

Factual Report on Hong Kong Rainfall and Landslides in 2021

GEO Report No. 368

C. Lam, V.S.F. Kong & E.K.H. Chu

**Geotechnical Engineering Office
Civil Engineering and Development Department
The Government of the Hong Kong
Special Administrative Region**

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C. Lam, V.S.F. Kong & E.K.H. Chu

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Preface

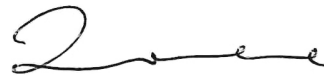
In keeping with our policy of releasing information which may be of general interest to the geotechnical profession and the public, we make available selected internal reports in a series of publications termed the GEO Report series. The GEO Reports can be downloaded from the website of the Civil Engineering and Development Department (<http://www.cedd.gov.hk>) on the Internet.



Raymond W M Cheung
Head, Geotechnical Engineering Office
February 2024

Foreword

This report presents a summary of the factual information on rainfall and landslides in Hong Kong throughout 2021. Details of the landslides were obtained from records of landslide incidents reported to the Geotechnical Engineering Office (GEO) of the Civil Engineering and Development Department. Supplementary information was collected from the Agriculture, Fisheries and Conservation Department, Architectural Services Department, Drainage Services Department, Highways Department, Housing Department, Lands Department, Water Supplies Department, and the GEO's landslide investigation consultants. The Hong Kong Observatory provided weather and rainfall information. The Standards and Testing Division of the GEO carried out a review of the available rainfall records as well as rainfall analyses, and prepared Section 2 of this report. All contributions are gratefully acknowledged.



Florence KO
Chief Geotechnical Engineer /
Landslip Preventive Measures 2

Abstract

This report presents a summary of the factual information on rainfall and landslides in Hong Kong throughout 2021. Rainfall information was obtained from the Hong Kong Observatory (HKO) to supplement the information available in the Geotechnical Engineering Office (GEO). Details of the landslides were obtained from records of landslide incidents reported to the GEO. Supplementary information was collected from the Agriculture, Fisheries and Conservation Department, Architectural Services Department, Drainage Services Department, Highways Department, Housing Department, Lands Department, Water Supplies Department, and the GEO's landslide investigation consultants, namely AECOM Asia Company Limited and Fugro (Hong Kong) Limited.

Rainfall recorded in 2021 at the HKO's Principal Raingauge at Tsim Sha Tsui amounted to 2,307.1 mm, about 5% lower than the annual normal of 2,431.2 mm recorded between 1991 and 2020. Two Black Rainstorm Warnings were issued, each on 28 June and 8 October 2021. Six Red Rainstorm Warnings and 27 Amber Rainstorm Warnings were issued between 1 June and 8 October 2021, and between 4 May and 13 October 2021 respectively.

Two Landslip Warnings were issued respectively on 28 June and 8 October 2021. A total of 170 incidents were reported to the government departments in 2021. Of these, 146 were classified as genuine landslides and 13 of them were designated as major failures (i.e. with a failure volume of 50 m³ or more, or where a fatality occurred). None of these major failures involved a fatality.

There were 15 landslides in 2021 with notable consequences. Of these landslides, one led to temporary evacuation from a village house, one resulted in damage of a temporary storage structure, one resulted in damage of the brick column of the entrance corridor of a house and the other 12 resulted in temporary closure of roads. Other landslides in 2021 primarily affected footpaths or minor access roads, catchwaters and open areas without any significant direct or indirect consequence. No casualty was reported as a result of the landslides.

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1 Introduction

This report summarises the factual information on rainfall and reported landslides in Hong Kong throughout 2021. Rainfall information was obtained from the Hong Kong Observatory (HKO) to supplement the information available in the Geotechnical Engineering Office (GEO) of the Civil Engineering and Development Department (CEDD). Details of the landslides were obtained from records of landslide incidents reported to the GEO. Supplementary information was collected from Agriculture, Fisheries and Conservation Department (AFCD), Architectural Services Department (ArchSD), Drainage Services Department (DSD), Highways Department (HyD), Housing Department (HD), Lands Department (LandsD), Water Supplies Department (WSD) and the GEO's landslide investigation consultants, namely AECOM Asia Company Limited and Fugro (Hong Kong) Limited under Agreement No. CE 29/2018 (GE) and CE 28/2018 (GE) respectively.

In this report, a landslide is defined as the detachment or excessive displacement of soil or rock mass. This includes the failure of a fill slope, cut slope, retaining wall, or natural hillside, as well as rockfall and boulder fall. A 'major' landslide is defined as a failure in which the estimated/recorded volume of the detached or displaced mass is $\geq 50 \text{ m}^3$, or where a fatality occurred. A 'very minor' landslide is defined as a failure that is small in scale (i.e. $\leq 5 \text{ m}^3$ for failures involving soil, or $\leq 0.1 \text{ m}^3$ for rockfalls/boulder falls) and does not give rise to any significant public nuisance or notable consequences (e.g. casualty, near-miss, evacuation of buildings or squatter dwellings, road closure, etc.). Landslides that are not classified as 'major' or 'very minor' are considered as 'minor'.

2 Rainfall

2.1 The Raingauge System

The GEO, in collaboration with the HKO, operates an automatic raingauge system that transmits rainfall data through mobile networks to the GEO and the HKO at 1-minute and 5-minute intervals respectively. The system comprises 90 GEO raingauges and 31 raingauges operated by the HKO and other government departments as at the end of 2021. The GEO raingauges are of the tipping-bucket type, tipping for every 0.5 mm of rainfall. The locations of all GEO raingauges and those operated by the HKO and other government departments are shown in Figure 2.1.

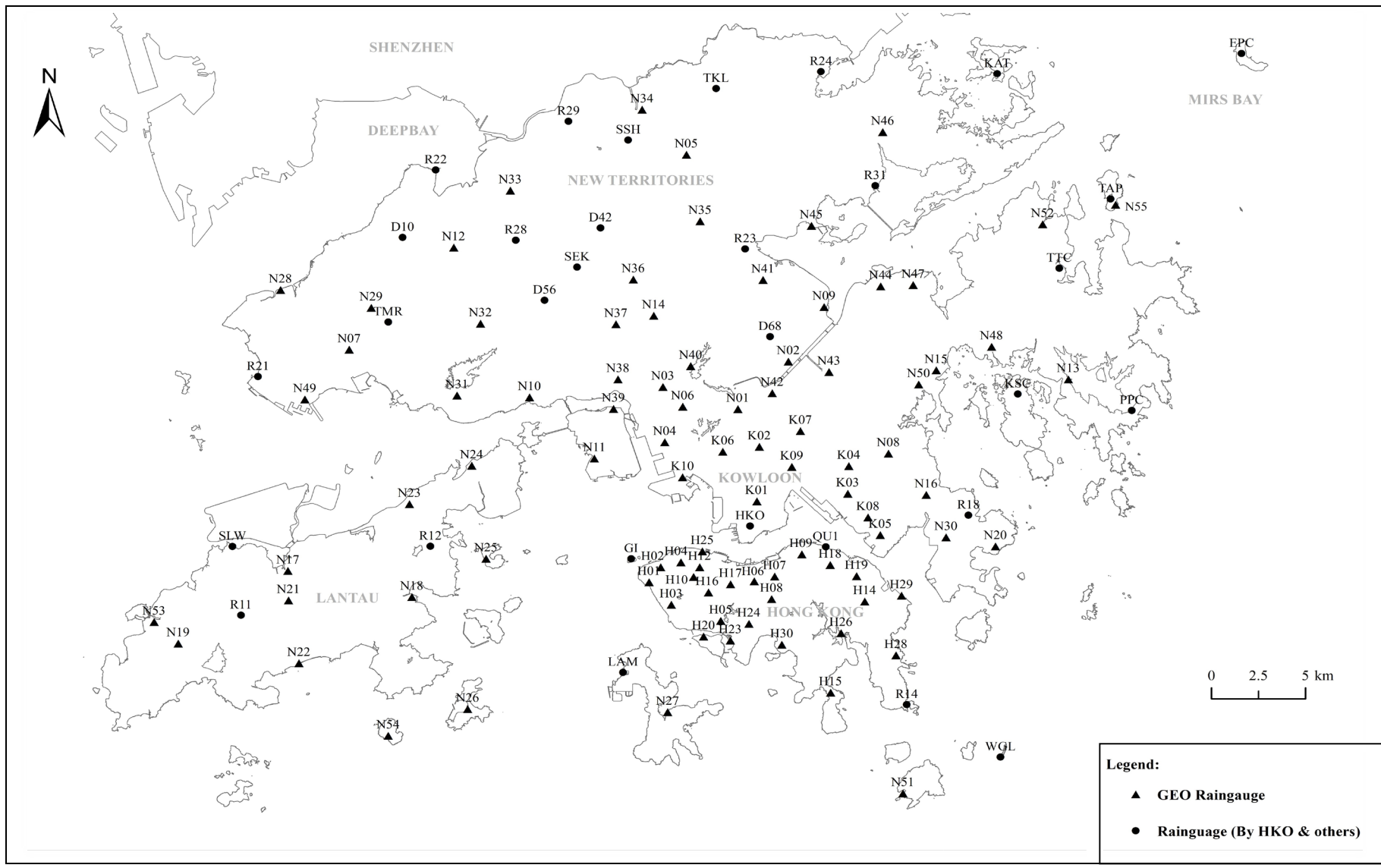


Figure 2.1 Locations of GEO Raingauges and Raingauges Operated by HKO and Other Government Departments

2.2 Rainfall Records

The rainfall data from the raingauge system are checked, verified and stored by the GEO in a database, from which they can be extracted for analysis. This report presents a selection of rainfall parameters for the whole year of 2021, as well as individual months and individual rainstorms.

The weather in 2021, as described by the HKO (2022), is excerpted as follows:

"The annual total rainfall in 2021 was 2,307.1 millimetres, 5 percent below the 1991-2020 normal of 2,431.2 millimetres (or 4 percent below the 1981-2010 normal of 2,398.5 millimetres).

Six red rainstorm warnings and two black rainstorm warnings were issued by the Observatory in the year. The number of days with thunderstorms reported in Hong Kong was 41 days in 2021, about 1 day less than the 1991-2020 normal (or 2 days more than the 1981-2010 normal)."

"A total of 27 tropical cyclones occurred over the western North Pacific and the South China Sea in 2021, less than the long-term (1961-2010) average of about 30. There were 10 tropical cyclones reaching typhoon intensity or above during the year, less than the long-term average of about 15, and 5 of them reached super typhoon intensity (with maximum 10-minute wind speed of 185 km/h or above near the centre). In Hong Kong, 8 tropical cyclones necessitated the issuance of tropical cyclone warning signals, more than the long-term average of about 6 in a year. The No. 8 Gale or Storm Signals were issued during the passages of Lionrock and Kompasu in October."

"Attributing to the heavy rain induced by tropical cyclones Lionrock and Kompasu, October 2021 was much wetter than usual in Hong Kong. The monthly rainfall of 631.1 millimetres was more than five times of the 1991-2020 normal figure of 120.3 millimetres (or more than six times of the 1981-2010 normal of 100.9 millimetres) and the second highest on record for October."

The following is excerpted from the HKO's Monthly Weather Summary describing the weather conditions of the rainstorms associated with Landslip Warnings and Black Rainstorm Warnings issued in 2021. Further details on the monthly weather are available on the HKO Website (<https://www.hko.gov.hk/en/wxinfo/pastwx/mws/mws.htm>).

Rainstorm associated with Landslip Warning and Black Rainstorm Warning issued on 28 June 2021

"With an active southwesterly airstream affecting the coast of Guangdong, the weather of Hong Kong remained unsettled with occasional showers and squally thunderstorms on 27-29 June. The rain was particularly heavy and persistent on the morning of 28 June and the incessant downpour necessitated the issuance of the first Black Rainstorm Warning this year. More than 150 millimetres of rainfall were recorded over Kowloon peninsula, Hong Kong Island, Tsing Yi, Tseung Kwan O, Cheung Chau and Lantau Island."

Rainstorm associated with Landslip Warning and Black Rainstorm Warning issued on 8 October 2021

"Under the combined effect of Lionrock and the northeast monsoon, it was windy with squally heavy showers and thunderstorms in Hong Kong on 7-8 October. The rain was particularly heavy and persistent on 8 October with more than 200 millimetres of rainfall generally recorded over Hong Kong, necessitating the issuance of the second Black Rainstorm Warning in the year. The rainfall recorded at the Observatory on that day even reached 329.7 millimetres, more than two times of October's monthly total normal figure of 120.3 millimetres and the highest daily rainfall on record for October. With Lionrock edging closer to the coast of Guangdong and winds over Hong Kong further strengthening on 9 October, the No. 8 Gale or Storm Signal was issued early that morning."

The rainfalls recorded at the HKO in the first three quarters of 2021 are 65.6 mm (55% below the normal rainfall), 725.5 mm (22% below the normal rainfall) and 859.6 mm (26% below the normal rainfall) respectively. The total rainfall recorded in the last quarter is 656.4 mm (248% above the normal rainfall). The annual rainfall for 2021 is 2,307.1 mm, about 5% lower than the annual normal of 2,431.2 mm recorded between 1991 and 2020. The cumulative rainfall for 2021 is compared with the highest, lowest and mean rainfall in Figure 2.2.

Figure 2.3 shows the monthly rainfall distribution in 2021. Figure 2.4 shows the annual rainfall distribution in 2021, together with the locations of the reported landslides.

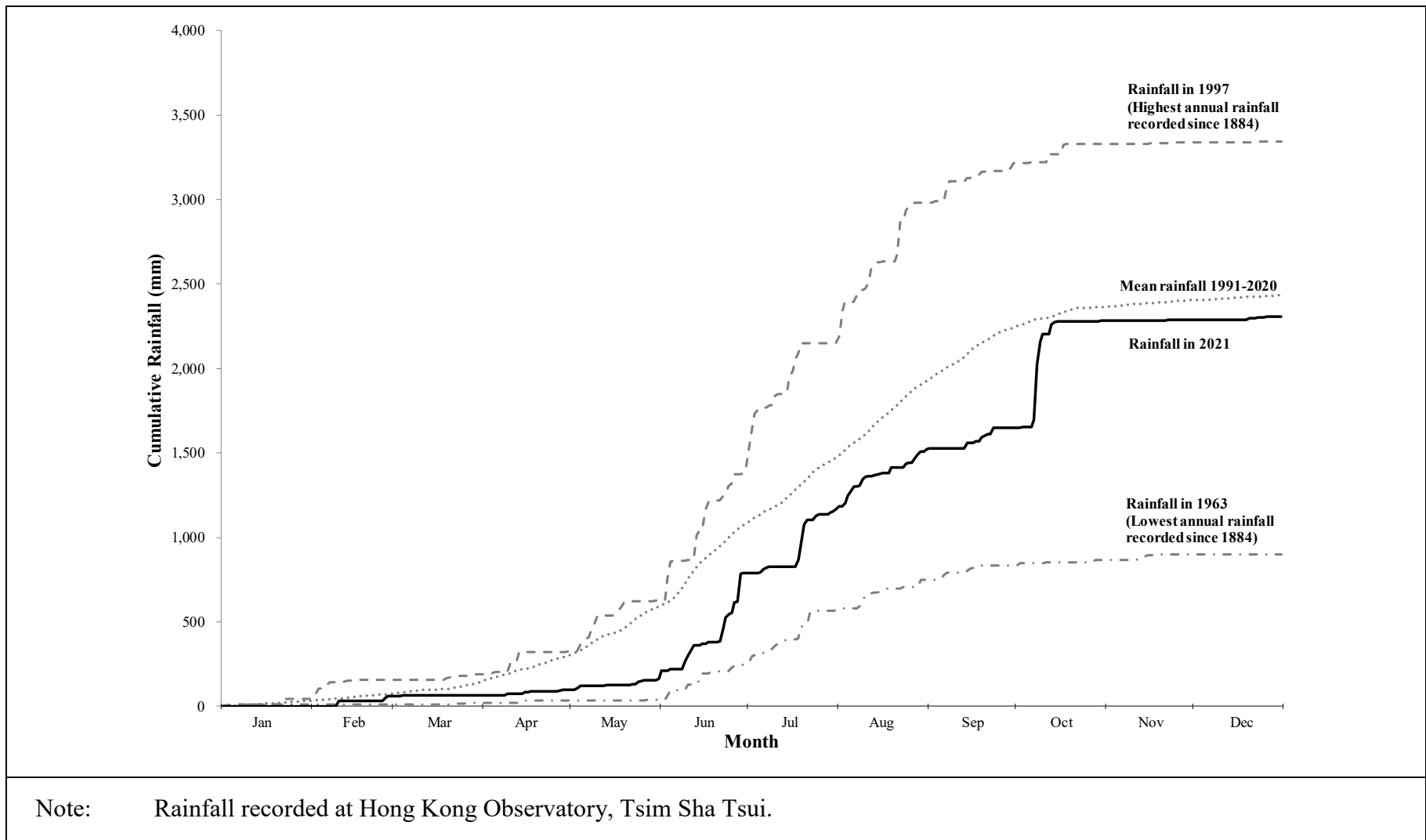
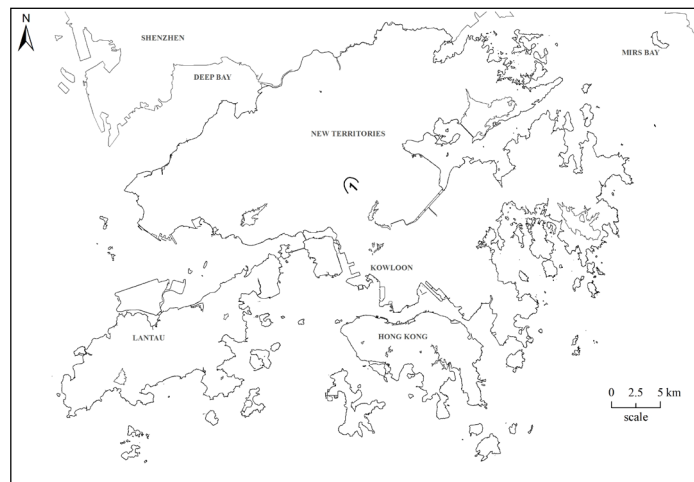
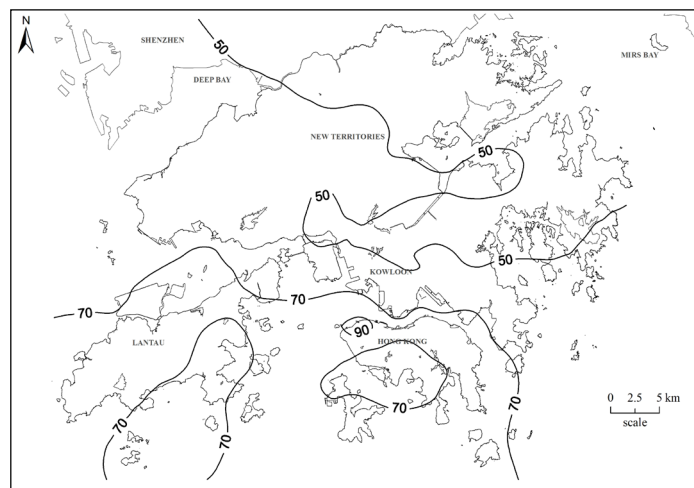


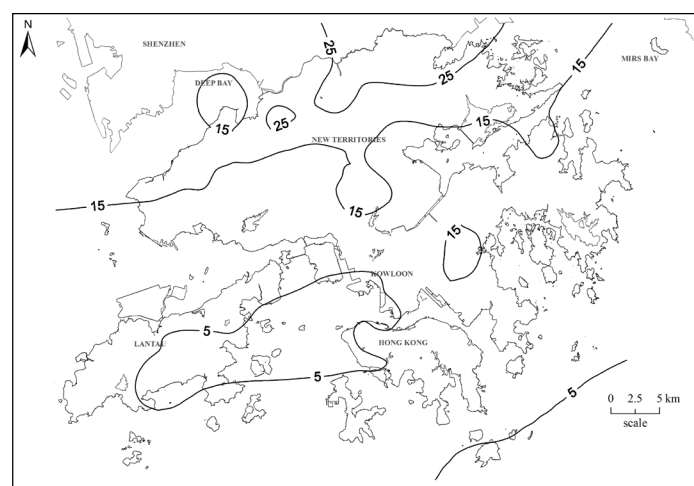
Figure 2.2 Cumulative Rainfall for 2021 at the Hong Kong Observatory and its Recorded Highest, Mean and Lowest Cumulative Rainfalls



January 2021



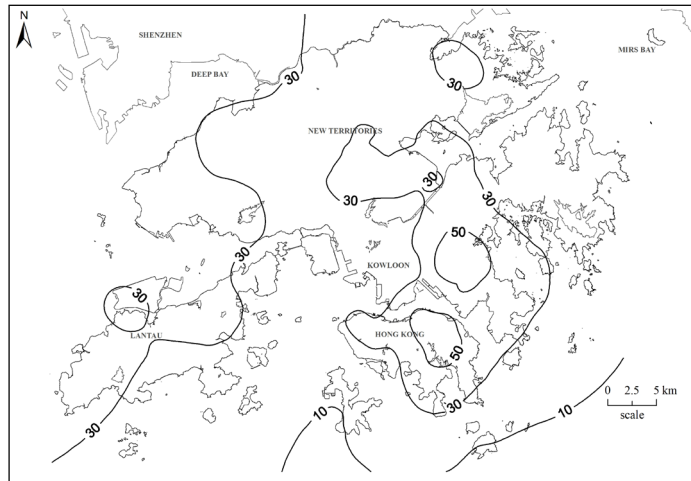
February 2021



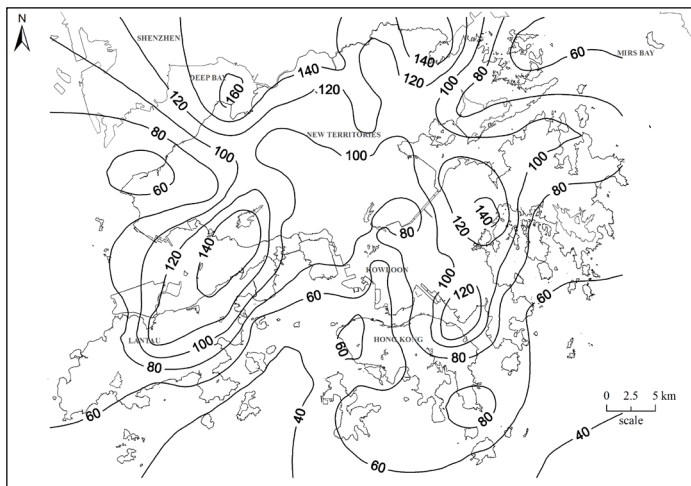
March 2021

Note: Isohyets are based on the GEO and HKO raingauges.

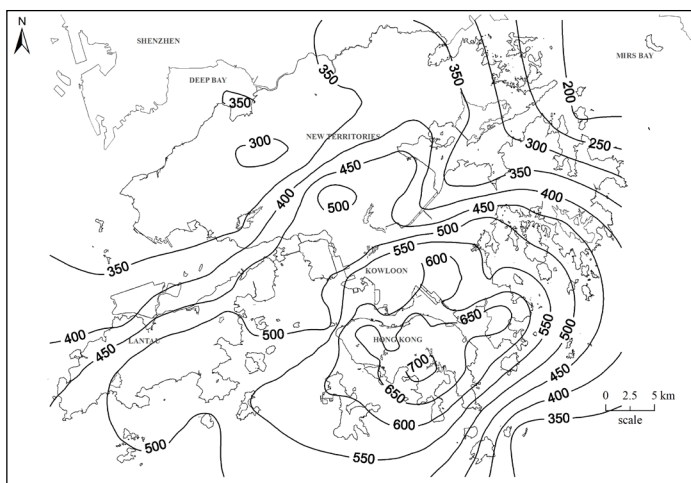
Figure 2.3 Monthly Rainfall Distribution in 2021 (Sheet 1 of 4)



April 2021



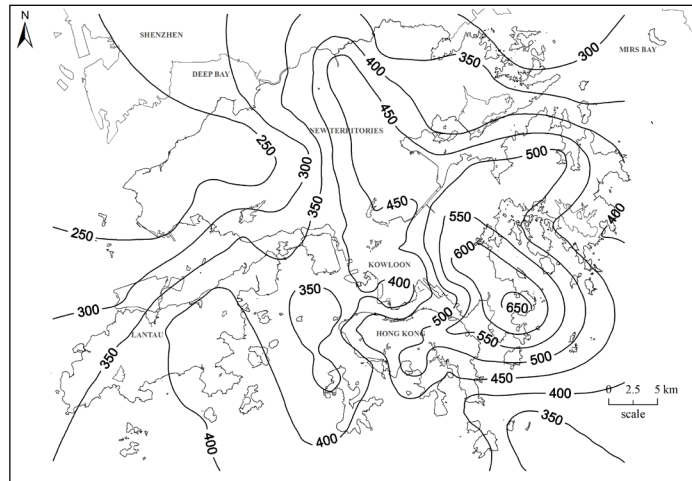
May 2021



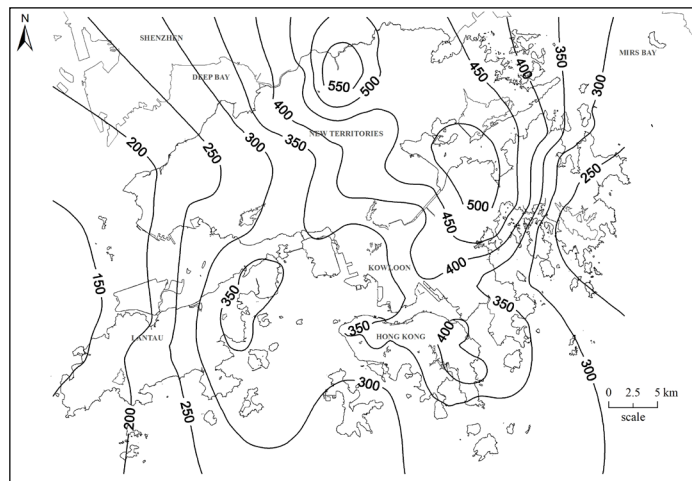
June 2021

Note: Isohyets are based on the GEO and HKO raingauges.

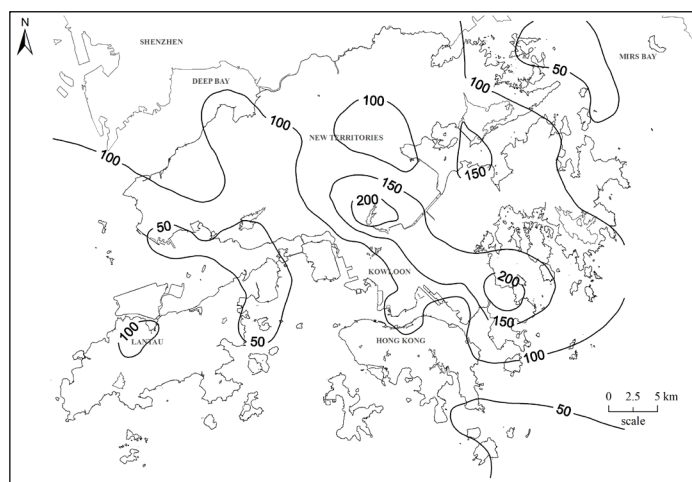
Figure 2.3 Monthly Rainfall Distribution in 2021 (Sheet 2 of 4)



July 2021



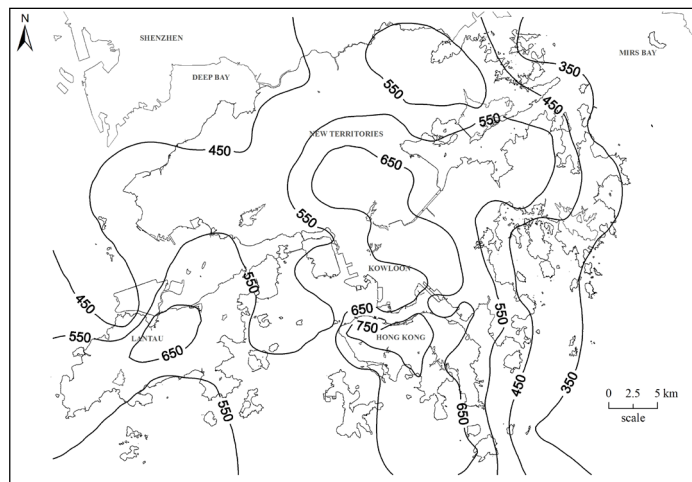
August 2021



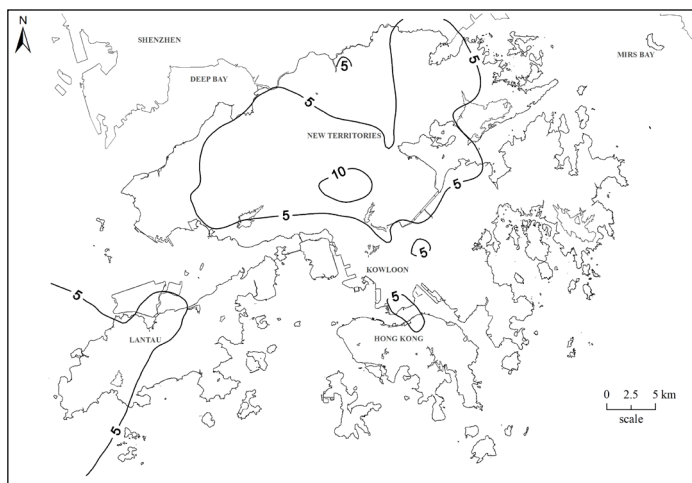
September 2021

Note: Isohyets are based on the GEO and HKO raingauges.

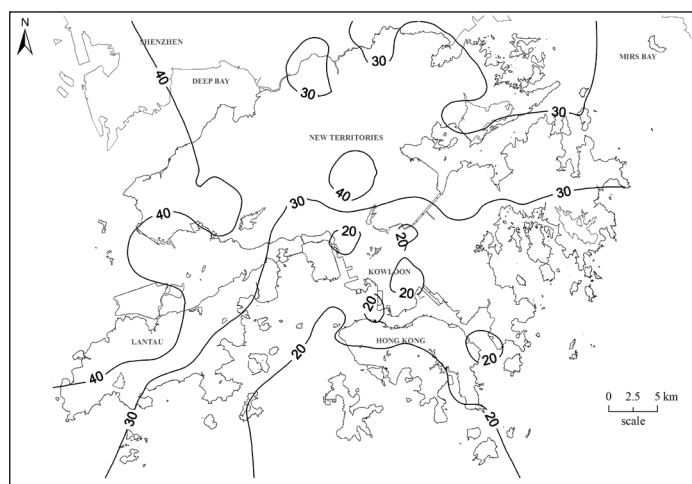
Figure 2.3 Monthly Rainfall Distribution in 2021 (Sheet 3 of 4)



October 2021



November 2021



December 2021

Note: Isohyets are based on the GEO and HKO raingauges.

Figure 2.3 Monthly Rainfall Distribution in 2021 (Sheet 4 of 4)

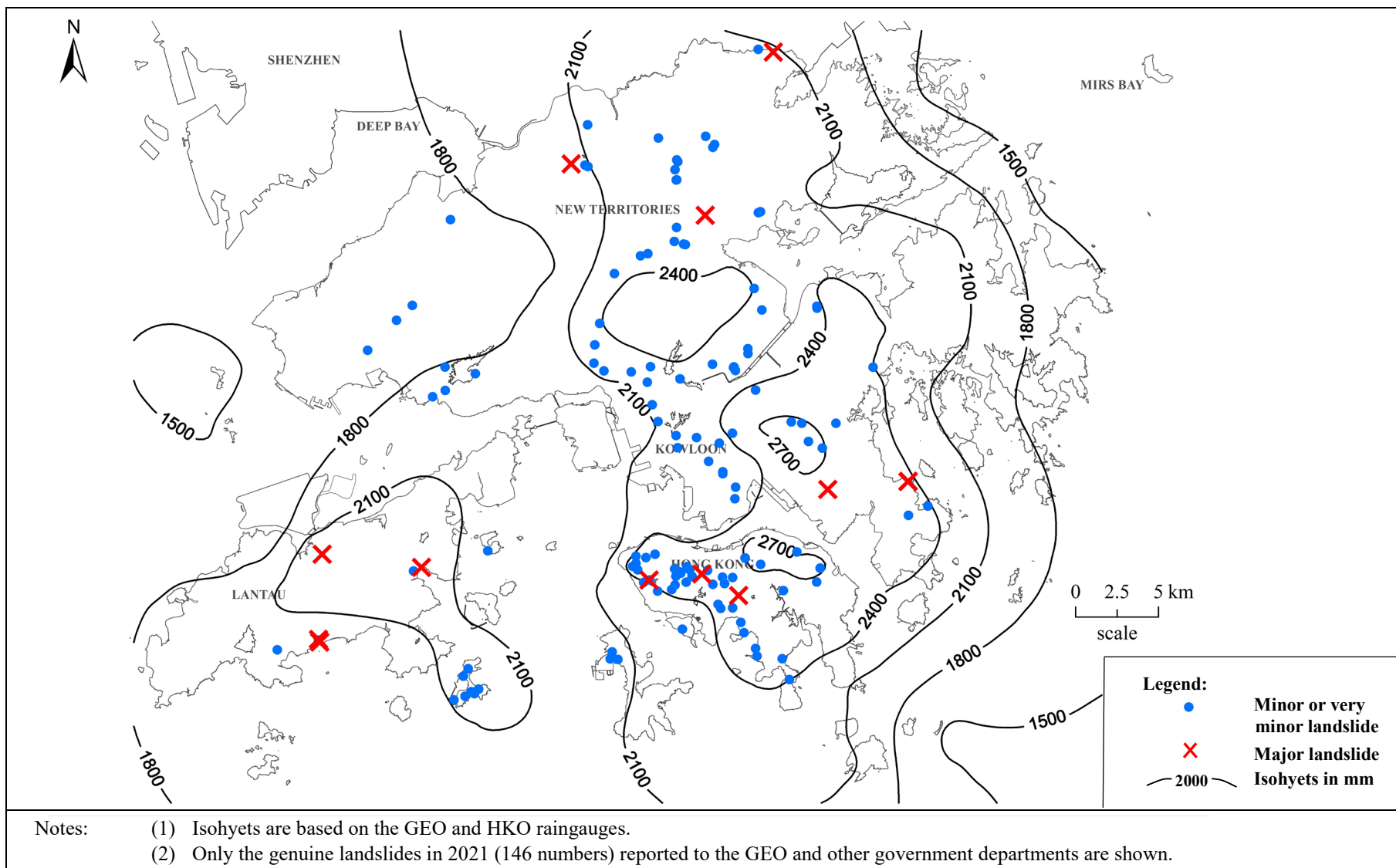


Figure 2.4 Annual Rainfall Distribution and Locations of Reported Landslides in 2021

2.3 Rainstorms in 2021

Table 2.1 tabulates the rainfall parameters for two rainstorms in 2021, during which Landslip Warnings were issued. The parameters include the maximum 24-hour, 4-hour and 1-hour rolling rainfalls (based on 5-minute rainfall data). Table 2.1 also includes the 4-day and 15-day antecedent rainfalls at the HKO's Principal Raingauge at Tsim Sha Tsui. Similar data for selected major rainstorms in the previous years are included in Table 2.1 for comparison. Other rainfall parameters for the above two rainstorms are also shown in Table A1 of Appendix A.

Figures A1 to A2 of Appendix A show the isohyets of the maximum rolling 24-hour rainfalls during the above two rainstorms, together with the locations of reported landslides with incident dates or incident reported dates that can be attributed to the rainstorm events, and the locations and values of maximum rolling rainfalls for durations ranging from five minutes to 48 hours.

The rainstorms of 28 to 29 June 2021 and 8 to 10 October 2021 triggered 15 and 27 reported landslides respectively. The Landslide Potential Indices of the two rainstorms were 10 and 72 respectively.

2.4 Warnings Issued by the Hong Kong Observatory

Table 2.2 summarises the details of the Flooding, Landslip, Tropical Cyclone and Rainstorm Warnings issued by the HKO in 2021. Two Black Rainstorm Warnings were issued, each on 28 June and 8 October 2021. Six Red Rainstorm Warnings and 27 Amber Rainstorm Warnings were issued between 1 June and 8 October 2021, and between 4 May and 13 October 2021 respectively. Two Landslip Warnings were issued respectively on 28 June and 8 October 2021.

Table 2.1 Rainfall and Landslides in 2021 and Selected Previous Major Rainstorms (Sheet 1 of 2)

Date of Rainstorm Event	Maximum Rainfall (mm) ⁽¹⁾								Number of Landslides Reported ⁽⁴⁾	Landslide Potential Index ⁽⁵⁾
	Principal Raingauge at HKO					GEO Raingauges ⁽²⁾				
	24-hr	4-hr	1-hr	Antecedent		24-hr	4-hr	1-hr		
				4-day	15-day					
28-29 June 2021	145.0	120.5	49.5	84.5	233.0	252.0 (H12)	227.0 (H01) [2] ⁽³⁾	91.0 (N26) [3] ⁽³⁾	15	10
8-10 October 2021	332.0	124.0	75.0	61.0	101.5	480.0 (H09) [1] ⁽³⁾	180.5 (H07)	99.5 (H07) [3] ⁽³⁾	27	72

- Notes:
- (1) The maximum rainfalls are calculated using 5-minute rainfall as the basic unit, except those recorded at the HKO, for which the rolling rainfall is calculated using one-clock hour rainfall as the basic unit.
 - (2) The maximum rainfalls are selected from the 90 GEO raingauges for the rainstorms. The GEO raingauge reference numbers are shown in round brackets.
 - (3) The ranking of the rainfall record is shown in the square brackets, if it is within the top three since the establishment of the corresponding GEO raingauge.
 - (4) Reported landslides refer to those genuine landslides that can be attributed to the rainstorm events.
 - (5) Landslide Potential Index (LPI) is derived by estimating the potential number of landslides based on rainfall intensity, rainfall location and spatial distribution of slopes in Hong Kong. More information on LPI can be found on the “Hong Kong Slope Safety Website” (<http://hkss.cedd.gov.hk>).

Table 2.1 Rainfall and Landslides in 2021 and Selected Previous Major Rainstorms (Sheet 2 of 2)

Date of Rainstorm Event	Maximum Rainfall (mm) ⁽¹⁾								Number of Landslides Reported ⁽³⁾
	Principal Raingauge at HKO					GEO Raingauges ⁽²⁾			
	24-hr	4-hr	1-hr	Antecedent		24-hr	4-hr	1-hr	
4-day				15-day					
Selected Major Rainstorms in Previous Years (for comparison only)									
20-21 May 1989	387.8	119.3	37.3	27.9	41.7	566.0 (N14)	194.5 (N14)	61.5 (N14)	378
7-9 May 1992	324.7	195.0	109.9	4.2	9.1	386.5 (H10)	243.0 (H10)	144.5 (H19)	314
15-16 June 1993	155.1	122.3	54.1	155.8	296.1	285.0 (N13)	191.5 (N13)	111.0 (H13)	123
4-5 November 1993	106.6	27.8	9.4	0	0	745.0 (N17)	285.0 (N17)	114.0 (N17)	394
21-25 July 1994	310.2	141.9	70.4	18.7	310.1	956.0 (N14)	365.0 (N14)	211.5 (N14)	208
3-11 August 1994	74.1	44.9	27.1	8.1	759.1	381.0 (N14)	187.5 (N14)	103.5 (N14)	46
11-15 August 1995	325.7	109.1	43.8	5.1	436.9	468.0 (H08)	223.5 (H14)	106.0 (N14)	110
3-5 June 1997	150.2	83.7	46.4	0.9	33.6	367.5 (N04)	262.5 (N04)	128.5 (N04)	81
1-4 July 1997	148.8	106.7	45.4	33.5	362.7	800.0 (N09)	249.5 (N09)	125.0 (N01)	150
8-9 June 1998	428.4	152.4	71.7	86.6	246.8	562.0 (N15)	218.5 (N15)	98.0 (N09)	96
22-26 August 1999	313.1	127.4	50.7	6.8	170.3	565.0 (N14)	230.5 (N10)	120.5 (N10)	269
16-21 August 2005	416.4	122.9	39.1	110.7	214.1	570.0 (N01)	173.5 (N18)	82.0 (N25)	229
6-9 June 2008	417.6	246.3	145.5	99.9	242.5	622.5 (N19)	384.0 (N19)	153.5 (N21)	363

Notes: (1) The maximum rainfalls are calculated using 5-minute rainfall as the basic unit, except those recorded at the HKO, for which the rolling rainfall is calculated using one-clock hour rainfall as the basic unit.

(2) The maximum rainfalls are selected from all the available GEO raingauges for the rainstorms. The GEO raingauge reference number is shown in brackets.

(3) Reported landslides refer to those genuine landslides that can be attributed to the rainstorm events.

Table 2.2 Warnings Issued by the Hong Kong Observatory in 2021

Month	Monthly Total Rainfall (mm)	Dates on which Warnings ⁽¹⁾ were in Effect			
		Flooding ⁽²⁾	Landslip ⁽³⁾	Tropical Cyclone ⁽⁴⁾	Rainstorm
January	0.0	-	-	-	-
February	62.1	-	-	-	-
March	3.5	-	-	-	-
April	32.5	-	-	-	-
May	65.0	25	-	-	4 (Amber)
June	628.0	-	28	11-12 (1, KOGUMA)	1 (3 × Amber), 1 (Red), 11 (Amber), 22 (Amber), 23 (Amber), 24 (2 × Amber), 26 (Amber), 28 (2 × Amber), 28 (2 × Red), 28 (Black)
July	379.5	20, 25, 29	-	6-7 (1, No name) 18-20 (1-3, CEMPAKA)	18 (Amber), 19 (2 × Amber), 20 (Amber), 25 (Amber), 30 (Amber)
August	350.5	4-5, 6, 8, 18, 19	-	2-4 (1-3, LUPIT)	4 (Amber), 6 (2 × Amber), 6 (Red), 9 (Amber), 29 (Amber)
September	129.6	-	-	-	-
October	631.1	8	8-10	8-10 (1-8, LIONROCK) 12-14 (1-8, KOMPASU)	7 (Amber), 8 (Amber), 8 (2 × Red), 8 (Black), 9 (Amber), 13 (Amber)
November	5.8	-	-	-	-
December	19.5	-	-	20-21 (1, RAI)	-
Total	2,307.1	10 Warnings	2 Warnings	7 Warnings	35 Warnings (27 × Amber, 6 × Red & 2 × Black)

- Notes:
- (1) Warnings and signals were based on the information from the HKO.
 - (2) More than one Flooding Warning may have been issued within a day but have only been shown once for clarity.
 - (3) Landslip Warning was issued after consultation between the GEO and the HKO.
 - (4) Tropical Cyclone Warning signal number hoisted is shown in the bracket followed by the name of the tropical cyclone.

3 Landslides

3.1 Landslides in 2021

Landslide incidents occurring in 2021 and reported to various government departments are summarised in Table 3.1.

Table 3.1 Breakdown of Landslides in 2021 Reported to Government Departments

Department	Reported Number of Landslides	Genuine Landslides
AFCD	0	0
ArchSD	1 (0)	1 (0)
DSD	0	0
GEO, CEDD	137 ⁽¹⁾	116 ⁽¹⁾
HyD	44 (39)	40 (36)
HD	2 (0)	2 (0)
LandsD	8 (2)	7 (2)
WSD	21 (2)	20 (2)
Total	213 (43) ⁽²⁾	186 (40) ⁽²⁾

Legend:

44 (39) Forty-four incidents were reported to the government departments concerned, 39 of which were also reported to the GEO separately by other parties (i.e. duplicate cases)

Notes: (1) A total of 137 landslide incidents that occurred in 2021 (discounting duplicate cases) were reported to the GEO, of which 116 were classified as genuine landslides.

(2) The number of reported landslide incidents that occurred in 2021 (discounting duplicate cases) is **170** [213 - 43]. The number of genuine landslides is **146** [186 - 40].

A total of 170 landslide incidents that occurred in 2021 were reported to various government departments. These include 137 incidents (discounting duplicate cases) reported to the GEO. Another 33 incidents were reported to other government departments (i.e. ArchSD, HyD, HD, LandsD and WSD). Of these 170 reported incidents, 146 were genuine landslides (see details in Appendix B). The other reported incidents were non-landslide events such as tree falls.

Of the 146 genuine landslides, 13 (8.9%) were major landslides (see Table B1 of Appendix B), 73 (50.0%) were minor landslides and 60 (41.1%) were very minor landslides with negligible consequences (see Section 1).

Selected notable landslides are presented in Section 4. For those landslide incidents inspected by the GEO, the information on the landslides was recorded in the incident reports prepared by the GEO. For those landslide incidents attended to by other government departments responsible for slope maintenance, landslide incident reports were prepared by the respective departments. Further details of these landslide incidents can be found in the relevant files of the three District Divisions and LPM Division 2 of the GEO.

Wherever possible, the dates and times of the landslides were assessed by geotechnical professionals. Of the 146 landslides, the timing of occurrence was determined to within one day for 42 incidents based on the reported date of failure given in the incident reports. For the remaining landslide incidents, the timing of occurrence could not be ascertained due to the lack of information or that the incidents were not reported to the GEO or other government departments until several days or even weeks after their occurrences.

3.2 Consequence of Landslides

The consequence of landslides in terms of the types of facilities affected (e.g. buildings, registered squatter dwellings, roads, catchwaters, car parks, etc.) in different regions is summarised in Table 3.2. In regard to the landslides with significant consequences (e.g. casualties, evacuation of buildings or squatter dwellings, temporary closure of roads, etc.), they are classified with respect to the types of slope failures, as shown in Table 3.3. The facility groups affected by the major landslides are presented in Table 3.4. Further descriptions of some selected notable landslides of 2021 are given in Section 4.

3.3 Types of Slope Failures

Landslides reported to the GEO and other government departments have been classified into four major types of slope failures, i.e. fill slope, cut slope, retaining wall and natural hillside failures. The breakdown of different types of slope failures is shown in Table 3.5.

Table 3.2 Breakdown of Landslides by Types of Affected Facilities

Types of Affected Facilities	Hong Kong Island	Kowloon	New Territories and Outlying Islands	All
Buildings (including village houses)	0	0	7 (0)	7 (0)
Registered Squatter Dwellings	0	0	6 (0)	6 (0)
Roads	21 (1)	2 (0)	21 (4)	44 (5)
Transportation Facilities (e.g. railways, tramways, etc.)	0	0	0	0
Pedestrian Pavements/Footways	1 (0)	0	0	1 (0)
Minor Footpaths/Access Paths/Access Roads	18 (1)	2 (0)	30 (1)	50 (2)
Construction Sites	0	1 (0)	0	1 (0)
Open Areas	0	3 (1)	10 (1)	13 (2)
Catchwaters	0	0	2 (1)	2 (1)
Others (e.g. carparks, parks, playgrounds, gardens, backyards, etc.)	3 (1)	2 (0)	4 (0)	9 (1)
Nil	5 (0)	2 (0)	9 (2)	16 (2)
Total	48 (3)	12 (1)	89 (9)	149 (13)

Legend:

21 (1) Twenty-one landslides, one of which was major.

Notes: (1) Incidents that were not genuine landslides have been excluded.
(2) A given landslide may affect more than one type of facility.
(3) 'Nil' refers to incidents where the landslide debris came to rest on the slopes, not affecting any facilities.

Table 3.3 Breakdown of Landslide Consequences by Types of Slope Failures

Types of Slope Failures		Number of Squatter Dwellings ⁽¹⁾ Evacuated		Number of Floors, Houses or Flats Evacuated or Partially Closed	Number of Incidents Involving Closure			Deaths	Injuries Reported to GEO
		Permanent	Temporary		Roads	Pedestrian Pavements	Footpaths, Alleyways or Private Access Paths		
Fill Slopes		0	0	0	1	0	0	0	0
Cut Slopes	Soil	0	0	0	8	0	4	0	0
	Soil/Rock	0	0	0	0	0	0	0	0
	Rock	0	0	0	1	0	0	0	0
Retaining Walls		0	0	0	0	0	0	0	0
Natural Hillsides		0	0	1 ⁽²⁾	2	0	1	0	0
Total		0	0	1	12	0	5	0	0

Legend:

1 (1) Number of squatter dwellings evacuated, with the number of tolerated squatter structures evacuated shown in brackets

Notes: (1) A squatter dwelling is defined as a place of residence that contains one or more tolerated squatter structures, i.e. all structures registered in 1982 Housing Department's Squatter Structure Survey (GEO, 2018).

(2) One person was temporarily evacuated from a village house resulted from a natural hillside failure (Incident No. 2021/06/2995).

Table 3.4 Breakdown of Facility Groups Affected by Major Landslides

Types of Major Landslides	Facility Group Affected by Major Landslides (Group No.)						
	1a	1b	2a	2b	3	4	5
All Major Landslides	0	0	0	0	2	4	5
Major Landslides on Man-made Slopes	0	0	0	0	1	2	3
Major Landslides on Natural Hillsides	0	0	0	0	1	2	2

Note: Facility groups are classified in accordance with the GEO Technical Guidance Note No. 15 (GEO, 2007).

Table 3.5 Breakdown of Landslides by Types of Slope Failures

Types of Slope Failures		Number	Percentage (%)
Fill Slopes		14 (2)	9.6
Cut Slopes	Soil	69 (4)	47.3
	Soil/Rock	10 (0)	6.8
	Rock	12 (0)	8.2
Retaining Walls		12 (0)	8.2
Natural Hillsides		29 (7)	19.9
Total		146 (13)	100

Legend:

14 (2) Fourteen landslides, two of which were major.

Note: Where a landslide involved more than one type of failure, the predominant type of failure has been considered in the above classification.

3.4 Landslide Volume Distribution

Tables 3.6 and 3.7 show the distribution of failure volumes for all the reported landslides. A total of 106 landslides (72.6%) involved less than 5 m³ of material. There were 13 major landslides (with a failure volume of 50 m³ or more), six of which occurred on man-made slopes and seven occurred on natural hillsides. Two incidents involved a failure volume of more than 1000 m³. One of them occurred on the natural hillside above South Lantau Road and the other on a fill slope at Peak Road. Detailed descriptions of these landslides are given in Sections 4.2 and 4.3.

Table 3.6 Landslide Volume Distribution with Respect to Geographical Locations

Volume of Failure (m ³)	Hong Kong Island	Kowloon	New Territories and Outlying Islands	All
< 5	36	9	61	106 (72.6%)
≥ 5 to < 10	4	0	5	9 (6.2%)
≥ 10 to < 20	1	0	7	8 (5.5%)
≥ 20 to < 50	4	2	4	10 (6.8%)
≥ 50 to < 200	2	1	5	8 (5.5%)
≥ 200 to < 500	0	0	3	3 (2.0%)
≥ 500 to < 1000	0	0	0	0 (0%)
≥ 1000	1	0	1	2 (1.4%)
Total	48	12	86	146 (100%)

Legend:

9 (6.2%) Nine landslides, which amount to 6.2% of the total 146 genuine landslides reported to the government departments

Table 3.7 Landslide Volume Distribution with Respect to Types of Slope Failures

Volume of Failure (m ³)	Fill Slopes	Cut Slopes			Retaining Walls	Natural Hill-sides	Total
		Soil	Soil/Rock	Rock			
< 5	9	50	9	10	11	17	106 (72.6%)
≥ 5 to < 10	0	6	0	1	1	1	9 (6.2%)
≥ 10 to < 20	1	4	1	1	0	1	8 (5.5%)
≥ 20 to < 50	2	5	0	0	0	3	10 (6.8%)
≥ 50 to < 200	1	4	0	0	0	5	8 (5.5%)
≥ 200 to < 500	0	0	0	0	0	3	3 (2.0%)
≥ 500 to < 1000	0	0	0	0	0	0	0 (0%)
≥ 1000	1	0	0	0	0	1	2 (1.4%)
Total	14	69	10	12	12	29	146 (100%)

Legend:

9 (6.2%) Nine landslides, which amount to 6.2% of the total 146 genuine landslides reported to the government departments

Note: Where a landslide involved more than one type of failure, the predominant type of failure has been considered in the above classification.

4 Notable Landslides

4.1 General

Of the 146 genuine landslides reported to the government departments that occurred in 2021, two landslide events are described in more detail below. They are selected on the basis of their consequences and scales.

4.2 The 28 June 2021 Landslides above South Lantau Road near Upper Cheung Sha Beach, Lantau Island (Incidents No. 2021/06/2988, 2021/06/2991 and WSD/2021/06/4/HK&I)

At about 8:00 a.m. on 28 June 2021 when Red Rainstorm Warning was in effect, a landslide with a volume of about 140 m³ occurred on a soil cut slope (Feature No. 13NE-B/CR158), which abuts a section of the Shek Pik Catchwater some 220 m (plan distance) above South Lantau Road (Figure 4.1). The landslide debris substantially blocked the catchwater channel. The blockage led to overflow with a significant amount of water diverted to the downslope areas passing over a fill slope (Feature No. 13NE-B/FR100) below the catchwater, the natural hillside further downslope and a soil cut slope (Feature No. 13NE-B/C133) which abuts South Lantau Road. The scouring effect of the concentrated overflow caused erosion to these slopes, with the erosion being particularly severe at the lower part of the natural hillside which falls within a topographic depression. The failure volume was about 2,000 m³ and the landslide debris was deposited on South Lantau Road, the adjacent lay-by and Upper Cheung Sha Beach. As a result, all two lanes of South Lantau Road were temporarily closed and a taxi stand shelter was damaged. No casualty was reported. This landslide was widely reported in the media.

4.3 The 5 November 2021 Landslide on a Fill Slope at Peak Road, The Peak (Incident No. 2021/11/3089)

At about 2:30 p.m. on 5 November 2021, a landslide occurred on a fill slope (Feature No. 11SW-D/FR135) below Peak Road, The Peak under dry weather (Figure 4.2). The landslide was probably triggered by the bursting of a buried 250 mm diameter pressurised water main running along the west-bound lane of Peak Road. The landslide scar on the slope measured about 20 m long by 30 m wide by 5 m deep and the failure volume was about 1,600 m³. Some of the caissons supporting Peak Road were exposed by the landslide. While Peak Road was partially undermined, the road surface remained in place with little damage observed following the landslide. The landslide debris travelled downhill to the natural hillside and along a stream course for over 300 m. As a result of the landslide, two lanes of Peak Road were temporarily closed. No casualty was involved. This landslide was widely reported in the media.

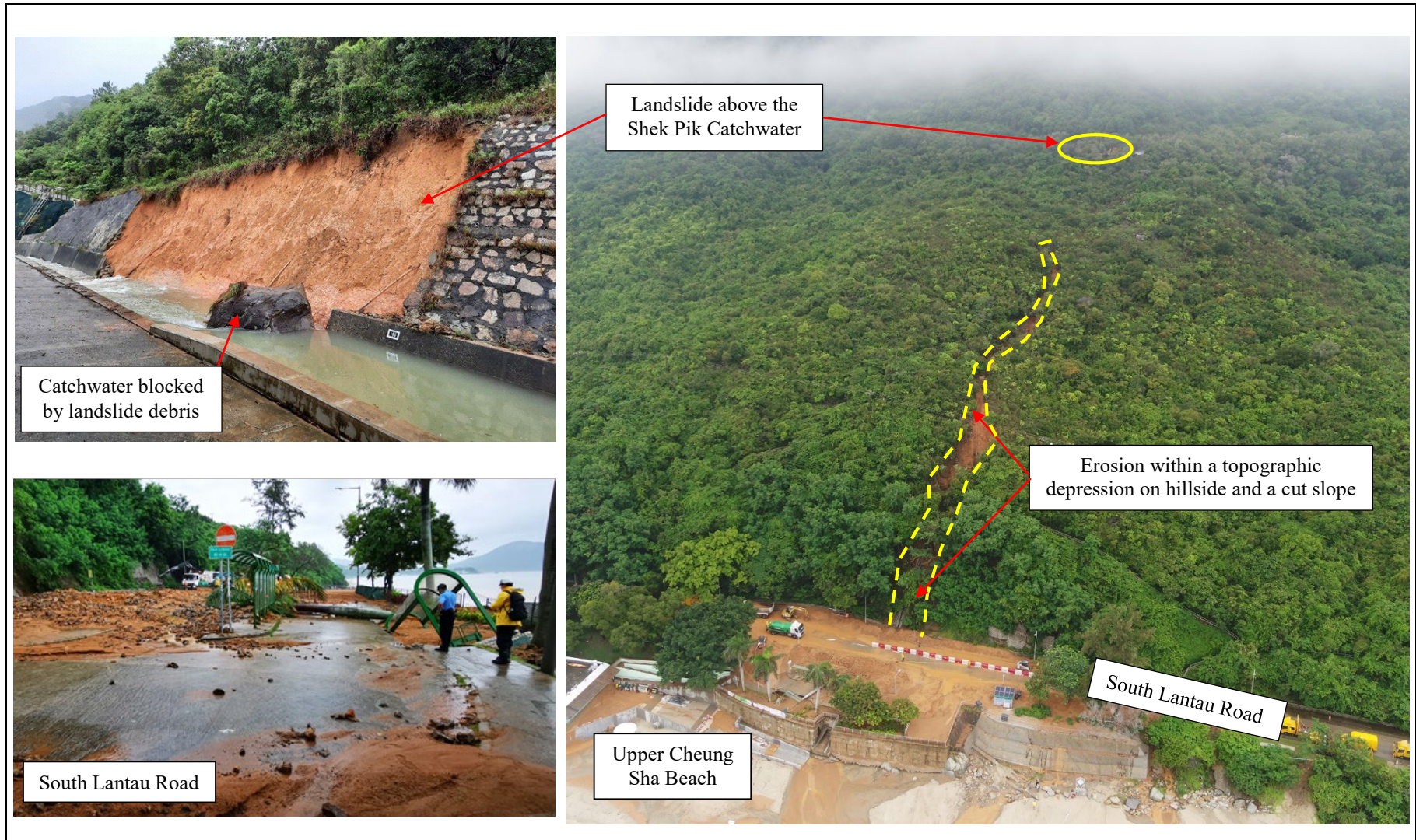


Figure 4.1 Views of the 28 June 2021 Landslides above South Lantau Road near Upper Cheung Sha Beach, Lantau Island (Incidents No. 2021/06/2988, 2021/06/2991 and WSD/2021/06/4/HK&I)



Figure 4.2 Views of the 5 November 2021 Landslide on a Fill Slope at Peak Road, The Peak (Incident No. 2021/11/3089)

5 Conclusion

Rainfall recorded at the HKO's Principal Raingauge at Tsim Sha Tsui amounted to 2,307.1 mm in 2021, about 5% lower than the annual normal of 2,431.2 mm recorded between 1991 and 2020. On 28 June and 8 October 2021, both Landslip Warnings and Black Rainstorm Warnings were issued on these two days. Of the 146 genuine landslides, 13 were major failures, 73 were minor failures and 60 were very minor failures with negligible consequences.

There were 15 landslides in 2021 with notable consequences. Of these landslides, one led to temporary evacuation from a village house, one resulted in damage of a temporary storage structure, one resulted in damage of the brick column of the entrance corridor of a house and the other 12 resulted in temporary closure of roads. Other landslides in 2021 primarily affected footpaths or minor access roads, catchwaters and open areas without any significant direct or indirect consequence. No casualty was reported as a result of the landslides.

6 References

- GEO (2007). *Guidelines for Classification of Consequence-to-Life Category for Slope Features (GEO Technical Guidance Note No. 15)*. Geotechnical Engineering Office, Civil Engineering and Development Department, Hong Kong, 14 p.
- GEO (2018). *Non-Development Clearance (Slope Safety) of Squatters (GEO Circular No. 3)*. Geotechnical Engineering Office, Civil Engineering and Development Department, Hong Kong, 19 p.
- HKO (2022). *The Year's Weather - 2021*. Hong Kong Observatory, Hong Kong. (<https://www.hko.gov.hk/en/wxinfo/pastwx/2021/ywx2021.htm>).

Appendix A

Some Selected Rainfall Parameters for the Two Rainstorms
with Landslip Warnings Issued in 2021

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Table A1 Some Selected Rainfall Parameters for the Two Rainstorms with Landslip Warnings Issued in 2021

Rainstorm		5-min		10-min		15-min		30-min	
		Max. Rainfall (mm)	Raingauge Station	Max. Rainfall (mm)	Raingauge Station	Max. Rainfall (mm)	Raingauge Station	Max. Rainfall (mm)	Raingauge Station
1	28-29 June 2021	17.5	H12	26.5	H12	32	H12, N03, N38	51.5	N22
2	8-10 October 2021	17	H07	31.5	H07	43.5	H07	73.5	H07

Rainstorm		1-hr		2-hr		4-hr		5-hr		6-hr	
		Max. Rainfall (mm)	Raingauge Station	Max. Rainfall (mm)	Raingauge Station	Max. Rainfall (mm)	Raingauge Station	Max. Rainfall (mm)	Raingauge Station	Max. Rainfall (mm)	Raingauge Station
1	28-29 June 2021	91	N26	136.5	H12	227	H01	245.5	H12	247.5	H12
2	8-10 October 2021	99.5	H07	119.5	H07	180.5	H07	220	K07	257.5	K07

Rainstorm		8-hr		12-hr		18-hr		24-hr		48-hr	
		Max. Rainfall (mm)	Raingauge Station	Max. Rainfall (mm)	Raingauge Station	Max. Rainfall (mm)	Raingauge Station	Max. Rainfall (mm)	Raingauge Station	Max. Rainfall (mm)	Raingauge Station
1	28-29 June 2021	249	H12	249	H12	249	H12	252	H12	265.5	H12
2	8-10 October 2021	311.5	K07	378	K07	443.5	H09	480	H09	637	H09

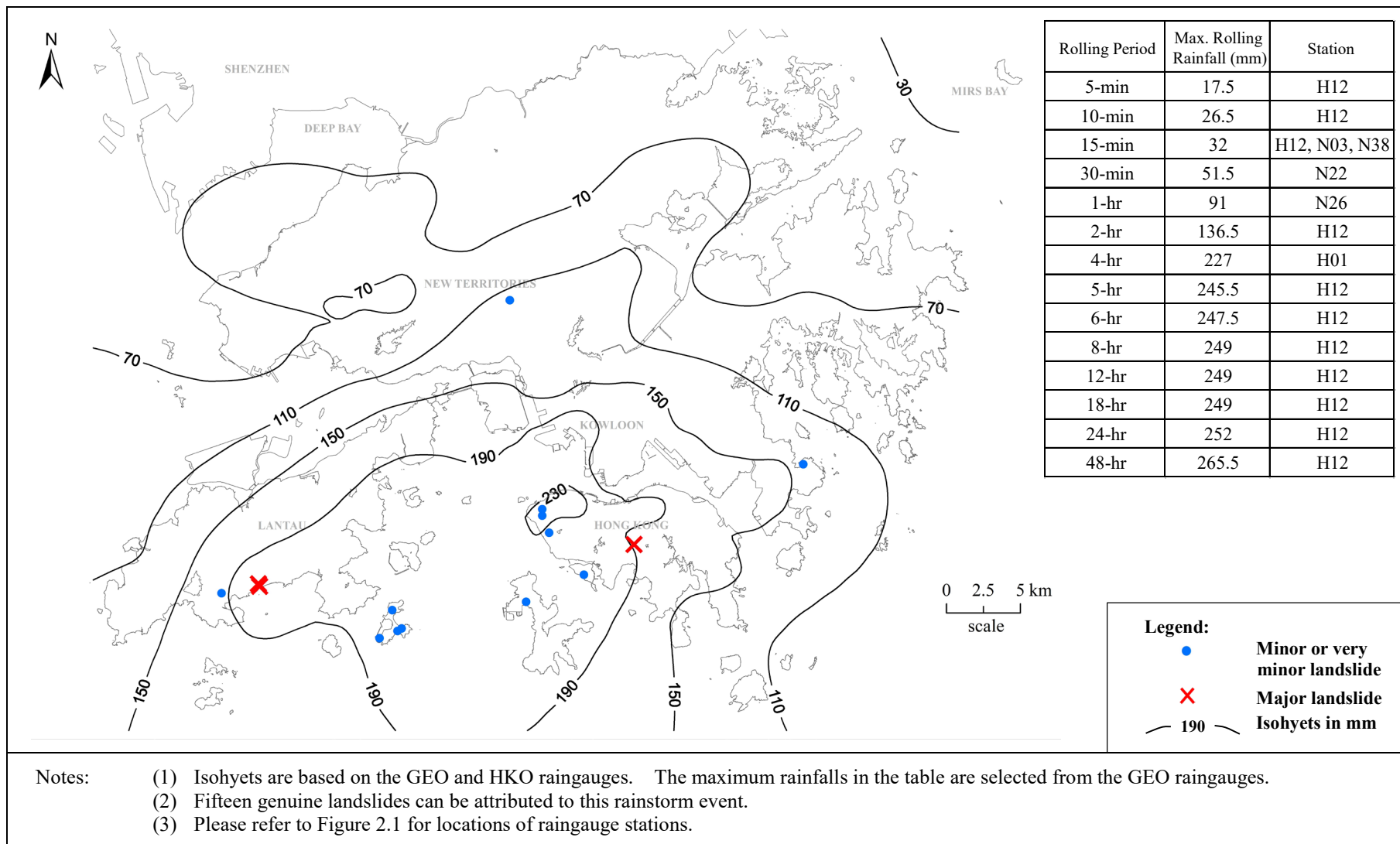


Figure A1 Maximum Rolling 24-hour Rainfall Distribution for the Period between 28 June (00:00) and 29 June 2021 (24:00) and Locations of Landslides

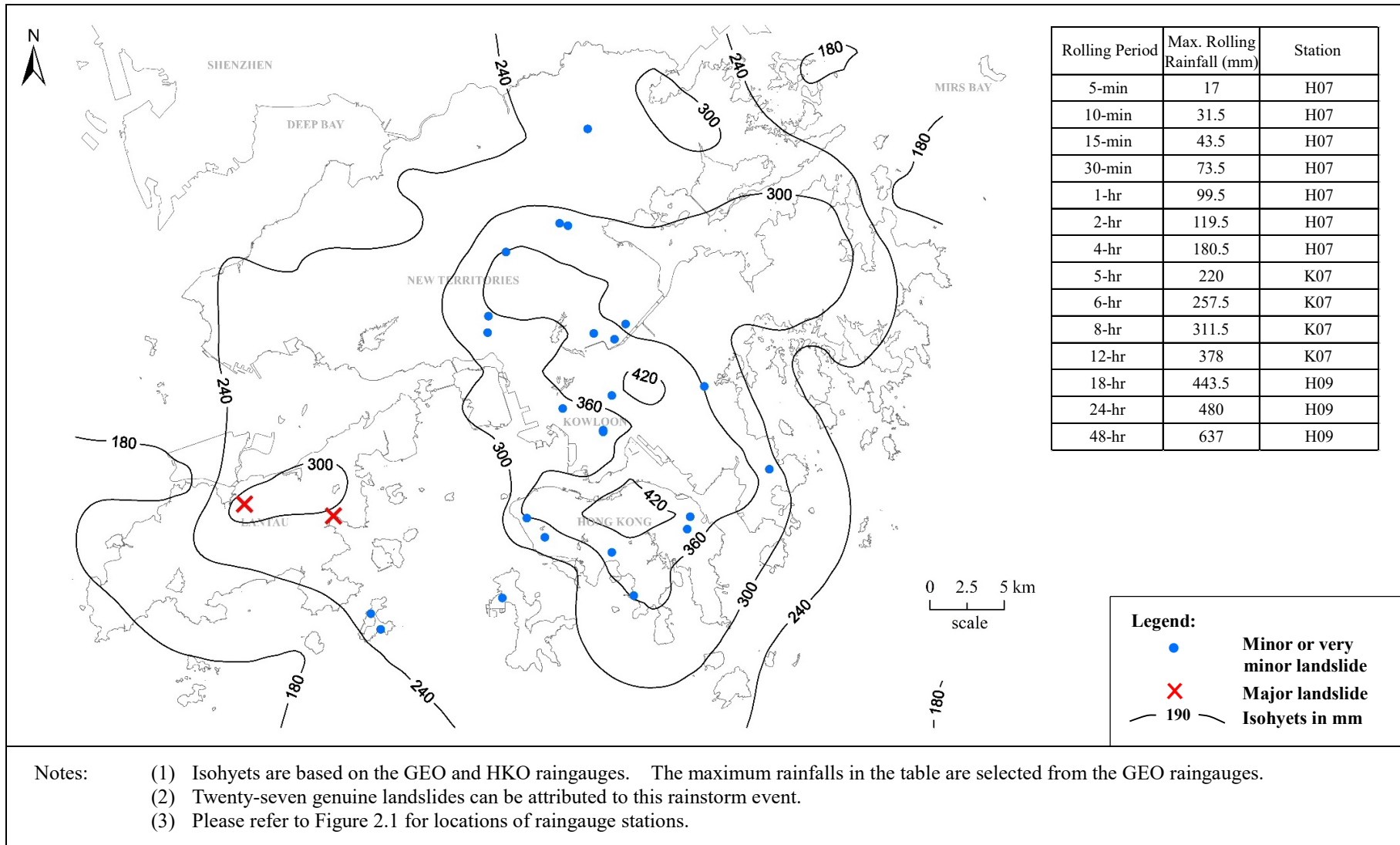


Figure A2 Maximum Rolling 24-hour Rainfall Distribution for the Period between 8 October (00:00) and 10 October 2021 (24:00) and Locations of Landslides

Appendix B

List of Landslide Incidents Reported to Government Departments

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Table B1 List of Major Landslide Incidents (Sheet 1 of 2)

Incident No.	Location	Feature Registration No. (if any)	Failure			Facility Affected	Consequence
			Date (Time)	Feature Type	Scale (m ³)		
2021/06/2988	Above South Lantau Road near Cheung Sha Beach, Lantau	Natural hillside & 13NE-B/C133	28/6 (08:00)	Natural hillside & Soil cut	2000	Road	All two lanes of South Lantau Road temporarily closed
2021/06/2991	Lantau Island Catchwater (Section F), Lantau	13NE-B/CR158	28/6 (08:00)	Soil cut	140	Catchwater	Catchwater blocked
2021/06/2993	Black's Link	11SW-D/C1334	28/6 (16:00)	Soil cut	80	Minor footpath	-
2021/07/3006	Hang Hau Wing Lung Road, Clear Water Bay, Sai Kung	12NW-C/C297	20/7 (12:35)	Soil cut	65	Road	Hang Hau Wing Lung Road (one-lane road) temporarily closed
2021/07/3007	Sau Mau Ping Road, Kwun Tong	11NE-D/F380	20/7 (10:20)	Fill	105	Open area	-
2021/07/3009	Below Hang Hau Wing Lung Road, Clearwater Bay, Sai Kung	Natural hillside	20/7 (12:35)	Natural hillside	300	Access road	Access road temporarily closed
2021/07/3014	Ki Lun Tsuen, Kwu Tung (near Lamp Post No. H3325)	Natural hillside	22/7 (07:20)	Natural hillside	200	Road	-
2021/08/3020	Block 3, Middleton Towers, No. 140 Pok Fu Lam Road, Pok Fu Lam	Natural hillside	3/8 (06:30)	Natural hillside	110	Other (government water supply facilities)	A water main ruptured
2021/09/3040	Above Feature No. 7NW-B/MH5, Tit Mei Tsai Village, Tai Po	Natural hillside	Unknown	Natural hillside	157	Nil	-
2021/10/3063	Methodist Villa, Tung Wan Tau, Mui Wo, Lantau	Natural hillside	9/10 (01:30)	Natural hillside	50	Open area	A building platform partially undermined

Table B1 List of Major Landslide Incidents (Sheet 2 of 2)

Incident No.	Location	Feature Registration No. (if any)	Failure			Facility Affected	Consequence
			Date (Time)	Feature Type	Scale (m ³)		
2021/10/3068	Lin Ma Hang Road, North	3NE-A/C129	Unknown	Soil cut	147	Road	Lin Ma Hang Road (one-lane road) temporarily closed
2021/10/3075	Above Feature No. 9SE-B/ND12, Ma Wan New Village, Pa Mei, Tung Chung, Lantau	Natural hillside	9/10 (18:00)	Natural hillside	220	Nil	-
2021/11/3089	Peak Road	11SW-D/FR135	5/11 (14:31)	Fill	1600	Road	Two lanes of Peak Road temporarily closed

Table B2 List of Landslide Incidents on Hong Kong Island (Sheet 1 of 5)

Incident No. ⁽¹⁾	Location	Feature Registration No. (if any)	Reported		Failure			Facility Affected	Consequence
			Date	By	Date (Time)	Feature Type	Scale (m ³)		
2021/03/2868	Nos. 19-25, Village Terrace, Happy Valley	11SW-D/CR36	25/2	BD	10/2	Rock cut	0.45 (Rockfall)	Road	-
2021/03/2869	Repulse Bay Road (opposite to Lamp Post No. 31628)	15NE-A/CR44	24/2	HyD	Unknown	Rock cut	0.5 (Rockfall)	Road	-
2021/04/2972	Findlay Road	Natural hillside	1/3	Public	Unknown	Natural hillside	0.1 (Boulder fall)	Minor footpath	-
2021/04/2973	Findlay Road	Natural hillside	24/4	Public	Unknown	Natural hillside	0.01 (Boulder fall)	Minor footpath	-
2021/04/2974	Findlay Road	Natural hillside	22/4	Public	Unknown	Natural hillside	0.03 (Boulder fall)	Minor footpath	-
2021/04/2975	Mount Davis Road	11SW-C/C212	13/4	HyD	Unknown	Rock cut	0.01 (Rockfall)	Road	-
2021/05/2979	Findlay Road	Natural hillside	21/5	HyD	Unknown	Natural hillside	0.02 (Boulder fall)	Minor footpath	-
2021/06/2981	South of Wong Chuk Hang Hospital, Wong Chuk Hang	11SW-D/F208	2/6	HyD	1/6	Fill	0.7	Minor footpath	-
2021/06/2982	No. 28 Severn Road	Natural hillside	10/6	Public	Unknown	Natural hillside	0.01 (Boulder fall)	Road	-
2021/06/2983	No. 18 Shing On Street, Sai Wan Ho	< 3 m high retaining wall	16/6	BD	16/6	Masonry wall	0.06	Minor footpath	-

Table B2 List of Landslide Incidents on Hong Kong Island (Sheet 2 of 5)

Incident No. ⁽¹⁾	Location	Feature Registration No. (if any)	Reported		Failure			Facility Affected	Consequence
			Date	By	Date (Time)	Feature Type	Scale (m ³)		
2021/06/2986	Findlay Road	Natural hillside	17/6	Public	Unknown	Natural hillside	0.03 (Boulder fall)	Access road	-
2021/06/2987	Mount Davis Road	Natural hillside	28/6	Police	28/6 (08:20)	Natural hillside	0.9	Road	All two lanes of Mount Davis Road flooded and temporarily closed
2021/06/2993	Black's Link	11SW-D/C1334	28/6	HyD	28/6 (16:00)	Soil cut	80	Minor footpath	-
2021/06/2996	Above Feature No. 15NW-A/CR18, Lee Wing Street, Ap Lei Chau	Natural hillside	29/6	HyD	28/6	Natural hillside	0.3 (Boulder fall)	Road	-
2021/07/3001	Victoria Road, Pok Fu Lam	11SW-C/C924	29/6	HyD	28/6 (11:00)	Soil cut	1.3	Pedestrian pavement	-
2021/07/3002	Near Fontana Gardens, Tai Hang Road	11SE-A/CR105	2/7	GEO	Unknown	Soil cut	0.73	Nil	-
2021/07/3004	Upslope side of Feature No. 11SW-D/C2319, Wong Chuk Hang	< 3 m high retaining wall	9/7	AMO	Unknown	Masonry wall	0.07	Minor footpath	-
2021/08/3019	Mount Nicholson Road	11SW-D/C338	31/7	Police	31/7 (09:51)	Soil cut	0.26	Road	-
2021/08/3020	Block 3, Middleton Towers, No. 140 Pok Fu Lam Road, Pok Fu Lam	Natural hillside	3/8	Public	3/8 (06:30)	Natural hillside	110	Other (government water supply facilities)	A water main ruptured
2021/08/3021	Mount Nicholson Road	11SW-D/C333	3/8	HyD	3/8 (22:46)	Soil cut	0.05 (Rockfall)	Road	-

Table B2 List of Landslide Incidents on Hong Kong Island (Sheet 3 of 5)

Incident No. ⁽¹⁾	Location	Feature Registration No. (if any)	Reported		Failure			Facility Affected	Consequence
			Date	By	Date (Time)	Feature Type	Scale (m ³)		
2021/08/3022	Island Road	15NW-B/C201	4/8	HyD	4/8 (10:30)	Rock cut	0.01	Road	-
2021/08/3030	Peak Road (between Lamp Post Nos. 37463 and 37465)	Natural hillside	21/7	HyD	Unknown	Natural hillside	0.02 (Boulder fall)	Road	-
2021/08/3032	South Bay Road	15NE-A/C100	16/8	Police	Unknown	Rock cut	8.4	Road	One lane of South Bay Road temporarily closed
2021/08/3037	Near No. 48 Mount Kellett Road	Natural hillside	17/8	DC	Unknown	Natural hillside	0.1 (Boulder fall)	Road	-
2021/09/3039	Above Feature No. 11SW-C/C308, Lugard Road	Natural hillside	1/9	HyD	Unknown	Natural hillside	1.8 (Boulder fall)	Road	-
2021/09/3042	Nos. 15-23 Stanley Village Road	< 3 m high cut slope	13/9	HyD	3/9 (10:53)	Rock cut	0.01 (Rockfall)	Minor footpath	-
2021/10/3059	South Bay Road	15NE-A/C305	11/10	HyD	10/10	Soil cut	27	Road	All two lanes of South Bay Road temporarily closed
2021/10/3060	Northeast of Pok Fu Lam Village, Pok Fu Lam	11SW-C/C407	11/10	DSD	9/10	Soil/rock cut	2.1	Minor footpath	-
2021/10/3066	Manderly Garden, Deep Water Bay	11SW-D/C1836	11/10	BD	10/10 (03:00)	Fill	34	Road	-
2021/10/3069	Chinese Christian Cemetery, Pok Fu Lam	11SW-C/CR185	11/10	Public	9/10	Soil cut	0.52	Nil	-

Table B2 List of Landslide Incidents on Hong Kong Island (Sheet 4 of 5)

Incident No. ⁽¹⁾	Location	Feature Registration No. (if any)	Reported		Failure			Facility Affected	Consequence
			Date	By	Date (Time)	Feature Type	Scale (m ³)		
2021/10/3073	Chatham Path	11SW-D/C2095	15/10	HyD	Unknown	Soil cut	6.5	Other (DSD's storm water drain adjacent to the slope)	-
2021/10/3076	Wong Ma Kok Road, Stanley	15NE-C/C13	15/10	HyD	15/10	Soil cut	0.5	Road	-
2021/10/3077	Eastern Nature Trail, Tai Tam	< 3 m high cut slope	21/10	WSD	16/10	Soil cut	1.96	Access road	-
2021/10/3078	Adjacent to Feature No. 11SE-A/C480, Sir Cecil's Ride	< 3 m high cut slope	20/10	LandsD	20/10	Soil cut	0.15	Minor footpath	-
2021/11/3084	Ka Ning Path	11SE-A/C419	1/11	BD	13/10	Soil cut	5	Road	-
2021/11/3085	Chatham Path	< 3 m high cut slope	1/11	HyD	Unknown	Soil cut	0.3	Minor footpath	-
2021/11/3089	Peak Road	11SW-D/FR135	5/11	HyD	5/11 (14:31)	Fill	1600	Road	Two lanes of Peak Road temporarily closed
2021/11/3091	Mount Kellett Road	Natural hillside	2/11	DSD	Unknown	Natural hillside	8	Other (DSD's sewer pipe on natural hillside)	-
2021/11/3092	Nos. 12-14 Middle Gap Road	Natural hillside	15/11	Public	13/10	Natural hillside	11	Road	-
2021/11/3096	Opposite to Feature No. 11SE-D/C385, Sai Wan Fort Morning Trail, Chai Wan	3.5 m high cut slope	23/11	GEO	2/11 (15:00)	Soil cut	0.06	Minor footpath	-
2022/02/3107	Above Kennedy Town Fresh Water Service Reservoir	11SW-A/C313	19/1/2022	Others	Unknown	Soil cut	15	Nil	-

Table B2 List of Landslide Incidents on Hong Kong Island (Sheet 5 of 5)

Incident No. ⁽¹⁾	Location	Feature Registration No. (if any)	Reported		Failure			Facility Affected	Consequence
			Date	By	Date (Time)	Feature Type	Scale (m ³)		
2021/03/1005HY (HyD/HK/2021/03/0002)	Near Feature No. 11SW-D/C589, Peak Road	< 3 m high cut slope	11/3	HyD	11/3	Soil/rock cut	0.3	Road	-
2021/03/1006WS (WSD/2021/04/1/HK&I)	Northeast of Feature No. 11SW-A/C602, Hatton Road Salt Water Service Reservoir, Mid-Levels	Natural hillside	8/4	WSD	26/3	Natural hillside	20	Nil	-
2021/06/1009WS (WSD/2021/06/2/HK&I)	Southwest of Feature No. 11SW-C/C920, adjoining Pok Fu Lam Reservoir Road	< 3 m high cut slope	25/6	WSD	Unknown	Soil cut	0.1	Road	-
2021/08/1018WS (WSD/2021/8/1/HK&I)	Below Feature No. 11SW-C/F64, Pok Fu Lam No. 1 Fresh Water Service Reservoir	Natural hillside	19/8	WSD	Unknown	Natural hillside	2	Nil	-
2021/10/1026WS (WSD/2021/10/3/HK&I)	Pok Fu Lam Conduit at CH0685	11SW-A/C506	21/10	WSD	Unknown	Soil/rock cut	4	Minor footpath	-
2021/10/1027AD (ArchSD/SKW&Is-S/2021/10/001)	Sai Wan Fort Morning Trail	11SE-D/C385	10/10	ArchSD	10/10	Soil/rock cut	4	Access road	-
2021/10/1028HD (HD/1 of 2021)	Hing Man Estate	11SE-D/C742	9/10	HD	9/10	Soil/rock cut	3.5	Minor footpath	-

Note: (1) The brackets denote the landslide number adopted by the government department concerned, other than the GEO.

Table B3 List of Landslide Incidents in Kowloon (Sheet 1 of 2)

Incident No. ⁽¹⁾	Location	Feature Registration No. (if any)	Reported		Failure			Facility Affected	Consequence
			Date	By	Date (Time)	Feature Type	Scale (m ³)		
2021/05/2976	Woh Chai Street, Sham Shui Po	2 m high cut slope	28/4	HAD	28/4 (15:52)	Soil cut	1.3	Minor footpath	-
2021/07/3005	Behind Lok Fung Lau (Block D), Lok Man Sun Chuen, No. 156 Kau Pui Lung Road, To Kwa Wan	11NW-D/C44	18/7	Public	15/7 (14:00)	Rock cut	1.7 (Rockfall)	Open area	-
2021/07/3007	Sau Mau Ping Road, Kwun Tong	11NE-D/F380	20/7	Public	20/7 (10:20)	Fill	105	Open area	-
2021/10/3045	Near Jao Tsung-I Academy, No. 800 Castle Peak Road, Mei Foo	11NW-A/C179	8/10	FSD	8/10	Soil cut	26	Road	One lane of Castle Peak Road temporarily closed
2021/10/3050	Nos. 93-95 Waterloo Road	11NW-D/CR179	8/10	BD	8/10 (15:00)	Retaining wall	3.5	Construction site	-
2021/10/3052	Behind Hannover Court, Nos. 85-91 Waterloo Road	11NW-D/R101	8/10	BD	8/10 (15:00)	Retaining wall	0	Other (open car park)	Car park cordoned off
2021/10/3074	Behind May Moon House, Nos. 97-97A Waterloo Road	11NW-D/CR179	20/10	Public	8/10	Masonry wall	0	Other (open car park)	Car park cordoned off
2021/10/3080	Western side of Yin Ping Road	Natural hillside	27/10	HyD	17/10	Natural hillside	39.3	Open area	-
2021/12/3098	Block B, Marigold Mansion, Kowloon City	11NW-D/C81	9/12	Public	9/12 (21:20)	Rock cut	0.1 (Rockfall)	Nil	-
2021/07/1012HY (HyD/K/2021/07/0027)	Kent Road, Kowloon Tong (near Lamp Post No. AA5892)	< 3 m high cut slope	29/7	HyD	27/7	Soil cut	1	Road	-

Table B3 List of Landslide Incidents in Kowloon (Sheet 2 of 2)

Incident No. ⁽¹⁾	Location	Feature Registration No. (if any)	Reported		Failure			Facility Affected	Consequence
			Date	By	Date (Time)	Feature Type	Scale (m ³)		
2021/10/1024WS (WSD/2021/10/2/ K)	Lion Rock High Level Fresh Water No. 1 Service Reservoir	11NW-B/C135	12/10	WSD	Unknown	Soil cut	3.2	Access road	-
2021/12/1032HY (HyD/K/2021/12/ 0036)	Shatin Pass Road (opposite to Lamp Post No. AE0460)	11NE-A/C360	30/12	HyD	21/12	Rock cut	0.7 (Rockfall)	Nil	-

Note: (1) The brackets denote the landslide number adopted by the government department concerned, other than the GEO.

Table B4 List of Landslide Incidents in the New Territories (Sheet 1 of 7)

Incident No. ⁽¹⁾	Location	Feature Registration No. (if any)	Reported		Failure			Facility Affected	Consequence
			Date	By	Date (Time)	Feature Type	Scale (m ³)		
2021/02/2867	Below Feature No. 7NE-C/F163, Kon Hang, Tai Po	7 m high cut slope	3/2	DLO	Unknown	Soil cut	1.5	Access road	-
2021/03/2870	Behind House No. 302, Wo Hop Shek Village, Fanling (near Lamp Post No. V5102)	2.5 m high fill slope	10/3	Public	Unknown	Fill	1.6	Village house	-
2021/04/2871	Lin Ma Hang Road, North	3NE-A/C55	29/3	HyD	Unknown	Soil cut	10	Access road	-
2021/04/2872	Ma Tso Lung, Sheung Shui (near Lamp Post No. VD7568)	2 m high fill slope	7/4	Public	Unknown	Fill	0.79	Access road	-
2021/05/2977	North of House No. 84A, Shek Kwu Lung, Tai Po	2 m high fill slope	14/5	GEO	7/5	Fill	0.5	Minor footpath	-
2021/06/2984	Da Chuen Ping Village, Sheung Kwai Chung, Tuen Wan	7SW-C/FR591	17/6	LandsD	14/6	Fill	0.5	Minor footpath	-
2021/06/2985	Sui Wo Road, Sha Tin (near Lamp Post No. VE4448)	3.5 m high cut slope	21/6	DLO	Unknown	Soil cut	0.5	Minor footpath	-
2021/06/2990	Lung Ha Wan Road, Clear Water Bay, Sai Kung	12NW-C/C207	28/6	Police	28/6	Soil cut	40	Road	Lung Ha Wan Road (one-lane road) temporarily closed
2021/07/3000	North of No. 382 Castle Peak Road, Kwai Chung, Kwai Tsing	7SW-C/C378	24/6	GEO	23/6 (11:30)	Soil cut	15	Road	-
2021/07/3003	Near No. 53 Fu Tei Sheung Tsuen, Tuen Mun	2.5 m high cut slope	2/7	Public	Unknown	Soil cut	0.2	Registered squatter dwelling	-
2021/07/3006	Hang Hau Wing Lung Road, Clear Water Bay, Sai Kung	12NW-C/C297	20/7	Police	20/7 (12:35)	Soil cut	65	Road	Hang Hau Wing Lung Road (one-lane road) temporarily closed

Table B4 List of Landslide Incidents in the New Territories (Sheet 2 of 7)

Incident No. ⁽¹⁾	Location	Feature Registration No. (if any)	Reported		Failure			Facility Affected	Consequence
			Date	By	Date (Time)	Feature Type	Scale (m ³)		
2021/07/3008	Ki Lun Village, Sheung Shui	2SE-B/C100	21/7	LandsD	20/7 (12:40)	Soil cut	0.47	Registered squatter dwelling	-
2021/07/3009	Below Hang Hau Wing Lung Road, Clear Water Bay, Sai Kung	Natural hillside	20/7	Police	20/7 (12:35)	Natural hillside	300	Access road	Access road temporarily closed
2021/07/3010	Lai Ping Road, Sha Tin	7NE-C/C207	22/7	Public	20/7	Rock cut	15 (Rockslide)	Nil	-
2021/07/3013	Near House No. 328, Wo Hop Shek Village, Fanling (near Lamp Post No. V5102)	< 3 m high cut slope	26/7	Public	21/7	Soil cut	1.3	Open area	-
2021/07/3014	Ki Lun Tsuen, Kwu Tung (near Lamp Post No. H3325)	Natural hillside	29/7	Public	22/7 (07:20)	Natural hillside	200	Road	-
2021/07/3015	Near To Fung Shan Road, Sha Tin	< 3 m high cut slope	28/7	HyD	26/7	Soil cut	0.2	Road	-
2021/07/3016	To Fung Shan Road, Sha Tin (near Lamp Post No. VE5079)	< 3 m high cut slope	28/7	HyD	26/7	Soil cut	0.4	Road	-
2021/07/3017	To Fung Shan Road, Sha Tin (near Lamp Post No. V9266)	< 3 m high cut slope	28/7	HyD	26/7	Soil cut	0.2	Road	-
2021/07/3018	To Fung Shan Road, Sha Tin (near Lamp Post No. V9266)	Natural hillside	28/7	HyD	26/7	Natural hillside	1	Road	-
2021/08/3024	Behind House No. 308, Shung Him Tong, Fanling	3SW-A/C151	6/8	Police	6/8 (01:00)	Soil cut	18	Village house; other (alleyway)	Alleyway temporarily closed
2021/08/3025	Ma Po Mei, Tai Po	7NW-A/C327	6/8	Public	6/8 (01:00)	Soil cut	2	Minor footpath	-

Table B4 List of Landslide Incidents in the New Territories (Sheet 3 of 7)

Incident No. ⁽¹⁾	Location	Feature Registration No. (if any)	Reported		Failure			Facility Affected	Consequence
			Date	By	Date (Time)	Feature Type	Scale (m ³)		
2021/08/3026	Shung Him Tong Tsuen, Fanling (near Lamp Post No. VA3906)	< 3 m high cut slope	6/8	Public	6/8 (01:00)	Soil cut	0.8	Access road	Access road temporarily closed
2021/08/3027	No. 141 Tong Hang, North	2.4 m high retaining wall	6/8	LandsD	Unknown	Retaining wall	7	Other (temporary storage structure)	A temporary storage structure damaged
2021/08/3031	Hok Tau Road, Sha Tau Kok, North	3SW-B/C294	6/8	HyD	6/8 (01:00)	Soil cut	5.6	Road	-
2021/08/3033	Hok Tau Country Trail, Sha Tau Kok, North	3SW-B/C292	16/8	HyD	Unknown	Soil cut	0.6	Open area	-
2021/08/3034	Tung Tsz Shan Road, Ting Kok, Tai Po	3SE-C/C112	16/8	HyD	6/8 (01:00)	Soil cut	47	Road	All two lanes of Tung Tsz Shan Road temporarily closed
2021/08/3035	Hung Cheung Road, Tuen Mun	5SE-B/C203	17/8	Public	16/8	Soil cut	0.7	Access road	-
2021/08/3036	Above Feature No. 3SW-A/C67, Shak Wu Sun Tsuen, Fanling	Natural hillside	10/8	LandsD	Unknown	Natural hillside	2.5	Building	-
2021/08/3038	Ki Lun Tsuen, Sheung Shui (near Lamp Post No. VD4492)	2.7 m high fill slope	20/8	Public	Unknown	Fill	3.77	Minor footpath	-
2021/09/3040	Above Feature No. 7NW-B/MH5, Tit Mei Tsai Village, Tai Po	Natural hillside	20/8	Public	Unknown	Natural hillside	157	Nil	-
2021/10/3046	Clear Water Bay Road, Leung Fai Tin, Sai Kung	12NW-C/C556	8/10	Police	Unknown	Soil cut	4	Road	One lane of Clear Water Bay Road temporarily closed
2021/10/3048	No. 238 Ha Wo Che, Sha Tin	7SE-A/C644	8/10	LandsD	Unknown	Soil cut	2	Open area	-
2021/10/3051	No. 395 Pai Tau, Hing Yuen Terrace	7SW-D/C143	8/10	BD	8/10 (16:30)	Soil cut	2	Open area	-

Table B4 List of Landslide Incidents in the New Territories (Sheet 4 of 7)

Incident No. ⁽¹⁾	Location	Feature Registration No. (if any)	Reported		Failure			Facility Affected	Consequence
			Date	By	Date (Time)	Feature Type	Scale (m ³)		
2021/10/3053	Shek Kwu Lung Village, Tai Po	< 3 m high cut slope	8/10	HyD	Unknown	Soil cut	1.82	Minor footpath	-
2021/10/3054	Lau Shui Heung Road, North	3SW-B/C109	8/10	HyD	Unknown	Soil cut	11	Road	One lane of Lau Shui Heung Road temporarily closed
2021/10/3061	Near Feature No. 6SE-B/F61, Route Twisk, Tai Lam, Tsuen Wan	< 3 m high cut slope	11/10	Public	Unknown	Soil cut	0.5	Minor footpath	-
2021/10/3062	Near Feature No. 7SW-B/C553, Pak Tin Area 2 (Lamp Post No. VA6680)	< 3 m high cut slope	11/10	Police	Unknown	Soil cut	1 (Boulder fall)	Minor footpath	-
2021/10/3065	No. 26 Pei Tau	< 3 m high retaining wall	11/10	Public	9/10 (11:26)	Masonry wall	0.3	Registered squatter dwelling	-
2021/10/3068	Lin Ma Hang Road, North	3NE-A/C129	13/10	HyD	Unknown	Soil cut	147	Road	Lin Ma Hang Road (one-lane road) temporarily closed
2021/10/3070	Public footpath behind Block E12 of The Castle Bay, Nos. 6-18 Lok Chui Street, Siu Lam	6SW-D/C261	15/10	Police	Unknown	Masonry wall	0.15	Access road	-
2021/10/3072	No. 18 Fei Ngo Shan Road, Fei Ngo Shan, Sai Kung	Natural hillside	15/10	Public	11/10 (21:42)	Natural hillside	2	Road	-
2021/10/3079	Lo Wai, Tsuen Wan	7SW-C/C655	21/10	DLO	Unknown	Soil cut	3	Open area	-
2021/10/3081	Wo Yi Hop Lane, Tsuen Wan	< 3 m high retaining wall	28/10	Public	Unknown	Masonry wall	0.15	Minor footpath	-
2021/11/3082	Ma On Shan Tsuen Road, Ma On Shan, Kowloon	7SE-D/C175	29/10	Public	3/10	Rock cut	0.045 (Rockfall)	Minor footpath	-

Table B4 List of Landslide Incidents in the New Territories (Sheet 5 of 7)

Incident No. ⁽¹⁾	Location	Feature Registration No. (if any)	Reported		Failure			Facility Affected	Consequence
			Date	By	Date (Time)	Feature Type	Scale (m ³)		
2021/11/3083	Ma On Shan Tsuen Road, Ma On Shan, Kowloon	7SE-D/C175	29/10	Public	3/10	Soil cut	0.018 (Rockfall)	Minor footpath	-
2021/11/3087	MacLehose Trail (Section 5), Tseng Lan Shue, Sai Kung	11NE-B/F336	3/11	Public	15/10 (13:00)	Fill	1.5	Other (agricultural land)	-
2021/11/3088	Behind House No. 31A, Ping Long Village, Tai Po	< 3 m high retaining wall	5/11	DO	13/10	Masonry wall	0.7	Village house	-
2021/11/3094	Fei Ngo Shan Road, Fei Ngo Shan, Sai Kung	11NE-A/C519	18/11	Public	Unknown	Soil/rock cut	0.6	Road	-
2022/04/3111	Fuk Hang Tsuen Road, Tai Lam, Tuen Mun	2 m high cut slope	6/4/2022	GEO	19/9	Rock cut	0.2 (Rockfall)	Access road	-
2021/01/1001WS (WSD/2021/1/1/NTE)	Tai Po Road, Tai Wo, Tai Po (within and adjoining to GLA-TP265)	7NW-A/C271	4/1	WSD	Unknown	Soil cut	0.7	Road	-
2021/01/1002WS (WSD/2021/1/2/NTE)	Near Tai Po East Low Level Fresh Water Service Reservoir and adjacent to Tung Tsz Shan Road, Tai Po	3SE-C/C112	11/1	WSD	Unknown	Soil cut	5	Road	-
2021/03/1003WS (WSD/2021/03/1/NTE)	Adjoining WSD Access Road NT 54, Sha Tin	7SE-C/C257	18/3	WSD	Unknown	Soil cut	0.5	Access road	-
2021/03/1004LD (LandsD/2021/07/0436)	Tso Kung Tam, Tsuen Wan	6SE-D/R225	27/3	LandsD	Unknown	Retaining wall	< 5	Open area	-
2021/06/1007WS (WSD/2021/06/1/NTE)	Tan Cheung Road, Sai Kung	8SW-A/C368	1/6	WSD	Unknown	Soil cut	2	Road	-

Table B4 List of Landslide Incidents in the New Territories (Sheet 6 of 7)

Incident No. ⁽¹⁾	Location	Feature Registration No. (if any)	Reported		Failure			Facility Affected	Consequence
			Date	By	Date (Time)	Feature Type	Scale (m ³)		
2021/06/1008HY (HyD/NTW/2021/06/0012)	Route Twisk, Yuen Long	6SE-B/C352	30/6	HyD	Unknown	Soil cut	0.12 (Rockfall)	Road	-
2021/07/1013WS (WSD/2021/7/2/NTW)	Adjoining WSD Access Road NT 31 near Spot Levels 96.3, 98.6 & 101.3, Tuen Mun	6SW-D/C606	9/7	WSD	Unknown	Soil cut	0.8	Access road	-
2021/08/1015WS (WSD/2021/8/2/NTE)	Adjacent to Tai Po East Low Level Fresh Water Service Reservoir, Tai Po	3SE-C/C110	23/8	WSD	Unknown	Soil cut	5	Nil	-
2021/08/1016WS (WSD/2021/8/3/NTW)	Adjoining WSD Acces Road NT 22 near Spot Level 53.5, Tuen Mun	6SW-B/C247	23/8	WSD	Unknown	Soil/rock cut	1	Nil	-
2021/09/1019WS (WSD/2021/9/1/K)	Tai Po Fresh Water Service Reservoir, Tai Po	11NW-A/C587	27/9	WSD	Unknown	Soil cut	3.6	Access road	Access road temporarily closed
2021/10/1020LD (LandsD/2021/10/0450)	Wong Cheuk Yuen Village, Shek Kong, Yuen Long	6NE-D/C328	30/12	LandsD	8/10	Soil cut	3.11	Nil	-
2021/10/1021LD (LandsD/2022/01/0455)	Tso Kung Tam, Route Twisk, Tsuen Wan	6SE-B/CR382	15/10	LandsD	8/10	Soil cut	4	Registered squatter dwelling	-
2021/10/1022LD (LandsD/2022/01/0459)	Cheung Hang Village, Kwai Chung	11NW-A/CR857	13/10	LandsD	Unknown	Soil cut	1	Minor footpath	-

Table B4 List of Landslide Incidents in the New Territories (Sheet 7 of 7)

Incident No. ⁽¹⁾	Location	Feature Registration No. (if any)	Reported		Failure			Facility Affected	Consequence
			Date	By	Date (Time)	Feature Type	Scale (m ³)		
2021/10/1023WS (WSD/2021/10/1/ NTE)	East of Tai Po Tau Treatment Works, Tai Po	7NW-A/F42	12/10	WSD	Unknown	Fill	10	Access road	-
2021/10/1025WS (WSD/2021/10/4/ NTE)	Along access road above Lower Shing Mun Reservoir, Sha Tin	7SW-D/C823	29/10	WSD	Unknown	Soil/rock cut	0.11 (Rockfall)	Access road	-
2021/11/1030LD (LandsD/2021/11/ 0453)	Shing Uk Tsuen, Yeung Long	6NW-B/C90	30/12	LandsD	10/11	Soil/rock cut	10.6	Nil	-
2021/11/1031WS (WSD/2021/11/1/ NTW)	Adjoining WSD Access Road NT 24, Tuen Mun	6SW-D/C694	8/11	WSD	Unknown	Soil cut	2	Access road	-

Note: (1) The brackets denote the landslide number adopted by the government department concerned, other than the GEO.

Table B5 List of Landslide Incidents on Outlying Islands (Sheet 1 of 2)

Incident No. ⁽¹⁾	Location	Feature Registration No. (if any)	Reported		Failure			Facility Affected	Consequence
			Date	By	Date (Time)	Feature Type	Scale (m ³)		
2021/06/2988	Above South Lantau Road near Cheung Sha Beach, Lantau	Natural hillside & 13NE-B/C133	28/6	TD	28/6 (08:00)	Natural hillside & Soil cut	2000	Road	All two lanes of South Lantau Road temporarily closed
2021/06/2989	No. 28 Self Help Care Village, Cheung Chau	4 m high cut slope	28/6	DO	28/6	Soil cut	1	Minor footpath	Minor footpath temporarily closed
2021/06/2991	Lantau Island Catchwater (Section F), Lantau	13NE-B/CR158	28/6	WSD	28/6 (08:00)	Soil cut	140	Catchwater	Catchwater blocked
2021/06/2995	Cheung Lee Park, Cheung Chau	Natural hillside	28/6	Police	28/6 (14:00)	Natural hillside	40	Village house; minor footpath	One person from a village house temporarily evacuated
2021/06/2997	Behind No. 3 Tai Wan, Yung Shue Wan, Lamma	Natural hillside	28/6	Public	28/6 (17:30)	Natural hillside	3.7	Nil	-
2021/07/2998	No. 5 Fa Peng Road, Cheung Chau	14NW-D/C275	29/6	Public	28/6	Soil cut	4.9	Minor footpath	-
2021/07/2999	No. 61E Lung Tsai Tsuen, Cheung Chau	< 3 m high cut slope	2/7	DC member	28/6	Soil cut	0.9	Village house	-
2021/07/3011	No. 17A Lung Tsai Tsuen, Cheung Chau	< 3 m high cut slope	25/7	Public	Unknown	Soil cut	0.4	Registered squatter dwelling	-
2021/07/3012	Cheung Chau Peak Road West, Cheung Chau	< 3 m high cut slope	27/7	Public	Unknown	Soil cut	0.2	Road	-
2021/08/3023	Yung Shue Long Old Village, Lamma (near Lamp Post No. 39193)	Natural hillside	6/8	Police	6/8 (07:00)	Natural hillside	0.15 (Boulder fall)	Minor footpath	-
2021/10/3057	House No. 22, Tai Shan East, Yung Shue Wan, Lamma	3 m high fill slope	9/10	Police	Unknown	Fill	4.8	Registered squatter dwelling	-

Table B5 List of Landslide Incidents on Outlying Islands (Sheet 2 of 2)

Incident No. ⁽¹⁾	Location	Feature Registration No. (if any)	Reported		Failure			Facility Affected	Consequence
			Date	By	Date (Time)	Feature Type	Scale (m ³)		
2021/10/3063	Methodist Villa, Tung Wan Tau, Mui Wo, Lantau	Natural hillside	9/10	Public	9/10 (01:30)	Natural hillside	50	Open area	A building platform partially undermined
2021/10/3067	No. 26 Cheung Chau Peak Road, Cheung Chau	14NW-D/FR112	11/10	LandsD	9/10	Fill	3	Building; other (brick column of the entrance corridor at 1st floor of house no. 26)	The brick column of the entrance corridor of the house damaged
2021/10/3075	Above Feature No. 9SE-B/ND12, Ma Wan New Village, Pa Mei, Tung Chung, Lantau	Natural hillside	18/10	Public	9/10 (18:00)	Natural hillside	220	Nil	-
2021/11/3086	House No. 9A, Nam Wan Shan Ting San Tsuen, Peng Chau	< 3 m high retaining wall	15/10	HyD	13/10	Masonry wall	1	Open area	-
2021/11/3090	Outside House No. 2, Wang Tong, Mui Wo, Lantau	< 3 m high cut slope	3/11	Public	13/10	Soil cut	1.3	Open area	-
2021/06/1010WS (WSD/2021/06/4/HK&I)	Shek Pik Catchwater (Section F, CH5390 - CH5530), Lantau	13NE-B/FR100	28/6	WSD	Unknown	Fill	20	Nil	-
2021/06/1011WS (WSD/2021/06/5/HK&I)	Shek Pik Catchwater (Section E, CH1700 - CH1803), Lantau	13NE-A/CR146	28/6	WSD	Unknown	Soil cut	8	Catchwater	-
2021/10/1029HD (HD/2 of 2021)	Cheung Kwai Estate, Cheung Chau	14NW-D/C35	10/10	HD	10/10	Soil/rock cut	4.5	Open area	-

Note: (1) The brackets denote the landslide number adopted by the government department concerned, other than the GEO.

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