59 UTC:16:14	28.78	84.10	5.3	NEMRC	Manang

Go to the Raspberry Shake server link:
https://fdsnws.raspberryshakedata.com/fdsnws/dataselect/1/builder

Step 2: Waveform download

Define **Start Time** and **End Time** to download the required data.

Time '**must be**' in

YYYY-MM-DDTHH:mm:ss format.

YYYY >> **year**, MM >> month

DD >> day, HH >> hour,

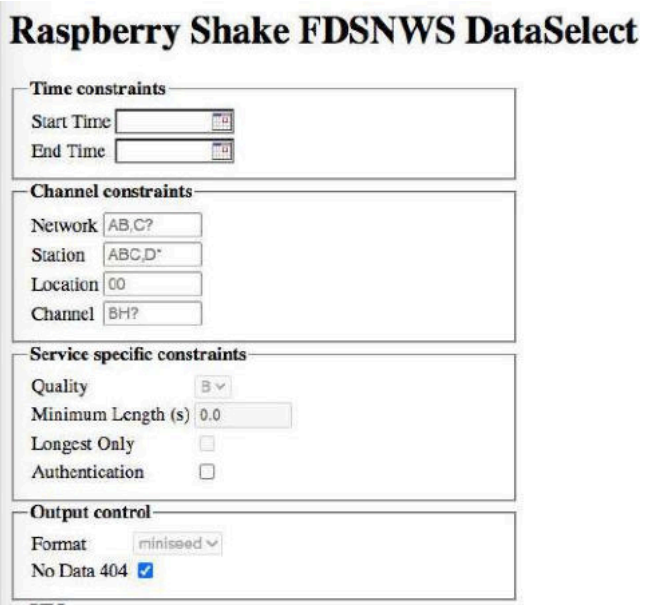
mm >> minute, ss >> second.

For example,

Start time: 2021-02 02T16:14:00

End time: 2021-02-02T16:19:00

(5 min window)



Step 2: Waveform download

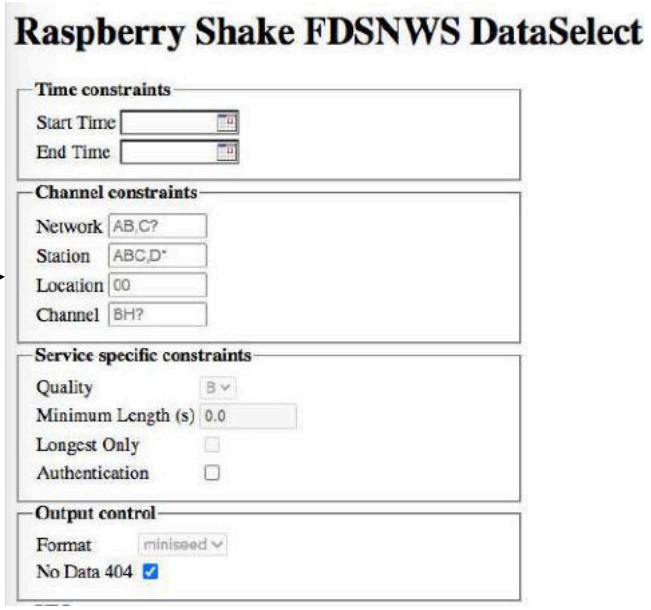
Channel constraints

Network = **AM**

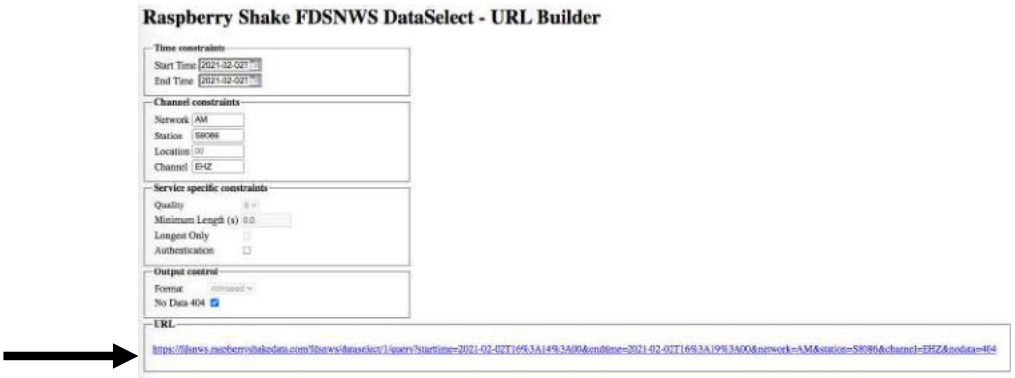
Station = St.ID, eg. **S8086**

Location = **00**

Channel = St.Channel, eg. **EHZ**



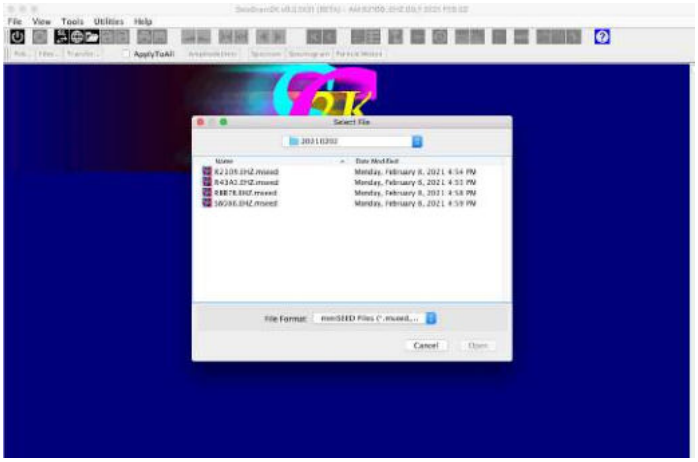
Step 2: Waveform download



Click **the URL** that is composed of your input data which appears at the bottom of the page to download the data. A file called ‘query’ should be downloading to your computer’s regular download folder. Rename file name with StationName in .mseed format,e.g. **S8086.mseed**

Step 3: Seismogram reading and phase picking

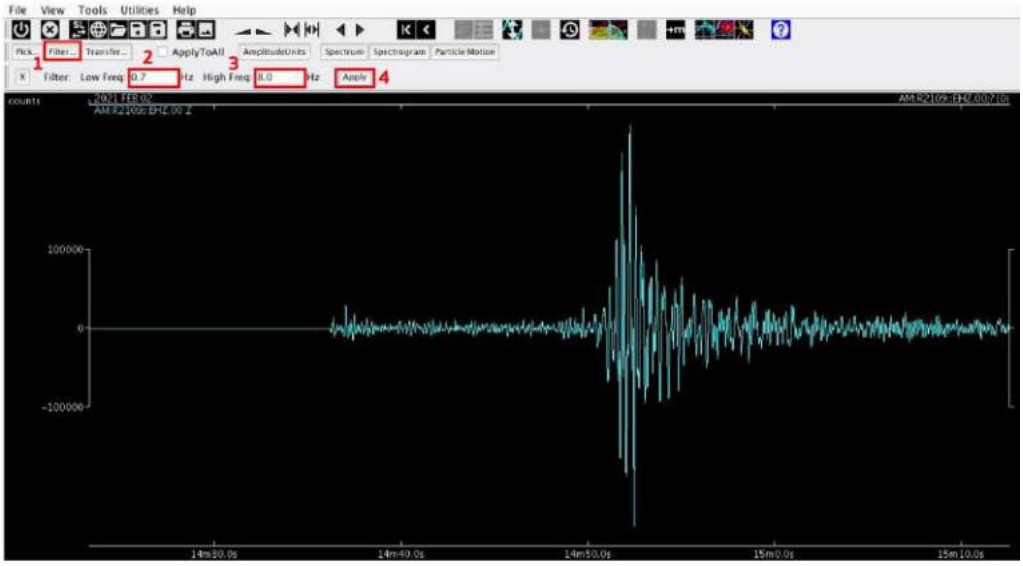
Open Seisgram2K with java application



Open seismograms by clicking,
File > Open file.
Click your seismograms file
Open > Open

Step 3: Seismogram reading and phase picking

Data Filtering: Apply a filter in the 0.7 to 8.0 Hz frequency band by following steps 1 to 4 highlighted in red



Step 3: Seismogram reading and phase picking

To pick phases, click the "**Pick**" tool, then select the wave which you think as a P wave or S wave.

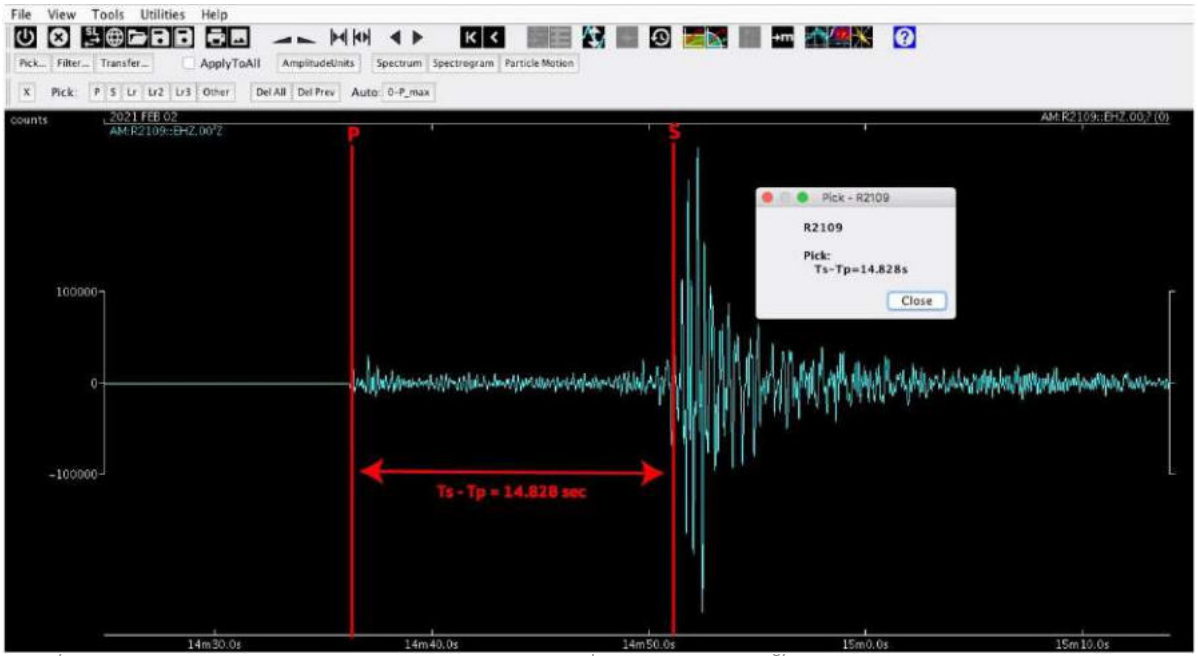
Click "Pick" > Click "P" >> choose the P phase arrival time on the screen and click with the mouse, and click “P”.

Play around zooming in and out by rolling your mouse for precise picking.

Step 3: Seismogram reading and phase picking

Similarly, click “S” in the drop-down menu, zoom and pick the S-phase, and click “S”

Step 3: Seismogram reading and phase picking

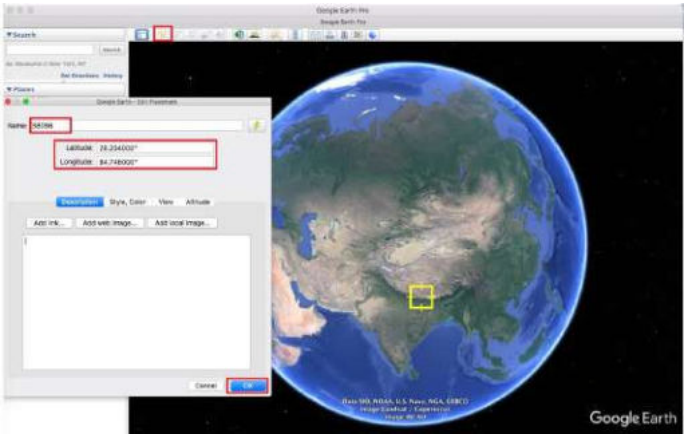


Step 3: Seismogram reading and phase picking

Station Name	T_S -T_P [sec]	distance = (T_S-T_P) ×8.2 [km]
R2109	14.80	122
R43A3	16.13	132
RBB7B	10	82
S8086	11.38	93

Step 4: Epicenter plotting

1. Open Google Earth in your computer.
2. Click "**Add Placemark**" from the top panel 2nd left option, to add each of the selected stations in the interface and using latitude and longitude and click "**OK**" to save it.

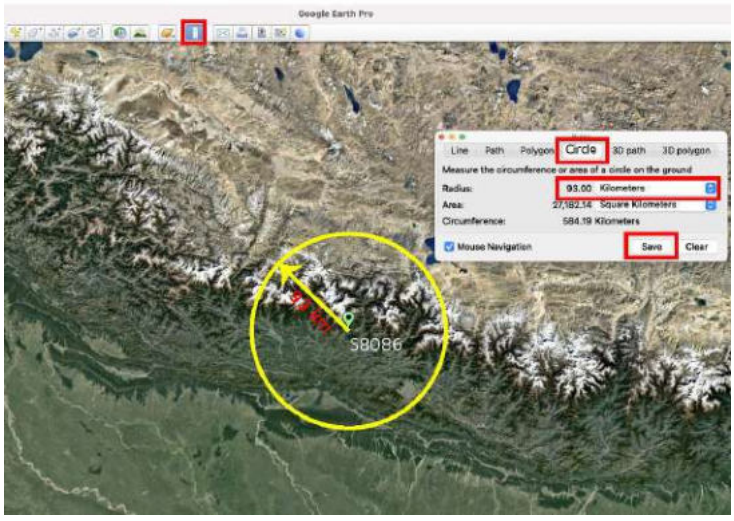


Step 4: Epicenter plotting

Click on the "**Ruler**" icon from the top menu

Click "**Circle**"

Select "**Kilometers**" for radius.



Step 4: Epicenter plotting

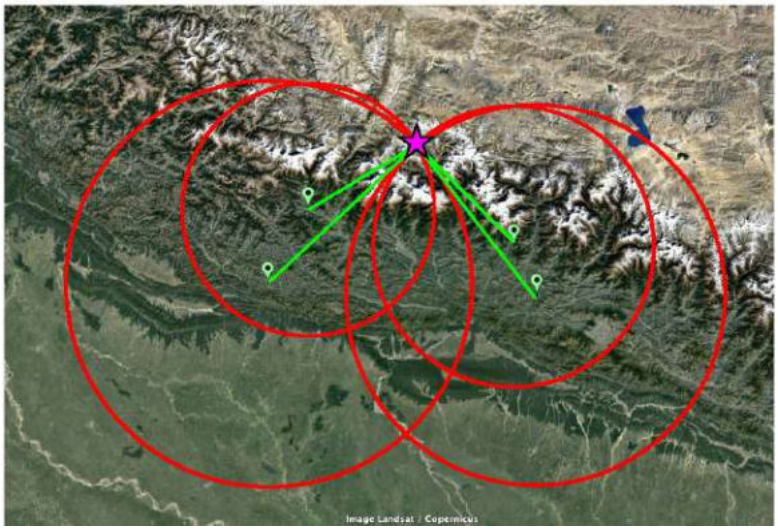
Similarly, put the origin at R2109 (Dhading Beshi) and draw a circle of a radius of 122 km, and save it.

Similarly, put the origin at R43A3 (Arghakhanchi) and draw a circle of a radius of 132 km, and save it.

Once again, put the origin at RBB7B (Myagdi) and draw a circle of a radius of 82 km, and save it.

Step 4: Epicenter plotting

Then, ideally, you will find **a point where all four circles intersect**, this is the **epicenter** of the earthquake



Homework

Pick another earthquake from the NEMRC catalog and try to locate it yourself.

List of some NEMRC 2022 earthquakes.

Date (AD)	Time (UTC)	Latitude	Longitude	Magnitude	Epicenter
2022-12-27	21:43	28.45	83.09	4.0	Baglung
2022-12-27	20:22	28.36	83.19	5.3	Baglung
2022-12-27	19:38	28.45	83.14	4.7	Baglung
2022-12-23	01:30	29.10	83.30	4.6	Dolpa
2022-12-21	19:15	30.00	80.74	4.1	Darchula
2022-12-18	17:08	28.26	85.06	4.5	Dhading
2022-11-28	05:00	26.93	87.26	4.0	Dhankuta
2022-11-15	12:23	29.35	81.21	4.2	Achham
2022-11-12	14:27	29.45	81.19	5.4	Bajhang
2022-11-09	23:28	29.35	81.29	4.1	Bajura

Further reading suggestions

http://seismoschoolnp.org/wp-content/uploads/2019/04/Talk3_PDenton_Waves.pdf

http://seismoschoolnp.org/wp-content/uploads/2021/01/denton_presentation.pdf

http://ds.iris.edu/data/vocab.htm

http://seismoschoolnp.org/wp-content/uploads/2019/04/IndiaAsiaCollision_fast.mp4?_=1

http://edumed.unice.fr/fr/contents/news/tools-lab/EduCarte

https://en.wikipedia.org/wiki/Seismic_wave

https://edu.raspberryshake.org/

https://www.iris.edu/hq/inclass/software-web-app/jamaseis

https://www.iris.edu/hq/inclass/fact-sheet/vocabulary_for_earthquakerelated_topics

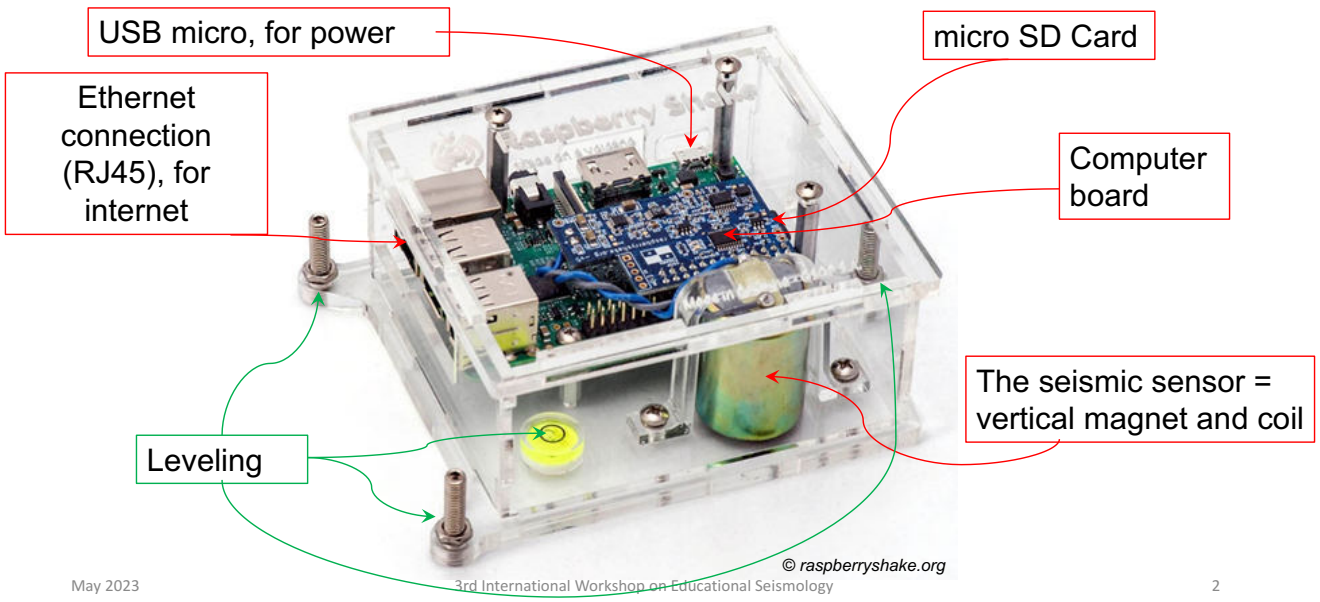
Seismology at school in Nepal: application and lessons

Shiba Subedi, György Hetényi

3 May 2023 | Pokhara, Nepal

The seismometer

RS1D = Raspberry Shake 1- component seismometer



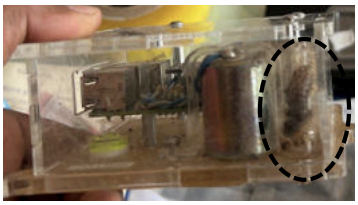
The seismometer

Where does it work well?

- Continuous power supply and stable internet connection
- Constant internet speed
- Less human activity close to the sensor
- Clean and safe room !

What are typical problems?

- SD card problem, if there is unexpected power problem or unplugging sensor without shutting down
- Slow internet may not send data to server, station offline !
- Charger problem, no lights on sensor, e.g. Kusma
- Ethernet cable problem e.g., Barpak
- Raspberry Pi board problem, e.g.. Barpak, Bhurjungkhola
- Physical damage because of dust or dead insects, e.g. Barpak



Monitoring is not easy

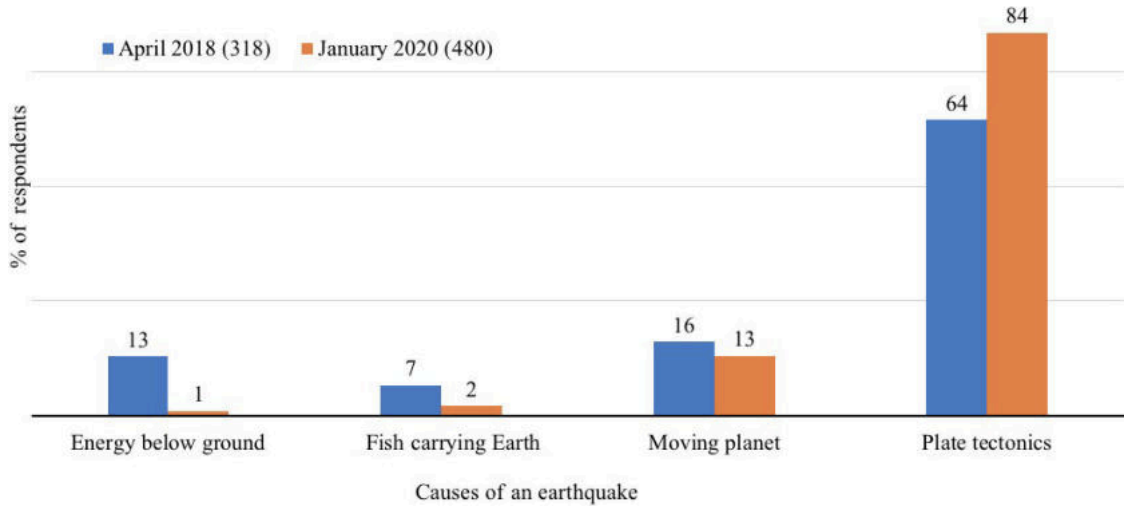
- Currently 33 seismometer installed
- We aim at 40 sensors soon
- Monitoring seismometer from Kathmandu or Pokhara is not that easy
- We strongly encourage each school: please try that YOU check the sensors, and try to host them in the best conditions

Possible strategy for keeping sensor in the best conditions

- Dedicate a teacher for seismology/seismometer related issues
- Install **Fing** on your smartphone and scan the devices every morning.
- You will see **RS.LOCAL** if seismometer is running.
- If seismometer is offline, check internet cable and power supply.
- If you could not figure out the problem, contact us !

Scan for Fing

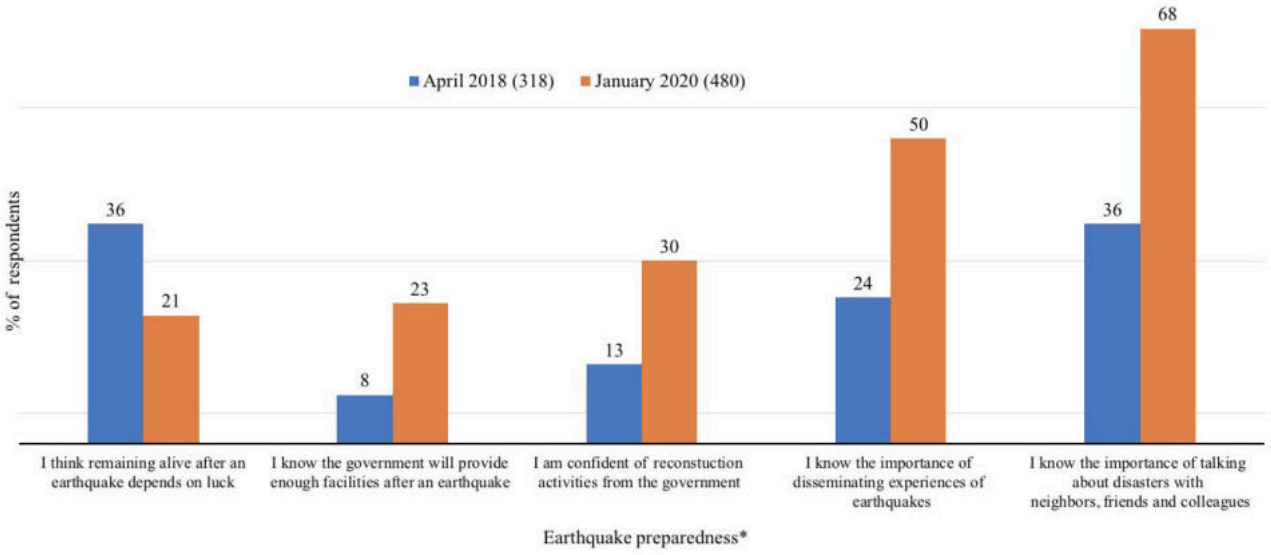
Impact on earthquake knowledge



- Earthquake related knowledge has significantly increased among students

Subedi et al., 2020b

Impact on earthquake preparedness



- Students are much better prepared

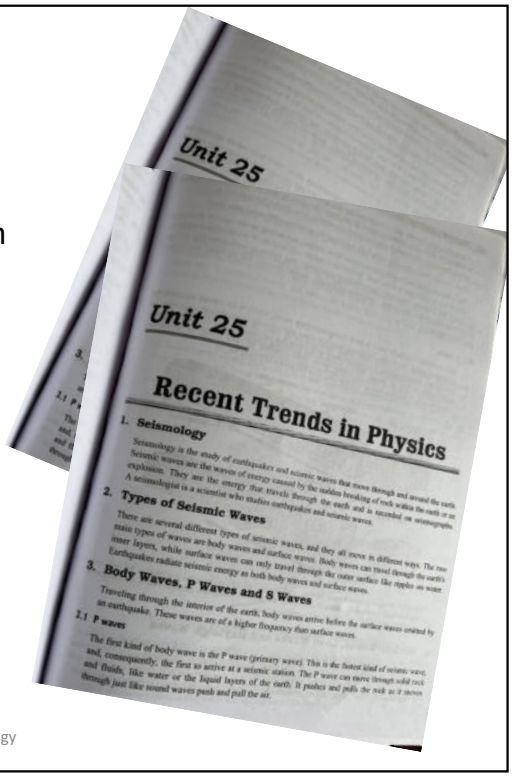
Subedi et al., 2020b

Educational materials for all-age group people

Earthquake awareness song https://youtu.be/ymE-IrAK0TI

Seismology in official curriculum

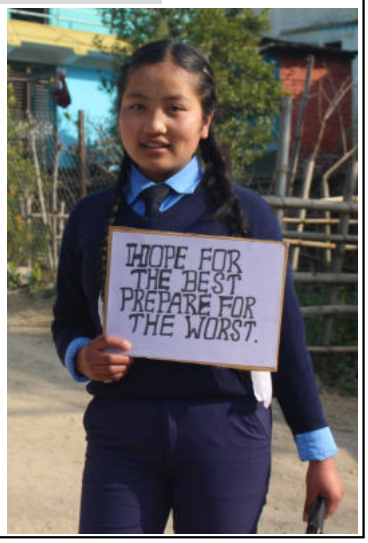
- Recently, a chapter introduced for grade XII (Physics) students
- Still, earthquake education is lacking in official curriculum
- No earthquake education policy
- We have prepared a document to foster an earthquake education policy to be implemented for Nepal, and are currently trying to publish it



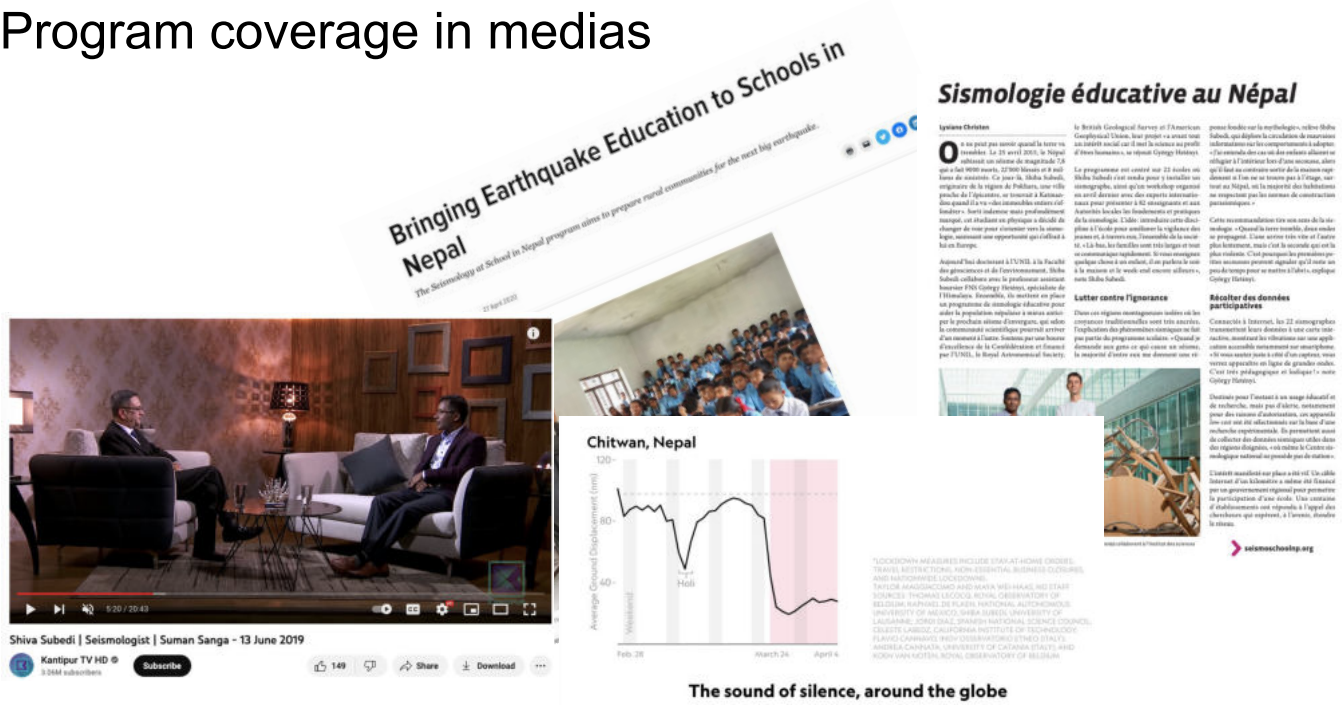
Program self evaluation

- Communication with the teachers: does it work well?
- Do you wish something changes or improves ?
- How often do you like to communicate (if the sensor is online) ?

- We are grateful for all help, feedback, and support to all teachers. Your strong motivation gives us energy.
- This is well recognized program and we are getting funding from abroad !
- We strive to find money every year to continue the project, and strongly plan to continue on the long term.
- Gorkha Earthquake Memorial Day and National Earthquake Safety Day are being celebrated by organizing school level programs. If anyone has ideas to contribute to the project, organize something, let us know.



Program coverage in medias



International connection opportunity

- Seismology at school program is currently running in the following countries: France, Switzerland, Australia, USA, UK, Nepal, Indonesia, etc.
- Seismology at School in Switzerland program is lead by Prof. Dr. György Hetényi and colleagues. If you wish to exchange experience and connect with Swiss classes, contact György or contact us !
- The next workshop in Switzerland is in one week !

Your feedback is important

Raise your hand and share your experience

What could be done form our side?

What you wish to add for this program?

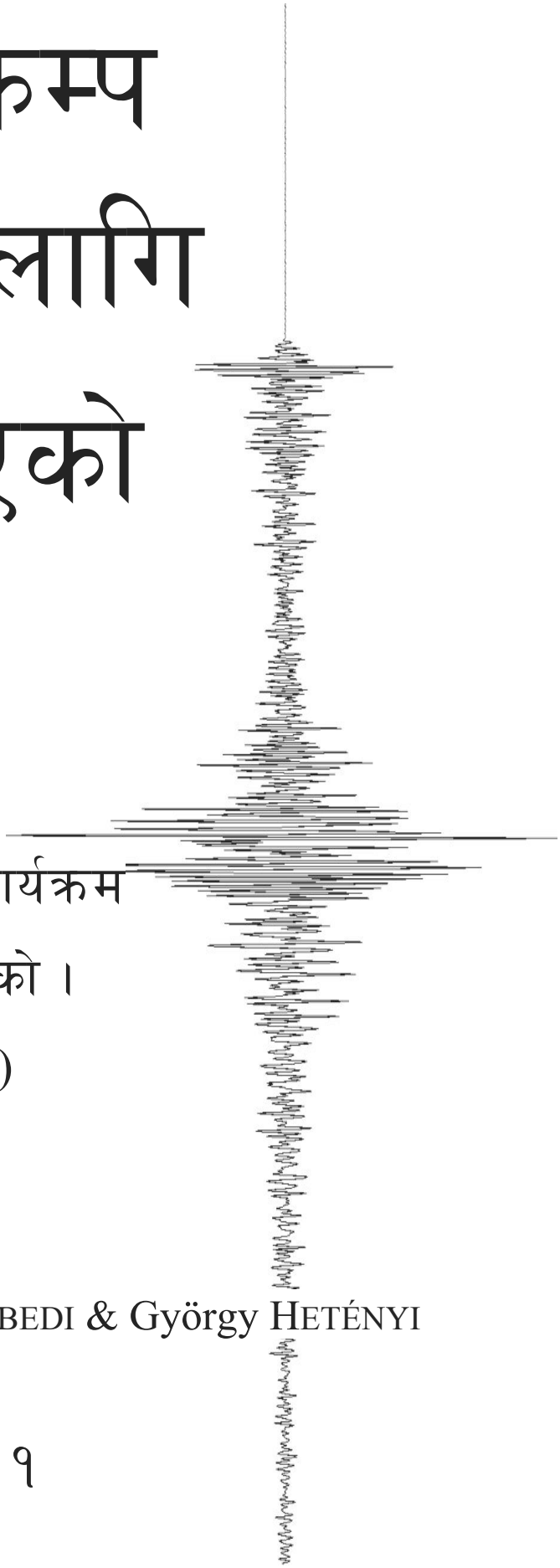
Learning takes time and level of motivation is high.

We aim to continue program and extend in near future.

Thank you all for your helping hands !


Thank you for your kind attention !

सुरक्षित भूकम्प अभ्यासको लागि तयार पारिएको कार्यविधि

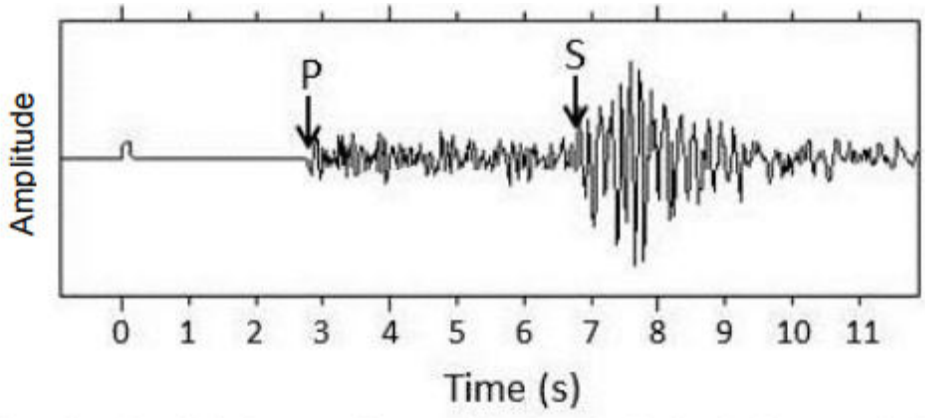


विद्यालयमा भूकम्प शिक्षा कार्यक्रम
नेपालको लागि तयार गरिएको ।
(www.seismoschoolnp.org)

प्रस्तुतकर्ता:
Sarah L. HOUGHTON, Shiba SUBEDI & György HETÉNYI

वैशाख २०८० । सस्करण १

विषय सूची



एउटा सामान्य सानो भूकम्पको तरंगको चित्र । उक्त चित्रमा पहिलो तरङ्ग (P wave) र दोश्रो तरंग (S wave) बिचको समय भिन्नता ४ सेकेन्ड देखाइएको छ ।

सबैभन्दा पछिल्लो प्रकोप अर्को प्रकोप आउनु केहि समय अघि मात्र सम्झनाबाट हराउँछ । - जापानी हितोपदेश[1]

भूकम्प लगायतका प्रकोपको तयारीको लागि विज्ञान तथा प्रविधिको विकास आवश्यक छन् तर पर्याप्त छैनन् । सार्वजनिक शिक्षा अनिवार्य छ । र प्रायः सबैभन्दा आधारभूत सिकाईहरु सबैभन्दा सशक्त हुन्छन् ।[1]

भूकम्प जानुअघि आफुले बिताउने स्थानहरुमा भूकम्पबाट कसरी सुरक्षित रहने भन्ने व्यक्तिगत निर्णय गर्ने क्षमताको महत्व अझबढेको अध्ययनहरुले देखाउछन् ।[२]

ड्रप, कभर, र होल्ड अन ड्रिल किन महत्त्वपूर्ण छ ? किनभने चाँडै प्रतिक्रिया दिन तपाईंले अक्सर अभ्यास गर्नुपर्छ । भूकम्पको शक्तिशाली कम्पन तपाइँनेर आउनु अघि वा कम्पनले गर्दा केहि वस्तु तपाईंमाथि खस्नुअघि तपाईसँग आफूलाई बचाउन केहि सेकेन्ड मात्र उपलब्ध हुन सक्छ ।[३]

भूकम्प तयारीको लागि तपाइंले के गर्न सक्नु हुन्छ ?

भूकम्प (वा कुनै पनि प्रकोप) को समयमा आफुलाई तयारी राखेर, भूकम्प सुरक्षाको लागि योजना बनाएर र सुरक्षित भूकम्पको अभ्यास गरेर तपाईंले प्रकोपबाट जीवन बचाउन र प्रकोपपछि दैनिकी सामान्य रुपमा पुनः सुरु गर्न सक्षम हुनको लागि आफूलाई तयार राख्दै हुनुहुन्छ ।

यो सुरक्षित भूकम्प अभ्यासको लागि तयार पारिएको गाइड हो, यो निश्चित छैन । यसलाई तपाइँको आफ्नो विद्यालयको अनुकुलतामा प्रयोग गर्न आवश्यक पर्दछ, जस्तै, तपाइको स्कुलमा भवनहरु एक तल्लाका छन् कि दुइ तल्लाका छन् भन्ने कुराले यो गाइड कसरी प्रयोग गर्ने भन्ने फरक पर्दछ । **यो गाइड सुरक्षित भूकम्प अभ्यासको लागि एउटा सुरुवाती बिन्दु हो ।**

सबै शिक्षक तथा कर्मचारीहरू तपाईंको अभ्यासमा संलग्न हुनु महत्वपुर्ण छ भने विद्यार्थीहरूलाई सचेत र संलग्न गराइन्छ । त्यसैले:

१ . सुरक्षित भूकम्प अभ्यासको तयारी सम्बन्धि छलफलहरु आफ्नो बिद्यालयको स्टाफ बैठकहरुमा चलाउनुस । यो गाइडलाई आफ्नो बैठकमा लैजानुहोस् ।

२. तल वर्णन गरेजस्तै आफ्नो विद्यालयको आपतकालीन योजना बनाउनुहोस् र सबै कर्मचारीहरूलाई आ-आफ्नो भूमिका थाहा छ भन्ने सुनिश्चित गर्नुहोस् ।

३. भुकम्पको समयमा तपाईले के गर्ने भनेर निर्णय लिन विद्यालयको प्रत्येक कोठाको लागि भूकम्प जोखिम मूल्याङ्कन गर्नुहोस् । सुरक्षित भूकम्प अभ्यास गर्नुहोस र त्यसपछि जोखिम मूल्याङ्कन समीक्षा गर्नुहोस् ।

४. तपाईं स्कूलमा जाँदा सुरक्षित भूकम्प अभ्यास गाइड निर्माण गर्नुहोस, सुरक्षित भूकम्प अभ्यास गर्नुहोस र समीक्षा गर्नुहोस् ।

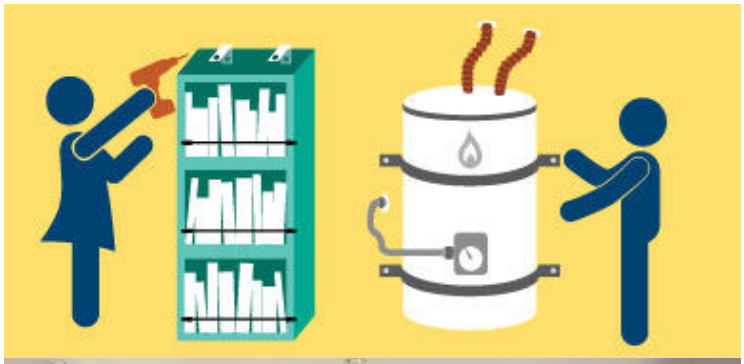
५. सुरक्षित भूकम्प अभ्यासको लागि कुनै निश्चित समय उपयुक्त छ भन्ने हुदैन तर यो अभ्यास सुरु गर्न महत्वपूर्ण छ र आवश्यक पनि । यस्ता अभ्यासले वास्तविक जीवनमा भूकम्पबाट बचाउन र चोटपटक कम गर्न सहयोग गर्दछन ।

६. तपाइँको सुरक्षित भूकम्प अभ्यासको तयारीहरु बारे छलफल गर्नको लागी तपाइँको पाठ्यक्रमका भएका जानकारीहरु अध्ययन र उपयोग गर्नुहोस् ।

तलको ७ स्टेपले तपाईंलाई सुरक्षित भूकम्प अभ्यासको लागि मद्दत गर्नेछ:

स्टेप १ :

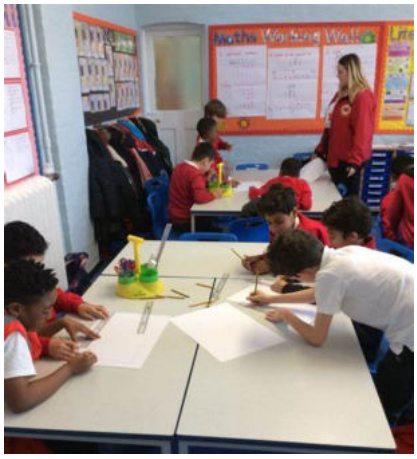
भूकम्पका खतराहरू पहिचान गरेर र चल्न मिल्ने वस्तुहरू सुरक्षित गरेर आफ्नो ठाउँ सुरक्षित गर्नुहोस् । उदाहरणका लागि, फर्निचरहरू पर्खालमा टाइट गर्नुहोस र धेरै तौल भएका वस्तुहरू दराजको तल्लो तल्लामा राखिएको छ भनी निश्चित गर्नुहोस् ।



स्टेप २:

विद्यालयको आपतकालीन योजना बनाएर र भूकम्पको बेला कसरी संचार गर्ने भन्ने निर्णय गरेर सुरक्षित हुने योजना बनाउनुहोस् ।

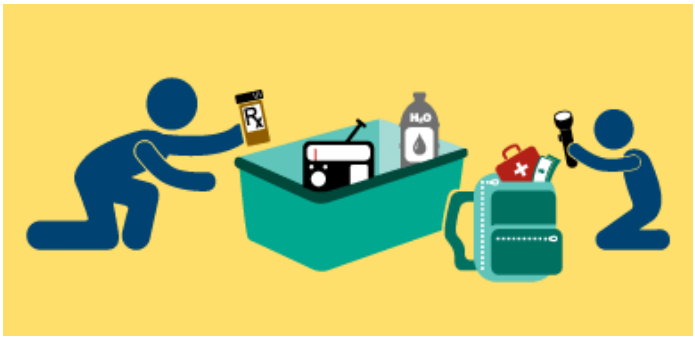
- भूकम्पको कारणले जमिन हल्लिन सुरु गरेपछि तपाईंको प्रतिक्रिया कस्तो हुनेछ ? भनेर प्रश्न सोध्नुहोस र यसबारेमा छलफल गर्नुहोस ।
- विद्यार्थीहरूलाई सुरक्षित भूकम्प अभ्यासको लागि पोस्टर तयार गर्न लगाउनुहोस् ।



- भूकम्पको बेला बस्ने **सुरक्षित ठाउँ** कहाँ छ ? जस्तैः डेस्क मुनि, भित्ता/भ्यालबाट अनुहार टाढा पारेर ।
- सुरक्षित भूकम्प अभ्यासको लागि आफु भवन बाहिर निस्कने मार्ग तयार गर्नुहोस् ।
- तपाईंको विद्यालय वरिपरि **सुरक्षित क्षेत्रहरू** कहाँ छन् ?
- सुरक्षित भूकम्प अभ्यास गाइड अनुसार प्रयोग गर्नुहोस् ।
- भूकम्प पछि तपाईं कसलाई सम्पर्क गर्नुहुनेछ र कहाँ भेट्नुहुनेछ ?
- आफ्नो कक्षा र विद्यालयको आपतकालीन सुरक्षा सुनिश्चितताको लागि के कस्ता कदमहरू चाल्नुहुनेछ ?

स्टेप ३ :

आपतकालीन आपूर्तिहरू सजिलै पुग्न सकिने स्थानहरूमा व्यवस्थित गर्नुहोस् ।



प्रत्येक कक्षाकोठाको लागि भूकम्प आकस्मिक सुरक्षा प्याक (EESP) र विद्यालय बाहिर भण्डारण गर्नको लागि आपतकालीन सुरक्षा बाकसहरुको व्यवस्था गर्नुहोस् । प्रत्येक वस्तु जाँच गर्नुहोस् ।

भूकम्प आकस्मिक सुरक्षा प्याक (EESP) सामाग्रीहरु :

- सिट्ठी
- टर्च
- प्राथमिक उपचारको सामानहरु
- पानीको बोतल
- आपतकालीन कम्बल
- नसड्ने खाना
- जुत्ता
- मास्क
- नाम लेख्ने रजिस्टर

स्टेप ४:

महत्त्वपूर्ण कागजातहरू तयार र व्यवस्थित गर्नुहोस् साथै विद्यालय भवनलाई सुदृढ गर्नुहोस्। विद्यालय भवन बाहिर पर्याप्त खुल्ला ठाउँ छ भन्ने निश्चित गर्नुहोस । कक्षाकोठाबाट खुल्ला ठाउँमा निस्कने विकल्पहरु जाँच गर्नुहोस् ।

२०७२ सालको भूकम्पले भत्काएका भवनका फोटोहरु ।

Figure 1a (left). Collapsed private school in central Port-au-Prince metropolitan region; a neighboring single-family house sustained no damage; (b, right) Well-built commercial building (left side) adjacent to catastrophic collapse of neighboring structure.

जतिबेला जमिन हल्लिन्छ, तपाईं के गर्नुहुन्छ

स्टेप ५ :

तपाईं कहाँ हुनुहुन्छ ?

भवन बाहिर :

१. यदि तपाईं बाहिर हुनुहुन्छ भने **बाहिर बस्नुहोस् ! भवनमा प्रवेश नगर्नुहोस् ।**
२. रूख, भवन, पुल, विद्युत लाइन, ट्रान्सफर्मरबाट टाढा सुरक्षित क्षेत्रमा जानुहोस् ।
३. भुइँमा बस्नुहोस ।
४. आफ्नो शरीरलाई सकेसम्म सानो बलको स्वरुपमा ढाल्नुहोस ।
५. आफ्नो टाउको र घाँटी छोप्नुहोस् ।

भवनभित्र, भुइँ तल्लामाः

१. भुइँ तल्लामा भएका कक्षा कोठाहरूको लागि सुरक्षित भूकम्प अभ्यासलाई सावधानीपूर्वक विचार गर्न, सावधानीपूर्वक जोखिम मूल्याङ्कन गर्न र उचित योजना बनाउन आवश्यक छ ।

२. पहिले आफ्नो भवनको मूल्याङ्कन गर्नुहोस्, के यो भूकम्प सुरक्षित छ ?

३. त्यसपछि आफ्नो कक्षाकोठाको स्थान मूल्याङ्कन गर्नुहोस्: के तपाईको कक्षाकोठाको ढोका बाहिर **'खतरा क्षेत्र'** छ ? अर्थात् भवनको वरिपरि १ - ५ मिटरको क्षेत्र जहाँ वस्तुहरु खस्न सक्छन ?

४. बाहिर कुनै एक **'सुरक्षित क्षेत्र'** मा सीधा पहुँच छ ? के तपाईं सजिलै बाहिर जान सक्नुहुन्छ ? अर्थात्, के तपाईं बाहिर जानको लागि सिधा पहुँच भएको भुइँ तल्लामा हुनुहुन्छ ?

५. त्यसपछि तपाईले आफ्नो सम्पूर्ण कक्षालाई लगभग ५ - १५ सेकेन्डमा खाली गर्न सक्नुहुन्छ कि सक्नुहुन्न मूल्याङ्कन गर्नुहोस् । (पहिलो कम्पन र बलियो कम्पन बिचको समय 'अवसरको भ्याल' हो) । तपाईले शिक्षकको रूपमा पहिले आफुलाई सहकर्मीहरूसँग यो प्रयास गर्न आवश्यक हुन सक्छ ।

विद्यालयको रूपमा सीधै बाहिर जाने (Evacuation) वा भवन भित्रै बस्ने (Drop, Cover, Hold on) दुवै विकल्पमा जोखिमको मूल्याङ्कन गर्नुहोस् । यदि तपाईंको विद्यालयको भवन भूकम्प प्रतिरोधी छैन भने सकेसम्म चाँडो बाहिर जानुहोस् ।

भवनभित्र, दोस्रो र दुई भन्दा माथिल्लो तलाः

१. ड्रप, कभर एण्ड होल्ड अन (Drop, Cover, Hold on).

२. सम्भव भएमा अनुहार भ्यालबाट टाढा राख्नुहोस् ।

३. आफ्नो हात वा किताबले आफ्नो टाउको घाँटी छोप्नुहोस् ।

शिक्षकले के गर्ने :

१. कक्षाकोठा खाली गर्न (यदि भुइँ तल्लामा भएको अवस्था र जोखिम मूल्याङ्कन गर्दा खाली गर्न सुझाइएको छ भने) ।

वा

बालबालिका/विद्यार्थीहरूलाई निर्देशन दिन्छ :

- Drop, Cover and Hold On !
- अनुहार झ्यालहरूबाट टाढा राख्न ।
- शान्त रहन, नआत्तिन ।

२. कक्षाकोठाको ढोका खुल्ला राखेर विद्यार्थी भित्रै अड्किनुबाट जोगाउन ।

३. सुरक्षित भूकम्प अभ्यासको प्रकिया अवलम्बन गर्न ।

Figure 2. Two different messages regarding what action to take inside a building: going to a pre-identified "safe zone" (left) and Drop, Cover, and Hold On (right). Images courtesy: Instituto Nacional de Defensa Civil (INDECI), Peru and ShakeOut.org, USA.

जमिन हल्लिन बन्द हुदा साथ के गर्ने ?

१. शान्त रहने ।

२. विधार्थी सबै उपस्थित छन् वा छैनन् भनेर रजिस्टर हेरेर जांच गर्ने ।

३. कसैलाई चोटपटक लागेको छ ?कोही भूकम्पमा फसेको छ ? विद्यार्थीलाई आफैलाई पनि चोटपटकको जाँच गराउन लगाउनुहोस ।

४. यदि सबै विधार्थीहरु उपस्थित छन् भने तपाईं सजिलै बाहिर जान सक्नुहुन्छ । भवनबाट बाहिर निस्कने सुरक्षित तरिका पालना गर्दै **सुरक्षित क्षेत्र** मा जानुहोस् ।

५. अत्यावश्यक आवश्यकता र उद्धार टोलीहरूका लागि लाइनहरू खाली राख्न मोबाइल फोनको प्रयोग कम गर्ने प्रयास गर्नुहोस् ।

रातको समयको लागि सुझाव:

१. ओछ्यानमा बस्नुहोस् ।

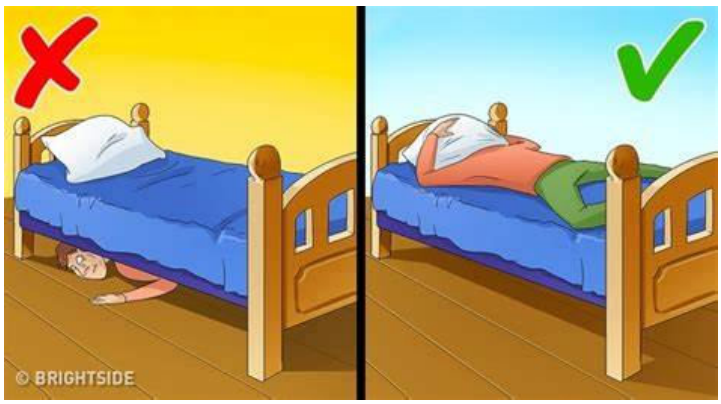
२. पेट तिरको भाग जोगाउने गरि बस्नुहोस ।

३. खस्ने वस्तुहरूबाट बच्न सिरानीको सहायताले टाउको छोप्नुहोस् ।

४. जमिन हल्लिन बन्द भएपछि शान्त रहनुहोस् र शरीरमा कतै चोट लागेको छ कि जाँच गर्नुहोस् ।

५. आफ्नो भूकम्प आकस्मिक सुरक्षा प्याक (EESP) समाल्नुहोस् (ओछ्यानमा बसेर नै जुत्ता लगाउनुहोस्) ।

६. कुनै एक **सुरक्षित क्षेत्र** मा जानुहोस ।



भूकम्पपछि तपाईको सुरक्षा कसरी बढाउने ?

स्टेप ६ :

भूकम्पपछि भवन बाहिर निस्केर, घाइतेहरूलाई मद्दत गरेर र थप चोटपटक वा क्षतिबाट जोगाएर भूकम्पपछिको आफ्नो सुरक्षालाई बढाउन सकिन्छ । भूकम्पको प्रमुख कम्पन पछि उक्त ठाउँमा धेरै परकम्पहरू जान सक्छन् र भवनहरू भत्किन सक्छन् भन्ने कुरा बिर्सिन हुदैन ।

भवन बाहिर जाने

तपाईंको कक्षाकोठा कहाँ छ र भूकम्पको समयमा तपाईं आफ्नो कक्षाकोठामा कहाँ हुनुहुन्छ साथै तपाईंको भवन भूकम्पले प्रभावित भएको छ वा छैन भन्ने कुराले तपाईं कसरी भवन बाट बाहिर जाने भन्ने कुरा भर पर्छ ।

१. यदि तपाईं बाहिर हुनुहुन्छ भने बाहिरै बस्नुहोस् र खाली ठाउँ खोज्नुहोस् । 'ड्रप, कभर, र होल्ड अन' ।

२. यदि तपाईं भवनभित्र रहनुभयो भने तपाईं सुरक्षित क्षेत्रमा जानु पर्छ ।

३. सुरक्षित क्षेत्र भनेको भवन, रुख, पोस्टहरूबाट टाढा रहेको ठाउँ हो । सम्भवत: बिहानको विद्यालय प्रार्थना यही ठाउँमा हुन्छ ।

४. परकम्पहरूका लागि तयार रहनुहोस्, यदि भवनबाट बाहिर निस्कने कुनै उपाय छैन भने तपाईंले *ड्रप, कभर र होल्ड* गर्न आवश्यक पर्दछ !

५. दर्ता रजिस्टर लिनुहोस् र सबैजना उपस्थित छन् छैनन् हेर्नुहोस । यदि कोहि बेपत्ता भएमा घटना नेतालाई रिपोर्ट गर्नुहोस् ।

६ .घाइते भएकाहरुको बारेमा जानकारी प्राथमिक उपचार टोलीलाई दिनुहोस ।

चित्र २५: सुरक्षित स्थानमा भेला हुँदै विद्यार्थीहरु

७. तपाईंले सबै कक्षाहरू सामेल गराएर अरूलाई मद्दत नगरेसम्म आफ्नो कक्षाका विधार्थीसंगै बस्नुहोस् । यदि तपाईंले सबै विधार्थीहरुलाई मर्ज गर्नुभयो भने केही शिक्षकहरू विपद व्यवस्थापनको भूमिका (जस्तै: प्राथमिक उपचार, विधार्थी भवन बाहिर लैजाने टोली आदि) को लागि उपलब्ध हुनुहुनेछ ।

८. बच्चाहरू उनीहरूको घरबाट लिन कोही नआएसम्म उनीहरूका शिक्षकहरूसँग स्कूलमा बस्नु नै उत्तम हुन्छ । एक्लै घर जान खोज्नु उनीहरूका लागि खतरनाक हुन सक्छ किनभने भूकम्पले गर्दा उनीहरूको घर वा अपार्टमेन्टमा क्षति भएको हुन सक्छ र उनीहरूको परिवार अन्यत्र कतै बसेको हुन सक्छ ।

यदि तपाईं भूकम्पमा फस्नुभयो भने

१. पहिले आफ्नो शरीर र टाउको जोगाउनुहोस् र चोटपटक लागेको छ कि आफैलाई जाँच गर्नुहोस् ।

२. आफ्नो मुख, नाक र आँखालाई धुलोबाट जोगाउनुहोस् ।

३. यदि शरीरको कुनै भागबाट रगत बगिरहेको छ भने उक्त भागमा थिच्नुहोस र घाइते भागलाई माथि उठाउनुहोस् ।

४. उद्दारको लागि संकेत दिनुहोस । यस्ता संकेत चिच्याएर, आपतकालीन सीटी बजाएर, भवनको पर्खालहरु ढकढकाएर हरेक एक मिनेटमा तिन पटकसम्म दिन सकिन्छ । यदि तपाईंसँग मोबाइल फोन छ भने मद्दतको लागि स्कूलको आधिकारिक व्यक्तिलाई सम्पर्क गर्ने प्रयास गर्नुहोस् (तपाईंको फोनमा स्कूलको फोन नम्बर राख्नुहोस) वा आपतकालीन सम्पर्क नम्बर ११२ प्रयोग गर्नुहोस् ।

५. उद्धारकर्मीहरूले त्यस्ता आवाजहरू सुन्नेछन् ।

घाइतेहरूलाई सहयोग गर्नुहोस्

Photo credit: iStock.com/DarrenTownsend

कोही घाइते भए नभएको जाँच गर्नुहोस्। यदि तपाईं **पहिलो सहयोगी, चिकित्सा व्यक्ति वा डाक्टर हुनुहुन्छ** भने आफ्नो सीपहरू प्रयोग गरेर अफ्ठ्यारोमा परेकालाई सहयोग गर्नुहोस् ।

१. यदि कुनै व्यक्तिको पल्स छैन भने, CPR (कार्डियो पल्मोनरी रिसस्सीटेसन/ Cardiopulmonary Resuscitation) प्रक्रिया सुरु गर्नुहोस् । यो प्रक्रियामा बिरामीको छाती थिच्नुका साथै मुखमा मुख जोडेर वा मुखबाट स्वासनलीसम्म पुग्ने गरी पाइप हालेर स्वासप्रश्वास गराउने गरिन्छ। पहिले एयरवे जाँच गर्नुहोस्, टाउको पछाडि झुकाउनुहोस्, मुटुको कम्प्रेसन ३० , सास फेर्ने २ , दोहोर्याउनुहोस् ।

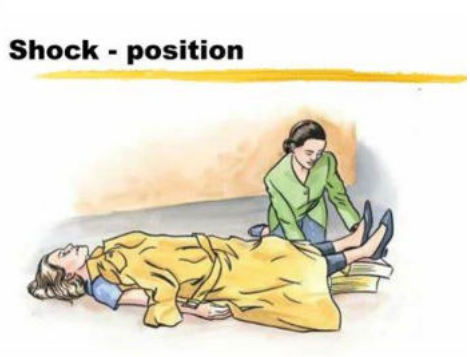
२. यदि कुनै व्यक्ति श्वास फेरिरहेको छैन भने उद्धार श्वासको प्रबन्ध गर्नुहोस् ।

३. यदि कुनै व्यक्ति बेहोस छ तर सास फेरेको छ भने उसलाई रिकभरी स्थितिमा राख्नुहोस् ।

Recovery position

४. यदि कुनै व्यक्तिको शरीरबाट रगत बगिरहेको छ भने घाउमा थिच्नुहोस । यदि उपलब्ध छ भने, थिच्नको लागि सफा कपडाको प्रयोग गर्नुहोस् ।

५. चोट लागेका जो कोहीलाई पनि कम्बलले न्यानो राखेर उपचार गर्नुहोस् । तिनीहरूको खुट्टा टाउको भन्दा माथिसम्म उचाल्नुहोस् जबसम्म यसले तिनीहरूको चोटहरूमा असर गर्दैन **(Shock position)** ।



६. गम्भीर घाइते व्यक्तिहरूलाई तत्काल थप चोटपटक लाग्ने खतरा नभएसम्म तिनीहरूको स्थान परिवर्तन नगर्नुहोस ।

७. घाइते व्यक्तिहरूलाई न्यानो राख्न कम्बल वा थप कपडाले छोप्नुहोस् ।

८. गम्भीर बिरामीहरुको लागि चिकित्सकको सहयोग लिनुहोस्, आपतकालीन सेवामा कल गर्नुहोस् (बत्ति गएर फोनले काम नगर्न सक्छ भन्ने पनि याद गर्नुहोस्)।

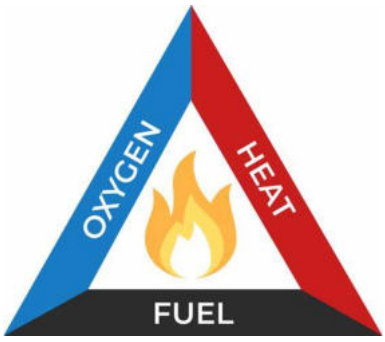
९. विशेष सहायता चाहिने बालबालिका, बुढापाका वा अरूलाई ध्यानपूर्वक जाँच गर्नुहोस् ।

थप चोटपटक वा क्षति रोक्नुहोस्

परकम्पहरूका लागि तयार रहनुहोस् र खस्ने जस्तो देखिने कुनै पनि चीज, वस्तु, सामग्रीबाट टाढा रहनुहोस् ।

१. *खसेका वस्तुहरू* : दराज र दराजको ढोका खोल्दा बाहिर निस्कने वस्तुहरूबाट सावधान रहनुहोस् ।

२. *आगो :* यदि तपाईं प्रशिक्षित हुनुहुन्छ र आगो निभाउने उपकरण छ भने सानो आगो आफै निभाउनुहोस् । ठूला आगोबाट जतिसक्दो छिटो टाढा जानुपर्छ, आपतकालीन सेवामा दमकल लाई १०१ मा) कल गर्नुहोस् ।



३. *ग्यास चुहावट :* यदि तपाईंलाई ग्यास चुहिएको शंका लागेमा ग्यास चुलोको रेगुलेटर बन्द गर्नुहोस् ।

४. *क्षतिग्रस्त विद्युतीय तार :* बिजुलीको तारमा कुनै क्षति देखिएमा बत्तिको मुख्य स्विच अफ गर्नुहोस् र तार मर्मत नभएसम्म स्विच बन्द नै छोड्नुहोस् ।

५. *बिग्रिएको बत्ती र उपकरणहरु:* झट्ट बिजुली आउदा बिग्रिएको बत्ती र उपकरणहरुबाट आगो फैलन सक्ने हुदा यी अनप्लग गर्नुहोस् ।

६. *ढल्केका पावर लाइनहर वा विद्युतका पोलहरू :* यदि तपाईंले बिजुलीका लाइनहरू वा पोलहरू झरेको देख्नुभयो भने तिनीहरूबाट करेन्ट बगेको हुन सक्छ भन्ने सोचेर तिनीहरूबाट टाढा रहनुहोस् ।

७. *दुर्गन्ध :* कुनै पनि दुर्गन्धहरु सावधानीपूर्वक सतर्कताका साथ सफा गर्नुहोस् ।

८. *क्षतिग्रस्त चिम्नी :* इट्टा वा ब्लकले बनेको चिम्नी र पर्खालबाट टाढा रहनुहोस् । तिनीहरू कमजोर हुन सक्छन् र पराकम्पनको समयमा खस्न सक्छन् ।

तपाईं ठीक हुनुहुन्छ भन्ने मानिसहरूलाई थाहा दिनुहोस् र जानकारी राख्नुहोस

१. आफ्नो स्थिति विद्यालयको सम्पर्क अधिकारीलाई बताउनुहोस्, त्यसपछि फोन बन्द गर्नुहोस् ।

२. फोन सेवा बन्द वा ओभरलोड हुन सक्छ । बालबालिका र कर्मचारीहरूको बारेमा जानकारी लिन वा दिन म्यासेजको प्रयास गर्नुहोस् । अनावश्यक फोन कलहरु नगर्नुहोस जसले गर्दा टेलिफोनको लाइन आपतकालीन उद्दार कार्यको लागि उपलब्ध हुन्छन ।

३. स्थानीय रेडियो सुन्नुहोस् ।

४. यदि तपाईं मोबाइलको ब्याट्री रिचार्ज गर्न सक्ने अवस्थामा हुनुहुन्छ भने तपाईंको क्षेत्रको मौसम सम्बन्धि पूर्वानुमान र आफ्नो क्षेत्रमा भैरहेका उद्दार कार्यको जानकारी लिनुहोस् । यदि हुनुहुन्न भने आफ्नो मोबाइलको ब्याट्री बचत गर्नुहोस् ।

भूकम्पपछि के गर्ने

स्टेप ७ :

भूकम्पको प्रमुख कम्पन सकिएपछि आगामी समय, हप्ता र महिनाहरूमा के हुन्छ भनेर तपाईंको भूकम्प तयारीको स्तरले निर्धारण गर्छ । बच्चाहरूको लागि, केही स्तरको सामान्य वातावरण आवश्यक हुनेछ त्यसैले सम्भव भएमा विद्यालय पुनः सुरु गर्ने प्रयास गर्नुहोस् तर भूकम्पबाट परेको मानसिक चोट र शारीरिक चोटपटक निको हुने बेला सम्मको लागि प्रतीक्षा गर्नुहोस् ।

समुदायका अन्य मानिसहरुसंग पुनर्मिलन गरेर, क्षति भएका संरचना र सामाग्रीहरु पुनर्निर्माण गरेर पुरानो दैनिकी शुरु गर्न आवश्यक हुन्छ ।

१. लगातारको परकम्पहरूपछि, ग्यास चुहावट, रासायनिक स्पिल, क्षतिग्रस्त बिजुलीको तार र भाँचिएको पानीको पाइपहरू नियमित रुपमा जाँच गर्नुहोस् ।

२. भूकम्पबाट आफन्ती र घर गुमाएकाहरु अस्थाई रुपमा तपाईंको विद्यालयमा बसोबास गर्न सक्छन, दुखको बेला छिमेकीहरूलाई मद्दत गर्न तयार हुनुहोस्, विशेष गरी बच्चा र वृद्धहरूलाई बास अनिवार्य हुने गर्छ ।

चित्र २२: दिशा पिशाब गरिसकेपछि साबुन पानीले हात धुने

३. आकस्मिक सहायता कहाँ प्राप्त गर्न सकिन्छ भनेर स्थानीय रेडियो वा टेलिभिजन हेर्दै सुन्दै गर्नुहोस् ।

४. सुरक्षित भएमा सुरुमा ताजा खाना प्रयोग गर्नुहोस् । क्यानको खानेकुराहरु पछिको लागि बचत गर्न ।

५. यदि तपाईंकोमा पानी बन्द छ वा भएको पानी सफा छैन भने बोतलको पानी पिउनुपर्छ वा पानी शुद्ध बनाएर पिउनुपर्छ ।

६. नजिकै फुटेको सिसा भएको खुल्ला कन्टेनरबाट केहि नखानुस र केहि नपिउनुहोस् ।

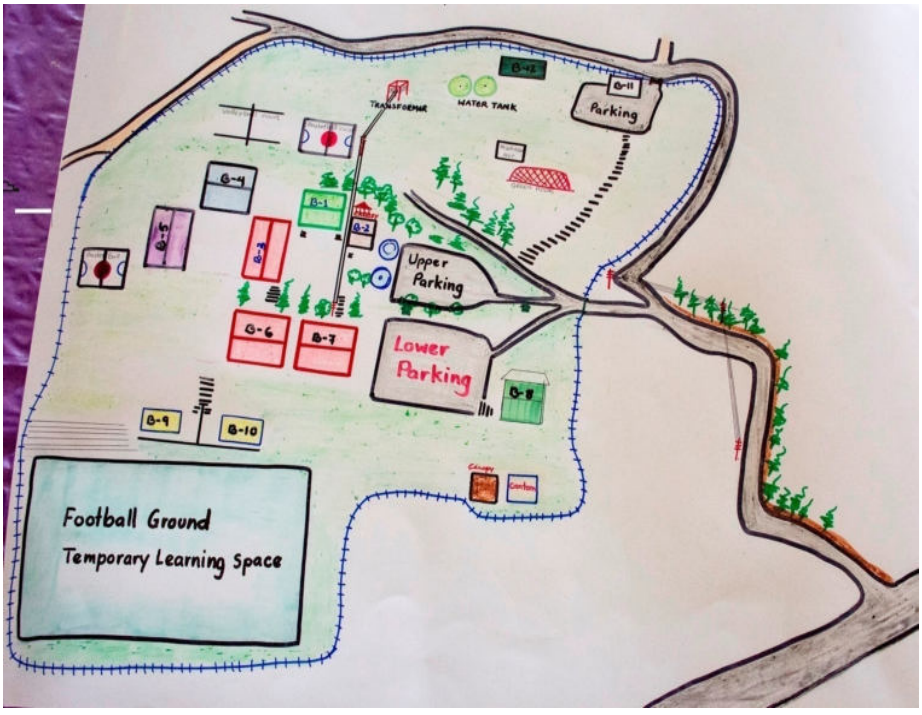
७. हात धुनुहोस् ।

तपाईंको विद्यालयको आपतकालीन व्यवस्थापन योजना

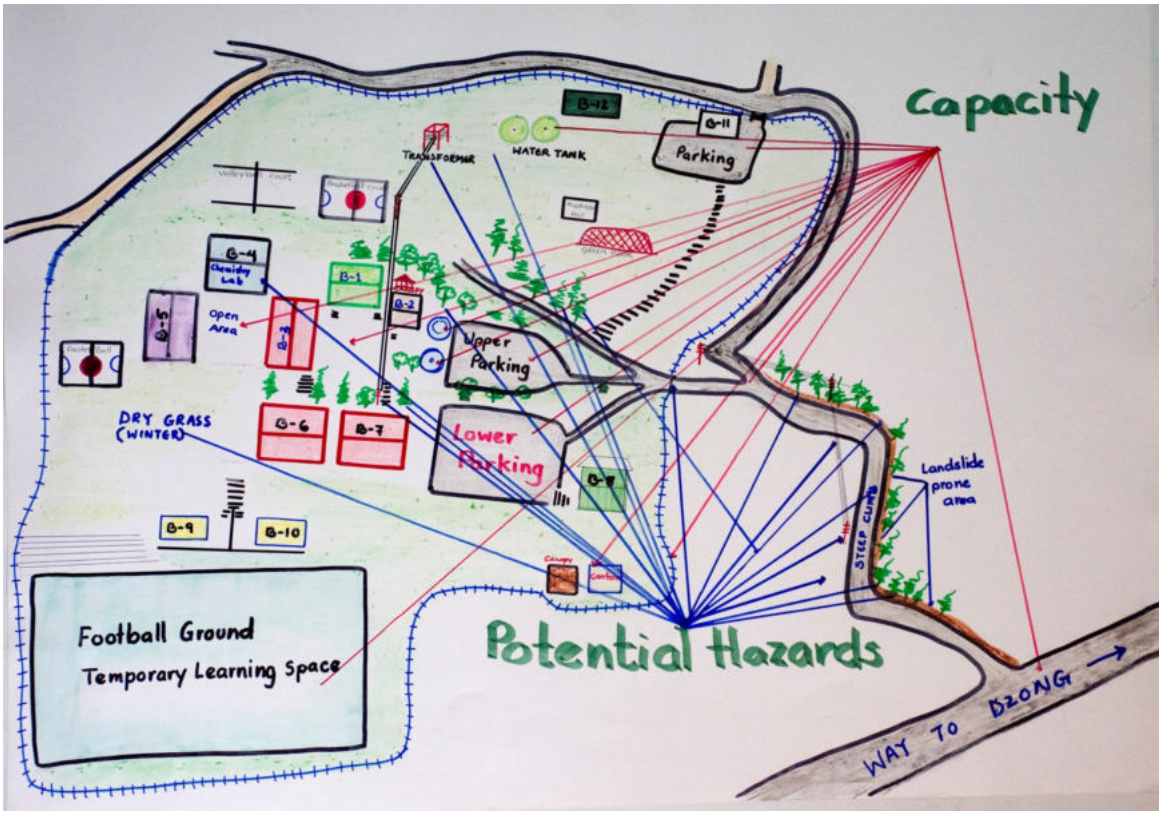
सुरक्षित र खुसी सिकाइ वातावरण तयारी गर्दै

विद्यालयको आपतकालीन व्यवस्थापन योजनाले आगो, भूकम्पजस्ता प्राकृतिक प्रकोपको समयमा विद्यार्थी र कर्मचारीहरूको सुरक्षा सुनिश्चित गर्ने लक्ष्य राख्छ । आपतकालीन व्यवस्थापन योजनाका निम्न उद्देश्यहरू छन् :

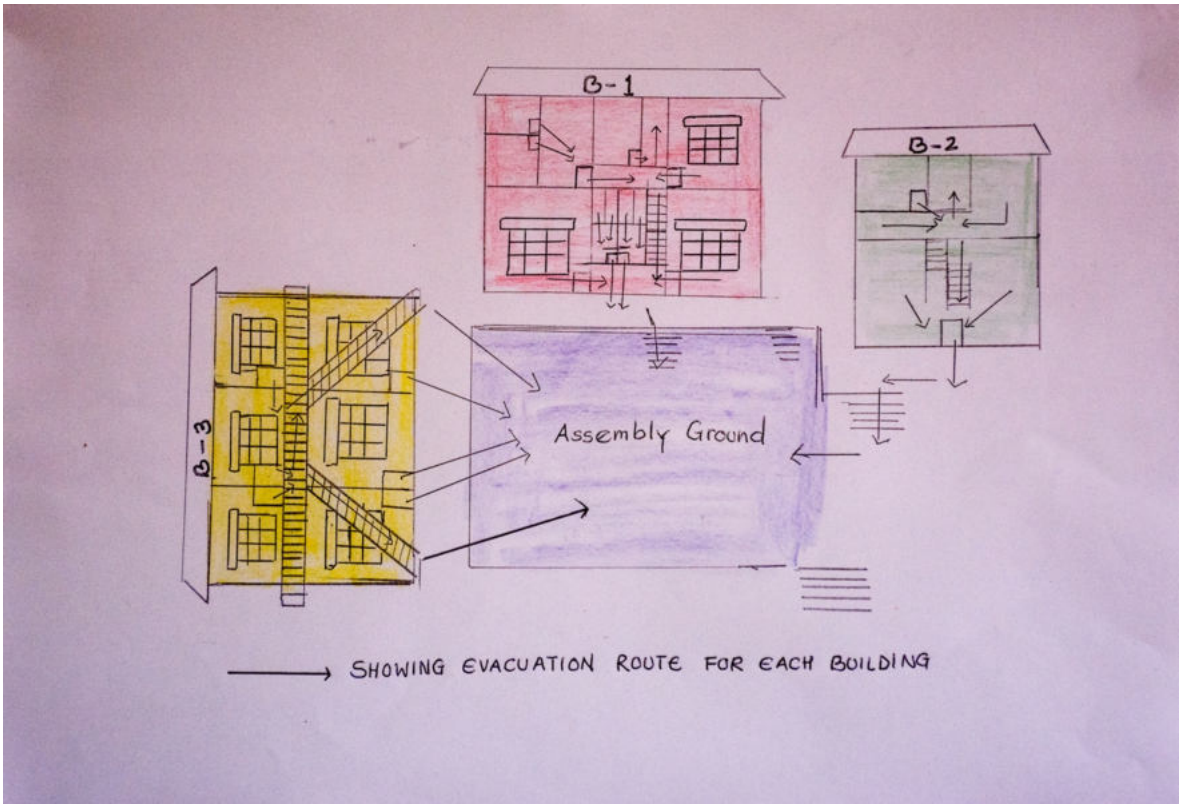
- सबै शिक्षक तथा कर्मचारीहरूलाई यो गाइड दिनुहोस्
- तपाईंको विद्यालयको 'आपतकालीन' टोली पहिचान गर्नुहोस् । उदाहरणका लागि प्राथमिक उपचारकर्मी, सुरक्षित भूकम्प अभ्यास टोली, तपाईंको विद्यालयको आपतकालीन व्यवस्थापन योजना बनाउने योजना टोली आदि । नोट: आपतकालीन घटना नेता तपाईको प्रध्यानाध्यापक नहुन सक्छ ।
- प्रत्येक कक्षाकोठाको लागि सुरक्षित क्षेत्रहरू र भवनबाट सुरक्षित बाहिर जाने बाटाहरु पहिचान गर्नुहोस् र तिनीहरूको बारेमा विधार्थीलाई भन्नुहोस । जस्तै विद्यालयको नक्सा बनाउनुहोस, बाहिर जाने सुरक्षित बाटाहरु नोट गर्नुहोस् । विद्यार्थीहरूले प्रत्येक वर्ष कक्षा कोठाहरू परिवर्तन गर्ने हुनाले हरेक नयाँ शैक्षिक सत्रमा नयाँ कोठाहरूका लागि नयाँ आपतकालीन योजनाहरू सिक्नुपर्ने हुन्छ ।
- विद्यालयमा रहेका संरचनात्मक समस्याहरू, पावर लाइनहरु जस्ता खतराहरू पहिचान गर्नुहोस् र यी खतराहरूबारे विधार्थीलाई सचेत गराउनुहोस् ।
- यी खतराहरू व्यवस्थापन र न्यूनीकरण गर्ने उपायहरू खोज्नुहोस् । उदाहरणका लागि भत्किन लागेका पर्खालहरू बलियो बनाउन सकिन्छ ।
- पहिचान गरिएका खतराहरूका लागि न्यूनीकरणका उपायको योजना बनाउनुहोस् । उदाहरणका लागि, विद्यालयको नक्सामा खतराहरू उल्लेख गर्नुहोस् ।
- किताब राख्ने दराज सुरक्षित गर्ने, भवनबाट बाहिरिने सुरक्षित बाटाहरु सफा र खालि राख्ने जस्ता जोखिम न्यूनीकरण गतिविधिहरू लागू गर्नुहोस् ।
- प्रभावकारी विपद् पूर्वतयारी र आपतकालीन रेस्पोन्स युनिटको स्थापना गर्नुहोस् ।
- प्रकोपको प्रभावकारी रोकथाम, न्यूनीकरण र प्रकोप व्यवस्थापनको लागि आवश्यक क्षमता अभिवृद्धि तालिमको पहिचान गर्नुहोस् र त्यस्ता सम्मेलनहरुमा सहभागी हुन शिक्षकलाई पठाउनुहोस । सहायक शिक्षकलाई यो गाइड दिनुहोस ।
- सुरक्षित प्रकोप अभ्यासहरुको लागि मितिहरू तय गर्नुहोस् ।
- जानकारी बिना नै एउटा प्रकोप अभ्यास गर्नुहोस्, जसले गर्दा कर्मचारी तथा विद्यार्थीहरूलाई प्रकोप अभ्यास हुन्छ भन्ने थाहा होस् तर कहिले हुनेछ भन्ने उनीहरूलाई थाहा हुँदैन ।



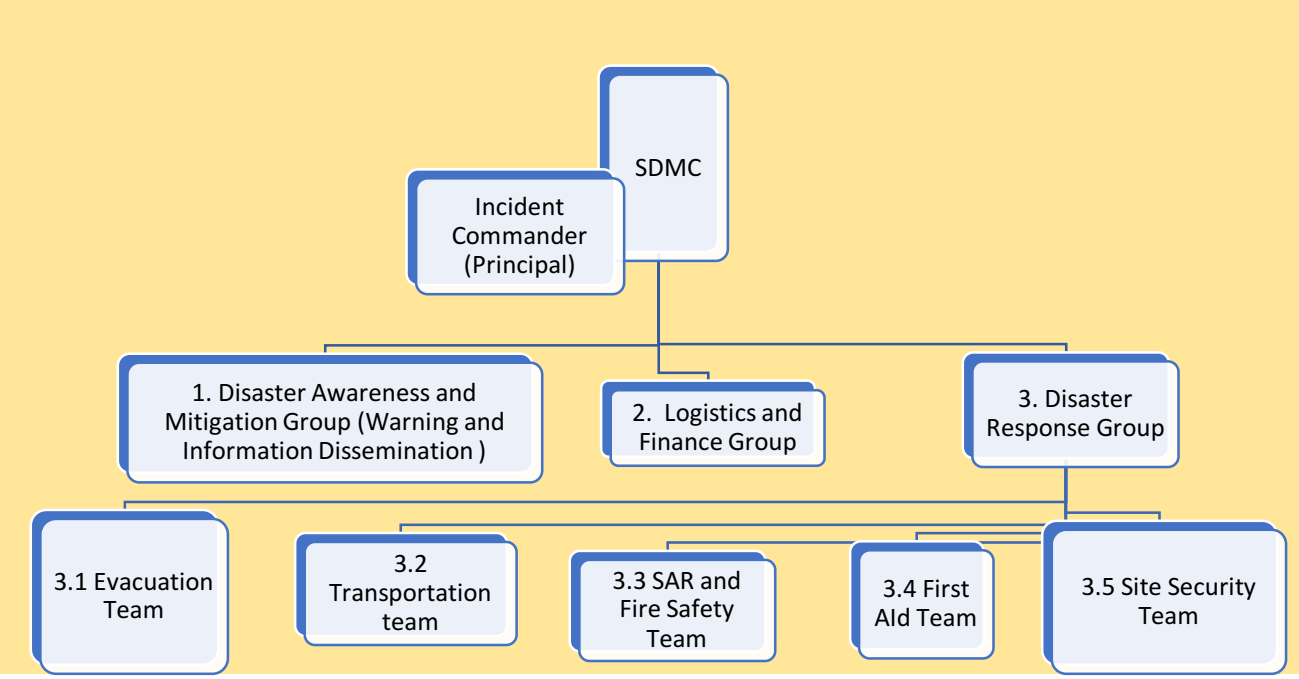
विद्यालयको नक्शा



सम्भावित जोखिमहरू (जस्तै : पहिरो जोखिम क्षेत्र) र क्षमता (जस्तै: खुल्ला ठाउँहरु) सहितको विद्यालयको नक्शा ।



विद्यालय भवनबाट बाहिर निस्कने मार्गहरूको नक्शा ।



टोली संरचनामा एउटा सामान्य योजना (SDMC: विद्यालय विपद् व्यवस्थापन समिति)

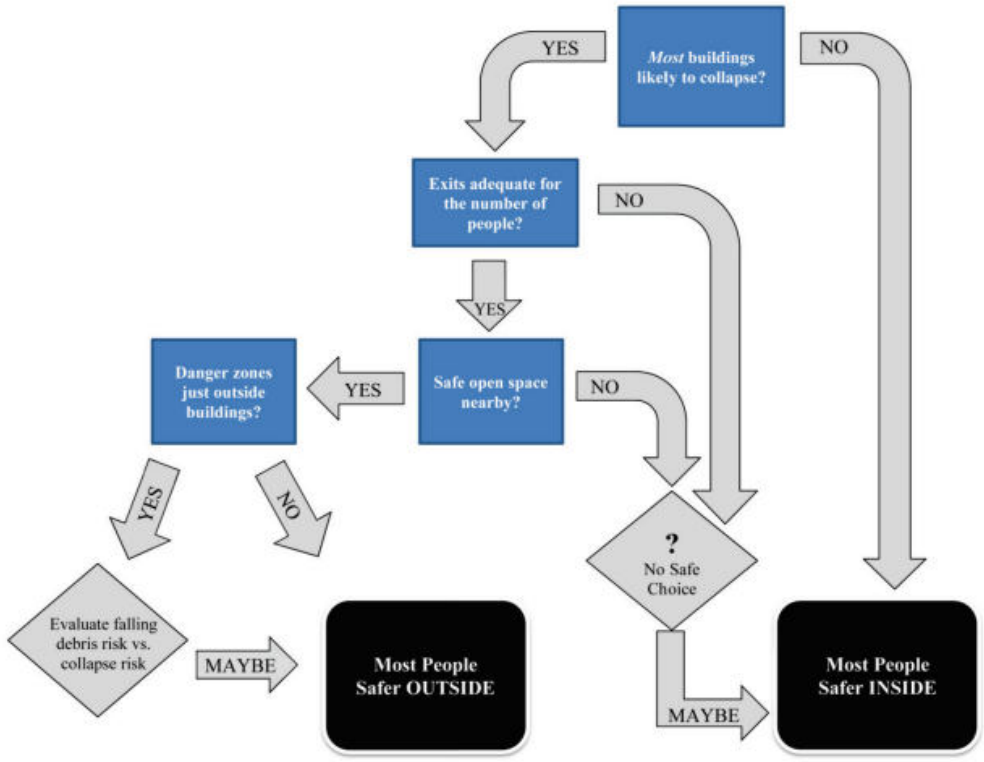


Figure 7. Flowchart to determine whether most people are likely to be safer inside or outside.

अधिकांश मानिसहरू भूकम्पबाट सुरक्षित हुने सम्भावना भवन भित्र वा भवन बाहिर कहाँ छ भनेर निर्धारण गर्ने चार्ट ।

_____ विद्यालय/स्थानको लागि भूकम्प जोखिम मूल्याङ्कनको उदाहरण

मितिः _____

ठाउँ/कोठाः _____

जोखिमहरूको मूल्याङ्कन १) यदी केहि भएमा तिनीहरू कत्तिको गम्भीर हुनेछन् र २) तिनीहरू हुने सम्भावना कत्तिको छ भन्ने आधारमा गरिन्छ। त्यसपछि, हरेक जोखिमको अवस्था र कारण साथै यसलाई न्यूनीकरण गरी स्वीकार्न सक्ने स्थितिमा ल्याउनको लागि के कस्ता सावधानीहरू अपनाउनु पर्छ भनेर लिखित रुपमा विवरण दिइएको छ।

यदि सबै आवश्यक र उचित सावधानीहरु अपनाएपछि पनि उच्च जोखिम मुल्यांकन गरिएको खण्डमा उक्त जोखिम अस्वीकार्य हुनेछ। आफ्नो विद्यालयको जोखिम मूल्याङ्कन गर्न अघिल्लो पृष्ठमा देखाइएको चित्रको प्रयोग गर्नुहोस् :

खतराहरू के हुन् ?	**कसलाई र कसरी हानी हुन सक्छ ?**	**खतरा गम्भीरता (उच्च, मध्यम, निम्न)**	**सम्भावना (धेरै सम्भावित, सम्भावित, असम्भव)**	**पहिले नै के भइरहेको छ ?**	**थप के काम आवश्यक छ ?**	**काम कसले गर्ने ?**	**काम कहिले सम्म गर्ने ?**	**काम भयो।**
मेरो भवन सुरक्षित छैन	भवनबाट विद्यार्थी वा शिक्षक असुरक्षित छन्।	उच्च	सम्भावित	सुरक्षित भूकम्प अभ्यास	अभ्यासहरु नियमित राख्नुस्।			
दोस्रो तल्लाका कक्षाकोठा	५ - १० सेकेन्ड भित्रमा विद्यार्थी वा शिक्षकलाई बाहिर निकाल्न सकिदैन।	उच्च	धेरै सम्भावित	Drop, Cover, Hold On !	अभ्यास पूरा भयो।			
कक्षाकोठा बाहिरका खतरा क्षेत्र	विद्यार्थी वा शिक्षकलाई, भग्नावशेषमा खसेर	मध्यम	असम्भव		खतरा क्षेत्र जाँच गर्नुहोस्।	विद्यार्थी वा शिक्षक	५ दिनमा	

योजना अघि बढाउनुपर्छ ?

सुरक्षित भूकम्प परिक्षण अभ्यासपछिको समीक्षा (के जोखिम मूल्याङ्कन उपयुक्त थियो ? त्यहाँ कुनै अप्रत्याशित खतराहरू थिए ? जोखिम मूल्याङ्कनका क्रममा भेटिएका महत्त्वपूर्ण निष्कर्षहरू):

जोखिम मूल्यांकन पुरा गर्ने व्यक्ति :

_____ विद्यालय/स्थानको लागि भूकम्प जोखिम मूल्याङ्कनको उदाहरण

मितिः _____

ठाउँ/कोठाः _____

जोखिमहरूको मूल्याङ्कन १) यदी केहि भएमा तिनीहरू कत्तिको गम्भीर हुनेछन् र २) तिनीहरू हुने सम्भावना कत्तिको छ भन्ने आधारमा गरिन्छ । त्यसपछि, हरेक जोखिमको अवस्था र कारण साथै यसलाई स्वीकार्न सक्ने स्थितिमा ल्याउनको लागि के कस्ता सावधानीहरू अपनाउनु पर्छ भनेर लिखित रुपमा विवरण दिइएको छ ।

यदि सबै आवश्यक र उचित सावधानीहरु अपनाएपछि पनि उच्च जोखिम मुल्यांकन गरिएको खण्डमा उक्त जोखिम अस्वीकार्य हुनेछ । आफ्नो विद्यालयको जोखिम मूल्याङ्कन गर्न अघिल्लो पृष्ठमा देखाईएको चित्रको प्रयोग गर्नुहोस् :

खतराहरू के हुन् ?	**कसलाई र कसरी हानी हुन सक्छ ?**	**खतरा गम्भीरता (उच्च, मध्यम, निम्न)**	**सम्भावना (धेरै सम्भावित, सम्भावित, असम्भव)**	**पहिले नै के भइरहेको छ ?**	**थप के काम आवश्यक छ ?**	**काम कसले गर्ने ?**	**काम कहिले सम्म गर्ने ?**	**काम भयो ।**

योजना अघि बढाउनुपर्छ ?

सुरक्षित भूकम्प परिक्षण अभ्यासपछिको समीक्षा (के जोखिम मूल्याङ्कन उपयुक्त थियो ? त्यहाँ कुनै अप्रत्याशित खतराहरू थिए ? जोखिम मूल्याङ्कनका क्रममा भेटिएका महत्त्वपूर्ण निष्कर्षहरू):

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जोखिम मूल्यांकन पुरा गर्ने व्यक्ति :

शैक्षिक संलग्नता समय तालिका

गतिविधि	भूकम्प शिक्षा सम्बन्धी वार्षिक गतिविधिहरू	समय	सहयोगी संस्थाहरु
सुरक्षित भूकम्प अभ्यास	• बैशाख १२ : बर्षको पहिलो सुरक्षित भूकम्प अभ्यास गोर्खा भूकम्प २०७२ को सम्झनामा। • अक्टोबर १९ बिहान १०: १९ बजे अमेरिकामा भूकम्प अभ्यास गर्ने दिन https://www.shakeout.org/ • माघ २ गते राष्ट्रिय भूकम्प सुरक्षा दिवसको अवसरमा (सन् १९३४ को भूकम्पको सम्झनामा) • कुनै एक अकस्मात तय गरिएको मिति (सरप्राइज अभ्यासको लागि)	करिब ६० मिनेट	उदाहरणको लागि अग्नि नियन्त्रकहरु बोलाउन सकिन्छ।
सभा	'भूकम्प' र 'भूकम्पबाट कसरी सुरक्षित राख्ने' भन्ने विषय । यदि यो सभा शैक्षिक वर्षको शुरुवात संगै राखिएको छ भने सुरक्षित भूकम्प अभ्यासको प्रक्रियाको बारेमा र आकस्मिक भूकम्प अभ्यासको बारेमा विद्यार्थीहरू बिस्तृतमा बताउन सकिन्छ जसले गर्दा विधार्थीहरु उक्त अभ्यासको क्रममा डराउदैनन।	करिब ३० मिनेट	भूकम्प विज्ञानसंग सम्बन्धित विज्ञलाई बोलाउने ।
अध्ययन / सिकाई	उदाहरणका लागि, चलचित्रहरू हेर्ने, भूकम्प सचेतना गीत हेर्ने, Beat the Quake कार्डको प्रयोग गर्ने, सुरक्षित भूकम्प अभ्यासको बारेमा छलफल गर्ने, पोस्टरहरु बनाउने । 	विविध	भूकम्प विज्ञानसंग सम्बन्धित विज्ञलाई बोलाउने ।

सुरक्षित भूकम्प अभ्यासको लागि चेकलिस्ट

भूकम्प अभ्यास गर्नु अघि :

१. शिक्षक तथा कर्मचारीहरूलाई यो गाइड दिनुहोस् ।

२. विद्यालयको आपतकालीन व्यवस्थापन योजना र जोखिम मूल्याङ्कन पूरा गर्नुहोस् र टोली घोषणा गर्नुहोस् ।

३. विद्यार्थीहरूसँग कुरा गर्नुहोस् र तिनीहरूलाई भूकम्प अभ्यासको योजना बनाउन मद्दत गर्नुहोस् । उदाहरणका लागी, पोस्टर, साइनेज, भूकम्प आपतकालीन सुरक्षा प्याक (EESP) को तयारी गर्न लगाउनुहोस् । विद्यार्थीहरूलाई ५ सेकेन्ड सम्म गन्न लगाउनुहोस् ।

४. शिक्षक तथा कर्मचारीहरूलाई विद्यार्थीहरू बिना नै परीक्षण अभ्यास गर्न भन्नुहोस् ।

भूकम्प अभ्यासको समयमा :

१. भवन खाली गर्न आदेश दिनुस (स्कूलको घण्टी बजाउनुहोस्।) ।

२. केहि विधार्थीलाई तुरुन्तै भवन बाहिर पठाउदै गर्दा स्थानको आधारमा अन्य विधार्थीलाई **ड्रप, कभर र होल्ड** गराउनु पर्छ र त्यसपछि भवन बाहिर पठाउनु पर्छ ।

३. विशेष आवश्यकता भएका विद्यार्थीहरू लगायत अन्य विधार्थीलाई **सुरक्षित क्षेत्र**मा लैजानको लागि सहयोग गर्नुहोस् ।

४. नाम दर्ता गर्ने रजिस्टर जाँच गर्नुहोस्, सबै विद्यार्थी र कर्मचारीहरूलाई सुरक्षित रूपमा बाहिर निकालिएको सुनिश्चित गर्नुहोस् । उक्त कुरा घटना नेतालाई रिपोर्ट गर्नुहोस् ।

५. कसैलाई चिकित्सा सहायताको आवश्यकता छ वा छैन जाँच गर्नुहोस् ।

६. चिकित्सा टोली र उद्धार टोलीलाई प्राथमिक उपचार र उद्धारका सामानहरु आवश्यक छ कि छलफल गर्नुहोस् ।

७. विद्यार्थीहरू ठीक छन् र बाहिर निकाल्ने क्रममा कसैलाई चोटपटक लागेको छैन भन्ने निश्चित गर्नुहोस् ।

८. सुरक्षित क्षेत्रमा सबैलाई भेला हुन कति समय लाग्यो भनेर समय जाँच गर्नुहोस् ।

कार्यविधिको निष्कर्ष :

१. घटना नेताले स्कूल पुनः प्रवेश वा ब्रेकटाइम घोषणा गर्नुहोस् ।

२. विद्यार्थी र शिक्षकहरूलाई विद्यालय भवनमा/कक्षाहरूमा जानको लागि समन्वय गर्नुहोस् ।

३. सबै सहभागीहरूलाई सुरक्षित भूकम्प अभ्यास प्रक्रियामा सम्भावित सुधारहरू रिपोर्ट गर्न प्रोत्साहित गर्नुहोस् ।

४. भूकम्प अभ्यास प्रक्रिया रिपोर्ट फारममा सुधारहरू रेकर्ड गर्नुहोस् ।

५. आवश्यकता अनुसार भूकम्प अभ्यास गाइड परिमार्जन गर्नुहोस् र सबै कर्मचारीहरूलाई परिमार्जित गाइड वितरण गर्नुहोस् ।

६. कर्मचारी र विद्यार्थीहरूसंग छलफल गर्नुहोस् ।

भूकम्प अभ्यास कार्यविधि रिपोर्ट

विद्यालयको नाम:

टेलिफोन नम्बर:

इमेल:

ठेगाना:

सम्पर्क व्यक्ति:

सहभागी विद्यार्थी संख्या:

शिक्षक संख्या:

शारीरिक रूपमा अशक्त विद्यार्थीहरू छन् ?

सुरक्षित भूकम्प अभ्यास कहिले गरियो ?

सुरक्षित भूकम्प अभ्यास गर्न कति समय लाग्यो ?

के सुरक्षित क्षेत्रमा गईसके पछि मानिसहरु उपस्थित भए नभएको रुजु गरिएको थियो ? (थियो/थिएन):

सुरक्षित भूकम्प अभ्यास कार्यविधिको अवधिमा अन्य कस्ता गतिविधिहरू गरियो? (खोज, उद्धार, प्राथमिक उपचार, आदि):

समीक्षात्मक छलफलको क्रममा के के सुधारहरू टिपोट गर्नुभयो ?

अन्य कुनै टिप्पणी

रिपोर्टको लागि निर्देशनहरु

- प्रतिवेदनको प्रतिलिपि तपाईको विद्यालयको प्रध्यानाध्यापक र विद्यालयमा भूकम्प शिक्षा कार्यक्रम नेपाललाई पठाउनुहोस् ।
- कुनै पनि प्रश्नहरूको लागि स्थानीय स्तरका सरकारी शिक्षा अधिकारी र विद्यालयमा भूकम्प शिक्षा कार्यक्रम नेपाललाई सम्पर्क गर्नुहोस् ।
- अतिरिक्त प्रमाणहरू पठाउनुहोस्, उदाहरणका लागि भिडियो, फोटोहरू तथा प्रतिवेदन ।

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विद्यालयमा भूकम्प शिक्षा कार्यक्रम नेपालको लागि तयार गरिएको ।

सहयोगी संस्थाहरु

International Union of Geodesy and Geophysics (IUGG)

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