BEFORE THE HON'BLE NATIONAL GREEN TRIBUNAL,

EASTERN ZONE BENCH, KOLKATA

ORIGINAL APPLICATION NO. 08 **OF** 2026 ~~2025~~

[Under Section 18 (1) read with sections 14, 15 and 17 of the National Green Tribunal Act, 2010]

IN THE MATTER OF

Kamakhya Bhairava Upasaka Foundation & Ors

..... Applicant

AND

STATE OF ASSAM & Ors

.....Respondents

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Paushali Banerjee

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Advocate

BEFORE THE HON'BLE NATIONAL GREEN TRIBUNAL,

EASTERN ZONE BENCH, KOLKATA

ORIGINAL APPLICATION NO._____OF 2025

IN THE MATTER OF

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SYNOPSIS

That the Applicants states that frequent and unscientific construction have already affected the Nilachal Hills leading to frequent landslides. The Kamakhya Temple, located on the Nilachal Hill, is surrounded by forests that are inhabited by animals such as leopards, golden langurs, and a variety of reptiles and amphibians. irregular & unregulated construction nearby the Dasha Mahavidya temples have contaminated the "eternal spring of water" in the garbhagruha through sewerage & other water outlet drains operating in an unscientific method. At the Siddheshwar Temple, the natural

underground water flow has been obstructed due to construction activities in the vicinity. This disruption has led to the artificial transport of water into the temple through pipes and pumping systems. This intervention has altered the natural flow, disrupting the sanctity of the sacred water. the **Seismic Micro zonation Reports** conducted for the **Guwahati region** (as per the **Remote Sensing & GIS Based inputs for hazard risk vulnerability assessment of Guwahati City by NESAC & Assam State Disaster Management Authority)** have identified this area as **highly vulnerable to seismic activities**. Guwahati, situated on the edge of the **Himalayan tectonic plate**, is at significant risk for **earthquakes**, and Nilachal Hill is no exception.

'Maa Kamakhya Temple Access Corridor, Guwahati, Assam', which is proposed to be constructed through the Public Works Department of State of Assam, for which the Public Works Department Assam, taken out a notice inviting tender NIT No.CE/TB-VI/26/2023/12 dated 28/12/23 for construction of Basement plus Lower Ground Floor plus Ground Floor plus second floor along with allied activities with total campus area of 21,482 square meter, portraying this construction project as an educational project so that obtaining environmental clearance can be skipped by the respondents , the respondent already started preparation of land and commenced the

construction of the project illegally without obtaining Environmental Clearence. Nilachal hills and Kamakhya Temple situated on the Nilachal hills are polluted due to sewerage & other water outlet drains operating in an unscientific method and illegal construction, Hence this Application

BEFORE THE HON'BLE NATIONAL GREEN TRIBUNAL,

EASTERN ZONE BENCH, KOLKATA

ORIGINAL APPLICATION NO._____OF 2025

IN THE MATTER OF

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LIST OF DATES

	the Government of Assam, through the Public Works Department, issued a public notice	**28/11/23**
	Master Plan for Guwahati Metropolitan Area	**2025**
	representation of the Applicant Respondent No.1	**20.03.25**
	frequent and unscientific construction have already affected the Nilachal Hills leading to	**4/06/25**

	frequent landslides. The Assam Tribunal in its news report published	
	Second representation of the Applicant to the respondent authority	23.07.2025

Paushali Banerjee

Advocate

BEFORE THE HON'BLE NATIONAL GREEN TRIBUNAL,

EASTERN ZONE BENCH, KOLKATA

ORIGINAL APPLICATION NO._____OF 2025

IN THE MATTER OF:

1. Kamakhya Bhairava Upasaka Foundation, through the authorized signatory, Registered Office at No.13A, Sri Vinayaka Nagar, Telephone Exchange Road, Kovaipudur, Coimbatore, Tamil Nadu - 641042

2. Rajeev Bhattacharya, 302 Basistha Road, Beltola, Guwahati, Assam-781028.

3. Akshay Ravindra Kolle, No.46, Jai Kamakshi, 1st A Cross, Model LIC Coloney, Basaveshwarnagar, Bangalore, Karnataka -560079

4. Suraj Kumar, C/o Rajendra Prasad Singh, Co-operative Colony, Demudi, Bokaro, Marafari Colony, Jharkhand - 827012

5. Sujay Bhattacharya, B501, VRR Nest, Beratana Agrahara, Electronic City, Bangalore, Karnataka - 560100

..... **APPLICANTS**

AND

1. **STATE OF ASSAM,** through its Chief Secretary, Government of Assam, Block- C, 3rd Floor, Assam Sachivalaya, Dispur, Guwahati-781006, Phone No.: 0361-2261120 / 0361-2261403.cs-assam@nic.in

2. **PUBLIC WORKS (BUILDING NATIONAL HIGHWAY) DEPTARMENT,** through its Special Commissioner& Special Secretary to the Govt. of Assam,Block B, Ground Floor, Assam Secretariat, Dispur, Guwahati – 781006,Ph.: 0361- 2237001(0), Email id: csspwdbnh2018@gmail.com

3. **STATE ENVIRONMENT IMPACT ASSESSMENT AUTHORITY,** through its Member Secretary, Bamunimaidam, Guawhati-21

SEIAA, Govt of Assam, Environment & Forest Department, Dispur-06.
Email: cherenda67@gmail.com

..... RESPONDENT

MOST RESPECTFULLY SHEWETH:

1. The Applicants No.1 is a registered Public Charitable Trust having address as stated above for the purpose of service of notices pertaining to the instant application. The object of the Trust is to propagate, promote, preserve and conduct activities and practices as enunciated in Sanathana Dharma, establish and maintain educational institution, hospitals, homes for aged etc. The Applicants no.2 is a responsible citizen and a journalist as well as a resident of Guwahati. The Applicant no.3 is an Advocate practicing before the Hon'ble High Court of Karnataka and is an ardent devotee of Ma Kamakhya. The Applicant no 4 is Businessman ana an ardent devotee of Ma Kamakhya. The Applicant no 5 is a Software Professional and ardent devotee of Ma Kamakhya.

2. The addresses of the respondents are stated above for the purpose of service of notices pertaining to the instant application. All the acts, actions and inactions of the respondent authorities are amenable to the jurisdiction of this Hon'ble Tribunal.

3. The Applicants above named begs to present the Memorandum of application against the proposed **'Maa Kamakhya Temple Access Corridor, Guwahati, Assam'**, which is proposed to be constructed through the Public Works Department of State of Assam, for which the Public Works Department Assam, taken out a notice inviting tender NIT No.CE/TB-VI/26/2023/12 dated 28/12/23 for construction of Basement plus Lower Ground Floor plus Ground Floor plus second floor along with allied activities with total campus area of 21,482 square meter, portraying this construction project as an educational project so that obtaining environmental clearance can be skipped by the respondents , the respondent already started preparation of land and commenced the construction of the project illegally without obtaining Environmental Clearence, the Nilachal, Narakasur, and Sarania hills, are covered with dense forests that are rich in medicinal plants, rare orchids, and other flora that have significant ecological and economic value. These forests are not just important for their biodiversity; they also play a critical role in regulating the climate of the region, preventing soil erosion, and maintaining the water cycle. The Kamakhya Temple, located on the Nilachal Hill, is surrounded by forests that are inhabited by animals such as leopards, golden langurs, and a variety of reptiles and amphibians;. The Nilanchal Hills which host the Maa Kamakhya temple complex falls under Seismic Zone V

and which mandates deep drilling into earth for foundation which has very high possibility of damaging the water source and it becomes pertinent to investigate the flow of water underground before preparing for such projects. Further, the project proponent wants to increase the influx of tourists from 3000/per day to 14,000/per day without any study as to the impact such influx of tourists might have on the whole hill ecosystem. Further, the Maa Dhumavati Temple and Siddeshwar Temple water flow in sanctum sanctorum is already effected due to rampant unchecked construction and seepage of effluent waterflow. Further, the Nagaon Division of Forest has 518 Ha of Forest Land in Kamakhya Hills in accordance with the definition of Forests held by the Hon'ble Apex Court in TN Godavarman Thirumalpad vs Union of India vide order & judgement dated 12.12.1996 which has held the field for last so many years, therefore this Application have been filed by the Applicants :

4. FACTS IN BREIF:

A. That the Applicants states that 'Maa Kamakhya Temple', Dasa Mahavidyas, Bhairav/ Shiva temples, all nestled amongst the sacred Nilachal Hill, which itself is worshiped as Lord Shiva himself, situated on the bank of Brahmaputra River, in the western part of Guwahati, Assam. The temple complex covers approximately 1.25 sq. km area or

approximately 308.9 acres of lands. In the Kamakhya temple site, there are *more than seventeen temples* dedicated to different deities. Most of the temples belong to the Shakta tradition, such as the temples dedicated to the Dasa- Mahavidyas (Ten Mahavidyas) and rest of the temples are dedicated to different forms of Lord Shiva, also known as Bhairavas such as, Aghora (or Heruka Siva), Amratakeswara (Sadyojata Siva), Kamesvara (or Vanadeva Siva), Kotilinga (or Tatpurusa Siva) and Siddheswar (or Ishana Siva) (reference - Bhuyan and Nayak, 2010)

B. That the Applicants submits that *Nīlāchal hill* is divided into three parts – *Brahma Parvat*, the *Vishnu Parvat* and the *Shiva Parvat*. The main Kamakhya temple is at the *Shiva Parvat* which is the central part of the hill. The glory of Kamakhya temple as one of the important Shakti Peetha in the entire Indian subcontinent was further reinforced by the ancient texts like Garuda Purana, Markandeya Purana, Skanda Purana, Devi Bhagavata Purana, and Devi Mahatmya, and so on. These ancient texts connected Maa Kamakhya temple to the broader sect of Brahmanism with the help of the legend of 'Goddess Sati's self- immolation at Daksa Yajna' and transformed this site into one of the most important Shakti peetha in the entire Indian subcontinent.

C. That That the Official Website of the Maa Kamakhya Devalaya, Guwahati, recognizes and describes the holiness of the world-famous Kamakhya temple as – "'Maa Kamakhya' or Kameswari is the renowned Goddess of

Desire whose famous shrine is located in the heart of Nilachala Hill situated in the western part of Guwahati, the Capital City of the State of Asom (now known as Assam) in North East India. Maa Kamakhya Devalaya is considered most sacred and oldest of the 51 Shakti Peethas on earth. It is the centerpiece of widely practiced, powerful Tantrik Shaktism cult in India. Apart from the main temple of Maa Kamakhya, there are temples of the Dasa Mahavidyas (ten incarnations of the deity) namely (1) Kamakhya (i.e. Tripura Sundari, alongwith (2) Matangi and (3) Kamala), (4) Kali, (5) Tara, (6) Bhuvaneshvari, (7) `Bagalamukhi, (8) Chinnamasta, (9) Bhairavi, (10) Dhumavati, and Six temples of Lord Shiva namely (1) Kameswara, (2) Siddheswara, (3) Kedareswara, (4) Amratokeswara, (5) Aghora and (6) Kautilinga around the Nilachala Hill which is also called as Kamakhya Temple Complex.

D. That there are several legends around Nilachal Hill and Goddess Kamakhya. One such legend depicted in 'Yogini Tantra' is that under the guidance of Goddess Kali, Brahma created a mountain known as Govardhana parvata, which was mentioned in the 'Yogini Tantra' as Nilakuta Parvata or the Nilachala hill and Goddess Kamakhya is treated as a manifestation of Goddess Kali. The description and the legends around the 'Maa Kamakhya Temple' and the entire 'Temple Complex' consisting of natural existence of 'Maa Kamakhya' herself, Dasa Mahavidyas and Lord Shiva in his various Avatars, are painstakingly

written in many holy books/ literatures/ theses, etc. and the same are well accepted and heavily believed by the locales and the devotees.

E. That Maa Kamakhya Temple' has been celebrated as a center of Shakti worship and pilgrimage site since ancient times, the position is still retained in present times. The Goddess Kamakhya is worshipped as a Goddess of wealth and prosperity, as a kind-hearted mother who fulfilled all the wishes of her devotees Goddess Kamakhya is accompanied by Dasa Mahavidyas, a group of Goddesses. The Kamakhya temple represents the symbolized epicenter of religiosity in Assam. It is an institution, which stands out as a celebrated and imperative Tantric center. Kamakhya temple is often regarded as the seat of Tantric practices. It is considered as a theological college of Tantra on account of its Tantric affiliations. In the Kamakhya temple complex, explicit rituals and practices affiliated to Tantric tradition are performed. Kamakhya is not only just a temple complex but an institution, which stands as a primary center for Tantric heritage. The tantric tradition is inherently associated with Kamakhya since ancient past and continuous to the present.

F. That the Applicants states that the relationship of Kamakhya Temple and Nilachal hills are intertwined, Studies show that the holy place started as a cave temple 1500 years ago. The temples have been rebuilt many times over the centuries. The location of the Maa Kamakhya is a *yoni* or *yoni*-like structure has a water stream attached to it. It is pertinent to mention

here that the Government of Assam, through the Public Works Department, issued a public notice on 18.08.2023 and again on 28.11.2023, re-inviting "Expression of Interest" (EOI) from Architects/ Architectural firms for Consultancy services for "Maa Kamakhya Temple Access Corridor at Guwahati Assam". Copy of the relevant pages of the E tender are annexed herewith and marked as **ANNEXURE-A**.

G. That the Applicants submits that the notice inviting tender specifies that the construction will consists an area of 21482 sqm, including basement plus lower basement plus ground floor plus two floors comprising of multi utility block, pilgrim management block, Chinnamasata block, Siddheshwar block, Corridor.

H. That the Applicants states that frequent and unscientific construction have already affected the Nilachal Hills leading to frequent landslides. The Assam Tribunal in its news report published on 4/06/25 have reported that "*Experts argue that most landslides in the city are not natural disasters but man-made crises. Unchecked felling of trees, reckless cutting of hills, and construction without proper retaining walls or drainage mechanisms have all contributed to destabilizing the fragile slope*". Copy of the news report published on 4/06/25 is annexed herewith and marked as **ANNEXURE- B**

I. The Applicants states that hills surrounding Guwahati, such as the Nilachal, Narakasur, and Sarania hills, are covered with dense forests that are rich in medicinal plants, rare orchids, and other flora that have significant ecological and economic value. These forests are not just important for their biodiversity; they also play a critical role in regulating the climate of the region, preventing soil erosion, and maintaining the water cycle. The Kamakhya Temple, located on the Nilachal Hill, is surrounded by forests that are inhabited by animals such as leopards, golden langurs, and a variety of reptiles and amphibians. The Guwahati Municipal Development Authoritie's Master Plan also states that RTI Information made available on the Assam Nilachal hills consist of a variety of wildlife.

J. The Applicants further states that RTI information made available on Assam Forest Department website with regards to the order & judgement of the Hon'ble Supreme Court of India dated 12.12.1996 in TN Godavarman Thirumalpad vs Union of India, wherein directions are issued to Forest Departments of all State Governments to protect and safeguard "Forests" in the dictionary sense of the meaning as per Forest Conservation Act, points out the fact that about 518 Hectares of Area is Forest in Kamakhya Hills in the

Nagaon Forest Division , the Copy of the RTI information is annexed herewith and marked as **ANNEXURE C**.

K. The Applicants states that the Master Plan for Guwahati Metropolitan Area 2025 developed by Guwahati Metropolitan Development authority delineates that "the *construction on the hills in Guwahati has resulted in the removal of vegetation cover in the forest area and exposed surface. The soil loss is 60 times more on the exposed slopes than on the vegetable covered slopes. The problem of soil erosion is significant not only from the view point of loss of soil fertility, but also from the many environmental issues like water logging, flash flood, decrease in ground water table and dusty environment on sunny days. To deal with the given situation, forest areas need to be sanctified and conserved with no further development whatsoever, any cutting of trees and encroachments to be stopped. Similarly massive afforestation programs are to be undertaken*". Copy of the relevant page of the Master Plan for Guwahati Metropolitan Area 2025 is annexed herewith and marked as **ANNEXURE-D**.

L. The Applicants further states that the Kamakhya Hills (Nilanchal Hills) is home to rich bio diversity, flora & fauna which can be seen through various studies done by competent researchers, to list out few of these studies regarding the Nilanchal hills and its sensitive landscape are as follows:

(I) Studies on the distributional pattern and habitat utilization pattern by ***Indian Leopard in Nilanchal Hill, Kamrup, Assam, India*** by Mridul Bora, Shah Nawaz Jelil & Pragoti Kalita from Animal Ecology & Wildlife Biology Lab, Department of Zoology, Gauhati University (ISBN: 978-81-924321-7-5).

Relevant extract of the study is extracted as under:

"The *Nilachal Hill in Kamrup, Assam, provides critical habitat for the Indian leopard (Panthera pardus fusca). According to a study by Bora, Jelil, and Kalita (2014), the distribution and habitat utilization patterns of the leopard were assessed in this area. The researchers found that leopards primarily utilized regions near the Brahmaputra riverbank, with less frequent sightings in the hilly terrains. In their study, it was noted that "Leopard signs like pugmarks, scat, scratches, and carcasses were predominantly found in patches A, B, and C, which were closer to the riverbank" (Bora et al., 2014, p. 225). This distribution pattern is indicative of the species' preference for certain habitat features and highlights the need for conservation measures to protect their ecological niche in the face of growing human encroachment. The study also*

emphasizes the importance of declaring Nilachal Hill a protected area to mitigate habitat destruction and reduce human-leopard conflicts."

(II) Snakes of Nilanchal Hill, Assam, India by Bijay Basfore, Trishna Das and Abhi Medhi, Department of Zoology, Pandu College, Guwahati.

Relevant extract of the study is extracted as under:

"In the past few years, Nilachal Hill has seen a gradual decline in its vegetation as a result of human encroachment (Kar et al. 2012), but nevertheless harbors a unique habitat mosaic that is home to a wide variety of animals ranging from small arthropods like the Assam Tarantula (Chilobrachys assamensis) to large mammals like Leopards (Panthera pardus) (Bora et al. 2014). Many of these animals are in regular conflict with humans due to loss of breeding and foraging grounds. Our study underscores the significant snake diversity on Nilachal Hill that, despite the pressures imposed by anthropogenic activities, continues to support a diverse ophidian fauna. This, in turn, highlights the necessity for conservation efforts to preserve remaining forest fragments not only for sustaining wildlife but also for mitigating human-wildlife conflicts in rapidly urbanizing regions."

(III) Folklore plants from Kamakhya Hills Reserve Forest Assam, India with their Ayurvedic Indications and corroborated

pharmacological activities by Devanjal Bora, Manajit Bora and Neha Dubey.

Relevant extract of the study is extracted as under:

*"**Results**: The reported folk claims involve 18 medicinal plants under 18 genera represented by 15 families. Corroborative Ayurvedic indications and reported pharmacological activities have been reviewed against documented folklore medicinal plants for further validation of folk claims. From the review, it is evident that there are total four plant species reported as the folk medicine of the region are not mentioned in any classical Ayurvedic texts as well as in Ayurvedic Pharmacopoeia of India (API). Among these, one plant species have come up with novel disease indications without having corroborative disease indications in Ayurvedic system of medicine as well as in reported pharmacological activities. **Conclusion**: Novel folklore plants are suggested for further validation and screening. Significance: Corroboration with Ayurvedic indication and reported pharmacological activities will validate the use of the folklore plant."*

(IV) An insight into the **Butterfly Diversity of Nilanchal Hills**, Assam published by Invertebrate Conservation and Information Network of South Asia (ICINSA). Relevant extract of the study is extracted as under:

"A total of 145 species of butterflies belonging to 95 genera and six families were recorded during the study. Among the recorded species, 19 species are listed as 'Least Concern' (LC), two as 'Data Deficient'

(DD), and 124 species remain non-assessed under the IUCN Red List. Additionally, Nymphalidae was found to be the most dominant family with 52 (36%) species, followed by Lycaenidae with 31 (22%), Hesperiidae with 30 (21%), Pieridae with 15 (10%), Papilionidae with 15 (10%), and the least was Riodinidae with only 2 (1%) species. This study established that a wide range of species may coexist in urban surroundings. Recently, the butterfly species Unkana ambasa was also reported from Nilachal Hill, which is the first visual proof of the adult species' existence in Assam (Bohra et al. 2024). Hence, Nilachal Hill which has been largely overlooked for biological richness, turned out to be a hub of butterflies. With the exception of the undisturbed forest patches, a large portion of the region is inhabited by people, which will inevitably reduce biodiversity. Inventorying the biodiversity of this particular forest patch is thus crucial because it is in jeopardy due to pollution and habitat loss brought on by numerous anthropogenic activities."

(V) Diversity of **Invasive plant species in Nilanchal Hill**, Kamrup Metro Assam by Shilpa Roy & Nijara Gosawami of Deaprtment of Botany, Gauhati University.

(VI) A study on Landuse/Landcover change detection and its **impacts on the soil quality of Nilanchal (Kamakhya) Hills**, Guwahati, Assam by Tanvi Hussain, Dulal C Gosawami of

Department of Environmental Science, Gauhati University.

Relevant extract of the study is extracted as under:

" 5. Conclusion Change analysis of landuse/ landcover of the study area derived from Landsat imagery has highlighted pattern of changes during the study period. The analysis has revealed that maximum changes have occurred between periods of 2011 to 2015. Landuse activities are more towards sprawling of built up area at the foothills and it has also expanded centrifugally from the temple complex at the cost of forest cover. It was also observed that physico-chemical properties of soil are in their natural state in the forested areas. Conversion of forest land to other landuse basically built up has a profound impact on soil characteristics. Besides, the inhabitants of the hill are not aware of the degrading environmental condition of their habitat. Thus, a proper environmental management plan should be made for maintenance of the natural ecosystem and to reduce the impact of sudden influx of pilgrims during the mela in the study area. A township should be built in the near vicinity of the study area for temporary rehabilitation of the pilgrims and to utilize it as a destination point for outstation devotees visiting the temple round the year and a plan for eco-housing complex should be undertaken. Proper waste disposal system and recycling of waste methods should be implemented. Landcover is a critical variable linking human and his environment intimately and calling one another for integrated planning and sustainable development."

(VII) Potable **Water Quality Analysis** of various sources available at Nilanchal Hills (Kamakhya Hill) by Tanvi Hussain, Dulal C

Gosawami of Department of Environmental Science, Gauhati University. Relevant extract of the study is extracted as under:

" 5. Conclusion:

People use water for drinking mostly from the six sources mentioned above. As a result, scarcity as well as chemical contamination of water affects a large number of people. Keeping in view the importance of the place and large influx of devotees during the mela, it is concluded that regular monitoring of water sources should be ensured by the concerned authorities to prevent the outbreak of water borne diseases in the area. Based on the study, it is concluded that the intrinsic drinking water quality in the area is not encouraging. Thus, suitable protective measure for drinking water sources in the area is recommended."

The copies of the RTI Reply and research papers regarding ecology & biodiversity of Nilanchal Hills is annexed herewith and marked as **ANNEXURE E to E6 series Collectively.**

M. It is pertinent to mention here that according to EIA Notification, 2006 , the proposed construction activity of the respondent authority falls under the category "B" project of the said EIA Notifications. Therefore, according to the EIA Notification 2006, for the project or construction activity the respondent authorities need to comply the mandatory requirement for obtaining the Environmental Clearance.

N. That the Applicants states that the following procedure has been laid down in EIA Notification, 2006, to issue environmental clearance to the projects and activities:-

> 6. *An application seeking prior environmental clearance in all cases shall be made in the prescribed Form 1 annexed herewith and Supplementary Form 1A, if applicable, as given in Appendix II, after the identification of prospective site(s) for the project and/or activities to which the application relates, before commencing any construction activity, or preparation of land, at the site by the Applicants. The Applicants shall furnish, along with the application, a copy of the pre-feasibility project report except that, in case of construction projects or activities (item 8 of the Schedule) in addition to Form 1 and the Supplementary Form 1A, a copy of the conceptual plan shall be provided, instead of the pre-feasibility report.*

O. That the Applicants states that an RTI application was filed by the Applicants to know if any Environmental Clearence was granted by the concerned authority to the respondents for the temple corridor project. The reply to this RTI application was received in negative.

The respondent authority has not applied for any Environmental Clearence, the reply is annexed as annexure E.

P. That the Applicants downloaded the Architectural Design Basis Report (hereinafter referred to as ADBR), the column Environment Impact Assessment in the ADBR states that the Kamakhya Corridor construction project is an educational project and therefore do not require Environmental Clearence. The copy of the relevant pages of the ADBR is annexed herewith and marked as **ANNEXURE-F**.

Q. The Applicants states that irregular & unregulated construction nearby the Dasha Mahavidya temples have contaminated the "eternal spring of water" in the garbhagruha through sewerage & other water outlet drains operating in an unscientific method. At the Siddheshwar Temple, the natural underground water flow has been obstructed due to construction activities in the vicinity. This disruption has led to the artificial transport of water into the temple through pipes and pumping systems. This intervention has altered the natural flow, disrupting the sanctity of the sacred water. At the **Dhumavati Temple**, it has been observed by devotees and the Applicants themselves that the water within the **garbhagriha** has become contaminated and polluted. This degradation of the sacred

water compromises the purity of the temple and the spiritual experience of its devotees which cannot be compromised.

R. The Applicants states that the Hon'ble National Green Tribunal, South Zone had suo motu intervened to protect trees falling near the sacred Arunachala Hill of Tiruvannamali, Tamil Nadu. "*The NGT took the issue to Suo Motu and constituted a two-member committee, comprising of retired Judge JAK Sampath Kumar and former Principal Chief Conservator of Forests T Sekar, to conduct field inspection. Based on the reports submitted by the committee after two field inspections, the NGT passed a final order directing the district administration and highways department to net fell trees*" and other specific guidelines.

S. The Applicants further states that the **Seismic Micro zonation Reports** conducted for the **Guwahati region** (as per the **Remote Sensing & GIS Based inputs for hazard risk vulnerability assessment of Guwahati City by NESAC & Assam State Disaster Management Authority)** have identified this area as **highly vulnerable to seismic activities**. Guwahati, situated on the edge of the **Himalayan tectonic plate**, is at significant risk for **earthquakes**, and Nilachal Hill is no exception. The report highlights that seismic

activity in this region can lead to landslides, soil erosion, and infrastructure damage, which is exacerbated by the proposed corridor construction. The Kamakhya Nilanchal Hills fall within Seismic Zone V as per the report on Sub Soil Investigation as per study conducted on Kamakhya Corridor by Ankan- The Design Desk, Guwahati. Further, the Project Proponents stated aim is to increase the flow of tourists for flourishing Tourism, currently around 3000 devotees visit the Kamakhya Hills daily and the same is sought to be increased to 14,000 devotees daily after the corridor project which will have devastating strain on the Nilanchal Hills and the ecology, causing irrepairable loss and damage to the whole hill ecosystem. Copy of Technical Report conducted by Assam State Disaster Management Authority & NESAC is produced as **ANNEXURE-G** and copy of Sub Soil Investigation of Kamakhya Corridor report is produced as **ANNEXURE - H**.

T. The Applicants submitted a representation before the authorities ventilating their grievances but till date no action is taken by the respondent authorities. Copy of the representation dated 23.07.2025 to Respondent No.3, Copy of the representation dated 20.03.2025 to Respondent No.1 is annexed herewith and produced as **ANNEXURE I**.

U. The Applicant submits that preparation work of the construction of the corridor have started, without any prior Environmental Clearence, The Apex Court in VANASHAKTI vs Union Of India vide order dated 16/05/25 have clarified that no post facto Environmental clearance is to be granted by the regulating authorities. Copies of Pictures showing construction work in the periphery of the Corridor is annexed herewith and marked as **Annexure J**.

V. Being highly aggrieved by and dissatisfied with the inaction on the part of the respondent's authority as stated above, your petitioner begs to move to Your Lordships on the following amongst other:-

Grounds:

I. FOR THAT the respondent authority have miserably failed to appreciate that the Nilachal, Narakasur, and Sarania hills, are covered with dense forests that are rich in medicinal plants, rare orchids, and other flora that have significant ecological and economic value. These forests are not just important for their biodiversity; they also play a critical role in regulating the climate of the region,

preventing soil erosion, and maintaining the water cycle. The Kamakhya Temple, located on the Nilachal Hill, is surrounded by forests that are inhabited by animals such as leopards, golden langurs, and a variety of reptiles and amphibians;. The Nilanchal Hills which host the Maa Kamakhya temple complex falls under Seismic Zone V and which mandates deep drilling into earth for foundation which has very high possibility of damaging the water source and it becomes pertinent to investigate the flow of water underground before preparing for such projects. Further, the project proponent wants to increase the influx of tourists from 3000/per day to 14,000/per day without any study as to the impact such influx of tourists might have on the whole hill ecosystem. Further, the Maa Dhumavati Temple and Siddeshwar Temple water flow in sanctum sanctorum is already effected due to rampant unchecked construction and seepage of effluent waterflow. Further, the Nagaon Division of Forest has 518 Ha of Forest Land in Kamakhya Hills in accordance with the definition of Forests held by the Hon'ble Apex Court in TN Godavarman Thirumalpad vs Union of India vide order & judgement dated 12.12.1996 which has held the field for last so many years.

II. **FOR THAT** the respondent authority has failed to appreciate that according to EIA Notification, 2006 , the proposed construction activity of the respondent authority falls under the category "B" project of the said EIA Notifications. Therefore, according to the EIA Notification 2006, for the project or construction activity the respondent authorities need to comply the mandatory requirement for obtaining the Environmental Clearance.

III. **FOR THAT** the respondent has failed to appreciate that frequent and unscientific construction have already affected the Nilachal Hills leading to frequent landslides.

IV. **FOR THAT** the respondent authorities ought to have appreciated that procedure has been laid down in EIA Notification, 2006, to issue environmental clearance to the projects and activities:-

An application seeking prior environmental clearance in all cases shall be made in the prescribed Form 1 annexed herewith and Supplementary Form 1A, if applicable, as given in Appendix II, after the identification of prospective site(s) for the project and/or activities to which the application relates, before commencing any construction activity, or preparation of land, at the site by the Applicants. The Applicants shall furnish, along with the application, a copy of the pre-feasibility project report except that, in case of construction

projects or activities (item 8 of the Schedule) in addition to Form 1 and the Supplementary Form 1A, a copy of the conceptual plan shall be provided, instead of the pre-feasibility report.

V. **FOR THAT** the respondent has failed to appreciate that the project requires Environmental Clearence as the column Environment Impact Assessment in the ADBR clearly states that the Kamakhya Corridor construction project is an educational project and therefore do not require Environmental Clearence;

VI. **FOR THAT** the respondent authorities failed to appreciate that the respondent authorities ought not to have started any construction work, or preparation of land at Nilachal Hills without obtaining Environmental Clearence.

VII. **FOR THAT** by remaining inactive and maintaining stoic silence with regard to the representation of the Applicants, the respondent authorities have acted in grave violation of their statutory duties;

5. <u>LIMITATION</u>:

The Applicants submits that cause of action is renewing on a day-to-day basis and as such the question of applicability of the limitation prescribed in Section 14 (3) of the National Green Tribunal Act, 2010 does not arise.

6. INTERIM PRAYER:

A) Direct the respondent and/or its servants and/or their employees and/or its agents not to continue the project of Kamakhya Corridor without Environmental Clearence till the disposal of this Application;

B) Direct the respondents for testing of water samples from Siddeshwar Temple and Maa Dhumavati Temple for Environmental Pollutants under Sec.11 of Environmental Protection Act.

C) Any other appropriate direction/directions and/or order/orders as this Hon'ble Tribunal may deem fit and proper;

7. PRAYER:

In view of the facts mentioned in paragraphs 4 & 5 above the Applicants prays for the following reliefs:

a) Mandatory order commanding the respondent each one of its men, agents, assigns and subordinates to certify and transmit to this Hon'ble Tribunal all records forming the basis of their

inaction regarding the representation of the Applicants before SEIAA;

b) Direct the respondent and/or its servants and/or their employees and/or its agents to take consider the EIA notification 2006 and consider the representation of the Applicants dated – 23/07/25 & 20/02/25

c) Direct the respondents to Immediate survey and sealing of illegal sewer outlets and greywater pipelines currently discharging into the hill's hydrological system.

d) Direct the respondents to classify Nilachal Hill as a Sacred and Ecological Zone and call for immediate conservation efforts to preserve the water stream and rare flora, fauna of Nilachal hills with full protection under environmental laws.

e) Direct any future construction should be strictly relocated to the base of Nilachal Hill, below the sacred zone, ensuring the preservation of the sacred and ecological balance of the hill.

f) Direct constitution of an Expert Committee consisting of hydrologists, archaeological survey experts (ASI), temple authorities, and seismic experts to:

(1) Map the entire sacred stream, including its origin, route, and entry/exit to the garbhagriha.

(2) Audit the seismic stability of the hill and assess risks from development activities.

(3) Conduct third-party testing of water in the garbhagriha of all temples and survey sources of contamination.

(4) Conduct Carrying Capacity assessment on the Nilachal Hill and submit a report.

g) Any other appropriate direction/directions and/or order/orders as this Hon'ble Tribunal may deem fit and proper;

h) Cost of and/or incidental to the instant application;

SL. No. 27/25

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NOTARY ★ GOVERNMENT OF WEST BENGAL
Subhendu Banerjee
Kolkata-[illegible]
Reg. [illegible]008/20[illegible]
Expiry Date
1/[illegible]/20[illegible]

AFFIDAVIT

I am, Rajarshi Ranjan Nandi , principal trustee of Kamakhya BhairavaUpasaka Foundation Trust, having registered address at No.13 A, Vinayaka Nagar, Telephone Exchange Road, Kovaipudar, Cimbatore, Tamil Nadu-641042, aged about 45 years, by religion Hindu, by occupation- Social Worker, I am Applicant no.1 of this instant OriginalApplication, I do solemnly affirm the Application and say as follows;

1. That I am the Applicant no.1 in this instant matter , the other Applicants are known to me and I am affirming thisOriginal Application on behalf of the other Applicants.

2. That the contents of paras 1,2,3,4,4(A)(B) to 4(L) ..... of the Original Application are based on information and/or derived from sources I verily believe to be true. The 4(O), 4(T), 4(U) ----- paragraphs are derived from my Knowledge, I have not suppressed any material facts; the rest of the paragraphs are my humble submissions before this Hon'ble Tribunal

Verified at Kolkata on this 26th day of September, 2025

For Kamakhya Bhairava Upasaka Foundation Trust
Rajarshi Nandy
Authorised Signatory

Paushali Banerjee
Advocate
WB/142/2006

Solemnly Affirmed and Declared before me u/s 139 CPC and u/s 333BNSS 2023

26 SEP 2025

Notary 26.9.2025
Govt. of West Bengal

SUBHENDU BANERJEE
Notary, Govt. of W.B
Regd. No. 008/2022
Advocate High Court Calcutta

SL. NO. 28/25

- 32 -

VERIFICATION

I am, Rajarshi Ranjan Nandi , principal trustee of Kamakhya BhairavaUpasaka Foundation Trust, having registered address at No.13 A, Vinayaka Nagar, Telephone Exchange Road, Kovaipudar, Cimbatore, Tamil Nadu-641042, aged about 45 years, by religion Hindu, by occupation- Social Worker, I am Applicant no.1 of this instant Original Application, I am verifying this Application on behalf other Applicants, Ido hereby verify that para 1,2,3,4(A)(B) to 4(L) of the Original Application are true to the best of my belief and Knowledge, rest are humble submissions before this Hon'ble Court and no part of the report is false and nothing has been concealed therefrom.

Verified at Kolkata on this the 26th day of September, 2025

Prepared in my office

Advocate
WB/142/2006

For Kamakhya Bhairava Upasaka Foundation
Rajarshi Nandy
DEPONENT
Authorised Signatory

Solemnly Affirmed and
Declared before me u/s
139 CPC and u/s 333BNSS 2023

Notary
Govt. of West Bengal
26.09.2025

SUBHENDU BANERJEE
Notary, Govt. of W.B
Regd. No. 008/2022
Advocate High Court Calcutta

26 SEP 2025

सत्यमेव जयते

GOVERNMENT OF ASSAM
PUBLIC WORKS DEPARTMENT
(BUILDING)

NOTICE INVITING TENDER

NIT No.: CE/TB-VI/26/2023/12, Dtd.: 28.11.2023

Name of Work: Maa Kamakhya Temple Access Corridor at Guwahati, Assamon Engineering, Procurement and Construction (EPC) Mode-1.

Estimated cost put to tender	**Part A: EPC-Rs.320,56,89,257/-** **Part B: Operation & Maintenance: Rs. 13,74,62,528/-**
Bid Security	**2% i.e. Rs.6,68,63,036/- for General Category OR 1% i.e. Rs.3,34,31,518/- for Reserved Category.** **(To be deposited through net banking or RTGS/NEFT as per office memorandum no. FEB.269/2017/27 Dtd. 21/08/2019).**
Cost of Bid Document	**Rs.30,000.00(To be deposited through net banking or RTGS/NEFT as per office memorandum no. FEB.269/2017/27 Dtd. 21/08/2019)**
Performance Guarantee	**5% of tendered amount**
Value of Security Deposit	**5% of tendered amount**
Period of Completion	**24 Months**

OFFICE OF THE CHIEF ENGINEER, P.W.D. (BUILDING), ASSAM, CHANDMARI, GUWAHATI-3.

INDEX

NIT No.: CE/TB-VI/26/2023/12, Dtd.: 28.11.2023

Name of the Work:Maa Kamakhya Temple Access Corridor at Guwahati, Assamon Engineering, Procurement and Construction (EPC) Mode-1 .

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Sd/
Chief Engineer, PWD (Building), Assam
Chandmari, Guwahati-3.

NOTICE INVITING e–tender

The ChiefEngineer on behalf of P.W.D. (Building), Assam, on behalf of the Governor of Assam invites online EPC Mode-1 e-tenders in two bid system (Eligibility and Financial) on **Engineering, Procurement and Construction (EPC) Mode-1 basis** from eligible firms/contractors of repute for the following work:

NIT No.	**CE/TB-VI/26/2023/12, Dtd.: 28.11.2023**
Name of the Work	**Maa Kamakhya Temple Access Corridor at Guwahati, Assamon Engineering, Procurement and Construction (EPC) Mode-1.**
Estimated cost put to tender	**Part A: EPC-Rs. 320,56,89,257/-** **Part B: Operation & Maintenance: Rs. 13,74,62,528/-**
Bid Security	**2% i.e. Rs.6,68,63,036/- for General Category OR 1% i.e. Rs.3,34,31,518/- for Reserved Category.** **(To be deposited through net banking or RTGS/NEFT as per office memorandum no. FEB.269/2017/27 Dtd. 21/08/2019).**
Cost of Bid Document	**Rs.30,000.00(To be deposited through net banking or RTGS/NEFT as per office memorandum no. FEB.269/2017/27 Dtd. 21/08/2019)**
Period of completion	24 Months
Pre-bid Meeting	Pre Bid Meeting (Pre-bid Clarification) will be held as per the following time and venue. Start Time at 12.30 hrs Closing Time at 15.30 hrs of **07.12.2023** Venue: - O/o the Chief Engineer, PWD (Building) Assam, Chandmari, Guwahati-3.
Last time & date of online submission of bid, Cost of Bid Document,Bid Security, and other documents as specified inthe press notice.	Up to 14:00 Hrs. on 11.01.2024
Period during which hard copies of documents shall be physically submitted	**Upto 14:00 Hrs on** 11.01.2024.
Time & date of online openingof documents.(Mandatory documents) Technical bid	15:00 Hrs. on 11.01.2024

The bid forms and other details can be seen & downloaded from the website P.W.D portal https://assamtenders.gov.in.

Sd/
Chief Engineer, PWD (Building), Assam
Chandmari, Guwahati-3

SECTION-II
TECHNICAL BID
(CIVIL WORK)

BRIEF PARTICULARS OF THE WORK

Brief scope of work:

PWD (Building), Assamproposed to**Maa Kamakhya Temple Access Corridor at Guwahati, Assamon Engineering, Procurement and Construction (EPC) Mode-1 .**

The details of the building and approximate plinth area and particulars are indicated **in table-A**. The minimum plinth area and particulars are also indicated. The work is to be executed on **Engineering Procurement and Construction Basis Mode-1.** The suggestive layout plan and conceptual architectural plans of buildings shall be provided by the department and are annexed with the NIT document. The execution will be done on the basis of drawings by the agency with due approval of the department. The execution shall be done on the basis on the approved working architectural & structural drawings. CPWD Specifications, relevant IS codes, National Building Code 2016, Harmonised Guidelines & Standards for Universal Accessibility in India 2021and other standard specifications shall be followed in general except otherwise mentioned in bid document. Samples of the materials of approved make or otherwise shall be got approved from the Engineer-in-charge before use in the work.

The Contractor shall obtain all Pre & all Post construction clearances/approvals from Statutory Authorities. The scope of work includes required services i.e electrical installations including all electrical fittings/fixtures, water supply pumps, sub-mersible pump, de-watering pumps etc. HT and LT include emergency and backup supply, sub-station, DG set with AMF panel, HT Panel, LT panel, feeder pillars. Lightning protection and Earthing system, External Lighting, Fire fighting, fire detection, UPSand any other services required but not specifically indicated, Signages, liaisoning with statutory agencies like Fire Services, BSNL/MTNL, Central Electricity authority, Muncipal Authority, Water supply & sewerage authorities, EIA, CPCB, CGWB / State Water Board etc, forest officer, fire officer, Electrical Service provider for obtaining the pre-construction and post construction clearances. The statutory payments to these agencies will be paid by the agency except the charges of HT Electrical Service connection from local supply agency to the HT energy meter in the premises of the building which will be initially paid by the contractor and reimbursed by the department to the contractor on producing the proof of charges paid to the local concern agency. Liasoning with the local supply agency shall be in the scope of the contractor for which nothing extra shall be paid to the contractor. Thereafter complete construction and commissioning of building(s) alongwith all mentioned services is in the scope of the work.

The speciallised works shall be done by reputed agencies who has carried out similar type of work with high standards and having statutory registrations. Agency will submit the structural steel erection manual, formality and modality as per standard best practice.

The scope of work includes:

- Substation Equipments.
- Diesel General Sets.
- Uniterrupted Power Supply
- VRV/VRF AC System
- Mechanical Ventilation System
- Solar Photo Voltaic Power Generation System
- Solar Water Heating System
- CCTV
- Access Control System
- Hyderopneumatic Water Supply System
- Lighting Automation Including Occupancy Sensors

- LAN System
- IP BASED EPABX System
- Audio Visual System
- Street Lighting With LED
- STP/ETP Plant
- Baggage Scanners
- Door Frame Metel Detector
- Boom Barrier
- Emergency Light & Illuminated Signages
- Water Cooler
- Water Treatment Plant
- Rccess Type water Fountain with Cooling System.
- Tubewell
- Sewage & Drainage Pumps
- Internal Electrical.
- Power Wiring & Plugs
- Lighting Conductors
- Telephone Conduits
- Fire Fighting and Fire Alarm & Public Address System
- UGT/OHT
- Lifts/Escalators
- Development Of Site (Temple Road, Pathway & Parking Work, Temple Entrance Gate, Landscape & Horticulture, Planter With Seating Bench, RCC Planter With Skylight, Storm Water Drains, Contour Site (Soil Cutting/Filling/Disposal), Retaining Wall To Counter Level Difference In Complete Campus, Demolishing Of Old Buildings, Improvement Of Street Façade, Stumbh & Street Bollards).
- Liaisoning with statutory agencies like Municipal, Fire Services, AAI, EIA, BSNL etc. for obtaining the pre construction and post construction clearances. The statutory payments to these agencies will be paid by the contractor which is in the scope of the work except the charges of HT Electrical Service connection from local supply agency to the HT energy meter in the premises of the building which will be initially paid bythecontractor and reimbursed by the department to the contractor on producing the proof of charges paid to the local concern agency. Liasoning with the local supply agency shall be in the scope of the contractor for which nothing extra shall be paid to the contractor.
- Plumbing & Water Supply system.
- Thereafter construction and commissioning of buildingswill be completed alongwith the above-mentioned services.
- Obtaining mandatory approvals (Pre & Post Construction)from all local bodies/ State & Central authorities/ Municipal Corporation, EIA (Environmental Impact Assessment) clearance, fire clearance, forest clearance etc. for the complete works in scope of this contract. Approvals as per latest Assam local building Byelaws / Town & Country Planning (Assam) Bye laws with up to date corrections slips, necessary Environmental Clearance from the appropriate authority, NOC from Fire Department, NOC from Airport Authority of Indiaetc. and any other statutory approval/Central Licensing Approving Authority etc. related to building for office building, approval from authorities required for commencing the work, execution of work & services and handing over the assets. The defect liability period after completion of work **shall be 12 months**. The contractor must withstand the warranty and must provide repair services to the building and all equipments & accessories during the defective liability period. The contractor mustattend to the complaints of minor nature within 24 hours and complaints of major nature within 3 days of receiving the complaints. For this purpose, the contractor must depute

enoughtechnical manpower within the building complex. In case, **if the complaint is not attended and rectified by the contractor within the specified period as above the work shall be got rectified by the department and the recovery at the double rate of cost of execution of work shall be recovered from the dues of the contractor**. LED fitting/fixtures shall withstand the warranty of five years from the date of handing over the installations to the client department.

- The cost of labour, material, tools and plants and machinery required for execution of the whole project as per Layout plan& detailed design and drawings to be approved, specifications etc. is within the scope of this work.
- The buildings are to be planned and registered to meet **THREE STAR GRIHA** rating. The contractor is required to execute the work in a befitting manner to suit these standards. The contractor shall take all precautions and abide by all rules, regulations and directions of the regulatory authorities, municipalities, traffic, labour, green tribunal in respect of all kinds of pollution, C&D waste management, labour safety measure etc.

A) Buildings:

Floor-wise distributions of various facilities are only indicative. The area details included in scope of works are as below:

Built Up Area:

TABLE-A

AREA SHEETS (IN SQUARE METER)					
Description	**Multi Utility Block**	**Pilgrim Management Block**	**Chinnamasta Block**	**Siddheshwar Block**	**Corridor**
No. Of Floors	**B+LG+G.F+2**	**G.F+2**	**G.F**	**G.F**	**LG+G.F+2**
BASEMENT (+208.00 LVL)	2345.00				
TOTAL (A)	**2345.00**	**0.00**	**0.00**	**0.00**	**0.00**
LOWER GROUND FLOOR (+212.00 LVL)	2897.00				460.00
GROUND FLOOR (+216.15 LVL)	3068.00	1018.00	489.00	205.00	1280.00
FIRST FLOOR (+221.00 LVL)	1290.00	1285.00			269.00
SECOND FLOOR (+226.00 LVL)	880.00	838.00			255.00
TERRACE AREA	45.00	55.00			

TOTAL (B)	8180.00	3196.00	489.00	205.00	2264.00
TOTAL (A+B)	10525.00	3196.00	489.00	205.00	2264.00
GRAND TOTAL (A+B)	16679.00				
TOTAL CAMPUS AREA FOR DEVELOPMENT	21482.00				
LESS TOTAL GROUND COVERAGE	-6349.00				
ACTUAL DEVELOPMENT AREA	**15133.00**	**Sqm**			
CAMPUS BOUNDARY WALL LENGTH	**895.00**	**Meter**			
BASEMENT FLOOR (+208.00 LVL)	4.00				
LOWER GROUND FLOOR (+212.00 LVL)	4.15				4.00
GROUND FLOOR (+216.15 LVL)	4.85	4.85	4.85	4.85	4.85
FIRST FLOOR (+221.00 LVL)	5.00	5.00			5.00
SECOND FLOOR (+226.00 LVL)	5.00	5.00			5.00
PLINTH HEIGHT	0.15	0.15	0.15	0.15	0.15

- Area and quantum of work as per layout attached with NIT/Tender Document.
- Building can be RCC Framed structure/RCC Composite Structure/PT Slab. Contractors can explore and achieve given design intent. However DBR of Structure is for RCC Framed Structure only.

Note:

The payments shall be made on the area basis with respect to each building. The area for the purpose of payment shall be the plinth area constructed. For calculation of plinth area, rules for working out the plinth area from plans as given in the annexure II of PAR-2021 shall be followed.

Following areas shall not be reckoned with for working out the plinth area and their cost shall be deemed to be included in the respective subheads / items of works.

i. Areas for security cabins at entrances, pump room, underground structures including UG Tanks, STP/WTP/Borewells etc. shall not be reckoned towards the plinth areas and their cost shall be deemed to be included in the respective subheads/items of works. Please Note, Porch/Boxing on external wall/Facade will not be counted under built up area.

ii. Shafts for sanitary, water supply installations, telecommunication, electrical, fire fighting, air-conditioning and lifts etc will not be counted under built up area.

iii. Area of Mumty/Machine room, architectural feature if any, above terrace not to be counted in the Plinth area for the calculation of EPC area calculation.

iv. The total plinth area of a building shall be the sum total of the plinth area at every

floor including the basement, if any.

v. All Courtyard covering with steel structure and polycarbonate sheet not to be counted in the Plinth area for the calculation of EPC area calculation .

vi. All Light weight porch with steel and polycarbonate/Tefflon fabric etc. not to be counted in the Plinth area for the calculation of EPC area calculation

vii. Stilted area not to be counted in the Plinth area for the calculation of EPC area calculation.

PLINTH AREA OF GROUND FLOOR

(a) The plinth area of the ground floor shall be calculated at the plinth level excluding the plinth off-sets provided such plinth off-sets are not more than 58mm. In cases where the building consists of – columns projecting beyond cladding, the plinth area shall be taken up to the external face of the cladding and shall not be included the projections of the columns.

(b) In case open verandah with parapets are protected at the ground floor projecting out of the building, the full area shall be taken up to the outer line of the external verandah lintel and only 50% of area shall be taken for the unprotected verandah. Open platform without parapets and terraces at ground floor and porches, shall not be included in the plinth area but shall be allowed for separately for costing purposes.

(c) Stair case: Main stair case, open spiral/service stair case/fire escape stair case etc.

(i) 100 percent of the plan area of main / service / fire escape stair (enclosed in defined stair hall and mumty at top)

(ii)50 percent of the plan areas of service /fire escape/ openstairs (without any enclosure around andmumty at top).

Note:- Any type of steps, ladder/cat-ladder, spiral/flat, with or without side guard rails created for the purpose of approaching inaccessible terrace or from terrace to top of bulk water storage tanks or otherwise for maintenance purposes shall not account for plinth area.

PLINTH AREA AT FIRST AND HIGHER FLOORS

(a) The plinth area of first and higher floors shall be calculated at the relevant floor levels. Architectural bands, cornice etc. shall not be included in the plinth area even though they may occur at the floor level, vertical sun breakers or box louvers projecting out also shall not be include in plinth area

(b) In the case of projecting balconies protected to their full width by the shades full width roof projections or by upper in the case of unprotected balconies equivalent area to the extent of 50% of the area of the balconies shall be included in the plinth area

(c) In case of alcove (box projection like storage below sill level and cupboards etc.) made by cantilevering a slab beyond external wall:

(i) 25 percent of the area for the alcove of height up to 1 m,

(ii) 50 percent of the area for the alcove of height more than 1m and upto 2 m, and

(iii) 100 percent of the area for the alcove of height more than 2 m.

GALLARIES, MEZZANINE FLOORS, LOFTS.

(a) Area of galleries i.e. upper floor of seats in an assembly hall, Auditorium, theatres, etc. shall be fully included in the plinth area.

(b) Area of mezzanine floor i.e. an intermediate floor introduced between two main floors, shall be included in the plinth area, if no separate provision is made for the same.

(c) The area of a loft i.e. an intermediate slab just beneath the floor of roof without any direct staircase leading to it and used for storage purpose shall not be included in the plinth area.

THE FOLLOWING SHALL NOT BE INCLUDED IN THE PLINTH AREA:

a) Area of architectural band, cornice, etc;
b) Area of vertical sun breaker or box louver projecting out and other architectural features, for example slab projection for flower pot, etc;
c) Open platform;
d) Terrace;
e) Open spiral/service stair cases; and
f) Area of mumty, machine room, towers, turrets, domes projecting above terrace level.
g) Porch/Boxing on external wall/Facade will not be counted under built up area.
h) Shafts for sanitary, water supply installations, garbage chute, telecommunication, electrical, fire fighting, etc will not be counted under built up area.

3. Necessary provision for car parking to be provided while preparing the architectural drawings.Depending upon the adequacy of theland for car parking as per local bye laws, car parking building may be included in the scope of work for which payment will be regulated as per DSR'2021 with relevant Cost index or market rate as applicable on date of execution.

4. All plumbing i.e. water supply and drainage, sewerage and fittings as well as fixtures for points is in the scope of work.

B] <u>Electrical Works:</u>

Brief description of E&M works: As mentioned in the Part C of the NIT.

C] Site Development Works as per Master Plan and Site Requirement (including survey, investigation, design and construction):

Roads: The road shall be constructed as per requirement and the drawing submittedbyagency and approved by PWD/Client

A	Main road and peripheral Road	Approach and peripheral roads & pathways as per functional requirements, of the building & as perdrawings approved by the Engineer in charge.

Water supply, Storm water drains and sewer line:

(a) Survey, investigation, design and execution of dual water supply system of the whole campus including fire fighting system.

(b) Providing and laying dual water supply lines (one for fresh water and one for treated wastewater) around the building as well as in green areas, inside the building. The wastewater from bathrooms, toilets, canteen and other such area is to be collected and treated in STP and the treated water is to be storage in separate under ground sump, which shall be lifted through pumps and collected in a separate over head tank for supply to the Water Closets only for flushing purpose and for watering in the green area with the uniform sprinkling facility. The surplus wastewater is to be drained out in the main sewer line. Separate over head tank for domestic, flushing and fire requirement are to be provided.

(c) Any dead / live sewer line / water supply line / electrical lineetc if passing through the site shall have to be removed / diverted/relocated to clear the site of any obstruction caused by such lines. Any approval from the local authority for such an action will also be taken by the bidder without any extra payment.

(d) Survey, investigation, design & construction of storm water drains, sewer line i/c connection to the trunk sewer line /STP/nearest drain. Sewerage treatment plant and

the Rainwater harvesting, underground sump overhead tank are included in the scope of work. It should be insured that the wastewater should be collected in the collection tank before the STP plant through gravity.

Landscape and Horticulture:

Survey, investigation, design & execution of Landscape works as mentioned/indicated in Master Plan and vertical plantation for entire plot (both hard & soft) in and around the existing/proposed buildings, roads & services in the scope of this tender and the maintenance of same upto defect **liability period of 12 months**. Landscaping plan including parks, planters and other details etc. as per concept/ landscape layout prepared by consultant, including water bodies, planters, plantation, street formation and other details for the horticulture works and execution of same including providing unfiltered/recycled water supply lines. Development of landscape, construction of its toe wall, providing SS railings, wicked gates, water hydrants, the grassing with Mexican grass, creepers and planting trees etc. shall be completed as per the specification and drawing approved by the Engineer-in-chargeOther Items which are not mentioned above but are essential considering functional requirements.

Note:

1 All works has to be executed as per specifications provided in the bid document, CPWD Specifications Vol-I &Vol. II-2019 and National Building Codes 2016, (in case of difference if any, stringent / higher specification of the two shall be followed. In absence of CPWD Specification, IS Codes, Harmonised Guidelines & Standards for Universal Accessibility in India 2021, MoRTH Specifications, National Building Code 2016, CPWD Specifications& sound engineering practices and other standard specifications suitable for modern office building and latest technology shall be adopted as per order of precedence defined in the contract.

2 The scope of works & specification are given in general but they are not exhaustive i.e. does not mention all the incidental works required to be carried out for complete execution of the work. The work shall be carried out, all in accordance with true intent and meaning of the specifications and the drawings taken together, regardless of whether the same may or may not be particularly shown on the drawings and/ or described in the specifications, provided that the same can be reasonably inferred there from. There may be several incidental works, which are not mentioned in the contract document/specifications but will be necessary to complete the items in all respect. All these incidental works/ costs which are not mentioned but are necessary to complete the work shall be deemed to have been included in the overall amount quoted by the contractor for various components of work. No adjustment of rates shall be made for any variation in quantum of incidental works due to variation/change in actual working drawings. Also, no adjustment of rates shall be made due to any change in incidental works or any other deviation in such element of work (which is incidental to the items of work and are necessary to complete such items in all respects) on account of the directions of Engineer-in-charge. Nothing extra shall be payable on this account.

3 In case, some of descriptions are missing in the scope of work or specifications in the bidding documents, items / work shall be executed as given in the CPWD Specifications, NBC-2016, Harmonised Guidelines & Standards for Universal Accessibility in India 2021, IS Codesetc and according to sound engineering practices so as to make the building including related services fully functional. No claim whatsoever shall be entertained at later stage. All cost of providing and making buildings with services, landscape and horticulture works fully complete and making buildings facilities functional in all aspect unless specifically mentioned in the contract document.

Brief Description of Activities:

Planning:

1 Survey, investigation (including soil investigation) and other related works & services.

Obtaining all statutory / local body approvals (Pre & Post Construction) through the statutory bodies. The agency shall also take permission fromFire Department/Environment/Pollution control Board, other necessary approvalsfrom local bodies etc required to start construction work as per plinth area given above. Signature / authority of department or the client department whenever required shall be provided to the contractor. All liasoning and charges to the concerned authority shall be paid by the contractor for obtaining the clearance. The charges so paid by the contractor are in the scope of the work. This also includes Environmental Impact Assessment & clearance and compliance, Traffic Impact assessment and design of merging/demerging of traffic etc.

2 The IS codes/Standards to befollowed for the design & execution of reinforced concrete structure shall be as given in table below in table B:

TABLE – B (IS CODES TO BE FOLLOWED FOR DESIGN OF BUILDING) as mentioned in para -6 above.

Sl. No.	Code	Description
1.	IS-875 (Part 1) - 1987	Code of Practice for Design Loads (other than earthquake) for Buildings and structures – Unit weights of buildings and Storedmaterial.
2.	IS-875 (Part 2) - 1987	Code of Practice for Design Load (other than earthquake) forbuildings and structures imposed loads.
3.	IS-875 (Part 3) - 1987	Code of practice for design load (other than earthquake) for Buildings and structures – Wind loads
4.	IS- 875 (Part 4) - 1987	Code of practice for loads (other than earthquake) for buildings and structures - Snow loads
5.	IS-875 (Part 5) - 1987	Code of practice for design loads (other than earthquake) forbuildings and structures – Special loads and load combinations.
6.	IS:456 - 2000	Code of practice for plain and Reinforced Concrete.
7.	IS: 1893 - 2016	Criteria for Earthquake resistant design of structures.
8.	IS: 13920-2016	Ductile detailing of reinforced concrete structures subjected toseismic forced – Code of practice.
9.	IS: 1904- 1986	Indian Standard Codes of practice for design &constructionfoundations in Soil : General Requirements
10.	IS: 800 - 2007	Code of Practice for General Construction in Steel.
11.	IS 2950	Indian Standard Code of practice for design & construction ofraft foundation – (Part- 1)
12.	IS 4326	Code of practice for earthquake resistantdesign Construction of buildings.
13.	IS:3370 (all parts)	Concrete structures for storage of liquids
14.	SP-16	Structural use of concrete. Design charts for singly reinforcedbeams, doubly reinforced beams and columns.
15.	SP 34	Handbook on Concrete Reinforcement & detailing
16.	SP-7	National Building Code of India

17.	Handbook-byReynolds& Steed man	Reinforced Concrete Designer's Handbook.
18.	Others	Technical literatures, Manufacturers brochures for usage ofstructural fixtures, text books, etc.

(Note: Latest updated revisions of the codes and standards would be applied where applicable).

3 construction of buildings, services, fittings etc. as per 3 STAR GRIHA rating including dual plumbing system (One from the normal water supply line and the other from the treated water supply of STP for flushing, horticulture purpose), energy saving LED lights etc.

4 Building shall be designed for differently-abled persons as per the latest norms of Central Govt.

Execution of Work:

1 After approval from PWD/Client and getting approval from local bodies including necessary modifications as per the requirements, execution of work as per the scope of buildings & services defined in the contract document, CPWD Specifications, NBC-2016, Harmonised Guidelines & Standards for Universal Accessibility in India 2021, IS Codes, MoRTH Specifications and Sound Engineering Practices and handing over the assets.

2 Submission of completion plan of the building & services including getting approval/clearance from local bodies. Submission of building & services plan & drawings and other related documents both in hard copy 6 nos and the soft copy (in Auto CAD and other software used for the purpose) after completion (i.e. 'as- built').

3 Clearance of site before Handing over of the facilities after fulfilling all the obligations under the contract.

4 Obtaining necessary clearances/licenses from different local bodies/ statuary authorities required to make office building fully operational during/after completion of work.

Defect Liability period of 12 Months:

1 Free defect liability period for buildings, Civil, E&M services, horticulture works for 12 months after completion of complete project (not from the date of actual commissioning of installation).

INFORMATION AND GUIDE-LINES FOR BIDDERS

1.0 GENERAL:

1.1 Letter of transmittal and forms for deciding eligibility are given in Section III.

1.2 All information called for in the enclosed forms should be furnished against the relevant columns in the forms. If for any reason, information is furnished on a separate sheet, this fact should be mentioned against the relevant column. Even if no information is to be provided in a column, **a "nil" or "no such case"** entry should be made in that column. If any particulars/query is not applicable in case of the bidder, it should be stated as **"not applicable".** The bidders are cautioned that not giving complete information called for in the application forms or not giving it in clear terms or making any change in the prescribed forms or deliberately suppressing the information may result in the bid being summarily disqualified. Bids made by telegram or telex and those received late will not be entertained.

1.3 The bid should be type written. The bidder should sign each page of application, forms and documents before scanning & uploading. Overwriting should be avoided. Corrections if any should be made by neatly crossing out, initialing, dating and rewriting. Pages of the eligibility criteria document are numbered. Additional Sheets if any added by the Bidder should also be numbered by him. They should be submitted as a package with signed letter of transmittal.

1.4 References, information and certificates from the respective clients certifying suitability, technical knowledge or capability of the bidder should be signed by an officer not below the rank of Executive Engineer or equivalent.

1.5 The bidder may furnish any additional information which he thinks is necessary to establish his capabilities to successfully complete the envisaged work. He is, however, advised not to furnish superfluous information. No information shall be entertained after uploading of eligibility criteria document unless it is called for by the Employer.

1.6 If private works are shown in support of eligibility, certified copy of the tax deducted at source certificate (TDS) shall be submitted along with the experience certificate and the TDS amount shall tally with the actual amount of work done.

2.0 DEFINITIONS:

2.1 In this document the following words and expressions have the meaning hereby assigned to them:

2.2 **EMPLOYER:** Means the Governor of Assam, acting through the **Chief Engineer (Building), Assam.**

2.3 **BIDDER/Agency/Contractor/Firm:** Means the individual, proprietary firm, firm in partnership, limited company (private or public) or corporation.

2.4 **"Year"** means "Financial Year" unless stated otherwise.

2.5 "Competent Authority" means "Committee constituted of Representatives of PWD and Client

3.0 METHOD OF APPLICATION:

3.1 If the bidder is an individual, the application shall be signed by him above his fulltype written name and current address

3.2 If the bidder is a proprietary firm, the application shall be signed by the proprietor above his full type written name and the full name of his firm with its current address.

Annexure – B

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The Assam Tribune

87 years of service to the nation

GUWAHATI

Why Guwahati's hills are crumbling: Inside city's growing landslide crisis

Unplanned construction, deforestation & neglect have turned city's hills into deadly monsoon traps

By **Monisha Devi** - 4 June 2025 1:53 PM

The India Meteorological Department (IMD) has forecast more rainfall in Guwahati till June 8, even as the city struggles to return to normalcy following the heavy downpour on May 30 that brought life to a standstill.

Also Read - SIT picks up first suspect in Zubeen Garg death probe; tracks other key figures

While civic issues such as waterlogged roads, traffic snarls, and safety concerns continue to dominate headlines, the city's hilly outskirts are grappling with a recurring menace—landslides. The latest incident in Bonda claimed three lives, including that of a minor.

Also Read - SIT probe to conclude in 10–15 days; CBI backup if it fails: CM on Zubeen Garg case

According to recent reports, 366 locations across Guwahati have been officially designated as landslide-prone.

Among these, Sunsali Hill tops the list with 77 vulnerable spots, followed by Noonmati (40), Kharguli (37), Khanapara (33), Narangi (31), and Hengrabari (30). Other high-risk areas include Kahilipara (25), Santipur (20), and Narakasur Hill (14).

Also Read - PIL filed in Gauhati High Court seeking CBI probe into Zubeen Garg's death

Additionally, there are 9 landslide-prone sites in Garbhanga, 8 in Maligaon, 7 in Kalapahar, and 6 each in Gotanagar and Nabagraha.

Fatasil, Kamakhya/Nilachal, Sarania, and Koina-Dhora each have 5 such spots, while Jalukbari/Lankeshwar has 2, and Sukreswar has 1.

Also Read - Assam forms SIT to probe Zubeen Garg's death amid public, political pressure

The unchecked urban sprawl into Guwahati's fragile hill ecosystems has worsened the situation. Once densely forested and sparsely populated, these slopes are now dotted with unauthorised constructions, making them increasingly vulnerable to landslides during the monsoon.

"Earlier, the hills of Guwahati would remain dark at night. Now, lights are visible in almost every corner. This illumination reflects the extent of human encroachment. Recurring landslides are a direct result of deforestation, and unregulated development is a major contributing factor," said Dipanjol Deka, an environmentalist.

A recent incident of landslide in Kamakhya Hills. (Photo: 'X')

'We live in fear every monsoon'

Just a week before the landslide tragedy in Bonda, the Assam State Disaster Management Authority (ASDMA) had issued advisory urging residents in landslide-prone areas to relocate to safer locations ahead of the monsoons. But many did not heed the warning — and the consequences are now tragically evident.

So, why do people continue to live in these vulnerable hillsides despite the obvious risks? Robin Das from Sunsali explained, "Our parents built this home, and we've lived here for so many years. It's not easy to leave everything behind and start over—we simply can't afford to build another house elsewhere."

Many residents believe that heavy rainfall, compounded by rampant construction, has destabilised the soil structure, leading to frequent slope failures.

"We've lived here for over ten years, but the situation has deteriorated. Although nothing has happened in our area yet, each time it rains heavily, we fear the hill behind our house might collapse," said Queen Pathak, a resident of Kharguli.

Echoing her concern, Alok Sarma, a resident of Noonmati, shared, "Every monsoon feels like a test of survival. We can't sleep peacefully on rainy nights—we're constantly listening for sounds of cracking earth or shifting soil. It's terrifying."

For many, especially those from lower-income backgrounds, relocation is not a realistic option. As Pathak and Sarma earlier shared, they feel trapped—unable to move due to financial constraints, yet forced to live under the constant shadow of danger.

Landslide in Bonda, Guwahati

The path towards prevention

Preventing landslides in Guwahati requires urgent and coordinated efforts - controlling unplanned construction, restoring green cover, and improving drainage systems.

Experts argue that most landslides in the city are not natural disasters but man-made crises. Unchecked felling of trees, reckless cutting of hills, and construction without proper retaining walls or drainage mechanisms have all contributed to destabilising the fragile slopes.

"If someone builds a house in the hills, they must construct a guard wall to protect themselves from landslides. But because guard walls are expensive, many people simply encroach on these areas and erect makeshift structures, which later put them at serious risk," said Deka.

The loss of vegetation not only weakens slope stability but also reduces the land's capacity to absorb rainwater — turning even moderate rainfall into a serious hazard.

"Nothing major has happened in our locality so far, but recently the District Commissioner visited and laid a tarpaulin along the roadside to divert rainwater," Pathak noted.

To mitigate the rising threat, experts recommend a multi-pronged approach, including strict enforcement of construction laws and targeted awareness campaigns.

"All encroachments in the hills must be stopped. Construction here directly endangers lives. The government must take strong action to prevent unauthorised settlements. If construction is to be allowed, it should be strictly conditional — such as mandating the construction of protective guard walls. There must be clear Standard Operating Procedures (SOPs) in place, which everyone must follow," stressed Deka.

The hills of Guwahati are sounding an alarm. What's at stake is more than just the city's ecological integrity — it's the safety and future of its residents.

Sustainable development, rooted in environmental responsibility, is the only way forward to safeguard these fragile landscapes and the lives built on them.

The aftermath of landslide in Bonda

Landslide Assam Flood ASDMA

Monisha Devi

25/B

RTI

25/8/23

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Rs.10 COURT FEE INDIA TEN RUPEES

<u>Application U/s 6(1) Of Right To Information Act, 2005</u>

Annexure-'C'

To,
State Public Information Officer (SPIO)
O/O Principal Chief Conservator of Forest & Head of Forest Force (PCCF & HoFF)
Environment & Forest, Government Of Assam
Aranya Bhawan, Panjabari, Guwahati,
Kamrup (Metropolitan) - 781037

Subject: ***<u>Information sought regarding the reports created by the State Expert Committees (SEC) in compliance with the Supreme Court order and judgement date 12 December 1996.</u>***

Madam/ Sir,

I, Aditya Banerjee, a citizen of India, am applying for Information u/s 6(1) of the Right to Information Act 2005. The particulars of the application are as follows:

I. Details of Applicant :

a) Name: Aditya Banerjee
b) Address: 64/74A, Belgachia Road, Milk Colony, Kolkata-700037, West Bengal
c) Contact No: 9366469689
d) Email: adiban22@gmail.com

II. Date of submission of the application: 21.08.2023

III. Information required: The Supreme Court, in its order and judgement dated 12 December 1996 in *T.N. Godavarman Thirumulkpad vs Union Of India & Ors* had issued directions for the protection of all forest lands throughout the country. A copy of the said order is attached and marked as **Annexure A.**

The aforesaid order mandated the creation of State Expert Committees (SECs) in each state within one month of the passing of the order. The SECs were tasked to do the following:

a) Identify areas which are "forests", irrespective of whether they are so notified, recognised or classified under any law, and irrespective of the ownership of the land of such forest;
b) identify areas which were earlier forests but stand degraded, denuded or cleared; and
c) identify areas covered by plantation trees belonging to the Government and those belonging to private persons

In addition to this, another committee comprising the Principal Chief Conservator of Forests (PCCF) and another Senior Officer were tasked with overseeing the compliance of the order and filing the status reports prepared by the SEC.

Regd. No. 199
28/8/2023

With respect to the above, the applicant would like to acquire information regarding the following:

1. **Has this State Government constituted a State level Expert Committee (SEC)** as mandated by the 202/96 T.N. Godavarman judgement of the Hon'ble Supreme Court. If yes, **please provide information on the members comprising the SEC.** Kindly furnish their names, designations and qualifications.

2. If the SEC was not constituted, **please provide reasons for the inability in the constitution of the SEC.**

3. Please provide **a copy of the report submitted by the State Expert Committee** in compliance of the Supreme Court's directives in the aforesaid order along with the dates on which they were filed.

4. Did the SEC update its reports? If yes, then **kindly make available the updated reports along with the dates** on which the updated reports were filed.

5. Has the **Ministry of Environment, Forest and Climate Change provided any feedback or input or suggestion on the report** submitted by the SEC? If yes, please provide copies of all such communication including feedback, clarification, suggestions etc. received from the MoEFCC .

6. Please **provide details of the area of land which is notified as Reserve Forests** under Section 20 of the Indian Forest Act 1927 or the State equivalent law for this state by way of GPS coordinates, etc. Kindly provide the data as per the Forest Division in the State.

7. Please provide the **details of the land which is notified under Section 4** of the Indian Forest Act 1927 or the State equivalent law, **and yet to be notified under Section 20** of the Indian Forest Act 1927 or the State equivalent law by way of GPS coordinates, etc. Kindly provide the data as per Forest Division in the State.

8. Please **provide the details of the land which are intended to be notified on the basis of any letter, notification, circular etc, but yet to be notified under Section 4** of the Indian Forest Act 1927 by way of GPS coordinates, etc. Kindly provide the data as per the Forest Division in the State.

9. In addition to identification of notified areas according to the Court-specified parameters, did the SEC identify **deemed** forests? If yes, then kindly provide the records/ reports and other relevant documents in relation to such identification.

10. Please **provide the details of the land which are recorded as 'forest' by way of GPS coordinates etc., in any Government record** including records held by government department, administration, authority, local body, community, or council recognized by the State government. Kindly provide the data as per Forest Division in the State.

IV. Application Fee details: Encl. Application Fee of Rs 10/- by court fee stamp of Rs. 10/- affixed on the top of the application.

1. I request you to follow Section 7(3) of the RTI Act 2005 for providing information with photocopies of supporting documents related to the information requested above.

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2. In case, the requested information is held by another public authority, I request the SPIO to transfer the application or part of it within FIVE days and immediately inform me about such a transfer.
3. In case, there are further fees required to provide the requested information, I request the SPIO to inform me of the additional fee amount along with the calculations made to arrive at the amount.

V. **How the Applicant would like the information to be sent:**

I would like the above mentioned information to be sent to me by either email and by post. My details are as below:

a) Email ID: adiban22@gmail.com

b) 64/74A, Belgachia Road, Milk Colony, Kolkata-700037, West Bengal

Aditya Banerjee
Signature of the Applicant
Date: 21/08/2023

PETITIONER:
T.N. GODAVARMAN THIRUMULKPAD

Vs.

RESPONDENT:
UNION OF INDIA & ORS.

DATE OF JUDGMENT: 12/12/1996

BENCH:
J.S. VERMA, B.N. KIRPAL

ACT:

HEADNOTE:

JUDGMENT:

(With W.P.(Civil) No. 171/96)

O R D E R

In view of the great significance of the points involved in these matters, relating to the protection and conservation of the forests throughout the country, it was considered necessary that the Central Government as well as the Governments of all the States are heard. Accordingly, notice w as issued to all of them. We have heard the learned Attorney General for the Union of India, learned counsel appearing for the States and the parties/applicants and, in addition, the learned Amicus Curiae, Shri H.N. Salve, assisted by Sarvashri U. U. Lalit, Mahender Das and P.K. Manohar. After hearing all the learned counsel, who have rendered very able assistance to the court, we have formed the opinion that the matters require a further indepth hearing to examine all the aspects relating to the National Forest Policy. For this purpose, several points which emerged during the course of the hearing require further study by the learned counsel and, therefore, we defer the continuation of this hearing for some time to enable the learned counsel to further study these points.

However, we are of the opinion that certain interim directions are necessary at this stage in respect of some aspects. We have heard the learned Attorney General and the other learned counsel on these aspects.

It has emerged at the hearing, that there is a misconception in certain quarters about the true scope of the Forest Conservation Act, 1980 (for short the 'Act') and the meaning of the word "forest" used therein. There is also a resulting misconception about the need of prior approval of the Central Government, as required by Section 2 of the Act, in respect of certain activities in the forest area which are more often of a commercial nature. It is necessary to clarify that position.

The Forest Conservation Act, 1980 was enacted with a view to check further deforestation which ultimately results in ecological imbalance; and therefore, the provisions made therein for the conservation of forests and fore matters connected therewith, must apply to all forests irrespective of the nature of ownership or classification thereof. The

State Governments, as approved by the Central Government. In the absence of any Working Plan in any particular State, such as Arunachal Pradesh, where the permit system exists, the felling under the permits can be done only by the Forest Department of the State Government or the State Forest Corporation.

4. There shall be a complete ban on the movement of cut trees and timber from any of the seven North-Eastern States to any other State of the country either by rail, road or water-ways. The Indian Railways and the State Governments are directed to take all measures necessary to ensure strict compliance of this direction. This ban will not apply to the movement of certified timber required for defence or other Government purpose. This ban will also not affect felling in any private plantation comprising of trees planted in any are which is not a forest.

5. Each State Government should constitute within one month an Expert Committee to:

(i) Identify areas which are "forests", irrespective of whether they are so notified, recognised or classified under any law, and irrespective of the ownership of the land of such forest;

(ii) identify areas which were earlier forests but stand degraded, denuded or cleared; and

(iii) identify areas covered by plantation trees belonging to the Government and those belonging to private persons.

6. Each State Government should within two months, file a report regarding:-

(i) the number of saw mills, veneer and plywood mills actually operating within the State, with particulars of their real ownership;

(ii) the licensed and actual capacity of these mills for stock and sawing;

(iii) their proximity to the nearest forest;

(iv) their source of timber.

7. Each State Government should constitute within one month, an Expert Committee to assess :

(i) the sustainable capacity of the forests of the State qua saw mills and timber based industry;

(ii) the number of existing saw mills which can safely be sustained in the State;

(iii) the optimum distance from the forest, qua that State, at which the saw mill should be located.

8. The Expert Committees so constituted should be requested to give its report within one month of being constituted.

9. Each State Government would constitute a Committee comprising of the Principal Chief Conservator of Forests and another Senior Officer to oversee the compliance of this order and file status reports.

II. FOR THE STATE OF JAMMU & KASHMIR:

1. There will be no felling of trees permitted in any

forest, public or private. This ban will not affect felling in any private plantation comprising of trees planted in any area which is not a 'forest'; and which has not been converted from an earlier "forest". This ban will not apply to permits granted to the right holders for their bonafide personal use in Himachal Pradesh.

2. In a 'forest', the State Government may either departmentally or through the State Forest Corporation remove fallen trees or fell and remove diseased or dry standing timber from areas other than those notified under Section 18 or Section 35 of the Wild Life Protection Act, 1972 or any other Act banning such felling or removal of trees.

3. For this purpose, the State Government is to constitute an expert Committee comprising a representative from MOEF, a representative of the State Government, two private experts of eminence and the MD of the State Forest Corporation (as Member Secretary), who will fix the qualitative and quantitative norms for the felling of fallen trees and diseased and standing timber. The State shall ensure that the trees so felled and removed are in accordance with these norms.

4. Felling of trees in any forest or any clearance of forest land in execution of projects shall be in strict conformity with the Forest Conservation Act, 1980 and any other laws applying thereto. Moreover, any trees so felled, and the disposal of such trees shall be done exclusively by the State Forest Corporation and no private agency is to be involved in any aspect thereof.

IV. FOR THE STATE OF TAMIL NADU:

1. There will be a complete ban on felling of trees in all forest areas'. This will however not apply to:-

(a) trees which have been planted and grown, and are not of spontaneous growth, and

(b) are in areas which were not forests earlier, but were cleared for any reason.

2. The State Government, within four weeks from today, is to constitute a committee for identifying all "forests".

3. Those tribals who are part of the social forestry programme in respect of patta lands, other than forests, may continue to grow and cut according to the Government Scheme provided that they grow and cut trees in accordance with the law applicable.

4. In so f ar as the plantations (tea, coffee, cardamom etc.) are concerned, it is directed as under:

a) The felling of shade trees in these plantations will be -

i) limited to trees which have been planted, and not those which have grown spontaneously;

ii) limited to the species identified in the TANTEA report;

iii) in accordance with the recommendations of (including to the extent recommended by) TANTEA; and

iv) under the supervision of the statutory committee constituted by the State Government.

b) In so far as the fuel trees planted by the plantations for fuel wood outside the forest area are concerned, the State Government is directed to obtain within four weeks, a report from TANTEA as was done in the case of Shade trees,

URGENT
SUPREME COURT MATTER

Annexure-I

GOVERNMENT OF ASSAM
FOREST DEPARTMENT :::::::: DISPUR

ORDERS BY THE GOVERNOR

NOTIFICATION

Dated Dispur, the 22nd January, 1998.

NO.FRM. 150/96/Vol-I/Pt.V/134 : In pursuance of the directions of the Hon'ble Supreme Court of India contained in the order passed on 15-1-98 on Writ Petition No. 202 of 1995 with Writ Petition(C) No.171/96, the Governor of Assam is pleased to constitute a State Level Expert Committee for matters concerning the preperation of working plan their implementation etc.,with the following members :-

1) The Principal Chief Conservator of Forests, Assam. - Chairman.
2) The Chief Conservator of Forests(C) Govt. of India, Regional Office, Shillong. - Member.
3) The Secretary to the Govt. of Assam Industries Department, Dispur, Guwahati-6. - Member.
4) The Secretary to the Govt. of Assam Revenue Department, Dispur, Guwahati-6. - Member.
5) The Chief Conservator of Forests, Research, Education and Working Plan. - Member.
6) The Chief Conservator of Forests (Territorial), Assam. - Member.
7) The Conservator of Forests (H.Q.), Assam. - Member Secretary.

The terms of reference of the above Committee are as follows :-

(1) The Committee will look into the preperation of working plans and their implementation.

(2) The Committee will advise the Govt. on matters relating to development of industrial estates and shifting of industrial units to those estates.

(3) The Committee will also advise the Govt. for formulation of rules and regulations regarding the grant and renewal of licenses to wood- based industries and other ancillary matters.

Sd/- A.B. Md. Eunus,
Joint Secretary to the Govt. of Assam,
Forest Department, Dispur.

Contd....2...

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28-1-98

Memo No.FRM.150/96/Vol.I/Pt.V/134-A, Dated Dispur, the 22nd January, 1998.

Copy forwarded to :-

1. The Joint Secretary to the Govt. of India, Ministry of Environment & Forests, Paryavaran Bhawan, C.G.O. Complex, Lodhi Road, New Delhi - 110003.
2. The Chairman, High Power Committee for North Eastern Region, Paryavaran Bhawan, C.G.O. Complex, Lodhi Road, New Delhi- 110003.
3. Senior Standing Counsel, Assam for Supreme Court of India, New Delhi.
4. The Commissioner & Secretary to the Govt. of Assam, Chief Minister's Secretariat, Assam, Dispur, Guwahati-6.
5. The Commissioner and Secretary to the Govt. of Assam, Industries Department, Dispur, Guwahati-6.
6. The Commissioner to the Govt. of Assam, Revenue Department, Dispur, Guwahati-6.
7. The Principal Chief Conservator of Forests, Assam, Rehabari, Guwahati-8.
8. All members of the Committee.
9. The Private Secretary to the Chief Minister, Assam, Dispur, Guwahati-6 for favour of information to the Hon'ble Chief Minister.
10. The Private Secretary to the Minister, Forest, Assam, Dispur, Guwahati-6 for favour of information to the Hon'ble Minister.
11. The Private Secretary to the Chief Secretary, Assam, Dispur, Guwahati-6 for favour of information.
12. The Superintendent, Assam Govt. Press, Bamunimaidan, Guwahati-21 with a request to publish it in the Assam Gazette early.

By order etc.,

Joint Secretary to the Govt. of Assam,
Forest Department, Dispur.

22/1/98

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Annexure – II
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Division wise List of Reserve Forest			
Sl. No.	**Name of Division**	**Name of Reserved Forests**	**RF Area (in ha)**
1	Kamrup East	Gotanagar	171.00
2		Sarania Hill RF	7.99
3		South Kalapahar	70.00
4		Fatasil	670.44
5		Jalukbari	97.70
6		Hengrabari	628.00
7		Garbhanga	18860.58
8		Jarasal	1256.00
9		Kawasing	998.00
10		Rani	4370.00
11		Maliata	325.46
12		Apricola	6075.30
13		Marakdola	1426.50
14		Matapahar	225.00
15		Chamata	27.00
16		Teteliguri	120.58
	Sub-Total		**35329.55**
17	Kamrup West	Barduar	7235.936
18		Matarkhar	1684.338
19		Mayang	2139.214
20		Kulsi	1855.119
21		Milmiliha	1853.905
22		Chhaygaon	1294.212
23		Kuhuksi Sikrabura	1019.627
24		Melaghat	362.606
25		Dumpara	193.443
26		Simla	126.264
27		Gohaingurung	125.455
28		Dudlikhari	98.340
29		Dimali	52.610
30		Ghoraputa	47.753
31		Dhaniagaon	36.422
32		Moman	3211.250
33		Jarikhari	1249.251
34		Luki	904.896
35		Sursuria	398.720
36		Tarajbari	319.303
37		khatahkati Hill	248.482
38		Mugakhal	129.097
39		Garubaldha	110.076
40		Khurkhuri	66.167
41		Gizang	3472.237

42	Kamrup West	Nampathar	1380.412
43		Borjuli	1129.906
44		Bordova	434.641
45		Singra (part-I)	379.080
46		Jaipur	326.183
47		Khatajuli	110.160
48		Singra (Part-II)	95.180
49		Mahipara	93.980
50		Bagaikhas	24668.770
51		Pantan	11280.857
	Sub-Total		**68133.892**
52	North Kamrup	Sila Pahar	819.68
53		Agiyathuri	363.96
54		Gopeswar	225.00
55		Dirgheswari	761.60
56		Naturanacha	897.00
57		Maniknagar	59.36
58		Hajo	98.00
59		Gondhmow	187.00
60		Boromboi	26.00
61		Sildar	51.01
62		Sanpara	227.00
63		Kurua	155.00
64		Boman	49.00
65		Kholihoi	600.00
	Sub-Total		**4519.61**
66	Goalpara	Dohikata	1685.05
67		Dewiee	190.00
68		Dwarka	181.30
69		Gonbina	117.00
70		Maia	766.46
71		Nalonga	838.46
72		Pancharatna	976.08
73		Rendu	245.00
74		Rokhapara	195.90
75		Segunbahi	238.40
76		Ajagorh Hill	4240.00
77		Borjhar	807.00
78		Chikichim	21.00
79		Dabli Hill	140.12
80		Gendabari	528.50
81		Geradubi	71.62
82		Guriajhar	1030.00
83		Paikon	711.00

84	Goalpara	Pholonga	277.00
85		Zangra /Zangsa	1538.58
86		Ambuk	377.96
87		Athiabari	1659.58
88		Alfibari	21.05
89		Awoimari	92.65
90		Buraburi	291.00
91		Budlung	286.91
92		Baghmara	94.28
93		Chekowary	538.62
94		Chitalmari	336.70
95		Dakuakata	189.80
96		Deosila	408.72
97		Damra	336.50
98		Dhanubhanga	46.53
99		Ghagra	408.74
100		Kanyakuchi	518.00
101		Kothakuthi	25.10
102		Kahibari	181.30
103		Kurbiamari	80.16
104		Kachudal	176.04
105		Kherapara	308.76
106		Langkee	137.50
107		Ranggpathar	58.00
108		Saipara	246.90
109		Upartola	44.67
110		Chatabari	702.83
111		Bamundanga	228.50
112		Bandarmatha	118.16
113		Bordol	86.00
114		Dhamar	176.03
115		Depalchang	277.74
116		Dipkai	193.00
117		Kumarkhali	884.62
118		Mogho	372.90
119		Nakkati	212.00
120		Natbari	166.00
121		Saikiabhasa	167.94
	Sub-Total		**25249.66**
122	Cachar	Borak RF	20438.00
123		Innerline RF (part)	44266.00
124		Kathakhal RF (part)	630.00
125		Sonai RF	3594.42
126		Lowerjiri	3642.98

127	Cachar	Upperjiri	6326.24
	Sub-Total		**78897.64**
128	Karimganj	Tilbhum	1848.90
129		Patharia Hill	7647.30
130		Duhalia	3478.20
131		Longai	15139.30
132		Singla	12429.28
133		Badshahitila	7513.81
	Sub-Total		**48056.79**
134	Hailakandi	Innerline	39849.45
135		Katakhal	13986.29
	Sub-Total		**53835.74**
136	Dhubri	Sarpamari	168.82
137		Srigram	713.24
138		Chandardinga	284.00
139		Dudhnath Hill	156.28
140		Sakati	22.63
	Sub-Total		**1344.97**
141	Aie Vally	Nakkati	2879.70
142		Barmangaon	1059.10
143		Rakhathakur	93.00
144		Kakojana	1720.16
145		Bahalpur	58.00
146		Arreanjhar	270.00
	Sub-Total		**6079.96**
147	Nagaon	Kamakhya	518.00
148		North Diju	1047.00
149		South Diju	1345.00
150		Suwang	2645.00
151		Bamuni	155.39
152		Doboka	4383.00
153		Lutumari	2040.00
154		Borpani	3173.00
155		Jukuta	139.61
156		Hirapuja	228.00
157		Pitkhana	166.00
158		Kathoni	292.00
159		Kholahat	6147.00
160		Sonaikuchi	5303
161		Killing	445.00
162		Tetelia Bagara	1806.50
163		Duadoloni	5.06
164		Borbari	55.00
165		Deosur	587.00

	Sub-Total		**30480.56**
166	Nagaon South	Daboka	7859.00
167		Jamuna Maudunga	1456.00
168		Hojai	543.00
169		Kumrakata	949.00
170		Hawaipur	1864.00
171		Lumding	25245.00
172		Kaki	11133.00
	Sub-Total		**49049.00**
173	Sonitpur West	Charduar RF	24072.00
174		Balipara RF	18972.00
175		Senglimari RF	339.86
176		Goroimari RF	42.22
177		Bhomoraguri RF	156.17
178		Singri RF	485.52
	Sub-Total		**44067.77**
179	Dhemaji	Poba RF	6550.49
180		Gali RF	10649.24
181		Chengajan RF	1618.71
182		Zamzing RF	9060.00
183		Archia Demow RF	606.25
184		Sinen RF	881.25
185		Sissi RF	906.25
186		Jiadhal RF	1816.00
187		Subansiri RF	17465.26
	Sub-Total		**49553.45**
188	Sonitpur East	Nadaar RF	8141.00
189		Biswanath RF	10561.00
190		Behali RF	14016.00
191		Singlijan RF	1400.00
192		Gohpur RF	13310.00
	Sub-Total		**47428.00**
193	Lakhimpur	Ranga	8528.87
194		Dullung	9900.03
195		Kakoi	4415.03
196		Pabha	4625.96
197		Kadam	3625.09
	Sub-Total		**31094.98**
198	Digboi	Upper Dehing (West Block)	27485.06
199		Upper Dehing (East Block)	12914.00
200		1st Addition Upper Dehing (East Block)	259.82
201		Bogapani	97.17

202	Digboi	Digboi RF (West Block)	936.44
203		Digboi RF (East Block)	70.20
204		Dirak	3042.51
205		Makumpani	485.00
206		Kotha	1133.60
207		Tinkopani	3033.60
208		Namphai	753.04
209		1st Addition Namphai	1364.37
210		Tipong	445.34
211		Lekhapani	1396.76
212		Paharpur	166.00
213		1st Addition Dirak	676.14
214		Tirap	1455.60
215		Seleki RF	1700.00
216		1st Addition to Makumpani RF	55.00
217		1st Addition to Tirap RF	3025.00
218		1st Addition to Tipong RF	2020.00
	Sub-Total		**62514.65**
219	Doomdooma	Kundil Kalia	7287.44
220		Deopani	2334.41
221		Sadia Station (NB)	2331.98
222		Sadia Station(WB)	965.18
223		Hollogaon	371.25
224		Kukurmara	365.18
225		Mesaki	1366.80
226		Kumsang	2252.63
227		Hakhati	671.25
228		Dangori	919.83
229		Duni Duma	2881.78
230		Kakojan	2347.36
231		Phillobari	317.81
232		Naloni	374.68
233		Tokowani	502.83
234		Hollonghabi	520.00
235		Torani	2040.08
236		Lokaipather	105.00
237		Buridehing	2295.83
238		Duarmara	653.03
	Sub-Total		**30904.35**
239	Sivasagar	Dilli RF	3032.769
240		Sapekhati	745.200
241		Deroi	4835.781
242		Abhoypur	6737.985
243		Sola	683.722

244	Sivasagar	Geleky	5929.200
245		Panidehing RF	2140.389
	Sub-Total		**24105.046**
246	Jorhat	Dessoi Vally RF	16381.100
247		Desoi RF	2797.100
248		Tiru Hill RF	5858.64
	Sub-Total		**25036.84**
249	Dibrugarh	Dehingmukh	5879.04
250		Jokai	1848.01
251		Telpani	1332.288
252		Jeypore	50.00
253		Namdang	1858.63
	Sub-Total		**10967.968**
254	Golaghat	Doyang	24635.77
255		Rengma	13921.49
256		Nambar South	27240.61
257		Dipha	18363.00
258		Nambor North	5613.00
	Sub-Total		**89773.87**
	Majuli	No RF	
259	EAWL	Kukurakata RF	1593.00
260		Panbari RF	766.00
261		Bagser RF	3367.05
	Sub-Total		**5726.05**
262	Nagaon WL	Kochmara RF	**2155.00**
263	Kachugaon	Ripu RF	60528.00
264		Kachugaon RF	21445.00
265		Elashighar RF	226.00
	Sub-Total		**82199.00**
266	Haltugaon	Chirang RF	46287.12
267		Satvendi	273.00
268		Nadangiri Hill	1019.00
269		Baxamara	136.00
270		Phukagaon	161.00
	Sub-Total		**47876.12**
271	Parbatjhora	Mahamaya	9913.59
272		Tipkai	279.63
273		Bhelakopa	1722.194
274		Silkikhata	174.338
275		Dudumari	292.547
276		Parowa	302.502
277		Katrigasha	706.581
278		Mangiajhora	4618.479
279		Gama	6793.59

280	Parbatjhora	Srigram	831.904
281		Fulkumari	4653.56
282		Bamunijhora	348.03
283		Atharokota	966.390
284		Rupshi	123.283
285		Sakati	22.63
286		Tilapara	117.358
287		Lalkura	156.208
	Sub-Total		**32022.811**
288	Chirang	Manas (pt-I)	18569.00
289		Manas (pt-II)	29068.00
290		Bengtol	6092.80
291		Ranisundari	48.60
292		Katribari	34.00
293		Sissobari	509.20
294		Digdari	65.10
295		Kuklung	1469.00
296		Tekiai	112.11
297		Chirang RF Dholpani Block	1700.00
	Sub-Total		**57667.81**
298	Dhansiri	Khalingduar	7090.20
299		Rowta	7739.99
300		Bharabkunda	2440.75
	Sub-Total		**17270.94**
301	Baksa	Darranga	4637.102
302		Sukanjuli	1315.00
303		Batabari	2162.599
304		Subankhata	2337.420
305		Morapaladia	1123.00
306		Daodhara	1748.209
	Sub-Total		**13323.330**
307	Dima Hasao East	Langting Mupa RF	49755.08
308	Dima Hasao West	Krungming Reserve Forest	9739.00
309		Choto Longku RF	83.07
310		Boro Langherang RF	425.50
311		Nabdi Daulagupu RF	86.23
312		Kapurcherra Khasi RF	74.94
313		Bagha Dima RF	62.49
314		Tortelangso RF	87.44
315		Bagha Dima One RF	23.24
316		Wayungdisa RF	62.58
	Sub-Total		**60399.57**
317	Hamren	Amreng RF	5694.00
318		Rongkhang RF	3339.00

319	Hamren	Jokota RF	1235.00
320		Langchithing RF	45.28
321	Karbi Anglong (East)	Jungthung	3257.89
322		Kalioni	20736.00
323		Nambor (WB)	16633.00
324		Nambor(NB)	1898.00
325		Selabor	3355.46
326		Sildharampur	2153.60
327	Karbi Anglong (West)	Doldoli	12332.00
328		Dhansiri	77039.66
	Sub-Total		**147718.89**
	Grand Total		**1282783.82**

Annexure – 'D'
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GUWAHATI METROPOLITAN DEVELOPMENT AUTHORITY

NOTIFICATION

GMDA/MP/1/98/Part-I/103 dated 7th July, 2009 - In exercise of the powers conferred by sub-section (1) of Section 21 of the GMDA Act 1985 the Guwahati Metropolitan Development Authority is pleased to publish the following Notice regarding the publication of the new final Master Plan and the Zoning Regulation 2025 for Guwahati as approved by Govt. under Section 19 of GMDA Act 1985 vide Govt. order No. GDD. 91/1997/395 dated 09/06/2009 for the area described in the Schedule-I.

NOTICE FOR THE PUBLICATION OF THE MASTER PLAN AND THE ZONING REGULATION 2025 FOR GUWAHATI

1. It is notified that the new final Master Plan and Zoning Regulation 2025 for Guwahati, prepared by Guwahati Metropolitan Development Authority is hereby published for operation with effect from 07/07/2009.

2. The final Master Plan and the Zoning Regulation together with all relevant papers and maps may be inspected free of cost during office hours at the offices of The Chief Executive Officer, Guwahati Metropolitan Development Authority, Bhangagarh, Guwahati-5, The Deputy Commissioner, Kamrup (Metro) and Kamrup, The Palasbari and North Guwahati Revenue Circle Offices, Guwahati Municipal Corporation and North Guwahati Town Committee. Copies of the Master Plan and Zoning Regulation and soft copy of report and maps are available at the office of The Chief Executive Officer, Guwahati Metropolitan Development Authority, Bhangagarh, Guwahati-5 for sale.

Sd/-
Chief Executive Officer
Guwahati Metropolitan Dev. Authority
Bhangagarh, Guwahati-5

9 Environment and Natural Hazards

9.1 Environment-Sensitive Areas

9.1.1 Hills and Forests

Guwahati City has large areas under hills and water bodies. Because of high intensity of urbanization, these areas are under tremendous pressure.

The hills and large water bodies are categorised as Eco-sensitive zone in the CMP-2025.These areas are to be conserved with no urban developments.

9.1.1.1 Hill Cutting and Soil Erosion

The construction on the hills in Guwahati has resulted in the removal of vegetation cover in the forest area and exposed surface. The soil loss is 60 times more on the exposed slopes than on the vegetable covered slopes. The problem of soil erosion is significant not only from the view point of loss of soil fertility, but also from the many environmental issues like water logging, flash flood, decrease in ground water table and dusty environment on sunny days. To deal with the given situation, forest areas need to be sanctified and conserved with no further development whatsoever, any cutting of trees and encroachments to be stopped. Similarly massive afforestation programmes are to be undertaken.

9.1.2 Rivers

9.1.2.1 Brahmaputra River

Brahmaputra river with Assam is almost 700 k.m. long with more than 100 tributaries. Brahmaputra, the major natural feature in Guwahati, has total length of 28.67 km in Guwahati and total area 49 sq.km.

This vast and beautiful river needs all along river front development. The River Development Zone has been marked in the existing area along the river. In the areas for new developments, As per CRZ III, a 200 m wide green belt has been marked as recreational green. Area for the same is indicated in the land use plan. The river-front area may be developed based on a landscape plan with seating in part of the area and on the water expanse attractive laser shows could be organised for tourists and for the local population.

9.1.2.2 River Bharalu

The Bharalu River rises as a small stream from the southern range of Khasi Hills and flows through the city gaining momentum in width and depth and ultimately joining river Brahmaputra. The natural topography of the city guides flow of the rainwater towards rivers Bharalu and Basishtha. Due to siltation, the bed level of river Bharalu has considerably risen. The shores often create temporary wetlands in winter. Most of the drains, directly or indirectly fall into river Bharalu. This is an important channel for the drainage of the city.

9.1.3 The Bils – Natural Water Bodies

9.1.3.1 Dipar Bil

Dipar bil is an important water body in Guwahati. It is fresh water lake in a former channel of the Brahmaputra River. It has been declared as one of the Ramsar Site and is recognized as wetland of national importance and has been proposed as a Bird Sanctuary in the Master Plan for Guwahati – 2001. The bil is the natural habitat of many species of birds, various aquatic life and vegetation.

It is proposed to develop the adjoining area connecting the National Highway as Capital Complex and the *Bil* area to form a nature reserve as extension of the Capital Complex.

9.1.3.2 Other Bils

Borsola and Sarusola Bils

Borsola and Sarusola *Bils* are two linear wetlands, which are located in the heart of the city. As there is a close link, they can be treated as a one system. Both the wetlands separately connect to Bharalu River in Sabipool area. The total area of the *bils* is approximately 12 hectares.

Narengi and Silsako bils

The Narengi and the Silsako *bils* are situated in the Bondajan Basin. The Silsako bil is connected with two small rivulets. The Narengi *bil* is connected with Bondajan.

9.1.3.3 Wetland Degeneration

Wetland degeneration is a problem in Guwahati, there is shrinking of wetlands by encroachment, natural siltation, earth filing and garbage dumping. This affects decreases in the water retention capacity. Ultimately, the degeneration of wetlands is leading to siltation in wetlands and drains; flash floods; water logging and depletion of the flora and fauna.

9.1.3.4 Actions envisaged

- To check depletion of wetlands, earth filling in the wet and low-lying areas should be stopped.
- The water quality of Sola Bil is highly polluted mainly because of the dumping of rice bran and other wastes from the wholesale fish market. This dumping of waste in Sola Bil should be stopped. The area could be used as tourist attraction
- As in the previous Master Plan – 2001 Botanical Garden cum City Forest is suggested in the areas along Dipar Bil Basistha and Silsakoo Bil to have picnic spots.

- The Dipar Bil could be a major possible recreational area for the city.
- To overcome sewage entering into the bils, the complete solution would be to provide sewage treatment and solid waste management for all residential and other urban areas.

Refer to **Map 9.1** for the proposed Eco-sensitive areas in GMA-2025.

9.2 Water and Air Pollution

River Brahmaputra has excessive bacterial pollution due to discharge of raw sewage directly into the river without treatment. In Bharalu river, the dissolved oxygen (DO) is depleted due to the presence of various oxygen demanding matter inflowing into the river.

The ground water pollution generally shows a moderate mineral content with slightly higher concentration of iron and the toxic elements. Chemical Oxygen Demand (COD) Value and concentration of Chloride shows a trend indicating seepage of polluted surface water to shallow level.

Air Pollution in Guwahati has increased in recent years due to growth of traffic and other urban activities. Moreover, due to uneven topography, the geographical conditions and the climatic factors and elements like circulation of air, temperature, radiation level and alternate change of local low and high pressure gradient have a role in the growing concentration and unequal dispersion of the air pollutants within the city. The concentration of pollutants is also affected by the micro-level changes in the atmosphere. As the city is blocked on three sides by the hills and the hillocks, free movement of air is hampered for which the pollution level is comparatively higher in few pockets

Vehicular emission is also increasing in the city. The numbers of vehicles in Guwahati have doubled in the last five years which has lead to more fuel consumption and more emission in the city. The vehicles during traffic congestion throw high collective air pollutants into the environment.

9.2.1 Actions Envisaged

- Scientific and systematic management of the liquid wastes.
- The mass rapid transport system to reduce the vehicle on the road to reduce the air pollution.
- Industries in the region and within Guwahati to follow the PCB norms.
- Preparation of landscape plans, and large scale plantation.
- Refer to Section 5.5.13 also.

9.3 Natural Hazards

9.3.1 Floods

Refer to section on 'Drainage'.

9.3.2 Earthquake

The Brahmaputra valley and its adjoining highlands constitute a highly active seismic zone. Guwahati falls in the Seismic Zone V, where

earthquakes of magnitude 8 or more can occur i.e. the zone with highest intensity along with the entire north-eastern region. Guwahati and its surrounding area are situated on the fringe of hard rock formation.

Since, earthquakes are among the most dangerous and destructive natural hazards, a comprehensive earthquake hazard reduction programme should be prepared, which should include earthquake prediction, control measure, and post earthquake rehabilitation measures.

Disaster Management Centre

Refer to **section 7.7** (Fire).

10. Heritage Conservation and Tourism

10.1 Heritage Conservation

10.1.1 Conservation Zones

Guwahati city and its surrounding area are rich in cultural and historical heritage. There are a number of important archaeological and architectural sites of historical importance. The creation of conservation zones is important to integrate the overall conservation of the area. Following conservation zones have been identified.

- Kamakhya Temple Zone
- Brahmaputra River Temple Zone: The Umananda Temple, the Janardhanan Temple, Sikh Temple (Fancy Bazaar).
- Vasistha Ashram Complex

10.1.2 Strategy for Conservation

Built heritage of Guwahati needs to be protected, and nurtured and passed on to the coming generations. For this purpose, a heritage conservation committee (HCC) may be established by the State Government. The HCC shall prepare a list of Heritage Buildings based on the following criteria:

i) The age of the building;
ii) Its special value for architectural or cultural reasons or historical periods
iii) Its relevance to history
iv) Its association with a well-known character or event
v) Its value as part of a group of buildings
vi) The uniqueness of the building or any object or structures fixed to the building or forming part of the land and comprised within the cartilage of the building. Also refer Section 13.5.

10.2 Tourism

Major Tourist Attractions in and around Guwahati

Vasistha Ashram

The Guwahati Metropolitan Area contains various sites for tourist attractions, which include historical and religious sites, nature related sites and others like museums and science centres. Some of the important religious/historic sites in

Guwahati are Kamakhya Temple, Vasistha Ashram, Dol Gobinda Temple and Umananda Temple. The religious tourist attractions around Guwahati include Sibasagar, Sualkuchi, Madan Kamdev, Barpeta, Tezpur, Hajo, Majuli. Amongst these, Hajo and Sibsagar are important religious centres.

Guwahati is rich in scenic landscapes, hills and flora and fauna including *bils*. Around Guwahati there are Bhairabkunda, Bhalukpung, Haflong, Kaziranga and Manas National Park, Orang and Nameri National Park, as the major sites for nature related and adventure tourism.

10.2.2 Tourism Vision – 2025

Assam Tourism should aim to position tourism as an engine of economic growth and to harness its multiplier effects for employment generation and economic development.

10.2.2.1Tourist Projections

It is proposed to develop integrated inter and intra district tourist circuits based on the unique cultural and natural heritage of the area. These circuits shall cover the entire Guwahati area along with nearby tourist attractions (Refer Map). In accordance with the growth of tourist attractions and opportunities, the estimated number of tourist expected to arrive by 2025 in Guwahati is around 46 lakh, including domestic and foreign. An annual growth rate of 9% has been taken to project the tourist population in Guwahati.

Table 10.1: Tourist Projections for Guwahati

Year	Domestic	Foreign	Total
2000	5,11,459	2,738	5,14,197
2001	2,71,231	3,586	2,74,817
2002	6,37,909	3,804	6,41,713
2003	7,01,459	3,311	7,04,770
2025 (estimate)	4,670,735	22,047	46,92,782

Source: Calculations by Consultants

10.2.2.2Tourists Accommodation

Presently there are 5151 beds at the rate of 7 beds per 1000 tourists. Considering the same, the number of tourist beds required in 2025 is 32849 beds; thus 27,698 additional hotel beds are to be developed during the Master Plan period. These would be provided in Community, District and other commercial centres.

10.2.2.3Tourism Strategies

The city and its surroundings can offer a wide variety of tourism experiences to its visitors and high quality amenities.

- **Tourism Options**

  Assam has immense potential in its diverse landscape and culture. Hence Cultural Tourism, Religious Tourism, Wildlife Tourism, Eco-tourism Water Tourism and Adventure Tourism hold options. The hills and the Brahmaputra River provide scope for development of adventure tourism. Sports like rock climbing, trekking, para-sailing, water sports, hang gliding and angling could be promoted through competitions and special excursions to

these sites. Some potential sites for such activities are the Nilachal Hills, Brahmaputra river etc.

- **Tourist Circuits**

  Development of the tourist circuits is another important component of tourism linking the major tourist attractions in the city and its surroundings. The tourism department in coordination with the private sector could develop these circuits towards making tourism an important economic sector.

- **Intra State Circuits**

  - City Tour
  - River Cruise on Brahmaputra (extension of Jolporee River Cruise)

  - **Inter-city Tours**

    - Guwahati – Manas – Dubri
    - Guwahati – Kaziranga – Majuli – Sibsagar – Guwahati
    - Guwahati – Tezpur – Bhalukpung - Nameri Wildlife Sanctuary - Pobitra Wildlife Sanctuary – Guwahati
    - Guwahati – Pobitra Wildlife Sanctuary – Haflong – Jatinga – Maibong – Guwahati

- **Inter State Circuits**

  - Guwahati-Kaziranga-Tezpur-Bhalukpung-Bomdila-Tawang
  - Guwahati-Jorhat-Majauli-Tinsukia-Tezu-Parsuramkund
  - Guwahati-Jorhat – Itanagar – Machuka

- **Infrastructure**

  All infrastructure connected with tourism such as good roads, hotels and safari resorts, and information support services needs to be developed.

  - Basic amenities like clean public toilets, easily accessible telecommunication services, tourist information centres, banks and currency exchange centres, food courts and restraints, hotels and lodges etc. among other services to be provided.
  - Quality Hotels, recreation and shopping centres, local transportation, taxi services etc.
  - Development and maintenance of the tourist destinations.
  - Developing the handicraft and handloom haats.

- **Tourism Package for North-east**

  Assam and in particular Guwahati, as stated before, is the gateway to North-East with splendid reservoir of natural beauty. There are many tourist attractions in the neighbouring states like Shillong, Cherapunji in Meghalaya and Tawang, Tezu, Bomdilla etc in Arunachal Pradesh. Hence an integrated approach could be followed as is reflected in the proposed Inter-state circuits.

Annexure - E

78

GOVERNMENT OF ASSAM
OFFICE OF THE DIVISIONAL FOREST OFFICER, KAMRUP EAST DIVISION, BASISTHA, GUWAHATI-29.

E-mail: dfo.ekamrupeast@gmail.com

Letter No. B/KE/RTI/R. Bhattacharya/125 ..

Dated: 19 /12/2024.

To,

Sri Rajeev Bhattacharya,
302 Basistha Road, Beltola (Opp Siva Mandir, Main Raoad)
Guwahati-28 (Email id: rajkrbhat@gmail.com ; Contact No. 9435556111)

Sub: - RTI.

Ref: - The SPIO & Admn. Officer, O/o the PCCF & HoFF, Assam Letter no. FG.4/RTI/Rajeev Bhattacharya/2024/132, dtd 25/11/2024.

Sir,

With reference to the letter cited above, I would like to submit herewith the following information pertaining to Kamrup East Division:

1. Please provide information on the environmental clearance received for the proposed Maa Kamakhya Temple Access Corridor in Guwahati under EIA Notification 2006.
   - No such environmental clearance certificates were received by this Division for the proposed Maa Kamakhya Temple Access Corridor in Guwahati.

2. Please provide a copy of the approval received for the above-mentioned project under EIA Notification 2006.
   - Does not arise.

This is for your kind information and necessary action.

Yours sincerely,

19/12/24

S.P.I.O cum ACF
O/o the Divisional Forest Officer
Kamrup East Division, Basistha,
Guwahati-29.

Memo No. A/KE/RTI/R. Bhattacharya/126

Dated: 19 /12/2024

Copy to:

The Principal Chief Conservator of Forests, & Head of Forest Force, Assam, Aranya Bhawan, Panjabari, Guwahati-37 for kind information.

19/12/24

S.P.I.O cum ACF
O/o the Divisional Forest Officer
Kamrup East Division, Basistha,
Guwahati-29.

ANNEXURE - E

Studies on the distributional pattern and habitat utilization pattern by Indian Leopard (Panthera purdus fusca) in Nilachal hill, kamrup, Assam, India

Chapter · January 2014

3 authors, including:

Shah Nawaz Jelil
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28 PUBLICATIONS 53 CITATIONS

SEE PROFILE

Studies on the distributional pattern and habitat utilization pattern by Indian Leopard (*Panthera purdus fusca)* in Nilachal hill, kamrup, Assam, India

Mridul Bora[1,2*], *Shah Nawaz Jelil*[1] and *Pragoti Kalita*[1]

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Abstract

A scientific study was carried out from 22th November of 2013 to 2nd February of 2014 to evaluate the presence and distribution of leopard and as well as their habitat used types in the Nilachal hill. During the study period questionnaire survey was done to know the presence of leopard, moreover opportunistic survey and active searching method and other methods were followed to collect all the possible secondary sign of leopard in the study area. After data analysis we get a distributional table and habitat utilization pattern by Indian leopard. The study site 'Nilachal hil' is protected under 'Biodiversity Conservation & Management Project' by Kamakhya Debuteer Board. This study reveals that Nilachal hill of Guwahati metro has a stable population of leopard and it widely distributed in the study area. Numerous leopard human conflicts officially registered in the last decade in Guwahati metro. From the conflict management and conservation view it is very important to officially declare the Nilachal hill as a protected area. Though Indian leopard is under threatened category of IUCN, but its population decreases day by day due to habitat destruction and other such anthropogenic activity. Here we need to adopt an immediate and multidimensional affective working plan to conserve the species as well as the Nilachal hill.

Keywords: Leopard, Nilachal hill, Guwahai

Introduction

The leopard, *Panthera pardus* is one of the most widely distributed and highly adaptable medium sized big cats discovered by Carl Linnaeus in 1758. Leopards are the member of Felidae family and it is the smallest members of five big cats found in India *(*Brakefield, *1993)*. Based on morphological and genetic analysis, nine subspecies of leopard are recognized till today, one from Africa and eight from Asia. *Panthera purdus fusca* is found in India (Breitenmoser, *et al.*, 2008). Leopards inhabit a variety of terrain. Generally leopards have a home range of about 35 km^2 areas (Stander, *et al.*, 1997). Leopards are declining in parts of their geographic range due to habitat loss and fragmentation and other anthropogenic activity. As a result, leopards are listed as "near threatened" on the IUCN Red List of Threatened Species (2008) (Henschel, *et al.*, (2008). Leopard included on CITES Appendix I. Legal international traffic is limited largely to exports of skins and hunting trophies under a CITES Appendix I quota system by 13 African countries (2005 CITES quota is 2,590).

Several studies have been carried out on leopard in India in the last decade. But very less study has been carried out in Assam, moreover in Guwahati no study on leopard has been carried out till today. This study aimed to evaluate the presence and distributional pattern of leopard and its habitat utilization pattern in the Nilachal hill of Guwahati.

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Study Area

The study was restricted in the Nilachal hill of Guwahati, located on the North-east of the pious landmass of India. Guwahati has a total municipal area of 264 sq km, spreading 19 hillocks all over it. Nilachal hill (hillock) is one of the biggest hills in Guwahati, Assam.This historic hill has a glorious mention in Bisnupuran and Kalikapuran. According to Hindu mythology King Narakasur rulled here. Kamakhya mandir is situated in this Nilachal hill. According to hindu mythology, after Dakshya Yagna was destroyed, Shiva carried the lifeless body of 'Sati' on his shoulder and roamed all over. Vishnu, apprehending the destruction of humanity, took his 'Sudarshan Chakra' at the request of all Devtas and cut Devi's body into pieces one by one. Wherever a part of the body fell on earth, the place was designated sacred and was termed as Mahatirtha. At Kamakhya, Devi's Yoni Mandal (Reproductive organ) fell and from consideration of creation, Kamakhya is recorded as Mahatirtha (Sivapuran & Kalikapuran)

Geographically, this hill located in the southern bank of the river Brahmaputra between 26° 05' to 26° 15' N Latitude and 91° 35' to 91 ° 55' E Longitudes. Geographically, Nilachal hill is located in the southern bank of the river Brahmaputra between 26° 05' to 26° 15' N Latitude and 91° 35' to 91 ° 55' E Longitudes. (Guwahati Metropolitan Development Authority, 2006). Mighty Brahmaputra river situated in the North direction of the study site.The study area is about 4 km^2. For study, this region was divided into four patches, Patch A, Patch B, Patch C and Patch D respectively.

The study site is protected under 'Biodiversity Conservation & Management Project' by Kamakhya Debuteer.

Method

To study the distribution and habitat used pattern of Indian leopard in Nilachal hill, some methods are adopted. Field study has been carried out from 22th November of 2013 to 2nd February of 2014. During field study both diurnal and nocturnal surveys are done. All surveys were done on foot and on boat. Questionnaire survey was conducted among 200 locals and priest.

The methodology for the field survey was followed after Mason and MacDonald (1987) with slight modification to fit the local conditions. It involved a spraint (scat) survey across Nilachal hill range, which gave a reliable picture of leopard distribution. Besides spraints, scratch on tree, carcass and footprints were also recorded to support the occurrence of leopard (see also Ottino and Giller, 2004).

A random approach was followed to collect any sign of leopard's presence (spraints and footprint) in the study site. At each site, opportunistic survey was done and active searching method was followed along the water body and hilly area for sign of leopards present. Vessel based survey also done for searching the caves near river bank.

For identification of leopard pocket, caves were surveyed and nearest pugmark, carcass, scat and regurgitate were observed. During survey photographs of secondary information were photographed, collected, and GPS (global positioning system) locations were recorded.

Results

After field study, collected samples and photographs were analyzed to evaluate the present status of leopard. Out of 4 surveyed patches, indirect signs of leopard were observed in three patches, while in patch D we could not encounter any sign of leopard. During study every type of secondary signs were recorded in the 3 patch, patch A, patch B and patch C respectively. Numerous pugmarks were encountered in patch A and patch B. Carcass, scratch and regurgitate were encountered in this two patch.

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Table 1: Observation of leopard sign in the study area

Sites	Location	Total Obs.	Pug mark	Scratch	Scat	Regurgitate	Carcass	Caves	sign present site
Patch A	N 26°10'18.0" E 91°41'42.1" and N 26°10'18.1" E 91°42'0.21"	28	15	0	0	1	2	2	20
Patch B	N 26°10'15.4" E 91°42'02.1" and N 26°10'.027" E 91°43'11.5"	21	7	2	0	0	3	3	15
Patch C	N 26°10'15.4" E 91°42'02.1" and N 26°09'35.5" E 91°42'17.0".	13	0	0	1	0		0	1
Patch D	N 26°09'35.5" E 91°42'17.0" and N 26°10'18.0" E 91°41'42.1"	8	0	0	0	0		0	0

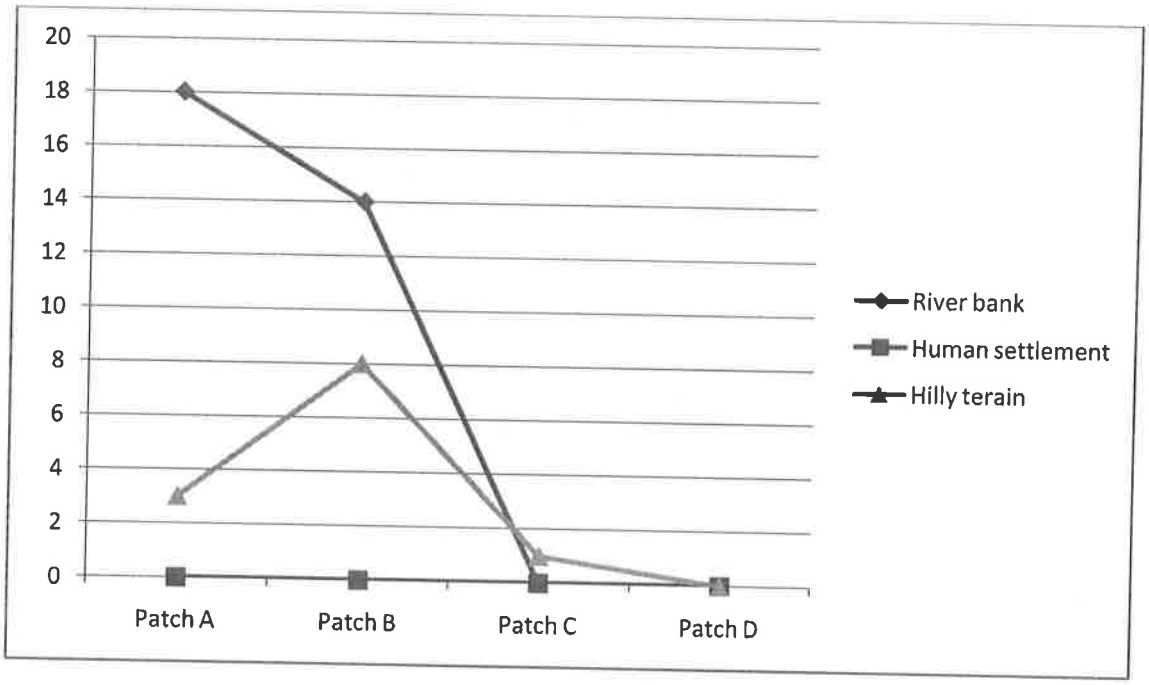

Fig. 1: Graphical representation of habitat used types of leopard in study area

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From patch C we collect a scat sample (waiting for the result of DNA analysis). Moreover we observed 2 caves of leopard in patch A and other 3 caves in patch B.

On the other hand maximum indirect evidences of leopard were found near Brahmaputra river bank. A few signs were collected from hilly terrain, moreover no sign of leopard was found human settlement.

Discussion

This survey was conducted for a short period, so the data collected during this study is not sufficient to determine the population status of leopard. Only secondary information and indirect evidences collected in a very short period can't give us a detailed distribution map of leopard present in Nilachal hill.

Numerous pugmarks were recorded from the patch A and patch B. Following the pugmark analyzing method by WWF 2005, we analyzed all the pugmarks and we get 4 different sized pugmarks including a cub. This result showed the presence of four leopards in the study area. We found carcass of different animals including cow and buffalo in patch B. Although leopard generally prey upon mid-sized ungulates, but their extraordinary and tremendous strength allows them to tackle up to 10 times their own weight (Stander, *et al.*, 1997). We observed only one scat sample of carnivore and scratches in two tress of the hilly area. Because it often hard to get sign of leopard in hard terrain. Patch C and Patch D showed negative results. Maximum signs were found along the river side, a few signs were collected from hilly terrain. Study shows that leopards of this hill preferred the river bank side. Comparatively this area is too far from human settlement. On the other hand human settlement shows negative result. Hence the habitat of leopard is totally destroyed due to population exploitation. During interview it has seen that almost all local people and priest familiar with leopard. Some of them claimed themselves as eye witness where many of them complained that leopard kills their domestic animal in winter season. But they also state that leopard didn't kill their domestic animal in other season. During study I observed huge diversity of rodents (different size) and monkey which are preferred food of leopard. But wildlife food habit tell us that in stressful time, when common or preferred food is absent they go for emergency food. So it is easy to understand that why leopard comes to human settlement for food in winter. Local people also stated that they did not saw leopard in other season (except winter), it leads us to believe that the leopard comes here only in winter season. Amchang wild life sanctuary is situated only 22 km far from this area and this hill is connected with numerous hills which act as a bridge between Amchang wildlife sanctuary and the study area. So the leopards present in this reason might be stray leopard, because leopard can occupy more than 35 km home range (Stander, *et al.*, 1997). So the leopards might be dispersed from Amchang wild life sanctuary for searching food and niche separation. On the other hand our study site is only about 4 km^2 area and we observed 4 leopards in this hill. Interestingly, during survey we found 5 caves along with pugmarks, carcass and scratch which is a very strong evidence to believe these caves are the home of leopard. However short term study and indirect evidence not enough to claim these caves as permanent leopard pocket, here we need to adopt more modern techniques like camera trapping, radio telemetry etc.

According to IUCN, Indian leopard is near threatened, but very soon leopard will join the endangered category of IUCN red list. Because the habitat fragmentation and habitat destruction rate increases day by day, regularly leopard contact unexpectedly with human which causes a great damage to leopards population. Illegal poaching also serves here a helping hand to reduce the population of leopard.

Interestingly news of leopard human conflict often reported from other parts of the Guwahati city. During interview an exciting result reveal. The local people believes that leopard is the bahan (vehicle) of Devi Durga,

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when leopard enter in human settlement, people do not come in direct contact with leopard, they only tried to remove leopard from their villages. Because they believes that killing of leopard or tiger is a sin. This is surely a superstitious belief, but only for their superstition no news of leopard killing in the Nilachal hill recorded yet.

This is a preliminary study to know the presence of leopard in Nilachal hill, it can be a very small step, but is a big step towards sustainable wildlife conservation in urban area like Guwahati.

Acknowledgement

Our special thanks to Prof. P. K. Saikia, Animal Ecology and Wildlife Biology Lab., Dept. of Zoology, Gauhati University. We would like to thank Mr. Nawakanta Sharma, President, Kamakhya Debuteer Board for his kind help. For helping us in the fild, we thanks to Mr. Kamaleswar Baruwah & Mr. Keshab Nath, Security persons of 'Biodiversity conservation and management Project'. We are very grateful to Dr. Abhijit Das, C Scientist, WII, Dehradun, for his inspiration and valuable advice. Our sincere thanks to Mr. Udayan Barthakur, Dr. Bibhuti Prasad Lahkar & Mrs. Purnima Devi Barman from 'Aaranyak'for their valuable advice.

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REPTILES & AMPHIBIANS

ANNEXURE - E1

Snakes of Nilachal Hill, Assam, India

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Of the 4,145 currently recognized species of snakes (Uetz et al. 2024), over 300 occur in India (Aengals et al. 2018). We herein address the diversity of snakes in an isolated forest patch in the city of Guwahati, Assam, where anthropogenic activities like road construction, deforestation, and human encroachment have led to drastic declines in the wildlife populations.

Covering an area of about 2.6 km^2 that includes a stream, some caves, rocky terrain, and patches of dense forest, Nilachal Hill is in the Kamrup Metropolitan District of Assam, India (26.16750, 91.71110), on the southern bank of the Brahmaputra River. Fringe areas support a developing commercial hub, with lodges, restaurants, apartments, hostels, and hospitals. During 53 morning (0900–1230 h) and evening (1600–2030 h) visits (8 person-hours each) from November 2021 to August 2023, we used visual encounter surveys to document snakes, actively searching under stones, fallen logs, trees, garbage dumps, near loose soil, streams, and along random forest trails. Snakes encountered during the study were disturbed as little as possible and photographed in the field. For identification, we used existing literature (Smith 1935, 1943; Ahmed et al. 2009) and consulted the IUCN Red List database (IUCN 2024) to determine the conservation status of the species we encountered.

We recorded 21 species of snakes in eight families and 18 genera (Table 1; Figs. 1–2); 16 of those species were listed as being of Least Concern (LC), one species was Near Threatened (NT), one was Vulnerable (VU), and three species had yet to be evaluated (NE).

Nilachal Hill lies in the city of Guwahati, and the diversity of snakes in Guwahati has been the subject of previous work. Purkayastha et al. (2011) reported 23 species of snakes from the city; Saikia (2005) reported 13 and Sengupta et al. (2016) reported 19 species of snakes from Deepor Beel; Purkayastha (2018) reported 28 species of snakes from Guwahati, and Purkayastha et al. (2020) reported 23 species of snakes from the Aamchang Wildlife Sanctuary, located on the eastern fringe of Guwahati. However, none of them reported the occurrence of *Boiga siamensis*, which was recorded during the present study. This highlights the importance of the Nilachal

Table 1. Checklist of snakes of Nilachal Hill, Assam, India. IUCN Red List status: LC = Least Concern, NT = Near Threatened, VU = Vulnerable, and NE = Not Evaluated.

Species	IUCN Red List Status
Colubridae	
Green Catsnake (*Boiga cyanea*)	LC
Thai Catsnake (*Boiga siamensis*)	LC
Ornate Flying Snake (*Chrysopelea ornata*)	LC
Copper-headed Trinket Snake (*Coelognathus radiatus*)	LC
Painted Bronze-backed Snake (*Dendrelaphis proarchos*)	NE
Common Wolfsnake (*Lycodon aulicus*)	LC
White-barred Kukri (*Oligodon albocinctus*)	LC
Indo-Chinese Ratsnake (*Ptyas korros*)	NT
Oriental Ratsnake (*Ptyas mucosa*)	LC
Elapidae	
Banded Krait (*Bungarus fasciatus*)	LC
Lesser Black Krait (*Bungarus lividus*)	LC
Monocled Cobra (*Naja kaouthia*)	LC
Homalopsidae	
Rainbow Watersnake (*Enhydris enhydris*)	LC
Natricidae	
Buff-striped Keelback (*Amphiesma stolatum*)	LC
Checkered Keelback (*Fowlea piscator*)	LC
Heller's Red-necked Keelback (*Rhabdophis helleri*)	NE
Pseudaspididae	
Mock Viper (*Psamodynastes pulverulentus*)	LC
Pythonidae	
Burmese Python (*Python bivittatus*)	VU
Typhlopidae	
Diard's Blindsnake (*Argyrophis diardii*)	LC
Brahminy Blindsnake (*Indotyphlops braminus*)	LC
Viperidae	
Salazar's Pitviper (*Trimeresurus salazar*)	NE

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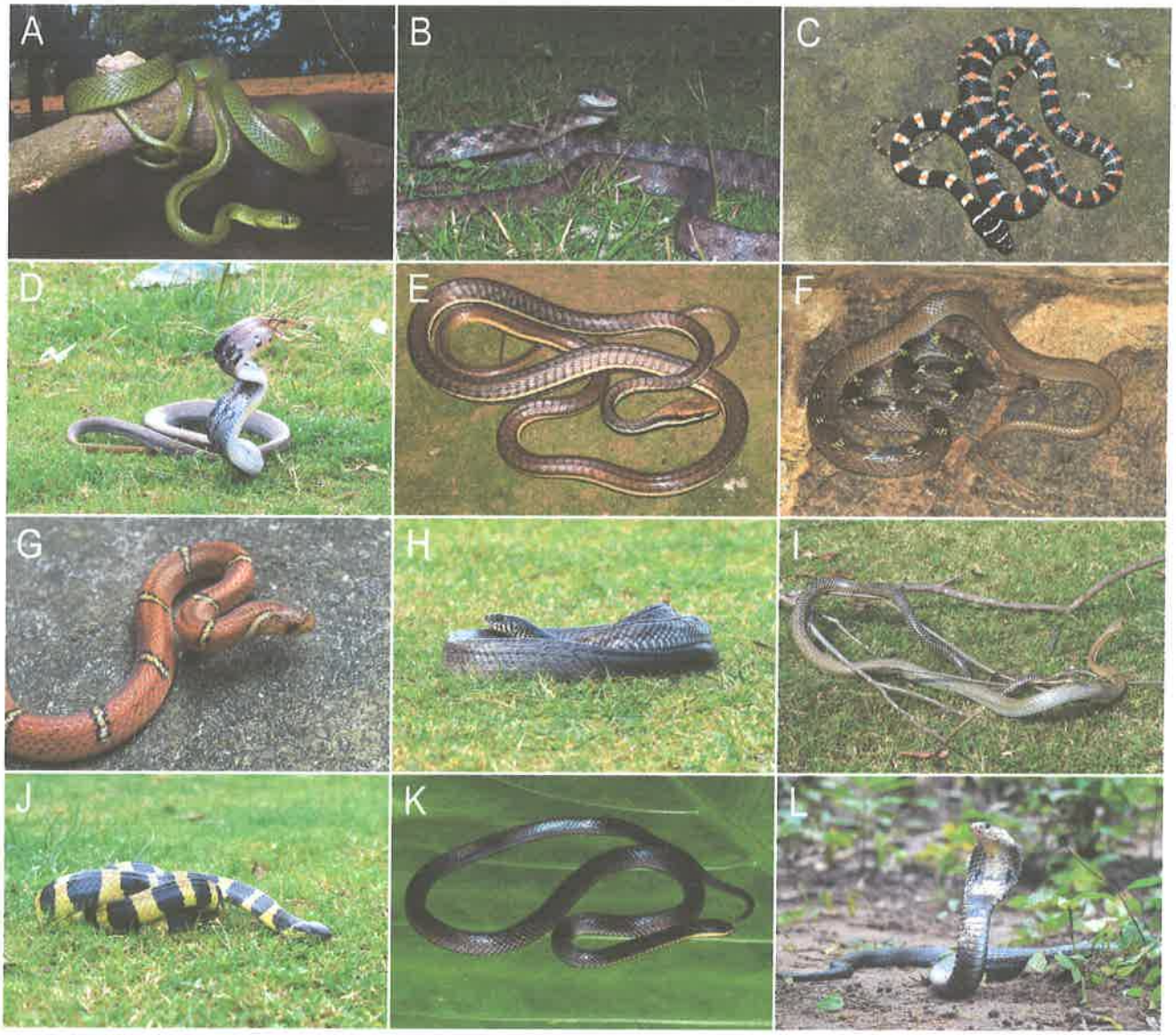

Figure 1. Snakes of Nilachal Hill, Assam, India: Green Catsnake (*Boiga cyanea*) (A); Thai Catsnake (*Boiga siamensis*) (B); Ornate Flying Snake (*Chrysopelea ornata*) (C); Copper-headed Trinket Snake (*Coelognathus radiatus*) (D); Painted Bronze-backed Snake (*Dendrelaphis proarchos*) (E); Common Wolfsnake (*Lycodon aulicus*) (F); White-barred Kukri (*Oligodon albocinctus*) (G); Oriental Ratsnake (*Ptyas mucosa*) (H); Indo-Chinese Ratsnake (*Ptyas korros*) (I); Banded Krait (*Bungarus fasciatus*) (J); Lesser Black Krait (*Bungarus lividus*) (K); Monocled Cobra (*Naja kaouthia*) (L). Photographs by Bijay Basfore.

Hill as habitat for snakes and suggests that the area provides suitable ecological conditions to support a diverse snake community, including uncommon species.

In the past few years, Nilachal Hill has seen a gradual decline in its vegetation as a result of human encroachment (Kar et al. 2012), but nevertheless harbors a unique habitat mosaic that is home to a wide variety of animals ranging from small arthropods like the Assam Tarantula (*Chilobrachys assamensis*) to large mammals like Leopards (*Panthera pardus*) (Bora et al. 2014). Many of these animals are in regular conflict with humans due to loss of breeding and foraging grounds. Our study underscores the significant snake diversity on Nilachal Hill that, despite the pressures imposed by anthropogenic activities, continues to support a diverse ophidian fauna. This, in turn, highlights the necessity for conservation efforts to preserve remaining forest fragments not only for sustaining wildlife but also for mitigating human-wildlife conflicts in rapidly urbanizing regions.

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We thank Sanath Chandra Bohra for his assistance and guidance throughout the study; our friends, teachers, and families for their support and guidance; and BB thanks Manmath Bharali, Arnab Deb, Biswajit Biswas, and

Figure 2. Snakes of Nilachal Hill, Assam, India (continued): Rainbow Watersnake (*Enhydris enhydris*) (M); Buff-striped Keelback (*Amphiesma stolatum*) (N); Checkered Keelback (*Fowlea piscator*) (O); Heller's Red-necked Keelback (*Rhabdophis helleri*) (P); Mock Viper (*Pssamodynastes pulverulentus*) (Q); Burmese Python (*Python bivittatus*) (R); Diard's Blindsnake (*Argyrophis diardii*) (S); Brahminy Blindsnake (*Indotyphlops braminus*) (T); Salazar's Pitviper (*Trimeresurus salazar*) (U). Photographs by Bijay Basfore.

Rupankar Bhattacharjee for assistance in the field and with photography.

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RESEARCH ARTICLE

ANNEXURE - E2

Folklore Plants from Kamakhya Hills Reserve Forest of Assam, India with their Ayurvedic Indications and Corroborated Pharmacological Activities

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ABSTRACT

Aim: The present communication deals with the report of Medico-ethnobotanical claims and folklore medicinal plants documented during the survey made to Kamakhya Hills Reserve Forest of Nagaon Forest Division situated in Central Assam region in South bank of the mighty river Brahmaputra.

Materials and methods: Field surveys were conducted in the study area where four folk healers were interviewed for documentation of Medico-ethnobotanical information. The reported folklore plant specimens are collected, identified and preserved.

Results: The reported folk claims involve 18 medicinal plants under 18 genera represented by 15 families. Corroborative Ayurvedic indications and reported pharmacological activities have been reviewed against documented folklore medicinal plants for further validation of folk claims. From the review, it is evident that there are total four plant species reported as the folk medicine of the region are not mentioned in any classical Ayurvedic texts as well as in Ayurvedic Pharmacopoeia of India (API). Among these, one plant species have come up with novel disease indications without having corroborative disease indications in Ayurvedic system of medicine as well as in reported pharmacological activities.

Conclusion: Novel folklore plants are suggested for further validation and screening.

Significance: Corroboration with Ayurvedic indication and reported pharmacological activities will validate the use of the folklore plant.

Keywords: Assam, Ayurvedic indications, Ethnobotanical claims, Folklore plants, Medico-pharmacological activities,

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INTRODUCTION

Assam is centrally located in the Brahmaputra valley which is a part of one of the biodiversity hotspots, occupies a special place in North-Eastern India represents 2.4% of India's total geographical area. The annual rainfall of the area starts from minimum 178 cm. to maximum of 305 cm. and temperature ranges between 18 to 37° C, with 83.00% of average humidity.[1] Many folklore medicinal plants are used by different tribes and rural people of Assam as a part of their folklife, scattered in various pockets normally neighboring some forest localities. All the folklore and traditional knowledge are transmitted from one generation to next generation which were elsewhere published in different headings like ethnobotanical studies or folklore practices of Assam among which no article is available focusing Kamakhya Hills Reserve Forest area situated in Nagaon Forest Division in Central Assam. A sincere attempt is being made to present a Medico-ethnobotanical report of recent survey made in this particular forest during June 2015 to document various folklore medicinal plants used for various disease conditions by the folk healers of the region to cater the medical needs of the folk.

Study Area

Kamakhya Hills Reserve Forest is situated in between 26°35.9' to 26°37.2' N and 92°56.1' to 92°59.8' E (Fig. 1) with a minimum altitude of 250 feet above sea level covering an area of approximately 518 hector area surrounded by the mighty river Brahmaputra in the North, Silghat village in West, Silikhaguri, Kamakhyagaon and Sonarigaon village in the South and Hatimura forest and village in the East. The reserve forest is situated in the extreme North part of Nagaon Forest Division situated in Koliabor subdivision of Nagaon district in Central Assam. A famous temple of Ma Kamakhya is situated within the forest range which was established in 1745 AD having patronage from then Ahom King Swargadeo Pramatta Singha made of stone

Fig. 1: Map of the study area (courtesy: https://en.wikipedia.org)

and brick of that time. Pre-communication links of Central Assam across the Brahmaputra are maintained through a port town named Silghat is situated near to this forest range.

MATERIALS AND METHODS

During June 2015 field survey was conducted by the survey team in different localities in and around the Kamakhya Hills Reserve Forest covering Sonari Gaon and Nam Kamakhya villages where folk healers were interviewed for documentation of Medico-ethnobotanical information like local name, parts used, mode of preparation and administration, any other precaution, etc. in respect to the folklore plants used against various disease conditions. The plants were collected by the help of folk healers and preserved properly as herbarium and museum sample which were identified by local flora[2] and by matching the specimens with the standard pre-identified specimens of the herbarium of the survey of medicinal plants unit, Regional Ayurveda Research Institute for Gastro-Intestinal Disorder (RARIGID), Guwahati (Assam) where voucher specimens were finally deposited for further reference.

RESULTS

Results of the Medico-ethnobotanical survey are enumerated below where folklore medicinal plants are arranged against disease conditions with scientific name, family, habit, Sanskrit name (S), local name (A), parts used and voucher numbers respectively in parenthesis with details of the mode of administration along with the amount of ingredients and doses.

Udarashula (Abdominal Pain)

One to two cm rhizome of *Acorus calamus* L. (Araceae; herb; Vachaa; Boch; Rhizome; AC4585) is crushed with one bulb of *Allium sativum* L. [*Liliaceae; Lashuna* (S); *Naharu* (A); Bulb; RD50] and a little amount of kitchen salt to prepare a paste. Three tablets are prepared from this paste and given one tablet orally in empty stomach for 3 days for relief. If the condition is associated with inflammation, 1 cm rhizome of *Zingiber zerumbet* Rosc. ex Sm. [Zingiberaceae; herb; *Mahaabhari-vachaa* (S); *Barahu* (A); Rhizome; AC6573] is mixed with the mixture and administered accordingly.

Pravahika (Dysentery)

Stem juice of *Saccharum officinarum* L. [Poaceae; herb; Ikshu (S); Kuhiyar (A); Stem; FB287] and fruit juice of *Citrus medica* L. [Rutaceae; shrub; Maatulunga (S); Nemu (A); Fruit; AC5712] is mixed in 40:1 ratio and A 1 to 2 table spoon full of the mixture is given orally daily for 2 to 3 times.

Raktaja Pravahika (Blood dysentery)

Twenty to 25 mL leaf juice of *Curcuma longa* L. [Zingiberaceae; herb; *Haridra* (S); *Halodhi* (A); Leaf; AC6285] is mixed with sugar and mixture is given in an empty stomach daily for 3 days.

Kamla (Jaundice)

Half spoon leaf juice of *Artocarpus heterophyllus* Lam. [Moraceae; tree; Panasa (S); Kathal (A); Leaf; AC6165] is mixed with the powder of 3 grains of *Oryza sativa* L. (Poaceae; herb; *Sali* (S); *Dhan* (A); grains; AC5330] and one cup of cow milk. The mixture is given orally in empty stomach at morning time daily for 3 days.

Kashtartava (Dysmenorrhoea)

A single spoon juice of apical branch of *Leucas aspera* Spreng. [Lamiaceae; herb; *Dronapushpi* (S); *Durun* (A); Apical branch; AC5878] is given orally daily from 1st to 3rd day of menstruation period in empty stomach.

Nine to eleven nos. leaves of *Achyranthes aspera* L. [Amaranthaceae; herb; *Apaamaarga* (S); Uvata bon (A); Leaf; AC6092] are crushed with 3 to 5 nos. fruits of *Piper nigrum* L. [Piperaceae; climber; *Maricha* (S); *Jaluk* (A); Fruit; AC6207] and grains of *Oryza sativa* L. [Poaceae; herb; *Sali* (S); Dhan (A); Grain; AC5330]. The paste is given orally in

empty stomach at morning time daily for 3 days from 1st to 3rd day of menstruation period.

Apasmara (Epilepsy)

Sprout of *Curcuma longa* L. [Zingiberaceae; herb; *Haridra* (S); *Halodhi* (A); Sprout and Rhizome; AC6285] is burn daily and prescribed for deep inhalation at morning time and one pea motor sized tablet prepared from rhizome is given orally for 8 to 9 days.

Pada Shwayathu/Shotha (Swelling of Leg)

Five to six cm root of each *Achyranthes aspera* L. [Amaranthaceae; herb; *Apaamaarga* (S); Uvata bon (A); Root; AC6092], *Cassia tora* L. [Caesalpiniaceae; herb; *Chakramarda* (S); Medelua (A); Root; AC5249] and *Urena lobata* L. [Malvaceae; herb; Naagabalaa (S); Root; AC6131] are crushed together, and about 5 gm paste is given orally daily in empty stomach at morning time for 3 days.

Stana-arbuda (Breast Tumor)

Paste of *Drymaria cordata* Willd. [Caryophylaceae; herb; Laijabori (A); Whole plant; AC4504] is given daily to apply locally on the breast to allay the tumor.

Pratishyaya/Jwara (Cold Fever)

One to two nos. mud daubers (insect) are crushed finely with 10-15 ml leaf juice of *Ocimum sanctum* L. [Lamiaceae; herb; *Tulasi* (S); *Toloshi* (A); Leaf; AC5076]. About 1 to 2 spoon of the mixture juice is given orally daily to cure the disease.

Netra-abhighata (Eye Injury)

One to two drops juice of *Oldenlandia corymbosa* L. [Rubiaceae; herb; Kshetraparpata (S); *Bon jaluk* (A); Whole plant; AC6433] is given locally during eye injury.

Shalyapaharana (Extraction of Foreign Body/Thorn)

One to two nos. leaves of *Argyreia nervosa* (Burm.f.) Boj. [Convolvulaceae; climber; *Vriddhadaaruka* (S); Takoria alu (A); Leaf; AC5534] is crushed with 15 to 20 nos. leaves of *Ziziphus jujuba* mill. [Rhamnaceae; shrub; *Badar* (S), *Kola*(s); *Bogori* (A); Leaf; AC5224] and paste is applied on injured area and bind with cotton cloth for a day to remove the thorn.

DISCUSSION

The present Medico-ethnobotanical survey results into report of 11 disease conditions prevailed in the study area. Four folk healers of the region belonging to plain Assamese tribe and Nepali community residing in the study area were interviewed to document these claims which results into report of 18 medicinal plants under 18 genera represented by 15 families. These plants are sporadic in the area and are collected by the healers as and when required. Many of the reported plants are indicated for specific disease conditions in Ayurvedic Pharmacopoeia of India as well as in different Ayurvedic classics which are tabulated in Table 1 along with respective Ayurvedic indications and reported corroborative pharmacological activities of the medicinal plants. From the table, it is evident that there are total four plant species reported as folk medicine of the region are not mentioned in any classical Ayurvedic texts as well as in Ayurvedic Pharmacopoeia of India, *viz.*, *Drymaria cordata* Willd., *Oldenlandia corymbosa* L., *Urena lobata* L. and *Zingiber zerumbet* Rosc. ex Sm. Many related plant species of the same genus have found a place in Ayurvedic Pharmacopoeia of India as well as in classics, but the respective species which are found in the region are lacking. Among these, one plant species have come up with new disease indications without having corroborative disease indications in Ayurvedic system of medicine which is juice of the whole plant of *Oldenlandia corymbosa* L. reported to be used against eye injury. Reported pharmacological activities suggested that *Oldenlandia corymbosa* L. have other pharmacological activities without having similarities with Ayurvedic indications. Also, leaves of *Artocarpus heterophyllus* Lam. have been reported to be used against Jaundice where no corresponding Ayurvedic indications (indication for other diseases in API are available), as well as pharmacological activities, have been found.

CONCLUSION

The study results in eight non Ayurvedic folklore medicinal plants used by Assamese plain tribes and Nepali community residing in the study area. The folklore plants which are not in classical Ayurvedic texts as well as in Ayurvedic Pharmacopoeia of India and data deficient with regards to their pharmacological activities may be planned for with detail literature review and screening in the line of folklore use for further validation.

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Table 1: Reported Folklore medicinal plants with Ayurvedic indications and corroborated pharmacological activities

S. N.	Medicinal plants as reported in folk claims	Part used	Dosage form	Reported disease condition	Ayurvedic indications	Corroborated pharmacological activities
1.	*Acorus calamus* L.	Rhizome	Paste form made into tablet	Abdominal pain	*Shula, Apasmara, Svasa, Kasa, Vibandha, Unmada, Adhmana, Karna Srava*[3]	Plant extract shows antispasmodic[4] and antimicrobial[5] activities
2.	*Achyranthes aspera* L.	Leaf Root	Leaf paste and root as paste	Dysmenorrhoea, Swelling	*Udara Roga, Arsha, Kandu, Medoroga*[6]	Arial parts shows analgesic and central nervous system depressant activity.[7] Root extract shows anti-inflammatory activity.[8]
3.	*Alium sativum* L.	Bulb	Paste made into tablet	Abdominal pain	*Jvara, Krimiroga, Gulma, Kustha, Kshaya, Svasa, Vrana,krrmi etc.*[9]	Bulb Powder shows analgesic and anti-nociceptive activity.[10] It has also antimicrobial activities.[11]
4.	*Argyreia nervosa* (Burm.f.) Boj.	Leaf	Crushed leaves as paste	To remove penetrated thorn from skin	*Sula, Sopha, Apasmara, Arsha, Aruchi, Amavata, Anaha, Kasa* etc.[12]	Plant is hypoglycaemic[13] and leaf extract shows wound healing activity[14]
5.	*Artocarpus heterophyllus* Lam.	Leaf	Juice form with rice grain powder	Jaundice	*Atisara, Daha,Rakta-pitta, Sotha, Tvakroga*[15]	Data deficient with regards to treatment of jaundice but having antibacterial, antimalarial and antifungal activities[16]
6.	*Cassia tora* L.	Root	Crushed root as paste	Swelling	*Kapha-vatajanya Vikara, Kustha, Vrana, Dadru, Pakshaghata, Vibandha, Gulma, Krimi, Pama*[17]	Leaf extract shows anti-inflammatory effect[18]
7.	*Citrus medica* L.	Fruit	Juice in mixture	Dysentery	*Raktapitta, Svasa, Kasa, Aruchi, UdaraRoga, Vibandha, Madatyaya*[19]	Fruit is antimicrobial[20] and peels/ leaf extract shows antiparasitic and antiprotozoal activity[21]
8.	*Curcuma longa* L.	Leaf, sprout	Juice of leaf and inhalation by burning of sprout	Blood dysentery, Epilepsy	*Pandu, Prameha, Vrana, Visa-vikara, Kustha, Tvakroga, Sitapitta, Pinasa*[22]	Anti-microbial[23] Rhizome shows anti-inflammatory[24] and anticonvulsant activity[25]
9.	*Drymaria cordata* Willd.	Whole plant	Paste applied locally	Breast tumor	Not in Classical Ayurvedic texts	Whole plant shows cytotoxic Activity[26], antiinflammatory, analgesic, antinociceptive, antibacterial, antipyretic, anxiolytic activities[27]
10.	*Leucas aspera* Spreng.	Apical branch	Juice	Dysmenorrhoea	Not in Classical Ayurvedic texts	Whole plant shows anti-inflammatory and analgesic activity[28]
11.	*Ocimum sanctum* L.	Leaf	Juice	Cold fever	*Ashmari, Svasa, Chardi, Hikka, Kasa, Krimiroga, Kustha, Netra-roga*[29]	Leaf extract shows anti-inflammatory, analgesic and antipyretic activity[30]; antifungal, immunomodulatory, and antiviral[31]
12.	*Oldenlandia corymbosa* L.	Whole Plant	Juice	Eye injury	Not in Classical Ayurvedic texts	Data deficient with regards to treatment of eye injury but having hepatoprotective, cytotoxic anti-oxidant, oxytocic and anti-malarial activities[32]
13.	*Oryza sativa* L.	Grains	Powder form	Jaundice	*Stanya-kshaya, Mutrakricchra*[33]	Anthocyanin-rich extract shows hepatoprotective and anti-oxidant action[34,35]
14.	*Piper nigrum* L.	Fruits	Crushed with other ingredients	Dysmenorrhoea	*Anaha, Gulma, Krimi-roga, Udara-roga, Vata-roga*[36]	Fruit extract shows antispasmodic effect[37] and an Alkaloid (Piperine) shows anti-inflammatory and antiarthritic effects[38]
15.	*Saccharum officinarum* L.	Stem	Juice form in the mixture	Dysentery	*Raktapitta, Visarpa, Mutrakricchra, Ojokshaya, Raktasrava, Grahani, Pandu*[39]	Cane extract shows antibiotic activity[40] along with antioxidant and anti-inflammatory activities[41]

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S. N.	Medicinal plants as reported in folk claims	Part used	Dosage form	Reported disease condition	Ayurvedic indications	Corroborated pharmacological activities
16.	*Urena lobata* L.	Root	Crushed root as paste	Swelling	Not in Classical Ayurvedic texts	Root extract shows diuretic activity[42]
17.	*Zingiber zerumbet* Rosc. ex Sm.	Rhizome	Paste made into tablet	Inflammation	Not in Classical Ayurvedic texts	Antioxidant, antidiarrhoeal, antibacterial, immunomodulatory, antidiabetic, anti- nociceptive and anti-Inflammatory[43,44]
18.	*Ziziphus jujuba* Mill.	Leaf	Crushed leaves as paste	Extraction of foreign body/ thorn	*Tvaka, Raktatisara, Vrana*[45]	Anxiolytic, Antimicrobial, Antiulcer, hypotensive[46]

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हिन्दी सारांश

असम (भारत) के कामाख्या हिल्स संरक्षित वन से लोकदावे पादपों के साथ उनके आयुर्वेदिक लक्षण और संपुष्टित फार्माकोलाजिकल गतिविधियाँ

उद्देश्यः वर्तमान सूचना मध्य असम क्षेत्र में ब्रह्मपुत्र नदी के दक्षिणी किनारे पर स्थित नागाँव वन विभाग के कामाख्या हिल्स संरक्षित वन में सर्वेक्षण के दौरान चिकित्सीय–प्रजातीय वानस्पतिक दावे और लोकदावे चिकित्सीय पादप पर रिपोर्ट से संबंधित है।

सामग्री और पद्धतिः अध्ययन क्षेत्र में क्षेत्र सर्वेक्षण किया गया जहाँ चार लोक चिकित्सकों का चिकित्सीय–प्रजातीय वानस्पतिक सूचना के प्रलेखन के लिए साक्षात्कार लिया गया। प्रतिवेदित लोकदावे पादप के नमूनों को एकत्रित किया गया, उनकी पहचान की गई एवं उनका संरक्षण किया गया।

परिणामः प्रतिवेदित लोक दावों में 15 संतति की 18 जाति के अंतर्गत 18 चिकित्सीय पादपों को सम्मलित किया गया है। संपुष्टित आयुर्वेदिक लक्षण और प्रतिवेदित फार्माकोलाजिकल गतिविधियों की समीक्षा लोक दावों के आगे के विधिमान्यकरण के लिए प्रलेखित लोकदावे चिकित्सीय पादपों के लिए की गई। समीक्षा से, यह स्पष्ट है कि क्षेत्र की लोक चिकित्सा में कुल 4 पादप प्रजाति को प्रतिवेदित किया गया जिसका भारतीय आयुर्वेदिक फार्माकोपिया के साथ–साथ किसी शास्त्रीय आयुर्वेदिक मूलपाठ में वर्णन नहीं है। इनमें से, 1 पादप प्रजातियाँ नॉवेल रोग लक्षण के रूप में है जिसमें फार्माकोलाजिकल गतिविधियाँ और आयुर्वेदिक औषधि पद्धति में संपुष्टित रोग लक्षण नहीं हैं।

निष्कर्षः नॉवेल लोकदावे पादपों को आगे के विधिमान्यकरण और जाँच के लिए सुझाया गया है।

महत्वः आयुर्वेदिक लक्षण और प्रतिवेदित फार्माकोलाजिकल गतिविधियों के साथ संपुष्टित लोकदावे पादपों के प्रयोग का विधिमान्यकरण करेंगें।

मुख्य शब्दः असम, आयुर्वेदिक लक्षण,चिकित्सीय प्रजातीय वानस्पतिक दावे, लोकदावे पादप,चिकित्सीय–फार्माकोलाजिकल गतिविधियाँ।

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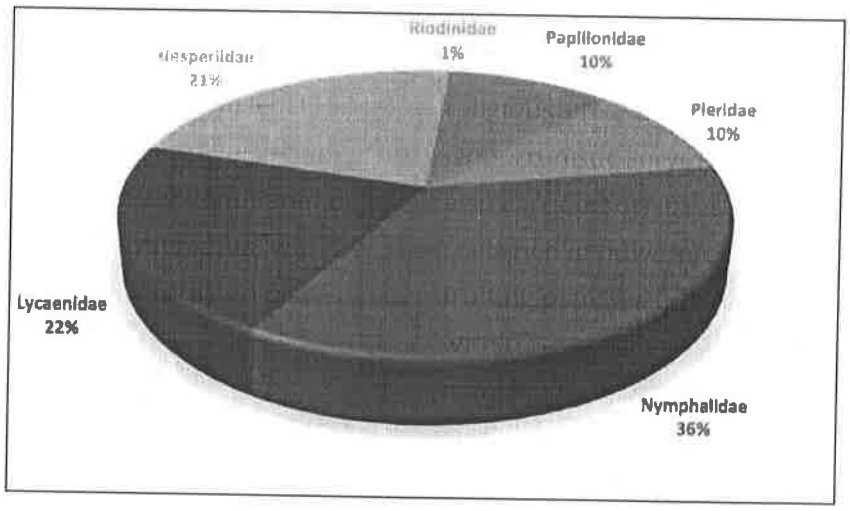
An insight into the butterfly diversity of Nilachal Hill, Assam

Butterflies are brilliantly coloured and one of the most diverse groups of insects (Basfore & Buragohain 2024) belonging to the order Lepidoptera. In addition to their visual appeal, butterflies serve as reliable indicators of habitat health and demonstrate sensitivity to shifts in climate conditions (Ramana 2010).

The global butterfly population boasts an impressive diversity, encompassing an extensive array of about 20,000–25,000 distinct species (Wynter-Blyth 1957), out of which 1500 species are found in India (Venkataramani 1986). Furthermore, about 962 species and sub-species belonging to five different families have been reported from Assam (Evans 1957).

The current study reports an assessment of the butterfly diversity in the Nilachal Hill, located in the Kamrup metropolitan district of Assam, India. The globally renowned Kamakhya Temple situated on the hill holds significant historical, archaeological, and spiritual value. The hill spans an area of 2.6 km² (Bohra et al. 2024) and is situated geographically at 26.1677 N, 91.7110 E. The Nilachal Hill encompasses diverse habitats and is mostly dominated by human settlements, with a few thickly forested places interspersed.

A total of 47 field surveys were conducted between August 2022 and February 2024, each involving an investment of atleast four man-hours. The sampling strategy adopted the Pollard Walk methodology (Pollard 1982), entailing traversing approximately 500 m on designated trails across various habitats, including residential areas, forests, religious sites, and streams. Opportunistic surveys were also carried out, focusing on trails rich in flowering and fruiting plants, as well as areas with trees, bushes, rocks, and damp soil, known to attract butterflies for feeding, basking, and mud-puddling activities. Species identification was



Family-wise abundance of butterflies in Nilachal Hill.

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Checklist of butterflies recorded from Nilachal Hill, Assam, India.

	Family	Scientific name	Common name	IUCN Red List
1.	Papilionidae	*Atrophaneura varuna* (White 1842)	Common Batwing	LC
2.		*Graphium agamemnon* (Linnaeus 1758)	Tailed Jay	NA
3.		*Graphium doson* (C. & R. Felder 1864)	Common Jay	LC
4.		*Graphium megarus* (Westwood 1844)	Assam Spotted Zebra	NA
5.		*Graphium sarpedon* (Linnaeus 1758)	Common Bluebottle	LC
6.		*Pachliopta aristolochiae* (Fabricius 1775)	Common Rose	LC
7.		*Papilio agenor* Linnaeus 1758	Great Mormon	LC
8.		*Papilio chaon* Westwood 1845	Yellow Helen	NA
9.		*Papilio clytia* Linnaeus 1758	Common Mime	NA
10.		*Papilio demoleus* Linnaeus 1758	Lime Butterfly	NA
11.		*Papilio helenus* Linnaeus 1758	Red Helen	NA
12.		*Papilio paris* Linnaeus 1758	Paris Peacock	NA
13.		*Papilio polytes* Linnaeus 1758	Common Mormon	NA
14.		*Troides aeacus* (C.& R. Felder 1860)	Golden Birdwing	LC
15.		*Troides helena* (Linnaeus 1758)	Common Birdwing	LC
16.	Pieridae	*Appias albina* (Boisduval 1836)	Common Albatross	NA
17.		*Appias lyncida* (Cramer [1777])	Chocolate Albatross	NA
18.		*Appias olferna* Swinhoe 1890	Eastern Striped Albatross	NA
19.		*Catopsilia pomona* (Fabricius 1775)	Lemon Emigrant	NA
20.		*Delias descombesi* (Boisduval 1836)	Red spot Jezebel	NA
21.		*Delias hyparete* (Linnaeus 1758)	Painted Jezebel	NA
22.		*Delias pasithoe* (Linnaeus 1767)	Red-base Jezebel	NA
23.		*Eurema andersonii* (Moore 1886)	One-spot Grass Yellow	LC
24.		*Eurema blanda* (Boisduval 1836)	Three-spot Grass Yellow	NA
25.		*Eurema hecabe* (Linnaeus 1758)	Common Grass Yellow	NA
26.		*Gandaca harina* (Horsfield [1829])	Tree Yellow	NA
27.		*Ixias pyrene* (Linnaeus 1758)	Yellow Orange Tip	NA
28.		*Leptosia nina* (Fabricius 1793)	Psyche	NA
29.		*Pieris brassicae* (Linnaeus 1758)	Large Cabbage White	NA
30.		*Pieris canidia* (Linnaeus 1768)	Indian Cabbage White	NA
31.	Lycaenidae	*Anthene emolus* (Godart [1824])	Common Ciliate Blue	NA
32.		*Anthene lycaenina* (Felder 1868)	Pointed Ciliate Blue	NA
33.		*Arhopala centaurus* (Fabricius 1775)	Centaur Oakblue	NA
34.		*Caleta decidia* (Hewitson 1876)	Angled Pierrot	LC
35.		*Caleta elna* (Hewitson 1876)	Elbowed Pierrot	LC
36.		*Castalius rosimon* (Fabricius 1775)	Common Pierrot	NA
37.		*Catochrysops strabo* (Fabricius 1793)	Forget-me-not	NA

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	Family	Scientific name	Common name	IUCN Red List
38.	Lycaenidae	*Cheritra freja* (Fabricius 1793)	Common Imperial	LC
39.		*Chilades lajus* (Stoll [1780])	Lime Blue	NA
40.		*Chilades pandava* (Horsfield [1829])	Plains Cupid	LC
41.		*Curetis acuta* Moore 1877	Acute Sunbeam	NA
42.		*Heliophorus epicles* (Godart [1824])	Purple Sapphire	NA
43.		*Hypolycaena erylus* (Godart [1824])	Common Tit	NA
44.		*Jamides alecto* (C. Felder 1860)	Metallic Cerulean	LC
45.		*Jamides bochus* (Stoll [1782])	Dark Cerulean	NA
46.		*Jamides celeno* (Cramer [1775])	Common Cerulean	NA
47.		*Lampides boeticus* (Linnaeus 1767)	Peablue	NA
48.		*Loxura atymnus* (Stoll 1780)	Yamfly	NA
49.		*Megisba malaya* (Horsfield [1828])	Malayan	NA
50.		*Neopithecops zalmora* (Butler [1870])	Common Quaker	NA
51.		*Prosotas dubiosa* (Semper [1879])	Tailless Lineblue	NA
52.		*Prosotas nora* (C. Felder 1860)	Common Lineblue	NA
53.		*Pseudozizeeria maha* (Kollar [1844])	Pale Grass Blue	NA
54.		*Rapala iarbas* (Fabricius 1787)	Common Red Flash	NA
55.		*Rapala manea* (Hewitson 1863)	Slate Flash	NA
56.		*Spalgis epius* (Westwood [1851])	Apefly	NA
57.		*Surendra quercetorum* (Moore [1858])	Common Acacia Blue	NA
58.		*Leptotes plinius* (Fabricius 1793)	Zebra Blue	NA
59.		*Taraka hamada* (Druce 1875)	Forest Pierrot	NA
60.		*Zeltus amasa* (Hewitson [1865])	Fluffy Tit	NA
61.		*Zizeeria karsandra* (Moore 1865)	Dark Grass Blue	NA
62.	Riodinidae	*Abisara echerius* (Stoll [1790])	Plum Judy	NA
63.		*Zemeros flegyas* (Cramer [1780])	Punchinello	NA
64.	Nymphalidae	*Acraea terpiscore* (Linnaeus 1758)	Tawny Coster	NA
65.		*Ariadne merione* (Cramer [1777])	Common Castor	NA
66.		*Athyma inara* Westwood 1850	Colour Sergeant	NA
67.		*Athyma perius* (Linnaeus 1758)	Common Sergeant	NA
68.		*Cethosia biblis* (Drury [1773])	Red Lacewing	NA
69.		*Cethosia cyane* (Drury [1773])	Leopard Lacewing	NA
70.		*Charaxes bernardus* (Fabricius 1793)	Tawny Rajah	NA
71.		*Charaxes bharata* C. & R. Felder [1867]	Common Nawab	NA
72.		*Charaxes marmax* Westwood 1847	Yellow Rajah	NA
73.		*Chersonesia intermedia* Martin 1895	Wavy Maplet	LC
74.		*Chersonesia risa* (Doubleday [1848])	Common Maplet	NA
75.		*Cirrochroa aoris* Doubleday [1847]	Large Yeoman	NA
76.		*Cirrochroa tyche* C. & R. Felder 1861	Common Yeoman	NA

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	Family	Scientific name	Common name	IUCN Red List
77.		*Cyrestis thyodamas* Doyère [1840]	Oriental Map Butterfly	NA
78.		*Danaus chrysippus* (Linnaeus 1758)	Plain Tiger	LC
79.		*Danaus genutia* (Cramer [1779])	Striped Tiger	NA
80.		*Discophora sondaica* Boisduval 1836	Common Duffer	NA
81.		*Elymnias hypermnestra* (Linnaeus 1763)	Common Palmfly	NA
82.		*Elymnias malelas* (Hewitson 1863)	Spotted Palmfly	NA
83.		*Euploea core* (Cramer [1780])	Common Crow	LC
84.		*Euploea midamus* (Linnaeus 1758)	Blue-spotted Crow	NA
85.		*Euploea mulciber* (Cramer [1777])	Striped Blue Crow	NA
86.		*Euthalia aconthea* (Cramer [1777])	Common Baron	NA
87.		*Euthalia lubentina* (Cramer [1777])	Gaudy Baron	NA
88.		*Hypolimnas bolina* (Linnaeus 1758)	Great Eggfly	NA
89.		*Junonia almana* (Linnaeus 1758)	Peacock Pansy	LC
90.		*Junonia atlites* (Linnaeus 1763)	Grey Pansy	NA
91.		*Junonia hierta* (Fabricius 1798)	Yellow Pansy	LC
92.		*Junonia iphita* (Cramer [1779])	Chocolate Pansy	NA
93.		*Junonia lemonias* (Linnaeus 1758)	Lemon Pansy	NA
94.		*Lebadea martha* (Fabricius 1787)	Knight	NA
95.		*Lethe chandica* (Moore [1858])	Angled Red Forester	NA
96.	Nymphalidae	*Lethe europa* (Fabricius 1775)	Bamboo Treebrown	DD
97.		*Lethe rhoria* (Fabricius 1787)	Common Treebrown	NA
98.		*Melanitis leda* (Linnaeus 1758)	Common Evening Brown	LC
99.		*Melanitis phedima* (Cramer [1780])	Dark Evening Brown	NA
100.		*Moduza procris* (Cramer [1777])	Commander	NA
101.		*Mycalesis mineus* (Linnaeus 1758)	Dark-branded Bushbrown	NA
102.		*Mycalesis perseus* (Fabricius 1775)	Common Bushbrown	NA
103.		*Mycalesis visala* Moore [1858]	Long-branded Bushbrown	NA
104.		*Neptis hylas* (Linnaeus 1758)	Common Sailer	NA
105.		*Orsotriaena medus* (Fabricius 1775)	Medus Brown	NA
106.		*Pantoporia hordonia* (Stoll [1790])	Common Lascar	NA
107.		*Parantica aglea* (Stoll [1782])	Glassy Tiger	NA
108.		*Parthenos sylvia* (Cramer [1775])	Clipper	NA
109.		*Symbrenthia lilaea* (Hewitson 1864)	Common Jester	DD
110.		*Tanaecia lepidea* (Butler 1868)	Grey Count	NA
111.		*Vagrans egista* (Cramer [1780])	Vagrant	NA
112.		*Ypthima baldus* (Fabricius 1775)	Common Five-ring	NA
113.		*Ypthima huebneri* Kirby 1871	Common Four-ring	NA
114.		*Vindula erota* (Fabricius 1793)	Cruiser	NA
115.		*Tirumala limniace* (Cramer [1775])	Blue Tiger	NA

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	Family	Scientific name	Common name	IUCN Red List
116.	Hesperiidae	*Ampittia subvittatus* (Moore 1878)	Tiger Hopper	NA
117.		*Ancistroides nigrita* (Latreille [1824])	Chocolate Demon	NA
118.		*Baoris unicolor* Moore [1884]	Black Paint-Brush Swift	NA
119.		*Borbo cinnara* (Wallace 1866)	Rice Swift	NA
120.		*Burara harisa* (Moore [1866])	Harisa Orange Awlet	NA
121.		*Cephrenes acalle* (Höpffer 1874)	Plain Palm Dart	NA
122.		*Erionota acroleuca* (Wood-Mason & de Nicéville 1881)	Small Palm-redeye	NA
123.		*Gerosis bhagava* (Moore [1866])	Common Yellow-breasted flat	NA
124.		*Gerosis phisara* (Moore 1884)	Dusky Yellow-breast flat	NA
125.		*Gerosis sinica* (C. & R. Felder 1862)	White Yellow-breasted flat	NA
126.		*Halpe zema* (Hewitson 1877)	Banded Ace	NA
127.		*Hasora chromus* (Cramer [1780])	Common Banded Awl	NA
128.		*Lambrix salsala* (Moore [1866])	Chestnut Bob	NA
129.		*Matapa sasivarna* (Moore [1866])	Black-veined Branded Redeye	NA
130.		*Notocrypta curvifascia* (C. & R. Felder 1862)	Restricted Demon	NA
131.		*Notocrypta paralysos* (Wood-Mason & de Nicéville 1881)	Common Banded Demon	NA
132.		*Odontoptilum angulata* (C. Felder 1862)	Chestnut Angle	NA
133.		*Oriens gola* (Moore 1877)	Common Dartlet	NA
134.		*Parnara* sp.		NA
135.		*Pelopidas assamensis* (de Nicéville 1882)	Great Swift	NA
136.		*Polytremis lubricans* (Herrich-Schäffer 1869)	Contiguous Swift	NA
137.		*Pseudocoladenia dan* (Fabricius 1787)	Fulvous Pied Flat	NA
138.		*Sarangesa dasahara* (Moore [1866])	Common Small Flat	NA
139.		*Scobura isota* (Swinhoe 1893)	Khasi Hills Bob	NA
140.		*Suastus gremius* (Fabricius 1798)	Oriental Palm Bob	NA
141.		*Tagiades gana* (Moore [1866])	Suffused Snow Flat	NA
142.		*Tagiades japetus* (Stoll [1781])	Common Snow Flat	NA
143.		*Telicota colon* (Fabricius 1775)	Pale Palm-Dart	NA
144.		*Udaspes folus* (Cramer [1775])	Grass Demon	NA
145.		*Unkana ambasa* (Moore [1858])	Hoary Palmer	NA

performed in the field or from photos using literature (Evans 1932; Kehimkar 2016) and web sources like ifoundbutterflies (https://www.ifoundbutterflies.org/).

A total of 145 species of butterflies belonging to 95 genera and six families were recorded during the study. Among the recorded species, 19 species are listed as 'Least Concern' (LC), two as 'Data Deficient' (DD), and 124 species remain non-assessed under the IUCN Red

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1. *Atrophaneura varuna*, 2. *Graphium agamemnon*, 3. *Graphium doson*, 4. *Pachliopta aristolochiae*, 5. *Papilio agenor*, 6. *Appias olferna*, 7. *Catopsilia pomona*, 8. *Delias descombesi*, 9. *Delias hyparete*, 10. *Leptosia nina*, 11. *Caleta decidia*, 12. *Chilades lajus*, 13. *Curetis acuta*, 14. *Hypolycaena erylus*, 15. *Prosotas dubiosa*, 16. *Abisara echerius*, 17. *Zemeros flegyas*, 18. *Cethosia cyane*, 19. *Charaxes bharata*, 20. *Moduza procris*, 21. *Ypthima baldus*, 22. *Vindula erota*, 23. *Erionota acroleuca*, 24. *Scobura isota*, 25. *Udaspes folus*.

List. Additionally, Nymphalidae was found to be the most dominant family with 52 (36%) species, followed by Lycaenidae with 31 (22%), Hesperiidae with 30 (21%), Pieridae with 15 (10%), Papilionidae with 15 (10%), and the least was Riodinidae with only 2 (1%) species. This study established that a wide range of species may coexist in urban surroundings. Recently, the butterfly species *Unkana ambasa* was also reported from Nilachal Hill, which

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is the first visual proof of the adult species' existence in Assam (Bohra et al. 2024). Hence, Nilachal Hill which has been largely overlooked for biological richness, turned out to be a hub of butterflies. With the exception of the undisturbed forest patches, a large portion of the region is inhabited by people, which will inevitably reduce biodiversity. Inventorying the biodiversity of this particular forest patch is thus crucial because it is in jeopardy due to pollution and habitat loss brought on by numerous anthropogenic activities.

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Diversity of Invasive plant species in Nilachal hill, Kamrup metro, Assam

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ANNEXURE - E4

Diversity of Invasive plant species in Nilachal hill, Kamrup metro, Assam

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ABSTRACT

Nilachal Hill, situated in the west from the heart of the city Guwahati is an abode to a variety of flora of which alien flora comprises a major part. These species grow and flourish extensively in the rich soil and suitable environmental condition and cause ecological imbalance to the surrounding flora. Human activities play a major role in the introduction and proliferation and spread of these invasive alien species. The present investigation deals with the status of invasive alien flora along with their diversity as well as harmful and beneficial uses in the Nilachal Hills, Assam.

Key words: Nilachal hill, invasive alien flora, nativity, harmful effect, beneficial uses.

INTRODUCTION

An invasive plant species is defined as one that has spread and developed self-sustaining populations, and become dominant or disruptive. Invasive plants are commonly known as weeds or alien, noxious, exotic, transient or foreign species. As per definition of International Union for Conservation of Nature and Natural Resources (IUCN) Alien Invasive Species is that which is established in natural or semi natural ecosystems or habitat and acts as an agent of change and threatens native biological diversity. They cause loss of biodiversity including species extinctions, changes in hydrology and ecosystem function. Thus, Invasive species are matters of serious concern for conservation and sustainable use of biodiversity.

Invasive species possess characteristic features like "pioneer species" as they are tolerant of a wide range of soil and weather conditions that help in their distribution, production of large amount of seed, easy dispersal of seeds, development of strong root systems, short generation time and long flowering and fruiting periods.

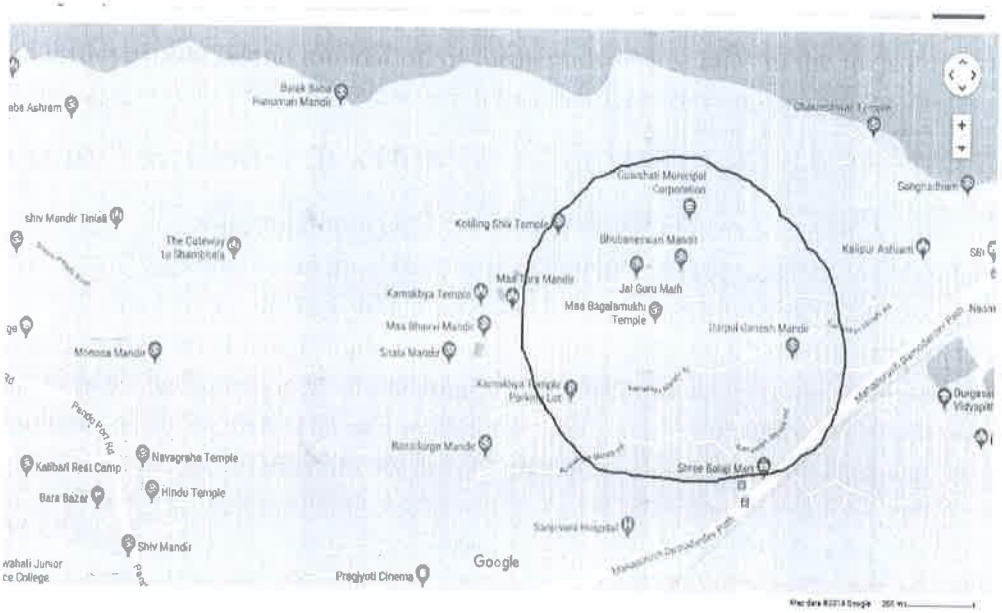
AIMS AND OBJECTIVES

The present study aims at compiling the first authentic catalogue of the invasive alien flora of Nilachal hill in the state Assam, NE India, along with supplementation of some information of each species *viz.* origin, life form, use, invasion status, and their diversity assessment. Such base line study would be the foundation of further advance studies in the invasion ecology and for the future assessment of invasive species in this biodiversity-rich zone.

STUDY AREA AND LOCATION

The study area Nilachal hill is located in the Kamrup Metro district of Assam and the geographic area is 127.84 sq km which lies between 26° 09' 55.32" N to 26° 09' 91.7" N latitude and 91° 41' 88.7" E and 91° 42' 94.7" E longitudes and an altitude ranging between 50.56 m and 387.18 m. The famous Kamakhya Temple is located on the top of Nilachal Hill, about 5 km from Guwahati city on the bank of river Brahmaputra. The mean annual rainfall is 1746.5mm. The relative humidity is over 70% .The soil is generally red laterite to sandy loam and alluvial in the river catches. The vegetation is mainly deciduous type with occasional presence of evergreen trees.

MAP



METHODOLOGY

Intensive field survey was conducted from September 2017 to January 2019 covering wild species to document and enlist the maximum number of alien flora from the site. The information regarding the usefulness of recorded plants were collected from different primary

and secondary sources[1,2]. The collected specimens were processed into mounted herbarium specimen following standard herbarium techniques [3]. Specimens were identified by consulting the specimens deposited in the H. K. Baruah Botanical Resource Centre, Botany Department, Gauhati University and with the help of various literatures [4]. Identified specimens were deposited in the Herbarium of Department of Botany, B. Borooah College, Guwahati for future reference. The invasive species were enumerated according to their families arranged alphabetically in tabular form (Table1). The nativity, life form types, uses and categories are also shown in the table. The categories were classified into naturalized, noxious and interfering. Self replacing plant populations by recruitment through seeds and capable of independent growth were categorized as naturalized. Alien plants which impacted native flora on the disturbed sites were taken as noxious. The species which were neither injurious nor noxious but cause profuse interference and hindrance to the growth of native species over a large area by virtue of their vast numbers were taken as interfering.

The nativity of the invasive plants has been recorded from the published literature and abbreviations used for the native countries are as follows: NAM- North America, SAM- South America, TAM- Tropical America, EU-Europe, TAF-Tropical Africa, SETA- South East Tropical Asia, SAF-South Africa, AM-America, TWA-Tropical West Asia, MDT-Mediterranean, BZ-Brazil, MEX- Mexico, and WI-West Indies. Plants are also categorized according to their economic uses as food, fodder, medicinal and ornamental, etc. Plants were also categorized by life form i.e., grass, herb, shrub, climber, vine and tree.

RESULTS AND DISCUSSION

A total of 98 invasive alien plant species have been documented which belong to 83 genera under 35 families. The number of dicot alien species was 81, under 68 genera and 31 families. On the other hand, there were only 17 species of monocot aliens distributed among 15 genera under 4 families (Arecaceae, Commelinaceae, Cyperaceae and Poaceae). Of 35 families having alien species, Asteraceae was the most dominant with 13 species followed by Poaceae with 9 species followed by Ceasalpinaceae and Solanaceae with 6 species each). The number of species in Amaranthaceae, Convolvulaceae, Euphorbiaceae, and Leguminosae is 5 in each. Of these aliens, 5 species were judged as noxious, 16 species as interfering, and 57 as naturalized species (Figure 2.). Habit wise analysis shows that 53% of species are herbs, 16% are shrubs, 7% climbers, 8% are trees, 13% are grasses and 2% vines. All the species reported in this study were also reported as weeds in the Global Compendium of Weeds. Further, it has been observed that few species like *Mikania micrantha, Lantana camara, Chromolaena odorata, Synedrella nodiflora* and *Ageratum conyzoides* are highly invasive and have invaded on the fringes of forests. On the basis of the nativity of the species, a total of 13 different geographical regions were recorded in the present study where 81% are contributed by 4 major geographical regions viz., Tropical America, Tropical Africa, South East Tropical Asia and South America. The remaining 19% species are contributed by 9 regions (Figure 1.).

Asteraceae, the most dominant family exhibited a much higher reproductive capacity than those of other families. This high reproductive potential is achieved by partitioning of reproductive capital into a large number of propagules that are minute, light and wind dispersed[5]. Various other workers have also reported the dominance of Asteraceae among invasive alien species. The members of Caesalpinaceae and Solanaceae are favored by human encroachment and habitat destruction. Convolvulaceae is the third largest family in the study area as the area contains open and thickets types of forest and this is the congeal habitat for the growth of climbers of the family Convolvulaceae. Monocots show seasonal dominance because of the disturbed soil structure and hydrology.

Table 1: Invasive alien plants of Nilachal hill

FAMILY	NAME OF THE SPECIES	NATIVITY	LIFE FORM	USES	CATEGORY
Acanthaceae	*Phlogacanthus thyrsiflorus* Nees.	SETA	Shrub	Medicinal	Naturalized
	Ruellia tuberosa L.	TAM	Herb	Ornamental	Naturalized
Amaranthaceae	*Achyranthes aspera* L.	SETA	Herb	Medicinal	Naturalized
	Alternanthera sessilis (L.)DC.	TAM	Herb	Food	Naturalized
	Alternanthera ficoidea (L.) Sm.	TAM	Herb	Food	Naturalized
	Amaranthus spinosus L.	TAM	Herb	Food	Naturalized
	Amaranthus viridis L.	SETA	Herb	Food	
Annonaceae	*Annona reticulata* L.	TAM	Tree	Food	Naturalized
Apocynaceae	*Catharanthus roseus*(L.) G. Don	TAM	Shrub	Ornamental	Naturalized
	Rauvolfia tertraphylla L.	MEX	Shrub	Medicinal	Naturalized
Araceae	*Alocasia macrorrhizos* (L.)G.Don	SAM	Herb	Food	Naturalized
	Caladium bicolor(Aiton) Vent.	SAM	Herb	Ornamental	Naturalized
	Colocasia esculenta (L.) Schott	SAM	Herb	Food	Naturalized

Asclepediaceae	*Calotropis gigantea* (L.)R.Br.	TAF	Shrub	Medicinal	Interfering
	Calotropis procera (Aiton) Drydon	TAF	Shrub	Medicinal	Interfering

FAMILY	NAME OF THE SPECIES	NATIVITY	LIFE FORM	USES	CATEGORY
Asteraceae	*Acmella paniculata* (Wall.ex DC.) J.	MEX	Herb	Medicinal	Naturalized
	Ageratum conyzoides (L.) L.	TAM	Herb	Fodder	Noxious
	Blumea lacera (Burm .F.) DC.	TAM	Herb	Food	Interfering
	Chromolaena odorata (L.) King and Rob.	SAM	Herb	Fodder	Interfering
	Crassocephalum crepidlodes (Benth) Moore	TAM	Herb	Fodder	Naturalized
	Cyanthillium cinereum (L.) H. Rob.	SAM	Herb	Fodder	Naturalized
	Eclipta prostrata (L.) L.	TAM	Herb	Fodder	Naturalized
	Mikania micrantha Kunth	AM	Herb	Medicinal	Naturalized
	Parthenium hysterophorus L.	NAM	Herb	Fodder	Noxious
	Sonchus asper (L.) Hill.	MDT	Herb	Weed	Interfering
	Synedrella nodiflora (L.) Gaertn.	WI	Herb	Fodder	Interfering
	Tridax procumbens (L.) L.	TAM	Herb	Medicinal	Naturalized
	Youngia japonica (L.) DC.	SAM	Herb	Medicinal	Naturalized
Brassicaceae	*Brassica campestris* L.	MDT	Herb	Food	Naturalized
	Brassica juncea (L.) Czern.	TWA	Herb	Food	Naturalized

FAMILY	NAME OF THE SPECIES	NATIVITY	LIFE FORM	USES	CATEGOR
Chenopodiaceae	*Chenopodium album* L.	EU	Herb	Food	Interfering
	Rorripa indica (L.) Hiern	TAM	Herb	Fodder	Naturalized
Caesalpinaceae	*Caesalpinia pulcherrima* (L.) Sw.	TAM	Tree	Ornamental	Naturalized
	Peltophorum pterocarpum (DC.) Heyne	TAM	Tree		Naturalized
	Senna alata (L.) Roxb.	SAM	Tree	Ornamental	Naturalized
	Senna siamea (Lam.) Irwin and Barneby	SETA	Shrub	ornamental	Naturalized
	Senna sophera (L.) Roxb.	TAM	Tree		Naturalized
	Senna tora (L.) Roxb.	SAM	Shrub	Ornamental	Noxious
				Medicinal	
				Fodder	
Caryophyllaceae	*Drymaria cordata* (L.) Willd. Ex Schult.	TAM	Herb	Medicinal	Naturalized

Commelinaceae	*Commelina benghalensis* L.	SETA	Herb	Food	Naturalize
Cleomaceae	*Cleome rutindospermum* DC.	TAM	Herb	Fodder	Naturalize
Convulvulaceae	*Evolvulus nummularius* (L.) L.	TAM	Herb	Fodder	Naturalize
	Ipomoea carnea Jacq.	TAM	Climber	Ornamental	Interfering
	Ipomoea hederifolia L.	TAM	Climber	Ornamental	Interfering
	Ipomoea quamoclit L.	TAM	Vine	Ornamental	Interfering
	Merremia vitifolia (Burm.f.) H f.	SETA	Vine	Fodder	Interfering
Cucurbitaceae	*Coccinia grandis* (L.) Voigt	TA	Climber	Food	Naturalize
	Luffa cylindrica (L.) M.Roem.	TA	Climber	Fodder	Naturalize
Cuscutaceae	*Cuscuta reflexa* Roxb.	MDT	Climber	Medicinal	Interfering
Cyperaceae	*Chloris barbata* Sw.	TAM	Grass	Fodder	Naturalize
	Cyperus cyperoides (L.) Kuntze	TAM	Grass	Fodder	Naturalize
	Cyperus iria L.	TAM	Grass	Fodder	Naturalize
	Cyperus rotundus L.	TAF	Grass	Fodder	Naturalize

Euphorbiaceae	*Croton bonplandianus* Baill.	SAM	Herb	Medicinal	Naturalized
		TAM	Herb	Fodder	Naturalized
	Euphorbia hirta L.	SAF	Shrub	Medicinal	Noxious
	Ricinus communis L.				
Fabaceae	*Ohwia caudata* (Thunb.) Ohashi	SETA	Herb	Medicinal	Naturalized
Lamiaceae	*Ocimum americana* L.	TAM	Herb	Medicinal	Naturalized

FAMILY	NA,E OF THE SPECIES	NATIVITY	LIFE FORM	USES	CATEGORY
Leguminosae	*Albizia lebbek* (L.) Benth.	TAM	Tree	Fuel wood	Naturalized
		TAM	Tree		Naturalized
	Albizia saman (J.) Merr.	TAM	Tree	Timber	Naturalized
		SAM	Shrub		Naturalized
	Leucaena leucocephala (Lam.) de Wit	BZ	Herb	Timber	Naturalized
	Mimosa invisa Colla			Agro forestry	
	Mimosa pudica L.			Medicinal	
Menispermaceae	Tinospora sinensis (Lour.) Merr.	SETA	Climber	Medicinal	Naturalized

Malvaceae	*Sida acuta* Burm.f.	TAM	Herb	Medicinal	Interfering
	Sida rhombifolia L.	TAF	Herb		Naturalized
	Urena lobata L.	TAM	Herb	Fodder	Naturalized
				Fodder	
Nyctaginaceae	*Boerhavia diffusa* L.	SAM	Herb	Fodder	Naturalized
	Bougainvillea glabra Choisy	TAM	Shrub		Naturalized
				Ornamental	
Oxalidaceae	*Oxalis corniculata* L.	EU	Herb	Food	Naturalized
Papilionaceae	*Crotalaria pallida Aiton*	SETA	Herb	Ornamental	Naturalized
Passifloraceae	*Passiflora foetida* L.	TAM	Climber	Medicinal	Interfering
Poaceae	*Arundo donax* L.	EU	Grass	Fencing	Naturalized
	Axonopus compressus (Sw.) P.Beauv.	TAM	Grass		Naturalized
		SETA	Grass	Fodder	Naturalized
	Bambusa bambos (L.) Voss	SETA	Grass		Naturalized
		TAF	Grass	Construction	Naturalized
	Chrysopogon aciculatus (Retz.) Trin.	TAM	Grass	Ornamental	Interfering
		SETA	Grass		Naturalized
	Cyanodon dactylon (L.) Pers	TAF	Grass	Fodder	Naturalized
		SETA	Grass		Naturalized
	Echinochloa colona	TAF		Fodde	

	(L.) Link	r
	Imperata cylindrica (L.) Raesch.	Fodde r
	Oplismenus burmanni (Ret.) Beauv.	Fodde r
	Pennisetum pedicellatum Trin.	Fodde r

FAMILY	NAME OF THE SPECIES	NATIVITY	LIFE FORM	USES	CATEGOR
Portulacaceae	*Portulaca quadrifida* L.	TAM	Herb	Ornamental	Naturalize
Rubiaceae	*Oldenlandia corymbosa* L.	TAM	Herb	Fodder	Naturalize
Scrophulariaceae	*Scoparia dulcis* L.	TAM	Herb	Medicinal	Naturalize
Solanaceae	*Datura metel* L.	TAM	Shrub	Medicinal	Interfering
	Nicotiana plumbaginifolia Viv.	TAM	Herb	Smoking	Naturalize
	Physalis minima L.	TAM	Herb	Medicinal	Naturalize
	Solanum nigrum Sw.	TAM	Herb	Food	Naturalize
	Solanum torvum Sw.	WI	Shrub	Medicinal	Naturalize
	Solanum viarum Dunal	TAM	Herb	Not known	Naturalize
Tiliaceae	*Corchorus olitorius* L.	TAF	Shrub	Food	Naturalize
	Triumfetta rhomboidea Jacq.	TAM	Shrub	Medicinal	Naturalize

Urticaceae	*Pilea microphylla* (L.) Liebm.	SAM	Herb	Medicinal	Naturalize
	Pouzolzia zeylanica (L.) B. & B.	SETA	Herb	Medicinal	Naturalize
Verbenaceae	*Clerodendrum infortunatum* L.	SETA	Shrub	Medicinal	Naturalize
	Holmoskioldea sanguinea Retz.	SETA	Tree	Ornamental	Naturalize
	Lantana camara L.	TAM	Shrub	Medicinal	Noxious
	Stachytarpheta jamaicencis(L.)Vahl	TAF	Herb	Ornamental	Naturalize

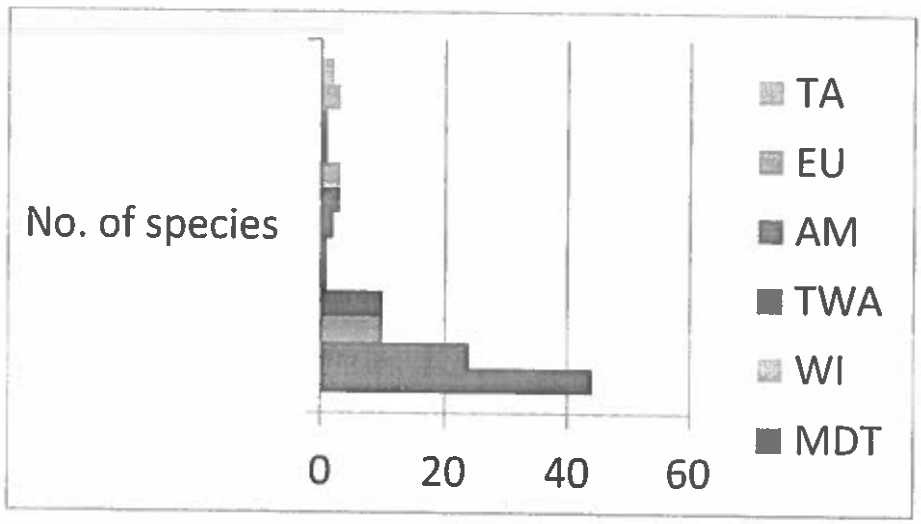


Figure 1. No. of alien species with reference to their nativity

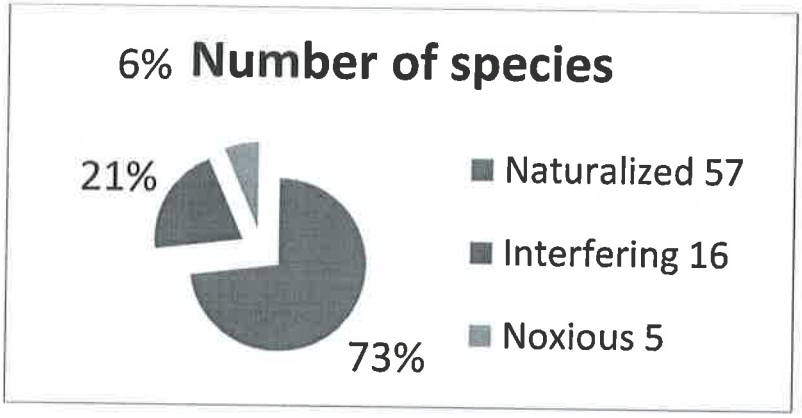


Figure 2. Status of invasive alien plant species in Nilachal hill

CONCLUSION

The invasive alien species can rapidly adapt to a wide range of environmental condition which may assist their dispersal to a far distance from their place of origin. Some herbaceous and shrubby alien plants like *Lantana camara, Ageratum conyzoides, Partheniun hysterophorous, and Senna tora* possess high allelopathic potential[6]. Their invasion and rapid propagation has triggered ecological imbalance within the native floristic composition. Differences between native and exotic plant species in their requirements and modes of resource acquisition and consumption may cause a change in soil structure, its profile, decomposition, nutrient content of soil, moisture availability, etc. Invasive species are thus a serious hindrance to conservation and sustainable use of biodiversity. For effective management of invasive species, knowledge about their ecology, morphology, phenology, reproductive biology, physiology and phytochemistry is essential[7]. Monitoring of invasion can be done through qualitative approach like species inventory (seasonally) and quantitative approach using phytosociological methods and mapping using ground based methods (via map overlays or GPS), remotely-sensed images. Therefore, early detection and reporting of noxious and naturalized weeds is required in order to control the spread of invasive plant species.

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A Study on Landuse/Land Cover change Detection and its Impacts on the Soil Quality of Nilachal (Kamakhya) Hills, Guwahati, Assam

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A Study on Landuse/Land Cover change Detection and its Impacts on the Soil Quality of Nilachal (Kamakhya) Hills, Guwahati, Assam

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Abstract: *The landuse/landcover (LULC) pattern of a region is an outcome of natural and socio-economic factor and their utilization by man in time and space. Remote sensing has become an important tool for identification and mapping of the global bio-geophysical process affecting the earth. Nilachal Hills located in the middle of Guwahati city of Assam, India is a famous holy place and a site of natural heritage. The study aims at detecting the LULC changes between 2000 to 2015 using Landsat image and understanding the impacts of LULC change on soil quality and also to study the environmental awareness of the inhabitants of the area. LULC map of the study area is prepared by visual image interpretation techniques. The study area has witnessed a decline of in forest cover from 202.38 ha in 2000 to 195.55 ha in 2006, 181.73 ha in 2011 & 153.09 ha 2015. Most prominent changes have been observed in the built up area from 29.93% to 32.30%, 37.08%, & 47% in 2000, 2006, 2011 & 2015 respectively. This study evaluated the influence of LULC in physico-chemical properties of soil which is critical for the unique ecology of Nilachal Hill. In order to reduce the impact of the excessive pressure on the natural ecosystem of the hill proper environmental management plan is suggested such as restoration of the forest cover of the area and checking on deforestation, building a township in the near vicinity of the area for temporary rehabilitation of devotees during Ambubachi Mela.*

Keywords: Nilachal Hills, LULC change detection, forest, soil quality, environment management plan

1. Introduction

Man's presence on the Earth and his use of land has a profound effect upon natural environment resulting in observable pattern of landuse/landcover change (LULCC) over time. Land, an area on the Earth's surface, is an important resource [1]. The landuse/landcover pattern of a region is an outcome of natural and socio-economic factors and their utilization by man in time and space. Land is becoming a scarce resource due to immense demographic pressure [2]. Demographic pressure and competition for land induces structural changes in modern societies and have modified not only the rural/urban equilibrium, but also the existing landuse pattern. Due to urbanization and industrialization, ever increasing amounts of arable and forest lands in and around sub-urban areas are being transformed into building plots, industrial zones, infrastructure projects and recreational values [3].

Landcover information is required for various policy, scientific, management purpose, forest inventories [4], planning as well as other biophysical resource inventories [5], modeling of vegetation-atmosphere interactions [6] and hydrological models [7]. Conventional methods of mapping stand alone and had several limitations, to name a few they are not spatially explicit, time consuming and involves lots of difficulty in revising those observations. But satellite remote sensing technology has overcome these hurdles and it is considered one of the potential complimentary tools for conventional ground assessment. Remote sensing derives synoptic and periodic information of the Earth's surface. The temporal revisits of the satellites have made it possible to assess and analyze changed scenario with better accuracy and precision [8]. Remote sensed imagery provides accurate understanding and comprehensive way of modeling and projecting land change [9]. Landcover mapping is a product of the development of remote sensing [10].

The conversion of natural forest to other forms of landuse can provoke soil erosion and leads to reduction in soil organic content, loss of soil quality and modification of soil structure [11] [12]. Soil is a complex system in which physical, chemical and biological factors occur in dynamic equilibrium [13]. It sustains the forest and provides raw materials for its life by recycling fallen leaves, woody debris and dead animals [14].

Guwahati, the gateway to North-East India and centre of attraction is characterized by a phenomenal change in urbanization in the last few years. The population of Guwahati has increased from 809,895 in 2001 to 963,429 in 2011 with an increase in population density from 3736 persons per sq. km. to 4445 persons per sq. km. respectively (Census of India, 2011). The rapid rate of urbanization has its effect on the vegetation cover and thus to the atmosphere in the city [15]. Nilachal Hills is a natural heritage of Guwahati city has a unique ecology with the temple at the top of the hill and covered by dense vegetation. It is of great historical and mythological interest and *Ambubachi mela* is an important festival of the country. It has also witnessed rapid development during the past years in terms of urbanization and substantially increasing population. Thus, a study on the hills has been taken up with the following objectives: (i) to detect change in the landuse/landcover pattern of the area within the Guwahati metropolitan region. (ii) to analyze the growing human impacts on its environment through soil analysis in those area where changes have taken place. (iii) to examine the status of environmental awareness among the inhabitants of the hills and the quality of their habitat.

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2. Study Area

Nilachal Hill located in the middle of Guwahati city between 91.689° E & 26.167° N to 91.718°E & 26.167°N at an altitude of 293 m from the mean sea level covers an area of 288.83 ha i.e. 2.88 sq km. It is a legendary holy place for devotees of Goddess Kamakhya, hence, also known as Kamakhya Hill and a natural heritage site of great eminence. It is thronged by lakhs of devotees from all over the country during Ambubachi Mela which takes place in mid June every year.

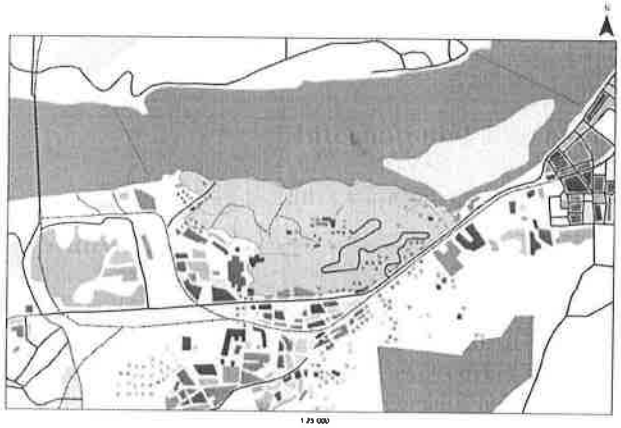


Figure 1: Base map of the study area

3. Methodology

The study is carried out using remote sensing and GIS techniques as well as conventional field survey. In the present study satellite data of Landsat 7 and Landsat ETM+ data of 2000, 2006, 2011 & 2015 were used to understand the dynamics of landuse/landcover change. Cloud free images between the month of October and November were selected for the study since trees of the study area are known be in full foliage in this season. Visual image interpretation of a satellite is a complex process. It includes the meaning of the image content; it requires the analyst's knowledge of the study area and spectral response. The boundary of the study area was obtained from Survey of India topographic map of 1:50,000 scale and the same was digitized and stored in GIS database. The LULC layer of the year 2000, 2006, 2011 & 2015 were prepared visually based on tone, texture, shape, size, pattern, site and association. Landuse/landcover of the area has classified into two broad classes forest land built up land [16]. The forest class was further divided into closed forest, open forest and scrub forest.

In this phase of the study, to observe the growing human impact on the physico-chemical properties of soil, four different locations within the study area were identified and composite soil samples for each sampling site from a depth of 20 cm is collected on March 2013. Soil parameters such as temperature, moisture, bulk density, water holding capacity, pH, conductivity, chloride, sulphate, nitrate, and phosphate were analyzed. The preparation and analysis of the soil samples were carried out following standard methods [17]. Further a socio-economic survey was carried out from 40 out of 4000 households following systematic sampling technique based on questionnaire especially designed for the study.

4. Results & Discussions

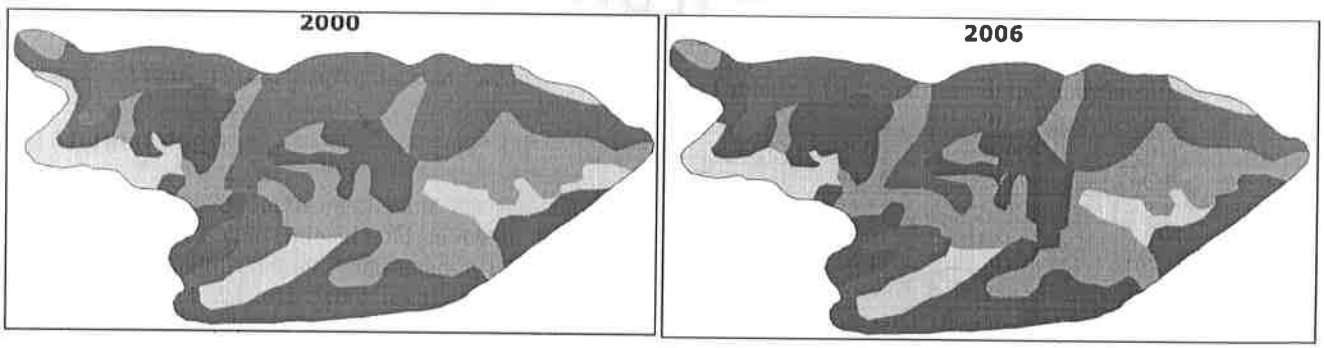
Temporal datasets used in the present study yielded the following comparison with respect to landuse/landcover change shown in Table1.

Table 1: LULC Statistics of the study area from 2000 to 2015

LULCC	2000	2006	2011	2013
CF	90.56	84.09	66.37	48.44
OF	75.81	79.78	42.43	37.07
SF	36.01	31.68	72.93	67.58
BL	86.45	93.28	107.10	135.74
TOTAL	288.83	288.83	288.83	288.83

CF = *Closed Forest* **OF** = *Open Forest* **SF** = *Scrub Forest*
BL = *Built up*

From the analysis it has been observed that there is considerable reduction of forest area from 202.38 ha in 2000 to 195.55 ha, 181.73 ha & 153.09 ha in 2006, 2011 & 2015 respectively.



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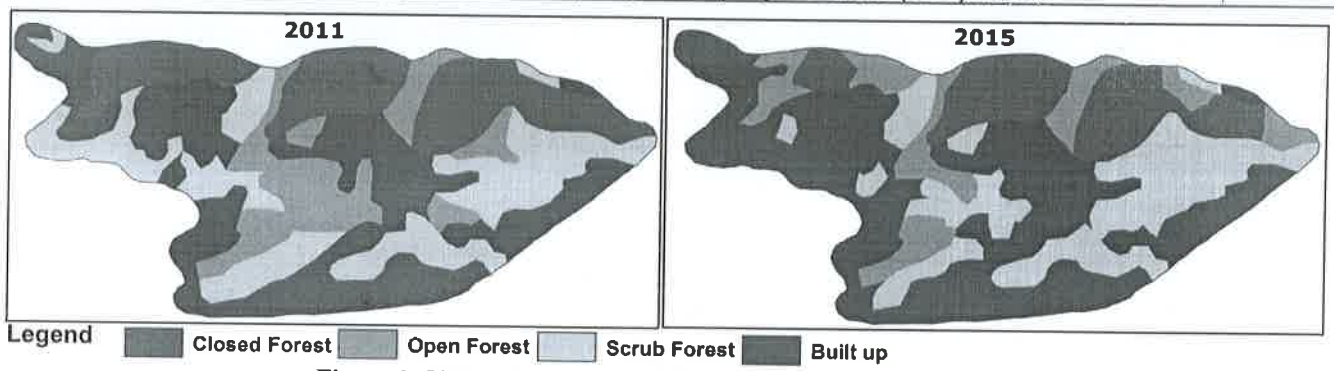

Figure 3: LULC change maps of the study area from 2000 – 2015

Most prominent changes of LULC have been observed in the built up area from 29.93% to 32.30%, 37.08%, & 47% in 2000, 2006, 2011 & 2015 respectively. Simultaneously, area of scrub forest has increased from 12.47% in 2000 to 23.40% in 2015. It has also been observed that closed forest has declined from 31.35% in 2000 to 16.77% in 2015. It was 29.11% in 2006 and 22.98% in 2011. But open forest increased from 26.25% in 2000 to 27.62% in 2006 declining gradually from 14.69% to 12.83% between 2011 and 2015 respectively and the gradual conversion of scrub forest to settlement.

Table 2: Analysis of physico-chemical characteristics of soil in the study area

Sample Code	Sampling Location	Temperature (°C)	Moisture (%)	Bulk Density (g/cm3)	WHC (%)	p^H	Conductivity (µS/cm)	Cl^- (mg/l)	SO_4^- (mg/l)	NO_3^- (mg/l)	PO_4^{3-} (mg/l)
S1	CF	2.4	33	1.33	41	6.32	2.103	106.58	38	1.08	11.23
S2	OF	2.5	24	1.3	38	6.79	2.19	117.62	42	1.26	20.19
S3	SF	2.7	13	1.11	33	7.01	2.291	121.46	49	0.98	47.18
S4	BL	3.4	3	1.26	29	8.04	2.309	181.23	58	2.18	51.06

Temperature of soil greatly affects the physical, biological and chemical processes occurring in soils. It regenerates absorption and transport of water and nutrients in higher plants [18]. Maximum value of soil temperature recorded was 3.4°C in S4 and minimum 2.4°C at S1. Mobility of soil depends on moisture content, soil become mobile and prone to erosion when moisture content is low. Soil moisture values ranges from 3% to 33% and it is evident from the result that closed forest (S1) retain the highest soil moisture and built up (S4) the least i.e. 3%. Bulk density of soil is indicative to the compactness of soil and it's defined as mass per unit volume which includes pore space occupied by solids [19]. Maximum bulk density 1.33 g/cm3 was found in S1 and minimum 1.11 g/cm3 at S3 which implies that scrub forest area has less organic content as compared to closed forest and built up area (S4) has bulk density of 1.26 g/cm3 which indicates that there may be addition of organic matter by human activity. Highest value to water holding capacity (WHC) 41% was found in soil sample of closed forest (S1) and lowest 29% in built up area sample (S4). Good WHC shows good physical condition of soil [20]. pH of soil is one of the most important physico-chemical parameter which affects mineral nutrient, soil quality and micro-organism activity [21]. It was observed to range from 6.32 to 8.05. S1 was found to be acidic i.e. 6.32 which go with acidic trend of the soil of Assam but S3 and S4 were found to be basic which implies presence of metal ions in the soil. The measurement of electrical conductivity is to measure the current that gives a clear idea of soluble salt present in the soil. Conductivity value ranges from 2.103 µS/cm to 2.306 µS/cm. Conductivity of S1 is less i.e. 2.103 µS/cm as compared to S2, S3 and highest at S4 i.e. 2.309 µS/cm which implies human impact on soil quality. Though soil testing for chloride (Cl^-) is not a common practice and little data exists for interpretation of test results. Man and other animal excreta accounts for higher quantities of Cl^- together with other nitrogenous compounds. Cl^- has been found to be highest in S4 i.e. 181.23 mg/l and lowest at S1 106.58 mg/l. Significant factors influence sulphate (SO_4^-) amounts in soil like precipitation [22], soil depth [23], composition of surface humus layer [24], atmospheric sulphur deposition [25], altitude [26] and physical and chemical properties of forest soil. The variability of SO_4^- was found lowest 38 mg/l in S1 and highest 58 mg/l in S4. The concentration of nitrate varies from 0.98 mg/l to 2.18 mg/l. it is well established that higher nitrate concentration gives lower p^H value which is due to effect of nitrification of NO_3^-. Phosphate comes from weathering of rocks and is responsible for eutrophication. Domestic waste and synthetic fertilizers are the major sources of nitrate and phosphate in soil [27]. Maximum concentration of nitrate and phosphate was obtained in S4 which is indicative of human activity and lowest in S1.

The outcome of the socio-economic survey is that, of the 40 houses survey, 27 households were found to be living in a joint family system while 3 households had a nuclear family. Majority of the houses had an RCC (33) structure while only 7 houses were of Assam type (slanting roofs). Maximum households i.e. 34 were directly dependent on the temple for their means of livelihood. The households presented a mixed literacy with members of 17 houses having low literacy (under HSLC) while 19 medium (under graduate) literacy and only 4 houses with higher (graduation & above) literacy. During the *Ambubachi mela*, 28 houses arrange accommodation for the pilgrims in their houses. Overall the waste disposal system practiced by the houses i.e. 29 was

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unscientific as they simply dump the litter in their backyard. Only 11 houses buried the waste in a landfill. Majority of the houses faced inconvenience in their daily living due to influx of pilgrims during the *mela*. It hampers their day to day activities during the period.

Change analysis of landuse/landcover of the study area derived from Landsat imagery has highlighted pattern of changes during the study period. The analysis has revealed that maximum changes have occurred between periods of 2011 to 2015. Landuse activities are more towards sprawling of built up area at the foothills and it has also expanded centrifugally from the temple complex at the cost of forest cover. It was also observed that physico-chemical properties of soil are in their natural state in the forested areas. Conversion of forest land to other landuse basically built up has a profound impact on soil characteristics. Besides, the inhabitants of the hill are not aware of the degrading environmental condition of their habitat.

5. Conclusion

Change analysis of landuse/landcover of the study area derived from Landsat imagery has highlighted pattern of changes during the study period. The analysis has revealed that maximum changes have occurred between periods of 2011 to 2015. Landuse activities are more towards sprawling of built up area at the foothills and it has also expanded centrifugally from the temple complex at the cost of forest cover. It was also observed that physico-chemical properties of soil are in their natural state in the forested areas. Conversion of forest land to other landuse basically built up has a profound impact on soil characteristics. Besides, the inhabitants of the hill are not aware of the degrading environmental condition of their habitat. Thus, a proper environmental management plan should be made for maintenance of the natural ecosystem and to reduce the impact of sudden influx of pilgrims during the mela in the study area. A township should be built in the near vicinity of the study area for temporary rehabilitation of the pilgrims and to utilize it as a destination point for outstation devotees visiting the temple round the year and a plan for eco-housing complex should be undertaken. Proper waste disposal system and recycling of waste methods should be implemented. Landcover is a critical variable linking human and his environment intimately and calling one another for integrated planning and sustainable development.

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Potable Water Quality Analysis of Various Sources Available at Nilachal Hills (Kamakhya Hill), Guwahati, Assam, India

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Potable Water Quality Analysis of Various Sources Available at Nilachal Hills (Kamakhya Hill), Guwahati, Assam, India

ANNEXURE - E6

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Abstract: ***Kamakhya temple situated atop Nilachal Hills in Guwahati, Assam is a famous pilgrimage and one of the shakti peeths in India. Several festivals are celebrated in the temple of which Amubachi mela is the prominent one. Lakhs of devotees throng the temple to have a glimpse to the deity during the mela. Devotees, saints, priests, tourists etc. who visit the temple, during the mela and round the year, and the inhabitants of the hills, use different sources of water available in the hill for drinking. Water is nature's elixir and even more than a nutrient, a cleanser in human body. Thus, pure drinking water is an essential commodity for healthy living. This paper attempts to bring the significant quality of potable water at various sources in Nilachal Hill before the mela. Physico-chemical parameter of any water body plays an important role in maintaining fragile ecosystem that maintains various life forms. Present research deals with various parameters such as temperature, pH, electrical conductivity, total hardness, dissolved oxygen, iron, chloride, fluoride, sulphate, and phosphate. The results were compared with World Health Organization (WHO) and Bureau of Indian Standards (BIS) for drinking water.***

Keywords: Potable water quality, Nilachal Hills, WHO, BIS, ecosystem

1. Introduction

Water is the elixir of life and one of the most indispensable resources. It is vital to the existence of living organisms but the valued resource is increasingly being threatened with the growing human population which demands water for domestic purposes and economic activities [1]. Increased population and associated pressure on resources has led to over-exploitation of water resources and water scarcity, which have become a nightmare to a huge section of population all over the globe, more specially in the developing countries[2]. Water quality is considered the main factor controlling health and the state of disease in both man and animals. Surface water quality in a region is largely determined both by natural processes (weathering and soil erosion) and by anthropogenic inputs (municipal and industrial wastewater discharge). The anthropogenic discharges constitute a constant polluting source, whereas surface runoff is a seasonal phenomenon, largely affected by climate within the basin [3] [4]. Human activities are a major factor determining the quality of the surface and groundwater through atmospheric pollution, effluent discharges, use of agricultural chemicals, eroded soils and land use. Environmental pollution, mainly of water sources, has become public interest [5]. As reported by [6], [7] and [8], the all-India scenario of drinking water supply continues to be deficient. World Health Organization (WHO) and UNICEF's Joint Monitoring Programme (JMP) for Water Supply and Sanitation (2011) states that 92 per cent of the total population of India had access to improved source of water (96%-urban/89%-rural). But the water supply systems in most cities of India are poorly operated with weak infrastructure and poor resource management. Due to unreliable nature of public water supply in most cities people have to depend either on their own sources or on some commercial agencies or on water vendors. In this regard Guwahati city is no exception. Thus a humble task has been carried out to study the quality of potable water at various available sources in the Nilachal Hills situated in Guwahati city.

2. Study Area

Nilachal Hills located between 91.689° E & 26.167° N to 91.718° E & 26.167° N and 293 meters above mean sea level in metropolis Guwahati, the gateway of Northeast India, is famous for the temple of Goddess Kamakhya. The temple is a springboard and centerpiece of *Shakti* worship in India. The temple is closely related to the history of Assam and has also found mention in *Devi Bhagavata. Devi Purana, Kalika Purana, Yogini Tantra, Hevajra Tantra, Chudamoni Tantra* etc. The *Ambubachi mela* is the most important and prominent festival of the temple. It is celebrated annually during the monsoon season, which happens to fall around the middle of the month of June. Several lakhs devotees throng the shrine from across the country including foreigners during the *mela*. The study area experiences mild subtropical climate with average rainfall at of 2272.37 mm, about 90 per cent of it occurs between May and September and maximum and minimum temperature variation between 31°C and 12°C [9]. Geology of the study area consists of gneiss and granite bodies intruded by quartz and quartz-feldsphetic veins, aplite and pegmite [10]. Soils on the hill slope is a product of physical and chemical weathering process on the parent rock viz., granite, gneiss and polymorphic granite [11]. Devotees who visit and stay in the temple complex during the *mela* and round the year and also the inhabitants of the hills use water from various sources such as river water, supply water, water filters installed in the temple complex, *Subhagya kund* (pond), *Kasopukhuri* (pond), well water for drinking and cooking purpose.

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3. Materials and Methods

In the study water samples were collected from 6 different sources of potable water. Water samples were collected in PET bottles of half litre size and closed tightly. The physico-chemical parameters analyzed in the study are temperature, pH, electrical conductivity, total hardness, dissolved oxygen, iron, chloride, fluoride, sulphate, and phosphate Temperature of the water samples was noted on the spot with a mercury thermometer. pH and electrical conductivity was determined in the laboratory immediately after sampling. The samples were analyzed as per standard procedure. Total hardness was determined by EDTA method and dissolved oxygen was measured by Winkler's method. Iron was estimated by using Phenanthroline Method at 510 nm. Chloride was determined by Argentimetric method. Fluoride was measured by the SPADNS method at 570nm. Turbidimetric method was used for Sulphate. Phosphate was determined by Molybdenum blue method. The instruments were used in the limit of précised accuracy and chemicals used were of analytical grade. Double-distilled water was used for all purposes [12].

Table 1: Showing sample location and code

Sampling Location	Sample Code
River water	PW1
Supply water	PW2
Inside temple complex	PW3
Kasopukhuri	PW4
Subhagya Kund	PW5
Well water	PW6

4. Results and Discussion

The results of the physico-chemical analysis of water samples are shown in Table 2 & Table 3

Table 1: Showing physical & biological parameters of potable water

Sample Code	Temp	pH	EC	DO	TH
PW1	25.3	6.76	1.5	23.2	111.33
PW2	24.5	6.98	0.61	22	117.33
PW3	24.5	6.89	0.89	19.2	84
PW4	27.4	6.73	1.73	6.8	123.33
PW5	25.4	6.79	1.86	8.14	186
PW6	24.4	6.95	1.34	20	83.33

Temp – temperature, EC – electrical conductivity, DO – dissolved oxygen, TH – total hardness

The pH value of drinking water is an important index of acidity or alkalinity. A number of minerals and organic matter interact with one another to give the resultant pH value of the sample [13]. In the present study, pH ranges from 6.73-6.95, which lies in the range prescribed by WHO. The Dissolved oxygen in the water samples ranges from 6.8-23.2 mg/L, which is higher than the permissible limit of 8 mg/L for good quality drinking water except PW4 which has a DO value of 6.8mg/L. The aquatic life is held responsible for lowering the value of dissolved oxygen. The ISI suggest that dissolved oxygen should be between 4-6 mg/L. The higher value of dissolved oxygen can impart good aesthetic taste to drinking water [14]. The total hardness ranges between 84 -186 mg/L, while WHO, 2011 and BIS, 2012 permit any value less than 300mg/L and 200 mg/L respectively. In all samples total hardness is within the acceptable limit.

Table 2: Showing chemical parameters of potable water

Sample Code	F^-	Cl^-	SO_4^{2-}	PO_4^{3-}	Fe
PW1	0.16	16.47	24.12	0.25	0.50
PW2	0.33	15.05	22.60	0.14	0.32
PW3	0.37	16.47	19.81	0.15	0.31
PW4	0.50	80.37	20.77	0.30	1.01
PW5	0.07	93.15	28.58	0.20	0.33
PW6	0.20	38.76	84.93	0.20	0.30

Permissible limit of fluoride in drinking water as prescribed by WHO, 2011 is 1.5 mg/L whereas the same has been prescribed by BIS, 2012 at 0.3 mg/L. Fluoride value in the study area ranges from 0.07 – 0.5 mg/L which is within the permissible limit of WHO, 2011 but as per BIS, 2012 fluoride value exceeds the permissible limit in PW2, PW3 and PW4. Fluoride concentration in drinking water produces divergent health effects on the consumer such as bone disease, children may get mottled teeth depending upon their relative proportions [15]. Chloride ranges from 15.05 – 93.15 mg/L which is within the BIS, 2012 guideline value of 250 mg/L. It is the most dominant anion in water [16]. Sulphate ion is estimated to vary from 19.81 - 84.93 mg/L. The maximum tolerance range for sulphate is 200 mg/L (BIS). The excess amount of sulphate causes diarrhea and other gastro intestinal irritation. All samples are free from sulphate problems. Sulphate produces an objectionable taste at 300 - 400 mg/L and bitter taste at 500 mg/L [19]. Phosphates are not toxic to people or animals unless they are present in very high levels. Digestive problem could occur from extremely high level of phosphate. Phosphate will stimulate the growth of plankton and aquatic plants which provide food for fish. When excess of phosphate enters the water way, algal and aquatic plants will grow wildly, choke up water ways and use large amounts of oxygen. This condition is known as eutrophication [20]. In this study phosphate ranges from 0.14 – 0.30 mg/L. Iron in the water samples ranges from 0.30 – 1.01 mg/L which is higher than the permissible limit of 0.3 mg/L as per WHO and BIS, except for PW6. Five out of six sampling locations are contaminated by iron. Piped water supply susceptible to internal corrosion and leaching of iron into water as well as forming iron scales that may produce particulate iron compound in water rendering "red water" that adversely affects the water quality [22]. Iron contamination affects taste and appearance. It has an adverse effect on domestic uses and water supply structures and promotes iron bacteria.

5. Conclusion

People use water for drinking mostly from the six sources mentioned above. As a result, scarcity as well as chemical contamination of water affects a large number of people. Keeping in view the importance of the place and large influx of devotees during the *mela*, it is concluded that regular monitoring of water sources should be ensured by the concerned authorities to prevent the outbreak of water borne diseases in the area. Based on the study, it is concluded that the intrinsic drinking water quality in the area is not

encouraging. Thus, suitable protective measure for drinking water sources in the area is recommended.

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Annexure – 'F'
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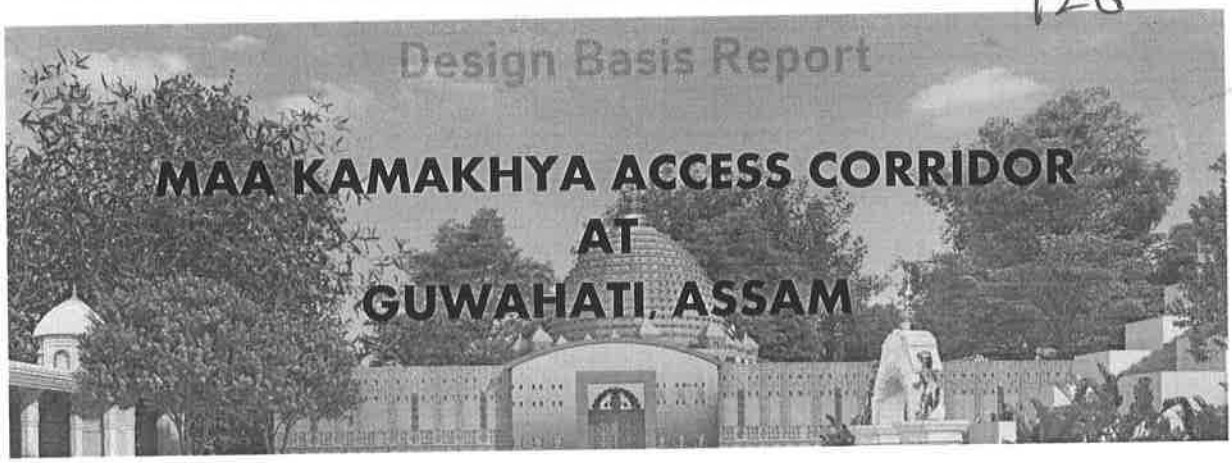

ARCHITECTURAL DBR

1. INTRODUCTION

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1.1 BACKGROUND

- Maa Kamakhya or Kameshwari is the renowned Goddess of Desire whose famous shrine is located in the heart of Nilachala Hill situated in the western part of Guwahati, the capital city of the state of Assam in North East India. Maa Kamakhya Devalaya is considered the most sacred and oldest of the 51 Shakti Peethas on earth. It is the centrepiece of widely practiced, powerful Tantrik Shaktism cult in India.
- The temple is the center of the Kulachara Tantra Marga and the site of the Ambubachi Mela, an annual festival that celebrates the menstruation of the goddess. Structurally, the temple is dated to the 8th-9th century with many subsequent rebuilding—and the final hybrid architecture defines a local style called **Nilachal**. An obscure place of worship for much of history it became an important pilgrimage destination, especially for those from Bengal, in the 19th century during colonial rule.
- Originally an autochthonous place of worship of a local goddess where the primary worship of the aniconic yoni set in natural stone continues till today, the Kamakya Temple became identified with the state power when the Mlecchadynasty of Kamarupa patronised it first, followed by the Palas, the Koch, and the Ahoms. The Kalika Purana, written during the Pala rule, connected Naraka, the legitimizing progenitor of the Kamarupa kings, with the goddess Kamakhya representing the region and the Kamarupa kingdom.
- Apart from the main temple of Maa Kamakhya, there are temples of the Dasamahavidya (ten incarnations of the deity) namely Kamakhya (i.e., Tripura Sundari, along with Matangi and Kamala), Kali, Tara, Bhuvaneshvari, Bagalamukhi, Chinnamasta, Bhairavi, Dhumavati, and five temples of Lord Shiva namely Kameshwara, Siddheswara, Kedareshwara, Amratokeshwara, Aghora and Kautilinga around the Nilachala Hill which is also called as Kamakhya Temple Complex.
- It has been suggested that historically the worship progressed in three phases - yoni under the Mlechhas, yogini under the Palas and the Mahavidyas under the Kochs.

1.2 AIMS, OBJECTIVES AND NEED OF THE PROJECT

- The Government of Assam has aimed to develop Maa Kamakhya Temple Access Corridor. Over the period, the number of Devotees have increased manifold and post-independence no work as such has ever been undertaken on large scale to upgrade the facilities. The facilities as proposed will provide easy access, public amenities to pilgrims visiting the Temple Complex. For the convenience of senior citizens and physically disabled people, lift and escalators are being provided as per harmonized guidelines of MOHUA. In long run, it will provide the devotees convenient way to worship Goddess.
- During restoration and upgradation of facilities around Temple, it will be ensured that the beauty of the temple is preserved. No tempering will be done with the architecture of the temple. The corridor will be constructed by keeping the ancient sculptures undisturbed.
- Assam being the largest state in the North Eastern Region (NER), the Government of Assam is in a mission to transform the life and livelihood of population of North East , which will help in overall growth of development trajectory of Assam. The same is also in line with Ministry of Social
- Justice and Empowerment mandate which has sought access audit of Kamakhya temple to make it Barrier Free for all persons with disability (copy enclosed) .The implementation of this project will not

only generate direct and indirect employment opportunities but in long run will give impetus to sustainable growth through religious tourism.

- The construction of this facility is planned to be executed under PM-DevINE Scheme.
- The Kamakhya Temple, located in Guwahati, Assam, India, is a revered Hindu shrine dedicated to the goddess Kamakhya, who is considered to be a form of the mother goddess Shakti. The temple attracts a large number of pilgrims and tourists every year, making it one of the busiest pilgrimage sites in India. Despite its popularity, the temple has limited access, which poses a major challenge to the smooth flow of visitors. This is why there is a growing need for an access corridor at Kamakhya Temple.
- An access corridor would provide a dedicated path for visitors to move freely in and around the temple without facing any hindrances. The existing pathway is often congested, making it difficult for devotees to move from one area of the temple to another. In addition, the narrow paths are not disabled-friendly, making it difficult for elderly and physically challenged people to access different parts of the temple.
- The existing limited access makes it difficult for security personnel to keep a watchful eye on visitors, increasing the risk of theft, pickpocketing, and other security threats. An access corridor would provide a better view of the surroundings, making it easier for security personnel to monitor visitors and ensure their safety.

1.3 ABOUT GUWAHATI

- Guwahati formerly rendered Gauhati, is the biggest city of the Indian state of Assam and also the largest metropolis in northeastern India. Dispur, the capital of Assam, is in the circuit city region located within Guwahati and is the seat of the Government of Assam. A major riverine port city along with hills, and one of the fastest growing cities in India, Guwahati is situated on the south bank of the Brahmaputra. It is called the "Gateway to North East India".
- Guwahati lies between the banks of the Brahmaputra River and the foothills of the Shillong plateau, with LGB International Airport to the west and the town of Narengi to the east. The North Guwahati area, to the northern bank of the Brahmaputra, is being gradually incorporated into the city limits. The noted Madan Kamdev is situated 30 kilometres (19 miles) from Guwahati. The Guwahati Municipal Corporation, the city's local government, administers an area of 216 square kilometres (83 sq mi), while the Guwahati Metropolitan Development Authority (GMDA) is the planning and development body of Greater Guwahati Metropolitan Area. Guwahati is the largest city in Northeast India.

2. HISTORY

- Epigraphic sources place the capital of Kamarupa kingdom in Guwahati. The 10th-12th century Kalika Purana mention that Kamrup was inhabited by Kiratas. As per legends, the tank Dighalipukhuri located in the heart of the city was dug by King Bhagadatta of Kamrup on the occasion of the wedding of his daughter Bhanumati with Duryodhan. Located within Guwahati is the Shakti temple of Goddess Kamakhya in Nilachal hill (an important seat of Tantric and Vajrayana Buddhism), the ancient and unique astrological temple Navagraha in Chitrachal Hill, and archaeological remains in Basistha and other archaeological locations of mythological importance.

- The Ambari excavations trace the time period of the city of Guwahati between the 2nd century BCE and the 1st century CE, in the Shunga-Kushana period of Indian history. Descriptions by Xuanzang (Hiuen Tsang) reveal that during the reign of the Varman king Bhaskaravarman (7th century CE), the city stretched for about 30 li (15 km or 9.3 mi). Archaeological evidence by excavations in Ambari, and excavated brick walls and houses discovered during construction of the present Cotton College's auditorium suggest the city was of economic and strategic importance until the 9th–11th century CE.

3. ART & CULTURE

3.1 ART

- The archaic Mauryan stupas discovered in and around Goalpara district are believed to be the earliest examples (c. 300B.C. to c. 100A.D.) of ancient art and architectural works. The monumental architectural remains discovered in Doporboteeya (Daparvatiya) archaeological site along with a beautiful doorframe in Tezpur are identified as the best examples of art works in ancient Assam with influence of Sarnath School of Art of the late Gupta period. Gupta influence was prominent due to intense interaction of the then Kamarupa with the kingdom of Magadha. Many other sites also exhibit development of local art forms with local motifs and sometimes with similarities with those in the Southeast Asia. There are currently more than forty discovered ancient archaeological sites across Assam with numerous sculptural and architectural remains. Moreover, there are examples of several Late-Middle Age art and architectural works including hundreds of sculptures and motifs along with many remaining temples, palaces and other buildings. The motifs available on the walls of the buildings such as Rang Ghar, Joydoul, etc. are remarkable examples of art works.
- The people of Assam have traditionally been craftsmen from time immemorial. Though Assam is mostly known for its exquisite silks and the bamboo and cane products, several other crafts are also made here. Different regions of Assam are known for their different forms of art and handicrafts.

3.2 CULTURE

- Assam is the meeting ground of diverse cultures. The people of the enchanting state of Assam are an intermixture of various racial stocks such as Mongoloid, Indo-Burmese, Indo-Iranian and Aryan. The Assamese culture is a rich and exotic tapestry of all these races evolved through a long assimilative process. The natives of the state of Assam are known as "Asomiya" (Assamese), which is also the state language of Assam. The state has a large number of tribes, each unique in its tradition, culture, dress and exotic way of life.
- Diverse tribes like Bodo, Kachari, Karbi, Miri, Mishimi, Rabha, etc co-exist in Assam; most tribes have their own languages though Assamese is the principal language of the state.
- **People** - Most commonly found tribe in Guwahati is the Mongolian tribe. Also, one can see intermingling of different tribes like Indo-Burmese, Mongolian, Aryan and Indo-Iranian. The people of Guwahati are quite simple and humble behavior having great feeling of hospitability. The trip to Guwahati becomes unforgettable because of the polite and courteousness of the local people.
- **Language and religion** - The main language spoken in Guwahati is Assamese or Asomiya though Hindi and English is also spoken but very rarely found. Other most common languages are Bodo, Rabha, Karbi, Dimaca, Mishing, etc. and all of these are regional languages. People of Guwahati follows

different types of religions like Buddhism, Sikhism, Jainism, Christianity, Muslims but the majority of the people of Guwahati follows Hinduism.

- **Food** - Rice is the main part of food in Guwahati and a diet is incomplete without the rice there. Fish curry is preferred by the people along with the rice.
- **Local festivals, Art and Music-** Most common festivals of Guwahati celebrated with complete joy and enthusiasm are the Ambubachi Mela, Debaddhani Festival, Rangoli Utsav, Brahmaputra Beach Festival, etc. Weaving is the main art and craft of the Guwahati people. Creativity of the people comes in the whole of the world in form of the silk and cotton clothes produced by the craftsmen of Guwahati

4. TOPOGRAPHY, PHYSIOGRAPHY, GEOLOGY AND CLIMATE OF GUWAHATI

- The Brahmaputra River flows to the north of the metropolis. The city is bordered on the south by the foothills of the Shillong plateau and to the east by the Amchang Wildlife Sanctuary. The Bharalu River, a tributary of the Brahmaputra, flows right through the heart of the city. To the south-west of the city lies Dipor Bil, a permanent freshwater lake with no prominent inflows apart from monsoon run-off from the hills that lie to the south of the lake. The lake drains into the Brahmaputra, 5 km (3.1 mi) to the north, and acts as a natural storm water reservoir for the city. There are also multiple hills within the city limits.

- Guwahati's 'urban form' radiates from a central core with growth corridors radiating and extending towards the south, east, and west. In the past few decades, southern Guwahati areas such as Ganeshguri, Beltola, Hatigaon, Six Mile, and Panjabari began forming a southern sub-center surrounding the capital complex at Dispur. The core area consists of the old city with Pan Bazaar, Paltan Bazaar, Fancy Bazaar and Uzan Bazaar, with each area facilitating unique urban activities.

- Among the city corridors, the most important is the corridor formed along the Guwahati-Shillong (GS) Road towards the south (almost 15 km [9.3 mi] from the city-center). The GS Road corridor is an important commercial area with retail, wholesale and commercial offices developed along the main road; it is also a densely built residential area in the inner parts. The capital complex of Assam at Dispur is situated in this corridor. This corridor has facilitated the growth of a southern city sub-center at Ganeshguri, along with other residential areas to the south developed during the past few decades.

- The corridor extending towards the west (around 30 km [19 mi] from the city-center) contains a rail-road linking not only Guwahati but also other parts of the northeastern region east of Guwahati to western Assam and the rest of India. The corridor links residential and historically important areas such as Nilachal Hill (Kamakhya), Pandu, and Maligaon (headquarters of Northeast Frontier Railways) before it separates into two – one towards North Guwahati via the Saraighat Bridge and the other continuing west towards LGB International Airport via Gauhati University (Jalukbari). There are also many river ports/jetties along this corridor.

- The third major corridor extends towards the east (around 15 km [9.3 mi] from the city-center) linking Noonmati (Guwahati Refinery) and Narengi, and has facilitated residential growth along with it. Highway NH-37, which encircles the city's southern parts and links the southern corridor in Noumile to the western corridor in Jalukbari is currently supporting rapid development. Similarly,

the VIP Road linking Zoo Road with the eastern corridor and recently completed Hengerabari-Narengi Road are also supporting massive residential development to the east.

4.1.1 CLIMATE

Guwahati has moderate climate all throughout the year, with warm summers and mild winters. Spring (March–April) and autumn (September–October) are usually pleasant with moderate rainfall and temperature.

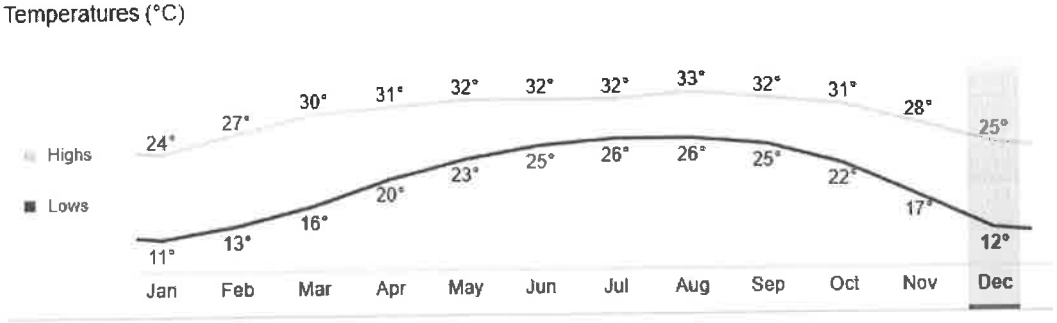

Chart1: Average temperature through out the year

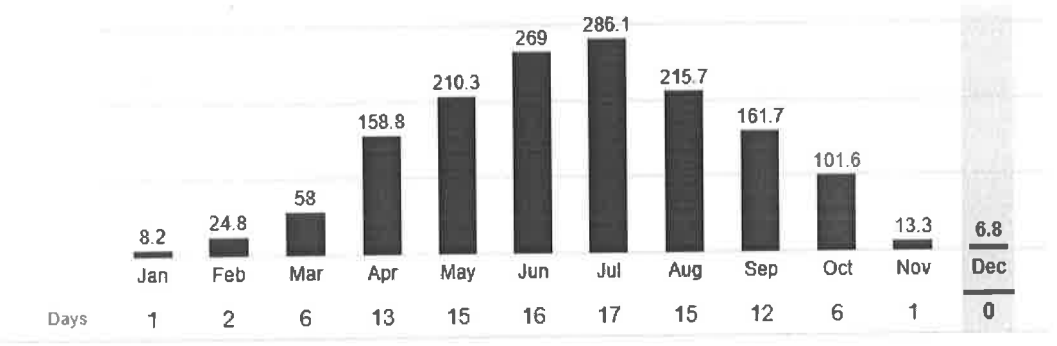

Chart2: Average rainfall through out the year

4.2 FLORA & FAUNA

- Assam, one of the biodiversity hotspots occupies a special place in North-eastern India located between 24° 44' N to 27" 45'N Latitude and 89° 41'E to 96° 02'E Longitude, covering 2.4% of the geographical area of the country.
- The annual rainfall ranges between 305 cm. max. to 178 cm. min. with an average of 211.76 cm. The temperature recorded in summer is 37 °C max. and 18 C min. and 26* Cmax, and 7°C min. in winter, with an average humidity of 83.00.
- Grass lands occur in the deciduous tracts and also in the riparian areas of the Brahmaputra and it's tributaries. The length of the Brahmaputra river in Assam is 640 km. & length of the Barak river is 225 km. and there are 121 drainage systems or tributaries in both the Brahmaputra & the Barak. The river Brahmaputra covers 23,3000 sq.km. under its drainage system in India.

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- Total recorded forest area of the state is 28,748 sq.km. out of which 359 sq. km. Come under water bodies and covers 32% of the total geographical area. On the other hand forest & tree cover is 36.67% of geographical areas including homestead forestland.
- Pattern of rainfall configuration of grounds are the factors controlling the distribution of plants in to the types of forest association. The state consists of two valleys-the Brahmaputra and the Barak, separated by range of comparatively low hills.

Figure 1: Traditional dance during the celebration of Ambubachi festival

5. AMBUBACHI FESTIVAL

- The Ambubachi Festival is an annual Hindu mela (gathering) held at Kamakhya Temple in Guwahati, Assam. This yearly mela is celebrated during the monsoon season that happens to fall during the Assamese month Ahaar, around the middle of June when sun transits to the zodiac of Mithuna, when the Brahmaputra river is in spate. During this time Brahmaputra River near the temple turns Red for three days.
- Ambubachi Mela is the celebration of the yearly menstruation course of goddess Kamakhya. It is believed that the presiding goddess of the temple, Devi Kamakhya, the Mother Shakti, goes through her annual cycle of menstruation during this time stretch. It is also believed that during the monsoon rains, the creative and nurturing power of the 'menses' of Mother Earth becomes accessible to devotees at this site during the mela. There is no idol of the presiding deity but she is worshipped in the form of a yoni-like stone instead over which a natural spring flows.
- This mela is also known as Ameti or Tantric fertility festival since it is closely associated with Tantric Shakti cult prevalent in eastern parts of India. Even some Tantric Babas make their public appearances only during these four days. The rest of the year, they remain in seclusion. Some Babas are seen displaying their psychic powers like putting their heads in a pit and stand upright on it, standing on one leg for hours at a stretch.
- Pilgrims- Every year lakhs of pilgrims, starting from Sadhus to householders, from all over India, come to Guwahati to observe this festival. They include Sanyasins, black clad Aghoras, the Khade-babas, the Baul or singing minstrels of West Bengal, intellectual and folk Tantriks, Sadhus and Sadhvis with long matted hair etc. Even foreigners from abroad come to seek blessings of mother Kamakhya.

Figure 2: Celebration at Ambubachi festival in Maa Kamakhya Temple

6. PROPOSED SITE AND AREA FOR DEVELOPMENT

- The Government of Assam has aimed to develop Maa Kamakhya Temple Access Corridor. Over the period, the number of Devotees have increased manifold and post-Independence no work as such has ever been undertaken on large scale to upgrade the facilities.
- The implementation of this project will not only generate direct and indirect employment opportunities but in long run will give impetus to sustainable growth through religious tourism. The construction of this facility is planned to be executed under **PM-DevINE Scheme**.

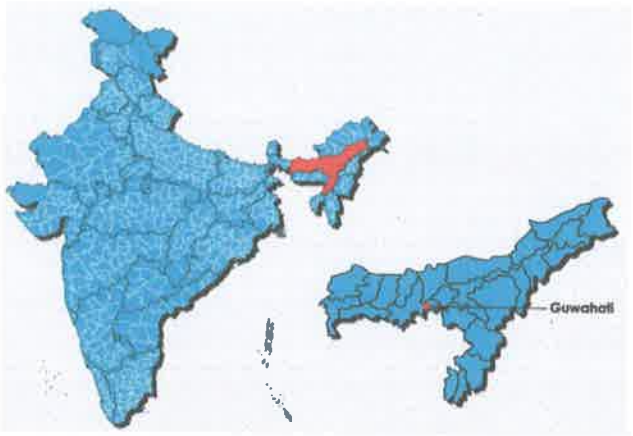

Figure 3: Location of site

Figure 4: State of Assam

Figure 5: Guwahati City

- The total land measuring around 5.30 Acres is one single land parcel. It starts after the existing MLCP on the Kamakhya Mandir Road in the southeast corner going up till the main entrance gate of the Kamakhya temple.
- It includes the Nilachal sports ground and a few existing temples namely Siddheshwar temple, Kedareshwar temple, Kameshwar temple, Chhinnamasta temple, Kali temple and Tara temple.
- The State Government shall provide availability of sufficient water supply, external drainage & sewerage network and electrical connection of required load etc..
- There is no live water body in the proposed land, however a pond is present outside the land parcel.
- The site is a substantially contoured site with level differential upto 25m i.e. entrance/exit of the corridor is at +212m lvl and it ends at Kamakhya Temple entrance at +227m lvl.

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Figure 6: Site Extent with urban context

6.1 TOPOGRAPHICAL SURVEY

The Kamakhya Temple is located in the hills of Guwahati, in the northeastern state of Assam In India. The region surrounding the temple is characterized by its hilly terrain, with a range of contours and elevations. The contours of the Kamakhya Temple region are shaped by the geological formations of the area, which are predominantly made up of sandstone and clay. The hills and valleys around the temple create a range of microclimates, supporting a diverse range of vegetation and wildlife.

The contours of the Kamakhya Temple region are also influenced by human activity, such as agriculture and urbanization. The hills around the temple have been terraced, and the valleys have been developed for urbanization, which has resulted in significant changes to the natural contours of the region. Despite these changes, the region around the Kamakhya Temple continues to be characterized by its unique and varied

topography, which provides a stunning backdrop to the temple and its surroundings.

Strengths of a contoured site context:

- Improved accessibility: Contouring can help to create a level and stable access road, making it easier for visitors to reach the temple.
- Enhanced safety: The contouring can help to reduce the risk of landslides and soil erosion, ensuring a safer and more stable access road.
- Increased aesthetic appeal: A well-designed contoured site can add visual appeal to the temple and its surroundings, enhancing the overall experience for visitors.

Opportunities of a contoured site context:

- Increased visitor numbers: An accessible and visually appealing access road can attract more visitors to the temple.
- Improved maintenance: By creating a stable and level access road, the maintenance and repair requirements can be reduced, saving resources and costs.
- Expansion possibilities: A contoured site may provide opportunities for expanding the temple complex or creating additional facilities for visitors.
- Environmental protection: By creating a sustainable access road, the natural environment around the temple can be protected and preserved for future generations.

7. OVERVIEW OF PILGRIMAGE BEHAVIOR

The temple has an average footfall of over 15,000 pilgrims per day. Being one of the prime religious fairs in the country, on an average the temple records over 2 lakh pilgrim footfalls during the festival like Ambubachi Mela.

8. SITE CONTEXT & SIGNIFICANT BUILDINGS

The main temple Is surrounded in a complex of individual temples dedicated to the ten Mahavidyas of Shaktism, namely **Kali, Tara, Tripura Sundari, Bhuvaneshwari, Bhairavi, Chhinnamasta, Dhumavati, Bagalamukhi, Matangi and Kamalatmika.** Among these, **Tripurasundari, Matangi and Kamala** reside inside the main temple whereas the other seven reside in individual temples.

8.1 THE SIGNIFICANT TEMPLES IN & AROUND THE INTERVENTION

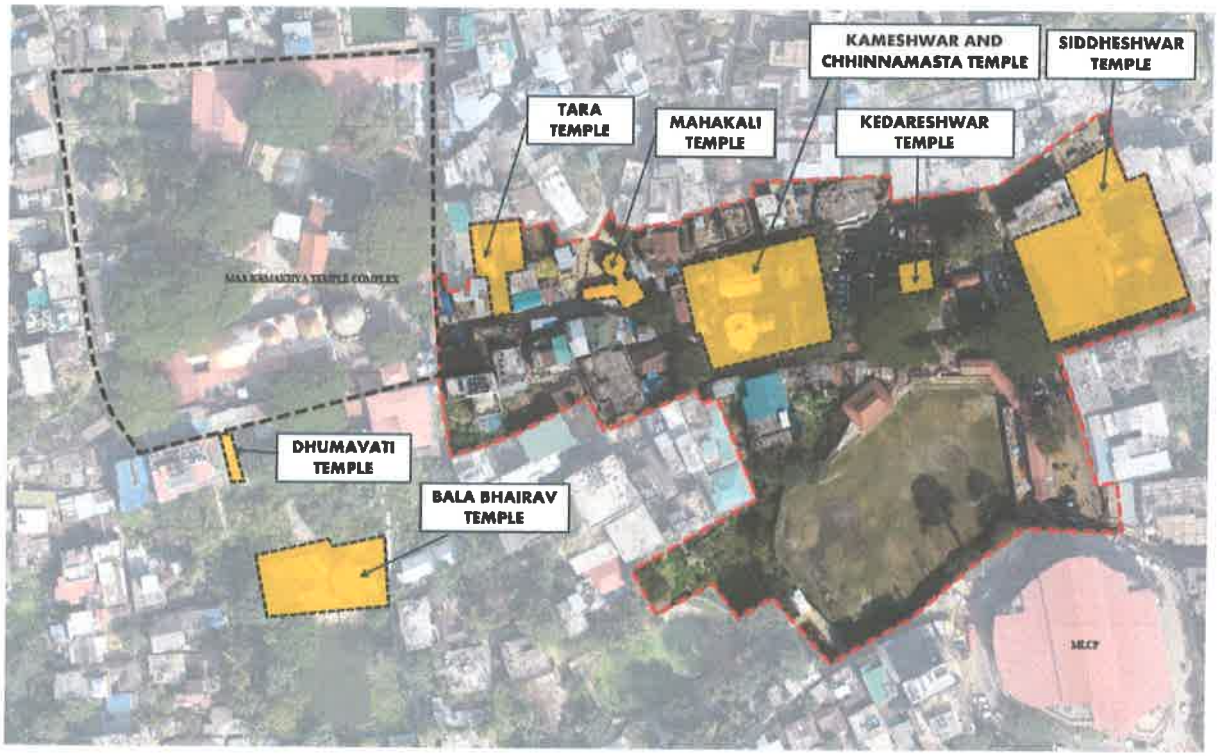


Figure 7: Significant buildings in site context

- **MAA TARA MANDIR:** Tara Devi gives 'Bak-shakti' i.e power of speech. She is also 'Nil Saraswati'. Sage Basistha placed Tara Devi near Jorpukhuri of present Guwahati-the famous mandir is known a 'Ugratara Mandir'. The Tara mandir in Nilachal Parvat lies between Mahakali and Kamakhya temple. Tara is the adhisthatridevi of Guru Brihaspati (Thursday) and is considered Devi who guides and protects and offers the ultimate knowledge that leads to salvation.

Figure 8: Maa tara mandir

- **MAHAKALI MANDIR:** Mahakali is the prime Goddess for sadhana. This form of the Devi is dark-skinned with dishevelled hair with a garland of severed human heads. The temple to Mahakali is situated in east of Kamakhya.

Figure9: Kali temple

- **CHINNAMASTA MANDIR:** Chhinnamasta Devi is headless and is in a fearsome look. Her cutout head lies next to her. Chinnamasta Devi is the adhisthatridevi of Rahu (Wednesday). This temple of Nilachal mountain adjoins the Kameshwar temple is only accessed through a steep and narrow flight of stairs that tests one's physical skills to reach.
- **KAMESHWAR TEMPLE:** Temple dedicated to Lord Shiva inside the Chinnamasta temple complex.

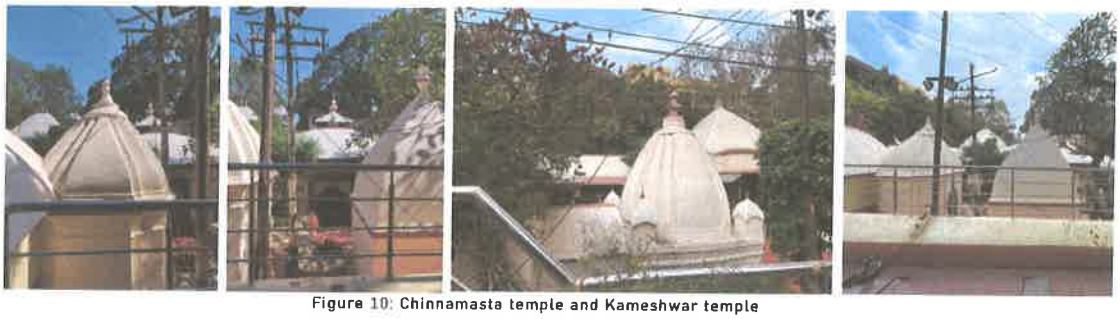
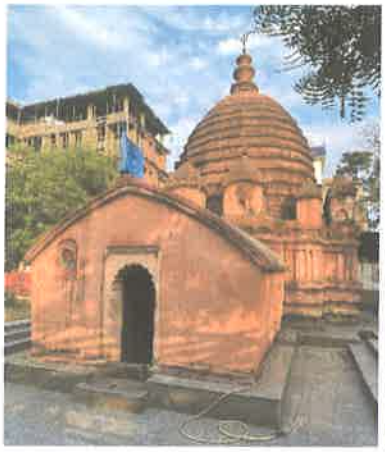


Figure 10: Chinnamasta temple and Kameshwar temple

- **KEDARESHWAR TEMPLE:** Temple dedicated to Lord Shiva inside the Kamakhya temple complex.

Figure 11: kedareshwar temple

- **SIDDHESHWAR TEMPLE:** Temple dedicated to Lord Shiva inside the Kamakhya temple complex.



9. MASTER PLANNING

9.1 OVERALL ZONING

The Master Plan reflects the strategic planning of the proposed access corridor for the present and the emerging needs in view of upgrading the existing infrastructure, tourism & allied employment and the needs of the population. The objectives of Master Plan include integrated access corridor complex up to the Kamakhya Temple gate considering the influx of devotees and creating holding spaces for them. The Master Planning has been done considering the following key parameters:

- Self-sustaining integrated corridor with dedicated zones for easy entrance/exit, cloak room & ticketing, holding spaces for devotees, multi-purpose halls & Annaghar, shops with better frontage, barrier free covered corridor, public utilities and beautiful open spaces with landscaping ensuring seamless movement of devotees.
- Segregation of various types of movement, including VVIP & non-VIP devotees, emergency vehicular movement and movement of vehicles for utilities have been planned.
- Creating a focus of a centre of pilgrimage
- Functional utility of all services with integrating contextual environment.
- Creating an environment for overall development of the Shaktipeeth.
- All blocks have been planned in the East-West axis maintaining the axial orientation of the main temple.
- The public utilities have been proposed in a dedicated complex to ensure easy connectivity handling of peak hour influx of devotees.

9.2 PROJECT COMPONENTS

It is proposed to create the various infrastructural facilities with a vision for developing the of Maa Kamakhya Temple complex.

A. MULTI-UTILITY BLOCK (M.U.B.)

This new block is the largest block of the proposal. It is a B+LG+UG+2 floors, and it houses multiple facilities for the pilgrims. This will be constructed on the existing Nilachal club playground and will the accessible from the main road in front of the existing MLCP. It has a large welcoming entrance flanked by corridors and shops on both sides. It has the main pedestrian entrance which leads to the cloack room and ticketing & security zone. The corridors are approximately 3M wide and 4.85M high finished with sandstone and decorative columns along with stone flooring.

B. SIDDESHWAR BLOCK (S.B.)

This single storied block is adjacent to the MUB, and it houses shops at lower ground level (+212m) The upper ground level has the new entrance gateway of the Siddheshwar temple. The corridors are approximately 3M wide and 4.85M high finished with sandstone and decorative columns along with stone flooring. The temple plinth goes further down from +216.15m to +214.50m.

C. CHHINNAMASTA BLOCK (C.B.)

Chhinnamasta block is a single storied building adjacent to the existing Chhinnamasta temple at the upper ground level (+216m) and it shops at lower ground level The upper ground level has the new entrance gateway of the Siddheshwar temple. The corridors are approximately 3M wide and 4.85M high finished with sandstone and decorative columns along with stone flooring.

D. PILGRIM MANAGEMENT BLOCK (P.M.B.)

This G+2 block is the penultimate zone which houses pilgrim holding halls and public utilities. It also houses the lifts and escalators for free movement of pilgrims till +226m lvl where we have the open-to-sky Kamakhya Plaza. The corridors are approximately 3M wide and 4.85M-5M high finished with sandstone and decorative columns along with stone flooring.

E. BASEMENT + SERVICES AREA

To accommodate services, the M.U.B. has a semi-open basement on +208m lvl along with a MS service platform. The basement which is accessed from a ramp from +212m lvl houses the following functions:

- VVIP Parking
- Multipurpose hall
- Substation
- Water tanks
- DG sets
- Other utilities

F. OPEN PLAZAS

The proposal has open plazas which are created by placing corridors between the periphery and the existing temples . The area around Siddheshwar temple has a lion stambh in sandstone before the main entry gate in marble. Further around Kedareshwar temple is the entrance plaza which has stepping stones and sandstone planters with seating.

Futher, there is Chhinnamasta Plaza having the temple at the centre and it leads to the P.M.B. Lower level plazas have cobblestone and flagstone flooring. Upper level plaza (Kamakhya Plaza) at +226m

has white and pink Makarana marble flooring, planters and plantations all around the Tara temple and Mahakali temple.

9.3 EXTERNAL DEVELOPMENT

9.3.1. SITE LEVELS

- The site levels proposed are +212m (Entry), +216m (major part of the corridor), +226m (Kamakhya Plaza and entry to temple)
- The plinth level for corridors and is proposed to be 150mm above the external level.
- The floor-to-floor height is 4M for basement (+208m) and +212m level, and 5M for all floors above.

9.3.2. CIRCULATION, PARKING, ROADS, AND PATHWAYS

- The circulation and parking have been planned to keep the pedestrian character of the corridor. The VVIP parking and service yard has been carefully placed and have been screened off with trees/ shrubbery where necessary.
- Paved pathways of width minimum 5.5M is proposed as per the layout drawing.
- For open pedestrian movement, combination of flagstone and cobblestone shall be provided, as required.
- Kerb stones: All corridor / building / pathway edges shall be provided with kerb stones (Tandur stone/Manipur stone) with honed finish as per approval.
- Adequate no. of RCC Pipes of suitable dia. shall be laid across the roads/pathways etc. to meet the requirements for crossing of cables, service lines etc.

9.3.3. LANDSCAPE DESIGN (REFER MASTER PLAN)

- Main objective of the landscape theme is to create a pleasant outdoor environment for the pilgrims coming to this corridor, complementary to the religious character of the main Kamakhya temple. The aim of the landscape theme is to create a devotional and sacred environment for the pilgrims.
- **Landscape Irrigation Design:** Irrigation to the plantation shall be done with the combination of modern irrigation techniques and manual irrigation methods, in line with the site conditions and local agro-climatic conditions and assist in conserving the landscapes besides saving water and ecology.
- **DESIGN CRITERIA**

  a. **Public and Semi-public spaces**: A clear segregation of public and semi-public spaces is aimed by creating clearly defined zones delineated by landscaping. Each area aims to create a self-contained zone to disable users from crossing over into restricted areas.

  b. **Buildings**: The built form merges seamlessly with the landscape. The relationship is ensured by use of similar materials for the landscape palette corresponding to the building materials. Dual shades of sandstone with wooden accents shall be used on facades.

  c. **Main Entrance**: The corridor has a roundabout after the vehicular ramp junction to facilitate smooth flow of existing traffic at the site. It also has a lion statue pillar in sandstone to accentuate the area also creating a religious ode to Maa Kamakhya as her *Vaahan*, and it is further continued by a white marble cladded grand entrance gateway.

d. **Lighting and Security**: Adequate lighting provision has been made to enhance safety and security. Parking areas, entrance, and service roads should be adequately lit and along with façade lighting for the whole corridor.

e. Avenue plantation is proposed along the corridor frontage.

f. Sculptures, Murals, Sit Out Spaces, shall be provided by EPC Contractor at required locations as per tender drawings/ finishing schedule and as directed by Engineer-in Charge

g. **Horticulture and Plantation**: - The Horticulture and Plantation works shall be carried out as per Tender Drawings, Design Basis Report, Technical Specifications and CPWD Specifications for Horticulture & Landscaping", with up to date correction slips. In absence of detail specification the standard horticulture practices for healthy growth of plants beautification should be followed as approved by Engineer-in-charge. The brief scope of Horticulture works includes avenue tree plantation along with shrubs plantation wherever necessary including digging holes, excavation, removal of excavated malba and refilling the same with proper ratio of manure and good earth as per the scope of site. To create aesthetic ambiance around the building and roads grassing with turf grass and dibbling with selection number 1 grass with proper land profile which includes trenching, fine dressing and leveling. In and around the building, pots along with plants is also to be arranged as required to create beauty all around the buildings. For proper growth of trees, shrubs and hedges the landscaping site has to be filled with good earth as required, and to improve the nutritional property of soil and proper growth of plant cow dung manure with vermicompost shall be arranged. After completion of project, the landscaping and horticulture works including lawn, trees, hedge and shrubs etc., will be maintained with proper tools and implements as necessary for a period of 1 year for their proper establishment and growth. For all these development and maintenance work, water must be arranged by the agency and nothing shall be paid extra for water procurement.

The development work includes minimum of following works:

1. Lawns – The lawns area in proposed campus is to be developed as shown in Master Layout Plan Drawing.
2. Trees / shrubs Plantation etc.– ·

The peripheral plantation of trees along the roads, green belts and buildings shall be planted as per nomenclature mentioned in Master layout drawing. The minimum height of individual variety of plants shall be as per CPWD guidelines for Horticulture & Landscaping. Tree guards for 50% plants/trees shall be provided as per directions of Engineer in Charge. ·

3. Religious / Sacred Plants- The different varieties of sacred plants shall be planted in the softscape areas as shown in Master Layout Plan drawing. The minimum height of individual variety of plants shall be as per CPWD guidelines for Horticulture & Landscaping. ·
4. Shrubs- The different variety of shrubs shall be planted as detailed in Master Layout Plan Drawing. The minimum height of individual variety of shrubs shall be as per CPWD guidelines for Horticulture & Landscaping. ·
5. Ground Covers -The different varieties of Ground Covers shall be planted as shown in Master Layout Plan Drawing. The minimum height of individual variety of Ground Cover shall be as per CPWD guidelines for Horticulture & Landscaping. ·
6. Climbers -The different varieties of Climbers shall be planted as shown in Master Layout Plan. The minimum height of individual variety of Climbers shall be as per CPWD guidelines for Horticulture & Landscaping. ·

7. Roundabouts at different location as shown in the Master Plan, shall be constructed as per drawing..,
8. Entrance Landscaping -. Landscaping at Main Entrance on Kamakhya Plaza as shown in the Master Plan shall be completed as per architectural drawing.
9. Hard landscaping – Development of plazas of as shown in Master Plan shall be carried out as per detailed Architectural drawing.
10. Irrigation system for Horticulture and plantation- It shall be carried out as per DBR (Plumbing).
11. Pots with plants (as per specification)

- Maintenance of plants & trees: It shall be one year after overall completion of the project. Note: The above list is only indicative and not exhaustive. The contractor has to plan and execute all the missing items required for plantation of trees, shrubs, hedges, grassing, potting with plant and maintenance of all the horticulture features to make the premises to the full use. Nothing extra shall be paid on this account.
- The Scope of work include preparation of landscaping plan including plazas, planters and other details etc. for the horticulture works and execution of same including, supply and laying of good earth, providing and laying unfiltered/recycled water supply lines from the existing treated water lines and installation of additional pumps if required. Contractor has to do horticulture works as per approved landscaping plan including grassing, grass turfs, plantation of shrubs, plants, trees etc. This Landscaping and horticulture work is also part of EPC tender and no extra payment will be made on any account. Grassing will be done with high quality grass including supplying good earth if needed including watering and maintenance of the lawn for 30 days or more till the grass forms a thick lawn free from weeds and fit for mowing. Plantation of tress at site will be done with healthy, well-developed trees established at the site of suitable varieties including watering, removal of unserviceable materials etc in quantity as per approved Landscaping drawings. Soil testing for texture, nutrient level, water retaining capacity, PH value and other essential test for healthy growth of plants shall be conducted near every building where horticulture/ Land scrapings works are to be done, from approved laboratory and at least 25% from ICAR/Krishi Vigyan Kendra/state universities. Necessary recommendation for fertilizer requirement and water consumption requirement shall be made available from the laboratories. Following points are to be followed for Horticulture & Landscaping work.
- Top good soil from the construction site shall be preserved for horticulture purposes. The soil not suitable for grasses and growth of trees shall be removed and good quality soil either from the preserved top soil or brought from outside the campus shall be used for horticulture purpose. No extra payment shall be made for same. The agency will be responsible for healthy growth of plants, trees, shrubs and grasses during construction stage and maintenance upto one year.
- Manure and Fertilizers: Cattle manure/ compost shall be well decayed (should be at least 6 months covered in dump), free from grits and any other unwanted materials. The contractor shall also provide and spread manure (cow dung manure/compost) for healthy growth the plants & trees under his maintenance. Depending upon requirement to maintain the nutrient level of the soil necessary application of chemical fertilizers (NPK) and other micronutrients should be done.
- Watering should be done in such any way that optimum level of moisture content for healthy growth of plants and trees is maintained, at no time moisture content should fall below the wilting point with respect to Guwahati climate. Inadequate or excessive watering is to be avoided. During

the dry season watering should be carried out at least daily in summer & twice a week in winter or as per requirement of the tree plant, shrub, water should be sourced from STP (Sewerage Treatment Plants) in case of emergency the source other then STP and be used provided that prior approval of Engineer –in – Charge has been obtained ·

- Weeding and Hoeing: The work includes maintaining areas close to the base of the trees and shrubs free from weeds within 300mm radius from the stem of the trees / 150mm radius from the stem of the plants. Weeding has to be carried out once in a month. All weeds are to be disposed off from the site with all leads and lifts. ·
- Pruning and Trimming: All dead or injured twigs, water shoots, unwanted branches are to be removed. Trees, shrubs and ground cover should be pruned to maintain natural shape. The hedges and shrubs shall be given special shapes and sizes to give aesthetic appearance of the greenery at regular intervals. ·
- Pest and Disease control: All trees/plants are to be inspected once in a month to determine any disease or pest infections. Once the infection is identified adequate control measures are to be taken. ·
- The trees and shrubs having height less than 3 meter in the plazas and planters shall be washed by sprinkler attached with water tankers on monthly basis. The contractor shall take utmost care of the trees and shrubs so that the casualty is brought to a minimum. The dead and fallen tree should be removed immediately from the site of work for smooth traffic movement and it should be brought to the notice of Department so that further survey and auction of the same can be done
- The contractor shall be responsible for removal of garden waste from the site and disposed off at designated dumping area or any other composting yard as approved by Engineer-in-charge. ·
- The contractor shall have to arrange all required tools & plants and other stock items like Bamboo, Sutli, and Hessian cloth, Tokari etc. for the proper development & maintenance of garden feature. Repair cost of tools & plant items shall be borne by the contractor & nothing shall be paid extra on this account. ·
- The Agency should ensure adequate deployed of Malis having experience of Horticulture work, In case of any deficiency the Engineer-in-Charge can issue the necessary direction to increase the staff and Agency should abide by order of Engineer-in-Charge.
- The contractor shall maintain the plants, hedges, trees, shrubs, and lawns in good and healthy condition during construction period as well as free maintenance period of one year. This will include Complete maintenance of the entire garden features of the garden area i.e. lawn, trees, shrubs, hedge, potted plants, flowers beds, creepers etc. and other garden feature including watering hoeing, making of plants basic manuring, trimming and cleaning of hedges / plants, Beds, spraying of insecticides, fungicides, weeding, mowing, and top dressing of lawn with good earth and manure and hedge clipping and removal of the garden waste, composting of green waste from plants, trees, lawn mowing, etc as per direction and satisfaction of the officer-in-charge.
- In case, if it is observed that the maintenance is not healthy and to the required standard, no payment shall be made of the specific area for the period over which the maintenance has been found to be neglected. The decision of the E-in-C shall be final and binding in this regard.
- The required quantity of insecticides/ Pesticides will be arranged by the agency for proper maintenance (only during the maintenance period) if needed.

10. SIGNAGES: (REFER SPECIFICATION)

Signages with different sizes & material specifications are proposed for different locations. Visibility and requirement study through architectural drawings as per pilgrim & staff circulation will be done. Signages for all major blocks will be made in English/Hindi/Assamese including interiors, corridor way finding and facade/building. Signages shall be provided as per relevant local bylaws and Govt. norms.

11. ENVIRONMENT IMPACT ASSESSMENT:

Since this building is being constructed for the Government by the Public Works Department, Govt. of Assam, hence as per CPWD Works Manual 2019 clause 3.1.1.7 exemption of Govt. Bldg. form operation of Municipal Laws is applicable. Requisite certificate of compliance of Municipal laws is attached from the Chief /Senior Architect of PWD (Building) Assam. Being an Institutional cum Educational Project, these buildings do not warrant any Environment impact assessment and its clearance however guidelines of Pollution Control Board of Assam and Sustainable Planning Management will be implemented during construction.

12. GRIHA RATING & CERTIFICATION

12.1 Project Vision

Maa Kamakhya Access Corridor is envisioned to be designed and constructed based on sustainability and green building principles. The vision is to conserve energy & water; reduce waste; renewable energy generation; reduce urban heat island effect and use sustainable materials.

12.2 Project Approach &Strategies

Minimum 3-Star GRIHA rating for the below mentioned buildings to be obtained by EPC Contractor with due compliance to various criteria stipulated under GRIHA Version 2015.

Buildings for which GRIHA certification is required are mentioned as below:

i. Multi-utility Block
ii. Siddheshwar Block
iii. Pilgrim Management Block
iv. Chinnamasta Block
v. Covered Corridor

12.3 Key Strategies for Minimum GRIHA 3 Star Rating

Key considerations & strategies for targeted rating are indicated below in 3 broad categories as follows:

A. PLANNING –

1. Site Plan and building plans conform to government approvals/requirements.
2. Compliance to ECBC 2007 and NBC 2016 is mandatory.
3. Net Imperviousness factor of site meets the NBC 2005 norms & the site is designed such that post-construction storm water discharge from the site is zero

4. Rainwater harvesting for managing the rainwater runoff from roof and ground surfaces.
5. Window to Wall Ratio to be limited in each building as per GRIHA V2015
6. Skylight to roof ratio to be limited in each building as per GRIHA V2015
7. All the fenestrations meet the SHGC requirement of ECBC-2007/Weighted Façade average SHGC (for each orientation) meets SHGC requirements of ECBC-2007
8. Energy Conservation Measures to achieve Energy Performance Index (EPI) lower than GRIHA V2015 Baseline EPI.
9. Insulation, refrigerants, fire suppression systems will be CFC, HCFC and halon free
10. Paints, adhesives and sealants to be low/free of VOC content as per GRIHA V2015 requirements.
11. Building Water demand to be reduced below GRIHA V2015 base case by using low flow fixtures in toilets, kitchen, cafeteria, pantry etc.
12. Sewage Treatment Plant to treat wastewater generated on site, as per GRIHA V2015
13. All materials (calculated by surface area) used for building interiors should meet the GRIHA V2015 requirements.
14. BIS recommended waste materials to be used in building structure.
15. Renewable energy generation through solar PV Panels installed on roof, sizing as per GRIHA V2015.

B. <u>DURING CONSTRUCTION</u>

1. Replantation/Plantation to be done as per GRIHA V2015
2. Air & Water pollution control measures including but not limited to –
   i. Provision of at least 3 meter high barricading around the construction area.
   ii. Wheel washing facility at the vehicular entrance of the site
   iii. Covering of fine aggregate and excavated earth on site with plastic/geotextile sheets
   iv. Water sprinkling on fine aggregate (sand) and excavated earth
   v. Diesel gensets on site must have proper chimneys with their outlet facing away from the site
3. Adopt strategies to reduce water use during construction like –
   i. Using gunny bags for curing and using ponding for curing
   ii. Monitoring to avoid leaks and water wastage
   iii. Use of additives to reduce water requirements during curing
   iv. Use of treated waste water/captured storm water
4. Implement waste management practices during construction including but not limited to,
   i. Allocation of separate waste storage spaces
   ii. Safe disposal of waste
   iii. Hiring of waste haulers

C. POST CONSTRUCTION

i. Monitoring of project's energy consumption by installing digital meters for Utility grid, on-site renewable energy system, diesel generator, AHU, Cooling tower etc

ii. Reduction in landscape water demand by using efficient irrigation techniques like drip irrigation, minimizing turf area and installing native trees, shrubs.

iii. Water used for drinking, irrigation to conform to BIS standards

iv. Monitoring of project's water consumption by installing digital meters at municipal supply, irrigation, cooling tower, STP/WTP/ETP.

v. Effective use of Sewage Treatment Plant to treat wastewater generated on site.

D. INNOVATION

A few other strategies should also be implemented for innovation, including but not limited to –

i. A GRIHA certified professional (Trainer or Evaluator) is involved in the project from beginning to end)

ii. Implementation of a technology for the first time in the country.

iii. E-waste recycling

iv. STP technologies

v. Net-Zero Energy/Water

13. AESTHETICS

Aesthetics is of utmost importance to enable a healing environment, this aesthetics is met by providing pleasing architectural elevation features coupled with the use of local materials, creating an enabling environment.

13.1 DESIGN PHILOSOPHY

The design philosophy takes into account the followings:

a. **All Weather Pedestrian Connectivity**

b. **Provision Of Rugged, Future Proof Pilgrim Facilities**

c. **Provision Of Tourist Facilities**

d. **Universal Access**

e. **Developing Safe Interactive Public Spaces**

f. **Integrating Historic Temple Complexes**

g. Utilising A **Traditional Architectural Vocabulary**

h. Providing A Scalable **Services Backbone**

i. **In-Situ Resettlement & Re-Organisation** Of Existing Shops.

j. The Corridor Redevelopment Shall **Enhance Traditional Practices.**

k. **Interpretation/ Museum** Space For Visitors & Tourists.

l. Segregation Of Vip & Visitors Movement To **Ensure Uninterrupted Access To The Temple**

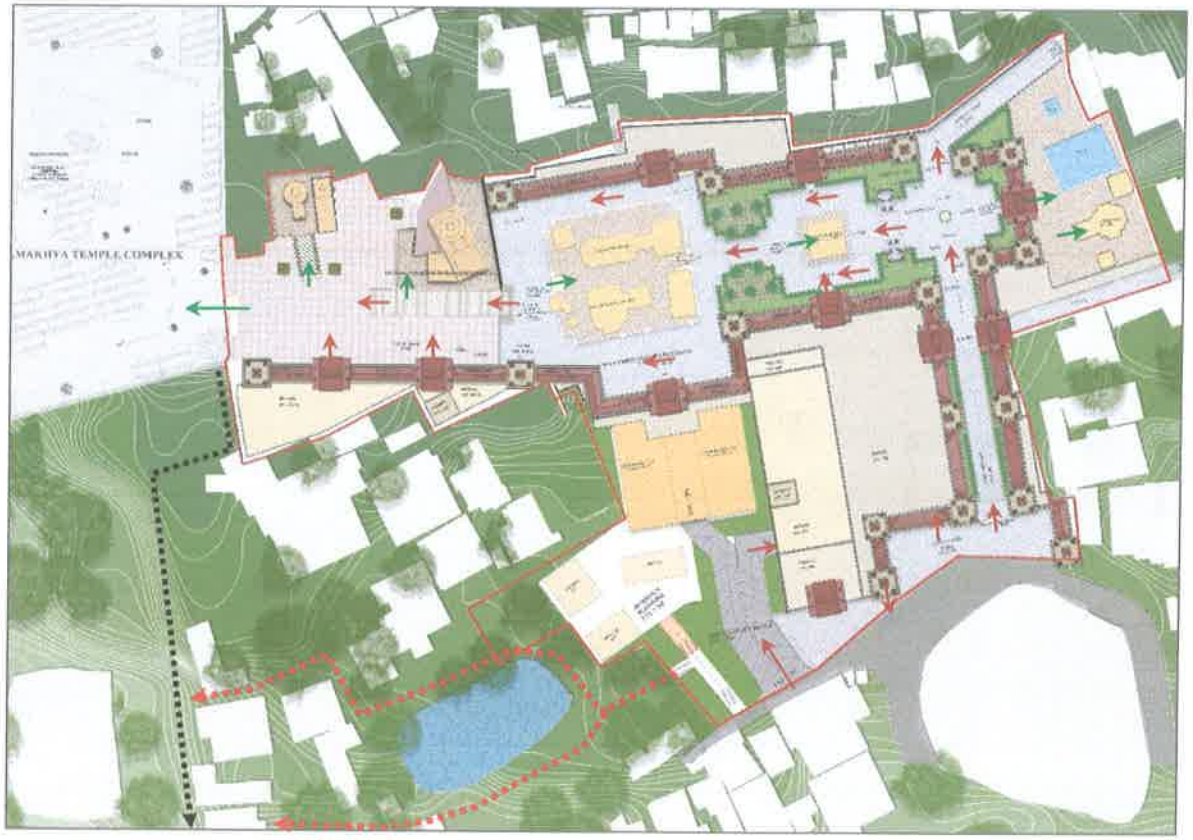
m. **Enhancing The Spiritual /Pilgrimage Character** Of The Complex

13.2 OPERATION & MAINTENANCE

Project once implemented will be supported by Govt. of Assam and suitable mechanism including all the stakeholders will be implemented so that there is sufficient fund to do the operation and maintenance if some gap will be there, it will be funded by the state Govt.

14. DESIGN DRAWINGS

14.1. ROOF PLAN



14.2 SALIENT FEATURES

A. MULTI-UTILITY BLOCK (B+LG+G+2) – 10,522 SQ.M.

- MULTI PURPOSE HALL (B)- 1500 capacity
- VIP PARKING (B) – 15 Nos.
- AREA FOR SERVICES (B)
- ANNAGHAR (LG, G) – 1000 capacity
- TICKETING COUNTER (LG)
- SECURITY CHECK (LG)

- SHOPS (LG) – 19 NOs
- INTERPRETATION CENTER (G)
- SHOPS (G) – 29 Nos
- KITCHEN (G) – 228 Sq m
- FOOD COURT (1ST FLOOR)- 280 capacity
- VIP LOUNGE (2ND FLOOR)- 3 Nos
- CONFERENCE HALL (1ST FLOOR)
- PILGRIM INTERPRETATION CENTER / KAMAKHYA MUSEUM

B. PILGRIM MANAGEMENT BLOCK (G+2) – 3,196 SQ.M.

- MULTIPURPOSE HALL (G,1)- 1000 capacity
- KAMAKHYA PLAZA (OPEN TO SKY) (2ND FLOOR)
- PUBLIC UTILITIES
- VIP ACCESS

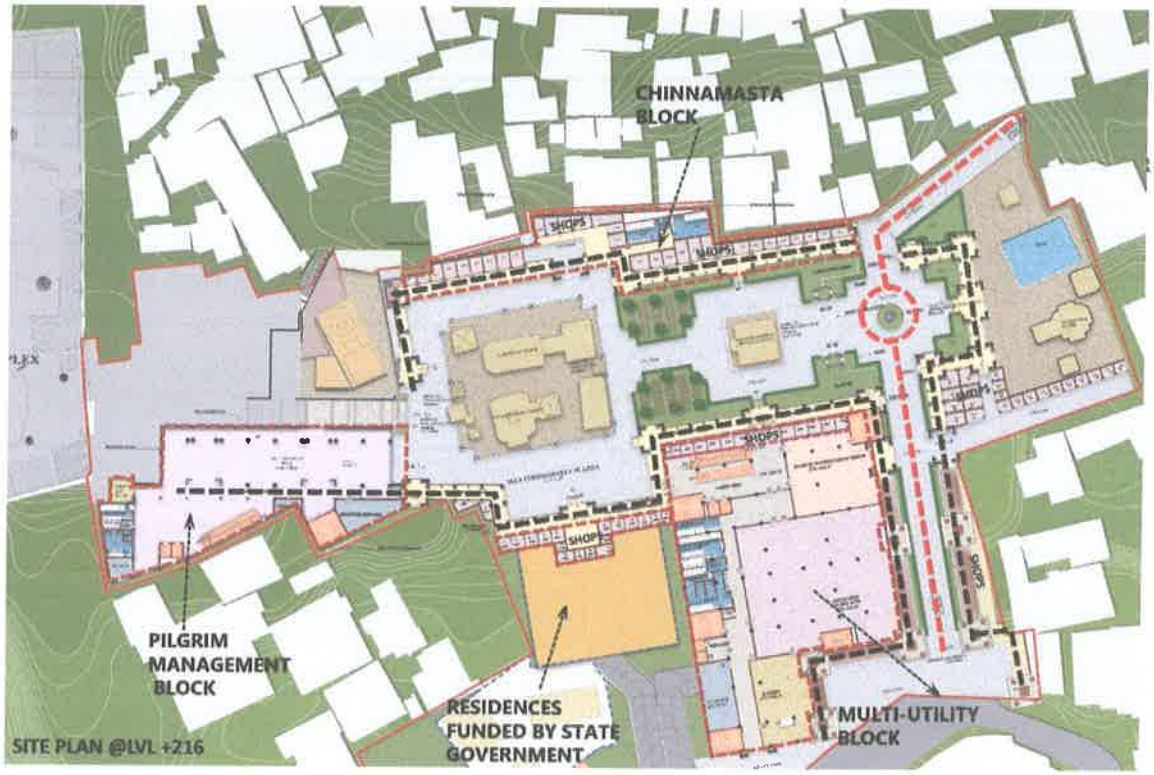
C. CHINNAMASTA BLOCK 486 SQ M

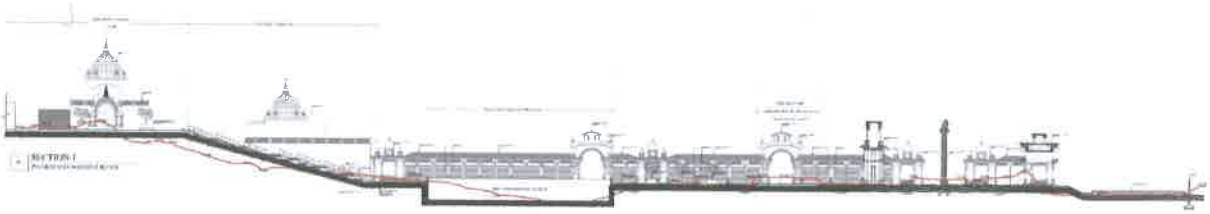
- SHOPS (G)- 30 Nos
- WASHROOM

D. SIDDHESHWAR BLOCK 205 SQ M

- SHOPS (LG)- 6 Nos.
- SHOPS (G)- 20 Nos

13.2.1 SITE PLAN (LVL +216M)





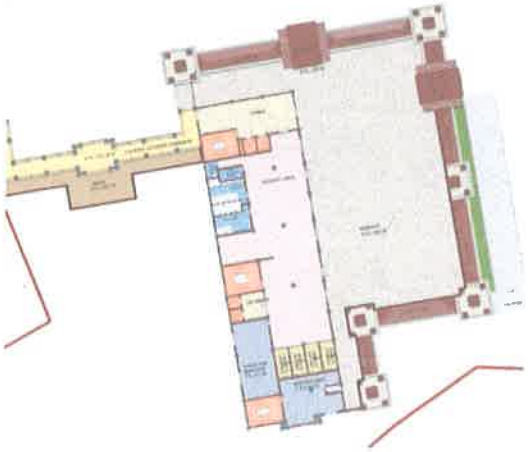
MULTI UTILITY BLOCK @ LVL +208 M & LVL +212 M

FLOOR PLAN LVL +208 M

FLOOR PLAN LVL +216 M

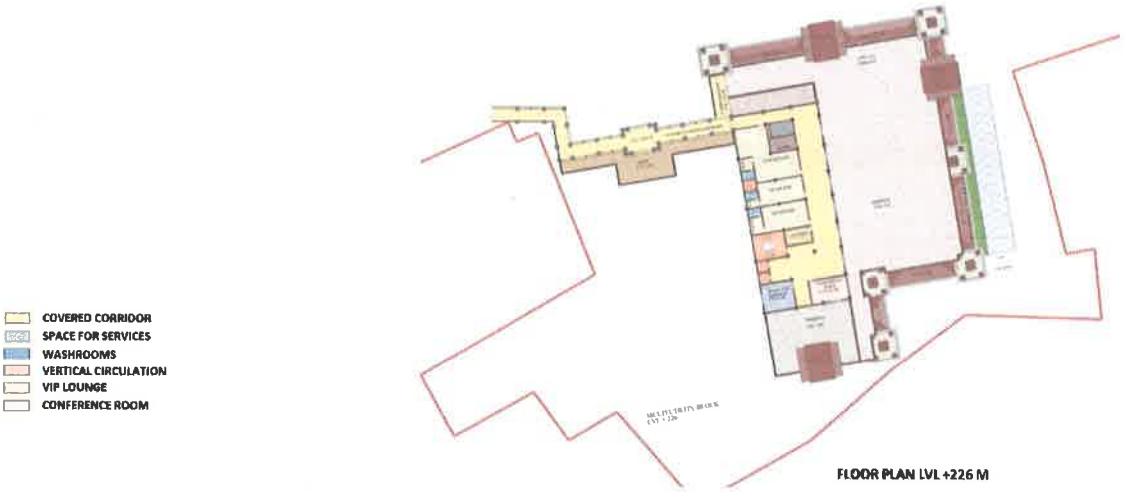
MULTI UTILITY BLOCK @ LVL +216 M & LVL +221 M

FLOOR PLAN LVL +216 M



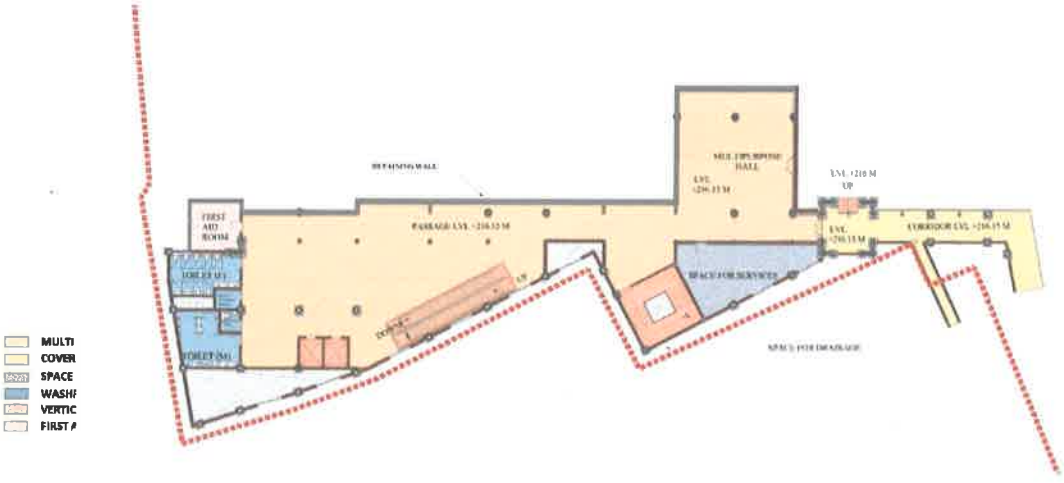
FLOOR PLAN LVL +221 M

MULTI UTILITY BLOCK @ LVL +226 M



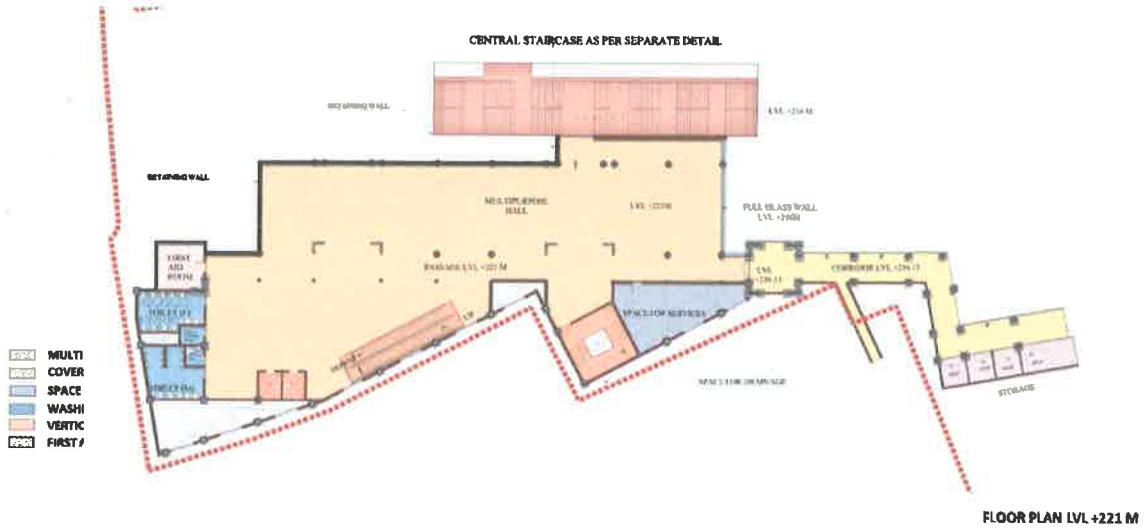
FLOOR PLAN LVL +226 M

PILGRIM MANAGEMENT BLOCK @ LVL +216 M



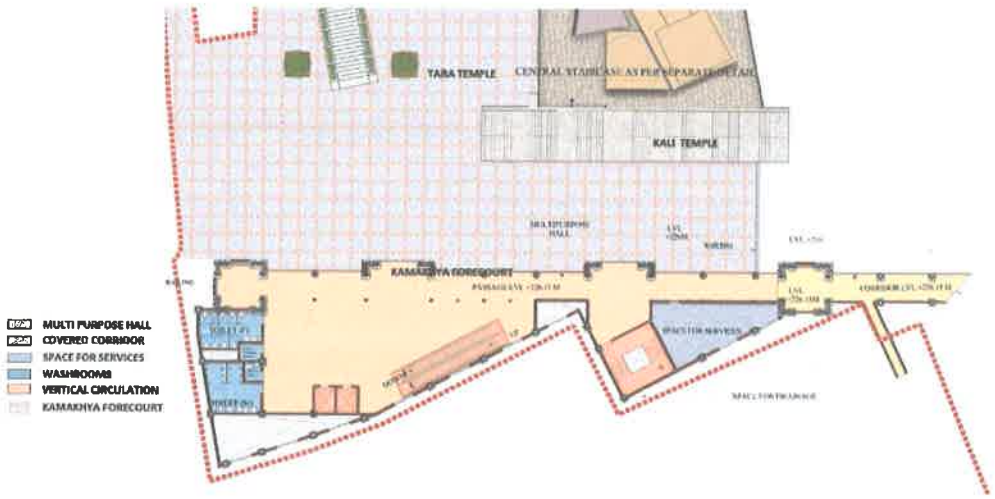
FLOOR PLAN LVL +216 M

PILGRIM MANAGEMENT BLOCK @ LVL +221 M

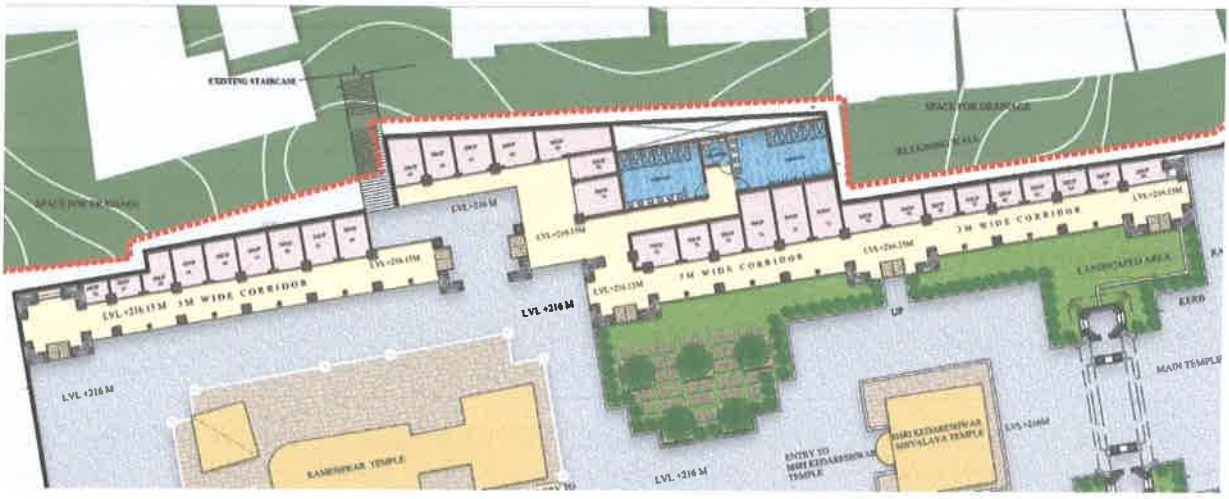


FLOOR PLAN LVL +221 M

PILGRIM MANAGEMENT BLOCK @ LVL +226 M

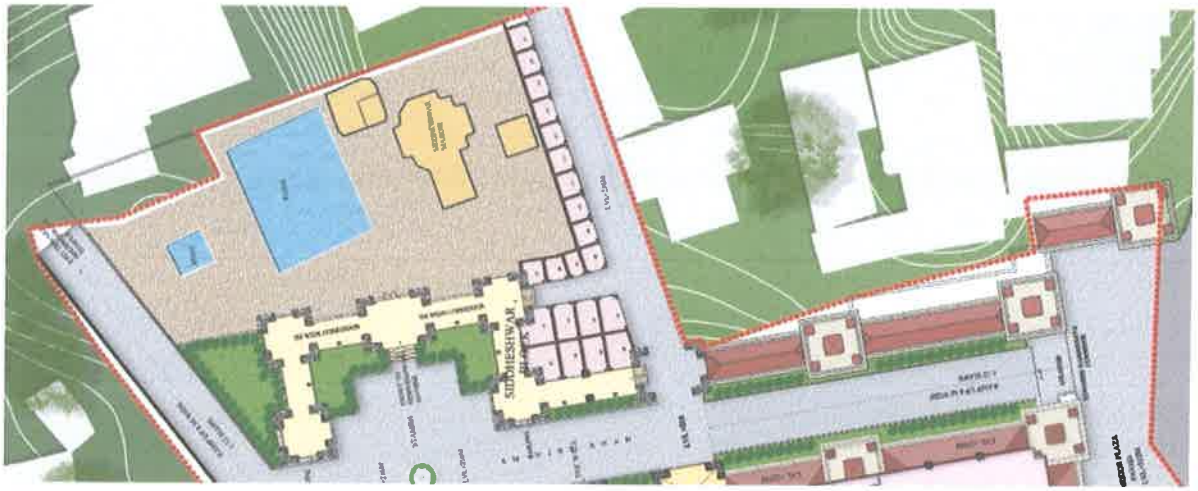


CHINNAMASTA BLOCK @ LVL +216 M

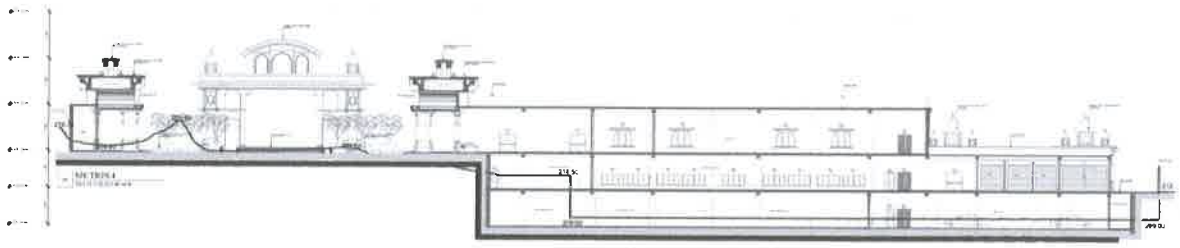


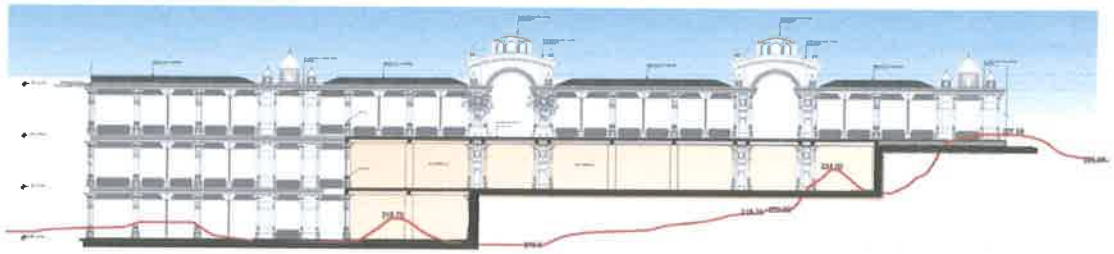
SHOPS
COVERED CORRIDOR
WASHROOMS

SIDDHESHWAR BLOCK @ LVL +216 M

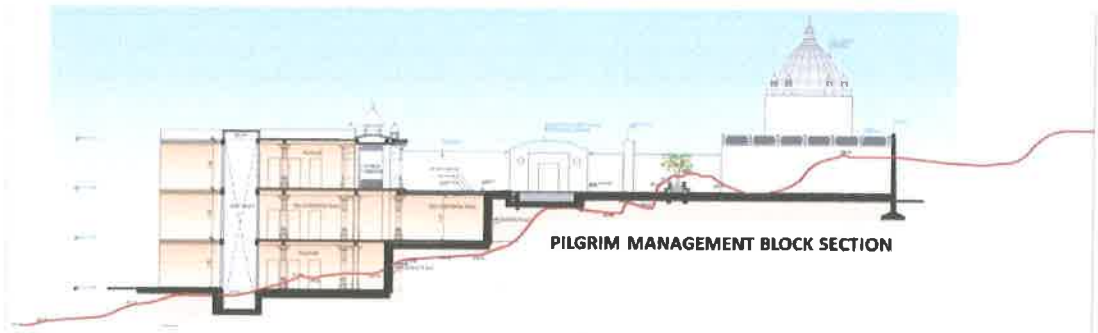


SHOPS
COVERED CORRIDOR
WASHROOMS

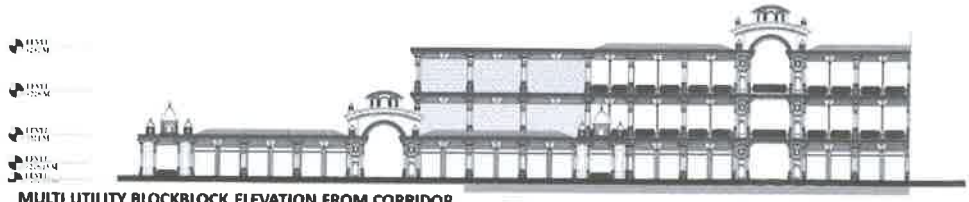




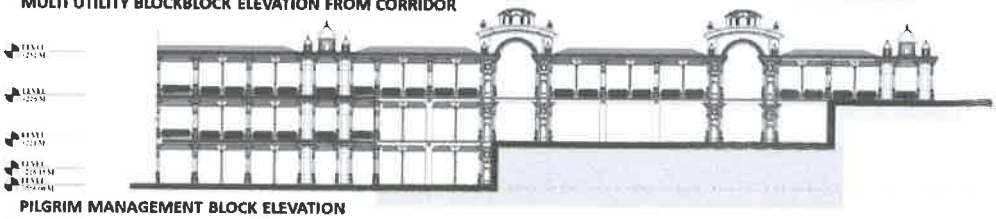
PILGRIM MANAGEMENT BLOCK SECTION



PILGRIM MANAGEMENT BLOCK SECTION



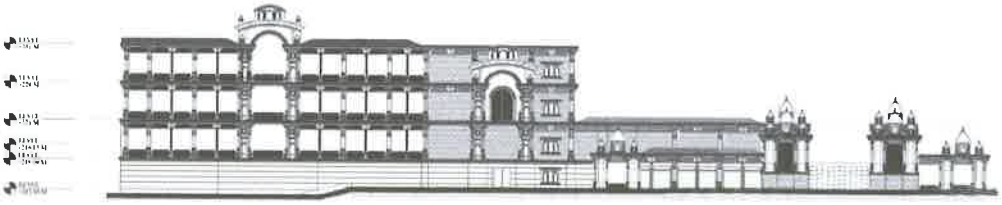
MULTI UTILITY BLOCKBLOCK ELEVATION FROM CORRIDOR



PILGRIM MANAGEMENT BLOCK ELEVATION

SIDDESHWAR BLOCK ELEVATION

MULTI UTILITY BLOCK ELEVATION FROM RAMP

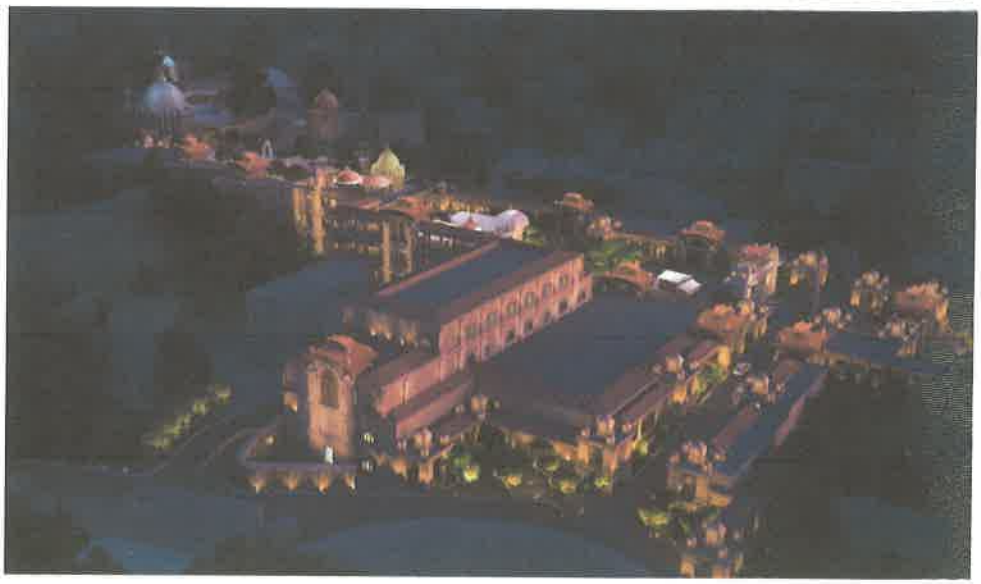


MULTI UTILITY BLOCK ELEVATION FROM FRONT ROAD

15.3D VIEWS

TYPICAL CORRIDOR ELEVATION

NIGHT VIEWS



16. AREA CHART:

MAA KAMAKHYA TEMPLE ACCESS CORRIDOR, AT GUWAHATI, ASSAM					
AREA SHEETS (IN SQUARE METER)					
Description	**MULTI UTILITY BLOCK**	**PILGRIM MANAGEMENT BLOCK**	**CHINNAMASTA BLOCK**	**SIDDHESHWAR BLOCK**	**CORRIDOR**
No. Of Floors	**B+LG+G.F+2**	**G.F+2**	**G.F**	**G.F**	**LG+G.F+2**
BASEMENT (+208.00 LVL)	2345.00				
TOTAL (A)	**2345.00**	**0.00**	**0.00**	**0.00**	**0.00**
LOWER GROUND FLOOR (+212.00 LVL)	2897.00				460.00
GROUND FLOOR (+216.15 LVL)	3068.00	1018.00	489.00	205.00	1280.00
FIRST FLOOR (+221.00 LVL)	1290.00	1285.00			269.00
SECOND FLOOR (+226.00 LVL)	880.00	838.00			255.00
TERRACE AREA	45.00	55.00			
TOTAL (B)	**8180.00**	**3196.00**	**489.00**	**205.00**	**2264.00**
TOTAL (A+B)	**10525.00**	**3196.00**	**489.00**	**205.00**	**2264.00**
GRAND TOTAL (A+B)	**16679.00**				
TOTAL CAMPUS AREA FOR DEVELOPMENT	21482.00				
LESS TOTAL GROUND COVERAGE	-6349.00				
ACTUAL DEVELOPMENT AREA	**15133.00**	Sqm			
CAMPUS BOUNDARY WALL LENGTH	895.00	Meter			
BASEMENT FLOOR (+208.00 LVL)	4.00				
LOWER GROUND FLOOR (+212.00 LVL)	4.15				4.00
GROUND FLOOR (+216.15 LVL)	4.85	4.85	4.85	4.85	4.85
FIRST FLOOR (+221.00 LVL)	5.00	5.00			5.00
SECOND FLOOR (+226.00 LVL)	5.00	5.00			5.00
PLINTH HEIGHT	0.15	0.15	0.15	0.15	0.15

1.60

- **Street furniture**

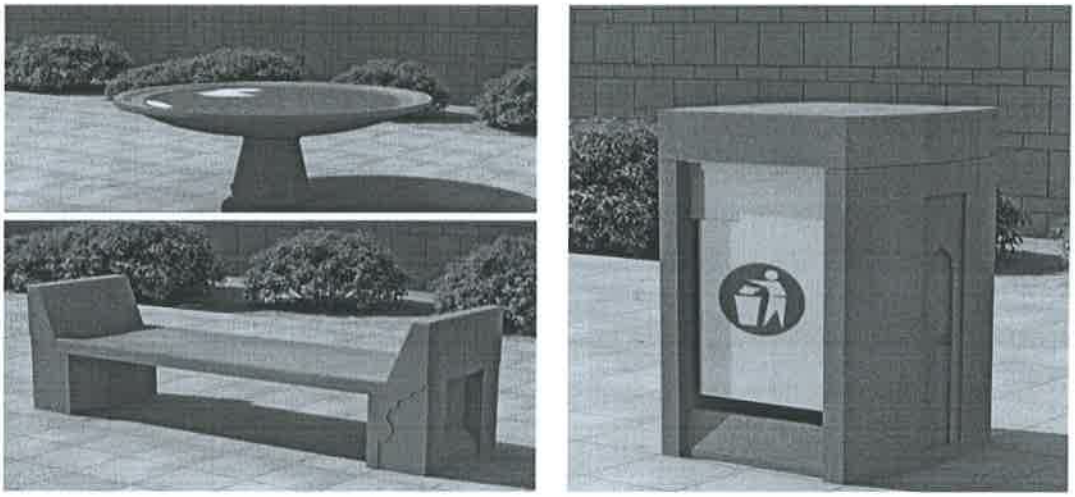


FIGURE 12: Proposed Street Furniture inside the corridor extent

- **Designing Of CCTV, Public Address System and WiFi**

FIGURE 13: DESIGN OF UTILITIES FOR SURVEILLANCE, PA SYSTEM, WIFI

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- **Designing Of Signages**

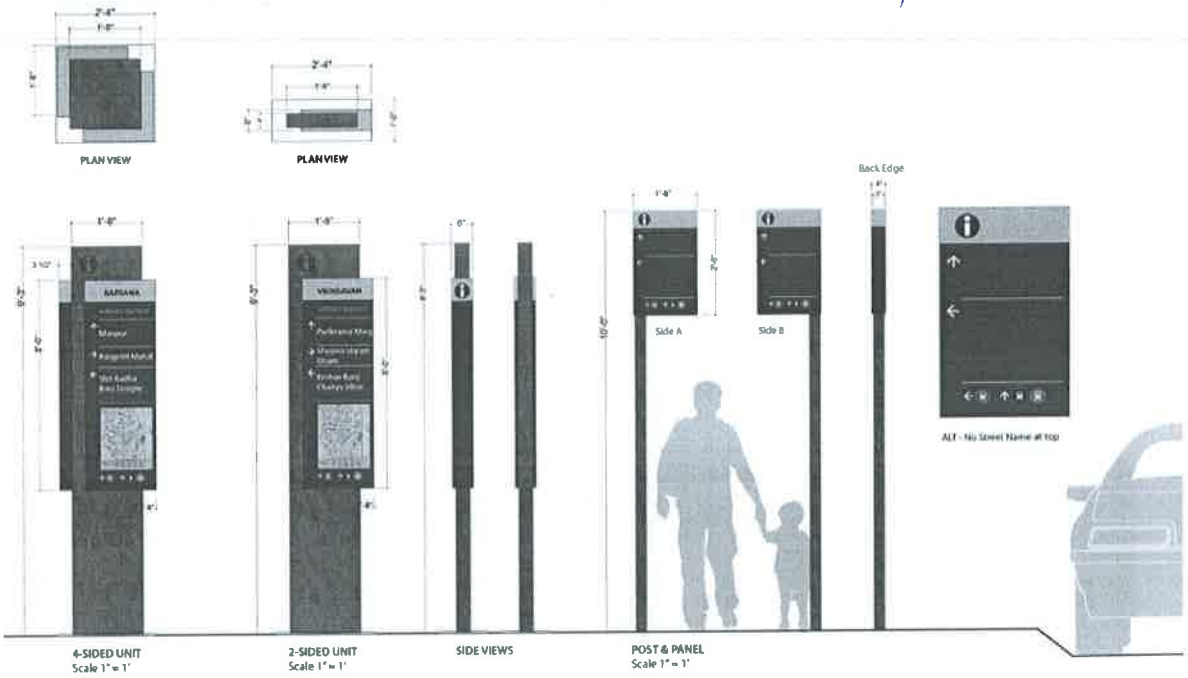

FIGURE 14: DESIGN PROPOSAL FOR SIGNAGE ALONG WITH GOVARDHAN PARIKRMA

FIGURE 15: Proposed Uniform Signage's System atParikrma Mar

Annexure - 'G'
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उत्तर पूर्वी अंतरिक्ष उपयोग केंद्र
भारत सरकार, अंतरिक्ष विभाग
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Director

Date: 12th June, 2013

Preface

Natural catastrophic incidences such as earthquakes, landslides, flood, cyclone, drought etc, have always caused a major problem in many developed and developing countries. Though, by itself any of the natural catastrophes never considered as a disaster until destruction in terms of damage to population and property is encountered. However, in recent years, the growth of population and the diffusion of haphazard development over hazardous areas have sharpened the impact of natural catastrophes or hazards worldwide. In addition, man made hazard mainly due to accidental failure of industries is a growing threat to any of the community. The State of Assam is vulnerable to various natural hazards and already witnessed many disastrous incidences other than the recurring problem of flood during rainy season. Many of the important cities/towns, are susceptible to such hazards.

Urban flash floods present greater runoff volumes and flow velocities, resulting in higher flow peaks and water stages resulting in disruption of social systems and significant economic losses. Hydrologic and hydraulic simulation tools integrated with closed contour ground survey inputs provide a viable solution to understand the movement of flood waters in intricate urban environments. The city of Guwahati is experiencing perpetual flash floods and landslide-related disaster during monsoon season causing threat to the population dwelling in low lying areas and on the hills and the intensity of such incidences are increasing day by day. The state also has number of medium to large scale industrial set up primarily related to natural gas and oil sector other than various small scale industries. However, most of the natural and man made catastrophic events are inherently complex phenomenon caused by a large set of factors many of which are still unidentified.

Seismic hazard can induce high scale disaster on existing natural conditions and man-made structures with varying relative motion of different magnitudes, and can be analyzed deterministically or probabilistically. Seismic hazard assessment is taken up in the project area of interests to address this disaster.

With the technological advancement, losses caused by a disastrous event can be avoided or minimize if timely measures are taken even if it cannot be prevented. The Hazard Susceptibility/Zonation Maps are one of the important inputs for such pre-disaster planning. In this regard, North Eastern Space Applications Centre (NESAC) has taken up an initiative to address the multi hazard zonation, vulnerability and risk assessment for Guwahati City, Dibrugarh and Silchar Towns in 1: 10,000 scale and Dhemaji district in 1: 25,000 scale qualitatively. This study has been proposed by Assam State Disaster Management Authority (ASDMA) under the Revenue and disaster management department, Government of Assam to address different hazards and to assess both social and physical vulnerability and associated risks.

Findings of the project are presented in four different atlases of which Volume I is for the Guwahati city, Volume II is for Silchar Town, Volume III is for Dibrugarh Town and Volume IV is for Dhemaji District. It is expected that the study will strengthen ASDMA the ways and means of extending similar approach to entire Assam towards minimizing the damage caused by natural and man made (industrial, mainly dealing with petrochemicals) hazards to the population and property. It is further expected that this technical report and atlas would serve as reference for disaster management and other concerned officials for developmental planning not only for Assam but also to the North Eastern Region in general.

(S.Sudhakar)

Executive Summary

The State of Assam is susceptible to various natural hazards like flood, both reverine and flash/urban floods, landslide and related phenomenon, earthquake etc. In addition, about 30 Major Accident Hazard Industries are reported from Assam with probable threats mostly associated to industrial facilities handling petro-chemical products. In recent years, relative vulnerability of population and infrastructure has increased due to unplanned development of settlements in hazardous areas because of population growth and influx. North Eastern Space Applications Centre (NESAC), Umiam, Meghalaya, had taken up the project "Hazard, Vulnerability and Risk Assessment of Guwahati city, Silchar, Dibrugarh towns and Dhemaji district, Assam" on request from Assam State Disaster Management Authority (ASDMA) under the Revenue and Disaster Management department, Government of Assam. As per the Disaster Management Act, 2005, one of the measures necessary for managing disaster is the preparedness to deal with any of them, which means the measures that enable rapid and effective response in disaster situation. Hazard analysis along with vulnerability and risk assessment (HRVA) is one of the efforts of preparedness for mitigating disasters. The outputs generated from HRVA is considered as one of the important inputs required for taking necessary mitigation measures there by to reduce risk of the society at large.

The project has the following broad objectives,

- To prepare GIS based multi hazard maps for Guwahati city, Silchar & Dibrugarh towns (1:10,000 scale) and for Dhemaji district (1:25,000 scale).
- To prepare vulnerability and risk assessment maps for probable multi hazards for the areas under study.

Broadly, the work was carried out in 3 major phases: assessment of frequency-magnitude- damages related to past hazardous events for each study area; preparation of hazard zonation maps for probable hazards; assessment of physical and social vulnerability and risk for each hazard. An integrated approach, using space technology in conjunction with field based survey was followed to address the objectives. Findings of the project were compiled in four different atlas volumes for the four study areas and this volume (Volume I) contains entire details of Guwahati city in 1:10,000 scale.

Guwahati, the capital of Assam is one of the fast growing major metropolitan cities of North Eastern Region (NER). The city is bounded by 26.08° to 26.17° N latitude and 91.50° to 91.83° E longitudes. Guwahati Municipal Corporation (GMC) covers an area of 216.7sq km. while the Guwahati Master Plan area indicates an area of 261.77 sq.km. The population density is of the order of 3750 persons/sq km. and the city is facing anthropogenic stress due to rapid urbanization. Depending upon the terrain conditions and considering the historic hazardous/ disaster events, it was decided to address following hazards for preparation of hazard zonation maps and also to assess vulnerability and risk associated to each hazard for Guwahati city

- Urban/Flash Flood Hazard
- Landslide Hazard
- Industrial Hazard
- A report on seismic scenario of Guwahati city is also prepared based on available subsurface data and published literature/maps etc.

Hazard zonation maps are prepared considering available historical records, frequency of each hazard, various resource/thematic maps in spatial domain, and sophisticated models for assessing nature, their probable impact to the study areas. Cartosat-I stereo data, World View (WV) I and WV II Multispectral data of 2009-2011 were used for generation of various resource/thematic maps on 1:10,000 scale using UTM projection and WGS84 datum. In addition, data from various ground surveys carried out during 2011-2012 are integrated for deriving hazard zonation, vulnerability and risk maps. These are, Real Time Kinematic (RTK) / Electronic Total Station (ETS) survey in urban areas for generation of hybrid Digital Elevation Model (DEM) of 1 m spatial resolution used for flash/urban flood hazard zonation; determination of rock and soil strength, Rock Quality Designation (RQD) analysis used for landslide hazard zonation; population and building survey used for vulnerability and risk assessment.

Urban flooding is one of the most recurrent hydro-meteorological disasters presently in the globe. Guwahati metropolitan experiences recurrent flood inundation and severe water logging during the rainy season and it has become a public grievance. Flooding is typically caused by short duration, locally centered, and high intensity summertime convective storms. Two-dimensional flood routing programs can efficiently simulate these complex urban flood environments with accuracy and detail. The objective of the project is to arrive at flood hazard zones (FHZ) in Guwahati urbane. Hydro-meteorological, spatial and ancillary database was collected and processed to aid the hydrological and hydraulic modelling platform.

Extensive ground reconciliation survey using DGPS and ETS (Electronic Total Station)/Real Time Kinematic (RTK) surveying techniques was carried out to obtain Z-flood points, which was also used to derive a hybrid Digital Elevation Model (DEM) of 1m spatial resolution and stature Base Flood Elevation (BFE) points for integration in the modelling process. Flood and Storm events have been identified and analyzed from the hourly rainfall data and Intensity–Duration–Frequency (IDF) analysis. Quasi-distributed hydrological modelling for Guwahati urban catchment was adopted to generate flood hydrographs for selected event dates when flood inundation has actually occurred. Flood inundation simulation was carried out using the derived flood hydrographs as boundary conditions with water levels, incorporating parameters as drainage nodes, congestion points, etc. The simulated flood inundation layers were extracted and schematized using scale of flood discharges from hydrographs and ground-based flood database. GIS spatial analysis and overlay/union/intersection areas, etc was applied for integration of the (i) Simulated flood inundation layers, (ii) Base Flood Elevation & Z-Flood point layers, and (iii) ground database of actual flooding. The generation of the final flood hazard layers has been done using the coupling of the hydraulic model-derived layers with BFE / Z-Flood points, and was checked with ground records. The major finding from the project study is that much of the urban flash flooding experienced in Guwahati is primarily due to local storm water congestion in the event of flash storm events along with the inadequacy of the drainage system to convey the storm water surge efficiently and rapidly.

Guwahati city is also susceptible to landslide (rock fall/slide & debris slide) especially during monsoon period. The first landslide incidence was reported in the year 1972, from Nabagraha hill, subsequently sharp increase in frequency of landslide occurrences are observed. During 80's and as well as in 90's landslide incidences were reported eight times in each decade. However, during 2000 to 2011 landslide incidences were reported for about twenty three times. It needs to be mentioned here that, systematic records of landslide incidences with precise location and time of incidence are lacking for the study area. Landslide Susceptibility map was prepared by integrating thematic criteria using Analytical Hierarchy Process (AHP). Detailed landslide inventory was prepared to assess role of different thematic parameters in causing landslides. The various thematic parameters used for landslide study were lithology, fault/lineament and their density, drainage and their density, geomorphology, slope, soil texture and depth and land use pattern. In addition, quantitative evaluation of rock quality (RQD), soil and rock strengths were carried out. Further, landslide hazard assessment was carried out from historic record of both landslide occurrences as well as role of triggering factors, namely earthquake and rainfall records. The map is further validated before using for risk analysis.

Industrial disasters however low in frequency but it may have a great potential to damage the environment. The damage may be either immediate or long term in nature. The present study was carried out for three Major Accident Hazard (MAH) units identified by Chief Inspector of Factories, Govt of Assam. with the estimation of areas of short duration probable accidental threats of key hazards such as toxicity, flammability, thermal radiation, over pressure etc. Industrial hazard map was prepared considering various physical, chemical and atmospheric parameters using Aerial Locations of Hazardous Atmosphere (ALOHA) software and depicted as various level of threat zones. Hazard zonation maps as well as vulnerability and risk assessment maps are prepared for various conditions, e.g, Toxic Dispersion, Thermal Radiation in case of a flash fire, Vapour Cloud Explosion (Congested), Boiling liquid expanding vapour explosion (BLEVE).

The state of Assam falls under Zone V of Seismic Zonation Map and the state has already experienced one great earthquake in the year 1950. In an area, intensity of damage due to earthquake also depends on site characteristics, usually represented by Predominant Frequency. In this project, site characterization assessment is done using empirical method from available subsurface data .

Vulnerability and risk was assessed for infrastructure and population through socio-economic survey using the samples of buildings derived from high resolution data along with physical survey of population characteristics and their pattern and temporal distribution. The use of space technology, especially the high resolution satellite data of Worldview coupled with Cartosat 1 have made it possible to identify buildings types in the study area. Though the collection of data on economic status of population from the field was not possible, but this was inferred indirectly from the building types extracted from the satellite data. However, educational qualification as a parameter was not used in the calculation of Vulnerability in the study. During the survey, temporal data on population occupying the buildings was collected on two-hourly basis and stratified method was used in the study. Temporal data was represented in four intervals of a day, i.e., morning, day, evening and night. This was done by averaging out the presence of persons residing in the buildings. By integrating all these in GIS platform, final risk map for each of the hazard under study were generated.

The risk assessment, which combines information on the nature of hazard with information on vulnerability of the targets, will help to clarify decision making for disaster management and the development of mitigation strategies.

To assure the quality of the data base generated under the project, an advisory committee was constituted taking experts from various Organizations like Geological Survey of India (GSI), National Remote Sensing Centre (NRSC), Regional Remote Sensing Centre (RRSC), Space Applications Centre (SAC), Indian Institute of Technology Guwahati (IIT-G), National Institute of Technology (NIT) and Universities.

Annexure – 'H'

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PROJECT REPORT

ON

SUB-SOIL INVESTIGATION

PROJECT

"CONSTRUCTION OF MAA KAMAKHYA ACCESS CORRIDOR"

AT

THE PARKING FIELD OF

KAMAKHYA TEMPLE COMPLEX,

KAMAKHYA, GUWAHATI

✡✡✡✡✡✡

Consultant:-

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-: CONTENTS :-

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-: CHAPTER – 1 :-

-: *Introduction* :-

Subsoil investigation was carried out for the site of the project *"Construction of Maa Kamakhya Access Corridor" at the parking field of Kamakhya Temple Complex, Kamakhya, Guwahati* to find out the Engineering properties of soil and strength.

This report consists of details of field investigation and laboratory analysis along with the rational interpretation of test results to find out the safe bearing capacity of soil and type of foundation to be adopted. Four vertical boreholes were drilled up to refusal level as preliminary borehole to cover up the construction area at parking field. The fieldwork was carried out from 15th September, 2023 to 16th September, 2023 . All the field investigation and laboratory tests were conducted as per I.S. specifications. More boreholes are suggested for better recommendation of type of foundation during the time of structural design.

Field tests :-

First reconnaissance survey was done on the site to locate the suitable points for boring. Our boring points are shown in the site plan attached with this report. Four boreholes were drilled by using posthole type augur boring technique up to a depth of 2.00m from ground level and the remaining depths of the boreholes were drilled by wash boring technique operated by manpower. Casings were used in the boreholes to prevent failure of soil in to the holes. Boreholes up to refusal level are drilled to collect disturbed and undisturbed sample from suitable and regular interval of depth. Standard Penetration Tests (S.P.T.) were also conducted on the boreholes by using split spoon sampler having internal diameter of 35mm as per I.S. 2131-1963. During the boring operation subsoil water level was recorded with respect to the ground level.

Standard Penetration Test (S.P.T) :-

Standard Penetration Test requires one drop hammer of 63.5Kg weight, a string of drill rods (A-type rods of 41.27mm OD and 28.57mm ID) of suitable length, casing, one split spoon sampler, one guide to transfer the impulse load from drop hammer to the drill rods and a mechanism to elevate the load and to release the same on the drill rods.

First the sampler is driven into the borehole with the drill rods to the required depth, at which we are going to take the S.P.T. value. The sampler is first driven in to the soil by light blows of hammer to a seating penetration of 15cm. Then the sampler is driven under full blows of the 63.5Kg hammer falling from a height of 75cm, to an additional penetration of 30cm and the no. of blows are recorded as the 'Standard Penetration Resistance' N-value.

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Disturbed samples :-

It is a sample which preserves the particle size distribution of the in situ soil, but in which the soil structure is significantly or completely disturbed. Disturbed samples are mainly required for identification and classification tests or for determining the properties of remolded soil.

Undisturbed samples :-

It is a sample that represents as closely as practicable the true in situ structure and moisture content of the soil. Undisturbed samples are required mainly for shear strength, consolidation and permeability tests.

Collection of disturbed and undisturbed samples :-

Disturbed or representative soil samples are reasonably collected from augur, cutting shoe of undisturbed sample, split spoon sampler and free fragment of materials washed up during wash boring process in each strata. The soil samples as recovered were collected, labeled depth wise and places in polythene bags, so that no reduction in moisture content of the samples can occur before the laboratory tests.

Undisturbed soil samples were recovered by using thin walled sampling tubes as per I.S. 1932-1963 specification, which can be connected with the split spoon sampler. The sampler is driven in to the soil with drill rods to required depth at which undisturbed sample are required. Taking out the sampler from soil, undisturbed soil sample can be recovered from the sampling tubes in the laboratory with the help of extractor. The sampling tubes are carried to the laboratory preserving it in the polythene bags.

Laboratory Tests :-

The following laboratory tests were performed on soil samples collected from boreholes at various depths.

From disturbed samples :-

1. Grain size analysis by sieves for classification of soil.
2. Determination of specific gravity of soil.
3. Atterberg's limits, i.e. Plastic limit and Liquid limit of the soil samples.
4. In situ moisture content of soil samples,
5. Determination of bulk density, submerged density, saturated density and dry density.
6. Determination of void ratio and porosity.

(b) From undisturbed samples :-

1. Triaxial Shear Test.
2. Unconfined Compressive strength test.
3. Consolidation test.

****

NOTES:-

1. ALL DIMENSIONS ARE IN METRES.
2. ALL DIMENSIONS ARE TO BE READ AND NOT MEASURED.
3. ALL LEVELS ARE IN METERS.
4. GRID DIMENSIONS AND PLOT LINES ARE TO BE STRICTLY ADHERED TO.
5. ALL LEVELS INCLUDING FLOOR LEVELS, CILL & LINTEL LEVELS, LANDING LEVELS, PARAPET HEIGHT/ LEVELS, LEVELS OF HORIZONTAL PROJECTION & BONDS INCLUDING ANY SURFACE FEATURES INDICATED IN THE DRAWINGS ARE TO BE STRICTLY ADHERED TO

MARK	DATE	DESCRIPTION

CLIENT-

MEP CONSULTANT-

STRUCTURE CONSULTANT-

ARCHITECTS-

DESIGN ASSOCIATES INC.
ARCHITECTURE
A-163, Sector-136, Noida 201301
PH :0120-2428600, Fax :0120-4778530
e-mail: ujjalray.tiwari@designassociates.in

PROJECT-

MAA KAMAKHYA TEMPLE
ACCESS CORRIDOR

DRAWING TITLE-

SITE EXTENT WITH COORDINATES (old on revised superimposed)

DRAWING PURPOSE-

CONCEPT DRAWING

JOB NO -	DWG. REF. NO.-	DATE-
D1161	—	20-05-2023
SCALE-	REVISION-	DATE OF ISSUE-
NTS	R1	26-08-2023

DWG. NO -
D1161/WD/AR/101

NORTH-	SHEET SIZE-	SHEET NO-
N	A1	01/01
	DRAWN BY-	CHECKED BY-
		CS

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-: CHAPTER-2 :-

-: Field Investigation :-

Introduction :-

The site is basically plain in terrain and also one part of the world's most seismically active regions. The site is under seismic zone-V of India as per I.S. 1893(Part-I):2002 and the seismic zone factor, Z is 0.36. So, it is important for the structural designers to give adequate consideration to this sensitive fact while designing the structure.

Ground Water Level :-

Ground water level is not in the range of borehole depth for the borehole.

Sample Collection :-

Disturbed samples are collected at every 1.50m depth and are labeled. Undisturbed samples are also collected at every 1.5m depth or at change in soil strata, whichever is found earlier.

S.P.T. Test :-

Standard Penetration Test is done in the boreholes for every 1.50m depth up to the refusal level. The S.P.T. value found from the site is varies from 5 to refusal for Borehole-1, 5 to refusal for Borehole-2, 4 to refusal for Borehole-3 and 3 to refusal for Borehole-4.

the borehole charts are shown in the next page with all details found in the site.

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BORE HOLE CHART

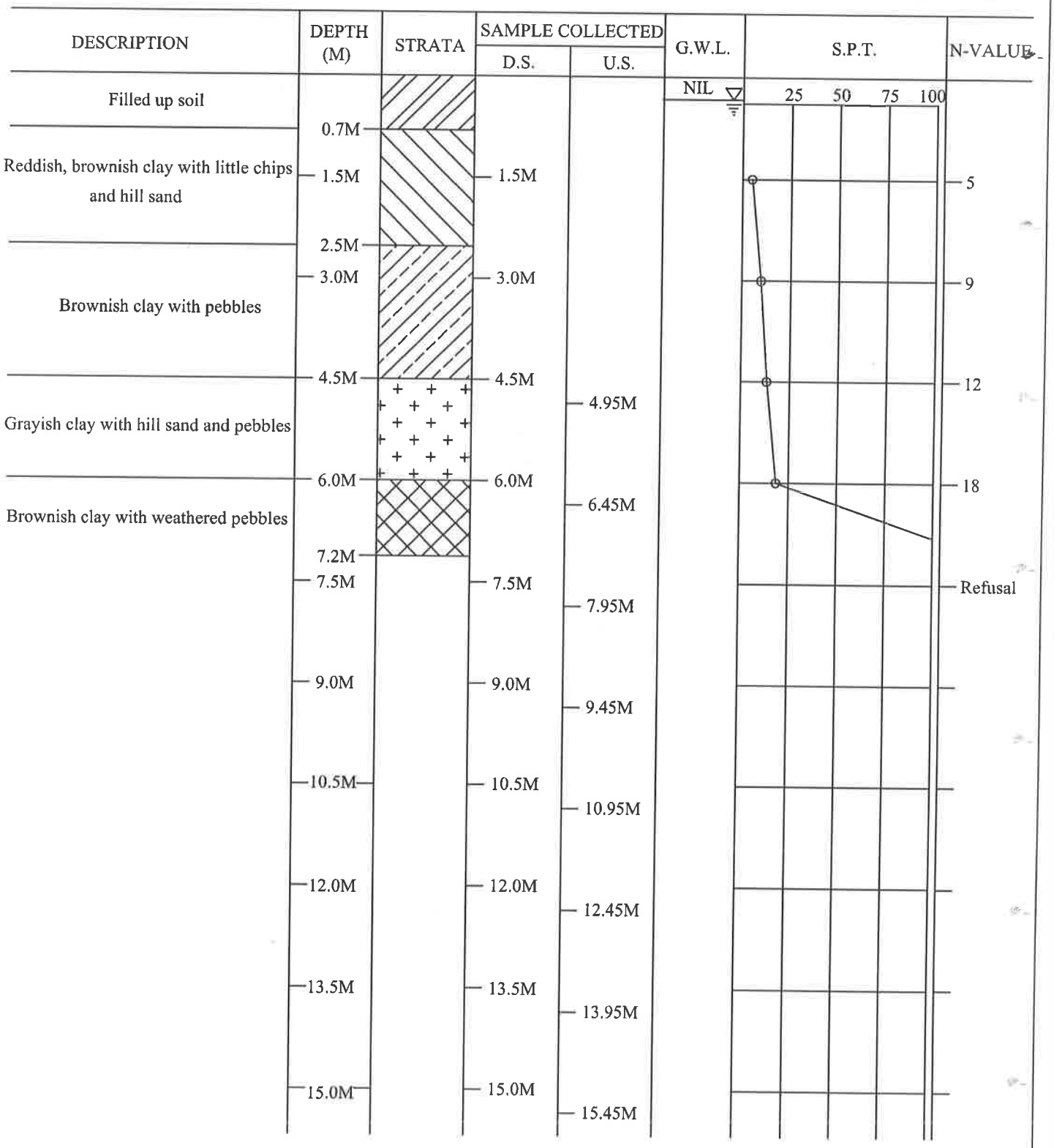
BORE HOLE NO. :- 1

Name of project :- Subsoil Investigation for the site of the Construction of Maa Kamakhya Access Corridor at Kamakhya, Guwahati

TYPE OF BORING :- AUGER & WASH

DATE STARTED :- 15.09.2023

DATE COMPLETED :-15.09.2023



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BORE HOLE CHART

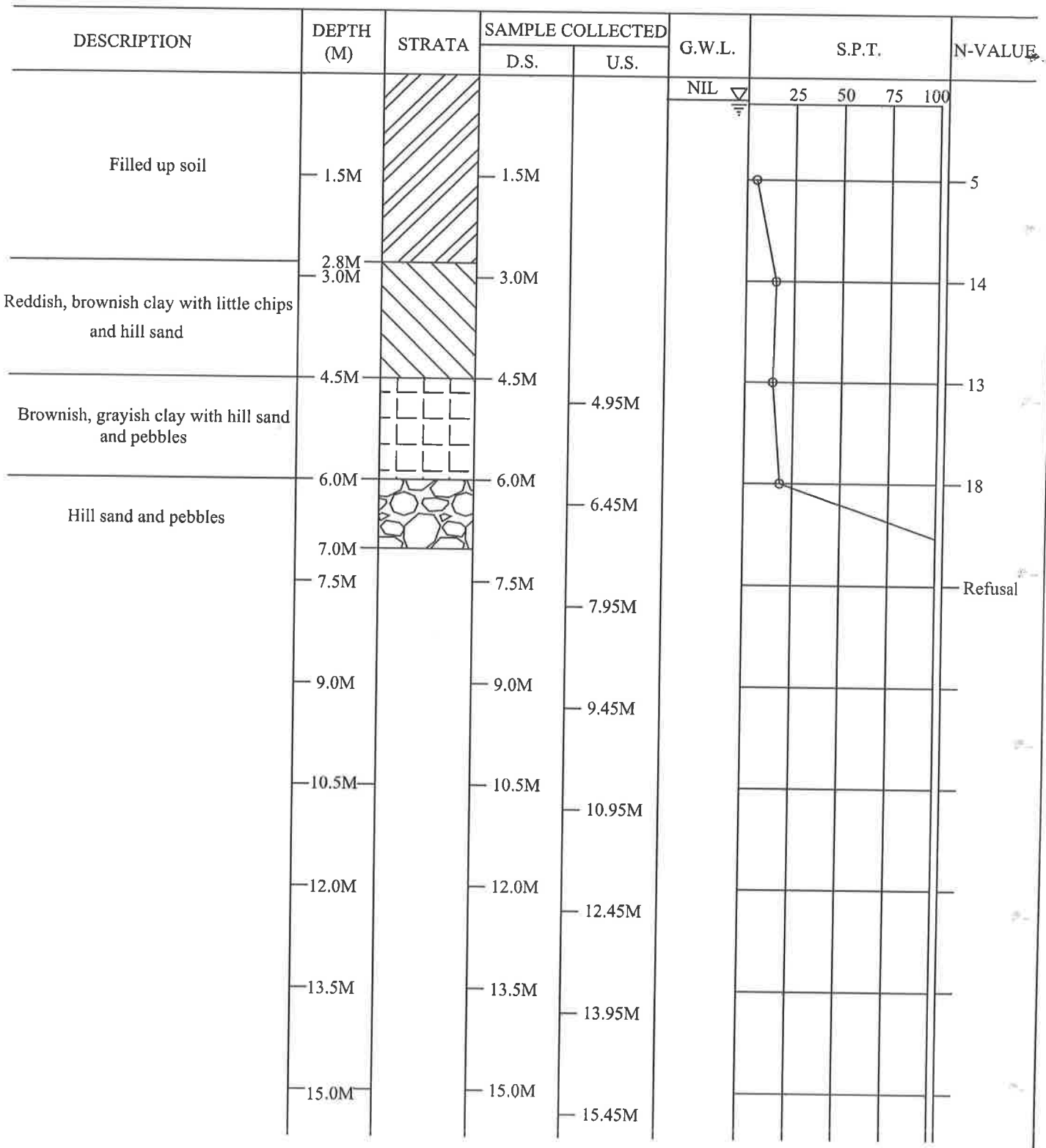
BORE HOLE NO. :- 2

Name of project :- Subsoil Investigation for the site of the Construction of Maa Kamakhya Access Corridor at Kamakhya, Guwahati

TYPE OF BORING :- AUGER & WASH

DATE STARTED :- 15.09.2023

DATE COMPLETED :-15.09.2023



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BORE HOLE CHART

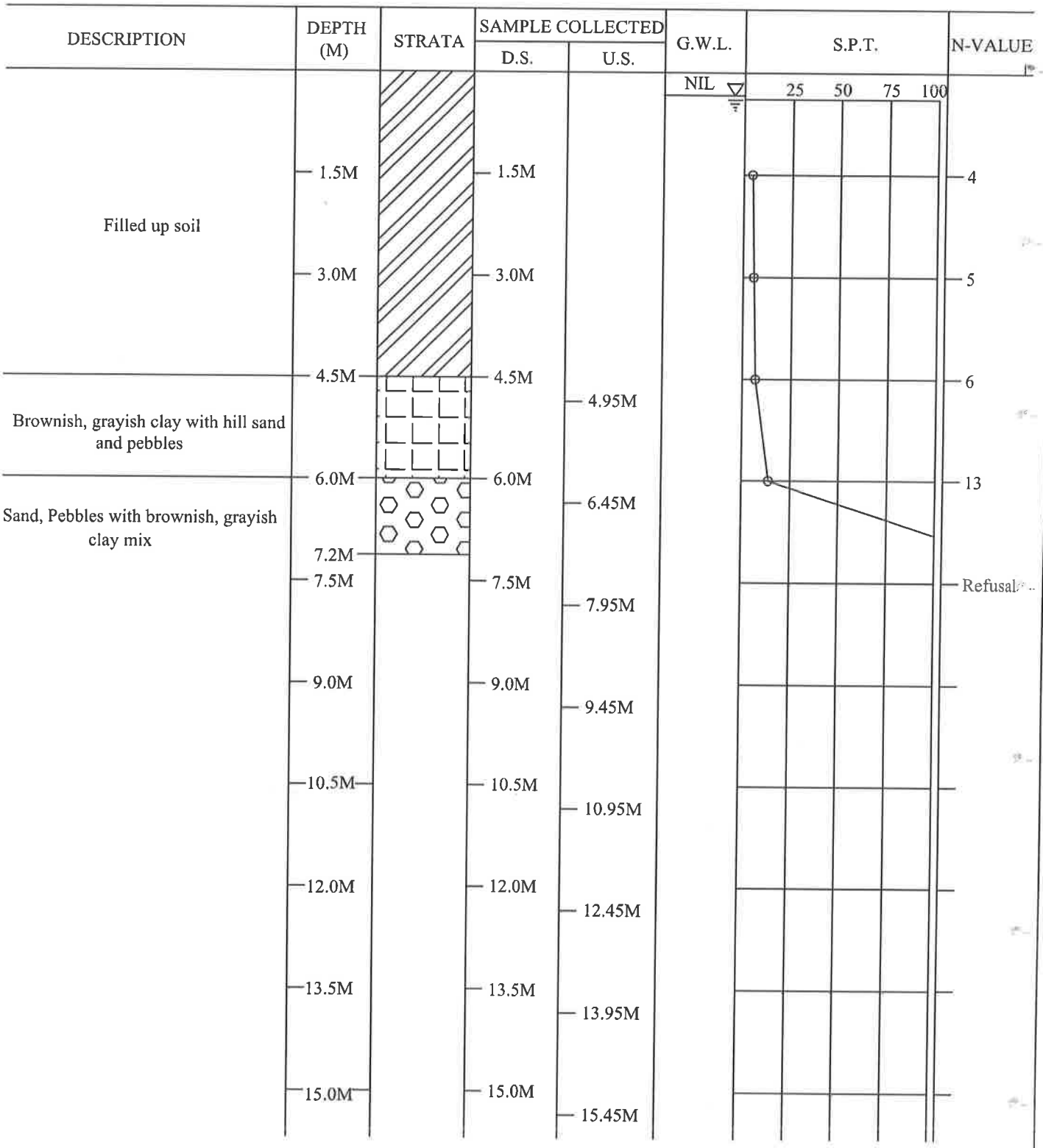
BORE HOLE NO. :- 3

Name of project :- Subsoil Investigation for the site of the Construction of Maa Kamakhya Access Corridor at Kamakhya, Guwahati

TYPE OF BORING :- AUGER & WASH

DATE STARTED :- 16.09.2023

DATE COMPLETED :-16.09.2023



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BORE HOLE CHART

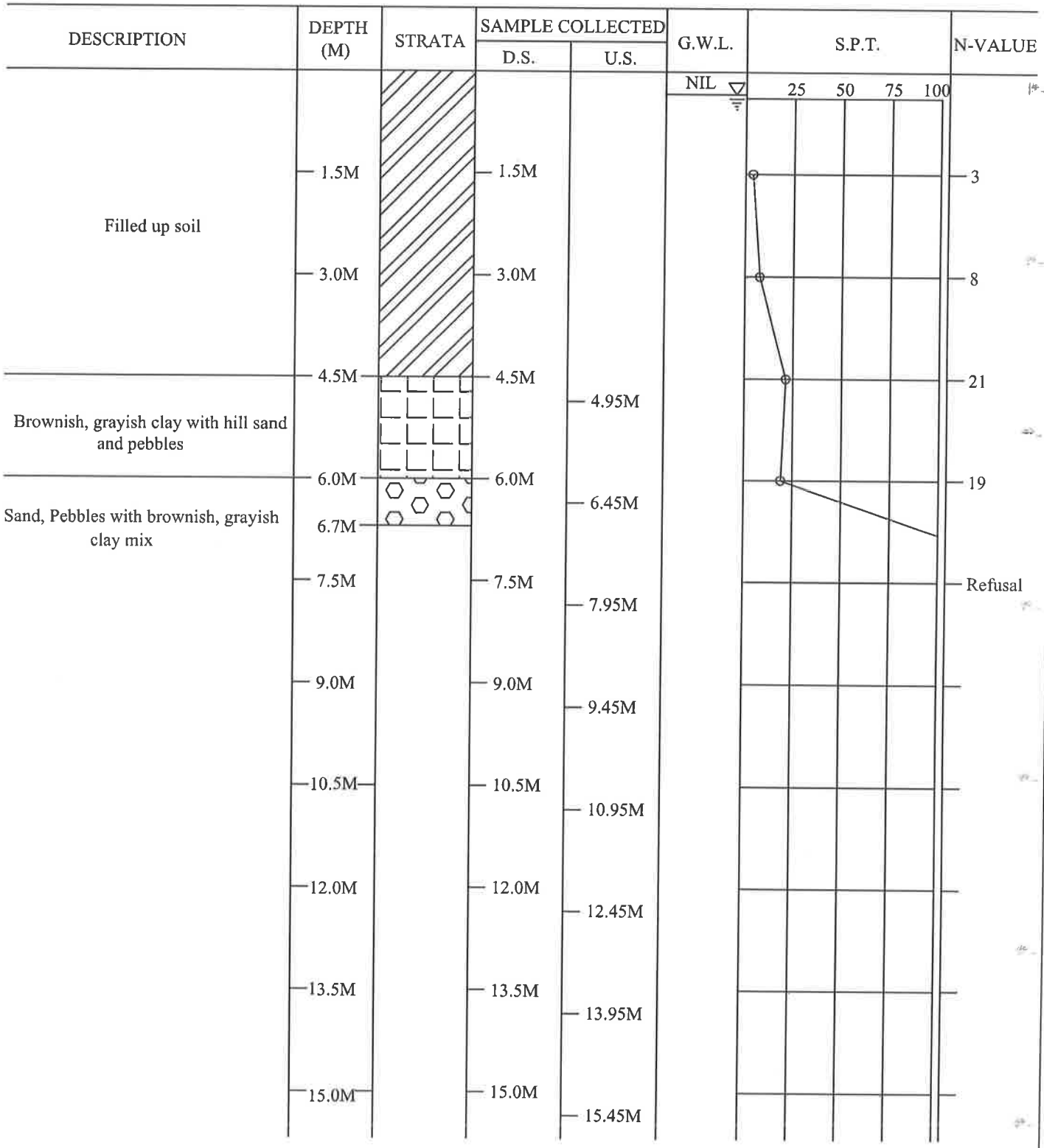
BORE HOLE NO. :- 4

Name of project :- Subsoil Investigation for the site of the Construction of Maa Kamakhya Access Corridor at Kamakhya, Guwahati

TYPE OF BORING :- AUGER & WASH

DATE STARTED :- 16.09.2023

DATE COMPLETED :-16.09.2023



-: CHAPTER-3 :-

-: *Laboratory Investigation* :-

The samples collected from the borehole are taken in to laboratory with proper in situ moisture content and properties. In the laboratory the following tests are done to find the physical and shear properties of the samples.

-: TABLE-1 :-

-: PHYSICAL PROPERTIES (BOREHOLE NO.-1):-

Depth In 'm'	Specific Gravity	In situ Moisture Content (%)	Bulk Density (gm/cm^3)	Submerged Density (gm/cm^3)	Saturated Density (gm/cm^3)	Dry Density (gm/cm^3)	Void Ratio (e)	Porosity in % (n)
1.5m	2.656	30.25	1.98	0.95	1.95	1.52	0.75	42.77
3.0m	2.658	30.40	1.99	0.95	1.95	1.53	0.74	42.59
4.5m	2.659	30.55	1.99	0.95	1.95	1.52	0.74	42.67
6.0m	2.660	30.75	1.99	0.95	1.95	1.52	0.75	42.78

-: TABLE-2 :-

-: PHYSICAL PROPERTIES (BOREHOLE NO.-2):-

Depth In 'm'	Specific Gravity	In situ Moisture Content (%)	Bulk Density (gm/cm^3)	Submerged Density (gm/cm^3)	Saturated Density (gm/cm^3)	Dry Density (gm/cm^3)	Void Ratio (e)	Porosity in % (n)
1.5m	-	-	-	-	-	-	-	-
3.0m	2.657	30.45	1.98	0.95	1.95	1.52	0.75	42.87
4.5m	2.657	30.40	1.98	0.95	1.95	1.52	0.75	42.85
6.0m	2.659	30.70	1.99	0.95	1.95	1.52	0.75	42.74

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-: TABLE-3 :-

-: PHYSICAL PROPERTIES (BOREHOLE NO.-3):-

Depth In 'm'	Specific Gravity	In situ Moisture Content (%)	Bulk Density (gm/cm^3)	Submerged Density (gm/cm^3)	Saturated Density (gm/cm^3)	Dry Density (gm/cm^3)	Void Ratio (e)	Porosity in % (n)
1.5m	-	-	-	-	-	-	-	-
3.0m	-	-	-	-	-	-	-	-
4.5m	2.657	30.85	1.99	0.95	1.95	1.52	0.75	42.76
6.0m	2.656	30.75	1.99	0.95	1.95	1.52	0.75	42.70

-: TABLE-4 :-

-: PHYSICAL PROPERTIES (BOREHOLE NO.-4):-

Depth In 'm'	Specific Gravity	In situ Moisture Content (%)	Bulk Density (gm/cm^3)	Submerged Density (gm/cm^3)	Saturated Density (gm/cm^3)	Dry Density (gm/cm^3)	Void Ratio (e)	Porosity in % (n)
1.5m	-	-	-	-	-	-	-	-
3.0m	-	-	-	-	-	-	-	-
4.5m	2.655	30.25	1.98	0.95	1.95	1.52	0.75	42.74
6.0m	2.658	30.50	1.98	0.95	1.95	1.52	0.75	42.92

-: TABLE-5 :-

-: ATTERBERG'S CONSISTANCY LIMIT :-

-: BOREHOLE NO. –1 :-

Depth In 'm'	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)
1.50m	39.30	25.75	13.55
3.00m	39.40	25.65	13.75
4.50m	39.50	25.55	13.95
6.00m	39.60	25.40	14.20

-: TABLE-6 :-

-: ATTERBERG'S CONSISTANCY LIMIT :-

-: BOREHOLE NO. –2 :-

Depth In 'm'	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)
1.50m	-	-	-
3.00m	39.45	25.65	13.80
4.50m	39.40	25.70	13.70
6.00m	39.65	25.35	14.30

-: TABLE-7 :-

-: ATTERBERG'S CONSISTANCY LIMIT :-

-: BOREHOLE NO. –3 :-

Depth In 'm'	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)
1.50m	-	-	-
3.00m	-	-	-
4.50m	39.30	25.75	13.55
6.00m	39.45	25.55	13.90

-: TABLE-8 :-

-: ATTERBERG'S CONSISTANCY LIMIT :-

-: BOREHOLE NO. –4 :-

Depth In 'm'	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)
1.50m	-	-	-
3.00m	-	-	-
4.50m	39.75	25.25	14.50
6.00m	39.60	25.35	14.25

-: TABLE-9 :-

-: SIEVE ANALYSIS (BOREHOLE NO.-1) :-

(MECHANICAL ANALYSIS) :-

Depth In 'm'	Clay (%) (0.002mm down)	Silt (%) (0.002mm to 0.075mm)	Sand (%) (0.075mm to 4.75mm)	Classification As per I.S.
3.00m	43%	30%	27%	CL
4.50m	45%	27%	28%	CL
6.00m	48%	22%	30%	CL

-: TABLE-10 :-

-: SIEVE ANALYSIS (BOREHOLE NO.-2) :-

(MECHANICAL ANALYSIS) :-

Depth In 'm'	Clay (%) (0.002mm down)	Silt (%) (0.002mm to 0.075mm)	Sand (%) (0.075mm to 4.75mm)	Classification As per I.S.
3.00m	45%	30%	25%	CL
4.50m	44%	30%	26%	CL
6.00m	48%	23%	29%	CL

-: TABLE-11 :-

-: SIEVE ANALYSIS (BOREHOLE NO.-3) :-

(MECHANICAL ANALYSIS) :-

Depth In 'm'	Clay (%) (0.002mm down)	Silt (%) (0.002mm to 0.075mm)	Sand (%) (0.075mm to 4.75mm)	Classification As per I.S.
4.50m	43%	32%	25%	CL
6.00m	47%	26%	27%	CL

-: TABLE-12 :-

-: SIEVE ANALYSIS (BOREHOLE NO.-4) :-

(MECHANICAL ANALYSIS) :-

Depth In 'm'	Clay (%) (0.002mm down)	Silt (%) (0.002mm to 0.075mm)	Sand (%) (0.075mm to 4.75mm)	Classification As per I.S.
4.50m	44%	29%	27%	CL
6.00m	45%	30%	25%	CL

-: TABLE-13 :-

-: SHEAR PROPERTIES (BOREHOLE NO. 1) :-

Depth In 'm'	Void ratio (e)	Porosity (n) in %	Saturated density (gm/cm^3)	Cohesion 'C' (Kg/cm^2)	Angle of Internal Friction 'ϕ' (in degree)
1.5m	0.75	42.77	1.95	0.39	16.0^0
3.0m	0.74	42.59	1.95	0.45	18.0^0
4.5m	0.74	42.67	1.95	0.50	19.0^0
6.0m	0.75	42.78	1.95	0.61	20.0^0

-: TABLE-14 :-

-: SHEAR PROPERTIES (BOREHOLE NO. 2) :-

Depth In 'm'	Void ratio (e)	Porosity (n) in %	Saturated density (gm/cm^3)	Cohesion 'C' (Kg/cm^2)	Angle of Internal Friction 'ϕ' (in degree)
1.5m	-	-	-	-	-
3.0m	0.75	42.87	1.95	0.55	19.0^0
4.5m	0.75	42.85	1.95	0.53	18.5^0
6.0m	0.75	42.74	1.95	0.61	20.0^0

-: TABLE-15 :-

-: SHEAR PROPERTIES (BOREHOLE NO. 3) :-

Depth In 'm'	Void ratio (e)	Porosity (n) in %	Saturated density (gm/cm^3)	Cohesion 'C' (Kg/cm^2)	Angle of Internal Friction 'ϕ' (in degree)
1.5m	-	-	-	-	-
3.0m	-	-	-	-	-
4.5m	0.75	42.76	1.95	0.41	16.5^0
6.0m	0.75	42.70	1.95	0.52	18.5^0

-: TABLE-16 :-

-: SHEAR PROPERTIES (BOREHOLE NO. 4) :-

Depth In 'm'	Void ratio (e)	Porosity (n) in %	Saturated density (gm/cm^3)	Cohesion 'C' (Kg/cm^2)	Angle of Internal Friction 'ϕ' (in degree)
1.5m	-	-	-	-	-
3.0m	-	-	-	-	-
4.5m	0.75	42.74	1.95	0.67	20.0^0
6.0m	0.75	42.92	1.95	0.63	19.0^0

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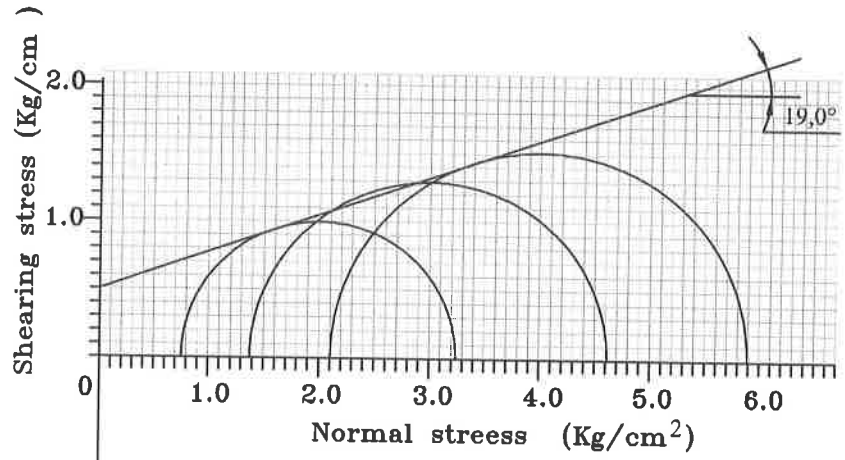
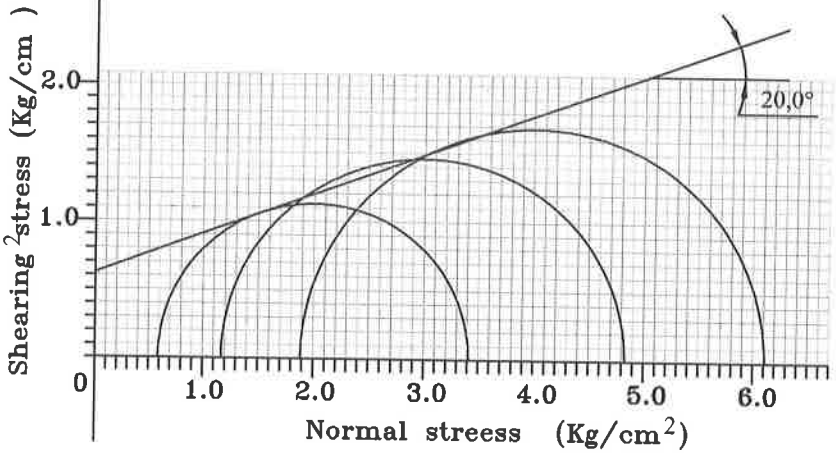
SHEAR PROPERTIES FROM TRIAXIAL TEST
BOREHOLE NO. –01



Bore Hole No.–01
Depth :– 4.95 m
Cohesion 'C' = 0.50 Kg/cm ^{2}
Angle of Internal Friction'ϕ'=19.0^0



Bore Hole No.–01
Depth :– 6.45 m
Cohesion 'C' = 0.61 Kg/cm ^{2}
Angle of Internal Friction'ϕ'=20.0^0

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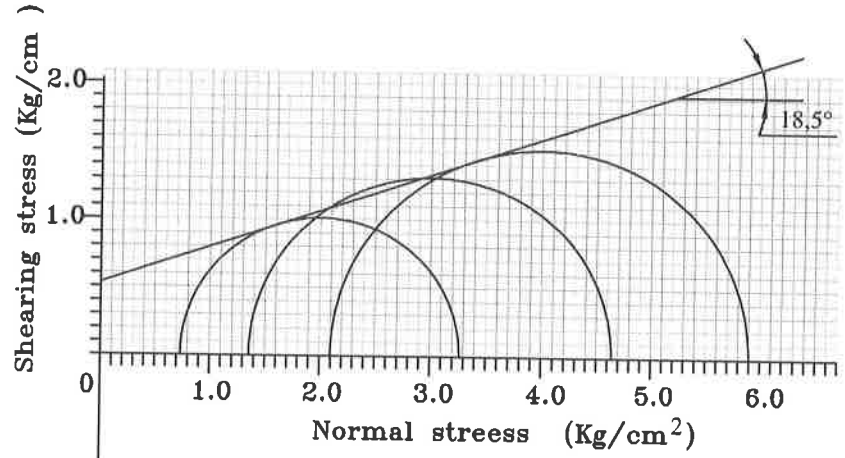
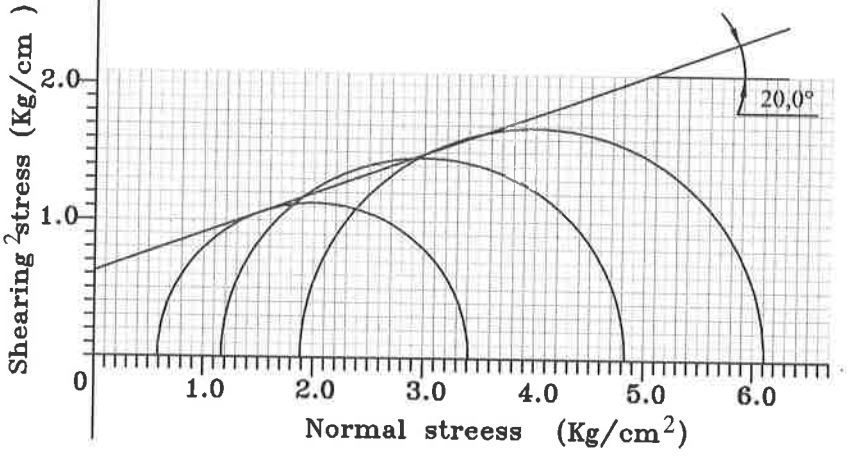
SHEAR PROPERTIES FROM TRIAXIAL TEST
BOREHOLE NO. –02



Bore Hole No.–02
Depth :– 4.95 m
Cohesion 'C' = 0.53 Kg/cm ^{2}
Angle of Internal Friction'ϕ'=18.5^0



Bore Hole No.–02
Depth :– 6.45 m
Cohesion 'C' = 0.61 Kg/cm ^{2}
Angle of Internal Friction'ϕ'=20.0^0

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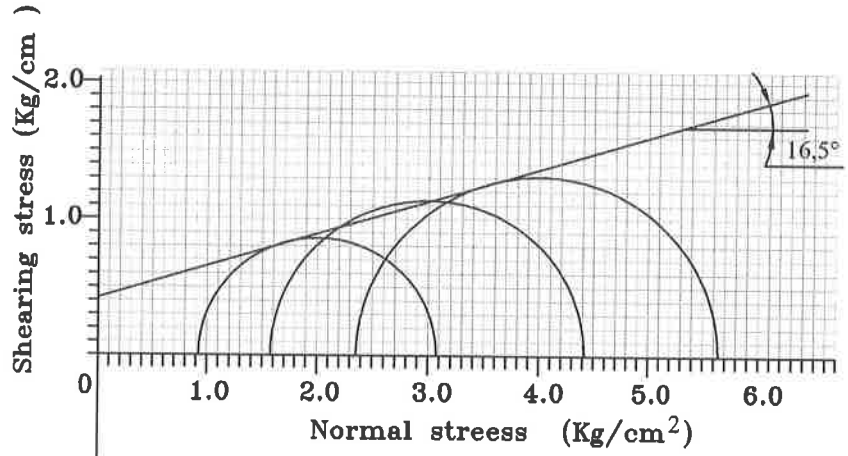
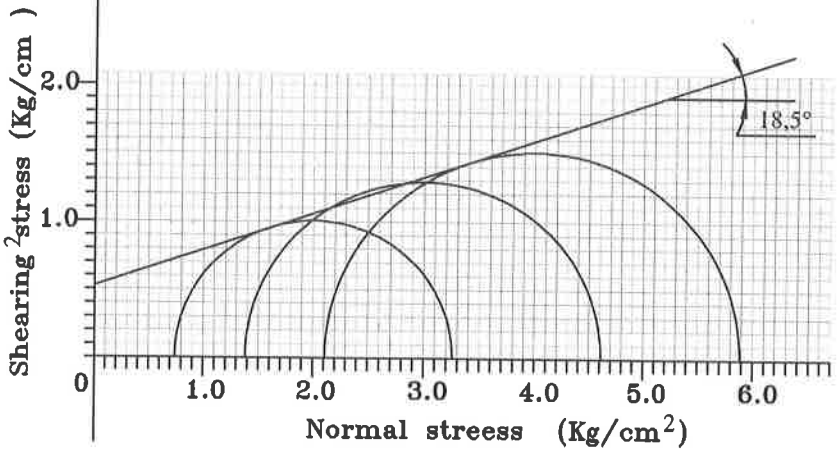
SHEAR PROPERTIES FROM TRIAXIAL TEST
BOREHOLE NO. –03



Bore Hole No.–03
Depth :– 4.95 m
Cohesion 'C' = 0.41 Kg/cm ^{2}
Angle of Internal Friction'ϕ'=16.5^0



Bore Hole No.–03
Depth :– 6.45 m
Cohesion 'C' = 0.52 Kg/cm ^{2}
Angle of Internal Friction'ϕ'=18.5^0

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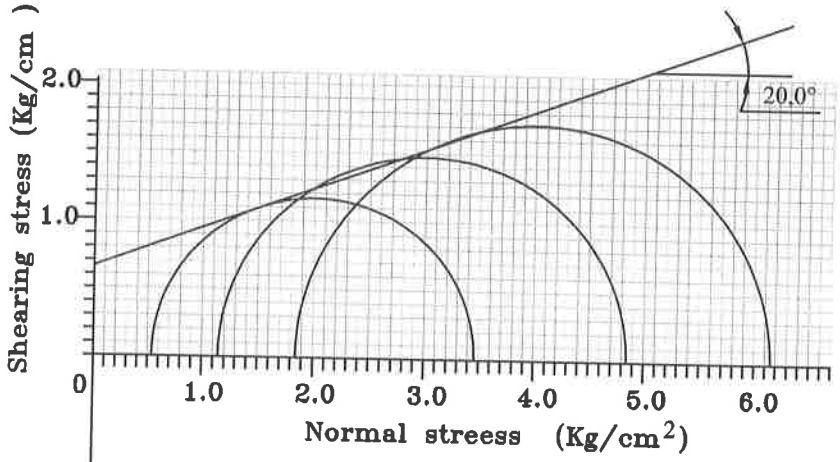
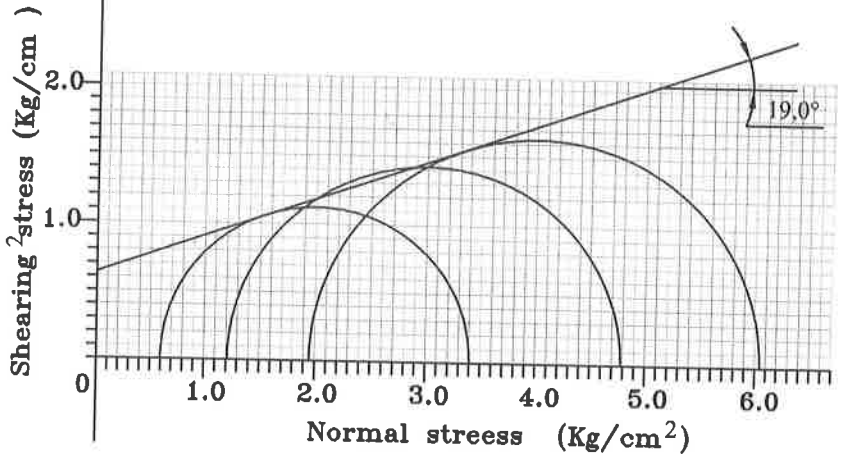
SHEAR PROPERTIES FROM TRIAXIAL TEST
BOREHOLE NO. –04



Bore Hole No.–04
Depth :– 4.95 m
Cohesion 'C' = 0.67 Kg/cm ^{2}
Angle of Internal Friction'ϕ'=20.0^0



Bore Hole No.–04
Depth :– 6.45 m
Cohesion 'C' = 0.63 Kg/cm ^{2}
Angle of Internal Friction'ϕ'=19.0^0

-: CHAPTER-4 :-

-: *Theory for Calculation of Bearing Capacity* :-

The bearing capacity of soil at various depths can be calculated by using relationships between, a) C-ϕ value of soil getting from triaxial shear test, b) N-value from Standard Penetration Test taken from site and they are checked for settlement criterion.

a) From C-ϕ value of soil :-

i) For shallow foundation :-

The safe bearing capacity q_s may be computed from the following equations based as Terzaghi's analysis:

i) For strip footing,

$$q_s = 1/F\ [cN_c + \gamma.D.(N_q-1).R_{w1} + 0.5\gamma.B.N_\gamma.R_{w2}] + \gamma.D \quad \text{.....(a)}$$

ii) For square footing,

$$q_s = 1/F\ [1.3cN_c + \gamma.D.(N_q-1).R_{w1} + 0.4\gamma.B.N_\gamma.R_{w2}] + \gamma.D \quad \text{.....(b)}$$

iii) For circular footing,

$$q_s = 1/F\ [1.3cN_c + \gamma.D.(N_q-1).R_{w1} + 0.3\gamma.B.N_\gamma.R_{w2}] + \gamma.D \quad \text{..... ... ...(c)}$$

iv) For rectangular footing,

$$q_s = 1/F\ [cN_c(1+0.3\,{}^{B}/_{L}) + \gamma.D.(N_q-1).R_{w1} + 0.5\gamma.B.N_\gamma.(1-0.2\,{}^{B}/_{L})R_{w2}] + \gamma.D \ \text{...(d)}$$

where,

D = Depth of footing,

B = Width of footing (strip or square) or diameter of circular footing,

L = Length of footing;

N_c, N_q, N_γ = Bearing capacity factors for general shear failure. For local shear failure N_c', N_q', N_γ' should be used.

R_{w1} & R_{w2} = Water reduction factors,

$R_{w1} = 0.5(1 + Z_{w1}/D)$

$R_{w2} = 0.5(1 + Z_{w2}/B)$

F = Factor of safety (2 to 3).

Again for **strip footing** we can apply the **I.S. code** method according to I.S. 6403-1981. In this method equations are given as,

i) For the case of general shear failure :

$$q_s = q_{nf}/F = 1/F\ [cN_c + \sigma.(N_q-1) + 0.5B\gamma.N_\gamma] \quad \text{.....(e)}$$

ii) For the case of local shear failure :

$$q_s = q_{nf}/F = 1/F\ [0.67cN_c' + \sigma.(N_q'-1) + 0.5B\gamma.N_\gamma] \quad \text{.....(f)}$$

For N_c, N_q, N_γ & N_c , N_q , N_γ values refer **Table-1** of I.S. 6403-1981.

ii) For deep foundation :-

The ultimate load capacity of under-reamed piles at higher depth can be calculated as per **clause 5.2.3.1** of **I.S. 2911(Part-III)-1980** for clayey and sandy soils. The expressions are given as,

i) For clayey soils :

$$Q_u = A_p.N_c.C_p + A_a.N_c.C'_a + C'_a.A'_s + \alpha.C_a.A_s \quad \text{.......................................(g)}$$

ii) For sandy soil :

$$Q_u = A_p.(0.5D.\lambda.N_\lambda + \lambda.d_f.N_q) + A_a(0.5D_u.n.\lambda N_\lambda + \lambda.N_q.\sum_{r=1}^{r=n} dr) + 0.5\pi.D.\lambda.K.\tan\delta \times (d_1^2 + d_f^2 + d_n^2) \quad \text{.................(h)}$$

The letter symbols are as per I.S. code.

In soil strata having both cohesion and friction or in layered strata having two types of soil, the bearing capacity may be estimated using both the formulae. However, in such cases the load test will be a better guide.

b) <u>From N-value of soil getting from S.P.T.</u> :-

The observed value of N has to be corrected for i) submergence correction and ii) overburden pressure correction.

(i) <u>Submergence correction</u> :-

In very fine or silty sand, situated bellow the water table, an apparent increase in penetration resistance occurs. Tarzaghi and Peck have recommended the use and equivalent penetration resistance N_e in place of actually observed N, when N is greater than 15. N_e is given by the following relation :

$$N_e = 15 + 0.5(N-15) \quad \text{...(i)}$$

(ii) <u>Overburden pressure correction</u> :-

For a constant density index the N-value increase with increasing effective overburden pressure for which correction have been proposed by Gibbs and Holtz, peck, Thornburn, Whitman and others.

Peck (1974) proposed that N-values be reported at a reference overburden pressure of $100 KN/m^2$, and the normalized value of N (corrected for overburden pressure) be expressed as follows :

$$N_0 = c_n . N$$

Where, N_o = Corrected value for overburden effect,

N = Actual values (observed),

c_n = Normalizing factor ,

$= 0.77 \times \log_{10} \frac{2000}{\sigma'}$, where, σ' = Effective overburden pressure (KN/m^2)

The empirical relationship for determination of bearing capacity From corrected N-value is given by the equation :

$$q_\rho = 35(N-3).[(B+0.3)/2B]^2.R_{w2}.R_d \ KN/m^2 \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (k)$$

where, q_ρ= allowable net increase in soil pressure over existing soil pressure for settlement of 25mm.

N = corrected N-value,

B = width of footing (or least lateral dimensions) in meter,

ρ = permissible settlement of 25mm,

R_{w2} = water reduction factor = $0.5[1+(Z_{w2}/B)]$

R_d = depth factor = $[1+(0.2.D/B)] \leq 1.20$

c) <u>Permissible settlement</u> :-

The vertical downward movement of the base of a structure is called settlement and its effect upon the structure depends on its magnitude, its uniformity, the length of the time over which it takes place and the nature of the structure itself. The following allowable maximum settlement values are suggested for different types of buildings :

Type of structure	*Allowable maximum settlement (mm)*
a) Commercial & Industrial Buildings	..... 25mm
b) Industrial Buildings	..... 38mm
c) Warehouses	..... 50mm
d) Special machinery foundations	..... Often less than 0.5mm

The consolidation settlement S_c can be computed from the following equation :

$$S_c = C.\frac{C_c}{1+e_0}.H.\log_{10}\frac{(\sigma_0+\Delta\sigma)}{\sigma_0} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (l)$$

where, σ_0 = effective initial overburden pressure due to soil overburden, measured at the center of the layer,

$\Delta\sigma$ = vertical stress increment due to footing load, at the center of the layer,

C_c = compression index = $0.009(w_L-10)$,

w_L = liquid limit of the soil,

e_0 = initial void ratio,

H = thickness of compressible layer,

C = a coefficient or correction factor depending upon the geometry of footing and the history of loading. (For clay it is 1.00)

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-: CHAPTER-5 :-

-: *Calculation of Bearing Capacity* :-

It is suitable from economic point of view to place shallow foundation within the depth of maximum 4.0m if required due to low bearing capacity. If the soil condition is much poorer then we have to go for either soil improvement technique or deep foundation whichever is economic. For calculation of bearing capacity, we adopt the methods and equations as described in **chapter-4**

Table-17 : Load Carrying Capacity for General pile of different diameters :

Length and dia. / Bore Hole no.	6.00m length		7.00m length	
	400mm dia. (in KN)	500mm dia. (in KN)	400mm dia. (in KN)	500mm dia. (in KN)
B.H.-01	172.64	247.22	234.93	340.79
B.H.-02	166.73	239.82	228.03	332.16
B.H.-03	142.32	209.31	209.60	312.27
B.H.-04	156.00	226.42	215.51	316.52
Adopted safe load capacity	140.00	210.00	210.00	310.00

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-: CHAPTER-6 :-

-: *Recommendation of foundation* :-

From careful study of test results obtained both from field investigation and laboratory analysis as described in the previous chapters, the following conclusions can be made for better results.

1. As per the site data and above analysis, it is observed that the parking field site of Maa Kamakhya Temple Complex is consists of filled up soil up to maximum 4.50m depth. Hence it will be wise not to rest shallow foundation for any structures on this variable loose filled up strata soil stratum.
2. From the above analysis data, for higher loading structures we can adopt ***R.C.C. general piles, as described in Table-17 with 500mm diameter and a length of 8.00m or up to refusal level with safe load carrying capacity is 370.00KN***. *The load capacity can be increased by 25% for seismic load condition as per I.S. 1893 (Part-1) : 2002 (clause 6.3.5.2),, i.e. the safe load carrying capacity will be 462.50KN.*
3. The cut off level for pile cap should be at a depth of 1.20m from G.L.
4. Depth of fixity for the piles may be taken as 4.5m maximum for design purpose.
5. For better result, **Pile Load Test** should be carried out to get actual load carrying capacity within the limit of permissible settlement

For ANKAN- The Design Desk

ANKAN - The Design Desk Dt..... Guwahati-24

Engineer in charge

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Annexure - 'I'

Gmail

Rajeev Bhattacharyya <rajkrbhat@gmail.com>

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Kamakhya Corridor Project

1 message

Rajeev Bhattacharyya <rajkrbhat@gmail.com>
To: membersecretary@pcbassam.org

23 July 2025 at 12:53

To
The Member Secretary
State Environment Impact Assessment Authority (SEIAA)
Assam State Pollution Control Board
Bamunimaidam, Guwahati – 781021
Assam, India

Date: 23 - 07 - 2025

Subject: Objection to the Kamakhya Corridor Project Proceeding Without Mandatory Environmental Impact Assessment (EIA)

Respected Sir/Madam,

I write to you as a concerned citizen under my constitutional and statutory right to a clean and ecologically sustainable environment, to formally challenge the progression of the Kamakhya Corridor project in Guwahati without the mandatory Environmental Impact Assessment (EIA) as required under the Environmental Impact Assessment Notification, 2006 and its subsequent amendments.

The Kamakhya Corridor project, by its very nature and scale, involves large-scale construction activity, land excavation, hill-cutting, and potential deforestation in a geologically sensitive and ecologically fragile zone — the Nilachal Hills. The area falls within proximity of forest patches and hill slopes that are prone to erosion and degradation. It is also a site of immense cultural and religious significance, attracting lakhs of pilgrims annually, thereby increasing pressure on local resources and infrastructure.

The Nilanchal Hills is home to rich biodiversity including Leopards, Snakes, Medicinal Plants & other rich flora & fauna. The Nilanchal Hills possess the Dasha Mahavidya Temples along with Maa Kamakhya Temple wherein the eternal spring of water is ever present in the garbhagruha of which devotees from time immemorial have been doing Sparsha Darshan. The corridor project of this scale without establishing the water patterns their origins and outflow will endanger the sensitive ecological balance of the hills and water stream appearing in the garbhagruha of DashaMahavidya temples.

The Corridor project is aimed to increase the influx of devotees from 3000/day presently to 14,000/day which will wreak havoc on the whole ecosystem.

In view of the above, I humbly request SEIAA Assam to:

- **Immediately suspend ongoing work** on the Kamakhya Corridor project until a comprehensive EIA is conducted.
- **Direct the project proponent** to submit all relevant documents and apply for environmental clearance as per the law.
- **Constitute an independent expert committee** to study the ecological and cultural impacts of the project.
- **Ensure public hearings and consultations** in accordance with the EIA Notification and principles of natural justice.

If the project continues without legal compliance, it may amount to an act of environmental negligence and contempt of the law, subject to challenge before the Hon'ble National Green Tribunal and other appropriate judicial forums.

I look forward to your swift intervention to uphold the rule of environmental law and protect Assam's natural and cultural heritage.

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Yours sincerely

Rajeev Bhattacharyya
302 Basistha Road
The Wilderness, Beltola
Guwahati - 781028
(Phone: 9435556111/ 7002202193)

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Rajeev Bhattacharyya <rajkrbhat@gmail.com>

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Ma Kamakhya Access Corridor

1 message

Rajeev Bhattacharyya <rajkrbhat@gmail.com>
To: cs-assam@nic.in

20 March 2025 at 17:15

Date– 20/3/25

To

Chief Secretary

Govt of Assam

Janata Bhawan

Guwahati - 781005

Sub: Dangers to Kamakhya Peeth from Ma Kamakhya Access Corridor

Sir

We are residents of Guwahati including Nilachal Hills where Kamakhya Peeth is located.

As you are aware, the proposed Ma Kamakhya Access Corridor has triggered a severe controversy over the manner in which the government has sought to execute the project.

Our objective is to highlight certain dangers stemming from the proposed Ma Kamakhya Access Corridor and the fragility of Nilachal Hills where the shrine(s) is located which happens to be the most ancient known Tantric place of worship in the world:

(a) A reply from the Department of Enviornment & Forest of Government of Assam on an RTI application received on 19 December last year said that no environmental clearance was taken under EIA Notification 2006 for the project which is huge in size with an allocation of Rs 498 cr

(b) Nilachal Hills where the shrine(s) is located has suffered several landslides over the past many years and is extremely fragile environmentally

(c) Nilachal Hills is on a high seismic zone

(d) No public hearing has happened so far on the project

We would be extremely grateful if you would kindly apprise us about the plans to execute the project. We also humbly submit to you to ensure that all environmental clearances are taken and public hearings held before the project is implemented.

Sincerely,

1. **Rajeev Bhattacharyya**

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6. Samar Sarma

C/o Joy Ram Sarma

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7. Raju Prasad Sarma

C/o Rebati Prasad Sarma

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8. Geetima Goswami

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11. Dhruba Kalita

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12. Nitu Sarma

C/o Mahananda Sarma

Rajabari

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13. Sujata Devi

C/o Bhumananda Sarma

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14. Rajiv Das

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C/o Batiram Das

Kamakhya Temple, Kamakhya Metro

Guwahati - 781010

Aadhar Card No – 852290054845

15. Runu Devi

C/o Tarapada Sarma

Bagala Mandir Road, VIP Parking Stand

Kamakhya, Kamakhya Metro

Guwahati - 781010

Aadhar Card No – 286034352280

16. Risha Sarma

C/o Bhudeb Sarma

Kamakhya, Kamakhya Metro

Guwahati - 781010

Aadhar Card No – 560030375154

194 -J-

Annexure-'J'

For Kamakhya Bhairava Upasaka Foundation
Rajarshi Nandy
Authorised Signatory

VAKALATNAMA

IN THE NATIONAL GREEN TRIBUNAL, EASTERN ZONE BENCH, KOLKATA

District: Guwahati

OA. ~~ON MA~~ / ~~RA~~/ ~~Contempt~~ No. of 20 25

Kamakhya Bhairava Upasaka Foundation {Appellant / Applicant {Petitioners

- Versus —

The State of Assam & ors. {Respondent {Opposite Party

Vakalatnama on behalf of the Applicant

Know all men by these presents that by Vakalatnama, I/We appoint the Advocates noted below or any one of them my/our lawful Advocate or Advocates for filing the

in the above matter for appearing conducting and arguing the same for depositing or withdrawing any money in connection therewith for moving the Court in any matter connected therewith, for preparing the paper book in the case and for putting in papers, petitions etc. On my/ our behalf for filing, taking back any documents for withdrawing suits or appeals or petitions with permission to institute fresh suit etc. For signing and filling petitions of compromise in connections with the said matter and for taking copies of paper from the Record and I / We further say that any act Done by my / our said Advocate or Advocates or by any one of them after accepting this Vakalatnama, shall be considered as my/our own true and lawful act.

And I/ We further hereby agree and undertake to pay the said Advocates his of their fees as settled and all others sums that may be necessary to carry out the requisition of the Court and otherwise to enable the said Advocates to conduct the case properly. Failing which the said Advocates after notice to me/us will be at liberty to withdraw from further conducting the case.

Akshaya Sujoy Bhattacharjee Rajeev Bhattacharjya.

IN WITNESS WHERE OF I/WE sign and execute this Vakalathnama on this the day of 20

Received & accepted on behalf of client
Paushali Banerjee
Advocate
WB/142/2006

Paushali Banerjee
Name of Advocates
Ms. Paushali Banerjee,
High Court, Calcutta,
NPS Business Centre,
Ground Floor, Kolkata — 700001
M. 9433253274

Rajarshi Nandy

LETTER OF AUTHORISATION

TO WHOM IT MAY CONCERN

Sub: Authorisation to Petitioner No. 1 (Rajarshi Ranjan Nandy, Trustee Kamakhya Bhairava Upasaka Foundation) to sign and represent on behalf of Petitioner No. 3 (Akshay Ravindra Kolle) in the Original Application before the National Green Tribunal, Eastern Zone Bench, Kolkata regarding Protection of Ecology of Kamakhya Hills, Guwahati

I, the undersigned, being Petitioner No.3 in the above-referred matter, do hereby state as follows:

I am fully aware of the contents of the Original Application filed before the Hon'ble National Green Tribunal, Eastern Zone Bench at Kolkata, concerning the protection of the ecology and environment of Kamakhya Hills, Guwahati, Assam.

I, unconditionally authorize RAJARSHI RANJAN NANDY (residing at Plot-AC-237, Street 39, Action Area -1, New Town, Kolkata – 700156), a Trustee of **Kamakhya Bhairava Upasaka Foundation**, appearing as Petitioner No. 1 in the above said Application, to sign the final Application, petition, Vakalatnama, affidavits, , replies, and any other documents on my behalf in the aforesaid matter.

I further authorize Rajarshi Ranjan Nandy, acting as Petitioner No. 1, to represent me before the Hon'ble Tribunal, appear in hearings, file documents, make statements, and take all necessary steps in the proceedings as may be required.

I affirm that all contents of the petition as submitted are known to me, have been approved by me, and is binding on me in the same manner as if I had personally signed the document.

I confirm that this authorisation is voluntary, unconditional, binding and irrevocable until the final disposal of the case or until revoked in writing by me and accepted by the Hon'ble Tribunal.

A copy of my Aadhaar Card is annexed hereto for identification.

Declared this 15th day of November 2025.

PETITIONER NO.3

Name: Akshay Ravindra Kolle

Address: No. 46, Jai Kamakshi, 1st A Cross, Model LIC Colony, Basaveswarnagar, Bangalore, Karnataka - 560079

LETTER OF AUTHORISATION

TO WHOM IT MAY CONCERN

Sub: Authorisation to Petitioner No. 1 (Rajarshi Ranjan Nandy, Trustee Kamakhya Bhairava Upasaka Foundation) to sign and represent on behalf of Petitioner No. 4 (Suraj Kumar) in the Original Application before the National Green Tribunal, Eastern Zone Bench, Kolkata regarding Protection of Ecology of Kamakhya Hills, Guwahati

I, the undersigned, being Petitioner No.4 in the above-referred matter, do hereby state as follows:

I am fully aware of the contents of the Original Application filed before the Hon'ble National Green Tribunal, Eastern Zone Bench at Kolkata, concerning the protection of the ecology and environment of Kamakhya Hills, Guwahati, Assam.

I, unconditionally authorize RAJARSHI RANJAN NANDY (residing at Plot-AC-237, Street 39, Action Area -1, New Town, Kolkata – 700156), a Trustee of **Kamakhya Bhairava Upasaka Foundation,** appearing as Petitioner No. 1 in the above said Application, to sign the final Application, petition, Vakalatnama, affidavits, , replies, and any other documents on my behalf in the aforesaid matter.

I further authorize Rajarshi Ranjan Nandy, acting as Petitioner No. 1, to represent me before the Hon'ble Tribunal, appear in hearings, file documents, make statements, and take all necessary steps in the proceedings as may be required.

I affirm that all contents of the petition as submitted are known to me, have been approved by me, and is binding on me in the same manner as if I had personally signed the document.

I confirm that this authorisation is voluntary, unconditional, binding and irrevocable until the final disposal of the case or until revoked in writing by me and accepted by the Hon'ble Tribunal.

A copy of my Aadhaar Card is annexed hereto for identification.

Declared this 15th day of November 2025.

PETITIONER NO.4

Name: Suraj Kumar

Address: C/o Rajendra Prasad Singh, Co-operative Colony, Demudi, Bokaro, Marafari Colony, Jharkhand - 827012

KAMAKHYA BHAIRAVA UPASAKA FOUNDATION PUBLIC CHARITABLE TRUST

REG OFFICE: NO 13A, SRI VINAYAKA NAGAR, TELEPHONE EXCHANGE ROAD, KOVAIPUDUR COIMBATORE SOUTH, COIMBATORE, TAMILNADU, INDIA, 641042

CERTIFIED TRUE COPY OF THE RESOLUTION PASSED AT THE MEETING OF THE BOARD OF TRUSTEES OF KAMAKHYA BHAIRAVA UPASAKA FOUNDATION PUBLIC CHARITABLE TRUST HELD ON Wednesday, 1st of October,2025,5pm.

RESOLVED THAT the Kamakhya Bhairava Upasaka Foundation Public Charitable Trust (hereinafter referred to as "the Trust") shall file a petition before the National Green Tribunal, Eastern Zone Bench, Kolkata, concerning environmental and public interest issues arising in relation to the Kamakhya Corridor, including but not limited to violations of environmental norms, unauthorized development, or any activity adversely affecting ecological and spiritual integrity of the area.

RESOLVED FURTHER THAT Rajarshi Ranjan Nandy, Trustee of the Trust, be and is hereby authorized to:

Engage legal counsel on behalf of the Trust for the purpose of preparing, filing, and pursuing the said petition;

Sign, submit, and verify all pleadings, affidavits, applications, and supporting documents before the National Green Tribunal;

Represent the Trust in all proceedings before the said Tribunal or delegate such representation to counsel, as necessary;

Do all such acts, deeds, and things as may be necessary, incidental, or conducive to the effective filing and prosecution of the petition.

RESOLVED FURTHER THAT the other Trustees shall extend all necessary cooperation and provide required documentation to facilitate the above-mentioned legal action.

RESOLVED FURTHER THAT a copy of this resolution may be issued by the authorized Trustee for submission to the National Green Tribunal, Kolkata, or any other authority as required.

For KAMAKHYA BHAIRAVA UPASAKA FOUNDATION PUBLIC CHARITABLE TRUST

Rajarshi Ranjan Nandy

RAJARSHI RANJAN NANDY
TRUSTEE

SETHURAMAN TATHAMANGALAM ANANTHAKALYANAKRISHNAN
TRUSTEE

YOGENDRA KHUSHIRAM SHARMA
TRUSTEE

DATE: 01/Sep/2025
PLACE: COIMBATORE

LETTER OF AUTHORISATION

TO WHOM IT MAY CONCERN

Sub: Authorisation to Petitioner No. 1 (Rajarshi Ranjan Nandy, Trustee Kamakhya Bhairava Upasaka Foundation) to sign and represent on behalf of Petitioner No. 5 (Sujay Kumar Bhattacherjee) in the Original Application before the National Green Tribunal, Eastern Zone Bench, Kolkata regarding Protection of Ecology of Kamakhya Hills, Guwahati

I, the undersigned, being Petitioner No.5 in the above-referred matter, do hereby state as follows:

I am fully aware of the contents of the Original Application filed before the Hon'ble National Green Tribunal, Eastern Zone Bench at Kolkata, concerning the protection of the ecology and environment of Kamakhya Hills, Guwahati, Assam.

I, unconditionally authorize RAJARSHI RANJAN NANDY (residing at Plot-AC-237, Street 39, Action Area -1, New Town, Kolkata – 700156), a Trustee of **Kamakhya Bhairava Upasaka Foundation**, appearing as Petitioner No. 1 in the above said Application, to sign the final Application, petition, Vakalatnama, affidavits, , replies, and any other documents on my behalf in the aforesaid matter.

I further authorize Rajarshi Ranjan Nandy, acting as Petitioner No. 1, to represent me before the Hon'ble Tribunal, appear in hearings, file documents, make statements, and take all necessary steps in the proceedings as may be required.

I affirm that all contents of the petition as submitted are known to me, have been approved by me, and is binding on me in the same manner as if I had personally signed the document.

I confirm that this authorisation is voluntary, unconditional, binding and irrevocable until the final disposal of the case or until revoked in writing by me and accepted by the Hon'ble Tribunal.

A copy of my Aadhaar Card is annexed hereto for identification.

Declared this 15th day of November 2025.

PETITIONER NO.5

Name: Sujay Kumar Bhattacherjee

Sujay Kr. Bhattacherjee

Address: B501, VRR Nest, Beratana Agrahara, Electronic City, Bangalore, Karnataka - 560100

LETTER OF AUTHORISATION

TO WHOM IT MAY CONCERN

Sub: Authorisation to Petitioner No. 1 (Rajarshi Ranjan Nandy, Trustee Kamakhya Bhairava Upasaka Foundation) to sign and represent on behalf of Petitioner No. 2 (Rajeev Bhattacharya) in the Original Application before the National Green Tribunal, Eastern Zone Bench, Kolkata regarding Protection of Ecology of Kamakhya Hills, Guwahati

I, the undersigned, being Petitioner No.2 in the above-referred matter, do hereby state as follows:

I am fully aware of the contents of the Original Application filed before the Hon'ble National Green Tribunal, Eastern Zone Bench at Kolkata, concerning the protection of the ecology and environment of Kamakhya Hills, Guwahati, Assam.

I, unconditionally authorize RAJARSHI RANJAN NANDY (residing at Plot-AC-237, Street 39, Action Area -1, New Town, Kolkata – 700156), a Trustee of **Kamakhya Bhairava Upasaka Foundation**, appearing as Petitioner No. 1 in the above said Application, to sign the final Application, petition, Vakalatnama, affidavits, , replies, and any other documents on my behalf in the aforesaid matter.

I further authorize Rajarshi Ranjan Nandy, acting as Petitioner No. 1, to represent me before the Hon'ble Tribunal, appear in hearings, file documents, make statements, and take all necessary steps in the proceedings as may be required.

I affirm that all contents of the petition as submitted are known to me, have been approved by me, and is binding on me in the same manner as if I had personally signed the document.

I confirm that this authorisation is voluntary, unconditional, binding and irrevocable until the final disposal of the case or until revoked in writing by me and accepted by the Hon'ble Tribunal.

A copy of my Aadhaar Card is annexed hereto for identification.

Declared this 15th day of November 2025.

PETITIONER NO.2

Name: Rajeev Bhattacharya

Address: 302 Basistha Road, Beltola, Guwahati , Assam - 781028

Rajeev Bhattacharyya