

# आपदा प्रबन्धन

समाचार पत्रिका 8 (1), 2014

## मुख्य सम्पादक:

डा. पीयूष रौतेला

## सम्पादक मण्डल:

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## प्रारूप:

गोविन्द रौतेला

## सम्पर्क:

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## देवभूमि और आपदा

अनंत काल से उत्तराखण्ड को देश और दुनिया में देवभूमि के रूप में जाना जाता रहा है। हिन्दू धर्म के तो इस क्षेत्र में अनेकों धर्मस्थल हैं ही परन्तु अन्य धर्मों के भी अनेकों धर्मस्थल यहाँ स्थापित हैं जिसके कारण हर साल लाखों की संख्या में तीर्थयात्री व पर्यटक देश-विदेश से उत्तराखण्ड का रूख करते हैं। अब इसे विडम्बना नहीं तो और क्या कहेंगे कि पिछले कुछ सालों में इस क्षेत्र को यहाँ स्थित तीर्थ स्थलों से कहीं ज्यादा यहाँ घटित आपदाओं के लिये जाना जाने लगा है। वर्ष 2010 के बाद 2012 और फिर 2013 में इस क्षेत्र में घटित आपदायें संचार माध्यमों की सुर्खियों में रही हैं।

अब यहाँ घटित हो रही आपदाओं और उनसे होने वाले नुकसान के निरन्तर बढ़ने की विवेचना के लिये यहाँ की स्थितियों पर गौर करना अत्यन्त आवश्यक है। यहाँ इस क्षेत्र में मानव बसावत आज या कुछ सालों पहले की तो है नहीं। हो सकता है कुछ समुदाय यहाँ बाहर से आ कर बसे हों परन्तु कोई तो होगा जो यहाँ का मूल निवासी भी होगा। वैसे भी जब से देश के अन्य भागों में मानव गतिविधियों व बसावत के साक्ष्य मिलते हैं उसी समय से ही यहाँ उत्तराखण्ड में भी मानव निवास एवं सभ्यता विकसित होने के प्रमाण मिलते हैं। अपने अर्जित ज्ञान एवं अनुभव के आधार पर यहाँ बसे हमारे पुरखों ने बहुत जल्द यह कटु सत्य भी निश्चित ही समझ लिया था कि यहाँ की पर्यावरणीय स्थितियाँ अन्य स्थानों से भिन्न हैं और सही सामंजस्य के अभाव में समुदाय की सुरक्षा खतरे में पड़ सकती है।

अतः जल्द ही उन्होंने यहाँ के पर्यावरण एवं पारिस्थितिकी से संतुलन बनाने के लिये कायदे-कानून भी बना लिये। कहीं इन्हें धार्मिक-सांस्कृतिक आधार दिया गया तो कहीं इनके लिये सामाजिक प्रतिबन्धों का सहारा लिया गया। जैसे भी हो उन्होंने सुनिश्चित किया कि इन नियमों का सभी कड़ाई से पालन करें। जल स्रोतों, जंगलों एवं अन्य संसाधनों को संरक्षित करने और यहाँ प्रायः घटित होने वाली आपदाओं से बचे रहने के लिये हमारे पुरखों द्वारा किये गये प्रयासों को इस क्षेत्र में प्रचलित रीति-रिवाजों एवं मान्यताओं के परिप्रेक्ष्य में सहज ही समझा जा सकता है।

वर्तमान परिदृश्य पर गौर करने पर स्पष्ट हो जाता है कि आज आपदा से जूझ रहे ज्यादातर स्थान

भूस्खलन या बाढ़ की समस्या झेल रहे हैं और इनमें से ज्यादातर नदी-नालों या अभी हाल में बनी सड़कों के समीप स्थित हैं। अब नदी-नाले तो हमेशा से कमाबेश ऐसे ही बहते रहे होंगे। आज अचानक से इनके विन्यास में कोई बहुत बड़ा बदलाव तो हुआ नहीं है। फिर अचानक से यह आपदा का दंश क्यों?

यहाँय हस मझनाअ त्यन्तअ त्वश्यकहै कइ सक्षेत्रक तीअ त्रिथकी हमेशा से कृषि व पशुपालन पर निर्भर रही हैं और यहाँ खेती सम्बन्धित ज्यादातर कार्य परम्परागत रूप से नदी-नालों के किनारे स्थित वेदिकाओं पर किये जाते रहे हैं तो पशुओं के चरान ऊपरी पहाड़ी ढालों पर। हमारे पुरखों को इन वेदिकाओं की अस्थिरता का पूरा ज्ञान था और वह जानते थे कि इनके साथ ज्यादा छेड़-छाड़ ठीक नहीं है। अपनी इस समझ के ही कारण वह हमेशा पहाड़ी के मध्य व ऊपरी ढाल पर स्थिर चट्टानों के ऊपर बसे और उन्होंने इन समतल वेदिकाओं के ऊपर बसने को कभी भी प्राथमिकता नहीं दी।

यहाँ यह भी ध्यान में रखना जरूरी है कि पहाड़ों में पानी के स्रोत पहाड़ी ढलान पर अपेक्षाकृत निचले स्थानों पर होते हैं। ऐसे में हमारे पूर्वजों को पानी व खेती-बाड़ी के लिये हर रोज लम्बी दूरी तय करना तो मंजूर था परन्तु अपने समुदाय के अस्तित्व को संकट में डालना नहीं। एक निश्चित योजना के अनुसार हमारे पुरखों ने व्यक्तिगत आराम व सुविधा की अपेक्षा हमेशा सुरक्षा को प्राथमिकता दी और यही उनकी सफलता का कारण भी बनी। सो, संसाधन सहज उपलब्ध हो या नहीं, वो बसे तो उन्हीं स्थानों पर जो अपेक्षाकृत सुरक्षित थे।

अब विकास के नाम पर पिछले कुछ सालों में हुये कार्यों पर एक नजर डालें तो इस क्षेत्र में और कुछ हुआ हो या न हुआ हो, अवसंरचना विकास के नाम पर हर जगह बिना ज्यादा सोचे-समझे सड़कों का जाल जरूर फैला दिया गया है। सड़क बनाने के लिये संवेदनशील पहाड़ों में बेतहाशा विस्फोटकों का उपयोग, पहाड़ी ढालों के दीर्घकालीन स्थायित्व पर समुचित विचार किये बिना ही जहाँ मर्जी वहाँ सड़कें बना देना, पहाड़ों को काटने से उत्पन्न मलबे के सुरक्षित निस्तारण का कोई भी उपाय न कर पाना; यह कुछ कारण हैं जिनकी वजह से आज हम आपदा का दंश झेलने को मजबूर हैं।

अपने पुरखों के एकदम विपरीत हमने कभी भी यह सोचने का कष्ट नहीं किया कि आखिर हमारे पुरखे समतल स्थानों पर क्यों नहीं बसे।

हमने ध्यान रखा तो बस अपनी सुविधा का और सड़क के नजदीक बस बसते ही चले गये। और फिर बदलते परिदृश्य में सारी व्यावसायिक गतिविधियाँ भी तो सड़क के आस-पास के क्षेत्र तक सीमित हो कर रह गयी है। ऐसे में स्थानीय निवासियों को भी दोषी नहीं माना जा सकता। अब रिसार्ट सड़क से दूर हैं तो वहाँ पर्यटक व यात्री आयेंगे नहीं और फिर आये भी क्यों जब सड़क किनारे सारी सुविधायें मिल रही हो। ऐसे में बेहतर तो यही है कि रिसार्ट भी सड़क किनारे ही बना लिया जाये।

फिर ज्यादातर नयी बनी सड़कों का विन्यास भी तो नदियों के समानान्तर ही रखा गया है। अब सड़क नदी के करीब थी और यहाँ विकास कार्यों के लिये अपेक्षाकृत कम ही निवेश किया जाना था। समतल जमीन उपलब्ध थी सो निर्माण स्थल के विकास पर कुछ ज्यादा निवेश करना नहीं था और निर्माण सामग्री को भी सड़क से दूर प्रस्तावित निर्माण स्थल तक नहीं ले जाना था। यहाँ बसना सच में मुनाफे का सौदा था।

सभी को स्थितियाँ अनुकूल प्रतीत हुयी और अनायास ही पहाड़ी नदियों के दोनों पाट कांकरीट के जंगल में तब्दील हो गये। पर जो जरूरी नियोजन विकास से पहले किया जाना था उस पर हम ज्यादा तो छोड़ो जरा भी ध्यान नहीं दे पाये। न जल निस्तारण की व्यवस्था की गयी और न ही निर्माण को सीमित करने की। ऐसे में विनाश की रेसेपी धीरे-धीरे परन्तु अच्छे तरीके से तैयार हो रही थी। बस इन्तजार था तो बारिश के दौर और नदियों के उफान का। यह कमी भी 2010, 2012 और 2013 में इस क्षेत्र में हुयी वर्षा ने पूरी कर दी।

ऐसे में आवश्यक है कि हम नये सिरे से राज्य में हो रहे व प्रस्तावित अवसंरचना विकास कार्यों पर विचार करने के बाद ईमानदारी से स्थितियों को ठीक-ठाक करने के प्रयास करें। यदि हमने ऐसा नहीं किया तो आने वाले समय में स्थितियाँ हमारी कल्पना से भी अधिक विनाशकारी हो सकती हैं और तब शायद हम चाह कर भी कुछ कर सकने की स्थिति में न हों।

  
( पीयूष रौतेला )

## Early warning system

- Bhavna Karki Sajwan

The story of Noah's Ark has always been fascinating. Noah's Ark was the vessel that Noah built as per the detailed instructions given by God to save himself, his family, and a remnant of all the world's animals after God decided to destroy the world by flood because of the evil deeds of mankind. Similar story also exists in Hindu mythology where Vaivasvata Manu, considered the first king to rule the earth, saved mankind from the great flood after being warned of the same by the Matsya avatar of Lord Vishnu who had also advised him to build a giant boat.

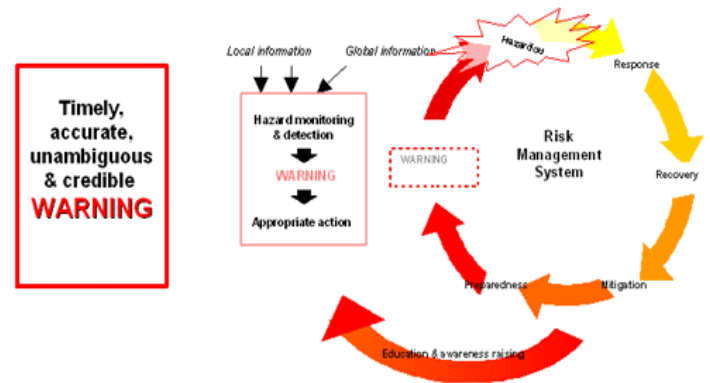
A child always listens to these stories in complete awe whereas a grown up tries to imagine and assess the whole scenario; magnitude of the incidence and size of the population involved. He even questions its nature; real or fiction.

Close scrutiny reveals this to be a classic case of disaster management that even includes what we in countries like India lack the most; early warning. In both the cases someone who could, may be based upon his knowledge and experience, comment upon extreme weather events had given an early warning. The same was responded to based upon the preparedness plan and the anticipated scale of impact.

Going by this example or otherwise, there is no doubt that an early warning can really turn a big disaster into just another incidence. Early warning system is in fact the first step and key to mitigation of the anticipated disaster event. Coming to the early warning in the Indian context, it is not possible in most cases but even in cases where some early warning is possible, initiatives on the part of most stakeholders are lacking.

In the previous some years there have however been some remarkable initiatives in this field. Indian Ocean Tsunami Warning System is one such initiative that has been set up to provide warning of the approaching tsunami to inhabitants of the nations bordering the Indian Ocean. Besides this, cyclone warning as also alerts, are issued for incessant rainfall and flood events by Indian Meteorological Department. Based on these public alerts or warnings are given in some states, especially in mountainous areas.

In fact, traffic updates provided by people to radio stations, are also example of early warning. A similar set up can well be established for interaction between the authorities and the public. This is especially important in



case of hilly areas where the roads are the lifeline and information regarding blockade or disruption of routes can be of great help in planning response or providing relief and other assistance. Many a times relief gets struck en route due to the disruption of surface transport. This can be avoided if information regarding the blocked roads is sent to authorities by the locals well in time. The scope of community radios can also be tested in areas where it has not yet been used.

Signage and signals used by traffic police for indicating onset of red light or condition of roads or traffic diversion are all in fact warnings that allow people to prepare themselves for facing various situations. Similar interventions can well be innovated for disaster management as well.

What an effective early warning system requires is strong technical foundation, good knowledge of risks and most importantly, robust and reliable information dissemination and response mechanism.

Developing and least developed countries have limited capacities for effective early warning and in many cases these are virtually non-existent. It however needs appreciation that opportunity and means always exist for developing a system and testing its reliability.

There do at the same time, also exist some traditional warning systems that people have been using for a long time and the reliability of these is time tested. There are numerous examples from across the world where people keenly observed and interpreted signs of nature, as also behavior of animals and issued early warning.

Besides this some simple and planned actions have the potential of making the difference felt. For example, Gujarat uses information from hospitals on the type of cases and their location, for issuing warning of outbreak of diseases. If number of reported cases exceeds a predefined number in some locality, an alarm is generated and actions are then initiated accordingly. This is not really complicated and can well be tried out

on small scale and then adopted accordingly by other regions. This kind of warning could be vital, especially during monsoon period when outbreak of diseases is common.

It needs to be understood that rather than technology and resources, we require innovative ideas for setting up effective early warning systems. Public is the key to establishing or testing these systems as the authorities have limited reach. By being part of the system public is sure to appreciate its purpose and cooperate effectively in the same. There is a need to work on building a rapport with public for devising and establishing effective early warning systems. When both the authorities and the public realize the importance of each other, and more so the importance of their working together, the system is certainly going to work. All we need to do is to keep trying and taking initiatives; small or big.

*(The author is City Project Coordinator, CRM Project, Shimla, Himachal Pradesh)*

## गरीबी हसरतों की

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कुछ अर्सा पहले शहर मेरा भी जवाँ हुआ करता था  
ख्वाइशों ने मेरी शायद बूढ़ा इसे कर दिया  
शहर के बीच इठलाती हुई नहर जब चलती थी  
दिल आशिकों का गुलजार / बागवान हुआ करता था।

आते थे जब लोग देखने मेरे शहर को  
लीचियों के बाग में मैं फक्र किया करता था  
अब मकानों के बीच में नदी है  
कर रही बहने की कोशिश।

ऐसी गरीबी शहर की, मैं शर्मिदा सा हो गया  
हसरतों की इम्तेहाँ नहीं, मकान ऊँचे गाड़ी बड़ी  
उस पर धूमिल आखों पर पट्टी काली चढ़ी  
किस दौड़ में शामिल हूँ मैं

वजह बेवजह आज मुझे मालूम नहीं।

हश्र आशियानों का तो होना ही था खराब  
जब पैसा, ईट, पत्थर बन गये स्थितोंकी मित्रस

का जवाब

ख्वाब मैं देखूँ तो देखूँ किसके लिए  
नस्ल की बेरुखी का हमें भी तो देना चाहिए

जवाब।

यूँ ना चल पायेगा महफिलों का दौर  
आधे फँकने वाले आधे से ज्यादा के मुँह में नहीं  
कौर

जिंदगी है सलाम तुझे क्या-क्या तूने जीने के लिए  
ना किया

ठिकुरन में बास्ति में भूखे नंगे जी रहे लोग बिन  
ठौर।

दरखतों से जो यारी थी वर्षों पुरानी  
शहर में देखी सुनी थी कहानी

## Telephone connection

- Devendra K. Budakoti

Padhani joined Jawaharlal Nehru University (JNU) in the year 1984 as a student of MA, Social Systems. He was a resident of Ganga Hostel, then a boys hostel. Some of his hostel friends are still friends and in regular touch. Murali was doing MA in English and is now an eminent journalist based in Delhi. Salim David, then student of Economics, is now Hyderabad based businessman. Syed Ali perusing Persian then is now in Saudi Arabia doing business and Sharad Tapasvi is now Associate Professor of Governance and Policy in some collage at Gurgoan. Swagata was Murali's classmate. It was through Murali that Padhani was introduced to her. Presently Swagata is teaching English and Communications in a Private University in Kuala Lumpur, Malaysia.

In those days mobile phones were unheard of. Even getting a simple landline connection in the campus was no easy job. In those days telephone connection in the hostel and campus used to be so important an issue to be incorporated in the manifestos of most parties contesting university elections.

To call home Padhani used to go all the way to Eastern Court Post Office in Janpath. Sometimes he also approached Chankyapuri Post Office. Later he used to stand in PCO queue for long hours late in the night to avail the benefit of low call rates. Today the scenario has changed drastically and looking at the telephone and mobile services available these days Padhani often remembers all kinds of contacts he had used to get a simple telephone connection.

I those days people who did not have a telephone connection gave their PP numbers, popularly called parosi - Phone. Today PP is history and the parosi relationship and concept has also undergone big transformation, at least in big cities and towns. PCO then came as a sign of relief and made it convenient to pass messages and communicate with each other. Before mobile services revolutionized the communication scenario, getting telephone connection was not easy and



one had to wait invariably for a few years before being obliged with a connection.

After marriage, Padhani moved to married hostel where his spouse insisted for a telephone connection. So he applied for the same in 1992. The couple had to wait for almost four long years to get the release order / letter from MTNL. This was in February 1996. After that weeks passed by but nothing seemed to move. In this period Padhani however paid many visits to MTNL sub-station near the campus. On every such visit both Lineman and Junior Engineer put forth reasons for inaction together with solid assurances.

A distant relative working with MTNL was then located. After a while, he too however surrendered to the circumstances. Hoping to break the inertia, a long telegram was then sent to the Chief General Manager, MTNL. Nothing really moved except the wife's hand to the poor husband's neck. Panicked Padhani thus met all and sundry; vegetable seller Lala Bhawani Shankar Choudhary ji in the University Shopping Complex, Sanjay Photostat - wala near the campus, loveable Joshi ji the Paper - wala, and not to forget the former students who were sahibs together with the students leaders close to various parties. Seeing the husband's pathetic condition Swagata even suggested meeting the Prime Minister in his morning darbar. The husband pacified her and instead sent a telegram and a registered letter to then Communication Minister, Beni Prasad Verma. Nothing moved even after meeting concerned senior officials on stipulated day and time.

In September 1996 Swagata faxed a letter to the Chief General Manager with seemingly guanine reasons of her husband's regular outstation assignments, their two years old daughter staying abroad with her mother and her in-laws staying at another station. Nothing happened and

the phone was installed on its own sweet time; in mid - October that year, though yet not activated. The nationwide P&T strike that year further delayed the activation. Padhani hoped to get birthday gift from MTNL by October end when the strike was called off. It was however realized hard way that the sarkari karmchaaris are used to return gifts.

The one sided attack on the husband during that period has by now become a classified matter. Any leakage of this information is bound to lead to further drama and trauma. The phone was finally activated in the first week of November 1996, after almost nine months of getting the release order from MTNL. On the day, when the telephone was finally activated, Swagata did not show any excitement or happiness. May be the long wait had taken its toll. But at that time Padhani finally heaved a sigh of relief.

(Author is a development consultant)

## पहाड़ों का जीवन

-हरीश सिंह चम्याल

पहाड़ों का जीवन है ये अनोखा

झुझलाता जीवन या है ये झरोखा

कभी बर्फ की चादर, तो कभी बारिश का बसेरा

सिमटता है जीवन, जब होता है अँधेरा

मासूम सी जिन्दगी, सच्चे लोगों का आसरा

बस यही सोचता हूँ कि इस जीवन में प्रकाश है या

अँधेरा।।

नित झर-झर झरते झरने, छल-छल करती नदियाँ

पक्षियों की चहचहाहट, पहाड़ों के बीच निकलता सूरज

सूखी रोटी, ठंडा पानी और आनन्दमय जीवन

जब गरजते हैं बादल, मौसम करता अटखेलियाँ

वो सावन की बरसात, फिर सिहिर उठता है जीवन

सोचता हूँ ये जिन्दगी की खुशियों है या या झुझलाता

जीवन।

जीवन की वो काली रात, जमकर हो रही थी

बरसात

एक ओर था पानी ही पानी और दूसरी ओर लाश ही

लाश

मासूम जिन्दगियाँ सिमट रही थी और थम रहे थे

जीवन के पल

## आपदा और हमारी जिम्मेदारी

-पीयूष रौतेला

यहाँ पहाड़ में घटित होने वाली किसी भी आपदा के बाद प्रायः हम सभी जाने-अनजाने सरकार, सिस्टम, अनियोजित विकास आदि को इसके लिये उत्तरदायी सिद्ध करने में कोई कोर-कसर नहीं छोड़ते हैं। शायद ऐसी प्रतिक्रिया करना हमारी आदत बन चुका है और हम में से कुछ ही होंगे जिन्होंने अपनी इस प्रतिक्रिया को कभी तर्क की कसौटी पर खरा साबित करने की कोशिश भी की होगी। हमारी इस सोच के लिये आज के ये तथाकथित पर्यावरणविद्, बुद्धिजीवी व पत्रकार भी कम जिम्मेदार नहीं हैं। अपनी-अपनी दुकान चलाने के लिये यह घटनाओं की विवेचना अपनी सुविधा के अनुसार करने में कभी भी पीछे नहीं रहते हैं। पर क्या सच में इस सब के लिये हम स्वयं जरा भी उत्तरदायी नहीं हैं? क्या हमारा कोई दोष नहीं है? यक्ष प्रश्न है यह इसलिये किसी निष्कर्ष पर पहुँचने से पहले तथ्यों की सही विवेचना करना आवश्यक है।

वैसे देखा जाये तो आपदायें उत्तराखण्ड के लिये कोई नयी घटना नहीं है और समय-समय पर घटित होने वाली आपदाओं ने हमेशा से इस क्षेत्र की आपदा संवेदनशीलता को उजागर किया है। यह बात और है कि हमारी तरह यहाँ के निवासी जोखिम मानचित्र नहीं बनाते थे पर पता उन्हें अच्छी तरह से था कि कहाँ पर किस प्रकार का खतरा है। शायद यह इस क्षेत्र की विषम भौगोलिक स्थितियाँ, संसाधनों की सीमित उपलब्धता व क्षेत्र में बार-बार घटित होने वाली आपदा ही तो है जिन्होंने इस क्षेत्र के निवासियों को झुंझारू, आपदाओं का सामना कर सकने में सक्षम व ईश्वर के प्रति आस्थावान बनाया है। यहाँ ईश्वर का उल्लेख इसलिये आवश्यक है कि यह शक्ति का एक ऐसा स्रोत था जिसने यहाँ के लोगों को असफलताओं का धैर्य के साथ सामना करने और फिर से प्रयास आरम्भ करने की शक्ति दी। इसके बिना प्रयासों में निरन्तरता बनाये रखना शायद सम्भव नहीं होता।

यहाँ पहाड़ों में स्थितियाँ प्रारम्भ से ही विषम थी और बिना कुछ ठोस किये किसी भी समुदाय का यहाँ सुरक्षित रह पाना असम्भव नहीं तो कठिन अवश्य था। अतः यहाँ बसने वाले लोगों ने अपने अर्जित ज्ञान और अनुभव के आधार पर यहाँ घटित होने वाली विनाशकारी घटनाओं के कारणों की विवेचना आरम्भ कर दी और साथ ही इनसे बचने के लिये सम्भावित विकल्पों पर भी कार्य करना शुरू कर दिया।

इन आपदाओं के कारणों की उनकी समझ को आज के अपने



वैज्ञानिक ज्ञान व समझ के सापेक्ष हम अपरिपक्व व अवैज्ञानिक अवश्य कह सकते हैं और हमारा ऐसा कहना एकदम से गलत भी नहीं होगा। परन्तु इन आपदाओं से बचने के लिये उनके द्वारा किये गये प्रयासों पर गौर करने पर हमें इतना तो अवश्य समझ में आ ही जायेगा कि उनके प्रयास अपने समय से कहीं आगे, उन्नत और भविष्यदर्शी थे और उनसे यहाँ पहाड़ों में मानव निवास की स्थापना व उसके स्थायित्व में सहायता मिली। इनके अभाव में यहाँ पहाड़ों पर सभ्यता का विकास होने और उसकी निरन्तरता बनाये रखने में निश्चित ही एक बड़ा प्रश्नचिन्ह लग जाता है।

यहाँ के लोगों ने जहाँ एक ओर समाज की सुरक्षा के लिये प्रभावी नियम-कानून बनाये वहीं यह भी सुनिश्चित किया कि सभी के द्वारा इनका कड़ाई से अनुपालन किया जाये। इसके लिये उन्होंने हमसे कहीं ज्यादा चतुराई से काम किया और नियमों के अनुपालन के लिये लोगों की ईश्वरीय आस्था व सामाजिक परम्परा में विश्वास को अपना अस्त्र बनाया; अवहेलना की स्थिति में सामाजिक बहिष्कार व प्रताड़ना या फिर दैवीय प्रकोप का भय तो था ही। इसने सच में एक सशक्त व्यवस्था स्थापित की और सैकड़ों साल पहले बनाये गये इन नियमों का आज अक्षरसः अनुपालन शायद न हो पर उनमें लोगों की आस्था आज भी कायम है।

यहाँ घटित होने वाली आपदाओं में से भूस्खलन व बाढ़ के कारणों की विवेचना करना भूकम्प की अपेक्षा काफी सरल रहा होगा। फिर इनकी बारम्बारता तब भी आज की तरह भूकम्प की अपेक्षा काफी अधिक ही रही होगी। प्रायः हर साल बरसात में होने वाली इन घटनाओं को देखने-समझने के अवसरों का यहाँ के निवासियों ने फायदा उठाया और इसके बाद उनके लिये इन घटनाओं व पानी की प्रचुर उपलब्धता के मध्य सम्बन्ध स्थापित करना कठिन नहीं था। इन

आपदाओं की विवेचना करते समय यहाँ के निवासियों ने जल चक्र की बारीकियों को भी समझा।

तब समुद्र और वहाँ से भाप बन कर उठने वाले बादलों व यहाँ पहाड़ों में होने वाली वर्षा के मध्य के जटिल सम्बन्ध को चाहे वह न समझ पाये हों परन्तु इतना तो वह स्पष्ट रूप से समझ ही गये थे कि पहाड़ की ऊपरी ढाल पर जो पानी भूमि के अन्दर प्रवेश करता है वहीं धारे, नाले के रूप में निचले क्षेत्रों में प्रकट होता है। अतः उनके लिये यह निष्कर्ष निकालना सरल था कि यदि ज्यादा पानी जमीन के अन्दर प्रवेश करेगा तो उनके आस-पास के जल स्त्रेत साल भर पानी देते रहेंगे।

इस समझ ने जहाँ एक ओर यहाँ के निवासियों को पहाड़ों के ऊपरी क्षेत्रों में वानस्पतिक आवरण को संरक्षित करने को प्रेरित किया वहीं दूसरी ओर पहाड़ी ढाल के मध्य क्षेत्र में चाल व खाल के निर्माण को। उनकी इस सरल-सीधी सोच को हम आज अपनी रिचार्ज जोन मैनेजमेन्ट और रिचार्ज पिट की अवधारणा से समझ व समझा तो सकते हैं पर सदियों पहले की इस परिकल्पना का कोई ठोस व प्रभावी विकल्प दे पाना हमारे लिये आज भी सरल नहीं होगा और फिर इन सब के रख-रखाव व सामाजिक स्वीकार्यता के लिये उनके द्वारा कही दैवीय श्रद्धा का तो कहीं सामाजिक प्रतिबन्धों का उपयोग किया गया। देवी-देवताओं को अर्पित वन इसका स्पष्ट उदाहरण हैं। आज भी क्षेत्र में अनेकों वन क्षेत्र हैं जिनमें कटान वर्जित है या फिर निश्चित अवधि या मात्रा में ही किया जाता है। कई वन क्षेत्रों में जलावन या घास के लिये काटने वाले उपकरणों का उपयोग प्रतिबन्धित है तो कई क्षेत्रों में लकड़ी या घास काटने से पहले कुछ अनुष्ठानों की बाध्यता है। यह सब दोहन किये जा रहे संसाधनों की मात्रा को सीमित करने का उनके द्वारा ईजाद किया गया एक कारगर तरीका है।

जल चक्र की पेचीदगियों का तो पता नहीं वह लोग कितना समझते थे पर उन्हें भूमिगत जल के अस्तित्व के बारे में अवश्य ही पता था और वह यह भी जानते थे कि इस जल को उपयोग में लाया जा सकता है। उसके बाद पता नहीं कैसे पर उन्होंने उन स्थानों को चिन्हित करने की विधि भी ईजाद कर ही ली जो कि भूमिगत जल के दोहन के लिये उपयुक्त थे।

इसी के साथ इस क्षेत्र में नौलों (जिसे कम गहरे कुवे के रूप में परिभाषित किया जा सकता है) को बनाने की समृद्ध परम्परा ने जन्म लिया। इनकी देख-रेख व रख-रखाव के लिये दैवीय आस्था व



परम्परा का सहारा लिया गया और आज भी मानव जीवन के लगभग सभी कर्म-काण्ड किसी न किसी रूप में इन जल स्रोतों से जुड़े हैं। विवाह के बाद नवव्याहता को पूजा के लिये प्रायः जल स्रोत पर ले जाया जाता है। यहाँ इस पूजन में नवव्याहता से जल स्रोत की तरह जीवन देने व परिवार की निरन्तरता बनाये रखने की अपेक्षा नीहित है। हिमनदों से निकलने वाली सदाबहार नदियों से लगभग विहीन कुमाऊँ के लिये तो भूमिगत जल के उपयोग की यह खोज वरदान सिद्ध हुयी और उस क्षेत्र में नौलों की परम्परा भी काफी अधिक विकसित हुयी।

हो सकता है कि भूमि की सतह के आस-पास उपलब्ध नमी या जल रिसाव की उपस्थिति के आधार पर उन लोगों ने नौलों के लिये उपयुक्त स्थान चिन्हित किये हो पर केवल इसी के आधार पर वह पहाड़ी के एकदम ऊपर बसे अल्मोड़ा या नागथात जैसे स्थानों पर गहरे कुँवे तो नहीं खोद सकते थे। निश्चित ही वह लोग भूमिगत जल का पता लगाने के बारे में कुछ ऐसा तो अवश्य जानते थे जिसका पता हम अब तक नहीं लगा पाये हैं। शायद उनका यह ज्ञान अब विलुप्त हो गया है या फिर उसके ऊपर समय बीतने के साथ इतनी धूल जम चुकी है कि हम उसे देख ही नहीं पा रहे हैं।

देखा जाये तो यह एक अत्यन्त ही महत्वपूर्ण खोज थी जिसने पहाड़ों में मानव बसाव की सीमा को नदी-नालों की निकटता से मुक्त कर दिया। इसके बिना पहाड़ी के ऊपर बसे अल्मोड़ा व पौड़ी जैसे स्थानों पर मानव निवास की कल्पना भी नहीं की जा सकती।

इस सब के साथ यहाँ निवास करने वाले व्यक्तियों ने यहाँ पहाड़ों पर प्रायः होने वाले भूस्खलन के कारणों और इस प्रक्रिया में पानी की भूमिका को भी भली-भाँति समझा और इसकी रोकथाम के उपाय किये। अपनी भूस्खलनों के कारणों की समझ के आधार पर आज भी हम भूमि के अन्दर छिद्रों में जल के दबाव को एक सीमा से अधिक

होने को भूस्खलन का मुख्य कारण मानते हैं। सरल शब्दों में कहा जाये तो भूमि की सतह के अन्दर रिसने वाले पानी के एक सीमा से अधिक होने पर भूस्खलन आरम्भ होते हैं और यदि किसी तरह इस पानी की मात्रा को एक सीमा के अन्दर सीमित किया जा सके तो भूस्खलनों को नियंत्रित किया जा सकता है। आज भूस्खलन की रोकथाम के लिये उपयोग में लाया जाने वाला यह एक कारगर तरीका है। भूस्खलन संवेदनशील ढाल से जल के निस्तारण के लिये प्रायः लगाये जाने वाले छिद्रयुक्त पाइप आपने भी कहीं न कहीं अवश्य देखे होंगे।

पता नहीं इतना सब उन्होंने समझा या नहीं पर किया ठीक वही जो हम करने की बात कर रहे हैं। अपने अनुभव के आधार पर उन्होंने भूस्खलन के प्रति संवेदनशील स्थान चिन्हित किये और उनके ऊपरी ढाल पर जंगल गूलों का निर्माण किया ताकि वर्षा के जल का निकटवर्ती नाले में सुरक्षित निस्तारण किया जा सके। वर्षा ऋतु के आगमन से पहले समुदाय मिल-जुल कर इन गूलों की सफाई व मरम्मत करता था और यह गूलें सच में बहुत प्रभावी थी। इन गूलों के अवशेष अब भी कालीगंगा व मध्यमहेश्वर घाटी में कई स्थानों पर देखे जा सकते हैं।

इसी के साथ इन लोगों ने पहाड़ी ढाल को सीढ़ीदार स्वरूप दिया। अब ऐसा निश्चित ही भूस्खलन की अपेक्षा खेती-बाड़ी को ध्यान में रख कर किया गया होगा पर जो कुछ उन्होंने किया उससे पहाड़ी ढाल को स्थायित्व तो मिला ही। और फिर आज भी भूस्खलन प्रभावित क्षेत्र को सीढ़ीदार स्वरूप देना ढाल के उपचार के लिये हमारे पास उपलब्ध विधियों में सर्वाधिक प्रचालित व प्रभावी विधि है। ऐसे में इस प्रश्न का उठना भी स्वाभाविक है कि कहीं यह विधा हमारे आज के वैज्ञानिकों ने यहाँ के निवासियों से ही तो नहीं सीखी?

अब यहाँ के निवासियों को पहाड़ी ढाल के स्थिरीकरण के लिये उन्हें सीढ़ीदार स्वरूप प्रदान करने के पीछे छुपे तकनीकी कारणों का ज्ञान हो या न हो पर उन्हें इतना जरूर मालूम था कि इन सीढ़ीदार खेतों में जमा होने वाले पानी का दबाव उन्हें नुकसान पहुँचा सकता है। तभी तो वह जान-बूझ कर घरों से दूर स्थित ऐसे खेतों में मेढ़ नहीं बनाते थे जिनकी देख-भाल करना बरसात के मौसम में कठिन हो।

यहाँ यह समझना भी जरूरी है कि इस क्षेत्र की अर्थव्यवस्था हमेशा से ही कृषि व पशुपालन पर निर्भर रही है और यहाँ ज्यादातर जगहों में खेती से सम्बन्धित कार्य मुख्यतः नदी-नालों के नजदीक के खेतों या

वेदिकाओं के ऊपर किये जाते रहे हैं तो पशुओं का चरान ऊपरी पहाड़ी ढालों पर। नदी-नालों के समीप स्थित खेती-बाड़ी के लिये प्रयुक्त होने वाले समतल खेतों को यहाँ के लोगों ने नदी का प्रवाह बढ़ने पर प्रायः अस्थिर होते और बाढ़ से प्रभावित होते अवश्य ही देखा होगा। तभी तो यहाँ के निवासियों ने इन स्थानों को कभी भी निवास के लिये सुरक्षित नहीं माना; यह लोग बसे तो बस पहाड़ों की ऊपरी या मध्य ढाल पर ठोस व स्थिर चट्टानों के ऊपर ही। ऐसे में जब पानी के स्रोत पहाड़ों की मध्य या निचली ढाल पर स्थित हो उनके इस निर्णय की दूरदर्शिता सच में अचम्भित कर देती है।

यहाँ पहाड़ों में आपदा का सबसे बड़ा खतरा भूकम्प से है और बाढ़ से बचने के लिये ही सही पर ठोस व स्थिर चट्टानों के ऊपर बसने के सामरिक महत्व के इस निर्णय ने यहाँ के निवासियों को भूकम्प से होने वाली क्षति से भी बचाया। आज हम जानते हैं कि भुरभुरी मिट्टी वाली जगहों पर ठोस चट्टानी स्थानों की अपेक्षा भूकम्प से अधिक नुकसान होता है। इसके साथ ही इन लोगों ने पता नहीं कैसे पर करीब-करीब हजार साल से भी ज्यादा समय पहले भूकम्प सुरक्षा के मूलभूत नियमों को अपनी पारम्परिक भवन निर्माण शैली में आत्मसात कर लिया था।

और ऐसे में जब हमें ही भूकम्प के कारणों का ठीक से पता अभी बीती सदी के उत्तरार्द्ध में लगा हो यह कहना कि यहाँ के निवासी भूकम्प के कारणों के बारे में जानते थे, अतिशयोक्ति ही होगा। कारण जानते हो या नहीं परन्तु इन लोगों की परम्परागत भवन निर्माण शैली के अध्ययन से इतना तो स्पष्ट पता चल ही जाता है कि यह लोग भूकम्प से होने वाली क्षति के कारणों तथा उसे कम करने के तरीकों के बारे में अवश्य ही काफी कुछ जानते थे।

लम्बी अवधि के अन्तराल में आने वाले भूकम्पों से अवसंरचनाओं को होने वाली क्षति को कम करने के लिये किसी भी प्रकार के उपाय करना और फिर अगले भूकम्प में इन उपायों की प्रभाविकता को परख पाना भूकम्प से होने वाली क्षति के विस्तृत प्रलेखन के बिना सम्भव नहीं है। ऐसे में यहाँ के निवासियों के प्रलेखन के तरीकों का अध्ययन अपने आप में किसी चुनौती से कम नहीं है।

भूकम्प सुरक्षा के लिये यहाँ के निवासी केवल ठोस चट्टानों के ऊपर बस जाने भर से संतुष्ट नहीं थे। इसके लिये उन्होंने अपने अर्जित ज्ञान व अनुभव के आधार पर न जाने कितने प्रयोग करने के उपरान्त सदियों की मेहनत से भूकम्प सुरक्षित भवन निर्माण के ठोस नियम बनाये।



भूकम्प सुरक्षा या आपदा से सुरक्षा के लिये सबसे ज्यादा जरूरी है सही स्थान का चयन। आज भी हम भू-वैज्ञानिक सर्वेक्षण एवं भूमि की धारण क्षमता की जाँच के बाद ही निर्माण स्थल का चयन करते हैं। चौकिये मत! ऐसी ही जाँच की एक सरल विधि यहाँ के निवासियों ने काफी समय पहले ही विकसित कर ली थी। निर्माण हेतु प्रस्तावित स्थान की मिट्टी कुछ विशिष्ट व्यक्तियों को दिखाने की यहाँ परम्परा हमेशा से रही है। यह व्यक्ति सम्बन्धित स्थान की मिट्टी के भौतिक गुणों के आधार पर उस स्थान पर निर्माण की उपयुक्तता पर अपनी विशेषज्ञ राय देने में सक्षम थे या फिर यह भी कहा जा सकता है कि इन व्यक्तियों ने अपने अनुभव व अर्जित ज्ञान के आधार पर मिट्टी के भौतिक गुणों और स्थान की धारण क्षमता के मध्य के सम्बन्ध को समझते हुये इस प्रकार परामर्श देने का एक सरल पैमाना विकसित कर लिया था। यह विधि आज भी कई क्षेत्रों में उपयोग में लायी जाती है।

स्थान के चयन के बाद आता है नींव का नम्बर। इसके लिये भी यहाँ स्पष्ट नियम थे। बुनियाद को ठोस चट्टान के मिलने तक खोदा जाता था और निर्माण कार्य शुरू करने से पहले उसे एक-दो बरसात तक छोड़ दिया जाता था ताकि निर्माण से पहले जितना धँसाव होना हो वह हो जाये। इससे भवनों को आजकल के निर्माण में प्रायः दिखायी देने वाली क्षैतिज दरारों से मुक्त रखा जाता था।

भूकम्प सुरक्षा में भवन के विन्यास की महत्वपूर्ण भूमिका है। आज हम जानते हैं कि भवनों का विन्यास समरूप होना चाहिये और साथ ही इसे आयताकार या वर्गाकार होना चाहिये। हमारे पारम्परिक भवन इस कसौटी पर पूरी तरह खरे उतरते हैं।

इसी से जुड़ा दूसरा जरूरी पक्ष यह है कि भूकम्प सुरक्षा के लिये भवन में खुले स्थानों का कम और छोटा होना चाहिये। शायद गाँव के पुराने घर के दरवाजे से गुजरते समय आप भी अपने बुजुर्गों की समझदारी पर प्रश्न चिन्ह लगाते हो, पर उनके द्वारा जानबूझ कर मकान में दरवाजों व खिड़कियों की संख्या को सीमित किया गया और इनके आकार को अपेक्षाकृत छोटा रखा गया। इससे जहाँ एक ओर भूकम्प से सुरक्षा मिली वहीं दूसरी ओर ऊष्मा का संचयन भी हुआ जो कि आज भी पहाड़ी क्षेत्र के लिये अत्यन्त आवश्यक है।

भूकम्प की स्थिति में सुरक्षित रहने के लिये किसी भी अवसंरचना द्वारा उस पर लगने वाले बलों को पृथ्वी की सतह तक सफलतापूर्वक स्थानान्तरित कर पाने में सक्षम होना सर्वाधिक महत्वपूर्ण है। इसके



लिये हम आज बीम और कॉलम का सहारा लेते हैं। परम्परागत भवनों में यह भूमिका निर्माण में उपयुक्त होने वाले कड़ीक ब्रीमों द्वारा निभायी जाती थी।

इतना सब होने पर ही तो इतनी सदियों के बाद भी हमारे परम्परागत बहुमंजिला भवन सुरक्षित हैं। इन्होंने अन्य बड़े भूकम्पों के अलावा 1720 के कुमाऊँ भूकम्प व 1803 के गढ़वाल भूकम्प को भी झेला ही है।

इसे अपने बनाये भूकम्प सुरक्षा नियमों पर विश्वास ही तो कहेंगे कि भूकम्प संवेदनशील इस भूभाग में बहुमंजिला भवन निर्माण की समृद्ध परम्परा ने जन्म लिया। यह बहुमंजिला भवन इतनी ज्यादा संख्या में थे कि उत्तराखण्ड की दोनों ही प्रमुख भाषाओं में इन भवनों की चार मंजिलों के लिये पृथक-पृथक शब्द निर्धारित हैं। कुमाऊँनी में यह शब्द गोठ, चाक, पान व छज हैं तो गढ़वाली में कोटी, मुजआ, बौण्ड व बौरार।

इस क्षेत्र में खेती हमेशा से ही वर्षा पर निर्भर रही है जिसके कारण वर्षा के समय या परिमाण में जरा से परिवर्तन से फसल की क्षति का होना एक आम बात है। ऐसी स्थितियों में यह सुनिश्चित करने के लिये कि किसी भी परिवार की पूरी की पूरी फसल नष्ट न हो यहाँ के निवासियों ने कृषि भूमि का बँटवारा इस प्रकार किया कि हर किसी के हिस्से में ऊखड़ खेतों के साथ ही कुछ सिंचित खेत भी अवश्य ही आये। आज चक्रबन्दी के युग में यह अटपटा अवश्य लग सकता है पर यह खाद्यान्न की आपूर्ति सुनिश्चित करने की यहाँ के निवासियों की एक सोची-समझी रणनीति का हिस्सा था। इसके साथ ही अपने कृषि के उन्नत ज्ञान के आधार पर यहाँ के निवासियों ने फसलों की ऐसी प्रजातियाँ विकसित की जिन पर मौसम का ज्यादा प्रभाव न पड़े।

इसी तरह पशुपालन के यहाँ की आर्थिकी का प्रमुख अंग होने के कारणय हाँके निवासियोंने एसीप शुप, जातियों चकसितक रीज के विषम भौगोलिक परिस्थितियों में इष्टतम् उत्पादन सुनिश्चित कर सकें।

यह बात और है कि यहाँ के निवासियों ने आपदा प्रबन्धन के नाम पर शायद कुछ भी न किया हो परन्तु संसाधनों के बेहतर प्रबन्धन व समुदाय की सुरक्षा सुनिश्चित करने के लिये उन्होंने जो कुछ किया उसके आगे हमारे द्वारा अब तक आपदा प्रबन्धन के नाम पर किये गये सभी प्रयास निरर्थक हैं। हमारे पूर्वजों के इन प्रयासों के बिना इस क्षेत्र में सभ्यताओं का विकास हो पाना इतना सरल न होता।

आज हमारे आस-पास आपदा के रूप में जो कुछ घट रहा है उसे हम में से ज्यादातर क्षेत्र में बढ़ रहे मानवीय हस्तक्षेप के रूप में परिभाषित करते हुये इस क्षेत्र के संरक्षण के तर्क देने में व्यस्त हैं। यहाँ शायद हम भूल रहे हैं कि निरन्तर बढ़ रही आबादी और उसकी जरूरतों के आकार-प्रकार के साथ किसी भी क्षेत्र में मानवीय हस्तक्षेप को नियंत्रित कर पाना सम्भव नहीं है और फिर यहाँ जो हो रहा है उसके लिये क्या परम्परागत ज्ञान की अनदेखी जिम्मेदार नहीं है?

आज जरूरत है तो यह समझने की, कि यहाँ के निवासी किस प्रकार इतनी सदियों से इस आपदा संवेदनशील क्षेत्र में सुरक्षित रह पाये। उसके बाद यहाँ के लोगों की परम्पराओं को परिष्कृत कर उनको आत्मसात करते हुये क्षेत्र के विकास के लिये उपयोगी व यथार्थपरक योजनायें बनायी जानी चाहिये। इसके लिये हमें लीक से हट कर शोध व अध्ययन करने होंगे, कुछ नया करने के विषय में सोचना होगा।

अब भी यदि हमने इस पर ठीक से ध्यान नहीं दिया तो एक ओर जहाँ समय बीतने के साथ क्षेत्र के परम्परागत ज्ञान की बारीकियों को हम भूलते जायेंगे वहीं दूसरी ओर क्षेत्र में आपदाओं से होने वाली क्षति का परिमाण भी निरन्तर बढ़ता ही जायेगा।

## Aam Adami

- Rahul Jugran

We are self-conscious, self-aware, self-determined, self-righteous, self-transparent, self-honest in our definitions of these; of course with variances to the definitions suiting our own comfort and ease. We have been quite very aware and rightly so achieved a lot, in terms of our rights, as citizens of this nation.

Apart from the rights enshrined in the Constitution we have achieved many other instruments to ensure



deliverance and recent ones include Right to Information, Right to Food, Right to Education. All this is fine and much desired without any iota of doubt, to ensure better deliverables and accountability at the end of government.

However is it not time for the common man in this country to indulge into some introspection?

In today's environment, I see the nation keenly asking for the Right to Honesty from its nation's common man, its aam admi, who has been on the fore front and has been the most vociferous in demanding his rights as the citizen of this country.

I do however observe a number of things in the common man's disposition and often get confused at our profound and intense demands for our right. In this righteous and right seeking nation, I am also able to see deep and find i) the walls of the city demanding honesty and freedom from punishable pukes and posters displayed so zealously as a mark of callousness and pathetic civic sense, ii) the tap asking for its right to water after colossal wastage, iii) the roads demanding honesty and mercy for their irreparable damage and absolute misuse and iv) the rivers demanding its share of honesty from a number of (if not all) hypocrites worshipping her for centuries and at the same time ensuring its suffocation in physical and spiritual sense.

I feel we the aam admi suit our convenience by ensuring that everything in the Constitution more or less talks / lays and highlights our rights as citizens; how about some introspection towards honesty in enjoying these rights with a very limited but meaningful sense of duty and responsibility.

Is it not high time for the aam admi to realize that there have been enough of accountability and queries from the politicians in this nation; the idea is not to stop their

accountability or the accountability of institutions but we need to realize that the danger with too much / extremity can be and has been well reflected in the sense that most of the this genuine criticism today has got reduced to triviality.

As part of honest selfless introspection can't the common man take his share of responsibility in the pathetic state of affairs? Or he is more than happy in attaining salvation in doing his duty of just blaming the politicians and systems in the country.

Has he been proactive enough to fulfill his duties by ensuring that the system could change with his greater participation in the largest democracy of the world?

Has he ever bothered to impress upon the political parties, to corner them, to ensure their manifesto reflects some sense of movement towards political reforms. Are political reforms not as much required as other important things of immediate necessity in the nation that is held at ransom over onion prices or CWG, 2G / 3G, or Adarsh to name a few.

While all this is important it still does not deliver goods; sustainable good in the larger and holistic improvement of the nation, with institution and systems working and the rot getting nipped in the bud.

We as a nation have come to an ironic state where 65 years after Independence our self-sufficiency, our green or white revolution and our agriculture based economy with all India shining credentials across the world now motivates us to move another bill; Right to Food Security.

This is not to say we have not achieved much or we are not capable of greater food production but the same, as many sociologists and economists feel, has to match with the power of buying which is abysmally low in our nation and the same is well reflected in figures of malnutrition, starvation deaths and the like.

Not deviating though but the fact is that no discussion today can be complete without mentioning the success of AAP but rather than allaying fears and discussing the prospects of AAP, the common man needs to focus on himself and his beliefs in life, to stand true and rock solid within and outside, charity begins at home.

On the other hand we need to realize that the common man and the leaders in this nation have lost the art of connecting (truly) with the deprived large sections of society, both in urban and rural India and we are not able to see the distressed and deprived people fast loosing aspirations and hope and getting increasingly angry.

As experts say, along with numerous other qualities, it is the quality of feeling empathy towards people, employees, colleagues that actually makes one a successful leader and eventually leads to success of an organization or nation. People or organizations that are not empathetic or are pseudo - empathetic often end up being selfish, shortsighted and full of vanity.

Empathy is built from three major behaviors; i) recognizing your short comings past and present, ii) listening to others and learning more about their lives and private, personal challenges, and iii) explicitly aspiring to a noble ideal of leadership.

In this world of fast consumerism where retaining balance in life itself is a major challenge, grooming a child away from the calculated incessant volleys of advertisements is a greater challenge more so when the groomers themselves are a prey to materialism and consumerism.

One has to realize and it is not as easy as it sounds in life; as someone said, "It does not matter what jeans, shoe or jewelry you wore in life; what matters is what you learnt in life and how you used it."

I feel very strongly that the common man has to really work on himself a lot before expecting leaders and political parties to deliver for the nation and before fanaticizing the destiny and glorious future for this nation.

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## आता नहीं है ख्वाब...

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- राहुल जुगरान

आता नहीं है ख्वाब में भी  
फिर नहीं वो शहर क्यों याद।  
बचपन जहाँ जवानी बीती  
ऐसा क्या हुआ वहाँ।  
कहते हैं कुछ समझदार परिंदे  
अटके हुये हैं उन्हीं घौसलों में जो  
आँधी अजीब सी आई थी यहाँ  
उड़ाकर ले गई सब, यादें भी मिलकर खोजो।  
तन्हा क्यों हर शक्स  
घूम रहा है झुण्ड में  
पानी में आग लगा ही दी है जब  
मजबूर है सब नहाने को गर्म कुण्ड में।  
घर अपना साफ रखने की होड़ में  
शहर का नाला गया है भर।

बरसा है पानी बरपा है कहर  
जाने कहाँ गुम हो गई शहर को जोड़ने वाली नहर।  
लीचियों के बाग में  
झूले सावन में पड़े  
दिखते हैं अब ज्यादा नहीं  
बाग ही उजड़ गये कहीं।  
क्या शोर शराबा होता था वहाँ  
खेलने हम भी लगते अनायास ही  
धूल-मिट्टी और पसीने में  
प्यार की मिठास बुझा देती हर प्यास यू ही।

### Car free cities

There is a growing trend amongst big metropolitan centers in Europe to curbe their emissions and the best example is Copenhagen that is building 26 bicycle superhighways that are to extend out from the city center as part of the city's goal to become carbon neutral by 2050.

One of the most beautiful cities in Europe, Hamburg has embarked on an ambitious plan that aims to promote cycling and walking as the main means of transportation throughout the city. The goal of Hamburg's project is to replace roads with a "gruenes netz" or a green network of interconnected open areas covering 40 percent of the city. The local administration plans to complete its green network that would virtually connect all parts of the city within 15 - 20 years. Even animal inhabitants are to benefit, as any critter that chooses to move through the network would be safe from being run over.

Hamburg is already one of the greenest cities of Europe with about 40 percent of the city's surface maintained as green areas, cemeteries, sports facilities, gardens, parks and squares. The city comprises of two major green hubs, one in the north and the other to the south. After the proposed green network is completed, all the residents would enjoy access to nature and a sustainable commute.

Median temperatures of the previous 60 years having risen to 9 degrees Celsius, marking a change of 1.2 degrees Celsius, the residents of Hamburg are reported to be particularly concerned about the implications of global warming on their routine lives. A bristling port city, Hamburg relies a lot on its North Sea trade routes and with the sea level already risen by

20 centimetres over the past 60 years and expected to rise by another 30 to 110 centimetres by 2100 their economy is sure to be adversely affected.

Besides curbing their emissions and making their own contributions to dimming global warming, the administration also has their residents' health in mind. Given that residents, especially children, the elderly and the ill, are to suffer with rise in temperature, making the city's climate as comfortable as possible is very important in order to provide quality of life.

Hamburg's vision does not just help residents get from point A to point B in a sustainable fashion, it offers people opportunities to hike, swim, do water sports, enjoy picnics and restaurants, experience calm and watch nature and wildlife right in the city. This is to ultimately reduce the need to take the car for weekend outings outside the city.

Hamburg is however not alone in banishing car from urban areas and the same is becoming a common trend in many European cities. London imposes a "congestion charge" on private vehicles entering the city centre during peak hours.

### संघर्ष विराम

- सुशील खण्डूड़ी

फैलती हुई बस्तियों की शाख से  
सिकुड़ते जल धाराओं के तट  
बयां कर रहे हैं अर्न्तद्वन्द  
मानव और अपने बीच की सीमा,  
विकास की होड़ ऐसी कि  
भूल गया मानव अपने आप में  
ये समझते हुए कि 'शक्तिशाली हूँ मैं',  
लेकिन जल धाराओं की असहनीय पीड़ा  
चुभ रही थी कंटक की तरह बदस्तूर,  
कुछ पल के लिए ही सही पर  
ये धारायें शांत हो गयी थी,  
शायद अपने अस्तित्व के लिए  
योजनाबद्ध तैयारी में लीन थी  
और अनवरत् दिखा ही गई  
शक्ति अपने महाप्रलय की पल में,  
लील गई वह सब कुछ जो

तटों के लिए बन बैठी थी अभिशाप,  
खौफ पैदा कर गई मनुष्य के दिल में  
प्रलय के ज्वार का कुरेद-कुरेद कर,  
और फिर से आधिपत्य जमा  
पुनः जीवित कर अपने क्षेत्र का विस्तार  
एक बार फिर शांत हो गयी .....।

## Break rules to set precedence

-Piyooosh Rautela

On the aftermath of 16 / 17 June, 2013 disaster in Uttarakhand a number of organisations have carried out studies in the affected area and have raised some fundamental questions on the relief and rescue works based on their observations. Evacuation of the disaster affected is one such area.

Evacuation refers to the acts undertaken to move a population group to places that are safe from the impact of disaster. This can well be precautionary and population likely to be affected can be moved to safe places before the disaster impact as was done before Phalin cyclone in Odhisa in October, 2013. Evacuation can well be carried out after the disaster impact and people can be moved to safer places from disaster affected areas as was done in Uttarakhand after June, 2013 floods.

Flash floods / floods in Uttarakhand disrupted road connectivity at many places across the state together with pedestrian connectivity at some places, particularly in the Mandakini valley that was hit the hardest. Both Valley of Flowers / Hemkunt Sahib and Kedarnath were thus cut off.

Extent of the damage incurred by floods to transport infrastructure can be well understood by the fact that the roads were washed off or blocked at 225 places affecting road length of around 18,000 kilometers. Along with this 245 culverts and bridges were either washed off or damaged.

Being peak tourist season people from across the country and abroad were present in large number in the state when the disaster struck. More than 1,50,000 persons were thus stranded at various places mostly on Gangotri, Bardinath, Kedarnath and Yamunotri route.

Despite inclement weather and inaccessible terrain conditions every possible resource was mobilized for evacuation that started in the wee hours of 18<sup>th</sup> June, 2013 itself and more than 2000 persons were airlifted the



same day. The magnitude of the effort put in can well be imagined from the fact that 69 permanent and temporary helipads were activated to evacuate the stranded persons and besides 17 civilian choppers hired by State Government, 54 IAF choppers and fixed wing crafts, 07 Army Aviation choppers and 04 choppers of other states were pressed into service. An Air Traffic Control, dedicated to rescue operations was set up at NTRO Jollygrant, 35 kilometers from Dehradun. More than 39,165 persons were thus evacuated by air.

Many were however unreachable even by air and were evacuated by surface route by ITBP, Army, Police, NDRF and DMMC SAR teams. 71 relief camps were organised across the state at different places and 1,51,629 persons were provided food, shelter, medical care and other facilities in these for different durations.

Persons evacuated by air from Mandakini valley were brought to the last road head at Guptakashi while those from Gangotri and Badrinath were brought to Chinyalisaur and Joshimath respectively. Even safe evacuation from these places was not hassle free and 586 buses and 1,440 taxis / jeeps were requisitioned for transport of these persons to Dehradun, Haridwar and Rishikesh.

Going by theory that is also based on previous experiences at different places, preference in evacuation should be given to ill, injured, elderly, children and women. That sounds perfect as healthy and younger ones can certainly withstand the odds for long and if not evacuated in time or on high priority the ones belonging to the above mentioned groups are most likely to be adversely affected.

There seemed nothing abnormal in following the theory and the set precedence was resorted for evacuation. But it was soon learnt that this was not a simple disaster situation and standard rules are meant for normal situations. So innovation became inevitable.



Majority of the people stranded in the disaster affected areas were from other states; apart from foreign nationals people from almost 23 states and union territories were involved. They had come over to Uttarakhand with friends and relatives or family for pilgrimage, sight seeing, trekking and adventure sports. They had little or no acquaintance with the place and hardly had anyone around who could be contacted for assistance. There was no problem in evacuating the injured and ill persons. Fixing priority on the evacuation of the remaining persons of the family and group however gave rise to many complications.

Firstly, the person, elderly or female, refused to be dissociated from the group. In an unknown place fear of dissociation, that too after a massive disaster was understandably no less than a trauma. Thus unless pressurized the identified persons resisted being evacuated.

Secondly, after being evacuated the person concerned refused to leave until rest of the group was evacuated. So logistics had to be arranged for the persons even after evacuation and that too in the vicinity of the helipad or airport being used for evacuation operations.

Thirdly, the evacuated persons in some situations were not conversant with either Hindi or English. In a group there was no problem as some of them could communicate in these languages but when evacuated alone this gave rise to major problems as rescue workers were not able to understand as to what the evacuee is trying to convey. In some cases it was hard even to make out the language being used for communication. With people from across the country, it was not easy to arrange persons who could interpret. Thanks to the volunteers, we could manage to communicate with these persons most of whom were females.

So rather than experimenting over it was decided that except in emergency situations the family be evacuated as a unit.

Large number of persons involved in disaster had lost their personal belongings and cash and had to travel long distances to reach their homes. The standard guidelines and relief norms are silent on the requirements of the disaster victims after they have been evacuated, but then something had to be done to ensure that these persons reach their destinations without much problems. Relief of Rs. 2,000 was thus provided to every evacuated person for en route expenses and arrangements were made for their travel back.

As an expression of solidarity with their people senior bureaucrats and politicians from across the country were stationed at Dehradun in the peak of the post - disaster operations. This was never expected and there was nothing in place to cater to their logistics and other requirements that largely involved information exchange and coordination. The same was however quickly arranged.

In a disaster involving people from many states with differing linguistic and ethnic characteristics and with no permanent anchorage in the state, the most important task was to ascertain the number of persons dead or missing in the event. It was not an easy task and lack of officially authenticated data had started to give rise to wild speculations. A missing cell was however quickly set up and information on the missing persons was collected and collated. It however had legal and financial implications and verifying if the person was actually missing was an uphill task. Procedures were however laid down for issuing death certificate and ex gratia relief to the next of kin of the persons who had gone missing.

## **धीरे-धीरे ही सही, पर सही दिशा में बढ़ रहे हैं कदम .....**

-आशीष कठैत, गोविन्द रौतेला, घनश्याम टम्टा

भूकम्प किसी को नहीं मारता, मारते हैं तो कमजोर घर। अतः स्पष्ट है कि भूकम्प सुरक्षा के लिये भवनों को भूकम्प सुरक्षित बनाया जाना ही भूकम्प से बचने का एकमात्र उपाय है। शहरों में तो शायद लोग अभियन्ताओं से परामर्श लेकर भूकम्प सुरक्षा सम्बन्धित उपाय कर भी लें परन्तु दूर-दराज क्षेत्रों का क्या? वहाँ तो राजमिस्त्री ही अभियन्ता और वास्तुविद् दोनों ही हैं।

यहाँ, हमारे यहाँ जैसे तो हर व्यवसाय के लिये औपचारिक प्रशिक्षण



की व्यवस्था है परन्तु पता नहीं क्यों पर राजमिस्त्री प्रशिक्षण की कहीं कोई व्यवस्था नहीं है। ऐसे में अनुभव के आधार पर सीखने के अलावा कोई विकल्प नहीं है। निर्माणकर्मियों में जदूरकरूप में अप्रैन्टिस करते यह मसाला बनाना सीख ही जाते हैं। अब यह बात और है कि सीमेन्ट-रेत-बजरी-पानी के अनुपात में झोल आ ही जाता है ऐसे ही किसी दिन जब उस्ताद का मूड ठीक न हो इन्हें कन्नी चलाने का मौका भी मिल ही जाता है। ऐसे में ये राजमिस्त्री आधुनिक भवन निर्माण कला के ज्ञान से अछूते रह जाते हैं और मसाला बनाने से लेकर सरियाँ मोड़ने, जाल बनाने तक की प्रक्रियाँ में कई छोटी-छोटी गलतियाँ करते रहते हैं। भूकम्प आने पर यही गलती जिन्दगी और मौत के बीच का फर्क बन जाती है। अतः हमारे लिये आवश्यक है कि समय रहते रूद्रराजकक्षेत्रों में काम करने वाले राजमिस्त्रियों का क्षमता विकास करते हुये उन्हें आधुनिक भवन निर्माण शैली का प्रशिक्षण दिया जाये।

आपदा न्यूनीकरण एवं प्रबन्धन केन्द्र द्वारा राजमिस्त्रियों के लिये भूकम्प सुरक्षित भवन निर्माण प्रशिक्षण कार्यक्रमों का आयोजन किया जाता रहा है। लगभग एक सप्ताह की अवधि के इन कार्यक्रमों में राजमिस्त्रियों को सरियाँ, सीमेन्ट, ईट, बुनियाद, उपकरण आदि से जुड़े विभिन्न पक्षों की प्रायोगिक जानकारी दी जाती है। वर्ष 2004 से वर्तमान तक केन्द्र द्वारा राज्य के विभिन्न जनपदों के 737 राजमिस्त्रियों को प्रशिक्षित किया है और जनसमुदाय की जागरूकता हेतु 30 से भी अधिक भूकम्प अवरोधी भवन निर्माण प्रदर्शन इकाईयों का निर्माण किया गया है।

प्रशिक्षण की अवधि में राजमिस्त्रियों को उपलब्ध कराये गये फीडबैक प्रपत्र का विश्लेषण करने पर स्पष्ट होता है कि ज्यादातर राजमिस्त्री इस बात को प्रत्यक्ष रूप से स्वीकार करते हैं कि सही जानकारी के अभाव में वे लम्बे समय से कई छोटी-छोटी गलतियाँ कर रहे थे। इस

प्रकार के प्रशिक्षणों से जहाँ एक ओर भविष्य में उन्हें सही दिशा मिलेगी, वहीं दूसरी ओर इन प्रशिक्षणों में सीखी गयी जानकारी व तकनीक का उपयोग का वह भविष्य में भूकम्प सुरक्षित भवन निर्माण कर पायेंगे।

उत्तराखण्ड आसन्न आपदाओं के प्रति अत्यन्त संवेदनशील है और इसमें भूकम्प सर्वाधिक विनाशकारी है। यदि हम नहीं चेते तो आपदाओं के परिमाण में गुणात्मक वृद्धि हो सकती है। इसके दृष्टिगत आपदा न्यूनीकरण एवं प्रबन्धन केन्द्र अन्य प्रशिक्षण कार्यक्रमों के साथ ही राजमिस्त्रियों के प्रशिक्षण पर भी विशेष बल दे रहा है। हमें आशा ही नहीं वरन् पूर्ण विश्वास है कि धीरे-धीरे ही सही पर हम सही दिशा में बढ़ रहे हैं।

## Natural vulnerability of Alaknanda valley

- K.S. Sajwan and Sushil Khanduri

Alaknanda and Bhagirathi valleys have experienced worst forms of disaster in recent times. Though prone to natural disasters what happened in June 2013 was unprecedented. The flooding of Mandakini on 16 and 17 June 2013 caused massive damage to settlements and infrastructures i.e., roads, buildings, hotels, bridges and hydropower projects. The damages were however restricted along the alignment of roads and river banks. The rainfall event that led to devastation started on 15 June and went on uninterrupted till 18 June 2013. District wise rainfall distribution between 13 and 19 June 2013 shows that Rudraprayag district received 366.3 mm of rainfall in that week. With normal weekly rainfall at 53.9 mm, what was received was significantly higher.

Preliminary assessment of National Remote Sensing Centre, ISRO, has identified 1356 landslides along the Alaknanda valley. 290 landslides have been identified and mapped through field investigations carried out after the disaster in Rudraprayag district. Debris, rock slides, rock cum debris, rockfall, topple, subsidence and complex type of slides are observed to be frequent in the area. Lake formation has also been observed around Jaggi village slide.

Mandakini valley of Rudraprayag district has a history of repeated natural disasters. High rainfall event between 11 and 18 August in 1998 was followed by hundreds of landslides that claimed 107 human lives and damaged 20 villages along Madhyamaheshwar and Kaliganga rivers. Among them, the Bhenti - Paundar landslide claimed 39 lives and caused damming of



Madhyamaheshwar river for more than 24 hours.

Geologically, the area is traversed by several faults and has witnessed two major incidences earthquakes in 1991 and 1999. These have widened the joints of already highly fractured and jointed rocks of the area. After heavy precipitation rainwater percolates through these jointed and fractured rocks and saturates the unconsolidated slope mass. With pore water pressure exceeding the limit of cohesion massive landslides often trigger.

Damming of rivers by landslide debris is no new phenomenon for Garhwal Himalaya and these together with landslides have caused massive losses in the past. Some of the reported disaster events of the region as summarized in the table below.

S.No.	Date/year	Event
01.	1803 & 1842	Earthquakes reportedly devastated Rudraprayag region.
02.	1857	A massive landslide reportedly blocked the flow of the Mandakini river for three days.
03.	1868	Landslide blocked Birahi river, a tributary of Alaknanda forming an artificial lake. Sudden bursting of the lake swept two villages and killed 70 pilgrims who were sleeping on the river bank at Chamoli.
04.	6 <sup>th</sup> Sept. 1893	Birahi river was again blocked by ~ 5,000 million tonnes of rock mass that rolled from 900 metres high valley flank. The debris blocked the river and an artificial lake, Gauna Tal, was formed. It was 270 metres high, 3 kilometres wide at the base and 600 metres wide at the summit. It was estimated that the lake would take at least a year to fill. The dam was thus to partially breach after the water began to topple it

05.	26 <sup>th</sup> Aug. 1894	Gauna Tal breached partially and the floods caused unprecedented damage to the property around Srinagar town; however no loss of life was reported.
06.	August 1968	Floods in Rishi Ganga created a 40 metres high blockade near Reni village in Chamoli. Lake was silted up by May 1970 and eventually breached in July 1970 causing landslide in downstream area.
07.	20 <sup>th</sup> July 1970	Alaknanda valley witnessed a major flood that is attributed to cloudburst. According to an estimate, flood transported about 15.9 million tonnes of sediment came down along with water of Birahi and blocked the flow of Alaknanda at Belakuchi that was later washed off along with several busses, pilgrims and local people.
08.	Aug 1979	Flash floods in Kunjya Gad, a tributary of Mandakini, inflicted heavy losses in Kontha, Chandranagar and Ajaypur. 29 persons were killed in this incidence and the course of Mandakini was blocked near Chandrapuri.
09.	1986	32 persons were killed in Sirwari landslide in Jakholi tehsil.
10.	July 1991	Prolonged rains and devastating debris avalanches near Gopeshwar destroyed many houses, killed 10 persons and caused loss of property. Two kilometres long stretch of road was completely washed away. 36 persons died in the event that devastated six villages around Gopeshwar.
11.	Aug 1995	Major cloudbursts took place at Bhimtala and Chamoli killing 18 persons and destroyed many vehicles. Four kilometres long road section was washed away in the incidence.
12.	Sept. 1995	Exceptionally heavy rainfall in the catchment of Alaknanda river caused considerable loss of property. Many houses, bridges, road sections and villages were washed away while lower portions of Srinagar and Karanprayag towns were flooded
13.	Aug 1998	Major landslides occurred at many places in Madhyamaheshwar and Kali Ganga valleys between 11 <sup>th</sup> and 19 <sup>th</sup> August. Massive landslide at Bheti - Paundar (in the vicinity of Mansuna) blocked the course of Madhyamaheshwar river for more than 24 hours causing serious concern in the downstream areas.
14.	1999	Chamoli Earthquake caused significant loss of human lives and property in



Rudraprayag district. Population of 11,500 in 34 villages was affected by the quake that caused loss of 36 human lives. 176 persons were injured in this incidence that took toll of 140 cattle.

15. 15<sup>th</sup> & 16<sup>th</sup> July, 2001 Landslides amid abnormally heavy precipitation in Phata area of Okhimath tehsil caused death of 28 persons. 15 villages of the area were affected by this incidence. 52 houses were damaged in the incidence that took toll of 62 cattle and 43 hectare agricultural land.
16. 21<sup>st</sup> July, 2005 04 persons were killed in the landslide around Vijaynagar in Agastyamuni. 14 houses were damaged in this incidence.
17. 26<sup>th</sup> July, 2006 Landslides and flash floods caused massive losses in Ladoli, Devali, Gholtir and Gursyal villages in Alaknanda valley.
18. 13<sup>th</sup> and 14<sup>th</sup> Sept. 2012 very heavy rainfall was recorded in the area around Okhimath in Rudraprayag district. This triggered landslides and debris flows at many places in the vicinity of Okhimath. These devastated Chunni, Mangoli and nearby villages and caused loss of 69 human lives. More than 70 residential houses were reportedly destroyed in these incidences that caused heavy loss of other infrastructure and facilities.
19. 16<sup>th</sup> and 17<sup>th</sup> June 2013 Flash floods in Alaknanda (Mandakini) valley.

The above description makes it amply clear that the areas devastated by the mass movement and flooding after June 2013 disaster have been inherently vulnerable and had been repeatedly affected by various disasters in the past. After the deluge of Kedarnath, reoccurrence of flooding in future cannot be ruled out in Mandakini valley.

It is therefore necessary to remove transported materials deposited by river during flood at many places along the river bed. This would otherwise pose a serious danger in the coming monsoon season. It is indeed a major challenge and resources are required to be earmarked for this on high priority. Certain stretches of national and state highway require realignment and these should be reconstructed appreciably away from the river.

Some slides, that include Nagjagai, Jaggi, Kunjethi and Jal Talla slides, have the potential of blocking the course of river. Besides this these have got huge amount of debris and debris laden water can easily erode the loose portions of the slope and lead to slope failures during monsoon period. Similar scenario was experienced during Kedarnath deluge where excavated rock mass dumped along the river banks by the hydropower

projects under construction in the area.

Special attention is therefore required to be given for treating major slide zones along the river and for removing transported material from the river bed. Detailed geological and geotechnical investigation of major slide zones would however be required before finalizing the mitigation plan.

### Fuel efficient travel

Professor Michael Sivak, at the University of Michigan Transportation Research Institute draws a surprising conclusion in one of his recent studies that flying is actually better than driving, when the amount of energy used is measured. In fact, everything seems better than driving. A long distance train uses 1,668 BTU per person mile. Planes use 2,691, and cars a staggering 4,218. (BTU, or British Thermal Unit, per person mile is a measure of energy used to move a person a mile.)

The balance has shifted since the 1970s, when the energy per person mile was about twice as much for flying than for driving. Now, cramming more people onto planes makes them more efficient per person. The load in aircraft, for better or worse, has increased, while the load in cars has decreased. So the energy is spread across fewer people in a car.

To match the emissions levels of flying, the US car fleet needs either to improve from the current 21.5 mpg on average to at least 33.8 mpg, or carry 2.3 people per trip instead of the current 1.38 people.

## खोज-बचाव व प्राथमिक चिकित्सा

- गोविन्द रौतेला, आशीष कटैत एवं घनश्याम टम्टा

आपदाओं या दुर्घटनाओं के एकदम बाद जिस कौशल की सबसे पहले और सर्वाधिक आवश्यकता होती है, वह है खोज-बचाव तथा प्राथमिक चिकित्सा। देखा जाये तो हम इन दो विधाओं को आपदा प्रबन्धन के दो महत्वपूर्ण स्तम्भ भी कह सकते हैं और यही आपदा या दुर्घटना के उपरान्त किये जाने वाले दो कार्य हैं जिनके कारण प्रतिवादन बलों को सबसे ज्यादा आलोचना का सामना करना पड़ता है। यदि ये काम ठीक हो जायें तो जाहिर है कि सराहना भी हो सकती है। वैसे त्वरित व प्रभावी प्रतिवादन के लिये हम राज्य आपदा प्रतिवादन बल भी बना रहे हैं पर इस बल की सहज उपस्थिति आपदा के एकदम बाद हर जगह तो हो नहीं पायेगी और यहाँ उत्तराखण्ड में



तो किसी भी क्षेत्र को आपदाओं से सुरक्षित माना नहीं जा सकता। ऐसे में ज्यादातर स्थितियों में प्रतिवादन कार्य आपदा में बच गये पास-पड़ोस के लोगों द्वारा ही किया जायेगा। ऐसे में जन सामान्य के लिये खोज-बचाव तथा प्राथमिक चिकित्सा जैसे प्रशिक्षण और भी महत्वपूर्ण हो जाते हैं। प्रशिक्षित व्यक्ति आपदा घटित होने के जितने समीप उपलब्ध होंगे प्रतिवादन निश्चित ही उतना प्रभावी होगा।

उपरोक्त तथ्य के दृष्टिगत राज्य सरकार द्वारा आरम्भ से ही भूकम्प सुरक्षित भवन निर्माण प्रशिक्षण कार्यक्रमों के साथ-साथ न्याय पंचायत स्तर पर खोज-बचाव व प्राथमिक चिकित्सा प्रशिक्षणों की आवश्यकता को प्राथमिकता के आधार पर स्वीकारा गया और वर्तमान तक राज्य के 11 जनपदों की 156 न्याय पंचायतों में 3,900 ग्रामवासियों को 10 दिवसीय खोज-बचाव व प्राथमिक सहायता प्रशिक्षण कार्यक्रमों द्वारा प्रशिक्षित किया जा चुका है।

अब ऐसा तो है नहीं कि एक बार प्रशिक्षण प्राप्त कर के प्रशिक्षक बन गये तो फिर आगे कुछ सीखना ही नहीं है। एक सफल प्रशिक्षक वहीं है जिसमें अरिज यादास ीखनेक ीभू खूक भीख त्मन ह ेअ रैव ह लगातार अपनी जानकारियाँ व ज्ञान बढ़ाता रहे, नई तकनीकें सीखता रहे। यह सुनिश्चित करने के लिये कि खोज एवं बचाव प्रशिक्षण कार्यक्रमों का संचालन करने वाले व्यक्ति नवीनतम विधाओं से परिचित हो, आपदा न्यूनीकरण एवं प्रबन्धन केन्द्र द्वारा समय-समय पर उनके लिये प्रशिक्षण कार्यक्रमों का आयोजन करवाया जाता है।

इन प्रशिक्षण कार्यक्रमों के अन्तर्गत दिनांक 11-12 मार्च, 2014 को मेडिकल फर्स्ट रिस्पॉन्डर (Medical First Responder; MFR) विषयक प्रशिक्षण कार्यक्रम का आयोजन आपदा न्यूनीकरण एवं प्रबन्धन केन्द्र में किया गया। उक्त प्रशिक्षण भारतीय रेड क्रॉस समिति, देहरादून के वरिष्ठ संसाधन व्यक्ति श्री योगम्बर एवं उनके सहयोगी श्री हरीश चन्द्र द्वारा प्रदान किया गया।

प्रशिक्षण के प्रथम दिवस में प्रशिक्षार्थियों को प्राथमिक चिकित्सा के मूलभूत सिद्धान्तों से अवगत करवाया गया। तद्पश्चात प्राथमिक सहायता के अन्तर्गत की जाने वाली विभिन्न प्रकार की गतिविधियों यथा; गुण, नियम, क्रम, मानवीय संरचना, शारीरिक कार्यप्रणाली, आस्ति भंग, सी.पी.आर., आकस्मिक बचाव आदि विभिन्न प्रकार की विधियों को विस्तृत रूप से समझाया गया। प्रशिक्षण को और सार्थक बनाये जाने हेतु समूह प्रस्तुतीकरण एवं समूह चर्चा पर विशेष बल दिया गया।

प्रशिक्षण के द्वितीय दिवस पर आस्थि भंग की स्थिति में बाँधी जाने वाली विभिन्न प्रकार की पट्टियों का प्रायोगिक प्रशिक्षण दिया गया। इस प्रशिक्षण कार्यक्रम में आपदा न्यूनीकरण एवं प्रबन्धन केन्द्र के 23 खोज एवं बचाव प्रशिक्षकों के साथ ही 02 विभागीय कार्मिकों ने भी प्रतिभाग किया।

## Changing roof-scape and increased vulnerability

- Piyooosh Rautela

There used to be a few water tanks at the top of the house. That is a necessary evil as without that continuous supply of water in the house is not possible. This however amounted to additional weight at the top of the structure. Think of the kind of force a half filled tank kept at the top of the house would generate when shaken during an earthquake. It is therefore advised to properly secure the tank to the rooftop. More than that flexible pipe connection is recommended at the junction to ensure that there is no leakage after the earthquake tremors.

This may be attributed to a number of different factors but it is a reality that the scenario at the rooftop is fast witnessing a change. Yes, the reference here is to solar water heaters that are increasingly adorning the rooftops and with this the roof-scape is changing fast.

Most might attribute it to increasing awareness on climate change and need for adopting greener energy options but the impact of increasing electricity tariff, reduced chances of pilferage due to the meters being fixed at the supply end and subsidy attached to these devices would be hard to rule out. May be, there is also a bit of social status attached to the use of these devices; with one adorning one's roof one can at least boast of being environmentally sensitive.

But then, an environmentally conscious populace would not restrict their environmentally responsible behavior



just to the use of solar water heaters. This must also be reflected in other walks of life as well but the same is nowhere to be witnessed.

Be what, it is a reality that more and more solar water heating apparatus are adorning the rooftops, particularly in the urban areas. The operating principle is simple; water is made to circulate through a network of pipes arranged in a solar panel placed at an angle that attracts maximum insolation all through the day. The water heated in the process is supplied through an outlet pipe for end use; washing, cleaning or bathing.

The principle of the apparatus requires inflow supply from an elevation higher than the level of solar panel. The tank supplying cold water has therefore to be placed well above the level of the roof where solar panel is installed. The frame that holds the tank in the elevated position above the level of solar panel is in fact something akin to inverted pendulum kept at the rooftop. The centre of gravity is well above the rooftop and it has a small base. Even slight vibration is therefore enough to generate force enough to dislodge this assembly.

The frame has therefore to be i) properly designed, ii) should be sufficiently strong and iii) properly secured to the main frame of the building. Moreover the solar panel has also to be well secured to the rooftop and placed at a location where it is shielded from direct impact of winds. If this aspect is not taken care of even a mild squall can dislodge it. This could be a serious flying hazard during strong winds.

Unfortunately these aspects are not being taken care of by the one's responsible for installing the solar water heaters. In some cases the frame holding the tank is weak, ill designed and elevated to a height that raises serious suspicion on its stability even under normal circumstances. Bare common sense can tell one that this

could collapse even under the load of the water alone. The drive for harnessing greener energy is thus increasing seismic vulnerability of the population.

It is the responsibility of both, the company supplying the water heating apparatus and the ones getting the same installed on their rooftops, to ensure that the device installed does not create vulnerability. Should the one installing the apparatus in his house not ask the power company for indemnity bond or insurance cover in case the facility erected and commissioned by them is destroyed or damaged by installation related faults during extreme natural phenomenon. After all it is all about one's hard earned money. One is rightfully right to bargain at least that much.

When one can fight over athanni and chavanni at the vegetable shop one has to have confidence to bargain at malls and showrooms as well. No one really feels bad about it and no one is really going to provide anything out of his / her pocket. It is all underwritten in every transaction. But out here the irony is that one would get the same only when one asks for the same and for one reason or the other one chooses to refrain from exercising that choice of his / her.

With increasing urge for greener energy options this kind of scenario is getting commonplace in Dehradun. Howsoever environmentally safe this might be, this is going to be a major hazard in case of even a moderate earthquake. Solar power companies have really to take care and ensure that the appliances they sell are installed using earthquake safety measures. Or else we await yet another legislation on this issue, if one is really not in existence.

## शायद ख्वाब था

- सुशील खण्डूड़ी

गुमनाम रास्तों की डगर पे चला था  
मुड़ कर भी नहीं देखा पीछे वक्त खड़ा था।  
तकदीर भी बयां न थी तब तक  
मन इन्द्रधनुष के रंगों से सजा था।  
खुले आकाश की तह निहार रहा था उन्हें  
आँखें थक चुकी थी फिर भी मजा था।  
घने कोहरे में ढूँढ़ रहा था पागल मन  
आरजू के समंदर से भी जाकर लड़ा था।  
एक लहर सी उठी थी दिल में आकर  
शायद कटी पतंग की डोर पर चढ़ा था।  
सहारा टूट चुका था मिलने से पहले

में छुप रहा था बाहर नजारा खड़ा था।  
ख्वाईश हो रही थी खुद से अलग-थलग  
अहसास तब हुआ जब में नींद से जगा था।  
शायद ख्वाब था.....

## Where have all the canals gone?

- Piyoosh Rautela

Aware of rich water resources of Dehradun, British devised ways of optimally utilising this for diverse purposes. They thus carefully planned and laid one of the finest canal networks in the valley. These traversed a total distance of 52 kilometers and though designed primarily for agriculture these served various socio economic, religio - cultural and environmental purposes.

With passage of time a number of water intensive pursuits flourished along the length of these canals. Dhobi, sabjiwala, gamlewala; all were dependent upon the canal water. Besides nurturing the basmati fields of Dehradun, canal water was used for gardening as also for raising nurseries that flourished on its sides. Along the canal there also used to be a number of water mills and people often used to visit these for freshly ground flour that was until recently considered healthy as compared to one coming from flour mills.

The canal was a convenient option available to the masses for ritualistic visarjan of the idols of their deities as also for their other religio cultural rites, most of which require running water. The proximity of the canal used to be a special place for Chath Pooja after Deepawali and people in large numbers used to gather by the canal side from early dawn for various related rituals. The people staying close to the canal must still have late night to early dawn sound crackers fresh in their memories.

The canal network at the same time served as an efficient storm water drain and unlike present scenario, when the main roads of the city are flooded in slight to moderate rains, the roads in those days used to remain free of stagnant water of all sorts despite heavy and prolonged torrential rains.

As if this was not enough, the canals played a crucial role in stabilising the micro-climate of the valley and not being cement lined allowed seepage that ensured minimum level of soil moisture in the surrounding area. The canal network at the same time contributed significantly to ground water recharge.

After Dehradun acquired the status of the capital of Uttarakhand, these water bodies slowly started to



become invisible. I am really not sure whose brainchild it really was. I am however confident that the ones responsible for executing this work neither applied common sense nor brains before giving green signal to this project. Common sense being uncommon, nobody is to be blamed. But then, there is no restriction on applying brains and the same could have been done.

There are a number of seasoned consultants available around. Their services could have been taken to assess the environmental and socio economic impact of turning these water bodies underground. I am really surprised. Dehradun is known for civil society organisations and environmentalists of national and international repute. Despite having lived in Dehradun all through, I am really not aware of even a single one having protested against this. Moreover this was not done overnight or during Court holidays. Interestingly, not one PIL was filed on this issue by anyone.

I am really surprised as to what the environmental lobby, that is so out vocal even on issues that everyone around realizes have no significance, was busy with when major portion of Dehradun was being dug apart for accommodating cement pipes that now house the running water of Dehradun canals. Can anyone really be sure if the same was done without their collusion or silent approval.

The ones responsible for implementing the project probably convinced the masses that whatever was being done was for their larger good. The issues raised mostly related to relief from frequent and tiring traffic jams, broader and convenient roads, relief from waste laden canals and overflowing waters. Some of the arguments put forth are even hard to digest and these relate to checking pollution of the water bodies and reducing water losses. The environmentalists, if they agreed to this plea of the officials, should then not be agitated over

the issue of streams and rivers being diverted to tunnels for power generation. This would then amount to double standards. Moreover it needs to be understood that water loss from a water body by way of evaporation and seepage is a necessary part of the hydrological cycle. As an integral part of the tactical game plan, everyone was thus kept so engrossed in these superficial issues that one could not even focus on other major issues related to environment, groundwater recharge, drainage and sanitation.

With major portions of canals within the city now already done underground and more to follow, some arterial roads have indeed become spacious, but this has come at a heavy cost on the city's water environs.

The roads are clearly wider but often flooded with water. And then making these canals underground was not the sole option. Canals would have efficiently served the purpose of dividers at the centre of the new roads. Moreover landscaping and placing of gravity run fountains along the length of the canal would have enhanced the aesthetic beauty of Dehradun by manifold.

Dehradun would really have been different if rather than just cement, mortar and bricks, the engineers were taught a few lessons on humanities, specially sociology and economics, and more so on aesthetics.

### **Arctic resource rush**

Almost 80,000 tourists visit the North Pole every year. On their way, the tourists would also encounter cargo liners on exploration missions that have heralded intense competition to grab and control abundant natural resources that lie under the melting sea ice.

Scientific studies confirm that the Arctic is warming twice as fast as the rest of the globe. The period between 2005 and 2010 was the warmest since record-keeping began in 1840. In September 2011, at the height of its summer time shrinkage, ice caps covered 4.33 million square kilometres of the Arctic Ocean; 50 percent drop from the average sea ice cover between 1979 and 2000. The IPCC, in 2007, estimated that the Arctic would have an ice-free summer by the end of this century. A few recent studies predict this to happen even as early as 2030-2040.

The Arctic's vast reservoirs of fossil fuel, fish, and minerals, including rare earths, are now accessible for a longer period. But, unlike Antarctica, that is protected from exploitation by the Antarctic Treaty framed during the Cold War and is not subject to territorial

claims by any country, there is no legal regime protecting the Arctic from human greed. The distinct possibility of ice-free summer has prompted countries with Arctic coastline to scramble for great chunks of the melting ocean.

Of the eight Arctic nations; Russia, Sweden, Norway, Iceland, Denmark (Greenland), Finland, Canada, and the US, several have explored the Arctic waters and found over 400 oilfields with proven reserves of around 240 billion barrels of crude oil and natural gas which is about 10 percent of the world's known hydrocarbon reserves. They have also discovered significant deposits of various minerals on the seabed.

New reserves would be available with further melting of the polar sea ice. The US Geological Survey estimates that the Arctic holds up to 20 percent of the world's unexplored hydrocarbon reserves, with potential oil reserves of 90 billion barrels, natural gas reserves of 47.3 trillion cubic metres, and gas condensate reserves of 44 billion barrels. Around 80 percent of these new discoveries are likely to be found offshore at an easy depth of 500 metres.

As a bonus, the vanishing ice also opens up two new faster shipping routes that sharply reduce the distance between Western countries and Asia by connecting the Pacific and Atlantic oceans. These are the Northwest Passage along the northern coast of North America and the Northeast Passage along the Siberia coast. The Northwest Passage would reduce the distance from US' Seattle port to Rotterdam in the Netherlands by almost 25 percent compared to the current route via the Panama Canal. The voyage from Rotterdam to Yokohama in Japan via the Northeast Passage would be 40 percent shorter than the traditional Suez Canal route. Explorers had long sought these trans-Arctic passages as possible trade routes.

With fast rising global temperatures, if these passages become navigable round the year in the coming decades, these would redraw the global trading routes. Shipping routes would then shift from politically unstable Western Asian region and piracy infested South China Sea, Malacca Straits and Gulf of Aden.

With fast melting of ice each shipping season is setting new milestones. In August 2008, a Danish cable ship became the first commercial vessel to pass through the Northwest Passage saving 15 days on its voyage from Japan to Newfoundland off the east coast of Canada. In

September 2010, the first cargo ship with 41,000 tonnes of iron ore sailed through the Northeast Passage to Asia. Around the same time two years ago, a Russian ship became the first super tanker to ferry 1,20,000 tonnes of gas condensate through this route. The largest ever bulk carrier crossed the ocean when a Japanese ship with 66,000 tonnes of iron ore completed its voyage from Russia's Kola Peninsula to Jing Tang in China.

According to Canadian and US maritime experts, nearly two percent of the ships worldwide could be sailing through the Arctic by 2030, which will grow to five percent by 2050. Several Arctic countries are planning deep sea ports in the pole. Shipping companies have already built 500 ice class ships, suitable for the Arctic region. More are under construction.

The newfound resources and routes have spurred hectic global geopolitics, especially among the Arctic nations. Till 2005, when definitive scientific predictions about the melting of Arctic sea ice appeared, the Arctic nations were a coherent group focused on the environment and sustainable development of the region. They are now vying to assert their dominance in the Arctic using the UN Convention on the Law of the Sea. The law allows member states to exploit all natural resources within 370 km off their coastline. They can, however, extend their jurisdiction up to 650 km by submitting geological evidence of the limits of their continental shelves. Russia, the US, Canada, Norway, and Denmark (Greenland) have already submitted claims for extending their jurisdiction in the Arctic territory.

New alliances are also being forged to extend control over the newly accessible Arctic region or to gain access to its resources. Except Russia, all the other Arctic nations are part of NATO. But, that has not deterred them from charting out their own strategies for the Arctic.

In March 2012, in an unexpected strategic move, dumping their four-decade-long dispute over the Arctic boundary, Norway and Russia agreed to improve military relations and expand cooperation in their Arctic territories. Other Arctic countries are also pumping in billions of dollars to build highly specialized ships.

In a demonstration of strength, the US, Canada, and Denmark staged military maneuvers in their Arctic territories in February 2012. In April, Norway

undertook an extensive military exercise called Exercise Cold Response with the participation of 16,300 troops from 14 countries to acclimatize soldiers to such harsh weather. Behind these high-voltage military displays, the countries are evolving new strategies and changing national policies to govern and exploit the resources, mainly energy reserves.

Russia, one-third of which lies within the Arctic Circle, has been the most aggressive in establishing itself as the superpower of the emerging region. About two-thirds of the resources of the state owned oil behemoth Rosneft are in the Arctic offshore most of which are icebound. To attract investment and technology, Russia has allowed foreign oil companies to explore Arctic resources and has even decided to extend tax concessions on hydrocarbons and minerals produced in the country's Arctic territory. This has resulted in a virtual stampede among oil majors to reach the Russian Arctic. To gain access to resources beyond the Russian Arctic territory, another state-owned energy giant, Gazprom, is working with Norwegian energy firm Statoil and French multinational Total on their projects in the Barents Sea.

Though Scandinavian countries own smaller chunks of the Arctic, they have plans in place on how to exploit the resources. Norway has a 20-year plan to unlock the region's oil and gas reserves and deliver them to foreign markets. Denmark recently unveiled a policy to open up its Arctic water to industry and trade. Canada sold exploration rights to BP and Exxon Mobil.

The US has also indicated that it would auction the exploration blocks in the Arctic by 2015. The Chukchi and Beaufort Seas off the coast of Alaska hold around 26 billion barrels of oil. Energy major Shell has obtained conditional approval to drill exploratory wells in the region from 2013.

The latest phase of the Arctic rush is being played out in the Arctic Council, an intergovernmental forum formed by the Arctic nations and representatives of the indigenous people of the pole like the Eskimo. The council discusses issues related to the environment, sustainable development, and scientific research in the Arctic. Six non-Arctic nations; UK, France, Spain, Germany, Poland, and the Netherlands were represented in the council as observers. In May 2013, India and five other countries, China, Japan, Italy, South Korea and Singapore were added to the council as observers. Other countries including Brazil and

several individual European states, are seeking observer status as well. The status would not only keep them apprised of the fast changing geopolitics in the Arctic, it might help them gain access to the region in future.

Being member of the British Commonwealth, India has rights to carry out commercial activities in the Svalbard region of Norway under the Svalbard Treaty the Great Britain signed in 1920. Using the rights granted under the treaty India has set up its research station Himadri, in the Arctic in 2007. In April 2013, it joined the International Arctic Science Council, which is an observer in the Arctic Council.

India has also managed to reach the Arctic for its resources. A consortium led by the public sector unit, Oil and Natural Gas Corporation, has recently acquired 15-percent stake, worth US \$3.4 billion, in an Arctic project of Russia's largest independent natural gas producer Novatek.

In India, there is a debate going on over whether the country should pursue a resource-oriented approach or just strengthen its research base.

The road to Arctic's bounty is not without obstacles. On the one hand, there are environmental concerns that call for restricting industrial activities. On the other hand is the challenge of building infrastructure in extreme weather conditions, which may hinder exploration activities and affect the economic viability of projects.

Even the existing projects may face the heat. They are built on permafrost, and in the event of its thawing the same would have to be rebuilt. The International Energy Agency's World Energy Outlook 2011 stated that, due to logistical challenges, the Russian Arctic continental shelf might not become a major production area until 2035. While the dash to claim great chunks of the Arctic has begun, there are no preparatory studies to gauge the impacts of such widespread activities on the region that so far remained under permafrost. Being the lesser studied pole, there is no accurate inventory of its ecological resources. The pristine Arctic nature has not been researched yet, and launching any production in the Arctic offshore could kill the natural habitat. There are also fears of oil spill, which can seriously damage the ecology.

Moreover, the melting itself may prove disastrous for the global climate. The Arctic Council in 2011 sponsored a study to gauge the impacts of climate change on snow, water, ice, and permafrost in the North

Pole. Some 200 scientists worked on the project. According to their report, the melting of Arctic ice and thawing of permafrost will accelerate global warming further through a mechanism called 'feedback effect'.

When permafrost melts, it releases carbon into the atmosphere and there is estimated to be approximately double the amount of carbon in the permafrost than there is in the atmosphere today. More greenhouse gases mean more heat is trapped in the atmosphere, resulting in more global warming. Depleting snow cover also leads to low reflection and higher absorption of sunlight. This will increase atmospheric temperature of the Arctic and induce further melting.

The debate over whether to exploit the Arctic now revolves around two perspectives. The Arctic nations want to reap the riches, while the non - Arctic nations want the pole to be preserved as global commons, such as Antarctica or the international sea. But, so far there have been no substantial global initiatives to decide how to govern the Arctic. This could be due to two major reasons. One, the Arctic has hydrocarbons. Two, its geographical location is unique.

Under the UN Convention on the Law of the Sea, all eight countries bordering the Arctic have territorial claims over the ocean waters. Since researchers have confirmed that the rising temperatures will open up a treasure trove of natural resources in the Arctic, most Arctic nations have submitted claims for extending their jurisdiction in the Arctic territory. Until the convention finalizes in 2014, one cannot say how much of the Arctic will come under the international law.

## **Soldiers of Azad Hind Fauj**

- Devendra Kumar Budakoti

The story of the Azad Hind Fauj or the Indian National Army of Subhas Chandra Bose is now the part of Indian Freedom Struggle. For defending their empire from the invading Japanese forces, the British used the colonial army under their command. The troops from India were thus sent in large numbers to what was then called Malaya Singapore.

Malaysia was a major British colony in the east with Singapore a major trading port city. In the east British had business interest in rubber, tin, spices and palm oil. They were therefore keenly monitoring movement of the Japanese troops in the Far East, where they had



overtaken parts of China and much of the Korean peninsula.

Despite reinforcement in Malaysia by British colonial army regiments and presence of the Australian Army and Air Force, motivation levels as also logistics support of the Japanese Army could not be matched by the British controlled armies. At the same time French and Dutch armies could not check the Japanese advances in Indo - China and Indonesia respectively.

British along with their allied powers had concentrated in Europe and then in North Africa. By the end of 1941, the Japanese had overtaken the Malaysian Peninsula and by February 1942 the British controlled armies surrendered to the Japanese in Singapore. This must be the only time in war history when the British must have ever surrendered to any power in the world.

Indian soldiers, then prisoners of war (POW), were motivated to join the Azad Hind Fauj - INA of Subhas Chandra Bose. Later they fought along with the Japanese troops in the jungles of Burma and in the eastern frontier of India. The Japanese were finally defeated in the Burma front and in the battles fought in Manipur and Nagaland, large number of INA soldiers died in this war theatre. Those who survived were arrested and dismissed from service by the military court of inquiry in 1946.

The INA soldiers were not taken back in the army by the British but after independence the Indian Government rehabilitated them by inducting them in the Central and



State police forces.

Many soldiers From Garhwal, particularly those from the second and the fifth battalion of the Garhwal Rifles who served in the Malaya - Singapore front died in the battlefield as also in captivity. Those who were arrested by the Japanese and made prisoners of war were however motivated to join the INA.

I felt privileged to meet and know some of the soldiers who served with the Indian Army and later with the Azad Hind Fauj. If still alive, most of them must be in their nineties. Wish I could meet more of them and share their thoughts and experience.

Murli Singh Rawat was born in the year 1919 in village Khaindodi, now in Devikhal block of Pauri Garhwal. His certificate of service, issued in 1946, shows that he was enrolled in the year 1937 and was with the 2nd Battalion of the Royal Garhwal Rifles. As a part of a Brigade he sailed from Mumbai on 28 October, 1940 along with his Battalion and reached Singapore on 13 November, 1940. The date of discharge shows 18 March, 1946 and indicates non-qualifying service period from 15 February, 1942 to 18 March, 1946. It was in this period that Murli Singh Rawat served with the Azad Hind Fauj-INA. He was a Lieutenant in INA and served with the 4th Guerilla Regiment. His certificate of service also shows that he was dismissed by the order of the Commander in Chief in consequence of conduct while POW. When I met him last he was living with his family





in Kotdwar.

Had the pleasure of meeting two other soldiers of Azad Hind Fauj. One was Bhim Singh Bisht of village Panai near Gauchar and Bakhtawar Singh Bisht of village Srikot also near Gauchar in Chamoli district of Uttarakhand state. Both were enrolled in the year 1940 when the Second World War was in its initial phases. After a short training of 4 to 5 months, they were inducted to the newly raised 5th Battalion of the Royal Garhwal Rifles, at Lansdowne. Bhaktawar Singh was not keeping well, when I met him.

As they were sent to Malaysia soon, their certificate of service reads, “embarked Bombay on 21 December, 1941 and disembarked at Malaya on 03 January, 1942”. Soon thereafter they were sent to the battlefield in the jungles of Malaysia to fight the Japanese. The 2nd Battalion of the Garhwal Rifles was already in Malaysia then. In this war against the Japanese many were killed and those who survived were taken as prisoners.

Like many others Bhim Singh Bisht and Bakhtawar Singh Bisht also joined Azad Hind Fauj and fought along with the Japanese forces in the jungles of Burma. After the Japanese defeat they were transported back to India from Malaysia. Back in India, all the INA soldiers were interviewed and discharged from service officially in April 1946 and sent back home. Their army certificate reads, “Discharged by order of His Excellency the Commander in Chief in consequences of service no longer required.”

Many of the INA soldiers were later absorbed by State police forces. Much later all the INA soldiers were given pension by Government of India. Today those surviving must be in their nineties.

All the three veterans of INA have been honored by the State and the Central governments on various occasions

as also by the local authorities and organizations. While interacting with them, I could clearly notice the glimpses of disillusionment in their eyes. They were certainly not happy with the state of affairs in the country and the state. Their dream of developed and prosperous India still eluded them.

### Conserving devastation for mass awareness

On September 21, 1999, Taiwan experienced its worst natural disaster of the previous century; 7.3 magnitude Chi-Chi Earthquake that devastated the central part of the island. Traversed by Chelongpu Fault almost all the buildings of Kuangfu Junior High School in Wu - Feng County were damaged and surface rupture together with surface changes were clearly visible on the ground around these buildings. Rather than tearing down and reconstructing the earthquake devastated buildings the authorities decided to conserve and convert this site into 921 Earthquake Museum so as to keep alive the memories of devastation and make people ware of the destruction an earthquake could cause.

Today 921 Earthquake Museum serves as a learning ground for students, researchers and others. It conserves the damage caused by Chi-Chi earthquake such as collapsed school buildings, fault rupture and elevation of riverbank. To make the ruined landscape and damaged structures stand out, the architects have surrounded the geological changes with exhibition halls.

**Chelongpu Fault preservation hall:** It holds many images of scenes involving the fault line of the Chi-Chi Earthquake, linking pictures of its current look with how it looked in the past. This is a very personal way for the public to witness and learn about the power of nature and earthquakes.

**Earthquake engineering education hall:** This area features houses that are safe in design and construction, and exhibits how modern buildings minimize the effects of earthquakes and ensure earthquake safety in public areas. Various exhibited models help visitors understand the relation between earthquakes and how buildings are constructed. It introduces visitors to some of the principles involved in putting up a building that can withstand effects of an earthquake so that visitors come out better educated on how earthquakes happen and the importance of well designed and constructed building to minimize their

effects.

**Image gallery:** It was originally the Student Activity Center of Kuangfu Junior High School. Rebuilt after the quake, it displays photographs and audiovisual materials featuring the Chi-Chi Earthquake, and presents the memories of the earthquake from the angle of the humanities, society, and historical records. It has three large theaters; the True Feeling Theater, the Bird's eye view Theater and the Earthquake Experience Theater. Watching and listening to images and accounts of what happened during the earthquake and on its aftermath gives the visitors good idea of what the people experienced on that night.

**Disaster prevention hall:** Prevention of the possible disaster and getting ready for it far outweighs the value of repair afterward. The goal of the gallery is to give knowledge of relief and rescue, first aid and other related information to the audiences so as to establish the correct concept of the disaster prevention.

**Reconstruction record hall:** It documents the reconstruction efforts after the Chi-Chi Earthquake. These display the tremendous achievements of the disaster relief and reconstruction work done by the government and the people. The design of the Reconstruction Record Hall is intended to bring new life to the running track. The outdoor track keeps extending interior, representing the idea of keep running no matter how hard life is. And the mobile cabinets displaying reconstructive records along the indoor track indicate the long laborious reconstruction process which was like a relay race involving many dedicated individuals.

In Uttarakhand we have witnessed a major disaster in 2013 and it is necessary to keep intact memories of this disaster the way Taiwanese have done. This would keep reminding both the masses and the officials, the importance of undertaking developmental initiatives with due respect towards nature. If not protected the masses are soon going to forget this devastation and engage again in pursuits that are sure to cause another major disaster.

## Landslide menace

- Piyooosh Rautela

Landslide is nothing but downslope movement of earth and rock mass under the influence of gravity. It implies that during a landslide event unstable mass resting on hill slope moves down. But then, Law of Inertia requires the mass to remain perpetually on the upslope area, in how-so-ever unstable state it be, unless an external trigger or



force initiates the downslope movement. External trigger or force is therefore a must and without the same landslide cannot initiate. Rainfall or presence of moisture often provides this trigger and therefore, it is no surprise that most landslides initiate during monsoon period.

Being a highly complex phenomenon involving a number of parameters, the treatment of landslides is both technically challenging and financially taxing. Adequate attention is therefore often not paid to the treatment of landslides and recourse is very often taken to measures that turn it into a chronic problem.

Uttarakhand is perceived to be highly prone to landslides and even though none has prepared inventory of these, there do exist differing claims as to the exact number of landslides. Based upon secondary data more than a thousand landslides are claimed to have been initiated in June 2013 in the Alaknanda valley alone.

Geological survey of Rudraprayag district carried out both before and after the June 2013 disaster by DMMC has revealed that as many as 255 new mass movements were initiated in 2013. The spatial distribution of these slides clearly shows that most are confined to the proximity of roads and rivers. Modification of the slope, therefore, seems to be the prime culprit. Distribution of infrastructure developmental initiatives, particularly in the hills, is largely governed by road connectivity and most roads being aligned along the rivers and streams there is no surprise that destabilization of slope by road construction and toe erosion by rivers and streams have together contributed to the devastation.

Intention is not to prove that all landslides are owed to anthropogenic activities and there do exist a number of landslides that have been initiated in virgin areas. Malpa, Madhyamaheshwar, Ramolsari and Varunavrat are

examples of these. Most landslides are however confined to the proximity of roads.

People have been living in the fragile Himalayan region for generations and they have, based on their experience and accumulated knowledge, always recognized the constraints imposed upon them by nature. Respecting these, they have been settling down at places that, to an outsider, might look inconvenient at first glance. Logic of settling down away from the river terraces, as also upslope of natural seepages occurring on lower hill slopes, is really not so easy and straight forward to be appreciated.

They, at the same time, devised indigenous ways of getting rid of excess precipitation or keeping the pore water pressure within threshold limits, particularly in areas vulnerable to slope instability. Unbunded and outward sloping far flung fields that are hard to manage during spells of heavy continuous rains, terracing of the slope for agricultural purposes and constructing and maintaining jungle gools (unlined canals / drains) above sensitive slopes are examples of their judiciousness.

The site for habitations was thus traditionally chosen after due care. It is therefore no surprise that most habitations affected by landslides are relatively new settlements. One is sure to come up with examples like Sai Polo and Kwiri Jimia where old habitations have been devastated by landslides but then, this is no attempt to generalize things. Many old habitations have surely been affected by slope instability and the state government already has a list of more than three hundred habitations that are facing recurring problems, mostly related to slope instability. This number however hardly works out to be two percent of the total habitations in the state.

Construction of roads based upon preset targets, aligning these along the rivers and leaving the modified slope without adequate protection therefore seems to be the main issue.

This argument is really not innovative. Most people, including the technocrats who finalise the road alignment and politicians who maneuver the same, very well know it. Every one knows and understands well that slope modification is not sustainable in long run but still we all are busy modifying the same for one or the other reason. There can very well be alternatives and these do exist many.

Even people not scantily conversant with geological phenomenon or evolutionary history of Himalaya, try to justify their actions hiding behind the veil of fragility of

Himalaya. What so if Himalaya is an evolving mountain range? So is Alps. We cannot put forth alibis for hiding our lack of integrity and commitment to preserve these pristine slopes.

We, in the capacity of residents of this fragile ecosystem have also to share the blame. It's we who best know the vulnerability of our surroundings. No expert agency or specialist is in a position to question our judiciousness for we have database, though not well documented, to show that everything engineered is not going to be safe perpetually. Based upon our understanding of the vulnerability of this region the people of this area have been settling down at safe places, building structures that could withstand seismic tremors and undertaking appropriate mitigation measures. Are we not to be blamed then for increasing frequency and magnitude of disasters in this region if we are increasingly engaged in defying the lessons so painstakingly learnt and passed on over the generations by the people of this beautiful land?

### **Why Nobel Prize still eludes Indians**

You can count them on fingertips. Yes it is about the Indians who have so far been awarded the coveted Nobel Prize. Despite boasting of the biggest scientific and technical manpower this performance often makes one question the quality of scientific research being done in the nation together with the logic behind pumping resources out of public exchequer on these pursuits.

Some might criticize the Nobel Committee for bias against Indians. But then the process for selecting individuals for the award needs to be understood. It is worth noting that the nominations to the Nobel Prize can be made only through invitation. The Nobel Committee sends out invitation letters to individuals that include former laureates, scholars and academicians and also to higher education institutes and universities in every country. It bases its assessment on nominations received before a particular date. The Committee then assesses the candidates' work and prepares a short list, which is later reviewed by permanent advisers specially recruited for their knowledge of specific candidates. Around October every year, the Committee chooses laureates through a majority vote.

Final outcome that comes before us is quite clear. No Indian gets through the selection process. Going by common sense there could well be two causes. Either the work done by Indians is substandard or there is

something wrong in the selection process.

There however exists a third reason that is responsible for Indians not getting considered. Indians really do not get nominated so as to be considered for the award. Indian institutes, academicians and scientists, invited to nominate Indians for the Nobel Prize reportedly do not respond to the same. Usually secretive Nobel Committee which decides the coveted prizes has revealed that in the year 2013 not a single Indian nomination was received for the Nobel Prize for Medicine. In other categories like economics, physics and chemistry, just 10 percent invitations sent to Indian institutes or scholars seeking nominations were responded to. It is interesting to note that, most of their responses were nominations for non - resident Indians.

Nobel Committee for Chemistry chairman Sven Lidin revealed that every year around 5,000 nomination forms are sent out globally to individuals and institutes in 220 countries. It is acknowledged that the response rate from India is abysmally low. It is told that the response rate among individuals asked to nominate is about 30 percent while among institutes it is as low as 10 percent.

It is said that the Indian universities do not take the nominations seriously. In some cases, they are not even aware of breakthrough work being conducted by individuals scientists or groups and hence do not know whom to nominate. In some cases, an institute director is not well versed with the subject for which nominations are sought because that has not been his field of specialization and hence he does not nominate when asked to do so for a Nobel in that subject.

It is acknowledged that the institutes with Nobel laureates are usually very good with nominations and there is no surprise that the UK, the US, Germany and France nominate large number of scientists and end up winning the most prestigious prize more often.

Quest for nomination is a big responsibility and the Nobel Committee acknowledges that science in India and China is incredibly strong with a very long academic tradition. Worried over low number of Nobel winners from these countries the Nobel Committee has recently decided to travel extensively across the world to search for the best people and institutes to be asked to nominate.

Hope with this initiative of the Nobel Committee more Indians are nominated for the coveted award and in coming years we get used to seeing a few Indians in the list of laureates announced every year. Amen.

## Genghis Khan and climate change

It still eludes most of us as to how small bands of nomadic Mongol horsemen united to conquer much of the world within a span of decades, some 800 years ago. A straightforward answer to the same is not so easy and the title of the title might well sound weird to most.

Researchers, led by Neil Pederson from the Columbia University, have however unearthed a connection between climate change and sudden rise of Genghis Khan. The clue, as put forth by the team, comes from the rings of ancient trees in Central Mongolia. Meteoric rise of the great Genghis Khan and the start of the largest contiguous empire in human history was reportedly propelled by a long period of warm, wet weather spanning more than a decade.

The studied tree rings from Central Mongolia demonstrate, with appreciable confidence, that the rise of the great empire coincided exactly with normally cold, arid steppes of Central Asia witnessing their mildest and wettest weather in more than one thousand years. This would have boomed grass production that was essential to support large number of warhorses and other livestock that gave the Mongols their power and strategic supremacy.

Before fossil fuels, grass and ingenuity were the sole fuels available to mankind as also to the Mongols and the success of Mongols is attributed to their wise and timely use of these resources.

In the late 1100s, the Mongol tribes were racked by disarray and internal warfare and the years preceding Genghis Khan's rule were stoked by intense drought from 1180 to 1190. Sudden ascendance of Genghis Khan in the early 1200s however transformed the scenario and in just a matter of years, he united the tribes into an efficient horse borne military state that rapidly invaded its neighbours and expanded outward in all directions. From 1211 to 1225, exactly coinciding with the empire's meteoric rise, Mongolia saw sustained rainfall and mild warmth never seen before or since and its contribution in the ascendance of Genghis Khan cannot be ruled out.

Genghis Khan died in 1227. His descendants however continued the conquering spree and ruled most of what became modern Korea, China, Russia, eastern Europe, southeast Asia, Persia, India and the Mideast.

The transition from extreme drought to extreme

moisture right then strongly suggests that climate played a role in human events. It might not have certainly been the only factor, but it must have created ideal conditions for a charismatic leader to emerge out of the chaos, develop an army and concentrate power.

Hope the climatic chaos of present times supports advent of another charismatic leader that transforms global socio economic and political scenario for the betterment of human race. Better so, if he is from our nation.

### **Global warming and precipitation**

Global Precipitation Measurement (GPM) satellite that, among other things, would gather data that would substantiate efforts to monitor the effects of global warming on precipitation, has been launched on February 28, 2014 from Japan's Tanegashima Space Center on an island off the southern tip of Kyushu. GPM satellite has been designed as the centerpiece of an international squadron of nine satellites that are already in orbit.

The data gathered by the new satellite is to feed unique information into current efforts to forecast weather and monitor the effects of global warming on precipitation. GPM data is also to serve as a standard against which data from the other satellites in the constellation would be adjusted to improve their accuracy. Beyond weather and climate applications, data from the constellation is to improve flood and landslide forecasts, as well as help track changes in the distribution of waterborne diseases.

The US - Japanese Tropical Rainfall Measuring Mission (TRMM) satellite, launched in 1997 focuses on precipitation in the tropics; peering into the structure and rainfall patterns of storms ranging from afternoon thundershowers to large tropical cyclones. It however covered only the tropics and subtropics, and moderate to heavy precipitation intensities.

GPM and its sister craft, aim to extend those measurements to the rest of world and over a wider range of storm intensities. Of particular interest are storms over mid - latitudes, which can deliver precipitation at intensities ranging from gentle to torrential and with a variety of raindrop and snowflake sizes and shapes.

Adding this information will give climate researchers a more inclusive measure of the global water cycle than they have now, a change that could help improve the



way climate models represent the water cycle.

The satellite is equipped with two instruments. A high - resolution microwave radiometer, built by the National Aeronautics and Space Administration, is to provide estimates of the overall intensity of rain and snow falling from particular storms, and a dual - frequency radar from Japan that has capabilities of generating 3 - D representation of the distribution of rainfall and its intensity within a storm. In addition, the radar can capture data on the sizes and shapes of raindrops and snowflakes that a storm generates.

The two instruments are to yield estimates of the amount of heat that storms release as they form rain and snow, and how that energy is distributed within a storm. This heat is known as the latent heat of condensation. In essence, as droplets condense from water vapor as the vapor rises in a storm and cools, the droplets release the heat it took to form the water vapor in the first place. This released heat can further intensify storms. Its cumulative effect globally plays an important role in redistributing energy in the atmosphere.

The craft is designed to send updated information to the ground every three hours. In addition, its orbit some 250 miles above the earth is designed to cross those of other satellites in the constellation, with opportunities for simultaneous measurements that will allow the GPM satellite to serve as the benchmark for data from the other satellites.

NASA has also provided the spacecraft's "bus," which houses navigation, communications, and power hardware in addition to serving as a platform for the instruments. Japan has provided the radar and the rocket, an H II A, that launched the satellite. NASA had shipped the satellite to Japan at the end of

November 2013 after extensive tests at Goddard Space Flight Center in Greenbelt, Md.

### **Heart attacks and water**

One must be knowing many persons who don't want to drink anything before going to bed because they dislike getting up during the night. Most people really need to urinate more at night time. This is because gravity holds water in the lower part of human body when one is upright (legs swell). When one lies down and the lower body (legs and others) is at the level of the kidneys, it is then that the kidneys remove the water because it is easier.

One thus needs minimum water to help flush the toxins out of one's body and water should be taken at correct time. Yes, the time of intake does count. Drinking water at a certain time maximizes its effectiveness on the body; two glasses of water after waking up helps activate internal organs, one glass of water 30 minutes before a meal helps in digestion, one glass of water before taking a bath helps lower blood pressure, one glass of water before going to bed avoids stroke or heart attack. Water at bed time also helps in preventing night time leg cramps. The leg muscles are seeking hydration when they cramp and wake you up with a Charlie Horse.

Medical research suggests that most heart attacks occur in the day, generally between 6 AM and noon. Having one during the night, when the heart should be most at rest, means that something unusual happened and for this sleep apnea is to be blamed.

So, if you take an aspirin or a baby aspirin once a day, take it at night. Aspirin has a 24 hour "half-life"; therefore, if most heart attacks happen in the wee hours of the morning, the Aspirin would be strongest in your system at that time. Moreover aspirin lasts a really long time in your medicine chest, for years and when it gets old, it smells like vinegar. Bayer is making crystal aspirin that dissolves instantly on the tongue and work much faster than the tablets.

It is good to keep aspirin by your bedside and if it is all about heart attack there are other symptoms of that than just pain on the left arm. An intense pain on the chin, as well as nausea and lots of sweating often accompany heart attack. However, the heart attack might well be free of chest pain.

The majority of people (about 60 percent) who had a heart attack during their sleep did not wake up. However, if it occurs, the chest pain may wake you up from your deep sleep. If that happens, immediately

dissolve two aspirins in your mouth and swallow them with a bit of water. Afterwards, call 108. Phone a neighbor or a family member who lives very close by. Say "heart attack!" Say that you have taken two aspirins. Take a seat on a chair or sofa near the front door, and wait for their arrival and do not lie down.

### **Era of the personal cars is ending**

In the century since the Ford Model T was introduced in 1908, global vehicle numbers have swollen to well over a billion. But according to recent research, the growth spurt may have peaked.

Professor Michael Sivak, at the University of Michigan Transportation Research Institute has just published a series of reports on car use, and its environmental impact. His calculations show that "motorisation" in the United States might have reached a peak in 2008, and that the figures have been on the decline since. That holds even when the global economic downturn, and its negative impact on car sales, is taken into account. He speculates that a number of factors could be contributing to the trend, probably making it more than a passing fad. These include increased telecommuting (or working from home) and the movement of populations back to city centres.

Another way to examine the issue is to look at the number of households without a car. In the United States, the percentage going motor-less is increasing. New York, Washington, Boston, Philadelphia, each have more than 30 percent of households without a light duty vehicle. In fact the figures show that 56 percent of households in New York (which top the list) do not have a car.

Perhaps it is not so surprising in cities like New York, which have extensive public transport networks, and where the costs of parking can far outweigh the cost of a purchase of a subway ticket. But it is not the full story. In Los Angeles, only 12 percent of households are car-less, and in affluent San Jose, heart of Silicon Valley, it is only 5.8 percent.

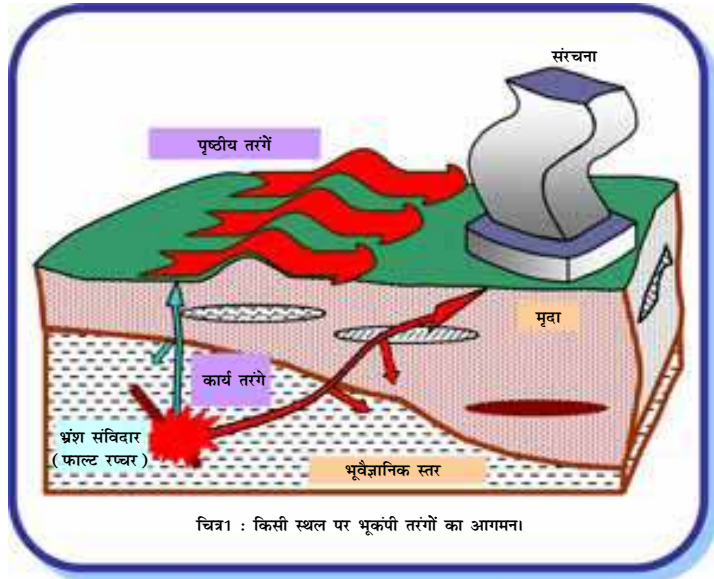


## भूकंप टिप - 2 भूमि किस प्रकार प्रकंपित होती है ?

भारतीय प्रौद्योगिकी संस्थान, कानपुर और भवन निर्माण सामग्री एवं प्रौद्योगिकी संवर्धन, नई दिल्ली द्वारा भूकम्प जागरूकता हेतु विकसित 24 कड़ियों वाली इस श्रृंखला के पुनः प्रकाशन की अनुमति दिये जाने के लिये हम प्रो. सुधीर कुमार जैन, सिविल इंजीनियरिंग विभाग, भारतीय प्रौद्योगिकी संस्थान, कानपुर (वर्तमान में भारतीय प्रौद्योगिकी संस्थान, गाँधीनगर के निदेशक) के आभारी हैं।

### भूकंपी तरंगें

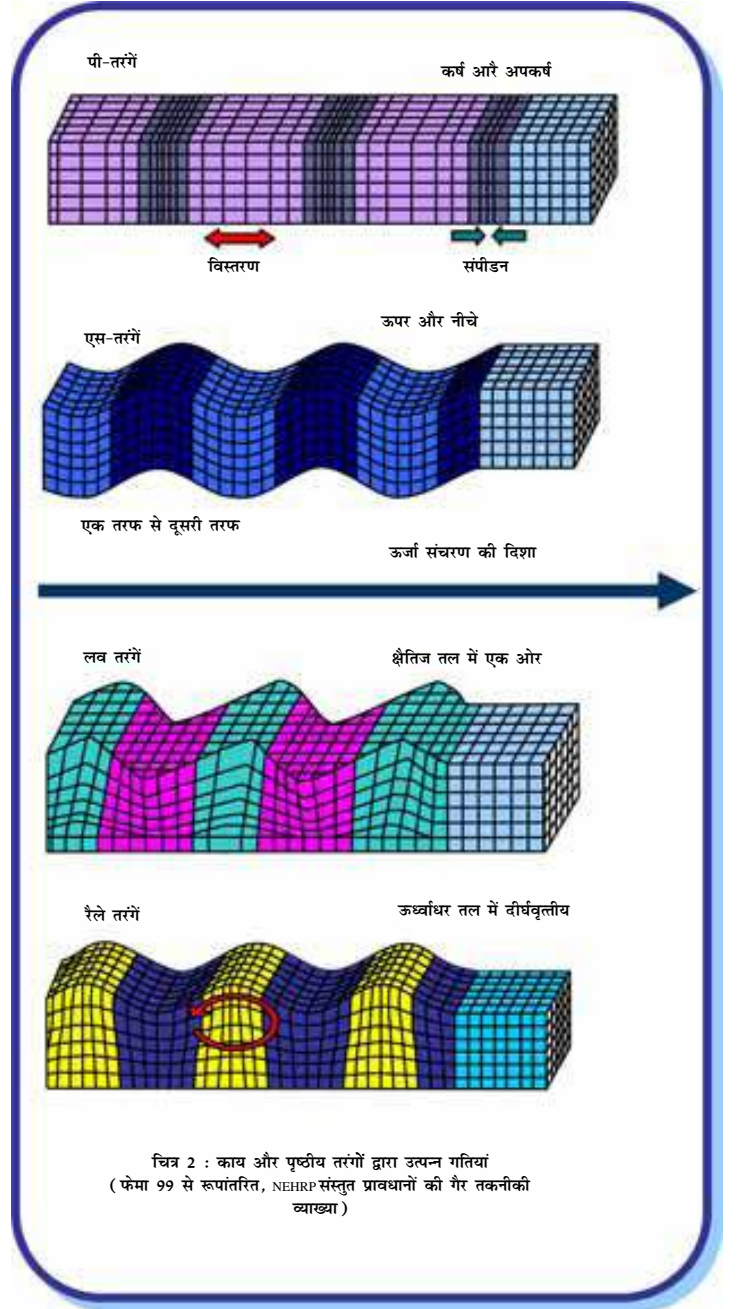
भूकंप के दौरान निर्मुक्त हुई विशाल विस्फुटि ऊर्जा पृथ्वी की परतों से, हर अंतरापृष्ठ पर परावर्तित और अपवर्तित होकर भूकंपी तरंगों के रूप में हर दिशा में संचरित होती है। ये तरंगें दो प्रकार की होती हैं - काय तरंगें और पृष्ठीय तरंगें, इनमें से पृष्ठीय तरंगें भू-पृष्ठ के निकट तक ही सीमित होती हैं (चित्र 1)। काय तरंगें, प्राथमिक तरंगों (पी-तरंगों) और द्वितीयक तरंगों (एस-तरंगों) से बनी होती हैं। पृष्ठीय तरंगें लव तरंगों और रैले तरंगों से बनी होती हैं। पी-तरंगों के अंतर्गत पदार्थ कण ऊर्जा संचरण की दिशा में विस्तरणी और संपीडकी विस्फुटियों से ऊर्जा संचरण की दिशा में गुजरते हैं, लेकिन एस-तरंगों के अंतर्गत पदार्थ कण ऊर्जा संचरण की लंबवत् दिशा में दोलन करते हैं (चित्र 2)। लव तरंगें, एस-तरंगों जैसी ही पृष्ठीय गतियों की सृष्टि करती हैं, लेकिन इनमें ऊर्ध्वाधार घटक का अभाव होता है। रैले तरंग किसी पदार्थ कण में ऊर्ध्वाधार तल के एक दीर्घवृत्तीय पथ में दोलन पैदा करती हैं (जिसमें क्षैतिज गति ऊर्जा संचरण की दिशा में होती है)।



पी-तरंगें तीव्रतम होती हैं; और इसके बाद अनुक्रम में एस, लव और रैले तरंगें आती हैं। उदाहरण के लिए, ग्रेनाइट में पी और एस-तरंगों की गतियां क्रमशः 4.8 कि.मी. प्रति सेकंड और 3.0 कि.मी. प्रति सेकंड होती हैं। एस-तरंगें द्रवों में से होकर नहीं गुजरती हैं। एस-तरंगें, लव तरंगों द्वारा उत्पन्न प्रभावों के साथ मिलकर संरचनाओं को क्षैतिज और ऊर्ध्वाधारद दोनों दिशाओं में तहप रहने वाली विनाशकारी (रैकिंग) गति द्वारा अधिकतम क्षति पहुंचाती हैं। जब पी और एस-तरंगें भू-पृष्ठ पर पहुंचती हैं तो उनकी अधिकतर ऊर्जा वापस परावर्तित हो जाती है। इसमें से कुछ ऊर्जा, मूवा और चट्टान की विभिन्न परतों से परावर्तनों द्वारा सतह को वापस लौटा दी जाती है। अधिक गहराइयों की तुलना में भू-पृष्ठ पर प्रकंपन अधिक प्रबल (लगभग दो गुने) होते हैं। यही अक्सर आधार कार्य है, भूमिगत संरचनाओं को पृथ्वी सतह से ऊपर बने संरचनाओं की अपेक्षा कम परिणामों के त्वरण के लिए बनाया जाता है।

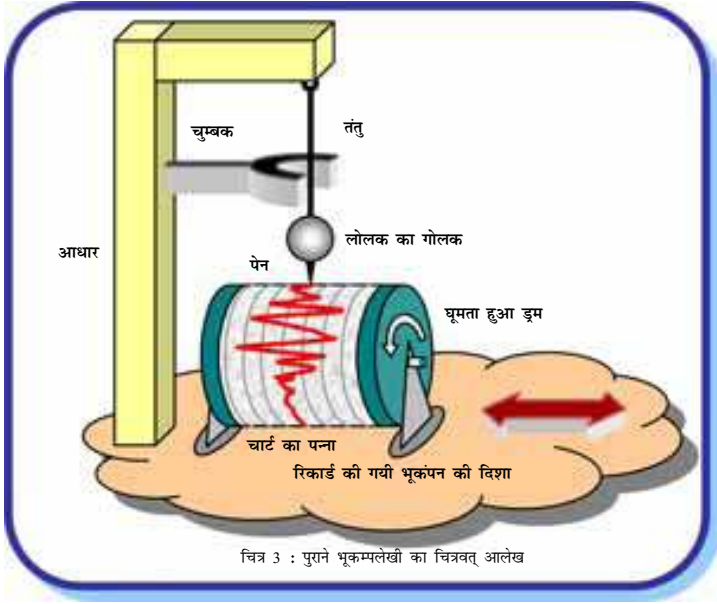
### मापन उपकरण

भूकंप के प्रकंपों को मापने वाले उपकरण, भूकंप-लेखी के तीन भाग होते हैं संवेदक, अभिलेखी और समय नियंत्रक। यह एक सरल सिद्धांत पर कार्य करता है और जिसे साफ



तौर पर आरंभिक भूकंप-लेखी में देखा जा सकता है (चित्र 3)। एक दोलनकारी सरल लोलक (किसी आधार से धागे के द्वारा झूलता हुआ कोई भार) के सिरे से एक पेन जुड़ा होता है जो चार्ट पेपर पर चिन्ह अंकित करता है। यह चार्ट पेपर स्थिर गति से घूर्णन करते एक ड्रम पर टिका होता है। धागे के इर्द-गिर्द एक चुंबक, दोलनों के आयाम को नियंत्रित करने के लिए वांछित अवमंदन उत्पन्न करता है। लोलक भार, धागा, चुंबक और आधार सब मिलकर संवेदक (सेंसर) की सृष्टि करते हैं; ड्रम, पेन और चार्ट पेपर मिलकर अभिलेखी बनाते हैं; तथा ड्रम को स्थिर गति से घूर्णित कराने वाली मोटर समय नियंत्रक का कार्य करती है।

दोनों ही लंबकोणिक क्षैतिज दिशाओं में ऐसे एक-एक उपकरण की आवश्यकता होती



है। बेशक, ऊर्ध्वाधर दोलनों के मापन के लिए तंतु लोलक (चित्र 3) के स्थान पर आलंब के ईद-गिर्द दोलन करते स्प्रिंग लोलक का प्रयोग किया जाता है। कुछ उपकरणों में समय नियंत्रक युक्ति नहीं लगी होती है (यानी वह ड्रम, जिस पर आर्ट का पन्ना लगा होता है, घूमता नहीं है)। ऐसे उपकरण भूकंप के दौरान गति के अधिकतम विस्तार को ही दर्ज करते हैं; यही कारण है कि इन्हें भूकंपदर्शी कहते हैं।

समय के साथ अनुरूप (एनालॉग) उपकरणों का विकास हुआ, लेकिन आधुनिक कंप्यूटर टेक्नोलॉजी पर आधारित सांख्य या अंकीय (डिजिटल) उपकरणों का ही आजकल अमतौर पर रइ स्तेमाल किया जाता है। डिजिटल उपकरण अपने अंदर लगे माइक्रोप्रोसेसर की स्मृति में भू-पृष्ठीय गति को दर्ज करता है।

### प्रबल भू-पृष्ठीय गति

भ्रंश स्थल पर सविदारण द्वारा विलग हुए त्रिमिलीय आयतन के भीतर स्थित पदार्थ के प्रत्येक बिन्दु द्वारा विमुक्त ऊर्जा से भूकंपी तरंगों का सृजन होता है। ये तरंगें अलग-अलग समयों पर पहुंचती हैं, इनके आयाम भिन्न होते हैं और ये भिन्न स्तर की ऊर्जा को अपने साथ लेकर चलती हैं। अतः, धरातल के किसी स्थल पर भू-पृष्ठीय गति बेतरतीब किस्म की होती है। इसका आयाम तथा इसकी दिशा समय के साथ भिन्न बेतरतीब रूप से बदलती रहती है।

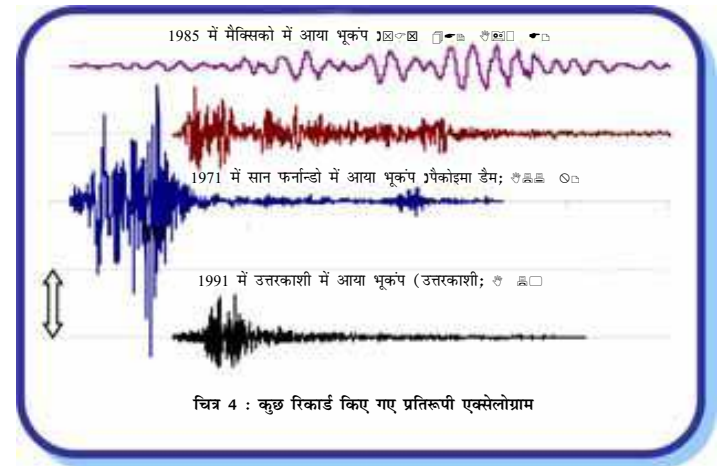
बड़े भूकंप दूरस्थ स्थानों पर क्षीण गतियों को ही जन्म देते हैं। ये संरचनाओं को क्षति पहुंचाने या इंसानों द्वारा महसूस किए जाने वाले नहीं होते हैं। लेकिन संवेदी उपकरणों द्वारा इन्हें दर्ज किया जा सकता है। इस तरह दूर-दराज के स्थानों पर आए भूकंपों का पता लगाया जा सकता है। लेकिन इंजीनियरी दृष्टि से संरचनाओं को संभावित क्षति पहुंचाने वाली प्रबल गतियां अपना महत्व रखती हैं। भूकंपों के आस-पास के क्षेत्र या विशाल भूकंपों से समुचित, मध्यम या अधिक दूरी वाले क्षेत्रों में यह बात लागू होती है।

### प्रबल भू-पृष्ठीय गतियों के अभिलक्षण

भू-पृष्ठीय गति को विस्थापन, वेग या त्वरण के माध्यम से वर्णित किया जा सकता है। भूकंप के दौरान भू-पृष्ठ के किसी बिन्दु पर दर्ज भू-त्वरण में समय के साथ होने वाले परिवर्तन को एक्सेलोग्राम कहते हैं। एक्सेलोग्राम की प्रसृत (चित्र 4) स्रोत पर विमुक्त ऊर्जा, भ्रंश सविदारण पर सर्पण के प्रकार, भ्रंश सविदारण से भू-पृष्ठ तक के संचरण पथ के भू-विज्ञान एवं स्थानीय मृदा (चित्र 1) के अनुसार परिवर्तित हो सकती है।

एक्सेलोग्रामों में भूकंपन संबंधी सुस्पष्ट सूचना मौजूद होती है, शिखर आयाम, प्रबल भूकंपन की अवधि, आवृत्ति अंश (यानी हर आवृत्ति के साथ संयुक्त प्रकंपन का आयाम) तथा ऊर्जा अंश (यानी हर आवृत्ति पर होने वाले भूकंपन द्वारा वहन की जाने वाली ऊर्जा) को अक्सर उनकी पहचान के लिए प्रयोग में लाया जाता है।

शिखर आयाम (शिखर भू-त्वरण, PGA) का अर्थ अपने आप में स्पष्ट है। उदाहरण के लिए, शिखर भू-त्वरण के क्षैतिज मान 0-6 g (गुरुत्वीय त्वरण का 0.6 गुना) का अर्थ यह है कि भू-पृष्ठीय गति किसी दृढ़ संरचना पर जिस अधिकतम क्षैतिज बल की सृष्टि कर सकती है वह इसके भार का 60 फीसद है। किसी दृढ़ संरचना में स्थित प्रत्येक बिंदु भू-पृष्ठ के साथ बराबर गति में रहता है। शिखर भू-त्वरण के 1.0 ह से अधिक क्षैतिज मानों को सन् 1994 में संयुक्त राज्य अमेरिका के नार्थरिज में आए भूकंप के दौरान दर्ज किया गया था। आमतौर पर, प्रबल भू-पृष्ठीय गतियां 0.03-30 हर्ट्ज (चक्र प्रति सेकेंड) के आवृत्ति परिसर में प्रकंपन की आवृत्तियों के साथ संयुक्त काफी अधिक ऊर्जा को अपने साथ लेकर चलती हैं।



सामान्यतया, दोनों लंबकोणीय दिशाओं में क्षैतिज गतियों के अधिकतम आयाम लगभग बराबर होते हैं। लेकिन ऊर्ध्वाधर दिशा में अधिकतम आयाम क्षैतिज दिशा के आयाम की तुलना में आमतौर पर कम होता है। अभिकल्प

(डिजाइन) कोडों में ऊर्ध्वाधर अभिकल्प त्वरण को क्षैतिज अभिकल्प त्वरण के 1/2 से लेकर 2/3 गुना तक रखा जाता है। इसके बरक्स, भ्रंश सविदारण के निकट अधिकतम क्षैतिज एवं ऊर्ध्वाधर भू-त्वरणों में इस तरह का कोई सहसंबंध नहीं होता है।

### संदर्भ (पठन) सामग्री

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