The Malin mud avalanche tragedy of 30 July 2014 – time to ask the right questions

The mud avalanche that ravaged the Malin village in Pune district of Maharashtra on 30 July 2014 is hardly any different in its end effect from the rock avalanche tragedy which struck the village of Malpa in Uttarakhand (then northern Uttar Pradesh) in the early hours of 18 August 1998. Both obliterated the villages located in the lower reaches of their respective potentially threatening mountain slopes. Of the comparable population of about 250 in each of the above two cases, 210 people were buried alive by the Malpa rock avalanche and the death toll in Malin may not be significantly different when the head count gets validated (Figure 1). Rescue teams at Malpa had to battle to exhume bodies buried under 15 m thick debris and in the present case, the National Disaster Response Force had no easier task dealing with 7 m thick muck at the foot of the Bhimashankar hill, fouled with bricks, thatch, gas cylinders, muddied clothes and bicycle parts.

The oft-repeated standard and stale reason put forward to explain the two ghastly events is the rainfall preceding the events. At Malpa, the avalanche had struck in the wee hours of the 18 August 1998. On the previous day at 21:30 h, rainfall resumed for a few hours and by about 00:37 h, Malpa was completely wiped out of the map of Uttarakhand. At Malin, the tragedy which occurred in the early hours of 30 July 2014 around 07:30 a.m., is also being explained in terms of the rainfall of 108 mm on the previous day. Is the rainfall figure too high when seen in the context of the meagre rain in the preceding weeks and years? These are only half-truths, as rainfall has always been a seasonal visitor for centuries on end and is to be considered as nothing more than the last straw that broke the camel's back. In both cases, even before scientific studies are taken on hand, the blame also fell on factors such as human violence against ecologically fragile slopes, deforestation, improper land use and quarrying, as in a textbook example.

At Malin, the Government has, as usual, assured all possible assistance, payments to compensate for every life lost with assurance of rehabilitation of the victims. Such declarations are, by now, familiar to our ears. In the next few months, it is not unlikely that Malin will be forgotten the same way as we have forgotten Malpa, until we get another jolt. In fact, it is not only Malpa, we have forgotten dozens of such tragedies which have paraded before our eyes from time to time.

The end of every such tragedy is usually the beginning of the season of meetings, conferences, seminars and workshops. The ensuing debates on whether the disaster was natural or man-made and whether it could have been prevented are seen to naturally fade after generating a lot of heat but hardly any light. The post-mortem studies are more sketchy than scientific and these too end up with piles of reports and papers, which eventually gather dust on the table.

It is high time we dare ask the right questions. The National Disaster Management Act of 2005 gave a passionate call for a paradigm shift in our approach from the relief-centred response to disaster prevention and mitigation. Yet no one speaks a word of prevention, leaving everything to the heroic deeds of the last bastion, the National Disaster Response Force (NDRF). The various guidelines issued by the National Disaster Management Authority after years of hard work, aim at zero tolerance for non-engineered constructions and for flouting of techno-legal regime. Yet no one raises even a little finger to insist on investigating disasters to the last detail, learning lessons and making someone accountable to ensure that the same mistakes are not repeated over and over again. The country has designated the Geological Survey of India as the nodal agency for landslides, but that declaration made several years ago, and ratified yet again, remains a secret to most of the landslide victims, and our countrymen at large. We would like GSI to lead from the front and be a visible face of hope.

We will never be able to avert future disasters unless the mandated institutions measure up to their responsibilities in a coordinated fashion with eyes fixed on clock and compass. The foremost responsibility is to usher the culture of safety in a way that progress is seen on the ground and touch the imagination of the people. Antoine de Saint Exupéry, a French writer sums it up beautifully when he says 'If you want to build a ship, don't drum up men to collect wood and don't assign them tasks and work, but rather teach them to long for the endless immensity of the sea.'

The other questions that must be asked are why the tragedy could not have been foreseen and avoided, and why the response was not quicker? The Malpa tragedy occurred at 00:37 a.m. on the 18 August 1998, after the symptoms that surfaced on the 14 August were ignored. The thunderous sound of the rock avalanche was heard on 18 August by around 00:25 a.m. Five minutes later, the sky witnessed fireworks due to colliding boulders. Closely on the heels of this came the fury of a dust storm. We had no preparedness to capture these signals and the first message of the tragedy could be radioed from ITBP only at 05:25 a.m.;

Figure 1. The mud avalanche of 30 July 2014 at Malin, Pune district, Maharashtra.

the real help came hours later. Why did we not learn from this?

Like at Malpa, the residents of the neighbouring Asane village had sensed the incoming mud avalanche at Malin by the loud noise heard at about 03:00 a.m. There were evidences of howling wind as well, similar to the experience at Malpa. There being no early warning system in place, Malin too did not receive attention until a bus driver encountered the devastated landscape at 07:30 a.m. and the Manchar city authorities got the news thereafter. NDRF personnel could reach the site only by the afternoon. The district collector reportedly came to know about the incident at 09:00 a.m.

Why no attempts were made to prevent abuse of land, educate people on the perceived threat and on the do's and don'ts, restore ecological stability of the area and disallow non-engineered dressing of the slopes for agriculture? Was it difficult for the Government to keep a tight check on the felling of trees, abuse of land and stone quarrying in the area, especially when landslides have been a common occurrence in this part of the district? Only last year, the neighbouring village of Kolthawadi was hit by a landslide.

Whenever landslide disasters strike, we rush to lean on fixed ideas in our minds. It has almost become ritualistic to name rainfall to explain away cataclysmic floods and devastating landslide events, without even attempting to understand the slope dynamics. We can understand landslides only by systematic geotechnical, geomorphologic, hydrogeological and seismic characterization of slopes, and study of the environmental impact of urbanization. The question to ask is: Why are scientific investigations in our landslide-prone areas exceptions rather than a rule? The earlier we insist on prevention by taking recourse to scientific investigations, the better.

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Discovery of the most distant lensing galaxy

In yet another example of serendipity, Tran and her team of scientists in Texas A&M University, USA, have discovered the most distant strong lensing galaxy[1]. While studying star formation in distant galaxy clusters, they spotted hot hydrogen [Lyman α] lines that appeared to come from a massive elliptical galaxy in the cluster IRC 0218. Lyα spectral lines were unexpected, because the elliptical galaxy being the brightest in the cluster was established to be old and dormant, with no star-formation activity. However, hot hydrogen [Lyα] lines strongly indicate the presence of active star formation[2]. To add to the surprise, the spectral lines suggested that the source is 10.7 billion years ago, while the elliptical galaxy was only 9.6 billion years ago[3].

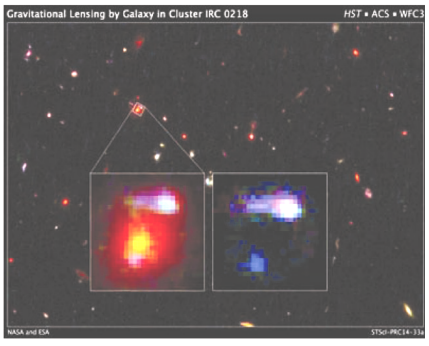

Figure 1. False colour image showing the arcs and smudged dot next to the elliptical, depicting distortion of the spiral galaxy due to lensing. Image credit: NASA, ESA, K-V Tran (Texas A&M University), and K. Wong (Academia Sinica Institute of Astronomy and Astrophysics).

This observation prompted Tran and her associates to propose that the elliptical galaxy was in fact lensing a smaller active spiral galaxy hiding behind. Further analyses of the images by Hubble's Advanced Camera for Surveys and the Wide field Camera 3, confirmed their claim by revealing arcs from a smudged dot next to the elliptical galaxy in the spatially resolved images. These arcs or distorted images are characteristic of strong gravitational lensing, thus corroborating their hypothesis. In other words, the team proved that the Lyα spectral lines are emerging from the spiral galaxy hidden behind, and is lensed by, the massive elliptical galaxy.

The lensing elliptical galaxy, at a red shift $z = 1.62$, beats the previously held record of the most distant lensing galaxy by 200 million years, which is at a red shift $z = 1.53$ (ref. 4). While lensing galaxies are frequent in the recent past, it is indeed fortuitous to have found one so distant in time, given that early galaxies were not massive enough to cause strong lensing.

In addition to establishing that the giant elliptical is the most distant lensing galaxy, the team has also been able to explore the evolution of dark matter content in early galaxies. Kenneth Wong and Sherry Suyu of Academia Sinica Institute of Astronomy and Astrophysics (ASIAA) in Taiwan[1], have reconstructed mass enclosed in the giant galaxy based on the lensing effect it exhibits and have deduced that, dark matter content is less than what is expected. In most recent galaxies of similar size, dark matter constitutes 70 to 90 per cent of the total mass, while it is a mere 30 per cent in the elliptical, implying that in the next 9 billion years it would accumulate more dark matter than normal matter. Such unusually less dark matter content in the early galaxy, has dispelled the long held hypothesis, that galaxies accumulate normal and dark matter in equal proportions over time, because galaxies were thought to grow purely by merging of smaller galaxies. Instead, the current study reveals that the ratio of dark matter to normal matter evolves with time as the galaxy grows. This finding might throw more light on the evolution of galaxies and their dark matter content.

Investigation of Hubble images of the spiral galaxy behind the elliptical has further uncovered a bright region with hot hydrogen close to its centre, which perhaps suggests an outburst of star formation in this zone. Tran and her team are now looking for more such lensing galaxies, which provide glimpses into the early universe.

1. Wong, K. C. *et al.*, *ApJ*, 2014, **789**, L31.
2. http://en.wikipedia.org/wiki/Lyman-alpha_emitter
3. http://hubblesite.org/newscenter/archive/releases/2014/33/full/
4. van der Wel, A. *et al.*, *ApJ*, 2013, **777**, L17.

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