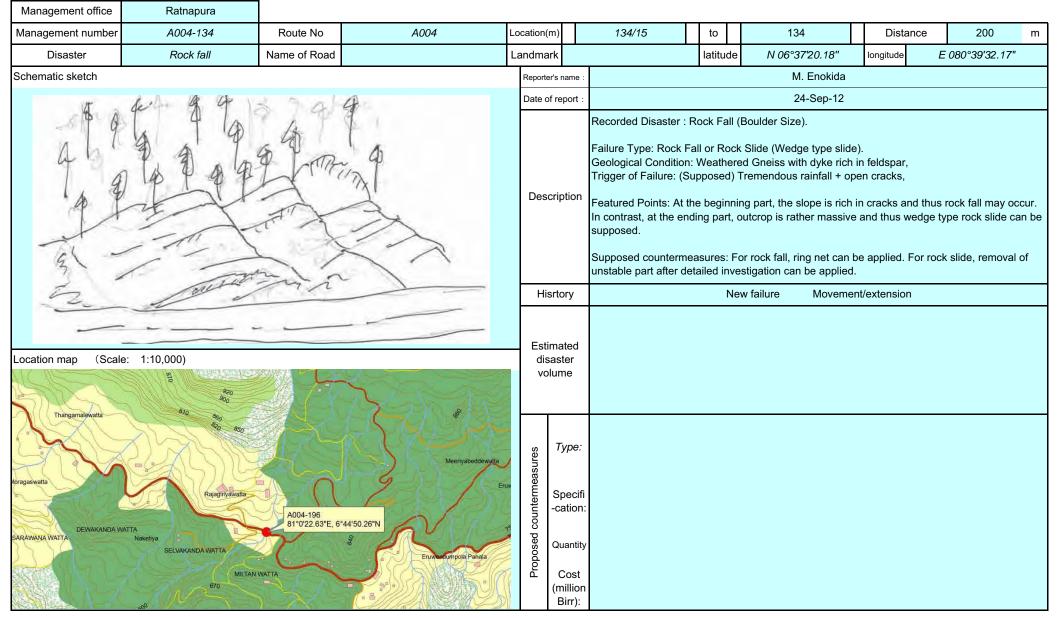
Appendix 3-2 Slope inspection sheets for Rank C and B



Management Number

A004-134

Evaluation sheet (rockfall-slope failure)

The countermeasure work is necessary.

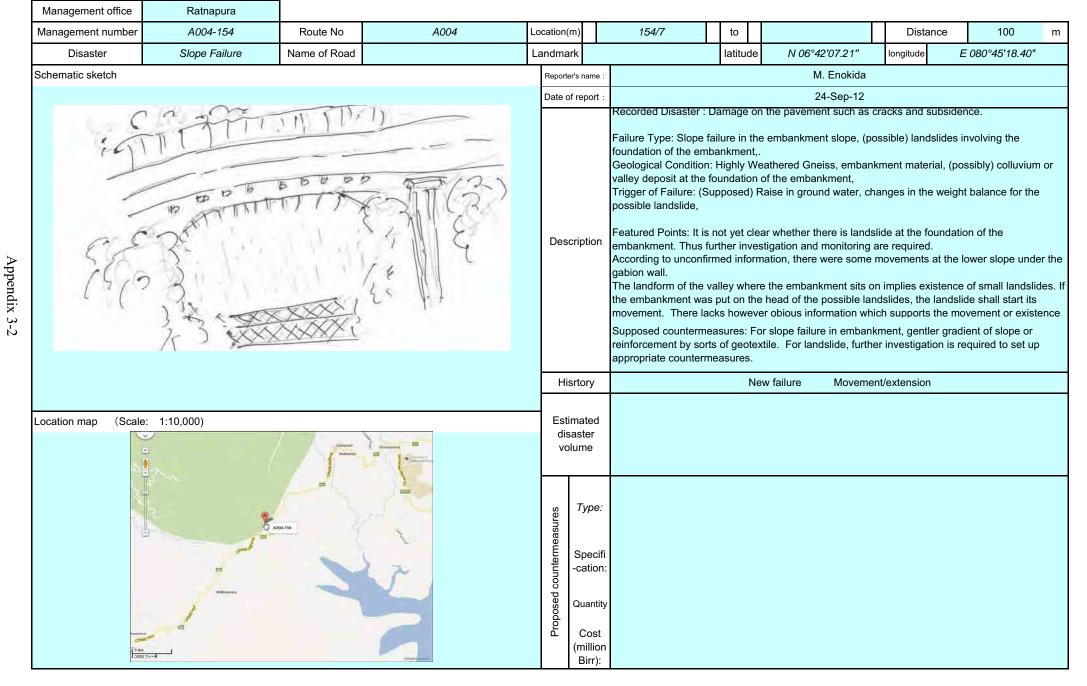
Though the urgent countermeasure is not necessary, regular inspections are needed. The countermeasure work is not necessary. Evaluator

M.Enokida JICA Study Team Organization

	Item	factor	category of score	point	score			
topography	collapsed factor	talus slope clear convex break of slope eroded toe of slope overhang, water catchment slope	3 or more correspondences 2 correspondences 1 correspondences no correspondence		Max=3			
ß	soil	susceptible to erosion less strength with water	marked a little marked None		Max=8 0			
geological conditions	rock	high density of cracks and a weak laye susceptible to erosion fast weathering	marked Image: Constraint of the second sec					
ologica	e e	dip slope of bedding plane	It corresponds. None	<u>√</u>	Max=8 8			
	structure	debris on impermeability bedrock The upper part is a hard /the toe of slope is weak.	marked a little marked None	1	Max=6 4			
uo		opsoil, detached rock and unsteady rock	instability a little unstable stability	`	Max=12 12			
<i>C</i> ⁻ surface codition		spring water	notable spring waster seepage None		Max=8 0			
sur		surface condition	bare land with minor vagetation					
figure		dip(i), height	$ \begin{array}{c} H \ge 50m \\ 30 \le H < 50m \\ \hline 9 \\ 15 \le H < 30m \\ H < 15m \\ \hline 1 \ge 70^{\circ} \end{array} $		Max=18 8			
			ਵਿੱ70 ਉੱ 45°≦i<70° i<45°	-	Max=10 10			
anomaly	targeted slope (surface collapse small fallen rock erosion piping hole subsidence heaving bending root fallen tree crack open crack anomaly of countermeasure)			✓ 	Max=5 5			
		sum total	66		(A)			

cut slope	1		effectivene	ss of existing cou	nterme	asures			$point(\alpha)$	chec
	•	Potential rockfa enough when it		lure are prevented	d enoug	ıh, or, it	is defei	nded	×0	
natural slope		Potential rockfa considerably de		lure are considera	ibly pre	vented,	or it is		-20	
[Main slope dis rockfall		Potential rockfa	all and slope fai	lure are partly pre					-10	
slope failure		There is no cou are not perform		or there is not effe	ctive ev	ven if co	unterm	easures	±0	1
	<u> </u>							sum t	(B)
								Sum	lotai	66
[History](C)					.					
Thora is a histo	my about	Level of disaster t large fallen rocks	,	rea that wara	point	check				
		affic after construc								
		t large fallen rocks		ures that gets to						
the road though	i ulere la	s no obstacle to tra	anic.							
	ory about	t small fallen rock		ures that did not		~				
There is a histo	ory about			ures that did not		✓	(D)=MAX		
There is a histo get to the road.	ory about			ures that did not		 Image: A start of the start of	s	D) =MAX core in evalu		
There is a histo get to the road.	ory about			ures that did not	(C)	✓ 	► S fr	core in evalu	uation (B	66
There is a histo get to the road.	ory about			ures that did not	(C)	✓	s fr	core in evalu om cause	uation (B	66
There is a histo get to the road.	ory about			ures that did not	(C)		S fr S fr A	core in evalu om cause core in evalu	uation (B uation (C	66)
There is a histo get to the road.	ory about			ures that did not	(C)		S fr S fr A	core in evalu om cause core in evalu om history mong (B)&((uation (B uation (C	66) 0 =MAX(B





Management Number

S

A004-154

Evaluation sheet (rockfall slope failure)

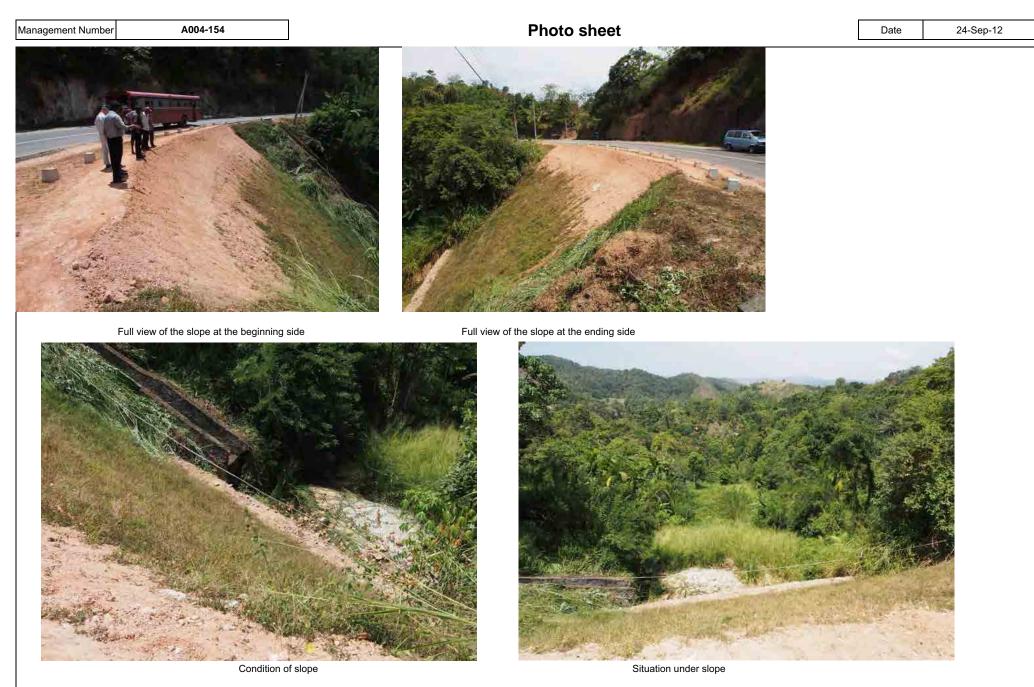
Evaluator Organization

M.Enokida JICA Study Team

1	ltem	factor	category of score	point	score	
topography	collapsed factor	talus slope clear convex break of slope eroded toe of slope overhang, water catchment slope	3 or more correspondences 2 correspondences 1 correspondences no correspondence		Max=3 3	
IS	soil	susceptible to erosion less strength with water	marked a little marked None	<u> </u>	Max=8 8	
geological conditions	rock	high density of cracks and a weak laye susceptible to erosion fast weathering	marked a little marked None	 ✓ 	Max=12 0	
eologi	nre	dip slope of bedding plane	It corresponds. None	 Image: A start of the start of	Max=8 0	
9	structure	debris on impermeability bedrock The upper part is a hard /the toe of slope is weak.	marked a little marked None	 Image: A start of the start of	Max=6 4	
on l	T	opsoil, detached rock and unsteady rock	instability a little unstable stability	>	Max=12 12	
surface codition		spring water	notable spring waster seepage None	 Image: A start of the start of	Max=8 4	
sur		surface condition	bare land with minor vagetation intermediate (bare · grass · tree) mainly structure, mainly tree	>	Max=5 5	
figure		dip(i)、height	H≥50m H≤50m 130≦H<50m 15≦H<30m H<15m	\[\] \[\[\] \[\] \[\[\] \[\] \[\] \[\[\] \[\[\] \[\[\] \[\[\[\[Max=18 5	
f			i≧70° ∰ 45°≦i<70° i<45°	~	Max=10 5	
nal	erosion root∙fal	d slope (surface collapse small fallen rock gully • piping hole subsidence heaving bending of tree len tree crack open crack anomaly of measure)	2 or more correspondences clarity certain • unclarity None	 Image: A start of the start of	Max=5 5	
-		sum total	51		(A)	

cut slope	1		effectivene	ss of existing cou	Interme	asures			point (α)	chec
	~	Potential rockf		lure are prevented	d enoug	gh, or, i	t is defe	ended	×0		
natural slope	tersl		all and slope fai efended when i	lure are considera t is generated.	ably pre	evented	, or it is		-20	D	
<u> </u>	✓			lure are partly pre		,			-10	C	1
slope failure		There is no co are not perform	,	or there is not effe	ective ev	ven if co	ountern	neasures	±0		
								sum t	เงเสเ		51
[History](C)											
[History](C)		Level of disaste	er history		point	check					
[History](C) There is a history obstacles to the ro		large fallen rocks	s and slope failu		point	check	[
There is a history obstacles to the ro There is a history	oad tra about	large fallen rocks ffic after construe large fallen rock	s and slope failu ction of recent n ss and slope fail	neasures.	point	check					
There is a history obstacles to the ro There is a history the road though th There is a history	oad tra about here is	large fallen rocks ffic after construe large fallen rock no obstacle to tr	s and slope failu ction of recent n s and slope failu affic.	neasures. ures that gets to	point						
There is a history obstacles to the ro There is a history the road though th There is a history get to the road.	about about nere is about	large fallen rocks ffic after construe large fallen rock no obstacle to tr	s and slope failu ction of recent n s and slope failu affic.	neasures. ures that gets to	point			(D)=MAX	(B,C)		
There is a history obstacles to the ro There is a history the road though th There is a history get to the road.	about about nere is about	large fallen rocks ffic after construe large fallen rock no obstacle to tr	s and slope failu ction of recent n s and slope failu affic.	neasures. ures that gets to				Score in evalu		(B)	
There is a history obstacles to the ro There is a history the road though th There is a history get to the road.	about about nere is about	large fallen rocks ffic after construe large fallen rock no obstacle to tr	s and slope failu ction of recent n s and slope failu affic.	neasures. ures that gets to	point (C)			Score in evalu from cause	uation	(B)	51
There is a history	about about nere is about	large fallen rocks ffic after construe large fallen rock no obstacle to tr	s and slope failu ction of recent n s and slope failu affic.	neasures. ures that gets to				Score in evalu	uation	(B)	
There is a history obstacles to the ro There is a history the road though th There is a history get to the road.	about about nere is about	large fallen rocks ffic after construe large fallen rock no obstacle to tr	s and slope failu ction of recent n s and slope failu affic.	neasures. ures that gets to		✓ ✓		Score in evalı rom cause Score in evalı	uation	(B) (C)	51

response	judgment
The countermeasure work is necessary.	1
Though the urgent countermeasure is not necessary, regular inspections are needed.	
The countermeasure work is not necessary.	



Management office	Ratnapura														
Management number	A004-173	Route No	A004	Location	(m)	173/11	to		Dista	ince	100 m				
Disaster	Slope Failure	Name of Road		Landma	ark		latitude	N 06°45′57.67″	longitude	E	080°51'27.54"				
Schematic sketch				Report	er's name :			M. Enokida							
an a	4	1th	Date	of report :			24-Sep-12								
		min () min () mi		Des	cription	Failure Type: Slope fa Geological Condition: Trigger of Failure: (Su Featured Points: Pylor slope. Thus retrogress	ilure invo Residual pposed) l ns of high ive failur	out traces of collapse can lving residual soil and we soil, highly weathered fel Rainfall, h-tension cables are locate e from the shoulder may o wentler gradient of slope, o	athered ro dspar quar ed adjacen lamage th	tzite, t to the e pylons					
- C				Hi	srtory	New failure Movement/extension									
Location map (Scale	e: 1:10,000)		andro and	dis	imated saster blume										
But the second sec	A004 - 173 80°51'27.54"E, 6°45'57.67"N Araiutalawa:	Proposed countermeasures	<i>Type:</i> Specifi -cation: Quantity Cost (million Birr):												

Management Number [Causes](A)

A004-173

Evaluation sheet (rockfall-slope failure)

Evaluator

Organization

M.Enokida JICA Study Team

 $point(\alpha)$

(B)

(B)

66 (C)

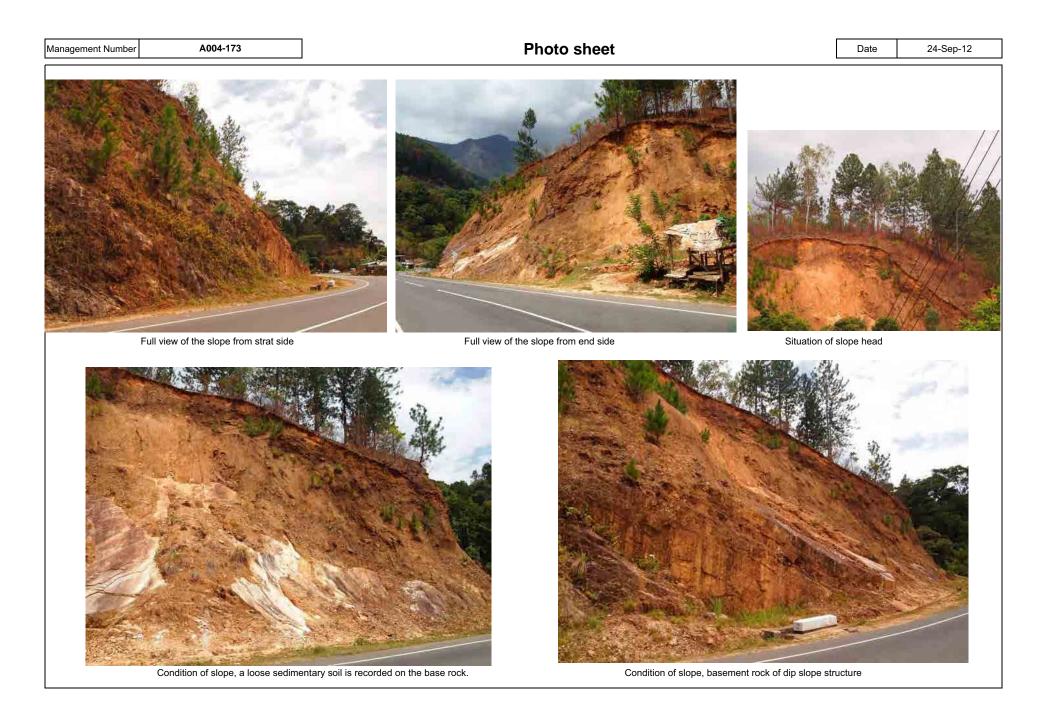
0 (D)=MAX(B,C)

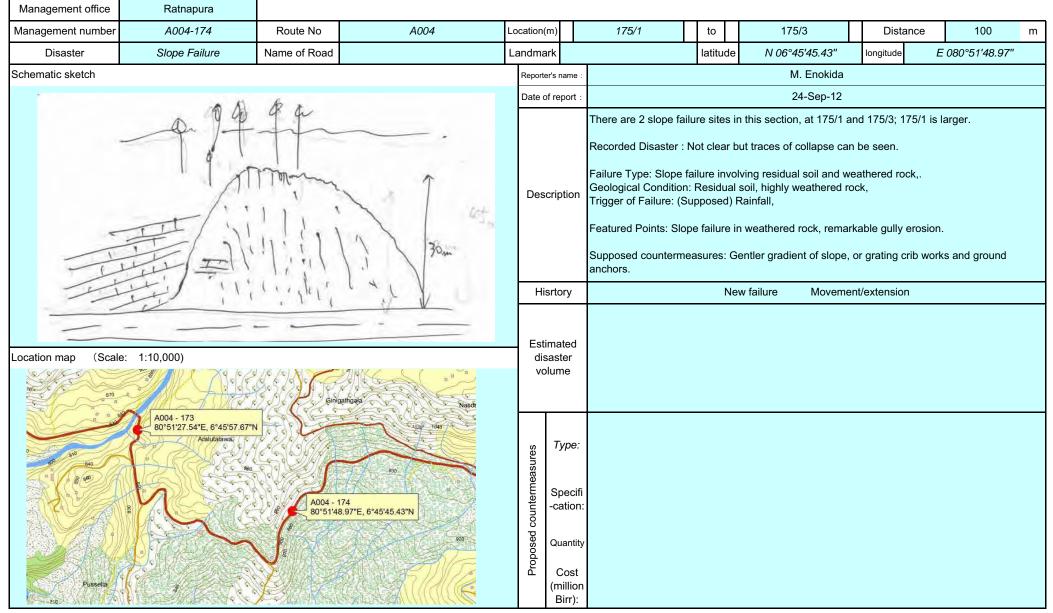
0

check

1

F	tem	factor					_										
				category of score	point	score						(
phy	ed ^r	talus slope		3 or more correspondences				[Main check o	bject]	[Countermeasure							
gra	aps	clear convex break of s	lope	2 correspondences	<u> </u>			cut slope				ss of existing cou				poin	ι(α
odo	collapsed factor	eroded toe of slope overhang, water catchr	ment slone	1 correspondences		Max=3 2				Potential rockfall ar enough when it is g		ure are prevente	d enough	or, it is	defended	×	0
Ĥ		susceptible to erosion	nent slope	marked		2		natural slope	\checkmark	Potential rockfall ar	,	ure are consider	ably prove	nted or	it ie		—
	soil	less strength with water	r	a little marked		Max=8		[Main slope disa	stersl	considerably defen				inteu, or	11 13	-:	20
s	S	0		None		8				Potential rockfall ar	nd slope fail	ure are partly pre	evented, c	r it is pa	rtly defende	d	
geological conditions	~	high density of cracks a	and a weak laye	marked				rockfall		when it is generate	d. However,	, it is not enough	for the re	maining	factors.	·	10
puo	rock	susceptible to erosion		a little marked	✓	Max=12		slope failure	1	There is no counter	rmeasure, o	r there is not effe	ective eve	n if coun	termeasure	s ±	0
al c	_	fast weathering		None		6		slope failure	v	are not performed.						1	_
ogic		dip slope of bedding pla	ane	It corresponds.	<u> </u>	Max=8											(
leol	ture			None		8									SL	im total	
	structure	debris on impermeabilit	-	marked a little marked	<u> </u>			[Liston/I(C)									⊥
	s	The upper part is a hare slope is weak.	d /the toe of	None		Max=6 6		[History](C)		Level of disaster his	tory		point c	heck			
				instability		Ŭ		There is a histor	v about	large fallen rocks and	,	res that were	point o	noon			
	Тс	psoil, detached rock and u	unsteady rock	a little unstable	1	Max=12				affic after construction				l I			
Б			-	stability		6		There is a histor	y about	large fallen rocks an	d slope failu	ires that gets to					
surface codition				notable spring waster				the road though	there is	no obstacle to traffic.		-					
õ		spring water		seepage		Max=8			y about	small fallen rocks an	d slope failu	ures that did not					
urfac				None	✓	0		get to the road.					+				
SL		ourfood openditio	_	bare land with minor vagetation				No disaster reco	ords							AX(B,C)	
		surface conditio	11	intermediate (bare • grass • tree) mainly structure, mainly tree	· · ·	Max=5 3							(C)		Score in e from caus		(
H				H≧50m		5							(0)		Score in e		(
				<u>ξ</u> 30≦H<50m										点	from histo		Ì
				e		Max=18									Among (E)&(C),	(1
figure		dip(i), height		– H<15m		12									large one		
fi				i≧70°													
				'ੳ 45°≦i<70°	 ✓ 	Max=10		[Overall judge	ment]			[Description]					_
Н			ll fellen neels multi	i<45°		10		response			judgment						
naly	erosion	piping hole subsidence heav	/ing · bending of tree	2 or more correspondences clarity	<u> </u>												
non	root∙fall	slope (surface collapse · sma piping hole · subsidence · heav en tree · crack · open crack · an neasure)	omaly of	certain • unclarity None		Max=5 5		The countermea	sure wo	ork is necessary.	\checkmark						
10	counteri	neasure)				5		Though the urge	ant cour	termeasure is not							
			sum total							ections are needed.							
				66		(A)				ork is not necessary.							
		L						LI DE COUNTERMES	CUICO M/C								





Management Number

A004-174

Evaluation sheet (rockfall slope failure)

Evaluator

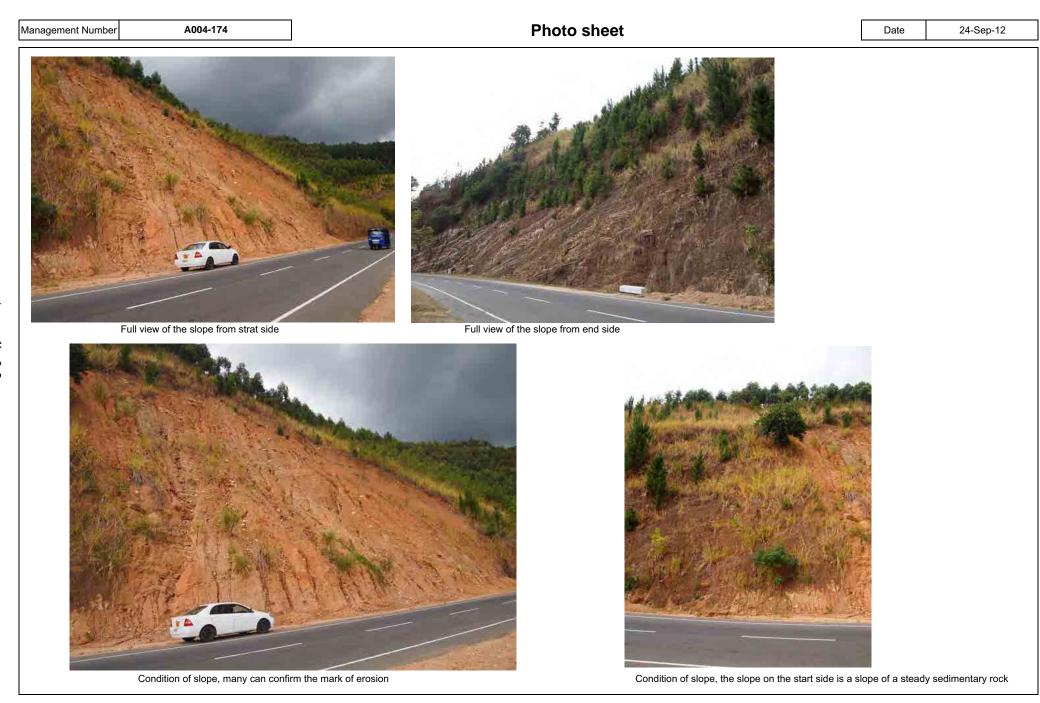
Organization

M.Enokida JICA Study Team

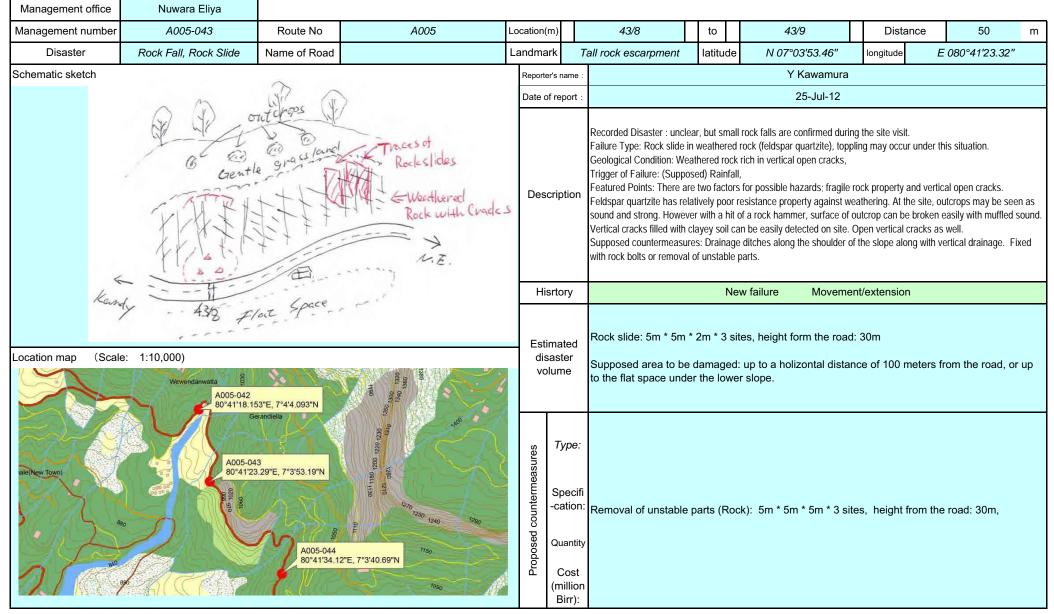
L	tem	factor					
				category of score	point	score	
topography	collapsed factor	talus slope clear convex break of eroded toe of slope overhang, water catch		3 or more correspondences 2 correspondences 1 correspondences no correspondence		Max=3 2	[Main check cut slope
s	soil	susceptible to erosion less strength with wate	·	marked a little marked None		Max=8 8	natural slop
al conditions	rock	high density of cracks susceptible to erosion fast weathering	-	marked a little marked None	<i>✓</i>	Max=12 6	rockfall slope failure
geological	arre	dip slope of bedding p	lane	It corresponds. None	√	Max=8 0	
	structure	debris on impermeabil The upper part is a ha slope is weak.		marked a little marked None		Max=6 4	[History](C)
ion	Т	opsoil, detached rock and	unsteady rock	instability a little unstable stability		Max=12 12	There is a his obstacles to There is a his
surface codition		spring water		notable spring waster seepage None		Max=8 0	the road thou There is a his get to the roa
sur		surface condition	on	bare land with minor vagetatio intermediate (bare · grass · tree mainly structure, mainly tre)	Max=5 5	No disaster r
figure		dip(i), heigh	t	$ \begin{array}{c} H \ge 50m \\ 30 \le H < 50m \\ 15 \le H < 30m \\ H < 15m \end{array} $		Max=18 12	
f				i≧70°		Max=10 5	[Overall jud
anomaly	targeted slope (surface collapse small fallen rock-gully- erosion-piping hole-subsidence heaving bending of tree root-fallen tree-crack-open crack anomaly of countermeasure)		2 or more correspondences•clarit certain•unclarity None		Max=5 5	response The counterr	
			sum total	59		(A)	Though the understand

out clone		effectiveness of existing cour	nterme	asures			point (a)	check
cut slope		Potential rockfall and slope failure are prevented enough when it is generated.	d enoug	gh, or, ii	is defe	nded	×0	
natural slope Main slope disa	asters]	Potential rockfall and slope failure are considera considerably defended when it is generated.	ably pre	vented	, or it is		-20	
rockfall	_	Potential rockfall and slope failure are partly pre when it is generated. However, it is not enough					-10	
slope failure	1	There is no countermeasure, or there is not effe are not performed.	ctive e	ven if co	ounterm	easures	±0	1
History](C)						sum t	otal (E	59
		Level of disaster history	point	check				
		large fallen rocks and slope failures that were affic after construction of recent measures.						
		large fallen rocks and slope failures that gets to no obstacle to traffic.						
There is a histo get to the road.	ry about	small fallen rocks and slope failures that did not						
No disaster rec	ords				- I - E	D)=MAX		3)
			(C)			core in evalı om cause	Jation (59
				点		core in evalu om history	uation ((C) 0
						mong (B)&((arge one.	C), (C)=MAX(B,

response	judgment
The countermeasure work is necessary.	1
Though the urgent countermeasure is not necessary, regular inspections are needed.	
The countermeasure work is not necessary.	



Appendix 3-2 12



Management Number [Causes](A)

A005-043

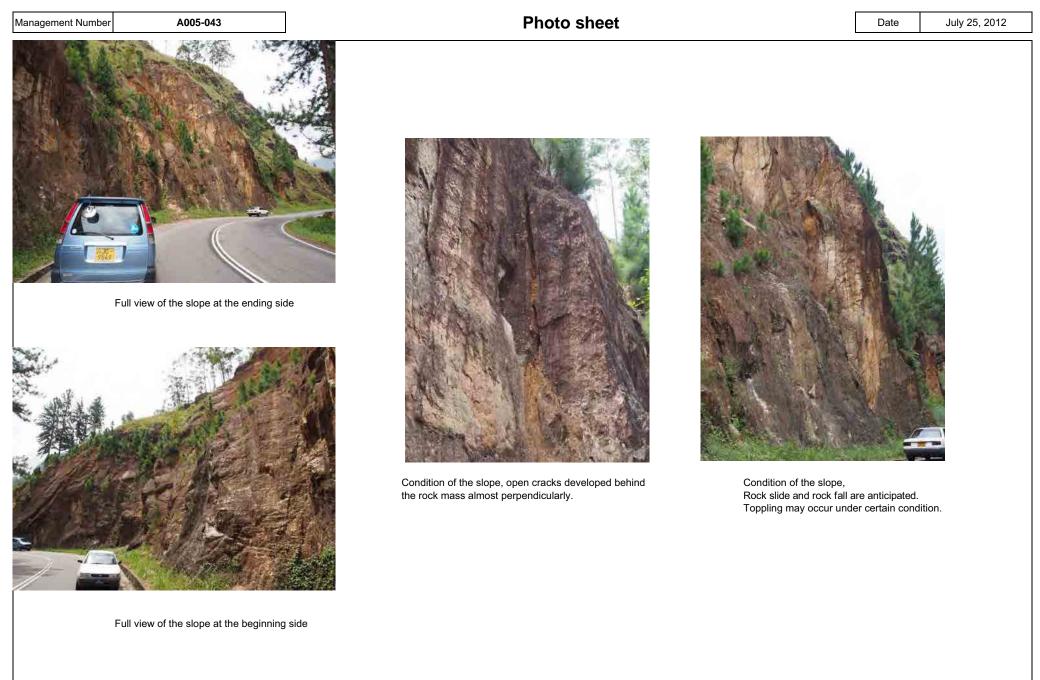
Evaluation sheet (rockfall-slope failure)

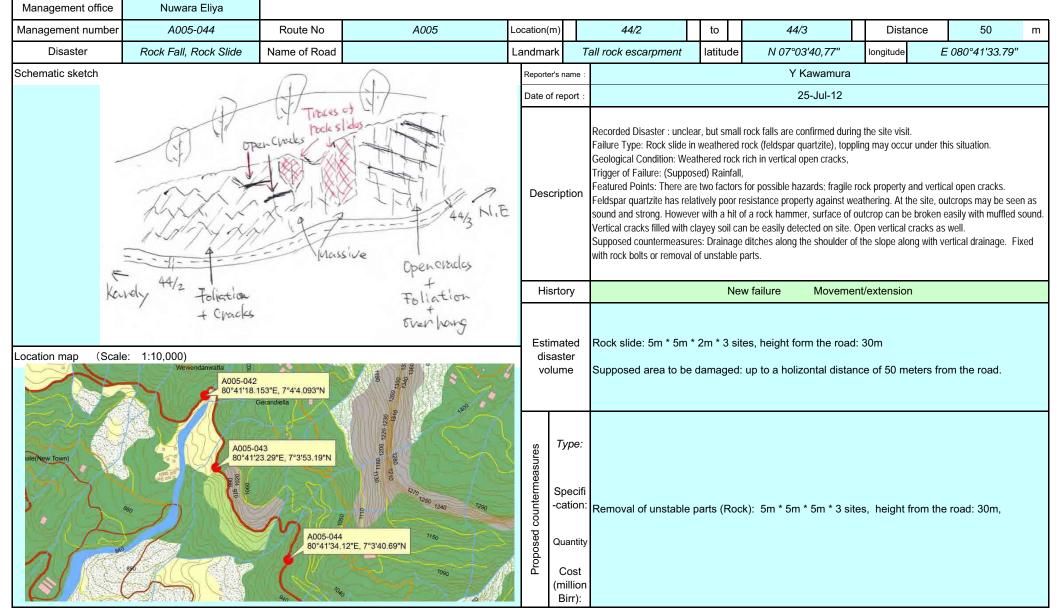
Evaluator

Organization

Y Kawamura JICA Study Team

lt	em	factor	category of score	point	score									
≥	73	talus slope	3 or more matches	point	30010	[Main check object] [Cou	untermeasure](B)=(A)+α or (A)×0					Ļ		
opography	collapsed factor	clear horseshoe break of slope	2 matches	_	•		effectiveness of existing coun	termea	sures		$point(\alpha)$) ch		
lgoc	ollapse factor	eroded toe of slope	1 match		Max=3	cut slope	ntial rockfall and slope failure are prevented	enougl	n, or, it i	s defended	×0			
top	ö	overhang, water catchment slope	None		2		igh when it is generated.				*0			
		vulnerable to erosion	marked			Poten	ntial rockfall and slope failure are moderately	/ preve	nted, or	it is moderately	-20			
	soil	less strength with water	a little marked	\checkmark	Max=8	[Main slope disasters] defen	nded when it is generated.				20			
su			None		4		ntial rockfall and slope failure are partly prev				-10			
condition	×	dense cracks / weak layers / foliation	marked	1		when	n it is generated. However, it is not enough fo	or the r	emainin	g factors.	10			
ouc	rock	vulnerable to erosion	a little marked		Max=12	slope tailure	e is no countermeasure, or there is not effec	tive ev	en if cou	Intermeasures	±0			
		easy to be weathered	None		12	are no	not performed.							
geological		dip slope of bedding plane or foliation	existing		Max=8		n				(E	B)		
	an		None	\checkmark	0					sum t	otal	62		
ອັ	structure	debris on impermeable bedrock	marked											
	stı	cap rocked weaker layer	a little marked		Max=6	[History](C)								
			None	\checkmark	0		of disaster history	point	check					
			unstable	<u> </u>		There is a history of large rock falls and slope failures that blocked the 100								
		Topsoil, loose rock and unstable rock	moderate		Max=12		raffic even after completion of latest countermeasure.							
tion			stable		12		falls and slope failures that damaged the	70	1					
codition			notable spring waster			road but not blocked the traffic.			· ·					
		spring water	seepage		Max=8	-	rock falls and slope failures that did not	40						
surface			None	✓ ✓	0	damage the road.				/				
ร		c	bare land with thin vagetation	<u> </u>		No disaster records		0		(D)=MAX				
		surface condition	moderate (bare grass tree)		Max=5			(0)		Score in evalu	ation (E	B)		
			mainly structure, mainly tree		5			(C)			()	62		
			H≧50m						₋⊢	Score in evalution	lation (C	C)		
			토 30≦H<50m 한 15≦H<30m	· · ·			l		点	,		0		
<u>n</u> e		din (;) boight	E 15≧H<30m H<15m		Max=18 12					Among (B)&(0 large one.	(D.	0)=MA		
figu		dip(i), height	i≧70°		12					large one.		0		
			i≦70 읓 45°≦i<70°	.		[Overall independent]	[Description]							
			i<45°		Max=10	[Overall judgement]	[Description]							
2			2 or more matches		10	response	judgment							
		slope (surface collapse small fallen rock gully- piping hole subsidence heaving bending of tree	•	····¥	Mov=F									
		ee crack open crack anomaly of countermeasure			Max=5 5	Countermeasures are necessary	ry.							
10		-			5	Regular inspections are needed	d in case							
		sum total				countermeasures are not insalle								
		Sum total	62		(A)									
					\/ \/	Countermeasures are not neces	0007							





Management Number [Causes](A)

A005-044

Evaluation sheet (rockfall-slope failure)

Evaluator

Organization

Y Kawamura JICA Study Team

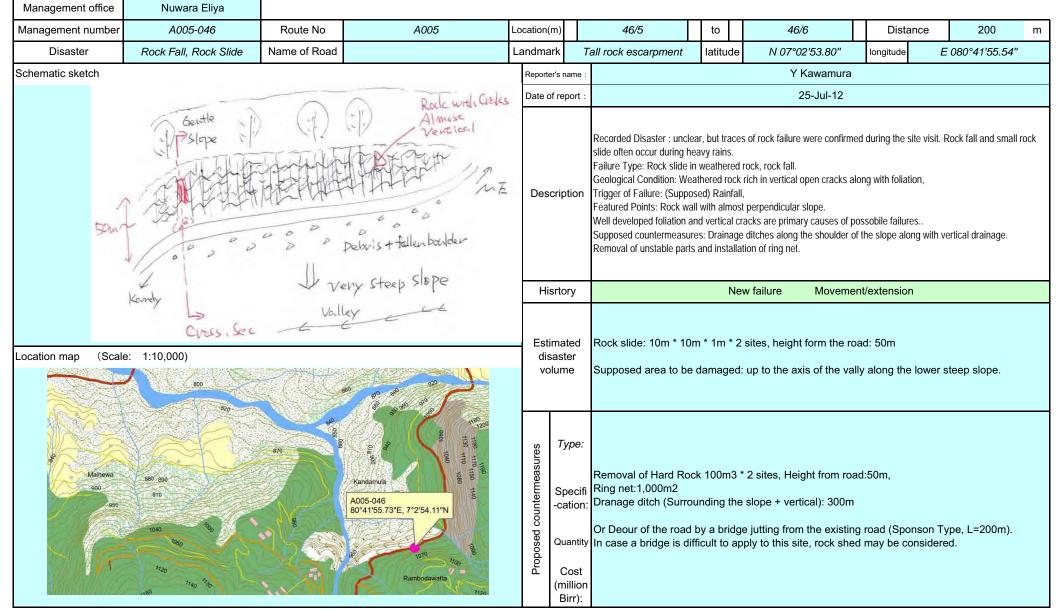
	lt	tem	factor															
				category of score	point	score						(
	phy	collapsed factor	talus slope	3 or more matches				[Main check of	oject]	[Countermeasur	-							<u> </u>
	gra	aps icto	clear horseshoe break of slope	2 matches				cut slope	1			s of existing coun					point(a)	check
	opography	fa	eroded toe of slope	1 match	<u> </u>	Max=3				Potential rockfall a enough when it is		ire are prevented	enoug	ih, or, it	is defer	ided	×0	
	Ţ		overhang, water catchment slope vulnerable to erosion	None marked		1		natural slope			-				., .			
		soil	less strength with water	a little marked				[Main alone diag	et e rel	Potential rockfall a defended when it is		ire are moderatel	y prev	entea, c	or it is m	oderately	-20	
		S	less stiength with water	None	<u> </u>	Max=8		[Main slope disa	stersj	Potential rockfall a	•	re are partly pro	ontod	or it io	northy d	fonded		
	geological conditions		dense cracks / weak layers / foliation	marked	/	4		rockfall	\checkmark	when it is generate							-10	
	nditi	rock	vulnerable to erosion	a little marked	v	Max=12				There is no counte	,	0			0			
	S	2	easy to be weathered	None		12		slope failure	\checkmark	are not performed.	,	there is not enec			unterni	asules	±0	\checkmark
	jical		dip slope of bedding plane or foliation	existing		Max=8				3							(B))
	golo	e	5 F F F F F F F F F F F F F F F F F F F	None	1	0				00						sum to		
ł	ge	structure	debris on impermeable bedrock	marked	-													69
Apj		str		a little marked	\checkmark	Max=6		[History](C)										
per			cap rocked weaker layer	None		4				Level of disaster his	story		point	check				
Appendix 3-2 17				unstable	\checkmark			There is a histor	/ of larg	e rock falls and slope	e failures that	blocked the	100					
× 3			Topsoil, loose rock and unstable rock	moderate		Max=12		traffic even after	completion of latest countermeasure.									
-2	tion			stable		12				ge rock falls and slop	e failures tha	t damaged the	70					
	sodi			notable spring waster				road but not bloc						•				
	ce c		spring water	seepage	<u> </u>	Max=8		There is a history about small rock falls and slope failures that did not										
	surface			None		4		damage the road	1.									
	าร			bare land with thin vagetation	<u> </u>			No disaster reco	rds				0			D)=MAX(
			surface condition	moderate (bare · grass · tree)		Max=5 5							$\langle \mathbf{O} \rangle$			core in evalua om cause	ation (B)	
				mainly structure, mainly tree H≧50m		5	4						(C)				ation (C	69
				1≦30≦H<50m										点		core in evalua om history	ation (C	0
				50⊒11<30m ₽ 15≦H<30m	v	Max=18								示		nong (B)&(C) (D):	=MAX(B,C)
	ure		dip(i), height	H<15m		12										ge one.),	0
	figu			i≧70°	1										L	-		-
				읓 45°≦i<70°		Max=10		[Overall judger	nentl			[Description]						
				i<45°		10												
	aly	targete	d slope (surface collapse · small fallen rock · gully ·	2 or more matches	\checkmark		1	response			judgment							
		erosion	• piping hole • subsidence • heaving • bending of tree •	1 match		Max=5		Countormoosura	o oro n	0000000								
	an	fallen tr	ree crack open crack anomaly of countermeasure)	None		5		Countermeasure	salen	ecessary.								
-	-							Regular inspection										
			sum total	69				countermeasure	s are no	t insalled.	v							
						(A)		Countermeasure	s are no	ot necessary.								
										,								

Management Number	A005-044	Photo sheet	Date July 25, 2012
	Full view of the slope at the ending sid	e Traces of rock slides	Sheeting joints notably developed parallel to the slope.

Full view of the slope at the beginning side

With foliation plunging to the slope, sheeting joints can form slip surfaces for rock slides.

Close up view of the left. The sheeting joints have some aperture, making a rock mass apart from the out crop.



Management Number

Evaluation sheet (rockfall-slope failure)

Evaluator

Organization

Y Kawamura JICA Study Team

[0	Causes](A)			
	Item	factor	category of score	point	score
topography	collapsed factor	talus slope clear horseshoe break of slope eroded toe of slope overhang, water catchment slope	3 or more matches 2 matches 1 match None	· ·	Max=3 1
su	soil	vulnerable to erosion less strength with water	marked a little marked None	 Image: A start of the start of	Max=8 4
aeoloaical conditions	rock	dense cracks / weak layers / foliation vulnerable to erosion easy to be weathered	marked a little marked None	✓ 	Max=12 12
ologic	e	dip slope of bedding plane or foliation	existing None	_	Max=8 0
Appendix 3	structure	debris on impermeable bedrock cap rocked weaker layer	marked a little marked None	 Image: A start of the start of	Max=6 4
		Topsoil, loose rock and unstable rock	unstable moderate stable	✓ 	Max=12 12
2- surface codition		spring water	notable spring waster seepage None	 Image: A start of the start of	Max=8 4
sur		surface condition	bare land with thin vagetation moderate (bare • grass • tree) mainly structure, mainly tree	<u> </u>	Max=5 5
figure	5	dip(i)、height	H ≥ 50m30 ≤ H < 50m15 ≤ H < 30mH < 15mi ≥ 70°		Max=18 18
			i≞70 i⊕ 45°≦i<70° i<45°	v	Max=10 10
anomalv	targete erosior fallen ti	d slope (surface collapse small fallen rock gully piping hole subsidence heaving bending of tree ree crack open crack anomaly of countermeasure)	2 or more matches 1 match None	✓ 	Max=5 5
		sum total	75		(A)

A005-046

cut slope	1		effectivene	ess	s of existing cour	nterme	asures			point (x) c	heck
· · ·	•		Potential rockfall and slope failure are prevented enough, or, it i enough when it is generated.						ded	×0		
natural slope	astersl	Potential rockfall defended when it			re are moderate	ly prev	ented, or	r it is mo	derately	-20		
rockfall		Potential rockfall	Potential rockfall and slope failure are partly prevented, or it is partly defended when it is generated. However, it is not enough for the remaining factors.						-10			
slope failure	✓	There is no count are not performed	ermeasure,		-			-		±0		1
											(B)	
									sum t	otal	7	' 5
[History](C)											•	
[History](C)		Level of disaster h	istory			point	check					
		ge rock falls and slop ation of latest counte		at	blocked the	100						j
There is a histo road but not blo		ge rock falls and slo e traffic.	pe failures ti	ha	t damaged the	70	✓					
There is a histo damage the roa		small rock falls and	d slope failur	es	that did not	40						
No disaster rec	ords					0)=MAX		(B)	
						(C)		fro	m cause		7	5
							点		ore in evalu m history	ation	(C) (0
									nong (B)&(0 ge one.	C),	(D)=MA	ах(в, 0
[Overall judge	ement]				[Description]							
response			judgment									
Countermeasu	res are n	ecessary.	1									
		mandad in ana										
Regular inspec	lions are	needed, in case										

Countermeasures are not necessary.

countermeasures are not insalled.











Full view of the slope at the beginning side

Debris cleared up to the shoulder of the road

Condition of the lower slope. From the shoulder of the road, very steep lower slope descends downward.







Full view of the slope at the ending side

Traces of rock fall or minor rock slides which occurred recently. The height from the road is around 30 meters.

Close up view of the left. With foliation plunging to the slope, vertical cracks can form slip surfaces for rock slides.

Management office Nuwara Eliya Management number A005-063 Route No A005 Location(m) 63/3 to Distance 100 m Disaster Slope Failure Name of Road Landmark latitude N 06°59'36.78" longitude E 080°44'53.13" Schematic sketch Reporter's name M. Enokida 25-Sep-12 Date of report Same situation can be seen at Km 46/5. Recorded Disaster : unclear, but small rock falls are confirmed during the site visit. Failure Type: Rock slide in weathered rock (feldspar quartzite), toppling may occur under this situation. Geological Condition: Weathered rock rich in vertical open cracks, Trigger of Failure: (Supposed) Rainfall, Description Featured Points: There are two factors for possible hazards; fragile rock property and vertical open cracks. Feldspar quartzite has relatively poor resistance property against weathering. At the site, outcrops may be seen as sound and strong. However with a hit of a rock hammer, surface of outcrop can be broken easily with muffled sound. Vertical cracks filled with clayey soil can be easily detected on site. Open vertical cracks as well. Supposed countermeasures: Drainage ditches along the shoulder of the slope along with vertical drainage. Fixed with rock bolts or removal of unstable parts. New failure Hisrtory Movement/extension Estimated (Scale: 1:15,000) Location map disaster volume ٩ 12 0 Type: Proposed countermeasures Specifi -cation Quantity Cost (million 500 m Birr):

Management Number

A005-063

Evaluation sheet (rockfall-slope failure)

Evaluator

M.Enokida Organization JICA Study Team

1	tem	factor	category of score	point	score
topography	collapsed factor	talus slope clear convex break of slope eroded toe of slope overhang, water catchment slope	3 or more correspondences 2 correspondences 1 correspondences no correspondence		Max=3 2
IS	soil	susceptible to erosion less strength with water	marked a little marked None	<u> </u>	Max=8 8
geological conditions	rock	high density of cracks and a weak laye susceptible to erosion fast weathering	marked a little marked None	~	Max=12 0
eologic	ture	dip slope of bedding plane	It corresponds. None	 ✓ 	Max=8 0
Appendix 3	structure	debris on impermeability bedrock The upper part is a hard /the toe of slope is weak.	marked a little marked None	 ✓ 	Max=6 0
	Т	opsoil, detached rock and unsteady rock	instability a little unstable stability		Max=12 6
surface codition		spring water	notable spring waster seepage None	>	Max=8 8
sur		surface condition	bare land with minor vagetation intermediate (bare · grass · tree) mainly structure, mainly tree	<u> </u>	Max=5 5
figure		dip(i), height	$ \begin{array}{c} H \ge 50m \\ 30 \le H < 50m \\ \hline 2 \\ 15 \le H < 30m \\ H < 15m \end{array} $		Max=18 8
			$ \begin{array}{c} i \geq 70^{\circ} \\ \vdots \\ \overline{\ominus} \\ 45^{\circ} \leq i < 70^{\circ} \\ i < 45^{\circ} \end{array} $	 Image: A start of the start of	Max=10 10
anomaly	targete erosior root•fa counte	ed slope (surface collapse small fallen rock gully h piping hole subsidence heaving bending of tree llen tree crack open crack anomaly of rmeasure)	2 or more correspondences clarity certain unclarity None	>	Max=5 5
		sum total	52		(A)

			effectiveness of e	existing cour	nterme	asures			point(a) chec
cut slope		Potential rockfall a enough when it is	and slope failure ar generated.	e prevented	l enouç	gh, or, if	t is defe	ended	×0	
natural slope Main slope dis		Potential rockfall a considerably defe	bly pre	vented		-20				
rockfall	astersj	Potential rockfall	and slope failure ar ed. However, it is r	e partly prev					-10	
slope failure	1	There is no count are not performed	ermeasure, or there	e is not effe	ctive ev	ven if co	ountern	neasures	±0	1
History](C)					-			sum t	lotai	52
		Level of disaster h	istory		point	check				
		large fallen rocks ar ffic after constructio								
		large fallen rocks a no obstacle to traffi		at gets to						
he road though	there is	•	с.	0						
he road though There is a histo get to the road.	n there is ry about	no obstacle to traffi	с.	0				(D)=MAX	(B,C)	
he road though There is a histo	n there is ry about	no obstacle to traffi	с.	0				Score in evalu	· .	B)
he road though There is a histo get to the road.	n there is ry about	no obstacle to traffi	с.	0	(C)		Ŀ	Score in evalu from cause	uation (52
he road though There is a histo get to the road.	n there is ry about	no obstacle to traffi	с.	0	(C)	点		Score in evalu	uation (•
he road though There is a histo get to the road.	n there is ry about	no obstacle to traffi	с.	0	(C)	 点	 	Score in evalı rom cause Score in evalı	uation (uation (52 C)

response	judgment
The countermeasure work is necessary.	1
Though the urgent countermeasure is not necessary, regular inspections are needed.	
The countermeasure work is not necessary.	



Management office Badulla Management number A005-091 Route No A005 Location(m) 91+019 to Distance 30 m Slope Failure (Collapse) Signboard "caution landslide" latitude N 06°54'12.76" E 080°51'39.19" Disaster Name of Road Landmark longitude Schematic sketch Y Kawamura Reporter's name Choss. Seci 25-Jul-12 Date of report Open chacks Recorded Disaster : Every rainy season, slope failures have occurred. In January 2007, the road was closed for 2 days due to the debris from the failure. Failure Type: Slope failure in residual soil and weathered rock. (+21 Geological Condition: Residual soi and weathered rock. Beddle Description tome Frigger of Failure: Rainfall, rise in ground water level, Topographic Condition: Water collectiong vally, Featured Points: Gradient of slope is apparently too steep for the heavily weathered rock and residual soil confirmed at the site. The actual gradient of slope at the section is 80 ~ 90 degrees. Gully erosion was also confirmed. In addition, many open cracks were confirmed behind the head scarp. Successive slope failures which can entail retrogressive development of failures behind the shoulder of the slope are anticipated. Supposed countermeasures: Reshaping the slope with stable angle or grating cribs with ground anchors. Removal of unstabe parts behind the shoulder. Drainage ditches along the shoulder of the slope along with vertical drainage. Weathered Rock NE New failure Hisrtory Movement/extension Very steep slope + deep valler Slope failure (collapse) : 30m * 15m Estimated (Scale: 1:10,000) disaster Location map volume Supposed area to be damaged: up to the small river running along the lower slope. 150 Ivadibita A005 - 091 80°51'23.65"E, 6°54'27.73"I Type: Proposed countermeasures Specifi Removal of Soil + Weathered Rock: 375 m3 -cation Concrete Crib + Anchor(L=20m): 510m2 + Vegetation:510m2 Dranage ditch (Surrounding slope + vertical): 81m Mudumpitigar Quantity agam Cost (million Birr):

Management Number [Causes](A)

A005-091

Evaluation sheet (rockfall-slope failure)

Evaluator

Organization

Y Kawamura JICA Study Team

	lt	tem	factor	-			│											
			talua alana	category of score 3 or more matches	point	score			:41	[O								
	topography	collapsed factor	talus slope clear horseshoe break of slope	2 matches				[Main check ob	ojecij	[Countermeasure		s of existing cour	tormo	acurac			point(a)	check
	ogra	lap: acto	eroded toe of slope	1 match	· · · · ·	Max=3		cut slope	\checkmark	Potential rockfall a					is dofo		point(u)	CHECK
	topo	<u>5</u>	overhang, water catchment slope	None		2				enough when it is g		are prevented	enoug	jii, 0i, it	13 UCICI	lucu	×0	
			vulnerable to erosion	marked	\checkmark	_		natural slope		Potential rockfall a	-	ire are moderate	v prev	ented. c	or it is m	oderatelv		
		soil	less strength with water	a little marked		Max=8		[Main slope disas	sters]	defended when it is	•			,		,	-20	
	S	.,		None		8		rockfall		Potential rockfall a	nd slope failu	ire are partly prev	vented	, or it is	partly d	efended	-10	\
	geological conditions	×	dense cracks / weak layers / foliation	marked	\checkmark			ТОСКТАП		when it is generate	ed. However,	it is not enough f	or the	remaini	ng facto	ors.	10	•
	ouc	rock	vulnerable to erosion	a little marked		Max=12		slope failure	1	There is no counte	rmeasure, oi	there is not effect	ctive ev	ven if co	ounterm	easures	±0	
	alc		easy to be weathered	None		12			v	are not performed.							-	
	ogic		dip slope of bedding plane or foliation	existing	<u> </u>	Max=8				00							(В)
	leol	ture		None		8	4									sum to	al	71
	0,	structure	debris on impermeable bedrock	marked				[Lister 1(C)										
pe		ò	cap rocked weaker layer	a little marked None	~	Max=6		[History](C)		Level of disaster his	ton		point	check				
Appendix 3-2 26	_			unstable		-		There is a history	of larg	e rock falls and slope	,	t blocked the		CITCOR				
X		-	Topsoil, loose rock and unstable rock	moderate		Max=12				tion of latest counter		blocked the	100					
3-2	ы			stable		12		There is a history	of lar	ge rock falls and slop	e failures tha	t damaged the	70					
	codition			notable spring waster			11	road but not bloc	ked the	traffic.		Ū	70	✓				
			spring water	seepage		Max=8		There is a history	/ about	small rock falls and	slope failures	s that did not	40					
	surface			None	\checkmark	0		damage the road	Ι.				40					
	su			bare land with thin vagetation	 ✓ 			No disaster recor	rds				0		(D)=MAX(E		
			surface condition	moderate (bare · grass · tree)		Max=5										core in evalua	tion (B	
	_			mainly structure, mainly tree	•	5							(C)		-	om cause		71
				H≧50m 互30≦H<50m										_F		core in evalua om history	tion (C) 0
				9 15≦H<30m		Max=18								点	-		(D)	=MAX(B,C)
	ure		dip(i), height	H<15m		101ax - 10										mong (B)&(C) irge one.	, (0)	0
	fig			i≧70°	•	, , , , , , , , , , , , , , , , , , ,										•		0
				; ≘ 45°≦i<70°		Max=10		[Overall judgen	nentl			[Description]						
				i<45°		10		, <u>,</u>			li salaran a sat							
	aly	targeted	slope (surface collapse · small fallen rock · gully ·	2 or more matches	\checkmark		1	response			judgment							
	E	erosion•	piping hole · subsidence · heaving · bending of tree ·	1 match		Max=5		Countermeasure	s are n	ecessary								
	an	fallen tre	e-crack-open crack-anomaly of countermeasure)	None		5				5	v							
								Regular inspection		,								
			sum total	71				countermeasures	s are no	ot insalled.								
				<u> </u>		(A)	J	Countermeasure	s are no	ot necessary.								

Management Number	

A005-091

Photo sheet



Full view of the site

Condition of the slope. Heavily weathered condition are understood. Foliation and cracks developed densely and helped weathering proceed.

Open craks seen at the terraces on the upper slope.

Date

July 25, 2012



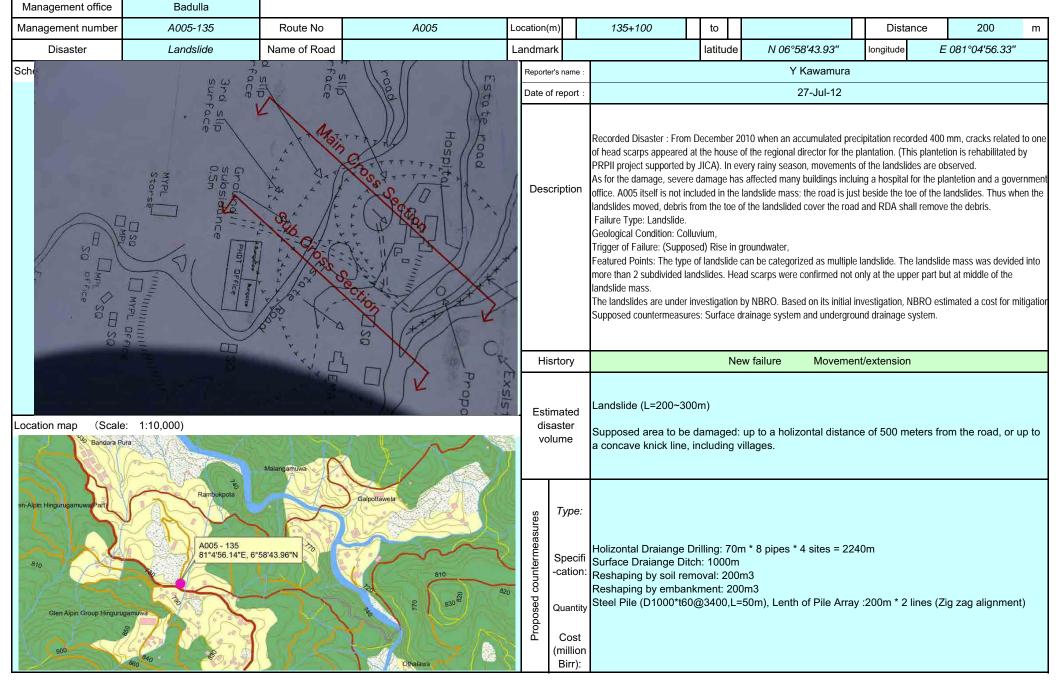




Open craks along with subsidence seen at the terraces.

Seen from the shoulder of the failure

Signboard warning the landslide



A005-135

Evaluation sheet (landslide)

EvaluatorY KawamuraOrganizationJICA Study Team

[Causes] (A)

		Category	Check	score
	Dhata	clearly indentified		
	Photo interpretation	identified partially or unclearly	✓	Max=30
-	morprotation	unclearly identified		15
Topographical factor		large and new cracks, steps and subsidence	✓	
10000	Surface	small and old cracks, steps and subsidence		
	anomalies	slight deformation		Max=30
		no anomalies		30
	Qualitation	fault, fracture zone, shear zone	1	
	Geological structure	dip slope		Max=18
		undip slope/ no characteristic feature		18
		colluvium	\checkmark	
		Gneiss		
		Charnokite		
	Main rock formation of	Quartzite		
Geological conditions	landslide body	Marble		
contaitions	,	Schist		
		Serpentite		Max=7
		Granite		7
		much springs / much seepage		
	Hydrological	little springs /little seepage	✓	
	feature	trace of water		Max=10
		no water observed		7
		sum total	77	(A)

[Countermeasure] (c)

	Category			
There is no counterme	pasure	1	±0	
Effectiveness of countermeasure	not working		±0	
	partially working		-20	
	completely working		× 0	
	Score in evaluation from cause	77	(B)	

	Check	score	
There is monitoring for I			
Monitoring devices			
Organization			

[Description]

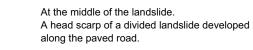


Appendix 3-2 29

[History] (B)

		Category	Check	score
	Existing record	obvious	✓	
	(documents or patrimony)	slight		
Records of		none		
Landslide		obvious	~	
		slight		
	houses	none		

Photo sheet July 27, 2012 Management Number A005-135 Date වේසමෙන් රිය පදවන්



Toe of the landslide. Hospitals and houses were destructed by the landslide movement.

Toe of the landslide. Debris from the landslide accumulated and closed the road when the landslide was activated.







Cracks at the middle of landslide.

Seeing downward from the middle of the landslide. Houses may be affected by the landslide movements.

Escarpment of a divided landslide.

Management office Badulla Management number A005-167 Route No A005 Location(m) 168/8 to 168/9 Distance 200 m Bridge at 168/9 N 07°00'31.54" E 081°11'52.19" Disaster Landslide Name of Road latitude Landmark longitude tic sketch Y Kawamura Reporter's name 27-Jul-12 Date of report Recorded Disaster : For more than 10 years, in every rainy season, the landslides moved toward A005 and the debris Leman Kolmein from the toe covered the road. Against each blockade by the debris, RDA needs to remove it from the road surface. moure Failure Type: Landslide. Mouth Geological Condition: Mainly weathered rock along with colluvium, Description Trigger of Failure: (Supposed) Rise in groundwater, Fopographic Condition: Water collecting valley, a stream is running along the road. Featured Points: The affecting landslide seems to be one of devided landslide from much wider landslide which was moved far past. The affecting landslide is mainly composed of weathered rock which seems to be low resistant against weathering and prone to alter into clay. At the head scarps at the shoulder and upper-middle of the affecting landslide, outcrops of weathered rocks can be observed. At the toe of the landslide, a spring was observed. Supposed countermeasures: Surface drainage system and underground drainage system. Ground anchor at the toe. 00 Relocation of the bridge passing the stream can be an option. 0 New failure Hisrtory Movement/extension Landslide (L=150m) Estimated (Scale: 1:10,000) Location map disaster Supposed area to be damaged: up to the small river and the opposite river bank (will not reach volume the house). Type: Proposed countermeasures Holizontal Draiange Drilling: 70m * 8 pipes * 2 sites = 1120m Specifi Surface Draiange Ditch: 500m -cation A005 - 167 Reshaping by soil removal: 100m3 81°11'51.5"E, 7°0'32.08"N Reshaping by embankment: 100m3 Concrete Crib + Anchor(L=50m,@1500, 600KN/anchor) at the toe: 100m * 12m Quantity Cost 060 (million Birr):

A005-167

Evaluation sheet (landslide)

EvaluatorY KawamuraOrganizationJICA Study Team

[Causes] (A)

		Category	Check	score
	_	clearly indentified	✓	
	Photo interpretation	identified partially or unclearly		Max=30
	Interpretation	unclearly identified		30
Topographical factor		large and new cracks, steps and subsidence	\checkmark	
Tactor	Surface	small and old cracks, steps and subsidence		
	anomalies	slight deformation		Max=30
		no anomalies		30
	0	fault, fracture zone, shear zone	√	
	Geological structure	dip slope		Max=18
	Siluciaic	undip slope/ no characteristic feature		18
		colluvium	✓	
		Gneiss	√	
		Charnokite		
	Main rock formation of	Quartzite		
Geological conditions	landslide body	Marble		
conditions	, , , , , , , , , , , , , , , , , , ,	Schist		
		Serpentite		Max=18
		Granite		10
		much springs / much seepage	 Image: A set of the set of the	
	Hydrological	little springs /little seepage		
	feature	trace of water		Max=10
		no water observed		10
		sum total	98	(A)

[Countermeasure] (c)

	Category	Check	score
There is no counterme	asure	1	±0
	not working		±0
Effectiveness of countermeasure	partially working		-20
	completely working		× 0
	Score in evaluation from cause	98	(B)

Monitoring	Check	score
There is monitoring for landslide		
Monitoring devices		
Organization		

[Description]



[History] (B)

[HISTORY] (B)				
		Category	Check	score
	Existing record	obvious	~	
· ·	slight			
Records of	patrimony)	none		
Landslide	Damage on road	obvious	~	
	facilities and	slight		
	houses	none		

Management Number

A005-167

Photo sheet



Full view of the landslide

At the toe of the landslide, seepage of water was confirmed

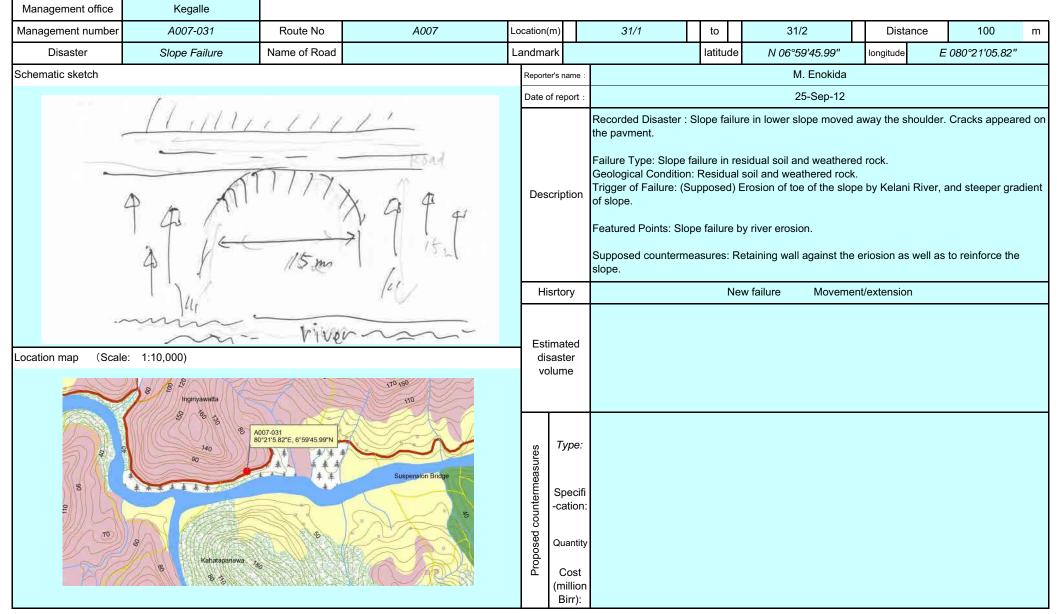
Head scarp Along the main head scarp, several divided head scarps were confrimed.



The bridge and the cleaned up debris. Amount of the debris is so big that the river course is about to be closed.

Open cracks were seen at the middle of the landslide.

Seen from the opposite side of the small river. Remaining mounds were clearly seen.



Management Number

35

A007-031

Evaluation sheet (rockfall slope failure)

Evaluator

Organization

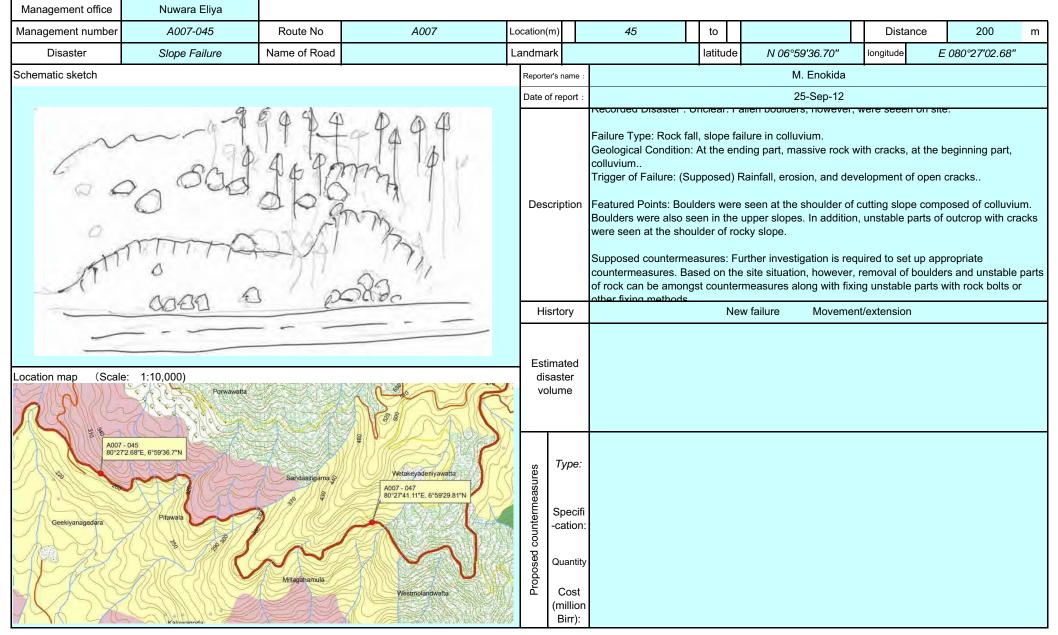
M.Enokida JICA Study Team

	Item	factor	category of score	point	score
topography	collapsed factor	talus slope clear convex break of slope eroded toe of slope overhang, water catchment slope	3 or more correspondences 2 correspondences 1 correspondences no correspondence		Max=3
ns	soil	susceptible to erosion less strength with water	marked a little marked None	√	Max=8 8
al conditions	rock	high density of cracks and a weak susceptible to erosion fast weathering	aye marked a little marked None		Max=12 0
geological	re	dip slope of bedding plane	It corresponds. None	_	Max=8 0
ge	structure	debris on impermeability bedrock The upper part is a hard /the toe of slope is weak.	marked a little marked None		Max=6 0
ion · · ·	Т	opsoil, detached rock and unsteady ro	instability ck a little unstable stability	 Image: A start of the start of	Max=12 6
surface codition		spring water	notable spring waster seepage None		Max=8 0
sur		surface condition	bare land with minor vagetation intermediate (bare grass tree) mainly structure, mainly tree	<	Max=5 3
figure		dip(i)、height	H≧50m 30≦H<50m 15≦H<30m H<15m		Max=18 8
Ĵ			i≧70° 45°≦i<70° i<45°		Max=10 10
anomaly	erosior root∙fa	d slope (surface collapse small fallen rock- piping hole subsidence heaving bending llen tree crack open crack anomaly of rmeasure)		✓ 	Max=5 5
		sum to	al 42		(A)

cut slope		eff	fectivenes	s of existing cou	nterme	asures			$point(\alpha)$	check
		Potential rockfall and enough when it is ger		re are prevented	d enoug	gh, or, it	is defe	nded	×0	
natural slope [Main slope dis		Potential rockfall and considerably defende	•		ibly pre	evented,	or it is		-20	
rockfall		Potential rockfall and when it is generated.	slope failu	re are partly pre					-10	
slope failure	✓	There is no countermare not performed.	easure, or	there is not effe	ctive ev	ven if co	ounterm	easures	±0	1
								sum t	(B total) 42
[History](C)		Level of disaster histor	ry		point	check				
		t large fallen rocks and saffic after construction of								
		t large fallen rocks and s no obstacle to traffic.	slope failur	es that gets to						
There is a histo get to the road.	-	small fallen rocks and s	slope failur	res that did not						
No disaster rec	ords						_	D)=MAX	· · ·	<u>\</u>
					(C)			core in evalı om cause	uation (B	, 42
						点		core in evalı om history	uation (C) 0
								mong (B)&(0 arge one.	C), (D)	=MAX(B,0
				[Description]					_	
[Overall judge	ement]			[Description]						

response	judgment
The countermeasure work is necessary.	~
Though the urgent countermeasure is not necessary, regular inspections are needed.	
The countermeasure work is not necessary.	





Management Number

Evaluation sheet (rockfall-slope failure)

Evaluator Organization

M.Enokida JICA Study Team

	Item	factor			1
	-		category of score	point	score
topography	collapsed factor	talus slope clear convex break of slope eroded toe of slope overhang, water catchment slope	3 or more correspondences 2 correspondences 1 correspondences no correspondence	_	Max=3 1
suc	susceptible to erosion marked iss strength with water a little marked None None		a little marked None	_	Max=8 8
al conditions	rock	high density of cracks and a weak la susceptible to erosion fast weathering	a little marked None	~	Max=12 6
geological	Ire	dip slope of bedding plane	It corresponds. None	<i>✓</i>	Max=8 0
af uo Appendix 3-2	structure	debris on impermeability bedrock The upper part is a hard /the toe of slope is weak.	marked a little marked None	`	Max=6 4
ion		Fopsoil, detached rock and unsteady roc	instability k a little unstable stability	✓ 	Max=12 12
C [−] surface codition		spring water	notable spring waster seepage None	~	Max=8 0
sur		surface condition	bare land with minor vagetation intermediate (bare · grass · tree) mainly structure, mainly tree	<u> </u>	Max=5 5
figure	2	dip(i)、height	H≧50m ± 30≦H<50m = 15≦H<30m H<15m		Max=18 5
4			i≧70° 용 45°≦i<70° i<45°	<u> </u>	Max=10 10
anomalv	erosio root∙fa	ed slope (surface collapse small fallen rock g n piping hole subsidence heaving bending c allen tree crack open crack anomaly of rmeasure)		✓ 	Max=5 5
		sum tota	al 56		(A)

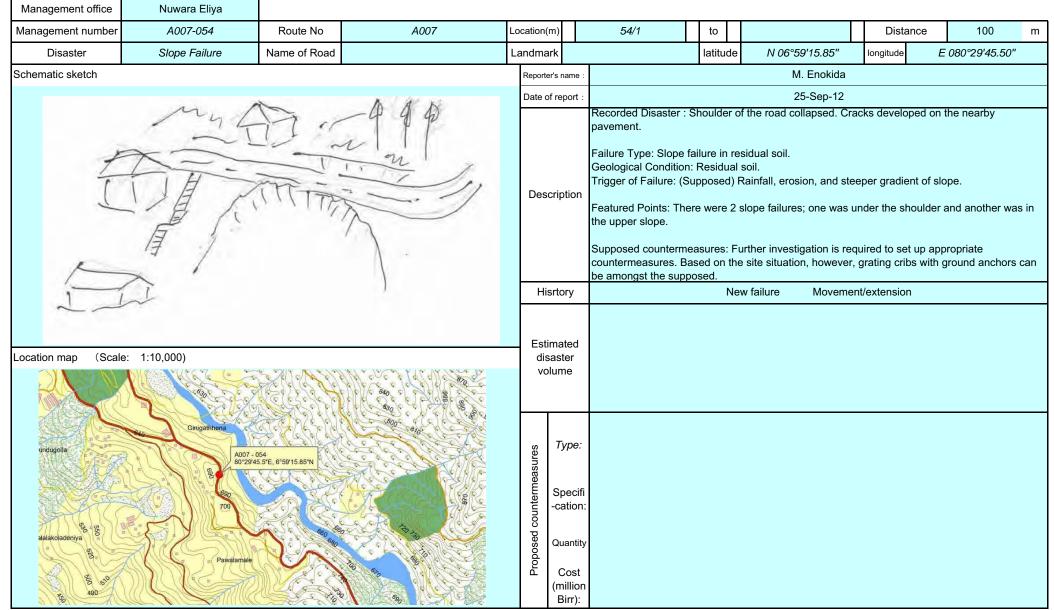
A007-045

out alana				effectiveness	of existing cou	nterme	asures			point (a) che
cut slope			Potential rockfal enough when it	l and slope failui is generated.	re are prevented	d enoug	gh, or, it	is defen	ded	×0	
natural slope	\checkmark	Р	Potential rockfal	I and slope failu	re are considera	ably pre	vented,	or it is		-20	
[Main slope dis	asters]	C	considerably de	fended when it is	s generated.					20	
rockfall				l and slope failu ated. However, i						-10	
slope failure	1		There is no cour are not performe	ntermeasure, or ed.	there is not effe	ctive ev	ven if co	ounterme	asures	±0	~
									sum t	lolal	56
[History](C)											
[History](C)		Le	evel of disaster	history		point	check				
There is a histo		t larg	ge fallen rocks	history and slope failure ion of recent me		point	check				
There is a histo obstacles to the There is a histo	e road tra ory about	t larg affic t larg	ge fallen rocks after construct	and slope failure ion of recent me and slope failure	asures.	point	check				
There is a histo obstacles to the There is a histo the road thoug There is a histo	e road tra ory about n there is ory about	t larg affic t larg s no	ge fallen rocks after construct rge fallen rocks obstacle to trat	and slope failure ion of recent me and slope failure	asures. es that gets to	point	check				
There is a histo obstacles to the There is a histo the road though There is a histo get to the road.	e road tra ory about or there is ory about	t larg affic t larg s no	ge fallen rocks after construct rge fallen rocks obstacle to trat	and slope failure ion of recent me and slope failure ffic.	asures. es that gets to	point	check		D)=MAX		B)
There is a histo obstacles to the There is a histo the road though There is a histo get to the road.	e road tra ory about or there is ory about	t larg affic t larg s no	ge fallen rocks after construct rge fallen rocks obstacle to trat	and slope failure ion of recent me and slope failure ffic.	asures. es that gets to	point (C)	check	Sc	D) =MAX ore in evalu m cause		B) 56
There is a histo obstacles to the There is a histo the road thoug	e road tra ory about or there is ory about	t larg affic t larg s no	ge fallen rocks after construct rge fallen rocks obstacle to trat	and slope failure ion of recent me and slope failure ffic.	asures. es that gets to		check	Sc fro	ore in evalu	uation (

response	judgment
The countermeasure work is necessary.	~
Though the urgent countermeasure is not necessary, regular inspections are needed.	
The countermeasure work is not necessary.	

38





Management Number

41

A007-054

Evaluation sheet (rockfall-slope failure)

Evaluator

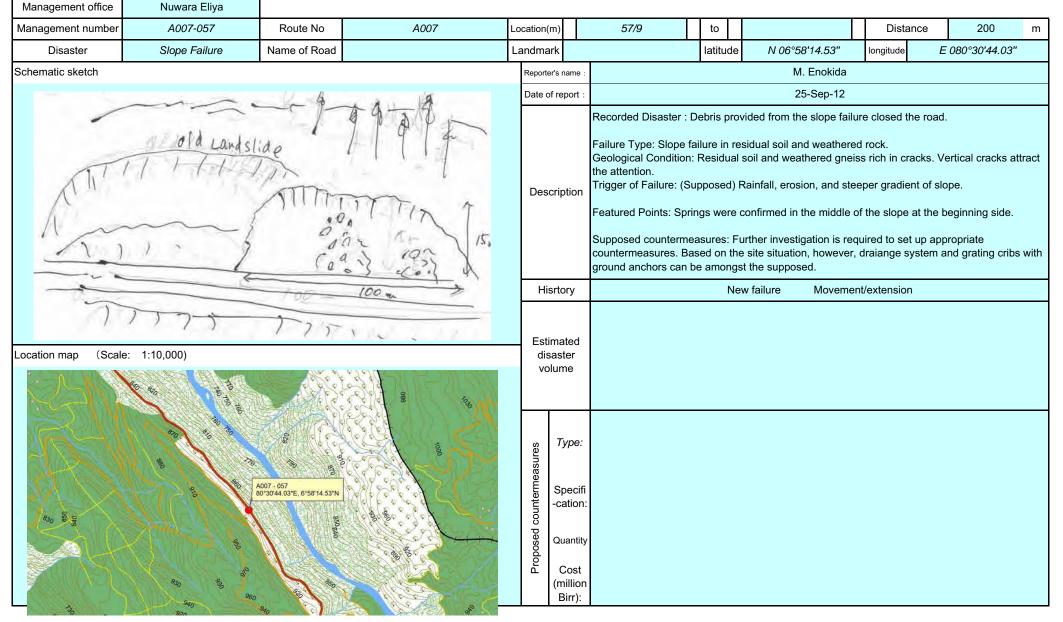
M.Enokida Organization JICA Study Team

	[C	auses](A)		_		_	
	1	ltem	factor					
	y	73	talus slope		3 0	category of score or more correspondences	point	score
	topography	collapsed factor	clear convex break of	slope	2 0	orrespondences		
	ogr	ollapse factor	eroded toe of slope		1 c	1 correspondences		Max=3
	top	8	overhang, water catch	ment slope	no	correspondence		2
			susceptible to erosion		ma	arked	\checkmark	
		soil	less strength with wate	er	a li	ttle marked		Max=8
	sı	.,			No	ne		8
	geological conditions		high density of cracks	and a weak laye	ma	arked		
	puc	rock	susceptible to erosion		a li	ttle marked		Max=12
	al co	-	fast weathering		No	ne	✓	0
	gica		dip slope of bedding pl	lane	lt c	orresponds.		Max=8
	oloe	er			No	ne	\checkmark	0
\mathbf{b}	g€	structure	debris on impermeabil	ity bedrock	ma	arked		
Idv		stn	The upper part is a ha	rd /the toe of	a l	ttle marked		Max=6
Jer			slope is weak.		None		\checkmark	0
Appendix 3-2					ins	tability	\checkmark	
× 3		Topsoil, detached rock and unsteady rock a little unstable stability		Topsoil, detached rock and unsteady rock a little unstable			Max=12	
-2	ion				12			
	surface codition				no	table spring waster		
	e co		spring water		seepage			Max=8
	fac				No	ne	\checkmark	0
	sui				bar	e land with minor vagetatior	1	
			surface condition	on	inte	ermediate (bare • grass • tree)		Max=5
					ma	ainly structure, mainly tree	е	3
						H≧50m		
					ght	30≦H<50m		
	a)				hei	15≦H<30m	✓	Max=18
	figure		dip(i), height	t		H<15m		8
	fi					i≧70°		
					dip	45°≦i<70°	 Image: A start of the start of	Max=10
						i<45°		10
	aly	0	d slope (surface collapse∙sm		2 o	r more correspondences clarity		
	anomaly		•piping hole•subsidence•hea llen tree•crack•open crack•ar		ce	rtain•unclarity		Max=5
	anc		measure)	iomary of	No	ne	-	5
1			,		Γ			
				sum total	1	40		
						48		(A)
				-				

Potential rockfall and slope failure are prevented enough, or, it is defended enough when it is generated. ×0 Inatural slope Image: State in the image:	cut slope		effectiveness of exis	ting count	termea	asures			point(o) che
[Main slope disasters] Potential rockfall and slope failure are considerably prevented, or it is considerably defended when it is generated. -20 rockfall Potential rockfall and slope failure are partly prevented, or it is partly defended when it is generated. However, it is not enough for the remaining factors. -10 slope failure Image: considerably defended when it is generated. However, it is not enough for the remaining factors. -10 There is no countermeasure, or there is not effective even if countermeasures are not performed. ±0 [History](C) Level of disaster history point check There is a history about large fallen rocks and slope failures that were obstacles to the road traffic after construction of recent measures. Image: construction of recent measures. Image: construction of recent measures. There is a history about large fallen rocks and slope failures that gets to the road though there is no obstacle to traffic. Image: construction of recent measures. Image: construction of recent measures. There is a history about small fallen rocks and slope failures that gets to the road. Image: construction of recent measures. Image: construction of recent measures. Image: construction of recent measures. There is a history about small fallen rocks and slope failures that did not get to the road. Image: construction of recent measures. Image: construction of recent measures. Image: construction construction construction c				revented	enoug	h, or, it i	s defen	ded	×0	
rockfall Potential rockfall and slope failure are partly prevented, or it is partly defended when it is generated. However, it is not enough for the remaining factors. -10 slope failure Image: Slope failure failure is no countermeasure, or there is not effective even if countermeasures are not performed. ±0 [History](C) Image: Slope failure failen rocks and slope failures that were obstacles to the road traffic after construction of recent measures. Image: Slope failure failen rocks and slope failures that gets to the road though there is no obstacle to traffic. Image: Slope failure failen rocks and slope failures that did not get to the road. No disaster records Image: Slope failure failen rocks and slope failures that did not get to the road. Image: Slope failures that did not slope failures that did not slope failures that did not get to the road.					ly pre	vented,	or it is		-20	
slope failure iare not performed. ±0 sum total [History](C) sum total [History](C) Level of disaster history point check There is a history about large fallen rocks and slope failures that were obstacles to the road traffic after construction of recent measures. Image: Construction of recent measures. Image: Construction of recent measures. There is a history about large fallen rocks and slope failures that gets to the road though there is no obstacle to traffic. Image: Construction of recent measures. Image: Construction of recent measures. There is a history about large fallen rocks and slope failures that gets to the road though there is no obstacle to traffic. Image: Construction of recent measures. Image: Construction of recent measures. No disaster records Image: Construction of recent measures. Image: Construction of recent measures. Image: Construction of recent measures. No disaster records Image: Construction of recent measures. Image: Construction of recent measures. Image: Construction of recent measures. No disaster records Image: Construction of recent measures. Image: Construction of recent measures. Image: Construction of recent measures.		Potential rockfa	ll and slope failure are p	artly preve					-10	
[History](C) point check Image: Level of disaster history point check There is a history about large fallen rocks and slope failures that were obstacles to the road traffic after construction of recent measures. Image: Level of disaster history Image: Level of disaster history There is a history about large fallen rocks and slope failures that gets to the road though there is no obstacle to traffic. Image: Level of disaster records Image: Level of disaster records No disaster records Image: Level of disaster history	ope failure 🗸		· · · · · · · · · · · · · · · · · · ·	not effect	tive ev	en if co	unterme	asures	±0	~
Level of disaster history point check There is a history about large fallen rocks and slope failures that were obstacles to the road traffic after construction of recent measures. Image: Construction of recent measures. Image: Construction of recent measures. There is a history about large fallen rocks and slope failures that gets to the road though there is no obstacle to traffic. Image: Construction of recent measures. Image: Construction of recent measures. There is a history about small fallen rocks and slope failures that did not get to the road. Image: Construction of recent measures. Image: Construction of recent measures. No disaster records Image: Construction of recent measures. Image: Construction of recent measures. Image: Construction of recent measures.								sum t		B) 48
There is a history about large fallen rocks and slope failures that were obstacles to the road traffic after construction of recent measures. There is a history about large fallen rocks and slope failures that gets to the road though there is no obstacle to traffic. There is a history about small fallen rocks and slope failures that did not get to the road. No disaster records	story](C)	Level of disaster	history		point	check				
the road though there is no obstacle to traffic. There is a history about small fallen rocks and slope failures that did not get to the road. No disaster records (D)=MAX(B,C)		t large fallen rocks	and slope failures that v	vere	<u> </u>					
get to the road. No disaster records (D)=MAX(B,C)	•	•		gets to						
INO disaster records		t small fallen rocks	and slope failures that	did not						
	disaster records									B)
(C) from cause					(C)					48
Score in evaluation from history						点			uation (C) 0
Among (B)&(C), large one.				_				• • • •	C), (D)=MAX(0

response	judgment
The countermeasure work is necessary.	1
Though the urgent countermeasure is not necessary, regular inspections are needed.	
The countermeasure work is not necessary.	





A007-057

Evaluation sheet (landslide)

EvaluatorM.EnokidaOrganizationJICA Study Team

[Causes] (A)

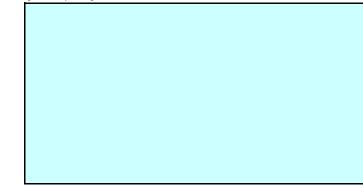
		Category	Check	score
	Desuit of abote	exist clearly		
	Result of photo interpretation	exist but partial and not clear	1	Max=30
T	interprotection	exist but not clear		15
Topographical factor		large and new cracks, steps and subsidence		
	Surface	small and old cracks, steps and subsidence	✓	
	anomalies	slight deformation		Max=30
		no anomalies		20
		fault, fracture zone		
	Geological structure	dip slope		Max=18
		undip slope/ no characteristic feature	\checkmark	0
	Main rock formation of landslide body	colluvium	1	
		Gneiss		
		Charnokite		
		Quartzite		
Geological conditions		Marble		
conditions		Schist		
		Serpentite		Max=18
		Granite		7
		much springs / much seepage		
	Hydrological	little springs /little seepage		
	feature	trace of water		Max=10
		no water observed	✓	0
		sum total	42	(A)

[Countermeasure] (c)

	Category	Check	score
There is no countermeasure		~	±0
	No effect		±0
Effectiveness of countermeasure	Some effect		-20
	High effect		× 0
	Score in evaluation from cause	42	(B)

Monitoring	Check	score
There is monitoring for landslide		
Monitoring devices		
Organization		

[Description]



Appendix 3-2 44

[History] (B)

[FISIOLY] (B)				
		Category	Check	score
	Existing record	obvious		
	(documents or patrimony)	slight	~	
Records of		none		
Landslide	facilities and	obvious		
		slight	~	
		none		

Management Number [Causes](A)

A007-057

Evaluation sheet (rockfall-slope failure)

Evaluator

Organization

M.Enokida JICA Study Team

 $point(\alpha)$

(B)

(B)

49 (C)

0 (D)=MAX(B,C)

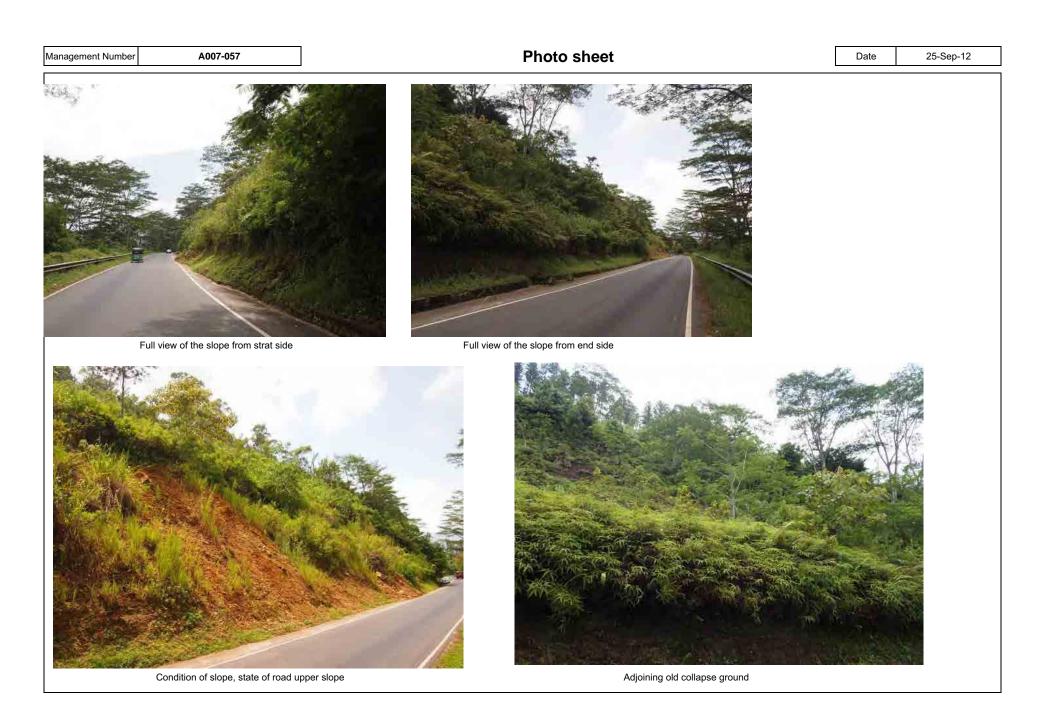
0

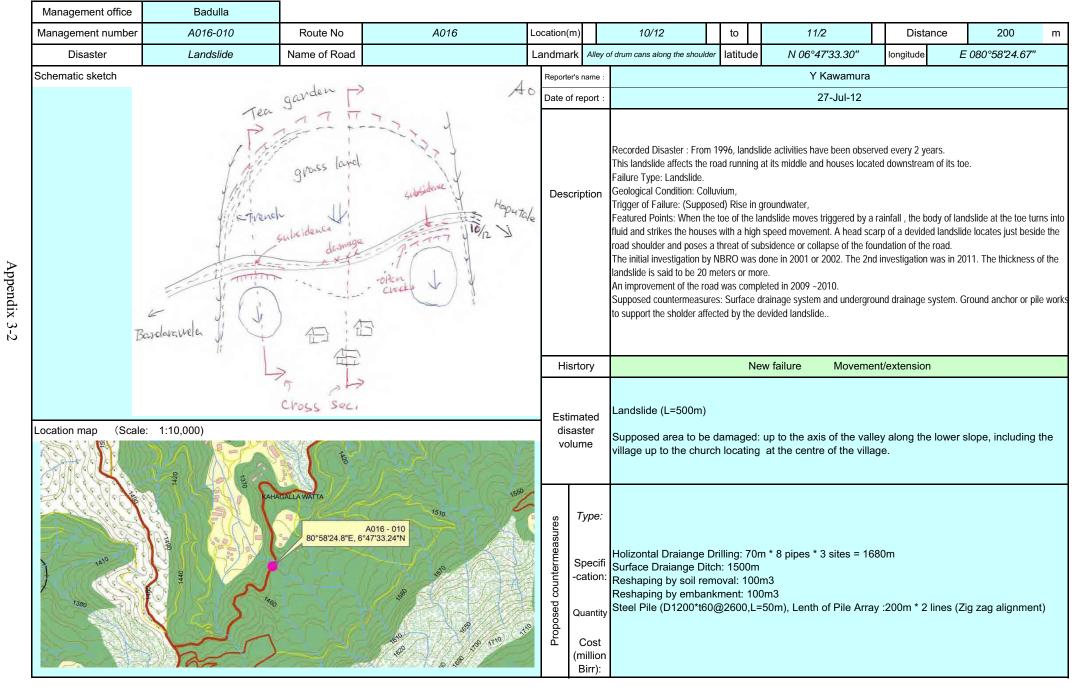
check

1

49

lt	em	factor				1												
<u>_</u>		talus slope		category of score	point	score	Main check	o ot ¹	Countermose	\mathbf{D}) - ~	$or(\Lambda) \ge 0$						
hy	r sed			3 or more correspondences			[Main check obj	ecij	[Countermeasure	-		or (A)×0	tormes	curoc			point(_
opography	aps	clear convex break of s eroded toe of slope	siope	2 correspondences	v	Maya	cut slope								a dafa:-		point(J
topo	collapsed factor	overhang, water catch	ment slope	1 correspondences no correspondence		Max=3 2			Potential rockfall ar enough when it is g		iiure	are prevented	enoug	n, or, it i	s aeten	uea	×0	
-		susceptible to erosion		marked		2	natural slope	\checkmark	Potential rockfall ar		iluro	are consideral	nly nrev	onted (or it is			-
	soil	less strength with wate	r	a little marked	v	Max=8	[Main slope disast	tersl	considerably defen				by pier	venteu, t	51 11 15		-20)
s	s			None		8			Potential rockfall ar				ented.	or it is p	artlv de	fended		-
conditions		high density of cracks	and a weak laye	marked			rockfall		when it is generate								-10)
ipug	rock	susceptible to erosion		a little marked		Max=12		(There is no counter	rmeasure, o	or th	ere is not effect	tive ev	en if cou	unterme	asures		
	2	fast weathering		None	\checkmark	0	slope failure		are not performed.								±0	
gica		dip slope of bedding pl	ane	It corresponds.		Max=8	· · · · · · · · · · · · · · · · · · ·											(
eological	e			None	\checkmark	0										sum to	otal	
ge	structure	debris on impermeabili	ty bedrock	marked														
	str	The upper part is a har	d /the toe of	a little marked	\checkmark	Max=6	[History](C)											
		slope is weak.		None		4			Level of disaster his	,			point	check				
				instability	<u> </u>				large fallen rocks and									-
	To	psoil, detached rock and	unsteady rock	a little unstable		Max=12			ffic after construction									
codition				stability		12			large fallen rocks an	•	lures	s that gets to						
Sodi				notable spring waster		-	-		no obstacle to traffic.									
ce		spring water		seepage		Max=8	-	about	small fallen rocks an	id slope fail	lures	s that did not						
surface				None	✓ ✓	0	get to the road.								/-			
ŝ		surface condition	n	bare land with minor vagetation intermediate (bare • grass • tree)			No disaster record	ds								0)=MAX(-
				mainly structure, mainly tree		Max=5 5							(C)			ore in evalua m cause	ation	(
+				H≧50m		5										ore in evalu	ation	- 7
				エ=3011 Ξ 30≦H<50m		•								点		m history	auon	`
					1	Max=18								/iii		nong (B)&(C	:)	(
Jure		dip(i), height		H<15m		8										ge one.	· /,	•
tig		,		i≧70°		-									L			-
				; ਊ 45°≦i<70°		Max=10	[Overall judgem	ent]			ןנ	Description]						
				i<45°	\checkmark	5	. , ,			I	Ĺ							Ī
		slope (surface collapse sma		2 or more correspondences clarity	\checkmark		response			judgment								
		piping hole • subsidence • hea en tree • crack • open crack • an		certain•unclarity		Max=5	The countermeas		rk is pocossan									
		neasure)		None		5	The countermeas		in is necessary.	~								
							Though the urgen											
			sum total	49			necessary, regula	r inspe	ections are needed.									
				+5		(A)	The countermeas	ure wo	rk is not necessary.									
								~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	y									





## A016-010

# **Evaluation sheet (landslide)**

Check

 $\checkmark$ 

✓

score

Y Kawamura Evaluator JICA Study Team Organization

[Causes] (A)

[History] (B)

Records of Landslide

		Category	Check	score
	Dhata	clearly indentified	$\checkmark$	
<b>-</b>	Photo interpretation	identified partially or unclearly		Max=30
	interprotation	unclearly identified		30
Topographical factor		large and new cracks, steps and subsidence	$\checkmark$	
	Surface	small and old cracks, steps and subsidence		
	anomalies	slight deformation		Max=30
		no anomalies		30
		fault, fracture zone, shear zone		
	Geological structure	dip slope		Max=18
		undip slope/ no characteristic feature	$\checkmark$	0
		colluvium	✓	
		Gneiss		
		Charnokite		
	Main rock formation of	Quartzite		
Geological conditions	landslide body	Marble		
conditions		Schist		
		Serpentite		Max=18
		Granite		7
		much springs / much seepage		
	Hydrological	little springs /little seepage	$\checkmark$	
	feature	trace of water		Max=10
		no water observed		7
		sum total	74	(A)

Category

obvious

slight

none

slight

none

obvious

Existing record (documents or

patrimony)

Damage on road

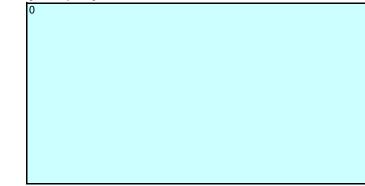
facilities and houses

Countermeasure] (c)	
	Category

	Category		
There is no countermeasure			±0
	not working		±0
Effectiveness of countermeasure	partially working		-20
	completely working		×0
	Score in evaluation from cause	74	(B)

Мс	onitoring	Check	score
There is monitoring for landslide			
Monitoring devices			
Organization			

### [Description]



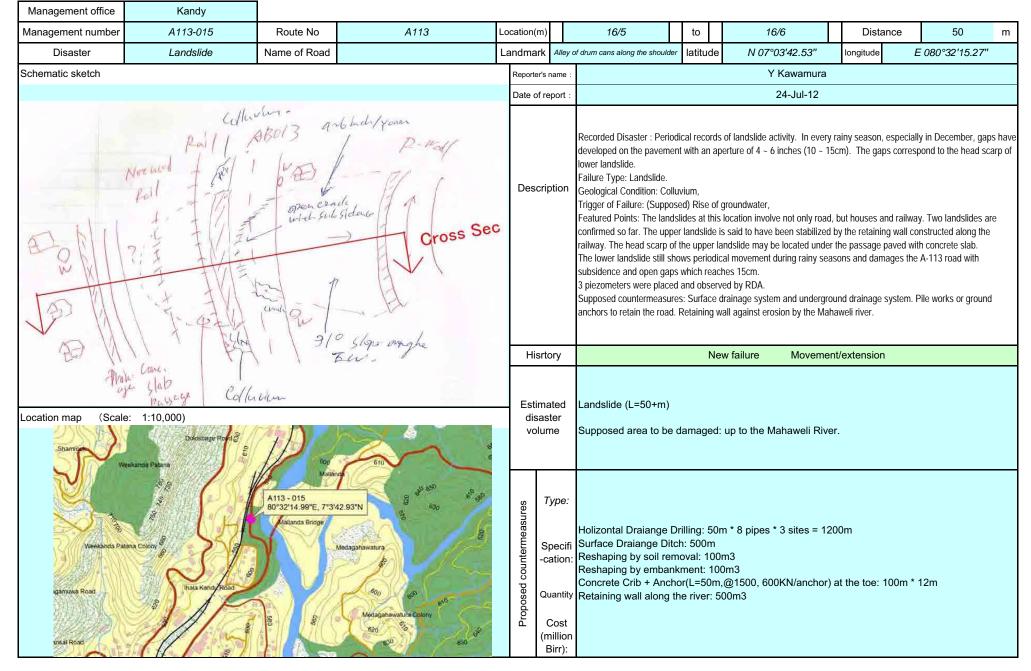
# Appendix 3-2 48

Management Number	A016-010	Photo sheet		Date	July 27, 2012
	Damage on the road at the middle of the landslide	Headscarp along the road shoulder at the ending side	Condition of the road arc side.	und the head so	carp at the ending

Subsidence on the road at the beginning side.

Tension cracks along the shoulder of the road at the beginning side.

Village developed downward of the toe of the landslide The debris is said to turn into mud flow when the landslide is activated, so the supposed affected area of the landslide can reach to the middle of the village, around the church.



## A113-015

# **Evaluation sheet (landslide)**

Y Kawamura Evaluator JICA Study Team Organization

[Causes] (A)

		Category	Check	score
	Dhata	clearly indentified		
	Photo interpretation	identified partially or unclearly	~	Max=30
Tananakiat	interpretation	unclearly identified		15
Topographical factor		large and new cracks, steps and subsidence	~	
lactor	Surface	small and old cracks, steps and subsidence		
	anomalies	slight deformation		Max=30
		no anomalies		30
	0	fault, fracture zone, shear zone	✓	
	Geological structure	dip slope		Max=18
	Structure	undip slope/ no characteristic feature		18
		colluvium	<b>\</b>	
		Gneiss		
		Charnokite		
	Main rock formation of	Quartzite		
Geological conditions	landslide body	Marble		
conditions	· · · · · · · · · · · · · · · · · · ·	Schist		
		Serpentite		Max=18
		Granite		7
		much springs / much seepage		
	Hydrological	little springs /little seepage		
	feature	trace of water	✓	Max=10
		no water observed		5
		sum total	75	(A)

# [Countermeasure] (c) Category There

	Category	Check	score
nere is no countermeasure			±0
	not working		±0
Effectiveness of countermeasure	partially working		-20
	completely working		× 0
	Score in evaluation from cause	75	(B)

Monitoring			score
There is monitoring for landslide			
Monitoring devices			
Organization	RDA		

# [Description]



# Appendix 3-2 51

[History] (B)

		Category	Check	score
	Existing record	obvious	~	
	(documents or patrimony)	slight		
Records of		none		
Landslide	Damage on road facilities and houses	obvious	~	
		slight		
		none		

Management Number	A113-015	Photo sheet		Date	July 24, 2012
Damag of the l	ge on the road at the middle landslide	Piezometer installed at the lower part of the landslide.	Condition of the lower p	art of the landli	sde.

Cracks appeared on the road surface. Cracks seem to follow the shape of a head scarp under the pavement.

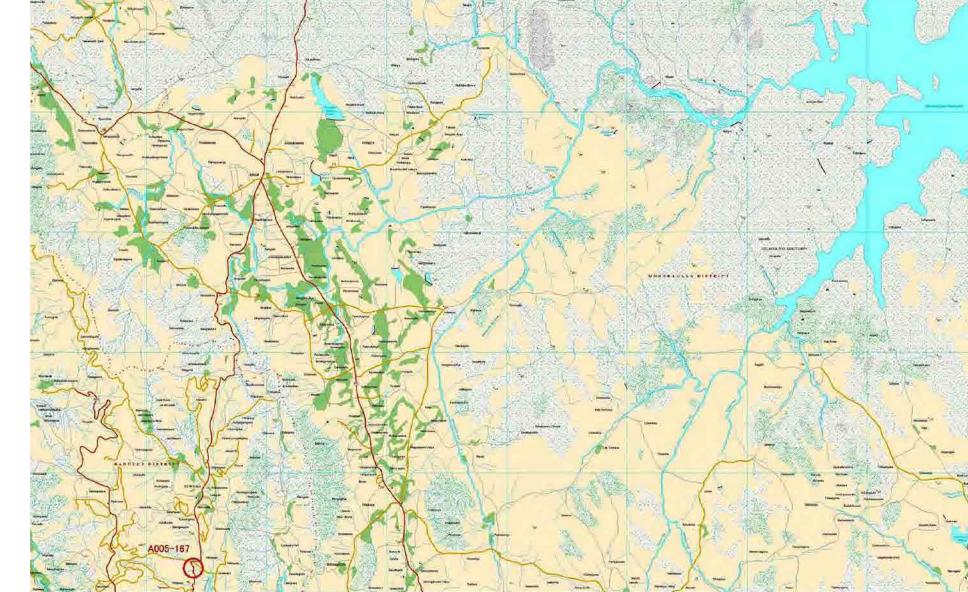
Colluvium is disributed in the site.

Retaining wall along the road. After the construction of this retainig wall, landslide of upper slope was said to be eased.

Appendix 3-3 Maps of prioritized section

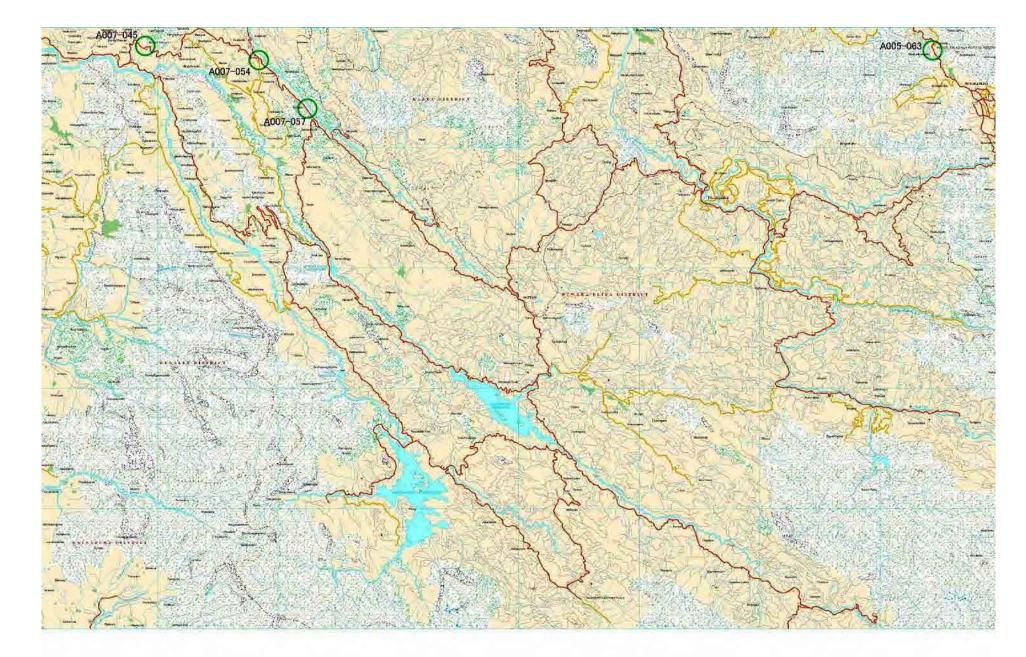
# WWARA PLINA DISTRICT A005-043 A005-044 Due to the improvement of A005 road, some locations of the sites are away from the road depicted on this map.

61 Gampola

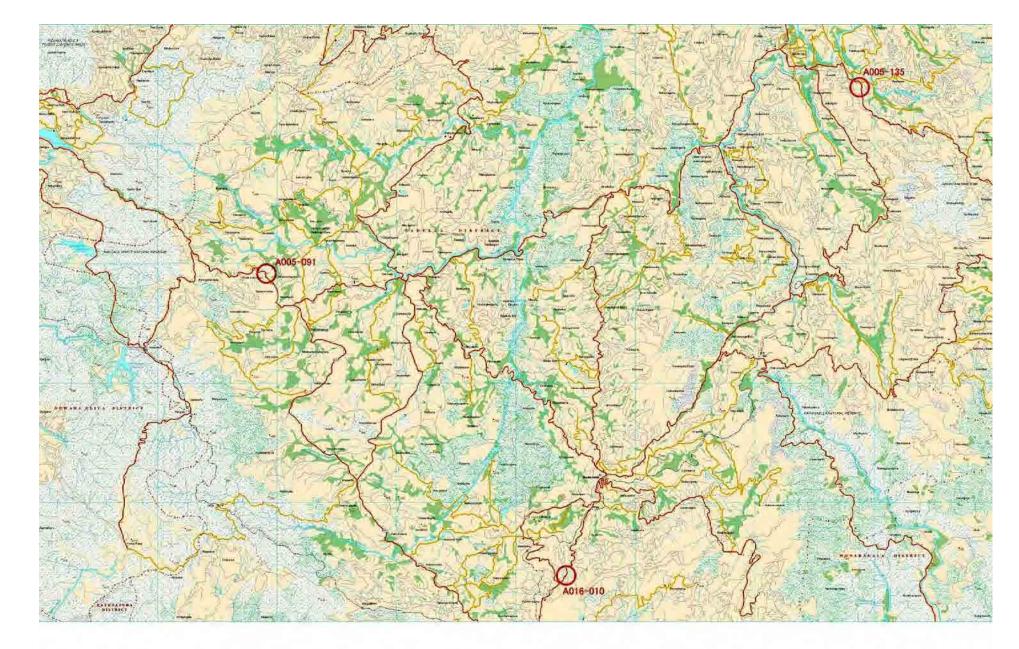


# A007 -03 REGALLE -----

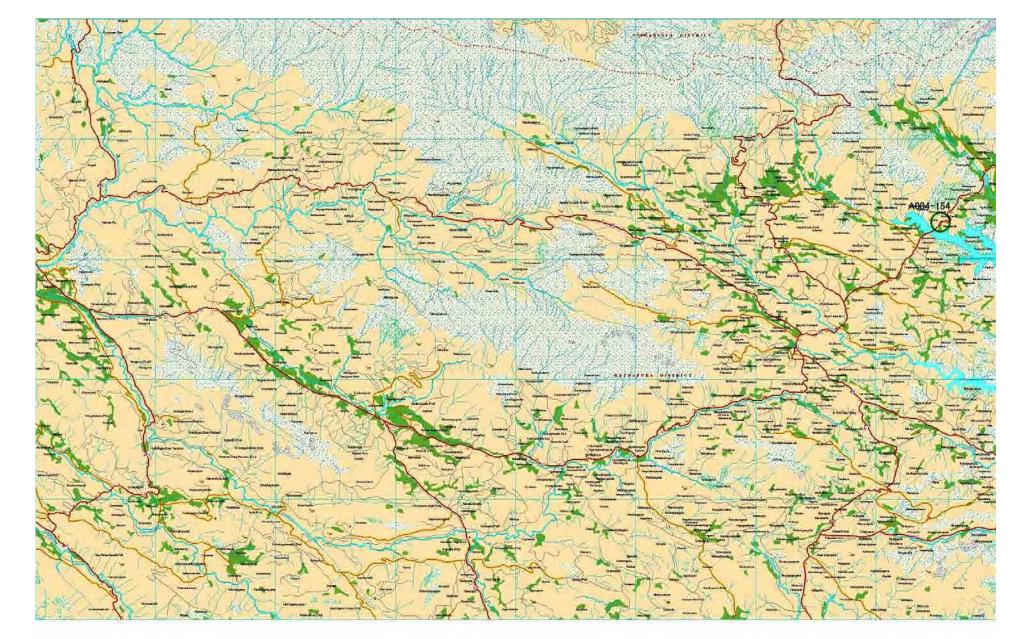
67 Avissawella



68 Nuwara Eliva

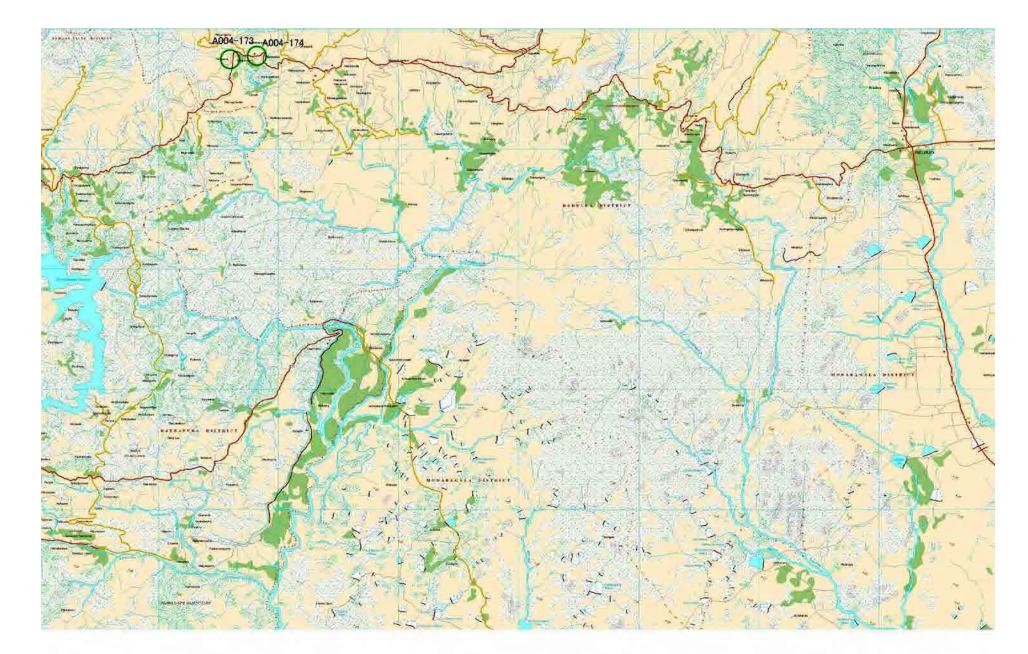


69 Badulla



Appendix 3-3 6

75 Balangoda



76 Haputale

Appendix 3-4 Photo reading and geological map information (Rank A, B, C)

### Photo Reading and Geological Map Information (Rank A, B, C)

					1	Acri	Photo R al Photos	eading and Geological Map Information (Rank A, B, C)		A Justice Man
No	Route No	Disaster Type	Rank	Featuring Points	District	Course	Number	Photo Reading	Number	Gelogical Map Geological Condition
A004-134	A004	Rock Fall	В		Ratnapura	2001-05	162,163	Blocked by clouds. Some phto lineaments were read.	17	Pmgk ^b : Undifferentiated charnockitic biotite gneiss
A004-154	A004	Landslide?	A	Slope Failure in Embankment? Needs to be investigated.	Ratnapura	99-21	62,63	Shape of the landslide is unclear. But several small landslides were read along the valleys around the site. Convergence of photo lineaments was seen around the site.	17	Pmgga: Garnet - sillmanite - biolite gneiss, Pmq: Quartzites. Beside a shear zone and a fault inferred by aerial photos.
A004-162	A004	Debris Flow	A	Debris Flow (L=8km)	Ratnapura	99-21	81,82,83	Sources of the debris flow were read in the mountain slopes located in the north of the site. The site is located at around the apex of the fan where the debris was accumulated.	17	Progga: Garnet - sillmanite - biotite gneiss. Close to a shear zone and an axis of a overturned synform.
A004-173	A004	Slope Failure	в	Adjucent to a high-tension pylon	Badulla	99-21	208,209,210	Convergence of photo lineaments was seen around the site. In the upper mountain slope, a trace of collapse was read.	17	<u>Pmgk:</u> Charnockitic gneiss, <u>Pmq</u> : Quartzites, <u>Pmgk^b</u> : Undifferentiated charnockitic biotite gneiss.
A004-174	A004	Slope Failure	в	2 major slope failures	Badulla	99-21	208,209,210	The site is surrounded by photo lineaments.	17	Pmgk: Charnockilic gneiss, Pmq: Quartzites, Pmgk ^b : Undifferentiated charnockilic biotite gneiss, Pmgga: Garnet - silimanite - biotite gneiss. Close to a probable thrust.
A004-185	A004	Landslide	A	Less Traffic	Badulla	99-21	215,216	Location shall be verified by geographical coordinate. Shape of the landslide is unclear.	17	Pmgk: Charnockilic gneiss, Pmg: Quartzites, Pmgk ² : Undifferentiated charnockilic biotile gneiss, Pmgga: Garnet - sillmanite - biotile gneiss. Close to a probable thrust.
A004-193	A004	Landslide	A	Less Traffic	Badulla	99-21	183,184	Location shall be verified by geographical coordinate. Shape of the landslide is unclear.	17	Pmgk ^b : Undifferentiated charnocktic biolite gneiss, Pmgga: Garnet - sillmanite - biolite gneiss. Convergence of 4 shear zones and faults inferred by aerial photos.
A004-196	A004	Landslide	A	Less Traffic (Not confirmed)	Badulla	99-21	219,220	Location shall be verified by geographical coordinate. Shape of the landslide is unclear.	17	Pingk ⁸ : Undifferentiated charmockitic biotite gneiss, <u>Pingga</u> : Garnet - sillmanite - biotite gneiss. Convergence of 4 shear zones and faults inferred by aerial photos.
A005-042	A005	Landslide	A	Landslide (L=1km)	Nuwara Eliya	99-34	148, 149, 150, 151, 152	Shapes of landslides were unclear. Instad, traces of collapse and deeply erroded gullies were confirmed by photo reading.	14	Pingga: Gamet - sillmanite - biolite gneiss, Pmgl ^k : Undifferentiated charnockitic biolite gneiss, <u>P</u> mg Quartzites. Faults and a shear zone inferred by aerial photos.
A005-043	A005	Rock Fall,	в	Unstable rocks with open cracks	Nuwara Eliya	99-34	148, 149, 150,	Photo lineaments were seen around the site.	14	Pmgga: Garnet - sillmanite - biotite gneiss, Pmgk ^b : Undifferentiated charnockitic biotite
A005-044	A005	Rock Slide Rock Fall,	в	Unstable rocks with open cracks	Nuwara Eliya	99-34	151, 152 148, 149, 150,	Photo lineaments were seen around the site.	14	gneiss, Pmq: Quartzites. Faults and a shear zone inferred by aerial photos. Pmgga: Garnet - sillmanite - biotite gneiss, Pmgk ² ; Undifferentiated charnockilic biotite
A005-046	A005	Rock Slide Rock Fall,	с	Unstable rocks with open cracks	Nuwara Eliya	99-34	151, 152 148, 149, 150,	Very steep slope.	14	gneiss, <u>P</u> mq: Quartzites. Faults and a shear zone inferred by aerial photos. <u>P</u> mgga: Garnet - sillmanite - biolite gneiss, <u>P</u> mqk: Charnocktitic gneiss, <u>P</u> mq: Quartzites.
7.003-040	A005	Rock Slide			Intuinara Eliya	77-34	151, 152	Photo lineaments were seen around the site. Small landslides were read as aligned terrace fields around the sites. Much larger	14	Faults and a shear zone inferred by aerial photos.           Pmgga: Garnet - sillmanite - biotite gneiss, Pmgk: Charnockitic gneiss, Pmgk ^b :
A005-063	A005	Slope Failure	В		Nuwara Eliya	99-35	32,33,34	landslides were read as angles terace reads around the sites, much arger landslides were read in the opposite side of the stream flown along the lower slope.	17	Undifferentiated charnockilic biolite gneiss. Close to a shear zone and a fault inferred by aerial photos.
A005-082	A005	Slope Failure	с	Former 2 sections were merged in to 1 section.	Nuwara Eliya	99-35	153,154,155	The site is surrounded by photo lineaments. The axis of the valley which the site is facing corresponds to one of the bphoto lineaments.	17	Progga: Garnet - sillmanite - biotite gneiss, Prnc: Marble, Close to shear zones inferred by aerial photos.
A005-091	A005	Slope Failure	с		Badulla	99-27	206,207	The site is surrounded by photo lineaments. Lateral displacement over a liniament was confirmed.	17	<u>P</u> mgga: Garnet - sillmanite - biotite gneiss, <u>P</u> mgk: Charnockitic gneiss, <u>P</u> mq: Quartzites. Close to shear zones inferred by aerial photos.
A005-135	A005	Landslide	с	Landslide (L=0.2 ~ 0.3km)	Badulla	99-28	53,54,55	Multiple Landslide, less clearly read, Other landslides were read in the upper slope but unclearly. This leads some possibilities of much larger landslide than currently expected. Divided landslides were seen in the lower slope.	17	Prngk: Charnocklic gneiss, Prng: Quartziles. Beside shear zones inferred by aerial photos.
A005-167	A005	Landslide	с	Landslide (L=0.1 ~ 0.2km) Detour by a bridge can be an option,	Badulla	99-17	35,36	Clearly read landslide. Another landslide was read on the west side but may not affect the road.	15	Pingga: Garnet - sillmanite - biolite gneiss, Pingk ^b : Undifferentiated charnockitic biolite gneiss, Pingk: Charnockitic gneiss, Ping: Quartzites. A shear zone inferred by aerial photos.
A007-031	A007	Slope Failure	в	Eroded by Kelani River.	Kegalle	No Photo			16	Pmgga: Garnet - sillmanite - biotite gneiss, Faults inferred by aerial photos.
A007-042	A007	Landslide?	A	Landslide or Slope Failure	Nuwara Eliya	99-35	04,05,06,07	Shape of a landslide was not read at the site. Several photo lineaments were read around the site. A trace of collapse was confirmed at the upper slope upstream.	17	Progga: Garnet - sillmanite - biolite gneiss, Convergence of shear zones and faults inferred by aerial photos.
A007-045	A007	Rock Fall, Rock Slide	в	Along with Slope Failure	Nuwara Eliya	99-35	04,05,06,07	Several lineaments were read around the site.	17	Pmgga: Garnet - sillmanite - biotite gneiss, Pmgk: Charnockitic gneiss. Close to shear zones and faults inferred by aerial photos.
A007-047	A007	Landslide	A		Nuwara Eliya	99-35	04,05,06,07	Shape of the landslide is unclear. Photo lineaments were seen around the site.	17	Pmgga: Garnet - sillmanite - biotite gneiss, Pmgk ^b : Undifferentiated charnockitic biotite gneiss, Pmg: Ouartzites. Close to a fault inferred by aerial photos.
A007-054	A007	Slope Failure	в		Nuwara Eliya	99-35	09,10	Convergence of photo lineaments was seen around the site.	17	Pmgga: Garnet - sillmanite - biotite gneiss, Pmgk: Charnockitic gneiss. Close to a shear zone and a fault inferred by aerial photos.
A007-057	A007	Slope Failure	в		Nuwara Eliya	99-35	95,96	Blocked by clouds. Steep planer slope. Several photo lineaments were read around the site.	17	Pmgga: Garnet - sillmanite - biolite gneiss, Close to shear zones and a fault inferred by aerial photos.
A007-069	A007	Landslide	А	Old road was moved away by the landslide.	Nuwara Eliya	99-35	195,196	Shape of the landslide is unclear, unable to read. Photo lineaments were seen around the site.	17	Pmgga: Garnet - sillmanite - biotite gneiss, Pmgk: Charnockitic gneiss.
A016-010	A016	Landslide	С	Head scarp approaching to the road shoulder	Badulla	99-22	17,18	Protou incalments were seen audulu une site. Clearly read landslide, located in a rolling slope of colluvium provided by a huge collapse of mountain slope. In the lower slope, several small sized divided landslides were read. Several landslides were read in the upper slope. This leads some possibilities of far much larger landslide than currently expected.	17	Close to shear zones inferred by aerial photos. Pmgga: Garnet - sillmanite - biotite gneiss, Pmgk: Charnockilic gneiss. Convergence of shear zones and faults inferred by aerial photos.
A021-020	A021	Landslide	А	Land owner didn't allow RDA to investigate the site.	Kegalle	07-07	236,237,238	Shape of the landslide is unclear, unable to read. Convergence of photo lineaments was seen around the site.	13	Pmgr: Granite gneiss, Pmgh ^h : Hornblend - biotite gneiss. Surrounded by shear zones inferred by aerial photos and probable thrusts.
A026-027	A026	Rock Fall, Rock Slide	А		Kandy	No Photo			14	<u>P</u> mgga: Garnet - sillmanite - biotite gneiss, <u>P</u> mgk ⁸ : Undifferentiated charnockilic biotite gneiss, <u>Pmc</u> : Marble, <u>Pmq</u> : Quartzites. Faults and a shear zone inferred by aerial photos.
A026-029	A026	Rock Fall, Rock Slide	А		Kandy	No Photo			14	<u>P</u> mgga: Garnet - sillmanite - biotite gneiss, <u>P</u> mgk ^b : Undifferentiated charnockitic biotite gneiss, <u>P</u> mc: Marble, <u>P</u> mq: Quartzites. Faults and a shear zone inferred by aerial photos.
A026-036	A026	Slope Failure	A	Damage occurred during construction. Retaining wall was	Kandy	99-29	53,54	Trace of small collapse of mountain slope was read in the upper slope. Photo lineaments were seen around the site.	14	Pmgga: Garnet - sillmanite - biotite gneiss, Pmgk: Charnockitic gneiss.
A026-045	A026	Slope Failure	A	constructed.	Kandy	99-32	65,66,67	Photo lineaments were seen around the site.	14	Prngga: Garnet - sillmanite - biotite gneiss, <u>Prngk^b:</u> Undifferentiated charnockitic biotite gneiss. Faults inferred by aerial photos.
A026-048	A026	Slope Failure	A		Kandy	99-32	65,66,67	Terraced rice fields are on the upper slope where colluvium is supposed. Photo lineaments were seen around the site.	14	Pmgk ^b : Undifferentiated charnockitic biotite gneiss.
A026-049	A026	Slope Failure	A		Kandy	99-32	65,66,67	Trace of collapse of mountain slope was read in the upper slope. Photo lineaments were seen around the site.	14	Faults inferred by aerial photos.  Pmgk ^b : Undifferentiated charnockitic biotite gneiss. Faults inferred by aerial photos.
A026-051	A026	Slope Failure	A	Damage occurred during construction. Retaining wall was	Kandy	99-32	65,66,67	Photo lineaments were seen around the site. Trace of collapse of mountain slope was read in the upper slope. Photo lineaments were seen around the site.	14	Pmgk ^b : Undifferentiated charnockitic biotite gneiss.
A026-055	A026	Rock Fall, Rock Slide	A	constructed.	Kandy	99-32	47,48,49	Very steep planner slope.	14	Faults inferred by aerial photos.  Pmgk: Chamockilic gneiss.  Shore range inferred by agrial photos
A026-056	A026	Rock Slide Slope Failure	A		Kandy	99-32	47,48,49	A couple of photo lineaments were seen around the site. Very steep planner slope.		Shear zones inferred by aerial photos. <u>Prngk: Charnocklic gneiss, Prngga: Garnet - sillmanite - biotite gneiss, Prng: Quartzites.</u>
A026-058	A026	Slope Failure	A	<u> </u>	Kandy	99-32	47,48,49	A couple of photo lineaments were seen around the site. Very steep planner slope. Trace of small collapse was read less clearly in the upper	14	Shear zones inferred by aerial photos. <u>P</u> mgga: Garnet - sillmanite - biotite gneiss, <u>P</u> mq: Quartzites, <u>P</u> mghb: Hornblend - biotite
	A026	Rock Fall,		Damage occurred during construction. Retaining wall was		99-32		slope. A couple of photo lineaments were seen around the site. Very steep planner slope.	14	gneiss. Shear zones inferred by aerial photos. <u>P</u> mgga: Garnet - sillmanite - biotite gneiss, <u>P</u> mq: Quartzites, <u>P</u> mghb: Hornblend - biotite
A026-060		Rock Slide	A	construction. Retaining wall was constructed.	Kandy		47,48,49	A couple of photo lineaments were seen around the site. Shape of a landslide was not read at the site.		gneiss. Shear zones inferred by aerial photos.  Pmq: Quartzites.
A113-010	A113	Landslide	A		Kandy	99-10	161,162	Trace of collapse of mountain slope was read in the upper slope.	14	Close to a probable thrust and an axis of antiform
A113-015	A113	Landslide	С	Involving road and residence.	Kandy	99-34	135,136	Less clearly read landslide, located in a colluvium slope formed by a collapse of upper mountain slope. In the axis of the ridge of upper mountain, 2 cols were clearly read.	14	<u>Pmghb + Pmgbh: Hornblend - biolite gneiss + Biolite hornblende gneiss.</u> Beside a shear zone inferred by aerial photos.



Appendix 4 List of collected materials

No.	date	Material name	Collected from	Format
1	20120618	Statistical Pocket Book - 2010	Department of Census & Statistics	Printed book
2	20120618	Sri Lanka Labour Force Survey AnnualReport -2010	Department of Census & Statistics	Printed book
3	20120618	Statistics on Vital Events2000-2010	Department of Census & Statistics	Printed book
4	20120618	Household Income and Expenditure Survey -2009/10	Department of Census & Statistics	Printed book
5	20120618	Road Atlas of Sri Lanka	Vijithayapa Bookshop	Printed book
6	20120618	Vijithayapa School Atlas	Vijithayapa Publications	Printed book
7	20120618	Sarasavi School Atlas	Sarasavi Publishers	Printed book
8		ADT Central,Sabragamuwa Provinces.pdf		
9		MCC Cen Sab Uva Wst	7	
10	20120620	Map: ADT Locations.jpg	Planning Division, RDA	DVD
11 12		Maps: Landslides in Badulla, Kandy, Matalre, Nuwara Eliya and Ratnapura Road Sections Affected by Landslides	-	
12	20120620	Hard copy of the maps of No.1 and No.8	Planning Division, RDA	Paper document
13		Guidelinses for Construction in Landslide Prone Areas, March 2003	NBRO	Paper document
15		Guidelinses for Construction in Landslide Prone Areas, 2009	NBRO	Paper document
16		VOC Data 2010	Planning Division, RDA	DVD
17		Wave of traffic volume( montyly and by day of the week)	Planning Division, RDA	Electronic file
18		20120704Traffic Growth Rate Calculation - 20071130	Planning Division, RDA	Electronic file
19		Hazard Map S=1:50,000	NBRO	JPG
20		Topographic Map S=1:50,000	Survey Department	Paper document
21		Topographic Map S=1:50,000	Survey Department	CD/JPG
22		Topographic Maps, S=1:10,000	Survey Department	CD (GIS)
23		Geological Map, Soil Map, Watershed Map	Survey Department	Paper document
24		Topographic Map S=1:250,000	Survey Department	Paper document
25		Geological Map of Sri Lanka	Geological Survey & Mines Bureau	Paper document
26		Metamorphic Map of Sri Lanka	GSMB	Paper document
27		Structual Map of Sri Lanka	GSMB	Paper document
28		Geological Map S=1:10,000	GSMB	Paper document
29		Geological Map of Central and Western Sri Lanka	GSMB	Paper document
30		Aerial Photo (62Pics)	Survey Department	Contact print
31		Aerial Photo (62Pics)	Survey Department	CD/TIFF
32	20120720	Index Map of Aerial Photos	Survey Department	Paper document
33	20120720	Geological Map S=1:10,000	GSMB	CD/TIFF
34	20120808	Project Proposal for Integrated Landslide Mitigation Project Phase 1 (Badulla, Kandy, Matale and Nuwara Eliya)	NBRO	PDF

No.	date	Material name	Collected from	Format
35		Structual Map of Sri Lanka	GSMB	CD/TIFF
36	20120809	Geological Map of Central and Western Sri Lanka	GSMB	CD/TIFF
37		Aerial Photo (12Pics)	Survey Department	Contact print
38	20120815	Aerial Photo (12Pics)	Survey Department	CD/TIFF
39		Met Data for 12 Met Stations	Department of Meteorology	Excel file
40	20120816	Earthquake Records	GSMB and other authorities	Excel file
41	20120816	National Atral of Sri Lanka	Survey Department	Paper document
42	20120914	Projects Summary, Emanating from National Physical Plan 2011-2030	National Physical Planning Department, Ministry of Construction, Engineering Services, Housing and Common Amenities	Printed book
43	20120914	National Physical Plannning Policy & Plan	National Physical Planning Department, Ministry of Construction, Engineering Services, Housing and	Printed book
44	20120918	National Road Master Plan Summary	RDA	Printed book
45	20120918	National Road Master Plan 2008-2012 Executive Summary	RDA	Printed book
46	20120918	National Road Master Plan 2008-2017 Investment Plan	RDA	Printed book
47		20120918 RDC SocioEconomic Data	Various sources	CD
48	20120926	20120926 RDC SE Data	Various sources	Electronic file
49		20120927 RDC SE Data	Various sources	Electronic file
50		Boundary maps of Sri Lanka - District and Division	Various sources	CD
51		Tourist Guide Map of Matale District	Various sources	Printed book
52		Tourist Guide Map of Nuwara Eliya District	Various sources	Printed book
53		Annual Report-2011	NBRO	Printed book
54		Road Maintenance Manual-1989	RDA	Printed book
55	20121005	Annual Report 2010	RDA	Printed book