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### **RAJMAHAL FOSSILS**

As Geologists, rocks are our great gift. What we see now in our world is not necessarily how it used to be in the past. The rocks have preserved the Earth's tale that we have to infer and fossils are a way to do so. Hunting for fossils can tell us a great deal about the landscapes of past ages. Studying the fossils help us to understand the past vegetation, climate and palaeoecology including the history of floral and faunal evolution, biostratigraphy, etc.

The Gondwana flora is the most important fossil floras found in India. In India various fossils from different periods have been found but they are not as interesting as Gondwana flora. The Gondwana basins are present along six linear belts namely Damodar Basin, Rewa Basin, Wardha Valley, Pranhita-Godavari Basins, Mahanadi Basin and Rajmahal Basin.

The Rajmahal Basin located in the Northeastern part of Jharkhand comprises of Upper Gondwana sediments, represented by the Dubrajpur formation (Lower Triassic to Lower Cretaceous) and the Rajmahal formation (Lower Cretaceous) have fossils, dating back 200 million years. The Rajmahal formation have basaltic lava flows and intertrappean beds. These intertrappean beds are rich in plant fossils.

The Earliest work done on these floral fossils was done by Oldham, et al., (1864) with special reference to Ferns and Cycads. Many researchers got involved in these fossils subsequently and many renowned workers have contributed till date. Palaeoecology of the Pentoxylon plant was studied by Srivastava and Krassilov (2012). Occurrence of new fossils are still being reported, B.D Sharma (2017) reported Leafy *Jungermanniales* and *Saprophytic* fossils for the first time. Works on Palaeoenvironmental reconstruction and marine influence in the coalfield of Lalmatia

have been done by Mathews et al., (2020). A Research project was carried out by Birbal Sahni Institute of Palaeosciences under coordination of Amit K Ghosh in the year 2019-2021, on Palynostratigraphy, Palaeoenvironment and evidence of Palaeo- wildfire from Late Palaeozoic of Rajmahal basin.

Such studies of fossils have helped scientists to understand how the Earth "greened" or became occupied by plants and how plants have responded to times of climate change in the past. Plant fossils help to ascertain the palaeophytogeographic condition. The most astonishing example of such aspect is the concept of Gondwanaland, which consisted of a single landmass formed by union of the faraway continents of the Southern Hemisphere. The study of fossil plant has an applied significance in understanding the biostratigraphical sequence.

The Intertrappean beds of Rajmahal basin have numerous floral fossils. One cannot help but think about the possibility of finding faunal fossils in this area. Much more work needs to be done in near future for we might find a faunal fossil some day.

The preservation of these fossils are a major cause of concern. The best option is to deposit the fossils in a well-curated museum. Many plans were made since the period of undivided Bihar for conservation of the site. In 2017 to our great satisfaction, Mandro Fossil Park's construction started near Sahibganj. Apart from funding and legal protection of sites, it is more important for the public to respect India's Palaeontological heritage especially in Jharkhand.

-Editor

**"The earth is large and old enough to teach us modesty." – Hans Cloos**

## News and Notes:

- Mid-Semester exam was held in the Department from 04 to 06-10-2021 of Semester II (2022-22).
- Dr. Suresh Kumar Samad, Asst. Prof. Univ. Dept. of Geology was awarded Ph.D Degree on basis of thesis entitled “ORGANOCHEMICAL, PETROLOGICAL AND PALAEOCLIMATOLOGICAL FACADES OF SHALES AND COAL FOR HYDROCARBON GENERATION AND STORAGE : A CASE STUDY FROM AURANGA BASIN, JHARKHAND, INDIA.” submitted under the Guidance of Prof. A. K. Verma from IIT(ISM) Dhanbad on 07-10-2021.
- Offline classes started for the M.Sc students in the Department from 08-10-2021.
- Arvind Lal, M.Sc(1989-91) Deputy Collector. J.P.S.C First Batch. Rank-03 earlier SDM rank has been promoted to ADM rank.
- Constitution Day also known as 'Samvidhan Divas', was celebrated in Gallery Hall of our department on 26th November to commemorate the adoption of the Constitution of India.
- **Publications:**
- Following 6 papers from Univ. Dept. of Geology were published in the Ranchi University Journal of Science and Technology (RUJOST) Vol. 5&6 No.1&2 (2020-2021).
- “Assessment Of Paleo-environmental conditions of deposition of coals of Raham Block of North Karanpura Coalfield, Chatra District, Jharkhand, India.” -Anup Kumar Sinha & Bacha Ram Jha
- “Geochemical evaluation of ground water of Gharbar panchayat, under Baliapur block, Dhanbad District, Jharkhand.”-Shashank Kumar; Bijay Singh & Pramod Kumar Singh
- “Volumetric Assessment Of (In-situ) Coal Bed Methane Gas Of Raham Block, North Karanpura Coalfield” -Anup Kumar Sinha & Bacha Ram Jha
- “Palynological dating of subsurface sample number WBPS-2 of Pundi area, West Bokaro Coalfield.”-Chanchal Lakra, Bacha Ram Jha and Ritika Tudu
- “A Comparative study of water pollution in North Koel River basin of pre and post monsoon months in Palamu and Latehar Districts”-Nikita Bhagat, Vijay Pandey, Shweta Mishra & P.K. Verma.
- “Delineation of Gem Mineral deposits using GIS techniques in Koderma District, Jharkhand”  
-Bijay Singh & Rosh Anshu Mala Toppo
- **Training:**
- Mr. Vikram Yadav, Research Scholar, Univ. Dept. of Geology has successfully completed Ph.D. Research Training at CCL(Central Coalfields Limited), Ranchi from 18-10-2021 to 13-11-2021.
- Eighteen (18) students were selected for Tier II Training Programme on “Local Groundwater management issues” organised by CGWB, State Unit Office from 27-10-2021 to 29-10-2021
- Twelve (12) students of M.Sc(2019-21) have been selected by Mines and Geology, Jharkhand for 6 months, Skill Development programme.
- **Placements:**
- Following students have been selected by CSIR CIMFR:-Satya Prakash Mishra, M.Sc(2018-20) has been selected as Project Associate-I :Navin Prabhakar Shukla and Shakti Kesri, M.Sc(2019-21) have been selected as Project Assistant - Manish Hembrom, Navin Chandr Sahu and Rahul Kumar Dey have been wait listed.
- **Meetings:**
- Stakeholders Workshop on Preparation of Institutional Development Plan for RUSA 3 and State Higher Education Plan(SHEP) was held on 01-10-2021 from 10a.m to 1:30p.m. Seminar Hall of the Department.
- Seminar on Digitization of Student Life Cycle, Teaching Learning System and Examination Database by experts from Maharashtra Knowledge Corporation Limited was held in the Seminar Hall of the Department. Hon' Vice-Chancellor, Prof(Mrs.) Kamini Kumar along with Deans of Faculties graced the occasion. Dr A. K. Jha Controller of Examination welcomed the participants. Dr. R.K. Sharma, Dean, Student Welfare presented the Vote of Thanks..
- A seminar and training on TDS & Traces Portal I.T Department o/o Addl. Commissioner of I.T and R.U was held on 29-10-2021 from 3:30p.m in the seminar hall of the Department.
- Ph. D. Viva-Voce of Mr. Shyam Lal Singh, Research Scholar, Univ. Dept. of Geology under the supervision of Dr. P. K. Verma was held on 29-11-2021 in Dean Conference Hall, Faculty of Science.

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## PICTURE GALLERY



**Mr. Arvind Kumar Lal, ADM**



**Presentation on Digitization on Student Life Cycle**



**RUSA Workshop**



**Ph. D. Viva Voce of Mr. Shyam Lal Singh**



## GLOBAL

### Newly discovered fossil footprints show humans were in North America thousands of years earlier than we thought

A new discovery offers definitive evidence that humans were in North America far earlier than archaeologists previously thought - a whopping 7,000 years earlier.

Fossil footprints found on the shore of an ancient lake bed in New Mexico's White Sands National Park date as far back as 23,000 years ago, making them the oldest ever found in North America. That timing means humans occupied southern parts of the continent during the peak of the final ice age, which upends our previous understanding of when and how they moved south.

The previous idea was that the first people to occupy North America crossed a land bridge that existed between modern-day Siberia and Alaska during the last ice age, between 26,500 and 19,000 ago. According to that theory, they would have had to settle near the Arctic because ice sheets covering Canada made it impossible for them to go south. Then later, once these glaciers melted between 16,000 and 13,500 years ago, the migration toward South America began



*Some of the fossil footprints discovered in White Sands National Park. Courtesy of Sally Reynolds et al.*

This new finding, however, "definitively places humans in North America at time when the ice sheet curtains were very firmly closed," Sally Reynolds, a paleoecologist at Bournemouth University in England and co-author of the new study, told Insider.

So most likely, Reynolds said, humans migrated south in multiple waves, and one of those was before the last ice age. Those early people may have even sailed down the Pacific coast. "Then more came down after the ice receded," Reynolds said. The finding was published Thursday in the journal *Science*, and the study also describes nearby tracks found from

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mammoths, dire wolves, and giant ground sloths - prey for ancient humans.



*One of the oldest footprints discovered dates to about 23,000 years-old. Courtesy of Sally Reynolds et al.*

**The oldest known footprints in the Americas-** Reynolds' team found 60 human footprints between 21,000 and 23,000 years old. The researchers estimated the tracks' age by dating microscopic seeds from an aquatic plant found in layers of lake sediment that sandwiched the prints.

"It's unequivocal evidence," Reynolds said. "The layers go seeds, footprints, seeds." The footprints are now the oldest in the Americas, taking over from a 15,600-year-old footprint found in Chile a decade ago. Most of the tracks belonged to teenagers and children, the team found, possibly indicating the youngsters played in the area while adults hunted and gathered.

Reynolds said that before this finding, the earliest estimate as to when humans started occupying North America was 16,000 years ago.

The only clue that people might have arrived earlier is a set of stone tools and artifacts found in remote Mexican cave. Archaeologists estimated that sediment ensconcing those artifacts was 32,000 years old, but that's not a trustworthy measure, Reynolds said.

Artifacts can migrate up and down through sediment layers over time, but that's not a trustworthy measure, Reynolds said. Artifacts can migrate up and down through sediment layers over time. "Footprints, by contrast, are fixed on the landscape," Reynolds said.

"Footprints, by contrast, are fixed on the landscape," Reynolds said. Reynolds said it's not yet clear how, exactly, humans travelled to the White Sands site - though there are several leading theories.



*Researchers excavate human and animal trackways in White Sands National Park. Courtesy of Sally Reynolds et al.*

One suggests they travelled down the west coast via an ice-free corridor of land. Another proposes that they came by boat, possibly sailing from modern-day Russia or Japan and then expanding south by hugging the Pacific Coast. Reynolds said she also thinks it's possible our ancestors might have crossed the continent then sailed down the Atlantic coast, before trekking to New Mexico. "There's this hovering question mark over the role of their seafaring skills," she said.

This isn't the first remarkable discovery to come from the White Sands site.

"Its value goes far, far beyond the date of these new footprints," Reynolds said.

Three years ago, her team uncovered a different set of human and animal tracks at the site dating back to about 15,500 years ago. Those footprints revealed an epic battle between predator and prey: A human was stalking a giant sloth.

The human was walking right behind it," Reynolds said, adding, "and the sloth is absolutely not liking it." Giant ground sloths went extinct some 12,000 years ago. Around the same time, up to 90% of all large-bodied animals in the world, including mastodons, prehistoric horses, and ancient giant armadillos, also went extinct.

Many archaeologists think that early humans in the Americas played an outsized role in that mass extinction there, given that it happened within a few millennia of their arrival.

Humans show up and megafauna start dying," Reynolds said. "It seems like an obvious cause and effect relationship."

*Source: Business Insider*

### **Technology to transform bauxite red mud into fertile soil nearly a reality:**

A new technology that could transform the bauxite residue known as 'red mud' into a soil-like material capable of hosting plant life is entering full-scale trials at alumina refineries in Queensland, Australia.



*Red mud near Stade, Germany. (Image by Ra Boe, Wikimedia Commons).*

According to the researchers working on the new system, there are more than four billion tonnes of red mud stored in dams around the world, with Australia being the second-largest producer of mineral waste.

Within this context, the eco-engineering solution is being developed by researchers at The University of Queensland's Sustainable Minerals Institute in partnership with Rio Tinto and Queensland Alumina Limited. In an email to MINING.COM, lead researcher Longbin Huang said the technology is a process to utilize functional and cost-effective engineering inputs, either organic or minerals, to accelerate in situ microbial bioweathering of minerals and soil pedological and ecological processes in the amended wastes, towards the formation of functional growth soil, that is compatible with ecological attributes of native/exotic plant species and communities.

The process, however, is not simple as the salinity and alkalinity associated with the minerals in red mud make any rehabilitation effort challenging. "The in situ eco-engineering of mineral wastes into soil largely offsets the need for excavating and transporting large volumes of natural soil resources from non-mined landscapes, thus achieving a great financial advantage while improving environmental quality expected," Huang said. "This game-changing technology is expected to enable mining operators to commence progressive rehabilitation of tailings and

mineral wastes, without the reliance on expensive and hard-to-come soil resources excavated from off sites.” Traditional methods to manage red mud require companies to excavate and transport metres of topsoil from other locations to cover thousands of hectares of waste landscapes.

By avoiding this reliance on external inputs, the process created by Huang and his group is considered a more sustainable and cost-effective way of managing red mud compared to traditional methods.

Huang pointed out that scalability is also one of the key features of the system.

“The technology developed so far is field-operable at large scale and transferable and adaptable across sites, based on the specific mineralogy of tailings, the availability of local economic and renewable resource, and climatic conditions,” the researcher said.

To reach the final stage of development, the UQ team secured over \$3 million in funding from Rio Tinto and QAL, which is aimed at trialling the technology at an operational scale at two red mud sites.

Yet, the tripartite partnership has been active for eight years as the three entities have been working together from proof of concept to full-field trials.

*Source: Mining.com*

### **100-million-year Old True Crab Found 'Perfectly Preserved' in Tree Resin in Myanmar Forest:**



*The study mentions that it is the first record of true crabs, also known as Brachyura, in amber, from the Cretaceous period in Myanmar. (Image for representation/Shutterstock)*

It may seem like a scene straight out of the first Jurassic Park movie, but a team of researchers have found a 100-million-year-old crab stuck in fossilized tree resin. The analysis of this marvellous finding was published in the Sciences Advances Journal on

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Wednesday. The team of eight researchers came from Harvard University, Yunnan University, University of Regina, Lynn University, Duke University, Yale University, and China University of Geosciences.

Their analysis of the crab stuck in the amber has shown that the ancient animal extracted from the jungles of Southeast Asia, holds what is believed to be the oldest modern-looking crab ever found. The latest discovery provides new insights into the evolution of marine animals and when and how they spread around the world.

Measuring just 5-millimeter, the ancient crab is the “first-ever” found in amber from the dinosaur era. The researchers believe that it represents the oldest evidence of represents the oldest evidence of incursions into non-marine environments by the true crabs. What makes this discovery even more unique is the fact that the best-known fossils in amber are usually terrestrial arthropods, primarily insects, whereas aquatic organisms are rarely represented.



*Artistic reconstruction of Cretapsara athanata: The immortal Cretaceous spirit of the clouds and waters. CREDIT: Artwork by Franz Anthony, courtesy of Javier Luque (Harvard University).*

The study mentions that it is the first record of true crabs, also known as Brachyura, in amber, from the Cretaceous period in Myanmar.

The latest fossil has perfectly preserved the large compound eyes, delicate mouthparts, and even the gills of the crab. The modern-looking crab is nested within crown Eubrachyura, or “higher” true crabs, which includes the majority of brachyuran species living today.

*Source: eurekaalert.org*

## NATIONAL

### India's sand-mines are treasure troves of Rare Earth Metals. And Modi Government doesn't want to miss out on it

India is an ambitious powerhouse that aspires to become a world leader in technologies like advanced ballistics systems, industrial machinery, semiconductors, IT, electric vehicles and clean energy systems. However, such technological advancement demands reliance on rare earth metals, which have important applications in all kinds of modern technologies. Yet, India still imports most of its rare earth needs in finished form from its geopolitical rival, China, which controls 70 per cent of the global production in rare earth metals.

It isn't as if India doesn't have rare earth reserves. India is estimated to have the world's fifth-largest reserves of rare earth elements, nearly twice as much as Australia. However, the country has failed to tap into those resources due to tight regulation and excessive government control. However, this is bound to change as India opens up to beach sand minerals mining.

India's Beach sand mining reserves:

Significant rare earth minerals found in India include ilmenite, sillimanite, garnet, zircon, monazite and rutile which are collectively called Beach Sand Minerals (BSM). India has almost 35 per cent of the world's total BSM deposits.

If India taps into its BSM deposits, it can grab a healthy share in the global rare earth supply chains. A government organisation named Indian Rare Earths Limited, IREL, currently has a monopoly over monazite beach sand, the primary mineral that contains rare earth metals.

Monazite beach sand is found in India's coastal states and is a goldmine of sorts given all the industrial uses of rare earth metals in sectors like smartphones, missiles and electric vehicles. However, presently, IREL simply produces rare earth oxides and sells them to foreign firms which supply the finished products and harvest huge profits. Moreover, the only other purpose of IREL is to supply thorium (extracted from monazite) to the Department of Atomic Energy. Thus, IREL or the work it undertakes has little to no significance in the global market or the domestic consumption market.

The Ministry of Mines and the Directorate General of Foreign Trade too had restricted private sector involvement and allowed export of BEM only of BEM only through State-owned canalising agents. This meant that even if there was a private player in the tightly regulated sector, it would not be able to add any value to India's rare earth export sector.

Allowing beach sand mining in India:

The Modi government understands that beach sand mines are treasure troves and tapping into them is the key to controlling a significant share in the global rare earth supply chains. Therefore, the latest action plan prepared by the Centre proposes opening up two restricted sectors- beach sand minerals and offshore mining, for exploration activity by private players.



*The Modi government is reversing a series of actions taken over the last five years to cut down the role of the private sector in order to avoid illegal mining. (Image Source: Express)*

Indian Express had earlier reported that the Centre prepared a 60-point action plan following a meeting of Prime Minister Modi with the Secretaries of all Departments and Ministries.

The action plan stated, "Two Sectors are currently restricted – Beach sand minerals (only Department of Atomic Energy can do mining) and Offshore mining (currently only through PSUs). A High level Committee may be set up for opening up these two sectors for exploration and production by private sector." The Modi government is introducing some milestone reforms in beach sand mining which reverse its earlier policy decisions in this sector. Moreover, beach sand mining was progressively restricted since 2015 by the NDA government. Earlier, private players involved in beach sand mining were required to get a licence from the AERB (Atomic Energy Regulatory Board)

. As a part of the licensing conditions, the miners were supposed to separate the beach sand minerals and dispose of the tailings containing monazite in the company premises or as backfill.

After 2015, the activities of the private players in beach sand mining were reduced drastically as licenses were not renewed by the AERB under the Atomic Energy (Radiation Protection) Rules 2004 over radiological safety concerns.

A July 2021 Department of Atomic Energy (DAE) on “restricting illegal mining” categorically acknowledged that sand beach mining by private enterprises has “been terminated” as a part of a broader effort to curb illegal mining.

With global earth geopolitics heating up, the present circumstances incentivise cashing in on the rare earth metals reserves. The Modi government realises this and this is why it is opening up beach sand mining to private players despite its earlier reluctance. India’s rich BSM deposits are an economic goldmine and the Modi government doesn’t want to miss out on the opportunity of capitalising on it.

*Source: tfipost.com*

### **New Snail Species, Less Than 2 mm In Length, Discovered In Meghalaya Cave:**

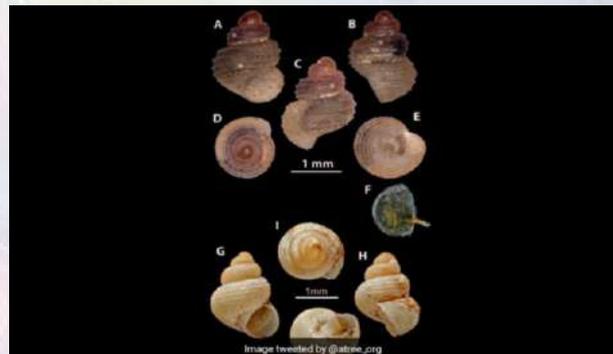
A new micro snail species was found from deep inside a limestone cave at Mawsmmai village in Meghalaya’s East Khasi Hills district, scientists who discovered it said. The snails having scientific name 'Georissa mawsmmaiensis' are so small in size that an adult measures less than 2 millimetres in length.

The discovery was made by Nipu Kumar Das and NA Aravind, scientists of the Bengaluru-based Ashoka Trust for Research in Ecology and the Environment (ATREE).

ATREE also tweeted about this. We have named this new species as *Georissa mawsmmaiensis* after this limestone cave, Mawsmmai. We collected the snails on the moist limestone rocks, 4-5 m inside the cave entrance. However, at present, we don't know whether our species is a true cave species or not," Mr Das and Mr Aravind told PTI in email interactions.

A member of the same group (genus), 'Georissa saritta', was discovered 170 years ago in the same area. The two scientists said their species was a little bit different from *Georissa sarrita* which was documented in 1851 by WH Benson, a civil servant in

British India and an amateur malacologist (who studies shell-less invertebrates). (Image Credit: @atree\_org)



The new species is different in shell size compared to the earlier one. Besides, it has four very prominent spiral striations on body whorls of the shell compared to seven in *Georissa sarrita*

A member of the same group (genus), 'Georissa saritta', was discovered 170 years ago in the same area. The two scientists said their species was a little bit different from *Georissa sarrita* which was documented in 1851 by WH Benson, a civil servant in British India and an amateur malacologist (who studies shell-less invertebrates). The new species is different in shell size compared to the earlier one. Besides, it has four very prominent spiral striations on body whorls of the shell compared to seven in *Georissa sarrita*.

Until now, five snail species have been found from the caves of Meghalaya and there could be more, they said.

However, Meghalaya is famous for its caves and the two scientists are concerned that tourist footfalls could affect the ecology of the area.

“The cave has a very unique environment that can harbour unique faunal diversity. There are several studies on cave biodiversity in Southeast Asian countries and other parts of the world, which reported various animals including snails, but very few studies are there from Indian caves," the two said.

These caves are very sensitive to change in environmental conditions resulting from anthropogenic activities such as mining and cave tourism, causing negative impacts on animals living inside them.

Mawsmmai cave is one of the major tourist attractions of Sohra, erstwhile Cherrapunji. Lately, artificial lights and cemented floor and steps have been added inside to make it more "tourist-friendly".

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**Regional land use planning can be started in Kerala to reduce the risk of landslides: GSI Geology directo:**

“GSI has just completed a macro scale landslide susceptibility mapping in 2020 for the entire landslide-prone areas of 19,300 sq. km. in parts of 13 districts of Kerala” "A regional land use planning can be started immediately in Kerala with the available macro-scale landslide geo database to reduce the risk to a great extent," says Dr. Saibal Ghosh, Director (Geology), Geohazard Research and Management Centre, Geological Survey of India (GSI), in an e-mail interview to The Hindu as the State continued to face the increasing threat of disasters induced by landslide events.

With landslides on the rise in Kerala following extreme weather events, is it not time for the State to make land use zoning regulation mandatory?

In hilly/ mountainous terrains, it is possible to understand or map areas with varying degrees/ likelihood of susceptibility to initiation of landslides or similar mass wasting processes, which can act as a vital geo information tool for use in land-use zoning regulations. However, the availability of that particular spatial geo information and its scale of mapping is very important to the planners and administrators for implementation.

GSI has just completed a macro scale (1:50,000) landslide susceptibility mapping in 2020 for the entire landslide-prone areas of 19,300 sq. km. in parts of 13 districts of Kerala. While preparing the landslide susceptibility map, GSI has also collected field-based data of 1395 nos. of landslide incidences. The above spatial geo information on a 1:50,000 scale can be used for regional planning purposes of land use zoning regulations. However, for the implementation of local-scale land-use zoning regulations in a more specific way on a smaller area, larger scale (at least 1:10,000 or larger) landslide susceptibility or hazard maps are required.

Now after completing the nation-wide baseline data generation task on the 1:50,000 scale, GSI, in consultation with the State governments concerned is stressing more on carrying out mesoscale (1:10,000) landslide susceptibility mapping in critical sectors in all the landslide-prone states in the country, including Kerala. GSI has a perspective plan to cover about 200

such critical sectors on a 1:10,000 scale by the next 4-5 years in India. I think with all the above tools together, feasible land-use zoning should be attempted in the fragile hilly/ mountainous terrains in the future in all the landslide-prone States.

What are the lessons learnt from the GSI's landslide susceptibility mapping programme carried out in Kerala? Spatial areas with the varying likelihood of susceptibility to landslide initiation (Low, Moderate, and High) on a baseline macro-scale (1:50,000) are now delineated and known.



*Dr. Saibal Ghosh, Director (Geology), Geohazard R*

The distribution of historic landslides is also known, which gives a proxy to the prevalent landslide susceptibility scenarios in an area. However, this inventory is getting updated every year with the occurrence of new/ fresh landslides in the State. The macro-scale (1:50,000) landslide susceptibility mapping provides an excellent baseline geoinformation tool for understanding landslide scenarios over a regional area. This also facilitates the identification of critical areas for taking up upscaled (1:10,000/ 1000) studies further. It is also important to note that, the conventional landslide susceptibility maps can only model the zone of initiation or source areas of any future landslide, and this is a systemic limitation of any landslide susceptibility model; however, like other areas, and in Kerala too, many damages have been noticed because of linear debris flows, where relatively stable slopes in the landslide runout and/ or accumulation zone, located much away from the source areas also become severely hazardous/ fatal, and thus need to

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be modeled too to comprehend the complete hazard scenario in an area, which is not only difficult but also is very challenging too. That is why, in mesoscale (1:10000) landslide susceptibility mapping, GSI is also attempting debris flow runout impact model outputs in the landslide susceptibility model to make it more inclusive, appropriate, and useful at that larger scale.



*Landslide susceptibility model to make it more inclusive, appropriate, and useful at that larger scale. (Image courtesy Mathrubhumi.com)*

Landslide susceptibility models are developed using rated and weighted pre-disposing geofactor maps which are mostly static in nature, but landslides are ultimately triggered by some dynamic triggering factor (e.g., rainfall, earthquake). In India, landslides are predominantly triggered by rainfall, occurring mostly during the monsoon period. In any terrain, the triggering of a landslide depends on the terrain-specific rainfall threshold. If those specific areas suddenly receive an extremely high amount of intense rainfall, which is much higher than the local rainfall thresholds, there could be the chances of occurrence of extreme landslide events in that area, and that may heavily transgress into the moderate, and even low susceptible areas too. In India, in many landslide-prone States in recent times, the same has been experienced often, where the triggering rainfall was 5-10 times higher than the normal peak monsoon rainfall intensity of that specific area, and that triggered severe damages through rockfall, slides, and flows, even in low to moderate areas. This particular extreme situation is very difficult to model.

The short-term and long-term solutions for the State to avoid such disasters in the future?

Landslides are natural phenomena, and the same can

rarely be avoided in hills/ mountains. What we can do is to reduce its risk to a great extent by implementing the following tasks in a planned phase-wise manner.

Land-use zoning regulations are required in Indian hills/ mountains, and for which all the available scientific data should be used. This should be implemented phase-wise by prioritising the most vulnerable districts and sectors in the State (both short and long term).

In each district of the State, all the critical sectors for mesoscale (1:10,000) landslide susceptibility and hazard mapping, and critical landslides for site-specific remediation need to be identified for planning and prioritising landslide remediation, mitigation, and management work (short term)

To take up comprehensive landslide mitigation and management, some pilot districts in the State are to be identified first; and a comprehensive mitigation strategy for those districts be planned and implemented by taking into account all the available scientific data/ information; if new data is to be generated, the same may be prioritized for use; arrangement for exclusive funding arrangement for such mitigation tasks be made beforehand in a DPR mode; execution of mitigation work also needs to be monitored closely by an expert group (both short and long term). The identified pilot district be made a model district for implementing comprehensive landslide mitigation and management tasks. Simultaneous implementation of regional rainfall threshold-based landslide early warning system, and site-specific landslide early warning system using in-situ instruments for a few critical landslides in the pilot district be planned and implemented in the identified pilot district too (both short and long term).

Landslides severely affect the community, and they are the first-level responders. Any relevant endeavour for landslide disaster risk reduction (DRR) thus requires the involvement of the community right from the planning stage. Therefore, any measures planned to be implemented should be designed and executed by involving the local stakeholders, and the community from the very beginning so that their understanding of landslide risks, their capacity, and resilience are improved altogether, to achieve a suitable landslide DRR in that area.

Therefore, any measures planned to be implemented should be designed and executed by involving the local stakeholders, and the community from the very beginning so that their understanding of landslide risks, their capacity, and resilience are improved altogether, to achieve a suitable landslide DRR in that area.

*Source: THE HINDU*

## STATE

### **Forest Act amendment proposes ease of mining, experts cry foul:**

Six weeks before the Ministry of Environment, Forests and Climate Change released a Consultation Paper with several proposals to amendment in the Forest (Conservation) Act, 1980, it had sent a letter to Principal Secretaries, Forests of all states and Union Territories with a subject line: “Considering linear projects linked to mining projects as standalone projects-regarding.”



“Supplementary linear projects linked to mining that are conceived after the start of the original mining, should be considered as a standalone linear project and decisions on according approval for those shall be made at the Regional Empowered Committee/ Integrated Regional Office concerned as per provisions provided in the Forest (Conservation) Rules, 2003,” the letter of August 23, 2021 said.

It also put in certain conditions to prevent misuse of the provision.

Eight months before that – in December 2020 – the Ministry had decided to allow coal mining on non-forest lands of a mining area by obtaining preliminary clearance (called State I Forest Clearance) under the Act. Under the FCA, non-forest activities such as mining had to obtain forest clearance in two stages.

Cut to October 2021 when on October 2, the Ministry issued the Consultation Paper – put out in public domain on October 4 – and among the several proposals for amendment is the one that relates to mining in forest areas.

“New technologies are coming up such as Extended Reach Drilling (ERD), which enables exploration or extraction of oil and natural gas deep beneath the forest land but making drilling holes from outside the forest areas and without impacting the soil or aquifer that supports the forest in the forest land. Ministry considers use of such technology is quite environment-friendly and as such should be kept outside the purview of Act,” read one of the proposed amendments.

This has not gone well with activists.

“The fact that the Ministry is certifying drilling machines shows its willingness, the recklessness with which this government cares two hoots for forests,” said Bengaluru’s Environment Support Group, an advocacy NGO that also files petitions against environmental and forest laws’ violations, coordinator Leo Saldanha.

As at now, no one has any idea of how this ERD will impact the geology in that area.

“The government’s claim that this technology of drilling holes from outside the forest areas without impacting the soil or aquifer that supports the forest in the forest land is suspect... it is not supported by any scientific evidence,” said think tank Centre for Financial Accountability researcher Dhvani Shah.

Shah said she has travelled in Jharkhand and seen the large scale devastation caused by machines used for boring in mining. “These are huge machines called diamond drilling machines. These cannot be airlifted and need to cut massive jungles for taking it by road to the site,” she said.

“There is no clarity about how exactly this ERD will save forest areas.” But the confusion is not restricted to such procedural issues. The Consultation Paper spent a good 321 words on how sub section 2 (II) and 2 (III) of the FCA together have been creating confusion in many respects and therefore, “proposed to delete the sub-section 2 (III) of the Act and clarify that sub-section 2 (II) can be invoked for any kind of lease assignment having an intention of using for non-forestry purpose”.

Given the context of the August letter and the December 2020 developments mentioned above, pieces fall in place and the picture does not at all relate to conservation of forests but of chipping it away, one piece at a time.

The Consultation Paper does not have a single word about tribal rights, considered as a lapse by experts, as majority of minerals are mined from dense forest areas coinciding with tribal habitats.

Saldanha said scores of honest forest officers from the state governments are “shocked” to say the least after reading the proposed changes. “The forest officers from BJP-ruled states are highly unlikely to talk about it. I am hoping, those from the non-BJP ruled states will speak up. Even the government of Tamil Nadu should speak out,” he said.

But it did not stop at that.

The Consultation Paper further said, the clause of explanation to ‘non-forestry use’ in Section 2 of the Act, identifies activities which are to be regarded as non-forestry activity and which are not for the purpose of that Section.

“It is understood that activities which are ancillary to conservation of forests and wildlife should not be considered as non-forestry activities. Accordingly, it has been proposed that, establishment of zoos, safaris, Forest Training infrastructures etc should not come within the meaning of ‘non-forestry activity’ for the purpose of Section 2(ii) of the Act,” it said.

Running of zoos and safaris without relevant scrutiny, as was done till now, would clearly mean there is no check on the number of people allowed in the pristine forest area and most important, no tab on environmental management of the site.

“Forest training infrastructure can be debatable, depending on the size of the building proposed. A single building in some forest division may not attract much problem but an almost resort-like raining centre in the middle of lush jungle certainly can,” said a forest official, who did not wish to be identified as he is still in the service.

On Sunday, one of the foresters re-tweeted a poem posted by a nature enthusiast. The concluding lines of the poem from 2004 by Ruskin Bond couldn’t have described the importance of foresters any better.

*Source: The Shillong Times*

## JHARKHAND TOURISM

### LODH Fall:

The Lodh Falls (also known as Budha Ghagh) is a waterfall in a mid forest of Palamau Tiger Reserve, South division of Latehar district in Jharkhand state in India. It is the highest waterfall in Jharkhand and the 21st highest waterfall in India. It is located on the Burha River, deep in the forest of the Latehar district the Chota Nagpur Plateau. It is also part of India's only sanctuary for the conservation of Indian Grey Wolf, known as Mahuadanr Wolf Sanctuary. The Lodh Falls is a tiered waterfall with multiple distinct drops in a relatively close succession. It is 143 metres (469 ft) high. The thundering sound of the fall is audible even 10 km away. The Lodh Falls is an example of a nick point caused by rejuvenation. Knick point, also called a nick point or simply nick, represents breaks in slopes in the longitudinal profile of a river caused by rejuvenation. The break in channel gradient allows water to fall vertically giving rise to a waterfall. It is 120 km from Daltonganj, 200 km from Ranchi, and 61 km from Netarhat. Being the highest waterfall of the Jharkhand, lakhs of tourists flock every year from different part of country to visit the fall. Being located inside the sanctum sanctorum of the Wolf Sanctuary, a protected area, the tourism is regulated by the Forest Department..

*Source - Wikipedia*

