

**MINUTES OF THE 56th MEETING OF THE
KERALA STATE GEOLOGICAL PROGRAMMING BOARD (SGPB)**

Date : 5th October 2019
Venue : Banquet Hall, Government Guest House, Thycaud,
Thiruvananthapuram
Time : 11:00 hrs to 13:30 hrs
Participants : Separate list appended

Proceedings:-

56.1.0 Shri. K. Biju IAS, Member Secretary of SGPB and Director of Mining and Geology informed that the Chairman of SGPB & Principal Secretary to Government, Industries Department who had consented to chair the meeting, due to his commitments in New Delhi is absent and extended a warm and hearty welcome to the esteemed members who are present for attending the 56th meeting of State Geological Programming Board. Shri. K. Biju IAS informed the gathering the following: Aftermath of floods, studies were conducted by teams comprising of officials of the Mining and Geology department, State Groundwater department and Soil Survey and Soil Conservation department, to understand the cause of landslides and other natural calamities that has happened in various parts of the State. This had been a good exercise in understanding issues pertaining to various terrains of the State where landslides and other natural disasters have happened, particularly in Palakkad, Wayanad, Kozhikode and Idukki districts and brought out reports on the causative factors of the various incidents. In view of the stringent environment and the Environmental Clearances becoming mandatory, the government and the department is ensuring that mining is being carried out in a scientific manner, after obtaining Environmental Clearance and in accordance with properly prepared mining plan, and without causing much damage to the environment. With recent judgments of the Hon'ble Supreme Court and National Green Tribunal regarding strict compliance of environmental regulations, it is becoming a norm that quarrying or mining activities in the State of Kerala are being closely scrutinised by all agencies including the media. So under these circumstances whether it is mining of major or minor minerals it should be done without conflicting the existing rules and regulations and in accordance with the compliance mechanisms as mandated in relevant Act and Rules. With the recent amendments in the Atomic Mineral Concession Rules mining of beach sand minerals is restricted to the public sector. As a result of which the mining leases granted to private people have to be cancelled. Prospecting or mining operations would be done in future only through Public Sector Undertakings (PSU's) or Government companies. There are instances of unauthorised mining or mining gone un-noticed by the department. Such instances of unauthorised quarrying need to be curbed by adopting technological advancements available in this field, thereby reduce the undue stress imparted on the officials of the Mining and Geology Department due to the lack of technical know-how. Technology for updating live data from the mining sites needs to be introduced. Therefore technology need to be used to ensure that proper mining is taking place in the State and the prospecting and exploration activities carried out need to be used for the benefit of the State, to garner revenue for the State as well as to create employment opportunities. So we should not look at mining only as a destructive activity and one need not obstruct mining activity that is being carried out in a proper way.

56.2.0 Shri. K. Biju IAS requested members to confirm the minutes of the 55th meeting of the State Geological Programming Board (SGPB) held on 17.9.2018. Since there were no comments the Member Secretary informed that the minutes of the 55th SGPB has been approved.

56.3.0 The next item in agenda, regarding inclusion of new members to the SGPB, was taken up by the Member Secretary. It was decided to include Kerala State Land Use Board, Kerala State Remote Sensing and Environment Centre (KSREC) and Centre for Water Resources Development and Management (CWRDM).

He invited the members, to present the review of work done during the period from June 2018 to June 2019 and the proposed programs for the year 2019-'20.

56.4.0 Dr. Sudhibrata Roy, Deputy Director General, GSI, Kerala State Unit, gave a brief overview of the work carried out by GSI and mentioned that Dr. Mathew Joseph, Director, GSI, Kerala State Unit would present the details of the work done by GSI during the field season 2018-'19.

56.5.0 Dr. Mathew Joseph, Director, GSI, Kerala State Unit presented the details of the work done by GSI during the field season 2018-'19 and those proposed to be taken up during 2019-'20. GSI carries out their work under mission mode i.e., Mission I to V. Mission I includes baseline data generation which includes mapping and data collection in the field; M-II refers to mineral exploration.

Investigations taken up during the Field Season 2018-'19:-

Mission I - Specialized Thematic Mapping

- Specialized Thematic Mapping on the eastern continuity of the Palghat-Cauvery Lineament and its geological implications, Palakkad, district, Kerala.

Mission - I: National Geochemical Mapping

- Geochemical Mapping in Idukki, Ernakulam, Trichur and Palakkad Districts of Kerala and Coimbatore District of Tamil Nadu

Mission II - Mineral Investigations

- Reconnaissance Survey for REE in syenite and associated laterite around Angadimogar, Kasargod district, Kerala
- Reconnaissance Survey for REE in Granite around Munnar, Idukki District, Kerala
- Preliminary exploration for platinum group of minerals in Elaichivazhi block, Attapadi Valley, Palakkad district, Kerala

Mission – IV: Mission Landslide investigation

Post Disaster Studies in Kerala

- In pursuance of the approved annual programme of Geological Survey of India, Item Code No. M4SI/NC/SR/SU-KRL/2018/21108, the post disaster landslide studies in Kerala was carried out during FS: 2018-19. This item was proposed to study post landslide events by collecting inventory data followed by detailed study, if needed, depending on the magnitude and critical situation of landslides. Post disaster studies of landslides will be helpful in suggesting control and corrective measures immediately, besides updating the landslide inventory of Kerala.

- During 2018, Kerala has witnessed high amount of precipitation during the southwest monsoon. The first spell of 'exceptionally high' rainfall was received from 8th to 28th June 2018. The northern and central districts of Kerala received "Large Excess" to "Excess" rainfall from the second week to the fourth week, triggering a number of landslides. Being the nodal agency for landslide studies in the country, Geological Survey of India responded immediately and carried out post disaster landslide studies to assess the slides, evaluate the causative factors and to suggest possible remedial measures. A total of 59 nos. of landslide incidences were reported in Kozhikode, Wayanad, Kannur, Malappuram, Palakkad and Idukki Districts of Kerala during this spell. The Karinchola mala landslide in Kattipara Panchayat, Kozhikode District was the most devastating with 14 casualties along with huge property loss. The details of the study and the 42 point geo-parametric data sheet for landslide inventory were prepared and submitted to respective revenue authorities and State Disaster Management Authority (SDMA).
- The second spell of Southwest monsoon started on 11th July 2018. Within this spell the period from 1st to 19th August was the most severe with a huge rainfall of 164% above the normal (758.6 mm against the normal of 287.6 mm) and lead to very devastating landslides in almost all districts of Kerala. During this period the region suffered its worst ever disaster in its recent history since 1924 with huge loss of life and property. The entire region was hit by excessive rainfall leading to filling up of reservoirs, flash floods and huge number of landslides and landslips. Landslides including debris flows, debris slides, slumps, creep, etc. have been reported. Idukki district was the worst affected, where a total of 1196 incidences were studied by GSI. A total of 1943 landslide incidences were studied, out of which 1193 are debris slides followed by 629 debris flows and 70 nos. of slumps share the major part. Each and every event has been assessed, evaluated for its causative factors and all possible remedial measures were also suggested. A detailed report pertaining to the study along with the number of houses affected due to landslides and the number of houses to be relocated (625 nos.) has been submitted to the State Government authorities so that the rehabilitation can be taken care of accordingly.

56.5.1. Shri. Biju IAS intervened and asked whether any study had been conducted so far in regard to prediction of landslides.

56.5.2. Dr. Mathew Josphe replied that they have taken up landslide susceptibility mapping and the work would be over only by 2020. The information gathered on completion of work in a particular area i.e., each landslide-based report with specific remedial measures have been timely passed on to State Disaster Management Authority (SDMA) and from there on to District Collectors. Due to incidence of over 4000 landslides and shortage of manpower (only fifteen persons), the work was taken up based on request from the district administration. The main objective of the study was to identify the landslide-affected/damaged houses and to report whether new houses can be constructed in that particular same site, as part of the 'Rebuild Kerala' initiative and the same could be achieved.

Mission IV - Engineering Geology

Geotechnical evaluation of Power & Water Resource Development Projects in Kerala.

- During FSP 2018-'19, geotechnical investigation was carried out for fifteen projects (twelve hydroelectric and three irrigation) in Kerala.

Proposed programme for the year 2019-'20

The details of the items which are just taken up and that are being executed in different parts of Kerala during the year 2019-'20 are given below:-

Mission – I: Specialized Thematic Mapping

- Specialized Thematic Mapping on the eastern continuity of the Palghat-Cauvery Lineament and its geological implications, Palakkad district.

Mission – I: National Geochemical Mapping

- Geochemical mapping in Palakkad, Kasargod and Kannur districts of Kerala, Coimbatore district of Tamil Nadu and Coorg and South Kanara districts of Karnataka.

Mission – II: Mineral Investigations

- Preliminary exploration for Platinum Group of Minerals in Kalkandi and Vellamari blocks, Attapadi Valley, Palakkad districts
- Reconnaissance survey for the possible occurrence of REE and PGE mineralization in and around Vazhavatta, Wayanad district
- Reconnaissance survey for REE and Rare Metals in Cheruppulasserri area, parts of Palakkad and Malappuram districts
- Reconnaissance survey for REE and Rare Metals in Amayur, Pattambi area, Palakkad district and in Peralimala syenite, Kannur district

Mission – IV: Landslide investigation

Landslide Susceptibility Mapping

- Macroscale (1:50,000) Landslide Susceptibility Mapping in Pathanamthitta, Kottayam, Idukki and Ernakulam districts

Post Disaster Landslide Studies

- Post Disaster Landslide Studies – already taken up (around 196 landslides have been visited) in Palakkad, Malappuram, Wayanad and Kannur districts, detailed work has been carried out and the reports would be soon submitted to SDMA.

Mission – IV: Engineering Geology

Geotechnical evaluation of Power & Water Resource Development Projects in Kerala.

Proposed Programme for 2020-'21

It is proposed to take up three programmes as part of Specialized Thematic Mapping; carry out National Geochemical Mapping in four toposheet areas; six programmes under Mineral Investigations and as part of Landslide investigation, detailed studies would be done, in meso- or large scale (in 1:10,000 scale) rather than in the usual 1:50,000; based on National Susceptibility Mapping identify specific areas for detailed mapping which includes sites like Kavalappara and continue geotechnical evaluation works under Engineering Geology.

In response to query raised by Shri. Biju IAS, Dr. Mathew Joseph reiterated that landslide susceptibility map is being prepared. Even in the areas identified to be less susceptible, 21% of landslides have occurred. But the same need to be attributed to human interventions in the form of alteration of slopes, road cuttings etc.

56.5.2. Dr. V. Nandakumar, Scientist G, NCESS informed that erstwhile CESS has already prepared Landslide Susceptibility Map (LSM), in 1:50,000 scale, way back in 2010 and the same was made available to almost all agencies and is also made available in the web portal of NCESS. He referred to his report on Puttumala and Kavalappara that appeared in the dailies. The causative reasons that come into play for landslides, being multi-factorial, it would be rather over-ambitious to pin point or predict a landslide event. Again, issue of warning in this regard, is the portfolio of SDMA and not the line departments. Any agency, GSI or NCESS can give inputs relevant to landslide forecasting. The fact pointed out by GSI that even the low susceptibility areas are prone to landslides is a fact. Even the plains are prone to some sort of landslide related mechanisms, called lateral spreads, which was noticed since last year. Soil piping phenomena was not reported 10 years back. This is due to an interplay of short duration high intensity rainfall (for example 300mm of rain in a span of twenty four hours time). What is required is a scientific modelling using various parameters collected from the field and which can be done only by a scientific organisation. As such, it is difficult to give a package or solution to the problem. There lot of work has to be done to forecast or even to reach a forecasting stage as far as landslide phenomena, in our State, is concerned.

56.5.3. Shri. Biju Sebastian, Senior Geologist, Mining and Geology department informed that this year SDMA had brought in Soil Survey and Soil Conservation department in post landslide studies. He enquired whether Soil Survey and Soil Conservation department can play a better role in mapping of landslide prone areas as most of the areas soil creep occurred. He also informed that, from the information in their websites, they do not have any Act or Rule for implementation of soil conservation.

56.5.4. Dr. V. Nandakumar, NCESS informed that Soil Survey and Soil Conservation department should be definitely brought into this aspect. Primarily because, they are getting huge funds for soil and water conservation. Landslide is caused due to soil failure. Rainfall is becoming a major factor. The field investigations have revealed instances of unscientific human intervention that resulted in occurrence of landslides i.e., the disruption/obliteration/blocking of first order streams/drains and unscientific agricultural practices mainly due to lack of information on management of agricultural land and has triggered many of the landslides. It is most important to impart education through pamphlets/brochures on scientific agriculture/cultivation practices and educate the people in regard to rubber/coffee plantation that is mainly being practiced in high lands. The threshold conditions of rainfall have to be continuously assessed and the inputs have to be provided to the line departments for further action.

56.5.5. Shri. Biju Sebastian, Senior Geologist, Mining and Geology department opined that Agriculture Department, whose presence is felt even in the grass root level, would be equally helpful in disseminating site-specific information agricultural practices that need/need not to be followed. This should be closely monitored by Soil Survey and Soil Conservation department and Agriculture Department rather than GSI or Mining and Geology department.

56.5.6. Dr. V. Nandakumar, NCESS informed tht one should not underestimate the role of geologist in such areas. The main drawback is the absence of a geologist in such departments. In the mean time assistance in this regard can be sought from University department, scientific organisations like GSI and NCESS.

56.5.5. Dr. C. K. Baiju, Deputy Director, Mining and Geology department pointed out the anxiety of the general public and the news shared by the visual and press media that all the landslides and related events are caused due to quarrying activities and requested opinion of the experts.

56.5.6. Dr. V. Nandakumar, NCESS informed that when such a question was being raised it was categorically mentioned that there was no connection at all. There exists no database to establish connection between landslides and mining or quarrying. But it was clearly mentioned that mining activities in environmentally fragile areas would harm the environment. As informed earlier, activities like cutting a road in a hillock can definitely destabilise such areas. He reiterated that mining is not responsible for occurrence of landslides. Even in the quarries if blasting is carried out with allowable level of detonators, it would not harm. This is because up to 50% of the blast wave is in the air, and the remaining is getting conducted into the rock, which is a good conductor of shock waves. It is opined that Mining and Geology should come up with the distirct-wise and state-wise requirement of raw material for various construction activities, like Vizhinjam Port. Both environment as well requirement of raw material for various construction activities are important. With regard to mining of river sand he quoted Dr. K. P. Thrivikramaji's words that "sand in the rivers should not be touched for they are very much important for construction of beaches". Now we are facing the after effects of mining of sand from river basins i.e., we are not having beaches and the sea shore is getting battered with waves. Alternatively it is better to identify 'Super quarries', one or two in each district and carry out quarrying following environmental regulations and provide raw material at affordable rates to the people. The illicit mining activities need to be regulated. Compared to northern Kerala there are not much illicit quarries in southern Kerala.

56.5.7. Dr. C. K. Baiju, Deputy Director, Mining and Geology department requested opinion of Dr. Sajin Kumar K. S., Assistant Professor, University of Kerala in this regard.

56.5.8. Dr. Sajin Kumar K. S., Assistant Professor, University of Kerala stated that he has a different opinion from Dr. V. Nandakumar, Scientist G, NCESS. Environmental Impact Assessment conducted in Padinjarathare, Wayanad has revealed that quarrying has influence on landslides. World-wide studies shows that any uncontrolled blasting has its effect on circumference of 2km. He put forward that Mining and Geology should initiate a study in this regard.

~~Action/DMG~~

56.5.9. Shri. Biju Sebastian, Mining and Geology department informed that the department is asking the quarry owners to make use of NONEL (Non Electrical) blasting technology which would produce less vibration. State Environmental Impact Assessment Authority (SEIAA) is insisting its use by

including 'use of NONEL (Non Electrical) blasting technology' as one of the conditions while grant of Environmental Clearance. Therefore such an initiative has been taken up from the part of department.

56.5.10. Dr. V. Nandakumar, NCESS informed that Indian Institute of Rock Mechanics (IIRM) is the apex institution carrying out such investigations and that State can invite them for carrying out such an investigation. It is true that extensive mining on a hillock would affect environment, but what is to be studied is the direct impact of quarrying on landslides. This is because landslides happen during wet/rainy season and he raised his suspicion whether any mining activities would be going on during rainy season. But the effect of quarrying that is already present on the soil strata need to be studied.

~~Action DMG~~

56.5.11. Dr. Arun P. R., Scientist, Centre for Water Resource Development and Management (CWRDM) informed that the main reason for landslides is the uncontrolled practices of soil and water conservation especially in the steep areas. This needs to be effectively controlled.

56.5.12. Dr. V. Nandakumar, NCESS informed that Dr. Arun was pointing towards unscientific construction of rain water pits. It is true that construction of rain water pits are needed for facilitating ground water recharge. Unfortunately no one has prescribed where and up to what level it should be done. Therefore using State Government funds there is rampant construction (thousands of rain pits are made in the same slope) of unscientific rainwater pits in the high land areas, which has really aggravated triggering of landslides.

56.5.13. Dr. Sajin Kumar K. S., University of Kerala informed that 1 cu. M. pit yield 2 tonnes of earth. In Puthumala they have planted about 600 cardamom, by taking pits of dimension 2x2x2ft i.e., they are loosening or displacing about one tonne of earth/soil, which would obviously facilitate infiltration of water which can subsequently lead to landslides.

56.5.14. Dr. V. Nandakumar, NCESS added that the above pits were not manually made, but using earth moving machines, small JCB's and the pits were actually of varying dimensions and not the one mentioned above and it really created the havoc.

56.5.15. Shri A. G. Gopakumar, Senior Hydrogeologist & Sup. Hydrogeologist (i/c) opined the need to disseminate the map which is referred to have already been prepared by various agencies in 1:50,000 scale to the user agencies such as Soil Conservation and Agriculture department or even irrigation department. So when a farmer approaches the user agency they would be in a position to define whether an area is suitable for agriculture/cultivation or not.

56.5.16. Shri. Biju IAS, Director of Mining and Geology informed that it is not the dissemination of maps which is important. What is more important is that the maps should be made available to the field officer in a readable and understandable format, preferably a pamphlet, so that he can disseminate the same to the general public in a more fruitful manner. The main problem is that the

issues are made too complex for the common man to understand and there exists a disconnect between what is done in research and what is put in the field.

56.5.17. Dr. V. Nandakumar, NCESS added that a map in 1:50,000 scale cannot not be taken as a 'panacea' for identifying landslide susceptible areas. It is only a first approximation, rather a zonation. NCESS has already made a map in 1:25,000 scale. If it is intended for use by field officers, it should be prepared at least in 1:10,000 scale.

56.5.18. Dr. V. S. Joji, Scientist, Central Groundwater Board (CGWB) informed that it would be better to opt for cadastral scale i.e., 1:4,000, which would be site-specific, scientific and could be made use of by field officers.

56.5.19. Shri . T. S. Shaji, Officer-in-Charge, Atomic Minerals Directorate for Exploration & Research (AMD) informed that the State has to constitute a separate body comprising of geologists from various departments and examine the causative factors for the occurrence of landslides. Prepare a map (in cadastral scale) and superimpose the same (using GIS) to compare the erstwhile landuse practices carried out in the landslide hit areas.

[Action-DMG]

56.5.20. Dr. V. Nandakumar, NCESS informed that carrying out mapping in cadastral scale i.e., 1:4,000 would require a massive programme, huge machinery and mechanism involving Grama panchayats and grama sabhas but the result would be only one dimensional. It requires additional factors such as rainfall and prediction (from IMD). NCESS has recently come up with a proposal for 'Landslide Long Term Monitoring and Prediction Mechanism' in which instrumental installations would be done in areas most probable for occurrence of landslides and monitor it as an experimental phase. The proposal is under active consideration of Ministry of Earth Sciences.

56.5.16. Shri. Biju IAS, Director of Mining and Geology informed that as an outcome of this meeting, a committee or forum for taking up further decisions in this regard, need to be constituted.

[Action-DMG]

56.6.0. Shri. Vivek Kumar, Senior Geologist, Op. West coast M&CSD, Cochin, GSI informed that they are working as a primary organisation for generating basic marine database. He presented the progress of field programmes under taken up during the period from June 2018 to July 2019.

He informed that as part of the field season programme for the year 2018-'19, Operation West Coast -11, GSI, Cochin has taken up and completed three projects which include:-

- Multi Thematic Mapping of Contiguous Zone Beyond Territorial Water in Arabian Sea off Cochin (due west of Cochin Port), Talikulam (south of Ponnani) and off Kozhikode

He also presented the field programmes for the period 2019 – '20. It is proposed to concentrate on re-evaluation of heavy mineral resources off south western coast. Most of the programmes will be taken up from Mangalore office.

- Multi thematic mapping of Contiguous Zone beyond Territorial Water off Tellicherry, Kerala (CRUISE : SD 291)
- Preliminary search for heavy mineral resource in the inner shelf area off Anjengo, off Paravur (Block III, IV) and off Kollam (Block I ,II)

56.7.0. Dr. V. Nandakumar, Scientist G, NCESS presented the field programmes.

- Granulite studies
- Landslide studies is being carried out throughout the Western Ghats
- Collaborative work (NCCS, Chennai) on coastal Protection measures (Cliff erosion especially Varkala)
- CRZ management
- Fluid inclusion – a new technology is being used for identifying the presence of oil in offshore, Kerala. Traces of oil in the offshore could be identified; but it is not a viable resource
- Geophysical and Geotechnical studies – Shear Zone mapping (Achenkovil)
- ‘Origin of Palghat gap – a revisit’ – to elucidate the genetic aspects
- Study on Indian Ocean geoid low

56.8.0. Dr. V. S. Joji, Scientist-D presented the activities, interventions and achievements of Central Ground Water Board, Kerala Region during the review period, which include

- Aquifer Mapping (hard rock areas of Kottayam and Ernakulam – ~3000 sq. km.)
- Aquifer Map and Management Plan preparation (Ernakulam and Kottayam in 1:50,000 scale),
- Groundwater modeling (for 2018-‘19) in Sq. km. through in-house (5025 Sq. km.)
- Intervention for Aquifer Rejuvenation
- Regular activities
 - Exploration
 - Groundwater monitoring
 - Hydrochemical studies (routine and heavy metal analysis)
 - Ground Water Resource Assessment
 - Publication of reports & information dissemination
- data entry of NAQUIM into GEMS
- Technical Assistance to State Government organisations
- Various public interaction (in Chittor and Malampuzha blocks – on utilisation of Aquifer Management Plan at grass root level) and mass awareness programmes
- Information, Education and Communication (IEC) activities – programmes were conducted in panchayat level
- Conducted training programmes (as per directions of Rajiv Gandhi National Groundwater Training and Research Institute) – in Kollam, Kalpetta and Sulthen Batheri in Wayanad and Nedumgandam in Idukki
- ‘Swachta Hi Seva’ – cleaning of Mangottuonam pond at Pattom; awareness programmes on water conservation in Govt. GHSS, Karamana, conducted river bank marches
- prepared technical reports and disseminated to the end users

- Two post-flood studies in Pamba and Periyar basin and submitted report to Secretary, Water Resources, Government of Kerala and various government organisations
- Dr. V. S. Joji, Scientist-D also presented the proposed programmes for the period 2019-'20.
- Aquifer Mapping
 - Ground water Exploration – in Aspirational District – Wayanad (Outsourcing)
 - Generation of water quality parameters (in-house)
 - Aquifer Map and Management Plan Preparation
 - Ground Water Modeling
 - Micro-level Aquifer Management Plan
 - Facilitating Public Interaction on Aquifer Maps & Management Plan
 - Aquifer Mapping & Management Plan Reports 2018-'19
 - Regular Activities
 - Technical Assistance to Govt. organisation - short-term water supply investigations
 - Publication of Reports & Information Dissemination
 - Activities under CGWA
 - Collaborative Studies
 - IEC Activities
 - Activities of NHP
 - Training Under RGI
 - Public Interaction Programme
 - Special Studies
 - Groundwater regime studies in urban area/city in reference to overexploitation, contamination and climatic change
 - Groundwater Isotopic Studies
 - Activities Under Pradhan Mantri Krishi Sinchai Yojna (PMKSY) - GW
 - Data Entry of NAQUIM into GEMS
 - Ground water regulation – role of CGWB is advisory in nature and the same is implemented by State Ground Water Authority
 - Activities under Swachhta Action Plan (SAP)

Jal Shakti Abhiyan (JSA) activities: Jal Shakti Abhiyan is a time-bound campaign launched by GOI intended to improve the conditions in 1592 blocks that are drought affected, water stressed or over exploited falling in 256 districts with water conservation activities mainly through 5 areas of intervention.

56.8.1. Dr. V. Nandakumar, NCESS requested details on flood studies, additional inputs in respect to soil and water conservation and watershed management, panchayat level, district-wise or state-wise estimates on optimal mineable quantity of ground water, drought management plan of drought hit areas, and regarding their intention to diversify to areas of watershed management.

56.8.2. Dr. V. S. Joji replied that block level reserve estimation reports are available. As part of post flood studies, quantitative as well as qualitative changes that occurred in ground water

scenario have been studied. Details on drought prone areas including depth to water table are available in Ground water year book, district-wise information booklets, aquifer mapping reports.

56.9.0. Shri . Sony K. Kuriakose, P. E. (Mines) informed that

- Exploration programme which started during the year 2017-'18 is being continued. Draft MoU and further clarifications for starting the work have already been sent to DMG and is awaiting further action on the subject.
- It was requested that Lease for the Pandarathu Limestone Captive Mines of Malabar Cements Ltd., shall be extended and be deemed to have been extended up to 31.6.2030, a period of fifty years from the date of grant of original land lease. It was also informed that letter in this regard has already been sent to DMG.
- The geo-referenced cadastral lease maps of Pandarathu Limestone Mines of Malabar Cements Ltd., prepared by DGPS Survey through NABET accredited EIA consultant have been submitted to DMG, to get duly authenticated by the DMG Authorities, Govt. of Kerala for submitting to IBM. As per the direction of DMG, later a modified DGPS survey map also has been submitted for authentication. Submission of duly authenticated DGPS survey maps of the subject mining to Regional Controller of Mines, Bangalore is a mandatory requirement.

56.10.0. Shri. T. S. Shaji, Officer-in-Charge, Atomic Minerals Directorate for Exploration and Research (AMD), Thriuvananthapuram explained about the exploration work carried out by AMD during the review period and that intended to be taken up during 2019-'20.

- Deeper parts of the Chavara Deposit are being explored, utilizing the new SONIC drilling technique since 2015. A total of 6003 m of drilling in 130 boreholes on contract, generating 5949 samples have been completed.
- Validation of geographic co-ordinates of 13 BSM deposits of Kerala for notification is completed with DMG & KSREC. A 100km stretch (Beypore – Valappatanam) is left which would be completed during this field season. The approved boundary coordinates of these deposits have been communicated from Headquarters to the State Government. In addition, validation of other deposits are also completed with DMG & KSREC.
- During the field season 2019-'20 (November 2019 to October 2020), the following investigations will be carried out:-
 - generation of composite samples and mineralogical studies of Chavara deposit will be continued
 - Reconnaissance survey exploration for identifying potential heavy mineral placer sediments of the 100 km long hitherto unexplored northern Kerala coast between Beypore and Valarpattanam in Kozhikode and Kannur Districts

56.11.0. Shri. A. G. Gopakumar, Senior Hydrogeologist & Sup. Hydrogeologist (i/c), Ground Water Department (GWD) presented the progress of the work carried out during the field season 2018-'19 which include:

- Groundwater Investigation and Development: During the financial year investigation work was carried out for 8959 drilled wells and 1344 dug wells, drilled 1389 drilled wells, Hand pump erection- 3 nos., repaired 587 hand pumps, conducted 500 pumping test, developed 383 wells and logged 383 tube wells and analysed 6527 water samples
- The report on Groundwater Resources of Kerala (as on March 2017) was published on May 2019. Chittur block of Palakkad district has been categorized as 'Over-exploited' and 2 blocks (Kasaragod block of Kasaragod district and Malampuzha block of Palakkad district) have been categorized as "Critical". Out of the remaining blocks, 30 blocks are "Semi-critical" and 119 blocks are under "Safe" category. Net Ground Water Availability for the entire State is 5211.75 MCM.
- Control and regulation of groundwater: The objective of the scheme is to control and regulate groundwater development through the implementation of Kerala Groundwater (control & regulation) Act-2002 to prevent adverse environmental impacts of ground water over exploitation and to ensure equitable distribution of resources to all sections of the society. The Kerala Groundwater Authority continued its activity more effectively with special attention to Over Exploited, Critical and Semi Critical blocks in the State. Mass awareness programme and rig registration activities etc. were carried out for judicious use of Groundwater. Detailed hydrogeological studies and pumping test were carried out before issuing NOC to bottling plants and infrastructure projects.
- A 'well census' programme is being carried out using software developed by KSREC.
- National Hydrology Project (NHP) – As part of the 40 crore project spanning over 8 years (4th year running) installed 756 peizometers. One well, out of 152 blocks, will be represented by telemetric system.
- During the financial year a total of 528 permits and 119 conversion permits were issued after conducting hydrogeological investigation.
- Training of Personnel: 55 officers attended training conducted by GWD, CWRDM, Land use Board and National Training Institute, Raipur
- Scheme for Groundwater Conservation and Artificial Recharge
- Groundwater Based Drinking Water Scheme
- Flood Restoration Works:- The following works were undertaken by the Department in flood affected Districts of the State.
- Data need to be shared without hindrance to avoid redundancy and reduce expenditure
- It is included in Disaster Management Plan that mining of laterite should be limited to a depth of 2 metres and permission should be sought from Groundwater department.

56.11.1. Proposed programme for the year 2019-'20:- After the unprecedented flood situation in the State, the changes in State's water situation will require a multi-phased prolonged approach with a focus on the following points:

- Quality deterioration in the available fresh water on account of flooding and poor management practices. Focus on generating awareness among the community on the sustainable use of groundwater.
- Encouraging groundwater recharge through construction of suitable Artificial

- Recharge structures and adopting community based water shed management.
- Regular monitoring of demand and supply of water resources.
- Implementation of groundwater based Mini Water Supply Schemes in community basis
- Rejuvenation of aquifer system along the valley sides and inundated areas for proper recharge of groundwater resources.
- Renovation of the Groundwater based drinking water schemes for providing safe drinking water.

56.12.0. Dr. Sajin Kumar K. S., Asst. Professor, Department of Geology, University of Kerala briefed that the department runs M. Sc., M. Phil. And Ph. D. programmes and explained the various ongoing projects in the Department which include:

- 'Petrogenesis of Mafic & Ultramafic Rocks of Wayanad, Kannur and Kasargod districts, Kerala: implications for Archean Crustal Evolution and metallogeny' (funded by Kerala State Council for Science, Technology and Environment)
- "Identification and source characterization of Arsenic contamination in groundwater resources of Kasargod, Wayanad and Trivandrum districts, Kerala, India" (funded by Kerala State Council for Science, Technology and Environment)
- 2018 and 2019 Landslides occurrences in Kerala and land use changes (Collaborative with UNEP)
- Landslides on Mars (Funded by ISRO)
- The department is on the move to develop a mobile application, which is expected to be unveiled within one year. This would be based on cloud sourcing. If a person is able to input data on rainfall of a particular location, the map would change its colour to green, yellow or red predicting 'how far his land is safe?' All the warning will not literally end in landslide. Atleast 10% success in warning is considered to be a major victory (out of 10 times if one time it happens)
- Development of paradigm landslide susceptibility model for Kerala (Funded by World Bank)
- Cultural Elements in landslide occurrences (Funded by National Science Foundation)
- Development of rainfall thresholds for selected landslide prone areas in Kerala (Funded by Society of Engineering Geologists)
- Geological investigation of the suspected impact site at Luna, Gujarat (Funded by UGC)
- Unravelling Submarine Groundwater Discharge (SGD) zones along the Indian subcontinent and its islands and its islands (Mission-SGD) – Pilot Study National Centre for Earth Science Studies (NCESS)
- Every year impart training to the graduate and post graduate students on geology mapping
- Organise seminars
- All studies have been published in high impact factor journals
- University have standing MOU's with NCESS, ISRO and Michigan Technological University

Since Mining and Geology department is spearheading the meeting, it is suggested that department should take initiative in a starting a portal in which all the members of SGPB can share their data and the same can be utilized by all.

56.13.0. Dr. Suresh Francis, Scientist Kerala State Remote Sensing And Environment Centre, (KSREC), explained the work carried out during the review period and the work proposed to be taken up during 2019-'20.

- Configured 33 blocks, two blocks are left. On completing the same would be transmitted to AMD and DMG for incorporating corrections and for final submission.
- Made portals for flood and landslides. Mapped the flood hit areas of 2018 and 2019 and cadastral level data is available on web.
- Groundwater impact assessment for Vizhinjam road connectivity to the NH and suggested measures to annihilate the impact.
- Ground water vulnerability hot spot identification of Thiruvananthapuram taluk for Kerala Water Authority
- More concentrating on participatory level mapping using mobile applications. Ground Water Department is using one such mobile application, for carrying out well census. 35000 wells in Thiruvananthapuram district has already been mapped. Entire Chirayinkil block has been completed.

During the field season 2019-'20 the following projects would be carried out:-

- well census, for Ground Water Department, would be completed for the entire Kerala
- propose to come up with 'Comprehensive end-to-end mapping' solution named GRAMAM – 'Grass Root level Mapping and Monitoring' application – a disaster management action plan for panchayats through Planning Board.

56.13.1. Shri. Biju IAS, Director of Mining and Geology informed that some of the activities should be complementary to Ground water Department and therefore care should be taken to avoid duplication.

56.14.0. Smt. Tina Bhaskaran, Deputy Director (Agri.), Kerala State Land Use Board informed that they are not directly carrying out any geology projects. Land use maps are being prepared and in the coming year Land use decision model is being prepared for 50 panchayats based on the studies carried out regarding land use changes that occurred during the last 10 years and using the expertise of the agriculture officers and geologists suggest conservation measures.

56.14.1. Shri. Biju IAS, Director of Mining and Geology informed that in the wake of recent instance of demolition of flats it is felt that there exists confusion within bureaucrats, whatever be the causative factor, regarding grant of permission for such constructions. The beaurocrats, officers in field or policy makers are concerned with the line to be drawn, that which should not be crossed at all? Land Use board has a pivotal role to play in this regard. If a land use map is readily available to the panchayat/municipality/corporation it would be helpful for the field officers so that one could easily avoid this unauthorised construction which finally end up in its demolition and end the families being put into despair. The concerned authority should notify the same and it should be taken as a *sacrosanct* document from which one cannot deviate. All these problems arise because of the confusion regarding what to do and what not. Such document need to be proved to each and every panchayat in our State to avoid instances of issual of permission for such constructions.

56.14.2. Smt. Tina Bhaskaran, Deputy Director (Agri.) informed that the land use maps, prepared in 1:5,000 scale, have been provided to the user departments upon their request. It will take time to cover entire State and it is planned to cover 50 panchayats in the coming year.

56.14.3. Shri. Biju IAS, Director of Mining and Geology informed that it should cover corporations and municipalities where lot of urbanisation and construction is taking place. The common citizen should not be put to problem for the inactivity or inaction of the bureaucracy.

56.14.2. Smt. Tina Bhaskaran, Deputy Director (Agri.) informed that the same has been completed for the corporations and municipalities of Thiruvananthapuram and Kollam districts and the same has been handed over to the LSGI's concerned.

56.15.0. Dr. Arun P. R., Scientist informed that Centre for Water Resources, Development and Management (CWRDM), Kozhikode is involved in groundwater and natural hazards related research activities, especially in the Malabar region of Kerala.

- 'Use of quarry for mitigation of drought period' in Kozhikkode and Malappuram districts
- Efficacy of sub surface dykes in Palakkad district
- Water quality study of rivers in our State
- Water Quality division is concentrating on the 'pesticide residues' in drinking water and bacteriological pathogens in drinking water and groundwater

56.16.0. Dr. Partha Kundu, Senior Scientist, National Institute For Interdisciplinary Science And Technology, NIIST, explained the studies carried out by NIIST during the review period which includes:-

- Environmental Impact Assessment study for Indian Rare Earths Ltd. for Mining of heavy mineral sand in village Chavara, District Kollam - NK Block II (62 Ha), NK Block II EE (Eastern Extension, 67 Ha), NK Block IV (40.5 Ha) NK Block IV EE (Eastern Extension, 180 Ha)
- Environmental Impact Assessment study for Mining of heavy mineral sand in village Chavara, District Kollam for Kerala Minerals and Metals Limited (KMML)
- Common Research and Technology Development Hub for Environmental Intervention of MSMEs
- Dioxin measurement facility at CSIR-NIIST
- Bioprocess for treating perchlorate
- Mitigation of air pollution for Cashew industries
- Vulnerability Assessment of climate change impacts in Coasts and island ecosystems of India
- Municipal and industrial solid waste treatment by Bio drying

56.17.0. Dr. C. K. Baiju, Deputy Director, Mining and Geology Department presented the progress of work carried out during 2018-'19 and proposed programmes for the year 2019-'20.

Progress for the period from June 2018 – June 2019

- Investigation for China Clay/Aluminous Laterite/Bauxite Kannur district:
 - Karakundu area in Panapuzha and Pariyaram villages, Payyannur and Thaliparambu taluks

- Mavilampara, Kulathur - Kurumathur area, Chuzhali village, Thaliparamba taluk
- Koyipra block II, Koyipra area, Vellora village of Payannur taluk
- **Survey for identification of Tile/Brick clay bearing areas in Kerala**
- **Collaborative studies with other organizations**
 - Kerala State Remote Sensing and Environment Centre (KSREC) has been entrusted with the digitization of beach sand mineral-bearing areas of Kerala State, based on the report provided by AMD.
- Mineralogy and Gem Testing Laboratory:- 801 gemstones/synthetic stones were tested and certificate issued to public. The lab also rendered services to Honourable Courts in connection with the identification of 11 samples seized in crimes.
- Chemical Laboratory:- 1372 samples were analysed in the laboratory

Proposed programme for the year 2019-'20

- Reconnaissance survey for mineral investigations
- Investigation for china clay/aluminous laterite/bauxite in Kannur District
- Investigation for limestone, Walayar, Palakkad district.
- Survey for Identification of tile/brick clay-bearing areas in the State
- Collaborative studies with other scientific organizations

56.18.0. Shri. Biju IAS, Director of Mining and Geology thanked each and every one of the members for being present in the meeting, informed deliberations were fruitful and some of the suggestions put forth by the agencies are well taken. The Mining and Geology department will take initiative in bringing out the portal in which data from the various departments/organisations can be shared. The data that is being collected from various agencies shall be put to good use so that the public also can get information about various activities being carried out by various agencies. He reiterated that some of the activities carried out by various agencies, being complementary in nature, care should be taken to avoid duplication. He expressed his gratitude to the members on behalf of Mining and Geology department and Industries Department, in particular.

The 56th SGPB meeting concluded at 13.30 hours.

Minutes approved by

K. Biju IAS

**Director of Mining and Geology
and Member Secretary,
State Geological Programming Board**

**K. BIJU IAS
Director**

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