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Internal Assessment Test 1 – March 2019

Sub:	INDUSTRIAL SAFETY					Sub Code:	15ME662	Branch:	MECHANICAL
Date:	07/03/2019	Duration:	90 min's	Max Marks:	50	Sem/Sec:	6th Sem A &B		OBE

	Answer any FIVE FULL Questions	MARKS	CO	RBT
1.	Define the following with examples: (i) Safety (ii) Hazard (iii) Caution (iv) Appliance (v) Precaution	[10]	CO1	L1
2.	Define accident and explain the reasons for accident.	[10]	CO1	L2
3.	Briefly explain MSDS.	[10]	CO1	L2
4. (a)	What is fire? What are the types of fire? Explain.	[05]	CO5	L1
(b)	Explain fire tetrahedron.	[05]	CO5	L2
5.	Explain prevention of fire.	[10]	CO5	L2
6.	Briefly explain in detail a case study of an accident with cause, effect (long and short term), preventive measure.	[10]	CO6	L2

Scheme of Evaluation
Internal Assessment Test 1 – March 2019

Sub:	Industrial Safety					Sub Code:	15EME662	Branch:	ME
Date:	07/03/2018	Duration:	90 min's	Max Marks:	50	Sem / Sec:	6th A&B		

Note: Answer any 5 question

Question #		Description	Marks Distribution		Max. MARKS
1		Define the following with examples: (i) Safety (ii) Hazard (iii) Caution (iv) Appliance (v) Precaution ➢ **Each definition 1 Mark** ➢ **Each example 1 Mark**	**5M** **5M**	10M	10M
2		What is accident? Explain the reasons of accident. ➢ **Definition of accident** ➢ **Stating the reason** ➢ **Explanation**	**2M** **4M** **4M**	10M	10M
3		Briefly explain MSDS. ➢ **Statements** ➢ **Explaining**	**5M** **5M**	10M	10M
4	**(a)**	What is fire? What are the types of fire? Explain. ➢ **Definition** ➢ **Stating types** ➢ **Explaining**	**1M** **2M** **2M**	5M	10M
	(b)	Explain fire tetrahedron. ➢ **Diagram** ➢ **Explaining**	**1M** **4M**	5M	
5		Explain prevention of fire. ➢ **Diagram** ➢ **Explaining**	**2M** **8M**	10M	10M
6		Briefly explain in detail a case study of an accident with cause, effect (long and short term), preventive measure. ➢ **Giving introduction** ➢ **Explaining causes** ➢ **List out the effects** ➢ **Preventive measure** ➢ **Conclusion**	**2M** **2M** **2M** **2M** **2M**	10M	10M

Solution of 1st IAT

1.

i. **Safety:** Condition of being safe undergoing or causing hurt, injury or loss.
   Example: Using mask while welding, waring golves

ii. **Hazard:** A hazard is any agent that can cause harm or damage to humans, property, or the environment.
   Example: Stored energy, when released, can cause damage, presence of hazardous situations example oxygen-depleted atmospheres, awkward positions, repetitive motions, low-hanging or protruding objects

iii. **Precaution:** An action that is done to prevent something unpleasant, inconvenient or dangerous happening,
   Example: Wearing seat belts while riding vehicle

iv. **Caution:** A warning against danger or evil. Careful forethought to avoid danger or harm.
   Example: Speed breakers, railway crossing

v. **Appliance:** A device or piece of equipment designed to perform a specific task
   Example: Refrigerator, Welding rod

2.

- **Taking shortcuts:** Every day we make decisions we hope will make the job faster and more efficient. But time savers ever risk your own safety or that of other workers. Shortcuts that reduce your safety on the job are not shortcuts, but an increased chance for injury.
- **Being over confident:** Confidence is a good thing. Overconfidence is too much of a good thing. “It’ll never happen to me” is an attitude that can lead to improper procedures, tools or methods in your work. Any of these can lead to an injury.
- **Starting a task with incomplete instructions:** To do the job safely and correctly the first time, you need complete information. Have you ever seen a worker sent to do a job having been given only a part of the job’s instructions? Don’t be shy about asking for explanations regarding work procedures and safety precautions. It isn’t dumb to ask questions, it’s dumb not to.

- **Poor housekeeping:** When clients, managers or safety professionals walk through your work site, housekeeping is an accurate indicator of everyone's attitude about quality, production and safety. Poor housekeeping creates hazards of all types. A well-maintained area sets a standard for others to follow. Good housekeeping involves both pride and safety.
- **Ignoring safety procedures:** Purposely failing to observe safety procedures can endanger you and your coworkers. You are being paid to follow safety policies – not to make your own rules. Being "casual" about safety can lead to a casualty
- **Mental distractions from work:** Having a bad day at home and worrying about it at work is a hazardous combination. Dropping your "mental guard" can pull your focus away from safe work procedures. You can also be distracted when you're busy working and a friend comes by to talk while you are trying to work. Don't become a statistic because you took your eyes off the machine "just for a minute."
- **Failure to Pre-Plan the Work:** There is a lot of talk today about job hazard analysis. JHAs are an effective way to figure out the smartest ways to work safely and effectively. Being hasty in starting a task or not thinking through the process can put you in harms way. Instead, plan your work and then work your plan.

3.

SECTION 1: Identification of the substance/mixture and of the company/undertaking
- 1.1. Product identifier
- 1.2. Relevant identified uses of the substance or mixture and uses advised against
- 1.3. Details of the supplier of the safety data sheet
- 1.4. Emergency telephone number

SECTION 2: Hazards identification
- 2.1. Classification of the substance or mixture
- 2.2. Label elements
- 2.3. Other hazards

SECTION 3: Composition/information on ingredients
- 3.1. Substances
- 3.2. Mixtures

SECTION 4: First aid measures
- 4.1. Description of first aid measures
- 4.2. Most important symptoms and effects, both acute and delayed
- 4.3. Indication of any immediate medical attention and special treatment needed

SECTION 5: Firefighting measures
- 5.1. Extinguishing media
- 5.2. Special hazards arising from the substance or mixture
- 5.3. Advice for firefighters

SECTION 6: Accidental release measure
- 6.1. Personal precautions, protective equipment and emergency procedures

- 6.2. Environmental precautions
- 6.3. Methods and material for containment and cleaning up
- 6.4. Reference to other sections

SECTION 7: Handling and storage

- 7.1. Precautions for safe handling
- 7.2. Conditions for safe storage, including any incompatibilities
- 7.3. Specific end use(s)

SECTION 8: Exposure controls/personal protection

- 8.1. Control parameters
- 8.2. Exposure controls

SECTION 9: Physical and chemical properties

- 9.1. Information on basic physical and chemical properties
  - Appearance (physical state, color, etc.)
  - Upper/lower flammability or explosive limits
  - Odor
  - Vapor pressure
  - Odor threshold
- 9.2. Other information

SECTION 10: Stability and reactivity

- 10.1. Reactivity
- 10.2. Chemical stability
- 10.3. Possibility of hazardous reactions
- 10.4. Conditions to avoid
- 10.5. Incompatible materials
- 10.6. Hazardous decomposition products

SECTION 11: Toxicological information

- 11.1. Information on toxicological effects

SECTION 12: Ecological information

- 12.1. Toxicity
- 12.2. Persistence and degradability
- 12.3. Bioaccumulative potential
- 12.4. Mobility in soil
- 12.5. Results of PBT and vPvB assessment
- 12.6. Other adverse effects

SECTION 13: Disposal considerations

- 13.1. Waste treatment methods

SECTION 14: Transport information

- 14.1. UN number
- 14.2. UN proper shipping name
- 14.3. Transport hazard class
- 14.4. Packing group
- 14.5. Environmental hazards
- 14.6. Special precautions for user
- 14.7. Transport in bulk

SECTION 15: Regulatory information

- 15.1. Safety, health and environmental regulations/legislation specific for the
- substance or mixture
- 15.2. Chemical safety assessment

SECTION 16: Other information: This section indicates when the SDS was prepared or when the last known revision was made. The SDS may also state where the changes have been made to the previous version. You may wish to contact the supplier for an explanation of the changes. Other useful information also may be included here.

4.

(a). Fire is a rapid chemical reaction of oxidant with fuel accompanied by the release of energy, indicated by incandescence or flame

- Class A Fires involving solid combustible materials of organic nature such as wood, paper, rubber and plastics where the cooling effect of water is essential.
- Class B Fires involving flammable liquids or liquefiable solids or the like where a blanketing effect is essential.
- Class C Fires involving flammable gases under pressure including liquefied gases, where it is necessary to inhibit the burning gas at fast rate with an inert gas, powder or vaporising liquid.
- Class D Fires involving combustible metals like magnesium, aluminium, zinc, sodium, and potassium where the burning metals are reactive to water containing agents and in certain cases carbon dioxide, halogenated hydrocarbons and ordinary dry powders. These fires require special media and techniques to extinguish.
- Class E Fire risks involving electrical apparatus/equipment.
- Class F/K Fires involving cooking oils, trans-fats or fats in cooking appliances. These typically occur in restaurant and cafeteria kitchens

(b). The fire triangle is a model for conveying the components of a fire. The fire triangle's three sides illustrate the three elements of fire, which are heat, fuel and oxidization.

The three elements must be combined in the right proportions for a fire to occur. If any of the three elements are removed, the fire is extinguished.

The first element in the fire triangle is heat, which is perhaps the most essential of fire elements. A fire cannot ignite unless it has a certain amount of heat, and it cannot grow without heat either.

One of the first things firefighters do to extinguish a fire is to apply a cooling agent — usually water. Another cooling agent is a chemical fire retardant, such as the ones used in fire extinguishers.

Another method of diffusing heat from a fire is to scrape the embers from the fire source, such as wood embers on a burning building. Firefighters will also turn off the electricity in a burning building to remove a source of heat.

The second element in the fire triangle is fuel. A fire needs a fuel source in order to burn. The fuel source can be anything that is flammable, such as wood, paper, fabric, or chemicals. Once the fuel element of the fire triangle is removed, the fire will go out.

If a fire is allowed to burn without any attempt to extinguish it, as in the case of a controlled burn conducted by the Forest Service, it will extinguish on its own when it is consumed all of the fuel.

The final element of the fire triangle is oxygen, which is also an essential component of fire. A fire needs oxygen to start and continue. That is why one recommendation for extinguishing a small fire is to smother it with a non-flammable blanket, sand or dirt.

A decrease in the concentration of oxygen retards the combustion process. In large fires where firefighters are called in, decreasing the amount of oxygen is not usually an option because there os no effective way to make that happen in an extended area.

An alternative to the fire triangle model is the fire tetrahedron. The fire tetrahedron adds another element to the fire, which is chemical reaction. Fires involving metals such as titanium, lithium and magnesium have a chemical reaction that requires a different approach for firefighters.

This is called a class D fire and the application of water will exacerbate the combustion. Because of the chain reaction caused by the metals in class D fires, firefighters must use a different approach involving the introduction of inert agents like sand to smother it.

5. Three elements such as heat, fuel and oxygen must be combined in the right proportions for a fire to occur. If any of the three elements are removed, the fire is extinguished.

The prevention of fire aims at not allowing **the conditions leading to combination of (1) Combustible material (2) Air and (3) Heat and local temperature rise (4) Spark/ignition.**

For prevention of fire :

— Inflammable explosive materials **should be stored separately** and should be handled, stored, used by using necessary precautions. Such material should be guarded against exposure to flames, sparks, arcs, flash-overs, intense heat, hot spots, hot air.

— Insulating materials in the plant and equipment must not be exposed to (1) high local temperatures (hot spot temperatures) beyond certain permissible limits (2) Sparks (3) Arcs (4) Flash-overs (4) Welding sparks.

— Special precautions should be taken while welding, carrying open flames so that fire is not initiated.

— Smoking, open flames and matchboxes, inflammable materials, explosive materials, open resistor heaters should not be allowed inside protected area of electrical plant and

control room. Smoking must be permitted only in special areas. Cigarette buts must be carefully extinguished.

— Special precautions are necessary while handling, storing, filling, drying-out transformer oil, furnace oil, fuels, circuit breaker oil, capacitor-fluid, paints, chemicals, explosive gases like oxygen, hydrogen, acetylene. Smoking, open flames and matchboxes, inflammable materials, explosive materials should not be allowed to be taken inside protected area of stores and near inflammable materials.

— LPG cylinder, Acetylene cylinder valves/pipes/tanks should be leak free. Gas cylinders must be stored separately as per safety recommendations.

— Inflammable material should not be used in electrical equipment as far as possible. Modern non-explosive/fire-free equipment must be preferred (*e.g.* Dry transformer in place of oil filled transformer SF_6 circuit breaker in place of Oil circuit breaker, XLPE cable in place of oil insulated cable.

  Inflammable material should not be used in civil construction as far as possible.

— Electrical equipment should not be overloaded. Over load protection, over current protection, temperature rise protection, temperature monitoring must be provided with oil filled equipment and electrical machines having inflammable insulation.

— Good house keeping goes a long way to prevent fires. Scrap, waste papers, waste wood, waste oil should be disposed off.

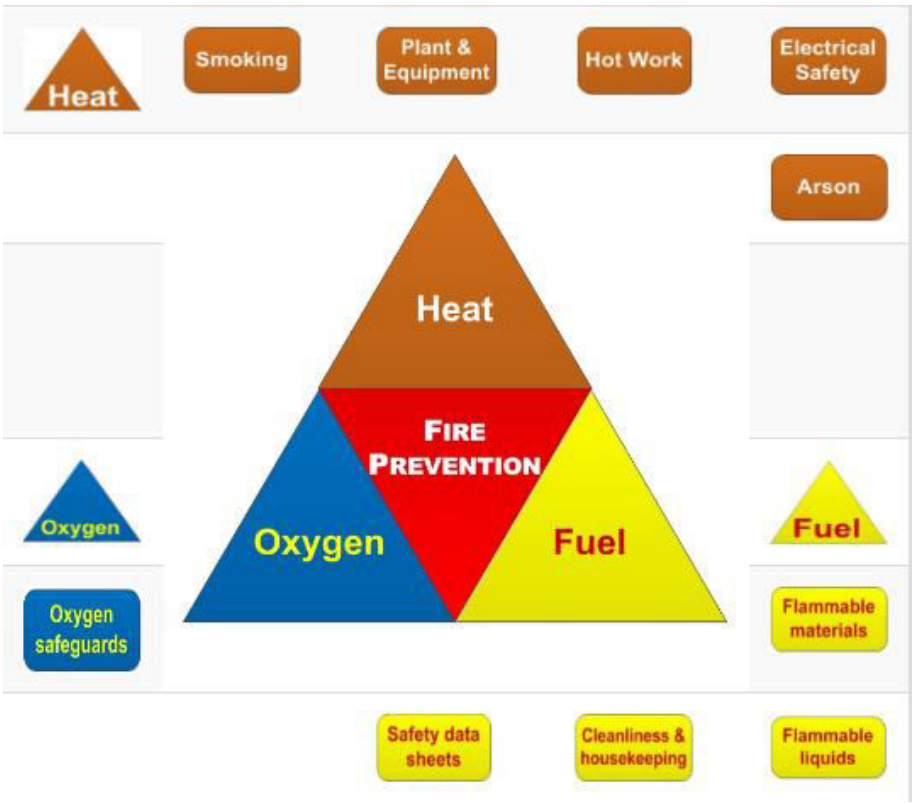
  Leakage should be attended immediately.

— Precautions are necessary in storage, erection, testing, commissioning, operation and maintenance that fires are not initiated due to carelessness.

— **Subsystems must not be energised unless the fire protection systems are commissioned and in alert workable state.**

— Precautions are necessary while welding, heating, flame cutting, grinding, drying etc., to eliminate initiation of fires.

— Good preventive maintenance of electrical, mechanical and chemical equipment helps in eliminating week points and preventing fires.



6.

Heavy Rain in Uttarkashi

Introduction:

South west monsoon of the year 2012 brought heavy rains to the northern region of the country, to the extent some places witnessed cloud burst leading to flash floods and number of landslides, especially in the state of Uttarakhand. This write up is based on the field visit report of Dr. Surya Prakash, Associate Professor of NIDM supplemented by the Memorandum submitted by the Government of Uttarakhand. Uttarkashi is one of the 13 districts of Uttarakhand which is a multi-hazard prone state, prone to many natural hazards. Along with natural causes to increased vulnerability to disasters, the State of Uttrakhand is socio economically also very vulnerable as twenty nine percent of the people living in the Indian part of this Himalayas have income below the national poverty line with an annual population growth rate of 1.4 % and infant mortality rate of 63 per 1000 live births (Shrestha and Bajracharya, 2013). During the year 2012 Uttarkashi district received abnormally high rainfall and incidences of localized concentrated precipitation (cloudburst) occurred between 4th and 6th August, 2012 in the upper catchment of the tributaries of Bhilangana river, particularly Assiganga and Swarigad (Disaster Relief Memorandum for Central Assistance, Government of Uttarakhand). This

unprecedented rain fall resulted in rise in the waters of Bhagirathi River at Uttarkashi as also in upstream areas by as much as 04 meters above the danger level.

Monsoon of 2012 & Causes of flood:

In the year 2012 the monsoon was relatively weak and both during June and July rainfall occurred in the month of August. Particularly high rainfall was received in the first week of August, especially in Uttarkashi district between 4th and 6th August, 2012. Cloudburst in the early hours of 4th August, 2012 in the catchment of the tributaries of Bhagirathi River, particularly Assiganga and Swarigad, resulted in rise in water level in Bhagirathi, as much as 04 meters above the danger level. Water level thus rose to 1127 meters above mean sea level (m.a.m.s.l) as against danger level of 1123 m.a.m.s.l. This resulted in widespread devastation in the district and even affecting the district headquarter. The rainfall resulted in blockage of drainage channels due to tree logs, sediments and boulders for some period of time, thereby forming transient lakes in some of the tributaries of Asiganga and Bhagirathi rivers. These transient lakes bursted on 3rd August 2012 bringing in huge volumes of water, sediment, boulders and tree logs into the Bhagirathi River and its tributaries like Asiganga. This area had
also received very heavy precipitation on 4th and 25th July 2012 in the Asiganga valley resulting in a big transient dam due to the debris (sediment, boulders and tree logs) in these channels. Apart from these, transient dams and lakes along these channels, the existing lakes like Dodi Tal, located on the upstream side were also filled with water due to these cloudburst events. The narrow basin of Asiganga river is long valley with a huge watershed area with a good potential for flashfloods, landslides and debris flows. However, though the river Bhagirathi is a wider valley compared to Asiganga, the water is fed to this by numerous other tributaries and Gangotri glacier on the upstream side. This resulted in both Asiganga and Bhagirathi having heavy discharge in the river resulting in the disaster (Surya Prakash, 2012).

Impact:

The river flow at high velocity mixed with heavy sediments resulted to toe erosion of the slope adjacent to riverside. The loss of toe support resulted in numerouslandslides which also increased the load of sediments in the water and further resulted in the rise in water level of the rivers due to aggradation of boulders and sediments. The wooden logs drifting with high velocity water currents, also accumulated in the reservoir areas, reducing the velocity of water. The wooden logs and debris were also seen, as evidence in the eddy areas where river water gets retarded and deposits its sediment (Surya Prakash, 2012). A number of motor and pedestrian bridges were washed off and damaged by these

eventualities. Large number of pilgrims were thus stranded at various places and there was scarcity of essential services. The heavy precipitation also washed away number of vehicular and pedestrian bridges, including motor bridge at Gangotri on the Rishikesh-Gangotri National Highway. As a result of heavy rainfall, a number of stretches of the Rishikesh – Gangotri National Highway and other connecting roads were also washed away. Connectivity to as many as 85 villages was disrupted and more than 500 persons were stranded at various stretches of the Rishikesh – Gangotri National Highway beyond Uttarkashi. The event also caused widespread devastation in the area. As many as 29 persons, including 3 Fire and Emergency Service personnel, were washed away in the event and 6 persons went missing. Unusually high and concentrated rainfall in Uttarkashi district during the monsoon season had resulted in cloudburst and flash flood, apart from landslides discussed earlier. Cumulatively these resulted in immense loss of human lives, livestock, personal property and infrastructure. Around 85 villages of the district were affected by these incidences that took toll of 34 human lives. Population of more than 7,000 was directly affected by these incidences. More than 2000 residential houses were damaged, and around 100 farm animals were lost

Details of Losses

1. Number of villages affected-85
2. Population affected-7,389
3. Permanent loss of land (in lakh)-56
4. House damaged :-
    (i) Fully damaged pucca houses-131
    (ii) Fully damaged kutcha houses-07
    (iii) Severely damaged pucca houses-127
    (iv) Partly damaged houses (pucca + kutcha)-269
5. No. of human lives lost-34
6. No. of missing persons-6
7. No. of persons with grievous injuries-12
8. Animal lost
    (a) No. of big animals lost-68
    (b) No. of small animals lost-338

The losses in the event that occurred at Uttarkashi district had aggravated by the topographic features and inherently fragile nature of the terrain. High relief of the area promotes fast and high surface runoff and enhanced pore water pressure together with reduced frictional forces promoting frequent mass wastage in the area. Hence heavy and concentrated rainfall (cloudburst) in the upper reaches of the catchment resulted in flash flood in the downstream areas, which was enhanced

by the sudden rise in the water level. In the plains, the heavy rainfall only leads to slow onset floods and water logging, whereas in the hills, mass wastage causes permanent loss of land and infrastructure. Transport sector was particularly hit hard by landside, flash flood, cloudburst and flood events. Rishikesh – Gangotri National Highway, along with link roads were disrupted and the Government had to arrange supply of essential commodities in the remote areas. The summary of traffic disruption along the Char Dham Yatra route highlights the seriousness of the situation. The National Highways of Uttarkashi, Gangotri and Yamunotri were almost closed during July-August.

Details of traffic disruption along Rishikesh – Gangotri as also other National Highways in the state between 1st June and 18th August 2012.

Sl No	Highway	Number of days when traffic was disrupted on the Highway			
		June (30days)	July (31 days)	August (Till 18th)	Total (79 days)
1	Rishikesh - Gangotri	05	09	15	29
2	Yamunotri	03	9	16	28
3	Rishikesh - Badrinath	NIL	08	10	18
4	Kedarnath	2	7	14	15

Relief and Rescue:

The Government of Uttarakhand mobilized its resources to manage the situation and Army, Para- military forces, Indian Air Force and NDRF assisted the state Government in rescue and relief operation. More than 34 human lives were lost due to the event that has totally devastated the entire region and gains of more than a decade of development were washed off overnight.

The State Government deployed its resources and took precautionary measures to manage the situation. All educational institutions of the district were closed and all the Government officials, who were on leave were recalled for duty. Additional Revenue officials (4 SDMs and 5 Tehsildars) were also deployed in district to assist the local administration. Support was sought from Army, ITBP, NDRF and IAF which assisted in rescue, evacuation and distribution of relief. The monsoon season also coincides with the peak pilgrim season of the State and people in large numbers from across the nation visit Badrinath, Kedarnath, Yamunotri, Gangotri and Hemkunt Shahib Shriness situated in the Higher Himalayas. These pilgrims and tourists in large number were stranded at various places during monsoon

season. The situation was more serious on Rishikesh – Gangotri National Highway, which was continuously blocked for a long period as the vehicular bridge at Gangotri was washed away. The State Government, however, ensured that the pilgrims and tourists were evacuated at the earliest and IAF helicopters were pressed into action to evacuate the stranded pilgrims as also those requiring medical aid. State Government also ensured the supply of essential commodities and medicines and medical teams were even air dropped at remote locations. The blockade of traffic along the link roads, however, hampered supply of essential commodities to the far flung remote areas and extra effort was made to ensure that the public do not face scarcity of the essential supplies. On many occasions the State Government resorted to manual or animal transportation of essential supplies to ensure that there was no scarcity in remote areas.

Uttarkashi is a multi-hazard prone district, also facing human induced disasters resulting from unplanned development of land, forest cover, river basins, flood plains and especially from manifold population growth and tourism. Thus Uttarkashi, which forms part of the Hindu Kush Himalayan region, has to be prepared to face and cope with such disasters, especially when it is not possible to prevent them. The development of coping capacity needs to be in all the forms and also with short and long term perspectives. There should be a plan to respond in the first phase and then to prevent or mitigate the disaster and to be prepared as a follow up phase. Early return to livelihood should be the goal of all these measures. This will need for mainstreaming the disaster risk reduction (DRR) in developmental plans (Anandha kumar, K.J., 2013). The predictions of the impact of the climate change through modeling studies indicate increase in intensity of rainfall in some areas, though there may not be much variation in the annual rainfall. Goswami et al. (2006) found that the frequency of occurrence, as well as intensity of heavy and very-heavy rainfall events have significant increasing trends. There is need to prepare for these eventualities and prepare the community, so that community can be a reliable first responder, before the help reaches from outside, especially when communication and approachability gets disturbed, hampering access to the area in the hilly terrain, covered with forest. Further, People centric disaster management will also bring in a sense of ownership which will sustain such initiatives. The community may have to learn to live in total harmony with the nature.