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कर्नाटक राज्य के चिकमंगलुरु, दक्षिण कन्नड़ और हसन जिले के भूआकृति संख्या 48O/11 और 48O/12 के कुछ हिस्सों में वृहद पैमाने पर (1:50,000) भूस्खलन संवेदनशीलता का मानचित्रण I
कार्य-सत्र कोड सं: (M4LSSM/एनसी/एस आर/SU-KG/2017/12187)
कार्य-सत्र : 2017-18

Macro-scale (1:50,000) Landslide Susceptibility Mapping in parts of Toposheets nos. 48O/11 & 48O/12 Chikmangaluru, Dakshin Kannad and Hassan districts, Karnataka.
(FSP CODE NO.: M4LSSM/NC/SR/SU-KG/2017/12187)
Field Season: 2017-18

द्वारा/BY

Neha Kumari, Geologist
&
Kamal Kumar, Geologist

नेहा कुमारी, भू-वैज्ञानिक
और
कमल कुमार, भू-वैज्ञानिक

Project
Landslide Susceptibility Mapping

परियोजना
भूस्खलन संवेदनशीलता मानचित्रण

State Unit: Karnataka and Goa
Southern Region

राज्य इकाई : कर्नाटक व गोवा
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इस प्रतिवेदन का कोई भी भाग महानिदेशक, भारतीय भूवैज्ञानिक सर्वेक्षण से पूर्व में लिखित में अनुमति लिए बिना उद्धृत नहीं किया जाना है या प्रतिकृति नहीं बनाया जाना है।

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Neha Kumari, Geologist

and

Kamal Kumar, Geologist

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कर्नाटक राज्य के चिकमंगलूर, दक्षिण कन्नड़ और हसन जिले के भूआकृति संख्या 48O/11 और 48O/12
के कुछ हिस्सों में वृहद पैमाने पर (1:50,000) भूस्खलन संवेदनशीलता का मानचित्रण
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द्वारा
नेहा कुमारी, भू-वैज्ञानिक
और
कमल कुमार, भू-वैज्ञानिक

सारांश

कार्य सत्र 17:- 18 के अनुसरण में 1490 वर्ग किलोमीटर क्षेत्र में भूस्खलन सुग्राहिता मानचित्रण किया गया। यह क्षेत्र 13°00'उ-13°30'उ अक्षांश व 75°30'पू-75°45'पू रेखांश से परिसीमित है। इसका उद्देश्य सुदूर संवेदन व क्षेत्र से प्राप्त आदानों की सहायता से 1:50,000 पैमाने पर सीवनहीन भूस्खलन सुग्राहिता मानचित्र व आकाशीय भूस्खलन जीआईएस पर आधारित (डाटाबेस तैयार करना है।

भूआकृतिक दृष्टि से यह क्षेत्र पश्चिमी घाट का भाग है व खड़े कटकों व निम्न विच्छेदित पहाड़ी खड़े ढाल सहित अति तरंगित नतोन्नत स्थलाकृति है, यह क्षेत्र तरंगित स्थलाकृति सहित आंतरायिक संकीर्ण घाटी पूरण (फिल्स (व पेडिमेंट-पदस्थली जटिल शैल समूह युक्त है। क्षेत्र में मानचित्रित अश्म इकाईयाँ पट्टित मैग्नेटाइट क्वार्ट्ज़ाइट, कार्बनयुक्त फिलाइट, लोहमय फिलाइट, अंतरासंस्तरित क्वार्ट्ज़ाइट व आद्यमहाकल्पी काल के ग्रेनाइटोभ हैं। अपक्षय की श्रेणी स्पष्ट है व मानसून के दौरान वर्षा भूस्खलन का विमोचक/प्रवर्तक घटक है।

-41 मीटर के भू अनुपात सहित कुल 58 भूस्खलन आपात रिकार्ड किए गए। प्रतिशत वितरण से यह पता चलता है कि 28 % भूस्खलन शैल स्खलन हैं, 43 % मलवे स्खलन हैं व 30 % भूस्खलनों को मलवे व शैल स्खलन में वर्गीकृत किए गए हैं। अधिकतर ढाल उथले स्थानांतरण मलवे फेलियर हैं) <2 मीटर। सड़क के किनारे प्राकृतिक ढाल पर खड़े ढाल कोण सहित विस्तृत कर्तित ढाल, ढाल अस्थायीकरण के कारण सरकने की स्थिति के लिए सुग्राह्य है। फेलियर तल को नियंत्रित करने वाले निर्धारणात्मक भू घटक ढाल प्रवणता है, इससे यह सूचित होता है कि लगभग 45 % स्खलन <15° ढाल कोण पर घटित होते हैं, 39 %, 15°-25° पर, 15 %, 25°-30° पर व बाकी 1 %, 35°-45° ढाल कोण पर घटित होते हैं। अध्ययन क्षेत्र में रिकार्ड किए गए मुख्य भूस्खलन चिकमंगलूर-श्रिंगेरी मार्ग सेक्शन) रामा (27-: 2 स्खलन मलवे स्खलन, देवरहल्ली-हुन्सहल्ली-जक्कनहल्ली गाँव क्षेत्र में 4 : मलवे स्खलन, काविकलगुण्डी-अट्टिगुण्डी-केम्मन्नगुण्डी/मुल्लयनगिरि-बाबाबूदान मार्ग सेक्शन में 5 : तलीय ढाल फेलियर व 7 मलवे स्खलन, मुलहल्ली-गुट्टिहल्ली-गुट्टि मार्ग सेक्शन: बहु फेलियर युक्त 2 मलवे स्खलन, मुडिगेरे-कोटिगेरे मार्ग सेक्शन में 5 उथले शैल व 2 मलवे स्खलन, बानाहल्ली-तटकोला-बपुंजिन्ग्रा मार्ग सेक्शन : 6 उथले शैल व मलवे स्खलन हैं।

भू घटक वर्गों के आधार पर भूस्खलन आपातों को प्रभावित करने वाली परिवर्तों के गुणात्मक व घनात्मक सांख्यिकीय विश्लेषण यह सूचित करता है कि कुल 41 % भूस्खलन आपात बहुत ही कम ऊँचाई युक्त बागान यानि सिल्वर शाहबलूत के वृक्षों से मिश्रित कॉफी के वृक्ष वाले क्षेत्रों में, पहाड़ी के ढलान के निचले भागों में सामान्य भूमि उपयोग की प्रक्रियाओं व पेड़िमेट-पदस्थली जटिल शैल समूहों में, 21.31% भूस्खलन सामान्य रूप से वनस्पति युक्त ढलान में हुए हैं। भूस्खलन आपातों के कुल 54 % निम्न रूप से विच्छेदित पहाड़ी ढलान में, 20 % सामान्य रूप से विच्छेदित पहाड़ी ढलानों में, 7 % पेड़िमेट-पदस्थली जटिल शैल समूहों में व 20 % पेड़िमेट ढलान में घटित होते पाए गए हैं। क्षेत्र के कुल 77.75% में मृदा की उपरिभार स्थूलता है जो 0.5- 5 मीटर में परिवर्तित रहती है, कुछ जगहों में 5 - 10 मीटर या 10 मीटर से अधिक स्थूलता भी है।

क्षेत्र के अंतिम भूस्खलन सुग्राहिता मानचित्र एएचपी आधारित गणितीय आँकड़े प्रतिरूपण की सहायता से तैयार किए गए हैं। विषयक आँकड़े सेट रास्ट्राइटीकृत हैं व जीआईएस आधार पर समाकलित हैं, निर्गम सुग्राहिता मानचित्रों से यह पता चलता है कि 5.65% क्षेत्र उच्च जोन में आते हैं, 23.17% सामान्य जोन में आते हैं व 71.18% निम्न सुग्राह्य जोन में आते हैं। भूस्खलन वितरण मानचित्र से यह पता चलता है कि 50 % भूस्खलन उच्च सुग्राह्य जोन में घटित होते हैं, जबकि 39 % व 11 % भूस्खलन क्रमशः सामान्य व निम्न सुग्राह्य जोन में घटित होते हैं।

विक्षुब्ध जोन को स्थायीकृत करने के लिए आवश्यक सुधारात्मक उपाय भित्ति को बनाए रखना, पहाड़ी ढलान के दो भाग में पंक्तिदार अपवाह तंत्र, ढलान पुनःश्रेणीकरण आदि हैं। भूतकनीकी ढलान संरक्षणात्मक उपाय-जिसमें जैविक तत्वों के साथ यांत्रिक तत्व) संरचनाएँ (यानि ढलान फेलियर व अपरदन को रोकने व ठीक करने के लिए वनस्पति लगाने की पद्धति को अपनाया जाता है व पदार्थों को हटा दिए या उत्खनित किए जाते हैं।

Macro-scale (1:50,000) Landslide Susceptibility Mapping in parts of Toposheets nos. 48O/11 & 48O/12 Chikmangaluru, Dakshin Kannad and Hassan districts, Karnataka. (FSP CODE NO.: M4LSSM/NC/SR/SU-KG/2017/12187) Field Season: 2017-18

By
Neha Kumari, Geologist
and
Kamal Kumar, Geologist

ABSTRACT

In pursuance of FS:17-18, Landslide Susceptibility Mapping was carried out covering an area of 1490 sq. km. bounded by 13°00' N-13°30' N latitudes and 75°30' E-75°45' E longitudes with the objective to prepare a seamless landslide susceptibility map and to generate spatial (GIS-based) landslide database on 1:50,000 scale using adequate remote sensing and field inputs.

Geomorphologically, the area forms a part of Western Ghats and is characterise by a highly undulating rugged topography with steep ridges and lowly dissected hillslope with intermittent narrow valley fills and pediment-pediplain complex having gently rolling topography. The litho-units mapped in the study area are banded magnetite quartzite, carbonaceous phyllite, ferrugenious phyllite, interbedded quartzite and granitoids of Archaean age. The degree of weathering is pronounced. The heavy rainfall is the triggering factor for landslides and landslips during Monsoon.

Total 58 nos. of landslide incidences with 41-point geoparameters was recorded. The percentage distribution of landslides shows that 28% of landslides are categorised as rock slides, 43% as debris slides and 30% are categorised as debris cum rock slides. Majority of the slides are shallow (<2m) translational debris failure. Extensive cut slope along road with steep slope angle destabilizes the natural hill slope making the slope susceptible to sliding during heavy rainfall. The slope gradient being the deterministic geofactor for governing the failure plane, which indicates that nearly 45% of slides are occurring on slope angle <15°, 39% on 15°-25°, 15% on 25°-35° and rest 1% on 35°-45° slope angle. Majority of the landslides are recorded in following road sections. 1. Chikmangalur-Sringeri road section (SH-27): 2 nos. of debris slide. 2. Devaravalli-Hunsahalli-Jakkanahalli village area: 4 nos. of debris slide. 3. Kavikalgandi-Attigundi-Kemmannugundi/Mulliyanagiri-Bababudan road section: 5 nos. of planar slope failure and 7 nos. of debris slides. 4. Mulahalli-Guttihalli-Gutti road section: 2 nos. debris slide with multiple failures. 5. Mudigere-Kotigehara road section: 5 nos. of shallow rock and 2 nos. of

debris slide. 6. Banahalli-Tattakola-Bapujinagra road section: 6 nos. of shallow rock cum debris slide.

Qualitative and Quantitative statistical analysis of variables influencing landslide incidences with respect to geofactor classes indicates that total 41% of the landslide incidences occurred on Low Height Plantation i.e. coffee mixed with silver oak practised in lower reaches of hill slope and pediment-pediplain complex, 21.31% on moderately vegetated slope. Total 54% of landslide incidences are found to be occurring on “Lowly dissected hillslope”, 20% on “Moderately dissected hillslope”, 7% on “Pediment-Pediplain Complex” and 20% on “Piedmont slope”. Total 77.75% of the area has overburden thickness of soil that varies from 0.5-5m, at few places 5-10m and > 10m.

The final landslide susceptibility maps of the area are generated using the AHP based mathematical data modeling. The thematic datasets are rasterised and integrated in GIS platform. The “Landslide Susceptibility Map” indicates that 5.65% of the area falls in high, 23.17% in moderate and 71.18% falls in low susceptible zones. Landslide distribution map indicates that 50% of the landslides fall in high susceptible zones, whereas 39% and 11% of landslide falls in moderate and low susceptible zones respectively. The road cut failure triggered by incessant rainfall is the causative factor for landsliding.

The remedial measures required to stabilize the disturbed zones are retaining wall, lined drainage at toe part of hill slope with weep holes and slope re-gradation. The biotechnical slope protection measures that utilizes mechanical elements (structures) in combination with biological elements i.e. plant should be practiced to prevent slope failure and erosion where the material has been removed or excavated for construction purposes.

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I. INTRODUCTION

1.1. Background Information

Landslides are one of the disastrous natural phenomenon around the world that takes a heavy toll on life and property every year. The landslides are the natural hazards in the hilly terrain of Western Ghats regions of Indian Peninsula. The heavy rainfall during peak rainy season is the major triggering factor for landslides, leading to the displacement of rocks and soils causing widespread damage to infrastructure such as rails, roads and loss of life and property. In view of the ever increasing developmental pressures and human interferences in hilly terrain of Western Ghats instability of hillslopes and hillside collapse leading to landslides all along National Highway (NH) and State Highway (SH) Ghat road sections are most common phenomenon. In the parts of Kodagu, Chikmangalur, Hassan, Shimoga, Dakshin Kannada and Uttar Kannada Districts in state of Karnataka are well affected by landslides/landslips incidences especially during heavy rainfall in monsoon due to improper and ineffective drainage, and high degree of weathering phenomenon prevailing in the study area.

As the frequent landslide occurrences has taken places in recent past in hilly terrains of Himalayas that has caused the national sorrow. Ministry of Mines, Government of India has taken up a nation-wide programme on “National Landslide Susceptibility Mapping” on 1:50,000 scale for delineating the landslide susceptible zones for the societal benefits.

Geological Survey of India, being the nodal agency for landslide studies in India has taken the nation-wide programmes for generating the baseline data in the field of landslide hazard study an macro-scale (1:50,000) Landslide Susceptibility Mapping. The Landslide Susceptibility Maps are generated on priority basis using knowledge-driven integration technique i.e. multi-class index overlay method for data integration of geofactors thematic maps prepared on Arc GIS platform. The hillslope is categorised as high, medium and low susceptible hill slopes based on weightage assigned to causative geofactors incorporating AHP based mathematical data modelling method.

In present study the landslides incidences are noticed only in malnad part of the district. The Ghat sections namely Charmadi ghat, Agumbe ghat roads in adjacent areas are subjected to minor landslides. The study area does not experience landslides of greater extent but past records

shows that during heavy rain the road sections along Mullayanagiri hills, Bababudan giri are experiencing minor landslides, frequently leading to blockage of communication line and dangerous to man and material.

Accordingly, during FS: 2017-18, total 1490 sq. km of area was taken up for Macro-scale (1:50,000) Landslide Susceptibility Mapping in parts of Toposheets nos. 48O/11 & 12 Chikmangaluru, Dakshin Kannad and Hassan districts in state of Karnataka on 1:50,000 scale vide FSP Code: M4LSSM/NC/SR/SU-KG/2017/12187.

1.2 Present Work

The aim of the present work was to carry out Macro-scale (1:50,000) Landslide Susceptibility Mapping in parts of Toposheets nos. 48O/11 & 48O/12 Chikmangaluru, Dakshin Kannad and Hassan districts, Karnataka with following objectives:

- (i).Preparation of landslide inventory database using high resolution remote sensing information and field inputs.
- (ii). Preparation of spatial database for geofactors of landslides.
- (iii). Categorisation of the hillslope in terms of landslide susceptibility.

Table 1: Details of nature of work, quantum and achievements.

Nature of Work	Target in (sq. km.)	Achievements in (sq. km.)
1.Pre field map preparation		
i) Preparation of Thematic maps (in GIS on scale 1:50000)		
a)Slope forming material map	1490 sq. km.	1490 sq. km.
b) Geomorphology and lineament map	1490 sq. km.	1490 sq. km.
c) Slope morphometry (slope, aspect & curvature) map	1490 sq. km.	1490 sq. km.
d) Landuse / Landcover map	1490 sq. km.	1490 sq. km.
e) Drainage map	1490 sq. km.	1490 sq. km.
f) Regolith Thickness map	1490 sq. km.	1490 sq. km.
ii) Preparation of landslide inventory map	1490 sq. km.	1490 sq. km.
2.Field based studies		
i)Field checking of all thematic maps	1490 sq. km.	1490 sq. km
ii)Field checking and collection of landslide inventory attributes (41 point geo -parametric sheet)	1490 sq. km.	1490 sq. km. (58 nos. of Landslides)
3. Post field studies and modelling		
i)Updation of thematic and landslide inventory maps	1490 sq. km.	1490 sq. km
ii)Landslide susceptibility modelling and finalization of landslide susceptibility map in GIS	1490 sq. km.	1490 sq. km.
4.Collection of rainfall data from available rain stations	Taluk wise 10 years rainfall data obtained from different rain gauge stations.	

1.3 Location and Accessibility

The study area is bounded by 13°00' N-13°30' N latitudes and 75°30' E-75°45' E longitudes covering SOI Toposheets nos. 48O/11 & 48O/12 in parts of Chikmangaluru, Dakshin Kannad and Hassan districts, Karnataka. The study area is located in the North West of Bengaluru and Central part of the Karnataka state. It is bounded by Shimoga district in the North & North-West, Dakshin Kannada in South & South West, Hassan districts in South & South East, Tumkur district in East, Davanagere & Chitradurga district in North-East (**Plate-1**). The study area is well connected with Chikmangaluru town located 245 km from Bengaluru and approached from Bengaluru via Hassan through NH-75. Mudigere is one of the towns and taluk headquarters of district. It is 35 km from the district headquarters Chikmangaluru and 260 km from Bengaluru via NH-75. The nearest rail head is 30km from Mudigere located in Kadur taluk and nearest airport is situated in Mangalore, which is at a distance of 122 km from Mudigere town. Mudigere is well connected by road network. The area falls in parts of Mudigere and Chikmangaluru taluks of Chikmangaluru district, Belur and Sakleshpur taluks of Hassan district and Belthangadi taluk of Mangalore District. The area forms the parts of malnad tract. Mullayanagiri (1930 meters) is the highest peak situated 12 km away from Chikmangaluru town and Seethalayanagiri is a prominent peak adjacent to the study area is the major tourist spot.

Mudigere, Aldur, Banakal and Kotigehara are main towns and villages present in the area. The study area is well connected by network of roads from Narsamharajpura, Chikmangaluru, Tarikere, Kadur etc. All the taluk headquarters are well connected to district headquarter and all the villages are connected to taluk headquarter by state highways and metalled roads. Bangalore-Mangalore Highway (NH-75) via Kotigehara, Bankal, and Mudigere passes west, central and northeastern part of the study area. Banavar-Mudigere main road in the western and central part, Sakaleshpura-Mudigere via Bidarhalli in the southern part, Belur-Aldur via Buskal in northern part passes through the area. The NH-234 passes through Kotigehara-Banakal-Bidarahill-Mudigere-Gonebidu village area. Chikmangaluru-Sringeri road (SH-27) traversing NW-SE connects Aldur-Bannur-Bilukoppa (SH-64) of the study area are well connected to Chikmangaluru town. The SH-107 passes towards south of study area passes traversing Jannapura-Kirugunda-Hanbal. The Charmadi Ghat lies on border of Dakshina Kannada and Chikmangaluru districts. The NH-234 passes through Charmadi Ghat road. All the villages are connected to taluk headquarter by state highways, national highways and metalled roads. Interior parts are well connected by fairly good metalled, weathered roads, cart and foot tracks.

1.4 Physiography and Drainage

The major physiographic units are Southern Malnad, Central Semi-Malnad & South-Eastern maiden area which covers the western and eastern slopes of the Western Ghats or Sahyadri mountain range. The study area is situated in the Mallenadu region of Karnataka in the Deccan plateau in the foothills of the Western Ghats. The area is a highly undulating terrain with many high ridges and valleys. The granite terrain is characterized by highly dissected topography. Some of the prominent peaks are 1305 (Galigudda), 1276 (Devigudda). The highest elevation is 1381m above MSL, and lowest elevation is 500m above MSL. The north-western, western, south-western part is covered by thick forest with cardamom plantation in the southern and central part, Bamboo and teak plantation in the north-western part of the area. The major places are Bannur, Mudigere, Banakal, Aldur, Kotigehara Jannapura. Mullayanagiri-Bababudan giri is a tourist place and trekker's delight, with its rugged mountain trails. Mudigere is the natural diversity coming under the 8 hotspots of the world. Banakal is situated at the top of the Charmadi hills in the Western Ghats is the major tourist spot and situated on the banks of river Hemavathi. The district is full of scenic surprises hills, valleys, streams and wide spread coffee estate with silver oak with pepper as climber. Chikmangaluru town attracts many tourists especially from India due its scenic locations and nearby hill stations such as Babubudan giri, Kudremukha, Kalasa, Koppa, Sringeri, Balehanoor and Mudigere. The area is known for its world famous Coffee Arabica is the major cash crop and other crops are Arecanut, Coconut, Coffee, Black Pepper and Cardamom etc. grown in the low lying areas are major landuse practices.

The rivers Bhadra, Tunga, Hemavathi, Netravati, and Vedavathi are the perennial rivers and drain this area. Drainage pattern is parallel, sub-parallel to radial in nature. Most of the nala joins Brinanala, Somavahini and Bhadra rivers (**Plate-8**). Drainage pattern is radial in the south-western part of toposheet no. 48O/12 and parallel and dendritic elsewhere. The weathered, fractured and jointed Gneiss and Schist serves as potential aquifer in the area.

1.5 Climate and Rainfall

The climate of the study area is moderate to hot in summer and cool in winter. Throughout the year the climate is pleasant. During the summer months from March to May the maximum day temperature is around 30°C and the night temperature is around 19°C. December and January are the coldest months, the mean maximum temperature ranges from 5-15°C. The annual variation of temperature is small in the Ghats. In the cold weather season from November to February, dry

continental winds prevail over the hills. The dry winter season is followed by the pre-monsoon transition period of a hot summer extending from March to the beginning of June.

The average annual rainfall of the Chikmangaluru district is 1904mm. The eastern belts receive a rainfall of about 600mm/yr only, while the western belt receiving around 3000mm/yr. During the southwest monsoon the state receives 80% of its rainfall. Rainfall in the winter season (January to February) is lesser than the hot weather season (March to May). The distribution of rainfall in August follows the same general pattern as in July but the amounts are generally less. The distribution of September rainfall over the area is similar to that of August but amounts are less. Subsequently the monsoon withdraws and retreats by October. About this time the winter season of northeast monsoon begins but is generally dry in this area. With the advent of the monsoon rains the maximum temperatures fall rapidly in the Ghats. The monsoon period has almost uniform temperature with very little variation. The autumn weather follows the rains in the Ghats during November to January. Past 10 years rainfall data obtained from different rain gauge stations of different taluks for the period (2008-2017) indicates that Kotigehara taluk (1055mm) receives maximum average rainfall, followed by Mudigere, Attigundi and Belahnoor taluks in the month of June and July influenced by advancing southwest monsoon that triggers landslip/landslide incidences (**Plate-13, Plate-14, Plate-15, Plate-16**).

1.6 Soil Types

With a wide range of climatic conditions, a wide range of soil types are seen. The Peninsular hill soils are categorised into four main types viz, red soil, black soil, lateritic soil and alluvial soil by Raychaudury et al. (1963). The major soil type in the district is red loamy & sandy soil. However, in hilly areas mixed red & black soil are also found to occur in the central and north-eastern parts. Laterite is generally reddish in colour and often has a vermicular structure. They are formed under conditions of high rainfall with alternating wet and dry periods. The sub-soil contains hydrated oxides of aluminium and iron. The soils of this group are well developed on the summits of hills. Alluvial soils are formed by transportation by streams and rivers and deposited over plains and valleys. The escarpment of the Ghats is made up of a succession of sub-vertical rocky crags and zones where huge rocky boulders measuring several cubic metres. Black soil is found around Baba Budangiri Hills whereas Red and Gravel soil are found in the southern parts of the district. The district has major portion of red sandy loamy soil, small patches of black soil in taluks of Chikkamagaluru, Kadur and Tarikere and lateritic soil in parts of Chikmangaluru, Sringeri, Mudigere, Koppa, Narasimarajapura taluks.

1.7 General Geology

The regional geology of Chikmangalur and Hassan districts includes rocks of Sargur Group, PG-I and older granitoids; Bababudan and Chitradurga Group of Dharwar Supergroup, mafic-ultramafic complex of Archaean age. The Dharwar Supergroup of rocks and PG-I are intruded by younger Granitoid and basic intrusive like dolerite dykes of Palaeo-Proterozoic age. Laterite caps of cenozoic age are also recorded in the area (**Plate-2**).

The litho-units of the study area consists of Older metamorphic of Sargur Group of rocks represented by enclaves of quartzite, amphibolite, iron formation, garnetiferous mica schist, talc-chlorite schist, kyanite-staurolite schist, silimanite-garnet schist, calc-silicate rock and ultramafics within gneisses and granites of Peninsular Gneissic Complex (PGC). The amphibolites are dark grey in colour, fine to medium grained, massive and schistose, rich in hornblende and plagioclase. The Peninsular Gneissic Complex in the study area is represented by granitic gneiss and granodiorite gneiss. The granite gneiss is coarse grained, comprises of quartz, orthoclase, plagioclase feldspars, mica and hornblende, show gneissic texture and migmatitic structures.

Peninsular Gneiss represented by granite gneiss and older granitoids (Chikmangaluru). Granite gneiss mostly occupies the southern and western part of the area. Grey porphyritic granite forms basement for the overlying Bababudan Group of rocks which comprises of Kalasapura, Santhaveri and Mullaingiri Formations. Kalasapura Formation consists of Conglomerate, amphibolite, metapyroxenite and metagabbro. Santaveri Formation: It consists of actinolitic amygdular metabasalt which occurs in and around Kaimara, Jagar valley, and east of Bainchaddal coffee estate and Kabbinahalli. These rocks have a characteristic greenish grey to dark grey colour with amygdales of epidote, quartz, calcite and chlorite. Mullaingiri Formation comprises of carbonaceous phyllite which is located just above the amygdulor basalt and exposed west of Muttodi and Kesave. The basic lava flows overlying the conglomerate have been metamorphosed to Amphibolite. Laterite invariably occurs capping the BIF. The chrono-stratigraphy of the one is given in the **Table-2**.

Structure and Metamorphism: The rock formations have been subjected to two phase of deformation viz. first one is represented by NW-SE trending broad synclinal trough of (horseshoe shaped) Bababudan hill ranges with all beds dipping towards Jagar valley. The second phase of folding has refolded the F1 folds into minor synclines and anticlines. The planar structures are represented by bedding, schistosity, fracture, cleavage and joints. Primary structures are represented by current bedding, ripple marks etc.

Table 2: Chrono-stratigraphic Sucession of Litho-units of the study Area (SOI T.S nos. 48O/11 & 48O/12) Source: Ballal, N.R.R, Reddy U.S. & Ranjan, K.T .et al, GSI (FS: 1972-75).

Age	Supergroup	Group	Formation	Lithology
Cenozoic				Laterite
Palaeo-proterozoic		Younger Intrusives	Acid Intrusives	Quartz vein
			Basic Intrusives	Dolerite
				Epidiorite
Archean	Dharwar	Babudan	Mullaingiri	Meta-ultramafic rock
				Metabasalt
				Banded Magnetite Quartzite
				Ferruginous Phyllite
				Carbonaceous Phyllite
			Santaveri	Metabasalt
			Kalasapura	Metapyroxenite
				Metagabbro
				Chlorite Schist
				Amphibolite
				Quartzite
				Conglomerate
	PGC	PG-I	Granitoids	Granite
			Gneisses	Granite Gneiss
		Sargur		Amphibolite
				Quartzite

1.8 Methodology

Landslide Susceptibility Map is prepared using AHP based data modelling method. In present study both probabilistic and heuristic-based method are used where the weightage is assigned based on knowledge of the causative factors/parameters. Due to insufficient data on landslide to support the data driven modelling, knowledge driven method is applied in the present study area. The Analytical Hierarchy Process is a multi-criteria decision making process of measurement through pair wise comparisons and relies on the judgements of the experts to derive priority scales (Saaty, 2008). AHP operates at four levels viz. Defining problems, construction of pair wise comparison matrix, determining weights and obtaining overall priority. In Landslide Susceptibility mapping different landslide causative factors are considered as alternatives. Absolute numbers (from 1 to 9) are assigned to each landslide related parameters

based on its relative importance and comparison matrices are constructed to Compute Consistency Ratio (CR), Consistency Index (CI).

Methodology followed for generating landslide susceptibility map is mentioned below:

I. Preparations of Pre-field thematic/geofactor map (in GIS on 1:50000 scale) includes:

Various geofactor thematic maps i.e. Landuse and Landcover Map, Geomorphology Map, Slope Forming Material Map, Regolith Thickness Map, Slope Morphometry (Slope, Aspect, and Curvature) Map, Drainage Map, Landslide inventory Map are prepared in Arc GIS platform with the aid of topographic sheets, Multi-temporal Google Earth Satellite Imagery.

- (i) LU/LC Maps and Geomorphology Maps are prepared from real time Google Earth Imagery (Multi-temporal imagery).
- (ii) Slope Forming Material Maps are generated with the aid of Geomorphology, Lithology (from legacy map: Geology map) and LU/LC map as proxy thematic maps.
- (iii) Regolith Thickness Maps are prepared with more accuracy during field checks.
- (iv) Drainage Maps and Slope Morphometry (Slope, Aspect, Curvature) Maps are DEM derivative map prepared from Carto DEM data of 30m resolution.
- (v) Landslide Inventory Map and Landslide inventory database is prepared with the help of multi-temporal data on Google Earth Imagery, historical and event based data are reported in old GSI reports and other relevant papers/articles.

II. Field based studies/Ground truthing includes:

- (i) Ground truthing/field checks of all geofactor thematic maps.
- (ii) Field validation of historic landslides and collection of recent landslide incidences at important locations.
- (iii) Collection of landslide inventory and damage data as per 41-point geo-parametric sheet.
- (iv) Validation and updation of pre-field thematic maps

III. Post field studies and modelling includes:

- (i) Updation of thematic maps and landslide inventory maps based on field data in GIS platform.
- (ii) Pair wise correlation matrix calculation, determination of LOFS and Rank as per weightage/rating assigned to different thematic (causative factors) variables.
- (iii) AHP based data modeling and overlay analysis of different rasterised thematic maps for the preparation of Landslide susceptibility map in GIS platform.

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II. PREVIOUS WORK ON LANDSLIDE STUDIES

2.1 REVIEW OF LITERATURE:

To update the landslide inventory database along National Highway (NH) and State Highway (SH) roads in Western Ghat sections the proposal was taken up in Mission-IV under Engineering Geology and geotechnical investigation programme of GSI: Landslide Hazard Evaluation. In order to implement the proposed action plan of the landslide hazard and risk mitigation, the landslide inventory database for preparation of the future models was carried out.

In the first phase of the inventory of landslides, the landslides along the National Highways (NH) and State Highways (SH) of the Western Ghat section in parts of Goa state and in parts of Karnataka state in toposheets no. 48I/2, I/3, E/14, 15 & 16 and J/7, J/6, J/9, and L/13 was taken up during F.S: 2007-08 in order to develop a landslide database for future landslide zonation and modelling as a part of the action plan of the MHA on landslide Hazard and risk mitigation.

During the F.S: 2009-10 (K.V. Maruthi et. al, 2011) Landslide inventory was carried out along NH & SH of ghat roads covering parts of toposheet nos. 48O/7, 48O/8, 48O/11, 48P/7, 48P/11 & 48P/15 in Chikmangalur, Coorg, Dakshina Kannada, Udupi and Shimoga Districts, Karnataka. Total 29 landslides are recorded along SH-64 between Chikmangaluru-Beltangady road sections. Total 13 landslides are recorded along SH-27 along Aldur-Balehonnur-Koppa road section. Most of the landslides are shallow (<2m depth) debris slides/slumps. The cut slope height and angle plays a major role in all the slides as the sliding events from crown to toe are restricted between the cut slopes. It was observed that majority of the slides are restricted to the cut slopes having height more than 10 m and slope angle varying from 70°- 90°. The relative relief from the cut slope is low to moderate at all the section and varies from 5m to 20m with depth of overburden varying from 0.5-10 m and 110 incidences of landslides were studied.

The Landslide Hazard Zonation in Macroscale (1:25,000 scale) were taken up during FS: 2008-09 and FS: 2009-2010 includes Charmudi ghat section from Charmudi to Kotigehara and Kotigehara to Kalasa in Dakshina Kannada and Chikmagalur districts of Karnataka and Shiradi ghat section from Sakleshpur to Gundiya (Uppinangadi taluk) along with Sakleshpur-Subramanya road and railway sections in Hassan and Dakshina Kannada districts of Karnataka. Total 152 landslide incidences were studied in the area. During the investigation it is observed that majority of the landslides are debris or earth slumps and slides occurred due to cutting of the natural slope for making road (A. K. Mishra, U. K. Pradhan et. al, 2011).

During F.S: 2010-12, the landslide inventory was carried out by (K.V. Maruthi et. al, 2012) along the road-sections of the Western Ghat in Uttar Kannada and Chikmangalur districts

covering parts of Toposheets no. 48 J/1, 6, 7, 10, 11, 14 & 15; 48 O/6, 7, 8, 10, 11, 14 & 15. The study reveals that most of the landslides are shallow (<2m depth) debris slides/slumps with the height of the cut slope as well as the inclination playing a major role in triggering the slides as the slides are confined to cut-slopes between the Crown to Toe of the slope. The study also reveals that majority of the slides are restricted to the cut slopes having more than 10m elevation and quite a steep slope angle varying between 70° and 90°. The relative relief from the cut-slope has also been low to moderate varying between 5m to 20m at all sections with relatively a heavy overburden varying from 0.5-10m.

2.2 Spatial distribution of historic landslide incidences:

In order to implement the proposed action plan of NDMA on Landslide Hazard Risk Mitigation it is proposed to take up landslide inventory of Karnataka state as a precursor to the landslide hazard zonation and risk evaluation of the hilly terrains of Western Ghats.

2.2.1 History of landslides: Due to the lack of data on the date of occurrence of landslides the exact age of landslide is difficult to arrive at; therefore history was taken on the morphological features observed on hill slopes. The landslides with fresh surface having less plant growth on debris categorized as new slides and rest are grouped as old slides. As regard to reactivated ones the old slides wherein new slides are developed are considered along with the slides wherein authorities have provided some remedial measures but still got failed are also grouped under reactivated ones. Most of the landslides are grouped as new slides (76 slides or 69.09% of the total) followed by old slides (30 slides or 27.27% of the total) and reactivated slides (4 slides or 3.64% of the total) (K.V. Maruthi et. al, 2011). The inventory database of past landslide incidences are listed in the tabular form below in **Table-2:**

Slide ID	Location	T.S no.	Lat	Long	History	Overburden Type	Material involved	Type of failure surface	Type of slide
MUDIGERE- CHIKMAGALURU ROAD SECTION (2008-09)									
KA-171	0.5 km from Mudigere towards chikmagalur on SH-64	48O/12	13.169	75.652	New	Soil	Weathered Gneiss	Slump	Debris slump
KA-172	10 km from Mudigere towards chikmagalur on SH-64	48O/12	13.197	75.669	New	Soil	Weathered Gneiss	Slump	Debris slump

Slide ID	Location	T.S no.	Lat	Long	History	Overburden Type	Material involved	Type of failure surface	Type of slide
KA-173	5 km from Mudigere towards chikmagalur on SH-64	48O/12	13.170	75.651	New	Soil	Weathered Gneiss	Slump	Debris slump
KA-174	20 mts from slide no KA-173 on SH-64	48O/12	13.170	75.651	New	Soil	Weathered Gneiss	Slump	Debris slump
CHIKMAGALURU-KEMMANNUGUNDI ROAD SECTION (2010-12)									
KA-518	2 km from Alampur on SH-27 towards Bababudangiri from Chickmagalur	48O/11	13.368	75.749	New	Soil	Weathered Quartzite	Wedge failure	Debris slide
KA-519	10 m from slide no KA-518 on SH-27 towards Bababudangiri from Chickmagalur	48O/11	13.368	75.747	Old & reactivated	Soil	Weathered Quartzite	Wedge failure	Debris slide
KA-520	3 km from Chickmagalur towards Bababudangiri	48O/11	13.381	75.723	Old and reactivated	Soil	Weathered Banded Iron Formation	Wedge failure	Debris slide
KA-521	20 m from slide no KA-520 from Chickmagalur towards Bababudangiri	48O/11	13.381	75.723	New	Soil	Weathered Banded Iron Formation	Slip	Debris slide
KA-522	1 km from slide no KA-521 from Chickmagalur towards Bababudangiri	48O/11	13.387	75.727	New	Soil	Weathered Banded Iron Formation	Slip	Debris slide
KA-523	800 m from KA-522 from Chickmagalur towards Bababudangiri	48O/11	13.388	75.728	New	Soil	Weathered Banded Iron Formation	Slump	Debris slump
KA-524	1.5 km from slide no KA-523 from Chickmagalur towards Bababudangiri	48O/11	13.391	75.730	Old and reactivated	Soil	Weathered Banded Iron Formation	Slip	Debris slide
KA-525	1.0 km from slide no KA-524 from Chickmagalur towards Bababudangiri	48O/11	13.400	75.735	New	Soil	Weathered Banded Iron Formation	Slip	Debris slide
KA-526	Near Forest naka from Chickmagalur towards Bababudangiri	48O/11	13.404	75.743	Old and reactivated	Soil	Weathered Banded Iron Formation	Planar failure	Rock fall

Slide ID	Location	T.S no.	Lat	Long	History	Overburden Type	Material involved	Type of failure surface	Type of slide
KA-527	200 m from slide no KA-526 from Chickmagalur towards Bababudangiri	48O/11	13.404	75.744	Old and reactivated	Soil	Weathered Banded Iron Formation	Planar failure	Rock fall
KA-528	2 km from slide no KA-527 from Chickmagalur towards Bababudangiri	48O/11	13.420	75.744	New	Soil	Weathered Banded Iron Formation	Slump	Earth slump
KA-529	1.5 km from slide no KA-528 from Chickmagalur towards Bababudangiri	48O/11	13.427	75.749	New	Soil	Weathered Banded Iron Formation	Slip	Debris slide
KA-530	Near Hair pin bend 3, 3 km from slide no KA-529 from Chickmagalur towards Bababudangiri	48O/11	13.426	75.750	New	Soil	Weathered Banded Iron Formation	Slump	Debris slump
KA-531	800 m from slide no KA-530 from Chikmagalur towards Bababudangiri	48O/11	13.430	75.748	New	Soil	Weathered Banded Iron Formation	Slump	Debris slump
KA-532	700 m from road cross (Chikmagalur Bababudangiri road) towards Kemmannugundi from Chikmagalur.	48O/11	13.434	75.740	New	Soil	Weathered Banded Iron Formation	Slump	Debris slump
KA-533	300 m from slide no KA-532 towards Kemmannugundi from Chikmagalur	48O/11	13.434	75.742	Old and reactivated	Soil	Weathered Banded Iron Formation	Slip	Debris slide
KA-534	500 m from slide no KA-533 towards Kemmannugundi from Chikmagalur	48O/11	13.435	75.744	Old	Soil	Weathered Banded Iron Formation	Slip	Debris slide
KA-535	800 m from slide no KA-534 towards Kemmannugundi from Chickmagalur	48O/11	13.444	75.746	Old	Soil	Weathered Banded Iron Formation	Slip	Debris slide

Slide ID	Location	T.S no.	Lat	Long	History	Overburden Type	Material involved	Type of failure surface	Type of slide
	CHIKMAGALURU-MULLAYYANGIRI ROAD SECTION (2010-12)								
KA-544	1.5 km from Mullayyangiri peak towards Chickmagalur on Mullayyangiri road.	480/11	13.388	75.705	New	Soil	Weathered Banded Iron Formation	Slump	Earth slump
KA-545	3 km from slide no KA-544 from Mullayyangiri top on Chickmagalur Mullayyangiri road.	480/11	13.386	75.704	Old	Soil	Weathered Banded Iron Formation	Slump	Debris slump
KA-546	1 km from slide no KA-545 from Mullayyangiri top on Chickmagalur-Mullayyangiri road.	480/11	13.383	75.708	Old	Soil	Weathered Banded Iron Formation	Slump	Debris slump
KA-547	2 km from slide no KA-546 from Mullayyangiri top towards Chickmagalur-Mullayyangiri road.	480/11	13.383	75.711	Old	Soil	Weathered Banded Iron Formation	Slump	Debris slump
KA-548	2 km from slide no KA-547 from Mullayyangiri top towards Chickmagalur on Chickmagalur-Mullayyangiri road.	480/11	13.382	75.713	Old and reactivated	Soil	Weathered Banded Iron Formation	Slip	Debris slide
KA-549	50 m from slide no KA-548 from Mullayyangiri top towards Chickmagalur on Chickmagalur-Mullayyangiri road.	480/11	13.382	75.714	Old and reactivated	Soil	Weathered Banded Iron Formation	Slip	Debris slide

III. LANDSLIDE INCIDENCES IN PRESENT SCENARIO

3.1 Spatial distribution of Landslides

Major slope failure are restricted to “Extensive cut slope” with steep slope angle between 70°-85° and vertical height >10m. Most of the slope failures are occurring on loose material (in-situ soil), highly weathered, fractured and jointed rocks. The water seepage and water saturation of the slope leads to decrease in the cohesive and shear strength of slope forming material. Major landslides/slope failures are recorded in following road sections:

1. Chikmangalur-Sringeri road section (SH-27): 2 nos. of debris slides.
2. Devaravalli-Hunsahalli-Jakkanahalli village area: 4 nos. of debris slides.
3. Kavikalgandi-Attigundi-Kemmannugundi/Mullayanagiri-Bababudan road section: 5 nos. of planar slope failure and 7 nos. of debris slides.
4. Mulahalli-Gutti halli-Gutti road section: 2 nos. debris slide with multiple failures.
5. Mudigere-Kotigehara road section: 5 nos. of shallow rock slides and 2 nos. of debris slides.
6. Banahalli-Tattakola-Bapujinagra road section: 6 nos. of shallow rock cum debris slides.

3.2 Landslides along the Major road and Ghat road sections including National Highway and State Highway of the study area:

I. Mudigere-Attigere-Kotigehara-Beltangadi road section:

The Bangalore-Mangalore National Highway (NH-234) passes through the Mudigere-Attigere-Kotigehara-Beltangadi road section. Total 8 nos. of landslide incidences are recorded, in which 2 nos. of debris slide, and 2 nos. of rock cum debris slides recorded on Piedmont Slope and 4 nos. of rock slide are recorded on Moderately Dissected Hillslope.

1. Location: The slide is located at latitude 13°07'55.39"N and longitude 75°32'37.59"E lies in Survey of India toposheet no. 48O/12 at Hebbarige village near Banakal on NH-234. And about 164m another debris slide is reported.

Slide description: The small dimension slide is classified as shallow (<2m) translational debris slide. The overburden material consists of in-situ soil and the upslope gradient is low. The rate of movement of sliding material is slow. The slide is widening, enlarging and progressive in nature. The slide is occurring on Piedmont Slope of lowly dissected hill slope. In current scenario the sliding activity is suspended and stable, so the risk is low. No damage to communication lines. The plantation on the slope and old scars are present. The slide may get reactivated during

monsoon. The slope forming material is in-situ soil and highly weathered rock. The morphometric parameters of slide are length=30m, width=40m, Height=10m and run out distance=25-30m. The slope angle of the sliding surface is gentle i.e. 15-25°.

Causes: The geo-scientific causes are weathering, erosion of loose materials due to water saturation, decrease of cohesive strength of slope forming material during heavy rainfall.

Remedial measures: Lined drainage, and slope gradation required as remedial measures.

2. Location: The slide is located at latitude 13°7'4.52"N and longitude 75°30'47.3"E lies in Survey of India toposheet no. 48O/12 on NH-234. And about 164m another debris slide is reported.

Slide description: The small dimension slide is classified as shallow (<2m) translational rock cum debris slide. The overburden material consists of weathered rock and in-situ soil and the upslope gradient is low. The slide is widening, enlarging and progressive in nature. The slide is occurring on Piedmont Slope of lowly dissected hill slope. In current scenario the sliding activity is suspended and stable, so the risk is low. No damage to communication lines. The plantation on the slope and old scars are present. The slide may get reactivated during monsoon. The slope forming material is in-situ soil and highly weathered rock. The morphometric parameters of slide are length=30m, width=55m, height=2m, VH=15m and run out distance=30m. The slope angle of the sliding surface is gentle i.e. 15°-25°.

Causes: The geo-scientific causes are weathering, erosion of loose materials due to water saturation, decrease of cohesive strength of slope forming material during heavy rainfall.

Remedial measures: Removal of loose material, lined drainage and slope re-gradation are required.

3.Location: The slide is located at latitude 13°7'12.84"N and longitude 75°30'42.32"E lies in Survey of India toposheet no. 48O/12 on NH-234.

Slide description: The small dimension slide is classified as shallow (<2m) translational rock cum debris slide. The overburden material consists of weathered rock and in-situ soil and the upslope gradient is low. The slide is widening, enlarging and progressive in nature. The slide is occurring on piedmont Slope of lowly dissected hill slope. In current scenario the sliding activity is suspended and stable, so the risk is low. No damage to communication lines. The plantation on the slope and old scars are present. The slide may get reactivated during monsoon. The slope forming material is in-situ soil and highly weathered rock. The morphometric parameters of slide are length=30m, width=100m, Height=2m, VH=15m and run out distance=15m. The slope angle of the sliding surface is gentle i.e. 15-25°.

Causes: The geo-scientific causes are weathering, erosion of loose materials due to water saturation, decrease of cohesive strength of slope forming material during heavy rainfall.

Remedial measures: Lined drainage and retaining wall is required.

4. Location: The slide is located at latitude 13°7'4.56"N and longitude 75°30'19.05"E lies in Survey of India toposheet no. 48O/12 on NH-234.

Slide description: The small dimension slide is classified as shallow (<2m) translational rock slide. The overburden material consists of weathered rock and soil. The rock type is Granite Gneiss with joints. The rate of movement of sliding material is slow. The slide is widening, enlarging and retrogressive in nature. The slide is occurring on moderately dissected hill slope. In current scenario the sliding activity is suspended and stable, so the risk is low. No damage to communication lines. Old scars are present. The morphometric parameters of slide are length=28m, width=55m, height=1.2m and run out distance=25m. The slope angle of the sliding surface is gentle i.e. 15°-25°.

Causes: Seepage along weak plane, water saturation leading to weathering, along nala.

Remedial measures: Lined drainage is required.

5. Location: The slide is located at latitude 13°7'6.97"N and longitude 75°30'14.29"E lies in Survey of India toposheet no. 48O/12 on NH-234.

Slide description: The small dimension slide is classified as shallow (<2m) translational rock slide. The overburden material consists of weathered rock and soil. The rock type is Granite Gneiss with joints. The rate of movement of sliding material is slow. The slide is widening, enlarging and retrogressive in nature. The slide is occurring on moderately dissected hill slope. In current scenario the sliding activity is suspended and stable, so the risk is low. No damage to communication lines. Old scars are present. The morphometric parameters of slide are length=30m, Width=40m, Height=10m and run out distance=25-30m. The slope angle of the sliding surface is gentle i.e. 15-25°.

Causes: Seepage along weak plane, water saturation leading to weathering, downslope Somavahini halla

Remedial measures: Lined drainage is required.

6. Location: The slide is located at latitude 13°7'9.83"N and longitude 75°30'14.29"E lies in Survey of India toposheet no. 48O/12 on NH-234.

Slide description: The small dimension slide is classified as shallow (<2m) translational rock slide. The overburden material consists of weathered rock and soil. The rock type is Granite

Gneiss with joints. The rate of movement of sliding material is slow. The slide is widening, enlarging and retrogressive in nature. The slide is occurring on moderately dissected hill slope. In current scenario the sliding activity is suspended and stable, so the risk is low. No damage to communication lines. Old scars are present. The morphometric parameters of slide are length=30m, width=70m, Height=13m and run out distance=25-30m. The slope angle of the sliding surface is gentle i.e. 15-25°.

Causes: Seepage along weak plane, water saturation leading to weathering, downslope
Somavahini halla

Remedial measures: Lined drainage is required.

7. Location: The slide is located at latitude 13°7'11.99"N and longitude 75°30'8.43"E lies in Survey of India toposheet no. 48O/12 on NH-234.

Slide description: The small dimension slide is classified as shallow (<2m) translational rock slide. The overburden material consists of weathered rock and soil. The rock type is massive Granite Gneiss. The rate of movement of sliding material is slow. The slide is widening, enlarging and retrogressive in nature. The slide is occurring on moderately dissected hill slope. In current scenario the sliding activity is suspended and stable, so the risk is low. No damage to communication lines. Old scars are present. The morphometric parameters of slide are length=30m, width=30m, Height=1.2m and run out distance=18m. The slope angle of the sliding surface is gentle i.e. 15-25°.

Causes: Seepage along weak plane, water saturation leading to weathering, downslope
Somavahini halla

Remedial measures: Lined drainage is required.

II. Jargal-Kotrakere-Gutti-Mulahalli road section:

1. Location: The slide is located at Mulahalli village latitude 13°02'31.05"N and longitude 75°33'45.77"E lies in Survey of India toposheet no. 48O/12.

Slide description: The small dimension slide is classified as shallow (<2m) translational rock cum debris slide. The overburden material consists of weathered rock and soil. The rock type is massive Granite Gneiss. The rate of movement of sliding material is slow. The slide is widening, enlarging and progressive in nature. The slide is occurring on moderately dissected hill slope with sparse vegetation. In current scenario the sliding activity is suspended and stable, so the risk is low. No damage to communication lines. Old scars are present. The morphometric parameters

of slide are length=30m, width=30m, height=1.2m and run out distance=5m. The slope angle of the sliding surface is gentle i.e. 15-25°.

Causes: Weathering and Erosion of loose material due to water saturation during heavy rainfall

Remedial measures: slope re-gradation required.

- 2. Location:** The slide is located at 2.5km from Mulahalli village at latitude 13°3'34.01"N and longitude 75°33'14.76"E lies in Survey of India toposheet no. 48O/12. .

Slide description: The small dimension slide is classified as shallow (<2m) translational rock cum debris slide with successive multiple failure. The overburden material consists of weathered rock and soil. The rock type is massive Granite Gneiss. The rate of movement of sliding material is slow. The slide is widening, enlarging and progressive in nature. The slide is occurring on lowly dissected hill slope with sparse vegetation. In current scenario the sliding activity is suspended and stable, so the risk is low. No damage to communication lines. Old scars are present. Hydrological condition is Damp. The morphometric parameters of slide are length=, width=55m, height=8m and run out distance=14m. The slope angle of the sliding surface is gentle i.e. 15-25°.

Causes: Weathering and Erosion of loose material due to water saturation during heavy rainfall

Remedial measures: lined drainage is required.

- 3. Location:** The slide is located at Kotrakere village at latitude 13°5'29.75"N and longitude 75°33'22.12"E lies in Survey of India toposheet no. 48O/12. .

Slide description: The small dimension slide is classified as shallow (<2m) translational rock cum debris slide with successive multiple failure. The overburden material consists of weathered rock and soil. The rock type is massive Granite Gneiss. The rate of movement of sliding material is slow. The slide is widening, enlarging and progressive in nature. The slide is occurring on lowly dissected hill slope/piedmont slope with sparse vegetation. In current scenario the sliding activity is suspended and stable, so the risk is low. No damage to communication lines. Old scars are present. The morphometric parameters of slide are length=15m, width=50m, height=1m and run out distance=12m. The slope angle of the sliding surface is gentle i.e. 15-25°.

Causes: Wedge failure due to water seepage and saturation along joint plane.

Remedial measures: Slope Gradation and lined drainage required.

Remarks: In present condition landslide is suspended and unstable and risk factor is moderate and meta-stable, few settlements were there at downslope/foothill are at low risk.

III. Old landslide incidence recorded along Chikmangaluru-Hirekolale road section.

Location: The slide is located at latitude 13°21'46.27" N and longitude 75°42'26.57" E in Survey of India toposheet no. 48O/11 near Hirekolale lake.

Slide description: Landslide on Lowly dissected hill slope is categorised as shallow rock cum debris slide of small dimension with wedge failure due to water seepage and saturation along joint plane. Joints sets are oriented ENE-WSW, WNW-ESE, and E-W direction. The rock type is quartzite exposed on crown part and fallen rock blocks at toe part where slope forming material is in-situ soil. In current scenario plantation on the slope indicates that the slide is dormant/suspended in current scenario. However, few settlements were there at downslope/foothill are at low risk. TheHHP (silver oak mixed with coffee) on the lowly dissected slope is the common land use practise in and around Hirekolale village area.

IV. Landslide incidences in Mudigere-Handi-Kannapura road section.

Location: The slide is located at 1.7km from Kannapura village at latitude 13°09'23.27" N and longitude 75°40'54.21" E in Survey of India toposheet no. 48O/12. The old shallow debris slide is extended up to 80m along road with vertical height: 14m, crown height is <5m, slope angle of 45-50°. The slope forming material is predominantly soil with few hanging rock blocks in between with overburden thickness of soil >10m. In current scenario the slide is suspended but not inactive as bending of trunk of tree shows perfect evidence of creep movement or subsidence. The plantation and re-gradation of slope are observed.

Remarks: The area is meta-stable; need concrete lined drainage with weep holes, proper slope re-gradation with benches required to stop sudden slope failure.

Note: Few debris slump/slide of small dimension recorded Along Handi-Kanakpura-Gattadahalli-Mudigere road section at latitude 13°09'28.29"N and longitude 75°41'14.86" E and latitude 13°09'28.23" N and longitude 75°41'01.55"E are demarcated as unstable zone. Extensive cut slope/road cut at 13°09'13.03"N/75°40'31.10"E is recorded. At few places bulges in retaining wall of 1m height with or without weep holes are observed. This indicates progressive movement of slope forming material.

V. Landslides along Seetalayyanagiri-Mullayangiri-Babudangiri (Dattathreya Peta) road section:

The planar slope failure is observed along the road cut section on the lowly dissected Mullayangiri hill range on weathered BIF is basically along joint plane dipping towards valley. The area is moderate to highly weathered. The slope forming material is in-situ soil, weathered

rock and rock with overburden thickness of 0.5-5m in-situ soil. The slope is covered with small grasses and shrubs. The landuse-landcover pattern is basically Plantation i.e. coffee mixed with silver oak marked as Low Height Plantation. Details of locations are mentioned below:

1. Shallow Planar failure in BIF near Kavikalgundi Village at Lat: 13°24'14"N Long: 75°33'42.60"E
2. Shallow Planar failure in BIF near Kavikalgundi Village at Lat: 13°24'19.93"N, Long: 75°44'34.47"E. Two sets of perfect joints where the failure has occurred along the joint plane J1: E-W/55N, J2: N-S/85W, 65°dip towards valley, Vertical Height: 10m, Width: 130m.
3. Shallow Debris Slide on Weathered BIF about 2 km from Sitamalikarjuna Devasthan, Seetalayyanagiri at Lat: 13°24'16.17"N Long: 75°44'19.49"E
Dimension: crown: 2m, Runoff: 25m, Width: 55m
4. Shallow Planar Failure in BIF of width: 50m and vertical height: 6m near Kavikalgundi at Lat: 13°24'16.86"N Long: 75°44'22.28"E
5. Shallow Planar Failure in BIF with width of 55m near Kavikalgundi at Lat: 13°24'16.17"N Long: 75°44'19.49"E.

VI. Landslide incidences on Muthodi-Honnahalli-Holegadde Road Sections:

Total 6 nos. of landslides are recorded where the sliding incidences has occurred on rock and weathered rock with loose soil debris on lowly dissected slope at slope angle 25-35°. The area is dense to moderately vegetate and at isolated place sparse vegetation is also occurring. The shallow translational slope failure has occurred along the weaker plane and along open spaces along joints where weathering due to water saturation has lead to slope instability. The slides are occurring parallel to Somavahini halla running in valley part in downslope direction.

1. Location: The Landslide is located at latitude 13°23'37.75"N and longitude 75°38'42.56"E SOI Toposheet no.48O/11 on Muthodi road section.

Slide Description: The small dimension slide is classified as shallow (<2m) translational rock cum debris slide with multiple failure. The overburden material consists of weathered rock and soil. The rock type is massive Quartzite which is highly Fractured and jointed. The rate of movement of sliding material is slow. The slide is confined, enlarging, widening, and retrogressive in nature. The slide is occurring on lowly dissected hill slope with sparse vegetation dipping towards valley. In current scenario the sliding activity is suspended but unstable. No damage to communication lines. Old scars are present. The morphometric parameters of slide are

length=, Width: Approx. 65m, Height= Approx. 1.2m, VH:15m and run out distance=Approx 12m. The slope angle of the sliding surface is i.e. 25-35°.

Causes: Seepage along weak plane, water saturation leading to weathering, downslope Somavahini halla.

Remedial measures: Removal of loose material, lined drainage and slope gradation required.

2. Location: The Landslide is located at latitude 13°23'41.95"N and longitude 75°38'42.28"E SOI Toposheet no.48O/11 on Muthodi road section.

Slide Description: The small dimension slide is classified as shallow (<2m) translational Planar failure. The overburden material consists of weathered rock and soil. The rock type is Amphibolite. The rate of movement of sliding material is slow. The slide is progressive, enlarging and widening in nature. The slide is occurring on lowly dissected hill slope/PPC with Moderate vegetation dipping towards valley. In current scenario the sliding activity is suspended and stable, so the risk is low. No damage to communication lines. Old scars are present. The morphometric parameters of slide are length=28m, width= Approx. 45m, height= Approx. 1 m and run out distance= Approx. 15m. The slope angle is 25-35°.

Causes: Seepage along weak plane, water saturation leading to weathering, downslope Somavahini halla.

Remedial measures: Removal of loose material, lined drainage and slope gradation required.

3. Location: The Landslide is located at latitude 13°23'53.00"N and longitude 75°38'41.61"E SOI Toposheet no.48O/11 on Muthodi road section.

Slide Description: The small rock slide is classified as shallow (<2m) translational Planar failure. The overburden material consists of weathered rock. The rock type is carbonaceous Phyllite. The rate of movement of sliding material is slow. The slide is progressive, enlarging and widening in nature. The slide is occurring on lowly dissected hill slope with Moderate vegetation dipping towards valley. In current scenario the sliding activity is suspended and stable, so the risk is low. No damage to communication lines. Old scars are present. The morphometric parameters of slide are length=35m, width= Approx.25m, height= 2.5m , VH:Approx. 12m and run out distance= Approx. 15m. The slope angle is 25-35°.

Causes: Seepage along weak plane, water saturation leading to weathering, downslope Somavahini halla.

Remedial measures: Removal of loose material, Lined drainage and slope gradation required.

4. Location: The Landslide is located at latitude 13°23'56.04"N and longitude 75°38'39.00"E SOI Toposheet no.48O/11 on Muthodi road section.

Slide Description: The small rock slide is classified as shallow (<2m) translational Planar failure. The overburden material consists of weathered rock. The rock type is Ferruginous Phyllite. The rate of movement of sliding material is slow. The slide is confined, enlarging and widening in nature. The slide is occurring on lowly dissected hill slope with Moderate vegetation dipping towards valley. In current scenario the sliding activity is suspended and stable, so the risk is low. No damage to communication lines. Old scars are present. The morphometric parameters of slide are length= Approx.28m, width= Approx.25m, VH=Approx. 20m and run out distance= Approx. 15m. The slope angle is 25-35°.Total 2 sets of joints, N-S/80W dipping towards valley

Causes: Seepage along weak plane, water saturation leading to weathering, downslope Somavahini halla.

Remedial measures: Removal of loose material, lined drainage and slope gradation required.

5. Location: The Landslide is located at latitude 13°24'26.72"N and longitude 75°38'47.42"E SOI Toposheet no.48O/11 on Muthodi road section.

Slide Description: The small rock slide is classified as shallow (<2m) translational Planar failure. The overburden material consists of weathered rock. The rock type is Ferruginous Phyllite. The rate of movement of sliding material is slow. The slide is confined, enlarging and widening. The slide is occurring on lowly dissected hill slope with Moderate vegetation dipping towards valley. In current scenario the sliding activity is suspended and stable, so the risk is low. No damage to communication lines. Old scars are present. The morphometric parameters of slide are length= Approx.21m, width= Approx.25m, Height= VH: Approx. 20m and run out distance= Approx. 15m. The slope angle is 25-35°.Two sets of joints, N-S/80W dipping towards valley

Causes: Seepage along weak plane, water saturation leading to weathering, downslope Somavahini halla.

Remedial measures: Removal of loose material, lined drainage and slope gradation required.

6. Location: The Landslide is located at latitude 13°24'26.72"N and longitude 75°38'47.42"E SOI Toposheet no.48O/11 on Muthodi road section.

Slide Description: The small rock slide is classified as shallow (<2m) translational Planar failure with multiple failure. The overburden material consists of weathered rock. The rock type is Ferruginous Phyllite. The rate of movement of sliding material is slow. The slide is confined, enlarging and widening, retrogressive. The slide is occurring on lowly dissected hill slope with

Moderate vegetation dipping towards valley at slope angle 25-35°. In current scenario the sliding activity is suspended and stable, so the risk is low. No damage to communication lines. Old scars are present. The morphometric parameters of slide are length=Approx 28m, width= Approx.50m, Height= Approx. 2m and run out distance= 22m.

Causes: Seepage along weak plane, water saturation leading to weathering, downslope Somavahini halla.

Remedial measures: Removal of loose material, lined drainage and slope gradation required.

VII. Landslide incidences along Banahalli-Tattakola-Bapujinagra road section.

Location: The Landslide is located at latitude 13°8'55.15"N and longitude 75°37'49.28"E SOI Toposheet no.48O/12 at 2.7km from Mudigere recorded along Banahalli-Tattakola-Bapujinagra road section.

Slide description: The slide is extended upto 100m along the road. The rock type is massive granite gneiss. The landslide is shallow rock slide of <5m depth, with multiple failures with length: 19m crown height: 1.3m, run out distance: 17m. The slide is dormant and slope is covered with dense shrubs and bushes. The rock blocks are dislodged along the nala section. Few extensive cut slope/road cut are also marked.

Causes: Seepage along weak plane, water saturation leading to weathering.

Remedial measures: Removal of loose material, lined drainage with weep holes at toe part is required.

IV. LANDSLIDE SUSCEPTIBILITY ANALYSIS

4.1 Background

Landslide occurrences in any terrain is governed by various factors associated which are site/terrain specific so; multivariate analysis is required to serve the purpose. Different geofactor themes are taken into consideration which includes i) Physical state of slope/slope morphometric parameters such as slope gradient, slope aspect, and slope curvature, ii) Lithology or physical characteristics of slope forming material iii) spatial variation in thickness of slope forming material/regolith, iv) Geomorphic features, v) Geology and rock structure: orientation of planar/linear discontinuities in the rock mass in relation to topography, vi) Drainage and, vii) Land use/Landcover including road and other physical features mappable on 1:50,000 scale. Based on the estimation of above pre-disposing geofactors, the following preparatory factors and its possible factor classes are considered for preparation of geofactor databases for the GIS-based analysis of susceptibility to landsliding.

4.2. Selection of preparatory factors

As per data model, some of the geofactor themes are categorical (e.g., geomorphology, LU/LC etc.) and others represent continuous data (e.g., slope, elevation etc.) These spatial geo-factor maps are prepared using various source data and employing different mapping techniques:

- (i) Geomorphology Map: The source data for preparation of Geomorphology map is National Geomorphological and Lineament map on 1:50,000 scale and Google Earth Based Satellite Imagery on 1:50,000 scale. The pre-field Geomorphology maps are validated in the field and necessary correction/updation in geomorphic features are made.
- (ii) Landuse/Landcover Maps: The source data for preparation of Landuse/ Landcover map is toposheet and Google Earth Based Satellite Imagery on 1:50,000 scale. The pre-field Landuse/Landcover maps are validated in the field and necessary correction/updates are made.
- (iii) Slope Morphometry Maps: The Slope, Aspect and Curvature maps are DEM derived continuous data, prepared from Carto DEM data of 30m resolution.
- (iv) Slope Forming Material Map: The pre-field maps are prepared taking proxies from geomorphology, geology, and landuse/landcover maps and further updated based on field inputs.
- (v) Regolith Thickness Map: The maps are prepared with help of overburden thickness observed along road cut sections and quarry sections during field work.

(vi) Road, River & Water bodies: Primary source data for preparing base map is topographic map sheet/Google Earth Imageries.

4.3 Geofactor Themes

The geofactor thematic maps prepared for landslide susceptibility analysis are mentioned below:

4.3.1 Slope Morphometry (Slope, Aspect, Curvature) Maps:

Raster maps of Slope (**Plate-5**), Aspect (**Plate-6**), and Curvature (**Plate-7**) are DEM derivative geofactor maps generated from Carto DEM of 30m resolution using Spatial Analyst/3D Analyst Module of Arc GIS software.

Slope Angle Map (**Plate-5**) is classified into 5 classes; $<15^\circ$, $15^\circ-25^\circ$, $25^\circ-35^\circ$, $35^\circ-45^\circ$, $>45^\circ$ based on slope gradient, slope is deterministic geofactor class governing the failure plane. The hillslope in the area is gentle that varies between $25^\circ-35^\circ$ whereas vertical cut at places has modified the slope angle from 70° to 90° . The percentage distribution of different slope gradient classes are listed in **Table 5** based on classified slope map.

Slope Curvature Map (**Plate-7**) shows negative and positive curvature values that represent concave and convex upward slopes respectively which are believed to have strong spatial correlation with landslides mapped and zero curvature shows flat surface. The percentage distribution of different slope curvature classes are listed in **Table 6** based on classified Slope Curvature Map.

Geofactor theme aspect is categorised into 12 classes namely NNE, NE, ENE, ESE, SE, SSE, SSW, SW, WSW, WNW, NW & NNW. Raster map of Aspect (**Plate-6**) are generated for analysing the Slope Morphometry. The computed aspect values are a categorical data, discretized into 12 classes extracted from Carto DEM of 30m resolution. Aspect parameter is not taken into consideration in the analysis as it has very less influence or of no affect on final Landslide Susceptibility Map.

Table 4: The Percentage distribution of Classified Slope Gradient/Angle Map for T.S Nos. 48O/11 & 48O/12 with their LOFS and Rank

CLASS	Rank	LOFS	Area in (%)
$<15^\circ$	2	0.1631	73.09146
$15^\circ-25^\circ$	4	0.4597	21.1302
$25^\circ-35^\circ$	8	1.0000	5.013441
$35^\circ-45^\circ$	6	0.2817	0.67688
$>45^\circ$	2	0.1631	0.088011

Table 5: The Percentage distribution of Classified Slope Curvature Map for T.S Nos. 48O/11 & 48O/12 with their LOFS and Rank.

CLASS	Rank	LOFS	Area in (%)
Concave	4	0.4113	47.32
Flat	2	0.1676	34.65
Convex	6	1.0000	18.03

4.3.2 Landuse/Landcover Map:

Pre-field landuse and landcover map is prepared through visual interpretation of Google Earth Imagery (multi-temporal real time datasets) and validated during field traverses. This thematic map is classified into some standard landuse/ landcover classes (**Plate-4**). The landuse and landcover categories classified and their geographical distribution in percentage is illustrated in (**Table 6**). Based on geographical distribution around 50.15% of the study area is predominantly covered by Plantation majorly low height plantation i.e. coffee mixed with silver oak and at isolated places coffee mixed with betel nut. The high height silver oak provide shadow to coffee plant whereas the pepper occurring as climber on silver oak are the common landuse practise on lower reaches of hill slope. Around 13.77% and 13.36% of the area is covered with Moderate and Thick vegetation respectively. Saragodu, Baluru, Basti, Gangeri, Kuskal, Basavankote, Muthodi reserved forests and Bhadra wildlife sanctuary is predominantly occupied by dense mixed jungle with bamboo.

The percentage geographical distribution of other LU/LC categories apart from vegetation cover are Settlement (1.55%), Barren (.06%), Sparse vegetation (3.26%) including Scrub land, Cultivation (10.15%), Quarry (.02%) i.e. Rock quarry, Fallow land (1.02%), Extensive cut slope (.02%) covering rest 22.72% of the study area. The Plantation occurring in study area mainly includes Coffee Arabica, Coconut (Cocos nucifera), Betel nut (Areca catechu), Acacia (Acacia confuse), and Cashew (Anacardium occidentale) (**Plate-3**). The area is known for its rich coffee estate. Coffee (Arabica) is the major cash crop. The agro-climatic condition is conducive for cultivation of arecanut, coconut, coffee, pepper, and other plantation crops. The silver oak, teak wood and Jungle wood are economically important timber wood grown in the area. Thus, together with Coffee, Chikmangaluru grows a considerable variety of horticulture crops like Arecanut, Coconut, Black Pepper, Banana, Mango, Cardamom, Ginger, and Vegetables. Other minor produces in horticulture include floriculture, Sapota, Orange, Cocoa and Jackfruit. Major cereals crops are Ragi, Paddy, Maize, & Jowar.

Table 6: The Percentage distribution of different Landuse/Landcover classes for T.S Nos. 48O/11 & 48O/12 with their LOFS and Rank.

Class	Rank	LOFS	Area in (sq. km.)	Area covered in (%)
Thick Vegetation	4	0.1988	200.117	13.362
Moderate Vegetation	5	0.2912	206.278	13.77338
Sparse Vegetation	7	0.5631	48.814	3.259377
Plantation (HHP)	4	0.1988	23.515	1.570119
Plantation (LHP)	3	0.1366	727.563	48.58007
Cultivation	2	0.0937	152.05	10.15252
Extensive Slope Cut	9	1	0.36	0.024037
Fallow Land	1	0.0626	15.397	1.028066
Barren	1	0.0626	86.039	5.744925
Quarry	5	0.2912	0.293	0.019576
Settlement	1	0.0683	23.226	1.550835
Settlement on modified slope	7	0.5631	9.046	0.603986
River	0	0	3.945	0.263413
Water body	0	0	1.014	0.067694

4.3.3 Geomorphology Map:

National Geomorphological and Lineament Map (NGLM) of GSI used as source maps for geomorphology theme for use in landslide susceptibility map. It is one of the categorical geofactor thematic databases. The geomorphic features are mapped mostly through visual interpretation of Satellite imagery with limited field checks. The NGLM data is substantiated by reclassifying the existing geomorphic features making it more useful as an evidential layer for landslide susceptibility.

Geomorphologically, the area forms a part of Western Ghats and is characterise by a highly undulating rugged topography with steep ridges and lowly dissected hill slope with intermittent narrow valley fills and Pediment-Pediplain Complex having rolling topography. The wide spread lowly dissected hill slope is trending NW-SE occupying 60.57% of the study area. The lower reaches of hill slope are categorised as Pediment-Pediplain Complex and Piedmont slope of slope angle <15%. The North-Eastern and South-Eastern parts are occupied by 10.98% of

Moderately Dissected hillslope. Lithology Viz, BIF, interbedded Quartzite, and the granitoids controls the geomorphological features of the area (**Plate-4**). The BIF owing to its greater resistance to weathering stands out a horseshoe shaped hill range with steep escarpment. The granitic terrain is characterised by highly dissected topography.

The different geomorphic features and categories identified in the area and their geographical distribution (**Table 7**) indicates that 60.57% of the area is Lowly Dissected hillslope, 10.98% Moderately Dissected slope, 13.53% Pediment-Pediplain Complex, 10.29% Piedmont Slope, 0.16% Escarpment, .01% Hilltop, 2.67% Rolling plain, 1.45% Valley fill, .05% Ridge top.

Table 7: The Percentage distribution of different Geomorphology classes for T.S Nos. 480/11 & 480/12 with their LOFS and Rank.

Class	Rank	LOFS	Area covered (in sq. km)	Area covered (%)
Escarpment	2	0.0819	2.322	0.155043
Hilltop	0	0	0.097	0.006462
Lowly Dissected Slope	4	0.1947	907.08	60.56658
Moderately Dissected Slope	6	0.4020	164.51	10.98449
Rolling Plain	0	0	39.501	2.637518
Pediment Pediplain Complex	0	0	202.56	13.52512
Ridge - top	0	0	0.816	0.05451
River	0	0	3.841	0.256459
Valley Fill	0	0	21.806	1.45602
Water body	0	0	154.143	0.065536
Piedmont Slope	4	0.1947	0.981	10.29227

4.3.4 Slope Forming Material Map:

Another important categorical data is geofactor theme of slope forming material which categorizes areas into discerning types of material occurring on slope which includes from different litho-units and overburden material. The primary source maps used for the preparation of such slope forming material map are 1:50,000 Geology Map, 1:50,000 Geomorphology maps, Landuse/Landcover and Slope maps. The field-based knowledge/inputs on characteristics of exposed rock masses, their weathering details, types of overburden material, depths etc, are then

combined with the above source maps and subsequently, a slope forming material map can be derived as an important geofactor thematic map for use in the landslide susceptibility analysis.

Since, on macro scale (1:50,000) it is generally difficult to classify susceptibility maps solely based on landslide types (e.g. debris and rock slides) so, the preparation of such a detailed and classified slope forming material map and using the same as an input thematic map in the landslide susceptibility modelling instead of general geology map would always be highly relevant. In the study area the slope forming material classes (**Plate-9**) are identified as in-situ soil, weathered rock, rock, and alluvium and identified as 21 classes and accordingly Rank was given below.

Table 8: The Percentage distribution of different Slope Forming Material classes for T.S Nos. 480/11 & 480/12 with their LOFS and Rank.

CLASS	Rank	LOFS	Area in (%)
Laterite	4	0.2409	0.054415
Alluvium	1	0.0682	0.03447
Amphibolite	1	0.0682	1.364793
Banded magnetite quartzite	1	0.0682	0.810527
Carbonaceous phyllite	1	0.0682	0.813304
Conglomerate	1	0.0682	0.006539
Dolerite	1	0.0682	0.010443
Epidiorite	1	0.0682	0.028727
Ferruginous phyllite	1	0.0682	2.057903
Granite gneiss	1	0.0682	13.23341
Granitoid	1	0.0682	0.13767
in-situ soil	1	0.0682	72.31502
Meta-ultramafite	6	0.5437	0.002762
Metabasalt	1	0.2409	0.188535
Metapyroxenite	3	0.1506	0.03425
Quartz-chlorite schist	4	0.2409	0.035623
Quartz vein	0	0.0000	0.001993
Quartzite	4	0.2409	0.10893
Weathered Rock	4	0.2409	8.429574
River	4	0.2409	0.263413
Water body	4	0.2409	0.067694

4.3.4 Regolith Thickness Map:

The Regolith Thickness map is prepared on the basis of field observation in the study area. The variation in the thickness of soil/regolith was observed to be very erratic. Regolith, here, means material (in-situ or transported), including soil and weathered rock mass, lying over the fresh country rock. The thickness depends on a large variety of factors, one important being the local variation in terrain morphology; therefore prediction of the thickness of regolith over a large area is extremely difficult. Ideally, for thickness modelling, a large number of observations (such as drill holes, outcrops or geophysical data) are required. However, at a catchment scale, this approach is difficult to implement. Given the above limitations, Regolith thickness map was prepared based on field observations. Assessment of depth of regolith at different sites was made by studying the exposures or cut sections along the road, streams, landslide scars and from open wells. The overburden thickness varies from <0.5m, 0-5m, 5-10m, 10-15m. **(Plate-10)**

Table 9: The Percentage distribution of different Regolith Thickness classes for T.S Nos. 480/11 & 480/12 with their LOFS and Rank.

CLASS	Rank	LOFS	Area covered (%)
< 0.5 m	0	0	18.89089
0.5 - 5 m	4	0.3229614	77.25488
5 - 10 m	0	0	3.134798
>10m	7	1	0.388324
River	0	0	0.263413
Water body	2	0.1362661	0.067695

4.3.5. Structure and Drainage

Structures, particularly joint and fracture play an important role in defining distribution of landslides. The presence of joint and their orientation has large influence in causing landslides particularly the rock failures during rainfall. The seepage along weaker planes builds pore pressure resulting in shattering of rocks such sliding surfaces are highly prone to failure. Concerning geo-hydrological parameters, the different order of streams are extracted and classified as first order, second order and higher order streams from Carto DEM data of 30m using Strahler's (1957) ordering system. It is observed that 1st order streams cause only limited erosion including shallow landslides. So, drainage is not considered as significant parameter for landslide susceptibility mapping. Drainage map of different streams orders i.e. 1st Order, 2nd Order, 3rd Order, 4th Order and 5th Order streams are extracted from Carto DEM data (50m resolution) in GIS platform using spatial analyst tool **(Plate-8)**.

4.4 LANDSLIDE SUSCEPTIBILITY ANALYSIS

Landslide susceptibility is a qualitative estimate of the spatial distribution of landslides, which exists or potentially may occur in an area. Although it is expected that landslide will occur more frequently in the most susceptible areas, however, in the susceptibility analysis, no time frame and magnitude of event are explicitly taken into account. A susceptibility map therefore gives only the qualitative estimation that the mapping unit (e.g., a pixel, slope unit or facet) will be affected by a future landslide. “Landslide Susceptibility Analysis” is carried out on the basis of AHP method for spatial prediction of landslide-prone areas and the final susceptible map of the area is classified as low, moderate and highly susceptible areas where likelihood of landslide occurrences in near future is expected.

4.4.1 Methodology

Due to the certain limitations/constraints in present ground condition and lack of sufficient landslide datasets for data driven modelling in such a situation empirically derived terrain-specific ratings and weights can pose problems. Hence, Analytical Hierarchy Processes is considered for the preparation and generation of landslide susceptibility map.

Different methods of predictive mapping of landslide susceptibility are adopted because landsliding has complex interactions with several geo-environmental factors. The cardinal aim of landslide susceptibility mapping is to identify locations where future landslides are likely to occur, based on the fundamental assumption that spatial factors that caused present and past landslides are likely to cause similar landslides in the future. Several knowledge-driven (heuristic) and data-driven or empirical methods of mapping landslide susceptibility are available in the literature which make use of indirect or direct spatial relations between landsliding of a certain type and relevant spatial factors.

Knowledge-driven/ Heuristic methods of landslide susceptibility can either be direct or indirect. In indirect heuristic methods, individual factors are assigned specified weight values or ratings that are solely based on subjective criteria (Hansen, 1984; BIS, 1998). In the latter method, specified factor weights are considered regardless of the existing landslide inventory maps and variations in terrain conditions and to use unique weight values for the factor in different geomorphological/geological environments. However, the most important aspect of any predictive mapping is the validation. Validating the landslide susceptibility maps by mere overlapping the landslide incidence map over landslide susceptibility map is only trivial and cannot quantitatively assess the actual performance of any predictive model. Predictive modelling of susceptibility to sliding aims to make an estimate at every location in a study area of the future occurrence of such landslides based on known occurrence of landslides. The

analysis thus assumes that the relations between spatial factors and past landslides are relevant to the occurrence of future landslides. Therefore, to effectively model the landsliding phenomenon, landslide incidences, controlling geofactors, their mutual importance in influencing landslides is taken into account.

Methodology of landslide susceptibility mapping is divided into the following main themes:

- **Identification and preparation of its landslide inventory database and maps in GIS:**

Landslides, its types and failure mechanisms are the basic and fundamental parameters required by any analyst for carrying out landslide susceptibility analysis. For this, availability of a complete landslide inventory of an area is a prime pre-requisite. To accomplish this task, landslide inventory mapping using all sorts of available and past source information such as archival data, old maps/ reports, very high-resolution remote sensing data and adequate fieldwork are carried out and landslide inventory database is generated and landslide inventory map is generated.

- **Role of geofactors in landsliding and preparation of its related GIS-based database.**

- **Empirical selection or spatial association analysis between various geofactors and landslides for determining both ratings of factor classes and weights of the geofactor themes:**

Several empirical techniques are available in the literature for selection and weighting of geofactors using landslide inventory data through which spatial association analyses between prevalent landslides and different types of geofactor maps are carried out in a GIS. The purpose of accomplishing such quantitative spatial association analyses in any predictive modeling of landslide susceptibility is to select and use only the good predictors, which are the spatial geofactors that exhibit positive spatial associations with existing landslides. After selection of such predictors, the next step is to objectively determine their inter-predictor weights and then combine the selected predictors with their weights in a suitable susceptibility model like Weighted Multiclass Index Overlay

- **GIS-based modeling for integration of selected and weighted geofactor maps for preparation of landslide susceptibility scores, validation and classification of landslide susceptibility score maps into qualitative maps showing varying degree of landslide susceptibility.**

4.4.2 Selection of mapping unit

After the selection of appropriate preparatory factors, the next step was the selection of mapping units for the GIS based susceptibility analysis. Total 1490 sq. km. study area was converted into an equal-area grid by rasterizing the geofactor vector map using a 50m × 50m

pixel size. The DEM derivative maps are extracted from Carto DEM of 30m resolution for the overlay analysis of different thematic maps. Therefore, in this work, a pixel was selected as the basic mapping unit for the susceptibility modelling so, that the smallest landslide can be represented by a single pixel of 50m × 50m resolution.

4.5 Methods of Susceptibility Analysis

The flow diagram (**Flow Diagram-1**) showing the methodology followed in the present study for calculation of factor class ratings and inter-predictor weights of factor maps using pairwise comparison matrix developed by Saaty, 1977.

1. Analysis for selection and weightage of geofactors (heuristic/ knowledge-driven AHP method)

- a. Empirical landslide-dependent analysis for determining terrain-specific ratings and weights of geofactors.
- b. Analysis and discussion about spatial association between each geofactor and observed landslides in the study area.

2. Data integration and landslide susceptibility mapping

- a. Data integration procedure - e.g., Weighted Multi-class Index Overlay.
- b. Data validation.
- c. Classification and preparation of qualitative landslide susceptibility maps.
- d. Utility of landslide susceptibility maps and information with specific recommendations.

3. Data Modelling using Analytic Hierarchy Process (AHP):

The Analytic Hierarchy Process (AHP) is a multi-criteria decision-making approach which was originally developed by Prof. Thomas L. Saaty (1977). It is an effective tool for dealing with complex decisions and may aid the decision maker to set priorities and make the best decision. By reducing complex decisions to a series of pair wise comparisons, and then synthesizing the results, the AHP helps to capture both subjective and objective aspects of a decision. In addition, the AHP incorporates a useful technique for checking the consistency of the decision maker's evaluations, thus reducing the bias in the decision making process. The Analytical Hierarchy Process-AHP provides measures of consistency, derives priorities among criteria and alternatives, and simplifies preference ratings among decision criteria using pair wise comparisons to establish priorities among the elements to obtain the set of overall weights for achieving, evaluating and checking the consistency of judgements.

4. Classification of the Landslide Susceptibility Map into High, Moderate and Low Susceptible zones.

The basic procedures followed are described below:

1. Develop the ratings for each decision alternative for each criterion by • developing a pair wise comparison matrix for each criterion • normalizing the resulting matrix • averaging the values in each row to get the corresponding rating • calculating and checking the consistency ratio.
2. Calculate the weighted average rating for each decision alternative and choose the one with the highest score.

Step 1: Pair wise comparison matrix

The criteria in the row are being compared to the criteria in the column.

Step 2: Normalization

This step is to normalize the matrix by totalling the numbers in each column. Each entry in the column is then divided by the column sum to yield its normalized score. The sum of each column is 1.

Step 3: Consistency analysis

Now, calculate the consistency ratio is calculated and value is checked. The purpose for doing this is to make sure that the original preference ratings were consistent

There are 3 steps to arrive at the consistency ratio:

1. Calculate the consistency measure
2. Calculate the consistency index (CI).
3. Calculate the consistency ratio (CI/RI where RI is a random index).

$$CI = \lambda_{\max} - n / n - 1$$

$$CR = CI / RI$$

To calculate the consistency measure, we can take advantage of Excel's matrix multiplication function = MMULT()

Approximation of the Consistency Index

1. Multiply each column of the pair wise comparison matrix by the corresponding weight.
2. Divide of sum of the row entries by the corresponding weight.
3. Compute the average of the values from step 2, denote it by $\lambda_{\max}$.
4. The approximate $CI = \lambda_{\max} - n / n - 1$

Consistency Ratio (CR)

$$CR = CI / RI$$

Random Index (RI)

The CI of a randomly-generated pair wise comparison matrix

n	1	2	3	4	5	6	7	8	9
RI	0.00	0.00	0.58	0.9	1.12	1.24	1.32	1.41	1.46

Notes: n = order of matrix, Random inconsistency indices for n = 10 (Saaty, 1980)

In the AHP method, the scale range 1–9 is assumed. The standard preference scale was used by Miller is as follows:

Preference Level	Numerical Value
Equally Preferred	1
Equally to Moderately Preferred	2
Moderately Preferred	3
Moderately to Strongly Preferred	4
Strongly Preferred	5
Strongly to Very Strongly Preferred	6
Very Strongly Preferred	7
Very Strongly to Extremely Preferred	8
Extremely Preferred	9

1. The calculation of the ratings for each factor classes and weights of each factor maps was performed in excel. Based on pair wise matrix comparison of each factor class for all geo-factor thematic maps, calculation of Eigen values, fraction rate values and Landslide Occurrence Favourability Score (LOFS) rating was obtained.
2. **Annexure III** provides the calculated LOFS ratings of all classes of six geo-factor thematic maps. The excel table is joined with the factor maps using “Table Join & Relate” function in Arc GIS.
3. Using the “Lookup” function in Reclassify tool of Arc GIS, LOFS rating map was generated for each thematic geo-factor maps, showing the spatial distribution of LOFS values.
4. Using “Map Algebra” function of Spatial Analyst Tool in Arc GIS rating maps were combined together to obtain landslide susceptibility score maps.

For generation of “Raw Landslide Susceptibility Score Map” in Arc GIS, “raster calculation” command under map algebra is used. For “Raw Landslide Susceptibility Score Map” the following formula is used.

$$\text{Susc Score} = (\text{LOFS_Factor1} * \text{weight of Factor1} + \text{LOFS_Factor2} * \text{weight of Factor2} + \text{LOFS_Factor3} * \text{weight of Factor3} + \dots + \text{LOFS_Factor}_n * \text{weight of Factor}_n) / \text{Sum of inter - predictor weight}$$

5. Classification break values were determined on the basis of logic of providing mutual comparison expert-driven ranking to sub-divide the score map. Considering rank value of ‘5’ in a scale of ‘0 to 9’ has higher likelihood in influencing landslides which comes after 50% of absolute difference values, similarly rank value of ‘≤3’ has least likelihood in influencing landslides comes after 30% of absolute difference value. Hence, 50% cut-off margin or weightage was used to determine the break raster value between “Moderate” and “High” susceptibility classes, while 30% cut-off margin or weightage was used between “Low” and “Moderate” susceptibility classes

In AHP based knowledge-driven models, classification break values can be determined on the basis of the logic applied while giving mutual comparison expert driven ranking. It is always thought by any expert that rank value for any factor class is ≥ 5 , and it is considered that the particular factor class has higher likelihood in influencing the landslides. This rank value of “5” in a scale of “0” to “9” comes after 50% of the absolute difference values ($9-0 = 9$; 50% of 9 is 4.5). That is why this 50% cut-off margin or weightage can be used to determine the break raster value between “Moderate” and “High” susceptibility classes (*BrMH*). Similarly, when rank value for any factor class is ≤ 3 (lower than 30% of the absolute difference value of 9), and it is considered that the particular geofactor class has lesser likelihood in influencing any landslides. Accordingly, 30% cut-off margin or weightage can be used to determine the break values between “Low” and “Moderate” susceptibility classes (*BrLM*).

Using the above logic the required break values can be determined by using the following formula:

$$\text{BrMH} = [(\text{Abs Diff LOFS Factor1} * 50) * \text{weight of Fcator1} + (\text{Abs Diff LOFS Factor2} * 50) * \text{weight of Fcator2} + (\text{Abs Diff LOFS Factor3} * 50) * \text{weight of Fcator3} + \dots + (\text{Abs Diff LOFS Factor}_n * 50) * \text{weight of Fcator}_n] / \text{Sum of inter - predictor weight}$$

$$\mathbf{BrLM} = [(Abs\ Diff\ LOFS\ Factor1*30)*weight\ of\ Fcator1 + (Abs\ Diff\ LOFS\ Factor2*30)*weight\ of\ Fcator2 + (Abs\ Diff\ LOFS\ Factor3*30)*weight\ of\ Fcator3 + + (Abs\ Diff\ LOFS\ Factor_n*30)*weight\ of\ Fcator_n] / Sum\ of\ inter - predictor\ weight$$

Once break values (BrMH and BrLM) are calculated, Classified Landslide Susceptibility Map is prepared by reclassifying the Raw Landslide Susceptibility Score Map using reclassify command in Arc GIS. In reclassification window, three classes is chosen and in break values, 2nd topmost value given as the first value (Class 1), 1st topmost value is given as the second value (Class 2) and third value (Class 3) is given as one. Now the Raw Landslide Susceptibility Score Map is classified into the following categories: Class 1 stands for “Low Susceptibility”, Class 2 stands for “Moderate Susceptibility” and Class 3 stands for “High Susceptibility”.

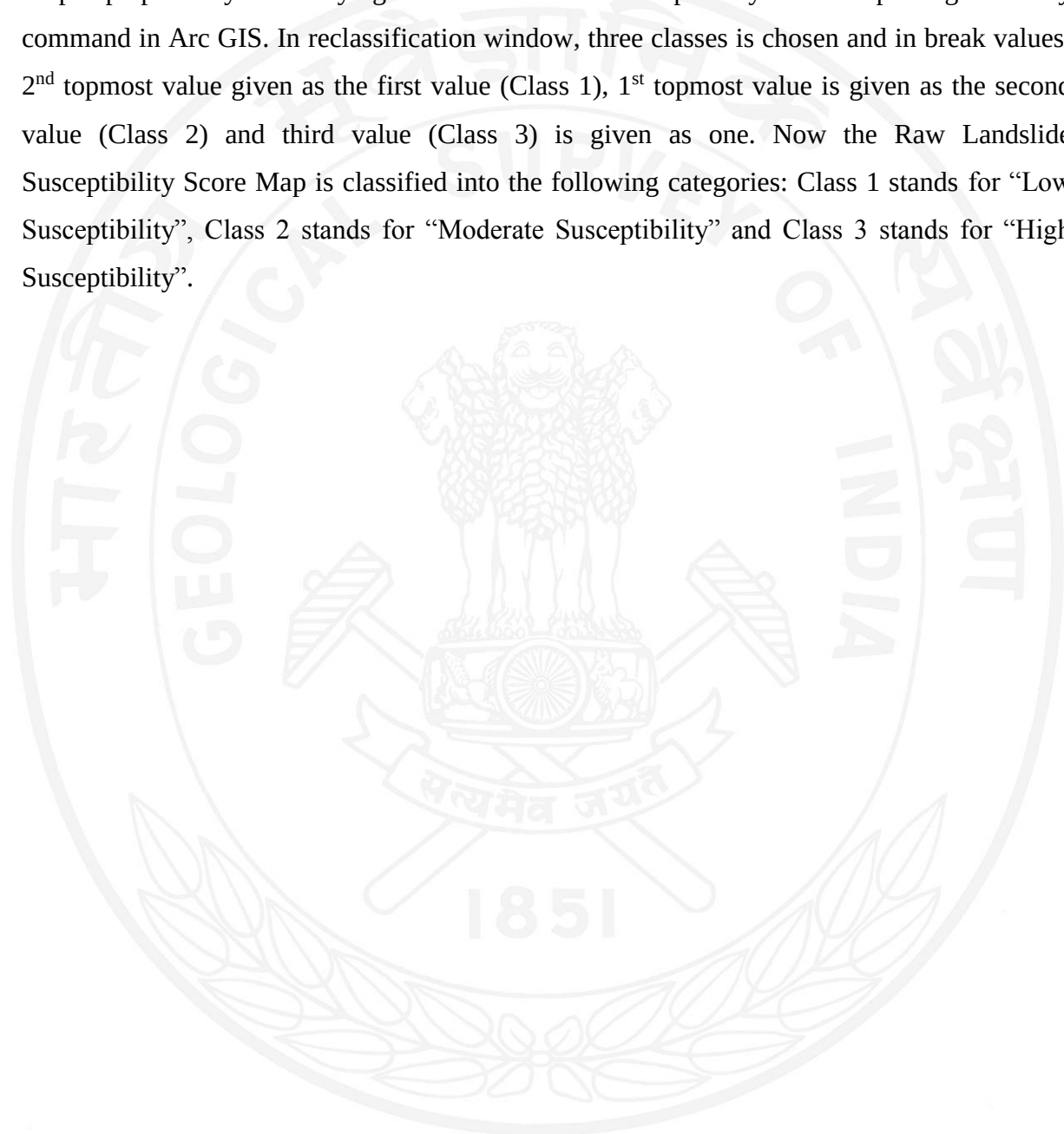
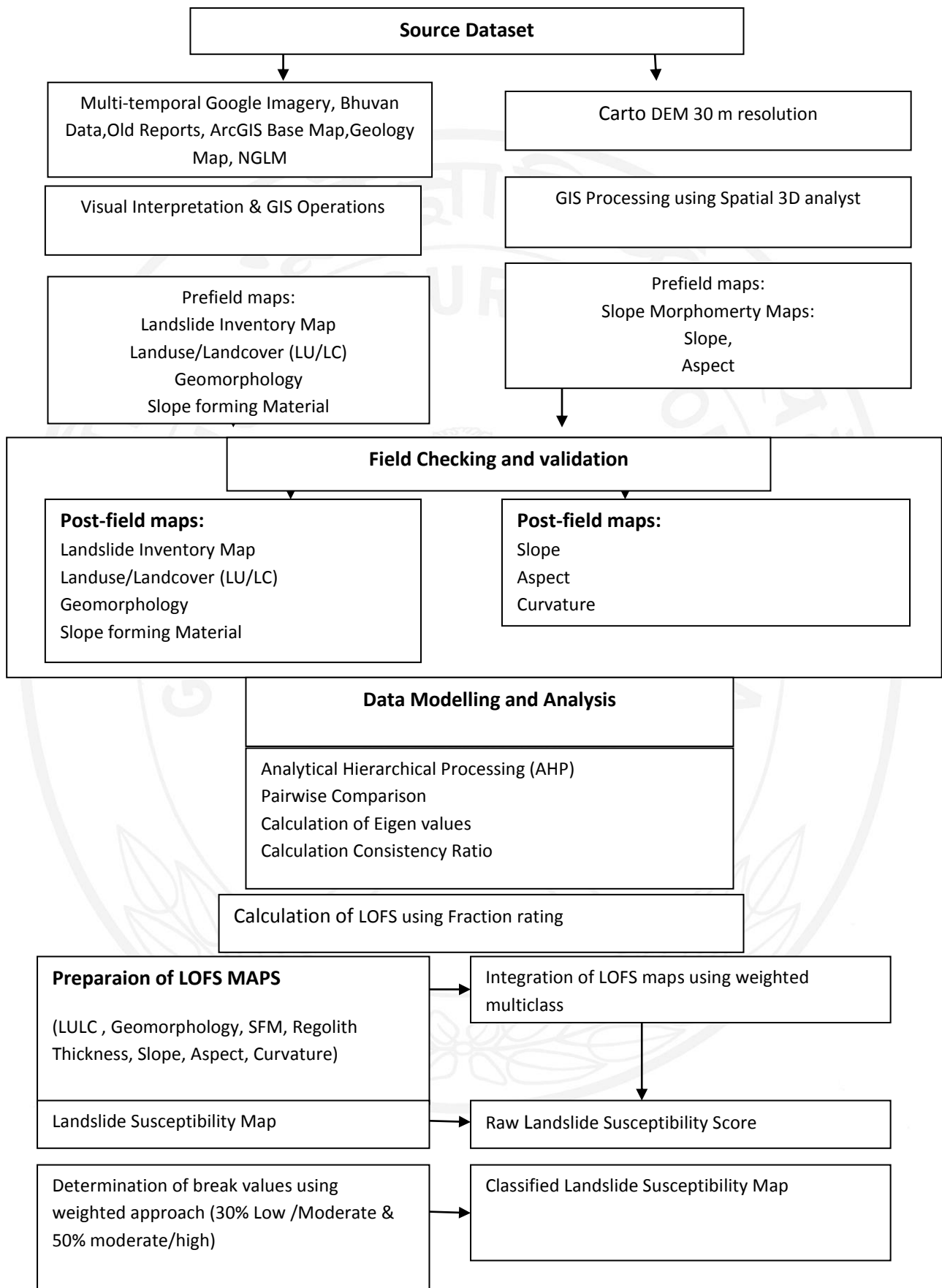


Figure-1: Flow diagram showing methodology for Landslide Susceptibility Mapping



V. LANDSLIDE SUSCEPTIBILITY MAP

The Landslide Susceptibility maps (**Plate-12**) in parts of Toposheets nos. 48O/11 & 12 Chikmangaluru, Dakshin Kannad and Hassan districts, Karnataka is generated using Weighted Multiclass Index Overlay method of data integration and the AHP based mathematical data modelling. Landslide Occurrences Frequency Score (LOFS) are determined based on Pair wise correlation matrix and Rank as per the weightage/rating assigned to different thematic (causative factors) variables, different thematic maps are generated in GIS platform and corresponding LOFS maps are generated using LOFS ratings/weights of geofactor classes and integrated with other DEM derivative input thematic maps. The output susceptibility map generated using rasterised data sets for data modelling. The analysis of susceptibility map indicates that 5.65% of the area is highly susceptible, 23.17% of the area lies in moderately susceptible and 71.18% of the area comes under low susceptible zones.

In the present area the weighted causative factors are slope gradient and landuse/landcover change which are considered to be the deterministic geofactors governing the failure plane. The distribution of landslide with respect to slope gradient indicates that nearly 45% of slides are occurring on slope $<15^\circ$, 39% on 15° - 25° slope, 15% on 25° - 35° slope and rest 1% on 35° - 45° slope, whereas $>45^\circ$ are demarcated as more stable areas. The metalled road traversing Khandya-Kondadakan-Konkanamane village area (T.S no. 48O/11) on the foothills of Gangegiri hill range with slope angle $<15^\circ$ are moderately susceptible, whereas slope gradient between 15° - 25° and 25° - 35° are highly susceptible to failure.

The Mullayangiri-Bababudan-Attigundi road section is the major tourist spot in western ghat hill range. The villages in and around Attigundi, Kavikalgandi village all along road sections towards Mullayangiri peak areas are demarcated as high to moderately susceptible zones. During rainy season the rock failure has resulted in road blockage. The areas in and around Bettadakan are found to be susceptible to failure. Major slope failures are restricted on “Extensive cut slope” with steep slope angle varying between 70° - 85° with vertical height $>10\text{m}$.

The areas/places in and around Joldalu village are moderately susceptible areas. The areas around Hosahalli, Karemakki, Devarahalli village on slope angle $<15^\circ$ and 15° - 25° are moderately to highly susceptible.

In moderately susceptible zone along the nala near Kanati village area are found to be moderately susceptible areas. The area between Hunasehalli-Jannagadde and Sangameshvarapet-Dasangadde village is moderately susceptible where coffee plantation is the major landuse practice. The area along Masigadde and Pur village are moderately susceptible

with slope angle $<15^\circ$. The water saturation due to nearby Hirekolale lake and settlement on gentle slope are on unstable zones.

The susceptibility map indicates that the central part of the study North and NNW covering Tattakola, Basti & Saragodu reserve areas are moderate to highly susceptible areas. The area having slope angle between 15° - 25° & 25° - 35° on lowly dissected hill slope on lower reaches of hill slope or on piedmont slope are susceptible to failure. The western part of the study area on NH-234 covering T.S nos. 48O/12 and about 3 km from Kotigehara 4 nos. of debris/ rock slides were recorded within .5 km range. The landslide incidences and cut slope failure has occurred on slope varying from 15° - 25° & 25° - 35° . The area to the west of Channahodlu, Devanagulu, Hebbraige and Sabli village are moderate to highly susceptible. The areas along Hulukumale halla is highly susceptible zones.

In an inaccessible area on Giri Betta and Doddinakolaga (T.S no.48O/12) are moderately susceptible, whereas Kesegeman is highly susceptible. The areas around Gattahalli, Niduvina Madakal, Kannapura are demarcated as moderate to highly susceptible areas. The southern part of T.S. no. 48O/12 in and around Hukkali, Hosahalli, Kemnanagudi & Tamattarbailu village areas are moderately Susceptible with slope angle $<15^\circ$. In SSW part of Baluru reserve forest, Kumbaradi village and Billigudda on moderately dissected hills are demarcated as moderate to high susceptible zones. The road sections from Chikmangaluru to Mudigere are almost stable where moderately susceptible zones with slope angle $<15^\circ$ occur at isolated places where few slope failures/slumps are observed.

On the basis of Landslide Susceptibility Map, it is inferred that the areas having slope angle between 15° - 25° are more prone to failure due to hindrance to slope/slope disturbance subsequently areas having slope varying between 25° - 35° are moderately susceptible, whereas $>45^\circ$ are almost stable. At few places moderately susceptible zones with slope angle 15° - 25° are found to be meta-stable. The slope with sparse vegetation, weathered rock and loose material on slope varying 15° - 25° are more susceptible to failure. Distribution of landslide with respect to slope gradient indicates that nearly 45% of slides are occurring on slope $<15^\circ$, 39% on 15° - 25° slope, 15% on 25° - 35° slope and rest 1% on 35° - 45° whereas slope angle $>45^\circ$ are almost stable.

Quantitative statistical analysis of parameters/variables influencing landslide incidences with respect to geofactor classes within a thematic geofactor maps indicates that total 41% of the landslide incidences occur on Low Height Plantation (LHP) i.e. coffee mixed with silver oak, the common landuse practices occurring in lower reaches of hill slope and pediment-pediplain complex occupying 50.15% of the study area whereas 21.31% of landslide falls in Moderately vegetated occupying nearly 14% of the study area.

VI. CONCLUSIONS AND RECOMMENDATIONS

1. Total 28% of landslides are rock slide, 43% of landslides are debris slide and 30% of landslides are categorized as debris cum rock slide. Most of the landslides are shallow (<2m) translational debris slide which are suspended and get reactivated during monsoon, few landslides are found to be dormant.
2. The new slides are advancing, progressive and widening in nature due to pronounced weathering and leaching affects at cut slopes. The slope angle between 15°-25° are more prone to failure due to hindrance to slope, the slopes of 25°-35° are moderately susceptible, whereas slope angle >45° are almost stable.
3. The sliding activity and disturbance on natural slope is generally observed on lower reaches of hill slope and Piedmont slope i.e. nearly 45% of slides are occurring on slope <15°.
5. Major slope failure are restricted to “Extensive cut slope” with steep slope angle between 70° and 85° with vertical height >10m.
6. Total 54% of landslide incidences are found to be occurring on Lowly dissected slope, 20% on Moderately Dissected slope, 7% on Pediment-Pediplain complex and 20% on Piedmont slope.
7. The slides are mainly triggered by anthropogenic activities i.e. human interference with the natural slope. The main causes of landslides and slope failure in the study area are pediment cutting, toe cutting of hill slope for the construction of road, modification for slope for human settlement, removal of soil and stripping of vegetation destabilizes the slope.
8. The triggering factors for slope failures is weathering and increased pore water pressure in highly weathered rock mass, jointed and fractured rocks that greatly reduces shearing resistance of underlying rock units during heavy rainfall.
9. Cut slope angle and height plays a major role in all the slides. Cut slope height was included as a factor as this is found to be a major cause of the slides. Prograding of the slide is more towards both the flanks rather than towards back of the crown. The sliding is more in convex turns of the road than concave sections.
10. The anthropogenic activities are the causative factors which leads instability and slope failure. Toe cutting or slope cutting, excavation, landuse change, vibration, water leakage, barren & sparsely vegetated areas. The probable physical causes are intense rainfall, prolonged precipitation, soil pore water pressure, surface runoff etc. The geological causes are weaker plane, weathered, jointed and fissured materials, permeability contrasts and material contrast.

11. The morphological parameters governing the slope failure are slope angle, erosional activity i.e. erosion of lateral margins and sub-terrain erosions, and overburden.
12. The slope with sparse vegetation, weathered rock and loose material with slope angle 15° - 25° are more susceptible to failure. Distribution of landslide with respect to slope gradient indicates that nearly 45% of slides are occurring on slope $<15^{\circ}$, 39% on 15° - 25° slope, 15% on 25° - 35° slope and rest 1% on 35° - 45° whereas slope angle $>45^{\circ}$ are almost stable.
13. The litho-units mapped are banded magnetite quartzite, carbonaceous phyllite, ferruginous phyllite, interbedded quartzite and granitoids of Archaean age. The degree of weathering is pronounced and rainfall is the landslide triggering factor during heavy rainfall in Monsoon.
14. Landslide susceptibility map indicates that 5.65% of the area is highly susceptible, 23.17% of the area lies in moderately susceptible and 71.18% of the area comes under low susceptible zones.

RECOMMENDATIONS:

1. The remedial measures required to stabilize the disturbed zones are retaining wall, lined drainage with weep holes in the toe portion of hill slope included chute drains, stone pitching, gabion wall, and slope re-gradation as per the site conditions are suggested.
2. A biotechnical slope protection measure that utilizes mechanical elements (structures) in combination with biological elements i.e. plants are also recommended.
3. Proper Management of drainage is required on roads in the hills. Weep holes with perforated pipes are to be provided where water seepage is observed in the slopes.
4. Vertical cut slopes should be modified to stabilize the slope by providing benching on slope at specific interval to reduce the risk of sliding in future.
5. The unscientific way of removal of material and slope modifications for construction purposes must be avoided, if required proper scientific way of slope treatment should be adopted for long term stability of disturbed slopes. During the cutting/modifications of the slope nearby Engineering Geology Division may be consulted for attending better slope protective measures.
6. Regulations on slope cutting and quarrying: Indiscriminate slope cuttings have to be strictly regulated and engineering solutions such as protective walls/embankments to be made where ever required.
7. Based on the landslide Susceptibility map it is suggested that the areas delineated under high and moderate susceptible zones, disturbance of natural slope due to Landuse/Landcover change and slope modification should be taken due caution before undergoing any development activity in order to avoid casualties due to landslips/landslides incidences.

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LOCALITY INDEX

Locality Name	Latitude	Longitude	T.S No.
Agala	13°17'4.876"N	75°37'35.854"E	48O/11
Aladagudde	13°16'14.433"N	75°43'13.570"E	48O/11
Alduru	13°14'35.073"N	75°39'16.165"E	48O/12
Anur	13°18'9.458"N	75°41'2.595"E	48O/11
Attigundi	13°25'50.294"N	75°44'23.940"E	48O/11
Baluru	13°8'53.831"N	75°30'57.861"E	48O/12
Baluru Reserve Forest	13°0'37.683"N	75°32'50.820"E	48O/12
Banahalli	13°9'13.274"N	75°34'46.664"E	48O/12
Banakal	13°8'11.879"N	75°32'46.523"E	48O/12
Bannur	13°15'28.418"N	75°38'9.185"E	48O/11
Bartebail	13°9'53.315"N	75°33'39.317"E	48O/12
Baskal	13°11'2.082"N	75°43'37.187"E	48O/12
Belagola	13°22'51.166"N	75°34'42.804"E	48O/11
Bellangi	13°28'56.674"N	75°31'30.399"E	48O/11
Bettadakan	13°24'0.016"N	75°40'56.735"E	48O/11
Bhadra Wildlife Sanctuary	13°29'13.513"N	75°38'55.133"E	48O/11
Bidarahalli	13°7'30.227"N	75°37'19.866"E	48O/12
Billigalgudda	13°5'20.018"N	75°30'39.352"E	48O/12
Bogase	13°23'49.667"N	75°35'22.013"E	48O/11
Bommanahalli	13°9'41.787"N	75°32'29.824"E	48O/12
Chandugodu	13°14'32.751"N	75°36'58.553"E	48O/12
Chikanahalli	13°6'23.212"N	75°44'30.449"E	48O/12
Chikka Kolale	13°20'35.777"N	75°43'25.224"E	48O/11
Chinnagaudanahalli	13°22'12.635"N	75°41'21.012"E	48O/11
Devarahalli	13°17'57.272"N	75°37'5.430"E	48O/11
Devarunda	13°1'29.943"N	75°37'25.848"E	48O/12
Durga	13°16'7.561"N	75°35'28.600"E	48O/11
Galigudde	13°24'46.520"N	75°37'47.154"E	48O/11
GallGuda	13°3'24.192"N	75°31'14.079"E	48O/12
Gangegiri	13°27'39.624"N	75°34'32.165"E	48O/11
Gattadahalli	13°8'43.396"N	75°40'21.144"E	48O/12
Gonibidu	13°5'5.258"N	75°42'6.038"E	48O/12
Gullanapete	13°12'24.385"N	75°39'30.013"E	48O/12

Locality Name	Latitude	Longitude	T.S No.
Gutti	13°4'41.211"N	75°33'14.091"E	48O/12
Hadige	13°0'42.134"N	75°43'45.679"E	48O/12
Halase	13°7'6.895"N	75°39'12.921"E	48O/12
Halekere	13°3'3.253"N	75°36'26.109"E	48O/12
Halekote	13°6'31.957"N	75°36'46.022"E	48O/12
Haliyur	13°15'55.722"N	75°40'20.901"E	48O/11
Hallikere	13°8'24.568"N	75°31'9.049"E	48O/12
Handi	13°11'38.511"N	75°39'51.294"E	48O/12
Handuguli	13°5'32.137"N	75°37'59.460"E	48O/12
Hanubalu	13°0'13.638"N	75°41'48.500"E	48O/12
Heggudlu	13°10'41.969"N	75°31'38.344"E	48O/12
Hirekolale	13°21'15.860"N	75°43'12.678"E	48O/11
Honnahalli	13°25'11.585"N	75°38'33.836"E	48O/11
Horati	13°3'50.662"N	75°42'6.908"E	48O/12
Hosahalli	13°19'53.267"N	75°37'42.786"E	48O/11
Hosamatadagadde	13°22'39.529"N	75°42'47.718"E	48O/11
Huigere	13°17'30.734"N	75°30'12.462"E	48O/11
Hukkali	13°11'3.284"N	75°33'51.696"E	48O/12
Hunasehalli	13°19'47.679"N	75°33'24.026"E	48O/11
Jakkanahalli	13°20'32.712"N	75°40'8.221"E	48O/11
Jannapura	13°4'51.188"N	75°41'4.032"E	48O/12
Joldalu	13°19'37.694"N	75°41'52.249"E	48O/11
Kabbinasetuve	13°13'56.170"N	75°41'13.102"E	48O/12
Kadabugere	13°21'51.406"N	75°31'19.557"E	48O/11
Kadavanti	13°21'45.414"N	75°33'43.493"E	48O/11
Kaimara	13°22'20.746"N	75°44'42.012"E	48O/11
Kallaki	13°9'42.702"N	75°30'24.055"E	48O/12
Kanati	13°18'15.728"N	75°35'4.947"E	48O/11
Kanegadde	13°13'25.633"N	75°35'29.388"E	48O/12
Kannapura	13°9'39.937"N	75°43'53.330"E	48O/12
KaradiBetta	13°1'44.467"N	75°31'8.072"E	48O/12
Karanji	13°26'51.600"N	75°41'26.564"E	48O/11
Karemakki	13°19'15.141"N	75°38'10.638"E	48O/11
Kavikalgandi	13°24'34.046"N	75°44'33.735"E	48O/11

Locality Name	Latitude	Longitude	T.S No.
Kelagani	13°12'20.127"N	75°44'19.847"E	48O/12
KelaMalandur	13°22'52.698"N	75°39'13.759"E	48O/11
Kenjige	13°9'21.396"N	75°35'50.383"E	48O/12
Kesegemane	13°18'0.741"N	75°32'47.100"E	48O/11
Khandya	13°22'40.819"N	75°31'30.791"E	48O/11
Kirugunda	13°2'28.441"N	75°40'57.964"E	48O/12
Kodi	13°27'46.049"N	75°31'31.345"E	48O/11
Kogile	13°5'28.332"N	75°32'29.561"E	48O/12
Kondadakan	13°28'1.674"N	75°35'26.997"E	48O/11
Koradi	13°1'39.653"N	75°41'45.703"E	48O/12
Kotigehara	13°7'14.494"N	75°31'21.509"E	48O/12
Kotrakere	13°5'35.785"N	75°33'28.798"E	48O/12
Kratti	13°11'21.541"N	75°38'31.443"E	48O/12
Kumbaradi	13°1'26.804"N	75°34'46.176"E	48O/12
Malandur	13°21'55.582"N	75°39'34.537"E	48O/11
Mattikette	13°10'8.845"N	75°32'2.857"E	48O/12
Mel Uluvati	13°29'2.193"N	75°42'46.875"E	48O/11
Mudigere	13°8'4.148"N	75°38'18.879"E	48O/12
Mugtihalli	13°17'4.831"N	75°44'38.132"E	48O/11
Mullayanagiri	13°23'28.130"N	75°43'15.681"E	48O/11
Muttodi	13°26'44.824"N	75°38'47.019"E	48O/11
Muttodi Reserve Forest	13°28'36.686"N	75°40'20.396"E	48O/11
Nellike	13°1'9.402"N	75°44'12.988"E	48O/12
NiduvinaMadakal	13°9'24.840"N	75°40'14.358"E	48O/12
Sampigekatte	13°27'14.164"N	75°44'57.458"E	48O/11
Sangameshvarpet	13°21'49.781"N	75°31'34.727"E	48O/11
Saragodu	13°14'21.044"N	75°31'28.001"E	48O/12
Shiragola	13°26'35.936"N	75°30'52.696"E	48O/11
Siddapur	13°27'20.312"N	75°34'3.081"E	48O/11
Tattakola	13°9'37.201"N	75°37'20.753"E	48O/12
Toranamavu	13°16'2.934"N	75°39'40.255"E	48O/11
Ulluvagalu	13°21'21.792"N	75°41'19.179"E	48O/11
Vastara	13°16'3.853"N	75°42'37.586"E	48O/11
Vataganahalli	13°11'44.856"N	75°42'19.032"E	48O/12

SYNOPSIS OF WORK DONE

1.	Title of the report	Macro-scale (1:50,000) landslide susceptibility mapping in parts of Toposheets nos. 48O/11 & 12 Chikmangaluru, Dakshin Kannad and Hassan districts, Karnataka.	
2.	FSP Code No	M4LSSM/NC/SR/SU-KG/2017/12187	
3.	Field Season	2017 – 2018	
4.	Date of Commencement	14 th September 2017	
5.	Date of Completion	14 th February 2018	
6.	Officers associated with the investigation and no. of days spent in the field	Neha Kumari, Geologist (95days) & Kamal Kumar, Geologist (98 days)	
7.	Quantum of work done		
	1.Pre field map preparation		
	Preparation of Thematic maps (in GIS on scale 1:50000)		
	(a) Slope Forming Material map	1490 sq. Km	
	(b) Geomorphology & Lineament map	1490 sq. Km	
	(c) Slope Morphometry (slope, aspect & curvature) map	1490 sq. Km	
	(d) Landuse / Landcover map	1490 sq. Km	
	(e) Drainage map	1490 sq. Km	
	(f) Regolith thickness map	1490 sq. Km	
	(ii) Preparation of Landslide Inventory Map	1490 sq. Km	
	2. Field-based studies		
	(i) Field-checking of all thematic maps	1490 sq. Km	
	(ii)Field checking and collection of landslide inventory attributes (41 point geo -parametric sheet)	1490 sq km (58 nos. Landslides)	
	3. Post-field studies and modelling		
	i)Updation of thematic and landslide inventory maps	1490 sq. Km	
	ii)Landslide susceptibility modelling and finalization of landslide susceptibility map in GIS	1490 sq. Km	
	4. Collection of rainfall data from available rain stations	1490 sq. Km (Taluk wise 10 years Monthly rainfall data obtained from different rain gauge stations.)	
8	Expenditure in Rs.	Wages (Rs.)	Rs. 55,950.00
		OC (Rs.)	Rs. 40,626.00
		Total (Rs.)	Rs. 96,576.00

FIVE POINT PROFORMA

Title of the report	Macro-scale (1:50,000) landslide susceptibility mapping in parts of Toposheets nos. 48O/11 & 12 Chikmangaluru, Dakshin Kannad and Hassan districts, Karnataka
Names of the Authors	Neha Kumari, Geologist and Kamal Kumar, Geologist
1. Background of the investigation at whose instance or with what particular objective in view the investigation was undertaken.	The item was taken up as per the annual programme of GSI vide FSP Code No: M4LSSM/NC/SR/SU-KG/2017/12187 with an objective to prepare seamless Landslide Susceptibility Map on 1:50,000 scale.
2. Whether the item of investigation was included in the approved programme for the year concerned. If so, particulars, such as item No. page reference etc. may be given.	Yes FSP Code No: M4LSSM/NC/SR/SU-KG/2017/12187
3. Date of commencement of the investigation with month and year, and exact number of days spent by the officers in the field in connection with the investigation.	14 th September 2017 1. Neha Kumari - 95 days 2. Kamal Kumar - 98 days
4. Brief comments by Director/ Supervisory officer on the conclusion and recommendation by the author(s) with suggestion for implementing the same.	I fully agree with the conclusions drawn and recommendations made by the authors.
5. Please state specifically how the results of the investigation were achieved compared with the objective for which it was undertaken	The objective of the investigation is fully achieved.
Date: Place: Bengaluru Project/Division: NLSM/Engineering and Landslide Division Operation/Region: SU:K&G/Southern Region	Signature: Name: Shri J. Srihari Designation: Director

GEO-PARAMETRIC LANDSLIDE INVENTORY DATABASE

ANNEXURE I

Slide NO./ID	District/State	Name of the slide	TS No.	Locality	Lat/Long	Type of Material	Activity	Distribution	Style	Failure Mechanism	Length (m)	Width (m)	Height (m)	Run out distance (m)	Geology	Geomorphology	Geo-scientific Causes	Remedial measures	Remarks
KAR/CHK/2017/01	Chikmangalur/ Karnataka	Hebbarige village near Banakal on NH-234	48O/12	NH-234	13°07'55.39"N/ 75°32'37.59"E	In-situ soil	Suspended	Widening and Enlarging	Single	Shallow translational failure	Approx. 30m	Approx. 40m	Approx 1 0m	Approx. 25m	Granite Gneiss	Piedmont slope	Weathering and erosion of loose material due to water saturation during heavy rainfall	Lined drainage and slope gradation required	Debris slide is suspended and stable, risk factor is low.
KAR/CHK/2017/02	Chikmangalur/ Karnataka	164m from KAR/CHK/2 017/02 on NH-234	48O/12	Hebbarige village near Banakal on NH-234	13°07'53.06"N/ 75°32'32.61"E	In-situ soil	Suspended	Widening and Enlarging, Progressive	Single	Shallow translational failure	Approx. 18m	Approx. 30m	Approx. 8m	Approx. 8m	Granite Gneiss	Piedmont slope	Weathering and erosion of loose material due to water saturation during heavy rainfall	Lined drainage and slope gradation required	Debris slide is suspended and stable, risk factor is low.
KAR/CHK/2017/03	Chikmangalur/ Karnataka	Kannapura village	48O/12	1km from Kannapura village on Kannapura-Mudigere road	13°09'28.29"N/ 75°41'14.86"E	In-situ soil	Suspended	Widening and Enlarging	Single	Shallow translational failure	Approx. 28m	Approx. 12m	Approx. 8m	Approx. 25m	Amphibolite	Lowly dissected slope	Weathering and Erosion of loose material due to water saturation during heavy rainfall	Slope gradation required/	Debris slide is suspended and stable, risk to communication line
KAR/CHK/2017/04	Chikmangalur/ Karnataka	Kannapura village	48O/12	1km from Kannapura village on Kannapura-Mudigere road	13°09'28.23"N/ 75°41'01.55"E	In-situ soil	Active	Widening and Enlarging	Single	Shallow translational failure	Approx. 35m	Approx. 30m	Approx. 10m	Approx. 25m	Amphibolite	Lowly dissected slope	Seepage and water saturation along weak plane during heavy rainfall	Lined drainage required.	Debris slide/slump is active .The area is demarcated as meta-stable . Risk to communication line.
KAR/CHK/2017/05	Chikmangalur/ Karnataka	Naduvina Madakal village	48O/12	1.7km from Kannapura village on Kannapura-Mudigere road	13°09'23.27"N/ 75°40'54.21"E	In-situ soil	Suspended	Widening and Enlarging, Progressive	Single	Shallow translational failure	Approx. 18m	Approx. 50m	Approx 12m	Approx. 8m	Granite Gneiss	Lowly Dissected slope	Weathering and erosion of loose material due to water saturation during heavy rainfall	Lined drainage with weep holes and easing of slope required, benches at small interval should be constructed.	Debris slide is active and however single bench are made to reduce the risk factor. The zone of 120m is demarcated as unstable zone. Downslope settlement is at risk. Risk to communication line, man and material.
KAR/CHK/2017/06	Chikmangalur/ Karnataka	Mulahalli village	48O/12	Mulahalli road section	13°02'31.05"N/ 75°33'45.77"E	Weathered rock	Suspended	Widening and Enlarging, Progressive	Single	Old Shallow translational failure	Approx. 14m	Approx. 30m	Approx.6 m/Crown height: .05m	Approx. 5m	Granite Gneiss	Lowly dissected slope	Weathering and Erosion of loose material due to water saturation during heavy rainfall	slope gradation required.	Debris slide is suspended and stable and risk factor is low. Risk to communication line
KAR/CHK/2017/07	Chikmangalur/ Karnataka	.5 km from Slide no. 06	48O/12	Mulahali-Gutti road section	13°03'34.01"N/ 75°33'14.76"E	Weathered rock	Suspended	Widening and Enlarging	Single slide with multiple failure	Old Shallow translational failure	Approx. 24m	Approx. 55m	Approx. 8m	Approx. 14m	Granite Gneiss	Lowly dissected slope	Weathering and Erosion of loose material due to water saturation during heavy rainfall	Lined drainage required	Ddebris slide is suspended and stable and risk factor is low. Risk to communication line
KAR/CHK/2017/08	Chikmangalur/ Karnataka	50m from Slide no. 07	48O/12	Mulahali-Gutti road section	13°03'34.01"N/ 75°33'14.76"E	Weathered rock	Suspended	Widening and Enlarging, confined	Single slide with 6 multiple failure	Old Shallow translational failure	Approx. 22m	Approx. 55m	Approx. 1.5m	Approx. 17m	Granite Gneiss	Lowly dissected slope	Weathering and Erosion of loose material due to water saturation during heavy rainfall	Lined drainage required	Debris slide is suspended and stable and risk factor is high. Risk to communication line
KAR/CHK/2017/09	Chikmangalur/ Karnataka	Mudigere-Tattakola road section	48O/12	2.5km from Mudigere	13°08'57.27"N/ 75°37'47.53"E	Weathered rock and in-situ soil	Suspended	Widening and Enlarging	Multiple slide	Shallow translational failure	Approx. 17m	Approx. 100m	Approx. 1.3m	Approx. 15m	Granite Gneiss	Lowly dissected slope	Weathering and Erosion of loose material due to water saturation during heavy rainfall along nala section	Lined drainage required, afforestation on slope	Landslide is suspended and stable and risk factor is low. Risk to communication line
KAR/CHK/2017/10	Chikmangalur/ Karnataka	Mudigere-Tattakola road section	48O/12	87m from Slide no. 09	13°08'55.15"N/ 75°37'49.28"E	Weathered rock and in-situ soil	Suspended	Widening and Enlarging	Single	Shallow translational failure	Approx. 22m	Approx 20 m	Approx. 1.3m	Approx. 17m	Granite Gneiss	Lowly dissected slope/Peidmont slope	Weathering and Erosion of loose material due to water saturation during heavy rainfall along nala section	Lined drainage required, afforestation on slope required.	Landslide is suspended and stable and risk factor is moderate. Risk to communication line and electric power line nearby is risky to man and material during slope failure.
KAR/CHK/2017/11	Chikmangalur/ Karnataka	Mudigere-Tattakola road section, 40m from Slide no. 10	48O/12	2.5km from Mudigere	13°08'57.27"N/ 75°37'47.53"E	Weathered rock and in-situ soil	Suspended	Confined	Multiple slide	Old Shallow translational failure	Approx. 30m	Approx. 45m	Approx 2m	Approx. 25m	Granite Gneiss	Lowly dissected slope	Weathering and Erosion of loose material due to water saturation during heavy rainfall along nala section	Lined drainage required, afforestation on slope	Landslide is suspended and stable due to vegetation cover on slope and risk factor is low. Risk to communication line.

GEO-PARAMETRIC LANDSLIDE INVENTORY DATABASE

ANNEXURE I

Slide N0/ID	District/State	Name of the slide	TS No.	Locality	Lat/Long	Type of Material	Activity	Distribution	Style	Failure Mechanism	Length (m)	Width (m)	Height (m)	Run out distance (m)	Geology	Geomorphology	Geo-scientific Causes	Remedial measures	Remarks
KAR/CHK/2017/12	Chikmangalur/ Karnataka	Mudigere-Tattakola road section, 50m from Slide no. 11	48O/12	2.4km from Mudigere	13°08'54.00"N/ 75°37'49.67"E	Weathered rock and in-situ soil	Suspended	Widening and enlarging	Multiple slide	Old Shallow translational failure	Approx. 17m	Approx. 22m	Approx 2m	Approx. 12m	Granite Gneiss	Lowly dissected slope	Weathering and Erosion of loose material due to water saturation during heavy rainfall along nala section	Lined drainage required, afforestation on slope	Landslide is suspended and stable, risk factor is moderate. Risk to communication line.
KAR/CHK/2017/13	Chikmangalur/ Karnataka	Mudigere-Tattakola road section, 125m from Slide no. 12	48O/12	2.3km from Mudigere	13°08'48.9"N/ 5°37'52.45"E	Weathered rock and in-situ soil	Suspended	Widening and enlarging	Multiple slide	Old Shallow translational failure	Approx. 16m	Approx. 22m	Appro 2m	Approx. 12m	Granite Gneiss	Lowly dissected slope	Weathering and Erosion of loose material due to water saturation during heavy rainfall along nala section	Lined drainage required, afforestation on slope	Landslide is suspended and stable , risk factor is moderate. Risk to communication line.
KAR/CHK/2017/14	Chikmangalur/ Karnataka	Mudigere-Tattakola road section, 125m from Slide no. 12	48O/12	2.3km from Mudigere	13°08'48.9"N/ 5°37'52.45"E	Weathered rock and in-situ soil	Suspended	Widening and enlarging	Multiple slide	Old Shallow translational failure	Approx. 21m	Approx. 50m	Approx 1.5m	Approx. 17m	Granite Gneiss	Lowly dissected slope	Weathering and Erosion of loose material due to water saturation during heavy rainfall along nala section	Lined drainage required, afforestation on slope	Landslide is suspended and stable and risk factor is moderate. Risk to communication line.
KAR/CHK/2017/15	Chikmangalur/ Karnataka	Mudigere-Tattakola road section	48O/12	1.1km from Mudigere	13°08'21.66"N/ 75°38'10.58"E	Weathered rock and in-situ soil	Active	Widening and enlarging	Single	Old Shallow translational failure	Approx. 17m	Approx. 25m	Approx 1m	Approx. 14m	Granite Gneiss	Lowly dissected slope	Weathering and Erosion of loose material due to water saturation during heavy rainfall	Lined drainage required, afforestation and slope gradation required	Landslide is suspended and stable and risk factor is moderate. Risk to communication line, man and material. Slope is fragile upto 200 m extensions.
KAR/CHK/2017/16	Chikmangalur/ Karnataka	Chandugodu village	48O/12	1km from Chandugodu	13°14'25.07"N/ 75°36'38.31"E	Weathered rock and in-situ soil	Active	Retrogressive upslope	Single slide with multiple failure	Old Shallow translational failure	Approx. 15m	Approx. 25m	Approx. 1.5m, VH:15m	Approx. 10m	Granite Gneiss	Lowly dissected slope	Weathering and Erosion along nala	Lined drainage required, afforestation and slope gradation required	In present condition landslide is suspended and stable and risk factor is High. Electric pole nearby, Risk to communication line, man and material.
KAR/CHK/2017/17	Chikmangalur/ Karnataka	Chandugodu-Kanegadde village area	48O/12	1.1km from Slide no.16, Chandugodu-Kanegadde road section	13°14'25.07"N/ 75°36'38.31"E	Weathered rock and in-situ soil	Active	Retrogressive upslope	Single slide with multiple failure	Old Shallow translational failure	Approx. 21m	Approx. 25m	Approx. 1m VH:7m	Approx. 50m	Granite Gneiss	Lowly dissected slope	Weathering and Erosion along nala	Lined drainage required, afforestation and slope gradation required	In present condition landslide is suspended and unstable and risk factor is High. Electric pole nearby, Risk to communication line, man and material.
KAR/CHK/2017/18	Chikmangalur/ Karnataka	Chandugodu-Kanegadde village area	48O/12	1km from Slide no.17, Chandugodu-Kanegadde road section	13°14'7.09"N/ 5°36'14.33"E	Weathered rock and in-situ soil	Active	Retrogressive upslope	Single slide with multiple failure	Old Shallow translational failure	Approx. 15m	Approx. 25m	Approx VH:10m	Approx. 13m	Granite Gneiss	Lowly dissected slope	Weathering and Erosion along nala , Toe erosion by nala section	Lined drainage required, afforestation and slope gradation required	Landslide is suspended and unstable and risk factor is High. Electric pole nearby, Risk to communication line, man and material.
KAR/CHK/2017/19	Chikmangalur/ Karnataka	Chandugodu-Kanegadde village area	48O/12	380 from S18, Chandugodu-Kanegadde road section	13°14'1.43"N/ 5°36'2.95"E	Weathered rock and in-situ soil	Active	Progressive	Single slide	Old Shallow translational failure	Approx. 16m	Approx. 70m	Approx. VH:7m	Approx. 13m	Granite Gneiss	Lowly dissected slope	Weathering and Erosion along nala , Toe erosion by nala section, seepage along weaker plane.	Lined drainage required.	Landslide is suspended and unstable and risk factor is High. Electric pole nearby, Risk to communication line, man and material.
KAR/CHK/2017/20	Chikmangalur/ Karnataka	Chandugodu-Kanegadde village area	48O/12	30 from S19 Chandugodu-Kanegadde road section	13°14'1.43"N/ 5°36'2.95"E	Weathered rock	Active	Progressive	Single slide	Old Shallow translational failure	Approx. 13m	Approx. 20m	Approx. 1.2m	Approx. 10m	Granite Gneiss	Lowly dissected slope	Weathering and Erosion along nala , Toe erosion by nala section	Lined drainage required.	Landslide is suspended and unstable and risk factor is High. Electric pole nearby, Risk to communication line, man and material.
KAR/CHK/2017/21	Chikmangalur/ Karnataka	Chandugodu-Kanegadde village area	48O/12	30 from Slide no.19, Chandugodu-Kanegadde road section	13°11'38.71"N/ 75°34'7.14"E	Weathered rock and in-situ soil	Active	Progressive, enlarging and widening	Single slide	Old Shallow translational failure	Approx. 17m	Approx. 25m	Approx. 1.7m	Approx. 15m	Granite Gneiss	Lowly dissected slope	Weathering and Erosion along nala , Toe erosion by nala section	Lined drainage required.	Landslide is suspended and unstable and risk factor is moderate and metastable, Risk to communication line, man and material. Old slide scars are visible.
KAR/CHK/2017/22	Chikmangalur/ Karnataka	Chandugodu-Kanegadde village area	48O/12	30 from Slide no.19, Chandugodu-Kanegadde road section	13°08'13.2"N/ 75°30'30.75"E	Weathered rock and in-situ soil	Active	Progressive, enlarging and widening	Single slide	Old Shallow translational failure	Approx. 18m	Approx. 50m	Approx. 1.5m, VH:18m	Approx. 15m	Granite Gneiss	Lowly dissected slope	Weathering and Erosion along nala , Toe erosion by nala section	Lined drainage required.	Landslide is suspended and unstable and risk factor is moderate and metastable, Risk to communication line, man and material.

GEO-PARAMETRIC LANDSLIDE INVENTORY DATABASE

ANNEXURE I

Slide NO./ID	District/State	Name of the slide	TS No.	Locality	Lat/Long	Type of Material	Activity	Distribution	Style	Failure Mechanism	Length (m)	Width (m)	Height (m)	Run out distance (m)	Geology	Geomorphology	Geo-scientific Causes	Remedial measures	Remarks
KAR/CHK/2017/23	Chikmangalur/ Karnataka	1.8 km from Kotighera	48O/12	Channahodlu to Kotigehara road	13°07'45"N/ 75°30'52.92"E	in-situ soil	Active	Progressive, enlarging and widening	Single slide	Old Shallow translational failure	Approx. 17m	Approx. 45m	Approx. 1.5m, VH:17m	Approx. 15m	Granite Gneiss	Lowly dissected slope	Weathering and Erosion along nala , Toe erosion by nala section	retaining wall with 25m lengh and 1.5m height is made.	Landslide is suspended and unstable and risk factor is moderate and metastable, Risk to communication line, man and material.
KAR/CHK/2017/24	Chikmangalur/ Karnataka	Kavikalgundi Village area	48O/11	Kavikalgundi road section	13°23'8.62"N/ 75°43'29.63"E	Weathered rock and in-situ soil	Active	Progressive, enlarging and widening	Single slide with multiple failure/ 3 debris slump	Old Shallow translational failure	Approx. 17m	Approx. 45m	Approx. 1.5m, VH:15m	Approx. 15m	Ferruginous Phyllite	Lowly dissected slope	Weathering and Erosion along nala	Lined drainage required.	Landslide is suspended and unstable and risk factor is moderate and metastable, Risk to communication line, man and material.
KAR/CHK/2017/25	Chikmangalur/ Karnataka	Kavikalgundi - Attigundi village area	48O/11	Kavikalgundi - Attigundi-Kemmannugundi road section	13°26'7.65"N/ 75°44'34.1"E	Weathered rock and in-situ soil	Active	Progressive, enlarging and widening	Single slide with multiple failure/ 3 debris slump	Old Shallow translational failure	Approx. 17m	Approx. 35m	Approx. 1.5m, VH:15m	Approx. 15m	Banded Magnetite Quartzite	Lowly dissected slope	Weathering and Erosion along nala	Lined drainage required.	In present condition landslide is suspended and unstable and risk factor is moderate and meta-stable, Risk to communication line, man and material. Vertical cut slope failure.
KAR/CHK/2017/26	Chikmangalur/ Karnataka	Kavikalgundi - Attigundi village area	48O/11	Kavikalgundi - Attigundi-Kemmannugundi road section	13°29'8.63"N/ 75°44'29.62"E	Weathered rock and in-situ soil	Active	Progressive, enlarging and widening	Single slide with multiple failure/ 3 debris slump	Old Shallow translational failure	Approx. 19m	Approx. 22m	Approx. 1.2m, VH:12m	Approx. 17m	Ferruginous Phyllite	Lowly dissected slope	Weathering and Erosion along nala	Lined drainage required.	Landslide is suspended and unstable and risk factor is moderate and metastable, Risk to communication line, man and material. Vertical cut slope failure.
KAR/CHK/2017/27	Chikmangalur/ Karnataka	Kavikalgundi village area	48O/11	Kavikalgundi road section	13°24'4.48"N/ 75°44'2.47"E	Weathered rock and in-situ soil	Active	Progressive, enlarging and widening	Single slide with multiple failure/ 3 debris slump	Old Shallow translational failure	Approx. 19m	Approx. 22m	Approx. 1.2m, VH:12m	Approx. 17m	Ferruginous Phyllite	Lowly dissected slope	Weathering and Erosion along nala	Lined drainage required.	Landslide is suspended and unstable and risk factor is moderate and metastable, Risk to communication line, man and material. Vertical cut slope failure.
KAR/CHK/2017/28	Chikmangalur/ Karnataka	Kavikalgundi village area	48O/11	Kavikalgundi road section	13°24'21.48"N/ 75°44'38.22"E	Weathered rock and in-situ soil	Active	Progressive, enlarging and widening	Single slide	Shallow translational planar failure	Approx. 19m	Approx. 22m	Approx. 1.2m, VH:12m	Approx. 17m	Banded magnetite Quartzite	Lowly dissected slope	Seepage along weak plane, water saturation leading to weathering	Lined drainage and retaining wall 1.5m , rock bolting required.	Landslide is active risk factor is high and metastable, Risk to communication line, man and material. Vertical cut slope failure dipping towards road.
KAR/CHK/2017/29	Chikmangalur/ Karnataka	Muthodi village area	48O/11	Muthodi road section	13°23'37.75"N/ 75°38'42.56"E	Weathered rock and in-situ soil	Suspended	Retrogressive , enlarging and widening	Single slide	Shallow translational planar failure	Approx. 14m	Approx. 65m	Approx. 1.2m, VH:15m	Approx. 12m	Quartzite	Lowly dissected slope	Seepage along weak plane, water saturation leading to weathering, downslope Somavahini halla	Removal of loose material, Lined drainage and slope gradation required.	Landslide is active and unstable and risk factor is high and metastable, Risk to communication line, man and material. Old slide plantation on slope
KAR/CHK/2017/30	Chikmangalur/ Karnataka	Muthodi village area	48O/11	Muthodi road section	13°23'41.95"N/ 75°38'42.28"E	Weathered rock	Suspended	progressive, enlarging and widening	Single slide	Shallow translational planar failure	Approx. 18m	Approx. 45m	Approx. 1 m	Approx. 15m	Amphibolite	Lowly dissected slope	Seepage along weak plane, water saturation leading to weathering, downslope Somavahini halla	Removal of loose material, Lined drainage and slope gradation required.	Landslide is active and unstable and risk factor is high and metastable, Risk to communication line, man and material. Old scars present
KAR/CHK/2017/31	Chikmangalur/ Karnataka	Muthodi village area	48O/11	Muthodi road section	13°23'53.00"N/ 75°38'41.61"E	Rock	Suspended	progressive, enlarging and widening	Single slide	Shallow translational planar failure	Approx.1 7m	Approx.2 5m	VH:Approx. 12m	Approx.1 5m	Carbonaceous Phyllite	Lowly dissected slope	Seepage along weak plane, water saturation leading to weathering, downslope Somavahini halla	Removal of loose material, Lined drainage and slope gradation required.	In present condition landslide is active and unstable and risk factor is high and metastable, Risk to communication line, man and material. Old scars present
KAR/CHK/2017/32	Chikmangalur/ Karnataka	Muthodi village area	48O/11	Muthodi road section	13°23'56.04"N/ 75°38'39.00"E	Rock and Weathered rock	Suspended	confined, enlarging and widening	Single slide	Shallow translational planar failure	Approx.1 5 m	Approx.2 5m	VH:Approx. 20m		Ferruginous Phyllite	Lowly dissected slope	Seepage along weak plane, water saturation leading to weathering, downslope Somavahini halla	Removal of loose material, Lined drainage and slope gradation required.	In present condition landslide is active and unstable , Risk to communication line, man and material. Old scars present

GEO-PARAMETRIC LANDSLIDE INVENTORY DATABASE

ANNEXURE I

Slide N0/ID	District/State	Name of the slide	TS No.	Locality	Lat/Long	Type of Material	Activity	Distribution	Style	Failure Mechanism	Length (m)	Width (m)	Height (m)	Run out distance (m)	Geology	Geomorphology	Geo-scientific Causes	Remedial measures	Remarks
KAR/CHK/2017/33	Chikmangalur/ Karnataka	Muthodi village area	48O/11	Muthodi road section	13°24'26.72"N/ 75°38'47.42"E	Rock	Suspended	confined, enlarging and widening	Single slide	Shallow translational planar failure	Approx.2 2m	Approx.2 5m	VH:Appr ox. 20m		Ferruginous Phyllite	Lowly dissected slope	Seepage along weak plane, water saturation leading to weathering, downslope Somavahini halla	Removal of loose material, Lined drainage and slope gradation required.	landslide is active and unstable and risk factor is high and metastable, Risk to communication line, man and material. Old scars present
KAR/CHK/2017/34	Chikmangalur/ Karnataka	Muthodi village area	48O/11	Muthodi road section	13°24'33.06"N/ 75°37'5.60"E	Weathered Rock	Suspended	confined, enlarging and widening, retrogressive	Single with multiple failure	Shallow translational failure	Approx. 11m	Approx.2 0m	Approx. 1m	Approx. 9m	Granite gneiss	Lowly dissected slope/PPC	Seepage along weak plane, water saturation leading to weathering, downslope Somavahini halla	Removal of loose material, Lined drainage and slope gradation required.	Landslide is active and unstable and risk factor is high and meta-stable, Risk to communication line, man and material. Old scars present
KAR/CHK/2017/35	Chikmangalur/ Karnataka	Muthodi village area	48O/11	Muthodi road section	13°24'12.34"N/ 75°36'33.72"E	Weathered Rock	Suspended	confined, enlarging and widening, retrogressive	Single with multiple failure	Shallow translational failure	Approx.1 8m	Approx. 65m	Approx. 2m	Approx. 15m	Granite gneiss	Lowly dissected slope	Seepage along weak plane, water saturation leading to weathering, downslope Somavahini halla	Removal of loose material, Lined drainage and slope gradation required.	Landslide is active and unstable and risk factor is high and meta-stable, Risk to communication line, man and material. Old scars present
KAR/CHK/2017/36	Chikmangalur/ Karnataka	Kotigehara village area	48O/12	Krigevara road section	13°7'4.52"N/ 75°30'47.3"E	Weathered Rock and in-situ soil	Suspended	enlarging and widening, progressive	Single	Shallow translational failure	Approx.1 9m	Approx. 55m	Approx. 2m, VH:15m	Approx. 15m	Granite gneiss	Lowly dissected slope/Peidmont slope	Seepage along weak plane, water saturation leading to weathering, downslope Somavahini halla	Removal of loose material, Lined drainage and slope gradation required.	Landslide is active and unstable and risk factor is high and meta-stable, Risk to communication line, man and material. Old scars present
KAR/CHK/2017/37	Chikmangalur/ Karnataka	Kotigehara village area	48O/12	Kotighera road section	13°7'12.84"N/ 75°30'42.32"E	Weathered Rock and in-situ soil	Suspended	enlarging and widening, retrogressive	Multiple	Shallow translational failure	Approx. 18m	Approx. 100m	Approx. 2m, VH:22m	Approx. 15m	Granite gneiss	Peidmont slope	Seepage along weak plane leading to weathering	Lined drainage and retaining wall is required.	Landslide is active and unstable and risk factor is high and meta-stable. Old scars present
KAR/CHK/2017/38	Chikmangalur/ Karnataka	Kotigehara village area	48O/12	Kotighera road section	13°7'4.56"N/ 75°30'19.05"E	Rock	Suspended	enlarging and widening, retrogressive	Single	Shallow translational failure	Approx. 22m	Approx. 55m	Approx. 1.2m, Approx. VH:13m	Approx. 17m	Granite gneiss	Moderately dissected slope	Seepage along weak plane, water saturation leading to weathering, along nala	Lined drainage required.	Landslide is active and unstable and risk factor is high and meta-stable, Risk to communication line, man and material. Old scars present
KAR/CHK/2017/39	Chikmangalur/ Karnataka	Kotigehara village area	48O/12	Kotighera road section	13°7'6.97"N/ 75°30'14.29"E	Rock	Suspended	enlarging and widening, retrogressive	Single	Shallow translational failure	Approx. 22m	Approx. 100m	Approx. 1.2m, VH:13m Approx	Approx. 17m	Granite gneiss	Moderately dissected slope	Seepage along weak plane, water saturation leading to weathering, downslope Somavahini halla	Lined drainage required.	Landslide is active and unstable and risk factor is high and meta-stable, Risk to communication line, man and material. Old scars present
KAR/CHK/2017/40	Chikmangalur/ Karnataka	Kotigehara village area	48O/12	Kotighera road section	13°7'9.83"N/ 75°30'11.38"E	Rock	Suspended	enlarging and widening, retrogressive	Single	Shallow translational failure	Approx. 22m	Approx. 70m	Approx. 1.2m,. VH:13m Approx	Approx. 18m	Granite gneiss	Moderately dissected slope	Seepage along weak plane, water saturation leading to weathering, near nala	Lined drainage required.	Landslide is active and unstable and risk factor is high and meta-stable, Risk to communication line, man and material. Old scars present
KAR/CHK/2017/41	Chikmangalur/ Karnataka	Kotigehara village area	48O/12	Kotighera road section	13°7'11.99"N/ 75°30'8.43"E	Rock	Suspended	enlarging and widening, retrogressive	Multiple	Shallow translational failure	Approx. 22m	Approx. 30m	Approx. 1.2m,. VH: Approx 2m	Approx. 18m	Granite gneiss	Moderately dissected slope	Seepage along weak plane, water saturation leading to weathering, near nala	Lined drainage required.	Landslide is active and unstable and risk factor is high and meta-stable, Risk to communication line, man and material. Old scars present
KAR/CHK/2017/42	Chikmangalur/ Karnataka	Aldur-Balehonnur road	48O/11	7 km from aldur	13°16'13.08"N/ 75°37'13.6"E	Weathered rock and in-situ soil	Suspended	enlarging and widening,	Multiple	Shallow translational failure	Approx. 12m	Approx. 40m	Approx 2m	Approx. 7m	Granite gneiss	Lowly dissected slope	Seepage along weak plane, water saturation leading to weathering, near nala, low cohesive strength.	Lined drainage required.	Landslide is active and unstable and risk factor is high and meta-stable, Risk to communication line, man and material.
KAR/CHK/2017/43	Chikmangalur/ Karnataka	Aldur-Balehonnur road	48O/11	7.4 km from aldur	13°16'8.56"N/ 75°37'2.51"E	Weathered rock and in-situ soil	Suspended	enlarging and widening,	Multiple	Shallow translational failure	Approx. 9m	Approx. 25m	Approx. 1.5m	Approx. 6.5m	Granite gneiss	Lowly Dissected slope	Seepage along weak plane, water saturation leading to weathering, near nala, low cohesive strength.	Lined drainage required.	Landslide is active and unstable and risk factor is high and meta-stable, Risk to communication line (Interruption), man and material.

Slide N0./ID	District/State	Name of the slide	TS No.	Locality	Lat/Long	Type of Material	Activity	Distribution	Style	Failure Mechanism	Length (m)	Width (m)	Height (m)	Run out distance (m)	Geology	Geomorph-ology	Geo-scientific Causes	Remedial measures	Remarks
KAR/CHK/2017/44	Chikmangalur/ Karnataka	Aldur- Balehonnur road	48O/11	Pura village, near Hunasehalli	13°19'58.32"N/ 75°33'42.8"E	Weathered rock	Suspended	enlarging and widening, confined	Multiple	Shallow translational failure	Approx. 12m	Approx. 30m	Approx. 3m	Approx. 10m	Granite gneiss	Lowly Dissected slope	Seepage along weak plane, water saturation leading to weathering, low cohesive strength., vertical cut slope failure, rainfall as triggering factor	Slope Gradation required. Removal of loose material	Landslide is active and unstable and risk factor is high and meta-stable, man and material and settlement nearby.
KAR/CHK/2017/45	Chikmangalur/ Karnataka	Kaimara village area	48O/11	Near Kaimara	13°22'6.11"N/7 5°44'51.9"E	Weathered rock and in-situ soil	Suspended	enlarging and widening, confined	Multiple	Shallow translational planar failure	Approx. 9m	Approx. 65m	Approx. 1m	Approx. 7m	Quartzite	Lowly Dissected slope	Seepage along weak plane, water saturation leading to weathering, low cohesive strength., vertical cut slope failure, rainfall as triggering factor	Slope Gradation required. Removal of loose material	Landslide is active and unstable and risk factor is moderate and meta-stable,
KAR/CHK/2017/46	Chikmangalur/ Karnataka	Muliyangiri hill	48O/11	Muliyangiri hill road	13°22'49.12"N/ 75°43'19.95"E	Weathered rock and in-situ soil	Suspended	enlarging and widening, confined	Multiple	Shallow translational failure	Approx. 14m	Approx. 25m	Approx. 1.5m, VH:12m	Approx. 12m	Ferrugenous phyllite	Lowly Dissected slope	Seepage along weak plane, water saturation leading to weathering, low cohesive strength., underground water seepage	Slope Gradation required	Landslide is suspended and unstable and risk factor is moderate and meta-stable,
KAR/CHK/2017/47	Chikmangalur/ Karnataka	Muliyangiri hill	48O/11	Muliyangiri hill road	13°23'46.48"N/ 75°43'56.98"E	Rock	Suspended	confined	Multiple	Shallow translational failure	Approx. 24m	Approx. 30m	Approx. 3.5m,	Approx. 20m	Ferrugenous phyllite	Lowly Dissected slope	Seepage along weak plane, water saturation leading to weathering, low cohesive strength., near nala	Slope Gradation required	L;andslide is suspended and unstable and risk factor is moderate and meta-stable,
KAR/CHK/2017/48	Chikmangalur/ Karnataka	Muliyangiri hill	48O/11	Muliyangiri hill road	13°24'19.93"N/ 75°44'34.47"E	Rock	Suspended	confined	Multiple	Shallow translational planar failure	Approx. 24m	Approx. 30m	Approx. 3.5m, VH:17m	Approx. 20m	Ferrugenous phyllite	Moderately Dissected slope	Seepage along weak plane, water saturation leading to weathering, low cohesive strength., near nala	Slope Gradation required	In present condition landslide is suspended and unstable and risk factor is moderate and meta-stable,
KAR/CHK/2017/49	Chikmangalur/ Karnataka	Muliyangiri hill	48O/11	Muliyangiri hill road	13°24'22.65"N/ 75°44'4.56"E	Rock	Suspended	confined	Multiple	Shallow translational planar failure	Approx. 24m	Approx. 10m	Approx. 3.5m, VH:17m	Approx. 20m	Ferrugenous phyllite	Moderately Dissected slope	Seepage along weak plane, water saturation leading to weathering, low cohesive strength., near nala	Slope Gradation required	landslide is suspended and unstable and risk factor is moderate and meta-stable,
KAR/CHK/2017/50	Chikmangalur/ Karnataka	Muliyangiri hill	48O/11	Muliyangiri hill road	13°24'52.55"N/ 75°43'29.03"E	Rock	Suspended	confined	Multiple	Shallow translational planar failure	Approx. 19m	Approx. 25m	Approx. 1.5m, VH:17m	Approx. 17m	Ferrugenous phyllite and Banded magnetite quartzite	Moderately Dissected slope	Seepage along weak plane, water saturation leading to weathering, low cohesive strength., near nala, vertical cut slope failure	Slope Gradation required	Landslide is suspended and unstable and risk factor is moderate and meta-stable,
KAR/CHK/2017/51	Chikmangalur/ Karnataka	Muthodi village area	48O/11	Muthodi road	13°25'2.17"N/7 5°38'34.7"E	Rock	Suspended	confined	Multiple	Shallow translational planar failure	Approx. 22m	Approx. 25m	Approx. 1.5m, VH:17m	Approx. 17m	Ferrugenous phyllite	Moderately Dissected slope	Seepage along weak plane, water saturation leading to weathering, low cohesive strength., near nala, vertical cut slope failure	Slope Gradation required	landslide is suspended and unstable and risk factor is moderate and meta-stable,
KAR/CHK/2017/52	Chikmangalur/ Karnataka	Devarahalli	48O/11	Bannur- Agala- Devarahalli road	13°17'57.9"N/7 5°37'31.8"E	Rock cum debris slide	Suspended	Widening, enlarging and confined	Single	Shallow translational failure	Approx. 27m	Approx. 50m	Approx. 2m	Approx. 30m	Granite Gneiss	Lowly Dissected slope	Seepage along weak plane, water saturation leading to weathering, low cohesive strength., near nala, vertical cut slope failure	Slope Gradation required	landslide is suspended and unstable and risk factor is moderate and meta-stable,

GEO-PARAMETRIC LANDSLIDE INVENTORY DATABASE

ANNEXURE I

Slide N0./ID	District/State	Name of the slide	TS No.	Locality	Lat/Long	Type of Material	Activity	Distribution	Style	Failure Mechanism	Length (m)	Width (m)	Height (m)	Run out distance (m)	Geology	Geomorphology	Geo-scientific Causes	Remedial measures	Remarks
KAR/CHK/2017/53	Chikmagalur/ Karnataka	Hirekolale Village area	48O/11	Chikmagalur-Hirekolale road section	13°21'46.27"N/ 75°42'26.57"E	Rock cum debris slide	Suspended	Widening, enlarging and confined	Single	Shallow translational failure	Approx. 28m	Approx. 50m	Approx 2m	Approx. 30m	Quartzite	Lowly Dissected slope	wedge failure due to water seepage and saturation along joint plane.	Slope Gradation required	Landslide is suspended and unstable and risk factor is moderate and meta-stable, few settlements were there at downslope/foothill are at low risk
KAR/CHK/2017/54	Chikmagalur/ Karnataka	Gutti village area	48O/11	Gutti-Kotrakere road section	13°5'29.75"N/ 75°33'22.12"E	in-situ soil	Suspended	Widening, enlarging and progressive	Single	Shallow translational failure	Approx. 14m	Approx. 50m	Approx 1m	Approx. 12m	Granite Gneiss	Lowly Dissected slope/Peidmont slope	wedge failure due to water seepage and saturation along joint plane.	Slope Gradation required	Landslide is suspended and unstable and risk factor is moderate and meta-stable, few settlements were there at downslope/foothill are at low risk
KAR/CHK/2017/55	Chikmagalur/ Karnataka	Bapujinagra village area	48O/11	Mudigere-Bapujinagra road section	13°8'21.66"N/ 75°38'10.58"E	in-situ soil	Suspended	Widening, enlarging and progressive	Single	Shallow translational failure	Approx. 15m	Approx. 25m	Approx 1m	Approx. 14m	Granite Gneiss	Peidmont slope	Vertical cut slope failure	Slope Gradation/Benching required	Landslide is suspended and unstable and risk factor is moderate and meta-stable, few settlements at downslope/foothill are at low risk
KAR/CHK/2017/56	Chikmagalur/ Karnataka	Mudigere village area on SH-64	48O/12	10 km from Mudigere towards chikmagalur on SH-6	13°11'48.40"N/ 75°40'7.40"E	in-situ soil	Suspended	Widening, enlarging and progressive	Single	Shallow translational failure	Approx. 16m	Approx. 10m	Approx1 m	Approx. 14m	Granite Gneiss	Peidmont slope	Vertical cut slope failure	Slope Gradation/Benching is required	Road cut failure
KAR/CHK/2017/57	Chikmagalur/ Karnataka	Mudigere towards chikmagalur on SH-64	48O/12	5 km from Mudigere towards chikmagalur on SH-64	13°10'12.81"N/ 75°39'4.12"E	in-situ soil	Suspended	Widening, enlarging and progressive	Single	Shallow translational failure	Approx. 17m	Approx. 10m	Approx1 m	Approx. 14m	Granite Gneiss	Peidmont slope	Vertical cut slope failure	Slope Gradation/Benching required	Landslide is suspended and unstable and risk factor is moderate and meta-stable, few settlements at downslope/foothill are at low risk
KAR/CHK/2017/58	Chikmagalur/ Karnataka	Hunasehalli village area	48O/11	10km from Hunasehalli village area	13°20'26.71"N/ 75°35'54.15"E	Rock	Suspended	Widening, enlarging and progressive	Single	Shallow translational failure	Approx. 16m	Approx. 150m	Approx 1m	Approx. 20m	Granite Gneiss	Lowly dissected slope	Weathering and Erosion of loose material due to water saturation during heavy rainfall	Lined drainage , slope gradation required	Debris slide is suspended and stable and risk factor is low.
KAR/CHK/2017/59	Chikmagalur/ Karnataka	Horatti village area	48O/12	Horatti village area	13°09'29.24"N/ 75°31'30.67"E	Rock	Suspended	Widening, enlarging and progressive	Single	Shallow translational failure	Approx. 18m	Approx. 30m	Approx 1m	Approx. 14m	Granite Gneiss	Lowly dissected slope	Weathering and Erosion of loose material due to water saturation during heavy rainfall		Debris slide is suspended and stable and risk factor is low.

Sl. No	Data Set	Geoparameters	Details
1.	Location details	Slide No./ID	KAR/CHK/2017/01
2.		State	Karnataka
3.		District	Chikmangalur
4.		Slide Name	Hebbarige village near Banakal on NH-234
5.		Toposheet No	48O/12
6.		NH/SH/locality	NH-234
7.		Latitude	13°07'55.39"N
8.		Longitude	75°32'37.59"E
9.		Date of occurrence	No record
10.	Slide type	Type of Material	In-situ soil
11.		Type of movement	Slide
12.		Failure Plane	Shallow (<=5m)
13.		Activity	Suspended
14.		Distribution	Widening and Enlarging
15.		Style	Single
16.		Failure mechanism	Shallow translational failure
17.		Landslide History	Old
18.	Slide morphology	Length(m)	Approx. 30m
19.		Width(m)	Approx. 40m
20.		Height(m)	VH: Approx. 10m
21.		Run out Distance	Approx. 25m
22.	Geological details	Geology/ Lithology	Granite Gneiss
23.		Rock Characteristic	Weathered
24.		Structural details	---
25.		Weathering	High
26.		Overburden thickness	5-10m
27.		Overburden type	In-situ soil
28.		Geomorphology Process	Others
29.		Geomorphology forms	Piedmont slope
30.		Land use/Land cover	Moderate vegetation/Dense vegetation
31.		Hydrological condition	Damp
32.	Landslide causes	Triggering factor and causes	Rainfall and Weathering
33.		Rainfall	--
34.		Landslide process	Modearte
35.		Geological causes	---
36.	Damage and risk due to landslide	Life/Livestock/Property	No records
37.		Risk	No records
38.		Susceptibility assessment of slope	Meta-stable
39.		Qualitative Risk Assessment	Moderate

40.	Remedial measures		Lined drainage with weep holes and slope re-gradation is required.
41.	Remarks		In present condition the debris slide is suspended and stable and risk factor is low.
Slide Photographs			

Sl. No	Data Set	Geoparameters	Details
1.	Location details	Slide No./ID	KAR/CHK/2017/02
2.		State	Karnataka
3.		District	Chikmangalur
4.		Slide Name	164m from KAR/CHK/2017/02 on NH-234
5.		Toposheet No	48O/12
6.		NH/SH/locality	Hebbarige village near Banakal on NH-234
7.		Latitude	13°07'53.06"N
8.		Longitude	75°32'32.61"E
9.		Date of occurrence	No record
10.	Slide type	Type of Material	In-situ soil
11.		Type of movement	Slide
12.		Failure Plane	Shallow (<=5m)
13.		Activity	Suspended
14.		Distribution	Widening and Enlarging/Progressive
15.		Style	Single
16.		Failure mechanism	Shallow translational failure
17.		Landslide History	Old
18.	Slide morphology	Length(m)	Approx. 18m
19.		Width(m)	Approx. 30m
20.		Height(m)	Approx. 8m
21.		Run out Distance	Approx. 8m
22.	Geological details	Geology/ Lithology	Granite Gneiss
23.		Rock Characteristic	Weathered
24.		Structural details	---
25.		Weathering	High
26.		Overburden thickness	5-10m
27.		Overburden type	In-situ soil
28.		Geomorphology Process	Others
29.		Geomorphology forms	Piedmont slope
30.		Land use/Land cover	Moderate vegetation/Dense vegetation
31.		Hydrological condition	Damp
32.	Landslide causes	Triggering factor and causes	Rainfall and Weathering
33.		Rainfall	--
34.		Landslide process	Modearte
35.		Geological causes	---
36.	Damage and risk due to landslide	Life/Livestock/Property	No records
37.		Risk	--
38.		Susceptibility assessment of slope	Meta-stable
39.		Qualitative Risk Assessment	Moderate

40.		Remedial measures(brief)	Lined drainage and slope gradation required
41.		Remarks/ Abstract	In present condition the debris slide is suspended and stable and risk factor is low.
Slide Photographs			

Sl. No	Data Set	Geoparameters	Details
1.	Location details	Slide No./ID	KAR/CHK/2017/03
2.		State	Karnataka
3.		District	Chikmangalur
4.		Slide Name	Kannapura village
5.		Toposheet No	48O/12
6.		NH/SH/locality	1km from Kannapura village on Kannapura-Mudigere road
7.		Latitude	13°09'28.29"N
8.		Longitude	75°41'14.86"E
9.		Date of occurrence	No record
10.	Slide type	Type of Material	In-situ soil
11.		Type of movement	Slide/Slump
12.		Failure Plane	Shallow (<=5m)
13.		Activity	Suspended
14.		Distribution	Widening and Enlarging
15.		Style	Single
16.		Failure mechanism	Shallow translational failure
17.		Landslide History	Old
18.	Slide morphology	Length(m)	Approx 28m
19.		Width(m)	Approx. 12m
20.		Height(m)	Approx. 8m
21.		Run out Distance	Approx 25m
22.	Geological details	Geology/ Lithology	Amphibolite
23.		Rock Characteristic	Weathered
24.		Structural details	--
25.		Weathering	Highly weathered
26.		Overburden thickness	5-10m
27.		Overburden type	In-situ soil
28.		Geomorphology Process	Piedmont Slope
29.		Geomorphology forms	Damp
30.		Land use/Land cover	Moderate vegetation/Dense vegetation
31.		Hydrological condition	Damp
32.	Landslide causes	Triggering factor and causes	Rainfall and Weathering
33.		Rainfall	---
34.		Landslide process	No records
35.		Geological causes	Weathering
36.	Damage and risk	Life/Livestock/Property	No records
37.		Risk	High
38.		Susceptibility assessment of slope	Unstable
39.		Qualitative Risk Assessment	
40.	Remedial measures(brief)		slope gradation required.

41.	Remarks/ Abstract	In present condition the debris slide is suspended and stable and risk factor is low. Risk to communication line
Slide Photographs		

Sl. No	Data Set	Geoparameters	Details
1.	Location details	Slide No./ID	KAR/CHK/2017/04
2.		State	Karnataka
3.		District	Chikmangalur
4.		Slide Name	Kannapura village
5.		Toposheet No	48O/12
6.		NH/SH/locality	1km from Kannapura village on Kannapura-Mudigere road
7.		Latitude	13°09'28.23"N
8.		Longitude	75°41'01.55"E
9.		Date of occurrence	No records
10.	Slide type	Type of Material	In-situ soil
11.		Type of movement	Slide/Slump
12.		Failure Plane	Shallow (<=5m)
13.		Activity	Active
14.		Distribution	Widening and Enlarging
15.		Style	Single
16.		Failure mechanism	Shallow translational failure
17.		Landslide History	Old
18.	Slide morphology	Length(m)	Approx. 35m
19.		Width(m)	Approx. 30m
20.		Height(m)	Approx. 10m
21.		Run out Distance	25m
22.	Geological details	Geology/ Lithology	Amphibolite
23.		Rock Characteristic	weathered
24.		Structural details	Jointed (2 sets)
25.		Weathering	Moderately Weathered
26.		Overburden thickness	5-10m
27.		Overburden type	In-situ soil
28.		Geomorphology Process	others
29.		Geomorphology forms	Lowly dissected slope
30.		Land use/Land cover	Plantation
31.	Landslide causes	Hydrological condition	Dry
32.		Triggering factor and causes	Rainfall and Weathering
33.		Rainfall	yes
34.		Landslide process	slow
35.		Geological causes	Gravity
36.	Damage and risk due to landslide	Life/Livestock/Property	No records
37.		Risk	
38.		Susceptibility assessment of slope	
39.		Qualitative Risk Assessment	

40.	Remedial measures(brief)	Lined drainage with weep holes are required
41.	Remarks/ Abstract	In present condition the debris slide/slump is active and risk factor is low. Fresh rock boulders are found lying. The area is demarcated as meta-stable to unstable zone. Risk to communication line.
Slide Photographs		

Sl. No	Data Set	Geoparameters	Details
1.	Location details	Slide No./ID	KAR/CHK/2017/05
2.		State	Karnataka
3.		District	Chikmangalur
4.		Slide Name	Naduvina Madakal village
5.		Toposheet No	48O/12
6.		NH/SH/locality	1.7 km from Kannapura village on Kannapura-Mudigere road
7.		Latitude	13°09'23.27"N
8.		Longitude	75°40'54.21"E
9.		Date of occurrence	No records
10.	Slide type	Type of Material	In-situ soil
11.		Type of Movement	Slide/Subsidence
12.		Failure Plane	Shallow (<=5m)
13.		Activity	Partly Active and partly suspended
14.		Distribution	Widening , Enlarging & Progressive
15.		Style	Single
16.		Failure mechanism	Shallow translational failure
17.		Landslide History	Old, Initiation
18.	Slide morphology	Length(m)	Approx. 18m
19.		Width(m)	Approx. 50m
20.		Height(m)	VH:Approx. 10m
21.		Run out Distance	8m
22.	Geological details	Geology/ Lithology	Granite Gneiss
23.		Rock Characteristic	Weathered
24.		Structural details	---
25.		Weathering	Moderately Weathered
26.		Overburden thickness	5-10m
27.		Overburden type	In-situ soil
28.		Geomorphology Process	others
29.		Geomorphology forms	Lowly Dissected slope
30.		Land use/Land cover	Low height Plantation
31.		Hydrological condition	Damp
32.	Landslide causes	Triggering factor and causes	Weathering and rainfall
33.		Rainfall	Yes, rainfall is the triggering factor
34.		Landslide process	--
35.		Geological causes	--
36.	Damage and risk due to landslide	Life/Livestock/Property	No records
37.		Risk	High
38.		Susceptibility assessment of slope	Unstable

39.		Qualitative Risk Assessment	Moderate
40.		Remedial measures(brief)	Lined drainage with weep holes , slope gradation , more benches are required
41.		Remarks/ Abstract	In present condition the debris slide is suspended but active and however single bench are made to reduce the risk factor. The subsidence and creep movement cannot be denied as the bending of trunk can clearly be examined. The zone of 120m is demarcated as unstable zone. Downslope settlement is at risk. Risk to communication line and man and material.
Slide Photographs			
			

Sl. No	Data Set	Geoparameters	Details
1.	Location details	Slide No./ID	KAR/CHK/2017/06
2.		State	Karnataka
3.		District	Chikmangalur
4.		Slide Name	Mulahalli village
5.		Toposheet No	48O/12
6.		NH/SH/locality	Mulahalli village area
7.		Latitude	13°02'31.05"N
8.		Longitude	75°33'45.77"E
9.		Date of occurrence	No records
10.	Slide type	Type of Material	Weathered rock
11.		Type of movement	Slide/Slump
12.		Failure Plane	Shallow (<=5m)
13.		Activity	Suspended
14.		Distribution	Widening, Enlarging & Progressive
15.		Style	Single
16.		Failure mechanism	Old Shallow translational failure
17.		Landslide History	Old, reactivated
18.	Slide morphology	Length(m)	Approx. 14m
19.		Width(m)	Approx. 30m
20.		Height(m)	Approx. 6m/ Crown height: .05m
21.		Run out Distance	Approx. 5m
22.	Geological details	Geology/ Lithology	Granite Gneiss
23.		Rock Characteristic	Weathered
24.		Structural details	--
25.		Weathering	Moderate
26.		Overburden thickness	0.5-5m
27.		Overburden type	Weathered rock
28.		Geomorphology Process	others
29.		Geomorphology forms	Lowly dissected slope
30.		Land use/Land cover	Sparse vegetation/Barren, Downslope Plantation and settlement
31.		Hydrological condition	Dry
32.	Landslide causes	Triggering factor and causes	Rainfall
33.		Rainfall	---
34.		Landslide process	---
35.		Geological causes	---
36.	Damage and risk due to landslide	Life/Livestock/Property	No records
37.		Risk	Moderate
38.		Susceptibility assessment of slope	Meta-stable
39.		Qualitative Risk Assessment	Moderate

40.	Remedial measures(brief)	slope gradation required
41.	Remarks/ Abstract	In present condition the debris slide is suspended and stable and risk factor is low. Risk to communication line.
Slide Photographs		

Sl. No	Data Set	Geoparameters	Details
1.	Location details	Slide No./ID	KAR/CHK/2017/07
2.		State	Karnataka
3.		District	Chikmangalur
4.		Slide Name	.05 km from Slide no. 06
5.		Toposheet No	48O/12
6.		NH/SH/locality	Mulahali- Gutti road section
7.		Latitude	13°03'34.01"N
8.		Longitude	75°33'14.76"E
9.		Date of occurrence	No records
10.	Slide type	Type of Material	Weathered rock
11.		Type of movement	Slide/Slump
12.		Failure Plane	Shallow (<=5m)
13.		Activity	Suspended
14.		Distribution	Widening and Enlarging
15.		Style	Single slide with multiple failure
16.		Failure mechanism	Old Shallow translational failure
17.		Landslide History	Old, Suspended
18.	Slide morphology	Length(m)	Approx. 24m
19.		Width(m)	Approx. 55m
20.		Height(m)	Approx. 8m
21.		Run out Distance	Approx. 14 m
22.	Geological details	Geology/ Lithology	Granite Gneiss
23.		Rock Characteristic	Massive
24.		Structural details	--
25.		Weathering	Low
26.		Overburden thickness	<0.5m
27.		Overburden type	rock
28.		Geomorphology Process	others
29.		Geomorphology forms	Lowly dissected slope
30.		Land use/Land cover	Sparse Vegetation
31.		Hydrological condition	Dry
32.	Landslide causes	Triggering factor and causes	Rainfall
33.		Rainfall	--
34.		Landslide process	--
35.		Geological causes	--
36.	Damage and risk due to landslide	Life/Livestock/Property	No records
37.		Risk	Moderate
38.		Susceptibility assessment of slope	Meta-stable
39.		Qualitative Risk Assessment	Moderate

40.	Remedial measures	Lined drainage required.
41.	Remarks/ Abstract	In present condition the debris slide is suspended and stable and risk factor is low. Risk to communication line.
Slide Photographs		

Sl. No	Data Set	Geoparameters	Details
1.	Location details	Slide No./ID	KAR/CHK/2017/08
2.		State	Karnataka
3.		District	Chikmangalur
4.		Slide Name	50m from Slide no. 07
5.		Toposheet No	48O/12
6.		NH/SH/locality	Mulahali- Gutti road section
7.		Latitude	13°03'34.01"N
8.		Longitude	75°33'14.76"E
9.		Date of occurrence	No records
10.	Slide type	Type of Material	Weathered rock
11.		Type of movement	Slide
12.		Failure Plane	Shallow (<=5m)
13.		Activity	Suspended
14.		Distribution	Widening and Enlarging/confined
15.		Style	Single slide with 6 multiple failure
16.		Failure mechanism	Old, Shallow translational failure
17.		Landslide History	Old
18.	Slide morphology	Length(m)	Approx. 22m
19.		Width(m)	Approx. 55m
20.		Height(m)	Approx. 1.5m
21.		Run out Distance	17 m
22.	Geological details	Geology/ Lithology	Granite Gneiss
23.		Rock Characteristic	Massive
24.		Structural details	--
25.		Weathering	Low
26.		Overburden thickness	<0.5m
27.		Overburden type	rock
28.		Geomorphology Process	others
29.		Geomorphology forms	Lowly dissected slope
30.		Land use/Land cover	Sparse Vegetation
31.		Hydrological condition	Dry
32.	Landslide causes	Triggering factor and causes	Rainfall
33.		Rainfall	--
34.		Landslide process	--
35.		Geological causes	--
36.	Damage and risk due to landslide	Life/Livestock/Property	No records
37.		Risk	Moderate
38.		Susceptibility assessment of slope	Meta-stable
39.		Qualitative Risk Assessment	Moderate
40.	Remedial measures(brief)		Lined drainage required

41.	Remarks/ Abstract	In present condition the debris slide is suspended and stable and risk factor is high. Risk to communication line
Slide Photographs		

Sl. No	Data Set	Geoparameters	Details
1.	Location details	Slide No./ID	KAR/CHK/2017/09
2.		State	Karnataka
3.		District	Chikmangalur
4.		Slide Name	Mudigere-Tattakola road section
5.		Toposheet No	48O/12
6.		NH/SH/locality	2.5 km from Mudigere
7.		Latitude	13°08'57.27"N
8.		Longitude	75°37'47.53"E
9.		Date of occurrence	No records
10.	Slide type	Type of Material	Weathered rock at base and on top in-situ soil present
11.		Type of movement	Rock cum debris Slide
12.		Failure Plane	Shallow ($\leq 5\text{m}$)
13.		Activity	Suspended
14.		Distribution	Widening and Enlarging
15.		Style	Multiple failure
16.		Failure mechanism	Shallow translational failure
17.		Landslide History	Old
18.	Slide morphology	Length(m)	Approx. 17m
19.		Width(m)	Approx. 100m
20.		Height(m)	Approx. 1.3m
21.		Run out Distance	Approx. 15m
22.	Geological details	Geology/ Lithology	Granite Gneiss
23.		Rock Characteristic	Massive
24.		Structural details	--
25.		Weathering	Low
26.		Overburden thickness	0.5-5m
27.		Overburden type	Weathered rock
28.		Geomorphology Process	others
29.		Geomorphology forms	Lowly dissected slope
30.		Land use/Land cover	Moderate vegetation
31.		Hydrological condition	Dry
32.	Landslide causes	Triggering factor and causes	Rainfall
33.		Rainfall	--
34.		Landslide process	--
35.		Geological causes	--
36.	Damage and risk due to landslide	Life/Livestock/Property	No records
37.		Risk	Moderate
38.		Susceptibility assessment of slope	Meta-stable
39.		Qualitative Risk Assessment	Moderate

40.	Remedial measures(brief)	Lined drainage required, afforestation on slope.
41.	Remarks/ Abstract	In present condition landslide is suspended and stable and risk factor is low. Risk to communication line
Slide Photographs		

Sl. No	Data Set	Geoparameters	Details
1.	Location details	Slide No./ID	KAR/CHK/2017/10
2.		State	Karnataka
3.		District	Chikmangalur
4.		Slide Name	Mudigere-Tattakola road section
5.		Toposheet No	48O/12
6.		NH/SH/locality	87 m from Slide no. 09
7.		Latitude	13°08'55.15"N
8.		Longitude	75°37'49.28"E
9.		Date of occurrence	No records
10.	Slide type	Type of Material	Weathered rock at base and on top In-situ soil present
11.		Type of movement	Rock cum debris Slide
12.		Failure Plane	Shallow (<=5m)
13.		Activity	Suspended/dormant
14.		Distribution	Widening and Enlarging
15.		Style	Single
16.		Failure mechanism	Shallow translational failure
17.		Landslide History	Old
18.	Slide morphology	Length(m)	Approx. 22m
19.		Width(m)	Approx 20 m
20.		Height(m)	Approx 1.3m
21.		Run out Distance	Approx 17m
22.	Geological details	Geology/ Lithology	Granite Gneiss
23.		Rock Characteristic	Massive
24.		Structural details	--
25.		Weathering	Low
26.		Overburden thickness	0.5-5m
27.		Overburden type	Weathered rock
28.		Geomorphology Process	others
29.		Geomorphology forms	Lowly dissected slope
30.		Land use/Land cover	Moderate Vegetation
31.		Hydrological condition	Dry
32.	Landslide causes	Triggering factor and causes	Rainfall
33.		Rainfall	--
34.		Landslide process	--
35.		Geological causes	--
36.	Damage and risk	Life/Livestock/Property	No records
37.		Risk	Moderate
38.		Susceptibility assessment of slope	Meta-stable
39.		Qualitative Risk Assessment	Moderate

40.	Remedial measures(brief)	Lined drainage required, afforestation on slope.
41.	Remarks/ Abstract	In present condition landslide is suspended and stable and risk factor is moderate. Risk to communication line and electric power line nearby is risky to man and material during slope failure.
Slide Photographs		

Sl. No	Data Set	Geoparameters	Details
1.	Location details	Slide No./ID	KAR/CHK/2017/11
2.		State	Karnataka
3.		District	Chikmangalur
4.		Slide Name	Mudigere-Tattakola road section, 40m from Slide no. 10
5.		Toposheet No	48O/12
6.		NH/SH/locality	2.5 km from Mudigere
7.		Latitude	13°08'57.27"N
8.		Longitude	75°37'47.53"E
9.		Date of occurrence	No records
10.	Slide type	Type of Material	Weathered rock at base and on top In-situ soil present
11.		Type of movement	Rock Slide
12.		Failure Plane	Shallow ($\leq 5\text{m}$)
13.		Activity	Suspended
14.		Distribution	Confined
15.		Style	Multiple Failure
16.		Failure mechanism	Old Shallow translational failure
17.		Landslide History	Old, Suspended
18.	Slide morphology	Length(m)	Approx. 30m
19.		Width(m)	Approx. 45m
20.		Height(m)	Approx. 2m
21.		Run out Distance	Approx. 25m
22.	Geological details	Geology/ Lithology	Granite Gneiss
23.		Rock Characteristic	Massive
24.		Structural details	--
25.		Weathering	Low
26.		Overburden thickness	0.5-5m
27.		Overburden type	Weathered rock
28.		Geomorphology Process	others
29.		Geomorphology forms	Lowly dissected slope
30.		Land use/Land cover	Moderate vegetation
31.		Hydrological condition	Dry
32.	Landslide causes	Triggering factor and causes	Rainfall
33.		Rainfall	--
34.		Landslide process	--
35.		Geological causes	--
36.	Damage and risk due to landslide	Life/Livestock/Property	No records
37.		Risk	Moderate
38.		Susceptibility assessment of slope	Meta-stable

39.		Qualitative Risk Assessment	Moderate
40.	Remedial measures		Lined drainage required, afforestation on slope
41.	Remarks/ Abstract		In present condition landslide is suspended and stable and risk factor is low. Risk to communication line. Vegetation on slope present.
Slide Photographs			
			

Sl. No	Data Set	Geoparameters	Details
1.	Location details	Slide No./ID	KAR/CHK/2017/12
2.		State	Karnataka
3.		District	Chikmangalur
4.		Slide Name	Mudigere-Tattakola road section, 50m from Slide no. 11
5.		Toposheet No	48O/12
6.		NH/SH/locality	2.4 km from Mudigere
7.		Latitude	13°08'54.00"N
8.		Longitude	75°37'49.67"E
9.		Date of occurrence	No records
10.	Slide type	Type of Material	Weathered rock at base and on top In-situ soil present/2 nos. Debris slide
11.		Type of movement	Slide
12.		Failure Plane	Shallow (<=5m)
13.		Activity	Suspended
14.		Distribution	Widening and enlarging
15.		Style	Multiple slide
16.		Failure mechanism	Old Shallow translational failure
17.		Landslide History	Old, Suspended
18.	Slide morphology	Length(m)	Approx. 17m
19.		Width(m)	Approx. 22m
20.		Height(m)	Approx. 2m
21.		Run out Distance	Approx.12m
22.	Geological details	Geology/ Lithology	Granite Gneiss
23.		Rock Characteristic	Massive
24.		Structural details	--
25.		Weathering	Low
26.		Overburden thickness	0.5-5m
27.		Overburden type	Weathered rock
28.		Geomorphology Process	others
29.		Geomorphology forms	Lowly dissected slope
30.		Land use/Land cover	Moderate vegetation
31.		Hydrological condition	Dry
32.	Landslide causes	Triggering factor and causes	Rainfall
33.		Rainfall	--
34.		Landslide process	--
35.		Geological causes	--
36.	Damage and risk due to landslide	Life/Livestock/Property	No records
37.		Risk	Moderate
38.		Susceptibility assessment of slope	Meta-stable
39.		Qualitative Risk Assessment	Moderate

40.	Remedial measures(brief)	Lined drainage required, afforestation on slope.
41.	Remarks/ Abstract	In present condition landslide is suspended and stable and risk factor is moderate. Risk to communication line.
Slide Photographs		

Sl. No	Data Set	Geoparameters	Details
1.	Location details	Slide No./ID	KAR/CHK/2017/13
2.		State	Karnataka
3.		District	Chikmangalur
4.		Slide Name	Mudigere-Tattakola road section, 125m from Slide no. 12
5.		Toposheet No	48O/12
6.		NH/SH/locality	2.3 km from Mudigere
7.		Latitude	13°08'48.9"N
8.		Longitude	75°37'52.45"E
9.		Date of occurrence	No records
10.	Slide type	Type of Material	Debris slide with multiple failure
11.		Type of movement	Slide
12.		Failure Plane	Shallow (<=5m)
13.		Activity	Suspended
14.		Distribution	Widening and enlarging
15.		Style	Multiple slide
16.		Failure mechanism	Old Shallow translational failure
17.		Landslide History	Old, Suspended
18.	Slide morphology	Length(m)	Approx. 16m
19.		Width(m)	Approx. 22m
20.		Height(m)	Approx. 2m
21.		Run out Distance	Approx. 12m
22.	Geological details	Geology/ Lithology	Granite Gneiss
23.		Rock Characteristic	Massive
24.		Structural details	--
25.		Weathering	Low
26.		Overburden thickness	0.5-5m
27.		Overburden type	Weathered rock
28.		Geomorphology Process	others
29.		Geomorphology forms	Lowly dissected slope
30.		Land use/Land cover	Moderate vegetation
31.		Hydrological condition	Dry
32.	Landslide causes	Triggering factor and causes	Rainfall
33.		Rainfall	--
34.		Landslide process	--
35.		Geological causes	--
36.	Damage and risk due to landslide	Life/Livestock/Property	No records
37.		Risk	Moderate
38.		Susceptibility assessment of slope	Meta-stable
39.		Qualitative Risk Assessment	Moderate

40.	Remedial measures(brief)	Lined drainage required, afforestation on slope
41.	Remarks/ Abstract	In present condition landslide is suspended and stable and risk factor is moderate. Risk to communication line.
Slide Photographs		

Sl. No	Data Set	Geoparameters	Details
1.	Location details	Slide No./ID	KAR/CHK/2017/14
2.		State	Karnataka
3.		District	Chikmangalur
4.		Slide Name	Mudigere-Tattakola road section
5.		Toposheet No	48O/12
6.		NH/SH/locality	1.1km from Mudigere
7.		Latitude	13°08'21.66"N
8.		Longitude	75°38'10.58"E
9.		Date of occurrence	No records
10.	Slide type	Type of Material	Debris slide , weathered rock cum in-situ soil
11.		Type of movement	Slide
12.		Failure Plane	Shallow (<=5m)
13.		Activity	Active
14.		Distribution	Widening and enlarging
15.		Style	Single
16.		Failure mechanism	Old Shallow translational failure
17.		Landslide History	Old
18.	Slide morphol ogy	Length(m)	Approx. 17m
19.		Width(m)	Approx. 25m
20.		Height(m)	Approx. 1m
21.		Run out Distance	Approx. 14m
22.	Geologic al details	Geology/ Lithology	Granite Gneiss
23.		Rock Characteristic	Massive
24.		Structural details	--
25.		Weathering	Low
26.		Overburden thickness	0.5-5m
27.		Overburden type	Weathered rock
28.		Geomorphology Process	others
29.		Geomorphology forms	Lowly dissected slope
30.		Land use/Land cover	Plantation
31.		Hydrological condition	Dry
32.	Landslid e causes	Triggering factor and causes	Rainfall
33.		Rainfall	--
34.		Landslide process	--
35.		Geological causes	--
36.	Damage and risk due to landslide	Life/Livestock/Property	No records
37.		Risk	Moderate
38.		Susceptibility assessment of slope	Meta-stable
39.		Qualitative Risk Assessment	Moderate
40.	Remedial measures		Lined drainage required, afforestation and slope gradation required.

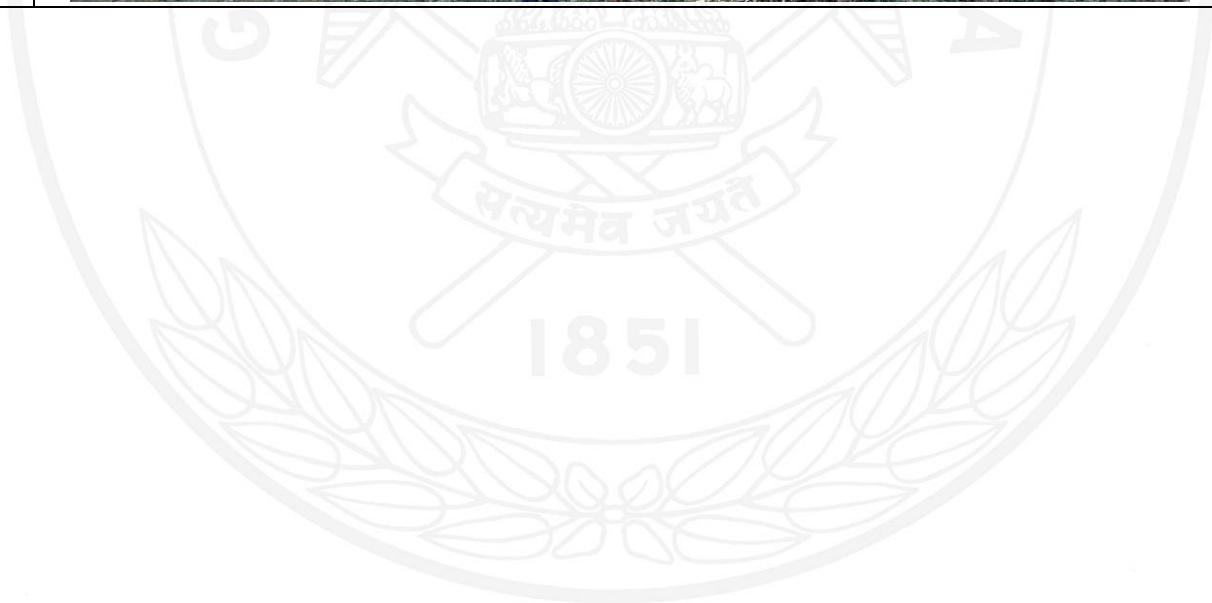
41.	Remarks/ Abstract	In present condition landslide is suspended and stable and risk factor is moderate. Risk to communication line, man and material. Slope is fragile upto 200 m extension.
Slide Photographs		

Sl. No	Data Set	Geoparameters	Details
1.	Location details	Slide No./ID	KAR/CHK/2017/15
2.		State	Karnataka
3.		District	Chikmangalur
4.		Slide Name	Chandugodu village
5.		Toposheet No	48O/12
6.		NH/SH/locality	1 km from Chandugodu
7.		Latitude	13°14'25.07"N
8.		Longitude	75°36'38.31"E
9.		Date of occurrence	No records
10.	Slide type	Type of Material	Debris slide , weathered rock cum in-situ soil
11.		Type of movement	Slide
12.		Failure Plane	Shallow (<=5m)
13.		Activity	Active
14.		Distribution	Retrogressive upslope
15.		Style	Single slide with multiple failure
16.		Failure mechanism	Shallow translational failure
17.		Landslide History	Old
18.	Slide morphology	Length(m)	Approx. 15m
19.		Width(m)	Approx. 25m
20.		Height(m)	Approx. 1.5m, VH:15m
21.		Run out Distance	Approx. 10m
22.	Geologic al details	Geology/ Lithology	Granite Gneiss
23.		Rock Characteristic	Weathered
24.		Structural details	--
25.		Weathering	High
26.		Overburden thickness	0.5-5m
27.		Overburden type	In-situ soil
28.		Geomorphology Process	Others
29.		Geomorphology forms	Lowly dissected slope
30.		Land use/Land cover	Plantation
31.		Hydrological condition	Damp
32.	Landslide causes	Triggering factor and causes	Rainfall and weathering
33.		Rainfall	--
34.		Landslide process	--
35.		Geological causes	--
36.	Damage and risk due to landslide	Life/Livestock/Property	No records
37.		Risk	Moderate
38.		Susceptibility assessment of slope	Meta-stable
39.		Qualitative Risk Assessment	High

40.	Remedial measures	Lined drainage required, afforestation and slope gradation required
41.	Remarks/ Abstract	In present condition landslide is suspended and stable and risk factor is High. Electric pole nearby, Risk to communication line, man and material.
Slide Photographs		

Sl. No	Data Set	Geoparameters	Details
1.	Location details	Slide No./ID	KAR/CHK/2017/16
2.		State	Karnataka
3.		District	Chikmangalur
4.		Slide Name	Chandugodu-Kanegadde village area
5.		Toposheet No	48O/12
6.		NH/SH/locality	1.1km from Slide no.16, Chandugodu-Kanegadde road section
7.		Latitude	13°14'25.07"N
8.		Longitude	75°36'38.31"E
9.		Date of occurrence	No records
10.	Slide type	Type of Material	Debris slide , weathered rock cum in-situ soil
11.		Type of movement	Slide
12.		Failure Plane	Shallow (<=5m)
13.		Activity	Active
14.		Distribution	Retrogressive upslope
15.		Style	Single slide with multiple failure
16.		Failure mechanism	Shallow translational failure
17.		Landslide History	Old
18.	Slide morphology	Length(m)	Approx. 21m
19.		Width(m)	Approx. 50m
20.		Height(m)	Approx. VH:7m
21.		Run out Distance	Approx. 25m
22.	Geological details	Geology/ Lithology	Granite Gneiss
23.		Rock Characteristic	Weathered
24.		Structural details	--
25.		Weathering	High
26.		Overburden thickness	0.5-5m
27.		Overburden type	In-situ soil
28.		Geomorphology Process	Others
29.		Geomorphology forms	Lowly dissected slope
30.		Land use/Land cover	Plantation
31.		Hydrological condition	Damp
32.	Landslide causes	Triggering factor and causes	Rainfall and weathering
33.		Rainfall	--
34.		Landslide process	--
35.		Geological causes	--
36.	Damage and risk due to landslide	Life/Livestock/Property	No records
37.		Risk	Moderate
38.		Susceptibility assessment of slope	Meta-stable
39.		Qualitative Risk Assessment	High

40.	Remedial measures	Lined drainage required, afforestation and slope gradation required
41.	Remarks/ Abstract	In present condition landslide is suspended and unstable and risk factor is high. Electric pole nearby, Risk to communication line, man and material.
Slide Photographs		

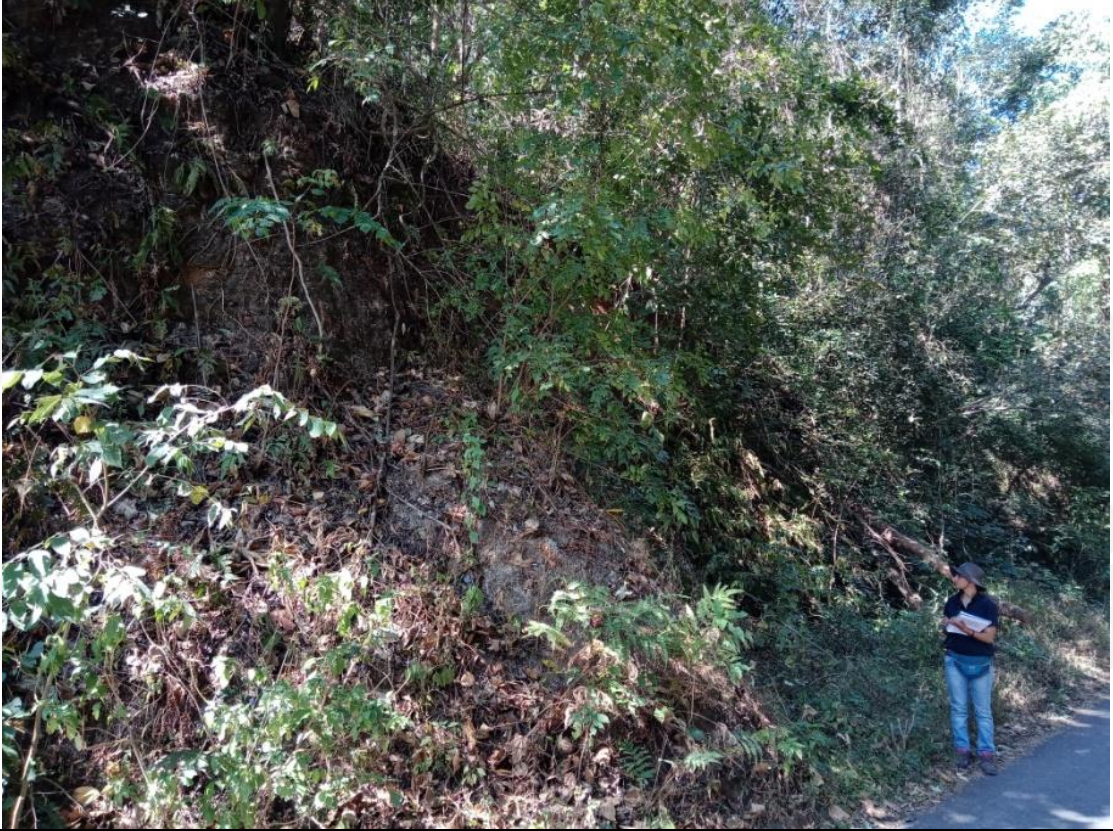


Sl. No	Data Set	Geoparameters	Details
1.	Location details	Slide No./ID	KAR/CHK/2017/17
2.		State	Karnataka
3.		District	Chikmangalur
4.		Slide Name	Chandugodu-Kanegadde village area
5.		Toposheet No	48O/12
6.		NH/SH/locality	1km from Slide no.17, Chandugodu-Kanegadde road section
7.		Latitude	13°14'7.09"N
8.		Longitude	75°36'14.33"E
9.		Date of occurrence	No records
10.	Slide type	Type of Material	Debris slide , weathered rock cum in-situ soil
11.		Type of movement	Slide
12.		Failure Plane	Shallow (<=5m)
13.		Activity	Active
14.		Distribution	Retrogressive upslope
15.		Style	Single slide with multiple failure
16.		Failure mechanism	Shallow translational failure
17.		Landslide History	Old
18.	Slide morphology	Length(m)	Approx. 15m
19.		Width(m)	Approx. 25m
20.		Height(m)	Approx. VH:10m
21.		Run out Distance	Approx. 13m
22.	Geological details	Geology/ Lithology	Granite Gneiss
23.		Rock Characteristic	Weathered
24.		Structural details	--
25.		Weathering	Moderate
26.		Overburden thickness	0.5-5m
27.		Overburden type	Weathered rock
28.		Geomorphology Process	Others
29.		Geomorphology forms	Lowly dissected slope
30.		Land use/Land cover	Moderate vegetation/Plantation
31.		Hydrological condition	Damp
32.	Landslide causes	Triggering factor and causes	Rainfall and weathering
33.		Rainfall	--
34.		Landslide process	--
35.		Geological causes	--
36.	Damage and risk due to landslide	Life/Livestock/Property	No records
37.		Risk	Moderate
38.		Susceptibility assessment of slope	Meta-stable

39.	Qualitative Risk Assessment	Moderate
40.	Remedial measures	Lined drainage required, afforestation and slope gradation required
41.	Remarks/ Abstract	In present condition landslide is suspended and un stable and risk factor is High. Electric pole nearby, Risk to communication line, man and material.
Slide Photographs		



Sl. No	Data Set	Geoparameters	Details
1.	Location details	Slide No./ID	KAR/CHK/2017/18
2.		State	Karnataka
3.		District	Chikmangalur
4.		Slide Name	Chandugodu-Kanegadde village area
5.		Toposheet No	48O/12
6.		NH/SH/locality	380 from Slide no.18, Chandugodu-Kanegadde road section
7.		Latitude	13°14'1.43"N
8.		Longitude	75°36'2.95"E
9.		Date of occurrence	No records
10.	Slide type	Type of Material	Debris slide, Highly weathered rock to soil, in-situ soil
11.		Type of movement	Slide
12.		Failure Plane	Shallow (<=5m)
13.		Activity	Suspended
14.		Distribution	Progressive
15.		Style	Single slide
16.		Failure mechanism	Shallow translational failure
17.		Landslide History	Old
18.	Slide morphology	Length(m)	Approx. 16m
19.		Width(m)	Approx. 70m
20.		Height(m)	Approx. VH:7m
21.		Run out Distance	Approx. 13m
22.	Geological details	Geology/ Lithology	Granite Gneiss
23.		Rock Characteristic	Massive
24.		Structural details	--
25.		Weathering	High
26.		Overburden thickness	0.5-5m
27.		Overburden type	Rock and in-situ soil
28.		Geomorphology Process	Others
29.		Geomorphology forms	Lowly dissected slope
30.		Land use/Land cover	Moderate vegetation/Plantation
31.		Hydrological condition	Damp
32.	Landslide causes	Triggering factor and causes	Rainfall and weathering
33.		Rainfall	--
34.		Landslide process	--
35.		Geological causes	--
36.	Damage and risk due to landslide	Life/Livestock/Property	No records
37.		Risk	Moderate

38.		Susceptibility assessment of slope	Meta-stable
39.		Qualitative Risk Assessment	Moderate
40.	Remedial measures(brief)		Lined drainage required.
41.	Remarks/ Abstract		In present condition landslide is suspended and un stable and risk factor is High. Electric pole nearby, Risk to communication line, man and material.
Slide Photographs			



Sl. No	Data Set	Geoparameters	Details
1.	Location details	Slide No./ID	KAR/CHK/2017/19
2.		State	Karnataka
3.		District	Chikmangalur
4.		Slide Name	Chandugodu-Kanegadde
5.		Toposheet No	48O/12
6.		NH/SH/locality	30 from Slide no.19, Chandugodu-Kanegadde road section
7.		Latitude	13°14'1.43"N
8.		Longitude	75°36'2.95"E
9.		Date of occurrence	No records
10.	Slide type	Type of Material	Weathered rock
11.		Type of movement	Slide
12.		Failure Plane	Shallow (<=5m)
13.		Activity	Active
14.		Distribution	Progressive
15.		Style	Single slide
16.		Failure mechanism	Shallow translational failure
17.		Landslide History	Old
18.	Slide morphology	Length(m)	Approx. 13m
19.		Width(m)	Approx. 20m
20.		Height(m)	Approx. 1.2m
21.		Run out Distance	Approx. 10m
22.	Geological details	Geology/ Lithology	Granite Gneiss
23.		Rock Characteristic	Massive
24.		Structural details	--
25.		Weathering	High
26.		Overburden thickness	0.5-5m
27.		Overburden type	Rock and in-situ soil
28.		Geomorphology Process	Others
29.		Geomorphology forms	Lowly dissected slope
30.		Land use/Land cover	Moderate vegetation/Plantation
31.		Hydrological condition	Damp
32.	Landslide causes	Triggering factor and causes	Rainfall and weathering
33.		Rainfall	--
34.		Landslide process	--
35.		Geological causes	--
36.	Damage and risk due to landslide	Life/Livestock/Property	No records
37.		Risk	Moderate
38.		Susceptibility assessment of slope	Meta-stable
39.		Qualitative Risk Assessment	Moderate

40.	Remedial measures(brief)	Lined drainage required.
41.	Remarks/ Abstract	In present condition landslide is suspended and un stable and risk factor is High. Electric pole nearby, Risk to communication line, man and material.
Slide photographs		

Sl. No	Data Set	Geoparameters	Details
1.	Location details	Slide No./ID	KAR/CHK/2017/20
2.		State	Karnataka
3.		District	Chikmangalur
4.		Slide Name	Chandugodu-Kanegadde village area
5.		Toposheet No	48O/12
6.		NH/SH/locality	Chandugodu-Kanegadde road section
7.		Latitude	13°11'38.71"N
8.		Longitude	75°34'7.14"E
9.		Date of occurrence	No records
10.	Slide type	Type of Material	Weathered rock and in-situ soil
11.		Type of movement	Slide
12.		Failure Plane	Shallow (<=5m)
13.		Activity	Active
14.		Distribution	Progressive, enlarging and widening
15.		Style	Single slide
16.		Failure mechanism	Shallow translational failure
17.		Landslide History	Old
18.	Slide morphology	Length(m)	Approx. 17m
19.		Width(m)	Approx. 25m
20.		Height(m)	Approx. 1.7m
21.		Run out Distance	Approx. 15m
22.	Geological details	Geology/ Lithology	Granite Gneiss
23.		Rock Characteristic	Weathered
24.		Structural details	--
25.		Weathering	High
26.		Overburden thickness	0.5-5m
27.		Overburden type	In-situ soil
28.		Geomorphology Process	Others
29.		Geomorphology forms	Lowly dissected slope
30.		Land use/Land cover	Moderate vegetation/Sparse vegetation
31.		Hydrological condition	Damp
32.	Landslide causes	Triggering factor and causes	Rainfall and weathering
33.		Rainfall	--
34.		Landslide process	--
35.		Geological causes	--
36.	Damage and risk due to landslide	Life/Livestock/Property	No records
37.		Risk	Moderate
38.		Susceptibility assessment of slope	Meta-stable
39.		Qualitative Risk Assessment	Moderate
40.	Remedial measures		Lined drainage required.

41.	Remarks/ Abstract	In present condition landslide is suspended and unstable and risk factor is moderate and the area is metastable, Risk to communication line, man and material. Old slide scars are visible.
Slide photographs		

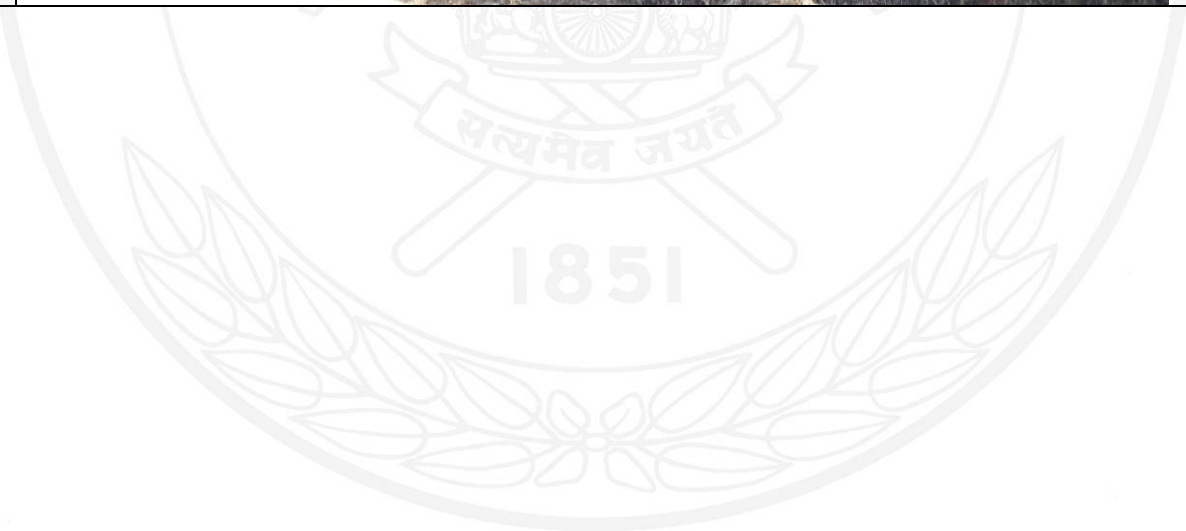
Sl. No	Data Set	Geoparameters	Details
1.	Location details	Slide No./ID	KAR/CHK/2017/21
2.		State	Karnataka
3.		District	Chikmangalur
4.		Slide Name	Chandugodu-Kanegadde Village area
5.		Toposheet No	48O/12
6.		NH/SH/locality	Chandugodu-Kanegadde road section
7.		Latitude	13°08'13.2"N
8.		Longitude	75°30'30.75"E
9.		Date of occurrence	No records
10.	Slide type	Type of Material	Weathered rock and in-situ soil
11.		Type of movement	Slide
12.		Failure Plane	Shallow (<=5m)
13.		Activity	Active
14.		Distribution	Progressive, enlarging and widening
15.		Style	Single slide
16.		Failure mechanism	Shallow translational failure
17.		Landslide History	Old
18.	Slide morphology	Length(m)	Approx. 18m
19.		Width(m)	Approx. 50m
20.		Height(m)	Approx. 1.5m, VH:18m
21.		Run out Distance	Approx. 15m
22.	Geological details	Geology/ Lithology	Granite Gneiss
23.		Rock Characteristic	Weathered and in-situ soil
24.		Structural details	--
25.		Weathering	High
26.		Overburden thickness	5-10m
27.		Overburden type	In-situ soil
28.		Geomorphology Process	Others
29.		Geomorphology forms	Lowly dissected slope
30.		Land use/Land cover	Plantation
31.		Hydrological condition	Damp
32.	Landslide causes	Triggering factor and causes	Rainfall and weathering
33.		Rainfall	--
34.		Landslide process	--
35.		Geological causes	--
36.	Damage and risk due to landslide	Life/Livestock/Property	No records
37.		Risk	Moderate
38.		Susceptibility assessment of slope	Meta-stable
39.		Qualitative Risk Assessment	Moderate

40.	Remedial measures(brief)	Lined drainage required.
41.	Remarks/ Abstract	In present condition landslide is suspended and un stable and risk factor is moderate and metastable, Risk to communication line, man and material.
Slide photographs		



Sl. No	Data Set	Geoparameters	Details
1.	Location details	Slide No./ID	KAR/CHK/2017/22
2.		State	Karnataka
3.		District	Chikmangalur
4.		Slide Name	1.8 km from Kotighera
5.		Toposheet No	48O/12
6.		NH/SH/locality	Channahodlu to Kotigehara road
7.		Latitude	13°07'45"N
8.		Longitude	75°30'52.92"E
9.		Date of occurrence	No records
10.	Slide type	Type of Material	in-situ soil
11.		Type of movement	Slide
12.		Failure Plane	Shallow (<=5m)
13.		Activity	Active
14.		Distribution	Progressive, enlarging and widening
15.		Style	Single slide
16.		Failure mechanism	Shallow translational failure
17.		Landslide History	Old
18.	Slide morphology	Length(m)	Approx. 17m
19.		Width(m)	Approx. 45m
20.		Height(m)	Approx. 1.5m, VH:17m
21.		Run out Distance	Approx. 15m
22.	Geological details	Geology/ Lithology	Granite Gneiss
23.		Rock Characteristic	Weathered and in-situ soil
24.		Structural details	--
25.		Weathering	High
26.		Overburden thickness	5-10m
27.		Overburden type	In-situ soil
28.		Geomorphology Process	Others
29.		Geomorphology forms	Lowly dissected slope
30.		Land use/Land cover	Moderate Vegetation
31.		Hydrological condition	Damp
32.	Landslide causes	Triggering factor and causes	Rainfall and weathering
33.		Rainfall	--
34.		Landslide process	--
35.		Geological causes	--
36.	Damage and risk due to landslide	Life/Livestock/Property	No records
37.		Risk	Moderate
38.		Susceptibility assessment of slope	Meta-stable
39.		Qualitative Risk Assessment	Moderate

40.	Remedial measures	Lined drainage required., retaining wall with 25m length and 1.5m height is constructed.
41.	Remarks/ Abstract	In present condition landslide is suspended and un stable and risk factor is moderate and metastable, Risk to communication line, man and material.
Slide photographs		



Sl. No	Data Set	Geoparameters	Details
1.	Location details	Slide No./ID	KAR/CHK/2017/23
2.		State	Karnataka
3.		District	Chikmangalur
4.		Slide Name	Kavikalgundi Village area
5.		Toposheet No	48O/11
6.		NH/SH/locality	Kavikalgundi road section
7.		Latitude	13°23'8.62"N
8.		Longitude	75°43'29.63"E
9.		Date of occurrence	No records
10	Slide type	Type of Material	Weathered rock and in-situ soil
11		Type of movement	Slide
12		Failure Plane	Shallow (<=5m)
13		Activity	Active
14		Distribution	Progressive, enlarging and widening
15		Style	Single slide with multiple failure/ 3 debris slump
16		Failure mechanism	Shallow translational failure
17		Landslide History	Old
18	Slide morphology	Length(m)	Approx. 17m
19		Width(m)	Approx. 45m
20		Height(m)	Approx. 1.5m, VH:15m
21		Run out Distance	Approx. 15m
22	Geological details	Geology/ Lithology	Ferruginous Phyllite
23		Rock Characteristic	Weathered
24		Structural details	---
25		Weathering	High
26		Overburden thickness	0.5-5m
27		Overburden type	Weathered rock
28		Geomorphology Process	Others
29		Geomorphology forms	Lowly dissected slope
30		Land use/Land cover	Moderate Vegetation
31		Hydrological condition	damp
32	Landslide causes	Triggering factor and causes	Rainfall and weathering
33		Rainfall	--
34		Landslide process	--
35		Geological causes	--
36	Damage and risk due to landslide	Life/Livestock/Property	No records
37		Risk	Moderate

38		Susceptibility assessment of slope	Unstable
39		Qualitative Risk Assessment	High
40	Remedial measures(brief)		Lined drainage required.
41.	Remarks/ Abstract		In present condition landslide is suspended and unstable and risk factor is moderate and metastable, Risk to communication line, man and material.
Slide photographs			

Sl. No	Data Set	Geoparameters	Details
1.	Location details	Slide No./ID	KAR/CHK/2017/24
2.		State	Karnataka
3.		District	Chikmangalur
4.		Slide Name	Kavikalgundi- Attigundi village area
5.		Toposheet No	48O/11
6.		NH/SH/locality	Kavikalgundi- Attigundi- Kemmannugundi road section
7.		Latitude	13°26'7.65"N
8.		Longitude	75°44'34.1"E
9.		Date of occurrence	No records
10.	Slide type	Type of Material	Weathered rock and in-situ soil
11.		Type of movement	Slide
12.		Failure Plane	Shallow (<=5m)
13.		Activity	Active
14.		Distribution	Progressive, enlarging and widening
15.		Style	Single slide with multiple failure/ 3 debris slump
16.		Failure mechanism	Shallow translational failure
17.	Slide morphology	Landslide History	Old
18.		Length(m)	Approx. 17m
19.		Width(m)	Approx. 35m
20.		Height(m)	Approx. 1.5m, VH:15m
21.		Run out Distance	Approx. 15m
22.	Geological details	Geology/ Lithology	Banded Magnetite Quartzite
23.		Rock Characteristic	Weathered
24.		Structural details	--
25.		Weathering	High
26.		Overburden thickness	5-10m
27.		Overburden type	In-situ soil
28.		Geomorphology Process	Others
29.		Geomorphology forms	Lowly dissected slope
30.		Land use/Land cover	Plantation
31.		Hydrological condition	damp
32.	Landslide causes	Triggering factor and causes	Rainfall and weathering
33.		Rainfall	--
34.		Landslide process	--
35.		Geological causes	--
36.	Damage and risk due to landslide	Life/Livestock/Property	No records
37.		Risk	Moderate

38.		Susceptibility assessment of slope	Unstable
39.		Qualitative Risk Assessment	High
40.		Remedial measures(brief)	Lined drainage required.
41.		Remarks/ Abstract	In present condition landslide is suspended and unstable and risk factor is moderate and metastable, Risk to communication line, man and material. Vertical cut slope failure.
Slide photographs			

Sl. No	Data Set	Geoparameters	Details
1.	Location details	Slide No./ID	KAR/CHK/2017/25
2.		State	Karnataka
3.		District	Chikmangalur
4.		Slide Name	Kavikalgundi- Attigundi village area
5.		Toposheet No	48O/11
6.		NH/SH/locality	Kavikalgundi- Attigundi- Kemmannugundi road section
7.		Latitude	13°29'8.63"N
8.		Longitude	75°44'29.62"E
9.		Date of occurrence	No records
10.	Slide type	Type of Material	Weathered rock and in-situ soil
11.		Type of movement	Slide
12.		Failure Plane	Shallow (<2m)
13.		Activity	active
14.		Distribution	Progressive, enlarging and widening
15.		Style	Single slide with multiple failure/ 3 debris slump
16.		Failure mechanism	Shallow translational failure
17.		Landslide History	Old
18.	Slide morphology	Length(m)	Approx. 19m
19.		Width(m)	Approx. 22m
20.		Height(m)	Approx. 1.2m, VH:12m
21.		Run out Distance	Approx. 17m
22.	Geological details	Geology/ Lithology	Ferruginous Phyllite
23.		Rock Characteristic	Weathered
24.		Structural details	--
25.		Weathering	High
26.		Overburden thickness	0.5-5m
27.		Overburden type	Weathered rock and in-situ soil
28.		Geomorphology Process	Others
29.		Geomorphology forms	Lowly dissected slope
30.		Land use/Land cover	Plantation
31.		Hydrological condition	damp
32.	Landslide causes	Triggering factor and causes	Rainfall and weathering
33.		Rainfall	--
34.		Landslide process	--
35.		Geological causes	--
36.	Damage and risk due to landslide	Life/Livestock/Property	No records
37.		Risk	Moderate
38.		Susceptibility assessment of slope	Unstable

39.		Qualitative Risk Assessment	High
40.	Remedial measures		Lined drainage required.
41.	Remarks/ Abstract		In present condition landslide is suspended and un stable and risk factor is moderate and metastable, Risk to communication line, man and material. Vertical cut slope failure.
Slide photographs			

Sl. No	Data Set	Geoparameters	Details
1.	Location details	Slide No./ID	KAR/CHK/2017/26
2.		State	Karnataka
3.		District	Chikmangalur
4.		Slide Name	Kavikalgundi village area
5.		Toposheet No	48O/11
6.		NH/SH/locality	Kavikalgundi road section
7.		Latitude	13°24'4.48"N
8.		Longitude	75°44'2.47"E
9.		Date of occurrence	No records
10.	Slide type	Type of Material	Weathered rock and in-situ soil
11.		Type of movement	Slide
12.		Failure Plane	Shallow (<=5m)
13.		Activity	Active
14.		Distribution	Progressive, enlarging and widening
15.		Style	Single slide with multiple failure/ 3 debris slump
16.		Failure mechanism	Shallow translational failure
17.		Landslide History	Old
18.	Slide morphology	Length(m)	Approx. 19m
19.		Width(m)	Approx. 22m
20.		Height(m)	Approx. 1.2m, VH:12m
21.		Run out Distance	Approx. 17m
22.	Geological details	Geology/ Lithology	Ferruginous Phyllite
23.		Rock Characteristic	Weatherd
24.		Structural details	--
25.		Weathering	
26.		Overburden thickness	<0.5m
27.		Overburden type	Weathered rock and in-situ soil
28.		Geomorphology Process	Others
29.		Geomorphology forms	Lowly dissected slope
30.		Land use/Land cover	Plantation
31.		Hydrological condition	damp
32.	Landslide causes	Triggering factor and causes	Rainfall and weathering
33.		Rainfall	--
34.		Landslide process	--
35.		Geological causes	--
36.	Damage and risk due to landslide	Life/Livestock/Property	No records
37.		Risk	Moderate
38.		Susceptibility assessment of slope	Unstable
39.		Qualitative Risk Assessment	High

40.	Remedial measures	Lined drainage required.
41.	Remarks/ Abstract	In present condition landslide is suspended and un stable and risk factor is moderate and metastable, Risk to communication line, man and material. Vertical cut slope failure.
Slide photographs		

Sl. No	Data Set	Geoparameters	Details
1.	Location details	Slide No./ID	KAR/CHK/2017/27
2.		State	Karnataka
3.		District	Chikmangalur
4.		Slide Name	Kavikalgundi Village area
5.		Toposheet No	48O/11
6.		NH/SH/locality	Kavikalgundi road section
7.		Latitude	13°24'21.48"N
8.		Longitude	75°44'38.22"E
9.		Date of occurrence	Shallow (<=5m)
10.	Slide type	Type of Material	Weathered rock and in-situ soil
11.		Type of movement	Slide
12.		Failure Plane	Shallow translational failure
13.		Activity	active
14.		Distribution	Progressive, enlarging and widening
15.		Style	Single
16.		Failure mechanism	Shallow translational planar failure
17.		Landslide History	Old
18.	Slide morphology	Length(m)	Approx. 19m
19.		Width(m)	Approx. 22m
20.		Height(m)	Approx. 1.2m, VH:12m
21.		Run out Distance	Approx. 17m
22.	Geological details	Geology/ Lithology	Banded magnetite Quartzite
23.		Rock Characteristic	Weathered
24.		Structural details	Jointed
25.		Weathering	Moderate to High
26.		Overburden thickness	<0.5m
27.		Overburden type	
28.		Geomorphology Process	Others
29.		Geomorphology forms	Lowly dissected slope
30.		Land use/Land cover	Sparse vegetation
31.		Hydrological condition	Damp
32.	Landslide causes	Triggering factor and causes	Extensive cut slope
33.		Rainfall	--
34.		Landslide process	--
35.		Geological causes	Planar failure along joints
36.	Damage and risk due to landslide	Life/Livestock/Property	No records
37.		Risk	High
38.		Susceptibility assessment of slope	Meta-stable
39.		Qualitative Risk Assessment	High

40.	Remedial measures	Remedial measures(brief)	Lined drainage and retaining wall 1.5m , rock bolting required.
41.		Remarks/ Abstract	In present condition landslide is active and un stable and risk factor is high and metastable, Risk to communication line, man and material. Vertical cut slope failure dipping towards road.
Slide photographs			

Sl. No	Data Set	Geoparameters	Details
1.	Location details	Slide No./ID	KAR/CHK/2017/28
2.		State	Karnataka
3.		District	Chikmangalur
4.		Slide Name	Muthodi village
5.		Toposheet No	48O/11
6.		NH/SH/locality	Muthodi road section
7.		Latitude	13°23'37.75"N
8.		Longitude	75°38'42.56"E
9.		Date of occurrence	No records
10.	Slide type	Type of Material	Weathered rock and in-situ soil
11.		Type of movement	Slide
12.		Failure Plane	Shallow (<=5m)
13.		Activity	Suspended
14.		Distribution	Retrogressive, enlarging and widening, upslope
15.		Style	Single
16.		Failure mechanism	Shallow translational planar failure
17.	Slide morphology	Landslide History	New, reactivated
18.		Length(m)	Approx. 14m
19.		Width(m)	Approx. 65m
20.		Height(m)	Approx. 1.2m, VH:15m
21.		Run out Distance	Approx. 12m
22.	Geological details	Geology/ Lithology	Quartzite
23.		Rock Characteristic	Jointed
24.		Structural details	Fractured and jointed
25.		Weathering	Moderate
26.		Overburden thickness	0.5-5m
27.		Overburden type	Weathered rock and in-situ soil
28.		Geomorphology Process	Others
29.		Geomorphology forms	Lowly dissected slope
30.		Land use/Land cover	Sparse vegetation
31.		Hydrological condition	Damp
32.	Landslide causes	Triggering factor and causes	Rainfall and cut slope failure
33.		Rainfall	--
34.		Landslide process	--
35.		Geological causes	Planar failure along joints
36.	Damage and risk due to landslide	Life/Livestock/Property	No records
37.		Risk	High
38.		Susceptibility assessment of slope	Meta-stable
39.		Qualitative Risk Assessment	High

40.	Remedial measures	Removal of loose material, Lined drainage and slope gradation required.
41.	Remarks/ Abstract	In present condition landslide is active and un stable and risk factor is high and metastable, Risk to communication line, man and material. Old slide plantation on slope.
Slide photographs		

Sl. No	Data Set	Geoparameters	Details
1.	Location details	Slide No./ID	KAR/CHK/2017/29
2.		State	Karnataka
3.		District	Chikmangalur
4.		Slide Name	Muthodi village area
5.		Toposheet No	48O/11
6.		NH/SH/locality	Muthodi road section
7.		Latitude	13°23'41.95"N
8.		Longitude	75°38'42.28"E
9.		Date of occurrence	No records
10.	Slide type	Type of Material	Weathered rock
11.		Type of movement	Slide
12.		Failure Plane	Shallow (<=5m)
13.		Activity	Suspended
14.		Distribution	Progressive, enlarging and widening,
15.		Style	Single
16.		Failure mechanism	Shallow translational planar failure
17.		Landslide History	Old, reactivated
18.	Slide morphology	Length(m)	Approx. 18m
19.		Width(m)	Approx. 45m
20.		Height(m)	Approx. 1 m
21.		Run out Distance	Approx. 15m
22.	Geological details	Geology/ Lithology	Amphibolite
23.		Rock Characteristic	Weathered
24.		Structural details	--
25.		Weathering	High
26.		Overburden thickness	0.5-5m
27.		Overburden type	Weathered rock
28.		Geomorphology Process	Others
29.		Geomorphology forms	Lowly dissected slope
30.		Land use/Land cover	Sparse vegetation
31.		Hydrological condition	Damp
32.	Landslide causes	Triggering factor and causes	Rainfall and cut slope failure
33.		Rainfall	--
34.		Landslide process	--
35.		Geological causes	Planar failure along joints
36.	Damage and risk due to landslide	Life/Livestock/Property	No records
37.		Risk	High
38.		Susceptibility assessment of slope	Meta-stable
39.		Qualitative Risk Assessment	High

40.	Remedial measures	Removal of loose material, Lined drainage and slope gradation required.
41.	Remarks/ Abstract	In present condition landslide is active and un stable and risk factor is high and metastable, Risk to communication line, man and material. Old scars present
Slide photographs		

Sl. No	Data Set	Geoparameters	Details
1.	Location details	Slide No./ID	KAR/CHK/2017/30
2.		State	Karnataka
3.		District	Chikmangalur
4.		Slide Name	Muthodi village area
5.		Toposheet No	48O/11
6.		NH/SH/locality	Muthodi road section
7.		Latitude	13°23'53.00"N
8.		Longitude	75°38'41.61"E
9.		Date of occurrence	No records
10.	Slide type	Type of Material	Rock massive
11.		Type of movement	Slide
12.		Failure Plane	Shallow (<=5m)
13.		Activity	Suspended
14.		Distribution	progressive, enlarging and widening,
15.		Style	Single
16.		Failure mechanism	Shallow translational planar failure
17.		Landslide History	Old
18.	Slide morphology	Length(m)	Approx.17m
19.		Width(m)	Approx.25m
20.		Height(m)	1.3m, VH:Approx. 12m
21.		Run out Distance	Approx.15m
22.	Geological details	Geology/ Lithology	Carbonaceous Phyllite
23.		Rock Characteristic	Weathered
24.		Structural details	--
25.		Weathering	High
26.		Overburden thickness	<0.5m
27.		Overburden type	Rock and weathered rock
28.		Geomorphology Process	Others
29.		Geomorphology forms	Lowly dissected slope
30.		Land use/Land cover	Moderate or Dense vegetation.
31.		Hydrological condition	Damp
32.	Landslide causes	Triggering factor and causes	Rainfall and cut slope failure
33.		Rainfall	--
34.		Landslide process	--
35.		Geological causes	Planar failure along joints
36.	Damage and risk due to landslide	Life/Livestock/Property	No records
37.		Risk	High
38.		Susceptibility assessment of slope	Meta-stable
39.		Qualitative Risk Assessment	High

40.	Remedial measures	Removal of loose material, Lined drainage and slope gradation required.
41.	Remarks/ Abstract	In present condition landslide is active and un stable and risk factor is high and metastable, Risk to communication line, man and material. Old scars present
Slide photographs		

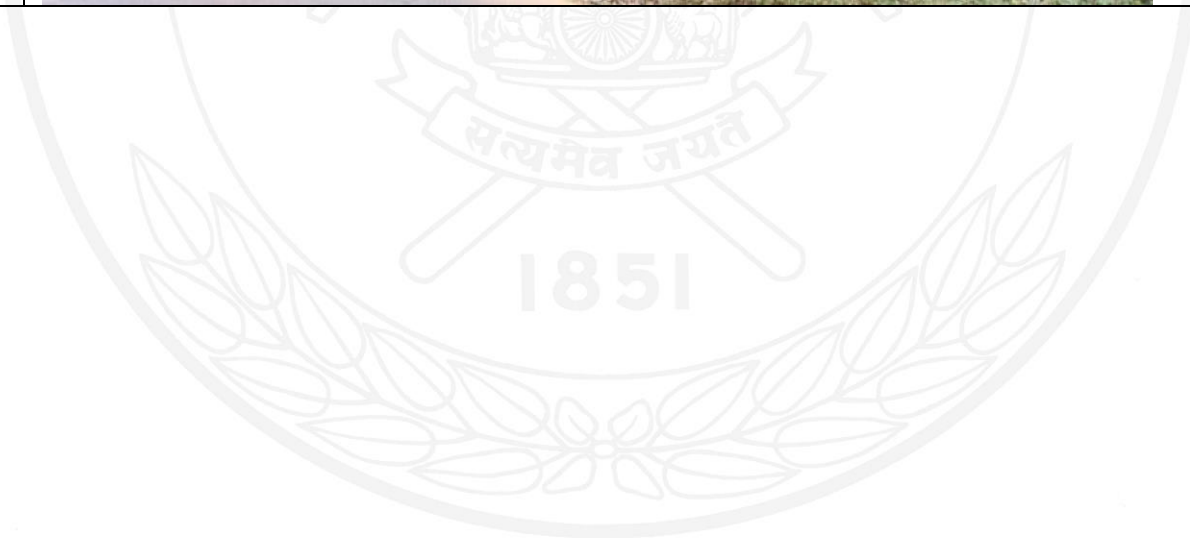


Sl. No	Data Set	Geoparameters	Details
1.	Location details	Slide No./ID	KAR/CHK/2017/31
2.		State	Karnataka
3.		District	Chikmangalur
4.		Slide Name	Muthodi village area
5.		Toposheet No	48O/11
6.		NH/SH/locality	Muthodi road section
7.		Latitude	13°23'56.04"N
8.		Longitude	75°38'39.00"E
9.		Date of occurrence	No records
10.	Slide type	Type of Material	Rock massive
11.		Type of movement	Slide
12.		Failure Plane	Shallow (<=5m)
13.		Activity	Suspended
14.		Distribution	confined, enlarging and widening,
15.		Style	Single
16.		Failure mechanism	Shallow translational planar failure
17.		Landslide History	Old
18.	Slide morphology	Length(m)	Approx.15 m
19.		Width(m)	Approx.25m
20.		Height(m)	VH:Approx. 20m
21.		Run out Distance	---
22.	Geological details	Geology/ Lithology	Ferruginous Phyllite
23.		Rock Characteristic	Jointed, Massive
24.		Structural details	2 sets of joints, N-S/80W dipping towards valley.
25.		Weathering	Moderate
26.		Overburden thickness	<0.5m
27.		Overburden type	Rock
28.		Geomorphology Process	Others
29.		Geomorphology forms	Lowly dissected slope
30.		Land use/Land cover	Moderate or Dense vegetation.
31.		Hydrological condition	Damp
32.	Landslide causes	Triggering factor and causes	Rainfall and cut slope failure
33.		Rainfall	--
34.		Landslide process	--
35.		Geological causes	Planar failure along joints
36.	Damage and risk due to landslide	Life/Livestock/Property	No records
37.		Risk	High
38.		Susceptibility assessment of slope	Meta-stable

39.		Qualitative Risk Assessment	High
40.	Remedial measures(brief)		Removal of loose material, Lined drainage and slope gradation required.
41.	Remarks/ Abstract		In present condition landslide is active and unstable and risk factor is high and metastable, Risk to communication line, man and material. Old scars present
Slide photographs			

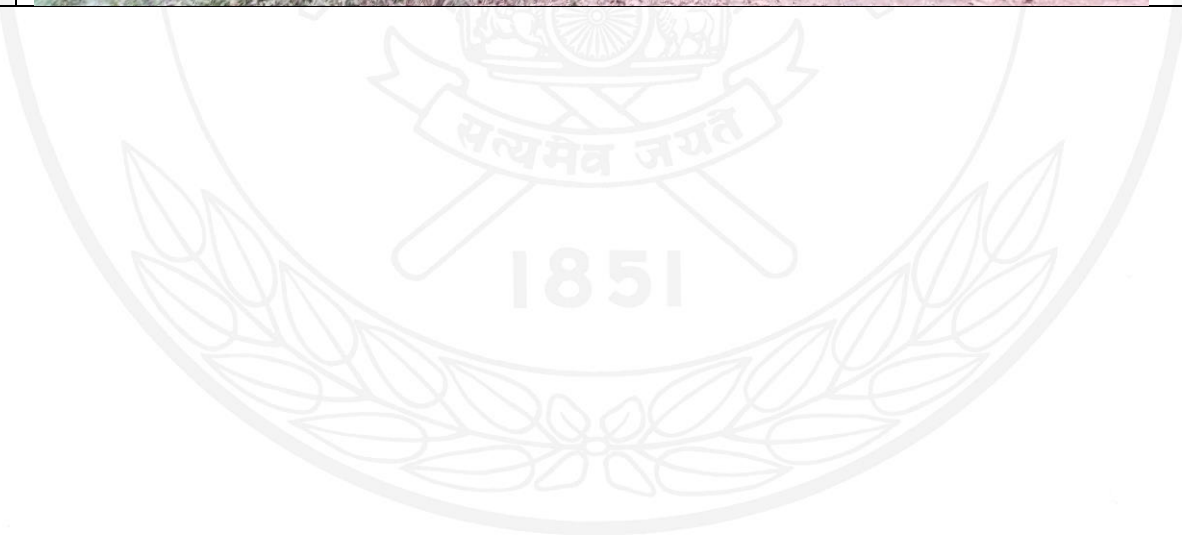
Sl. No	Data Set	Geoparameters	Details
1.	Location details	Slide No./ID	KAR/CHK/2017/32
2.		State	Karnataka
3.		District	Chikmangalur
4.		Slide Name	Muthodi village area
5.		Toposheet No	48O/11
6.		NH/SH/locality	Muthodi road section
7.		Latitude	13°24'26.72"N
8.		Longitude	75°38'47.42"E
9.		Date of occurrence	No records
10.	Slide type	Type of Material	Rock
11.		Type of movement	Slide
12.		Failure Plane	Shallow ($\leq 5\text{m}$)
13.		Activity	Suspended
14.		Distribution	confined, enlarging and widening,
15.		Style	Single
16.		Failure mechanism	Shallow translational planar failure
17.		Landslide History	old
18.	Slide morphology	Length(m)	Approx.22m
19.		Width(m)	Approx.25m
20.		Height(m)	VH:Approx. 20m
21.		Run out Distance	---
22.	Geological details	Geology/ Lithology	Ferruginous Phyllite
23.		Rock Characteristic	Massive
24.		Structural details	dipping towards valley.
25.		Weathering	Moderate
26.		Overburden thickness	<0.5m
27.		Overburden type	Rock
28.		Geomorphology Process	Others
29.		Geomorphology forms	Lowly dissected slope
30.		Land use/Land cover	Moderate or Dense vegetation.
31.		Hydrological condition	Damp
32.	Landslide causes	Triggering factor and causes	Rainfall and cut slope failure
33.		Rainfall	--
34.		Landslide process	--
35.		Geological causes	--
36.	Damage and risk due to landslide	Life/Livestock/Property	No records
37.		Risk	High
38.		Susceptibility assessment of slope	Meta-stable
39.		Qualitative Risk Assessment	Moderate

40.	Remedial measures	Removal of loose material, Lined drainage and slope gradation required.
41.	Remarks/ Abstract	In present condition landslide is active and unstable and risk factor is high and metastable, Risk to communication line, man and material. Old scars present
Slide photographs		



Sl. No	Data Set	Geoparameters	Details
1.	Location details	Slide No./ID	KAR/CHK/2017/33
2.		State	Karnataka
3.		District	Chikmangalur
4.		Slide Name	Muthodi village area
5.		Toposheet No	48O/11
6.		NH/SH/locality	Muthodi road section
7.		Latitude	13°24'33.06"N
8.		Longitude	75°37'5.60"E
9.		Date of occurrence	No records
10.	Slide type	Type of Material	Weathered Rock
11.		Type of movement	Slide
12.		Failure Plane	Shallow (<=5m)
13.		Activity	Suspended
14.		Distribution	Confined, enlarging and widening, retrogressive
15.		Style	Single with multiple failure
16.		Failure mechanism	Shallow translational failure
17.		Landslide History	Old, reactivated
18.	Slide morphology	Length(m)	Approx. 11m
19.		Width(m)	Approx.20m
20.		Height(m)	Approx. 1m
21.		Run out Distance	Approx.9m
22.	Geological details	Geology/ Lithology	Granite gneiss
23.		Rock Characteristic	Weathered rock
24.		Structural details	dipping towards valley.
25.		Weathering	High
26.		Overburden thickness	0.5-5m
27.		Overburden type	Weathered Rock and In-situ soil
28.		Geomorphology Process	
29.		Geomorphology forms	Lowly dissected slope/PPC
30.		Land use/Land cover	Moderate or Dense vegetation.
31.		Hydrological condition	Damp
32.	Landslide causes	Triggering factor and causes	Rainfall and cut slope failure
33.		Rainfall	--
34.		Landslide process	--
35.		Geological causes	--
36.	Damage and risk due to	Life/Livestock/Property	No records
37.		Risk	High
38.		Susceptibility assessment of slope	Meta-stable
39.		Qualitative Risk Assessment	Moderate

40.	Remedial measures	Removal of loose material, Lined drainage and slope gradation required.
41.	Remarks/ Abstract	In present condition landslide is active and unstable and risk factor is high and meta-stable, Risk to communication line, man and material. Old scars present
Slide photographs		



Sl. No	Data Set	Geoparameters	Details
1.	Location details	Slide No./ID	KAR/CHK/2017/34
2.		State	Karnataka
3.		District	Chikmangalur
4.		Slide Name	Muthodi village area
5.		Toposheet No	48O/11
6.		NH/SH/locality	Muthodi road section
7.		Latitude	13°24'12.34"N
8.		Longitude	75°36'33.72"E
9.		Date of occurrence	No records
10.	Slide type	Type of Material	Weathered Rock
11.		Type of movement	Rock cum debris slide
12.		Failure Plane	Shallow (<=5m)
13.		Activity	Suspended
14.		Distribution	confined, enlarging and widening, retrogressive
15.		Style	Single with multiple failure
16.		Failure mechanism	Shallow translational failure
17.		Landslide History	Old
18.	Slide morphology	Length(m)	Approx.18m
19.		Width(m)	Approx 65m
20.		Height(m)	Approx 2m
21.		Run out Distance	Approx 15m
22.	Geologic details	Geology/ Lithology	Granite gneiss
23.		Rock Characteristic	Weathered
24.		Structural details	Dipping towards valley.
25.		Weathering	Moderate
26.		Overburden thickness	0.5-5m
27.		Overburden type	In-situ soil
28.		Geomorphology Process	Others
29.		Geomorphology forms	Lowly dissected slope
30.		Land use/Land cover	Sparse vegetation.
31.		Hydrological condition	Damp
32.	Landslide causes	Triggering factor and causes	Rainfall and cut slope failure
33.		Rainfall	--
34.		Landslide process	--
35.		Geological causes	--
36.	Damage and risk due to landslide	Life/Livestock/Property	No records
37.		Risk	High
38.		Susceptibility assessment of slope	Meta-stable
39.		Qualitative Risk Assessment	Moderate

40.	Remedial measures	Removal of loose material, Lined drainage and slope gradation required.
41.	Remarks/ Abstract	In present condition landslide is active and unstable and risk factor is high and meta-stable, Risk to communication line, man and material. Old scars present
Slide photographs		

Sl. No	Data Set	Geoparameters	Details
1.	Location details	Slide No./ID	KAR/CHK/2017/35
2.		State	Karnataka
3.		District	Chikmangalur
4.		Slide Name	Kotigehara
5.		Toposheet No	48O/12
6.		NH/SH/locality	Kotigehara road section
7.		Latitude	13°7'4.52"N
8.		Longitude	75°30'47.3"E
9.		Date of occurrence	No records
10.	Slide type	Type of Material	Weathered Rock and in-situ soil
11.		Type of movement	Rock cum debris slide
12.		Failure Plane	Shallow (<=5m)
13.		Activity	Suspended
14.		Distribution	enlarging and widening, progressive
15.		Style	Single
16.		Failure mechanism	Shallow translational failure
17.		Landslide History	Old
18.	Slide morphology	Length(m)	Approx.19m
19.		Width(m)	Approx 55m
20.		Height(m)	Approx 2m, VH:15m
21.		Run out Distance	Approx 15m
22.	Geological details	Geology/ Lithology	Granite gneiss
23.		Rock Characteristic	Weathered
24.		Structural details	Dipping towards valley.
25.		Weathering	Moderate
26.		Overburden thickness	0.5-5m
27.		Overburden type	Weathered rock
28.		Geomorphology Process	Others
29.		Geomorphology forms	Lowly dissected slope/Peidmont slope
30.		Land use/Land cover	Plantation.
31.		Hydrological condition	Damp
32.	Landslide causes	Triggering factor and causes	Rainfall and cut slope failure
33.		Rainfall	--
34.		Landslide process	--
35.		Geological causes	--
36.	Damage and risk due to landslide	Life/Livestock/Property	No records
37.		Risk	High
38.		Susceptibility assessment of slope	Meta-stable

39.		Qualitative Risk Assessment	High
40.	Remedial measures		Removal of loose material, Lined drainage and slope gradation required.
41.	Remarks/ Abstract		In present condition landslide is active and unstable and risk factor is high and meta-stable, Risk to communication line, man and material. Old scars present
Slide photographs 			

Sl. No	Data Set	Geoparameters	Details
1.	Location details	Slide No./ID	KAR/CHK/2017/36
2.		State	Karnataka
3.		District	Chikmangalur
4.		Slide Name	Kotighera
5.		Toposheet No	48O/12
6.		NH/SH/locality	Kotighera road section
7.		Latitude	13°7'12.84"N
8.		Longitude	75°30'42.32"E
9.		Date of occurrence	No records
10.	Slide type	Type of Material	Weathered Rock and in-situ soil
11.		Type of movement	Debris slide
12.		Failure Plane	Shallow (<=5m)
13.		Activity	Suspended
14.		Distribution	enlarging and widening, retrogressive
15.		Style	Multiple failure
16.		Failure mechanism	Shallow translational failure
17.	Slide morphology	Landslide History	Old, suspended
18.		Length(m)	Approx. 18m
19.		Width(m)	Approx. 100m
20.		Height(m)	Approx. 2m, VH:22m
21.		Run out Distance	Approx. 15m
22.	Geological details	Geology/ Lithology	Granite gneiss
23.		Rock Characteristic	Weathered
24.		Structural details	---
25.		Weathering	Moderate
26.		Overburden thickness	0.5-5m
27.		Overburden type	In-situ soil
28.		Geomorphology Process	Others
29.		Geomorphology forms	Peidmont slope
30.		Land use/Land cover	Plantation
31.	Landslide causes	Hydrological condition	Dry
32.		Triggering factor and causes	Rainfall
33.		Rainfall	--
34.		Landslide process	--
35.		Geological causes	--
36.	Damage and risk due to landslide	Life/Livestock/Property	No records
37.		Risk	Moderate
38.		Susceptibility assessment of slope	unstable
39.		Qualitative Risk Assessment	High

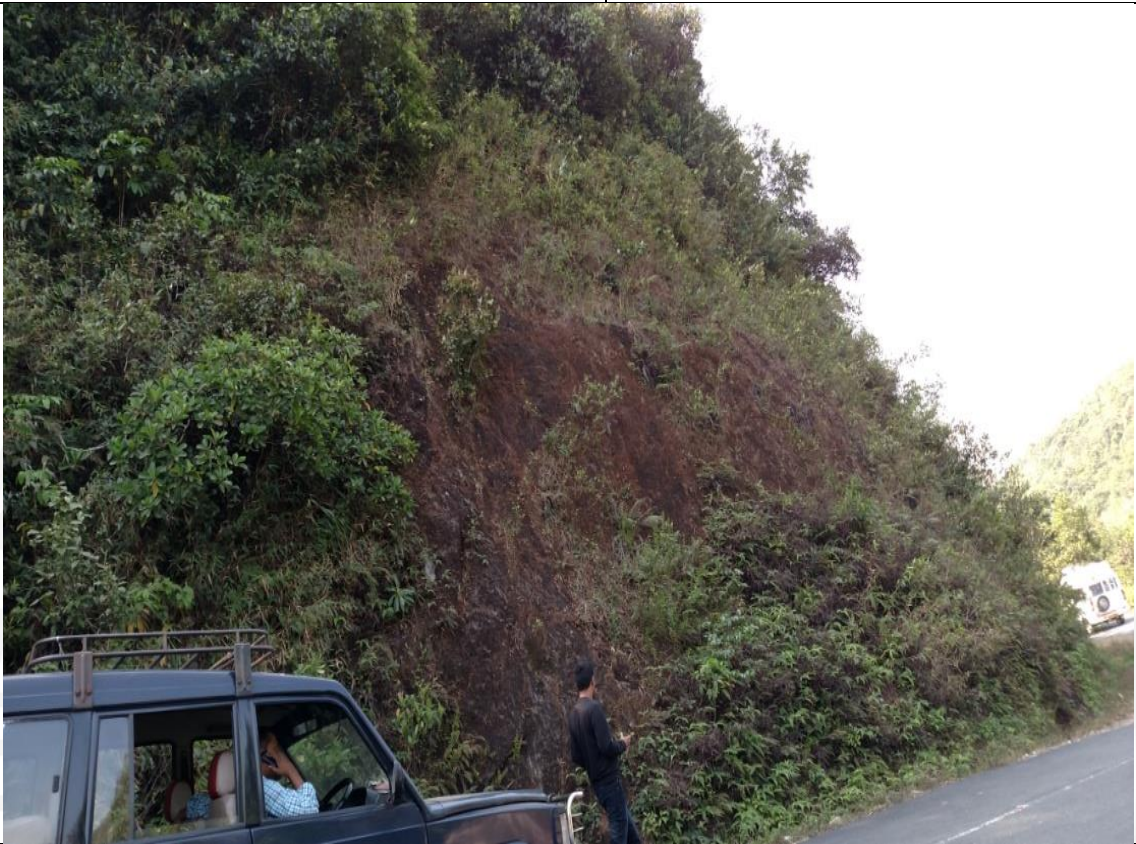
40.	Remedial measures	Lined drainage and retaining wall is required.
41.	Remarks/ Abstract	In present condition landslide is active and unstable and risk factor is high and meta-stable, Risk to communication line, man and material. Old scars present, vegetation on slope
Slide photographs		



Sl. No	Data Set	Geoparameters	Details
1.	Location details	Slide No./ID	KAR/CHK/2017/37
2.		State	Karnataka
3.		District	Chikmangalur
4.		Slide Name	Kotighera village area
5.		Toposheet No	480/12
6.		NH/SH/locality	Kotighera road section
7.		Latitude	13°7'4.56"N
8.		Longitude	75°30'19.05"E
9.		Date of occurrence	No records
10.	Slide type	Type of Material	rock
11.		Type of movement	slide
12.		Failure Plane	Shallow (<=5m)
13.		Activity	Suspended
14.		Distribution	enlarging and widening, retrogressive
15.		Style	single
16.		Failure mechanism	Shallow translational failure
17.		Landslide History	Old, suspended
18.	Slide morphology	Length(m)	Approx. 22m
19.		Width(m)	Approx. 55m
20.		Height(m)	Approx. 1.2m, Approx. VH:13m
21.		Run out Distance	Approx. 17m
22.	Geological details	Geology/ Lithology	Granite gneiss
23.		Rock Characteristic	Massive
24.		Structural details	Jointed rock
25.		Weathering	Moderate
26.		Overburden thickness	0.5-5m
27.		Overburden type	Weathered rock
28.		Geomorphology Process	Others
29.		Geomorphology forms	Moderately dissected slope
30.		Land use/Land cover	Moderate vegetation/Thick vegetation
31.		Hydrological condition	Dry
32.	Landslide causes	Triggering factor and causes	Rainfall
33.		Rainfall	--
34.		Landslide process	--
35.		Geological causes	--
36.	Damage and risk due to landslide	Life/Livestock/Property	No records
37.		Risk	High
38.		Susceptibility assessment of slope	Meta-stable
39.		Qualitative Risk Assessment	High

40.	Remedial measures	Lined drainage required.
41.	Remarks/ Abstract	In present condition landslide is active and unstable and risk factor is high and meta-stable, Risk to communication line, man and material. Old scars present
Slide photographs		

Sl. No	Data Set	Geoparameters	Details
1.	Location details	Slide No./ID	KAR/CHK/2017/38
2.		State	Karnataka
3.		District	Chikmangalur
4.		Slide Name	Kotighera
5.		Toposheet No	48O/12
6.		NH/SH/locality	Kotighera road section
7.		Latitude	13°7'6.97"N
8.		Longitude	75°30'14.29"E
9.		Date of occurrence	No records
10.	Slide type	Type of Material	Rock
11.		Type of movement	Slide
12.		Failure Plane	Shallow ($\leq 5\text{m}$)
13.		Activity	Suspended
14.		Distribution	enlarging and widening, retrogressive
15.		Style	single
16.		Failure mechanism	Shallow translational failure
17.		Landslide History	Old, suspended
18.	Slide morphology	Length(m)	Approx. 22m
19.		Width(m)	Approx. 100m
20.		Height(m)	Approx. 1.2m, Approx. VH:13m
21.		Run out Distance	Approx. 17m
22.	Geological details	Geology/ Lithology	Granite gneiss
23.		Rock Characteristic	Massive
24.		Structural details	---
25.		Weathering	Moderate
26.		Overburden thickness	0.5-5m
27.		Overburden type	Weathered rock
28.		Geomorphology Process	Others
29.		Geomorphology forms	Moderately dissected slope
30.		Land use/Land cover	Barren
31.		Hydrological condition	Dry
32.	Landslide causes	Triggering factor and causes	Rainfall
33.		Rainfall	--
34.		Landslide process	--
35.		Geological causes	--
36.	Damage and risk due to landslide	Life/Livestock/Property	No records
37.		Risk	High
38.		Susceptibility assessment of slope	Meta-stable
39.		Qualitative Risk Assessment	High
40.	Remedial measures		Lined drainage required.

41.	Remarks/ Abstract	In present condition landslide is active and unstable and risk factor is high and meta-stable, Risk to communication line, man and material. Old scars present
Slide photographs		

Sl. No	Data Set	Geoparameters	Details
1.	Location details	Slide No./ID	KAR/CHK/2017/39
2.		State	Karnataka
3.		District	Chikmangalur
4.		Slide Name	Kotighera village area
5.		Toposheet No	48O/12
6.		NH/SH/locality	Kotighera road section
7.		Latitude	13°7'9.83"N
8.		Longitude	75°30'11.38"E
9.		Date of occurrence	No records
10.	Slide type	Type of Material	Rock
11.		Type of movement	Slide
12.		Failure Plane	Shallow (<=5m)
13.		Activity	Suspended
14.		Distribution	enlarging and widening, retrogressive
15.		Style	single
16.		Failure mechanism	Shallow translational failure
17.		Landslide History	Old, Suspended
18.	Slide morphology	Length(m)	Approx. 22m
19.		Width(m)	Approx. 70m
20.		Height(m)	Approx. 1.2m, Approx. VH:13m
21.		Run out Distance	Approx. 18m
22.	Geological details	Geology/ Lithology	Granite gneiss
23.		Rock Characteristic	Massive
24.		Structural details	---
25.		Weathering	Moderate
26.		Overburden thickness	0.5-5m
27.		Overburden type	Weathered rock
28.		Geomorphology Process	Others
29.		Geomorphology forms	Moderately dissected slope
30.		Land use/Land cover	Barren
31.		Hydrological condition	Dry
32.	Landslide causes	Triggering factor and causes	Rainfall
33.		Rainfall	--
34.		Landslide process	--
35.		Geological causes	--
36.	Damage and risk due to landslide	Life/Livestock/Property	No records
37.		Risk	High
38.		Susceptibility assessment of slope	Meta-stable
39.		Qualitative Risk Assessment	High
40.	Remedial measures		Lined drainage required.

41.	Remarks/ Abstract	In present condition landslide is active and unstable and risk factor is high and meta-stable, Risk to communication line, man and material. Old scars present
Slide photographs		

Sl. No	Data Set	Geoparameters	Details
1.	Location details	Slide No./ID	KAR/CHK/2017/40
2.		State	Karnataka
3.		District	Chikmangalur
4.		Slide Name	Kotighera village area.
5.		Toposheet No	48O/12
6.		NH/SH/locality	Kotighera road section
7.		Latitude	13°7'11.99"N
8.		Longitude	75°30'8.43"E
9.		Date of occurrence	No records
10.	Slide type	Type of Material	Rock
11.		Type of movement	Slide
12.		Failure Plane	Shallow (<=5m)
13.		Activity	Suspended
14.		Distribution	enlarging and widening, retrogressive
15.		Style	multiple
16.		Failure mechanism	Shallow translational failure
17.		Landslide History	Old, reactivated
18.	Slide morphology	Length(m)	Approx. 22m
19.		Width(m)	Approx. 30m
20.		Height(m)	Approx. 1.2m, Approx. VH:2m
21.		Run out Distance	Approx. 18m
22.	Geological details	Geology/ Lithology	Granite gneiss
23.		Rock Characteristic	Massive
24.		Structural details	--
25.		Weathering	Moderate
26.		Overburden thickness	0.5-5m
27.		Overburden type	Weathered rock
28.		Geomorphology Process	Others
29.		Geomorphology forms	Moderately dissected slope
30.		Land use/Land cover	Barren
31.		Hydrological condition	Dry
32.	Landslide causes	Triggering factor and causes	Rainfall
33.		Rainfall	--
34.		Landslide process	--
35.		Geological causes	--
36.	Damage and risk due to landslide	Life/Livestock/Property	No records
37.		Risk	High
38.		Susceptibility assessment of slope	Meta-stable
39.		Qualitative Risk Assessment	High

40.	Remedial measures	Lined drainage required.
41.	Remarks/ Abstract	In present condition landslide is active and unstable and risk factor is high and meta-stable, Risk to communication line, man and material. Old scars present
Slide Photographs		

Sl. No	Data Set	Geoparameters	Details
1.	Location details	Slide No./ID	KAR/CHK/2017/41
2.		State	Karnataka
3.		District	Chikmangalur
4.		Slide Name	Aldur Village area
5.		Toposheet No	48O/11
6.		NH/SH/locality	7 km from aldur
7.		Latitude	13°16'13.08"N
8.		Longitude	75°37'13.6"E
9.		Date of occurrence	No records
10.	Slide type	Type of Material	Weathered rock and in-situ soil
11.		Type of movement	Rock cum debris slide
12.		Failure Plane	Shallow (<=5m)
13.		Activity	Suspended
14.		Distribution	Enlarging and widening
15.		Style	Multiple
16.		Failure mechanism	Shallow translational failure
17.		Landslide History	Old
18.	Slide morphology	Length(m)	Approx. 12m
19.		Width(m)	Approx. 40m
20.		Height(m)	Approx. 2m
21.		Run out Distance	Approx. 7m
22.	Geological details	Geology/ Lithology	Granite gneiss
23.		Rock Characteristic	Massive
24.		Structural details	---
25.		Weathering	High
26.		Overburden thickness	0.5-5m
27.		Overburden type	In-situ soil
28.		Geomorphology Process	Others
29.		Geomorphology forms	Lowly dissected slope
30.		Land use/Land cover	Plantation
31.		Hydrological condition	Dry
32.	Landslide causes	Triggering factor and causes	Rainfall
33.		Rainfall	---
34.		Landslide process	---
35.		Geological causes	--
36.	Damage and risk due to landslide	Life/Livestock/Property	No records
37.		Risk	Moderate
38.		Susceptibility assessment of slope	Meta-stable
39.		Qualitative Risk Assessment	High
40.	Remedial measures		Lined drainage required.

41.	Remarks/ Abstract	In present condition landslide is active and unstable and risk factor is high and meta-stable, Risk to communication line (Interuption), man and material.
Slide Photographs		

Sl. No	Data Set	Geoparameters	Details
1.	Location details	Slide No./ID	KAR/CHK/2017/42
2.		State	Karnataka
3.		District	Chikmangalur
4.		Slide Name	Aldur-Balehonnur road
5.		Toposheet No	48O/11
6.		NH/SH/locality	7.4 km from aldur
7.		Latitude	13°16'8.56"N
8.		Longitude	75°37'2.51"E
9.		Date of occurrence	No records
10.	Slide type	Type of Material	Weathered rock and in-situ soil
11.		Type of movement	Debris slide
12.		Failure Plane	Shallow (<=5m)
13.		Activity	Suspended
14.		Distribution	Enlarging and widening
15.		Style	Multiple
16.		Failure mechanism	Shallow translational failure
17.		Landslide History	Old
18.	Slide morphology	Length(m)	Approx. 9m
19.		Width(m)	Approx. 25m
20.		Height(m)	Approx. 1.5m
21.		Run out Distance	Approx. 6.5m
22.	Geological details	Geology/ Lithology	Granite gneiss
23.		Rock Characteristic	Massive
24.		Structural details	--
25.		Weathering	High
26.		Overburden thickness	0.5-5m
27.		Overburden type	In-situ soil
28.		Geomorphology Process	Others
29.		Geomorphology forms	Lowly Dissected slope
30.		Land use/Land cover	Plantation
31.		Hydrological condition	Dry
32.	Landslide causes	Triggering factor and causes	Rainfall
33.		Rainfall	---
34.		Landslide process	---
35.		Geological causes	--
36.	Damage and risk due to landslide	Life/Livestock/Property	No records
37.		Risk	Moderate
38.		Susceptibility assessment of slope	Meta-stable
39.		Qualitative Risk Assessment	High

40.	Remedial measures		Lined drainage required.
41.		Remarks/ Abstract	In present condition landslide is active and unstable and risk factor is high and meta-stable, Risk to communication line (Interuption), man and material.
Slide Photographs			

Sl. No	Data Set	Geoparameters	Details
1.	Location details	Slide No./ID	KAR/CHK/2017/43
2.		State	Karnataka
3.		District	Chikmangalur
4.		Slide Name	Aldur-Balehonnur road
5.		Toposheet No	48O/11
6.		NH/SH/locality	Pura village, near Hunasehalli
7.		Latitude	13°19'58.32"N
8.		Longitude	75°33'42.8"E
9.		Date of occurrence	No records
10.	Slide type	Type of Material	Weathered rock
11.		Type of movement	Debris slide
12.		Failure Plane	Shallow (<=5m)
13.		Activity	Suspended
14.		Distribution	enlarging and widening, confined
15.		Style	multiple
16.		Failure mechanism	Shallow translational failure
17.		Landslide History	New
18.	Slide morphology	Length(m)	Approx. 12m
19.		Width(m)	Approx. 30m
20.		Height(m)	Approx. 3m
21.		Run out Distance	Approx. 10m
22.	Geological details	Geology/ Lithology	Granite gneiss
23.		Rock Characteristic	Weathered
24.		Structural details	--
25.		Weathering	High
26.		Overburden thickness	5-10m
27.		Overburden type	In-situ soil
28.		Geomorphology Process	Others
29.		Geomorphology forms	Lowly Dissected slope
30.		Land use/Land cover	Plantation
31.		Hydrological condition	Dry
32.	Landslide causes	Triggering factor and causes	Rainfall
33.		Rainfall	---
34.		Landslide process	---
35.		Geological causes	--
36.	Damage and risk due to landslide	Life/Livestock/Property	No records
37.		Risk	Moderate
38.		Susceptibility assessment of slope	Meta-stable
39.		Qualitative Risk Assessment	High
40.	Remedial measures		Slope Gradation required. Removal of loose material

41.	Remarks/ Abstract	In present condition landslide is active and unstable and risk factor is high and meta-stable, man and material and settlement nearby.
Slide Photographs		

Sl. No	Data Set	Geoparameters	Details
1.	Location details	Slide No./ID	KAR/CHK/2017/44
2.		State	Karnataka
3.		District	Chikmangalur
4.		Slide Name	Kaimara Village
5.		Toposheet No	48O/11
6.		NH/SH/locality	Near Kaimara
7.		Latitude	13°22'6.11"N
8.		Longitude	75°44'51.9"E
9.		Date of occurrence	No records
10.	Slide type	Type of Material	Weathered rock and in-soil
11.		Type of movement	Debris slide
12.		Failure Plane	Shallow (<=5m)
13.		Activity	Suspended
14.		Distribution	Enlarging and widening, confined
15.		Style	Multiple
16.		Failure mechanism	Shallow translational planar failure
17.		Landslide History	Old
18.	Slide morphology	Length(m)	Approx. 9m
19.		Width(m)	Approx. 65m
20.		Height(m)	Approx. 1m
21.		Run out Distance	Approx. 7m
22.	Geological details	Geology/ Lithology	Quartzite
23.		Rock Characteristic	Highly fractured and jointed
24.		Structural details	J1:N80E/50, J2:N60E/55
25.		Weathering	Moderate
26.		Overburden thickness	0.5-5m
27.		Overburden type	In-situ soil
28.		Geomorphology Process	Others
29.		Geomorphology forms	Lowly Dissected slope
30.		Land use/Land cover	Plantation
31.		Hydrological condition	Dry
32.	Landslide causes	Triggering factor and causes	Rainfall
33.		Rainfall	--
34.		Landslide process	--
35.		Geological causes	--
36.	Damage and risk due to landslide	Life/Livestock/Property	No records
37.		Risk	Moderate
38.		Susceptibility assessment of slope	Meta-stable
39.		Qualitative Risk Assessment	Moderate

40.	Remedial measures	Slope Gradation required. Removal of loose material
41.	Remarks/ Abstract	In present condition landslide is active and unstable and risk factor is moderate and meta-stable.
Slide Photographs		

Sl. No	Data Set	Geoparameters	Details
1.	Location details	Slide No./ID	KAR/CHK/2017/45
2.		State	Karnataka
3.		District	Chikmangalur
4.		Slide Name	Mulliyangiri hill
5.		Toposheet No	48O/11
6.		NH/SH/locality	Mulliyangiri hill road
7.		Latitude	13°22'49.12"N
8.		Longitude	75°44'51.9"E
9.		Date of occurrence	No records
10.	Slide type	Type of Material	Weathered rock and soil
11.		Type of movement	Debris slide
12.		Failure Plane	Shallow (<=5m)
13.		Activity	Suspended
14.		Distribution	Enlarging and widening, confined
15.		Style	Multiple
16.		Failure mechanism	Shallow translational failure
17.		Landslide History	Old
18.	Slide morphology	Length(m)	Approx. 14m
19.		Width(m)	Approx. 25m
20.		Height(m)	Approx. 1.5m, VH:12m
21.		Run out Distance	Approx. 12m
22.	Geological details	Geology/ Lithology	Ferruginous Phyllite
23.		Rock Characteristic	Weathered
24.		Structural details	--
25.		Weathering	High
26.		Overburden thickness	5-10m
27.		Overburden type	In-situ soil
28.		Geomorphology Process	Others
29.		Geomorphology forms	Lowly Dissected slope
30.		Land use/Land cover	Plantation
31.		Hydrological condition	Damp
32.	Landslide causes	Triggering factor and causes	Rainfall and weathering
33.		Rainfall	--
34.		Landslide process	--
35.		Geological causes	--
36.	Damage and risk due to landslide	Life/Livestock/Property	No records
37.		Risk	High
38.		Susceptibility assessment of slope	Unstable
39.		Qualitative Risk Assessment	High
40.	Remedial measures		Slope Gradation required

41.	Remarks/ Abstract	In present condition landslide is suspended and unstable and risk factor is moderate and meta-stable,
Slide Photographs		

Sl. No	Data Set	Geoparameters	Details
1.	Location details	Slide No./ID	KAR/CHK/2017/46
2.		State	Karnataka
3.		District	Chikmangalur
4.		Slide Name	Muliyangiri village
5.		Toposheet No	48O/11
6.		NH/SH/locality	Muliyangiri hill road
7.		Latitude	13°23'46.48"N
8.		Longitude	75°43'56.98"E
9.		Date of occurrence	No records
10.	Slide type	Type of Material	Rock cum debris
11.		Type of movement	slide
12.		Failure Plane	Shallow (<=5m)
13.		Activity	Suspended
14.		Distribution	Confined
15.		Style	Multiple
16.		Failure mechanism	Shallow translational failure
17.		Landslide History	Old
18.	Slide morphology	Length(m)	Approx. 24m
19.		Width(m)	Approx. 30m
20.		Height(m)	Approx. 3.5m
21.		Run out Distance	Approx. 20m
22.	Geological details	Geology/ Lithology	Ferruginous phyllite
23.		Rock Characteristic	Weathered
24.		Structural details	--
25.		Weathering	High
26.		Overburden thickness	<0.5m
27.		Overburden type	Rock and weathered rock
28.		Geomorphology Process	Others
29.		Geomorphology forms	Lowly Dissected slope
30.		Land use/Land cover	Barren/Plantation
31.		Hydrological condition	Dry
32.	Landslide causes	Triggering factor and causes	Rainfall and Weathering
33.		Rainfall	--
34.		Landslide process	--
35.		Geological causes	--
36.	Damage and risk due to landslide	Life/Livestock/Property	No records
37.		Risk	Moderate
38.		Susceptibility assessment of slope	Meta-Stable
39.		Qualitative Risk Assessment	Moderate
40.	Remedial measures		Slope Gradation required

41.	Remarks/ Abstract	In present condition landslide is suspended and unstable and risk factor is moderate and meta-stable.
Slide Photographs		

Sl. No	Data Set	Geoparameters	Details
1.	Location details	Slide No./ID	KAR/CHK/2017/47
2.		State	Karnataka
3.		District	Chikmangalur
4.		Slide Name	Muliyangiri
5.		Toposheet No	48O/11
6.		NH/SH/locality	Muliyangiri hill road
7.		Latitude	13°24'19.93"N
8.		Longitude	75°44'34.47"E
9.		Date of occurrence	No records
10.	Slide type	Type of Material	Rock
11.		Type of movement	Slide
12.		Failure Plane	Shallow (<=5m)
13.		Activity	Suspended
14.		Distribution	Confined
15.		Style	Multiple
16.		Failure mechanism	Shallow translational planar failure
17.		Landslide History	Old
18.	Slide morphology	Length(m)	Approx. 24m
19.		Width(m)	Approx. 30m
20.		Height(m)	Approx. 3.5m, VH:17m
21.		Run out Distance	Approx. 20m
22.	Geological details	Geology/ Lithology	Ferruginous phyllite
23.		Rock Characteristic	Highly jointed and fractured
24.		Structural details	Highly jointed and fractured, J1: EW/50W, J2: NS/85W
25.		Weathering	Moderate
26.		Overburden thickness	<0.5m
27.		Overburden type	Rock and Weathered rock
28.		Geomorphology Process	Others
29.		Geomorphology forms	Moderately Dissected slope
30.		Land use/Land cover	Barren
31.		Hydrological condition	Dry
32.	Landslide causes	Triggering factor and causes	Rainfall and Weathering
33.		Rainfall	--
34.		Landslide process	--
35.		Geological causes	--
36.	Damage and risk due to landslide	Life/Livestock/Property	No records
37.		Risk	Moderate
38.		Susceptibility assessment of slope	Meta-Stable
39.		Qualitative Risk Assessment	Moderate

40.	Remedial measures	Slope Gradation required
41.	Remarks/ Abstract	In present condition landslide is suspended and unstable and risk factor is moderate and meta-stable.
Slide Photographs		



Sl. No	Data Set	Geoparameters	Details
1.	Location details	Slide No./ID	KAR/CHK/2017/48
2.		State	Karnataka
3.		District	Chikmangalur
4.		Slide Name	Mulliyangiri
5.		Toposheet No	48O/11
6.		NH/SH/locality	Mulliyangiri hill road
7.		Latitude	13°24'22.65"N
8.		Longitude	75°44'4.56"E
9.		Date of occurrence	No records
10.	Slide type	Type of Material	Rock
11.		Type of movement	Slide
12.		Failure Plane	Shallow (<=5m)
13.		Activity	Suspended
14.		Distribution	Confined
15.		Style	Multiple
16.		Failure mechanism	Shallow translational planar failure
17.		Landslide History	Old, Reactivated
18.	Slide morphology	Length(m)	Approx. 24m
19.		Width(m)	Approx. 10m
20.		Height(m)	Approx. 3.5m, VH:17m
21.		Run out Distance	Approx. 20m
22.	Geological details	Geology/ Lithology	Ferruginous phyllite
23.		Rock Characteristic	jointed and fractured
24.		Structural details	jointed and fractured
25.		Weathering	Moderate
26.		Overburden thickness	<0.5m
27.		Overburden type	Rock
28.		Geomorphology Process	Others
29.		Geomorphology forms	Moderately Dissected slope
30.		Land use/Land cover	Barren
31.		Hydrological condition	Dry
32.	Landslide causes	Triggering factor and causes	Rainfall and Weathering
33.		Rainfall	--
34.		Landslide process	--
35.		Geological causes	--
36.	Damage and risk due to landslide	Life/Livestock/Property	No records
37.		Risk	Moderate
38.		Susceptibility assessment of slope	Meta-Stable
39.		Qualitative Risk Assessment	Moderate
40.	Remedial measures		Slope Gradation required

41.	Remarks/ Abstract	In present condition landslide is suspended and unstable and risk factor is moderate and meta-stable.
Slide Photographs		

Sl. No	Data Set	Geoparameters	Details
1.	Location details	Slide No./ID	KAR/CHK/2017/49
2.		State	Karnataka
3.		District	Chikmangalur
4.		Slide Name	Muliyangiri
5.		Toposheet No	48O/11
6.		NH/SH/locality	Muliyangiri hill road
7.		Latitude	13°24'52.55"N
8.		Longitude	75°43'29.03"E
9.		Date of occurrence	No records
10.	Slide type	Type of Material	Rock
11.		Type of movement	Slide
12.		Failure Plane	Shallow (<=5m)
13.		Activity	Suspended
14.		Distribution	Confined
15.		Style	Multiple
16.		Failure mechanism	Shallow translational planar failure
17.		Landslide History	Old
18.	Slide morphology	Length(m)	Approx. 19m
19.		Width(m)	Approx. 25m
20.		Height(m)	Approx. 1.5m, VH:17m
21.		Run out Distance	Approx. 17m
22.	Geological details	Geology/ Lithology	Ferruginous phyllite and Banded magnetite quartzite
23.		Rock Characteristic	jointed and fractured
24.		Structural details	Highly jointed and fractured
25.		Weathering	High
26.		Overburden thickness	<0.5m
27.		Overburden type	Rock
28.		Geomorphology Process	Others
29.		Geomorphology forms	Moderately Dissected slope
30.		Land use/Land cover	Barren
31.		Hydrological condition	Dry
32.	Landslide causes	Triggering factor and causes	Rainfall and Weathering
33.		Rainfall	--
34.		Landslide process	--
35.		Geological causes	--
36.	Damage and risk due to landslide	Life/Livestock/Property	No records
37.		Risk	Moderate
38.		Susceptibility assessment of slope	Meta-Stable
39.		Qualitative Risk Assessment	Moderate

40.	Remedial measures	Slope Gradation required
41.	Remarks/ Abstract	In present condition landslide is suspended and unstable and risk factor is moderate and meta-stable.
Slide Photographs		

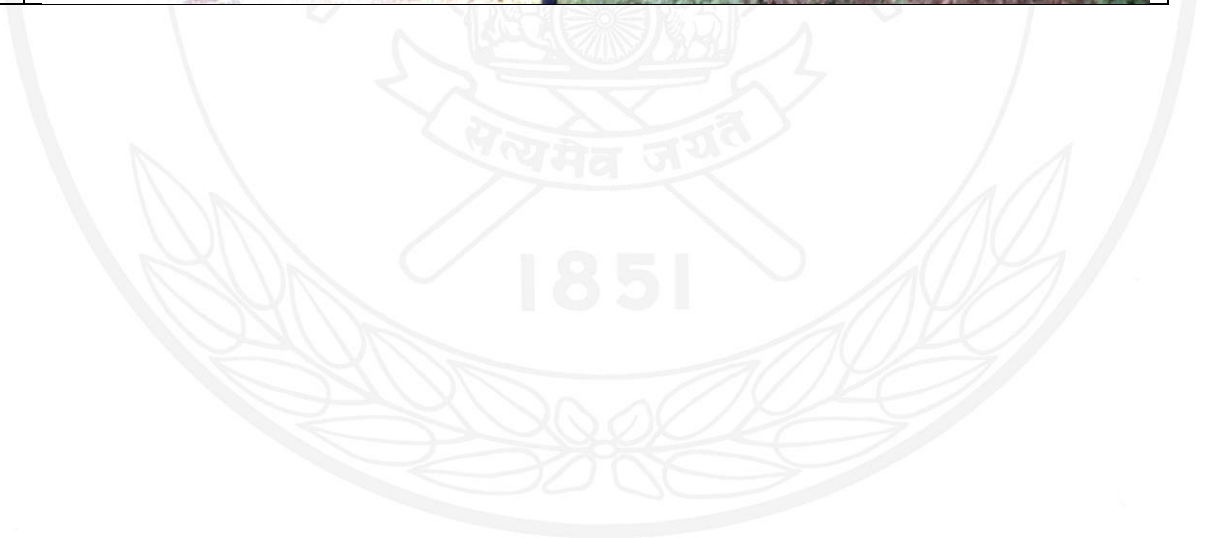
Sl. No	Data Set	Geoparameters	Details
1.	Location details	Slide No./ID	KAR/CHK/2017/50
2.		State	Karnataka
3.		District	Chikmangalur
4.		Slide Name	Muthodi village area
5.		Toposheet No	48O/11
6.		NH/SH/locality	Muthodi road
7.		Latitude	13°25'2.17"N
8.		Longitude	75°38'34.7"E
9.		Date of occurrence	No records
10.	Slide type	Type of Material	Rock
11.		Type of movement	Slide
12.		Failure Plane	Shallow (<=5m)
13.		Activity	Suspended
14.		Distribution	Confined
15.		Style	Multiple
16.		Failure mechanism	Shallow translational planar failure
17.		Landslide History	Old
18.	Slide morphology	Length(m)	Approx. 22m
19.		Width(m)	Approx. 25m
20.		Height(m)	Approx. 1.5m, VH:17m
21.		Run out Distance	Approx. 17m
22.	Geological details	Geology/ Lithology	Ferrugenous phyllite
23.		Rock Characteristic	Weathered rock
24.		Structural details	Highly jointed and fractured
25.		Weathering	High
26.		Overburden thickness	0.5-5m
27.		Overburden type	Weathered rock
28.		Geomorphology Process	Others
29.		Geomorphology forms	Moderately Dissected slope
30.		Land use/Land cover	Barren
31.		Hydrological condition	Damp
32.	Landslide causes	Triggering factor and causes	Rainfall
33.		Rainfall	--
34.		Landslide process	--
35.		Geological causes	Failure along joints and fracture
36.	Damage and risk due to landslide	Life/Livestock/Property	No records
37.		Risk	Moderate
38.		Susceptibility assessment of slope	Unstable
39.		Qualitative Risk Assessment	High
40.	Remedial measures		Slope Gradation required

41.	Remarks/ Abstract	In present condition landslide is suspended and unstable and risk factor is moderate and meta-stable,
Slide Photographs		



Sl. No	Data Set	Geoparameters	Details
1.	Location details	Slide No./ID	KAR/CHK/2017/51
2.		State	Karnataka
3.		District	Chikmangalur
4.		Slide Name	Devarahalli
5.		Toposheet No	48O/11
6.		NH/SH/locality	Bannur-Agala-Devarahalli road
7.		Latitude	13°17'57.9"N
8.		Longitude	75°37'31.8"E
9.		Date of occurrence	No records
10.	Slide type	Type of Material	Weathered rock and soil
11.		Type of movement	Slide
12.		Failure Plane	Shallow (<=5m)
13.		Activity	Suspended
14.		Distribution	Widening, enlarging confined
15.		Style	single
16.		Failure mechanism	Shallow translational failure
17.		Landslide History	New
18.	Slide morphology	Length(m)	Approx. 27m
19.		Width(m)	Approx. 50m
20.		Height(m)	Approx. 2m
21.		Run out Distance	Approx. 30m
22.	Geological details	Geology/ Lithology	Granite Gneiss
23.		Rock Characteristic	Weathered
24.		Structural details	--
25.		Weathering	High
26.		Overburden thickness	0.5-5m
27.		Overburden type	In-situ soil
28.		Geomorphology Process	Others
29.		Geomorphology forms	Lowly Dissected slope
30.		Land use/Land cover	Plantation
31.		Hydrological condition	Damp
32.	Landslide causes	Triggering factor and causes	Rainfall
33.		Rainfall	--
34.		Landslide process	--
35.		Geological causes	--
36.	Damage and risk due to landslide	Life/Livestock/Property	No records
37.		Risk	Modearte
38.		Susceptibility assessment of slope	Meta-stable
39.		Qualitative Risk Assessment	High

40.	Remedial measures	Slope Gradation required
41.	Remarks/ Abstract	In present condition landslide is suspended and unstable and risk factor is moderate and meta-stable
Slide Photographs		



Sl. No	Data Set	Geoparameters	Details
1.	Location details	Slide No./ID	KAR/CHK/2017/52
2.		State	Karnataka
3.		District	Chikmangalur
4.		Slide Name	Hirekolale Village area
5.		Toposheet No	48O/11
6.		NH/SH/locality	Chikmagalur-Hirekolale road section
7.		Latitude	13°21'46.27"N
8.		Longitude	75°42'26.57"E
9.		Date of occurrence	No records
10.	Slide type	Type of Material	Rock cum debris slide
11.		Type of movement	Slide
12.		Failure Plane	Shallow (<=5m)
13.		Activity	Suspended
14.		Distribution	Widening, enlarging, confined
15.		Style	single
16.		Failure mechanism	Shallow translational failure
17.		Landslide History	Old
18.	Slide morphology	Length(m)	Approx. 28m
19.		Width(m)	Approx. 50m
20.		Height(m)	Approx. 2m
21.		Run out Distance	Approx. 30m
22.	Geological details	Geology/ Lithology	Quartzite
23.		Rock Characteristic	Jointed
24.		Structural details	Joints sets are oriented ENE-WSW, WNW-ESE, and E-W direction
25.		Weathering	Moderate
26.		Overburden thickness	5-10m
27.		Overburden type	In-situ soil
28.		Geomorphology Process	Others
29.		Geomorphology forms	Lowly Dissected slope
30.		Land use/Land cover	Plantation
31.		Hydrological condition	Dry
32.	Landslide causes	Triggering factor and causes	Rainfall
33.		Rainfall	--
34.		Landslide process	--
35.		Geological causes	Seepage along joints
36.	Damage and risk due to landslide	Life/Livestock/Property	No records
37.		Risk	Moderate
38.		Susceptibility assessment of slope	Meta-stable

39.		Qualitative Risk Assessment	Moderate
40.	Remedial measures		Slope Gradation required
41.	Remarks/ Abstract		In present condition landslide is suspended and unstable and risk factor is moderate and meta-stable, few settlements were there at downslope/foothill are at low risk
Slide Photographs			

Slide Photographs



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Sl. No	Data Set	Geoparameters	Details
1.	Location details	Slide No./ID	KAR/CHK/2017/53
2.		State	Karnataka
3.		District	Chikmangalur
4.		Slide Name	Gutti village area
5.		Toposheet No	48O/12
6.		NH/SH/locality	Gutti-Kotrakere road section
7.		Latitude	13°5'29.75"N
8.		Longitude	75°33'22.12"E
9.		Date of occurrence	No records
10.	Slide type	Type of Material	In-situ soil
11.		Type of movement	Slide
12.		Failure Plane	Shallow (<=5m)
13.		Activity	Suspended
14.		Distribution	Widening, enlarging progressive
15.		Style	Single
16.		Failure mechanism	Shallow translational failure
17.		Landslide History	Old
18.	Slide morphology	Length(m)	Approx. 14m
19.		Width(m)	Approx. 50m
20.		Height(m)	Approx. 1m
21.		Run out Distance	Approx. 12m
22.	Geological details	Geology/ Lithology	Granite Gneiss
23.		Rock Characteristic	Highly Weathered
24.		Structural details	--
25.		Weathering	High
26.		Overburden thickness	5-10m
27.		Overburden type	In-situ soil
28.		Geomorphology Process	Others
29.		Geomorphology forms	Lowly Dissected slope/Peidmont slope
30.		Land use/Land cover	Plantation
31.		Hydrological condition	Dry
32.	Landslide causes	Triggering factor and causes	Rainfall
33.		Rainfall	--
34.		Landslide process	--
35.		Geological causes	--
36.	Damage and risk due to landslide	Life/Livestock/Property	No records
37.		Risk	Moderate
38.		Susceptibility assessment of slope	Meta-stable
39.		Qualitative Risk Assessment	Moderate

40.	Remedial measures	Slope Gradation required
41.	Remarks/ Abstract	In present condition landslide is suspended and unstable and risk factor is moderate and meta-stable, few settlements were there at downslope/foothill are at low risk/
Slide Photographs		

Sl. No	Data Set	Geoparameters	Details
1.	Location details	Slide No./ID	KAR/CHK/2017/54
2.		State	Karnataka
3.		District	Chikmangalur
4.		Slide Name	Bapujinagra village area
5.		Toposheet No	48O/11
6.		NH/SH/locality	Mudigere- Bapujinagra road section
7.		Latitude	13°8'21.66"N
8.		Longitude	75°38'10.58"E
9.		Date of occurrence	No records
10.	Slide type	Type of Material	In-situ soil
11.		Type of movement	Slide
12.		Failure Plane	Shallow (<=5m)
13.		Activity	Suspended
14.		Distribution	Widening, enlarging progressive
15.		Style	Single
16.		Failure mechanism	Shallow translational failure
17.		Landslide History	Old
18.	Slide morphology	Length(m)	Approx. 15m
19.		Width(m)	Approx. 25m
20.		Height(m)	Approx. 1m
21.		Run out Distance	Approx. 14m
22.	Geological details	Geology/ Lithology	Granite Gneiss
23.		Rock Characteristic	Weathered
24.		Structural details	--
25.		Weathering	High
26.		Overburden thickness	5-10m
27.		Overburden type	In-situ soil
28.		Geomorphology Process	Others
29.		Geomorphology forms	Peidmont slope
30.		Land use/Land cover	Plantation
31.		Hydrological condition	Dry
32.	Landslide causes	Triggering factor and causes	Rainfall
33.		Rainfall	--
34.		Landslide process	--
35.		Geological causes	--
36.	Damage and risk due to landslide	Life/Livestock/Property	No records
37.		Risk	Moderate
38.		Susceptibility assessment of slope	Unstable
39.		Qualitative Risk Assessment	High

40.	Remedial measures	Slope Gradation/Benching required
41.	Remarks/ Abstract	In present condition landslide is suspended and unstable and risk factor is moderate and meta-stable, few settlements were there at downslope/foothill are at low risk

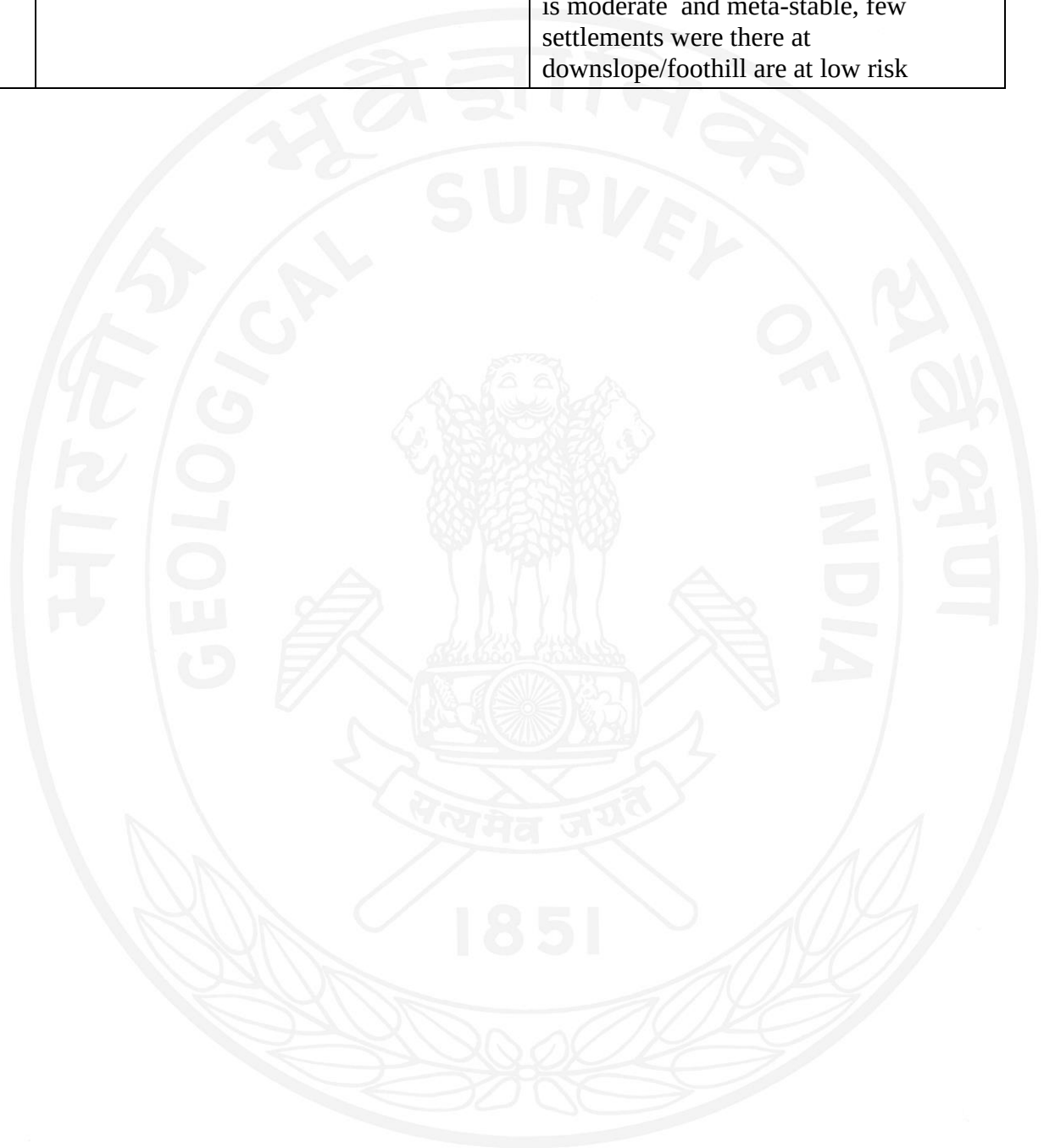


Sl. No	Data Set	Geoparameters	Details
1.	Location details	Slide No./ID	KAR/CHK/2017/55
2.		State	Karnataka
3.		District	Chikmangalur
4.		Slide Name	Mudigere village area on SH-64
5.		Toposheet No	48O/12
6.		NH/SH/locality	10 km from Mudigere towards chikmagalur on SH-64
7.		Latitude	13°11'48.40"N
8.		Longitude	75°40'7.40"E
9.		Date of occurrence	No records
10.	Slide type	Type of Material	In-situ soil
11.		Type of movement	Debris slump
12.		Failure Plane	Shallow (<=5m)
13.		Activity	Suspended
14.		Distribution	Widening, enlarging progressive
15.		Style	Single
16.		Failure mechanism	Shallow translational failure
17.		Landslide History	New
18.	Slide morphology	Length(m)	Approx. 16m
19.		Width(m)	Approx. 10m
20.		Height(m)	Approx. 1m
21.		Run out Distance	Approx. 14m
22.	Geological details	Geology/ Lithology	Granite Gneiss
23.		Rock Characteristic	Weathered
24.		Structural details	--
25.		Weathering	High
26.		Overburden thickness	0.5-5m
27.		Overburden type	Weathered rock and in-situ soil
28.		Geomorphology Process	Others
29.		Geomorphology forms	Peidmont slope
30.		Land use/Land cover	Plantation
31.		Hydrological condition	Damp
32.	Landslide causes	Triggering factor and causes	Rainfall
33.		Rainfall	--
34.		Landslide process	--
35.		Geological causes	--
36.	Damage and risk due to landslide	Life/Livestock/Property	No records
37.		Risk	Moderate
38.		Susceptibility assessment of slope	Meta-stable

39.		Qualitative Risk Assessment	Moderate
40.	Remedial measures		Slope Gradation/Benching required
41.	Remarks/ Abstract		Road cut failure
Slide Photographs			

Sl. No	Data Set	Geoparameters	Details
1.	Location details	Slide No./ID	KAR/CHK/2017/56
2.		State	Karnataka
3.		District	Chikmagalur
4.		Slide Name	Mudigere towards chikmagalur on SH-64
5.		Toposheet No	480/12
6.		NH/SH/locality	5 km from Mudigere towards chikmagalur on SH-64
7.		Latitude	13°10'12.81"N
8.		Longitude	75°39'4.12"E
9.		Date of occurrence	No records
10.	Slide type	Type of Material	In-situ soil
11.		Type of movement	Debris slump
12.		Failure Plane	Shallow (<=5m)
13.		Activity	Suspended
14.		Distribution	Widening, enlarging progressive
15.		Style	single
16.		Failure mechanism	Shallow translational failure
17.	Slide morphology	Landslide History	Old
18.		Length(m)	Approx. 17m
19.		Width(m)	Approx. 10m
20.		Height(m)	Approx. 1m
21.		Run out Distance	Approx. 14m
22.	Geological details	Geology/ Lithology	Granite Gneiss
23.		Rock Characteristic	--
24.		Structural details	--
25.		Weathering	High
26.		Overburden thickness	5-10m
27.		Overburden type	In-situ soil
28.		Geomorphology Process	Others
29.		Geomorphology forms	Peidmont slope
30.		Land use/Land cover	Plantation
31.		Hydrological condition	Damp
32.	Landslide causes	Triggering factor and causes	Rainfall
33.		Rainfall	--
34.		Landslide process	--
35.		Geological causes	--
36.	Damage and risk due to landslide	Life/Livestock/Property	No records
37.		Risk	Moderate

38.		Susceptibility assessment of slope	Meta-stable
39.		Qualitative Risk Assessment	High
40.	Remedial measures		Slope Gradation/Benching required
41.	Remarks/ Abstract		In present condition landslide is suspended and un stable and risk factor is moderate and meta-stable, few settlements were there at downslope/foothill are at low risk



Sl. No	Data Set	Geoparameters	Details
1.	Location details	Slide No./ID	KAR/CHK/2017/57
2.		State	Karnataka
3.		District	Chikmangalur
4.		Slide Name	Hunasehalli village area
5.		Toposheet No	48O/11
6.		NH/SH/locality	10km from Hunasehalli village area
7.		Latitude	13°20'26.71"N
8.		Longitude	75°35'54.15"E
9.		Date of occurrence	No records
10.	Slide type	Type of Material	Rock
11.		Type of movement	Fall
12.		Failure Plane	Shallow (<=5m)
13.		Activity	Suspended
14.		Distribution	Widening, enlarging progressive
15.		Style	single
16.		Failure mechanism	Shallow translational failure
17.		Landslide History	Old
18.	Slide morphology	Length(m)	Approx. 16m
19.		Width(m)	Approx. 20m
20.		Height(m)	Approx. 1m
21.		Run out Distance	Approx. 14m
22.	Geological details	Geology/ Lithology	Granite Gneiss
23.		Rock Characteristic	Weathered
24.		Structural details	--
25.		Weathering	High
26.		Overburden thickness	<0.5m
27.		Overburden type	Weathered rock
28.		Geomorphology Process	Others
29.		Geomorphology forms	Lowly dissected slope
30.		Land use/Land cover	Plantation
31.	Landslide causes	Hydrological condition	Damp
32.		Triggering factor and causes	Rainfall
33.		Rainfall	--
34.		Landslide process	--
35.		Geological causes	--
36.	Damage and risk due to landslide	Life/Livestock/Property	No records
37.		Risk	Moderate
38.		Susceptibility assessment of slope	Meat-stable
39.		Qualitative Risk Assessment	High

40.		Remedial measures(brief)	Lined drainage , slope gradation required
41.		Remarks/ Abstract	In present condition the debris slide is suspended and stable and risk factor is low.



Sl. No	Data Set	Geoparameters	Details
1.	Location details	Slide No./ID	KAR/CHK/2017/58
2.		State	Karnataka
3.		District	Chikmangalur
4.		Slide Name	Horatti village area
5.		Toposheet No	48O/12
6.		NH/SH/locality	Horatti village area
7.		Latitude	13°09'29.24"N
8.		Longitude	75°31'30.67"E
9.		Date of occurrence	No records
10.	Slide type	Type of Material	Rock
11.		Type of movement	Fall
12.		Failure Plane	Shallow ($\leq 5\text{m}$)
13.		Activity	Suspended
14.		Distribution	Widening, enlarging and progressive
15.		Style	Single
16.		Failure mechanism	Shallow translational failure
17.		Landslide History	Old
18.	Slide morphology	Length(m)	Approx. 18m
19.		Width(m)	Approx. 30m
20.		Height(m)	Approx. 1m
21.		Run out Distance	Approx. 14m
22.	Geological details	Geology/ Lithology	Granite Gneiss
23.		Rock Characteristic	Weathered
24.		Structural details	--
25.		Weathering	High
26.		Overburden thickness	$< 0.5\text{m}$
27.		Overburden type	Weathered rock
28.		Geomorphology Process	Others
29.		Geomorphology forms	Lowly dissected slope
30.		Land use/Land cover	Plantation
31.		Hydrological condition	Damp
32.	Landslide causes	Triggering factor and causes	Rainfall
33.		Rainfall	--
34.		Landslide process	--
35.		Geological causes	--
36.	Damage and risk	Life/Livestock/Property	No records
37.		Risk	Moderate
38.		Susceptibility assessment of slope	Meat-stable
39.		Qualitative Risk Assessment	High

40.	Remedial measures	Retaining with weep holes already constructed, stabilized
41.	Remarks/ Abstract	In present condition the slide is suspended and stable and risk factor is low.
Slide Photographs		



Tabular matrices for LOFS and consistency ratio calculations for six factor maps

Table 10: Slope angle classes with LOFS rating

I. Pair-wise comparison matrix of Slope Angle classes

Slope Angle	<15°	15-25°	25°-35°	35°-45°	>45°
<15°	1.00	0.33	0.14	0.20	1.00
15°-25°	3.00	1.00	0.20	0.33	3.00
25°-35°	7.00	5.00	1.00	3.00	7.00
35°-45°	5.00	3.00	0.33	1.00	5.00
>45°	1.00	0.33	0.14	0.20	1.00
Cumulative Sum	17.00	9.67	1.82	4.73	17.00

II. LOFS rating for Slope Angle class

Slope Angle	<15°	15-25°	25-35°	35-45°	>45°	Sum	Frac. Rate	LOFS rating
<15°	0.05882	0.034483	0.078534	0.042254	0.058824	0.272917	0.054583	0.1081
15-25°	0.17647	0.103448	0.109948	0.070423	0.176471	0.63676	0.127352	0.2523
25-35°	0.41176	0.517241	0.549738	0.633803	0.411765	2.524312	0.504862	1.0000
35-45°	0.29412	0.310345	0.183246	0.211268	0.294118	1.293094	0.258619	0.5123
>45°	0.05882	0.034483	0.078534	0.042254	0.058824	0.272917	0.054583	0.1081

Slope Angle class	Rank	LOFS Rating
<15°	2	0.1081
15°-25°	4	0.2523
25°-35°	8	1.0000
35°-45°	6	0.5123
>45°	2	0.1081

Tabular matrices for LOFS and consistency ratio calculations for six factor maps

Table 11: Slope Curvature classes with LOFS rating

I. Pair-wise comparison matrix of Slope Curvature classes

Curvature	Concave	Flat	Convex
Concave	1.00	3.00	0.33
Flat	0.33	1.00	0.20
Convex	3.00	5.00	1.00
Cumulative Sum	4.33	9.00	1.53

II. LOFS rating for Slope Curvature classes

Curvature	Concave	Flat	Convex	Sum rows	Frac. rate	LOFS Rating
Concave	0.230769	0.333333	0.217391	0.781494	0.260498	0.4113
Flat	0.076923	0.111111	0.130435	0.318469	0.106156	0.1676
Convex	0.692308	0.555556	0.652174	1.900037	0.633346	1.0000

CLASS	Rank	LOFS Rating
Concave	4	0.4113
Flat	2	0.1676
Convex	6	1.0000

Tabular matrices for LOFS and consistency ratio calculations for six factor maps

Table 12: Landuse and Landcover classes with LOFS rating

I. Pair-wise comparison matrix of Landuse-Landcover classes

LULC	B	CL	ESC	FL	MV	HHP	LHP	QR	S	SM	TV	SV
B	1.00	0.50	0.11	1.00	0.20	0.25	0.33	0.20	1.00	0.14	0.25	0.14
CL	2.00	1.00	0.13	2.00	0.25	0.33	0.50	0.25	2.00	0.17	0.33	0.17
ESC	9.00	8.00	1.00	9.00	5.00	6.00	7.00	5.00	9.00	3.00	6.00	3.00
FL	1.00	0.50	0.11	1.00	0.20	0.25	0.33	0.20	1.00	0.14	0.25	0.14
MV	5.00	4.00	0.20	5.00	1.00	2.00	3.00	1.00	5.00	0.33	2.00	0.33
HHP	4.00	3.00	0.17	4.00	0.50	1.00	2.00	0.50	4.00	0.25	1.00	0.25
LHP	3.00	2.00	0.14	3.00	0.33	0.50	1.00	0.33	3.00	0.20	0.50	0.20
QR	5.00	4.00	0.20	5.00	1.00	2.00	3.00	1.00	5.00	0.33	2.00	0.33
S	1.00	0.50	0.11	1.00	0.20	0.25	0.33	0.50	1.00	0.14	0.25	0.14
SM	7.00	6.00	0.33	7.00	3.00	4.00	5.00	3.00	7.00	1.00	4.00	1.00
TV	4.00	3.00	0.17	4.00	0.50	1.00	2.00	0.50	4.00	0.25	1.00	0.25
SV	7.00	6.00	0.33	7.00	3.00	4.00	5.00	3.00	7.00	1.00	4.00	1.00
Cumulative Sum	49.00	38.50	3.00	49.00	15.18	21.58	29.50	15.48	49.00	6.96	21.58	6.96

II. LOFS rating for Landuse-Landcover classes

LU /LC	B	CL	ESC	FL	MV	HHP	LHP	QR	S	SM	TV	SV	Sum rows	Frac rate	LOFS
B	0.020408	0.012987	0.037022	0.020408	0.013172	0.011583	0.011299	0.012917	0.020408	0.02052	0.011583	0.02052	0.212828	0.017736	0.0626
CL	0.040816	0.025974	0.04165	0.040816	0.016465	0.015444	0.016949	0.016146	0.040816	0.02394	0.015444	0.02394	0.318402	0.026533	0.0937
ESC	0.183673	0.207792	0.333201	0.183673	0.329308	0.277992	0.237288	0.322928	0.183673	0.430917	0.277992	0.430917	3.399356	0.28328	1.0000
FL	0.020408	0.012987	0.037022	0.020408	0.013172	0.011583	0.011299	0.012917	0.020408	0.02052	0.011583	0.02052	0.212828	0.017736	0.0626
MV	0.102041	0.103896	0.06664	0.102041	0.065862	0.092664	0.101695	0.064586	0.102041	0.04788	0.092664	0.04788	0.989888	0.082491	0.2912

Tabular matrices for LOFS and consistency ratio calculations for six factor maps

LU /LC	B	CL	ESC	FL	MV	HHP	LHP	QR	S	SM	TV	SV	Sum rows	Frac rate	LOFS
HHP	0.081633	0.077922	0.055534	0.081633	0.032931	0.046332	0.067797	0.032293	0.081633	0.03591	0.046332	0.03591	0.675857	0.056321	0.1988
LHP	0.061224	0.051948	0.0476	0.061224	0.021954	0.023166	0.033898	0.021529	0.061224	0.028728	0.023166	0.028728	0.46439	0.038699	0.1366
QR	0.102041	0.103896	0.06664	0.102041	0.065862	0.092664	0.101695	0.064586	0.102041	0.04788	0.092664	0.04788	0.989888	0.082491	0.2912
S	0.020408	0.012987	0.037022	0.020408	0.013172	0.011583	0.011299	0.032293	0.020408	0.02052	0.011583	0.02052	0.232204	0.01935	0.0683
SM	0.142857	0.155844	0.111067	0.142857	0.197585	0.185328	0.169492	0.193757	0.142857	0.143639	0.185328	0.143639	1.91425	0.159521	0.5631
TV	0.081633	0.077922	0.055534	0.081633	0.032931	0.046332	0.067797	0.032293	0.081633	0.03591	0.046332	0.03591	0.675857	0.056321	0.1988
SV	0.142857	0.155844	0.111067	0.142857	0.197585	0.185328	0.169492	0.193757	0.142857	0.143639	0.185328	0.143639	1.91425	0.159521	0.5631

CLASS	Rank	LOFS Rating
Barren	1	0.0626
Barren Sand	0	0.0000
Cultivation	2	0.0937
Extensive Slope Cut	9	1.0000
Fallow Land	1	0.0626
Moderate Vegetation	5	0.2912
Plantation (HHP)	4	0.1988
Plantation (LHP)	3	0.1366
Quarry	5	0.2912
Settlement	1	0.0683
Settlement on modified slope	7	0.5631
Swamp	0	0.0000
Thick Vegetation	4	0.1988
Sparse Vegetation	7	0.5631
Water body	0	0.0000
Salt Pan	0	0.0000

Tabular matrices for LOFS and consistency ratio calculations for six factor maps

Table 13: Geomorphology classes with LOFS rating

I. Pair-wise comparison matrix of Landuse-Landcover classes

CLASS	DS	ESC	MOUND	CFS	LDS	MDS	HDS	PIED SLOPE
DS	1	8	8	7	6	4	2	6
ESC	0.125	1	1	0.5	0.33333333	0.2	0.142857143	0.33333333
MOUND	0.125	1	1	0.5	0.33333333	0.2	0.142857143	0.33333333
CFS	0.142857143	2	2	1	0.5	0.25	0.166666667	0.5
LDS	0.166666667	3	3	2	1	0.33333333	0.2	1
MDS	0.25	5	5	4	3	1	0.33333333	3
HDS	0.5	7	7	6	5	3	1	5
PIED SLOPE	0.166666667	3	3	2	1	0.33333333	0.2	1
Sum total	2.476190476	30	30	23	17.16666667	9.316666667	4.185714286	17.16666667

II. LOFS rating for Geomorphology classes

CLASS	DS	ESC	MOUND	CFS	LDS	MDS	HDS	PIED SLOPE	Sum Rows	Frac rate	LOFS
DS	0.403846154	0.266667	0.266666667	0.30435	0.349514563	0.429338104	0.4778157	0.34951456	2.8477102	0.35596	1
ESC	0.050480769	0.033333	0.033333333	0.02174	0.019417476	0.021466905	0.034129693	0.01941748	0.2333181	0.02916	0.08193
MOUND	0.050480769	0.033333	0.033333333	0.02174	0.019417476	0.021466905	0.034129693	0.01941748	0.2333181	0.02916	0.08193
CFS	0.057692308	0.066667	0.066666667	0.04348	0.029126214	0.026833631	0.039817975	0.02912621	0.3594079	0.04493	0.12621
LDS	0.067307692	0.1	0.1	0.08696	0.058252427	0.035778175	0.04778157	0.05825243	0.5543288	0.06929	0.19466
MDS	0.100961538	0.166667	0.166666667	0.17391	0.174757282	0.107334526	0.07963595	0.17475728	1.144693	0.14309	0.40197
HDS	0.201923077	0.233333	0.233333333	0.26087	0.291262136	0.322003578	0.23890785	0.29126214	2.072895	0.25911	0.72792
PIED SLOPE	0.067307692	0.1	0.1	0.08696	0.058252427	0.035778175	0.04778157	0.05825243	0.5543288	0.06929	0.19466

Tabular matrices for LOFS and consistency ratio calculations for six factor maps

GEOMORPHOLOGY CLASSES	Rank	LOFS Rating
Denudational Slope (DS)	9	1
Escarpment(ESC)	2	0.0819
Mound	2	0.0819
Colluvial Footslope (CFS)	3	0.1262
Lowly Dissected Slope (LDS)	4	0.1947
Moderately Dissected Slope (MDS)	6	0.402
Highly Dissected Slope (HDS)	8	0.7279
Piedmont Slope (PIED SLOPE)	4	0.1947
Ridge-top	0	0
Tidal Flat	0	0
Water body	0	0
Plateau Top (Flat)	0	0
Rolling Plain	0	0
Valley Fill	0	0
Alluvial Plain	0	0
Beach	0	0
Coastal Plain	0	0
Pediment-Pediplain Complex	0	0
Hilltop	0	0

Tabular matrices for LOFS and consistency ratio calculations for six factor maps

Table 14: Slope Forming Material map with LOFS rating

I. Pair-wise comparison matrix of Slope Curvature classes

SFM CLASSES	CSD	INSITU	COL	LSD	R (Type-1)	R (Type-2)	R (Type-3)	TS	WR
CSD	1	0.5	0.333333	0.166667	3	2	0.5	1	0.25
INSITU	2	1	0.5	0.2	4	3	1	2	0.333333
COL	3	2	1	0.25	5	4	2	3	0.5
LSD	6	5	4	1	8	7	5	6	3
R(Type-1)	0.333333	0.25	0.2	0.125	1	0.5	0.25	0.333333333	0.166667
R(Type-2)	0.5	0.333333	0.25	0.142857	2	1	0.333333333	0.5	0.2
R(Type-3)	2	1	0.5	0.2	4	3	1	2	0.333333
TS	1	0.5	0.333333	0.166667	3	2	0.5	1	0.25
WR	4	3	2	0.333333	6	5	3	4	1
SUM	19.83333	13.58333	9.116667	2.584524	36	27.5	13.58333333	19.83333333	6.033333

II. LOFS rating for Slope Forming Material classes

SFM CLASSES	CSD	INSITU	COL	LSD	R(Type-1)	R(Type-2)	R(Type-3)	TS	WR	Sum Rows	Frac rate	LOFS
CSD	0.05042	0.03681	0.036563	0.064486	0.083333333	0.072727273	0.036809816	0.050420168	0.041436	0.473006521	0.052556	0.150594949
INSITU	0.10084	0.07362	0.054845	0.077384	0.111111111	0.109090909	0.073619632	0.100840336	0.055249	0.756598876	0.084067	0.240884562
COL	0.151261	0.147239	0.109689	0.09673	0.138888889	0.145454545	0.147239264	0.151260504	0.082873	1.17063473	0.130071	0.372704538
LSD	0.302521	0.368098	0.438757	0.386918	0.222222222	0.254545455	0.36809816	0.302521008	0.497238	3.140918908	0.348991	1
R(Type-1)	0.016807	0.018405	0.021938	0.048365	0.027777778	0.018181818	0.018404908	0.016806723	0.027624	0.214309818	0.023812	0.068231567
R(Type-2)	0.02521	0.02454	0.027422	0.055274	0.055555556	0.036363636	0.024539877	0.025210084	0.033149	0.307264657	0.034141	0.097826358
R(Type-3)	0.10084	0.07362	0.054845	0.077384	0.111111111	0.109090909	0.073619632	0.100840336	0.055249	0.756598876	0.084067	0.240884562
TS	0.05042	0.03681	0.036563	0.064486	0.083333333	0.072727273	0.036809816	0.050420168	0.041436	0.473006521	0.052556	0.150594949
WR	0.201681	0.220859	0.219378	0.128973	0.166666667	0.181818182	0.220858896	0.201680672	0.165746	1.707661092	0.18974	0.543682006

Tabular matrices for LOFS and consistency ratio calculations for six factor maps

CLASS	Rank	LOFS
In-situ soil	4	0.2409
Banded magnetite quartzite	1	0.0682
Granite	1	0.0682
Granite gneiss	1	0.0682
Quartzite	1	0.0682
Quartz vein	1	0.0682
Ultramafite	1	0.0682
Dolerite	1	0.0682
Granitoid	1	0.0682
Meta-dolerite	1	0.0682
Epidiorite	1	0.0682
Gabbro	1	0.0682
Metabasalt	1	0.0682
Metagabbro	1	0.2409
Quartz porphyry	1	0.2409
Calcrete	2	0.2409
Conglomerate	2	0.2409
Transported Soil	3	0.1506
Weathered Rock	6	0.5437
Water body	0	0.0000
River	0	0.0000
Laterite	4	0.2409
Amphibolite	4	0.2409
Metapyroxenite	4	0.2409
Pyroxene granulite	4	0.2409
Carbonaceous phyllite	4	0.2409
Ferruginous phyllite	4	0.2409
Quartz-chlorite schist	4	0.2409

Tabular matrices for LOFS and consistency ratio calculations for six factor maps

Table 15: Regolith Thickness classes with LOFS rating

I. Pair-wise comparison matrix of Regolith Thickness classes

Regolith Thickness	0.5 - 5 m	5 - 10 m	>10 m
0.5 - 5 m	1.00	4.00	6.00
5 - 10 m	0.25	1.00	3.00
>10 m	0.17	0.33	1.00
Sun Cumulative	1.42	5.33	10.00

II. LOFS rating for Regolith Thickness classes

Regolith Thickness	0.5 - 5 m	5 - 10 m	>10 m	Sum rows	Frac rate	LOFS
0.5 - 5 m	0.705882	0.75	0.6	2.055882	0.685294	1.0000
5 - 10 m	0.176471	0.1875	0.3	0.663971	0.221324	0.3230
>10 m	0.117647	0.0625	0.1	0.280147	0.093382	0.1363

Regolith Thickness classes (in mts)	Rank	LOFS Rating
<0.5m	0	0
0.5-5m	7	1
5-10m	4	0.322961
>10m	2	0.136266

Tabular matrices for LOFS and consistency ratio calculations for six factor maps

Table 16: Table showing Pair-wise comparison matrix of individual geofactor maps and weights.

Factor	Slope	Curvature	SFM	LULC	Geom	RT	Factor Classes	Rank
Slope	1.00	6.00	0.33	2.00	5.00	3.00	Slope	7
Curvature	0.17	1.00	0.13	0.20	0.50	0.25	Curvature	2
SFM	3.00	8.00	1.00	4.00	7.00	5.00	SFM	9
LULC	0.50	5.00	0.25	1.00	4.00	2.00	LULC	6
Geom	0.20	2.00	0.14	0.25	1.00	0.33	Geomorphology	3
RT	0.33	4.00	0.20	0.50	3.00	1.00	Regolith Thickness	5
Sum Cumulative	5.20	26.00	2.05	7.95	20.50	11.58		

Factor	Slope	Curvature	SFM	LULC	Geom	RT	Sum rows	Frac rate	Weight	Weight WN
Slope	0.19231	0.23077	0.16098	0.25157	0.24390	0.25907	1.33859	0.2230991	6.5073541	7
Curvature	0.03269	0.03846	0.06341	0.02516	0.02439	0.02159	0.20570	0.0342842	1	1
SFM	0.57692	0.30769	0.48780	0.50314	0.34146	0.43178	2.64881	0.4414679	12.876734	13
LULC	0.09615	0.19231	0.12195	0.12579	0.19512	0.17271	0.90403	0.1506721	4.3948026	4
Geom	0.03846	0.07692	0.06829	0.03145	0.04878	0.02850	0.29240	0.0487336	1.4214622	1
RT	0.06346	0.15385	0.09756	0.06289	0.14634	0.08636	0.61046	0.1017432	2.9676444	3

Factor	Slope	Curvature	SFM	LULC	Geom	RT	Sum rows	CV
Slope	0.223099109	0.205704903	0.1456844	0.3013441	0.2436681	0.3052295	1.4247302	6.3860863
Curvature	0.037926849	0.034284151	0.0573908	0.0301344	0.0243668	0.0254358	0.2095388	6.1118283
SFM	0.669297328	0.274273204	0.4414679	0.6026883	0.3411354	0.5087158	2.8375779	6.4275977
LULC	0.111549555	0.171420753	0.110367	0.1506721	0.1949345	0.2034863	0.9424302	6.254843
Geom	0.044619822	0.068568301	0.0618055	0.037668	0.0487336	0.0335752	0.2949705	6.0527105
RT	0.073622706	0.137136602	0.0882936	0.075336	0.1462009	0.1017432	0.622333	6.1167052
							Sum CV	37.349771

Rain gauge Stations	Lat	Long	Annual Rainfall (in mm)									
			2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Chikmangaluru	13.315	75.775	1022.9	1154.2	1358.6	866.5	621.6	1015.3	1013.3	976.6	339.5	955.3
Vasthare	13.27	75.709	1371.5	1765.0	1411.7	1304.8	1010.8	1445.8	1504.0	1178.4	380.0	1305.7
Joladalu	13.324	75.696	1591.7	1927.1	1661.5	1626.5	1036.3	1836.7	1469.5	1477.2	1477.2	1321.0
Aldur	13.243	75.649	1647.4	2292.8	1714.7	1900.1	1258.9	2011.9	2001.0	1798.0	1798.0	1283.7
Athigundi	13.429	75.742	389.0	2400.9	2656.3	2228.1	1780.7	2731.9	1963.0	1857.4	1857.4	1642.1
Kalaspura	13.28	75.936	297.2	908.9	895.9	608.1	475.4	571.3	666.1	728.3	728.3	658.8
Kadur	13.553	76.01	272.2	745.0	901.6	457.9	519.1	576.7	788.3	746.6	746.6	512.5
Koppa	13.533	75.356	857.2	3177.3	2949.0	2619.6	2489.3	3637.6	3383.5	2138.6	2138.6	2232.7
Mudigere	13.137	75.64	967.2	3388.5	2706.8	2569.1	1972.3	2951.3	2756.4	2243.2	2243.2	2429.2
Kottigehara	13.121	75.523	400.5	5217.9	4637.3	4502.2	3641.4	4560.9	4890.3	3631.1	3631.1	3508.5
Gonibeddu	13.086	75.716	477.0	2695.6	2351.2	2330.0	1675.2	2597.9	2326.1	1818.6	1818.6	1466.7
Kalasa	13.234	75.355	434.7	3813.6	2813.8	3171.4	2493.6	4534.8	3682.6	2619.6	2619.6	2318.5
Belahanoor	13.349	75.465	571.2	2293.2	2149.9	2122.4	1639.6	2264.1	2160.8	1724.3	1724.3	1507.9
Sringeri	13.419	75.256	1079.9	3945.6	3356.6	4105.0	3263.5	4481.9	3882.7	3240.0	3240.0	2723.5
Kigga	13.417	75.188	328.5	5238.9	4448.2	5759.8	4458.6	6394.9	5588.2	4062.2	4062.2	3983.6
Kerekatte	13.325	75.144	453.2	6648.9	5515.7	6775.8	5956.3	7645.0	6198.3	4912.5	4912.5	5537.5
Tarikere	13.708	75.815	324.6	1246.1	1411.8	905.7	748.8	1162.5	1207.5	1167.7	1167.7	853.1
Jayapura	13.401	75.372	575.8	3722.0	2937.2	3205.1	2469.5	3669.2	3209.2	2809.6	2809.6	2250.8
Belthangadi	12.99	75.27	4044.0	4818.0	4601.1	4590.5	3974.4	5163.4	3179.7	3179.7	3596.1	3412.5
Malalur	13.256	75.78	286.2	1172.6	954.3	821.2	563.0	992.2	615.2	934.2	934.2	771.7
Javali	13.156	75.475	397.1	3373.5	2775.0	2975.0	2236.2	3185.8	2999.7	2547.7	2547.7	2391.6
Sakaleshapura (IB)	12.944	75.786	2543.2	2543.4	2178.2	2335.6	2020.4	2578.5	2378.8	1934.0	1376.1	1376.1
Hosooru estate	12.96	75.825	2401.7	2401.7	1931.3	1900.2	1670.5	1989.9	1859.1	1498.2	1287.7	1287.7
Ballupete	12.945	75.885	1945.1	1945.1	1761.6	1870.6	1182.7	1939.3	1809.8	1549.3	1158.4	1158.4

FIELD PHOTOGRAPHS



Photo 1A & Photo 1B: Field Photographs showing Lowly Dissected Hillslope of Mullayangiri-Bababudan giri hill range

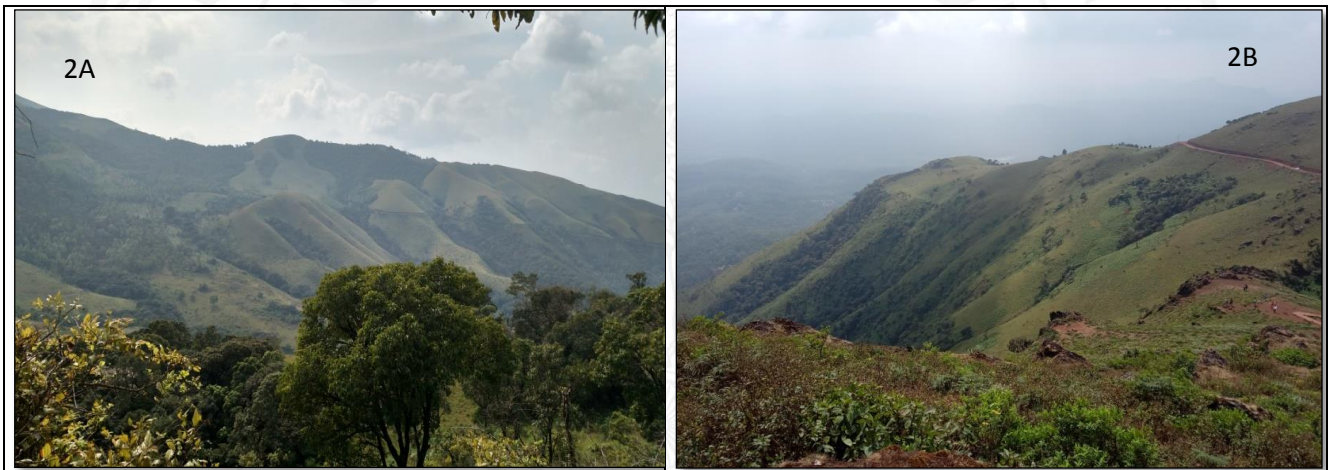


Photo 2A & Photo 2B: Field Photographs showing Moderately Dissected Hillslope of Mullayangiri-Bababudan giri hill range



Photo 3A & Photo 3B :Field Photographs showing Extensive Cut Slope on Mulliyangiri-Attigudi-Bababudan giri Road section

FIELD PHOTOGRAPHS

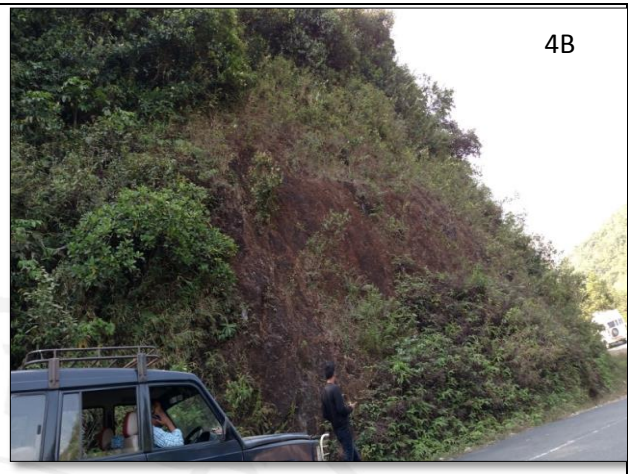


Photo 4A & Photo 4B:: Field Photographs showing Extensive Cut Slope on Mudigere- Kotegehara road section



Lat:13°20'14"N Long:75°33'42.60"E

Photo 5A: Shallow Planar failure in BIF near Kavikalgundi Village



Lat:13°24'19.93"N Long:75°44'34.47"E

Photo 5B :Shallow Planar failure in BIF near Kavikalgundi Village



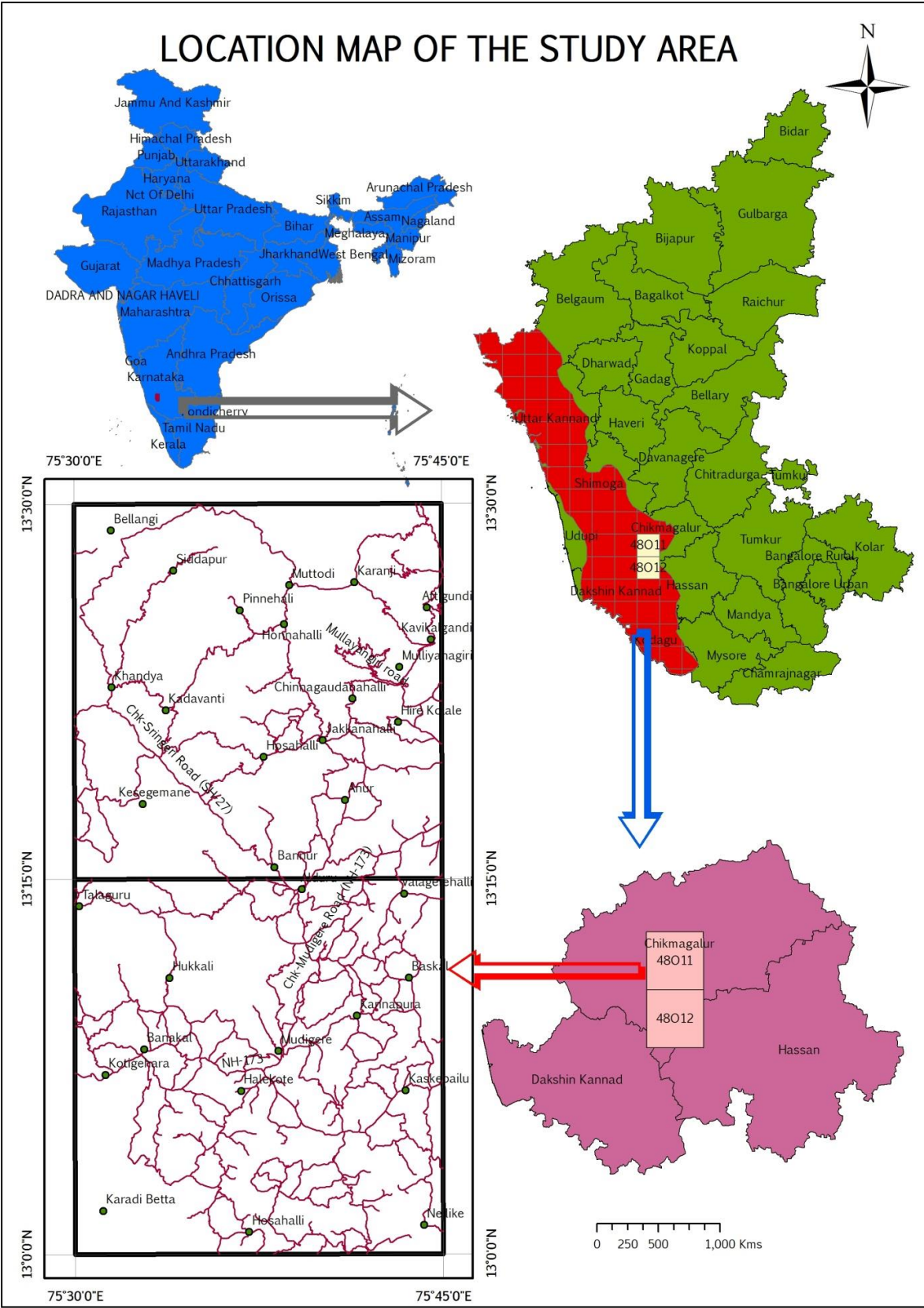
Lat:13°24'4.48"N Long:75°44'2.47"E

Photo 6A: Shallow Debris Slide on Weathered BIF on Attigudi- Bababuda Road section

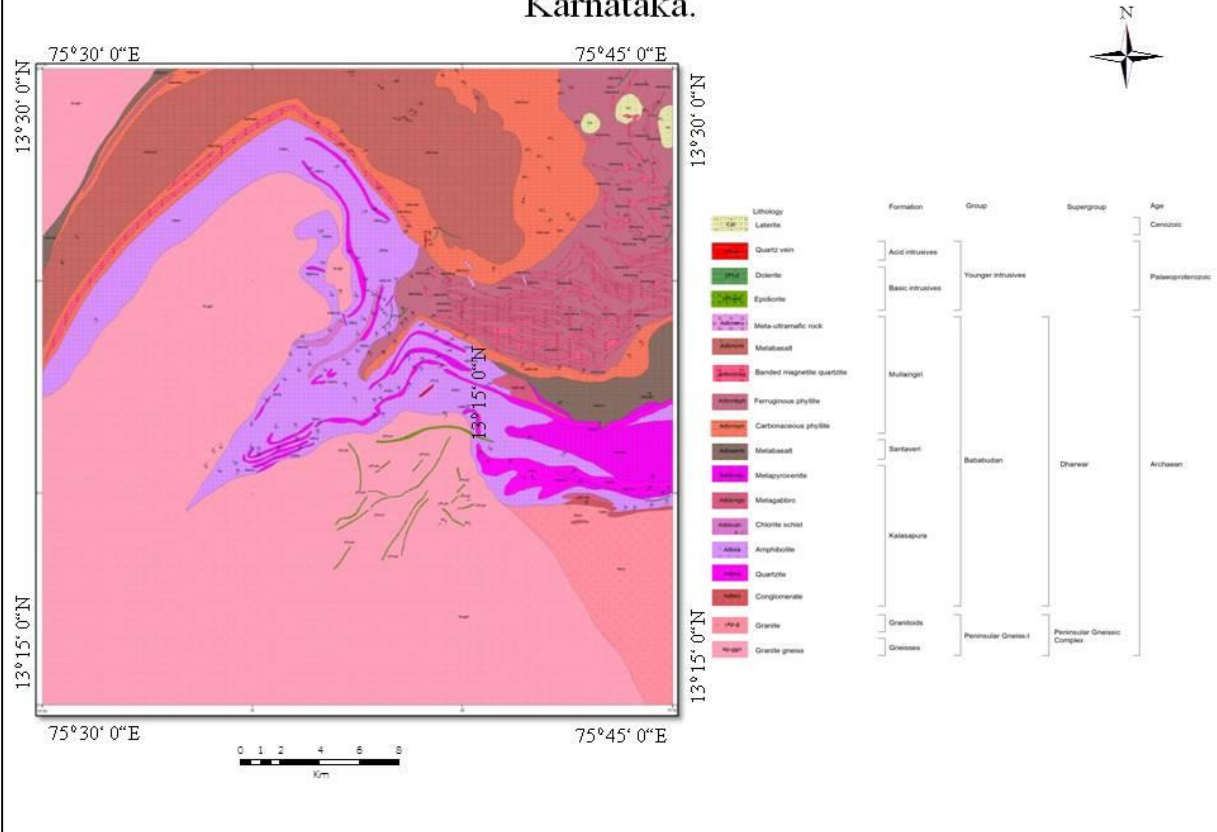


Lat:13°25'38.88"N Long:75°44'54.68"E

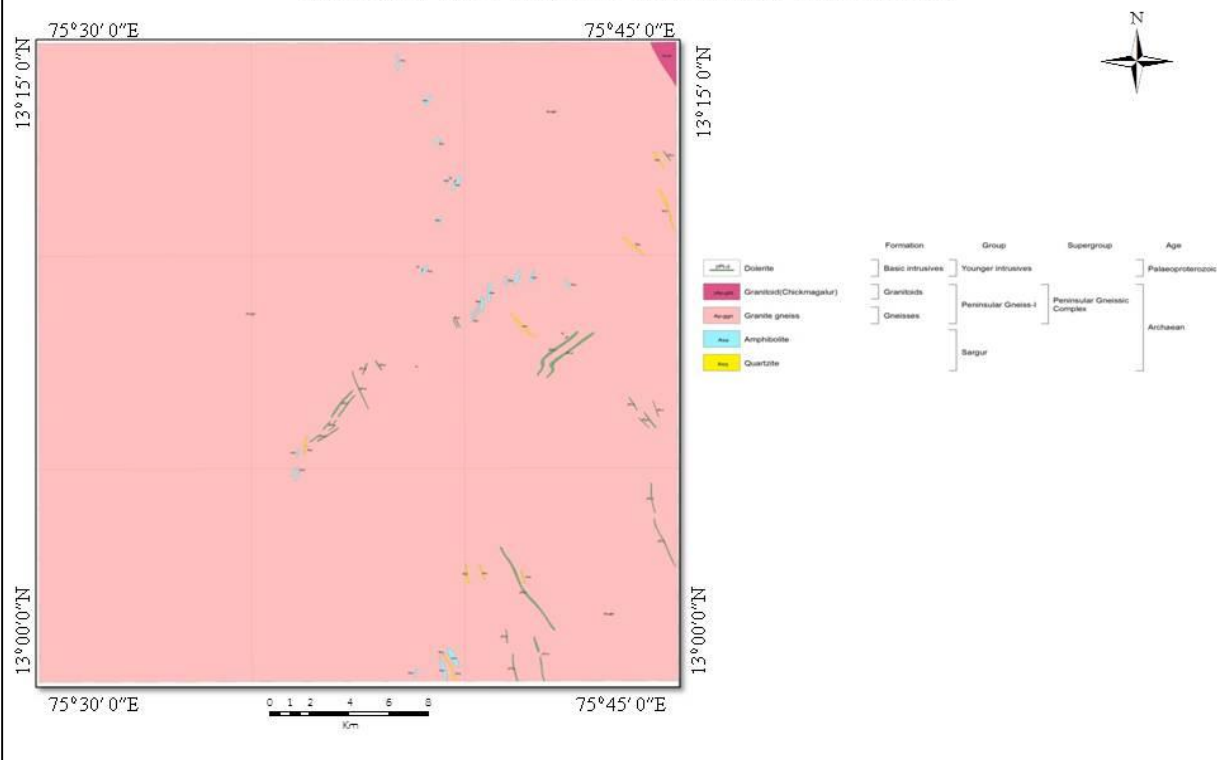
Photo 6B: Shallow Debris Slide 2km from Attigundi Village



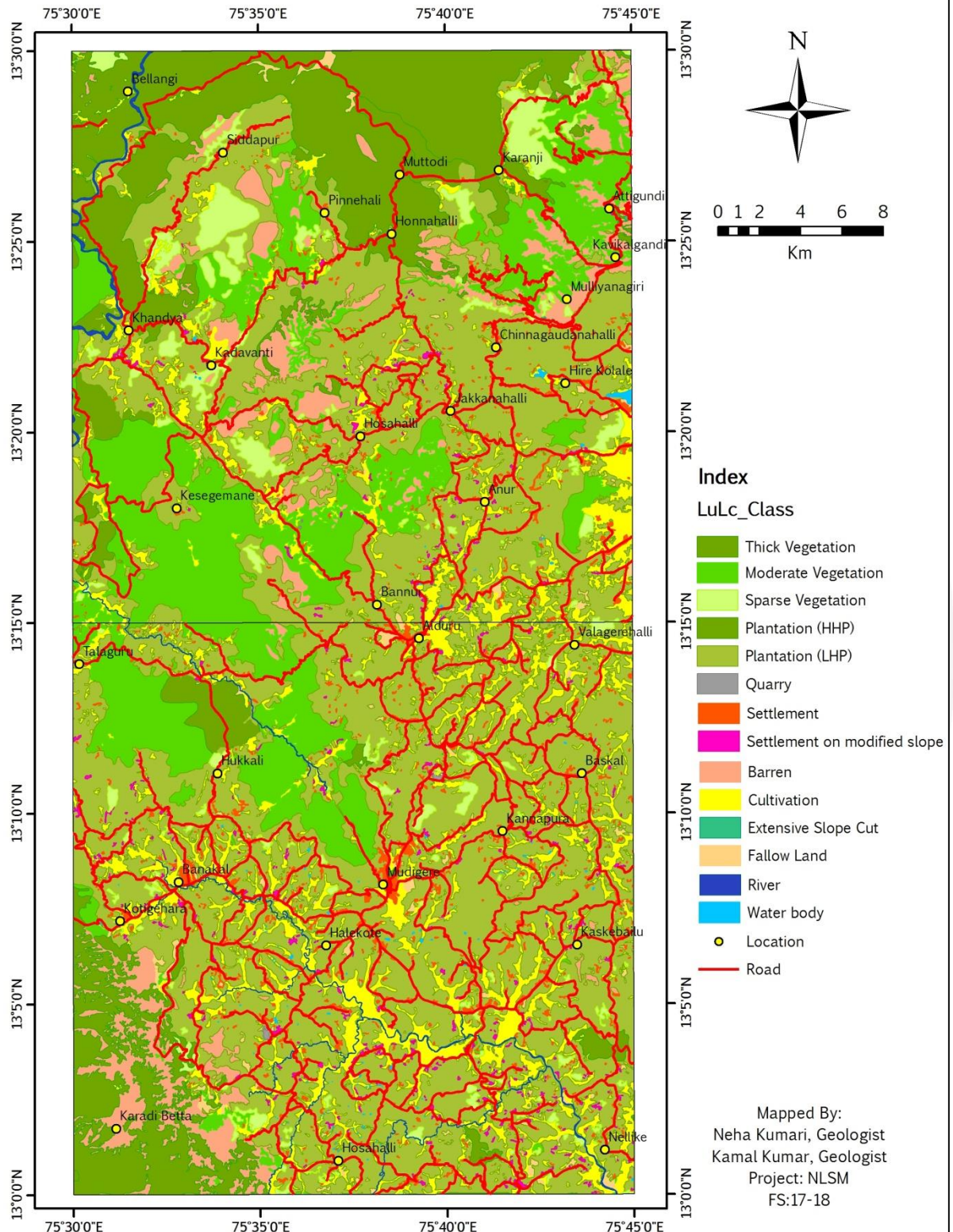
Geology Map of TS no. 48O/12 in parts of Chikmangaluru Districts, Karnataka.



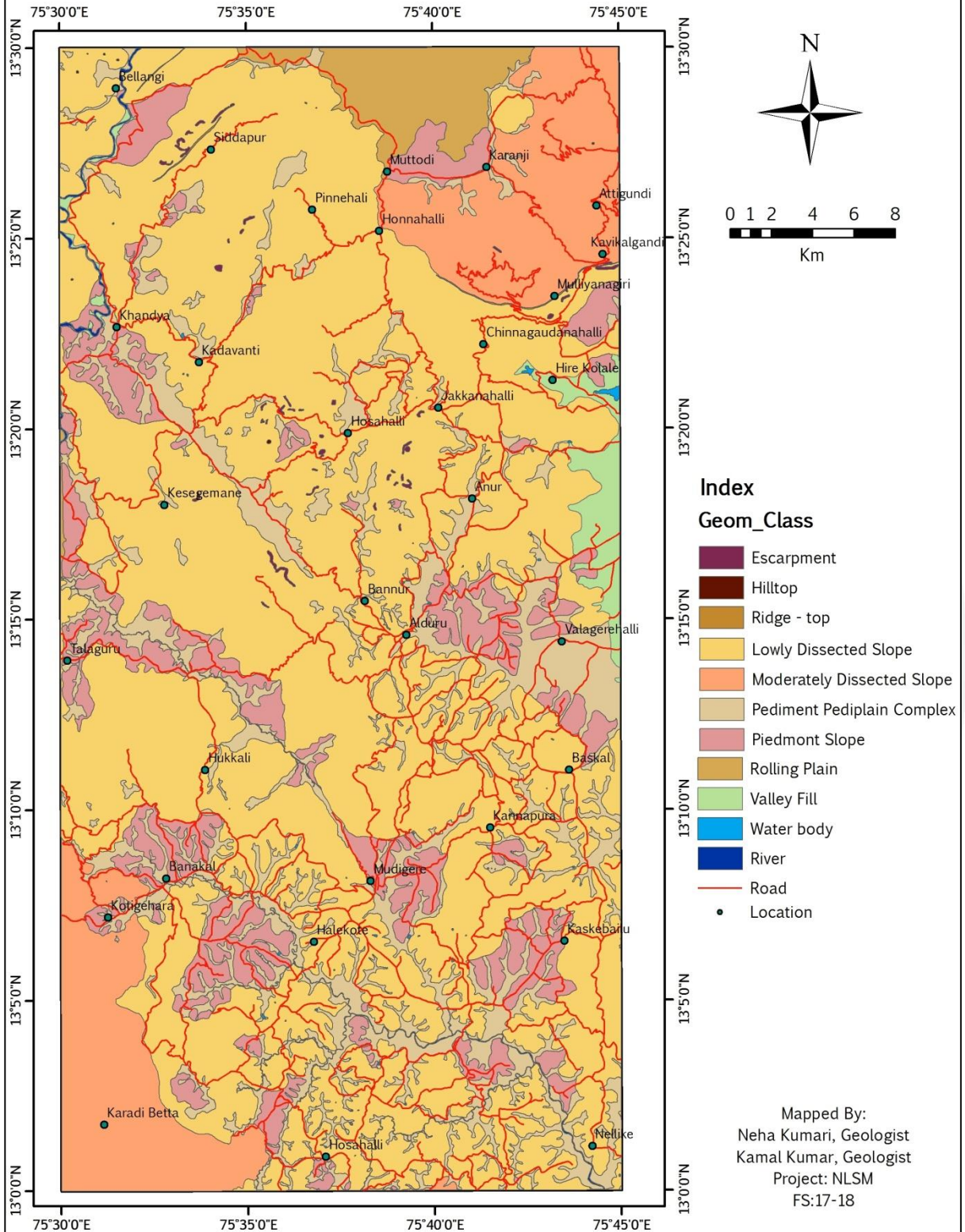
Geology Map of TS no. 48O/12 in parts of Chikmangaluru, Dakshin Kannad and Hassan Districts, karnataka.



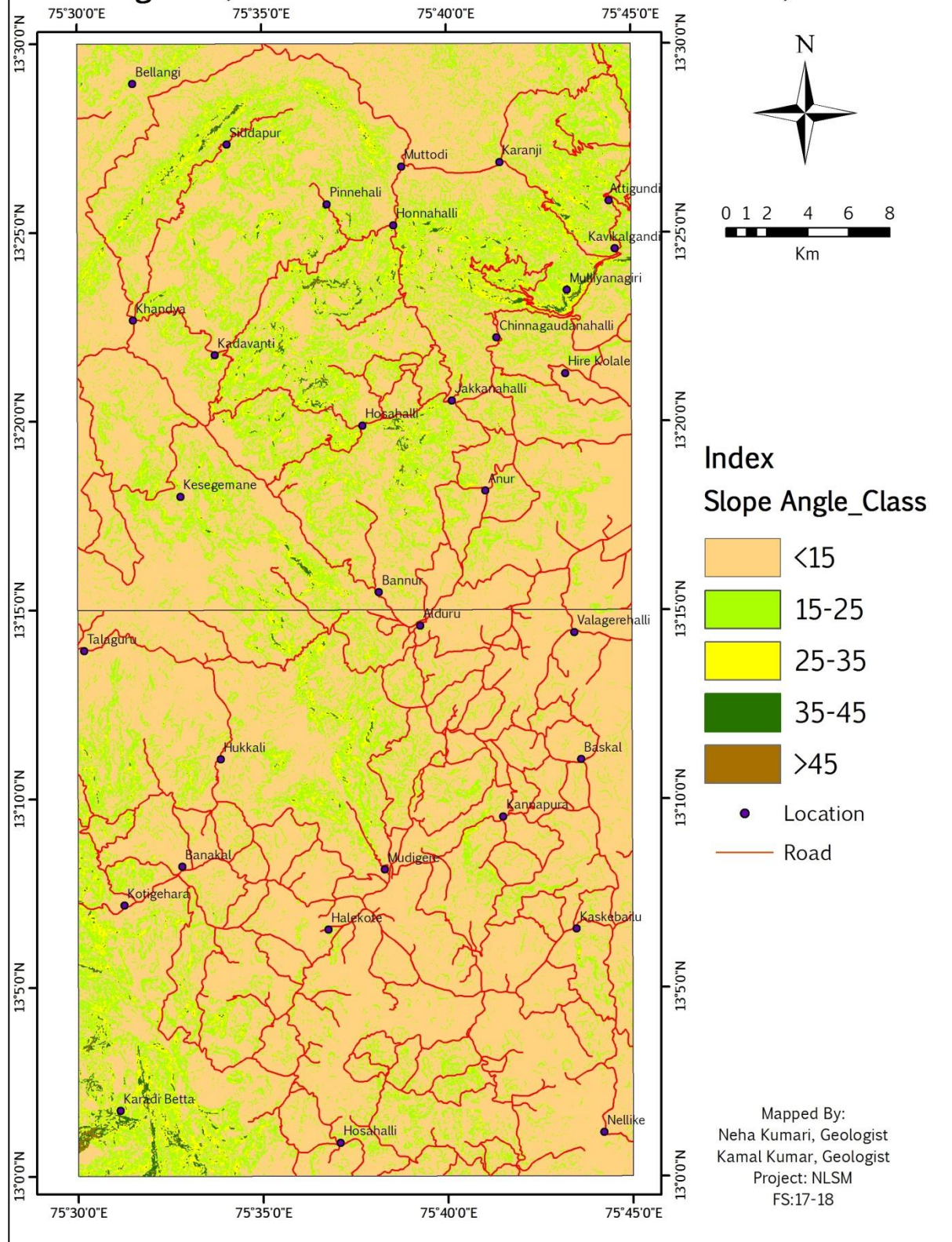
Landuse/Landcover Map in parts of TS Nos. 480/11 & 12
Chikmangaluru, Dakshin Kannad and Hassan districts, Karnataka.



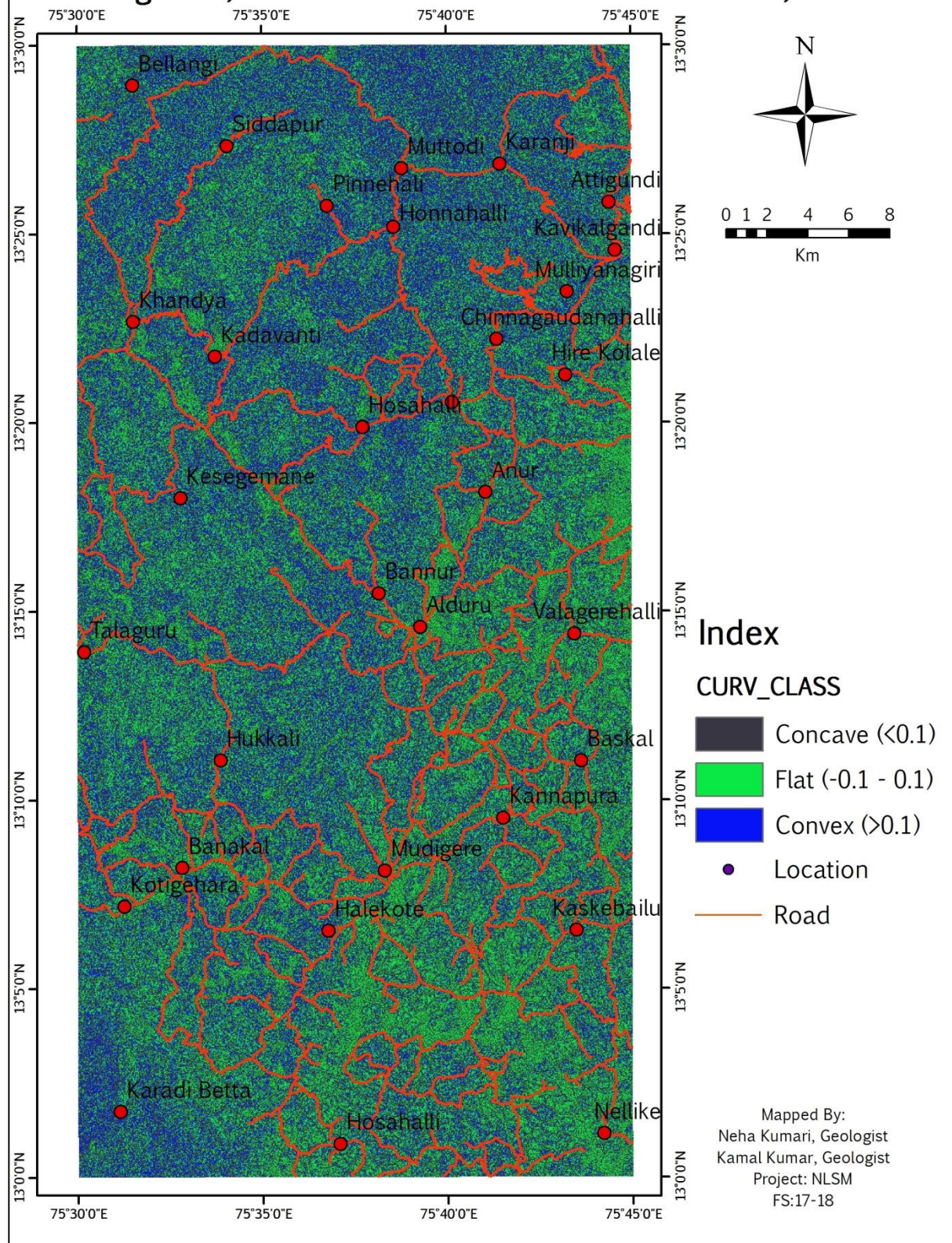
Geomorphology Map in parts of TS Nos. 480/11 & 12
Chikmangaluru, Dakshin Kannad and Hassan districts, Karnataka.



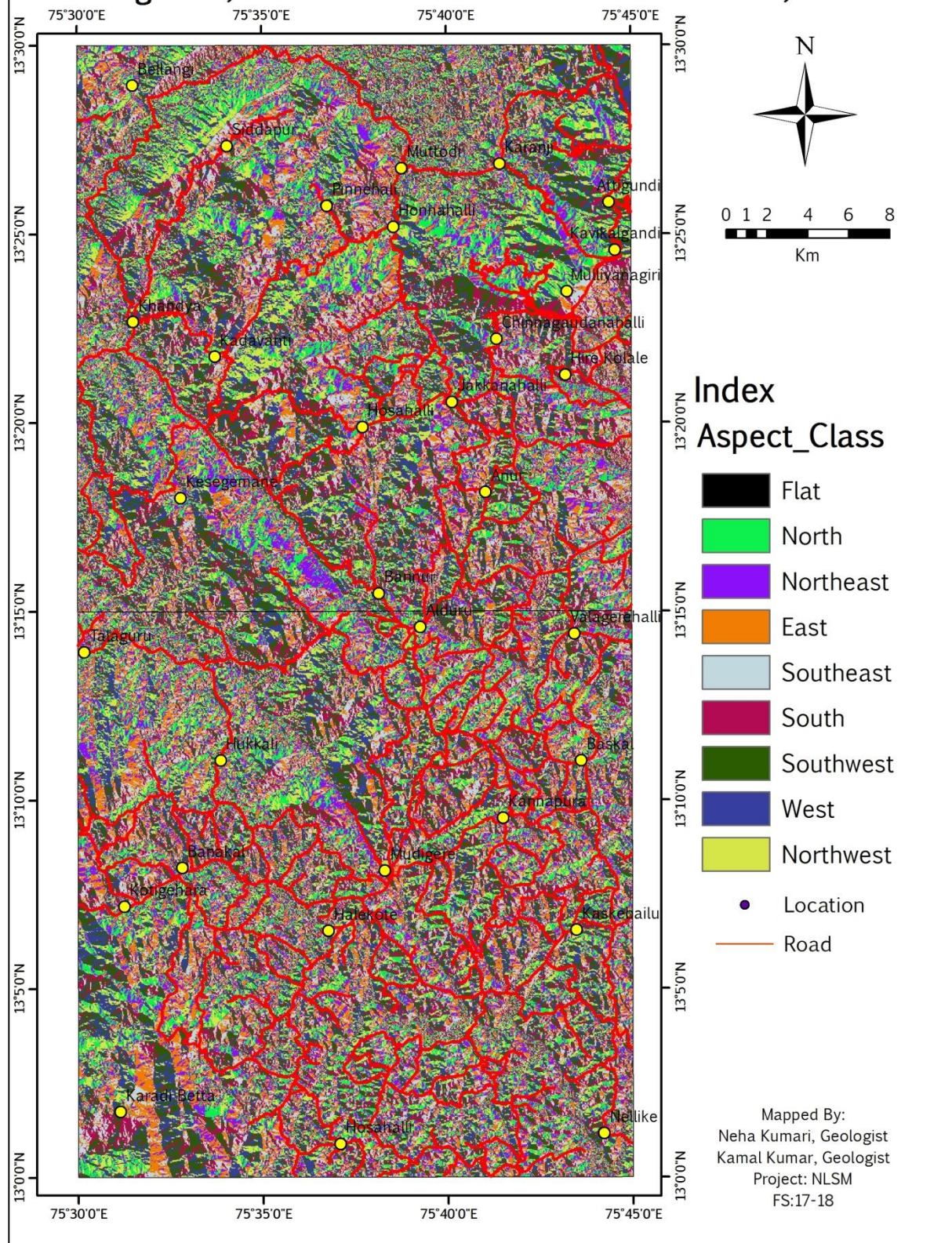
Slope Angle Map in parts of TS Nos. 480/11 & 12 Chikmangaluru, Dakshin Kannad and Hassan districts, Karnataka.



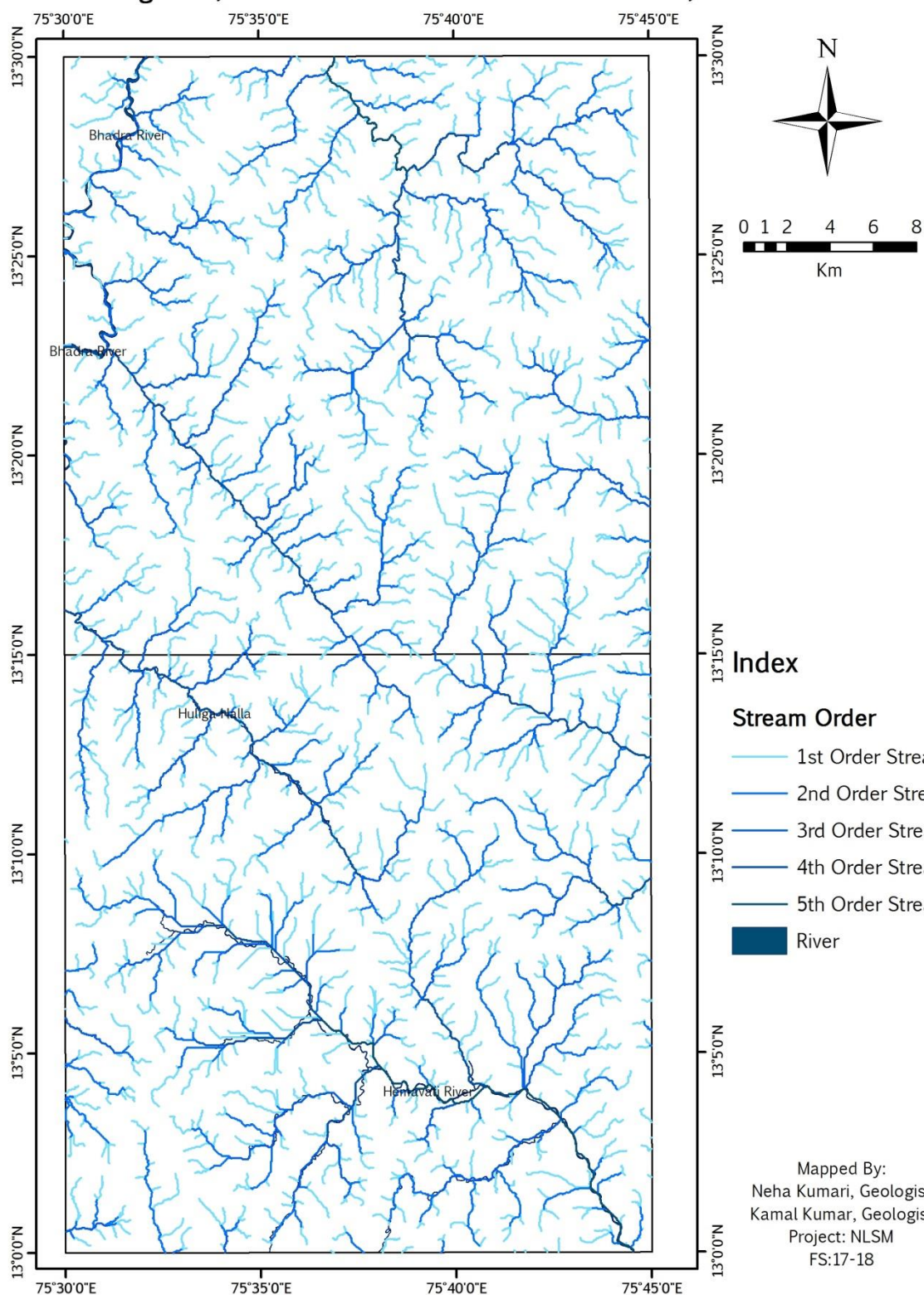
Slope Curvature Map in parts of TS Nos. 480/11 & 12 Chikmangaluru, Dakshin Kannad and Hassan districts, Karnataka.



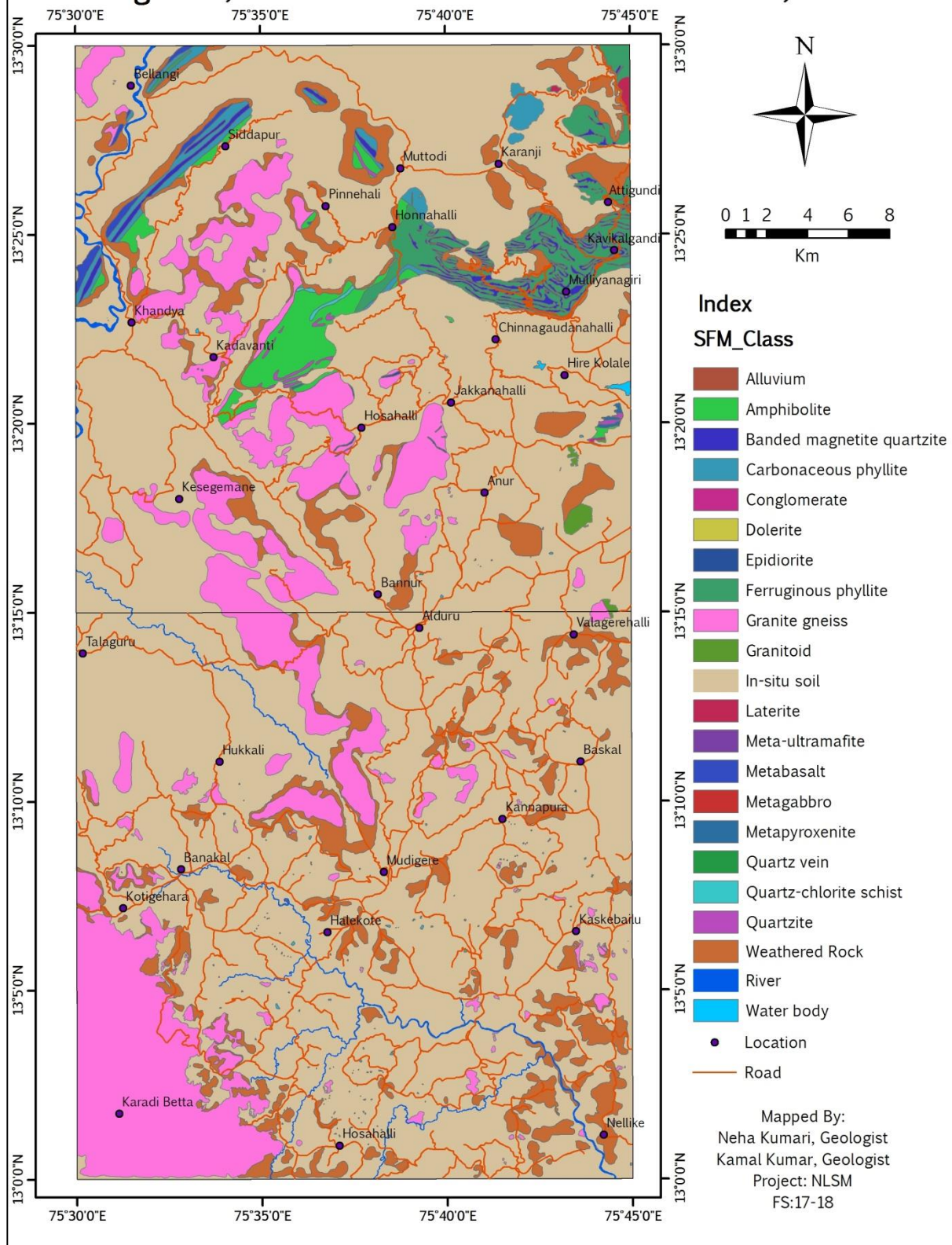
Slope Aspect Map in parts of TS Nos. 480/11 & 12 Chikmangaluru, Dakshin Kannad and Hassan districts, Karnataka.



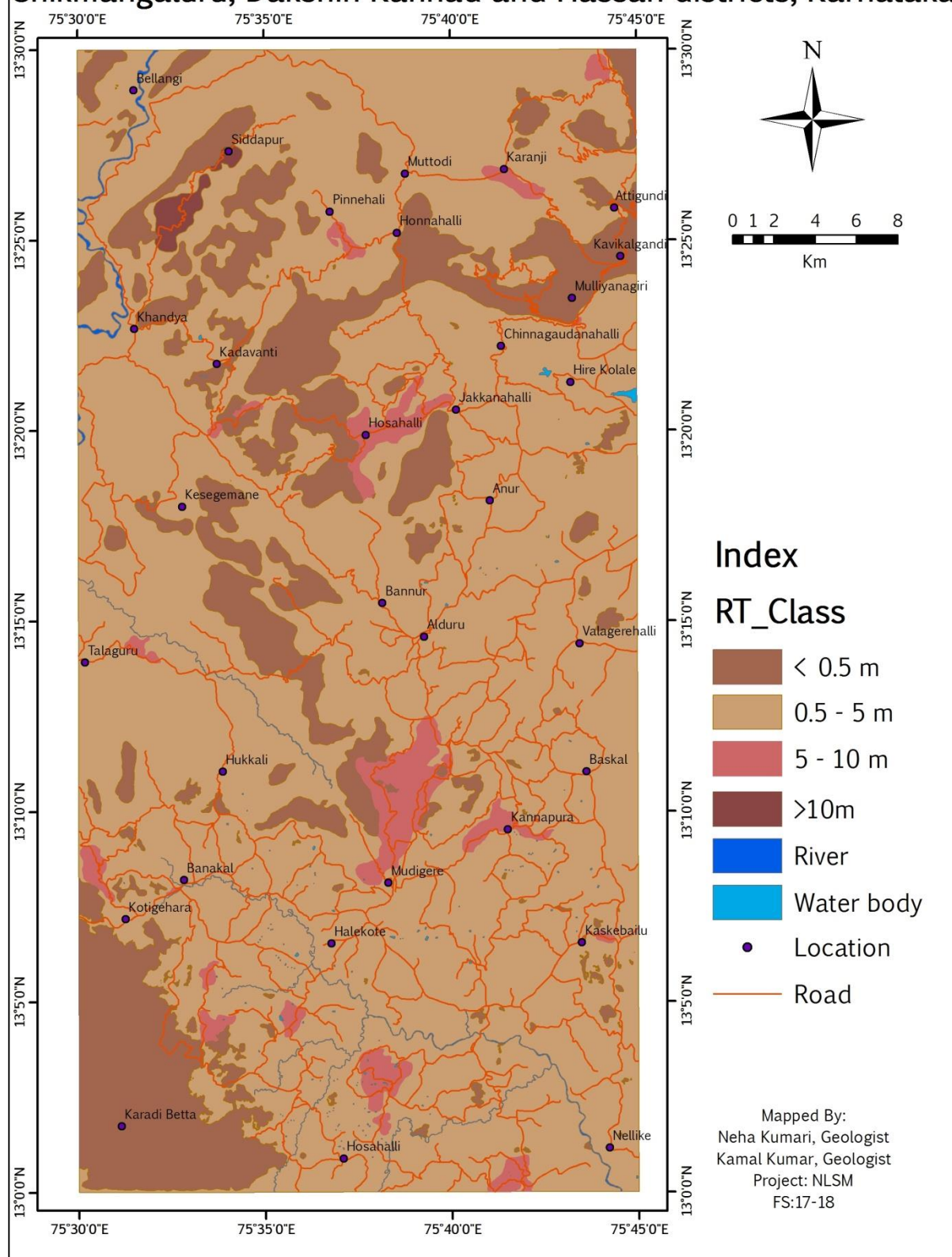
**Drainage Map in parts of TS Nos. 480/11 & 12
Chikmangaluru, Dakshin Kannad and Hassan districts, Karnataka.**



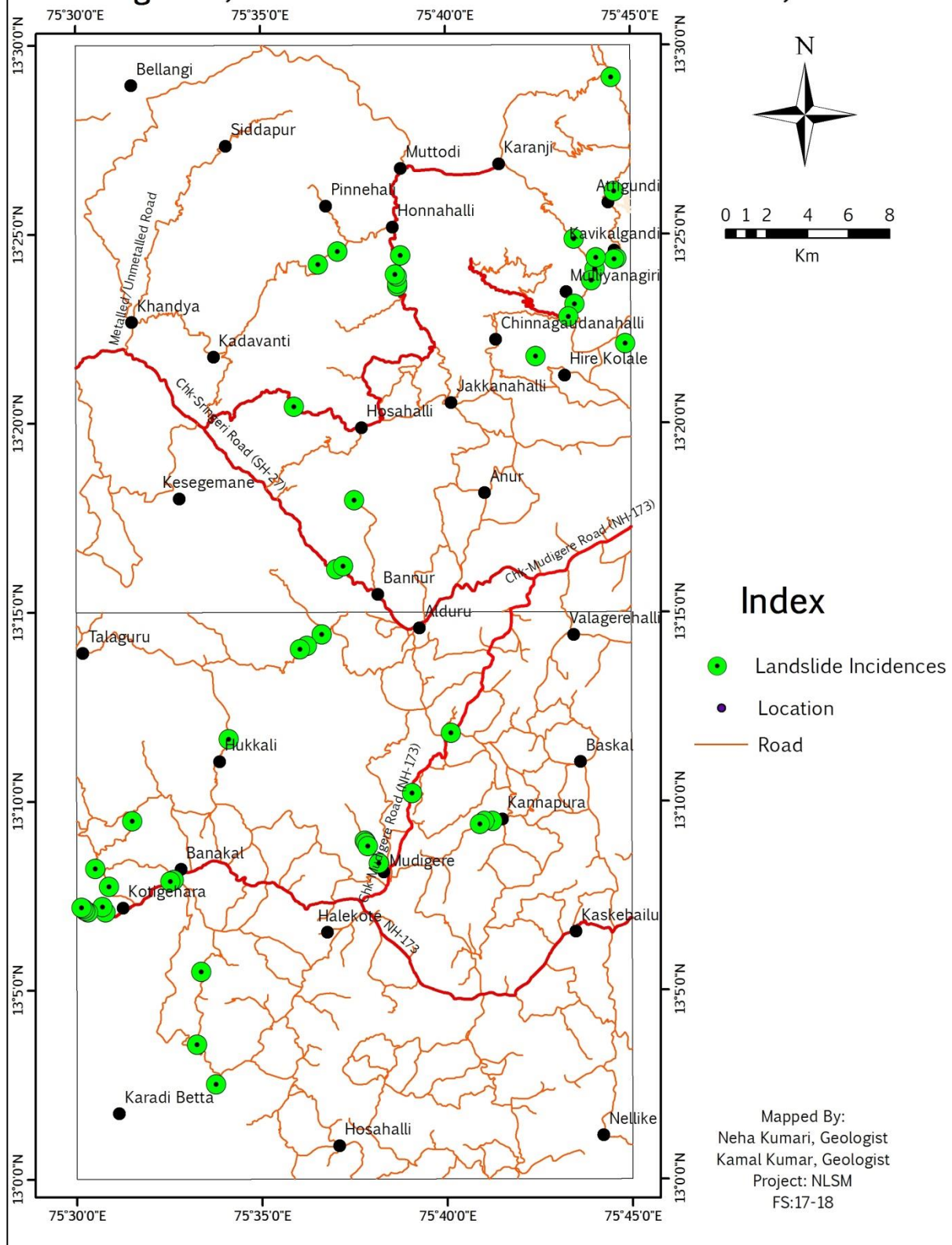
Slope Forming Material Map in parts of TS Nos. 480/11 & 12 Chikmangaluru, Dakshin Kannad and Hassan districts, Karnataka.



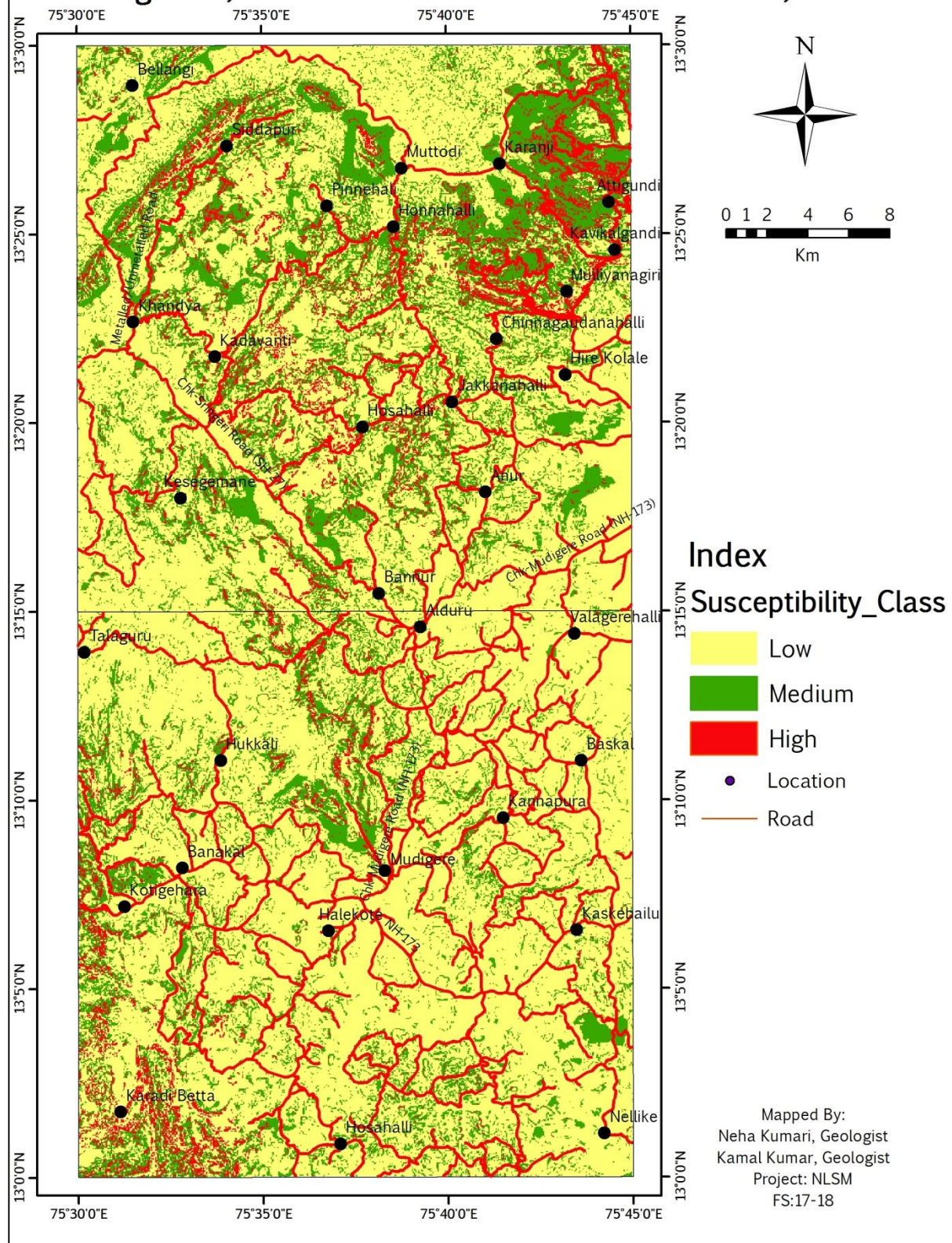
Regolith Thickness Map in parts of TS Nos. 480/11 & 12 Chikmangaluru, Dakshin Kannad and Hassan districts, Karnataka.



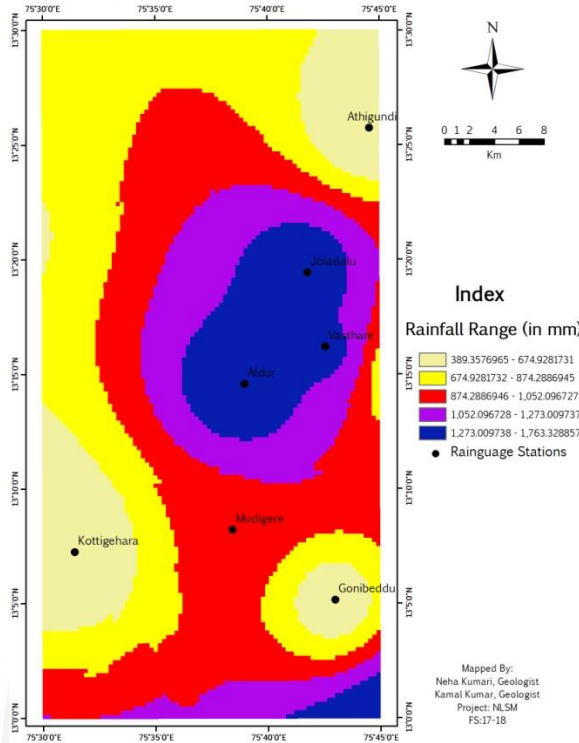
Landslide Inventory Map in parts of TS Nos. 480/11 & 12 Chikmangaluru, Dakshin Kannad and Hassan districts, Karnataka.



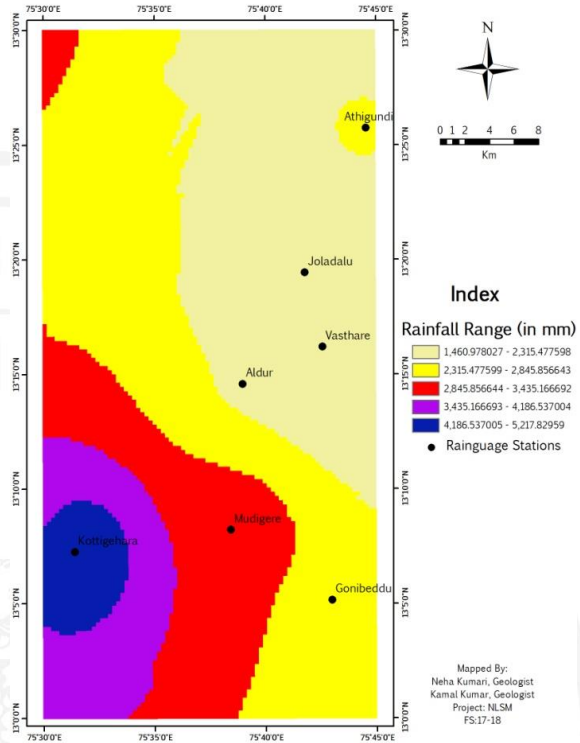
Landslide Susceptibility Map in parts of TS Nos. 480/11 & 12 Chikmangaluru, Dakshin Kannad and Hassan districts, Karnataka.



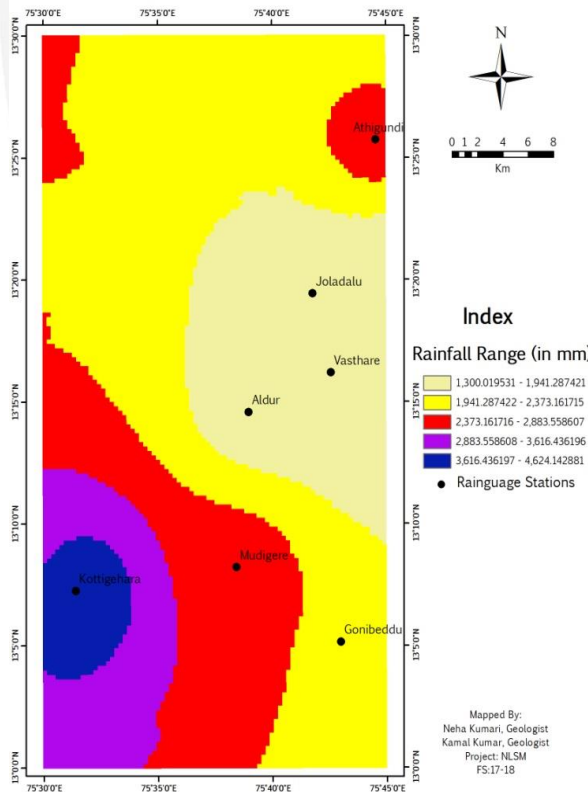
Rainfall Distribution Map for the year 2008 in parts of TS Nos. 480/11 & 12 Chikmangaluru, Dakshin Kannad and Hassan districts, Karnataka.



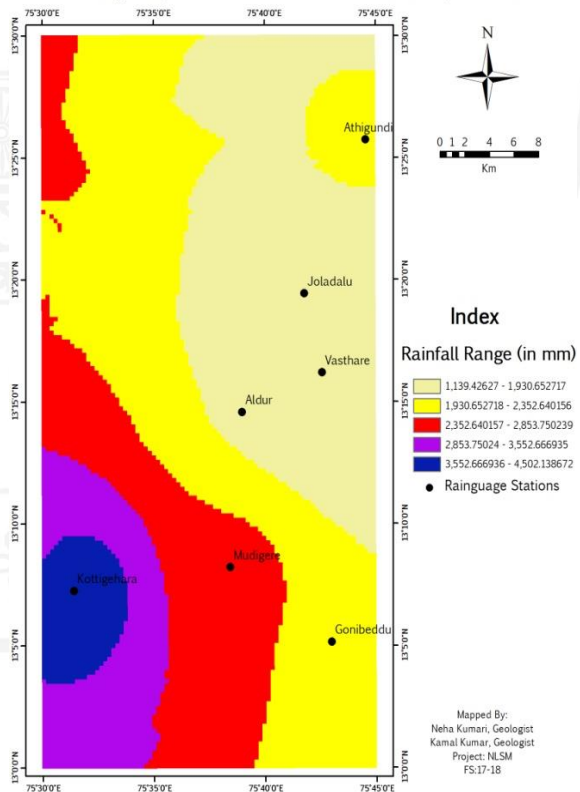
Rainfall Distribution Map for the year 2009 in parts of TS Nos. 480/11 & 12 Chikmangaluru, Dakshin Kannad and Hassan districts, Karnataka.



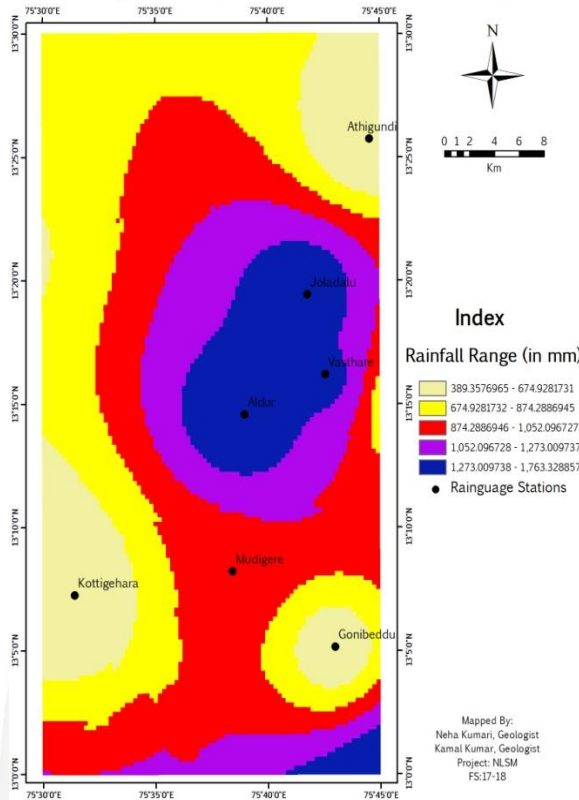
Rainfall Distribution Map for the year 2010 in parts of TS Nos. 480/11 & 12 Chikmangaluru, Dakshin Kannad and Hassan districts, Karnataka.



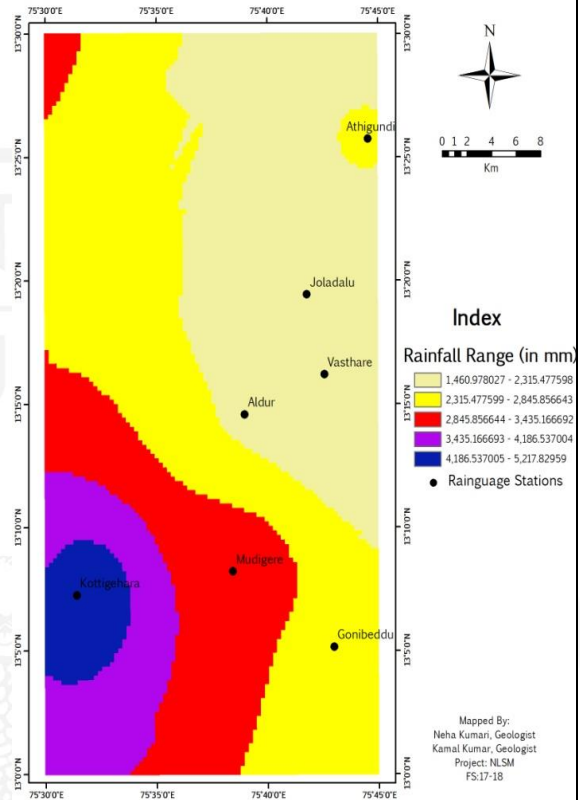
Rainfall Distribution Map for the year 2011 in parts of TS Nos. 480/11 & 12 Chikmangaluru, Dakshin Kannad and Hassan districts, Karnataka.



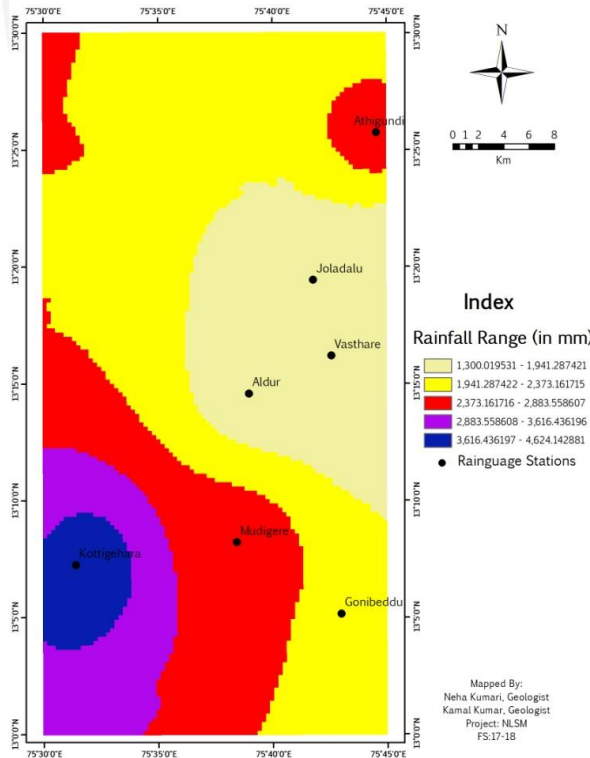
Rainfall Distribution Map for the year 2008 in parts of TS Nos. 480/11 & 12 Chikmangaluru, Dakshin Kannad and Hassan districts, Karnataka.



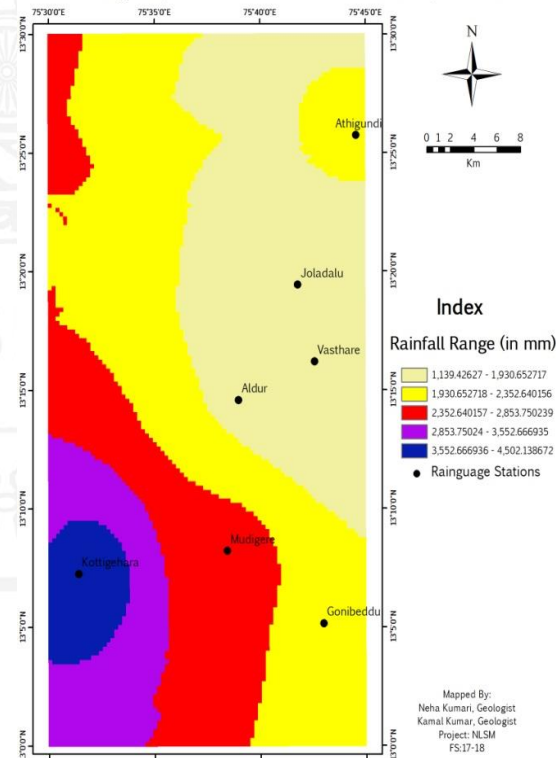
Rainfall Distribution Map for the year 2009 in parts of TS Nos. 480/11 & 12 Chikmangaluru, Dakshin Kannad and Hassan districts, Karnataka.



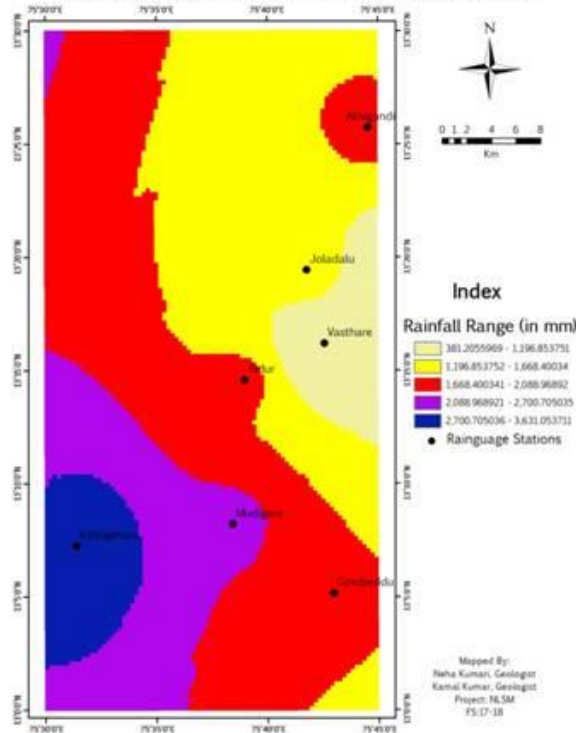
Rainfall Distribution Map for the year 2010 in parts of TS Nos. 480/11 & 12 Chikmangaluru, Dakshin Kannad and Hassan districts, Karnataka.



Rainfall Distribution Map for the year 2011 in parts of TS Nos. 480/11 & 12 Chikmangaluru, Dakshin Kannad and Hassan districts, Karnataka.



Rainfall Distribution Map for the year 2016 in parts of TS Nos. 480/11 & 12 Chikmangaluru, Dakshin Kannad and Hassan districts, Karnataka.



Rainfall Distribution Map for the year 2017 in parts of TS Nos. 480/11 & 12 Chikmangaluru, Dakshin Kannad and Hassan districts, Karnataka.

