



DISASTER PULVERISES UTTRAKHAND

Primeval India broke away from the super continent of Gondwanaland 75 million years ago and drifted northwards for 50 million years to form the Indian subcontinent as we know it today. While doing so, India evolved a unique geomorphology when the drifting Indian 'plate' subducted under the Eurasian 'plate' 25 million years ago, thereby slowly creating the Great Himalayas. This makes the Himalayas the world's 'youngest' mountain chain (the South African Barberton Mountains are the oldest, at 3.5 billion years) and still growing (eight centimetres annually) mountain chain in the world. This makes the Himalayas inherently unstable and prone to earthquakes and landslides...

RAJ MEHTA examines the Uttarakhand Disaster but also introspects on the possibility of a 'return to Eden' through sustainable development, a unique work ethic, ability to auto-correct; a commitment to unlearning; to re-learning what made India historically special: peaceful and sustainable co-existence with nature and 'Aranya Sanskriti'; living in nature.



PERSPECTIVE



A paradigm shift has taken place in India from the relief centric approach of the past to the current holistic system encompassing all aspects of Disaster Management...A working group for ensuring Disaster Risk Reduction (DRR) has been set up...its report will be included in the 12th Five Year Plan (2012-2017) ”

Extracted from the message issued on May 3, 2011 by Union Home Minister P C Chidambaram in GOI Publication: ‘Disaster Management in India’.



Lake, these men in power went about their evening pursuits in Delhi and Dehradun oblivious to the unfolding disaster.

The Glacier Complex

Let's first understand the glacier complex. Chorabari-Bamak Glacier lies on the slopes of Kedar Peak in the Garhwal Himalayas, looming menacingly above Kedarnath Temple, a revered pilgrimage for Hindus. One of the glacier's two snouts is the source for the Mandakini River, a tributary of the Alaknanda River; the other snout feeding into Chorabari Lake. The seven kilometre long glacier lies under the 22,255 feet high Kedar Peak, spreading from 20,000 to 12,500 feet at 11 degree incline. Studies since 1960 reveal its retreat at an average of 21 feet per year. The Chorabari Lake, at 12,582 feet, is located four kilometres away and 827 feet above Kedarnath Temple (11,755 feet) which lies on relative high ground in the valley centre. Chorabari was renamed Gandhi Sarovar after Mahatma Gandhi's ashes were immersed here.

Kedarnath's unplanned urban agglomeration that feeds over 10,000 pilgrims per day rush in season is situated in the flood plains of the glacier(s) as some geologists term the snout feeding Gandhi Sarovar as Companion glacier. The Mandakini River channels encircle this narrow plain and meet below Kedarnath 'town'. As per geologist Deepak Srivastava, the Kedar slopes have 28 identified avalanche

zones with one, termed R-13, having an impact force of 84.8 tonnes/m³. It is worth noting that while an impact force of 10 tonnes/ m³ can uproot mature trees, an avalanche of 100 tonnes/ m³ can destroy reinforced concrete structures.

Kedarnath Temple Largely Withstood the Tsunami

One is compelled to salute the builders of the temple, who, 1200 years ago had the prescience and traditional wisdom not just to site the temple on relative high ground between the Mandakini River branches, but also constructed a very strong plinth and walls, using stone slabs with 'man-woman' joints and not lime to integrate the superstructure and build its twelve feet thick walls. Some structural damage has now been observed, but is repairable.

Kedarnath 'town' had ceased to exist. The raging Mandakini River had ensured that. The Alaknanda and the other river valleys that all make the Ganga had similar scenes of horror, with roads, paths, houses, bridges all swept away... over 2000 buildings, 154 bridges, almost 1600 kilometres of roads and at least 5748 people of which almost a 1000 were locals were swept away or fatally trapped in debris.

Why it happened

Expert opinion is still divided but just-released, time-lapse satellite imagery, simulation videos, meteorological weath-

It was the Ides of June; on rainy, overcast, grey June 16, 2013 to be precise. A macabre *rudra tandava* (Shiva's mythical dance of death) was about to be enacted at the head of the steep, narrow Kedarnath Valley crowned by a cirque (semi-circle) of 18,000 to 22,000 feet high Himalayan peaks spread over six kilometres. Death in the form of a massive wall of water carrying rocky moraine detritus and silt preceded by its trademark, deafening roar was about to engulf thousands of pilgrims and inhabitants; only, they were unaware. Tragically, the Disaster Management (DM) Authority at Uttarakhand was asleep and its Delhi staff laid back (as June 16 was a Sunday). So while death hatched a conspiracy under the icy wastes of the Chorabari-Bamak Glacier and Chorabari

Internationally cited, United Nations and WHO supported EM-DAT, Brussels, Belgium statistics indicate that:

- India is 15th out of the top 25 countries in absolute and relative values of people killed (67, 505 people) and affected (680.8 million) during the period 1994 - 2003.
- The total amount of economic damages reported for India for the period 1994 - 2003 were \$17.08 billion or ₹76,500 crores. The 2011 DM report of MHA places annual DM losses in India as a staggering two per cent of GDP.



PERSPECTIVE



When you touch a flower, you disturb a star.

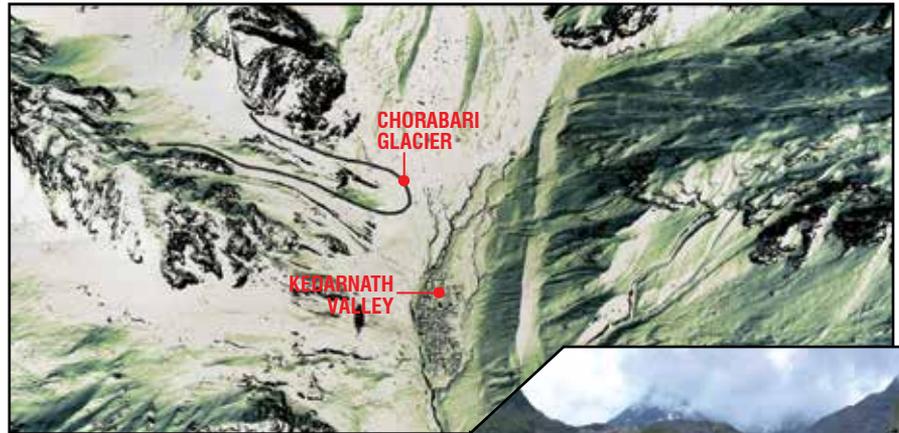
This crisp 1970 summary of a prophetic disaster prevention Francis Thompson poem by ex-PM Indira Gandhi haunts us because successive governments at the centre and states have done little to give substance to its empirical truth.

er tracking data/inputs from GSI/Bhuvan (ISRO's geoportal) NRSA/Wadia Institute of Geology—supports the hypothesis that the culprit was serial cloud bursts. This tragic coincidence took place because of low pressure areas created in both the Arabian Sea and Bay of Bengal; bringing rain bearing 'pregnant' clouds into the upper reaches of the Uttarakhand river system. The last twist of destiny's knife was that these successive cloudbursts, in turn, triggered off a climacteric breach in the Gandhi Sarovar Lake above Kedarnath valley...The phenomenon are termed Glacier Lake Outburst Floods (GLOF). But for Kedarnath temple, all else where human or infrastructure related was pulverised by this unholy collusion of cloudbursts with glacial lake outburst. The Intezamia stood by; paralysed and clueless about the enormity of the disaster.

No lessons had obviously been learnt from earlier cloudbursts; near Badrinath in July 1970, when a village was swept away, at Malpa, Kali valley, Kumaon Division, in 1998, when 250 Mansarovar bound pilgrims/locals got buried under cloud-burst initiated landslides; in July 2004 when 17 pilgrims died, with 5000 stranded at Badrinath after a cloudburst; at Nachini, Pithoragarh in 2009 when a cloudburst killed 38 people; and at Al-mora when a cloudburst swept away two villages in 2010.

UTTARAKHAND: ITS GEOGRAPHY, DRAINAGE AND IMPORTANCE The Ganga

The Ganga rises in the Garhwal Himalayas and flows 2,525 km south and east to empty into the Bay of Bengal. It is India's longest river and the world's second largest by water discharge. It starts from an ice cave at the foot of a snow-bed at 13,800 feet at Gaumukh; the river be-



CAUSE BEHIND DISASTER: (Above) Chorabari Glacier is situated above Kedarnath temple and (right) Kedarnath valley after the flood

ing called Bhagirathi. This becomes the Ganga after the longer Alaknanda River joins it at Devprayag. The Alaknanda is formed by snow melt from several peaks of the Zaskar Mountains—Nanda Devi, Trisul, and Kamet. The Ganga debouches from the Himalayas at Rishikesh, turning southwest to Haridwar. The six sacred Ganga headstreams are the Alaknanda, Dhauliganga, Nandakini, Pindar, Mandakini and Bhagirathi. Their confluences, known as the Panch Prayag drain into the Alaknanda. They are, north to south/southwest, Vishnuprayag, where the Dhauliganga joins; Nandprayag, where the Nandakini joins; Karnaprayag, where the Pindar joins, Rudraprayag, where the Mandakini joins; and finally Devprayag, where the Bhagirathi joins the Alaknanda to form the Ganges River. The Yamuna River is the largest tributary of the Ganga and originates from the Yamunotri Glacier at around 21,000 feet on the southwestern slopes of Banderpooch peak. It merges with the Ganges at Allahabad, UP.

The Chhota Char Dham River sources are aligned in west-southeast configuration and are spread over 150 odd kilometers in the districts of Uttarkashi, Rudraprayag and Chamoli. Starting from the west, NH-123 from Paonta Sahib runs along the Yamuna Valley up to Yamunotri. NH-94 from Rishikesh also feeds into NH-123. Next is NH-108, which takes off from Dharasu, (a major ALG for disaster relief and potential IAF airbase) for Gangotri via Uttarkashi-Harsil military station-Bhaironghati and Gangotri. The third road takes off from NH-58 at Rudraprayag.



Called NH-109, it heads for Kedarnath via Guptkashi-Sonprayag-Gaurikund, where the road ends and a 14 kilometre bridle-path via Rambara connects to Kedarnath temple. The last road; NH-58, starts at Rishikesh and was the scene of the maximum disaster next to the Kedarnath axis. It runs along the Alaknanda River into which all the Ganga tributaries terminate and is the mother road of the pilgrimage area. From Rishikesh, NH-58 proceeds to Devprayag, then upstream to Srinagar-Rudraprayag-Gauchar, (a major ALG used for disaster relief)-Karnaprayag-Nandaprayag-Gopeshwar-Joshimath-Govindghat (where the trek to Hemkund Sahib begins)—Hanuman Chatti (from where the trek to the Valley of Flowers begins)—Badrinath temple and finally Mana, where the road ends. It is noteworthy that the Yamuna and Bhagirathi valleys are inter-connected by NH-94 from Dharasu to Rajgarhi. Kedarnath valley is inter-connected to Bhagirathi valley by state roads from Rudraprayag to New Tehri and Kedarnath and Alaknanda valleys are inter-connected by several state roads in the areas of Karnaprayag-Gopeshwar-Okhimath.

In sum, viewed at the macro level, the Chhota Char Dhams are served by northeast-southwest roads that follow the



PERSPECTIVE



TEHRI DAM... The majority view is that its 'pondage' absorbed the excessive rainfall; preventing downstream flooding

There was neither emergency communication plan nor infrastructure to manage communication with cut off areas and people.

- The reckless *Government drive to promote religious tourism well beyond the "carrying capacity"* of existing infrastructure resulted in uncontrolled urban development in the Char Dham flood plains; in forested areas and on unstabilised slopes; with capacity overload endemic. An example was Kedarnath, which can at best handle 1000-1500 pilgrims per day but was overwhelmed with around 12,000 per day with no evacuation plan in sight in case of disaster.
- *The dam building spree* (70 built, with 680 on the way as per the NGO People's Science Institute) seems to be a short term gain to produce electricity for profit at the expense of ruining the state's delicate ecological balance over time. In an active seismic zone, dam related construction activity spells ecological imbalance and impedes the flow of water with its attendant disadvantages. Dams are common the world over but need careful thinking through to ensure ecological balance and must be poised for crisis management. The mega, 2000 MW Tehri Dam may indeed have saved the areas of Rishikesh, Haridwar and UP from floods due to its ponding capacity, but most other dams have bypassed stringent ecological scrutiny.
- Gautam Siddharth writing in The Hindu correctly points out that *large scale replacement of the traditional Oak* by the more commercially viable Pine in Uttarakhand was criminal. "What's profitable for man is not profitable for the Himalayas," he writes. "The Oak is a wonderful tree that creates a layer of black subsoil that nourishes the thickest undergrowth one can ever see. These scrubs and brushwood feed on rainwater that seep down to create an organic whole, a sort of natural masonry that toughens and fortifies the soil against erosion caused even by heavy rainfall...Pine trees, unlike the Oak, grow needles that fall and form a smooth dry bed that does not soak water. This prevents the soil from developing underbrush—a major cause of the Garhwal Himalaya fragility."
- The Tibetan Plateau contains the

steep river valleys; with all of them finally resting on the east-west running NH-58 and its westward extension towards Dehradun, NH-72. It is thus a compact, boxed area of steadily ascending parallel roads in mountainous terrain which is mostly high altitude and is thickly forested in its lower reaches. All the valleys have steep gorges that made rescue efforts by road and air hazardous. End-to-end, the disaster area measured 150 kilometres by 150 kilometres. It was the biggest rescue effort ever launched world-wide in high altitude and in daunting weather conditions.

DISTURBING DIMENSIONS OF THE UTTARAKHAND DISASTER

No state or administration anywhere in the world could have escaped without suffering hugely because of nature's collusion that brought havoc on Uttarakhand. This does not, however, account for the systemic ineptitude displayed by those in authority nor their inability to think through DM. Here is a listing of what went wrong:

- *Lack of an early warning system:* Various agencies like IMD, ISRO, NRSA, now claim that they generated warnings of impending doom well in time or had DM support system data but these claims seem hollow, 'post

event' euphemisms rather than real time warnings. The fact that Doppler weather radars were sanctioned but not installed because of narrow politics is shameful. Also, Uttaranchal has just one flood forecasting system installed whereas UP has 31, Bihar 32 and Assam 23. The fact remains that no worthwhile pre-disaster efforts were made to warn pilgrims and get them to safe places/restrict shrine access.

- The Economist, UK, has recently pointed out that "*Too little is known about summer weather systems...* India is short of observation stations, weather planes, satellites, climate scientists and modellers...The monsoons are ill-understood once they leave the sea or low-lying land.... Approaching the Himalayas, it is far trickier to grasp just how factors such as wind direction, air pressure, latent heating and moisture levels interact to deliver monsoon rains..."
- The CAG indictment that the "*Uttarakhand Disaster Management Authority have never met since it was formed in 2007, leave alone making DM plans or formulating rules, regulations, policies or guidelines*" for mitigation, evacuation, disaster relief shames us.



NODAL MINISTRIES FOR DISASTER MANAGEMENT

Disasters	Nodal Ministry
Earthquake and Tsunami	MHA/Ministry of Earth Sciences/IMD
Floods	MHA/Ministry of Water Resources/CWC
Cyclones	MHA/Ministry of Earth Sciences/IMD
Drought	Ministry of Agriculture
Biological Disasters	Ministry of Health and Family Welfare
Chemical Disasters	Ministry of Environment & Forests
Nuclear Disasters	Ministry of Atomic Energy
Air Accidents	Ministry of Civil Aviation
Railway Accidents	Ministry of Railways

SOURCE: [HTTP://NDMA.GOV.IN/NDMA/NODALMINISTRIES.HTM](http://ndma.gov.in/ndma/nodalministries.htm)

world's third-largest store of ice. Qing Dahe, former head of the China Meteorological Administration, says that the recent fast pace of melting and warmer temperatures may be good for agriculture and tourism in the short term; but warns that "temperatures are rising four times faster than elsewhere in China, and Tibetan glaciers are retreating at a higher speed than elsewhere in the world.... In the short term, this will cause lakes to expand and bring floods and mudflows..." Tragically, India has made no concerted effort to reduce warming by promoting sustainable development.

DM IN INDIA—GREAT RHETORIC; ABYSMAL DELIVERY

Let us see how the Centre handles DM. At the national level, the MHA is the nodal Ministry for DM. The MHA is organised into six Departments and 18 Divisions, one of which is the DM Division. Its lead star is the National Disaster Management Authority (NDMA), chaired by the PM himself. It is authorised a Vice Chairperson and nine Minister-level members. NDMA was created under an act of Parliament in 2005 and is expected to lay down

policy on DM, approve the national DM plan, lay down guidelines for Central ministries and state authorities, and provide such DM support to other countries. Its working is overseen by a National Executive Committee (NEC) which is chaired by the Union Home Secretary with Secretaries from 15 DM related ministries as its members.

Shockingly however, this August, body did not meet at all between 2008 and 2012. NDMA till date does not have a working DM plan. The CAG slammed NDMA's functioning in a March 2013 report, pointing out that most NDMA projects had been aborted. This, notwithstanding the fact that the MHA's 2011 DM report lists India as the world's 10th most disaster-prone nation with annual DM losses of 2 per cent of GDP.

NDMA linkages at centre, state levels and below are as depicted on the graphic (see graphic—1 on next page):

Analysing the pre and post NDMA outlook of MHA, three observations come to mind. *First*, the NDMA is merely a semantic rehash of the old organisation; great in rhetoric; abysmal in delivery...

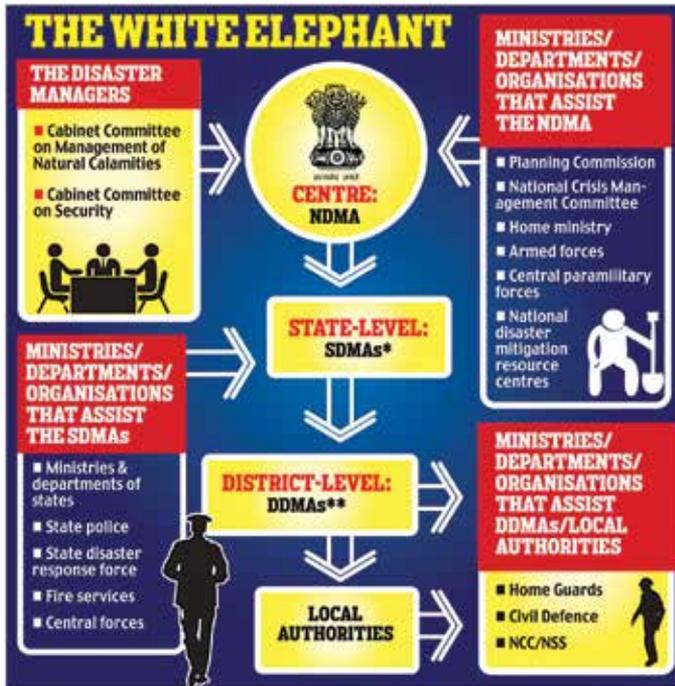
Secondly, it is hugely overstaffed and consistently under-delivers; mechanically repeating the "DM-is-a-state-responsibility" ad nauseum to cover up its huge deficiencies. *Lastly*, the MHA is visibly overburdened and simply cannot handle DM. A separate DM Ministry is needed.

RESCUE EFFORTS—THE UNIFORMED FORCES FINEST HOUR

HQ Uttar Bharat Area at Bareilly is commanded by Lt Gen N S Bawa, a Kargil War veteran. Cleared by Central Army Commander, Lt Gen Anil Chait, he relocated on June 17 to Dehradun as did his Army Commander from Lucknow. That same day, an Army Unit was ordered to be effective in Kedarnath and establish its command elements there by June 18. As the CO flew in, his state Government counterparts were noted flying out.

Enough has been written about how Generals Chait and Bawa led from the front; moved in almost 9000 men and involved in dangerous rescue acts with skill, panache, and compassion. The IAF wasn't far behind and created bases at Gauchar and Dharasu ALG's, handling over 30 helicopters/fixed wing aircraft of their own, two dozen from the Army and over a dozen civilian aircraft with guts, commitment and skill. They kept 'rotors flying' through the crash tragedy. The uniformed brave-hearts included over 1500 first rate ITBP personnel and a dozen teams of the NDRF; about 300 capable men in all.

They all did a splendid job, led by their spirited Air and Army Chiefs who visited them on site; the charismatic Gen Chait who was there every day till rescue was over; on one occasion walking 500 stranded pilgrims to safety. Task accomplishment driven by their Service Before Self ethic drove these men including Special Forces paratroopers to walk the extra mile; the magnificent fliers in Air Force, Army Aviation uniforms and in civvies did wonders with their flying machines, including rescuing a Mule by ex Air Force pilot now civilian Bhopinder Singh; surely a 'first' worldwide. Over a lakh people were rescued via land and air, watched by grateful countrymen and largely mute DM authority and bureaucrats at Centre and state levels. It is another matter that when it is time to show care and compassion for the uniformed fraternity, the unholy politician-bureaucrat unearths ways to derail stall or reduce benefits. The soldiers still carry on because, for them,



GRAPHIC—1

WORK MODULE:
The graphic showing how NDMA works at different levels

the Idea of India stands supreme over all other considerations, including life.

THE UTTARAKHAND DISASTER HAS A SILVER LINING...

When one recalls that NDMA officialdom sits in tony Safdarjung Enclave, Delhi; glossing over the fact that it hasn't yet evolved a national DM plan; that only 8 out of 29 states have DM plans, one tends to be dismissive. Perish that thought. Let us see the Uttarakhand Disaster as a new beginning which may compel the NDMA right down to the block level to deliver.

Let us see NDMA, Ministries, Agencies, NGO's, People, traditional wisdom all on the same page. The armed forces of India have brilliantly demonstrated at Uttarakhand just what all can be done by DM players sitting on the same page and by proactively walking their talk. Surely their Government can follow their lead.

In specific terms, the following suggestions could be thought through and implemented:

- *The Supreme Court should order immediate setting up of a time bound National Commission to examine what went wrong at Uttarakhand and why*

DM Authority failed to deliver when disaster struck. The need for pragmatic afforestation, critical review of all hydroelectricity projects; removal of flood plain/paleo-channel obstructions, creation of avalanche shelters, examining the NDMA structure and delivery; weather early warning and flood warning systems, national and state level DM and rescue plans and infrastructure improvement/upgrading/replacement of roads, ropeways, helipads/upgrading of ALG's to full fledged air bases, Medicare facilities and DM training from block level to apex NDMA levels must find prominence in their report. The issue of creating a separate DM Ministry must also be examined.

- *The unexplored field of comparative politics has great relevance for the study and documentation of disasters.* It examines how cultures around the world view disasters. Why do class relations have such a large impact on disaster vulnerability? What can be done to increase political support for disaster mitigation policies? What is the relationship between development and disasters? It also emphasises the area of methods in DM. Many

Asian nations face hydro-meteorological hazards. A study of the handling methods of countries like India, Vietnam, Indonesia, China, Pakistan, Nepal and Sri Lanka can be rewarding and result in better DM.

- *Tourism and pilgrimages especially in hardship areas needs strict regulation.* The nightmare situation created by up to 1.3 million pilgrims doing the Char Dham Yatra in a month; with no regulation; access control; assessment of impact, carrying capacity of infrastructure and contingency safety arrangements, must stop. Shrine boards are present in India and the world over; with Vaishno Devi and Mansarovar Yatra regulatory bodies being noteworthy. These models must be improved upon and implemented.
- *Hygiene, sanitation, human, animal, commercial, industrial and hydro-electric waste management in an eco-friendly; biodegradable manner needs top most priority.* The realisation that 1.3 million pilgrims produce human waste at 1.5 kg per individual per day is mind boggling... Rivers choked with landslide/blasting waste breach their banks. This must stop.
- *A sustainable development blue-print needs preparation and strict implementation.* This should include protection of river pollution and flood plains, afforestation and integrated water management, control of urban agglomerations, spread of awareness and ensuring truly visionary governance.
- *Lastly, when disaster strikes, the most experienced senior person on the ground across service affiliation must be nominated as the Nodal Officer for that disaster.* A case in point is the Uttarakhand Disaster when the NDMA member in charge of Northern Indian states for DM was nominated as the Nodal Officer on Friday (June 21) but held his first meeting on June 24, after the week end. This was the period of great human and capital loss. Detailing General Anil Chait, a Secretary level officer who was throughout in the disaster area, would not just have saved lives but also impacted positively on the rescue effort with greater sense and sensibility than was managed from far-off Delhi.

The author is a retired Major General