BEFORE THE HON'BLE NATIONAL GREEN TRIBUNAL

SOUTHERN ZONE, CHENNAI

ORIGINAL APPLICATION No. 313 of 2024 (SZ)

The Tribunal on its own motion SUO MOTU based on the news item published in Mongabay dt: 30.10.2024 titled, "Local lifeline, nature's timeline, Varkala cliffs threatened by climate and human activities".

: Applicant

Vs

Kerala State Pollution Control Board, Through its Member Secretary & others

: Respondents

REPORT FILED BY THIRD RESPONDENT, GEOLOGICAL SURVEY OF INDIA

Through

Mr. A.R.SAKTHIVEL
SENIOR PANEL COUNSEL
FOR THIRD RESPONDENT

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I, S.N. Mariappan, aged 59 years, working as Director & Head of Office am authorized to represent the 3rd Respondent in the Original Application No. 313/2024. The factual submissions made hereunder are true and correct to the best of my knowledge, information and belief. In these circumstances, it is just and necessary that this Hon'ble Tribunal may be pleased to accept the accompanying information on file and it is so humbly prayed in the interest of justice.

1. It is respectfully submitted that cognizance was taken *suo motu* by the Hon'ble National Green Tribunal based on the news article titled "Local lifeline nature's timeline Varkala cliffs threatened by climate and human activities," published in Mongabay on 30.10.2024. The article highlighted the deteriorating condition of the Varkala cliffs in Kerala, a designated national geo-heritage site, due to alleged environmental violations and administrative negligence. Alleged issues raised include the demolition of part of the cliffs, unauthorized construction along the site, and alterations to the natural environment, all of which are compromising the cliffs' geological integrity,

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biodiversity, and ecosystem services. The matter raises concerns under the Environment Protection Act, 1986, and the Biodiversity Act, 2002, and is being addressed by various authorities, including the Kerala State Pollution Control Board, Geological Survey of India, and Kerala Coastal Zone Management Authority. The case was transferred to the Southern Zonal Bench and renumbered as OA 313/2024 for further proceedings and the Hon'ble Southern Zone during the hearing held on 15.01.2025 directed the concerned departments to file reports in this regard.

2. It is submitted that Varkala cliff was declared as a National Geo-heritage Site by GSI on 28th May, 2014 which has a unique place in the Indian Geology and geomorphology. It is one of the few places in southern Kerala where a coastal cliff can be found next to a sandy beach. The cliff is about 6.14 km long and altitude ranges from 15 m to 40 m from MSL. The type section of the "Warkalli Formation" is the lithological sequence exposed in the section of cliff with gentle westerly dip. The laterite capping is formed on the sedimentary succession.

3. It is submitted that the area is listed as Geo-heritage site as declared by the Geological Survey of India for their protection, maintenance, promotion and enhancement of geo-tourism. The site is under Coastal Regulation Zones (CRZ) and it comes under CRZ-II category as per Kerala Coastal Zone Management Plan 2019.

4. It is submitted that in the year 2012, GSI conducted a study along Varkala cliff, to identify different type of landslides, it's causes-mechanisms, to suggest management practices and design in such a way that the charm of the cliff which attracts thousands of tourists every day (especially during peak season) should not be affected. Considering this fact and scenario the following remedial measures were suggested.

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a) *Implementation of Coastal Regulation Zone (CRZ) rules*

b) *Prohibition of vehicular movement and shifting of helipad*

c) *Construction of surface drainage network*

d) *Puncturing groundwater table away from cliff*

e) *Seawall construction and strengthening*

f) *Reduction of slope*

5. It is submitted that in the year 2013, as per the directive of the Chief Minister, the District Collector constituted a team of experts, and it was decided to prepare a preliminary report jointly by GSI, NCESS and University of Kerala and the report was submitted to District Collector on 25th July, 2013. During the construction of the *Balimandapam,* a preliminary report was submitted to the State Government in which mitigatory measures were suggested like fencing with iron mesh supported by iron rods separated by 4m interval and covering by rock curtains suspended from an anchored cable, so that it acts as flexible barrier to dissipate the energy if any rock/block fall occurs.

6. It is submitted that later a detailed report on protection of Varkala Cliff was prepared and submitted by GSI, NCESS and University of Kerala in the month of November, 2013. In that report, the following recommendations were suggested:
    a. Soft engineering options (Beach nourishment, beach & dune restoration, artificial reef, etc.) will be suitable to prevent the coastal erosion.
    b. Percolation of rain water to be minimized by diverting it away from sea side towards east. The natural springs present may be kept undisturbed and spring water can be collected and used for various purpose.

c. Surface run off and waste water have to be diverted away from the cliff face and should not be allowed to percolate down. Prepare a plan and execute new drainage system which has to be entrusted to a competent engineering agent.

d. No new construction to be allowed within a distance of 100m ahead.

e. To ensure the safety of human life, entry should be restricted to the cliff edge during rainy season and no entry within 10 m from cliff edge to be maintained.

f. Construction of steps, pathways have to be discouraged.

g. The vehicle movement along the cliff edge should be restricted.

7. It is submitted that recently, the district administration (vide order H5-3093/2021 dated 05.06.2024) demolished a portion of the Varkala Cliff, citing the need for immediate removal of trees and soil from the top of the cliff which has become unstable near the *Balimandapam*. In this regard, a Preliminary assessment was carried out by Geological Survey of India on 10.06.2024 for the slope under modification at Varkala cliff area near *Balimandapam* to evaluate the slope stability. The analysis has taken into account slope forming material, thickness of overburden, and geomorphological and geological parameters.

8. It is submitted that the forecited preliminary study recommended that;

a. any decision to demolish the cliff section of Geo heritage (Varkala cliff) is not justifiable without a proper scientific investigation regarding the slope stability. Importance of the site has to be considered before any decision regarding the slope modification/demolishing activities.

b. insisted that, without considering the slope stability aspect, *Balimandapam* was constructed on the foot of the cliff section without

providing any toe protection. The *Balimandapam* was constructed after the Coastal Zone Management Plan by Government of Kerala, which states that from High Tide Level (HTL) to 500m inland is classified as CRZ.

c. The study reveals that, anthropogenic activities (unscientific construction of building, resorts, slope modification done for construction activities) along the top of the cliff and both side of the cliff is observed to be one of the causative factors of slope instability.

9. Geological Survey of India, State Unit: Kerala and Lakshadweep, carried out Post Disaster Landslide Studies along Varkala Cliff during October 2024 and handed over the findings to Kerala State Disaster Management Authority (KSDMA) with recommendations *viz.*

   a. proper channelization of drainage in order to avoid the infiltration of water which results in the oversaturation of the slopes. Drainage system of the resorts and other settlements should be properly monitored by the local authority to prevent seepage activities which results in the oversaturation of slopes causing failure.
   b. no constructional activities should be permitted near the edge of the cliff as it increases the load which results in the failure of slope.
   c. fencing and pavements along the edge of the cliff should not be allowed as it increases the load which results in the collapse of cliff along its edges.
   d. alteration of cliff face for the construction of pathways (steps) for accessing the beach from the upper portion of the cliff has affected the stability of slopes.
   e. sea wall construction along the cliff section near Kappil area should be carried out for avoiding wave cut erosion.

f. coastal regulation zone rules (CRZ) should be implemented strictly for the sustainable management along the coast of Varkala.

g. proper methods for the stabilization should be carried out immediately for the basement of the swimming pool of the resort which is hanging precariously on the top of the cliff which is located approximately 900 m towards north of *Balimandapam*.

h. anthropogenic activities (unscientific slope modification done for construction activities) along the top of the cliff are observed to be one of the causative factors of slope instability.

10. It is submitted that vide letter No.SD-7/39/2024-SD from Ministry of Tourism, Government of India on 22nd June, 2024, GSI had a closed-door session with Honourable Minister Shri Suresh Gopi and District Collector-Trivandrum followed by a site visit to the cliff along with Honourable Minister and District Collector and reviewed the situation.

11. It is submitted that since the area, which was already disturbed is at a high risk, senior level domain experts from GSI, SR visited the site along with officers of GSI, SU: Kerala and conducted a detailed study along Varkala cliff to protect the Geo-heritage site. Recommendations for Preservation and Maintenance of Geological Heritage includes;

1. There should be proper awareness both at site and digitally through social media about Varkala as a hot Tourist Spot with Unique Geology.

2. There should be signages in three language Hindi, English and Malayalam about the Varkala Geoheritage at different places along the cliff with LED display for the night visibility.

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3. The area between 1km to 1.5 km south of *Balimandapam* in South cliff should be restricted from further anthropogenic development except for Geo Tourism development.
4. The already existing manmade pathway/steps can be modified with proper drainage and a tour along the different lithotypes can be promoted by Kerala Tourism in technical consultation with GSI to make the geo heritage walk interesting, with few selfie points.

A Report was submitted to KSDMA and District Collector on 02.08.2024.

12. It is submitted that GSI, SU: Kerala attended a Stakeholder meeting on 8th November 2024 in connection with Preparation of Master Plan for 'Comprehensive Development of Varkala Tourism Destination' – conducted by Kerala Tourism Infrastructure Ltd (KTIL). In this meeting GSI proposed erection of plaques in two locations at Varkala cliff.

13. It is submitted that based on the recommendation of domain expert report, District collector requested for detailed study and GSI, SU: Kerala formulated Field Season program on detailed study in Varkala cliff under Engineering Geology for the Field Season 2025-26.

14. It is submitted that Varkala cliff is one among the 90 Geo-heritage sites in India and is a proud possession of Kerala State with its unique landscape and geology, GSI, SU: Kerala is trying to protect, conserve and suggesting scientific mitigative measures to protect the cliff.

Effective conservative strategies include:

a. Legal protection by implementing National legislation laws and regulations.

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b. Management plan

c. Community involvement

d. Education and awareness

e. Research and monitoring

f. Sustainable tourism practices

g. Restoration projects

h. Collaboration and funding

15. In light of the comprehensive facts, assessments, and recommendations presented above, it is respectfully submitted that the Varkala cliff represents not only a geological marvel of national importance but also a delicate and vulnerable ecosystem that demands immediate and sustained attention. The Geological Survey of India, through its State Unit and Southern Region, has consistently undertaken detailed scientific investigations, post-disaster studies, stakeholder consultations, and collaborative efforts with academic institutions and government bodies to evaluate the stability of the cliff and propose mitigative strategies rooted in sound geoscientific principles. The findings unequivocally point to the adverse impact of unregulated anthropogenic activities, including unauthorized construction, slope modification, and inadequate drainage management, which have collectively contributed to the destabilization of the cliff face and pose a serious threat to public safety, biodiversity, and the long-term viability of the site.

16. Given the cliff's designation as a National Geo-heritage Site and its inclusion within the Coastal Regulation Zone, it is imperative that all future interventions be guided by scientific evidence, regulatory compliance, and a commitment to sustainable development. The recommendations outlined in this report, ranging from soft engineering solutions and slope stabilization to legal protection, community engagement, and geo-tourism promotion, are

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aimed at ensuring that the Varkala cliff is not only preserved for its geological uniqueness but also responsibly integrated into Kerala's tourism and environmental planning frameworks.

It is therefore humbly prayed that this Hon'ble Tribunal may be pleased to take cognizance of the submissions made herein, and issue appropriate directions to the concerned authorities for the implementation of the proposed measures, enforcement of existing environmental laws, and formulation of a long-term conservation and management plan for the Varkala cliff. Such action is essential to uphold the principles of environmental justice, safeguard the interests of future generations, and honour the scientific and cultural legacy embodied by this iconic landscape.

Dated at Chennai this 14th day of August 2025

3rd Respondent

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