NOTE ON POST DISASTER STUDIES FOR LANDSLIDES OCCURRED IN JUNE 2018 AT KOZHIKODE, WAYANAD AND KANNUR DISTRICTS, KERALA

Field Season 2018-2019

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During heavy downpour in the second week of June 2018, a number of landslide incidences were reported in various parts of northern Kerala. Being the nodal agency for landslide studies in the country, Geological Survey of India responded immediately and carried out post disaster landslide studies to assess the slides, evaluate the causative factors and to suggest possible remedial measures. During this study, the landslide inventory details of Kozhikode, Wayanad and Kannur districts have been collected on a 42-point geo-parametric datasheet. A total of 36 nos. of landslide incidences were inventoried including 27 in Kozhikode, 8 in Wayanad and one in Kannur districts. The district wise details of different type of landslide incidences are as follows:

Landslide Type	Kozhikode	Wayanad	Kannur
Debris Flow	14	1	1
Debris Slide	11	3	-
Earth Slide	1	3	-
Debris cum rock flow	1	-	-
Rock cum debris slide	-	1	-
TOTAL	**27**	**8**	**1**

Kozhikode is the worst affected among these three districts with respect to the number of landslide incidences, casualties and property loss. The Karinchola mala landslide in Kattipara Panchayat, Kozhikode District is the most devastating with 14 casualties besides huge property loss. The other flank of the same hill also witnessed huge debris flow event. In Wayanad District, out of the 8 nos. of the landslide incidences inventoried, Achoor (6^{th} mile) and Veetikunnu landslides seems to be more damaging

with one casualty and huge property loss. During this post disaster landslide studies, one debris flow incidence (Parakkamala landslide) which is a reactivated one (earlier in July 2007) has also been collected from Ayyankunnu Panchayat of Kannur District. It is inferred from the site conditions that the instability in the slope has been induced by reduction of strength on saturation and increase in pore water pressure. The heavy downpour prior to landslide owing to oversaturation of slope forming material and development of high hydrostatic pressure resulted in these landslide events.

LANDSLIDE INVENTORY ASSESSMENTS

1. Kozhikode District

A total of twenty seven major landslide incidences were reported from Kozhikode District (Fig. 1). The Karinchola mala slide, which occurred on 14th June 2018 at 05:00 hrs is a complex one which caused 14 casualties besides huge property loss. This slide is of debris flow type initiated as planar translational debris slide and later transformed to debris flow with four prominent run-out chutes.

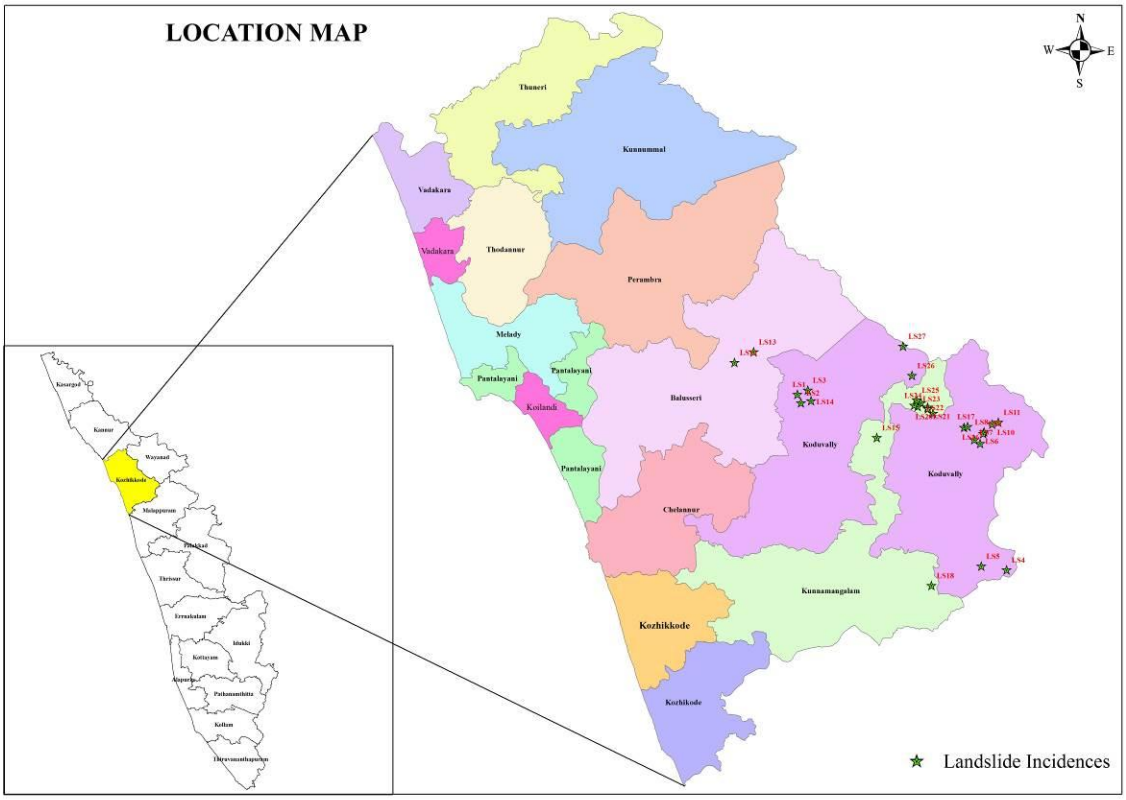


Fig. 1 : Location of landslide incidences at Kozhikode District

The details of the geo-technical investigation carried out at Karinchola mala is described below:

Karinchola mala Landslide

Karinchola mala forms part of a 2 km long ridge whose flanks are of steeply to moderately sloping with a maximum elevation of about +435 m from a datum of about 65 m. The ridge at its upper reaches forms an escarpment with negligible soil cover and a break in slope at its toe area from where slope grades into moderate. The area has been witnessing slope failures from the past and during the monsoon of 2018, the area suffered number of landslides on both flanks. The one at Karinchola mala (75° 55′ 17″ E, 11° 28′ 15″ N) claimed 14 lives besides complete damage of plantation and property (Figs. 2, 3 & 4). The landslide investigation studies hinted an interesting mechanism of failures which originally initiated as debris slide probably due to excess cleft water pressure in the discontinuities from the toe of the escarpment, which progressively gathered the nature of a soil / debris flow by shearing the super-saturated loose overburden media in its path. The distressed material flows through four prominent run-out chutes (Fig. 5). The detached rock boulders are of the size in the order of even 14 m x 7 m x 5 m. The overburden thickness is hardly up to about 2 m in the southern flank whereas it is slightly more in the north. The controls of the joints / discontinuities are obvious in the incident, that they form huge potential rock blocks prone to sliding.

Geomorphologically, the area forms part of the lowly dissected slope. Hornblende biotite gneiss and migmatite with pegmatite veins are the predominant rock units exposed in the area. Mylonite bands are also present (Fig. 6). Foliation, foliation parallel joints and four other sets of joints are the predominant discontinuities deciphered in the rock mass. The general foliation is dipping 80º towards N 100º. Four sets of prominent joints are:

1. *Foliation parallel joint*
2. *Joint dipping 56º towards N 100º*
3. *Joint dipping 30º towards N 155º (Valley dipping)*
4. *Joint dipping 32º towards N 80º*
5. *Joint dipping 85º towards N 64º (open penetrative joint along one of the run-out chutes in the left flank)*

Though five sets of prominent joints are present in the total rock mass, at a given location only two to three sets are generally noticed.

Landslide initiated as planar failure at the contact between rock and overburden in the form of debris slide and then transformed into debris flow and discharged through four run-out chutes. It accounts for a death of 14 persons including children. During the downward flow it totally washed out five houses and three houses got partly damaged at downslope area (Figs. 7 & 8). Four persons were severely injured and livestocks were also affected. The entire vegetation and plantation along the hill slope area got washed out during this slide and the material got transported up to a distance of about 620 m from the crown (Figs. 9 & 10). The approach road located downslope of the Karinchola mala, its RR masonry retaining wall, the culverts at the road level, electric transmission lines, electric poles and 2 nos. of transformers were washed away (Figs. 11 & 12). One motor car is also trapped in the debris material. The slide initiated as a planar failure with the slide plane dipping 35º towards N 176º (Fig. 13). One penetrative sub-vertical joint is present along one of the chutes on the left flank which passes through the entire length of the slide plane (Fig. 14).

During field investigation it is observed that a number of precarious rock boulders are perched within the distressed zone (Fig. 15). The details of the prominent precarious boulders on the slide plane are as follows:

Sl. No.	Boulder	Location (Latitude; Longitude)	Dimension (L x W x H)
1	Boulder - 1	75.9214; 11.4706	4m x 3m x 2m
2	Boulder - 2	72.9215; 11.4698	15m x 12m x 7m
3	Boulder - 3	75.9212; 11.4697	4.5m x 1.5m x 1.5m
4	Boulder - 4	75.9215; 11.4696	6m x 2.5m x 3.5m
5	Boulder - 5	75.9213; 11.4693	4m x 1.5m x 1.5m
6	Boulder – 6	75.9218; 11.4687	14m x 7m x 5m
7	Boulder – 7	75.9218; 11.4687	6m x 3.5m x 2m
8	Boulder – 8	75.9215; 11.4684	13m x 11m x 5m
9	Boulder – 9	75.9220; 11.4683	4m x 3m x 2m
10	Boulder – 10	75.9214; 11.4678	3m x 0.5m x 2m

These precarious boulders present along the slide plane are to be removed immediately. Debris material along the naturally occurring nala on the right flank of the landslide has to be removed and the free flow of water through it may be restored.

A vertical rockcut observed below the crown area may have disturbed the toe which is inferred as one of the causative factors (Fig. 16). The depression made by this rockcut to hold huge amount of water at that level may have breached due to the impact of huge rock boulder transported from upslope (Fig. 17) augmented the intensity of the landslide. During this slide most of the debris material present on the hill slope has been washed out and the rock outcrop is exposed at several places. The threat of downward movement of the remaining disturbed material and the huge rock blocks are still there and it is advised to avoid habitations in this slope. The material and the rock blocks may be removed and it is also suggested that a detailed geo-technical study of the distressed portion and adjacent area may be conducted prior to any construction or development work at this location.

Fig. 2: Distant view of Karinchola mala landslide

Fig. 3: Close view of Karinchola mala landslide

Fig. 4: View towards uphill - Karinchola mala landslide

Fig. 5: Flow chutes through which debris material flown

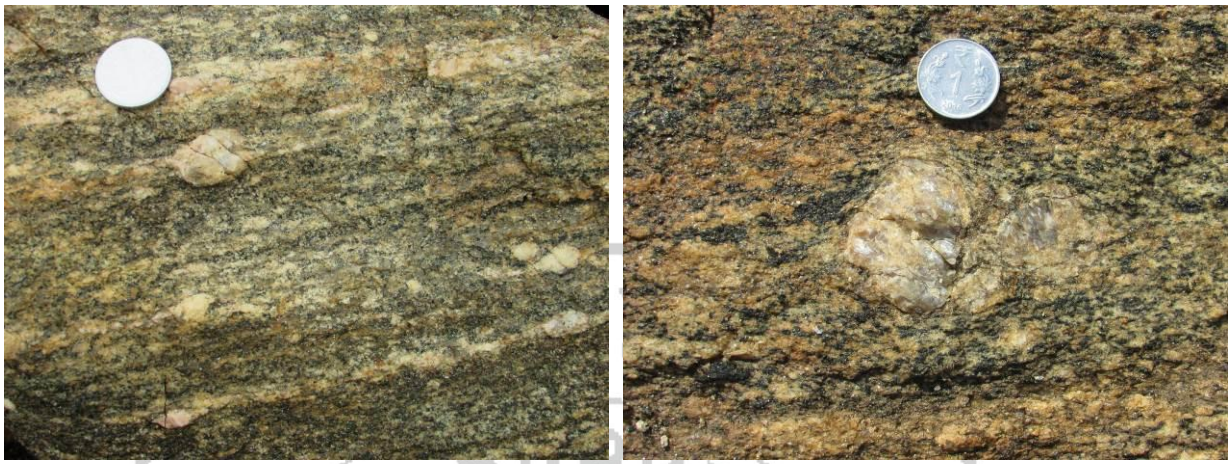


Fig. 6: Mylonites representing shear zone exposed at the landslide plane

Fig. 7: Location of the houses washed out during the landslide

Fig. 8: Houses damaged during the landslide

Fig. 9: View from crown towards the toe portion of the landslide

Fig. 10: Accumulation zone of the Karinchola mala landslide.

Fig. 11: Damaged RR masonry retaining wall of the road.

Fig. 12: Damaged road and culvert due to the debris flow

Fig. 13: Crown portion of the Karinchola mala landslide

Fig. 14: Sub-vertical penetrative joint along one of the debris chutes exposed on the left flank




Fig. 15: Precarious boulders of various sizes observed along the slide plane

Fig. 16: Sharp rock cut at top of the hill

Fig. 17: Huge rock boulder whose impact probably caused the breaching of the collected water in the rock cut depression.

The details of all the landslides studied in the district are given in ***Annexure I.***

2. Wayanad District

During this period, a total of 8 nos. of landslide incidences has been collected as part of the post disaster landslide studies in Wayanad district. On the basis of the type of

incidences, there are 3 nos. of each in earth and debris slide, one in debris flow and remaining one in rock cum debris slide type. The details of all these landslide incidences are collected on a 42-point geo-parametric sheet for landslide inventory and given in Annexure - 1.

3. Kannur District

Only one landslide incidence is reported from Kannur district which is a debris flow type. The details are given in Annexure – 1. The Makkootam area got flooded due to landslide incidences occurred in deep forest in the Kerala-Karnataka border.

(ANNEXURE-I)

Slide-1:

No	Field		Description
1	Slide No.	:	*KER/KKD/49M15/2018/01*
2	State	:	*Kerala*
3	District	:	*Kozhikode*
4	Toposheet No.	:	*49 M/15*
5	Name of the slide	:	*Karinchola mala slide*
6	NH/SH/Locality	:	*Punur – Kattipara road*
7	Latitude	:	*11.4708*
8	Longitude	:	*75.9213*
9	Length	:	*260 m*
10	Width	:	*60 m (Measured at middle portion of the slide)*
11	Height	:	*130 m*
12	Area	:	*15600 m^2*
13	Depth	:	*3 m*
14	Volume	:	*46800 m^3*
15	Runout distance	:	*360 m*
16	Type of Material	:	*Debris*
17	Type of movement	:	*Flow*
18	Rate of movement	:	*Extremely rapid*
19	Activity	:	*Active*
20	Distribution	:	*Confined*
21	Style	:	*Complex*
22	Failure mechanism	:	*Shallow planar (≤ 5m) failure*
23	History	:	*14th June 2018 (05:00 hrs)*
24	Geomorphology	:	*Lowly dissected slope. Landslide occurred in the southern flank of the Karinchola mala and slide flow is towards N 170º.*
25	Geology/Lithology	:	*Hornblende biotite gneiss and migmatite with pegmatite veins at places. Mylonite bands are also present.*
26	Structure	:	*Foliation dipping 80º towards N 100º. Joint planes : Dipping 56º towards N 100º, Dipping 30º towards N 155º (Valley dipping), Dipping 85º towards N 60º, Dipping 32º towards N*

			80º and Dipping 85º towards N 64º (open penetrative joint along one of the runout chutes in the left flank). A shear band dipping 72º towards N 105º. Slide movement plane dipping 35º towards N 176º.
27	Landuse/ Landcover	:	*Mixed cultivation (Rubber and coconut)*
28	Hydrological condition	:	*Wet*
29	Triggering Factor	:	*Heavy Rainfall*
30	Death of persons	:	*14 nos.*
31	People affected	:	*4 nos.*
32	Livestock Loss	:	-
33	Communication	:	*Road and transmission line damaged. Electric polls and two transformers washed out.*
34	Infrastructure	:	*Five nos. of houses totally washed out and three houses partly damaged. One car damaged.*
35	Agriculture/forest/Barren	:	*Settlement area with cultivation*
36	Geo-scientific Causes	:	*Landslide initiated as planar failure at the contact between rock and overburden in the form of debris slide and then transformed into debris flow along four runout chutes. Unscientific hill slope modification resulted in the removal of toe support. Excessive rainfall is the triggering factor which resulted in the reduction of strength on saturation and increase in pore water pressure.*
37	Remedial measures	:	*The precarious boulders of different dimensions (Details of prominent precarious boulders are given in the note) present along the slide plane are to be removed immediately. Debris material along the naturally occurring nala on the right flank of the landslide has to be removed for the free flow of water.*
38	Remarks, if any		*Vertical rock cut observed below the crown area may have disturbed the toe which is inferred as one of the causative factors. The depression made by this rock cut to hold huge amount of water at that level which may have breached due to the impact of huge rock boulder transported from upslope augmented the intensity of the landslide. During this slide most of the debris material present on the hill slope has been washed out and the rock outcrop is exposed at several places. The threat of downward movement of the remaining disturbed material and the huge rock blocks are still there and it is advised to avoid habitations in this slope. The material and the rock blocks may be removed and it also suggested that a detailed geo-technical study of the distressed portion and adjacent area may be conducted prior to any construction or development work at this location.*

39	Photos. Sketch of Plan & section of the slide	:	
40	Summary/Abstract	:	*On 14th June 2018 a huge landslide occurred at Karinchola mala in Kattipara Panchayat resulted in the death of 14 people along with huge property loss. The landslide initiated as a planar failure and then transformed to debris flow along four runout chutes. The important geoscientific causes include unscientific hill slope modification that resulted in the removal of toe support. Excessive rainfall is the triggering factor which resulted in the reduction of strength on saturation and increase in pore water pressure. The depression made by the rock cut to hold huge amount of water below the crown level may have breached due to the impact of huge rock boulder transported from upslope augmented the intensity of the landslide. The immediate remedial measures include the removal of precarious boulders present along the slide plane and the remaining disturbed debris material. For further modification of the hill slope, a detailed geo-technical study of the distressed portion and adjacent area is recommended.*
41	Date of Reporting	:	*29/06/2018*
42	Landslide Category	:	*Category I*

Slide-2:

No	Field		Description
1	Slide No.	:	*KER/KKD/49M15/2018/02*
2	State	:	*Kerala*
3	District	:	*Kozhikode*
4	Toposheet No.	:	*49 M/15*
5	Name of the slide	:	*Vettiozhinja Thottam Landslide*
6	NH/SH/Locality	:	*Vettiozhinjathottam - Karinchola road*
7	Latitude	:	*11.4633*
8	Longitude	:	*75.9248*
9	Length	:	*50 m*
10	Width	:	*12 m*
11	Height	:	*20 m*
12	Area	:	*600 m^2*

13	Depth	:	*1.5 m*
14	Volume	:	*900 m^3*
15	Runout distance	:	*55 m*
16	Type of Material	:	*Debris*
17	Type of movement	:	*Slide*
18	Rate of movement	:	*Very Rapid*
19	Activity	:	*Active*
20	Distribution	:	*Retrogressive*
21	Style	:	*Single*
22	Failure mechanism	:	*Shallow rotational (≤ 5m) failure*
23	History	:	*14th June 2018 (03:15 hrs)*
24	Geomorphology	:	*Lowly dissected slope. Landslide occurred in the southern flank of the hill and slide flow is towards N 180º.*
25	Geology/Lithology	:	*Highly weathered and fractured hornblende biotite gneiss.*
26	Structure	:	-
27	Landuse/ Landcover	:	*Cultivation (Rubber)*
28	Hydrological condition	:	*Dry. During rainy period spring appeared on slope*
29	Triggering Factor	:	*Heavy Rainfall*
30	Death of persons	:	*Nil*
31	People affected	:	*4 nos.*
32	Livestock Loss	:	*Six goats dead*
33	Communication	:	*Nil*
34	Infrastructure	:	*Two houses totally damaged. 10 cents of land affected.*
35	Agriculture/forest/Barren	:	*Settlement area with rubber plantation*
36	Geo-scientific Causes	:	*Unscientific hill slope modification for construction of houses and plantation. Incessant rainfall resulted in reduction of strength on saturation and increase in pore water pressure.*
37	Remedial measures	:	*Construction of retaining wall with proper drainage out let. Natural flow of water along the hill slope should not be blocked.*
38	Remarks, if any		-
39	Photos. Sketch of Plan & section of the slide	:	

40	Summary/Abstract	:	*A debris flow has occurred on 14th June 2018 along the southern slope of the hill at Vettiozhinja thottam. Unscientific hill slope modification for construction of houses and plantation along with incessant rainfall resulted in the reduction of strength on saturation and increase in pore water pressure. Immediate remedial measures include construction of retaining wall with proper drainage outlet. Natural flow of water along the hill slope should not be blocked.*
41	Date of Reporting	:	*29/06/2018*
42	Landslide Category	:	*Category II*

Slide-3:

No	Field		Description
1	Slide No.	:	*KER/KKD/49M15/2018/03*
2	State	:	*Kerala*
3	District	:	*Kozhikode*
4	Toposheet No.	:	*49 M/15*
5	Name of the slide	:	*Kalvari Landslide*
6	NH/SH/Locality	:	*Kattipara - Chamal road*
7	Latitude	:	*11.4747*
8	Longitude	:	*75.9306*
9	Length	:	*80 m*
10	Width	:	*10 m*
11	Height	:	*60 m*
12	Area	:	*800 m^2*
13	Depth	:	*6 m*
14	Volume	:	*48000 m^3*
15	Runout distance	:	*130 m*
16	Type of Material	:	*Debris*
17	Type of movement	:	*Flow*
18	Rate of movement	:	*Very Rapid*
19	Activity	:	*Active*
20	Distribution	:	*Confined*
21	Style	:	*Complex*
22	Failure mechanism	:	*Deep rotational (≥ 5m) failure*
23	History	:	*14th June 2018 (04:30 hrs)*
24	Geomorphology	:	*Lowly dissected slope. Landslide occurred in the northern flank of the Karinchola mala and slide flow is towards N 20º.*
25	Geology/Lithology	:	*Weathered hornblende biotite gneiss.*
26	Structure	:	*Foliation and foliation parallel joint dipping 70º towards N 165º*
27	Landuse/ Landcover	:	*Mixed cultivation (Rubber and coconut at uphill side)*
28	Hydrological condition	:	*Wet*
29	Triggering Factor	:	*Heavy Rainfall*
30	Death of persons	:	*Nil*
31	People affected	:	*Nil*
32	Livestock Loss	:	*Nil*

33	Communication	:	*Nil*
34	Infrastructure	:	*Two houses totally and one house partially damaged. One pump house with tank damaged. About 4.5 acres agricultural land destroyed.*
35	Agriculture/forest/Barren	:	*Settlement area with cultivation*
36	Geo-scientific Causes	:	*Landslide initiated as deep rotational failure at the contact between rock and overburden in the form of debris slide and then transformed in to debris flow along two runout chutes. Excessive rainfall is the triggering factor which resulted in the reduction of strength on saturation and increase in pore water pressure.*
37	Remedial measures	:	*Precarious boulders present in the debris flown path may be safely removed. Natural drainage path has to be maintained for avoiding water logged situation.*
38	Remarks, if any		*The slope forming material present near the crown area is soil and debris with a thickness of 0 to 0.5m and towards the downslope area it changes to soil, lithomarge and weathered rock with the thickness of the column increases up to 6m. The distressed material flows through two runout chutes of which one is a tributary channel already present in the site.*
39	Photos. Sketch of Plan & section of the slide	:	 
40	Summary/Abstract	:	*On 14th June 2018, a debris flow occurred on the northern flank of Karinchola mala. The landslide initiated as deep*

			rotational failure at the contact between rock and overburden in the form of debris slide and then transformed in to debris flow along two runout chutes. Excessive rainfall is the triggering factor which resulted in the reduction of strength on saturation and increase in pore water pressure. Precarious boulders present in the debris flown path may be safely removed. Natural drainage path has to be maintained for avoiding water logged situation.
41	Date of Reporting	:	*29/06/2018*
42	Landslide Category	:	*Category II*

Slide-4:

No	Field		Description
1	Slide No.	:	*KER/KKD/58A3/2018/04*
2	State	:	*Kerala*
3	District	:	*Kozhikode*
4	Toposheet No.	:	*58 A/3*
5	Name of the slide	:	*Kakkadampoyil Landslide*
6	NH/SH/Locality	:	*Kakkadampoyil - Nilambur road*
7	Latitude	:	*11.3191*
8	Longitude	:	*76.1109*
9	Length	:	*70 m*
10	Width	:	*18 m*
11	Height	:	*25 m*
12	Area	:	*1260 m^2*
13	Depth	:	*1.5 m*
14	Volume	:	*1890 m^3*
15	Runout distance	:	*45 m*
16	Type of Material	:	*Debris*
17	Type of movement	:	*Slide*
18	Rate of movement	:	*Rapid*
19	Activity	:	*Active*
20	Distribution	:	*Retrogressive*
21	Style	:	*Single*
22	Failure mechanism	:	*Shallow planar (≤ 5m) failure*
23	History	:	*14^{th} June 2018*
24	Geomorphology	:	*Lowly dissected slope. Landslide occurred in the southern flank of the hill and slide flow is towards N 215º.*
25	Geology/Lithology	:	*Granite gneiss. Weathered at places.*
26	Structure	:	*Slide plane dipping 45º towards N 220º.*
27	Landuse / Landcover	:	*Mixed cultivation*
28	Hydrological condition	:	*Wet*
29	Triggering Factor	:	*Heavy Rainfall*
30	Death of persons	:	*Nil*
31	People affected	:	*Nil*
32	Livestock Loss	:	*Nil*
33	Communication	:	*Nil*
34	Infrastructure	:	*Nil*

35	Agriculture/forest/Barren	:	*Cultivated land destroyed*
36	Geo-scientific Causes	:	*Landslide occurred as planar failure at the contact between rock and overburden in the form of debris slide. Unscientific hill slope modification resulted in the removal of toe support. Excessive rainfall is the triggering factor which resulted in the reduction of strength on saturation and increase in pore water pressure.*
37	Remedial measures	:	*Proper retaining structures with drain holes have to be provided.*
38	Remarks, if any		*On the right flank of the slide one tributary nala (natural) is present. At the toe portion, a pond and well with pump house is seen. At the crown area, the overburden thickness is 0 to 0.5 m and towards downslope it increases to 0.5 to 5 m. A water theme park is present on the top portion of the hill (saddle area).*
39	Photos. Sketch of Plan & section of the slide	:	
40	Summary/Abstract	:	*A debris slide occurred on 14th June 2018 downhill side of the water theme park located at Kakkadampoyil. The landslide occurred as planar failure at the contact between rock and overburden in the form of debris slide. Unscientific hill slope modification resulted in the removal of toe support. Excessive rainfall is the triggering factor which resulted in the reduction of strength on saturation and increase in pore water pressure. The overburden thickness varies from 0 to 0.5 m at top and towards downslope it increases to 0.5 to 5 m. Proper retaining structures with drain holes has to be provided.*
41	Date of Reporting	:	*01/07/2018*
42	Landslide Category	:	*Category III*

Slide-5:

No	Field		Description
1	Slide No.	:	*KER/KKD/58A3/2018/05*
2	State	:	*Kerala*

3	District	:	*Kozhikode*
4	Toposheet No.	:	*58 A/3*
5	Name of the slide	:	*Kooderanji Landslide*
6	NH/SH/Locality	:	*Kooderanji - Kakkadampoyil road*
7	Latitude	:	*11.3221*
8	Longitude	:	*76.0883*
9	Length	:	*40 m*
10	Width	:	*8 m*
11	Height	:	*25 m*
12	Area	:	*320 m^2*
13	Depth	:	*1 m*
14	Volume	:	*320 m^3*
15	Runout distance	:	*Up to the road bench level*
16	Type of Material	:	*Debris*
17	Type of movement	:	*Flow*
18	Rate of movement	:	*Rapid*
19	Activity	:	*Active*
20	Distribution	:	*Confined*
21	Style	:	*Complex*
22	Failure mechanism	:	*Shallow rotational (≤ 5m) failure*
23	History	:	*14th June 2018*
24	Geomorphology	:	*Lowly dissected slope. Debris flow direction is towards N 20º. Upslope is steeply sloping (escarpment) and downslope is having moderate slope*
25	Geology/Lithology	:	*Weathered gneiss*
26	Structure	:	-
27	Landuse/ Landcover	:	*Mixed vegetation*
28	Hydrological condition	:	*Dry*
29	Triggering Factor	:	*Heavy Rainfall*
30	Death of persons	:	*Nil*
31	People affected	:	*Nil*
32	Livestock Loss	:	*Nil*
33	Communication	:	*Kooderanji – Kakkadampoyil road blocked*
34	Infrastructure	:	*Nil*
35	Agriculture/forest/Barren	:	*Mixed vegetation area damaged*
36	Geo-scientific Causes	:	*Landslide initiated as rotational failure at the contact between rock and overburden in the form of debris slide and then transformed in to debris flow along the pre-existing nala path. Excessive rainfall is the triggering factor which resulted in the reduction of strength on saturation and increase in pore water pressure.*
37	Remedial measures	:	*Precarious boulders along the debris flow path have to be removed. The natural flow should not be blocked along the nala.*
38	Remarks, if any		-

39	Photos. Sketch of Plan & section of the slide	:	
40	Summary/Abstract	:	*A debris flow occurred on 14th June 2018 at Kooderanji. Landslide initiated as debris slide and then transformed in to debris flow along the pre-existing nala path. Excessive rainfall is the triggering factor which resulted in the reduction of strength on saturation and increase in pore water pressure. Precarious boulders along the debris flow path have to be removed. The natural flow should not be blocked along the nala.*
41	Date of Reporting	:	*01/07/2018*
42	Landslide Category	:	*Category III*

Slide-6:

No	Field		Description
1	Slide No.	:	*KER/KKD/58A3/2018/06*
2	State	:	*Kerala*
3	District	:	*Kozhikode*
4	Toposheet No.	:	*58 A/3*
5	Name of the slide	:	*Muthappanpuzha Landslide*
6	NH/SH/Locality	:	*Anakkampoyil – Karimbu - Poomarathumkolli road*
7	Latitude	:	*11.4302*
8	Longitude	:	*76.0854*
9	Length	:	*20 m*
10	Width	:	*8 m*
11	Height	:	*16 m*
12	Area	:	*160 m^2*
13	Depth	:	*1 m*
14	Volume	:	*160 m^3*
15	Runout distance	:	*180 m*
16	Type of Material	:	*Debris cum rock*
17	Type of movement	:	*Flow*
18	Rate of movement	:	*Rapid*
19	Activity	:	*Active*
20	Distribution	:	*Confined*

21	Style	:	*Complex*
22	Failure mechanism	:	*Shallow rotational (≤ 5m) failure*
23	History	:	*13th June 2018 (17:00 hrs)*
24	Geomorphology	:	*Lowly dissected slope. Debris flow towards N 340º*
25	Geology/Lithology	:	*Charnockite gneiss. Gneissic bands at places.*
26	Structure	:	-
27	Landuse/ Landcover	:	*Mixed vegetation*
28	Hydrological condition	:	*Dry*
29	Triggering Factor	:	*Heavy Rainfall*
30	Death of persons	:	*Nil*
31	People affected	:	*Nil*
32	Livestock Loss	:	*Nil*
33	Communication	:	*Road damaged*
34	Infrastructure	:	*Nil*
35	Agriculture/forest/Barren	:	*Arecanut plantation in 0.5 acre affected*
36	Geo-scientific Causes	:	*Landslide initiated as debris slide and then transformed in to debris flow. Incessant rainfall is the triggering factor which resulted in the reduction of strength on saturation and increase in pore water pressure.*
37	Remedial measures	:	*Precarious boulders along the debris flow path have to be removed. Ensure free flow of water along the hill slopes.*
38	Remarks, if any		-
39	Photos. Sketch of Plan & section of the slide	:	 
40	Summary/Abstract	:	*On 13th June 2018 a debris-cum-rock flow occurred at*

			Muthappanpuzha. This landslide initiated as debris slide and then transformed in to debris flow. Incessant rainfall is the triggering factor which resulted in the reduction of strength on saturation and increase in pore water pressure. The immediate remedial measures include removal of precarious boulders along the debris flow path and to ensure free flow of water along the hill slopes.
41	Date of Reporting	:	*01/07/2018*
42	Landslide Category	:	*Category III*

Slide-7:

No	Field		Description
1	Slide No.	:	*KER/KKD/58A3/2018/07*
2	State	:	*Kerala*
3	District	:	*Kozhikode*
4	Toposheet No.	:	*58 A/3*
5	Name of the slide	:	*Karimbu Landslide*
6	NH/SH/Locality	:	*Anakkampoyil –Poomarathumkolli road*
7	Latitude	:	*11.4335*
8	Longitude	:	*76.0802*
9	Length	:	*45 m*
10	Width	:	*7 m*
11	Height	:	*30 m*
12	Area	:	*315 m^2*
13	Depth	:	*1 m*
14	Volume	:	*315 m^3*
15	Runout distance	:	*Upto the road bench*
16	Type of Material	:	*Debris*
17	Type of movement	:	*Flow*
18	Rate of movement	:	*Rapid*
19	Activity	:	*Active*
20	Distribution	:	*Retrogressive*
21	Style	:	*Complex*
22	Failure mechanism	:	*Shallow rotational (≤ 5m) failure*
23	History	:	*14^{th} June 2018 (17:30 hrs)*
24	Geomorphology	:	*Lowly dissected slope. Debris flow towards N 350º*
25	Geology/Lithology	:	*Weathered charnockite gneiss*
26	Structure	:	*Movement plane dipping 34º towards N 350º*
27	Landuse/ Landcover	:	*Mixed cultivation*
28	Hydrological condition	:	*Wet*
29	Triggering Factor	:	*Heavy Rainfall*
30	Death of persons	:	*Nil*
31	People affected	:	*Nil*
32	Livestock Loss	:	*Nil*
33	Communication	:	*Nil*
34	Infrastructure	:	*15 cents land damaged*
35	Agriculture/forest/Barren	:	*Mixed plantation affected*

36	Geo-scientific Causes	:	*Landslide initiated as planar failure at the contact between rock and overburden in the form of debris slide and then transformed in to debris flow. Excessive rainfall is the triggering factor which resulted in the reduction of strength on saturation and increase in pore water pressure.*
37	Remedial measures	:	*Three huge precarious boulders seem to occupy on the crown area and which is advised to be removed/treated. Proper retaining wall with drain holes at the cut slope may be provided.*
38	Remarks, if any		-
39	Photos. Sketch of Plan & section of the slide	:	
40	Summary/Abstract	:	*A debris flow occurred at Karimbu on 14th June 2018. Landslide initiated as planar failure at the contact between rock and overburden in the form of debris slide and then transformed in to debris flow. Excessive rainfall is the triggering factor which resulted in the reduction of strength on saturation and increase in pore water pressure. At the crown area, three huge precarious boulders seem to occupy and which is advised to be removed/treated. Proper retaining wall with drain holes at the cut slope may be provided.*
41	Date of Reporting	:	*01/07/2018*
42	Landslide Category	:	*Category II*

Slide-8:

No	Field		Description
1	Slide No.	:	*KER/KKD/58A3/2018/08*
2	State	:	*Kerala*
3	District	:	*Kozhikode*
4	Toposheet No.	:	*58 A/3*
5	Name of the slide	:	*Melemuthappanpuzha - 1 Landslide*
6	NH/SH/Locality	:	*Melemuthappanpuzha road*
7	Latitude	:	*11.4404*
8	Longitude	:	*76.0889*
9	Length	:	*12 m*

10	Width	:	*15 m*
11	Height	:	*10 m*
12	Area	:	*180 m^2*
13	Depth	:	*0.8 m*
14	Volume	:	*144 m^3*
15	Runout distance	:	*140 m (upto the nala below)*
16	Type of Material	:	*Debris*
17	Type of movement	:	*Slide*
18	Rate of movement	:	*Rapid*
19	Activity	:	*Active*
20	Distribution	:	*Retrogressive*
21	Style	:	*Single*
22	Failure mechanism	:	*Shallow rotational (≤ 5m) failure*
23	History	:	*12th June 2018 (17:30 hrs)*
24	Geomorphology	:	*Lowly dissected slope. Debris material flown towards N 255º upto the nala downslope.*
25	Geology/Lithology	:	*Charnockite. Gneissic at places.*
26	Structure	:	-
27	Landuse/ Landcover	:	*Mixed cultivation*
28	Hydrological condition	:	*Dry*
29	Triggering Factor	:	*Heavy Rainfall*
30	Death of persons	:	*Nil*
31	People affected	:	*Nil*
32	Livestock Loss	:	*20 nos. poultry dead*
33	Communication	:	*Melemuthappanpuzha road blocked*
34	Infrastructure	:	*One shed damaged*
35	Agriculture/forest/Barren	:	*Mixed plantation affected*
36	Geo-scientific Causes	:	*Unscientific slope modification and unprotected cut slope made for road construction. Incessant rainfall is the triggering factor which resulted in the reduction of strength on saturation and increase in pore water pressure.*
37	Remedial measures	:	*Retaining wall with proper drainage outlets*
38	Remarks, if any		*Another cut slope failure noticed behind the nearby house located above this landslide*
39	Photos. Sketch of Plan & section of the slide	:	

40	Summary/Abstract	:	*On 12th June 2018, a debris slide occurred at melemuthappanpuzha. Geoscientific causes include unscientific slope modification and unprotected cut slope made for road construction. Incessant rainfall is the triggering factor which resulted in the reduction of strength on saturation and increase in pore water pressure. Retaining wall with proper drainage outlets has to be provided.*
41	Date of Reporting	:	*01/07/2018*
42	Landslide Category	:	*Category II*

Slide-9:

No	Field		Description
1	Slide No.	:	*KER/KKD/58A3/2018/09*
2	State	:	*Kerala*
3	District	:	*Kozhikode*
4	Toposheet No.	:	*58 A/3*
5	Name of the slide	:	*Melemuthappanpuzha - 2 Landslide*
6	NH/SH/Locality	:	*Melemuthappanpuzha road*
7	Latitude	:	*11.4390*
8	Longitude	:	*76.0881*
9	Length	:	*6 m*
10	Width	:	*12 m*
11	Height	:	*5 m*
12	Area	:	*72 m^2*
13	Depth	:	*1 m*
14	Volume	:	*72 m^3*
15	Runout distance	:	-
16	Type of Material	:	*Soil*
17	Type of movement	:	*Slide*
18	Rate of movement	:	*Very rapid*
19	Activity	:	*Active*
20	Distribution	:	*Retrogressive*
21	Style	:	*Single*
22	Failure mechanism	:	*Shallow rotational (≤ 5m) failure*
23	History	:	*12th June 2018 (18:00 hrs)*
24	Geomorphology	:	*Lowly dissected slope*
25	Geology/Lithology	:	*Charnockite. Gneissic at places*
26	Structure	:	-
27	Landuse/ Landcover	:	*Mixed cultivation*
28	Hydrological condition	:	*Wet*
29	Triggering Factor	:	*Heavy Rainfall*
30	Death of persons	:	*Nil*
31	People affected	:	*Nil*
32	Livestock Loss	:	*Nil*
33	Communication	:	*Nil*
34	Infrastructure	:	*20 cents land damaged*
35	Agriculture/forest/Barren	:	*Mixed plantation affected*
36	Geo-scientific Causes	:	*Unscientific slope modification and unprotected cut slope*

			made for house construction. Incessant rainfall is the triggering factor which resulted in the reduction of strength on saturation and increase in pore water pressure.
37	Remedial measures	:	*Retaining wall with proper drain holes. Easing of the slope.*
38	Remarks, if any		-
39	Photos. Sketch of Plan & section of the slide	:	
40	Summary/Abstract	:	*A debris slide occurred on 12th June 2018 at Muthappanpuzha. The important causes include unscientific slope modification and unprotected cut slope made for house construction. Incessant rainfall is the triggering factor which resulted in the reduction of strength on saturation and increase in pore water pressure. Important remedial measures include providing retaining wall with proper drain holes and easing of the slope.*
41	Date of Reporting	:	*01/07/2018*
42	Landslide Category	:	*Category II*

Slide-10:

No	Field		Description
1	Slide No.	:	*KER/KKD/58A3/2018/10*
2	State	:	*Kerala*
3	District	:	*Kozhikode*
4	Toposheet No.	:	*58 A/3*
5	Name of the slide	:	*Maripuzha -1 Landslide*
6	NH/SH/Locality	:	*Maripuzha road*
7	Latitude	:	*11.4475*
8	Longitude	:	*76.0959*
9	Length	:	*25 m*
10	Width	:	*18 m*
11	Height	:	*20 m*
12	Area	:	*450 m^2*
13	Depth	:	*2 m*
14	Volume	:	*900 m^3*
15	Runout distance	:	-

16	Type of Material	:	*Debris*
17	Type of movement	:	*Slide*
18	Rate of movement	:	*Rapid*
19	Activity	:	*Active*
20	Distribution	:	*Retrogressive*
21	Style	:	*Single*
22	Failure mechanism	:	*Shallow rotational (≤ 5m) failure*
23	History	:	*12th June 2018*
24	Geomorphology	:	*Lowly dissected slope. Debris material flown towards N 10º upto the nala downslope*
25	Geology/Lithology	:	*Charnockite gneiss*
26	Structure	:	-
27	Landuse/ Landcover	:	*Mixed cultivation*
28	Hydrological condition	:	*Dry*
29	Triggering Factor	:	*Heavy Rainfall*
30	Death of persons	:	*Nil*
31	People affected	:	*Nil*
32	Livestock Loss	:	*Nil*
33	Communication	:	*Nil*
34	Infrastructure	:	*Nil*
35	Agriculture/forest/Barren	:	*Agricultural land damaged*
36	Geo-scientific Causes	:	*Removal of toe due to the flow of water in the nala at the downslope. Incessant rainfall is the triggering factor which resulted in the reduction of strength on saturation and increase in pore water pressure.*
37	Remedial measures	:	*Retaining structure with proper weep holes has to be provided*
38	Remarks, if any		-
39	Photos. Sketch of Plan & section of the slide	:	
40	Summary/Abstract	:	*A debris slide occurred near maripuzha on 12th June 2018. The main causes include removal of toe due to the flow of water in the nala at the downslope. Incessant rainfall is the triggering factor which resulted in the reduction of strength on saturation and increase in pore water pressure. Retaining wall with proper weep holes has to be provided.*

41	Date of Reporting	:	*01/07/2018*
42	Landslide Category	:	*Category III*

Slide-11:

No	Field		Description
1	Slide No.	:	*KER/KKD/58A3/2018/11*
2	State	:	*Kerala*
3	District	:	*Kozhikode*
4	Toposheet No.	:	*58 A/3*
5	Name of the slide	:	*Maripuzha -2 Landslide*
6	NH/SH/Locality	:	*Anakkampoyil – Kalladi - Meppadi road*
7	Latitude	:	*11.4492*
8	Longitude	:	*76.1014*
9	Length	:	*32 m*
10	Width	:	*30 m*
11	Height	:	*22 m*
12	Area	:	*960 m^2*
13	Depth	:	*7 m*
14	Volume	:	*6720 m^3*
15	Runout distance	:	-
16	Type of Material	:	*Debris*
17	Type of movement	:	*Slide*
18	Rate of movement	:	*Rapid*
19	Activity	:	*Active*
20	Distribution	:	*Retrogressive*
21	Style	:	*Single*
22	Failure mechanism	:	*Deep rotational (≥ 5m) failure*
23	History	:	*12th June 2018*
24	Geomorphology	:	*Lowly dissected slope. Debris material flown towards N 250º upto the river.*
25	Geology/Lithology	:	*Gneiss*
26	Structure	:	-
27	Landuse/ Landcover	:	*Mixed cultivation*
28	Hydrological condition	:	*Wet*
29	Triggering Factor	:	*Heavy Rainfall*
30	Death of persons	:	*Nil*
31	People affected	:	*Nil*
32	Livestock Loss	:	*Nil*
33	Communication	:	*Nil*
34	Infrastructure	:	*Nil*
35	Agriculture/forest/Barren	:	*Agricultural land damaged*
36	Geo-scientific Causes	:	*Removal of toe support due to river bank erosion. Incessant rainfall is the triggering factor which resulted in the reduction of strength on saturation and increase in pore water pressure.*
37	Remedial measures	:	*Provide retaining structures/river bank protection structures with proper drainage holes.*

38	Remarks, if any		-
39	Photos. Sketch of Plan & section of the slide	:	
40	Summary/Abstract	:	*On 12th June 2018 a debris slide occurred at Maripuzha. Important causes include removal of toe support due to river bank erosion. Incessant rainfall is the triggering factor which resulted in the reduction of strength on saturation and increase in pore water pressure. It is to provide retaining structures / river bank protection structures with proper drainage holes.*
41	Date of Reporting	:	*01/07/2018*
42	Landslide Category	:	*Category III*

Slide-12:

No	Field		Description
1	Slide No.	:	*KER/KKD/49M15/2018/12*
2	State	:	*Kerala*
3	District	:	*Kozhikode*
4	Toposheet No.	:	*49 M/15*
5	Name of the slide	:	*Kurumpoyil Landslide*
6	NH/SH/Locality	:	*Kurumpoyil - Vayalada road*
7	Latitude	:	*11.4978*
8	Longitude	:	*75.8647*
9	Length	:	*20 m*
10	Width	:	*6 m*
11	Height	:	*42 m*
12	Area	:	*120 m^2*
13	Depth	:	*1 m*
14	Volume	:	*120 m^3*
15	Runout distance	:	*50 m*
16	Type of Material	:	*Debris*
17	Type of movement	:	*Flow*
18	Rate of movement	:	*Very rapid*
19	Activity	:	*Active*
20	Distribution	:	*Confined*
21	Style	:	*Complex*
22	Failure mechanism	:	*Shallow planar (≤ 5m) failure*
23	History	:	*14th June 2018*

24	Geomorphology	:	*Lowly dissected slope.*
25	Geology/Lithology	:	*Gneissic charnockite*
26	Structure	:	-
27	Landuse/ Landcover	:	*Rubber plantation*
28	Hydrological condition	:	*Dry*
29	Triggering Factor	:	*Heavy Rainfall*
30	Death of persons	:	*Nil*
31	People affected	:	*Nil*
32	Livestock Loss	:	*Nil*
33	Communication	:	*Nil*
34	Infrastructure	:	*Nil*
35	Agriculture/forest/Barren	:	*Agricultural land damaged*
36	Geo-scientific Causes	:	*Landslide initiated as planar failure at the contact between rock and overburden in the form of debris slide and then transformed in to debris flow. Excessive rainfall is the triggering factor which resulted in the reduction of strength on saturation and increase in pore water pressure.*
37	Remedial measures	:	*Unscientific hill slope modification has to avoided*
38	Remarks, if any		-
39	Photos. Sketch of Plan & section of the slide	:	
40	Summary/Abstract	:	*On 14th June 2018 a debris flow was occurred at Kurumpoyil. This landslide initiated as planar failure at the contact between rock and overburden in the form of debris slide and then transformed in to debris flow. Excessive rainfall is the triggering factor which resulted in the reduction of strength on saturation and increase in pore water pressure. Unscientific hill slope modification has to avoided.*
41	Date of Reporting	:	*02/07/2018*
42	Landslide Category	:	*Category III*

Slide-13:

No	Field		Description
1	Slide No.	:	*KER/KKD/49M14/2018/13*
2	State	:	*Kerala*
3	District	:	*Kozhikode*

4	Toposheet No.	:	*49 M/14*
5	Name of the slide	:	*Thalayad Landslide*
6	NH/SH/Locality	:	*Thalayad - Vayalada road*
7	Latitude	:	*11.5076*
8	Longitude	:	*75.8817*
9	Length	:	*14 m*
10	Width	:	*18 m*
11	Height	:	*12 m*
12	Area	:	*252 m^2*
13	Depth	:	*1.5 m*
14	Volume	:	*378 m^3*
15	Runout distance	:	-
16	Type of Material	:	*Debris*
17	Type of movement	:	*Slide*
18	Rate of movement	:	*Rapid*
19	Activity	:	*Active*
20	Distribution	:	*Retrogressive*
21	Style	:	*Single*
22	Failure mechanism	:	*Shallow rotational (≤ 5m) failure*
23	History	:	*14th June 2018*
24	Geomorphology	:	*Lowly dissected slope. Debris material flown towards N 330º*
25	Geology/Lithology	:	*Weathered charnockite*
26	Structure	:	-
27	Landuse/ Landcover	:	*Mixed cultivation*
28	Hydrological condition	:	*Dry*
29	Triggering Factor	:	*Heavy Rainfall*
30	Death of persons	:	*Nil*
31	People affected	:	*Nil*
32	Livestock Loss	:	*Nil*
33	Communication	:	*Thalayad – Vayalada road damaged*
34	Infrastructure	:	*Nil*
35	Agriculture/forest/Barren	:	*Agricultural land damaged*
36	Geo-scientific Causes	:	*Unscientific slope modification and unprotected cut slope made for road construction. Incessant rainfall is the triggering factor which resulted in the reduction of strength on saturation and increase in pore water pressure.*
37	Remedial measures	:	*Retaining wall with proper weep holes.*
38	Remarks, if any		

39	Photos. Sketch of Plan & section of the slide	:	
40	Summary/Abstract	:	*A debris slide was occurred on 14th June 2018 at Thalayad. Unscientific slope modification and unprotected cut slope made for road construction. Incessant rainfall is the triggering factor which resulted in the reduction of strength on saturation and increase in pore water pressure. Retaining wall with proper weep holes has to be provided.*
41	Date of Reporting	:	*02/07/2018*
42	Landslide Category	:	*Category III*

Slide-14:

No	Field		Description
1	Slide No.	:	*KER/KKD/49M15/2018/14*
2	State	:	*Kerala*
3	District	:	*Kozhikode*
4	Toposheet No.	:	*49 M/15*
5	Name of the slide	:	*Poovanmala Landslide*
6	NH/SH/Locality	:	*Kattipara – Chamal - Thamarassery road*
7	Latitude	:	*11.4653*
8	Longitude	:	*75.9337*
9	Length	:	*55 m*
10	Width	:	*10 m*
11	Height	:	*50 m*
12	Area	:	*550 m^2*
13	Depth	:	*1.5 m*
14	Volume	:	*825 m^3*
15	Runout distance	:	*750 m (upto chamal church)*
16	Type of Material	:	*Debris*
17	Type of movement	:	*Flow*
18	Rate of movement	:	*Very Rapid*
19	Activity	:	*Active*
20	Distribution	:	*Retrogressive*
21	Style	:	*Complex*
22	Failure mechanism	:	*Shallow rotational (≤ 5m) failure*

23	History	:	*14th June 2018 (03:00 hrs)*
24	Geomorphology	:	*Lowly dissected slope. Debris flow towards N 100º*
25	Geology/Lithology	:	*Migmatized gneiss*
26	Structure	:	-
27	Landuse/ Landcover	:	*Mixed cultivation*
28	Hydrological condition	:	*Wet*
29	Triggering Factor	:	*Heavy Rainfall*
30	Death of persons	:	*Nil*
31	People affected	:	*Nil*
32	Livestock Loss	:	*Nil*
33	Communication	:	*Kattipara – Chamal road and one unmetalled road got damaged*
34	Infrastructure	:	*Pipe culvert damaged.*
35	Agriculture/forest/Barren	:	*Agricultural land damaged*
36	Geo-scientific Causes	:	*Landslide initiated as debris slide and then transformed to debris flow. Excessive rainfall is the triggering factor which resulted in the reduction of strength on saturation and increase in pore water pressure.*
37	Remedial measures	:	*The existing nala path has to be preserved and avoid its blockage*
38	Remarks, if any		-
39	Photos. Sketch of Plan & section of the slide	:	
40	Summary/Abstract	:	*On 14th June 2018, a debris flow occurred at Poovanmala near Chamal. This landslide initiated as debris slide and then transformed to debris flow. Excessive rainfall is the triggering factor which resulted in the reduction of strength on saturation and increase in pore water pressure. The existing nala path has to be preserved and avoid its blockage.*
41	Date of Reporting	:	*02/07/2018*
42	Landslide Category	:	*Category II*

Slide-15:

No	Field		Description
1	Slide No.	:	*KER/KKD/49M15/2018/15*
2	State	:	*Kerala*
3	District	:	*Kozhikode*
4	Toposheet No.	:	*49 M/15*
5	Name of the slide	:	*Theyyapara Landslide*
6	NH/SH/Locality	:	*Kodencheri – Theyyapara road*
7	Latitude	:	*11.4337*
8	Longitude	:	*75.9931*
9	Length	:	*70 m*
10	Width	:	*55 m*
11	Height	:	*50 m*
12	Area	:	*3850 m^2*
13	Depth	:	*1.5 m*
14	Volume	:	*5775 m^3*
15	Runout distance	:	*90 m (upto nala downslope)*
16	Type of Material	:	*Debris*
17	Type of movement	:	*Slide*
18	Rate of movement	:	*Rapid*
19	Activity	:	*Active*
20	Distribution	:	*Retrogressive*
21	Style	:	*Single*
22	Failure mechanism	:	*Shallow rotational (≤ 5m) failure*
23	History	:	*14th June 2018 (03:00 hrs)*
24	Geomorphology	:	*Lowly dissected slope. Slide debris flown towards N 240º*
25	Geology/Lithology	:	*Hornblende biotite gneiss*
26	Structure	:	-
27	Landuse/ Landcover	:	*Rubber plantation*
28	Hydrological condition	:	*Wet*
29	Triggering Factor	:	*Heavy Rainfall*
30	Death of persons	:	*Nil*
31	People affected	:	*Nil*
32	Livestock Loss	:	*Nil*
33	Communication	:	*Kodencheri – Theyyapara road damaged*
34	Infrastructure	:	*Nil*
35	Agriculture/forest/Barren	:	*Agricultural land damaged*
36	Geo-scientific Causes	:	*Unscientific slope modification and unprotected cut slope made for road construction. Incessant rainfall is the triggering factor which resulted in the reduction of strength on saturation and increase in pore water pressure.*
37	Remedial measures	:	*Retaining wall with proper drainage outlet may be provided*
38	Remarks, if any	:	*Seepage noticed at the toe (Road bench level). At lower slope three houses observed. Palaeoslide observed at left flank of the landslide.*

39	Photos. Sketch of Plan & section of the slide	:	
40	Summary/Abstract	:	*A debris slide was occurred on 14th June 2018 at Theyyapara. Unscientific slope modification and unprotected cut slope made for road construction. Incessant rainfall is the triggering factor which resulted in the reduction of strength on saturation and increase in pore water pressure. The important remedial measures include provision of retaining wall with proper drainage outlet.*
41	Date of Reporting	:	*02/07/2018*
42	Landslide Category	:	*Category II*

Slide-16:

No	Field		Description
1	Slide No.	:	*KER/KKD/58A3/2018/16*
2	State	:	*Kerala*
3	District	:	*Kozhikode*
4	Toposheet No.	:	*58 A/3*
5	Name of the slide	:	*Kandapanchal - 1 Landslide*
6	NH/SH/Locality	:	*Nellipoyil – Kandapanchal road*
7	Latitude	:	*11.4441*
8	Longitude	:	*76.0709*
9	Length	:	*22 m*
10	Width	:	*10 m*
11	Height	:	*18 m*
12	Area	:	*220 m^2*
13	Depth	:	*1 m*
14	Volume	:	*220 m^3*
15	Runout distance	:	*Upto the river*
16	Type of Material	:	*Debris*
17	Type of movement	:	*Slide*
18	Rate of movement	:	*Rapid*
19	Activity	:	*Reactivated*
20	Distribution	:	*Retrogressive*
21	Style	:	*Single*

22	Failure mechanism	:	*Shallow rotational (≤ 5m) failure*
23	History	:	*13th June 2018 (17:30 hrs)*
24	Geomorphology	:	*Lowly dissected slope. The slide material flown towards N 185º.*
25	Geology/Lithology	:	*Gneiss*
26	Structure	:	-
27	Landuse/ Landcover	:	*Mixed cultivation*
28	Hydrological condition	:	*Wet*
29	Triggering Factor	:	*Heavy Rainfall*
30	Death of persons	:	*Nil*
31	People affected	:	*Nil*
32	Livestock Loss	:	*Nil*
33	Communication	:	*Nil*
34	Infrastructure	:	*Nil*
35	Agriculture/forest/Barren	:	*About 15 cents agricultural land damaged*
36	Geo-scientific Causes	:	*Removal of toe support due to river bank erosion (Elavanchi puzha flows at the downstream eroded the bank). Incessant rainfall is the triggering factor which resulted in the reduction of strength on saturation and increase in pore water pressure.*
37	Remedial measures	:	*Provide retaining structures/river bank protection structures with proper drainage holes.*
38	Remarks, if any	:	-
39	Photos. Sketch of Plan & section of the slide	:	
40	Summary/Abstract	:	*On 13th June 2018, a debris slide was occurred at Kandapanchal. The main causes include removal of toe support due to river bank erosion. Incessant rainfall is the triggering factor which resulted in the reduction of strength on saturation and increase in pore water pressure. Provide retaining structures/river bank protection structures with proper drainage holes.*
41	Date of Reporting	:	*02/07/2018*
42	Landslide Category	:	*Category III*

Slide-17:

No	Field		Description
1	Slide No.	:	*KER/KKD/58A3/2018/17*
2	State	:	*Kerala*
3	District	:	*Kozhikode*
4	Toposheet No.	:	*58 A/3*
5	Name of the slide	:	*Kandapanchal - 2 Landslide*
6	NH/SH/Locality	:	*Nellipoyil – Mundur - Kandapanchal road*
7	Latitude	:	*11.4450*
8	Longitude	:	*76.0739*
9	Length	:	*50 m*
10	Width	:	*42 m*
11	Height	:	*18 m*
12	Area	:	*2100 m^2*
13	Depth	:	*6 m*
14	Volume	:	*12600 m^3*
15	Runout distance	:	*Upto the nala downslope*
16	Type of Material	:	*Debris*
17	Type of movement	:	*Slide*
18	Rate of movement	:	*Very Rapid*
19	Activity	:	*Active*
20	Distribution	:	*Retrogressive*
21	Style	:	*Single*
22	Failure mechanism	:	*Deep rotational (≥ 5m) failure*
23	History	:	*13th June 2018 (01:00 hrs)*
24	Geomorphology	:	*Lowly dissected slope. Slide material flown towards N 185º.*
25	Geology/Lithology	:	*Gabbro/Dolerite with pegmatite veins*
26	Structure	:	*Parallel set of pegmatite veins with varying thickness trending N 50º – N 230º present*
27	Landuse/ Landcover	:	*Mixed cultivation (Rubber, coconut, etc.)*
28	Hydrological condition	:	*Wet*
29	Triggering Factor	:	*Heavy Rainfall*
30	Death of persons	:	*Nil*
31	People affected	:	*Nil*
32	Livestock Loss	:	*Nil*
33	Communication	:	*Unmetalled road blocked*
34	Infrastructure	:	*Nil*
35	Agriculture/forest/Barren	:	*70 cents agricultural land damaged*
36	Geo-scientific Causes	:	*Unscientific slope modification made for road construction and cultivation. Incessant rainfall is the triggering factor which resulted in the reduction of strength on saturation and increase in pore water pressure.*
37	Remedial measures	:	*Removal of precarious boulders along the slide plane. Natural drainage system has to be preserved.*
38	Remarks, if any	:	*A cut road is observed above the crown of the landslide.*

39	Photos. Sketch of Plan & section of the slide	:	
			
40	Summary/Abstract	:	*A debris slide was occurred on 13th June 2018 at Kandapanchal. Geoscientific cause includes unscientific slope modification made for road construction and cultivation. Incessant rainfall is the triggering factor which resulted in the reduction of strength on saturation and increase in pore water pressure. It is suggested to remove precarious boulders along the slide plane. Natural drainage system has to be preserved.*
41	Date of Reporting	:	*02/07/2018*
42	Landslide Category	:	*Category II*

Slide-18:

No	Field		Description
1	Slide No.	:	*KER/KKD/58A3/2018/18*
2	State	:	*Kerala*
3	District	:	*Kozhikode*
4	Toposheet No.	:	*58 A/3*
5	Name of the slide	:	*Kulakkadanmala Landslide*

6	NH/SH/Locality	:	*Mukkam - Kakkadampoyil road*
7	Latitude	:	*11.3041*
8	Longitude	:	*76.0441*
9	Length	:	*35 m*
10	Width	:	*8 m*
11	Height	:	*30 m*
12	Area	:	*280 m^2*
13	Depth	:	*1 m*
14	Volume	:	*280 m^3*
15	Runout distance	:	*900 m*
16	Type of Material	:	*Debris*
17	Type of movement	:	*Flow*
18	Rate of movement	:	*Rapid*
19	Activity	:	*Active*
20	Distribution	:	*Confined*
21	Style	:	*Complex*
22	Failure mechanism	:	*Shallow rotational (≤ 5m) failure*
23	History	:	*14^{th} June 2018 (05:30 hrs)*
24	Geomorphology	:	*Lowly dissected slope. Debris material flown towards N 10º.*
25	Geology/Lithology	:	*Charnockite gneiss*
26	Structure	:	-
27	Landuse/ Landcover	:	*Mixed cultivation (Mainly coconut)*
28	Hydrological condition	:	*Dry*
29	Triggering Factor	:	*Heavy Rainfall*
30	Death of persons	:	*Nil*
31	People affected	:	*Nil*
32	Livestock Loss	:	*Nil*
33	Communication	:	*Foot track damaged*
34	Infrastructure	:	*Nil*
35	Agriculture/forest/Barren	:	*Agricultural land damaged*
36	Geo-scientific Causes	:	*Landslide initiated at the contact between rock and overburden in the form of debris slide and then transformed in to debris flow. Excessive rainfall is the triggering factor which resulted in the reduction of strength on saturation and increase in pore water pressure.*
37	Remedial measures	:	*Precarious boulders along the slide path have to be removed. Avoid unscientific hill slope modifications.*
38	Remarks, if any	:	-

39	Photos. Sketch of Plan & section of the slide	:	
40	Summary/Abstract	:	*On 14th June 2018 a debris flow occurred at Kulakkadanmala. Landslide initiated at the contact between rock and overburden in the form of debris slide and then transformed in to debris flow. Excessive rainfall is the triggering factor which resulted in the reduction of strength on saturation and increase in pore water pressure. Important remedial measures include removal of precarious boulders along the slide path and to avoid unscientific hill slope modifications.*
41	Date of Reporting	:	*03/07/2018*
42	Landslide Category	:	*Category III*

Slide-19:

No	Field		Description
1	Slide No.	:	*KER/KKD/58A3/2018/19*
2	State	:	*Kerala*
3	District	:	*Kozhikode*
4	Toposheet No.	:	*58 A/3*
5	Name of the slide	:	*Vattachuvadu Landslide*
6	NH/SH/Locality	:	*Pulikkayam - Thusharagiri road*
7	Latitude	:	*11.4562*
8	Longitude	:	*76.0429*
9	Length	:	*60 m*
10	Width	:	*30 m*
11	Height	:	*22 m*
12	Area	:	*1800 m^2*
13	Depth	:	*1 m*
14	Volume	:	*1800 m^3*
15	Runout distance	:	*400 m (upto the nala at downslope)*
16	Type of Material	:	*Debris*
17	Type of movement	:	*Flow*
18	Rate of movement	:	*Very Rapid*
19	Activity	:	*Active*

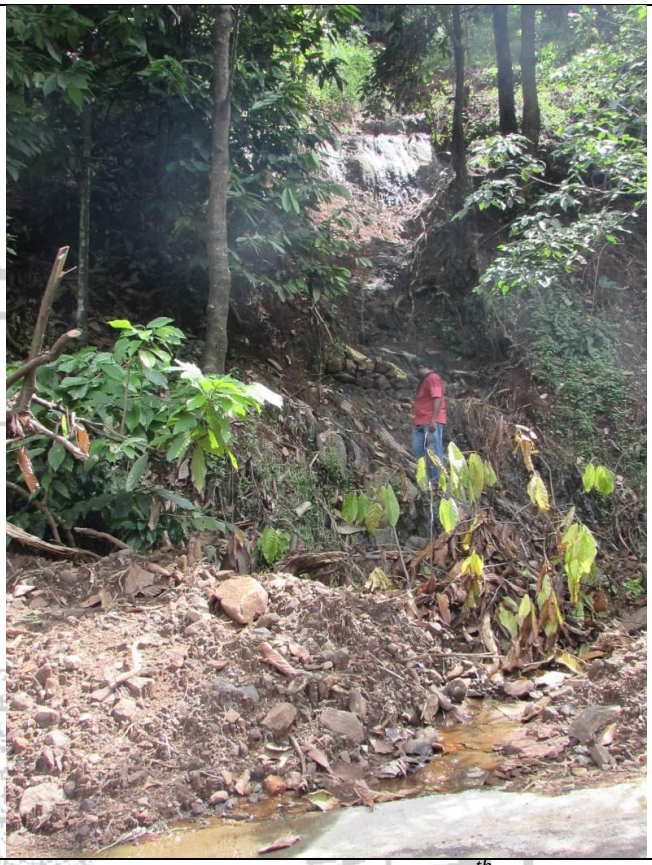
20	Distribution	:	*Confined*
21	Style	:	*Complex*
22	Failure mechanism	:	*Shallow planar (≤ 5m) failure*
23	History	:	*12th June 2018 (18:00 hrs)*
24	Geomorphology	:	*Lowly dissected slope. The slide is limited with an escarpment face at the uphill side and is having steep slope town N 280º.*
25	Geology/Lithology	:	*Granite gneiss*
26	Structure	:	-
27	Landuse/ Landcover	:	*Mixed cultivation (Mainly Rubber)*
28	Hydrological condition	:	*Dry*
29	Triggering Factor	:	*Heavy Rainfall*
30	Death of persons	:	*Nil*
31	People affected	:	*Nil*
32	Livestock Loss	:	*Nil*
33	Communication	:	*Unmetalled road damaged*
34	Infrastructure	:	*Three houses got damaged, two wells got buried*
35	Agriculture/forest/Barren	:	*About 1.5 acre Agricultural land damaged*
36	Geo-scientific Causes	:	*Landslide initiated as debris slide at the contact between rock and overburden and then transformed in to debris flow. Excessive rainfall is the triggering factor which resulted in the reduction of strength on saturation and increase in pore water pressure.*
37	Remedial measures	:	*Precarious boulders along the slide flow path have to be removed/treated. Avoid blockage of drainage system along the hill slope.*
38	Remarks, if any	:	*At the crown area the debris slide fall upto about 50 to 60 m towards N 275º and then converted to debris flow downstream towards N 285º upto the tributary below.*
39	Photos. Sketch of Plan & section of the slide	:	

			
			
40	Summary/Abstract	:	*At Vattachuvadu, one debris flow was occurred on 12th June 2018. Landslide initiated as debris slide at the contact between rock and overburden and then transformed in to debris flow. Excessive rainfall is the triggering factor which resulted in the reduction of strength on supersaturation and increase in pore water pressure. Precarious boulders along the slide flow path have to be removed/treated. Avoid blockage of drainage system along the hill slope.*
41	Date of Reporting	:	*03/07/2018*
42	Landslide Category	:	*Category II*

Slide-20:

No	Field		Description
1	Slide No.	:	*KER/KKD/58A3/2018/20*
2	State	:	*Kerala*
3	District	:	*Kozhikode*
4	Toposheet No.	:	*58 A/3*
5	Name of the slide	:	*Vendekkumpoyil-1 Landslide*
6	NH/SH/Locality	:	*Chempukadavu - Vendekumpoyil road*

7	Latitude	:	*11.4616*
8	Longitude	:	*76.0379*
9	Length	:	*180 m*
10	Width	:	*8 m*
11	Height	:	*m*
12	Area	:	m^2
13	Depth	:	*m*
14	Volume	:	m^3
15	Runout distance	:	*upto the nala at downslope*
16	Type of Material	:	*Debris*
17	Type of movement	:	*Flow*
18	Rate of movement	:	*Rapid*
19	Activity	:	*Active*
20	Distribution	:	*Confined*
21	Style	:	*Complex*
22	Failure mechanism	:	*Shallow rotational failure*
23	History	:	*13th June 2018 (04:00 hrs)*
24	Geomorphology	:	*Lowly dissected slope. Slide debris flown towards N 60º*
25	Geology/Lithology	:	*Charnockite gneiss*
26	Structure	:	-
27	Landuse/ Landcover	:	*Mixed vegetation*
28	Hydrological condition	:	*Dry*
29	Triggering Factor	:	*Heavy Rainfall*
30	Death of persons	:	*Nil*
31	People affected	:	*Nil*
32	Livestock Loss	:	*Nil*
33	Communication	:	*Chempukadavu - Vendekumpoyil road blocked*
34	Infrastructure	:	*Nil*
35	Agriculture/forest/Barren	:	*Agricultural land damaged*
36	Geo-scientific Causes	:	*Excessive rainfall is the triggering factor which resulted in the reduction of strength on saturation and increase in pore water pressure.*
37	Remedial measures	:	*The natural flow may not be blocked along the nala.*
38	Remarks, if any	:	*The debris material flows through the already existing nala path.*

39	Photos. Sketch of Plan & section of the slide	:	
40	Summary/Abstract	:	*A debris flow was occurred on 13th June 2018 at Vendekkumpoyil. The debris material flows through the already existing nala path. Excessive rainfall is the triggering factor which resulted in the reduction of strength on saturation and increase in pore water pressure. The natural flow may not be blocked along the nala.*
41	Date of Reporting	:	*03/07/2018*
42	Landslide Category	:	*Category III*

Slide-21:

No	Field		Description
1	Slide No.	:	*KER/KKD/58A3/2018/21*
2	State	:	*Kerala*
3	District	:	*Kozhikode*
4	Toposheet No.	:	*58 A/3*
5	Name of the slide	:	*Vendekkumpoyil-2 Landslide*
6	NH/SH/Locality	:	*Chempukadavu - Vendekumpoyil road*
7	Latitude	:	*11.4600*
8	Longitude	:	*76.0382*
9	Length	:	*80 m*
10	Width	:	*8 m*
11	Height	:	*m*
12	Area	:	*640 m^2*
13	Depth	:	*1 m*
14	Volume	:	*m^3*

15	Runout distance	:	*40 m*
16	Type of Material	:	*Debris*
17	Type of movement	:	*Flow*
18	Rate of movement	:	*Very Rapid*
19	Activity	:	*Active*
20	Distribution	:	*Widening*
21	Style	:	*Complex*
22	Failure mechanism	:	*Shallow rotational failure*
23	History	:	*13th June 2018 (18:00 hrs)*
24	Geomorphology	:	*Lowly dissected slope. Debris material flown towards N 120º.*
25	Geology/Lithology	:	*Granite gneiss*
26	Structure	:	-
27	Landuse/ Landcover	:	*Mixed cultivation (Rubber, Arecanut, etc.)*
28	Hydrological condition	:	*Dry*
29	Triggering Factor	:	*Heavy Rainfall*
30	Death of persons	:	*Nil*
31	People affected	:	*Nil*
32	Livestock Loss	:	*Nil*
33	Communication	:	*Chempukadavu - Vendekumpoyil road blocked*
34	Infrastructure	:	*One house totally damaged*
35	Agriculture/forest/Barren	:	*Agricultural land damaged*
36	Geo-scientific Causes	:	*Landslide initiated as debris slide and then transformed in to debris flow. Excessive rainfall is the triggering factor which resulted in the reduction of strength on saturation and increase in pore water pressure.*
37	Remedial measures	:	*Precarious boulders along the debris flow path have to be removed. The natural flow of water may not be blocked along the hill slopes. Retaining structure with proper drain holes has to be provided.*
38	Remarks, if any	:	*Crown cracks are present which increases the threat at this location.*
39	Photos. Sketch of Plan & section of the slide	:	

			
40	Summary/Abstract	:	*Another debris flow occurred on 13th June 2018 at Vendekumpoyil which resulted in the destruction of one house and blockage to Chempukadavu-Vendekumpoyil road. Crown cracks are present which increases the threat at this location. The landslide initiated as debris slide and then transformed in to debris flow. Excessive rainfall is the triggering factor which resulted in the reduction of strength on saturation and increase in pore water pressure. Remedial measures include (a) precarious boulders along the debris flow path has to be removed, (b) the natural flow of water may not be blocked along the hill slopes and (c) Retaining structure with proper drain holes has to be provided.*
41	Date of Reporting	:	*03/07/2018*
42	Landslide Category	:	*Category II*

Slide-22:

No	Field		Description
1	Slide No.	:	*KER/KKD/58A3/2018/22*
2	State	:	*Kerala*
3	District	:	*Kozhikode*
4	Toposheet No.	:	*58 A/3*
5	Name of the slide	:	*Kozhikodanchal Landslide*
6	NH/SH/Locality	:	*Kozhikodanchal – Ambedkar Colony road*
7	Latitude	:	*11.4650*
8	Longitude	:	*76.0321*
9	Length	:	*35 m*
10	Width	:	*7 m*
11	Height	:	*25 m*
12	Area	:	*245 m^2*
13	Depth	:	*1m*
14	Volume	:	*245 m^3*
15	Runout distance	:	*160 m (Up to the cut road at down slope)*
16	Type of Material	:	*Debris*

17	Type of movement	:	*Flow*
18	Rate of movement	:	*Very Rapid*
19	Activity	:	*Active*
20	Distribution	:	*Confined*
21	Style	:	*Complex*
22	Failure mechanism	:	*Shallow rotational failure*
23	History	:	*12th June 2018 (17:30 hrs)*
24	Geomorphology	:	*Lowly dissected slope. Debris material flown towards N 155º. The terrain has a general slope of about 24 0.*
25	Geology/Lithology	:	*Gneiss*
26	Structure	:	-
27	Landuse/ Landcover	:	*Cultivation (Rubber)*
28	Hydrological condition	:	*Dry*
29	Triggering Factor	:	*Heavy Rainfall*
30	Death of persons	:	*Nil*
31	People affected	:	*Nil*
32	Livestock Loss	:	*Nil*
33	Communication	:	*Road damaged*
34	Infrastructure	:	*Nil*
35	Agriculture/forest/Barren	:	*Agricultural land damaged (Rubber Plantation)*
36	Geo-scientific Causes	:	*Landslide initiated as debris slide and then transformed in to debris flow. Excessive rainfall is the triggering factor which resulted in the reduction of strength on saturation and increase in pore water pressure.*
37	Remedial measures	:	*Precarious boulders along the debris flow path have to be removed/treated. The natural flow should not be blocked along the hill slope.*
38	Remarks, if any	:	-
39	Photos. Sketch of Plan & section of the slide	:	
40	Summary/Abstract	:	*On 12th June 2018, a debris flow was occurred at Kozhikodanchal near Ambedkar Colony. The landslide initiated as debris slide and then transformed in to debris flow. Excessive rainfall is the triggering factor which resulted in the reduction of strength on saturation and increase in*

			pore water pressure. Precarious boulders along the debris flow path have to be removed/treated. The natural flow may not be blocked along the hill slope.
41	Date of Reporting	:	*03/07/2018*
42	Landslide Category	:	*Category III*

Slide-23:

No	Field		Description
1	Slide No.	:	*KER/KKD/58A3/2018/23*
2	State	:	*Kerala*
3	District	:	*Kozhikode*
4	Toposheet No.	:	*58 A/3*
5	Name of the slide	:	*Ambedkar Colony -1 Landslide*
6	NH/SH/Locality	:	*Chempukadavu – Palakunnu – Ambedkar Colony*
7	Latitude	:	*11.4618*
8	Longitude	:	*76.0290*
9	Length	:	*300 m (including the runout distance)*
10	Width	:	*8 m*
11	Height	:	*m*
12	Area	:	m^2
13	Depth	:	*1 m*
14	Volume	:	m^3
15	Runout distance	:	*m*
16	Type of Material	:	*Debris*
17	Type of movement	:	*Flow*
18	Rate of movement	:	*Rapid*
19	Activity	:	*Active*
20	Distribution	:	*Confined*
21	Style	:	*Single*
22	Failure mechanism	:	*Shallow rotational failure*
23	History	:	*12th June 2018 (16:15 hrs)*
24	Geomorphology	:	*Lowly dissected slope. Debris material flown towards N 160º.*
25	Geology/Lithology	:	*Hornblende biotite gneiss*
26	Structure	:	*Foliation dipping 85º towards N 100º. Pegmatite veins of ~50cm are found parallel to foliation plane. Joint dipping 82º towards N 200º.*
27	Landuse/ Landcover	:	*Mixed cultivation (Mainly Rubber)*
28	Hydrological condition	:	*Wet*
29	Triggering Factor	:	*Heavy Rainfall*
30	Death of persons	:	*Nil*
31	People affected	:	*Nil*
32	Livestock Loss	:	*Nil*
33	Communication	:	*Unmetalled road blocked*
34	Infrastructure	:	*Nil*
35	Agriculture/forest/Barren	:	*About 2 acre Agricultural land damaged*
36	Geo-scientific Causes	:	*Excessive rainfall is the triggering factor which resulted in the reduction of strength on saturation and increase in pore*

			water pressure.
37	Remedial measures	:	*Precarious boulders along the debris flow path have to be removed. The natural flow may not be blocked along the nala.*
38	Remarks, if any	:	-
39	Photos. Sketch of Plan & section of the slide	:	-
40	Summary/Abstract	:	*On 12th June 2018, a debris flow occurred at Ambedkar Colony. Excessive rainfall is the triggering factor which resulted in the reduction of strength on saturation and increase in pore water pressure. Immediate remedial measures include removal of precarious boulders along the debris flow path and non-blockage of the natural flow along the nala.*
41	Date of Reporting	:	*03/07/2018*
42	Landslide Category	:	*Category III*

Slide-24:

No	Field		Description
1	Slide No.	:	*KER/KKD/58A3/2018/24*
2	State	:	*Kerala*
3	District	:	*Kozhikode*
4	Toposheet No.	:	*58 A/3*
5	Name of the slide	:	*Ambedkar colony-2 Landslide*
6	NH/SH/Locality	:	*Chempukadavu – Palakunnu – Ambedkar Colony*
7	Latitude	:	*11.4628*
8	Longitude	:	*76.0259*
9	Length	:	*60 m*
10	Width	:	*6 m*
11	Height	:	*30 m*
12	Area	:	*360 m^2*
13	Depth	:	*1 m*
14	Volume	:	*360 m^3*
15	Runout distance	:	*290 m*
16	Type of Material	:	*Debris*
17	Type of movement	:	*Flow*
18	Rate of movement	:	*Rapid*
19	Activity	:	*Active*
20	Distribution	:	*Retrogressive*
21	Style	:	*Complex*
22	Failure mechanism	:	*Shallow rotational (≤ 5m) failure*
23	History	:	*14th June 2018 (04:00 hrs)*
24	Geomorphology	:	*Lowly dissected slope. Debris material flown towards N 295º.*
25	Geology/Lithology	:	*Gneiss. Weathered at places*
26	Structure	:	-
27	Landuse/ Landcover	:	*Rubber plantation*
28	Hydrological condition	:	*Dry*
29	Triggering Factor	:	*Heavy Rainfall*

30	Death of persons	:	*Nil*
31	People affected	:	*Nil*
32	Livestock Loss	:	*Nil*
33	Communication	:	*Unmetalled road blocked.*
34	Infrastructure	:	*One electrical poll damaged*
35	Agriculture/forest/Barren	:	*About 30 cents of Agricultural land damaged*
36	Geo-scientific Causes	:	*Landslide initiated as debris slide and then transformed in to debris flow. Excessive rainfall is the triggering factor which resulted in the reduction of strength on saturation and increase in pore water pressure.*
37	Remedial measures	:	*Precarious boulders along the debris flow path have to be removed. The natural flow should not be blocked along the hill slopes.*
38	Remarks, if any	:	*The cut road got damaged, transverse cracks (4 m length) developed and retaining wall also damaged in the vicinity of this landslide. Such cracks are to be sealed and should not permit the water to percolate through it. Retaining wall has to be repaired with proper drain holes.*
39	Photos. Sketch of Plan & section of the slide	:	
			

			
40	Summary/Abstract	:	*On 14th June 2018, another debris flow occurred at Ambedkar Colony resulted in the damage to cut road. Transverse cracks were developed and retaining wall also damaged. The landslide initiated as debris slide and then transformed in to debris flow. Excessive rainfall is the triggering factor which resulted in the reduction of strength on saturation and increase in pore water pressure. Remedial measures include (a) removal of precarious boulders along the debris flow path, (b) Natural flow of water should not be blocked along the hill slopes, (c) The cracks are to be sealed and should not permit the water to percolate through it and (d) Retaining wall has to be repaired with proper drain holes.*
41	Date of Reporting	:	*03/07/2018*
42	Landslide Category	:	*Category III*

Slide-25:

No	Field		Description
1	Slide No.	:	*KER/KKD/58A3/2018/25*
2	State	:	*Kerala*
3	District	:	*Kozhikode*
4	Toposheet No.	:	*58 A/3*
5	Name of the slide	:	*Nooranthodu LP School Landslide*
6	NH/SH/Locality	:	*Chempukadavu – Thusharagiri Road*
7	Latitude	:	*11.4675*
8	Longitude	:	*76.0281*
9	Length	:	*350 m*
10	Width	:	*8 m*
11	Height	:	*30 m*
12	Area	:	*2800 m^2*
13	Depth	:	*4 m*
14	Volume	:	*11200 m^3*
15	Runout distance	:	*600 m (including length)*
16	Type of Material	:	*Debris*

17	Type of movement	:	*Flow*
18	Rate of movement	:	*Very Rapid*
19	Activity	:	*Reactivated (15 years back debris flow occurred)*
20	Distribution	:	*Retrogressive*
21	Style	:	*Multiple*
22	Failure mechanism	:	*Shallow rotational (≤ 5m) failure*
23	History	:	*12th June 2018 (18:00 hrs & 19:00 hrs)*
24	Geomorphology	:	*Lowly dissected slope. The debris material flown towards N 5º.*
25	Geology/Lithology	:	*Biotite gneiss*
26	Structure	:	-
27	Landuse/ Landcover	:	*Mixed cultivation (Rubber, coconut, arecanut, coco, etc.)*
28	Hydrological condition	:	*Dry*
29	Triggering Factor	:	*Heavy Rainfall*
30	Death of persons	:	*Nil*
31	People affected	:	*Nil*
32	Livestock Loss	:	*One cow injured*
33	Communication	:	*Panchayath road and the side wall of the nala got damaged.*
34	Infrastructure	:	*One House and one Temple got damaged*
35	Agriculture/forest/Barren	:	*20 cents of Agricultural land damaged*
36	Geo-scientific Causes	:	*Landslide initiated as debris slide and then transformed in to debris flow along the pre-existing nala path. Excessive rainfall is the triggering factor which resulted in the reduction of strength on saturation and increase in pore water pressure.*
37	Remedial measures	:	*Precarious boulders along the debris flow path have to be removed. The natural flow may not be blocked along the nala.*
38	Remarks, if any	:	*The temple in the downslope area flooded with debris material. Initially the material flows from eastern side and then diverted to a northward slope. Material flows at two times 18:00 hrs and 19:00 hrs on 12th June 2018.*
39	Photos. Sketch of Plan & section of the slide	:	

			
			
40	Summary/Abstract	:	*A multiple type debris flow occurred on 12th June 2018 at 18:00 hrs and 19:00 hrs near Nooranthodu LP school. Panchayath road and the side wall of the nala got damaged. One house and one temple got damaged. The temple in the downslope area flooded with debris material. Initially the material flows from eastern side and then diverted to a northward slope. The landslide initiated as debris slide and then transformed in to debris flow along the pre-existing nala path. Excessive rainfall is the triggering factor which resulted in the reduction of strength on saturation and increase in pore water pressure. It is suggested to remove the precarious boulders along the debris flow path and the natural flow may not be blocked along the nala.*
41	Date of Reporting	:	*03/07/2018*
42	Landslide Category	:	*Category II*

Slide-26:

No	Field		Description
1	Slide No.	:	*KER/KKD/58A3/2018/26*
2	State	:	*Kerala*
3	District	:	*Kozhikode*
4	Toposheet No.	:	*58 A/3*
5	Name of the slide	:	*Chipplithodu (29th mile) Landslide*
6	NH/SH/Locality	:	*Adivaram – Vythiri (Thamarassery Churam) Road*
7	Latitude	:	*11.4891*
8	Longitude	:	*76.0235*
9	Length	:	*30 m*
10	Width	:	*40 m*
11	Height	:	*12 m*
12	Area	:	*1200 m^2*
13	Depth	:	*2 m*
14	Volume	:	*2400 m^3*
15	Runout distance	:	*90 m*
16	Type of Material	:	*Debris*
17	Type of movement	:	*Slide*
18	Rate of movement	:	*Rapid*
19	Activity	:	*Active*
20	Distribution	:	*Retrogressive*
21	Style	:	*Single*
22	Failure mechanism	:	*Shallow rotational (≤ 5m) failure*
23	History	:	*14th June 2018 (06:30 hrs)*
24	Geomorphology	:	*Lowly dissected slope*
25	Geology/Lithology	:	*Charnockite*
26	Structure	:	*-*
27	Landuse/ Landcover	:	*Forest vegetation*
28	Hydrological condition	:	*Dry*
29	Triggering Factor	:	*Heavy Rainfall*
30	Death of persons	:	*Nil*
31	People affected	:	*Nil*
32	Livestock Loss	:	*Nil*
33	Communication	:	*Adivaram – Vythiri (Thamarassery Churam) road damaged.*
34	Infrastructure	:	*Nil*
35	Agriculture/forest/Barren	:	*Nil*
36	Geo-scientific Causes	:	*Excessive rainfall is the triggering factor which resulted in the reduction of strength on saturation and increase in pore water pressure. The failure of the filled slope material for road construction resulted in this landslide.*
37	Remedial measures	:	*Proper retaining structure with drain holes has to be provided immediately.*
38	Remarks, if any	:	*On the left side of the road (towards Wayanad) at this location the retaining wall has been breached away which damaged the road and formed a deep gully (~15m). Radial cracks seen on the tar road. The material on the upslope and downslope seems to be debris in nature.*

39	Photos. Sketch of Plan & section of the slide	:	
			
40	Summary/Abstract	:	*On 14th June 2018 a debris slide occurred at Chipplithodu (29th mile) in the Adivaram-Vythiri road. On the left side of the road (towards Wayanad) at this location the retaining wall has been breached away which damaged the road and formed a deep gully (~15m). Radial cracks seen on the tar road. The material on the upslope and downslope seems to be debris in nature. Excessive rainfall is the triggering factor which resulted in the reduction of strength on saturation and increase in pore water pressure. The failure of the filled slope material for road construction resulted in this landslide. Proper retaining structure with drain holes has to be provided immediately.*
41	Date of Reporting	:	*03/07/2018*
42	Landslide Category	:	*Category II*

Slide-27:

No	Field		Description
1	Slide No.	:	*KER/KKD/58A2/2018/27*
2	State	:	*Kerala*
3	District	:	*Kozhikode*

4	Toposheet No.	:	*58 A/2*
5	Name of the slide	:	*Churam Landslide*
6	NH/SH/Locality	:	*Adivaram – Vythiri (Thamarassery Churam) Road*
7	Latitude	:	*11.5148*
8	Longitude	:	*76.0151*
9	Length	:	*15 m*
10	Width	:	*18 m*
11	Height	:	*10 m*
12	Area	:	*270 m^2*
13	Depth	:	*0.8 m*
14	Volume	:	*216 m^3*
15	Runout distance	:	-
16	Type of Material	:	*Debris*
17	Type of movement	:	*Slide*
18	Rate of movement	:	*Rapid*
19	Activity	:	*Active*
20	Distribution	:	*Retrogressive*
21	Style	:	*Single*
22	Failure mechanism	:	*Shallow rotational (≤ 5m) failure*
23	History	:	*14^{th} June 2018*
24	Geomorphology	:	*Moderately dissected slope. The debris material flown towards N 255º upto the road bench level.*
25	Geology/Lithology	:	*Charnockite*
26	Structure	:	-
27	Landuse/ Landcover	:	*Forest vegetation*
28	Hydrological condition	:	*Dry*
29	Triggering Factor	:	*Heavy Rainfall*
30	Death of persons	:	*Nil*
31	People affected	:	*Nil*
32	Livestock Loss	:	*Nil*
33	Communication	:	*Adivaram – Vythiri (Thamarassery Churam) road blocked.*
34	Infrastructure	:	*Nil*
35	Agriculture/forest/Barren	:	*Nil*
36	Geo-scientific Causes	:	*Unscientific slope modification and unprotected cut slope made for road construction. Incessant rainfall is the triggering factor which resulted in the reduction of strength on saturation and increase in pore water pressure.*
37	Remedial measures	:	*Retaining wall with proper drainage outlet has to be provided*
38	Remarks, if any	:	-

39	Photos. Sketch of Plan & section of the slide	:	
40	Summary/Abstract	:	*On 14th June 2018, a debris slide occurred at churam road. The rock – overburden contact is the movement plane. Unscientific slope modification and unprotected cut slope made for road construction. Incessant rainfall is the triggering factor which resulted in the reduction of strength on saturation and increase in pore water pressure. Retaining wall with proper drainage outlet has to be provided.*
41	Date of Reporting	:	*03/07/2018*
42	Landslide Category	:	*Category III*

Slide-28:

No	Field		Description
1	Slide No.	:	*KER/WYD/58A2/2018/01*
2	State	:	*Kerala*
3	District	:	*Wayanad*
4	Toposheet No.	:	*58 A/2*
5	Name of the slide	:	*Aramalakunnu Landslide*
6	NH/SH/Locality	:	*Vythiri - Aramala Road*
7	Latitude	:	*11.5294*
8	Longitude	:	*76.0293*
9	Length	:	*18 m*
10	Width	:	*8 m*
11	Height	:	*12 m*
12	Area	:	*144 m^2*
13	Depth	:	*2 m*
14	Volume	:	*288 m^3*
15	Runout distance	:	*Upto the house in toe area*
16	Type of Material	:	*Soil*
17	Type of movement	:	*Slide*
18	Rate of movement	:	*Very Rapid*
19	Activity	:	*Active*
20	Distribution	:	*Retrogressive*
21	Style	:	*Single*

22	Failure mechanism	:	*Shallow rotational (≤ 5m) failure*
23	History	:	*14th June 2018 (05:30 hrs)*
24	Geomorphology	:	*Lowly dissected slope. The slide material flown towards N 130º.*
25	Geology/Lithology	:	*Charnockite*
26	Structure	:	-
27	Landuse/ Landcover	:	*Mixed cultivation*
28	Hydrological condition	:	*Wet*
29	Triggering Factor	:	*Heavy Rainfall*
30	Death of persons	:	*Nil*
31	People affected	:	*3 nos.*
32	Livestock Loss	:	*Nil*
33	Communication	:	*Nil*
34	Infrastructure	:	*One house totally damaged*
35	Agriculture/forest/Barren	:	*Nil*
36	Geo-scientific Causes	:	*Unscientific slope modification and unprotected cut slope made for house construction. Incessant rainfall is the triggering factor which resulted in the reduction of strength on saturation and increase in pore water pressure.*
37	Remedial measures	:	*The vertical cut may be protected with proper retaining wall with weep holes. Crown cracks are to be treated in order to avoid percolation of water.*
38	Remarks, if any	:	*Rock boulders are seen embedded in the soil column. Another adjacent house also got damaged with small stripping failures. Panchayat foot track passes above the crown area of this slide. Crown cracks are developed. Two houses located above this landslide are in threat. Another house adjacent to the damaged one, is also partially damaged with development of wall cracks. Two houses are located at the downslope along the flow path.*
39	Photos. Sketch of Plan & section of the slide	:	

			
40	Summary/Abstract	:	*An earth side occurred on 14th June 2018 at Aramalakunnu which affected the people and damage to the houses. Rock boulders are observed to be embedded in the soil column. Another adjacent house also got damaged with small stripping failures. Crown cracks are developed. Two houses located above this landslide are in threat. Another house adjacent to the damaged one is also partially damaged with development of wall cracks. Two houses are located at the downslope along the flow path. The important causes include (a) unscientific slope modification and unprotected cut slope made for house construction and (b) excessive rainfall is the triggering factor which resulted in the reduction of strength on saturation and increase in pore water pressure. It is suggested to provide proper retaining wall with weep holes at the vertically cut surfaces. Crown cracks are to be treated in order to avoid percolation of water.*
41	Date of Reporting	:	*04/07/2018*
42	Landslide Category	:	*Category II*

Slide-29:

No	Field		Description
1	Slide No.	:	*KER/WYD/58A2/2018/02*
2	State	:	*Kerala*
3	District	:	*Wayanad*
4	Toposheet No.	:	*58 A/2*
5	Name of the slide	:	*Jawaharvidhya Nagar Landslide*
6	NH/SH/Locality	:	*Vythiri – Kalpetta road*
7	Latitude	:	*11.5356*
8	Longitude	:	*76.0215*
9	Length	:	*18 m*
10	Width	:	*60 m*
11	Height	:	*10 m*
12	Area	:	*1080 m^2*

13	Depth	:	*4 m*
14	Volume	:	*4320 m^3*
15	Runout distance	:	*m*
16	Type of Material	:	*Soil*
17	Type of movement	:	*Slide*
18	Rate of movement	:	*Rapid*
19	Activity	:	*Active*
20	Distribution	:	*Retrogressive*
21	Style	:	*Single*
22	Failure mechanism	:	*Shallow rotational (≤ 5m) failure*
23	History	:	*14th June 2018 (05:00 hrs)*
24	Geomorphology	:	*Rolling plain. The slide material flown towards N 230º.*
25	Geology/Lithology	:	*Charnockite*
26	Structure	:	-
27	Landuse/ Landcover	:	*Mixed cultivation*
28	Hydrological condition	:	*Dry*
29	Triggering Factor	:	*Heavy Rainfall*
30	Death of persons	:	*Nil*
31	People affected	:	*Nil*
32	Livestock Loss	:	*Nil*
33	Communication	:	*Nil*
34	Infrastructure	:	*One office building affected*
35	Agriculture/forest/Barren	:	*Nil*
36	Geo-scientific Causes	:	*Unscientific slope modification and unprotected cut slope made for building construction. Incessant rainfall is the triggering factor which resulted in the reduction of strength on saturation and increase in pore water pressure.*
37	Remedial measures	:	*The vertical cut may be protected with proper retaining wall with weep holes.*
38	Remarks, if any	:	*The landslide seems to be widening*
39	Photos. Sketch of Plan & section of the slide	:	

			
40	Summary/Abstract	:	*On 14th June 2018, an earth slide occurred in the compound of Jawahar Vidhya Nagar school. The important causes include unscientific slope modification for building construction. Incessant rainfall resulted in the reduction of strength on saturation and increase in pore water pressure. Proper retaining structures may be provided.*
41	Date of Reporting	:	*04/07/2018*
42	Landslide Category	:	*Category III*

Slide-30:

No	Field		Description
1	Slide No.	:	*KER/WYD/58A2/2018/03*
2	State	:	*Kerala*
3	District	:	*Wayanad*
4	Toposheet No.	:	*58 A/2*
5	Name of the slide	:	*Veterinary College Landslide*
6	NH/SH/Locality	:	*Vythiri – Kalpetta road*
7	Latitude	:	*11.5346*
8	Longitude	:	*76.0244*
9	Length	:	*22 m*
10	Width	:	*8 m*
11	Height	:	*18 m*
12	Area	:	*176 m^2*
13	Depth	:	*1 m*
14	Volume	:	*176 m^3*
15	Runout distance	:	-
16	Type of Material	:	*Debris*
17	Type of movement	:	*Slide*
18	Rate of movement	:	*Rapid*
19	Activity	:	*Reactivated (occurred earlier in 2009)*
20	Distribution	:	*Retrogressive / widening*
21	Style	:	*Single*
22	Failure mechanism	:	*Shallow rotational (≤ 5m) failure*

23	History	:	*14th June 2018 (05:30 hrs)*
24	Geomorphology	:	*Rolling plain. The slide material flown towards N 100º.*
25	Geology/Lithology	:	*Charnockite*
26	Structure	:	-
27	Landuse/ Landcover	:	*Mixed cultivation*
28	Hydrological condition	:	*Dry*
29	Triggering Factor	:	*Heavy Rainfall*
30	Death of persons	:	*Nil*
31	People affected	:	*Nil*
32	Livestock Loss	:	*Nil*
33	Communication	:	*Nil*
34	Infrastructure	:	*One office building damaged*
35	Agriculture/forest/Barren	:	*Nil*
36	Geo-scientific Causes	:	*Unscientific slope modification and unprotected cut slope made for building construction. Incessant rainfall is the triggering factor which resulted in the reduction of strength on saturation and increase in pore water pressure.*
37	Remedial measures	:	*Easing of slope. Proper retaining structures with weep holes may be provided at the cut surfaces. Ground cracks are to be treated in order to avoid percolation of water.*
38	Remarks, if any	:	*Ground cracks were developed at the hostel location*
39	Photos. Sketch of Plan & section of the slide	:	
			
40	Summary/Abstract	:	*A debris slide was occurred on 14th June 2018 at the Veterinary College, Vythiri. The main cause is the unscientific*

			slope modification for building construction. Remedial measures include easing of slope, provision of proper retaining structures.
41	Date of Reporting	:	*04/07/2018*
42	Landslide Category	:	*Category III*

Slide-31:

No	Field		Description
1	Slide No.	:	*KER/WYD/58A2/2018/04*
2	State	:	*Kerala*
3	District	:	*Wayanad*
4	Toposheet No.	:	*58 A/2*
5	Name of the slide	:	*Achoor (6th mile) Landslide*
6	NH/SH/Locality	:	*Vythiri – Padinjarathara road*
7	Latitude	:	*11.6066*
8	Longitude	:	*76.0077*
9	Length	:	*20 m*
10	Width	:	*45 m*
11	Height	:	*15 m*
12	Area	:	*900 m^2*
13	Depth	:	*1.5 m*
14	Volume	:	*1350 m^3*
15	Runout distance	:	*Upto the house at the bench below*
16	Type of Material	:	*Soil*
17	Type of movement	:	*Slide*
18	Rate of movement	:	*Very Rapid*
19	Activity	:	*Active*
20	Distribution	:	*Retrogressive*
21	Style	:	*Single*
22	Failure mechanism	:	*Shallow rotational (≤ 5m) failure*
23	History	:	*14th June 2018 (08:30 hrs)*
24	Geomorphology	:	*Rolling plain. The slide material flown towards N 270º.*
25	Geology/Lithology	:	*Schistose rock*
26	Structure	:	*-*
27	Landuse / Landcover	:	*Mixed cultivation*
28	Hydrological condition	:	*Dry*
29	Triggering Factor	:	*Heavy Rainfall*
30	Death of persons	:	*1 No.*
31	People affected	:	*1 No.*
32	Livestock Loss	:	*Nil*
33	Communication	:	*Nil*
34	Infrastructure	:	*One house fully and one house partially damaged*
35	Agriculture/forest/Barren	:	*Agricultural land*
36	Geo-scientific Causes	:	*Unscientific slope modification and unprotected vertical cut slope made for house construction. Incessant rainfall is the triggering factor which resulted in the reduction of strength on saturation and increase in pore water pressure.*

37	Remedial measures	:	*Easing of slope with benches. The vertical cut may be protected with proper retaining wall with weep holes.*
38	Remarks, if any	:	*The houses at this location are built with vertical cut without any retaining wall. Weathered rock patch is also observed along the slide zone*
39	Photos. Sketch of Plan & section of the slide	:	
40	Summary/Abstract	:	*An earth slide was occurred on 14th June 2018 at Achoor, Vythiri resulted in the death of one person and damage to house. The important causes include (a) Unscientific slope modification and unprotected vertical cut slope made for house construction and (b) Incessant rainfall is the triggering factor which resulted in the reduction of strength on saturation and increase in pore water pressure. Remedial measures include (a) Easing of slope with benches and (b) The vertical cut may be protected with proper retaining wall with weep holes.*
41	Date of Reporting	:	*04/07/2018*
42	Landslide Category	:	*Category II*

Slide-32:

No	Field		Description
1	Slide No.	:	*KER/WYD/49M14/2018/05*
2	State	:	*Kerala*
3	District	:	*Wayanad*
4	Toposheet No.	:	*49 M/14*
5	Name of the slide	:	*Valaramkunnu Landslide*
6	NH/SH/Locality	:	*Mananthavady – Niravilpuzha road*
7	Latitude	:	*11.6941*
8	Longitude	:	*75.9371*
9	Length	:	*15 m*
10	Width	:	*8 m*
11	Height	:	*10 m*
12	Area	:	*120 m^2*
13	Depth	:	*0.5 m*

14	Volume	:	*60 m^3*
15	Runout distance	:	*350 m*
16	Type of Material	:	*Debris*
17	Type of movement	:	*Slide*
18	Rate of movement	:	*Very Rapid*
19	Activity	:	*Active*
20	Distribution	:	*Retrogressive*
21	Style	:	*Single*
22	Failure mechanism	:	*Shallow rotational (≤ 5m) failure*
23	History	:	*14th June 2018 (08:00 hrs)*
24	Geomorphology	:	*Lowly dissected slope. The slide material flown towards N 35º.*
25	Geology/Lithology	:	*Charnockite gneiss*
26	Structure	:	-
27	Landuse/ Landcover	:	*Mixed cultivation*
28	Hydrological condition	:	*Dry*
29	Triggering Factor	:	*Heavy Rainfall*
30	Death of persons	:	*Nil*
31	People affected	:	*Nil*
32	Livestock Loss	:	*Nil*
33	Communication	:	*Road damaged*
34	Infrastructure	:	*Nil*
35	Agriculture/forest/Barren	:	*Nil*
36	Geo-scientific Causes	:	*Unscientific slope modification and unprotected cut slope made for road construction. Incessant rainfall is the triggering factor which resulted in the reduction of strength on saturation and increase in pore water pressure.*
37	Remedial measures	:	*Toe support with proper drainage conduits may be provided. Radial cracks are to be treated in order to avoid percolation of water.*
38	Remarks, if any	:	*Radial cracks developed on the upslope area. Debris material has reached up to nursery school downslope*
39	Photos. Sketch of Plan & section of the slide	:	

			
40	Summary/Abstract	:	*A debris slide was occurred on 14th June 2018 at Valaramkunnu. Radial cracks developed on the upslope area. Debris material has reached up to nursery school downslope The main causes include (a) Unscientific slope modification and unprotected cut slope made for road construction and (b) Incessant rainfall is the triggering factor which resulted in the reduction of strength on saturation and increase in pore water pressure. Remedial measures include (a) Toe support with proper drainage conduits may be provided and (b) Radial cracks are to be treated in order to avoid percolation of water.*
41	Date of Reporting	:	*04/07/2018*
42	Landslide Category	:	*Category III*

Slide-33:

No	Field		Description
1	Slide No.	:	*KER/WYD/49M14/2018/06*
2	State	:	*Kerala*
3	District	:	*Wayanad*
4	Toposheet No.	:	*49 M/14*
5	Name of the slide	:	*Veetikunnu Landslide*
6	NH/SH/Locality	:	*Mananthavady – Niravilpuzha road*
7	Latitude	:	*11.7013*
8	Longitude	:	*75.9359*
9	Length	:	*70 m*
10	Width	:	*12 m*
11	Height	:	*45 m*
12	Area	:	*840 m^2*
13	Depth	:	*6 m*
14	Volume	:	*5040 m^3*
15	Runout distance	:	*Upto the house at the downslope*
16	Type of Material	:	*Rock cum Debris*
17	Type of movement	:	*Slide*

18	Rate of movement	:	*Very Rapid*
19	Activity	:	*Reactivated*
20	Distribution	:	*Retrogressive*
21	Style	:	*Single*
22	Failure mechanism	:	*Deep rotational (≥ 5m) failure*
23	History	:	*14th June 2018 (10:00 hrs)*
24	Geomorphology	:	*Moderately dissected slope. The debris material flown towards N 355º.*
25	Geology/Lithology	:	*Charnockite gneiss*
26	Structure	:	-
27	Landuse/ Landcover	:	*Mixed cultivation*
28	Hydrological condition	:	*Dry*
29	Triggering Factor	:	*Heavy Rainfall*
30	Death of persons	:	*Nil*
31	People affected	:	*Nil*
32	Livestock Loss	:	*Nil*
33	Communication	:	*Nil*
34	Infrastructure	:	*One house damaged*
35	Agriculture/forest/Barren	:	*Agricultural land damaged*
36	Geo-scientific Causes	:	*Incessant rainfall is the triggering factor which resulted in the reduction of strength on saturation and increase in pore water pressure.*
37	Remedial measures	:	*Precarious boulders along the slide path have to be removed. Ensure free flow of water along the hill slopes. Avoid construction of dwelling units in the vicinity of the flow path.*
38	Remarks, if any	:	*A number of rock boulders fallen along with this slide destroyed the house at the downslope side. Three precarious boulders are present in the crown area and three huge boulders already detached from the crown are also lying along the flow path. This location seems to be an old slide (Palaeoslide) area which activated during the recent rain. Locals reported that during rainy season, water drains through this palaeoslide location. The two boulders lying near the toe portion is having a dimension of L x W x H as 6 m x 3m x 2.5m and 3.5 m x 3 m x 2 m respectively.*

39	Photos. Sketch of Plan & section of the slide	:	
			
40	Summary/Abstract	:	*A rock cum debris slide was occurred on 14th June 2018 at Veetikunnu which resulted in the damage to one house. Incessant rainfall is the triggering factor which resulted in the reduction of strength on saturation and increase in pore water pressure. Remedial measures include removal of precarious boulders along the slide path and ensure free flow of water along the hill slopes. Avoid construction of dwelling units in the vicinity of the flow path.*
41	Date of Reporting	:	*04/07/2018*
42	Landslide Category	:	*Category II*

Slide-34:

No	Field		Description
1	Slide No.	:	*KER/WYD/49M14/2018/07*
2	State	:	*Kerala*
3	District	:	*Wayanad*
4	Toposheet No.	:	*49 M/14*
5	Name of the slide	:	*Pulipparakunnu Landslide*

6	NH/SH/Locality	:	*Mananthavady – Niravilpuzha road*
7	Latitude	:	*11.7034*
8	Longitude	:	*75.9369*
9	Length	:	*25 m*
10	Width	:	*12 m*
11	Height	:	*18 m*
12	Area	:	*300 m^2*
13	Depth	:	*4 m*
14	Volume	:	*1200 m^3*
15	Runout distance	:	*Upto the nala below (~250 m)*
16	Type of Material	:	*Debris*
17	Type of movement	:	*Flow*
18	Rate of movement	:	*Rapid*
19	Activity	:	*Reactivated*
20	Distribution	:	*Retrogressive*
21	Style	:	*Successive*
22	Failure mechanism	:	*Shallow rotational (≤ 5m) failure*
23	History	:	*14^{th} June 2018*
24	Geomorphology	:	*Lowly dissected slope. Upslope is steeply sloping (escarpment). The debris material flown towards N 175º.*
25	Geology/Lithology	:	*Charnockite gneiss*
26	Structure	:	-
27	Landuse/ Landcover	:	*Mixed cultivation*
28	Hydrological condition	:	*Dry*
29	Triggering Factor	:	*Heavy Rainfall*
30	Death of persons	:	*Nil*
31	People affected	:	*Nil*
32	Livestock Loss	:	*Nil*
33	Communication	:	*Nil*
34	Infrastructure	:	*Nil*
35	Agriculture/forest/Barren	:	*Agricultural land damaged*
36	Geo-scientific Causes	:	*Landslide initiated at the contact between rock and overburden in the form of debris slide and then transformed in to debris flow. Excessive rainfall is the triggering factor which resulted in the reduction of strength on saturation and increase in pore water pressure.*
37	Remedial measures	:	*Precarious boulders along the debris flow path have to be removed. The natural flow of water should not be blocked along the nala.*
38	Remarks, if any	:	*Adjacent to this landslide another landslide with similar properties was observed.*

39	Photos. Sketch of Plan & section of the slide	:	
			
40	Summary/Abstract	:	*A successive landslide occurred on 14th June 2018 at Pulipparakunnu. The landslide initiated at the contact between rock and overburden in the form of debris slide and then transformed in to debris flow. Excessive rainfall is the triggering factor which resulted in the reduction of strength on saturation and increase in pore water pressure. Precarious boulders along the debris flow path have to be removed. The natural flow of water should not be blocked along the nala.*
41	Date of Reporting	:	*04/07/2018*
42	Landslide Category	:	*Category III*

Slide-35:

No	Field		Description
1	Slide No.	:	*KER/WYD/49M13/2018/08*
2	State	:	*Kerala*
3	District	:	*Wayanad*
4	Toposheet No.	:	*49 M/13*

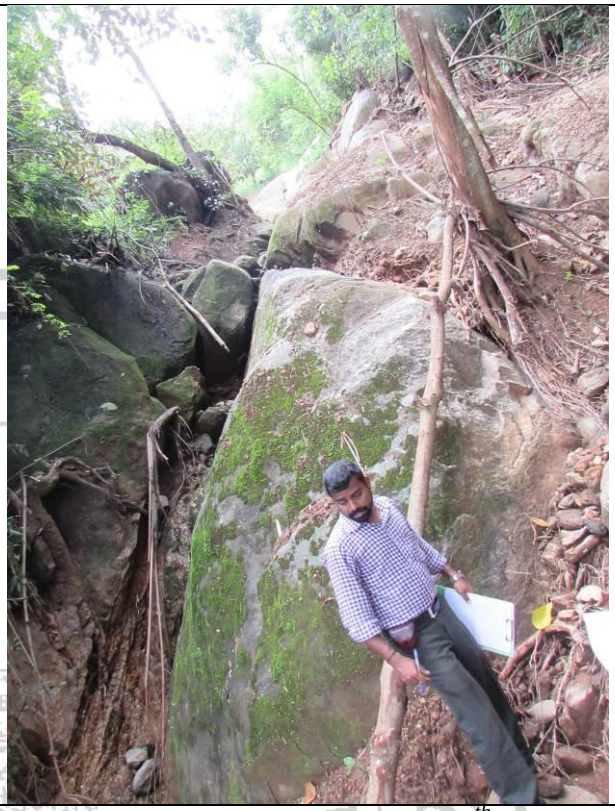
5	Name of the slide	:	*Thazhe Kunnothmala Landslide*
6	NH/SH/Locality	:	*Valad - Kunnothmala road*
7	Latitude	:	*11.8297*
8	Longitude	:	*75.9298*
9	Length	:	*25 m*
10	Width	:	*40 m*
11	Height	:	*18 m*
12	Area	:	*1000 m^2*
13	Depth	:	*3 m*
14	Volume	:	*3000 m^3*
15	Runout distance	:	*Upto the road level*
16	Type of Material	:	*Debris*
17	Type of movement	:	*Slide*
18	Rate of movement	:	*Rapid*
19	Activity	:	*Active*
20	Distribution	:	*Retrogressive*
21	Style	:	*Single*
22	Failure mechanism	:	*Shallow rotational (≤ 5m) failure*
23	History	:	*14^{th} June 2018*
24	Geomorphology	:	*Lowly dissected slope. The debris material flown towards N 105º*
25	Geology/Lithology	:	*Schistose/Phyllitic*
26	Structure	:	-
27	Landuse/ Landcover	:	*Mixed vegetation*
28	Hydrological condition	:	*Dry*
29	Triggering Factor	:	*Heavy Rainfall*
30	Death of persons	:	*Nil*
31	People affected	:	*Nil*
32	Livestock Loss	:	*Nil*
33	Communication	:	*Valad - Kunnothmala road*
34	Infrastructure	:	*Nil*
35	Agriculture/forest/Barren	:	*Agricultural land damaged*
36	Geo-scientific Causes	:	*Unscientific slope modification and unprotected cut slope made for road construction. Excessive rainfall is the triggering factor which resulted in the reduction of strength on saturation and increase in pore water pressure.*
37	Remedial measures	:	*Retaining structures with proper drainage outlet has to be provided. Crown cracks are to be treated to avoid percolation of water through it.*
38	Remarks, if any	:	*Crown cracks are developed which may activate the slide in future.*

39	Photos. Sketch of Plan & section of the slide	:	
			
40	Summary/Abstract	:	*A debris slide was occurred on 14th June 2018 at Thazhe Kunnothumala along Valad-Kunnathumala road. Crown cracks are developed which may activate the slide in future. The important causes include (a) Unscientific slope modification and unprotected cut slope made for road construction and (b) Excessive rainfall is the triggering factor which resulted in the reduction of strength on saturation and increase in pore water pressure. Remedial measures include (a) Retaining structures with proper drainage outlet has to be provided and (b) Crown cracks are to be treated to avoid percolation of water through it.*
41	Date of Reporting	:	*04/07/2018*
42	Landslide Category	:	*Category II*

Slide-36:

No	Field		Description
1	Slide No.	:	*KER/KNR/48P16/2018/01*
2	State	:	*Kerala*

3	District	:	*Kannur*
4	Toposheet No.	:	*48 P/16*
5	Name of the slide	:	*Parakkamala Landslide*
6	NH/SH/Locality	:	*Mudikkayam – Vaniyapara road*
7	Latitude	:	*12.0709*
8	Longitude	:	*75.7581*
9	Length	:	*m*
10	Width	:	*6 m*
11	Height	:	*m*
12	Area	:	m^2
13	Depth	:	*m*
14	Volume	:	m^3
15	Runout distance	:	*Upto the road level*
16	Type of Material	:	*Debris*
17	Type of movement	:	*Flow*
18	Rate of movement	:	*Very Rapid*
19	Activity	:	*Reactivated (Earlier in July 2007)*
20	Distribution	:	*Retrogressive*
21	Style	:	*Complex*
22	Failure mechanism	:	*Shallow rotational (≤ 5m) failure*
23	History	:	12^{th} *June 2018 (18:00 hrs)*
24	Geomorphology	:	*Lowly dissected slope. The debris material flown towards N 275º.*
25	Geology/Lithology	:	*Gneiss*
26	Structure	:	*Shear zone having thickness of about 1m dipping 47º towards N 330º.*
27	Landuse/ Landcover	:	*Mixed cultivation*
28	Hydrological condition	:	*Wet*
29	Triggering Factor	:	*Heavy Rainfall*
30	Death of persons	:	*Nil*
31	People affected	:	*Nil*
32	Livestock Loss	:	*Nil*
33	Communication	:	*Mudikkayam – Vaniyapara road*
34	Infrastructure	:	*Nil*
35	Agriculture/forest/Barren	:	*Agricultural land damaged*
36	Geo-scientific Causes	:	*Excessive rainfall is the triggering factor which resulted in the reduction of strength on saturation and increase in pore water pressure.*
37	Remedial measures	:	*Unscientific hill slope modification has to be avoided. Avoid constructing houses/buildings along the debris flown nala path.*
38	Remarks, if any	:	*Debris material flown along the already existing nala resulted blockage of the road and damaged the small box culvert at the road bench.*

39	Photos. Sketch of Plan & section of the slide	:	
40	Summary/Abstract	:	*A debris flow was occurred on 12th June 2018 at Parakkamala where the debris material flown along an already existing nala path. This landslide is a reactivated one. Excessive rainfall is the triggering factor which resulted in the reduction of strength on saturation and increase in pore water pressure is the important cause. Remedial measures include (a) Unscientific hill slope modification has to avoided and (b) Avoid constructing houses/buildings along the debris flown nala path.*
41	Date of Reporting	:	*05/07/2018*
42	Landslide Category	:	*Category II*