

Appendix 7
Cost-Benefit

Appendix B3 Cost/ Benefit Data

Cost-Benefit Analysis

Site No	1	N001A290	A-Node	1109	B-Node	706
Site Name	NIC 1, 60.9		Link Length (km)		31.2	
Type of Disaster	Rock Fall		Permanent/Temporary (P/T)		T	
Discount Rate (%)	10		Discount Period		18	

Maintenance Cost per km	1340
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Risk : Without Prevention Measures Road will fail in	years
Score	70
Benefit Factor	70

Mode	2003		2010		2020	
	Base	Disaster	Base	Disaster	Base	Disaster
1	268075	286774	391821	437200	713997	780521
2	472217	509041	691700	785385	1230257	1361510
3	161758	169458	199148	217435	271850	292703
4	193383	208435	309413	343656	560748	611220
5	131812	137885	199698	211750	379407	397997
6	93608	97090	107094	113766	260251	272737
Total	11482201	11982201	16344168	17344168	36171046	39171046

AADT Cars
Vehicle Pick-ups
Kilometres Buses
input from L Goods
JICA STRADA M Goods
Traffic Model H Goods

Capital Cost Estimate US \$	413370
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Veh. Op Cost	Benefits, US \$, per year					
	2003		2010		2020	
1000 km						
185.5	18699	1265950	45379	3072226		4503773
215.1	36824	2890742	93685	7354419		10303566
529.7	7700	1488840	18287	3535899		4032051
549.1	15052	3016767	34243	6863084		10115748
768.2	6073	1702803	12052	3379249		5212432
878.5	3484	1117100	6672	2139291		4003475
Total	413370	11482201	16344168	17344168	36171046	39171046

AADT Cars
Vehicle Pick-ups
Hours Buses
input from L Goods
JICA STRADA M Goods
Traffic Model H Goods

Passenger VOT, 2002	Benefits, US \$, per year					
	2003		2010		2020	
2.84	866	921933	1008	1294622		5957328
1.09	1679	686026	1984	977985		4280947
14.9	393	2195038	388	2614461		9393975
1.04	597	232740	818	384725		1748498
1.04	276	107598	346	162732		768526
0.75	179	50324	157	53251		348224
Total	4193660	11936660	5487777	22497498		22497498

Occurrence probability 1/3
Restoration Cost 2000 US\$

Value of Time Base	1.027	1.239	2.678
Factors Sensitivity	0.97	0.924	0.811

<With Project>

Year	Capital Cost US\$	Maintenance Cost (US\$)	Total Cost (US \$)	Total Dis-counted Cost	Veh Km Benefits	Veh Hour Benefits	Ben	Total Benefits \$ US	Total Dis. Benefits \$ US	Benefits - Cost \$ US	Net Pre Value \$ US
2002											
2003	413370		413370	413370	1887485	689369	0	1333	1333	-412037	-412037
2004	0	8267	8267	7441	2236494	719759	1	1972169	1774952	1963901	1767511
2005	0	8267	8267	6697	2595503	750149	0	1333	1080	-6934	-5617
2006	0	8267	8267	6027	2934512	780539	0	1333	972	-6934	-5055
2007	0	8267	8267	5424	3283521	810930	0	1333	875	-6934	-4549
2008	0	8267	8267	4882	3632530	841320	0	1333	787	-6934	-4094
2009	0	8267	8267	4394	3981539	871710	0	1333	709	-6934	-3685
2010	0	8267	8267	3954	4330548	902100	0	1333	636	-6934	-3317
2011	0	8267	8267	3569	4524963	1181712	0	1333	574	-6934	-2985
2012	0	8267	8267	3203	4719377	1461324	0	1333	517	-6934	-2686
2013	413370		413370	144133	4913791	1740936	0	1333	485	-412037	-143668
2014	0	8267	8267	2594	5108206	2020548	1	4753836	1491804	4745568	1489210
2015	0	8267	8267	2335	5302620	2300160	0	1333	377	-6934	-1958
2016	0	8267	8267	2101	5497035	2579771	0	1333	339	-6934	-1763
2017	0	8267	8267	1891	5691449	2859383	0	1333	305	-6934	-1566
2018	0	8267	8267	1702	5885864	3138995	0	1333	275	-6934	-1428
2019	0	8267	8267	1532	6080278	3418607	0	1333	247	-6934	-1285
2020	0	8267	8267	1379	6274692	3698219	0	1333	222	-6934	-1156
2021											
2022											
2023											
Total	826,740	132,278	959,018	616,618	78,870,408	30,765,532		6,747,338	3,276,470	5,788,319	2,659,851

B/C 5.31
EIRR 4%

Cost-Benefit Analysis

Site No	2	N001A280	A-Node	1109	B-Node	1102
Site Name	NIC 1, 73.2		Link Length (km)	36.4		
Type of Disaster	Rock Fall		Permanent/Temporary (P/T)	P		
Discount Rate (%)	10		Discount Period	18		

Base Case	
Maintenance Cost per km	1340

Risk : Without Prevention Measures Road will fail in	years
Score	78
Benefit Factor	78

Mode	2003		2010		2020	
	Base	Disaster	Base	Disaster	Base	Disaster
1	268075	289512	391813	440747	713975	783332
2	472217	505241	691648	778155	1230257	1343893
3	161758	169705	199148	217227	271850	291178
4	193383	209752	309370	344033	560748	610522
5	131812	137811	199683	210966	379385	396166
6	93606	97189	107094	113857	260251	272008

AAADT Vehicle Pick-ups
Kilometres Buses
input from L Goods
JICA STRADA M Goods
Traffic Model H Goods

Veh. Op Cost	Benefits, US \$, per year		
	2003	2010	2020
1000 km			
185.5	21437	1451317	48934
215.1	33024	2592436	86507
529.7	7947	1536599	18079
549.1	16369	3280724	34663
768.2	5999	1682054	11283
878.5	3583	1148843	6763
Total	11691972	25878881	35804151

Capital Cost Estimate US \$	12339
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Passenger VOT, 2002	Benefits, US \$, per year		
	2003	2010	2020
2.84	908	966646	1072
1.09	1530	625146	1758
14.9	372	2077746	367
1.04	617	240537	839
1.04	269	104869	327
0.75	179	50324	158
Total	4065269	5318347	19612955

AAADT Vehicle Hours
input from L Goods
JICA STRADA M Goods
Traffic Model H Goods

Value of Time Factors	Benefits, US \$, per year		
	2003	2010	2020
Base	1.027	1.239	2.678
Sensitivity	0.97	0.924	0.811

Occurrence probability 1/3
Restoration Cost 2000 US\$

Value of Time Factors	Base	1.027	1.239	2.678
	Sensitivity	0.97	0.924	0.811

Year	Capital Cost US\$	Maintenance Cost (US\$)	Total Cost (US \$)	Total Discounted Cost	Veh Km Benefits	Veh Hour Benefits	Ben	Total Benefits \$ US	Total Dis. Benefits \$ US	Benefits - Cost \$ US	Net Pre Value \$ US
2002											
2003	12339		12339	12339	480492	167066	0	1333	1333	-11006	-11006
2004	0	247	247	222	563781	174422	1	493469	444122	493222	443900
2005	0	247	247	200	647070	181779	0	1333	1080	1087	880
2006	0	247	247	180	730359	189136	0	1333	972	1087	792
2007	0	247	247	162	813648	196492	0	1333	875	1087	713
2008	0	247	247	146	896937	203849	0	1333	787	1087	642
2009	0	247	247	131	980227	211206	0	1333	709	1087	577
2010	0	247	247	118	1063516	218562	0	1333	638	1087	520
2011	0	247	247	106	966973	277307	0	1333	574	1087	468
2012	0	247	247	96	870431	336052	0	1333	517	1087	421
2013	0	247	247	86	773889	394797	0	1333	465	1087	379
2014	0	247	247	77	677347	453542	0	1333	418	1087	341
2015	0	247	247	70	580805	512287	0	1333	377	1087	307
2016	0	247	247	63	484262	571032	0	1333	339	1087	276
2017	0	247	247	56	387720	629777	0	1333	305	1087	249
2018	0	247	247	51	291178	688522	0	1333	275	1087	224
2019	0	247	247	46	194636	747267	0	1333	247	1087	201
2020	0	247	247	41	98094	806012	0	1333	222	1087	181
2021											
2022											
2023											
Total	12,339	4,195	16,535	14,190	11,501,388	6,959,107		516,136	454,254	499,601	440,064

B/C 32.01
EIRR 44%

Cost-Benefit Analysis

Site No	3	Junquillal	A-Node	1101	B-Node	1102
Site Name	NIC 1, 113.2		Link Length (km)	10.4		
Type of Disaster	Bridge Scouring		Permanent/Temporary (P/T)	T		
Discount Rate (%)	10		Discount Period	18		

Base Case
Maintenance Cost per km 1340

Risk : Without Prevention Measures Road will fail in _____ years
Score 90 Benefit Factor 90

Mode	2003		2010		2020	
	Base	Disaster	Base	Disaster	Base	Disaster
1	268075	289503	391813	440012	713975	790357
2	472217	522499	691648	800377	1230257	1399546
3	161758	182692	199148	231323	271850	315491
4	193383	214298	309370	351475	560748	632607
5	131812	141319	199693	214772	379385	408119
6	93606	98849	107094	115397	260251	278904

Veh. Op Cost 1000 km

	Benefits, US \$, per year		
	2003	2010	2020
185.5	21428	1450707	48199
215.1	50282	3947216	108729
529.7	20934	4047712	32175
549.1	20915	4191847	42105
768.2	9507	2665658	15089
878.5	5243	1681100	8303
Total	17984241	33351616	55338608

AADT Vehicle input from JICASTRADA Traffic Model
Cars Pick-ups Buses L Goods M Goods H Goods

Capital Cost Estimate US \$ 51825

Passenger VOT, 2002	Benefits, US \$, per year		
	2003	2010	2020
2.84	858	913417	1025
1.09	1773	724434	2156
14.9	633	3535520	716
1.04	674	262758	952
1.04	376	146583	481
0.75	203	57072	189
Total	5639783	7941929	29818788

AADT Vehicle input from JICASTRADA Traffic Model
Cars Pick-ups Buses L Goods M Goods H Goods

Value of Time Factors	Base	1.027	1.239	2.678
Sensitivity		0.97	0.924	0.811

Occurrence probability 1/3
Restoration Cost 1000 US\$

<With Project>

Year	Capital Cost US\$	Maintenance Cost (US\$)	Total Cost (US \$)	Total Dis-counted Cost	Veh Km Benefits	Veh Hour Benefits	Ben	Total Benefits \$ US	Total Dis. Benefits \$ US	Benefits - Cost \$ US	Net Pre Value \$ US
2002											
2003	51825		51825	51825	739078	231772	0	667	667	-51159	-51159
2004	0	1037	1037	933	829298	201770	1	688045	619241	687009	618308
2005	0	1037	1037	840	919517	171768	0	667	540	-370	-300
2006	0	1037	1037	756	1009737	141766	0	667	486	-370	-270
2007	0	1037	1037	680	1099956	111764	0	667	437	-370	-243
2008	0	1037	1037	612	1190176	81762	0	667	394	-370	-218
2009	0	1037	1037	551	1280395	51761	0	667	354	-370	-197
2010	0	1037	1037	496	1370614	21759	0	667	319	-370	-177
2011	0	1037	1037	446	1460972	142126	0	667	287	-370	-159
2012	0	1037	1037	402	1551329	262493	0	667	258	-370	-143
2013	51825	0	51825	18070	1641687	382860	0	667	232	-51158	-17838
2014	0	1037	1037	325	1732044	503227	1	1490848	467844	1489811	467519
2015	0	1037	1037	293	1822402	623594	0	667	188	-370	-104
2016	0	1037	1037	263	1912759	743961	0	667	169	-370	-94
2017	0	1037	1037	237	2003117	864328	0	667	153	-370	-85
2018	0	1037	1037	213	2093474	984695	0	667	137	-370	-76
2019	0	1037	1037	192	2183832	1105063	0	667	124	-370	-69
2020	0	1037	1037	173	2274189	1225430	0	667	111	-370	-62
2021											
2022											
2023											
Total	103,650	16,584	120,235	77,307	27,114,577	7,851,900		2,189,560	1,091,941	2,069,325	1,014,634

B/C 14.12
EIRR 12%

Cost-Benefit Analysis

Site No	4	San Nicolás	A-Node	304	B-Node	1101
Site Name	NIC 1, 135.64		Link Length (km)	20.8		
Type of Disaster	Bridge Scouring		Permanent/Temporary (P/T)	T		
Discount Rate (%)	10		Discount Period	18		

Base Case	
Maintenance Cost per km	1340

Risk : Without Prevention Measures Road will fail in	years
Score	100
Benefit Factor	100

Mode	2003		2010		2020	
	Base	Disaster	Base	Disaster	Base	Disaster
1	287097	285605	391813	418104	713997	760768
2	470719	504343	691648	740532	1230274	1313252
3	161384	171408	199148	211679	271850	288832
4	192832	204035	309370	327249	560766	592874
5	131282	136891	199683	206529	379407	392346
6	93418	97176	107094	110753	260286	269366
Total	10853750	10853750	14716470	14716470	25938459	25938459

Capital Cost Estimate US \$ 30849

← AADT Vehicle Kilometres input from JICA STRADA Traffic Model

Cars Pick-ups Buses L Goods M Goods H Goods

Veh. Op Cost	Benefits, US \$, per year					
	2003		2010		2020	
1000 km						
185.5	18508	1253019	26291	1779940		3166466
215.1	33624	2639537	48884	3837471		6513903
529.7	10024	1938200	12531	2422943		3283570
549.1	11203	2245339	17879	3583362		6435181
768.2	5609	1572702	6846	1919543		3627954
878.5	3758	1204954	3659	1173211		2911385
Total	10853750	10853750	14716470	14716470	25938459	25938459

Capital Cost Estimate US \$ 30849

Passenger VOT, 2002	Benefits, US \$, per year					
	2003		2010		2020	
2.84	432	459902	588	755196		3542195
1.09	780	318702	1074	529413		2403638
14.9	255	1424262	303	2041705		7078251
1.04	260	101361	383	180134		914912
1.04	169	65885	224	105353		514384
0.75	96	26990	86	29169		208934
Total	2397100	2397100	3640971	3640971	14662314	14662314

← AADT Vehicle Hours input from JICA STRADA Traffic Model

Cars Pick-ups Buses L Goods M Goods H Goods

Value of Time Factors	Base Sensitivity	1.027	0.97	1.239	0.924	2.678	0.811
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Occurrence probability 1/3
Restoration Cost 1000 US\$

<With Project>

Year	Capital Cost US\$	Maintenance Cost (US\$)	Total Cost (US \$)	Total Discounted Cost	Veh Km Benefits	Veh Hour Benefits	Ben	Total Benefits \$ US	Total Dis. Benefits \$ US	Benefits - Cost \$ US	Net Pre Value \$ US
2002											
2003	30849		30849	30849	446045	98511	0	667	667	-30182	-30182
2004	0	617	617	555	468722	105814	1	383690	345321	383073	344766
2005	0	617	617	500	491399	113116	0	667	540	50	40
2006	0	617	617	450	514077	120419	0	667	486	50	38
2007	0	617	617	405	536754	127721	0	667	437	50	33
2008	0	617	617	364	559432	135024	0	667	394	50	29
2009	0	617	617	328	582109	142326	0	667	354	50	26
2010	0	617	617	295	604786	149629	0	667	319	50	24
2011	0	617	617	266	650904	194922	0	667	287	50	21
2012	0	617	617	239	697022	240215	0	667	258	50	19
2013	30849	0	30849	10756	743140	285509	0	667	232	-30182	-10524
2014	0	617	617	194	789257	330802	1	747373	234534	746756	234340
2015	0	617	617	174	835375	376095	0	667	188	50	14
2016	0	617	617	157	881493	421388	0	667	169	50	13
2017	0	617	617	141	927611	466881	0	667	153	50	11
2018	0	617	617	127	973729	511974	0	667	137	50	10
2019	0	617	617	114	1019846	557268	0	667	124	50	9
2020	0	617	617	103	1065964	602561	0	667	111	50	8
2021											
2022											
2023											
Total	61,697	9,872	71,569	46,016	12,787,665	4,979,973		1,141,730	584,712	1,070,161	538,695

B/C 12.71
EIRR 12%

Cost-Benefit Analysis

Site No	5	Las Chanillas	A-Node	303	B-Node	302
Site Name	NIC 1, 150.33		Link Length (km)		11.4	

Maintenance Cost per km	1340
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Type of Disaster	Bridge Scouring	Permanent/Temporary (P/T)	T
Discount Rate (%)	10	Discount Period	18

Risk : Without Prevention Measures Road will fail in	years
Score	90
Benefit Factor	90

Mode	2003		2010		2020	
	Base	Disaster	Base	Disaster	Base	Disaster
1	268075	283215	391813	413404	713975	755041
2	472217	494278	691648	725035	1230257	1290990
3	161758	169277	199148	208355	271850	285828
4	193383	202409	309370	325099	560748	589534
5	131812	137046	199683	207544	379385	393355
6	93606	96577	107094	110014	260251	267905

Base Case
 AADT Vehicle Kilometres input from JICA STRADA Traffic Model
 Cars Pick-ups Buses L Goods M Goods H Goods

Veh. Op Cost	Benefits, US \$, per year		
	2003	2010	2020
1000 km			
185.5	15140	1025000	21591
215.1	22061	1731823	33387
529.7	7519	1453843	9207
549.1	9026	1809018	15729
768.2	5234	1467556	7861
878.5	2971	952613	2920
Total	8439853	12155754	22391161

Capital Cost Estimate US \$ 233215

Mode	2003		2010		2020	
	Base	Disaster	Base	Disaster	Base	Disaster
1	4300	4879	6167	7004	11365	12907
2	7586	8369	10991	12143	19747	21785
3	2686	2940	3136	3445	4340	4785
4	3133	3485	4938	5522	9042	10067
5	2121	2400	3105	3531	6042	6764
6	1560	1692	1684	1821	4146	4507

AADT Vehicle Hours input from JICA STRADA Traffic Model
 Cars Pick-ups Buses L Goods M Goods H Goods

Passenger VOT, 2002	Benefits, US \$, per year		
	2003	2010	2020
2.84	579	616397	837
1.09	783	319927	1152
14.9	254	1418676	309
1.04	352	137227	584
1.04	279	108768	426
0.75	132	37111	137
Total	2638106	4246491	14973697

Value of Time Factors	Base Sensitivity	1.027	0.97
		1.239	0.924
		2.678	0.811

Occurrence probability 1/3
 Restoration Cost 1000 US\$

<With Project>

Year	Capital Cost US\$	Maintenance Cost (US\$)	Total Cost (US \$)	Total Discounted Cost	Veh Km Benefits	Veh Hour Benefits	Ben	Total Benefits \$ US	Total Dis. Benefits \$ US	Benefits - Cost \$ US	Net Pre Value \$ US
2002											
2003	233215		233215	233215	346843	108415	0	667	667	-232548	-232548
2004	0	4664	4664	4198	368659	117858	1	325011	292510	320347	288312
2005	0	4664	4664	3778	390474	127300	0	667	540	-3998	-3238
2006	0	4664	4664	3400	412290	136743	0	667	486	-3998	-2914
2007	0	4664	4664	3060	434105	146186	0	667	437	-3998	-2623
2008	0	4664	4664	2754	455921	156628	0	667	394	-3998	-2361
2009	0	4664	4664	2479	477736	165071	0	667	354	-3998	-2125
2010	0	4664	4664	2231	499552	174513	0	667	319	-3998	-1912
2011	0	4664	4664	2008	541615	218598	0	667	287	-3998	-1721
2012	0	4664	4664	1807	583678	262682	0	667	258	-3998	-1549
2013	233215	0	233215	81317	625741	306767	0	667	232	-232548	-81084
2014	0	4664	4664	1464	667805	350851	1	679771	213319	675106	211855
2015	0	4664	4664	1317	709868	394935	0	667	188	-3998	-1129
2016	0	4664	4664	1186	751931	439020	0	667	169	-3998	-1016
2017	0	4664	4664	1067	793995	483104	0	667	153	-3998	-915
2018	0	4664	4664	960	836058	527189	0	667	137	-3998	-823
2019	0	4664	4664	864	878121	571273	0	667	124	-3998	-741
2020	0	4664	4664	778	920185	615357	0	667	111	-3998	-667
2021											
2022											
2023											
Total	466,429	74,629	541,058	347,883	10,894,577	5,301,490		1,015,448	510,686	474,390	162,803

B/C 1.47
 EIRR 0%

Cost-Benefit Analysis

Site No	6	San Ramon	A-Node	303	B-Node	302
Site Name	NIC 1, 151.9		Link Length (km)	11.4		
Type of Disaster	Bridge Scouring		Permanent/Temporary (P/T)	T		
Discount Rate (%)	10		Discount Period	18		

Base Case	
Maintenance Cost per km	1340

Risk : Without Prevention Measures Road will fail in	years
Score	100
Benefit Factor	100

Mode	2003		2010		2020	
	Base	Disaster	Base	Disaster	Base	Disaster
1	258075	283215	391813	413404	713975	755041
2	472217	494278	691648	725035	1230257	1290990
3	161758	169277	199148	208355	271850	285828
4	193388	202409	309370	325099	560748	589534
5	131812	137046	199683	207544	379385	393355
6	93606	96577	107094	110014	260251	267905

Veh. Op Cost 1000 km

	2003	2010	2020
185.5	15140	1025000	21591
215.1	22061	1731823	33387
529.7	7519	1453843	9207
549.1	9026	1809018	15729
768.2	5234	1467556	7861
878.5	2971	952613	2920
Total	8439853	12155754	22391161

ADT Vehicle Kilometres input from JICASTRADA Traffic Model
 Cars Pick-ups Buses L Goods M Goods H Goods

Capital Cost Estimate US \$	11105
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Passenger VOT, 2002	2003		2010		2020	
	2.84	579	616397	837	1074999	4280615
1.09	783	319927	1152	567862	2171371	
14.9	254	1418676	309	2082135	6481115	
1.04	352	137227	584	274669	1041983	
1.04	279	108768	426	200358	733963	
0.75	132	37111	137	46467	264650	
Total	2638106	4246491	14973697			

ADT Vehicle Hours input from JICASTRADA Traffic Model
 Cars Pick-ups Buses L Goods M Goods H Goods

Value of Time Factors	Base Sensitivity	1.027	0.97	1.239	0.924	2.678	0.811	Occurrence probability	1/3	Restoration Cost	1000 US\$
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<With Project>

Year	Capital Cost US\$	Maintenance Cost (US\$)	Total Cost (US \$)	Total Discounted Cost	Veh Km Benefits	Veh Hour Benefits	Ben	Total Benefits \$ US	Total Dis. Benefits \$ US	Benefits - Cost \$ US	Net Pre Value \$ US
2002											
2003	11105		11105	11105	346843	108415	0	667	667	-10439	-10439
2004	0	222	222	200	368659	117858	1	325011	292510	324789	292310
2005	0	222	222	180	390474	127300	0	667	540	445	360
2006	0	222	222	162	412290	136743	0	667	486	445	324
2007	0	222	222	146	434105	146186	0	667	437	445	292
2008	0	222	222	131	455921	155628	0	667	394	445	263
2009	0	222	222	118	477736	165071	0	667	354	445	236
2010	0	222	222	106	499552	174513	0	667	319	445	213
2011	0	222	222	96	541615	218588	0	667	287	445	191
2012	0	222	222	86	583678	262682	0	667	258	445	172
2013	11105	0	11105	3872	625741	306767	0	667	232	-10439	-3640
2014	0	222	222	70	667805	350851	1	679771	213319	679548	213249
2015	0	222	222	63	709868	394935	0	667	188	445	126
2016	0	222	222	56	751931	439020	0	667	169	445	113
2017	0	222	222	51	793995	483104	0	667	153	445	102
2018	0	222	222	46	836058	527189	0	667	137	445	92
2019	0	222	222	41	878121	571273	0	667	124	445	82
2020	0	222	222	37	920185	615357	0	667	111	445	74
2021											
2022											
2023											
Total	22,211	3,554	25,765	16,566	10,694,577	5,301,490		1,015,448	510,686	989,684	494,120

B/C 30.83
 EIRR 30%

Cost-Benefit Analysis

Site No	7	N001A240	A-Node	302	B-Node	301
Site Name	NIC 1, 168.4		Link Length (km)	26.0		

Base Case	
Maintenance Cost per km	1340

Type of Disaster	Rock Fall	Permanent/Temporary (P/T)	T
Discount Rate (%)	10	Discount Period	18

Risk : Without Prevention Measures Road will fail in	years
Score	84
Benefit Factor	84

Mode	2003		2010		2020	
	Base	Disaster	Base	Disaster	Base	Disaster
1	268075	277292	391813	404830	713975	737697
2	472217	486793	691648	713654	1230257	1267254
3	161758	166566	199148	205011	271850	280087
4	193383	198866	309370	318958	560748	578093
5	131812	134526	199683	203777	379385	386096
6	93606	95278	107094	109679	250251	254403
Total	5093899	5201199	7320199	7430199	12792322	12902322

AADT Vehicle Kilometres input from JICASTRADA Traffic Model
Cars Pick-ups Buses L Goods M Goods H Goods

Veh. Op Cost	Benefits, US \$, per year		
	2003	2010	2020
1000 km			
185.5	9217	624005	13017
215.1	14576	1144239	22006
529.7	4808	929655	5863
549.1	5483	1098919	9588
768.2	2714	760976	4094
878.5	1672	536105	1585
Total	5093899	7320199	12792322

Capital Cost Estimate US \$ 32082

Mode	2003		2010		2020	
	Base	Disaster	Base	Disaster	Base	Disaster
1	4300	4688	6167	6726	11365	12375
2	7586	8106	10991	11739	19747	21043
3	2686	2851	3136	3333	4340	4617
4	3133	3363	4938	5316	9042	9698
5	2121	2314	3105	3398	6042	6528
6	1560	1653	1684	1780	4146	4400

AADT Vehicle Hours input from JICASTRADA Traffic Model
Cars Pick-ups Buses L Goods M Goods H Goods

Passenger VOT, 2002	Benefits, US \$, per year		
	2003	2010	2020
2.84	388	413060	559
1.09	520	212468	748
14.9	165	921581	197
1.04	230	89665	378
1.04	193	75241	293
0.75	93	26146	96
Total	1738161	2762260	9566030

Value of Time	Base	1.027	1.239	2.678
Factors Sensitivity		0.97	0.924	0.811

Occurrence probability 1/3
Restoration Cost 2000 US\$

Year	Capital Cost US\$	Maintenance Cost (US\$)	Total Cost (US \$)	Total Dis-counted Cost	Veh Km Benefits	Veh Hour Benefits	Ben	Total Benefits \$ US	Total Dis. Benefits \$ US	Benefits - Cost \$ US	Net Pre Value \$ US
2002											
2003	32082		32082	32082	628015	214234	0	1333	1333	-30749	-30749
2004	0	642	642	577	667226	232331	1	601038	540934	600396	540356
2005	0	642	642	520	706436	250368	0	1333	1080	692	560
2006	0	642	642	468	745647	268405	0	1333	972	692	504
2007	0	642	642	421	784858	286442	0	1333	875	692	454
2008	0	642	642	379	824069	304479	0	1333	787	692	408
2009	0	642	642	341	863280	322516	0	1333	709	692	368
2010	0	642	642	307	902490	340553	0	1333	638	692	331
2011	0	642	642	276	969955	424435	0	1333	574	692	298
2012	0	642	642	249	1037419	508317	0	1333	517	692	268
2013	32082	0	32082	11186	1104884	592199	0	1333	465	-30749	-10722
2014	0	642	642	201	1172348	676081	1	1233620	387123	1232978	386922
2015	0	642	642	181	1239813	759963	0	1333	377	692	195
2016	0	642	642	163	1307278	843845	0	1333	339	692	176
2017	0	642	642	147	1374742	927727	0	1333	305	692	158
2018	0	642	642	132	1442207	1011609	0	1333	275	692	142
2019	0	642	642	118	1509671	1095491	0	1333	247	692	128
2020	0	642	642	107	1577136	1179374	0	1333	222	692	115
2021											
2022											
2023											
Total	64,165	10,266	74431	47,857	18,857,473	10,238,427		1,855,991	937,770	1,781,559	889,914

B/C 19.60
EIRR 19%

Cost-Benefit Analysis

Site No	8	N001B230	A-Node	302	B-Node	301
Site Name	NIC 1, 168.6		Link Length (km)	26.0		
Type of Disaster	Rock Collapse		Permanent/Temporary (P/T)	T		
Discount Rate (%)	10		Discount Period	18		

Base Case
Maintenance Cost per km
1340

Risk : Without Prevention Measures Road will fail in	years
Score	72
Benefit Factor	72

Mode	2003		2010		2020	
	Base	Disaster	Base	Disaster	Base	Disaster
1	268075	277292	391813	404830	713975	737697
2	472217	486793	691648	713654	1230257	1267254
3	161758	166566	199148	205011	271850	280087
4	193363	198866	309370	318958	560748	578093
5	131812	134526	199683	203777	379385	386096
6	93606	95278	107094	108679	260251	264403
Total	8675972	8921401	12430102	12644371	21726705	2228072

AAADT Vehicle Kilometres input from JICA STRADA Traffic Model

Cars Pick-ups Buses L Goods M Goods H Goods

Veh. Op Cost 1000 km	Benefits, US \$, per year					
	2003	2010		2020		
341.9	9217	1150222	13017	1624437	2960351	
365.6	14576	1945080	22006	2936569	4937028	
909.8	4808	1596626	5863	1946967	2735318	
891.9	5483	1784955	9588	3121311	5646552	
1289.8	2714	1277689	4094	1927361	3159384	
1509.8	1672	921401	1585	873457	2288072	
Total	8675972	12430102	12644371	21726705	2228072	

Capital Cost Estimate US \$
7404

Mode	2003		2010		2020	
	Base	Disaster	Base	Disaster	Base	Disaster
1	4300	4688	6167	6726	11365	12375
2	7586	8106	10991	11739	19747	21043
3	2686	2851	3136	3333	4340	4617
4	3133	3363	4938	5316	9042	9698
5	2121	2314	3105	3398	6042	6528
6	1560	1653	1684	1780	4146	4400
Total	1738161	1862161	2762260	2966030	9566030	10222030

AAADT Vehicle Hours input from JICA STRADA Traffic Model

Cars Pick-ups Buses L Goods M Goods H Goods

Passenger VOT, 2002	Benefits, US \$, per year					
	2003	2010		2020		
2.84	388	413060	559	717950	2803775	
1.09	520	212468	748	368716	1380813	
14.9	165	921581	197	1327445	4034312	
1.04	230	89665	378	177783	666869	
1.04	193	75241	293	137805	494052	
0.75	93	26146	96	32561	186208	
Total	1738161	2762260	9566030	10222030	10222030	

Value of Time Factors	Base	1.027	1.239	2.678
Sensitivity	0.97	0.924	0.811	

Occurrence probability 1/3
Restoration Cost 2000 US\$

<With Project>

Year	Capital Cost US\$	Maintenance Cost (US\$)	Total Cost (US \$)	Total Discounted Cost	Veh Km Benefits	Veh Hour Benefits	Ben	Total Benefits \$ US	Total Dis. Benefits \$ US	Benefits - Cost \$ US	Net Pre Value \$ US
2002											
2003	7404		7404	7404	178273	35716	0	1333	1333	-6070	-6070
2004	0	148	148	133	189293	38722	1	153343	138009	153195	137876
2005	0	148	148	120	200313	41728	0	1333	1080	1185	960
2006	0	148	148	108	211333	44734	0	1333	972	1185	864
2007	0	148	148	97	222353	47740	0	1333	875	1185	778
2008	0	148	148	87	233373	50746	0	1333	787	1185	700
2009	0	148	148	79	244393	53753	0	1333	709	1185	630
2010	0	148	148	71	255413	56759	0	1333	638	1185	567
2011	0	148	148	64	274516	70739	0	1333	574	1185	510
2012	0	148	148	57	293618	84719	0	1333	517	1185	459
2013	7404	0	7404	2581	312721	98700	0	1333	465	-6070	-2117
2014	0	148	148	46	331823	112680	1	297669	93412	297521	93365
2015	0	148	148	42	350926	126661	0	1333	377	1185	335
2016	0	148	148	38	370029	140641	0	1333	339	1185	301
2017	0	148	148	34	389131	154621	0	1333	305	1185	271
2018	0	148	148	30	408234	168602	0	1333	275	1185	244
2019	0	148	148	27	427337	182582	0	1333	247	1185	220
2020	0	148	148	25	446439	196562	0	1333	222	1185	198
2021											
2022											
2023											
Total	14,807	2,369	17,176	11,044	5,339,520	1,706,405		472,346	241,134	455,169	230,091

B/C 21.83
EIRR 24%

Cost-Benefit Analysis

Site No	12	N001B150	A-Node	302	B-Node	301
Site Name	NIC 1, 175.0		Link Length (km)	26.0		
Type of Disaster	Rock Collapse		Permanent/Temporary (P/T)	P		
Discount Rate (%)	10		Discount Period	18		

Base Case	
Maintenance Cost per km	1340

Risk: Without Prevention Measures Road will fail in	years
Score	76
Benefit Factor	76

Mode	2003		2010		2020	
	Base	Disaster	Base	Disaster	Base	Disaster
1	268075	277292	391813	404830	713975	737697
2	472217	486793	691648	713654	1230257	1267254
3	161758	166566	199148	205011	271850	280087
4	193383	198866	309370	318958	560748	578093
5	131812	134526	199683	203777	379385	386096
6	93606	95278	107094	108679	260251	264403

ADT Vehicle input from JICASTRADA Traffic Model
 Cars Pick-ups Buses L Goods M Goods H Goods

Veh. Op Cost	Benefits, US \$, per year					
	2003		2010		2020	
1000 km						
185.5	9217	624005	13017	881270	1606015	
215.1	14576	1144239	22006	1727506	2904323	
529.7	4808	929655	5863	1133646	1592673	
549.1	5483	1098919	9588	1921655	3476336	
768.2	2714	760976	4094	1147913	1881691	
878.5	1672	536105	1585	508210	1331285	
Total		5093899		7320199		12792322

Capital Cost Estimate US \$	33316
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Mode	2003		2010		2020	
	Base	Disaster	Base	Disaster	Base	Disaster
1	4300	4698	6167	6726	11365	12375
2	7586	8106	10991	11739	19747	21043
3	2686	2851	3136	3333	4340	4617
4	3133	3363	4938	5316	9042	9698
5	2121	2314	3105	3398	6042	6528
6	1560	1653	1684	1780	4146	4400

ADT Vehicle input from JICASTRADA Traffic Model
 Cars Pick-ups Buses L Goods M Goods H Goods

Passenger VOT, 2002	Benefits, US \$, per year					
	2003		2010		2020	
2.84	388	413060	559	717950	2803775	
1.09	520	212468	748	368716	1380813	
14.9	165	921581	197	1327445	4034312	
1.04	230	89665	378	177783	666869	
1.04	193	75241	293	137805	494052	
0.75	93	26146	96	32561	186208	
Total		1738161		2762260		9566930

Occurrence probability 1/3
 Restoration Cost 2000 US\$

Value of Time	Base	1.027	1.239	2.678
Factors Sensitivity		0.97	0.924	0.811

<With Project>

Year	Capital Cost US\$	Maintenance Cost (US\$)	Total Cost (US \$)	Total Discounted Cost	Veh Km Benefits	Veh Hour Benefits	Ben	Total Benefits \$ US	Total Dis. Benefits \$ US	Benefits - Cost \$ US	Net Pre Value \$ US
2002											
2003	33316		33316	33316	837353	285725	0	1333	1333	-31983	-31983
2004	0	666	666	600	899634	309774	1	800939	720845	800273	720246
2005	0	666	666	540	941915	333824	0	1333	1080	667	540
2006	0	666	666	486	994196	357873	0	1333	972	667	486
2007	0	666	666	437	1046477	381922	0	1333	875	667	438
2008	0	666	666	393	1098758	405972	0	1333	787	667	394
2009	0	666	666	354	1151039	430021	0	1333	709	667	354
2010	0	666	666	319	1203320	454070	0	1333	638	667	319
2011	0	666	666	287	1293273	565913	0	1333	574	667	287
2012	0	666	666	258	1383226	677756	0	1333	517	667	258
2013	0	666	666	232	1473179	789599	0	1333	465	667	233
2014	0	666	666	209	1563131	901441	0	1333	418	667	209
2015	0	666	666	188	1653084	1013284	0	1333	377	667	188
2016	0	666	666	169	1743037	1125127	0	1333	339	667	170
2017	0	666	666	152	1832989	1236970	0	1333	305	667	153
2018	0	666	666	137	1922942	1348812	0	1333	275	667	137
2019	0	666	666	123	2012895	1460655	0	1333	247	667	124
2020	0	666	666	111	2102847	1572498	0	1333	222	667	111
2021											
2022											
2023											
Total	33,316	11,328	44644	38,313	25,143,298	13,651,237		823,606	730,977	778,962	692,664

B/C 19.08
 EIRR 24%

Cost-Benefit Analysis

Site No	18	Rio Infall	A-Node	405	B-Node	404
Site Name	NIC 1, 226.9		Link Length (km)	18.7		
Type of Disaster	Bridge Scouring		Permanent/Temporary (P/T)	T		
Discount Rate (%)	10		Discount Period	18		

Base Case	
Maintenance Cost per km	1340

Risk : Without Prevention Measures Road will fail in	years
Score	100
Benefit Factor	100

Mode	2003		2010		2020	
	Base	Disaster	Base	Disaster	Base	Disaster
1	268075	268115	391813	391891	713975	714321
2	472217	472678	691648	692283	1230257	1231245
3	161758	161746	199148	199141	271850	271839
4	193383	193290	309370	309245	560748	560748
5	131812	131637	199683	199406	379385	378861
6	93606	94105	107094	107553	260251	261674
Total	128866	128866	98228	98228	408200	408200

ADT Vehicle Kilometres input from JICA STRADA Traffic Model

Cars Pick-ups Buses L Goods M Goods H Goods

Capital Cost Estimate US \$	1021702
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Veh. Op Cost	Benefits, US \$, per year		
	2003	2010	2020
1000 km	40	78	5281
185.5	461	635	49848
215.1	-12	-7	-1353
529.7	-93	-125	-25053
549.1	-175	-277	-77668
768.2	499	458	147172
878.5			
Total	128866	98228	408200

ADT Vehicle Hours input from JICA STRADA Traffic Model

Cars Pick-ups Buses L Goods M Goods H Goods

Passenger VOT, 2002	2.84	39	8	31	20	21
		24486	15935	44683	12085	7797
		31	55	10	45	33
		39815	27111	67383	21165	15521
		185993	80974	160207	70143	47779
		5904	20	6784	41054	
Total	110890	177778	586150			

Occurrence probability 1/3
Restoration Cost 5000 US\$

Year	Capital Cost US\$	Maintenance Cost (US\$)	Total Cost (US \$)	Total Discounted Cost	Veh Km Benefits	Veh Hour Benefits	Ben	Total Benefits \$ US	Total Dis. Benefits \$ US	Benefits - Cost \$ US	Net Pre Value \$ US
2002											
2003	1021702		1021702	1021702	190653	164056	0	3333	3333	-1018369	-1018369
2004	0	20434	20434	18391	184178	178193	1	244914	220422	224479	202032
2005	0	20434	20434	16552	177702	192330	0	3333	2700	-17101	-13852
2006	0	20434	20434	14896	171226	206467	0	3333	2430	-17101	-12466
2007	0	20434	20434	13407	164750	220603	0	3333	2187	-17101	-11220
2008	0	20434	20434	12066	158274	234740	0	3333	1968	-17101	-10098
2009	0	20434	20434	10859	151799	248877	0	3333	1771	-17101	-9088
2010	0	20434	20434	9774	145323	263014	0	3333	1594	-17101	-8179
2011	0	20434	20434	8796	139182	277441	0	3333	1435	-17101	-7361
2012	0	20434	20434	7917	133704	291847	0	3333	1291	-17101	-6625
2013	1021702	0	1021702	356246	282900	444264	0	3333	1162	-1018369	-355083
2014	0	20434	20434	6412	328759	504681	1	558960	175407	538526	168995
2015	0	20434	20434	5771	374618	565097	0	3333	941	-17101	-4830
2016	0	20434	20434	5194	420477	625514	0	3333	847	-17101	-4347
2017	0	20434	20434	4675	466336	685930	0	3333	763	-17101	-3912
2018	0	20434	20434	4207	512195	746347	0	3333	686	-17101	-3521
2019	0	20434	20434	3786	558054	806764	0	3333	618	-17101	-3169
2020	0	20434	20434	3408	603913	867180	0	3333	556	-17101	-2852
2021											
2022											
2023											
Total	2,043,405	326,945	2370350	1,524,059	5,919,377	7,661,336		857,206	420,114	-1,513,143	-1,103,945

B/C 0.28
EIRR #DIV/0!

Cost-Benefit Analysis

Site No	19	Rio Tapacalí	A-Node	405	B-Node	404
Site Name	NIC 1, 233.2		Link Length (km)	18.7		

Base Case	
Maintenance Cost per km	1340

Type of Disaster	Bridge Scouring	Permanent/Temporary (P/T)	T
Discount Rate (%)	10	Discount Period	18

Risk : Without Prevention Measures Road will fail in	years
Score	100
Benefit Factor	100

Mode	2003		2010		2020	
	Base	Disaster	Base	Disaster	Base	Disaster
1	268075	268115	391813	391891	713975	714321
2	472217	472678	691648	692283	1230257	1231245
3	161758	161746	199148	199141	271850	271839
4	193383	193290	309370	309245	560748	560748
5	131812	131637	199683	199406	379385	378861
6	93606	94105	107094	107553	260251	261674

AADT Vehicle Kilometres input from JICA STRADA Traffic Model
 Cars Pick-ups Buses L Goods M Goods H Goods

Veh. Op Cost	Benefits, US \$, per year		
	2003	2010	2020
1000 km	40	78	5281
185.5	2708	635	49848
215.1	461	-7	77560
529.7	-12	-1353	-2127
549.1	-93	-25053	0
768.2	-175	-77668	-146924
878.5	499	147172	456267
Total	128668	98228	408200

Capital Cost Estimate US \$	347971
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Passenger VOT, 2002	Benefits, US \$, per year		
	2003	2010	2020
2.84	23	31	39815
1.09	39	55	27111
14.9	8	10	67383
1.04	31	45	21165
1.04	20	33	15521
0.75	21	20	6784
Total	110890	177778	586150

AADT Vehicle Hours input from JICA STRADA Traffic Model
 Cars Pick-ups Buses L Goods M Goods H Goods

Value of Time Factors	Base Sensitivity	1.027	0.97
		1.239	0.924
		2.678	0.811

Occurrence probability 1/3
 Restoration Cost 1000 US\$

<With Project>

Year	Capital Cost US\$	Maintenance Cost (US\$)	Total Cost (US \$)	Total Discounted Cost	Veh Km Benefits	Veh Hour Benefits	Ben	Total Benefits \$ US	Total Dis. Benefits \$ US	Benefits - Cost \$ US	Net Pre Value \$ US
2002											
2003	347971		347971	347971	105919	91142	0	667	667	-347304	-347304
2004	0	6959	6959	6263	102321	98996	1	134878	121390	127918	115127
2005	0	6959	6959	5837	98723	106850	0	667	540	-6293	-5097
2006	0	6959	6959	5073	95126	114704	0	667	486	-6293	-4587
2007	0	6959	6959	4566	91528	122557	0	667	437	-6293	-4129
2008	0	6959	6959	4109	87930	130411	0	667	394	-6293	-3716
2009	0	6959	6959	3699	84333	138265	0	667	354	-6293	-3344
2010	0	6959	6959	3329	80735	146119	0	667	319	-6293	-3010
2011	0	6959	6959	2996	106212	179684	0	667	287	-6293	-2709
2012	0	6959	6959	2696	131689	213249	0	667	258	-6293	-2438
2013	347971	0	347971	121330	157167	246813	0	667	232	-347304	-121098
2014	0	6959	6959	2184	182644	280378	1	309348	97077	302388	94893
2015	0	6959	6959	1966	208121	313943	0	667	188	-6293	-1777
2016	0	6959	6959	1769	233598	347508	0	667	169	-6293	-1600
2017	0	6959	6959	1592	259075	381072	0	667	153	-6293	-1440
2018	0	6959	6959	1433	284553	414637	0	667	137	-6293	-1296
2019	0	6959	6959	1290	310030	448202	0	667	124	-6293	-1166
2020	0	6959	6959	1161	335507	481767	0	667	111	-6293	-1049
2021											
2022											
2023											
Total	695,942	111,351	807,293	519,064	2,955,209	4,256,298		454,892	223,324	-352,401	-295,740

B/C 0.43
 EIRR #DIV/0!

Cost-Benefit Analysis

Site No	24	N003B400	A-Node	1115	B-Node	1102
Site Name	NIC 3, 6.9		Link Length (km)	9.0		
Type of Disaster	Rock Collapse		Permanent/Temporary (P/T)	P		
Discount Rate (%)	10		Discount Period	18		

Base Case	
Maintenance Cost per km	1340

Risk : Without Prevention Measures Road will fail in	years
Score	72
Benefit Factor	72

Mode	2003		2010		2020	
	Base	Disaster	Base	Disaster	Base	Disaster
1	268075	285360	391813	417062	713975	757858
2	472217	505010	691648	739359	1230257	1312652
3	161758	169090	199148	207977	271850	284020
4	193383	205837	308370	328691	560748	594278
5	131812	135869	199683	205365	379385	389506
6	93606	94563	107094	108290	260251	263698
Veh. Op Cost						
1000 km	Benefits, US \$, per year					
185.5	2003		2010		2020	
215.1	17285	1170220	25249	1709395	2970944	6468137
529.7	32793	2574302	47711	3745388	2353141	6720182
549.1	7332	1417685	8829	1707139	2837817	1105236
768.2	12454	2496068	19321	3872372	2837817	1105236
878.5	4057	1137538	5682	1593170	2837817	1105236
	957	306850	1196	383482	22455458	
Total	9102663		13010947		22455458	

ADT Vehicle input from JICA STRADA Traffic Model
 Cars Pick-ups Buses L Goods M Goods H Goods

Capital Cost Estimate US \$	49358
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Passenger VOT, 2002	2003		2010		2020	
	Base	Disaster	Base	Disaster	Base	Disaster
2.84	432	459902	593	761618	3192417	2290701
1.09	823	336271	1129	556525	6262650	861034
14.9	242	1351652	282	1900201	330385	81374
1.04	303	118124	436	205061	11532	81374
1.04	128	49901	182	85599	11532	81374
0.75	33	9278	34	11532	81374	81374
Total	2325128		3520536		13018561	

ADT Vehicle input from JICA STRADA Traffic Model
 Cars Pick-ups Buses L Goods M Goods H Goods

Value of Time Factors	Base Sensitivity	1.027 0.97	1.239 0.924	2.678 0.811	Occurrence probability 1/3	Restoration Cost 2000 US\$
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<With Project>

Year	Capital Cost US\$	Maintenance Cost (US\$)	Total Cost (US \$)	Total Dis-counted Cost	Veh Km Benefits	Veh Hour Benefits	Ben	Total Benefits \$ US	Total Dis. Benefits \$ US	Benefits - Cost \$ US	Net Pre Value \$ US
2002											
2003	49358		49358	49358	2244492	573319	0	1333	1333	-48024	-48024
2004	0	987	987	888	2382162	615428	1	1999726	1799754	1998739	1798865
2005	0	987	987	800	2519831	657536	0	1333	1080	348	280
2006	0	987	987	720	2657501	699644	0	1333	972	348	252
2007	0	987	987	648	2795170	741753	0	1333	875	348	227
2008	0	987	987	583	2932840	783861	0	1333	787	348	204
2009	0	987	987	525	3070509	825969	0	1333	709	348	184
2010	0	987	987	472	3208179	868077	0	1333	638	348	166
2011	0	987	987	425	3441057	1102275	0	1333	574	348	149
2012	0	987	987	382	3673935	1336473	0	1333	517	348	134
2013	0	987	987	344	3906814	1570671	0	1333	465	348	121
2014	0	987	987	310	4139692	1804869	0	1333	418	348	109
2015	0	987	987	279	4372570	2039067	0	1333	377	348	98
2016	0	987	987	251	4605449	2273265	0	1333	339	348	88
2017	0	987	987	226	4838327	2507463	0	1333	305	348	79
2018	0	987	987	203	5071206	2741660	0	1333	275	348	71
2019	0	987	987	183	5304084	2975858	0	1333	247	348	64
2020	0	987	987	165	5536962	3210056	0	1333	222	348	58
2021											
2022											
2023											
Total	49,358	16,782	66,139	56,760	66,700,781	27,327,245		2,022,393	1,809,886	1,956,254	1,753,125
										B/C	31.89
										EIRR	41%

Cost-Benefit Analysis

Site No	25	N003B370	A-Node	1115	B-Node	1102
Site Name	NIC 3, 7.4		Link Length (km)	9.0		

Base Case	
Maintenance Cost per km	1340

Type of Disaster	Rock Collapse	Permanent/Temporary (P/T)	P
Discount Rate (%)	10	Discount Period	18

Risk : Without Prevention Measures Road will fail in		years	
Score	80	Benefit Factor	80

Mode	2003		2010		2020	
	Base	Disaster	Base	Disaster	Base	Disaster
1	268075	285360	391813	417062	713975	757858
2	472217	505010	691648	739359	1230257	1312652
3	161758	169090	199148	207977	271850	294020
4	193383	205837	309370	328691	560748	594278
5	131812	135869	199683	205365	379385	389506
6	93606	94563	107094	108290	260251	263698

← AADT Vehicle Kilometres input from JICASTRADA Traffic Model
Cars Pick-ups Buses L Goods M Goods H Goods

Veh. Op Cost 1000 km	Benefits, US \$, per year		
	2003	2010	2020
185.5	17285	1170220	25249
215.1	32793	2574302	47711
529.7	7332	1417685	8829
549.1	12454	2496068	19321
768.2	4057	1137538	5682
878.5	957	308850	1196
Total		9102663	13010947

Capital Cost Estimate US \$	215940
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1	4300	4732	6167	6760	11365	12515
2	7586	8409	10991	12120	19747	21897
3	2686	2928	3136	3418	4340	4770
4	3133	3436	4938	5374	9042	9889
5	2121	2249	3105	3287	6042	6367
6	1560	1593	1684	1718	4146	4257

← AADT Vehicle Hours input from JICASTRADA Traffic Model
Cars Pick-ups Buses L Goods M Goods H Goods

Passenger VOT, 2002	Benefits, US \$, per year		
	2003	2010	2020
2.84	432	459902	593
1.09	823	336271	1129
14.9	242	1351652	282
1.04	303	118124	436
1.04	128	49901	182
0.75	33	9278	34
Total		2325128	3520536

Value of Time	Base	1.027	1.239	2.678
Factors Sensitivity		0.97	0.924	0.811

Occurrence probability 1/3
Restoration Cost 2000 US\$

<With Project>											
Year	Capital Cost US\$	Maintenance Cost (US\$)	Total Cost (US \$)	Total Dis-counted Cost	Veh Km Benefits	Veh Hour Benefits	Ben	Total Benefits	Total Dis. Benefits	Benefits - Cost	Net Pre Value
								\$ US	\$ US	\$ US	\$ US
2002											
2003	215940		215940	215940	1122246	286660	0	1333	1333	-214606	-214606
2004	0	4319	4319	3887	1191081	307714	1	1000530	900477	996211	896590
2005	0	4319	4319	3498	1259916	328768	0	1333	1080	-2985	-2418
2006	0	4319	4319	3148	1328750	349822	0	1333	972	-2985	-2178
2007	0	4319	4319	2834	1397585	370876	0	1333	875	-2985	-1959
2008	0	4319	4319	2550	1466420	391930	0	1333	787	-2985	-1763
2009	0	4319	4319	2295	1535255	412985	0	1333	709	-2985	-1587
2010	0	4319	4319	2066	1604089	434039	0	1333	638	-2985	-1428
2011	0	4319	4319	1859	1720529	551138	0	1333	574	-2985	-1285
2012	0	4319	4319	1673	1836968	668237	0	1333	517	-2985	-1157
2013	0	4319	4319	1506	1953407	785336	0	1333	465	-2985	-1041
2014	0	4319	4319	1355	2069846	902434	0	1333	418	-2985	-937
2015	0	4319	4319	1220	2186285	1019533	0	1333	377	-2985	-843
2016	0	4319	4319	1098	2302724	1136632	0	1333	339	-2985	-769
2017	0	4319	4319	988	2419164	1253731	0	1333	305	-2985	-683
2018	0	4319	4319	889	2535603	1370830	0	1333	275	-2985	-615
2019	0	4319	4319	800	2652042	1487929	0	1333	247	-2985	-553
2020	0	4319	4319	720	2768481	1605028	0	1333	222	-2985	-498
2021											
2022											
2023											
Total	215,940	73,419	289,359	248,326	33,350,390	13,663,622		1,023,196	910,609	733,837	662,283

B/C 3.67
EIRR 4%

Cost-Benefit Analysis

Site No	27	N003B320	A-Node	1116	B-Node	1103
Site Name	NIC 3, 22.1		Link Length (km)	13.0		
Type of Disaster	Rock Collapse		Permanent/Temporary (P/T)	P		
Discount Rate (%)	10		Discount Period	18		

Base Case	
Maintenance Cost per km	1340

Risk : Without Prevention Measures Road will fail in	years
Score	74
Benefit Factor	74

Mode	2003		2010		2020	
	Base	Disaster	Base	Disaster	Base	Disaster
1	268075	284859	390157	403981	710529	734347
2	472217	504008	687643	713452	1222922	1267241
3	161758	169090	198464	204131	270874	278928
4	193383	204835	307556	317340	556835	574399
5	131812	135869	198831	201147	377752	382686
6	93606	94563	106710	107223	259277	261018
Veh. Op Cost	Benefits, US \$, per year					
1000 km	2003		2010		2020	
185.5	16784	1136302	13824	935905	1612514	1612514
215.1	31791	2495643	25809	2026047	3479111	3479111
529.7	7332	1417685	5667	1095748	1557288	1557288
549.1	11452	2295244	9784	1960938	3520229	3520229
768.2	4057	1137538	2316	649381	1383439	1383439
878.5	957	306850	513	164487	558229	558229
Total	8789262		6832506		12110811	

← AADT Vehicle Kilometres input from JICA STRADA Traffic Model

Cars Pick-ups Buses L Goods M Goods H Goods

Capital Cost Estimate US \$	294912
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Mode	2003		2010		2020	
	Base	Disaster	Base	Disaster	Base	Disaster
1	4229	4357	6138	6536	11289	11910
2	7581	7771	10923	11633	19581	20690
3	2686	2721	3124	3336	4134	4585
4	3128	3227	4903	5151	8959	9344
5	2114	2153	3091	3202	6007	6163
6	1560	1580	1678	1690	4126	4167
Passenger VOT, 2002	Benefits, US \$, per year					
2.84	2003		2010		2020	
1.09	128	136267	398	511170	1723905	1723905
14.9	190	77632	710	349985	1181576	1181576
1.04	35	195487	212	1428520	6568501	6568501
1.04	99	38595	248	116640	391379	391379
0.75	39	15204	111	52206	158585	158585
	20	5623	12	4070	30057	30057
Total	468809		2462591		10054002	

← AADT Vehicle Hours input from JICA STRADA Traffic Model

Cars Pick-ups Buses L Goods M Goods H Goods

Value of Time Factors	Base Sensitivity	1.027	0.97	1.239	0.924	2.678	0.811
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Occurrence probability 1/3
Restoration Cost 2000 US\$

<With Project>

Year	Capital Cost US\$	Maintenance Cost (US\$)	Total Cost (US \$)	Total Dis-counted Cost	Veh Km Benefits	Veh Hour Benefits	Ben	Total Benefits \$ US	Total Dis. Benefits \$ US	Benefits - Cost \$ US	Net Pre Value \$ US
2002											
2003	294912		294912	294912	722405	38532	0	1333	1333	-293578	-293578
2004	0	5898	5898	5308	699430	61943	1	508915	458023	503017	452715
2005	0	5898	5898	4778	676454	85353	0	1333	1080	-4565	-3698
2006	0	5898	5898	4300	653478	108763	0	1333	972	-4565	-3328
2007	0	5898	5898	3870	630503	132174	0	1333	875	-4565	-2995
2008	0	5898	5898	3483	607527	155584	0	1333	787	-4565	-2696
2009	0	5898	5898	3135	584551	178994	0	1333	709	-4565	-2426
2010	0	5898	5898	2821	561576	202405	0	1333	639	-4565	-2183
2011	0	5898	5898	2539	604959	264800	0	1333	574	-4565	-1965
2012	0	5898	5898	2285	648343	327195	0	1333	517	-4565	-1769
2013	0	5898	5898	2057	691726	389590	0	1333	465	-4565	-1592
2014	0	5898	5898	1851	735109	451985	0	1333	418	-4565	-1433
2015	0	5898	5898	1666	778492	514381	0	1333	377	-4565	-1289
2016	0	5898	5898	1499	821876	576776	0	1333	339	-4565	-1160
2017	0	5898	5898	1349	865259	639171	0	1333	305	-4565	-1044
2018	0	5898	5898	1214	908642	701566	0	1333	275	-4565	-940
2019	0	5898	5898	1093	952026	763961	0	1333	247	-4565	-846
2020	0	5898	5898	984	995409	826356	0	1333	222	-4565	-761
2021											
2022											
2023											
Total	294,912	100,270	395,182	339,143	13,137,766	6,419,529		531,581	468,155	136,400	129,012

B/C 1.38
EIRR 69%

Cost-Benefit Analysis

Site No	29	N003C230	A-Node	602	B-Node	610
Site Name	NIC 3, 32.9		Link Length (km)	13.0		
Type of Disaster	Slope Slide		Permanent/Temporary (P/T)	P		
Discount Rate (%)	10		Discount Period	18		

Base Case	
Maintenance Cost per km	1340

Risk : Without Prevention Measures Road will fail in	years
Score	73
Benefit Factor	73

Mode	2003		2010		2020	
	Base	Disaster	Base	Disaster	Base	Disaster
1	268075	269916	390157	390157	710529	710674
2	472267	478408	687643	687685	1222922	1223285
3	161758	162820	198464	198464	270874	270874
4	191426	195880	307556	307440	556835	557116
5	131812	132815	198831	198831	377752	378125
6	93606	94274	106710	106710	259277	259306

input from JICASTRADA Traffic Model

AADT Vehicle Kilometres
Cars Pick-ups Buses L Goods M Goods H Goods

Veh. Op Cost 1000 km	Benefits, US \$, per year		
	2003	2010	2020
185.5	1841	124638	0
215.1	6141	482076	42
529.7	1062	205344	0
549.1	4454	892684	-116
768.2	1003	281230	0
878.5	668	214166	0
Total	2200160	-19952	208515

Capital Cost Estimate US \$	404732
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Passenger VOT, 2002	Benefits, US \$, per year		
	2003	2010	2020
2.84	128	136267	0
1.09	190	77632	1
14.9	35	195487	0
1.04	99	38595	2
1.04	39	15204	0
0.75	20	5623	0
Total	468809	1434	55911

AADT Vehicle Hours
Cars Pick-ups Buses L Goods M Goods H Goods

Value of Time Factors	Base	1.027	1.239	2.678
Sensitivity	0.97	0.924	0.811	

Occurrence probability 1/3
Restoration Cost 3000 US\$

<With Project>

Year	Capital Cost US\$	Maintenance Cost (US\$)	Total Cost (US \$)	Total Dis-counted Cost	Veh Km Benefits	Veh Hour Benefits	Ben	Total Benefits \$ US	Total Dis. Benefits \$ US	Benefits - Cost \$ US	Net Pre Value \$ US
2002											
2003	404732		404732	404732	904175	192661	0	2000	2000	-402732	-402732
2004	0	8095	8095	7285	773836	165222	1	628039	565235	619944	557950
2005	0	8095	8095	6557	643497	137783	0	2000	1620	-6095	-4937
2006	0	8095	8095	5901	513158	110345	0	2000	1458	-6095	-4443
2007	0	8095	8095	5311	382818	82906	0	2000	1312	-6095	-3999
2008	0	8095	8095	4780	252479	55467	0	2000	1181	-6095	-3599
2009	0	8095	8095	4302	122140	28028	0	2000	1063	-6095	-3239
2010	0	8095	8095	3872	-8199	589	0	2000	957	-6095	-2915
2011	0	8095	8095	3484	1190	2828	0	2000	861	-6095	-2624
2012	0	8095	8095	3136	10579	5067	0	2000	775	-6095	-2361
2013	0	8095	8095	2822	19968	7306	0	2000	697	-6095	-2125
2014	0	8095	8095	2540	29357	9544	0	2000	628	-6095	-1913
2015	0	8095	8095	2286	38746	11783	0	2000	565	-6095	-1721
2016	0	8095	8095	2058	48135	14022	0	2000	508	-6095	-1549
2017	0	8095	8095	1852	57524	16261	0	2000	458	-6095	-1394
2018	0	8095	8095	1667	66913	18500	0	2000	412	-6095	-1255
2019	0	8095	8095	1500	76302	20738	0	2000	371	-6095	-1129
2020	0	8095	8095	1350	85691	22977	0	2000	334	-6095	-1016
2021											
2022											
2023											
Total	404,732	137,609	542,341	466,435	4,018,308	902,027		662,039	580,433	119,698	114,999

B/C 1.25
EIRR 0.01

Cost-Benefit Analysis

Site No	30	N003E170	A-Node	602	B-Node	610
Site Name	NIC 3, 35.2		Link Length (km)	13.0		
Type of Disaster	Debris Flow		Permanent/Temporary (P/T)	P		
Discount Rate (%)	10		Discount Period	18		

Base Case	
Maintenance Cost per km	1340

Risk : Without Prevention Measures Road will fail in	years
Score	83
Benefit Factor	83

Mode	2003		2010		2020	
	Base	Disaster	Base	Disaster	Base	Disaster
1	268075	269916	390157	390157	710529	710674
2	472267	478408	687643	687685	1222922	1223285
3	161758	162820	198464	198464	270874	270874
4	191426	195880	307556	307440	556835	557116
5	131812	132815	198831	198831	377752	378125
6	93606	94274	106710	106710	259277	259306

Veh. Op Cost

1000 km	Benefits, US \$, per year		
	2003	2010	2020
185.5	1841	124638	0
215.1	6141	482078	42
529.7	1062	205344	0
549.1	4454	892684	-116
768.2	1003	281230	0
878.5	668	214186	0
Total	2200160	-19952	208515

← AADT Vehicle Kilometres input from JICA STRADA Traffic Model

Cars Pick-ups Buses L Goods M Goods H Goods

Capital Cost Estimate US \$	382521
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Mode	2003		2010		2020	
	Base	Disaster	Base	Disaster	Base	Disaster
1	4229	4357	6138	6138	11289	11292
2	7581	7771	10923	10924	19581	19590
3	2686	2721	3124	3124	4134	4136
4	3128	3227	4903	4905	8959	8969
5	2114	2153	3091	3091	6007	6005
6	1560	1580	1678	1678	4126	4127

← AADT Vehicle Hours input from JICA STRADA Traffic Model

Cars Pick-ups Buses L Goods M Goods H Goods

Passenger VOT, 2002	Benefits, US \$, per year		
	2003	2010	2020
2.84	128	136267	0
1.09	190	77632	1
14.9	35	195487	0
1.04	99	38595	2
1.04	39	15204	0
0.75	20	5623	0
Total	468809	1434	55911

Value of Time Factors Sensitivity	Base 1.027	0.97	1.239	0.924	2.678	0.811
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Occurrence probability 1/3
Restoration Cost 2000 US\$

With Project											
Year	Capital Cost US\$	Maintenance Cost (US\$)	Total Cost (US \$)	Total Dis-counted Cost	Veh Km Benefits	Veh Hour Benefits	Ben	Total Benefits \$ US	Total Dis. Benefits \$ US	Benefits - Cost \$ US	Net Pre Value \$ US
2002											
2003	382521		382521	382521	1100080	234404	0	1333	1333	-381188	-381188
2004	0	7650	7650	6885	941501	201020	1	763014	686713	755364	679827
2005	0	7650	7650	6197	782921	167636	0	1333	1080	-6317	-5117
2006	0	7650	7650	5577	624342	134253	0	1333	972	-6317	-4605
2007	0	7650	7650	5019	465762	100869	0	1333	875	-6317	-4145
2008	0	7650	7650	4518	307183	67485	0	1333	787	-6317	-3730
2009	0	7650	7650	4066	148603	34101	0	1333	709	-6317	-3357
2010	0	7650	7650	3659	-9976	717	0	1333	638	-6317	-3021
2011	0	7650	7650	3293	1447	3441	0	1333	574	-6317	-2719
2012	0	7650	7650	2964	12871	6165	0	1333	517	-6317	-2447
2013	0	7650	7650	2668	24294	8888	0	1333	465	-6317	-2203
2014	0	7650	7650	2401	35717	11612	0	1333	418	-6317	-1982
2015	0	7650	7650	2161	47141	14336	0	1333	377	-6317	-1784
2016	0	7650	7650	1945	58564	17060	0	1333	339	-6317	-1606
2017	0	7650	7650	1750	69988	19784	0	1333	305	-6317	-1445
2018	0	7650	7650	1575	81411	22508	0	1333	275	-6317	-1301
2019	0	7650	7650	1418	92834	25232	0	1333	247	-6317	-1171
2020	0	7650	7650	1276	104258	27956	0	1333	222	-6317	-1054
2021											
2022											
2023											
Total	382,521	130,057	512,579	439,892	4,888,941	1,097,466		785,681	696,845	273,102	256,952

B/C 1.58
EIRR 0.01

Cost-Benefit Analysis

Site No	32	N003C150	A-Node	602	B-Node	610
Site Name	NIC 3, 38.9		Link Length (km)	13.0		
Type of Disaster	Slope Slide		Permanent/Temporary (P/T)	P		
Discount Rate (%)	10		Discount Period	18		

Base Case
Maintenance Cost per km
1340

Risk : Without Prevention Measures Road will fail in	years
Score	90
Benefit Factor	90

Mode	2003		2010		2020	
	Base	Disaster	Base	Disaster	Base	Disaster
1	268075	269916	390157	390157	710529	710674
2	472267	478408	687643	687685	1222922	1223285
3	161758	162820	198464	198464	270874	270874
4	191426	195880	307556	307440	556835	557116
5	131812	132815	198831	198831	377752	378125
6	93606	94274	106710	106710	259277	259306

AADT Vehicle Kilometres input from JICASTRADA Traffic Model: Cars, Pick-ups, Buses, L Goods, M Goods, H Goods

Veh. Op Cost 1000 km	Benefits, US \$, per year					
	2003		2010		2020	
185.5	1841	124638	0	0	0	9817
215.1	6141	482078	42	3297	0	28496
529.7	1062	205344	0	0	0	0
549.1	4454	892684	-116	-23249	0	56319
768.2	1003	281230	0	0	0	104585
878.5	668	214186	0	0	0	9298
Total		2200160		-19952		208515

Capital Cost Estimate US \$: 1132757

Passenger VOT, 2002	Benefits, US \$, per year					
	2003		2010		2020	
2.84	128	136267	0	0	0	8328
1.09	190	77632	1	493	0	9589
14.9	35	195487	0	0	0	29129
1.04	99	38595	2	941	0	10166
1.04	39	15204	0	0	0	-2033
0.75	20	5623	0	0	0	733
Total		468809		1434		55911

AADT Vehicle Hours input from JICASTRADA Traffic Model: Cars, Pick-ups, Buses, L Goods, M Goods, H Goods

Value of Time Factors	Base	1.027	1.239	2.678
Sensitivity		0.97	0.924	0.811

Occurrence probability: 1/3
Restoration Cost: 2000 US\$

Year	Capital Cost US\$	Maintenance Cost (US\$)	Total Cost (US \$)	Total Dis-counted Cost	Veh Km Benefits	Veh Hour Benefits	Ben	Total Benefits \$ US	Total Dis. Benefits \$ US	Benefits - Cost \$ US	Net Pre Value \$ US
2002											
2003	1132757		1132757	1132757	2200160	468809	0	1333	1333	-1131424	-1131424
2004	0	22655	22655	20390	1883001	402041	1	1524695	1372225	1502040	1351836
2005	0	22655	22655	18351	1565842	335273	0	1333	1080	-21322	-17271
2006	0	22655	22655	16516	1248684	268505	0	1333	972	-21322	-15544
2007	0	22655	22655	14864	931525	201737	0	1333	875	-21322	-13969
2008	0	22655	22655	13378	614366	134969	0	1333	787	-21322	-12590
2009	0	22655	22655	12040	297207	68201	0	1333	709	-21322	-11331
2010	0	22655	22655	10836	-19952	1434	0	1333	638	-21322	-10198
2011	0	22655	22655	9752	2895	6881	0	1333	574	-21322	-9178
2012	0	22655	22655	8777	25741	12329	0	1333	517	-21322	-8261
2013	0	22655	22655	7899	48598	17777	0	1333	465	-21322	-7434
2014	0	22655	22655	7109	71435	23225	0	1333	418	-21322	-6691
2015	0	22655	22655	6398	94282	28672	0	1333	377	-21322	-6022
2016	0	22655	22655	5759	117128	34120	0	1333	339	-21322	-5420
2017	0	22655	22655	5183	139975	39568	0	1333	305	-21322	-4878
2018	0	22655	22655	4664	162822	45016	0	1333	275	-21322	-4390
2019	0	22655	22655	4198	185669	50464	0	1333	247	-21322	-3951
2020	0	22655	22655	3778	208515	55911	0	1333	222	-21322	-3556
2021											
2022											
2023											
Total	1,132,757	385,137	1517894	1,302,649	9,777,883	2,194,932		1,547,361	1,382,357	29,467	79,708

B/C: 1.06
EIRR: 0.00

Cost-Benefit Analysis

Site No	33	N003C140	A-Node	602	B-Node	610
Site Name	NIC 3, 39.4		Link Length (km)	13.0		
Type of Disaster	Slope Slide		Permanent/Temporary (P/T)	P		
Discount Rate (%)	10		Discount Period	18		

Base Case

Maintenance Cost per km	1340
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Risk : Without Prevention Measures Road will fail in _____ years

Score	90	Benefit Factor	90
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Mode	2003		2010		2020	
	Base	Disaster	Base	Disaster	Base	Disaster
1	268075	269916	390157	390157	710529	710674
2	472267	478408	687643	687685	1222922	1223285
3	161758	162820	198464	198464	270874	270874
4	191426	195880	307556	307440	556835	557116
5	131812	132815	198831	198831	377752	378125
6	93606	94274	106710	106710	259277	259306

Veh. Op Cost Benefits, US \$, per year

1000 km	2003		2010		2020	
	Base	Disaster	Base	Disaster	Base	Disaster
185.5	1841	124638	0	0	9817	9817
215.1	6141	482078	42	3297	28496	28496
529.7	1062	205344	0	0	0	0
549.1	4454	892684	-116	-23249	56319	56319
768.2	1003	281230	0	0	104586	104586
878.5	668	214186	0	0	9298	9298
Total	2200160	2200160	-19952	-19952	208515	208515

AADT Vehicle Kilometres input from JICA STRADA Traffic Model

Cars Pick-ups Buses L Goods M Goods H Goods

Capital Cost Estimate US \$	924221
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Passenger VOT, 2002	2003		2010		2020	
	Base	Disaster	Base	Disaster	Base	Disaster
2.84	128	136267	0	0	8328	8328
1.09	190	77632	1	493	9589	9589
14.9	35	195487	0	0	29129	29129
1.04	99	38595	2	941	10166	10166
1.04	39	15204	0	0	-2033	-2033
0.75	20	5623	0	0	733	733
Total	468809	468809	1434	1434	55911	55911

AADT Vehicle Hours input from JICA STRADA Traffic Model

Cars Pick-ups Buses L Goods M Goods H Goods

Value of Time Factors Sensitivity

Base	1.027	1.239	2.678
Sensitivity	0.97	0.924	0.811

Occurrence probability 1/3
Restoration Cost 2000 US\$

<With Project>

Year	Capital Cost US\$	Maintenance Cost (US\$)	Total Cost (US \$)	Total Discounted Cost	Veh Km Benefits	Veh Hour Benefits	Ben	Total Benefits \$ US	Total Dis. Benefits \$ US	Benefits - Cost \$ US	Net Pre Value \$ US
2002											
2003	924221		924221	924221	1808351	385322	0	1333	1333	-922888	-922888
2004	0	18484	18484	16636	1547672	330444	1	1253411	1128070	1234927	111434
2005	0	18484	18484	14972	1286994	275567	0	1333	1080	-17151	-13892
2006	0	18484	18484	13475	1026315	220689	0	1333	972	-17151	-12503
2007	0	18484	18484	12128	755637	165811	0	1333	875	-17151	-11253
2008	0	18484	18484	10915	504958	110934	0	1333	787	-17151	-10128
2009	0	18484	18484	9823	244280	56056	0	1333	709	-17151	-9115
2010	0	18484	18484	8841	-16399	1178	0	1333	638	-17151	-8203
2011	0	18484	18484	7957	2379	5656	0	1333	574	-17151	-7383
2012	0	18484	18484	7161	21157	10134	0	1333	517	-17151	-6645
2013	0	18484	18484	6445	39935	14611	0	1333	465	-17151	-5980
2014	0	18484	18484	5801	58714	19089	0	1333	418	-17151	-5382
2015	0	18484	18484	5221	77492	23566	0	1333	377	-17151	-4844
2016	0	18484	18484	4698	96270	28044	0	1333	339	-17151	-4360
2017	0	18484	18484	4229	115048	32522	0	1333	305	-17151	-3924
2018	0	18484	18484	3806	133826	38999	0	1333	275	-17151	-3531
2019	0	18484	18484	3425	152604	41477	0	1333	247	-17151	-3178
2020	0	18484	18484	3083	171382	45954	0	1333	222	-17151	-2860
2021											
2022											
2023											
Total	924,221	314,235	1,238,456	1,062,837	8,036,616	1,804,054		1,276,078	1,138,202	37,621	75,365

B/C 1.07
EIRR 0.00

Cost-Benefit Analysis

Site No	35	N005A070	A-Node	1117	B-Node	1111	Base Case					
Site Name	NIC 5, 24.6		Link Length (km)			12.0	Maintenance Cost per km	1340				
Type of Disaster	Rock Fall		Permanent/Temporary (P/T)			P						
Discount Rate (%)	10		Discount Period			18						
Risk : Without Prevention Measures Road will fail in _____ years												
Score			76		Benefit Factor		76					
Mode	2003		2010		2020							
	Base	4976	Base	Disaster	Base	Disaster						
1	269904	270850	394190	395397	719386	720689						
2	488684	495999	717076	728372	1276519	1294976						
3	166510	167628	205422	206844	280705	282296						
4	194878	195909	310937	312251	564193	566762						
5	134970	136623	204274	206725	386998	391867						
6	94185	94437	107931	108295	261770	262304						
Veh. Op Cost	Benefits, US \$, per year											
1000 km	2003		2010		2020							
185.5	946	64046	1207	81716	87176	88215						
215.1	7315	574239	11296	866754	1448903							
529.7	1118	216172	1422	274952	307629							
549.1	1031	206636	1314	263356	514867							
768.2	1653	463483	2451	687233	1365214							
878.5	252	80801	364	116712	171220							
Total	1605376		2310723		3896069							
1	4342	4401	6229	8313	11498	11638						
2	7963	8346	11579	12165	20803	21843						
3	2795	2876	3280	3386	4541	4683						
4	3165	3213	4976	5034	9123	9257						
5	2192	2277	3210	3333	6216	6446						
6	1574	1587	1703	1722	4180	4211						
Passenger VOT, 2002	Benefits, US \$, per year											
2.84	59	62811	84	107885	388642							
1.09	383	156491	586	288861	1108060							
14.9	81	452412	106	714260	2068131							
1.04	48	18713	58	27279	136220							
1.04	85	33137	123	57850	232794							
0.75	13	3655	19	6444	22726							
Total	727219		1202579		3956574							
Value of Time Factors	Base	1.027	1.239	2.678	Occurrence probability 1/3							
Sensitivity	0.97	0.924	0.811	Restoration Cost 2000 US\$								
<With Project>												
Year	Capital Cost US\$	Maintenance Cost (US\$)	Total Cost (US \$)	Total Dis-counted Cost	Veh Km Benefits	Veh Hour Benefits	Ben	Total Benefits \$ US	Total Dis. Benefits \$ US	Benefits - Cost \$ US	Net Pre Value \$ US	
2002												
2003	480003		480003	480003	989615	448286	0	1333	1333	-478669	-478669	
2004	0	9600	9600	8640	1051730	490147	1	1029251	926326	1019851	917686	
2005	0	9600	9600	7776	1113845	532008	0	1333	1080	-8267	-6696	
2006	0	9600	9600	6998	1175959	573870	0	1333	972	-8267	-6026	
2007	0	9600	9600	6299	1238074	615731	0	1333	875	-8267	-5424	
2008	0	9600	9600	5669	1300189	657593	0	1333	787	-8267	-4881	
2009	0	9600	9600	5102	1362303	699454	0	1333	709	-8267	-4393	
2010	0	9600	9600	4592	1424418	741316	0	1333	638	-8267	-3954	
2011	0	9600	9600	4133	1522145	911083	0	1333	574	-8267	-3559	
2012	0	9600	9600	3719	1619872	1080849	0	1333	517	-8267	-3203	
2013	0	9600	9600	3347	1717599	1250616	0	1333	465	-8267	-2882	
2014	0	9600	9600	3013	1815325	1420383	0	1333	418	-8267	-2594	
2015	0	9600	9600	2711	1913052	1590150	0	1333	377	-8267	-2335	
2016	0	9600	9600	2440	2010779	1759917	0	1333	339	-8267	-2101	
2017	0	9600	9600	2196	2108506	1929683	0	1333	305	-8267	-1891	
2018	0	9600	9600	1977	2206233	2099450	0	1333	275	-8267	-1702	
2019	0	9600	9600	1779	2303959	2269217	0	1333	247	-8267	-1532	
2020	0	9600	9600	1601	2401686	2438984	0	1333	222	-8267	-1379	
2021												
2022												
2023												
Total	480,003	163,201	643,204	551,994	29,275,290	21,508,736		1,051,918	936,458	408,714	384,464	
										B/C	1.70	
										EIRR	0.01	

Cost-Benefit Analysis

Site No	44	N026A060	A-Node	1101	B-Node	604
Site Name	NIC26, 24.7		Link Length (km)	26.0		
Type of Disaster	Rock Fall		Permanent/Temporary (P/T)	P		
Discount Rate (%)	10		Discount Period	18		

Base Case
Maintenance Cost per km
1340

Risk: Without Prevention Measures Road will fail in _____ years
 Score 70 Benefit Factor 70

Mode	2003		2010		2020	
	Base	Disaster	Base	Disaster	Base	Disaster
1	268075	269413	391813	393527	713975	716938
2	472217	477630	691648	698644	1230257	1242272
3	161758	164995	199148	202950	271850	276824
4	193383	196045	309370	314928	560748	569767
5	131812	133060	199683	200944	379385	380919
6	93606	94114	107094	107693	260251	261726
Total	2368122	2368122	3059960	3059960	4816219	4816219

AADT Vehicle Kilometres input from JICA STRADA Traffic Model
 Cars Pick-ups Buses L Goods M Goods H Goods

Veh. Op Cost	Benefits, US \$, per year		
	2003	2010	2020
1000 km			
185.5	1338	90585	1714
215.1	5413	424929	6996
529.7	3237	625893	3802
549.1	3562	713907	5558
768.2	1248	349926	1261
878.5	508	162884	599
Total	2368122	3059960	4816219

Capital Cost Estimate US \$ 389925

Passenger VOT, 2002	Benefits, US \$, per year		
	2003	2010	2020
2.84	50	53229	86
1.09	151	61697	253
14.9	73	407730	99
1.04	92	35866	163
1.04	46	17933	78
0.75	20	5623	33
Total	582079	1026800	3267887

AADT Vehicle Hours input from JICA STRADA Traffic Model
 Cars Pick-ups Buses L Goods M Goods H Goods

Value of Time Factors Base Sensitivity 1.027 0.97 1.239 0.924 2.678 0.811

Occurrence probability 1/3 Restoration Cost 2000 US\$

Year	Capital Cost US\$	Maintenance Cost (US\$)	Total Cost (US \$)	Total Discounted Cost	Veh Km Benefits	Veh Hour Benefits	Ben	Total Benefits \$ US	Total Dis. Benefits \$ US	Benefits - Cost \$ US	Net Pre Value \$ US
2002											
2003	389925		389925	389925	811001	199342	0	1333	1333	-388592	-388592
2004	0	7799	7799	7019	844848	221099	-1	711965	640768	704166	633750
2005	0	7799	7799	6317	878695	242857	0	1333	1080	-6465	-5237
2006	0	7799	7799	5685	912542	264614	0	1333	972	-6465	-4713
2007	0	7799	7799	5117	946390	286372	0	1333	875	-6465	-4242
2008	0	7799	7799	4605	980237	308129	0	1333	787	-6465	-3818
2009	0	7799	7799	4144	1014084	329886	0	1333	709	-6465	-3436
2010	0	7799	7799	3730	1047931	351644	0	1333	638	-6465	-3092
2011	0	7799	7799	3357	1108077	428393	0	1333	574	-6465	-2783
2012	0	7799	7799	3021	1168223	505143	0	1333	517	-6465	-2505
2013	0	7799	7799	2719	1228369	581892	0	1333	465	-6465	-2254
2014	0	7799	7799	2447	1288515	658642	0	1333	418	-6465	-2029
2015	0	7799	7799	2203	1348661	735392	0	1333	377	-6465	-1826
2016	0	7799	7799	1982	1408807	812141	0	1333	339	-6465	-1643
2017	0	7799	7799	1784	1468953	888891	0	1333	305	-6465	-1479
2018	0	7799	7799	1606	1529098	965640	0	1333	275	-6465	-1331
2019	0	7799	7799	1445	1589244	1042390	0	1333	247	-6465	-1198
2020	0	7799	7799	1301	1649390	1119140	0	1333	222	-6465	-1078
2021											
2022											
2023											
Total	389,925	132,575	522,500	448,406	21,223,066	9,941,607		734,632	650,901	212,132	202,494

B/C 1.45
 EIRR 0.01

Cost-Benefit Analysis

Site No	45	La Banderita	A-Node	1101	B-Node	604
Site Name	NIC26, 24.7		Link Length (km)	26.0		
Type of Disaster	Rock Fall		Permanent/Temporary (P/T)	P		
Discount Rate (%)	10		Discount Period	18		

Maintenance Cost per km	1340
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Risk : Without Prevention Measures Road will fail in	_____	years	
Score	70	Benefit Factor	70

Mode	2003		2010		2020	
	Base	Disaster	Base	Disaster	Base	Disaster
1	268075	269413	391813	393527	713975	716938
2	472217	477630	691648	698644	1230257	1242272
3	161758	164995	199148	202950	271850	276824
4	193383	196945	309370	314928	560748	569767
5	131812	133060	199683	200944	379385	380919
6	93606	94114	107094	107693	260251	261726
Total	2368122	2368122	3059960	3059960	4816219	4816219

AADT Vehicle Kilometres input from JICASTRADA Traffic Model
 Cars Pick-ups Buses L Goods M Goods H Goods

Veh. Op Cost 1000 km	Benefits, US \$, per year		
	2003	2010	2020
185.5	1338	90585	1714
215.1	5413	424929	6996
529.7	3237	625893	3802
549.1	3562	713907	5558
768.2	1248	349926	1261
878.5	508	162884	599
Total	38252	3059960	4816219

Capital Cost Estimate US \$ 38252

Passenger VOT, 2002	Benefits, US \$, per year		
	2003	2010	2020
2.84	50	53229	86
1.09	151	61697	253
14.9	73	407730	99
1.04	92	35866	163
1.04	46	17933	78
0.75	20	5623	33
Total	582079	1026800	3267887

AADT Vehicle Hours input from JICASTRADA Traffic Model
 Cars Pick-ups Buses L Goods M Goods H Goods

Value of Time Factors	Base	1.027	1.239	2.678
Sensitivity		0.97	0.924	0.811

Occurrence probability 1/3
 Restoration Cost 1000 US\$

<With Project>

Year	Capital Cost US\$	Maintenance Cost (US\$)	Total Cost (US \$)	Total Discounted Cost	Veh Km Benefits	Veh Hour Benefits	Ben	Total Benefits \$ US	Total Dis. Benefits \$ US	Benefits - Cost \$ US	Net Pre Value \$ US
2002											
2003	38252		38252	38252	194640	47842	0	1000	1000	-37252	-37252
2004	0	765	765	689	202764	53064	1	171552	154396	170787	153708
2005	0	765	765	620	210887	58286	0	1000	810	235	190
2006	0	765	765	558	219010	63507	0	1000	729	235	171
2007	0	765	765	502	227134	68729	0	1000	656	235	154
2008	0	765	765	452	235257	73951	0	1000	590	235	139
2009	0	765	765	407	243380	79173	0	1000	531	235	125
2010	0	765	765	366	251504	84394	0	1000	478	235	112
2011	0	765	765	329	259939	90214	0	1000	430	235	101
2012	0	765	765	296	280374	121234	0	1000	387	235	91
2013	0	765	765	267	294809	139654	0	1000	349	235	82
2014	0	765	765	240	309244	158074	0	1000	314	235	74
2015	0	765	765	216	323679	176494	0	1000	282	235	66
2016	0	765	765	194	338114	194914	0	1000	254	235	60
2017	0	765	765	175	352549	213334	0	1000	229	235	54
2018	0	765	765	158	366984	231754	0	1000	206	235	48
2019	0	765	765	142	381419	250174	0	1000	185	235	44
2020	0	765	765	128	395854	268593	0	1000	167	235	39
2021											
2022											
2023											
Total	38,252	13,006	51,258	43,989	5,093,536	2,385,986		188,552	161,995	137,294	118,006

B/C 3.68
 EIRR 0.04

Cost-Benefit Analysis

Site No	49	N026B140	A-Node	302	B-Node	301
Site Name	NIC 26, 34.0		Link Length (km)	26.0		
Type of Disaster	Rock Collapse		Permanent/Temporary (P/T)	P		
Discount Rate (%)	10		Discount Period	18		

Base Case
Maintenance Cost per km
1340

Risk : Without Prevention Measures Road will fall in	years
Score	80
Benefit Factor	80

Mode	2003		2010		2020	
	Base	Disaster	Base	Disaster	Base	Disaster
1	268075	271711	391813	396818	713875	722465
2	472217	480873	691648	703098	1230257	1249978
3	161758	167419	199148	205533	271850	280477
4	193383	197817	309370	315853	560748	571425
5	131812	134167	199683	202956	379385	384300
6	93606	94293	107094	107741	260251	262138

← AADT Vehicle Kilometres input from JICA STRADA Traffic Model
Cars Pick-ups Buses L Goods M Goods H Goods

Veh. Op Cost 1000 km	Benefits, US \$, per year					
	2003		2010		2020	
185.5	3636	246163	5005	338846	574786	
215.1	8656	679510	11450	898843	1548129	
529.7	5661	1094588	6385	1234577	1668081	
549.1	4434	888675	6483	1299342	2139916	
768.2	2355	660316	3273	917713	1378112	
878.5	687	220278	647	207452	605042	
Total		3789529		4896774	7914067	

Capital Cost Estimate US \$
1115482

Passenger VOT, 2002	Benefits, US \$, per year					
	2003		2010		2020	
2.84	157	167140	262	336499	1457408	
1.09	342	139738	554	273087	1130434	
14.9	172	960678	239	1610454	5039249	
1.04	173	67444	298	140157	571312	
1.04	123	47951	197	92654	386462	
0.75	45	12651	68	23064	147354	
Total		1395604		2475914	8742218	

← AADT Vehicle Hours input from JICA STRADA Traffic Model
Cars Pick-ups Buses L Goods M Goods H Goods

Value of Time Factors	Base Sensitivity	1.027	0.97	1.239	0.924	2.678	0.811
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Occurrence probability 1/3
Restoration Cost 2000 US\$

Year	Capital Cost US\$	Maintenance Cost (US\$)	Total Cost (US \$)	Total Dis-counted Cost	Veh Km Benefits	Veh Hour Benefits	Ben	Total Benefits \$ US	Total Dis. Benefits \$ US	Benefits - Cost \$ US	Net Pre Value \$ US
2002							0				
2003	1115482		1115482	1115482	2180277	802950	0	1333	1333	-1114149	-1114149
2004	0	22310	22310	20079	2271284	891743	1	2110018	1899016	2087708	1878937
2005	0	22310	22310	18071	2362290	980535	0	1333	1080	-20976	-16991
2006	0	22310	22310	16264	2453296	1069328	0	1333	972	-20976	-15292
2007	0	22310	22310	14637	2544303	1158121	0	1333	875	-20976	-13763
2008	0	22310	22310	13174	2635309	1246913	0	1333	787	-20976	-12386
2009	0	22310	22310	11856	2726316	1335706	0	1333	709	-20976	-11148
2010	0	22310	22310	10571	2817322	1424499	0	1333	638	-20976	-10033
2011	0	22310	22310	9604	2909200	1785026	0	1333	574	-20976	-9030
2012	0	22310	22310	8643	3164517	2145553	0	1333	517	-20976	-8127
2013	0	22310	22310	7779	3338115	2506080	0	1333	465	-20976	-7314
2014	0	22310	22310	7001	3511713	2866607	0	1333	418	-20976	-6583
2015	0	22310	22310	6301	3685310	3227134	0	1333	377	-20976	-5824
2016	0	22310	22310	5671	3858908	3587661	0	1333	339	-20976	-5332
2017	0	22310	22310	5104	4032506	3948188	0	1333	305	-20976	-4799
2018	0	22310	22310	4593	4206103	4308715	0	1333	275	-20976	-4319
2019	0	22310	22310	4134	4379701	4669242	0	1333	247	-20976	-3887
2020	0	22310	22310	3721	4553299	5029769	0	1333	222	-20976	-3498
2021											
2022											
2023											
Total	1,115,482	379,264	1,494,746	1,282,783	57,711,488	42,983,770		2,132,684	1,909,148	637,938	626,365

B/C 1.49
EIRR 0.01

Cost-Benefit Analysis

Site No	50	N026A150	A-Node	302	B-Node	301
Site Name	NIC 26, 34.2		Link Length (km)	26.0		
Type of Disaster	Rock Fall		Permanent/Temporary (P/T)	P		
Discount Rate (%)	10		Discount Period	18		

Base Case	
Maintenance Cost per km	1340

Risk : Without Prevention Measures Road will fall in	years
Score	85
Benefit Factor	85

Mode	2003		2010		2020	
	Base	Disaster	Base	Disaster	Base	Disaster
1	268075	271711	391813	396818	713975	722465
2	472217	480673	691648	703098	1230257	1249978
3	161758	167419	199148	205533	271850	280477
4	193383	197817	309370	315853	560748	571425
5	131812	134167	199683	202956	379385	384300
6	93606	94293	107094	107741	260251	262138
Total	3789529	3886774	4896774	4967422	7914067	8000000

ADT Vehicle Kilometres input from JICA STRADA Traffic Model
 Cars Pick-ups Buses L Goods M Goods H Goods

Veh. Op Cost	Benefits, US \$, per year					
	2003		2010		2020	
1000 km						
185.5	3636	246163	5005	338846		574786
215.1	8656	679510	11450	898843		1548129
529.7	5661	1094588	6385	1234577		1668081
549.1	4434	888675	6483	1299342		2139916
768.2	2355	660316	3273	917713		1378112
878.5	687	220278	647	207452		605042
Total		3789529		4896774		7914067

Capital Cost Estimate US \$	259127
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Mode	2003		2010		2020	
	Base	Disaster	Base	Disaster	Base	Disaster
1	4300	4457	6167	6429	11365	11890
2	7586	7928	10991	11545	19747	20808
3	2686	2858	3136	3375	4340	4686
4	3133	3306	4938	5236	9042	9604
5	2121	2244	3105	3302	6042	6432
6	1560	1605	1684	1752	4146	4347
Total	1395604	1452218	2475914	2572218	4742218	5000000

ADT Vehicle Hours input from JICA STRADA Traffic Model
 Cars Pick-ups Buses L Goods M Goods H Goods

Passenger VOT, 2002	Benefits, US \$, per year					
	2003		2010		2020	
2.84	157	167140	262	336499		1457408
1.09	342	139738	554	273087		1130434
14.9	172	960678	239	1610454		5039249
1.04	173	67444	298	140157		571312
1.04	123	47951	197	92654		396462
0.75	45	12651	68	23064		147354
Total		1395604		2475914		8742218

Value of Time	Base	1.027	1.239	2.678
Factors Sensitivity		0.97	0.924	0.811

Occurrence probability 1/3
 Restoration Cost 2000 US\$

<With Project>

Year	Capital Cost US\$	Maintenance Cost (US\$)	Total Cost (US \$)	Total Dis-counted Cost	Veh Km Benefits	Veh Hour Benefits	Ben	Total Benefits \$ US	Total Dis. Benefits \$ US	Benefits - Cost \$ US	Net Pre Value \$ US
2002											
2003	259127		259127	259127	467202	172061	0	1333	1333	-257794	-257794
2004	0	5183	5183	4664	486704	191088	1	453194	407875	448012	408211
2005	0	5183	5183	4198	506205	210115	0	1333	1080	-3849	-3118
2006	0	5183	5183	3778	525706	229142	0	1333	972	-3849	-2806
2007	0	5183	5183	3400	545208	248189	0	1333	875	-3849	-2525
2008	0	5183	5183	3060	564709	267196	0	1333	787	-3849	-2273
2009	0	5183	5183	2754	584210	286223	0	1333	709	-3849	-2046
2010	0	5183	5183	2479	603712	305250	0	1333	638	-3849	-1841
2011	0	5183	5183	2231	640911	325206	0	1333	574	-3849	-1657
2012	0	5183	5183	2008	678111	345761	0	1333	517	-3849	-1491
2013	0	5183	5183	1807	715310	367017	0	1333	465	-3849	-1342
2014	0	5183	5183	1626	752510	389273	0	1333	416	-3849	-1208
2015	0	5183	5183	1464	789709	411529	0	1333	377	-3849	-1087
2016	0	5183	5183	1317	826909	434785	0	1333	339	-3849	-978
2017	0	5183	5183	1186	864108	458040	0	1333	305	-3849	-881
2018	0	5183	5183	1067	901308	482296	0	1333	275	-3849	-793
2019	0	5183	5183	960	938507	506552	0	1333	247	-3849	-713
2020	0	5183	5183	864	975707	531808	0	1333	222	-3849	-642
2021											
2022											
2023											
Total	259,127	86,103	347,231	297,992	12,366,747	9,210,808		475,861	418,007	128,630	120,015

B/C 1.40
 EIRR 0.01

Cost-Benefit Analysis

Site No	51	N026B160	A-Node	602	B-Node	610
Site Name	NIC 26, 37.0		Link Length (km)	7.3		
Type of Disaster	Rock Collapse		Permanent/Temporary (P/T)	T		
Discount Rate (%)	10		Discount Period	18		

Base Case	
Maintenance Cost per km	1340

Risk : Without Prevention Measures Road will fail in	years
Score	86
Benefit Factor	86

Mode	2003		2010		2020	
	Base	Disaster	Base	Disaster	Base	Disaster
1	268075	278692	391813	407297	713975	741196
2	472217	497633	691648	728519	1230257	1295084
3	161758	175114	199148	215169	271850	293993
4	193383	203219	309370	324822	560748	587516
5	131812	137311	199683	207634	379385	393396
6	93606	94963	107094	108510	260251	265252

AADT Vehicle Kilometres input from JICA STRADA Traffic Model

Cars Pick-ups Buses L Goods M Goods H Goods

Veh. Op Cost	Benefits, US \$, per year					
	2003		2010		2020	
1000 km						
185.5	10617	718787	15484	1048290	1842902	
215.1	25416	1995196	36871	2894431	5089021	
529.7	13356	2582461	16021	3097755	4261480	
549.1	9836	1971360	15452	3096936	5364922	
768.2	5499	1541859	7951	2229373	3928531	
878.5	1357	435105	1416	454022	1603506	
Total		9244768		12820807		22110362

Capital Cost Estimate US \$ 16041

Mode	2003		2010		2020	
	Base	Disaster	Base	Disaster	Base	Disaster
1	4300	4538	6167	6551	11365	12261
2	7586	8136	10991	11823	19747	21551
3	2686	2951	3136	3479	4340	4927
4	3133	3373	4938	5337	9042	9887
5	2121	2282	3105	3367	6042	6618
6	1560	1613	1684	1768	4146	4464

AADT Vehicle Hours input from JICA STRADA Traffic Model

Cars Pick-ups Buses L Goods M Goods H Goods

Passenger VOT, 2002	Benefits, US \$, per year					
	2003		2010		2020	
2.84	238	253372	384	493189	2487309	
1.09	550	224726	832	410123	1922058	
14.9	265	1480115	343	2311237	8549246	
1.04	240	93564	399	187659	859001	
1.04	161	62766	262	123225	585544	
0.75	53	14900	84	28491	233127	
Total		2128443		3553925		14636284

Value of Time	Base	1.027	1.239	2.678
Factors Sensitivity		0.97	0.924	0.811

Occurrence probability 1/3
Restoration Cost 2000 US\$

<With Project>

Year	Capital Cost US\$	Maintenance Cost (US\$)	Total Cost (US \$)	Total Discounted Cost	Veh Km Benefits	Veh Hour Benefits	Ben	Total Benefits \$ US	Total Dis. Benefits \$ US	Benefits - Cost \$ US	Net Pre Value \$ US
2002											
2003	16041		16041	16041	569883	131267	0	1333	1333	-14708	-14708
2004	0	321	321	289	601375	143811	1	498124	448312	497803	448023
2005	0	321	321	260	632866	156356	0	1333	1080	1013	820
2006	0	321	321	234	664358	168900	0	1333	972	1013	738
2007	0	321	321	210	695849	181444	0	1333	875	1013	664
2008	0	321	321	189	727341	193989	0	1333	787	1013	598
2009	0	321	321	170	758832	206533	0	1333	709	1013	538
2010	0	321	321	153	790324	219078	0	1333	638	1013	484
2011	0	321	321	138	847588	287393	0	1333	574	1013	436
2012	0	321	321	124	904852	355709	0	1333	517	1013	392
2013	16041	0	16041	5593	962117	424025	0	1333	465	-14708	-5128
2014	0	321	321	101	1019381	492341	1	1009148	316881	1008827	316581
2015	0	321	321	91	1076646	560657	0	1333	377	1013	286
2016	0	321	321	82	1133910	628973	0	1333	339	1013	257
2017	0	321	321	73	1191174	697289	0	1333	305	1013	232
2018	0	321	321	66	1248439	765605	0	1333	275	1013	208
2019	0	321	321	59	1305703	833921	0	1333	247	1013	188
2020	0	321	321	54	1362968	902237	0	1333	222	1013	169
2021											
2022											
2023											
Total	32,082	5,133	37,216	23,928	16,493,605	7,349,529		1,528,606	774,707	1,491,390	750,778
										B/C	32.36
										EIRR	0.33

Cost-Benefit Analysis

Site No	52	San Juan de I	A-Node	302	B-Node	301
Site Name	NIC 26, 156+785		Link Length (km)	26.0		
Type of Disaster	Bridge Scouring		Permanent/Temporary (P/T)	T		
Discount Rate (%)	10		Discount Period	18		

Base Case
Maintenance Cost per km
1340

Risk : Without Prevention Measures Road will fail in	years
Score	90
Benefit Factor	90

Mode	2003		2010		2020	
	Base	Disaster	Base	Disaster	Base	Disaster
1	268075	271711	391813	396818	713975	722465
2	472217	480873	691648	703098	1230257	1249978
3	161758	167419	199148	205533	271850	280477
4	193383	197817	309370	315853	560748	571425
5	131812	134167	199683	202956	379385	384300
6	93606	94293	107094	107741	260251	262138

AADT Vehicle Kilometres input from JICASTRADA Traffic Model
 Cars Pick-ups Buses L Goods M Goods H Goods

Veh. Op Cost	Benefits, US \$, per year					
	2003		2010		2020	
1000 km						
185.5	3636	246163	5005	338846		574786
215.1	8656	679510	11450	898843		1548129
529.7	5661	1094588	6385	1234577		1668081
549.1	4434	888675	6483	1299342		2139916
768.2	2355	660316	3273	917713		1378112
878.5	687	220278	647	207452		605042
Total		3789529		4896774		7914067

Capital Cost Estimate US \$
6170

Passenger VOT, 2002	Benefits, US \$, per year					
	2003		2010		2020	
2.84	157	167140	262	336499		1457408
1.09	342	139738	554	273087		1130434
14.9	172	960678	239	1610454		5039249
1.04	173	67444	298	140157		571312
1.04	123	47951	197	92654		396462
0.75	45	12651	68	23064		147354
Total		1395604		2475914		8742218

AADT Vehicle Hours input from JICASTRADA Traffic Model
 Cars Pick-ups Buses L Goods M Goods H Goods

Value of Time Factors	Benefits, US \$, per year					
	2003		2010		2020	
Base	1.027		1.239		2.678	
Sensitivity	0.97		0.924		0.811	

Occurrence probability 1/3
 Restoration Cost 1000 US\$

<With Project>

Year	Capital Cost US\$	Maintenance Cost (US\$)	Total Cost (US\$)	Total Discounted Cost	Veh Km Benefits	Veh Hour Benefits	Ben	Total Benefits \$ US	Total Dis. Benefits \$ US	Benefits - Cost \$ US	Net Pre Value \$ US
2002											
2003	6170		6170	6170	155734	57354	0	667	667	-5503	-5503
2004	0	123	123	111	162235	63696	1	151287	136158	151164	136047
2005	0	123	123	100	168735	70038	0	667	540	543	440
2006	0	123	123	90	175235	76381	0	667	486	543	396
2007	0	123	123	81	181736	82723	0	667	437	543	356
2008	0	123	123	73	188236	89065	0	667	394	543	321
2009	0	123	123	66	194737	95408	0	667	354	543	289
2010	0	123	123	59	201237	101750	0	667	319	543	260
2011	0	123	123	53	213637	127502	0	667	287	543	234
2012	0	123	123	48	226037	153254	0	667	258	543	210
2013	6170	0	6170	2151	238437	179006	0	667	232	-5503	-1919
2014	0	123	123	39	250837	204758	1	304396	95523	304273	95484
2015	0	123	123	35	263236	230510	0	667	188	543	153
2016	0	123	123	31	275636	256262	0	667	169	543	138
2017	0	123	123	28	288036	282013	0	667	153	543	124
2018	0	123	123	25	300436	307765	0	667	137	543	112
2019	0	123	123	23	312836	333517	0	667	124	543	101
2020	0	123	123	21	325236	359269	0	667	111	543	91
2021											
2022											
2023											
Total	12,339	1,974	14314	9,203	4,122,249	3,070,269		466,350	236,538	452,036	227,335

B/C 25.70
 EIRR 0.26

Cost-Benefit Analysis

Site No	54	Papalón	A-Node	605	B-Node	608
Site Name	NIC 26, 108+154		Link Length (km)	25.0		
Type of Disaster	Bridge Scouring		Permanent/Temporary (P/T)	T		
Discount Rate (%)	10		Discount Period	18		

Base Case
Maintenance Cost per km
1340

Risk : Without Prevention Measures Road will fail in	years
Score	90
Benefit Factor	90

Mode	2003		2010		2020	
	Base	Disaster	Base	Disaster	Base	Disaster
1	268075	279526	391813	407860	713975	742305
2	472217	495774	691648	726194	1230257	1287002
3	161758	175067	199148	214535	271850	292326
4	193383	203763	309370	323929	560748	583174
5	131812	137202	199683	207654	379385	391484
6	93606	95190	107094	108514	260251	265211

AADT Vehicle Kilometres input from JICASTRADA Traffic Model

Cars Pick-ups Buses L Goods M Goods H Goods

Veh. Op Cost	Benefits, US \$, per year					
	2003		2010		2020	
1000 km						
185.5	11451	775250	16047	1086406		1917983
215.1	23557	1849261	34546	2711915		4454572
529.7	13309	2573374	15387	2975167		3969155
549.1	10380	2080390	14559	2917958		4494686
768.2	5390	1511297	7971	2234981		3392427
878.5	1584	507689	1420	455305		1590360
Total		9297461		12381732		19809182

Capital Cost Estimate US \$ 62931

Mode	2003		2010		2020	
	Base	Disaster	Base	Disaster	Base	Disaster
1	4300	4632	6167	6670	11365	12424
2	7586	8196	10991	11922	19747	21602
3	2686	2986	3136	3516	4340	4953
4	3133	3407	4938	5363	9042	9881
5	2121	2306	3105	3416	6042	6643
6	1560	1622	1684	1771	4146	4461

AADT Vehicle Hours input from JICASTRADA Traffic Model

Cars Pick-ups Buses L Goods M Goods H Goods

Passenger VOT, 2002	Benefits, US \$, per year					
	2003		2010		2020	
2.84	332	353443	503	646027		2939800
1.09	610	249241	931	458924		1976395
14.9	300	1675602	380	2560555		8927918
1.04	274	106819	425	199888		852901
1.04	185	72122	311	146271		610958
0.75	62	17431	87	29508		230927
Total		2474658		4041172		15538899

Value of Time Factors	Base Sensitivity	1.027 0.97	1.239 0.924	2.678 0.811
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Occurrence probability 1/3
Restoration Cost 1000 US\$

<With Project>

Year	Capital Cost US\$	Maintenance Cost (US\$)	Total Cost (US \$)	Total Dis-counted Cost	Veh Km Benefits	Veh Hour Benefits	Ben	Total Benefits \$ US	Total Dis. Benefits \$ US	Benefits - Cost \$ US	Net Pre Value \$ US
2002											
2003	62931		62931	62931	1528350	406793	0	667	667	-62264	-62264
2004	0	1259	1259	1133	1600779	443580	1	1363573	1227215	1362314	1226083
2005	0	1259	1259	1019	1673208	480367	0	667	540	-592	-479
2006	0	1259	1259	918	1745637	517154	0	667	486	-592	-432
2007	0	1259	1259	826	1818066	553941	0	667	437	-592	-388
2008	0	1259	1259	743	1890495	590728	0	667	394	-592	-350
2009	0	1259	1259	669	1962924	627515	0	667	354	-592	-315
2010	0	1259	1259	602	2035353	664302	0	667	319	-592	-283
2011	0	1259	1259	542	2157448	853306	0	667	287	-592	-255
2012	0	1259	1259	488	2279543	1042310	0	667	258	-592	-229
2013	62931	0	62931	21943	2401638	1231313	0	667	232	-62264	-21710
2014	0	1259	1259	395	2523733	1420317	1	2630034	825332	2628775	824938
2015	0	1259	1259	355	2645829	1609321	0	667	188	-592	-167
2016	0	1259	1259	320	2767924	1798325	0	667	169	-592	-150
2017	0	1259	1259	288	2890019	1987328	0	667	153	-592	-135
2018	0	1259	1259	259	3012114	2176332	0	667	137	-592	-122
2019	0	1259	1259	233	3134209	2365336	0	667	124	-592	-110
2020	0	1259	1259	210	3256304	2554340	0	667	111	-592	-99
2021											
2022											
2023											
Total	125,862	20,138	146,000	93,873	41,323,573	21,322,609		4,004,273	2,057,405	3,858,273	1,963,531

EIRR= B/C
EIRR 0.21

Cost-Benefit Analysis

Site No	55	Soils	A-Node	605	B-Node	608
Site Name	NIC 26, 107+533		Link Length (km)	25.0		

Base Case	
Maintenance Cost per km	1340

Type of Disaster	Bridge Scouring	Permanent/Temporary (P/T)	T
Discount Rate (%)	10	Discount Period	18

Risk : Without Prevention Measures Road will fail in	years
Score	100
Benefit Factor	100

Mode	2003		2010		2020	
	Base	Disaster	Base	Disaster	Base	Disaster
1	268075	279526	391813	407860	713975	742305
2	472217	495774	691648	726194	1230257	1287002
3	161758	175067	199148	214535	271850	292326
4	193383	203763	309370	323929	560748	583174
5	131812	137202	199683	207654	379385	391484
6	93606	95190	107094	108514	260251	265211

ADT Vehicle input from JICA STRADA Traffic Model
 Cars Pick-ups Buses L Goods M Goods H Goods

Veh. Op Cost	Benefits, US \$, per year		
	2003	2010	2020
1000 km			
185.5	11451	775250	16047
215.1	23557	1849261	34546
529.7	13309	2573374	15387
549.1	10380	2080390	14559
768.2	5390	1511297	7971
878.5	1584	507889	1420
Total	9297461	12381732	19809182

Capital Cost Estimate US \$	81440
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Mode	2003		2010		2020	
	Base	Disaster	Base	Disaster	Base	Disaster
1	4300	4632	6167	6670	11365	12424
2	7586	8196	10991	11922	19747	21602
3	2686	2986	3136	3516	4340	4953
4	3133	3407	4938	5363	9042	9881
5	2121	2306	3105	3416	6042	6643
6	1560	1622	1684	1771	4146	4461

ADT Vehicle input from JICA STRADA Traffic Model
 Hours Cars Pick-ups Buses L Goods M Goods H Goods

Passenger VOT, 2002	Benefits, US \$, per year		
	2003	2010	2020
2.84	332	353443	503
1.09	610	249241	931
14.9	300	1675602	380
1.04	274	106819	425
1.04	185	72122	311
0.75	62	17431	87
Total	2474658	4041172	15538899

Value of Time	Base	1.027	1.239	2.678
Factors Sensitivity		0.97	0.924	0.811
Occurrence probability				1/3
Restoration Cost				1000 US\$

<With Project>

Year	Capital Cost US\$	Maintenance Cost (US\$)	Total Cost (US \$)	Total Dis-counted Cost	Veh Km Benefits	Veh Hour Benefits	Ben	Total Benefits \$ US	Total Dis. Benefits \$ US	Benefits - Cost \$ US	Net Pre Value \$ US
2002											
2003	81440		81440	81440	764175	203397	0	667	667	-80773	-80773
2004	0	1629	1629	1466	800389	221790	1	682120	613908	680491	612442
2005	0	1629	1629	1319	836604	240184	0	667	540	-962	-779
2006	0	1629	1629	1187	872818	258577	0	667	486	-962	-701
2007	0	1629	1629	1069	909033	276971	0	667	437	-962	-631
2008	0	1629	1629	962	945248	295364	0	667	394	-962	-568
2009	0	1629	1629	866	981462	313758	0	667	354	-962	-511
2010	0	1629	1629	779	1017677	332151	0	667	319	-962	-460
2011	0	1629	1629	701	1078724	426653	0	667	287	-962	-414
2012	0	1629	1629	631	1139772	521155	0	667	258	-962	-373
2013	81440	0	81440	28396	1200819	615657	0	667	232	-80773	-28164
2014	0	1629	1629	511	1261867	710159	1	1315350	412771	1313721	412260
2015	0	1629	1629	460	1322914	804660	0	667	188	-962	-272
2016	0	1629	1629	414	1383962	899162	0	667	169	-962	-245
2017	0	1629	1629	373	1445009	993664	0	667	153	-962	-220
2018	0	1629	1629	335	1506057	1088166	0	667	137	-962	-198
2019	0	1629	1629	302	1567104	1182668	0	667	124	-962	-178
2020	0	1629	1629	272	1628152	1277170	0	667	111	-962	-160
2021											
2022											
2023											
Total	162,880	26,061	188,941	121,483	20,661,787	10,661,305		2,008,137	1,031,535	1,819,196	910,052
										B/C	8.49
										EIRR	0.07

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