Appendix-1

Inventory Sheet Forms

Integration Table of Risk Management for Road Slope Disasters (1/4)

(RCD: Road Closure Disaster, FRCDa: Actual Frequency of RCD, FRCDp: Potential Frequency of RCD, FRCDpwc: Potential Frequency of RCD with countermeasure)

Survey ID	Preliminary inventory survey																	
	Sheet 1														Sheet 2			
	Region Name	Engineering District	Road ID	Road Name	Road Section ID	Road Classification	Side of Survey	Station				Survey Length (m)	Disaster Type	FRCDa (nos. /year)	Disturbance Situation	FRCDp (nos. /year)	Necessity of detailed inventory survey
							Right side of road/ Left side of road	Start (km)	Start (m)	End (km)	End (m)						

Integration Table of Risk Management for Road Slope Disasters (2/4)

(RCD: Road Closure Disaster, FRCDa: Actual Frequency of RCD, FRCDp: Potential Frequency of RCD, FRCDpwc: Potential Frequency of RCD with countermeasure)

Survey ID	Detailed inventory survey													
	Sheet 5 (1)													
	Potential Disaster Magnitude		No. of predicted closure days of the whole width of the road on the survey site per RCD (days)	AADT Annual Average Daily Traffic on the survey site (vehicles/day)	Potential annual loss				Countermeasure alternative I					
	Accumulation volume on the road per RCD (m^3)	LRC: Length of Road Closure Site (m)			Annual reopening cost per RCD (pesos/year)	Annual value of human life lost (pesos/year)	Annual detour cost (pesos/year)	Total (pesos/year)	Cost of countermeasure with 20 years maintenance (pesos)	Risk reduction ratio in RCD due to countermeasure (ratio)	Decrease in annual loss due to countermeasure (pesos)	BCR : Benefit/Cost Ratio at 15% discount rate (ratio)	ENPV : Economic Net Present Value at 15% discount rate (pesos)	EIRR: Economic Internal Rate of Return (%)

Integration Table of Risk Management for Road Slope Disasters (3/4)

(RCD: Road Closure Disaster, FRCDa: Actual Frequency of RCD, FRCDp: Potential Frequency of RCD, FRCDpwc: Potential Frequency of RCD with countermeasure)

Survey ID	Detailed Inventory Survey												
	Sheet 5												
	Countermeasure alternative II							Countermeasure alternative III					
	Cost of countermeasure with 20 years maintenance (pesos)	Risk reduction ratio in RCD due to countermeasure (ratio)	Decrease in annual loss due to countermeasure (pesos)	FRCDpwc: FRCDp with countermeasure (years)	BCR: Benefit/Cost Ratio at 15% discount rate (ratio)	ENPV: Economic Net Present Value at 15% discount rate (pesos)	EIRR: Economic Internal Rate of Return (%)	Cost of countermeasure with 20 years maintenance (pesos)	Risk reduction ratio in RCD due to countermeasure (ratio)	Decrease in annual loss due to countermeasure (pesos)	BCR: Benefit/Cost Ratio at 15% discount rate (ratio)	ENPV: Economic Net Present Value at 15% discount rate (pesos)	EIRR: Economic Internal Rate of Return (%)

Integration Table of Risk Management for Road Slope Disasters (3/4)

Survey ID	Countermeasure progress management				
	Selected countermeasure plan	Budget (pesos)	Proposed implementation year	Situation of countermeasure implementation, planned, ongoing, completed	FRCDpwc: FRCDp with selected countermeasure plan (pesos/year)

Inventory Sheet 1 General Information

Region	1					Responsible DEO					
Road name	3					Road Section ID					
Station	from	km		m	until	km		m	Length of survey site	m	
Side of survey	Left side of road										
Disaster type	SC: Soil Slope Collapse										
Name of surveyor for preliminary inventory survey, sheet 1, 2					Survey date				Date	Month	Year
Name of surveyor											

Photographs

General View

Portion to which attention should be paid

Note

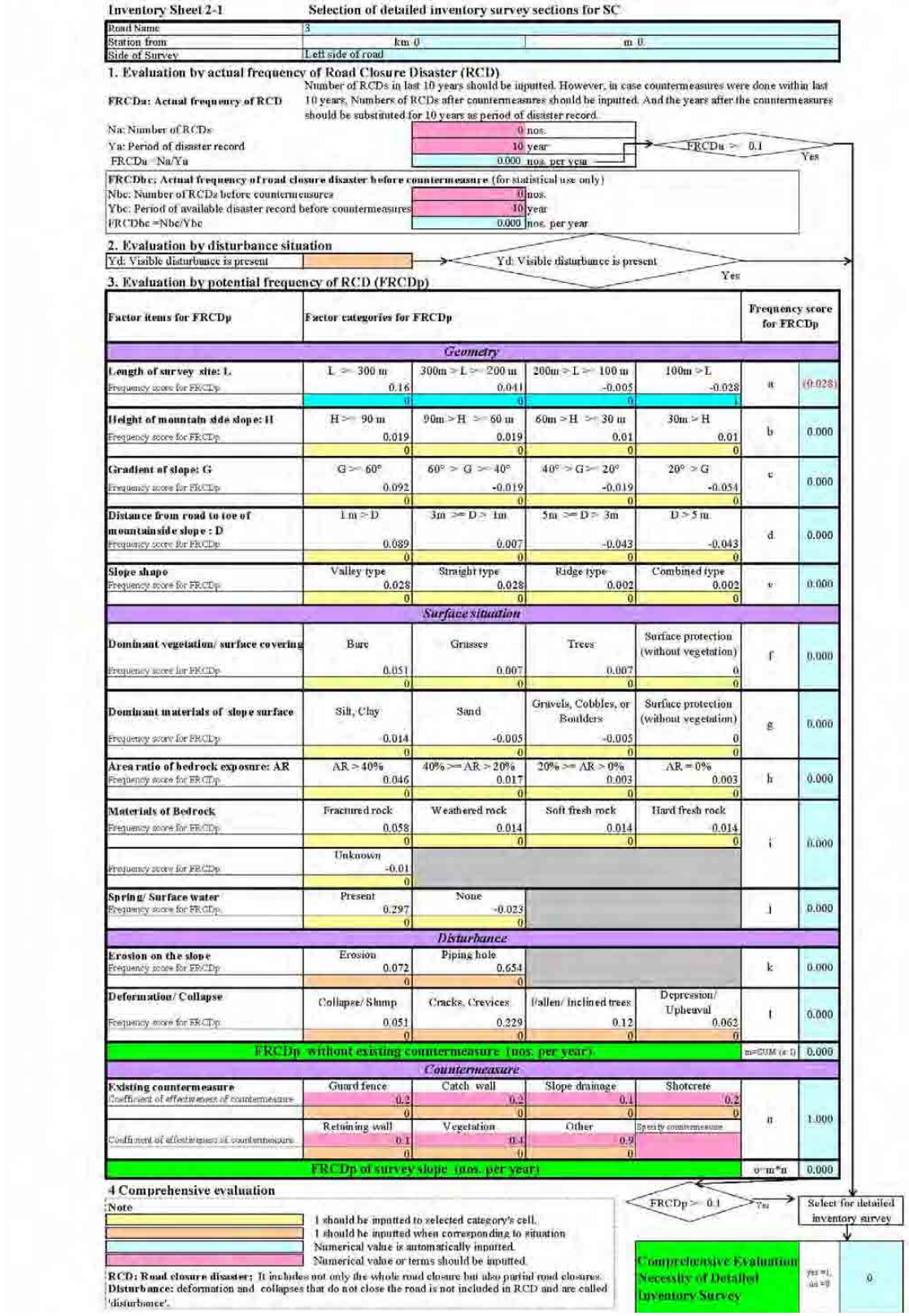
Numerical value or terms should be inputted.

Numerical value is automatically inputted.

Checking and approval of sheet-1 to sheet-5

Checked by _____ Approved by _____

1



Inventory Sheet 2-1 **Selection of detailed inventory survey sections for SC**

Road Name	3	
Station from	km 0	m 0
Side of Survey	Left side of road	

1. Evaluation by actual frequency of Road Closure Disaster (RCD)

FRCDa: Actual frequency of RCD — Number of RCDs in last 10 years should be inputted. However, in case countermeasures were done within last 10 years, Numbers of RCDs after countermeasures should be inputted. And the years after the countermeasures should be substituted for 10 years as period of disaster record.

Na: Number of RCDs	0	nos.
Ya: Period of disaster record	10	year
FRCDa =Na/Ya	0.000	nos. per year

FRCDa >= 0.1 ? Yes

FRCDbc: Actual frequency of road closure disaster before countermeasure (for statistical use only)

Nbc: Number of RCDs before countermeasure	0	nos.
Ybc: Period of available disaster record before countermeasures	10	year
FRCDbc =Nbc/Ybc	0.000	nos. per year

2. Evaluation by disturbance situation

Yd: Visible disturbance is present — Yd: Visible disturbance is present ? Yes

3. Evaluation by potential frequency of RCD (FRCDp)

Factor items for FRCDp	Factor categories for FRCDp					Frequency score for FRCDp
Geometry						
Length of survey site: L	L >= 300 m	300m > L >= 200 m	200m > L >= 100 m	100m > L	a	(0.028)
Frequency score for FRCDp	0.16	0.041	-0.005	-0.028		
	0	0	0	1		
Height of mountain side slope: H	H >= 90 m	90m > H >= 60 m	60m > H >= 30 m	30m > H	b	0.000
Frequency score for FRCDp	0.019	0.019	0.01	0.01		
	0	0	0	0		
Gradient of slope: G	G >= 60°	60° > G >= 40°	40° > G >= 20°	20° > G	c	0.000
Frequency score for FRCDp	0.092	-0.019	-0.019	-0.054		
	0	0	0	0		
Distance from road to toe of mountainside slope : D	1 m > D	3m >= D > 1m	5m >= D > 3m	D > 5 m	d	0.000
Frequency score for FRCDp	0.089	0.007	-0.043	-0.043		
	0	0	0	0		
Slope shape	Valley type	Straight type	Ridge type	Combined type	e	0.000
Frequency score for FRCDp	0.028	0.028	0.002	0.002		
	0	0	0	0		
Surface situation						
Dominant vegetation/ surface covering	Bare	Grasses	Trees	Surface protection (without vegetation)	f	0.000
Frequency score for FRCDp	0.051	0.007	0.007	0		
	0	0	0	0		
Dominant materials of slope surface	Silt, Clay	Sand	Gravels, Cobbles, or Boulders	Surface protection (without vegetation)	g	0.000
Frequency score for FRCDp	0.014	-0.005	-0.005	0		
	0	0	0	0		
Area ratio of bedrock exposure: AR	AR > 40%	40% >= AR > 20%	20% >= AR > 0%	AR = 0%	h	0.000
Frequency score for FRCDp	0.046	0.017	0.003	0.003		
	0	0	0	0		
Materials of Bedrock	Fractured rock	Weathered rock	Soft fresh rock	Hard fresh rock	i	0.000
Frequency score for FRCDp	0.058	0.014	0.014	0.014		
	0	0	0	0		
Frequency score for FRCDp	Unknown -0.01					
	0					
Spring/ Surface water	Present	None			j	0.000
Frequency score for FRCDp	0.297	-0.023				
	0	0				
Disturbance						
Erosion on the slope	Erosion	Piping hole			k	0.000
Frequency score for FRCDp	0.072	0.654				
	0	0				
Deformation/ Collapse	Collapse/ Slump	Cracks, Crevices	Fallen/ Inclined trees	Depression/ Upheaval	l	0.000
Frequency score for FRCDp	0.051	0.229	0.12	0.062		
	0	0	0	0		
FRCDp without existing countermeasure (nos. per year)					m=SUM (e:l)	0.000
Countermeasure						
Existing countermeasure	Guard fence	Catch wall	Slope drainage	Shotcrete	n	1.000
Coefficient of effectiveness of countermeasure	0.2	0.2	0.1	0.2		
	0	0	0	0		
	Retaining wall	Vegetation	Other	Specify countermeasure		
Coefficient of effectiveness of countermeasure	0.1	0.4	0.9			
	0	0	0			
FRCDp of survey slope (nos. per year)					o=m*n	0.000

4 Comprehensive evaluation

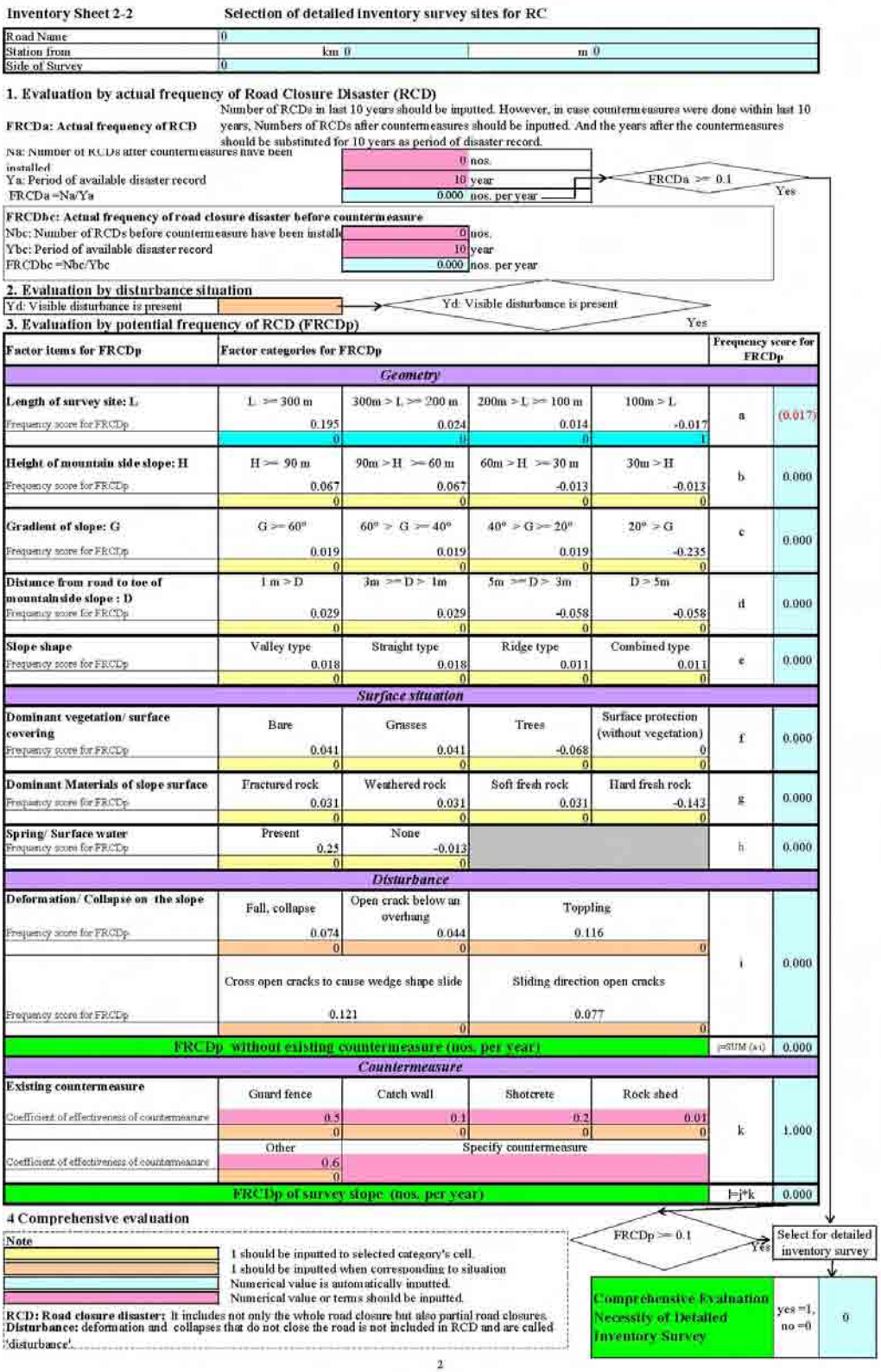
FRCDp >= 0.1 ? Yes → Select for detailed inventory survey

Note

- 1 should be inputted to selected category's cell.
- 1 should be inputted when corresponding to situation
- Numerical value is automatically inputted.
- Numerical value or terms should be inputted.

RCD: Road closure disaster; It includes not only the whole road closure but also partial road closures.
Disturbance: deformation and collapses that do not close the road is not included in RCD and are called 'disturbance'.

Comprehensive Evaluation Necessity of Detailed Inventory Survey	yes =1, no =0	0



Inventory Sheet 2-2 **Selection of detailed inventory survey sites for RC**

Road Name	0	
Station from	km 0	m 0
Side of Survey	0	

1. Evaluation by actual frequency of Road Closure Disaster (RCD)

FRCDa: Actual frequency of RCD Number of RCDs in last 10 years should be inputted. However, in case countermeasures were done within last 10 years, Numbers of RCDs after countermeasures should be inputted. And the years after the countermeasures should be substituted for 10 years as period of disaster record.

Na: Number of RCDs after countermeasures have been installed	0	nos.
Ya: Period of available disaster record	10	year
FRCDa =Na/Ya	0.000	nos. per year

FRCDa >= 0.1 → Yes

FRCDbc: Actual frequency of road closure disaster before countermeasure

Nbc: Number of RCDs before countermeasure have been install	0	nos.
Ybc: Period of available disaster record	10	year
FRCDbc =Nbc/Ybc	0.000	nos. per year

2. Evaluation by disturbance situation

Yd: Visible disturbance is present → Yd: Visible disturbance is present → Yes

3. Evaluation by potential frequency of RCD (FRCDp)

Factor items for FRCDp	Factor categories for FRCDp					Frequency score for FRCDp
Geometry						
Length of survey site: L	L >= 300 m	300m > L >= 200 m	200m > L >= 100 m	100m > L	a	(0.017)
Frequency score for FRCDp	0.195	0.024	0.014	-0.017		
	0	0	0	1		
Height of mountain side slope: H	H >= 90 m	90m > H >= 60 m	60m > H >= 30 m	30m > H	b	0.000
Frequency score for FRCDp	0.067	0.067	-0.013	-0.013		
	0	0	0	0		
Gradient of slope: G	G >= 60°	60° > G >= 40°	40° > G >= 20°	20° > G	c	0.000
Frequency score for FRCDp	0.019	0.019	0.019	-0.235		
	0	0	0	0		
Distance from road to toe of mountainside slope : D	1 m > D	3m >= D > 1m	5m >= D > 3m	D > 5m	d	0.000
Frequency score for FRCDp	0.029	0.029	-0.058	-0.058		
	0	0	0	0		
Slope shape	Valley type	Straight type	Ridge type	Combined type	e	0.000
Frequency score for FRCDp	0.018	0.018	0.011	0.011		
	0	0	0	0		
Surface situation						
Dominant vegetation/ surface covering	Bare	Grasses	Trees	Surface protection (without vegetation)	f	0.000
Frequency score for FRCDp	0.041	0.041	-0.068	0		
	0	0	0	0		
Dominant Materials of slope surface	Fractured rock	Weathered rock	Soft fresh rock	Hard fresh rock	g	0.000
Frequency score for FRCDp	0.031	0.031	0.031	-0.143		
	0	0	0	0		
Spring/ Surface water	Present	None			h	0.000
Frequency score for FRCDp	0.25	-0.013				
	0	0				
Disturbance						
Deformation/ Collapse on the slope	Fall, collapse	Open crack below an overhang	Toppling		i	0.000
Frequency score for FRCDp	0.074	0.044	0.116			
	0	0	0			
	Cross open cracks to cause wedge shape slide		Sliding direction open cracks			
Frequency score for FRCDp	0.121		0.077			
	0		0			
FRCDp without existing countermeasure (nos. per year)					j=SUM (a:i)	0.000
Countermeasure						
Existing countermeasure	Guard fence	Catch wall	Shotcrete	Rock shed	k	1.000
Coefficient of effectiveness of countermeasure	0.5	0.1	0.2	0.01		
	0	0	0	0		
	Other	Specify countermeasure				
Coefficient of effectiveness of countermeasure	0.6					
	0					
FRCDp of survey slope (nos. per year)					l=j*k	0.000

4 Comprehensive evaluation

FRCDp >= 0.1 → Yes → Select for detailed inventory survey

Comprehensive Evaluation Necessity of Detailed Inventory Survey	yes =1, no =0	0

Note

- 1 should be inputted to selected category's cell.
- 1 should be inputted when corresponding to situation
- Numerical value is automatically inputted.
- Numerical value or terms should be inputted.

RCD: Road closure disaster; It includes not only the whole road closure but also partial road closures.
Disturbance: deformation and collapses that do not close the road is not included in RCD and are called 'disturbance'.

2

Inventory Sheet 2-3 **Selection of detailed inventory survey sites for LS**

Road Name	0	
Station from	km 0	m 0
Side of Survey	Right side of road	

1. Evaluation by actual frequency of Road Closure Disaster (RCD)

FRCDa: Actual frequency of RCD Number of RCDs in last 10 years should be inputted. However, in case countermeasures were done within last 10 years, Numbers of RCDs after countermeasures should be inputted. And the years after the countermeasures should be substituted for 10 years as period of disaster record.

Na: Number of RCDs after countermeasures have been installed	0 nos.
Ya: Period of available disaster record	10 year
FRCDa =Na/Ya	0.000 nos. per year

FRCDa >= 0.1 → Yes

FRCDbc: Actual frequency of RCD before countermeasure	
Nbc: Number of RCDs before countermeasure	0 nos.
Ybc: Period of available disaster record	10 year
FRCDbc =Nbc/Ybc	0.000 nos. per year

2. Evaluation by disturbance situation

Yd: Visible disturbance is present → Yd: Visible disturbance is present → Yes

3. Evaluation by potential frequency of road closure disaster (FRCDp)

Factor items for FRCDp	Factor categories for FRCDp				Frequency Score for FRCDp	
Geometry						
Length of survey site: L	L >= 300 m	300m > L >= 200 m	200m > L >= 100 m	100m > L	a	0.010
Frequency score for FRCDp	0.04	0.03	0.02	0.01		
	0	0	0	1		
Gradient of slope: G	G >= 60°	60° > G >= 40°	40° > G >= 20°	20° > G	b	0.000
Frequency score for FRCDp	0.04	0.01	0.005	0.001		
	0	0	0	0		
Slope shape	Valley type	Straight type	Ridge type	Combined type	c	0.000
Frequency score for FRCDp	0.05	0.02	0.01	0.01		
	0	0	0	0		
Surface situation						
Dominant vegetation/ surface covering	Bare	Grasses	Trees	Surface protection (without vegetation)	d	0.000
Frequency score for FRCDp	0.02	0.01	0.005	0.001		
	0	0	0	0		
Dominant materials of slope surface	Silt, Clay	Sand	Gravels, Cobbles, or Boulders	Surface protection (without vegetation)	e	0.000
Frequency score for FRCDp	0.02	0.01	0.005	0.001		
	0	0	0	0		
	Fractured rock	Weathered rock	Soft fresh rock	Hard fresh rock		
Frequency score for FRCDp	0.01	0.01	0.01	0.001		
	0	0	0	0		
Spring/ Surface water	Present	None			f	0.000
Frequency score for FRCDp	0.06	0.001				
	0	0				
Disturbance						
Erosion on the slope	Erosion	Piping hole			g	0.000
Frequency score for FRCDp	0.03	0.02				
	0	0				
Deformation/ Collapse	Collapse/ Slump	Cracks, Crevices	Fallen/ Inclined trees	Depression/ Upheaval	h	0.000
Frequency score for FRCDp	0.06	0.06	0.05	0.05		
	0	0	0	0		
FRCDp without existing countermeasure (nos. per year)					i=SUM (a:h)	0.010
Countermeasure						
Existing countermeasure	Slope/Road drainage	Dewatering method	Cutwork of landslide head	Embankment of landslide toe		
Coefficient of effectiveness of countermeasure	0.2	0.2	0.05	0.05		
	0	0	0	0	j	1.000
	Catch wall	Other	Specify countermeasure			
Coefficient of effectiveness of countermeasure	0.5	0.3				
	0	0				
FRCDp of survey slope (nos. per year)					k =i*j	0.010

4 Comprehensive evaluation

FRCDp >= 0.1 → YES → Select for detailed inventory

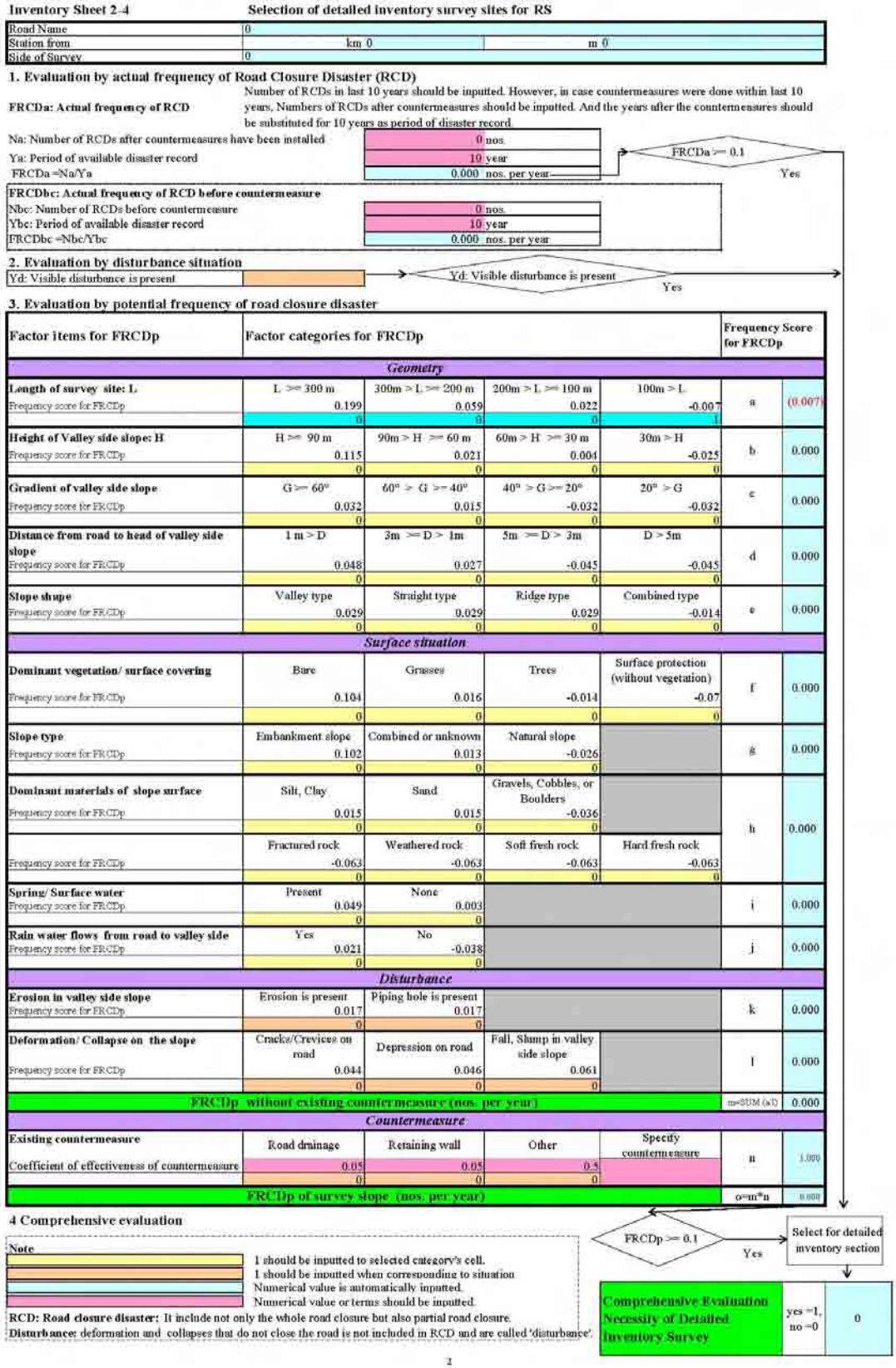
Comprehensive Evaluation Necessity of Detailed Inventory Survey	yes =1, no =0	0

Note

- 1 should be inputted to selected category's cell.
- 1 should be inputted when corresponding to situation
- Numerical value is automatically inputted.
- Numerical value or terms should be inputted.

RCD: Road closure disaster; It includes not only the whole road closure but also partial road closures
Disturbance; deformation and collapses that do not close the road is not included in RCD and are called 'disturbance'.

2



Inventory Sheet 2-4 **Selection of detailed inventory survey sites for RS**

Road Name	0	
Station from	km 0	m 0
Side of Survey	0	

1. Evaluation by actual frequency of Road Closure Disaster (RCD)

FRCDa: Actual frequency of RCD Number of RCDs in last 10 years should be inputted. However, in case countermeasures were done within last 10 years, Numbers of RCDs after countermeasures should be inputted. And the years after the countermeasures should be substituted for 10 years as period of disaster record.

Na: Number of RCDs after countermeasures have been installed	0	nos.
Ya: Period of available disaster record	10	year
FRCDa =Na/Ya	0.000	nos. per year

FRCDa >= 0.1 → Yes

FRCDbc: Actual frequency of RCD before countermeasure

Nbc: Number of RCDs before countermeasure	0	nos.
Ybc: Period of available disaster record	10	year
FRCDbc =Nbc/Ybc	0.000	nos. per year

2. Evaluation by disturbance situation

Yd: Visible disturbance is present

Yd: Visible disturbance is present → Yes

3. Evaluation by potential frequency of road closure disaster

Factor items for FRCDp	Factor categories for FRCDp					
					Frequency Score for FRCDp	
Geometry						
Length of survey site: L	L >= 300 m	300m > L >= 200 m	200m > L >= 100 m	100m > L	a	(0.007)
Frequency score for FRCDp	0.199	0.059	0.022	-0.007		
	0	0	0	1		
Height of Valley side slope: H	H >= 90 m	90m > H >= 60 m	60m > H >= 30 m	30m > H	b	0.000
Frequency score for FRCDp	0.115	0.021	0.004	-0.025		
	0	0	0	0		
Gradient of valley side slope	G >= 60°	60° > G >= 40°	40° > G >= 20°	20° > G	c	0.000
Frequency score for FRCDp	0.032	0.015	-0.032	-0.032		
	0	0	0	0		
Distance from road to head of valley side slope	1 m > D	3m >= D > 1m	5m >= D > 3m	D > 5m	d	0.000
Frequency score for FRCDp	0.048	0.027	-0.045	-0.045		
	0	0	0	0		
Slope shape	Valley type	Straight type	Ridge type	Combined type	e	0.000
Frequency score for FRCDp	0.029	0.029	0.029	-0.014		
	0	0	0	0		
Surface situation						
Dominant vegetation/ surface covering	Bare	Grasses	Trees	Surface protection (without vegetation)	f	0.000
Frequency score for FRCDp	0.104	0.016	-0.014	-0.07		
	0	0	0	0		
Slope type	Embankment slope	Combined or unknown	Natural slope		g	0.000
Frequency score for FRCDp	0.102	0.013	-0.026			
	0	0	0			
Dominant materials of slope surface	Silt, Clay	Sand	Gravels, Cobbles, or Boulders		h	0.000
Frequency score for FRCDp	0.015	0.015	-0.036			
	0	0	0			
	Fractured rock	Weathered rock	Soft fresh rock	Hard fresh rock		
Frequency score for FRCDp	-0.063	-0.063	-0.063	-0.063		
	0	0	0	0		
Spring/ Surface water	Present	None			i	0.000
Frequency score for FRCDp	0.049	0.003				
	0	0				
Rain water flows from road to valley side	Yes	No			j	0.000
Frequency score for FRCDp	0.021	-0.038				
	0	0				
Disturbance						
Erosion in valley side slope	Erosion is present	Piping hole is present			k	0.000
Frequency score for FRCDp	0.017	0.017				
	0	0				
Deformation/ Collapse on the slope	Cracks/Crevices on road	Depression on road	Fall, Slump in valley side slope		l	0.000
Frequency score for FRCDp	0.044	0.046	0.061			
	0	0	0			
FRCDp without existing countermeasure (nos. per year)					m=SUM (a:l)	0.000
Countermeasure						
Existing countermeasure	Road drainage	Retaining wall	Other	Specify countermeasure	n	1.000
Coefficient of effectiveness of countermeasure	0.05	0.05	0.5			
	0	0	0			
FRCDp of survey slope (nos. per year)					o=m*n	0.000

4 Comprehensive evaluation

FRCDp >= 0.1 → Yes → Select for detailed inventory section

Comprehensive Evaluation Necessity of Detailed Inventory Survey	yes =1, no =0	0

Note

- 1 should be inputted to selected category's cell.
- 1 should be inputted when corresponding to situation
- Numerical value is automatically inputted.
- Numerical value or terms should be inputted.

RCD: Road closure disaster: It include not only the whole road closure but also partial road closure.
Disturbance: deformation and collapses that do not close the road is not included in RCD and are called 'disturbance'.

2

Inventory Sheet 2-5 **Selection of detailed inventory survey sites for DF**

Road Name	0	
Station from	km 0	m 0
Side of Survey	Right side of road	

1. Evaluation by Actual Frequency of Road Closure Disaster (RCD)

Number of RCDs in last 10 years should be inputted. However, in case countermeasures were done within the last 10 years, the Number of RCDs after the provision of countermeasure should be inputted, with the years after the countermeasure's construction substituted for the 10 year disaster record period.

FRCDa: Actual Frequency of RCD

Na: Number of RCDs after countermeasures have been installed	0 nos.
Ya: Period of available disaster record	10 year
FRCDa =Na/Ya	0.000 nos. per year

FRCDa >= 0.1 → Yes

FRCDbc: Actual Frequency of Road Closure Disaster before Countermeasure

Nbc: Number of RCDs before Countermeasure	0 nos.
Ybc: Period of Available Disaster Record	10 year
FRCDbc =Nbc/Ybc	0.000 nos. per year

2. Evaluation by Disturbance Situation

Yd: Visible disturbance is present	

Visible disturbance is present → Yes

3. Evaluation by Potential Frequency of Road Closure Disaster

Factor Items for FRCDp	Factor Categories for FRCDp				Frequency Score for FRCDp	
Geometry						
Width of channel: W	3 >= W	5 >= W > 3	10 >= W > 5	W > 10	a	0.060
Frequency score for FRCDp	0.06	0.06	-0.004	-0.004		
	1	0	0	0		
Area of drainage basin : A	A >= 0.5 km^2	0.5 km^2 > A >= 0.15 km^2		0.15 km^2 > A	b	0.000
Frequency score for FRCDp	0.074	0.074		-0.007		
	0	0		0		
Height from channel bottom to road: H	1 m >= H	2 m > = H > 1 m	5 m >= H > 2 m	H > 5m	c	0.000
Frequency score for FRCDp	0.032	0.032	-0.013	-0.013		
	0	0	0	0		
Surface situation						
Dominant vegetation of drainage area	Bare	Grasses	Trees	Unknown	d	0.000
Frequency score for FRCDp	0.11	0.016	0.001	0		
	0	0	0	0		
Dominant materials of river sediment	Cobbles, Boulders	Gravel	Sand, silt, clay	bedrock	e	0.000
Frequency score for FRCDp	0.141	0.066	-0.012	-0.016		
	0	0	0	0		
Disturbance						
Slope failure situation in drainage area	More than 5 slope collapses	2-4 slope collapses	1 slope collapse	No slope collapse or Unknown	f	0.000
Frequency score for FRCDp	0.358	0.07	-0.015	-0.015		
	0	0	0	0		
Trace of debris on or beside the road	Present	None			g	0.000
Frequency score for FRCDp	0.133	-0.054				
	0	0				
FRCDp without existing countermeasure (nos. per year)					h=SUM(a:g)	0.060
Countermeasure						
Existing countermeasure	Small check dam (less than 10 m height)	Sabo dam (equal to more than 10 m height)	Other	Specify countermeasure	i	1.000
Coefficient of effectiveness of countermeasure	0.05	0.01	0.1			
	0	0	0			
FRCDp of survey slope (nos. per year)					j = h *i	0.060

4 Comprehensive evaluation

FRCDp >= 0.1 → Yes → Select section for detailed inventory

Note

	1 should be inputted to selected category's cell.
	1 should be inputted when corresponding to situation
	Numerical value is automatically inputted.
	Numerical value or terms should be inputted.

RCD: Road closure disaster; It Includes not only the whole road but also partial road closures
Disturbance: Deformation and collapses that do not result to the road closure is not considered RCD but only called 'disturbance'.

Comprehensive Evaluation Necessity of Detailed Inventory Survey	yes=1, no=0	0

2

Inventory Sheet 2-6 **Selection of detailed inventory survey sites for RE**

Road Name	0	
Station from	km 0	m 0
Side of Survey	0	

1. Evaluation by actual frequency of Road Closure Disaster (RCD)

Number of RCDs in last 10 years should be inputted. However, in case countermeasures were done within last 10 years, Numbers of RCDs after countermeasures should be inputted. And the years after the countermeasures should be substituted for 10 years as period of disaster record.

FRCDa: Actual frequency of RCD

Na: Number of RCDs after countermeasures have been installed	0	nos.
Ya: Period of available disaster record	10	year
FRCDa =Na/Ya	0.000	nos. per year

FRCDa >=0.1 → Yes

FRCDbc: Actual frequency of RCD before countermeasure

Nbc: Number of RCDs before countermeasure	0	nos.
Ybc: Period of available disaster record	10	year
FRCDbc =Nbc/Ybc	0.000	nos. per year

2. Evaluation by disturbance situation

Yd: Visible disturbance is present

Yd: Visible disturbance is → Yes

3. Evaluation by potential frequency of road closure disaster (FRCDp)

Factor items for FRCDp	Factor categories for FRCDp					
					Frequency Score for FRCDp	
Geometry						
Length of survey site: L	L >=300 m	300m > L >= 200 m	200m > L >= 100 m	100m > L	a	0.009
Frequency score for FRCDp	0.141	0.141	0.009	0.009		
	0	0	0	1		
Distance from low water to road: D	0.5 m > = D	1 m > = D > 0.5 m	2 m > = D > 1 m	D > 2 m	b	0.000
Frequency score for FRCDp	0.057	0	-0.034	-0.034		
	0	0	0	0		
Width of river stream at low water discharge : W	W >= 10 m	10 m > W >= 5 m	5 m > W >= 3 m	3 m > W	c	0.000
Frequency score for FRCDp	0.045	0.009	0.009	0		
	0	0	0	0		
Height from high water to road surface or head of revetment: H	0 m >= H	1 m > H >= 0 m	2 m > H >= 1 m	H >= 2 m	d	0.000
Frequency score for FRCDp	0.322	0.322	0.013	-0.056		
	0	0	0	0		
Surface situation						
Dominant materials of river bank	Cobbles, Boulders	Gravel	Sand	Silt, Clay	e	0.000
Frequency score for FRCDp	0.051	-0.009	-0.009	-0.009		
	0	0	0	0		
	Bedrock	Artificial structure (without vegetation)				
Frequency score for FRCDp	-0.009	0				
	0	0				
Dominant materials of river bed	Cobbles, Boulders	Gravel	Sand	Silt, Clay	f	0.000
Frequency score for FRCDp	0.043	0.043	-0.069	-0.069		
	0	0	0	0		
	bedrock					
Frequency score for FRCDp	-0.069					
	0					
Disturbance						
Deformation/ Collapse / Erosion	Cracks, Crevices on road	Depression on road	Fall, Slump, Erosion in river side slope		g	0.000
Frequency score for FRCDp	0.071	0.071	0.071			
	0	0	0			
FRCDp without existing countermeasure effect (nos. per year)					h = SUM(a:g)	0.009
Countermeasure						
Existing countermeasure	Revetment	Groin/ spur dike	Other	Specify Countermeasure	i	1.000
Coefficient of effectiveness of countermeasure	0.05	0.05	0.1			
	0	0	0			
FRCDp of survey slope (nos. per year)					j = h *i	0.009

4 Comprehensive evaluation

FRCDp >=0.10 → Yes → Select for detailed inventory section

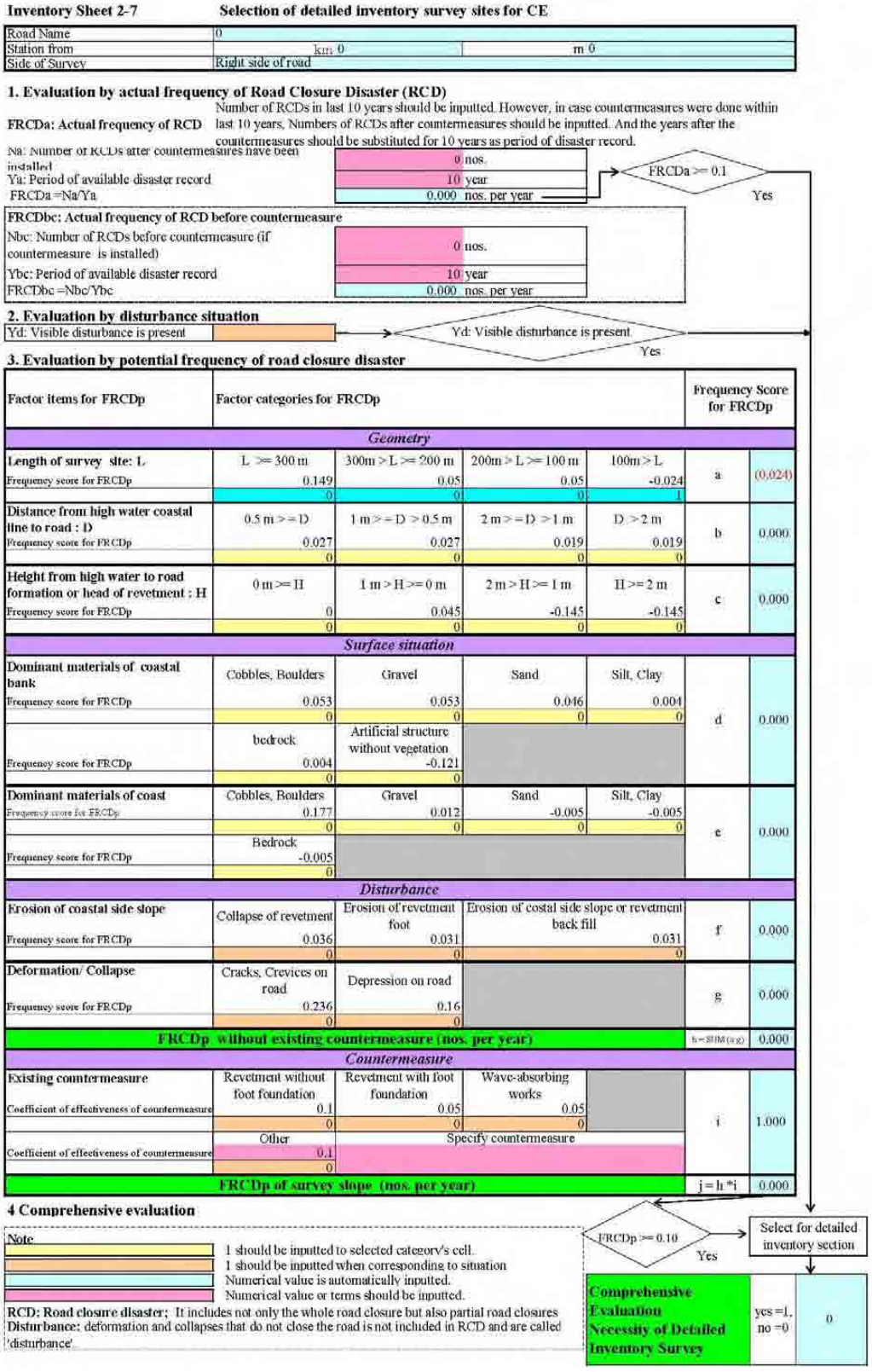
Comprehensive Evaluation Necessity of Detailed Inventory Survey	yes=1, no=0	0

Note

- 1 should be inputted to selected category's cell.
- 1 should be inputted when corresponding to situation
- Numerical value is automatically inputted.
- Numerical value or terms should be inputted.

RCD: Road closure disaster; It includes not only the whole road closure but also partial road closures
Disturbance: deformation and collapses that do not close the road is not included in RCD and are called 'disturbance'.

2



Inventory Sheet 2-7 **Selection of detailed inventory survey sites for CE**

Road Name	0	
Station from	km 0	m 0
Side of Survey	Right side of road	

1. Evaluation by actual frequency of Road Closure Disaster (RCD)

FRCDa: Actual frequency of RCD Number of RCDs in last 10 years should be inputted. However, in case countermeasures were done within last 10 years, Numbers of RCDs after countermeasures should be inputted. And the years after the countermeasures should be substituted for 10 years as period of disaster record.

Na: Number of RCDs after countermeasures have been installed	0 nos.
Ya: Period of available disaster record	10 year
FRCDa =Na/Ya	0.000 nos. per year

FRCDa >= 0.1 → Yes

FRCDbc: Actual frequency of RCD before countermeasure

Nbc: Number of RCDs before countermeasure (if countermeasure is installed)	0 nos.
Ybc: Period of available disaster record	10 year
FRCDbc =Nbc/Ybc	0.000 nos. per year

2. Evaluation by disturbance situation

Yd: Visible disturbance is present → Yd: Visible disturbance is present → Yes

3. Evaluation by potential frequency of road closure disaster

Factor items for FRCDp	Factor categories for FRCDp				Frequency Score for FRCDp	
Geometry						
Length of survey site: L	L >= 300 m	300m > L >= 200 m	200m > L >= 100 m	100m > L	a	(0.024)
Frequency score for FRCDp	0.149	0.05	0.05	-0.024		
	0	0	0	1		
Distance from high water coastal line to road : D	0.5 m > = D	1 m > = D > 0.5 m	2 m > = D > 1 m	D > 2 m	b	0.000
Frequency score for FRCDp	0.027	0.027	0.019	0.019		
	0	0	0	0		
Height from high water to road formation or head of revetment : H	0 m >= H	1 m > H >= 0 m	2 m > H >= 1 m	H >= 2 m	c	0.000
Frequency score for FRCDp	0	0.045	-0.145	-0.145		
	0	0	0	0		
Surface situation						
Dominant materials of coastal bank	Cobbles, Boulders	Gravel	Sand	Silt, Clay	d	0.000
Frequency score for FRCDp	0.053	0.053	0.046	0.004		
	0	0	0	0		
	bedrock	Artificial structure without vegetation				
Frequency score for FRCDp	0.004	-0.121				
	0	0				
Dominant materials of coast	Cobbles, Boulders	Gravel	Sand	Silt, Clay	e	0.000
Frequency score for FRCDp	0.177	0.012	-0.005	-0.005		
	0	0	0	0		
	Bedrock					
Frequency score for FRCDp	-0.005					
	0					
Disturbance						
Erosion of coastal side slope	Collapse of revetment	Erosion of revetment foot	Erosion of costal side slope or revetment back fill		f	0.000
Frequency score for FRCDp	0.036	0.031	0.031			
	0	0	0			
Deformation/ Collapse	Cracks, Crevices on road	Depression on road			g	0.000
Frequency score for FRCDp	0.236	0.16				
	0	0				
FRCDp without existing countermeasure (nos. per year)					h=SUM(e:g)	0.000
Countermeasure						
Existing countermeasure	Revetment without foot foundation	Revetment with foot foundation	Wave-absorbing works		i	1.000
Coefficient of effectiveness of countermeasure	0.1	0.05	0.05			
	0	0	0			
	Other	Specify countermeasure				
Coefficient of effectiveness of countermeasure	0.1					
	0					
FRCDp of survey slope (nos. per year)					j = h *i	0.000

4 Comprehensive evaluation

FRCDp >= 0.10 → Yes → Select for detailed inventory section

Comprehensive Evaluation Necessity of Detailed Inventory Survey	yes =1, no =0	0

Note

- 1 should be inputted to selected category's cell.
- 1 should be inputted when corresponding to situation
- Numerical value is automatically inputted.
- Numerical value or terms should be inputted.

RCD: Road closure disaster; It includes not only the whole road closure but also partial road closures
Disturbance: deformation and collapses that do not close the road is not included in RCD and are called 'disturbance'.

Inventory Sheet 3 Sketches

Road Name	0				
Station from	km 0	m 0	Side of survey	Left side of road	
Name of Inspector/ Coordinator for detailed inventory survey; sheet 3, 4, 5		Survey date (d/m/y)	Date	Month	Year
Name of surveyor					

3-1 Front view sketches

scale:

3-2 Cross section sketches

scale:

Note
- Numerical value or terms should be inputted.
- Numerical value is automatically inputted.

3

Inventory Sheet 4-1 Planning of Countermeasures Alternative I

Road Name	3						
Station from	km	0	m	0	Side of survey	Left side of road	

4-1 Plan of countermeasures (plan layout and descriptions)

4-2 Section of countermeasures

4- 3 Cost estimation with 20 years maintenance

No.	Work	Unit	Quantity	Unit price (pesos)	Amount (pesos)
1					0
2					0
3					0
4					0
5					0
6					0
7					0
Total Cost					0

Note
Numerical value or terms should be inputted.
Numerical value is automatically inputted.

4-1

Inventory Sheet 4-2 Planning of Countermeasures Alternative II

Road Name	3						
Station from	km	0	m	0	Side of survey	Left side of road	

4-1 Plan of countermeasures (plan layout and descriptions)

4-2 Section of countermeasures

4- 3 Cost estimation with 20 years maintenance

No.	Work	Unit	Quantity	Unit price (pesos)	Amount (pesos)
1					0
2					0
3					0
4					0
5					0
6					0
7					0
Total Cost					0

Note
Numerical value or terms should be inputted.
Numerical value is automatically inputted.

4-2

Inventory Sheet 4-3 Planning of Countermeasures Alternative III

Road Name	3						
Station from	km	0	m	0	Side of survey	Left side of road	

4-1 Plan of countermeasures (plan layout and descriptions)

4-2 Section of countermeasures

4- 3 Cost estimation with 20 years maintenance

No.	Work	Unit	Quantity	Unit price (pesos)	Amount (pesos)
1					0
2					0
3					0
4					0
5					0
6					0
7					0
Total Cost					0

Note
Numerical value or terms should be inputted.
Numerical value is automatically inputted.

4-3

Inventory Sheet 5-1 **Indicative Feasibility Assessment for SC**

Road Name	0				
Km station from		km	0	m	0
Side of Survey	Left side of road				

Items	symbol	equation	Unit	Quantity	Remarks
(1) Disaster Frequency and Magnitude					
1-1) Potential frequency of road closure disasters	FRCDp		nos. per year	0.000	evaluated in sheet 2
1-2-1) Coefficient for volume estimation (method of dimension setting for collapsible material)	a				1-2-1) When dimensions of collapsible materials cannot be predicted, 'no input' should be selected. And "Volume of collapsible material" is estimated by Figure 3.15 in the Guide and is directly inputted in the yellow cell below.
1-2-2) Length of collapsible materials	b		m		
1-2-3) Width of collapsible materials	c		m		
1-2-4) Depth of collapsible materials	d		m		
1-2-5) Volume of collapsible materials per RCD	e	e=a*b*c*d	m^3 per RCD	0	
1-2-6) Ratio of accumulation to collapsible materials	f		ratio		1-2-6) Evaluated by the Figure 3.16 of the Guide
1-2) Accumulation volume on the road per RCD	g	g=e*f	m^3 per RCD	0	
(2) Annual Losses without Countermeasure					
2-1-1) Reopening cost per accumulation volume of road closure site (excluding fixed cost)	h		pesos per m^3		refer 3.4.2.2-1-1) of the Guide
Fixed cost for reopening per RCD	i		pesos per RCD		
2-1) Annual reopening cost	j	j=FRCDp*(h*g+i)	pesos per year	0	refer 3.4.3.2-1) of the Guide
2-2-1) Average number of human deaths per RCD	k	k=0.006	ave. deaths per RCD	0.006	refer 3.4.2 (2) 2-2-1) of the Guide
2-2-2) Unit value of human life lost (death)	l		pesos per human life	2,300,000	refer 3.4.2 (2) 2-2-2) of the Guide
2-2) Annual value of human lives lost	m	m=FRCDp*k*l	pesos per year	0	refer 3.4.2 (2) 2-2) of the Guide
2-3-1) Length of survey road (from entry to exit point of detour road to avoid road closure site on survey road)	n		km		refer 3.4.2 (2) 2-3-1) of the Guide
Length of detour road (from entry to exit point of survey road to avoid road closure site on survey road)	o		km		refer 3.4.2 (2) 2-3-2) of the Guide
2-3-2) AADT: Annual Average Daily Traffic on the survey site	p		vehicles per day		refer 3.4.2 (2) 2-3-3) of the Guide
2-3-3) Nos. of predicted closure days of the whole width of the road on the survey site per RCD	q		days		refer 3.4.2 (2) 2-3-4) of the Guide
2-3-4) Average Vehicle Operating Cost per km on survey road	r		pesos per vehicle*km		refer 3.4.2 (2) 2-3-5) of the Guide
Average Vehicle Operating Cost per km on detour road	s		pesos per vehicle*km		
2-3) Annual detour cost	t	t=FRCDp*p*q*(o*s-n*r)	pesos per year	0	refer 3.4.2 (2) 2-3) of the Guide
Total Annual Loss	u	u=j+m+t	pesos per year	0	refer 3.4.2 (2) of the Guide
(3) Feasibility Indicators of Countermeasures					
Countermeasure alternative I					
3-1) Cost of countermeasure with 20 years maintenance	v I		pesos	0	evaluated in sheet 4
3-2) Risk reduction ratio in RCD due to countermeasure	w I		ratio		refer 3.4.2 (3) 3-2) of the Guide
3-3) Decrease in annual loss due to countermeasure	x I	x I = u* wI	pesos per year	0	refer 3.4.2 (3) 3-3) of the Guide
Potential frequency of road closure disaster with countermeasure	FRCDpwc I	FRCDpwc I = FRCDp*(1- wI)	ratio	0.000	refer 3.4.2 (3) 3-4) of the Guide
Benefit/cost ratio at 15% discount rate	BCR I		ratio	#DIV/0!	
Economic net present value at 15% discount rate	ENPV I		pesos	0	
Economic internal rate of return	EIRR I		percent	#NUM!	
Countermeasure alternative II					
3-1) Cost of countermeasure with 20 years maintenance	v II		pesos	0	evaluated in sheet 4
3-2) Risk reduction ratio in RCD due to countermeasure	w II		ratio		refer 3.4.2 (3) 3-2) of the Guide
3-3) Decrease in annual loss due to countermeasure	x II	x II = u* wII	pesos per year	0	refer 3.4.2 (3) 3-3) of the Guide
Potential frequency of road closure disaster with countermeasure	FRCDpwc II	FRCDpwc II = FRCDp*(1- wII)	nos. per year	0.000	refer 3.4.2 (3) 3-4) of the Guide
Benefit/cost ratio at 15% discount rate	BCR II		ratio	#DIV/0!	
Economic net present value at 15% discount rate	ENPV II		pesos	0	
Economic internal rate of return	EIRR II		percent	#NUM!	
Countermeasure alternative III					
3-1) Cost of countermeasure with 20 years maintenance	v III		pesos	0	evaluated in sheet 4
3-2) Risk reduction ratio in RCD due to countermeasure	w III		ratio		refer 3.4.2 (3) 3-2) of the Guide
3-3) Decrease in annual loss due to countermeasure	x III	x III = u * w III	pesos per year	0	refer 3.4.2 (3) 3-3) of the Guide
Potential frequency of road closure disaster with countermeasure	FRCDpwc III	FRCDpwc III= FRCDp*(1- wIII)	nos. per year	0.000	refer 3.4.2 (3) 3-4) of the Guide
Benefit/cost ratio at 15% discount rate	BCR III		ratio	#DIV/0!	
Economic net present value at 15% discount rate	ENPV III		pesos	0	
Economic internal rate of return	EIRR III		percent	#NUM!	

Note

Numerical value or terms should be inputted.
Numerical value is automatically inputted.

5

Inventory Sheet 5-2 **Indicative Feasibility Assessment for RC**

Road Name	0				
Km station from		km	0	m	0
Side of Survey	0				

Items	symbol	equation	Unit	Quantity	Remarks
(1) Disaster Frequency and Magnitude					
1-1) Potential frequency of road closure disasters	FRCDp		nos. per year	0.000	evaluated in sheet 2
1-2-1) Coefficient for volume estimation (method of dimension setting for collapsible material)	a				1-2-1) When dimensions of collapsible materials cannot be predicted, 'no input' should be selected. And 'Volume of collapsible material' is estimated by Figure 3.15 in the Guide and is directly inputted in the yellow cell below
1-2-2) Length of collapsible materials	b		m		
1-2-3) Width of collapsible materials	c		m		
1-2-4) Depth of collapsible materials	d		m		
1-2-5) Volume of collapsible materials per RCD	e	e=a*b*c*d	m^3 per RCD	0	
1-2-6) Ratio of accumulation to collapsible materials	f		ratio		1-2-6) Evaluated by the Figure 3.16 of the Guide
1-2) Accumulation volume on the road per RCD	g	g=e*f	m^3 per RCD	0	
(2) Annual Losses without Countermeasure					
2-1-1) Reopening cost per accumulation volume of road closure site (excluding fixed cost)	h		pesos per m^3		refer 3.4.2.2-1-1) of the Guide
Fixed cost for reopening per RCD	i		pesos per RCD		
2-1) Annual reopening cost	j	j=FRCDp*(h*g+i)	pesos per year	0	refer 3.4.3 2-1) of the Guide
2-2-1) Average number of human deaths per RCD	k	k=0.006	ave. death per RCD	0.006	refer 3.4.2(2) 2-2-1) of the Guide
2-2-2) Unit value of human life lost (death)	l		pesos per human life	2,300,000	refer 3.4.2(2) 2-2-2) of the Guide
2-2) Annual value of human lives lost	m	m=FRCDp*k*l	pesos per year	0	refer 3.4.2 (2) 2-2) of the Guide
2-3-1) Length of survey road (from entry to exit point of detour road to avoid road closure site on survey road)	n		km		refer 3.4.2(2) 2-3-1) of the Guide
Length of detour road (from entry to exit point of survey road to avoid road closure site on survey road)	o		km		refer 3.4.2(2) 2-3-2) of the Guide
2-3-2) AADT: Annual Average Daily Traffic on the survey site	p		vehicles per day		refer 3.4.2(2) 2-3-3) of the Guide
2-3-3) Nos. of predicted closure days of the whole width of the road on the survey site per RCD	q		days		refer 3.4.2(2) 2-3-4) of the Guide
2-3-4) Average Vehicle Operating Cost per km on survey road	r		pesos per vehicle*km		refer 3.4.2(2) 2-3-5) of the Guide
Average Vehicle Operating Cost per km on detour road	s		pesos per vehicle*km		
2-3) Annual detour cost	t	t=FRCDp*p*q*(o*s-n*r)	pesos per year	0	refer 3.4.2 (2) 2-3) of the Guide
Total Annual Loss	u	u=j+m+t	pesos per year	0	refer 3.4.2 (2) of the Guide
(3) Feasibility Indicators of Countermeasures					
Countermeasure alternative I					
3-1) Cost of countermeasure with 20 years maintenance	v I		pesos	0	evaluated in sheet 4
3-2) Risk reduction ratio in RCD due to countermeasure	w I		ratio		refer 3.4.2 (3) 3-2) of the Guide
3-3) Decrease in annual loss due to countermeasure	x I	x I = u* wI	pesos per year	0	refer 3.4.2 (3) 3-3) of the Guide
Potential frequency of road closure disaster with countermeasure	FRCDpwc I	FRCDpwc I = FRCDp*(1- wI)	ratio	0.000	refer 3.4.2 (3) 3-4) of the Guide
Benefit/cost ratio at 15% discount rate	BCR I		ratio	#DIV/0!	refer 3.4.2 (3) of the Guide
Economic net present value at 15% discount rate	ENPV I		pesos	0	
Economic internal rate of return	EIRR I		percent	#NUM!	
Countermeasure alternative II					
3-1) Cost of countermeasure with 20 years maintenance	v II		pesos	0	evaluated in sheet 4
3-2) Risk reduction ratio in RCD due to countermeasure	w II		ratio		refer 3.4.2 (3) 3-2) of the Guide
3-3) Decrease in annual loss due to countermeasure	x II	x II = u* wII	pesos per year	0	refer 3.4.2 (3) 3-3) of the Guide
Potential frequency of road closure disaster with countermeasure	FRCDpwc II	FRCDpwc II = FRCDp*(1- wII)	ratio	0.000	refer 3.4.2 (3) 3-4) of the Guide
Benefit/cost ratio at 15% discount rate	BCR II		ratio	#DIV/0!	
Economic net present value at 15% discount rate	ENPV II		pesos	0	
Economic internal rate of return	EIRR II		percent	#NUM!	
Countermeasure alternative III					
3-1) Cost of countermeasure with 20 years maintenance	v III		pesos	0	evaluated in sheet 4
3-2) Risk reduction ratio in RCD due to countermeasure	w III		ratio		refer 3.4.2 (3) 3-2) of the Guide
3-3) Decrease in annual loss due to countermeasure	x III	x III = u * w III	pesos per year	0	refer 3.4.2 (3) 3-3) of the Guide
Potential frequency of road closure disaster with countermeasure	FRCDpwc III	FRCDpwc III= FRCDp*(1- wIII)	ratio	0.000	refer 3.4.2 (3) of the Guide
Benefit/cost ratio at 15% discount rate	BCR III		ratio	#DIV/0!	
Economic net present value at 15% discount rate	ENPV III		pesos	0	
Economic internal rate of return	EIRR III		percent	#NUM!	

Note:
Numerical value or terms should be inputted.
Numerical value is automatically inputted.

5

Inventory Sheet 5-3 **Indicative Feasibility Assessment for LS**

Road Name	0				
Km station from		km	0	m	0
Side of survey	Right side of road				

Items	symbol	equation	Unit	Quantity	Remark
(1) Disaster Frequency and Magnitude					
1-1) Potential frequency of road closure disaster	FRCDp		nos. per year	0.010	sheet 2
1-2) Length of road closure site	LRC		m		refer 3.4.2 1-2) of the Guide
(2) Annual Losses Without Countermeasure					
2-1-1) Reopening cost per length of road closure site (excluding fixed cost)	h		pesos per m		refer 3.4.2 2-1-1) of the Guide
Fixed cost for reopening per RCD	i		pesos per RCD		
2-1) Annual reopening cost	j	j=FRCDp*(h*LRC+i)	pesos per year	0	refer 3.4.3 2-1) of the Guide
2-2-1) Average number of human deaths per RCD	k	k=0.006	ave. death per RCD	0.006	refer 3.4.2 (2) 2-2-1) of the Guide
2-2-2) Unit value of human life lost (death)	l		pesos per human life	2,300,000	refer 3.4.2 (2) 2-2-2) of the Guide
2-2) Annual value of human lives lost	m	m=FRCDp*k*l	pesos per year	138	refer 3.4.2 (2) 2-2) of the Guide
2-3-1) Length of survey road (from entry to exit point of detour road to avoid road closure site on survey road)	n		km		refer 3.4.2 (2) 2-3-1) of the Guide
Length of detour road (from entry to exit point of survey road to avoid road closure site on survey road)	o		km		refer 3.4.2 (2) 2-3-2) of the Guide
2-3-2) AADT: Annual Average Daily Traffic on the survey site	p		vehicles per day		refer 3.4.2 (2) 2-3-3) of the Guide
2-3-3) Nos. of predicted closure days of the whole width of the road on the survey site per RCD	q		days		refer 3.4.2 (2) 2-3-4) of the Guide
2-3-4) Average Vehicle Operating Cost per km on survey road	r		pesos per vehicle*km		refer 3.4.2 (2) 2-3-5) of the Guide
Average Vehicle Operating Cost per km on detour road	s		pesos per vehicle*km		
2-3) Annual detour cost	t	t=FRCDp*p*q*(o*s-n*r)	pesos per year	0	refer 3.4.2 (2) 2-3) of the Guide
Total Annual Loss	u	u=j+m+t	pesos per year	138	**refer 3.4.2 (2) of the Guide**
(3) Feasibility Indicators of Countermeasures					
Countermeasure alternative I					
3-1) Cost of countermeasure with 20 years maintenance	v I		pesos	0	evaluated in sheet 4
3-2) Risk reduction ratio in RCD due to countermeasure	w I		ratio		refer 3.4.2 (3) 3-2) of the Guide
3-3) Decrease in annual loss due to countermeasure	x I	x I = u* wI	pesos per year	0	refer 3.4.2 (3) 3-3) of the Guide
Potential frequency of road closure disaster with countermeasure	FRCDwc I	FRCDpwc I = FRCDp*(1- wI)	nos. per year	0.010	refer 3.4.2 (3) of the Guide
Benefit/cost ratio at 15% discount rate	BCR I		ratio	#DIV/0!	
Economic net present value at 15% discount rate	ENPV I		pesos	0	
Economic internal rate of return	EIRR I		percent	#NUM!	
Countermeasure alternative II					
3-1) Cost of countermeasure with 20 years maintenance	v II		pesos	0	evaluated in sheet 4
3-2) Risk reduction ratio in RCD due to countermeasure	w II		ratio		refer 3.4.2 (3) 3-2) of the Guide
3-3) Decrease in annual loss due to countermeasure	x II	x II = u* wII	pesos per year	0	refer 3.4.2 (3) 3-3) of the Guide
Potential frequency of road closure disaster with countermeasure	FRCDpwc II	FRCDpwc II = FRCDp*(1- wII)	nos. per year	0.010	refer 3.4.2 (3) of the Guide
Benefit/cost ratio at 15% discount rate	BCR II		ratio	#DIV/0!	
Economic net present value at 15% discount rate	ENPV II		pesos	0	
Economic internal rate of return	EIRR II		percent	#NUM!	
Countermeasure alternative III					
3-1) Cost of countermeasure with 20 years maintenance	v III		pesos	0	evaluated in sheet 4
3-2) Risk reduction ratio in RCD due to countermeasure	w III		ratio		refer 3.4.2 (3) 3-2) of the Guide
3-3) Decrease in annual loss due to countermeasure	x III	x III = u * w III	pesos per year	0	refer 3.4.2 (3) 3-3) of the Guide
Potential frequency of road closure disaster with countermeasure	FRCDpwc III	FRCDpwc III = FRCDp*(1- wIII)	nos. per year	0.010	refer 3.4.2 (3) of the Guide
Benefit/cost ratio at 15% discount rate	BCR III		ratio	#DIV/0!	
Economic net present value at 15% discount rate	ENPV III		pesos	0	
Economic internal rate of return	EIRR III		percent	#NUM!	

Note
Numerical value or terms should be inputted.
Numerical value is automatically inputted.

5

Inventory Sheet 5-4 **Indicative Feasibility Assessment for RS**

Road Name	0				
Km station from		km	0	m	0
Side of survey	0				

Items	symbol	equation	Unit	Quantity	Remark
(1) Disaster Frequency and Magnitude					
1-1) Potential frequency of road closure disaster	FRCDp		nos. per year	0.000	sheet 2
1-2) Length of road closure site	LRC		m		refer 3.4.2 1-2) of the Guide
(2) Annual Losses Without Countermeasure					
2-1-1) Reopening cost per length of road closure site (excluding fixed cost)	h		pesos per m		refer 3.4.2 2-1-1) of the Guide
Fixed cost for reopening per RCD	i		pesos per RCD		
2-1) Annual reopening cost	j	j=FRCDp*(h*LRC+i)	pesos per year	0	refer 3.4.3 2-1) of the Guide
2-2-1) Average number of human deaths per RCD	k	k=0.006	ave. death per RCD	0.006	refer 3.4.2 (2) 2-2-1) of the Guide
2-2-2) Unit value of human life lost (death)	l		pesos per human life	2,300,000	refer 3.4.2 (2) 2-2-2) of the Guide
2-2) Annual value of human lives lost	m	m=FRCDp*k*l	pesos per year	0	refer 3.4.2 (2) 2-2) of the Guide
2-3-1) Length of survey road (from entry to exit point of detour road to avoid road closure site on survey road)	n		km		refer 3.4.2 (2) 2-3-1) of the Guide
Length of detour road (from entry to exit point of survey road to avoid road closure site on survey road)	o		km		refer 3.4.2 (2) 2-3-2) of the Guide
2-3-2) AADT: Annual Average Daily Traffic on the survey site	p		vehicles per day		refer 3.4.2 (2) 2-3-3) of the Guide
2-3-3) Nos. of predicted closure days of the whole width of the road on the survey site per RCD	q		days		refer 3.4.2 (2) 2-3-4) of the Guide
2-3-4) Average Vehicle Operating Cost per km on survey road	r		pesos per vehicle*km		refer 3.4.2 (2) 2-3-5) of the Guide
Average Vehicle Operating Cost per km on detour road	s		pesos per vehicle*km		
2-3) Annual detour cost	t	t=FRCDp*p*q*(o*s-n*r)	pesos per year	0	refer 3.4.2 (2) 2-3) of the Guide
Total Annual Loss	u	u=j+m+t	pesos per year	0	refer 3.4.2 (2) of the Guide
(3) Feasibility Indicators of Countermeasures					
Countermeasure alternative I					
3-1) Cost of countermeasure with 20 years maintenance	v I		pesos	0	evaluated in sheet 4
3-2) Risk reduction ratio in RCD due to countermeasure	w I		ratio		refer 3.4.2 (3) 3-2) of the Guide
3-3) Decrease in annual loss due to countermeasure	x I	x I = u* wI	pesos per year	0	refer 3.4.2 (3) 3-3) of the Guide
Potential frequency of road closure disaster with countermeasure	FRCDwc I	FRCDpwc I = FRCDp*(1- wI)	nos. per year	0.000	refer 3.4.2 (3) of the Guide
Benefit/cost ratio at 15% discount rate	BCR I		ratio	#DIV/0!	
Economic net present value at 15% discount rate	ENPV I		pesos	0	
Economic internal rate of return	EIRR I		percent	#NUM!	
Countermeasure alternative II					
3-1) Cost of countermeasure with 20 years maintenance	v II		pesos	0	evaluated in sheet 4
3-2) Risk reduction ratio in RCD due to countermeasure	w II		ratio		refer 3.4.2 (3) 3-2) of the Guide
3-3) Decrease in annual loss due to countermeasure	x II	x II = u* wII	pesos per year	0	refer 3.4.2 (3) 3-3) of the Guide
Potential frequency of road closure disaster with countermeasure	FRCDpwc II	FRCDpwc II = FRCDp*(1- wII)	nos. per year	0.000	refer 3.4.2 (3) of the Guide
Benefit/cost ratio at 15% discount rate	BCR II		ratio	#DIV/0!	
Economic net present value at 15% discount rate	ENPV II		pesos	0	
Economic internal rate of return	EIRR II		percent	#NUM!	
Countermeasure alternative III					
3-1) Cost of countermeasure with 20 years maintenance	v III		pesos	0	evaluated in sheet 4
3-2) Risk reduction ratio in RCD due to countermeasure	w III		ratio		refer 3.4.2 (3) 3-2) of the Guide
3-3) Decrease in annual loss due to countermeasure	x III	x III = u * w III	pesos per year	0	refer 3.4.2 (3) 3-3) of the Guide
Potential frequency of road closure disaster with countermeasure	FRCDpwc III	FRCDpwc III = FRCDp*(1- wIII)	nos. per year	0.000	refer 3.4.2 (3) of the Guide
Benefit/cost ratio at 15% discount rate	BCR III		ratio	#DIV/0!	
Economic net present value at 15% discount rate	ENPV III		pesos	0	
Economic internal rate of return	EIRR III		percent	#NUM!	

Note:
Numerical value or terms should be inputted.
Numerical value is automatically inputted.

5

Inventory Sheet 5-5 **Indicative Feasibility Assessment for DF**

Road Name	0				
Km station from		km	0	m	0
Side of survey	Right side of road				

Items	symbol	equation	Unit	Quantity	Remark
(1) Disaster Frequency and Magnitude					
1-1) Potential frequency of road closure disaster	FRCDp		nos. per year	0.060	sheet 2
1-2) Length of road closure site	LRC		m		refer 3.4.2 1-2) of the Guide
(2) Annual Losses Without Countermeasure					
2-1-1) Reopening cost per length of road closure site (excluding fixed cost)	h		pesos per m		refer 3.4.2 2-1-1) of the Guide
Fixed cost for reopening per RCD	i		pesos per RCD		
2-1) Annual reopening cost	j	j=FRCDp*(h*LRC+i)	pesos per year	0	refer 3.4.3 2-1) of the Guide
2-2-1) Average number of human deaths per RCD	k	k=0.006	ave. death per RCD	0.006	refer 3.4.2 (2) 2-2-1) of the Guide
2-2-2) Unit value of human life lost (death)	l		pesos per human life	2,300,000	refer 3.4.2 (2) 2-2-2) of the Guide
2-2) Annual value of human lives lost	m	m=FRCDp*k*l	pesos per year	828	refer 3.4.2 (2) 2-2) of the Guide
2-3-1) Length of survey road (from entry to exit point of detour road to avoid road closure site on survey road)	n		km		refer 3.4.2 (2) 2-3-1) of the Guide
Length of detour road (from entry to exit point of survey road to avoid road closure site on survey road)	o		km		refer 3.4.2 (2) 2-3-2) of the Guide
2-3-2) AADT: Annual Average Daily Traffic on the survey site	p		vehicles per day		refer 3.4.2 (2) 2-3-3) of the Guide
2-3-3) Nos. of predicted closure days of the whole width of the road on the survey site per RCD	q		days		refer 3.4.2 (2) 2-3-4) of the Guide
2-3-4) Average Vehicle Operating Cost per km on survey road	r		pesos per vehicle*km		refer 3.4.2 (2) 2-3-5) of the Guide
Average Vehicle Operating Cost per km on detour road	s		pesos per vehicle*km		
2-3) Annual detour cost	t	t=FRCDp*p*q*(o*s-n*r)	pesos per year	0	refer 3.4.2 (2) 2-3) of the Guide
Total Annual Loss	u	u=j+m+t	pesos per year	828	refer 3.4.2 (2) of the Guide
(3) Feasibility Indicators of Countermeasures					
Countermeasure alternative I					
3-1) Cost of countermeasure with 20 years maintenance	v I		pesos	0	evaluated in sheet 4
3-2) Risk reduction ratio in RCD due to countermeasure	w I		ratio		refer 3.4.2 (3) 3-2) of the Guide
3-3) Decrease in annual loss due to countermeasure	x I	x I = u* wI	pesos per year	0	refer 3.4.2 (3) 3-3) of the Guide
Potential frequency of road closure disaster with countermeasure	FRCDwc I	FRCDpwc I = FRCDp*(1- wI)	nos. per year	0.060	refer 3.4.2 (3) of the Guide
Benefit/cost ratio at 15% discount rate	BCR I		ratio	#DIV/0!	
Economic net present value at 15% discount rate	ENPV I		pesos	0	
Economic internal rate of return	EIRR I		percent	#NUM!	
Countermeasure alternative II					
3-1) Cost of countermeasure with 20 years maintenance	v II		pesos	0	evaluated in sheet 4
3-2) Risk reduction ratio in RCD due to countermeasure	w II		ratio		refer 3.4.2 (3) 3-2) of the Guide
3-3) Decrease in annual loss due to countermeasure	x II	x II = u* wII	pesos per year	0	refer 3.4.2 (3) 3-3) of the Guide
Potential frequency of road closure disaster with countermeasure	FRCDpwc II	FRCDpwc II = FRCDp*(1- wII)	nos. per year	0.060	refer 3.4.2 (3) of the Guide
Benefit/cost ratio at 15% discount rate	BCR II		ratio	#DIV/0!	
Economic net present value at 15% discount rate	ENPV II		pesos	0	
Economic internal rate of return	EIRR II		percent	#NUM!	
Countermeasure alternative III					
3-1) Cost of countermeasure with 20 years maintenance	v III		pesos	0	evaluated in sheet 4
3-2) Risk reduction ratio in RCD due to countermeasure	w III		ratio		refer 3.4.2 (3) 3-2) of the Guide
3-3) Decrease in annual loss due to countermeasure	x III	x III = u * w III	pesos per year	0	refer 3.4.2 (3) 3-3) of the Guide
Potential frequency of road closure disaster with countermeasure	FRCDpwc III	FRCDpwc III = FRCDp*(1- wIII)	nos. per year	0.060	refer 3.4.2 (3) of the Guide
Benefit/cost ratio at 15% discount rate	BCR III		ratio	#DIV/0!	
Economic net present value at 15% discount rate	ENPV III		pesos	0	
Economic internal rate of return	EIRR III		percent	#NUM!	

Note
Numerical value or terms should be inputted.
Numerical value is automatically inputted.

5

Inventory Sheet 5-6 **Indicative Feasibility Assessment for RE**

Road Name	0				
Km station from		km	0	m	0
Side of survey	0				

Items	symbol	equation	Unit	Quantity	Remark
(1) Disaster Frequency and Magnitude					
1-1) Potential frequency of road closure disaster	FRCDp		nos. per year	0.009	sheet 2
1-2) Length of road closure site	LRC		m		refer 3.4.2 1-2) of the Guide
(2) Annual Losses Without Countermeasure					
2-1-1) Reopening cost per length of road closure site (excluding fixed cost)	h		pesos per m		refer 3.4.2 2-1-1) of the Guide
Fixed cost for reopening per RCD	i		pesos per RCD		
2-1) Annual reopening cost	j	j=FRCDp*(h*LRC+i)	pesos per year	0	refer 3.4.3 2-1) of the Guide
2-2-1) Average number of human deaths per RCD	k	k=0.006	nos. death per RCD	0.006	refer 3.4.2 (2) 2-2-1) of the Guide
2-2-2) Unit value of human life lost (death)	l		pesos per human life	2,300,000	refer 3.4.2 (2) 2-2-2) of the Guide
2-2) Annual value of human lives lost	m	m=FRCDp*k*l	pesos per year	124	refer 3.4.2 (2) 2-2) of the Guide
2-3-1) Length of survey road (from entry to exit point of detour road to avoid road closure site on survey road)	n		km		refer 3.4.2 (2) 2-3-1) of the Guide
Length of detour road (from entry to exit point of survey road to avoid road closure site on survey road)	o		km		refer 3.4.2 (2) 2-3-2) of the Guide
2-3-2) AADT: Annual Average Daily Traffic on the survey site	p		vehicles per day		refer 3.4.2 (2) 2-3-3) of the Guide
2-3-3) Nos. of predicted closure days of the whole width of the road on the survey site per RCD	q		days		refer 3.4.2 (2) 2-3-4) of the Guide
2-3-4) Average Vehicle Operating Cost per km on survey road	r		pesos per vehicle*km		refer 3.4.2 (2) 2-3-5) of the Guide
Average Vehicle Operating Cost per km on detour road	s		pesos per vehicle*km		
2-3) Annual detour cost	t	t=FRCDp*p*q*(o*s-n*r)	pesos per year	0	refer 3.4.2 (2) 2-3) of the Guide
Total Annual Loss	u	u=j+m+t	pesos per year	124	refer 3.4.2 (2) of the Guide
(3) Feasibility Indicators of Countermeasures					
Countermeasure alternative I					
3-1) Cost of countermeasure with 20 years maintenance	v I		pesos	0	evaluated in sheet 4
3-2) Risk reduction ratio in RCD due to countermeasure	w I		ratio		refer 3.4.2 (3) 3-2) of the Guide
3-3) Decrease in annual loss due to countermeasure	x I	x I = u* wI	pesos per year	0	refer 3.4.2 (3) 3-3) of the Guide
Potential frequency of road closure disaster with countermeasure	FRCDwc I	FRCDpwc I = FRCDp*(1- wI)	nos. per year	0.009	refer 3.4.2 (3) of the Guide
Benefit/cost ratio at 15% discount rate	BCR I		ratio	#DIV/0!	
Economic net present value at 15% discount rate	ENPV I		pesos	0	
Economic internal rate of return	EIRR I		percent	#NUM!	
Countermeasure alternative II					
3-1) Cost of countermeasure with 20 years maintenance	v II		pesos	0	evaluated in sheet 4
3-2) Risk reduction ratio in RCD due to countermeasure	w II		ratio		refer 3.4.2 (3) 3-2) of the Guide
3-3) Decrease in annual loss due to countermeasure	x II	x II = u* wII	pesos per year	0	refer 3.4.2 (3) 3-3) of the Guide
Potential frequency of road closure disaster with countermeasure	FRCDpwc II	FRCDpwc II = FRCDp*(1- wII)	nos. per year	0.009	refer 3.4.2 (3) of the Guide
Benefit/cost ratio at 15% discount rate	BCR II		ratio	#DIV/0!	
Economic net present value at 15% discount rate	ENPV II		pesos	0	
Economic internal rate of return	EIRR II		percent	#NUM!	
Countermeasure alternative III					
3-1) Cost of countermeasure with 20 years maintenance	v III		pesos	0	evaluated in sheet 4
3-2) Risk reduction ratio in RCD due to countermeasure	w III		ratio		refer 3.4.2 (3) 3-2) of the Guide
3-3) Decrease in annual loss due to countermeasure	x III	x III = u * w III	pesos per year	0	refer 3.4.2 (3) 3-3) of the Guide
Potential frequency of road closure disaster with countermeasure	FRCDpwc III	FRCDpwc III = FRCDp*(1- wIII)	nos. per year	0.009	refer 3.4.2 (3) of the Guide
Benefit/cost ratio at 15% discount rate	BCR III		ratio	#DIV/0!	
Economic net present value at 15% discount rate	ENPV III		pesos	0	
Economic internal rate of return	EIRR III		percent	#NUM!	

Note
Numerical value or terms should be inputted.
Numerical value is automatically inputted.

5

Inventory Sheet 5-7 **Indicative Feasibility Assessment for CE**

Road Name	0				
Km station from		km	0	m	0
Side of survey	Right side of road				

Items	symbol	equation	Unit	Quantity	Remark
(1) Disaster Frequency and Magnitude					
1-1) Potential frequency of road closure disaster	FRCDp		nos. per year	0.000	sheet 2
1-2) Length of road closure site	LRC		m		refer 3.4.2 1-2) of the Guide
(2) Annual Losses Without Countermeasure					
2-1-1) Reopening cost per length of road closure site (excluding fixed cost)	h		pesos per m		refer 3.4.2 2-1-1) of the Guide
Fixed cost for reopening per RCD	i		pesos per RCD		
2-1) Annual reopening cost	j	j=FRCDp*(h*LRC+i)	pesos per year	0	refer 3.4.2 2-1) of the Guide
2-2-1) Average number of human deaths per RCD	k	k=0.006	ave. death per RCD	0.006	refer 3.4.2 (2) 2-2-1) of the Guide
2-2-2) Unit value of human life lost (death)	l		pesos per human life	2,300,000	refer 3.4.2 (2) 2-2-2) of the Guide
2-2) Annual value of human lives lost	m	m=FRCDp*k*l	pesos per year	0	refer 3.4.2 (2) 2-2) of the Guide
2-3-1) Length of survey road (from entry to exit point of detour road to avoid road closure site on survey road)	n		km		refer 3.4.2 (2) 2-3-1) of the Guide
Length of detour road (from entry to exit point of survey road to avoid road closure site on survey road)	o		km		refer 3.4.2 (2) 2-3-2) of the Guide
2-3-2) AADT: Annual Average Daily Traffic on the survey site	p		vehicles per day		refer 3.4.2 (2) 2-3-3) of the Guide
2-3-3) Nos. of predicted closure days of the whole width of the road on the survey site per RCD	q		days		refer 3.4.2 (2) 2-3-4) of the Guide
2-3-4) Average Vehicle Operating Cost per km on survey road	r		pesos per vehicle*km		refer 3.4.2 (2) 2-3-5) of the Guide
Average Vehicle Operating Cost per km on detour road	s		pesos per vehicle*km		
2-3) Annual detour cost	t	t=FRCDp*p*q*(o*s-n*r)	pesos per year	0	refer 3.4.2 (2) 2-3) of the Guide
Total Annual Loss	u	u=j+m+t	pesos per year	0	refer 3.4.2 (2) of the Guide
(3) Feasibility Indicators of Countermeasures					
Countermeasure alternative I					
3-1) Cost of countermeasure with 20 years maintenance	v I		pesos	0	evaluated in sheet 4
3-2) Risk reduction ratio in RCD due to countermeasure	w I		ratio		refer 3.4.2 (3) 3-2) of the Guide
3-3) Decrease in annual loss due to countermeasure	x I	x I = u* wI	pesos per year	0	refer 3.4.2 (3) 3-3) of the Guide
Potential frequency of road closure disaster with countermeasure	FRCDwc I	FRCDpwc I = FRCDp*(1- wI)	nos. per year	0.000	refer 3.4.2 (3) of the Guide
Benefit/cost ratio at 15% discount rate	BCR I		ratio	#DIV/0!	
Economic net present value at 15% discount rate	ENPV I		pesos	0	
Economic internal rate of return	EIRR I		percent	#NUM!	
Countermeasure alternative II					
3-1) Cost of countermeasure with 20 years maintenance	v II		pesos	0	evaluated in sheet 4
3-2) Risk reduction ratio in RCD due to countermeasure	w II		ratio		refer 3.4.2 (3) 3-2) of the Guide
3-3) Decrease in annual loss due to countermeasure	x II	x II = u* wII	pesos per year	0	refer 3.4.2 (3) 3-3) of the Guide
Potential frequency of road closure disaster with countermeasure	FRCDpwc II	FRCDpwc II = FRCDp*(1- wII)	nos. per year	0.000	refer 3.4.2 (3) of the Guide
Benefit/cost ratio at 15% discount rate	BCR II		ratio	#DIV/0!	
Economic net present value at 15% discount rate	ENPV II		pesos	0	
Economic internal rate of return	EIRR II		percent	#NUM!	
Countermeasure alternative III					
3-1) Cost of countermeasure with 20 years maintenance	v III		pesos	0	evaluated in sheet 4
3-2) Risk reduction ratio in RCD due to countermeasure	w III		ratio		refer 3.4.2 (3) 3-2) of the Guide
3-3) Decrease in annual loss due to countermeasure	x III	x III = u * w III	pesos per year	0	refer 3.4.2 (3) 3-3) of the Guide
Potential frequency of road closure disaster with countermeasure	FRCDpwc III	FRCDpwc III = FRCDp*(1- wIII)	nos. per year	0.000	refer 3.4.2 (3) of the Guide
Benefit/cost ratio at 15% discount rate	BCR III		ratio	#DIV/0!	
Economic net present value at 15% discount rate	ENPV III		pesos	0	
Economic internal rate of return	EIRR III		percent	#NUM!	

Note
Numerical value or terms should be inputted.
Numerical value is automatically inputted.

5

Inventory Sheet 6 Disaster Record

Road Name	3										
Station from	km	0	m	0	Side of survey	Left side of road					
Name of inspector for disaster record; sheet 6						Survey date (d/m/y)		Date	Month	Year	
Name of surveyor											
Disaster Occurrence Date, Hour	Hour	Date	Month	Year		Disaster Type (Select from drop down list)					
Length of road closure site		Road closure type (Full width/At least one lane is secured)									
Reopen Date, Hour at least one lane is secured	Hour	Date	Month	Year		Number of days of full width road closure (days)					
Disaster station	from	km		m		until	km		m		
Probable provoking cause of the disaster											
Collapsed materials						Collapsed volume (m^3)					
Accumulation volume on the road (m^3)		Total reopening cost (pesos)				Estimated			Actual		
Reopening method (Select from drop down list)	Soil/Rock removal by manual labour										
Number of dead persons due to disaster (nos.)		Number of injured persons by the disaster (nos.)									
Existing countermeasure	Countermeasure type	Station									
		from	km		m		until	km		m	
		from	km		m		until	km		m	
		from	km		m		until	km		m	
		from	km		m		until	km		m	
		from	km		m		until	km		m	
		from	km		m		until	km		m	
Rehabilitation plan (planned, not yet planned)		Outline of the plan									

Photos/ Sketches and other data

Numerical value or terms should be inputted.
Numerical value is automatically inputted.

Checking and approval of sheet-6

Checked by _____ Approved by _____

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