EVALUATION OF THE EFFECTIVENESS OF SQUATTER CLEARANCE ACTIONS IN REDUCING LANDSLIDE RISK

GEO REPORT No. 141

W.M. Cheung & Y.K. Shiu

GEOTECHNICAL ENGINEERING OFFICE
CIVIL ENGINEERING DEPARTMENT
THE GOVERNMENT OF THE HONG KONG SPECIAL ADMINISTRATIVE REGION

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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 Department (http://www.ced.gov.hk) on the Internet. Printed copies are also available for some GEO Reports. For printed copies, a charge is made to cover the cost of printing.

The Geotechnical Engineering Office also publishes guidance documents as GEO Publications. These publications and the printed GEO Reports may be obtained from the Government's Information Services Department. Information on how to purchase these documents is given on the last page of this report.

R.K.S. Chan
Head, Geotechnical Engineering Office
December 2003

FOREWORD

This Technical Note presents the results of an evaluation of the effectiveness of various squatter clearance actions in reducing landslide risk over the last 17 years. Historical data on landslide fatalities, total squatter population and squatter population re-housed under different squatter clearance actions have been used for this exercise.

Some early work to collect data on landslide risk posed to squatters was carried out by Dr W.K. Lam in 1997. Further work was subsequently carried out by Mr W.M. Cheung. Mr W.M. Cheung and Mr Y.K. Shiu have prepared this Note. Many of the calculations were performed by the technical officer Mr K.C. Chan.

Mr H.N. Wong and Mr S.C. Wong of the Planning Division facilitated the formation of an expert panel for part of the study, which related to the apportionment of reduction in landslide fatality rate among different squatter clearance actions. Valuable opinions were provided by members of the expert panel. In addition, Mr H.K. Wong and Mr S.T. Hui of the Housing Department and Mr Y. Lam and Dr C.A.M. Franks of the Mainland West Division have provided useful information on squatters. All assistance is gratefully acknowledged.

W.K. Pun
Chief Geotechnical Engineer/Special Projects

ABSTRACT

Since the establishment of the Geotechnical Control Office in 1977 (renamed as the Geotechnical Engineering Office in 1991), there have been concerns about the safety of squatters living on steep hillsides. Various clearance actions have been taken by the Government to reduce landslide risk to squatters. They include (i) Emergency Clearance (EC) due to landslides, (ii) Non Development Clearance (Slope Safety) (NDC) Programme, and (iii) Development Clearance (DC) Programme.

The objective of this study is to evaluate the effectiveness of the various squatters clearance actions in respect of landslide risk reduction to squatters up to September 2001. The technique of expert opinion has been used in an attempt to quantify the apportionment of landslide risk reduction associated with the respective squatter clearance actions. The results of the study show that the landslide fatality rate has been reduced by about 90% since the mid 1980s. This reduction is largely attributable to the combined effects of the squatter clearance actions. Based on the judgement of the expert panel formed for this study, the relative contributions in reducing landslide fatality rate attributable to the EC, NDC and DC Programmes are about 27 to 29%, 14 to 18%, and 57 to 55% respectively.

The landslide risk posed to squatters presented in this study is reflected by the historical fatality rates. As such, it should not be regarded as being equivalent to landslide risk calculated in a formal quantitative risk assessment because ‘near-miss’ events would not have been fully considered.

CONTENTS

1. INTRODUCTION

Since the Second World War, successive waves of immigrants from the Mainland have resulted in squatter huts spreading over Hong Kong rapidly, especially in the urban areas of the Hong Kong Island and Kowloon. Most of the squatter huts, particularly those in urban areas, were situated in rugged hilly terrain. They were subjected to relatively high landslide risk during the wet seasons (GEO, 1982; HD, 1982).

Since the establishment of the Geotechnical Control Office (GCO) in 1977 (now known as Geotechnical Engineering Office (GEO)), there have been concerns about the safety of squatters living on steep hillsides which are disturbed by the non-engineered works to erect squatter huts and hence are prone to landsliding.

The objective of this study is to evaluate the effectiveness of the various squatter clearance actions in respect of landslide risk reduction to squatters up to September 2001. Attempt is made to quantify the apportionment of landslide risk reduction associated with the respective squatter clearance actions.

2. TYPE OF SQUATTER CLEARANCE ACTIONS

The following are the three main types of squatter clearance actions and they are all considered in this study:

(a) Emergency Clearance (EC) due to landslides;

(b) Non Development Clearance (Slope Safety) (NDC) excluding Emergency Clearance; and

(c) Development Clearance (DC).

In this study, all other squatter clearance actions such as emergency clearance due to reasons other than landslides (e.g. high fire risk, lack of sanitation, etc.) are also referred to as DC. This will avoid confusion with clearance actions related to slope safety.

3. AVAILABLE DATA

The following documents/information have been reviewed as part of the assessment:

(a) Publications on the annual Review of Hong Kong (The Government of the HKSAR, 1960 to 2000);

(b) Data provided by Housing Department (HD, 1990, 1997 and 2001);

(c) Minutes of the NDC (Slope Safety) Programme liaison meetings (meeting no. 1 to no. 37);

(d) Annual Reports on Hong Kong Rainfall and Landslides (GEO, 1984 to 1997);

(e) Database on Landslide Consequence compiled by MMBP (1996); and

(f) GEO Landslide Database.

From file records, the GEO conducted two Terrain Evaluation Studies in 1982 and 1988 to classify squatter areas into categories of potential hazard from landslides during periods of heavy rainfall. This resulted in recommendations made for re-housing of about 64,200 squatters (58,000 squatters on Hong Kong Island and Kowloon, and 6,200 squatters in the New Territories) under NDC Programme. In 1992, the GEO undertook further geotechnical inspections in the New Territories (NT), which include re-inspection of NT areas dealt with in the NDC Programme and inspection of NT areas not previously covered as part of the NDC Programme (GEO, 1994, 1996 & 1997).

4. LIMITATIONS OF THE DATA AVAILABLE

It is not possible to differentiate all inhabitants of "squatter areas" from those of "licensed areas" from the records. However, in this study people known to be living in "licensed areas" have been excluded.

The accuracy of the statistics on re-housing of squatters through NDC Programme is not as good as those after 1992. This is because data on squatters to be re-housed based on NDC recommendations prior to 1992 may be implemented through actions other than NDC Programme. According to the information provided by the HD (1990), about 63% of the NDC recommendations made on Hong Kong Island and Kowloon were actually implemented through DC Programme with a certain percentage of the remaining through EC. Thus, some squatter areas although cleared through DC Programme, they might not necessarily be developed. Therefore the following two scenarios have been considered in this study:

Scenario 1: 63% of the NDC population before 1992 were re-housed through DC Programme and the remaining NDC population also includes the EC population

Scenario 2: 63% of the NDC population before 1992 were re-housed through DC Programme and the remaining NDC population does not include the EC population

5. SQUATTER POPULATION

5.1 Estimated Squatter Population

Figure 1 shows the estimated squatter population and the total population in Hong Kong from 1960 to 2000. Information on the total population in Hong Kong was provided by the Census and Statistics Department. The squatter population is based on information provided by the HD and data given in the publications on the annual Review of Hong Kong.

The HD's information on squatter is based on the results of two comprehensive territory-wide surveys conducted by the HD in 1982 and 1984 and the HD's squatter control monthly statistics.

5.2 Re-housed Squatter Population

Table 1 shows the re-housed squatter population from 1981 to 2000 attributable to the EC, NDC and DC Programmes. The statistics of the EC were obtained from the GEO's annual rainfall and landslide reports, supplemented by review of landslip incident records. Those of the NDC and DC Programmes were based on information provided by the HD (see (b) and (c) in Section 3).

Table 2 shows the breakdown of the number of squatters recommended to be re-housed and those actually re-housed in each programme under the NDC Programme. The locations of these outstanding GEO re-housing recommendations are shown in Figure 2.

6. LANDSLIDE RISK IN SQUATTER AREAS

It is impracticable to carry out failure frequency and consequence analyses required in a formal quantitative risk assessment (QRA) because of the lack of information on squatter slope features, and the highly transient nature of the squatter population and their geographical locations. Instead, a review of historical records on landslide fatalities involving squatters locations has been carried out. These landslide fatalities were resulted from geotechnical hazards such as failures of man-made slopes and natural terrain, and boulder fall. The landslide risk in squatter areas is represented by the landslide fatality rates. However, the landslide fatality rate should not be considered exactly as landslide risk. It is an index indicating the level of landslide risk. For example, the absence of landslide fatality in squatter area between 1990 and 1996 does not imply the non-existence of landslide risk. Furthermore, the use of historical records of landslides involving squatter fatalities for risk assessment has the limitation that "near-miss" cases cannot be taken into account. This limitation should be borne in mind when interpreting the results of the assessment. Other types of risk such as economic risk and social impact are not considered in this study.

7. LANDSLIDE FATALITY

Figure 3 shows the temporal distribution of landslide fatalities involving squatters for the period 1960 to 2000. The landslide fatalities involving squatters are influenced by, inter alia, factors such as yearly variations in rainfall, population growth and the spatial distribution of squatters vulnerable to landslide risk. To minimise the influence of such yearly variations, plots of 10-year and 15-year rolling annual average landslide fatalities involving squatters have been prepared, as illustrated in Figure 4.

The trends of the 10-year and 15-year rolling annual average landslide fatalities involving squatters are similar. They are about 8 in the early 1970s, 4 in the early 1980s, 3 in the mid 1980s and 0.3 in the late 1990s. This indicates that up to the late 1990s the global landslide fatality rate has been reduced by some 90% when compared with that in the mid

1980s (the start of the NDC Programme). In the same period, the squatter population has dropped by about 55% (i.e. from about 500,000 in the mid 1980s to 220,000 in the late 1990s, see Figure 1). The difference between the reduction in fatality rate and that in squatter population rate could be attributable to the re-housing of squatters, especially those from big urban-fringe squatter settlements, which by their nature tended to be very dense flimsy developments on steep terrain. If taking the squatter population into consideration, the 10-year rolling annual average landslide fatality per capita is about 6.0×10^{-6} in the mid 1980s, reducing to about 1.2×10^{-6} in the late 1990s. The same values apply to the 15-year rolling annual average landslide fatality.

Figure 5 shows the locations of landslide incidents affecting squatters reported to the GEO during the period 1982 to 2000. These landslides mainly occurred in the urban areas of the Hong Kong Island and Kowloon, Tsuen Wan and Shatin. Table 3 shows the number of landslide incidents reported to the GEO and the annual number of reported landslide incidents affecting squatters for the period 1984 to 2000. Although the percentage of landslide incidents affecting squatters was influenced by the characteristics and the spatial distribution of the rainstorms during that period, there is a general trend of decrease, from about 60% in the 1980s to about 10% in the late 1990s. In addition, there is a significant decrease from late 1980s to early 1990s. This decrease provides another indication of risk reduction attributable to all squatter clearance actions. It should be noted that this decrease does not necessarily mean that the failure rate of squatter slopes has decreased. Instead, the statistics only indicate that the landslide incidents affecting squatters (i.e. failure consequence) and reported to the GEO have decreased. One of the reasons could be a landslide occurring within a cleared squatter area might not have caused concern for it to be reported to the GEO.

8. APPORTIONMENT OF REDUCTION IN LANDSLIDE FATALITY RATE AMONG DIFFERENT SQUATTER CLEARANCE ACTIONS

The reduction in landslide fatality rate is largely attributable to the combined effects of the three main squatter clearance actions (i.e. EC, NDC and DC). Owing to lack of complete records and data, there is insufficient information to determine accurately the proportion of contribution of each action. As such, the technique of expert opinion (Cooke, 1991 and Stewart & Melchers, 1997) has been used to estimate the relative contributions of the actions. In the context of risk assessment, an expert is defined as an individual with particular experience or knowledge about a project, site, or other aspect of a risk assessment.

An expert panel, with composition as given in Appendix A, met on 7 September 2001. At the meeting, the expert panel examined the significance of the three squatter clearance actions and apportioned the landslide fatality rate among them by judgement. The members of the panel unanimously considered that the EC contributed most and the DC the least in reducing landslide risk to an individual squatter. The panel also established the probable Risk Ratio, which is the average risk ratio among a typical squatter in each of the three clearance actions.

The panel reached a consensus that the upper and lower bound values of the Risk Ratio for EC:NDC:DC actions were 100:10:1 and 5:3:1 respectively. Based on these values, the upper and lower bound contributions to risk reduction among the three squatter clearance actions for scenarios 1 and 2 have been derived and are summarised in Table 4 (see

Appendix B for supporting calculations). The panel concluded that given the uncertainties in assigning the Risk Ratio, further improvement to the accuracy of the estimated population in each type of squatter clearance action would not result in significant improvement to the accuracy of the risk reduction contribution.

Each panel member also provided his own "best" estimate of the Risk Ratio (see Appendix C). The average of these ratios has been used to deduce the "best" estimated relative contributions to risk reduction among the three squatter clearance actions for scenarios 1 and 2. The results are summarised in Table 5, and the calculations are contained in Appendix C.

9. DISCUSSION & CONCLUSIONS

In this study, landslide risk is reflected by the historical fatality rate but in reality, it is likely to be under-estimated because 'near-miss' events would not have been fully considered. However, the approach adopted is considered to be adequate in terms of assessing the overall degree of landslide risk reduction associated with squatter clearance actions.

Based on a review of historical records, it is estimated that the landslide risk posed to squatters (in terms of landslide fatality rate) has been reduced by about 90% since the mid 1980s. This reduction is largely attributed to the combined effects of the Emergency Clearance, Non Development Clearance and Development Clearance Programmes. Part of the reduction may also be attributed to other risk reduction measures such as public education, issuance of landslip warnings, squatter area improvement works, and in a few cases landslip remedial works. However, it is not possible to quantify the contributions of these measures.

The 15-year rolling annual average landslide fatality per capita involving squatters is about 6.0×10^{-6} in the mid 1980s, reducing to 1.2×10^{-6} in the late 1990s. According to the study on global landslide risk posed by pre-1978 man-made slope features (Cheung & Shiu, 2000), the 15-year rolling annual average landslide fatality per capita for non-squatters is about 1.2×10^{-6} in the mid 1980s and 0.15×10^{-6} in the late 1990s. This indicates that even though the average landslide fatality rates for squatters have been reduced substantially, they are still high when compared with those for non-squatters.

As far as the contributions to landslide fatality rate reduction are concerned, Tables 4 and 5 indicate that the differences between scenarios 1 and 2 are small when compared with those attributable to Risk Ratio.

Based on the judgement of the expert panel, the Emergency Clearance and Development Clearance Programmes have significantly reduced the landslide risk posed to squatters. The relative contributions to landslide fatality rate reduction by the EC, NDC and DC Programmes for scenario 1 are about 29% (with standard deviation of 10%), 14% (with standard deviation of 3%) and 57% (with standard deviation of 9%) respectively, whereas those for scenario 2 are 27% (with standard deviation of 10%), 18% (with standard deviation of 4%) and 55% (with standard deviation of 9%) respectively (see Table 5). The spread of the contributions (i.e. coefficient of variation of about 0.16 to 0.36) is quite small, indicating general agreement among the expert panel members.

If all the NDC recommendations before 1992 have been implemented through the NDC Programme only, the relative contributions to landslide fatality rate reduction by the NDC Programme for scenarios 1 and 2 would have become 31% and 33% respectively.

It should be noted that the relative contributions to risk reduction are based on the subjective assessments of the expert panel. They should not be regarded as absolute values as there are some degree of uncertainty attached to them.

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Table 1 - Re-housed Squatter Population Resulting from Emergency Clearance, Non Development Clearance (Slope Safety) Programme and Development Clearance Programme

Period	Re-housed Squatter Population		
	EC	NDC	DC
1981-1992	8,496 (8,496)	15,258 (23,754)	450,864 + 40,446 = 491,310
1993-2000	1,605	10,422	66,998
Total	10,101 (10,101)	25,680 (34,176)	558,308

Notes:
(1) The total squatters recommended to be re-housed through NDC Programme prior to 1992 is 64,200. Based on the information provided by the Housing Department (1990), about 63% of these recommendations were actually implemented through DC Programme (i.e. 64,200 x 63% = 40,446 squatters were re-housed through DC Programme prior to 1992). The remaining 64,200 - 40,446 = 23,754 squatters could have been re-housed through EC and NDC Programme (Scenario 1) or through NDC Programme (Scenario 2).
(2) The EC figures are based on the assumption that the average number of squatters per hut is 3.

Table 2 - Status of the Non Development Clearance (Slope Safety) Programme as in March 2002

Inspection Programmes	Squatters Recommended to be Re-housed (A)	Squatters Re-housed (B)	Percentage Recommendations for Re-housing Not Discharged (1-B/A) x 100%
Inspection Programmes prior to 1992	64,200[1]	64,200[1]	-
1992 Re-inspection Programme of Squatter Villages in the NT	11,238	9,122	18.8
1993-1994 New NT Villages Inspection Programme	4,993	787	84.2
1994-1995 New NT Villages Inspection Programme	941	98	89.6
1995-1996 Lei Yue Mun Inspection Programme	683	580	15.1
1997-1998 Inspection Programme for Isolated Structures in the NT	328	27	91.8
1999-2002 Inspection Programme in the Islands District	883	16	98.2
Total	83,266[1]	74,830[1]	10.1

Note: (1) The accuracy of statistics prior to 1992 is not as good as those after 1992. Before 1992, the number of squatters recommended to be re-housed on slope safety grounds may be implemented through Clearance Programmes other than NDC such as EC and DC.

Table 3 - Total Number of Landslide Incidents Reported to the GEO and Those Affecting Squatters during the Period 1984 to 2000

Year	No. of Landslide Incidents Reported to the GEO (A)	No. of Reported Landslide Incidents Affecting Squatters (B)	Percentage of Reported Landslide Incidents Affecting Squatters (B)/(A) x 100%
1984	106	60	57
1985	210	139	66
1986	197	119	60
1987	281	128	46
1988	131	68	52
1989	575	227	40
1990	99	44	44
1991	88	19	22
1992	641	82	13
1993	827	96	12
1994	436	60	14
1995	295	37	13
1996	153	12	8
1997	491	76	16
1998	216	21	10
1999	402	54	13
2000	282	15	5

Table 4 - Relative Risk Reduction Contribution Attributable to Emergency Clearance, Non Development Clearance (Slope Safety) Programme and Development Clearance Programme

	Clearance Action	Risk Reduction Contribution (%)	
		Upper Bound Risk Ratio for EC:NDC:DC = 100:10:1	Lower Bound Risk Ratio for EC:NDC:DC = 5:3:1
Scenario l (Scenario 2)	EC	55.3 (52.9)	7.4 (7.1)
	NDC	14.1 (17.9)	11.2 (14.4)
	DC	30.6 (29.2)	81.4 (78.5)

Notes: (1) Risk Ratio is the average risk ratio among a typical squatter in each of the three clearance actions (i.e. EC: NDC: DC).
(2) See Appendix B for detailed calculation.

Table 5 - Relative Risk Reduction Contribution Based on "Best" Estimate of Risk Ratios for Emergency Clearance, Non Development Clearance (Slope Safety) Programme and Development Clearance Programme

	Clearance Action	Risk Reduction Contribution (%)		
		Range	Mean (μ)	Standard Deviation (σ)
Scenario l (Scenario 2)	EC	12.4 to 42.4 (11.7 to 40.9)	28.7 (27.5)	10.3 (9.9)
	NDC	10.0 to 19.5 (12.9 to 24.4)	14.1 (17.9)	3.4 (4.1)
	DC	42.3 to 68.7 (39.7 to 64.6)	57.2 (54.6)	9.3 (8.8)

Note: See Appendix C for detailed calculation.

LIST OF FIGURES

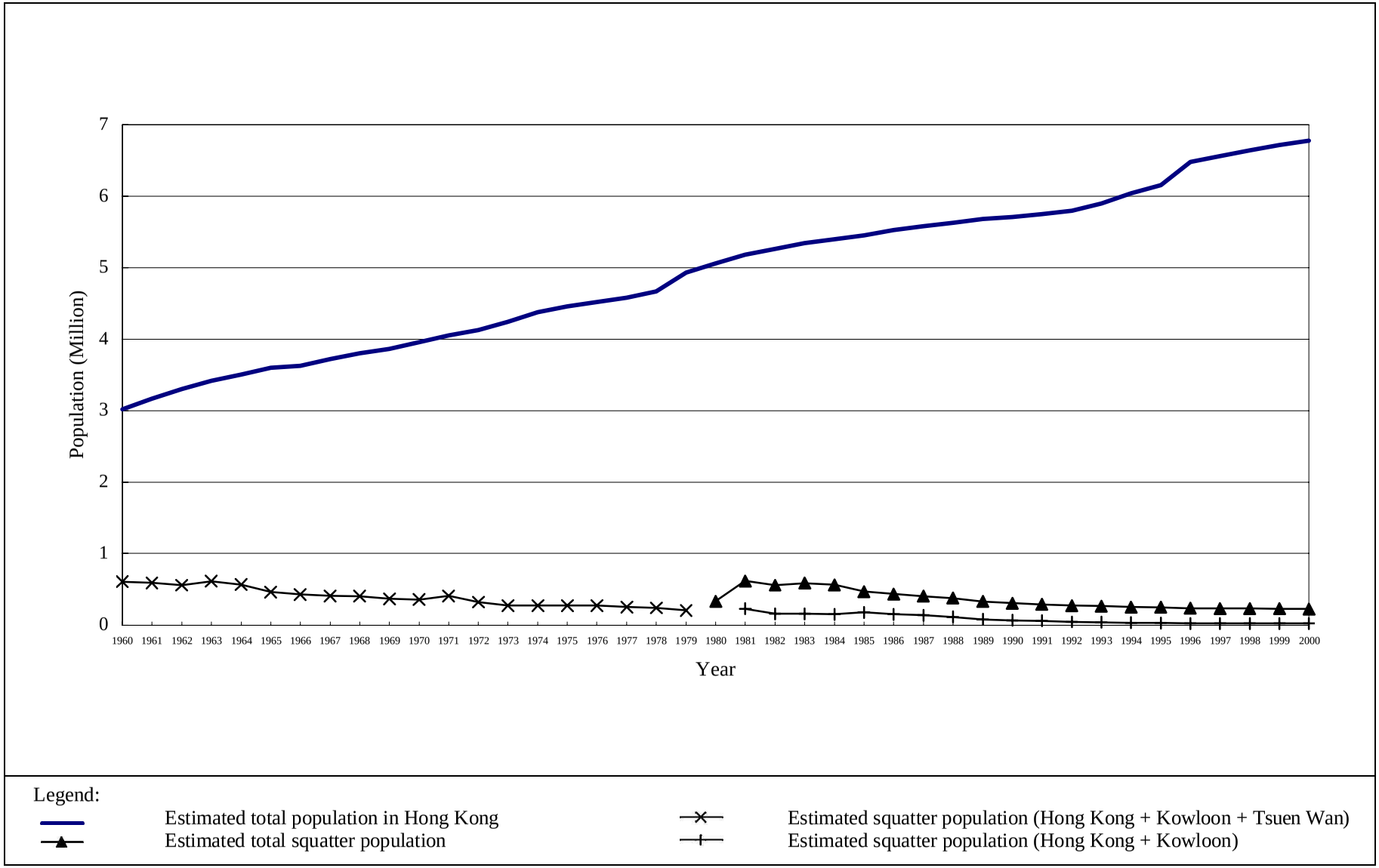

Figure 1 - Temporal Distribution of the Estimated Total and Squatter Population in Hong Kong

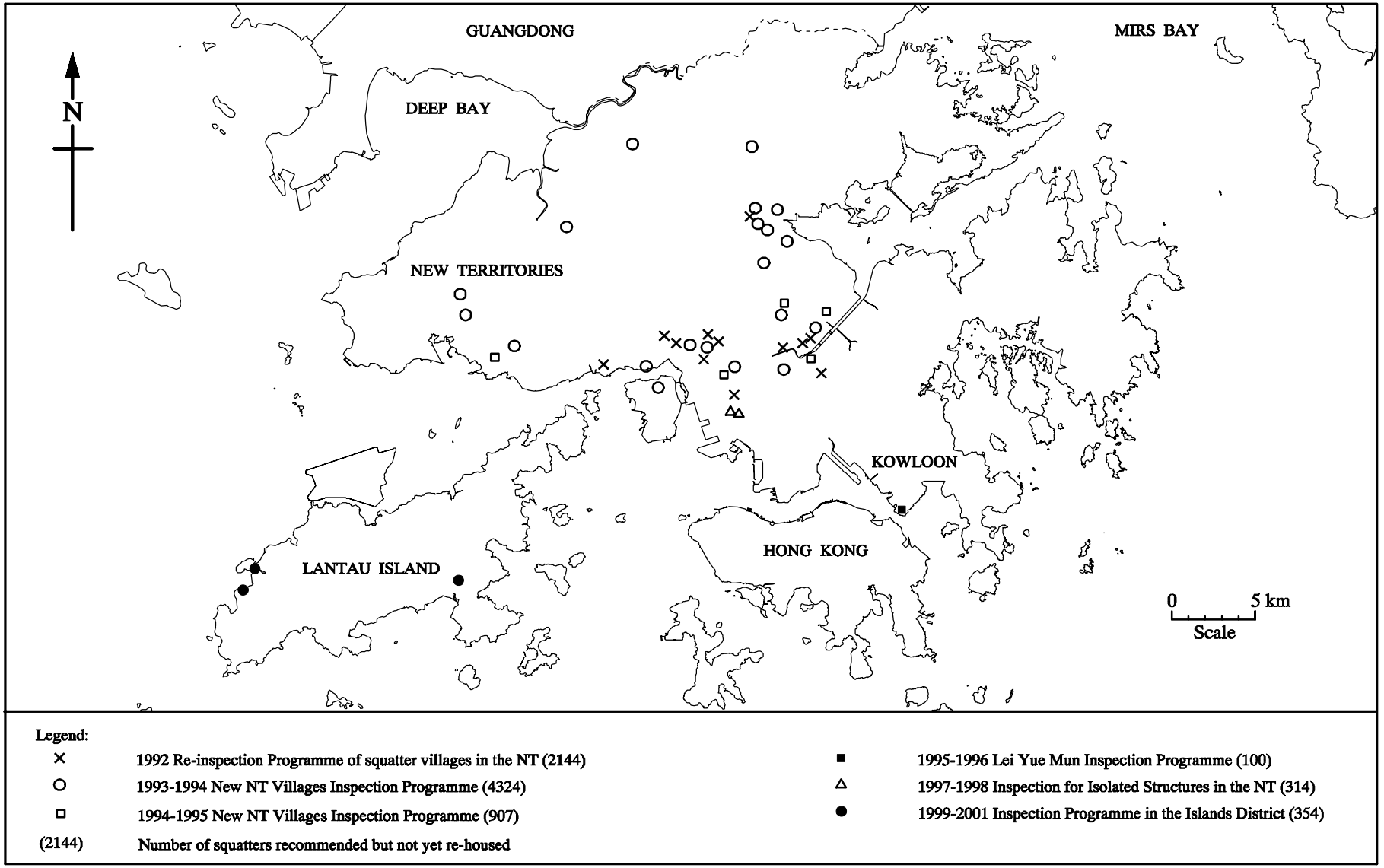

Figure 2 - Locations of the Outstanding GEO Re-housing Recommendations as in February 2001

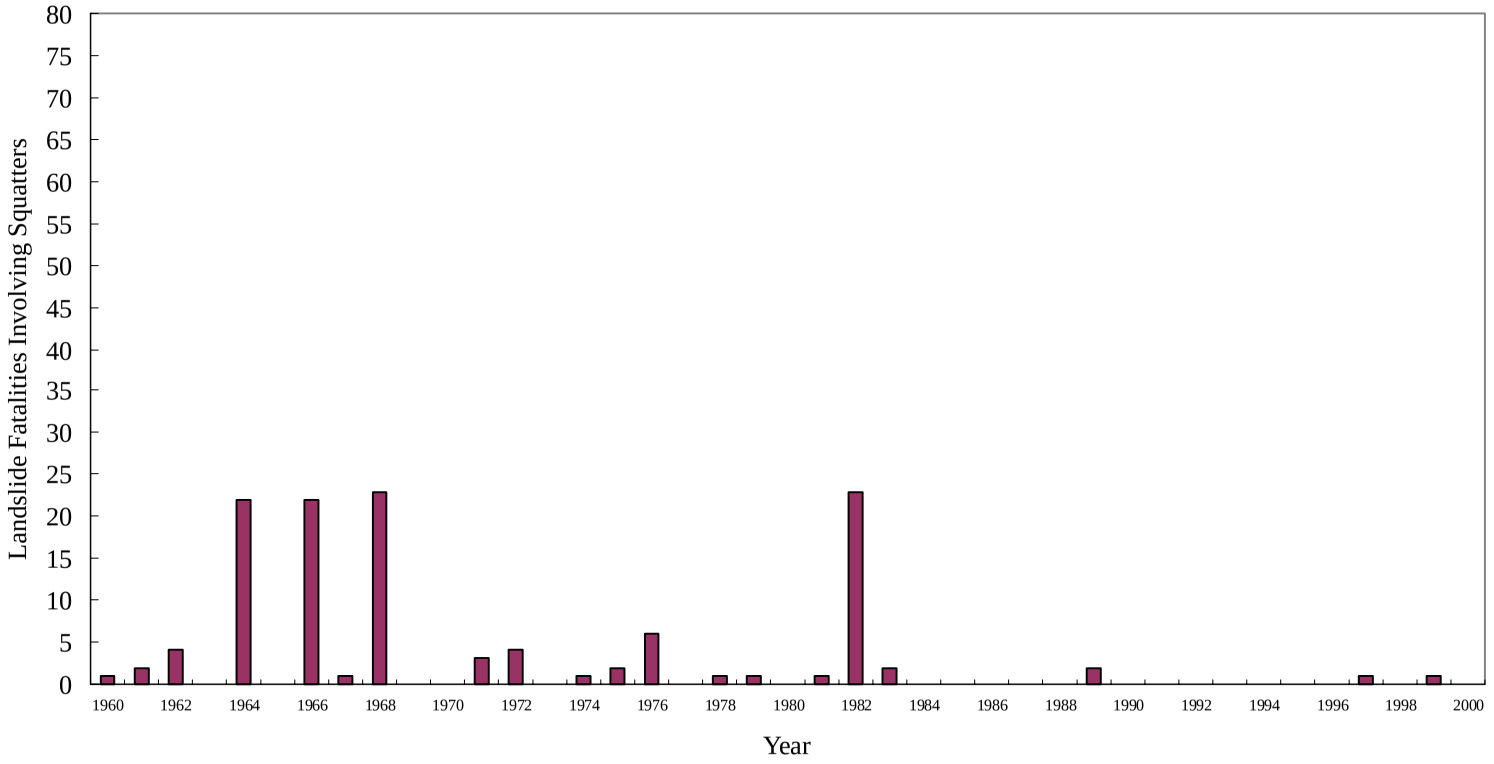

Figure 3 - Temporal Distribution of Landslide Fatalities Involving Squatters

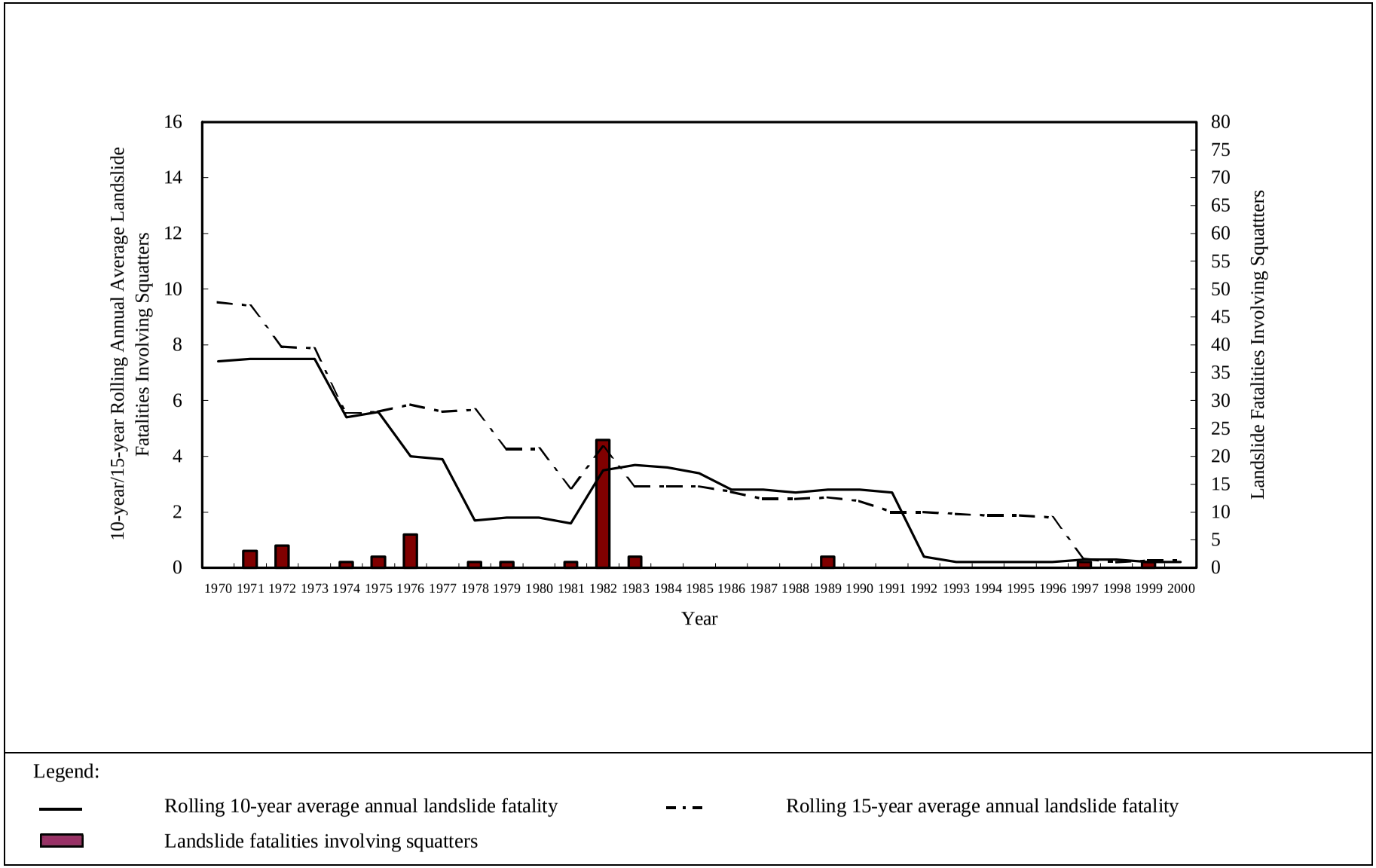

Figure 4 - Historical 10-year and 15-year Rolling Annual Average Landslide Fatalities Involving Squatters

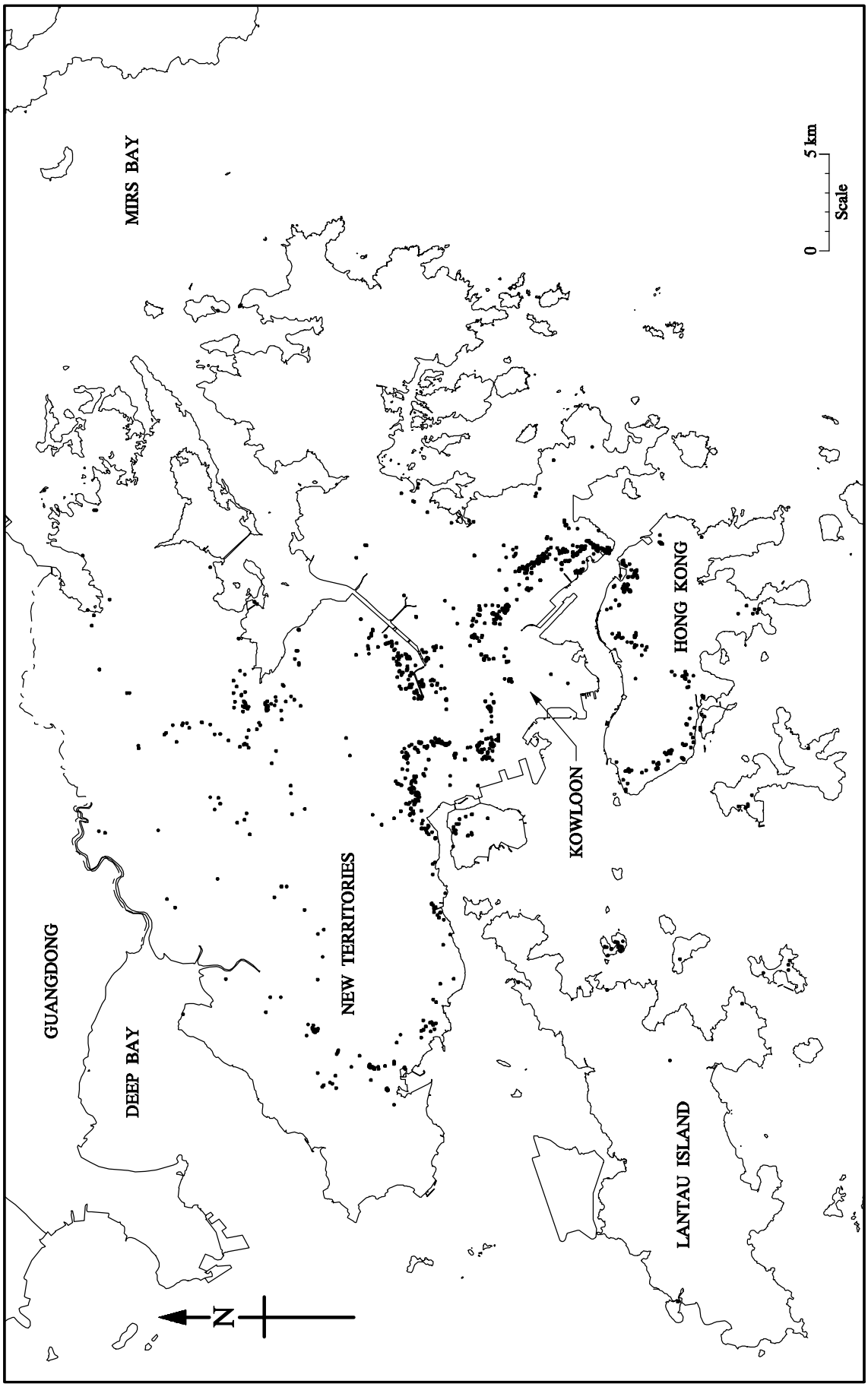

Figure 5 - Locations of Landslide Incidents Reported to the GEO Affecting Squatters (1982-2000)

APPENDIX A

COMPOSITION OF THE EXPERT PANEL

Name	Post
Mr Y.C. Chan	AD(G)/D
Dr P.L.R. Pang	CGE/FM
Mr H.N. Wong	CGE/P
Mr K.S. Ho	Ag. CGE/LI
Mr Y.K. Shiu	Ag. CGE/SP
Mr W.F. Chu	SGE/D3
Mr P.L. Yip	SGE/PM3
Mr Y. Lam	SGE/Squatters
Mr W.M. Cheung	GE2/Slopes 1

APPENDIX B

ESTIMATION OF UPPER BOUND AND LOWER BOUND RISK REDUCTION CONTRIBUTIONS ATTRIBUTABLE TO THE EC, NDC AND DC PROGRAMMES

Scenario 1:

Estimated nos. of squatters re-housed through EC, NDC and DC Programmes for the period 1981 to 2000 are 10,101, 25,680 and 558,308 respectively.

For upper bound Risk Ratio of EC:NDC:DC = 100:10:1, the relative Risk Reduction Contribution is given by:

$$\text{EC: } \frac{10{,}101 \text{ x } 100}{10{,}101 \text{ x } 100 + 25{,}680 \text{ x } 10 + 558{,}308 \text{ x } 1} \text{ x } 100 = 55.3\%$$

$$\text{NDC : } \frac{25{,}680 \text{ x } 10}{10{,}101 \text{ x } 100 + 25{,}680 \text{ x } 10 + 558{,}308 \text{ x } 1} \text{ x } 100 = 14.1\%$$

$$\text{DC : } \frac{558{,}308 \text{ x } 1}{10{,}101 \text{ x } 100 + 25{,}680 \text{ x } 10 + 558{,}308 \text{ x } 1} \text{ x } 100 = 30.6\%$$

For lower bound Risk Ratio of EC:NDC:DC = 5:3:1, the relative Risk Reduction Contribution is given by:

$$\text{EC : } \frac{10{,}101 \text{ x } 5}{10{,}101 \text{ x } 5 + 25{,}680 \text{ x } 3 + 558{,}308 \text{ x } 1} \text{ x } 100 = 7.4\%$$

$$\text{NDC : } \frac{25{,}680 \text{ x } 3}{10{,}101 \text{ x } 5 + 25{,}680 \text{ x } 3 + 558{,}308 \text{ x } 1} \text{ x } 100 = 11.2\%$$

$$\text{DC : } \frac{558{,}308 \text{ x } 1}{10{,}101 \text{ x } 5 + 25{,}680 \text{ x } 3 + 558{,}308 \text{ x } 1} \text{ x } 100 = 81.4\%$$

Scenario 2:

Estimated nos. of squatters re-housed through EC, NDC and DC Programmes for the period 1981 to 2000 are 10,101, 34,176 and 558,308 respectively.

For upper bound Risk Ratio of EC:NDC:DC = 100:10:1, the relative Risk Reduction Contribution is given by:

$$\text{EC : } \frac{10{,}101 \text{ x } 100}{10{,}101 \text{ x } 100 + 34{,}176 \text{ x } 10 + 558{,}308 \text{ x } 1} \text{ x } 100 = 52.9\%$$

$$\text{NDC : } \frac{34{,}176 \text{ x } 10}{10{,}101 \text{ x } 100 + 34{,}176 \text{ x } 10 + 558{,}308 \text{ x } 1} \text{ x } 100 = 17.9\%$$

$$\text{DC : } \frac{558{,}308 \text{ x } 1}{10{,}101 \text{ x } 100 + 34{,}176 \text{ x } 10 + 558{,}308 \text{ x } 1} \text{ x } 100 = 29.2\%$$

For lower bound Risk Ratio of EC:NDC:DC = 5:3:1, the relative Risk Reduction Contribution is given by:

$$\text{EC}: \frac{10{,}101 \text{ x } 5}{10{,}101 \text{ x } 5 + 34{,}176 \text{ x } 3 + 558{,}308 \text{ x } 1} \text{ x } 100 = 7.1\%$$

$$\text{NDC}: \frac{34{,}176 \text{ x } 3}{10{,}101 \text{ x } 5 + 34{,}176 \text{ x } 3 + 558{,}308 \text{ x } 1} \text{ x } 100 = 14.4\%$$

$$\text{DC}: \frac{558{,}308 \text{ x } 1}{10{,}101 \text{ x } 5 + 34{,}176 \text{ x } 3 + 558{,}308 \text{ x } 1} \text{ x } 100 = 78.5\%$$

APPENDIX C

ESTIMATION OF RELATIVE RISK REDUCTION CONTRIBUTIONS ATTRIBUTABLE TO EC, NDC AND DC PROGRAMMES BASED ON "BEST" ESTIMATE OF RISK RATIO FROM INDIVIDUAL EXPERT PANEL MEMBERS

The following table summarises the relative Risk Reduction Contribution based on the "best" Risk Ratio estimate of individual personnel:

"Best" estimate of Risk Ratio given by individual expert panel members for EC:NDC:DC	Relative risk reduction contribution (%) - scenario 1 (1)			Relative risk reduction contribution (%) - scenario 2 (1)		
	EC	NDC	DC	EC	NDC	DC
50:5:1	42.4	10.8	46.8	40.9	13.9	45.2
50:5:1	42.4	10.8	46.8	40.9	13.9	45.2
50:10:1	38.2	19.5	42.3	35.9	24.4	39.7
25:5:1	26.9	13.7	59.4	25.7	17.4	56.9
25:3.5:1	28.0	10.0	62.0	27.1	12.9	60.0
20:5:1	22.7	14.5	62.8	21.7	18.3	60.0
20:5:1	22.7	14.5	62.8	21.7	18.3	60.0
20:5:1	22.7	14.5	62.8	21.7	18.3	60.0
10:6:1	12.4	18.9	68.7	11.7	23.7	64.6
Mean (μ)	28.7	14.1	57.2	27.5	17.9	54.6
Standard Deviation (σ)	10.3	3.4	9.3	9.9	4.1	8.8
Coefficient of Variation (σ/μ)	0.36	0.24	0.16	0.36	0.23	0.16

Note: (1) The method for determining the relative risk reduction contribution is given in Appendix B.