NATIONAL ROAD ADMINISTRATION (ANE)
GOVERNMENT OF REPUBLIC OF MOZAMBIQUE

PREPARATORY SURVEY
FOR
NACALA CORRIDOR ROAD NETWORK UPGRADING PROJECT
IN
THE REPUBLIC OF MOZAMBIQUE

FINAL REPORT

APPENDIX

MAY 2018

JAPAN INTERNATIONAL COOPERATION AGENCY

ORIENTAL CONSULTANTS GLOBAL CO., LTD.
EIGHT-JAPAN ENGINEERING CONSULTANTS INC.
KOKUSAI KOGYO CO., LTD.

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ORIENTAL CONSULTANTS GLOBAL CO., LTD.
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Appendix-1 OD Table of Network Traffic Assignment

(1) Nacala in 2017 / OD Table of Network Traffic Assignment

(2) Nacala in 2025 / OD Table of Network Traffic Assignment

(3) Nacala in 2035 / OD Table of Network Traffic Assignment

(4) Nampula in 2017 / OD Table of Network Traffic Assignment

(5) Nampula in 2025 / OD Table of Network Traffic Assignment

(6) Nampula in 2035 / OD Table of Network Traffic Assignment

(7) Cuamba in 2017 / OD Table of Network Traffic Assignment

(8) Cuamba in 2025 / OD Table of Network Traffic Assignment

(9) Cuamba in 2035 / OD Table of Network Traffic Assignment

(1) Nacala in 2017 / OD Table of Network Traffic Assignment

Nacala

2017 OD (vehicle/day)

O	D	2	3	4	5	6	7	8
1	2	10	15	13	4	166	43	86
1	3	14	20	18	5	108	47	94
1	4	8	11	10	3	216	72	143
1	5	7	10	9	2	58	19	38
1	6	0	0	0	0	0	0	0
1	7	0	0	0	0	0	0	0
2	4	0	0	0	0	53	7	15
2	5	0	0	0	0	14	2	4
2	6	0	0	0	0	0	0	0
2	7	0	0	0	0	0	0	0
3	4	0	0	0	0	71	23	46
3	5	0	0	0	0	19	6	12
3	6	0	0	0	0	0	0	0
3	7	0	0	0	0	0	0	0
4	2	8	11	10	3	0	0	0
4	3	11	16	14	4	0	0	0
4	4	6	8	7	2	142	35	70
4	5	7	9	9	2	38	9	19
4	6	0	0	0	0	0	0	0
4	7	0	0	0	0	0	0	0
5	2	2	3	3	1	0	0	0
5	3	3	4	4	1	0	0	0
5	5	1	2	2	0	10	3	5
5	6	0	0	0	0	0	0	0
5	7	0	0	0	0	0	0	0
6	2	0	0	0	0	0	0	0
6	3	0	0	0	0	0	0	0
6	4	0	0	0	0	0	0	0
6	5	0	0	0	0	0	0	0
6	6	0	0	0	0	0	0	0
6	7	0	0	0	0	0	0	0
7	2	0	0	0	0	0	0	0
7	3	0	0	0	0	0	0	0
7	4	0	0	0	0	0	0	0
7	5	0	0	0	0	0	0	0
7	7	0	0	0	0	0	0	0
8	2	95	136	122	32	0	0	0
8	3	143	204	183	48	0	0	0
9	2	64	91	81	21	0	0	0
9	3	95	136	122	32	0	0	0

O	D	2	3	4	5	6	7	8
2	1	10	15	13	4	166	43	86
3	1	14	20	18	5	108	47	94
4	1	8	11	10	3	216	72	143
5	1	7	10	9	2	58	19	38
6	1	0	0	0	0	0	0	0
7	1	0	0	0	0	0	0	0
4	2	0	0	0	0	53	7	15
5	2	0	0	0	0	14	2	4
6	2	0	0	0	0	0	0	0
7	2	0	0	0	0	0	0	0
4	3	0	0	0	0	71	23	46
5	3	0	0	0	0	19	6	12
6	3	0	0	0	0	0	0	0
7	3	0	0	0	0	0	0	0
2	4	8	11	10	3	0	0	0
3	4	11	16	14	4	0	0	0
4	4	6	8	7	2	142	35	70
5	4	7	9	9	2	38	9	19
6	4	0	0	0	0	0	0	0
7	4	0	0	0	0	0	0	0
2	5	2	3	3	1	0	0	0
3	5	3	4	4	1	0	0	0
5	5	1	2	2	0	10	3	5
6	5	0	0	0	0	0	0	0
7	5	0	0	0	0	0	0	0
2	6	0	0	0	0	0	0	0
3	6	0	0	0	0	0	0	0
4	6	0	0	0	0	0	0	0
5	6	0	0	0	0	0	0	0
6	6	0	0	0	0	0	0	0
7	6	0	0	0	0	0	0	0
2	7	0	0	0	0	0	0	0
3	7	0	0	0	0	0	0	0
4	7	0	0	0	0	0	0	0
5	7	0	0	0	0	0	0	0
7	7	0	0	0	0	0	0	0
2	8	95	136	122	32	0	0	0
3	8	143	204	183	48	0	0	0
2	9	64	91	81	21	0	0	0
3	9	95	136	122	32	0	0	0

Vehicle Type: 2=Passenger Car, 3=Pickup, 4=Minibus
5=Bus, 6=2 Axle Truck, 7=3or4 Axle Truck, 8=5+Axle Truck

(2) Nacala in 2025 / OD Table of Network Traffic Assignment

Nacala

2025 OD (vehicle/day)

O	D	2	3	4	5	6	7	8
1	2	17	24	22	6	289	90	180
1	3	24	33	30	8	177	73	145
1	4	13	18	16	4	189	66	132
1	5	11	16	14	4	101	35	70
1	6	0	0	0	0	176	62	123
1	7	0	0	0	0	0	0	0
2	4	0	0	0	0	34	6	13
2	5	0	0	0	0	18	3	7
2	6	0	0	0	0	32	6	12
2	7	0	0	0	0	0	0	0
3	4	0	0	0	0	48	14	28
3	5	0	0	0	0	26	8	15
3	6	0	0	0	0	45	13	26
3	7	0	0	0	0	0	0	0
4	2	56	80	72	19	0	0	0
4	3	83	119	107	28	0	0	0
4	4	4	6	5	1	52	13	25
4	5	6	8	7	2	28	7	14
4	6	0	0	0	0	48	12	24
4	7	0	0	0	0	0	0	0
5	2	3	4	4	1	0	0	0
5	3	4	6	5	1	0	0	0
5	5	2	3	2	1	15	4	7
5	6	0	0	0	0	26	6	13
5	7	0	0	0	0	0	0	0
6	2	5	7	7	2	0	0	0
6	3	7	10	9	2	0	0	0
6	4	4	6	5	1	0	0	0
6	5	3	5	4	1	0	0	0
6	6	0	0	0	0	45	11	22
6	7	0	0	0	0	0	0	0
7	2	0	0	0	0	0	0	0
7	3	0	0	0	0	0	0	0
7	4	0	0	0	0	0	0	0
7	5	0	0	0	0	0	0	0
7	7	0	0	0	0	0	0	0
8	2	278	396	355	94	0	0	0
8	3	416	593	532	140	0	0	0
9	2	177	252	226	60	0	0	0
9	3	265	377	339	89	0	0	0

O	D	2	3	4	5	6	7	8
2	1	17	24	22	6	289	90	180
3	1	24	33	30	8	177	73	145
4	1	13	18	16	4	189	66	132
5	1	11	16	14	4	101	35	70
6	1	0	0	0	0	176	62	123
7	1	0	0	0	0	0	0	0
4	2	0	0	0	0	34	6	13
5	2	0	0	0	0	18	3	7
6	2	0	0	0	0	32	6	12
7	2	0	0	0	0	0	0	0
4	3	0	0	0	0	48	14	28
5	3	0	0	0	0	26	8	15
6	3	0	0	0	0	45	13	26
7	3	0	0	0	0	0	0	0
2	4	56	80	72	19	0	0	0
3	4	83	119	107	28	0	0	0
4	4	4	6	5	1	52	13	25
5	4	6	8	7	2	28	7	14
6	4	0	0	0	0	48	12	24
7	4	0	0	0	0	0	0	0
2	5	3	4	4	1	0	0	0
3	5	4	6	5	1	0	0	0
5	5	2	3	2	1	15	4	7
6	5	0	0	0	0	26	6	13
7	5	0	0	0	0	0	0	0
2	6	5	7	7	2	0	0	0
3	6	7	10	9	2	0	0	0
4	6	4	6	5	1	0	0	0
5	6	3	5	4	1	0	0	0
6	6	0	0	0	0	45	11	22
7	6	0	0	0	0	0	0	0
2	7	0	0	0	0	0	0	0
3	7	0	0	0	0	0	0	0
4	7	0	0	0	0	0	0	0
5	7	0	0	0	0	0	0	0
7	7	0	0	0	0	0	0	0
2	8	278	396	355	94	0	0	0
3	8	416	593	532	140	0	0	0
2	9	177	252	226	60	0	0	0
3	9	265	377	339	89	0	0	0

Vehicle Type: 2=Passenger Car, 3=Pickup, 4=Minibus
5=Bus, 6=2 Axle Truck, 7=3or4 Axle Truck, 8=5+Axle Truck

(3) Nacala in 2035 / OD Table of Network Traffic Assignment

Nacala

2035 OD (vehicle/day)

O	D	2	3	4	5	6	7	8
1	2	35	49	44	12	600	200	399
1	3	49	69	62	16	337	113	224
1	4	27	38	34	9	216	72	144
1	5	23	33	29	8	115	39	77
1	6	0	0	0	0	505	168	335
1	7	0	0	0	0	101	34	67
2	4	0	0	0	0	26	6	13
2	5	0	0	0	0	14	3	7
2	6	0	0	0	0	60	15	30
2	7	0	0	0	0	12	3	6
3	4	0	0	0	0	39	10	19
3	5	0	0	0	0	21	5	10
3	6	0	0	0	0	90	22	45
3	7	0	0	0	0	18	4	9
4	2	198	282	253	67	0	0	0
4	3	296	422	379	100	0	0	0
4	4	4	5	5	1	25	6	12
4	5	5	7	6	2	13	3	7
4	6	0	0	0	0	58	14	29
4	7	0	0	0	0	12	3	6
5	2	51	72	65	17	0	0	0
5	3	76	108	97	26	0	0	0
5	5	2	2	2	1	7	2	3
5	6	0	0	0	0	31	8	15
5	7	0	0	0	0	6	2	3
6	2	11	15	14	4	0	0	0
6	3	15	22	19	5	0	0	0
6	4	8	12	11	3	0	0	0
6	5	7	10	9	2	0	0	0
6	6	0	0	0	0	135	33	67
6	7	0	0	0	0	27	7	13
7	2	2	3	3	1	0	0	0
7	3	3	4	4	1	0	0	0
7	4	2	2	2	1	0	0	0
7	5	1	2	2	0	0	0	0
7	7	0	0	0	0	5	1	3
8	2	435	619	556	147	0	0	0
8	3	651	928	833	220	0	0	0
9	2	290	413	371	98	0	0	0
9	3	434	619	556	146	0	0	0

O	D	2	3	4	5	6	7	8
2	1	35	49	44	12	600	200	399
3	1	49	69	62	16	337	113	224
4	1	27	38	34	9	216	72	144
5	1	23	33	29	8	115	39	77
6	1	0	0	0	0	505	168	335
7	1	0	0	0	0	101	34	67
4	2	0	0	0	0	26	6	13
5	2	0	0	0	0	14	3	7
6	2	0	0	0	0	60	15	30
7	2	0	0	0	0	12	3	6
4	3	0	0	0	0	39	10	19
5	3	0	0	0	0	21	5	10
6	3	0	0	0	0	90	22	45
7	3	0	0	0	0	18	4	9
2	4	198	282	253	67	0	0	0
3	4	296	422	379	100	0	0	0
4	4	4	5	5	1	25	6	12
5	4	5	7	6	2	13	3	7
6	4	0	0	0	0	58	14	29
7	4	0	0	0	0	12	3	6
2	5	51	72	65	17	0	0	0
3	5	76	108	97	26	0	0	0
5	5	2	2	2	1	7	2	3
6	5	0	0	0	0	31	8	15
7	5	0	0	0	0	6	2	3
2	6	11	15	14	4	0	0	0
3	6	15	22	19	5	0	0	0
4	6	8	12	11	3	0	0	0
5	6	7	10	9	2	0	0	0
6	6	0	0	0	0	135	33	67
7	6	0	0	0	0	27	7	13
2	7	2	3	3	1	0	0	0
3	7	3	4	4	1	0	0	0
4	7	2	2	2	1	0	0	0
5	7	1	2	2	0	0	0	0
7	7	0	0	0	0	5	1	3
2	8	435	619	556	147	0	0	0
3	8	651	928	833	220	0	0	0
2	9	290	413	371	98	0	0	0
3	9	434	619	556	146	0	0	0

Vehicle Type: 2=Passenger Car, 3=Pickup, 4=Minibus
5=Bus, 6=2 Axle Truck, 7=3or4 Axle Truck, 8=5+Axle Truck

(4) Nampula in 2017 / OD Table of Network Traffic Assignment

Nampula

2017 OD (vehicle/day)

O	D	2	3	4	5	6	7	8
1	**3**	120	56	72	24	38	19	21
1	**4**	17	8	11	1	8	1	0
1	**5**	21	10	10	18	7	1	0
1	**6**	27	13	21	3	25	5	17
1	**7**	28	13	22	3	59	12	39
1	**8**	54	25	42	7	15	3	10
1	**9**	69	32	53	8	88	18	59
1	**10**	134	62	105	17	0	0	0
1	**11**	17	8	14	2	15	3	10
2	**1**	95	44	51	16	31	9	47
2	**3**	80	37	45	27	0	0	0
2	**4**	16	7	8	1	0	0	0
2	**5**	18	8	8	20	0	0	0
2	**6**	18	8	12	6	15	8	11
2	**7**	19	9	13	6	34	19	26
2	**8**	35	16	25	12	9	5	7
2	**9**	45	21	32	15	51	29	39
2	**10**	88	41	62	29	0	0	0
2	**11**	11	5	8	4	9	5	7
3	**1**	99	46	65	24	28	51	36
3	**2**	88	41	46	28	4	13	64
3	**4**	24	11	10	2	0	0	0
3	**5**	29	13	10	32	0	0	0
3	**6**	34	16	14	11	27	10	4
3	**7**	35	16	15	12	62	24	8
3	**8**	67	31	29	23	16	6	2
3	**9**	86	40	37	29	93	36	12
3	**10**	167	78	72	57	0	0	0
3	**11**	22	10	9	7	16	6	2
1	**2**	82	38	53	14	25	21	28
4	**1**	17	8	10	1	8	1	0
4	**2**	15	7	7	1	0	0	0
4	**3**	23	11	9	2	0	0	0
4	**5**	5	2	2	2	0	0	0
4	**6**	9	4	3	0	8	1	0
4	**7**	9	4	4	0	18	2	1
4	**8**	17	8	7	0	5	1	0
4	**9**	22	10	8	0	27	3	2
4	**10**	43	20	17	0	0	0	0
4	**11**	6	3	2	0	5	1	0

O	D	2	3	4	5	6	7	8
5	**1**	23	11	11	19	8	1	0
5	**2**	19	9	8	21	0	0	0
5	**3**	31	14	11	33	0	0	0
5	**4**	5	2	2	3	0	0	0
5	**6**	9	4	2	13	8	1	0
5	**7**	10	4	2	14	19	2	0
5	**8**	18	8	4	26	5	1	0
5	**9**	23	11	5	33	28	3	1
5	**10**	45	21	10	65	0	0	0
5	**11**	6	3	1	9	5	1	0
4	**4**	0	0	0	0	0	0	0
6	**4**	9	4	4	0	8	1	0
7	**4**	9	4	4	0	18	2	1
8	**4**	18	8	8	0	5	1	0
9	**4**	23	10	10	0	27	4	2
10	**4**	44	20	19	1	0	0	0
11	**4**	6	3	2	0	5	1	0
5	**5**	0	0	0	0	0	0	0
6	**5**	8	4	2	12	7	1	0
7	**5**	8	4	2	13	16	2	1
8	**5**	16	7	3	24	4	0	0
9	**5**	20	9	4	31	24	3	1
10	**5**	40	18	8	61	0	0	0
11	**5**	5	2	1	8	4	0	0
6	**1**	27	13	21	3	25	5	17
7	**1**	28	13	22	3	59	12	39
8	**1**	54	25	42	7	15	3	10
9	**1**	69	32	53	8	88	18	59
10	**1**	134	62	105	17	0	0	0
11	**1**	17	8	14	2	15	3	10
6	**2**	18	8	12	6	15	8	11
7	**2**	19	9	13	6	34	19	26
8	**2**	35	16	25	12	9	5	7
9	**2**	45	21	32	15	51	29	39
10	**2**	88	41	62	29	0	0	0
11	**2**	11	5	8	4	9	5	7
6	**3**	34	16	14	11	27	10	4
7	**3**	35	16	15	12	62	24	8
8	**3**	67	31	29	23	16	6	2
9	**3**	86	40	37	29	93	36	12
10	**3**	167	78	72	57	0	0	0
11	**3**	22	10	9	7	16	6	2

Vehicle Type: 2=Passenger Car, 3=Pickup, 4=Minibus
5=Bus, 6=2 Axle Truck, 7=3or4 Axle Truck, 8=5+Axle Truck

(5) Nampula in 2025 / OD Table of Network Traffic Assignment

Nampula

2025 OD (vehicle/day)

O	D	2	3	4	5	6	7	8
1	**3**	199	85	118	39	99	48	42
1	**4**	28	12	18	1	30	5	6
1	**5**	35	15	17	29	21	3	1
1	**6**	15	6	11	2	4	1	3
1	**7**	71	31	56	9	12	2	8
1	**8**	148	64	116	18	180	38	126
1	**9**	111	48	86	14	79	17	56
1	**10**	145	63	113	18	49	11	35
1	**11**	152	66	119	19	20	4	14
2	**1**	161	69	83	27	72	27	100
2	**3**	129	55	72	43	0	0	0
2	**4**	25	11	12	2	3	2	3
2	**5**	29	12	13	32	0	0	0
2	**6**	10	4	7	3	2	1	2
2	**7**	47	20	33	15	6	4	5
2	**8**	97	42	68	32	95	56	76
2	**9**	73	31	51	24	42	25	34
2	**10**	95	41	67	31	26	16	21
2	**11**	100	43	70	33	11	6	9
3	**1**	159	68	106	39	82	106	70
3	**2**	143	62	75	45	6	24	117
3	**4**	39	17	17	4	6	2	1
3	**5**	46	20	16	52	0	0	0
3	**6**	18	8	8	6	4	1	0
3	**7**	88	38	38	30	11	5	2
3	**8**	184	79	79	62	174	70	24
3	**9**	138	59	59	47	76	31	11
3	**10**	181	78	77	61	48	19	7
3	**11**	189	81	81	64	20	8	3
1	**2**	138	59	88	22	62	49	67
4	**1**	28	12	17	1	30	4	6
4	**2**	25	11	11	2	3	2	3
4	**3**	38	16	15	4	6	2	1
4	**5**	8	3	3	4	1	0	0
4	**6**	5	2	2	0	1	0	0
4	**7**	23	10	9	0	3	0	0
4	**8**	48	21	18	0	50	6	3
4	**9**	36	15	14	0	22	3	1
4	**10**	47	20	18	0	14	2	1
4	**11**	49	21	19	0	6	1	0

O	D	2	3	4	5	6	7	8
5	**1**	37	16	18	31	24	3	1
5	**2**	31	13	14	34	0	0	0
5	**3**	50	22	17	55	0	0	0
5	**4**	9	4	3	4	2	0	0
5	**6**	5	2	1	7	1	0	0
5	**7**	24	10	5	35	3	0	0
5	**8**	51	22	11	73	52	6	1
5	**9**	38	16	8	54	23	3	1
5	**10**	50	21	11	71	14	2	0
5	**11**	52	22	11	75	6	1	0
4	**4**	0	0	0	0	0	0	0
6	**4**	5	2	2	0	1	0	0
7	**4**	24	10	10	0	3	0	0
8	**4**	49	21	21	1	52	7	3
9	**4**	37	16	16	1	23	3	1
10	**4**	48	21	21	1	14	2	1
11	**4**	51	22	22	1	6	1	0
5	**5**	0	0	0	0	0	0	0
6	**5**	4	2	1	7	1	0	0
7	**5**	21	9	4	33	3	0	0
8	**5**	44	19	8	68	45	5	2
9	**5**	33	14	6	51	20	2	1
10	**5**	43	19	8	67	13	1	0
11	**5**	45	20	9	70	5	1	0
6	**1**	15	6	11	2	4	1	3
7	**1**	71	31	56	9	12	2	8
8	**1**	148	64	116	18	180	38	126
9	**1**	111	48	86	14	79	17	56
10	**1**	145	63	113	18	49	11	35
11	**1**	152	66	119	19	20	4	14
6	**2**	10	4	7	3	2	1	2
7	**2**	47	20	33	15	6	4	5
8	**2**	97	42	68	32	95	56	76
9	**2**	73	31	51	24	42	25	34
10	**2**	95	41	67	31	26	16	21
11	**2**	100	43	70	33	11	6	9
6	**3**	18	8	8	6	4	1	0
7	**3**	88	38	38	30	11	5	2
8	**3**	184	79	79	62	174	70	24
9	**3**	138	59	59	47	76	31	11
10	**3**	181	78	77	61	48	19	7
11	**3**	189	81	81	64	20	8	3

Vehicle Type: 2=Passenger Car, 3=Pickup, 4=Minibus
5=Bus, 6=2 Axle Truck, 7=3or4 Axle Truck, 8=5+Axle Truck

(6) Nampula in 2035 / OD Table of Network Traffic Assignment

Nampula

2035 OD (vehicle/day)

O	D	2	3	4	5	6	7	8
1	**3**	299	169	177	58	199	112	99
1	**4**	42	24	27	2	61	11	13
1	**5**	52	29	25	44	43	6	2
1	**6**	22	13	17	3	7	2	6
1	**7**	109	62	85	13	23	6	19
1	**8**	227	128	177	28	360	89	295
1	**9**	170	96	132	21	158	39	130
1	**10**	223	126	173	27	99	25	81
1	**11**	233	132	182	29	41	10	34
2	**1**	243	137	124	41	144	62	235
2	**3**	193	109	108	64	0	0	0
2	**4**	38	21	19	3	6	4	6
2	**5**	43	24	19	48	0	1	2
2	**6**	15	8	10	5	4	3	4
2	**7**	71	40	50	23	12	9	12
2	**8**	149	84	105	49	190	132	178
2	**9**	111	63	78	36	83	58	78
2	**10**	146	82	103	48	52	36	49
2	**11**	153	86	107	50	22	15	20
3	**1**	238	134	159	59	164	248	164
3	**2**	215	122	112	68	13	57	274
3	**4**	58	33	25	6	11	5	2
3	**5**	70	39	24	79	0	0	0
3	**6**	28	16	12	9	7	3	1
3	**7**	135	76	58	46	23	11	4
3	**8**	282	159	121	95	348	165	57
3	**9**	211	119	90	71	153	72	25
3	**10**	276	156	118	93	96	45	16
3	**11**	289	163	124	98	40	19	6
1	**2**	208	117	132	33	124	114	156
4	**1**	41	23	25	2	59	10	13
4	**2**	37	21	17	3	6	4	6
4	**3**	57	32	23	6	11	5	2
4	**5**	12	7	4	6	3	0	0
4	**6**	7	4	3	0	2	0	0
4	**7**	35	20	14	0	7	1	0
4	**8**	73	41	28	1	101	14	7
4	**9**	55	31	21	1	44	6	3
4	**10**	72	41	28	1	28	4	2
4	**11**	75	42	29	1	11	2	1

O	D	2	3	4	5	6	7	8
5	**1**	56	32	26	47	49	7	1
5	**2**	47	26	21	50	0	0	0
5	**3**	75	42	26	83	0	0	0
5	**4**	13	7	5	6	3	0	0
5	**6**	8	4	2	11	2	0	0
5	**7**	37	21	8	54	7	1	0
5	**8**	78	44	17	112	104	15	3
5	**9**	58	33	12	83	46	6	1
5	**10**	76	43	16	109	29	4	1
5	**11**	80	45	17	114	12	2	0
4	**4**	0	0	0	0	0	0	0
6	**4**	7	4	3	0	2	0	0
7	**4**	36	20	16	1	7	1	0
8	**4**	75	43	33	1	104	16	7
9	**4**	56	32	24	1	46	7	3
10	**4**	74	42	32	1	29	5	2
11	**4**	77	44	34	1	12	2	1
5	**5**	0	0	0	0	0	0	0
6	**5**	7	4	1	10	2	0	0
7	**5**	33	18	6	50	6	1	0
8	**5**	68	38	13	104	91	12	4
9	**5**	51	29	10	78	40	5	2
10	**5**	66	38	13	102	25	3	1
11	**5**	70	39	13	107	10	1	0
6	**1**	22	13	17	3	7	2	6
7	**1**	109	62	85	13	23	6	19
8	**1**	227	128	177	28	360	89	295
9	**1**	170	96	132	21	158	39	130
10	**1**	223	126	173	27	99	25	81
11	**1**	233	132	182	29	41	10	34
6	**2**	15	8	10	5	4	3	4
7	**2**	71	40	50	23	12	9	12
8	**2**	149	84	105	49	190	132	178
9	**2**	111	63	78	36	83	58	78
10	**2**	146	82	103	48	52	36	49
11	**2**	153	86	107	50	22	15	20
6	**3**	28	16	12	9	7	3	1
7	**3**	135	76	58	46	23	11	4
8	**3**	282	159	121	95	348	165	57
9	**3**	211	119	90	71	153	72	25
10	**3**	276	156	118	93	96	45	16
11	**3**	289	163	124	98	40	19	6

Vehicle Type: 2=Passenger Car, 3=Pickup, 4=Minibus
5=Bus, 6=2 Axle Truck, 7=3or4 Axle Truck, 8=5+Axle Truck

(7) Cuamba in 2017 / OD Table of Network Traffic Assignment

Cuamba

2017 OD (vehicle/day)

O	D	2	3	4	5	6	7	8
1	**2**	0	0	0	0	0	0	0
1	**3**	0	0	0	0	0	0	0
1	**4**	23	20	0	0	0	0	0
1	**5**	0	0	0	0	0	0	0
1	**6**	14	12	10	0	23	15	17
1	**7**	9	8	6	0	9	6	7
1	**8**	13	11	9	0	11	7	8
1	**9**	10	9	7	0	9	6	7
1	**10**	2	2	2	0	0	0	0
1	**11**	0	0	0	0	0	0	0
1	**12**	2	2	2	0	0	0	0
2	**1**	0	0	0	0	0	0	0
2	**3**	0	0	0	0	0	0	0
2	**4**	0	0	4	1	37	24	24
2	**5**	0	0	0	0	0	2	0
2	**6**	16	14	5	2	25	6	5
2	**7**	10	9	3	1	10	2	2
2	**8**	14	13	5	2	12	3	3
2	**9**	11	10	4	1	10	2	2
2	**10**	2	2	1	0	0	0	0
2	**11**	0	0	0	0	0	0	0
2	**12**	2	2	1	0	0	0	0
3	**1**	0	0	0	0	0	0	0
3	**2**	0	0	0	0	0	0	0
3	**4**	0	0	0	0	0	0	0
3	**5**	0	0	0	0	0	0	0
3	**6**	10	9	3	0	4	7	4
3	**7**	7	6	2	0	1	3	2
3	**8**	9	8	3	0	2	3	2
3	**9**	7	6	2	0	1	3	2
3	**10**	2	1	1	0	0	0	0
3	**11**	0	0	0	0	0	0	0
3	**12**	2	1	1	0	0	0	0
4	**1**	23	20	0	0	0	0	0
4	**2**	0	0	7	2	59	17	32
4	**3**	0	0	0	0	0	0	0
4	**5**	0	0	10	1	8	7	0
4	**6**	20	17	5	0	27	11	0
4	**7**	13	11	3	0	11	4	0
4	**8**	18	16	5	0	14	5	0
4	**9**	14	12	4	0	11	4	0
4	**10**	3	3	1	0	0	0	0
4	**11**	0	0	0	0	0	0	0
4	**12**	3	3	1	0	0	0	0

O	D	2	3	4	5	6	7	8
5	**1**	0	0	0	0	0	0	0
5	**2**	0	0	1	0	0	0	0
5	**3**	0	0	0	0	0	0	0
5	**4**	13	11	15	0	0	0	0
5	**6**	17	15	2	0	42	4	2
5	**7**	11	10	2	0	17	2	1
5	**8**	16	14	2	0	21	2	1
5	**9**	12	11	2	0	17	2	1
5	**10**	3	2	0	0	0	0	0
5	**11**	0	0	0	0	0	0	0
5	**12**	3	2	0	0	0	0	0
6	**1**	14	12	10	0	23	15	17
6	**2**	16	14	4	2	21	5	9
6	**3**	10	9	3	0	4	7	4
6	**4**	21	19	4	0	35	14	7
6	**5**	21	18	4	0	38	0	2
7	**1**	9	8	6	0	9	6	7
7	**2**	10	9	2	1	8	2	4
7	**3**	7	6	2	0	1	3	2
7	**4**	14	12	3	0	14	6	3
7	**5**	14	12	3	0	15	0	1
8	**1**	13	11	9	0	11	7	8
8	**2**	15	13	4	2	10	3	4
8	**3**	9	8	3	0	2	3	2
8	**4**	19	17	4	0	18	7	3
8	**5**	19	17	4	0	19	0	1
9	**1**	10	9	7	0	9	6	7
9	**2**	11	10	3	1	8	2	4
9	**3**	7	6	2	0	1	3	2
9	**4**	15	13	3	0	14	6	3
9	**5**	14	13	3	0	15	0	1
10	**1**	2	2	2	0	0	0	0
10	**2**	2	2	1	0	0	0	0
10	**3**	2	1	1	0	0	0	0
10	**4**	3	3	1	0	0	0	0
10	**5**	3	3	1	0	0	0	0
11	**1**	0	0	0	0	0	0	0
11	**2**	0	0	0	0	0	0	0
11	**3**	0	0	0	0	0	0	0
11	**4**	0	0	0	0	0	0	0
11	**5**	0	0	0	0	0	0	0
12	**1**	2	2	2	0	0	0	0
12	**2**	2	2	1	0	0	0	0
12	**3**	2	1	1	0	0	0	0
12	**4**	3	3	1	0	0	0	0
12	**5**	3	3	1	0	0	0	0

Vehicle Type: 2=Passenger Car, 3=Pickup, 4=Minibus
5=Bus, 6=2 Axle Truck, 7=3or4 Axle Truck, 8=5+Axle Truck

(8) Cuamba in 2025 / OD Table of Network Traffic Assignment

Cuamba

2025 OD (vehicle/day)

O	D	2	3	4	5	6	7	8
1	2	0	0	0	0	0	0	0
1	3	0	0	0	0	0	0	0
1	4	38	34	1	0	0	0	0
1	5	0	0	0	0	0	0	0
1	6	9	8	7	0	18	12	13
1	7	15	13	10	0	8	5	6
1	8	11	10	8	0	0	0	0
1	9	7	7	5	0	39	25	28
1	10	14	12	10	0	12	8	9
1	11	4	3	3	0	30	20	22
1	12	22	19	15	0	12	8	9
2	1	0	0	0	0	0	0	0
2	3	0	0	0	0	0	0	0
2	4	0	0	7	1	85	55	54
2	5	0	0	0	1	0	5	0
2	6	10	9	4	1	20	5	4
2	7	16	15	6	2	9	2	2
2	8	13	11	4	1	0	0	0
2	9	8	7	3	1	42	10	9
2	10	16	14	5	2	13	3	3
2	11	4	4	1	0	33	8	7
2	12	24	22	8	3	13	3	3
3	1	0	0	0	0	0	0	0
3	2	0	0	0	0	0	0	0
3	4	0	0	0	0	0	0	0
3	5	0	0	0	0	0	0	0
3	6	7	6	2	0	3	6	4
3	7	11	10	4	0	1	2	2
3	8	8	7	3	0	0	0	0
3	9	5	5	2	0	6	12	8
3	10	10	9	3	0	2	4	2
3	11	3	2	1	0	5	9	6
3	12	16	14	5	0	2	4	2
4	1	38	34	1	0	0	0	0
4	2	0	0	11	4	136	40	72
4	3	0	0	0	0	0	0	0
4	5	0	0	17	1	18	16	0
4	6	13	11	3	0	22	9	0
4	7	21	18	6	0	10	4	0
4	8	16	14	4	0	0	0	0
4	9	10	9	3	0	46	18	0
4	10	20	17	5	0	14	6	0
4	11	5	4	1	0	37	15	0
4	12	30	27	8	0	14	6	0

O	D	2	3	4	5	6	7	8
5	1	0	0	0	0	0	0	0
5	2	0	0	1	0	0	0	0
5	3	0	0	0	0	0	0	0
5	4	21	18	25	1	0	0	0
5	6	12	10	2	0	34	3	2
5	7	18	16	3	0	15	1	1
5	8	14	12	2	0	0	0	0
5	9	9	8	1	0	71	7	4
5	10	17	15	2	0	22	2	1
5	11	4	4	1	0	56	5	3
5	12	27	24	4	0	22	2	1
6	1	9	8	7	0	18	12	13
6	2	11	9	3	1	17	4	7
6	3	7	6	2	0	3	6	4
6	4	14	12	3	0	29	11	6
6	5	14	12	3	0	31	0	2
7	1	15	13	10	0	8	5	6
7	2	17	15	4	2	8	2	3
7	3	11	10	4	0	1	2	2
7	4	22	20	5	0	13	5	2
7	5	22	19	4	0	14	0	1
8	1	11	10	8	0	0	0	0
8	2	13	11	3	1	0	0	0
8	3	8	7	3	0	0	0	0
8	4	17	15	4	0	0	0	0
8	5	17	15	3	0	0	0	0
9	1	7	7	5	0	39	25	28
9	2	8	7	2	1	35	9	15
9	3	5	5	2	0	6	12	8
9	4	11	10	2	0	60	23	12
9	5	11	10	2	0	65	0	4
10	1	14	12	10	0	12	8	9
10	2	16	14	4	2	11	3	5
10	3	10	9	3	0	2	4	2
10	4	21	19	4	0	19	7	4
10	5	21	19	4	0	20	0	1
11	1	4	3	3	0	30	20	22
11	2	4	4	1	0	28	7	12
11	3	3	2	1	0	5	9	6
11	4	5	5	1	0	47	18	9
11	5	5	5	1	0	51	0	3
12	1	22	19	15	0	12	8	9
12	2	25	22	6	3	11	3	5
12	3	16	14	5	0	2	4	2
12	4	33	29	7	0	19	7	4
12	5	33	29	6	0	20	0	1

Vehicle Type: 2=Passenger Car, 3=Pickup, 4=Minibus
5=Bus, 6=2 Axle Truck, 7=3or4 Axle Truck, 8=5+Axle Truck

(9) Cuamba in 2035 / OD Table of Network Traffic Assignment

Cuamba

2035 OD (vehicle/day)

O	D	2	3	4	5	6	7	8
1	2	0	0	0	0	0	0	0
1	3	0	0	0	0	0	0	0
1	4	59	52	1	0	0	0	0
1	5	0	0	0	0	0	0	0
1	6	14	13	10	0	41	27	30
1	7	23	20	16	0	18	12	13
1	8	17	15	12	0	0	0	0
1	9	11	10	8	0	86	56	63
1	10	22	19	15	0	27	17	20
1	11	6	5	4	0	68	44	50
1	12	34	30	24	0	27	17	20
2	1	0	0	0	0	0	0	0
2	3	0	0	0	0	0	0	0
2	4	0	0	11	2	191	124	121
2	5	0	0	0	1	0	12	0
2	6	16	14	5	2	45	11	9
2	7	25	22	9	3	20	5	4
2	8	19	17	7	2	0	0	0
2	9	13	11	4	1	94	23	20
2	10	24	21	8	3	29	7	6
2	11	6	5	2	1	74	18	16
2	12	38	33	13	4	29	7	6
3	1	0	0	0	0	0	0	0
3	2	0	0	0	0	0	0	0
3	4	0	0	0	0	0	0	0
3	5	0	0	0	0	0	0	0
3	6	11	9	3	0	7	13	8
3	7	17	15	5	0	3	6	4
3	8	13	11	4	0	0	0	0
3	9	8	7	3	0	14	26	17
3	10	16	14	5	0	4	8	5
3	11	4	4	1	0	11	21	13
3	12	25	22	8	0	4	8	5
4	1	59	52	1	0	0	0	0
4	2	0	0	17	6	304	89	161
4	3	0	0	0	0	0	0	0
4	5	0	0	26	2	40	36	0
4	6	20	18	5	0	50	20	0
4	7	32	28	8	0	22	9	0
4	8	24	21	7	0	0	0	0
4	9	16	14	4	0	104	41	0
4	10	30	27	8	0	32	13	0
4	11	8	7	2	0	82	32	0
4	12	47	41	13	0	32	13	0

O	D	2	3	4	5	6	7	8
5	1	0	0	0	0	0	0	0
5	2	0	0	2	0	0	0	0
5	3	0	0	0	0	0	0	0
5	4	32	28	39	1	0	0	0
5	6	18	16	2	0	76	7	4
5	7	28	25	4	0	34	3	2
5	8	21	19	3	0	0	0	0
5	9	14	12	2	0	159	15	9
5	10	27	24	4	0	49	5	3
5	11	7	6	1	0	125	12	7
5	12	42	37	6	0	49	5	3
6	1	14	13	10	0	41	27	30
6	2	16	14	4	2	38	10	16
6	3	11	9	3	0	7	13	8
6	4	22	19	5	0	64	25	12
6	5	21	19	4	0	70	0	4
7	1	23	20	16	0	18	12	13
7	2	26	23	6	3	17	4	7
7	3	17	15	5	0	3	6	4
7	4	34	30	7	0	28	11	6
7	5	34	30	7	0	31	0	2
8	1	17	15	12	0	0	0	0
8	2	20	17	5	2	0	0	0
8	3	13	11	4	0	0	0	0
8	4	26	23	5	0	0	0	0
8	5	26	23	5	0	0	0	0
9	1	11	10	8	0	86	56	63
9	2	13	12	3	1	79	20	33
9	3	8	7	3	0	14	26	17
9	4	17	15	4	0	134	52	26
9	5	17	15	3	0	146	-1	9
10	1	22	19	15	0	27	17	20
10	2	25	22	6	3	25	6	10
10	3	16	14	5	0	4	8	5
10	4	33	29	7	0	41	16	8
10	5	32	29	6	0	45	0	3
11	1	6	5	4	0	68	44	50
11	2	6	6	2	1	62	16	26
11	3	4	4	1	0	11	21	13
11	4	8	7	2	0	105	41	20
11	5	8	7	2	0	115	0	7
12	1	34	30	24	0	27	17	20
12	2	38	34	9	4	25	6	10
12	3	25	22	8	0	4	8	5
12	4	51	45	11	0	41	16	8
12	5	50	44	10	0	45	0	3

Vehicle Type: 2=Passenger Car, 3=Pickup, 4=Minibus
5=Bus, 6=2 Axle Truck, 7=3or4 Axle Truck, 8=5+Axle Truck

APPENDIX-2 Evaluation Result of Alternative Routes/Alignments

(1) Nacala Port Access Road - Section 1– Detailed evaluation

(2) Nacala Port Access Road - Section 2– Detailed evaluation

(3) Nampula Southern Bypass Road - Section 1– Detailed evaluation

(4) Nampula Southern Bypass Road - Section 2- Detailed evaluation

(5) Nampula Southern Bypass Road - Section 3- Detailed evaluation

(6) Cuamba Bypass Road

(1) Nacala Port Access Road - Section 1– Detailed evaluation

Evaluation Item	Evaluation Criteria	Alternatives			
		Alt-1 (Yellow)	**Alt-2 (Red)**	**Alt-3 (Blue)**	**Alt-4 (Green)**
1) Consistency with integrated development plan (e.g. PEDEC -Nacala, PEU)	Objective: To function as an integrated infrastructure development plan to realise the strategy for the Nacala Corridor regional development ✓ Consistency with PEDEC-Nacala ✓ Consistency with Land Use Plans (PEU) ✓ Consistency with other Infrastructure Development Plans (e.g. High voltage Electric Line Plan, Plans by municipalities, etc.)	• Satisfactory connection between the bypass and the industrial area planned by PEDEC-Nacala	• Satisfactory connection between the bypass and the industrial area planned by PEDEC-Nacala • Since the route crosses industrial plant areas, there are several obstructions.	• Excellent connection between the bypass and the industrial area planned by PEDEC-Nacala	• No connection to the industrial area planned by PEDEC-Nacala • Route runs close to the high voltage transmission line.
2) Benefit to Traffic Congestion Relief	Project Objective: To alleviate current and future traffic congestion: ✓ Reduction of transport cost ✓ Reduction of travel time	• Major part of the traffic related to the port will use this alternative (higher travelling speed ensures a lower transportation cost)	• Same as Alt-1	• Road length is approx. 500 m longer than Alt-1 • There are some curve sections, but more moderate slopes than Alt-1	• Steep horizontal curve is located at the railway crossing. • Since gradient of existing ground is steep, the vertical gradient also is steep.
3) Benefits to Urban Development and Residents	Objective: To promote well-organised urban developments along the road and to act as an urban road for residents of the municipality's daily use: ✓ Possibility of urban development along the road and function of generated traffic demand ✓ Function for residents in the municipality as an urban road	• Houses and facilities are not relocated, only limited to planned industrial area because the road runs through the erosion control zone.	• Same as Alt-1	• Same as Alt-1	• It would not function as a bypass because the road runs through the zone for developing residential areas.
4) Road Safety	Objective: To Promote/Ensure a safe road: ✓ Safety for drivers ✓ Safety for residents	• Horizontal alignment is almost straight. • Crossing structures should be considered in village areas.	• Crossing structures should be considered in village areas.	• Crossing structures should be considered in village areas.	• Crossing structures should be considered because many residents will cross the road. • There are some steep vertical gradient sections.
5) Affordability	Objective: To be an affordable project and have sustainable maintenance costs: ✓ Construction cost ✓ Compensation costs such as houses, land and facilities ✓ Other compensation such as removal of utility lines, etc. ✓ Road maintenance cost	Road length: 8,200 m (Bridge length 800 m) Construction cost: 1.00 Buildings affected: ~ 7 units Compensation facilities: None Embankment volume: 1.32 Million m³ Maintenance cost: 1.13 Number of railway crossings: 0	Road length: 8,360 m (Bridge length 1,490 m) Construction Cost: 1.45 Buildings affected: ~ 7 units Compensation facilities: Pipeline Embankment volume: 1.69 Million m³ Maintenance cost: 1.05 Number of railway crossings: 1	Road length: 8,810 m (Bridge length 760 m) Construction cost: 1.07 Buildings affected: ~ 6 units Compensation facilities: None Embankment volume: 1.57 Million m³ Maintenance cost: 1.23 Number of railway crossings: 0	Road length: 8,815 m (Bridge Length 1,450 m) Construction Cost: 1.33 Buildings affected: ~ 11 units Compensation facilities: Pipeline Embankment volume: 1.42 Million m³ Maintenance cost: 1.00 Number of railway crossings: 1
6) Environmental Impacts	Objective: To minimise the adverse impacts on the natural environment: ✓ Number of trees cut (soil water retention property, control soil erosion against rainfall, etc.) ✓ Reduce the volume of soil borrowed from Borrow pits and crushed stone used in the construction ✓ Impacts on the coastal environment (Nacala) ✓ Other environmental impacts (Threatened species, etc.)	• Road protection needs to be considered due the proximity of the sea shore. • Larger embankment volume requires larger borrow pit and longer construction period.	• Countermeasures for soil erosion should be considered (e.g. improvement of river embankment, construction of drainages, landslide disaster management plan, etc.)	• Road protection needs to be considered due the proximity of the sea shore. • Larger embankment volume requires larger borrow pit and longer construction period.	• Same as Alt-2.
7) Property Acquisitions	Objective: To minimise removal of houses and land acquisition: ✓ Number of houses and facilities affected by the road project ✓ Area of required land acquisition	Buildings affected: ~ 7 units Land expropriation area: ~ 891,700 m² Not accommodated with factories' lands	Buildings affected: ~ 7 units Land expropriation area: ~ 827,835 m²	Buildings affected: ~ 6 units Land expropriation area: ~ 970,025 m²	Buildings affected: ~ 11 units Land expropriation area: ~ 791,083 m²
8) Community including property access	Objective: To minimise the adverse social impacts in the long term, such as impact on the communities along the road: ✓ Creating/ensuring access to community facilities such as schools, hospitals and cemeteries (no adverse impact such as interrupt/disconnect with existing foot paths) ✓ Impact for Amenities, Noise, Accessibility to roads, Passing vehicles, etc.)	• Crossing structures (such as under pass etc.) should be considered for local villagers' usage.	• Crossing structures (such as under pass etc.) should be considered for factory staff and residents usage.	• Crossing structures (such as under pass etc.) should be considered for local villagers' usage.	• The road runs through a developed residential area, it's expected that many residents will use the road.

(2) Nacala Port Access Road - Section 2– Detailed evaluation

Evaluation Item	Evaluation Criteria	Alignment Alternatives			
		Alt-1 (Yellow)	**Alt-2 (Red)**	**Alt-3 (Blue)**	**Alt-4 (Green)**
1) Consistency with integrated development plan (e.g. PEDEC -Nacala, PEU)	Objective: To function as an integrated infrastructure development plan to realise the strategy for the Nacala Corridor regional development ✓ Consistency with PEDEC-Nacala ✓ Consistency with Land Use Plans (PEU) ✓ Consistency with other Infrastructure Development Plans (e.g. High voltage Electric Line Plan, Plans by municipalities, etc.)	• It cannot connect with the Multi-modal terminal (Railway cargo & Truck).	• It can connect with the Multi-modal Terminal (Railway cargo & Truck). • It cannot serve the industrial area along the road.	• It can connect with the Multi-modal Terminal (Railway cargo & Truck). • It also can serve the industrial area along the road.	• It cannot connect with the Multi-modal Terminal (Railway cargo & Truck).
2) Benefit to Traffic Congestion Relief	Project Objective: To alleviate current and future traffic congestion: ✓ Reduction of transport cost ✓ Reduction of travel time	• Traffic related to Nacala Port will use this road. • Traffic from Nampula to Nacala-a-Velha will use this road.	• This road is a large detour route.	• Distance is slightly longer than Alt-1. • A better access from Nampula to Nacala-a-Velha.	• This road is parallel to the existing road (N12). • There is almost no difference in distance for the traffic coming from Nampula and going to Nacala-a-Velha.
3) Benefits to Urban Development and Residents	Objective: To promote well-organised urban developments along the road and to form an urban road for residents of the municipality's daily use: ✓ Possibility of urban development along the road and function of generating traffic demand ✓ Function for residents in the municipality as an urban road	• Development is not expect along the road, because the road runs between the villages and the erosion control zone,	• Houses already have been built in the connection area with N12, so significant development is not expected in the area.	• It's possible to serve the industrial area including installation of the service road.	• Road runs in a developed residential area providing service for the residents. However, there is a reasonable risk of losing the bypass functionality.
4) Road Safety	Objective: To promote/Ensure a safe road: ✓ Safety for drivers ✓ Safety for residents	• Horizontal alignment is predominantly straight. • Pedestrian crossing structures need to be considered in the villages.	• Since houses already have been located in the connection area with N12, pedestrian safety needs to be carefully considered.	• Horizontal alignment is predominantly straight. • Since a development zone is planned along the road, road safety needs to be considered carefully, including the service road.	• Since there are many communities and villages, pedestrian safety needs to be carefully considered.
5) Affordability	Objective: To be an affordable project and have sustainable maintenance costs: ✓ Construction cost ✓ Compensation costs such as houses, land and facilities ✓ Other compensation such as removal of utility lines, etc. ✓ Road maintenance cost	Road length: 5,742 m (Bridge length 40 m) Construction cost: 1.33 Buildings affected: ~ 0 units Compensation facilities: None Embankment volume: 0.67 Million m^3 Maintenance cost: 1.22 Number of railway crossings: 0	Road length: 5,386 m (Bridge length 80 m) Construction cost: 2.36 Buildings affected: ~ 49 units Compensation facilities: None Embankment volume: 1.65 Million m^3 Maintenance cost: 1.13 Number of railway crossings: 1	Road length: 6,008 m (Bridge length 40 m) Construction cost: 2.29 Buildings affected: ~ 0 units Compensation facilities: None Embankment volume: 1.60 Million m^3 Maintenance cost: 1.27 Number of railway crossings: 0	Road length: 4,730 m (Bridge length 40 m) Construction cost: 1.00 Buildings affected: ~ 180 units Compensation facilities: None Embankment volume: 0.52 Million m^3 Maintenance cost: 1.00 Number of railway crossings: 0
6) Environmental Impacts	Objective: To minimise the adverse impacts on the natural environment: ✓ Number of trees cut (soil water retention property, control soil erosion against rainfall, etc.) ✓ Reduce the volume of soil borrowed from Borrow pits and crushed stone used in the construction ✓ Impacts on the coastal environment (Nacala) ✓ Other environmental impacts (Threatened species, etc.)	• Railway embankment partially collapsed due to soil flow during heavy rain season. Since the road is located in a lower area than the railway, countermeasures for soil erosion should be considered.	• Same as Alt-1. • Furthermore, embankment volume is larger than other alternatives.	• Same as Alt-1.	• Runs through a more stable soil area than the other alternatives. • Drainage system from N12 needs to be considered.
7) Property Acquisitions	Objective: To minimise removal of houses and land acquisition: ✓ Number of houses and facilities affected by the road project ✓ Area of required land acquisition	Buildings affected: ~ 0 units Land expropriation: ~ 687,091 m^2	Buildings affected: ~ 49 units Land expropriation: ~ 637,204 m^2	Buildings affected: ~ 0 units Land expropriation: ~ 719,144 m^2	Buildings affected: ~ 180 units Land expropriation: ~ 565,145 m^2
8) Community including property access	Objective: To minimise the adverse social impacts in the long term, such as impact to communities along the road: ✓ Creating/ensuring access to community facilities such as schools, hospitals and cemeteries (no adverse impact such as interrupt/disconnect of existing foot paths) ✓ Impact for Amenities, Noise, Accessibility to roads, Passing vehicles, etc.)	• Since the road runs through communities and villages, pedestrian crossing structures need to be considered. • Large size vehicles may produce noise and also represent a potential risk for local citizens.	• Since houses already have been built in the connection area with N12, pedestrian crossings need to be considered. • Large size vehicles may produce noise and also represent a potential risk for local citizens.	• Social issues are not expected because the road runs through non-inhabited areas.	• Same as Alt-2.

(3) Nampula Southern Bypass Road - Section 1– Detailed evaluation

Evaluation Item	Evaluation Criteria	Alignment Alternatives		
		Alt-1 (Yellow)	**Alt-2 (Red)**	**Alt-3 (Blue)**
1) Consistency with integrated development plan (e.g. PEDEC-Nacala, PEU)	Objective: To function as an integrated infrastructure development plan to realise the strategy for the Nacala Corridor regional development ✓ Consistency with PEDEC-Nacala ✓ Consistency with Land Use Plans (PEU) ✓ Consistency with other Infrastructure Development Plans (e.g. High voltage Electric Line Plan, Plans by municipal, etc.)	• Consistency with circular road and bypass proposed by PEDEC-Nacala. Also, consistency with PEU.	Same as Alt-1.	• This route is based on the circular road in the initial PEU proposed by UN-Habitat.
2) Benefit to Traffic Congestion Relief	Project Objective: To alleviate current and future traffic congestion: ✓ Reduction of transport cost ✓ Reduction of travel time	• Bypass functionality can be guaranteed since the connection point is outside of the urbanised area.	• Bypass functionality can be guaranteed since the connection point is outside of the urbanised area (approximately 1 km closer to the urbanised area than Alt-1).	• Connection point is near the urbanised area (approximately 3.5 km closer to the urbanised area than Alt-1), due the proximity, reasonable travel speed cannot be guaranteed.
3) Benefits to Urban Development and Residence	Objective: To promote well-organised urban developments along the road and to form an urban road for residents of the municipality's daily use: ✓ Possibility of urban development along the road and function of generated traffic demand ✓ Function for residents in the municipality as an urban road	• The area along the road is not used and is expected to develop.	• The area along the road is not used and is expected to develop.	• Houses already have been built in this area, significant additional residential development is not expected.
4) Road Safety	Objective: To Promote/Ensure a safe road: ✓ Safety for drivers ✓ Safety for residents	• Horizontal alignment is predominantly straight. • Traffic safety is ensured along the main road due the construction of a service road for residential people to use.	• Same as Alt-1.	• This alternative runs through developed residential areas. It will be necessary to provide many pedestrian crossing structures to guarantee safety for all users.
5) Affordability	Objective: To be an affordable project and have sustainable maintenance costs: ✓ Construction cost ✓ Compensation costs such as houses, land and facilities ✓ Other compensation such as removal of utility lines, etc. ✓ Road maintenance cost	Road length: 14,440 m (Bridge length 640 m) Construction cost: 1.48 Buildings affected: ~ 56 units Compensation facilities: None Embankment volume: 0.73 Million m^3 Maintenance cost: 1.12 Number of railway crossings: 1	Road length: 14,160 m (Bridge length 640 m) Construction cost: 1.06 Buildings affected: ~ 21 units Compensation facilities: None Embankment volume: 0.79 Million m^3 Maintenance cost: 1.14 Number of railway crossings: 1	Road length: 12,360 m (Bridge length 640 m) Construction cost: 1.00 Buildings affected: ~ 42 units Compensation facilities: None Embankment volume: 0.83 Million m^3 Maintenance cost: 1.00 Number of railway crossings: 1
6) Environmental Impacts	Objective: To minimise the adverse impacts on the natural environment: ✓ Number of trees cut (soil water retention property, control soil erosion against rainfall, etc.) ✓ Reduce the volume of soil borrowed from Borrow pits and crushed stone used in the construction ✓ Impacts on the coastal environment (Nacala) ✓ Other environmental impacts (Threatened species, etc.)	• Road level should be considered to avoid overtopping during flooding events. • No environmental issues.	• Same as Alt-1.	• Same as Alt-1. • Also, high embankments or cuts should be avoided in the residential area.
7) Property Acquisitions	Objective: To minimise removal of houses and land acquisition: ✓ Number of houses and facilities affected by the road project ✓ Area of required land acquisition	Buildings affected: ~ 56 units Land expropriation: ~ 1,662,900 m^2	Buildings affected: ~ 21 units Land expropriation: ~ 1,694,230 m^2	Buildings affected: ~ 42 units Land expropriation: ~ 1,484,560 m^2
8) Community including property access	Objective: To minimise the adverse social impacts in the long term, such as impacts on the community along the road: ✓ Creating/ensuring access to community facilities such as schools, hospitals and cemeteries (no adverse impact such as interrupt/disconnect with existing foot paths) ✓ Impacts on Amenities, Noise, Accessibility to roads, Passing vehicles, etc.)	• Few residents affected. No municipal facilities located in the area.	• Same as Alt-1.	• This alternative runs through residential areas, dividing the local community. • Considerable number of pedestrians crossing the road. • Large size vehicles may produce noise and also represent a potential risk for local citizens.

(4) Nampula Southern Bypass Road - Section 2- Detailed evaluation

Evaluation Item	Evaluation Criteria	Alignment Alternatives			
		Alt-1 (Yellow)	**Alt-2 (Red)**	**Alt-3 (Blue)**	**Alt-Branch (Green)**
1) Consistency with development plan (e.g. PEDEC-Nacala, PEU)	Objective: To function as an integrated infrastructure development plan to realise the strategy for the Nacala Corridor regional development ✓ Consistency with PEDEC-Nacala ✓ Consistency with Land Use Plans (PEU) ✓ Consistency with other Infrastructure Development Plans (e.g. High voltage Electric Line Plans, Plans by municipalities, etc.)	• Consistency with circular road and bypass proposed by PEDEC-Nacala. However, this route runs on the north side of the river.	• Consistency with circular road and bypass proposed by PEDEC-Nacala. Also, this route is included in PEU.	• This route is based on the circular road in the initial PEU proposed by UN-Habitat.	• This route was proposed by Nampula district. • The effect of this road is only a bypass between N1 and N1.
2) Benefit to Traffic Congestion Relief	Project Objective: To alleviate current and future traffic congestion: ✓ Reduction of transport cost ✓ Reduction of travel time	• The main OD are N1 to N1, N1 to N13 and the city area to N1/N13/Rapale. • Traffic congestion will be reduced in the city area.	• Same as Alt-1.	• Same as Alt-1.	• The traffic volume is supposed to be smaller than the other alternatives because the main OD is only N1 to N1.
3) Benefits to Urban Development and Residents	Objective: To promote well-organised urban developments along the road and to form an urban daily life of city residents: ✓ Possibility of urban development along the road and function of generated traffic demand ✓ Function for residents in the city as an urban road	• The area along the road is not used and is expected to develop.	• The area along the road is not used and is expected to develop.	• Urban development along the road cannot be expected due to its proximity with the river.	• The area along the road is not used and is expected to develop. • However, considering that the area is too far from the city, the potential for residential development is imitated.
4) Road Safety	Objective: To Promote/Ensure a safe road: ✓ Safety for drivers ✓ Safety for residents	• Horizontal alignment is predominantly straight. • Traffic safety is ensured along the main road due to the construction of a service road for residential people to use.	• Same as Alt-1.	• Same as Alt-1. • However service road is limited by the proximity of the river.	• The number of pedestrians crossing the road is expected to be very low, because this alternative is located far from urban areas.
5) Affordability	Objective: To be an affordable project and have sustainable maintenance costs: ✓ Construction cost ✓ Compensation costs such as houses, land and facilities ✓ Other compensation such as removal of utility lines, etc. ✓ Road maintenance cost	Road length: 11,460 m (Bridge length 120 m) Construction cost: 1.07 Buildings affected: ~ 19 units Compensation facilities: None Embankment volume: 0.76 Million m^3 Maintenance cost: 1.00 Number of railway crossings: 0	Road length: 13,820 m (Bridge length 40 m) Construction cost: 1.22 Buildings affected: ~ 77 units Compensation facilities: None Embankment volume: 0.98 Million m^3 Maintenance cost: 1.22 Number of railway crossing are: 0	Road length: 13,040 m (Bridge length 40 m) Construction cost: 1.00 Buildings affected: ~ 79 units Compensation facilities: None Embankment volume: 0.69 Million m^3 Maintenance cost: 1.15 Number of railway crossings: 0	Road length: 7,804 m Buildings affected: ~ 197* units *Total Section 2 + Section 3 Compensation facilities: None Maintenance cost: 2.05** **Total Section 2 + Section 3 Number of railway crossings: 0
6) Environmental Impacts	Objective: To minimise the adverse impacts on the natural environment: ✓ Number of trees cut (soil water retention property, control soil erosion against rainfall, etc.) ✓ Reduce the volume of soil borrowed from Borrow pits and crushed stone used in the construction ✓ Impacts on the coastal environment (Nacala) ✓ Other environmental impacts (Threatened species, etc.)	• Located farther upstream than Alt-2~3, therefore the river channel is expected to be more stable. • No relevant environmental issues.	• Impacts of embankments in flooding areas during the rainy season. • No relevant environmental issues.	• Same as Alt-2.	• No relevant environmental issues.
7) Property Acquisitions	Objective: To minimise removal of houses and land acquisition: ✓ Number of houses and facilities affected by the road project ✓ Area of required land acquisition	Buildings affected: ~ 19 units Land expropriation: ~ 1,366,470 m^2	Buildings affected: ~ 77 units Land expropriation: ~ 1,660,490 m^2	Buildings affected: ~ 79 units Land expropriation: ~ 1,566,500 m^2	Buildings affected: ~ 197* units *Total Section 2 + Section 3 Land expropriation area: ~ 3,715,136** m^2 **Total Section 2 + Section 3
8) Community including property access	Objective: To minimise the adverse social impacts in the long term, such as impacts to communities along the road: ✓ Creating/ensuring access to community facilities such as schools, hospitals and cemeteries (no adverse impact such as interrupt/disconnect of existing foot paths) ✓ Impact for Amenity, Noise, Accessibility for roads, Passing vehicles, etc.)	• There are several access roads connected to the project road from the city centre, in addition, the areas along the project road are expected to be developed for urban land use including public facilities and commercial properties. • In this regard the planned frontage roads will play an essential role of providing the mobility to access public facilities easily for residents of Nampula city Note that several pedestrian crossings shall be installed with safety measures.	• Same as Alt.1	• Same as Alt. 1. • However, it is difficult to connect existing roads to this alternative due to the limitation imposed by the rivers. • This alternative is restricted to only a bypass functionality.	• This alternative is restricted only to only a bypass functionality. • No use for local people

(5) Nampula Southern Bypass Road - Section 3- Detailed evaluation

Evaluation Item	Evaluation Criteria	Alignment Alternatives			
		Alt-1 (Yellow)	**Alt-2 (Red)**	**Alt-3 (Blue)**	**Alt-Branch (Green)**
1) Consistency with integrated development plan (e.g. PEDEC-Nacala, PEU)	Objective: To function as integrated infrastructure development plan to realise the strategy for the Nacala Corridor regional development ✓ Consistency with PEDEC-Nacala ✓ Consistency with Land Use Plans (PEU) ✓ Consistency with other Infrastructure Development Plans (e.g. High voltage Electric Line Plans, Plans by municipalities, etc.)	Consistency with circular road and bypass proposed by PEDEC-Nacala. However, the connecting point with N13 is located at a more southern point (nearer the city) than proposed in PEDEC-Nacala.	Consistency with circular road and bypass proposed by PEDEC-Nacala. However, the connecting point with N13 is located at a more northern point (further from the city) than proposed in PEDEC-Nacala.	• Same as Alt-1	• This route was proposed by Nampula district. • This road is not included in PEU
2) Benefit to Traffic Congestion Relief	Project Objective: To alleviate current and future traffic congestion: ✓ Reduction of transport cost ✓ Reduction of travel time	• This road can be used to access road from Rapale to N1 (Direction toward Nacala and southern area) and to southern area in Nampula.	• This road can be used as the access road from Rapale to N1 (Direction toward Nacala and southern area) and to southern area in Nampula.	• Same as Alt-1	• Traffic flow with OD at Rapale will not use this alternative. • Shortcut route between N13 and N1 only.
3) Benefits to Urban Development and Residents	Objective: To promote well-organised urban developments along the road and to form an urban road for daily life of city residents: ✓ Possibility of urban development along the road and function of generated traffic demand ✓ Function for residents in the city as an urban road	• The area along the road is currently not used and is expected to develop.	• Same as Alt-1	• Same as Alt-1	• The area along the road is currently not used and is expected to develop. • However, considering that the area is too far from the city, the potential for residential development is imitated.
4) Road Safety	Objective: To Promote/Ensure a safe road: ✓ Safety for drivers ✓ Safety for residents	• Gentle alignment can be used. • The traffic safety can be ensured for residential people by constructing a service road along the road.	• Gentle alignment can be used. • The traffic safety can be ensured for residential people by constructing a service road along the road.	• Same as Alt-1	• The number of people crossing the road cannot be estimated because the road is located far from the city area.
5) Affordability	Objective: To be an affordable project and to have sustainable maintenance costs: ✓ Construction cost ✓ Compensation costs such as houses, land and facilities ✓ Other compensation such as removal of utility lines, etc. ✓ Road maintenance cost	Road length: 3,945 m (Bridge length 260 m) Construction cost: 1.00 Buildings affected: ~ 33 units Compensation facilities: None Embankment volume: 0.15 Million m^3 Maintenance cost: 1.00 Number of railway crossings: 1	Road length: 4,549 m (Bridge length 500 m) Construction cost: 1.22 Buildings affected: ~ 56 units Compensation facilities: Pipeline Embankment volume: 0.31 Million m^3 Maintenance Cost: 1.10 Number of railway crossings: 1	• Same as Alt-1	Road length: 23,027 m Buildings affected: ~ 197* units *Total Section 2 + Section 3 Compensation facilities: None Maintenance cost: 2.05** **Total Section 2 + Section 3 Number of railway crossings: 0
6) Environmental Impacts	Objective: To minimise the adverse impacts on the natural environment: ✓ Number of trees cut (soil water retention property, control soil erosion against rainfall, etc.) ✓ Reduce the volume of soil borrowed from Borrow pits and crushed stone used in the construction ✓ Impacts to the coastal environment (Nacala) ✓ Other environmental impacts (Threatened species, etc.)	• No relevant issues	• No relevant issues	• Same as Alt-1	• No relevant issues
7) Property Acquisitions	Objective: To minimise removal of houses and land acquisition: ✓ Number of houses and facilities affected by the road project ✓ Area of required land acquisition	Buildings affected: ~ 33 units Land expropriation: ~ 444,043 m^2	Buildings affected: ~ 56 units Land expropriation: ~ 487,905 m^2	• Same as Alt-1	Buildings affected: ~ 197* units *Total Section 2 + Section 3 Land expropriation area: ~ 3,715,136** m^2 **Total Section 2 + Section 3
8) Community including property access	Objective: To minimise the adverse social impacts in the long term, such as impacts on the communities along the road: ✓ Creating/ensuring access to community facilities such as schools, hospitals and cemeteries (no adverse impacts such as interrupt/disconnect of existing foot paths) ✓ Impacts on Amenities, Noise, Accessibility to roads, Passing vehicles, etc.)	• The probability of dividing residential areas is low due to the route not passing through any large villages.	• Same as Alt-1	• Same as Alt-1	• Same as Alt-1

(6) Cuamba Bypass Road

Evaluation Item	Evaluation Criteria	Alignment Alternatives (Section-1)			Alignment Alternatives（Section-2）	
		Alt-1 (Yellow)	Alt-2 (Red)	Alt-3 (Blue)	Alt-1 (Yellow)	Alt-2 (Red)
1) Consistency with integrated development plan (e.g. PEDEC-Nacala, PEU)	Objective: To function as an integrated infrastructure development plan to realise the strategy for the Nacala Corridor regional development ✓ Consistency with PEDEC-Nacala ✓ Consistency with Land Use Plans (PEU) ✓ Consistency with other Infrastructure Development Plans (e.g. High voltage Electric Line Plans, Plans by the municipality, etc.)	• Consistency with bypass proposed by PEDEC-Nacala. • Consistency with municipal planned cargo terminal.	• Same as Alt-1	• Same as Alt-1	• Consistency with bypass proposed by PEDEC-Nacala.	• This road is not consistent with PEDEC-Nacala. • However it connects growth poles planned in the PEU.
2) Benefit to Traffic Congestion Relief	Project Objective: To alleviate current and future traffic congestion: ✓ Reduction of transport cost ✓ Reduction of travel time	• This road is a bypass for N13 that runs through Cuamba city area • Shortcut between N13 and R360	• Same as Alt-1	• Same as Alt-1	• This road is a bypass for N13. • Shortcut between N13 and R360. • Users of R360 will also use this alternative.	• This road is a bypass for N13. • Shortcut between N13 and R360. • Lower number of users than Alt-1.
3) Benefits to Urban Development and Residents	Objective: To promote well-organised urban developments along the road and to form an urban road for daily life of city residents: ✓ Possibility of urban development along the road and function of generated traffic demand ✓ Function for residents in the city as an urban road	• The development along the road is limited by the flooding area.	• The area along the road is not used and is expected to develop.	• Same as Alt-2	• Improve existing R360. • The industrial area can be developed near the crossing point between the road and the railway to Lichinga. However, the available area is limited by villages.	• The area along the road is not used and is expected to develop. • However, considering that the area is far from the city, the potential of residential development is imitated.
4) Road Safety	Objective: To Promote/Ensure a safe road: ✓ Safety for drivers ✓ Safety for residents	• The vertical alignment is designed with a gentle gradient. • Crossings on the road for residential people should be considered.	• Same as Alt-1	• Same as Alt-1	• Passing vehicles and general vehicles pass on the road together due to using the existing road,	• Since there only a few small roads crossing this road due to its distance from the city area, the crossing structures required for this road would be very few.
5) Affordability	Objective: To be an affordable project and to have sustainable maintenance costs: ✓ Construction cost ✓ Compensation costs such as houses, land and facilities ✓ Other compensation such as removal of utility line, etc. ✓ Road maintenance cost	Road length: 6,756 m (Bridge length: 400 m) Construction cost: 1.14 Buildings affected: ~ 30 units Compensation facilities: None Embankment volume: 0.37 Million m³ Maintenance cost: Prop. to Length Number of railway crossings: 0	Road length: 6,808 m (Bridge length: 340 m) Construction cost: 1.01 Buildings affected: ~ 21 units Compensation facilities: None Embankment volume: 0.27 Million m³ Maintenance cost: Prop. to Length Number of railway crossings: 0	Road length: 7,238 m (Bridge length: 340 m) Construction cost: 1.00 Buildings affected: ~ 57 units Compensation facilities: None Embankment volume: 0.27 Million m³ Maintenance cost: Prop. to Length Number of railway crossings: 0	Road length: 3,398 m Construction cost: 1.00 Buildings affected: ~ 90 units Compensation facilities: None Embankment volume: 0.05 Million m³ Maintenance cost: 1.00 Number of railway crossings: 1	Road length: 4,727 m Construction cost: 2.03 Buildings affected: ~ 0 units Compensation facilities: None Embankment volume: 0.17 Million m³ Maintenance cost: 1.39 Number of railway crossings: 1
6) Environ-mental Impacts	Objective: To minimise the adverse impacts on the natural environment: ✓ Number of trees cut (soil water retention property, control soil erosion against rainfall, etc.) ✓ Reduce the volume of soil borrowed from Borrow pits and crushed stone used in the construction ✓ Impacts on the coastal environment (Nacala) ✓ Other environmental impacts (Threatened species, etc.)	• No relevant issues	• Need environmental impact study for rock excavation	• Same Alt-2	• No relevant issues	• Part of this route passes on lower land areas.
7) Property Acquisitions	Objective: To minimise removal of houses and land acquisition: ✓ Number of houses and facilities affected by the road project ✓ Area of required land acquisition	Buildings affected: ~ 30 units Land expropriation: ~ 476,298 m²	Buildings affected: ~ 21 units Land expropriation: ~ 479,964 m²	Buildings affected: ~ 57 units Land expropriation: ~ 486,309 m²	Buildings affected: ~ 90 units Land expropriation: ~ 239,559 m²	Buildings affected: ~ 0 units Land expropriation: ~ 333,254 m²
8) Community including property access	Objective: To minimise the adverse social impacts in the long term, such as impacts to communities along the road: ✓ Creating/ensuring access to community facilities such as schools, hospitals and cemeteries (no adverse impacts such as interrupt/disconnect of existing foot paths) ✓ Impacts for Amenities, Noise, Accessibility to roads, Passing vehicles, etc.)	• Some residential people and students near Cassiano Bridge cross this bypass because they go to the city area passing over the access road.	• Same as Alt-1	• Same as Alt-1 • However, this alternative divides in a small degree one residential area.	• The route passes through villages in some sections.	• The probability of dividing residential areas is low due to there being no large villages.

Appendix-3 Results of Consultation with Local Administrative Governments (Nacala Port Access Road)

(1) Minutes of Meeting

(2) Participant List

(3) Letter from Nacala Municipality to ANE

(4) Letter from ANE to Nacala Municipality

(5) Attached Drawing

Minute
of
the Consultation Meeting
for
the Preparatory Survey
for
Nacala Corridor Road Network Improvement Project
in
the Republic of Mozambique
(EPCoNa-MeRR)

Nacala Port Access Road

Nacala, June 24th, 2015

Consultation Meeting

The Consultation Meeting for the "Preparatory Survey for Nacala Corridor Road Network Improvement Project" (hereinafter referred to as "Study") regarding the "Nacala Port Access Road" (hereinafter referred to as "Access Road") was held below:

(i) Date and Time: 24th June 2015, 10:30am – 11:40am
(ii) Place: Conference Room of Nacala City Municipal Council (hereinafter referred to as "CMC")
(iii) Participants: CMC,
National Road Administration (hereinafter referred to as "ANE")
JICA Study Team
See attached Annex 1
(iv) Chairperson: Mr. Paulo BAUQUE, Project Coordinator of ANE

(1) Opening Speech

Mr. Toni H. CLOFE, Mayor's Substitute, opened the meeting and welcomed the Consultation Meeting members.

Mr. Paulo BAUQUE explained that the Access Road is one of the most important and priority projects defined in the PEDEC-Nacala Plan for development of Nacala Corridor. Also, he stated that the objective of this Consultation Meeting was to hear from the local authority comments and suggestions to help of the Access Road alignment.

(2) Presentation

JICA Study Team presented the study contents, study background, study policy & strategy, basic design criteria, evaluation criteria for route selection and the study schedule. The presentation was used the slides as shown in Annex 2.

(3) Questions & Answers, Suggestions & Opinions session

After the presentation, Mr. Paulo BAUQUE opened the questions & answers, suggestions, opinions etc. below:

(a) CMC commented that the Access Road have effective to reduce the traffic congestion in the city. And CMC requested to indicate the Access Road alignment.

ANE answered that since the Access Road alignment study has not been completed to study, ANE cannot indicate the final alignment today. After ANE will fix the road alignment, ANE will inform CMC by official letter.

(b) CMC requested the road alignment to avoid public infrastructures such as schools, hospitals, etc.

JICA Study Team answered that preserving existing public facilities are considered in the road alignment definition process.

(c) CMC requested that Access Road should be connected to planned are for the Multimodal Terminal (Railway Cargo & Truck).

JICA Study Team answered that JICA Study Team considered it in the Study.

(d) CMC commented that usually the trucks need to wait a long-time to enter in Nacala Port. So, CMC requested to plan the truck parking area/lots in the Access Road.

ANE answered that it is very difficult to include a Truck Parking Lot in the Access Road project due limited budget. And ANE suggested that CMC should solve yourself.

(e) CMC commented that this project with the magnitude should be considered the social responsibility. So, CMC requested ANE that it should be built the schools and/or hospitals around the Access Road.

ANE answered that is not in the project scope. Also, ANE suggested that CMC should secure this budget.

CMC understood that it is very difficult to include the construction of schools and hospitals in this project.

(f) CMC mentioned that Access Road will be concerned for the negative impacts. Especially, it is concerned for the people affected (Resettlement) by the construction of the Access Road.

ANE answered that ANE will consider this matter very carefully in the Resettlement Action Plan (RAP) according to the guideline of Mozambique and JICA.

Closing Remarks

The members agreed that the suggestions and opinions by CMC shall be sent directly to ANE General Direction by formal letter until July 03, 2015.

Control points shall be sent by kml file and suggestion & opinions shall be included reasons. A letter will be sent by CMC.

The meeting was closed at 11:40.

ANNEX 1
List of Attendees

OCGLOBAL

Lista de Participantes (Participant List)

Reunião de Consulta: Nacala (Nacala Consultation Meeting) **Data (Date): 24/Jun/2015**

No.	Nome (Name)	Organização (Organization)	Cargo (Position)	Email	Telefone (Telephone)	Assinatura (Signature)
1	Manuel Marina	Conselho Municipal	Vereador		825277348 / 847339311	[signature]
2	Chamboreia Nicanete	C.M.N	Vereador	[illegible]@yahoo.com	825815677 / 844200019	[signature]
3	Jnamete Dinis	C.M.N	Vereadora	Jnamete.dinis@gmail.com	828110800	[signature]
4	Aurélia Helena Pepere	CMCN	Vereadora		820520990	[signature]
5	Sequina Abdul	CMCN	Vereadora	Sabdu[illegible]@gmail.	824547240	[signature]
6	Alita Wilson	C.M.C.N	Vereadora		827617493 / 846353120	[signature]
7	Samuel Vasco	CM.CN	Director	s.vascodomingos@gmail.com	827311215 / 845361903	[signature]
8	Dino da Silva	ANE	Focal Point	dynosilva@gmail.com	840657678	[signature]
9	Paulo Bazique	ANE	Coordenador do Projecto	[illegible]@ane.gov.mz	848731536	[signature]

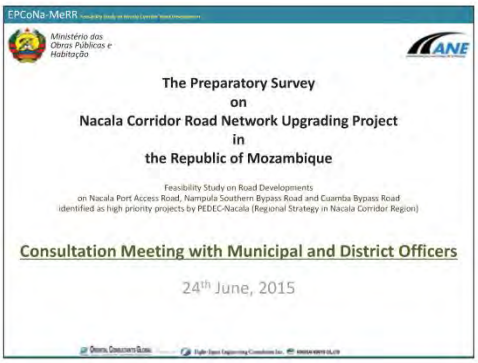
OCGLOBAL

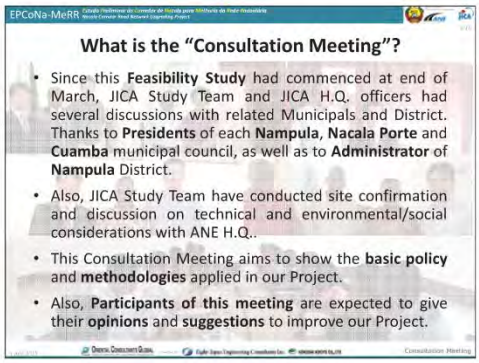
Lista de Participantes (Participant List)

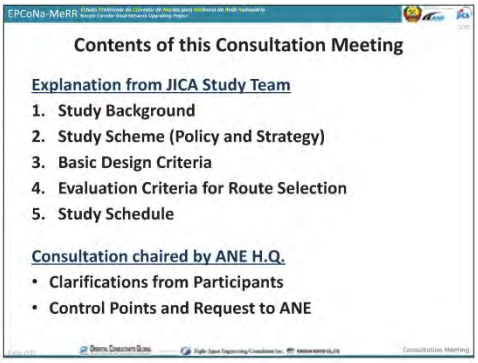
Reunião de Consulta: Nacala (Nacala Consultation Meeting) **Data (Date): 24/Jun/2015**

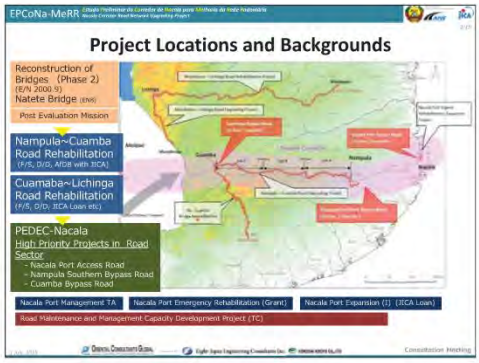
No.	Nome (Name)	Organização (Organization)	Cargo (Position)	Email	Telefone (Telephone)	Assinatura (Signature)
10	Alberto Atumane	Conselho Municipal	Vereador	albertoatumane@gmail.com	825982579 / 843988242	
11	Evaristo Simoco	CMCN - Nacala	Vereador	ejsimoco@yahoo.com	843823120	
12	Adelino Cobre	CMCN - Nacala	Director	adelinocobre@gmail.com	842734466	
13		CMCN - Nac	Vereador		847017200	
14	Tomi Matias Clafe		Substituto chefe do G.P		849065922	
15	Isac Bonacorso	CMCN - Nacala	Director	isacbonacorso@gmail.com	843108455	
16						
17						
18						

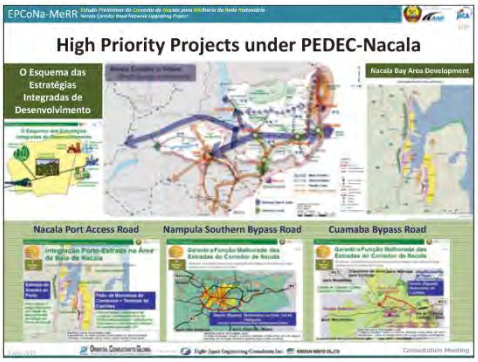
ANNEX 2
Presentation Slides

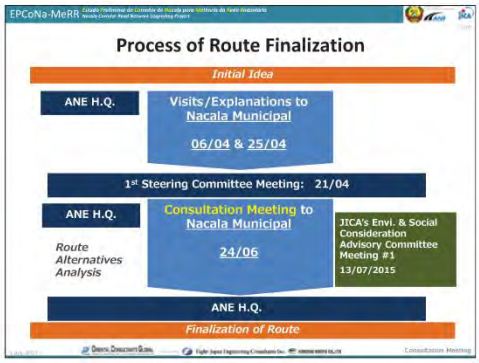












EPCoNa-MeRR

Basic Design Conditions

- Each road forms a part of Urban Area;

✓ Applied Road Design Standards: **"ANE's Design Standards (Draft)"**
✓ Road Class: **Primary Road** of asphalt pavement Design Speed: **100 km/hour**
✓ Operational Speed Limited: **80 km/hour**
✓ Right of way (ROW) : **Mozambique Law**
✓ Construction Methods: **Stage Construction**

EPCoNa-MeRR

Proposed Road Cross Section

Nacala Port Access Road

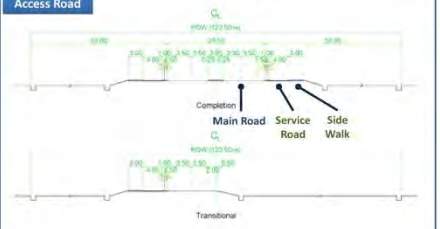
(Nacala Port - Road R702)

EPCoNa-MeRR

Proposed Road Cross Section

Nacala Port Access Road

(Road R702 - Road N12)



EPCoNa-MeRR

Control Points (1)

- **Public Facilities**
  - Schools,
  - Hospitals,
  - High voltage transmission lines,
  - Pipeline, etc.
- **Religious Sites**
  - Churches, Mosques,
  - Cemetery, etc.

EPCoNa-MeRR

Control Points (2)

- **Natural Obstacles**
  - Rivers,
  - Rock formations,
  - Flood zones, etc.
- **Particular Properties**
  - Houses, Stores,
  - Railways,
  - Industrial Areas,
  - Cargo Terminal, etc.

EPCoNa-MeRR

Image of Nacala Port Access Road

*Nacala Port Access Road (especially section-1) requires **Access Control** function;*

Not allowed to access freely (ONLY limited access ramp),

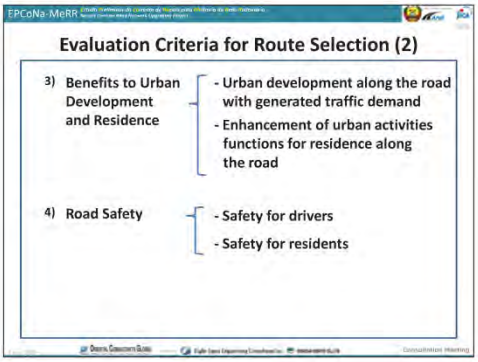
EPCoNa-MeRR

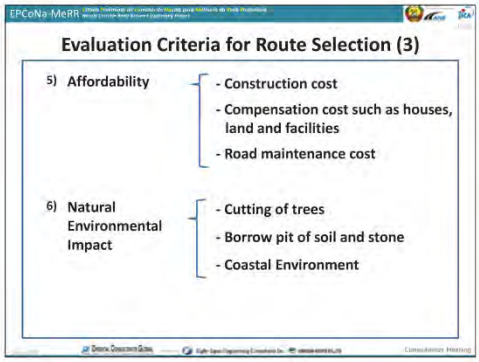
Nacala Port Access Road

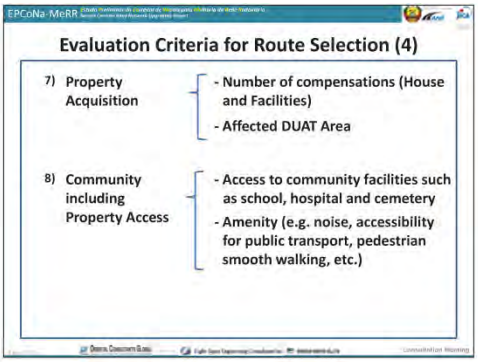
EPCoNa-MeRR

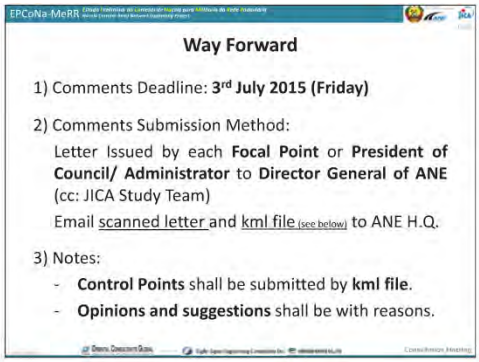
Evaluation Criteria for Route Selection (1)

1) **Consistency to Integrated Development Plan**
   - Consistency for PEDEC-Nacala
   - Consistency for Urban Planning (PEU)
   - Other Infrastructure Development Plan (e.g. High-voltage Electric Line Plan, Plans by municipal, etc.)
2) **Benefits to Traffic and Congestion Relief**
   - Reduction of transport cost
   - Reduction of travel time


EPCoNa-MeRR
Evaluation Criteria for Route Selection (2)
3) Benefits to Urban Development and Residence
- Urban development along the road with generated traffic demand
- Enhancement of urban activities functions for residence along the road
4) Road Safety
- Safety for drivers
- Safety for residents


EPCoNa-MeRR
Evaluation Criteria for Route Selection (3)
5) Affordability
- Construction cost
- Compensation cost such as houses, land and facilities
- Road maintenance cost
6) Natural Environmental Impact
- Cutting of trees
- Borrow pit of soil and stone
- Coastal Environment


EPCoNa-MeRR
Evaluation Criteria for Route Selection (4)
7) Property Acquisition
- Number of compensations (House and Facilities)
- Affected DUAT Area
8) Community including Property Access
- Access to community facilities such as school, hospital and cemetery
- Amenity (e.g. noise, accessibility for public transport, pedestrian smooth walking, etc.)


EPCoNa-MeRR
Way Forward
1) Comments Deadline: 3rd July 2015 (Friday)
2) Comments Submission Method:
Letter Issued by each Focal Point or President of Council/ Administrator to Director General of ANE (cc: JICA Study Team)
Email scanned letter and kml file (see below) to ANE H.Q.
3) Notes:
- Control Points shall be submitted by kml file.
- Opinions and suggestions shall be with reasons.

Lista de Participantes (Participant List)

Reunião de Consulta: Nacala (Nacala Consultation Meeting) **Data (Date): 24/Jun/2015**

No.	Nome (Name)	Organização (Organization)	Cargo (Position)	Email	Telefone (Telephone)	Assinatura (Signature)
1	Manuel Morais Essimela	CMCN (Nacala City Municipal Council)	Alderman	—	847-339-311 826-277-340	
2	Chandrech Noconela	CMCN	Alderman	nxandrech@yahoo.com	844-200-019 825-815-677	
3	Iranete Dinnis	CMCN	Alderman	iranetedinis@gmail.com	828-110-800	
4	Maria Helena	CMCN	Alderman	—	822-520-190	
5	Saquina Abdul	CMCN	Alderman	sabdulcamae@gmail.com	824-547-240	
6	Atija Wilson	CMCN	Alderman	—	827-671-493 846-353-120	
7	Samuel Vasco	CMCN	Director	s.vascodomingos@gmail.com	827-311-215 845-361-903	
8	Dino da Silva	ANE	Focal Point	dynesilver@gmail.com	840-657-678	
9	Paulo Bauque	ANE	Project Coordinator	pbauque@ane.gov.mz	848-731-506	

Lista de Participantes (Participant List)

Reunião de Consulta: Nacala (Nacala Consultation Meeting) **Data (Date): 24/Jun/2015**

No.	Nome (Name)	Organização (Organization)	Cargo (Position)	Email	Telefone (Telephone)	Assinatura (Signature)
10	Alberto Atumane	CMCN	Alderman	albertoatumane6@gmail.com	825-982-579 843-988-242	
11	Evaristo Simoco	CMCN	Alderman	ejsimoco@yahoo.com.br	843-823-120	
12	Adelino Cobre	CMCN	Director	adelinicobre@gmail.com	842-734-466	
13	Simao Pedro de Almeida	CMCN	Alderman	simaoalmeidacmcn@gmail.com	847-017-200	
14	Tomi Matias	CMCN	Substitute of Mayor (Mayor's Cabinet Head)	—	849-065-922	
15	Isac Bauman	CMCN	Director	isacbauo6@gmail.com	843-108-655	
16	Takao Inami	Study Team	Deputy Team Lider			
17	Lucas Jun Kase Kiso	Study Team	Bridge Design (Assistant)			
18	João M. Mutoti	Study Team	Support Staff			

CONSELHO MUNICIPAL DE NACALA
DEPARTAMENTO DOS SERVIÇOS DE CADASTRO, CONSTRUÇÃO E INFRA-ESTRUTURAS

Exmo Senhor
Director Nacional de Administração de Estradas(ANE)

Maputo

V/Refª___/___/___ N/Refª552/DSCCI/2015 Data: 13/07/2015

Assunto: **Desvio Parcial do Traçado da Estrada**

O Conselho Municipal de Nacala recebeu, do Projecto JICA, a proposta do traçado da Estrada que ligará a EN12 à Zona Industrial I, bairro da Matola, passando pelas Zonas Francas Industriais.

Para efeito, fez-se um trabalho técnico de campo, onde se constatou a existência nesse traçado, de concessões e habitações de algumas comunidades do bairro da Matola.

Devido a estes factores e tendo em consideração as orientações deixadas pela equipe da JICA, constituídas pelos Mr. Takao INAMI e Mr. Kiso Lucas Jun Kase, de se procurar outras alternativas, havendo, propômos à V.Excias o desvio parcial do traçado apresentado, segundo o esboço em anexo.

Contudo, cabe à V.Excias fazer as avaliações técnicas necessárias neste desvio, incluindo Avaliação do Impacto Ambiental, para a aprovação do traçado proposto ou a manutenção do traçado anterior.

De referir que das concessões supracitadas, não poderão ser executadas as respectivas obras, antes que o projecto em carteira (JICA), apresente o estudo e o seu projecto final tenha sido aprovado, para evitar obstáculos ao projecto.

Sem mais, nossas cordiais saudações.

Nacala-Porto, 13 de Julho de 2015

O Presidente

Rui Chong Saw

20 Augustus 2015
02:34 PM

ADMINISTRAÇÃO NACIONAL DE ESTRADAS

DIRECÇÃO DE PROJECTOS

DEPARTAMENTO DE ESTUDOS

E

PROJECTOS

Para:
Conselho Municipal da Cidade de Nacala
Att: Sr. Rui Chong Saw
Presidente

Nacala

Sua referência	Sua comunicação de	Nossa referência	Nossa comunicação de
		496/RE/DEP/DIPRO/2015	17/08/2015

ASSUNTO: ESTUDO DE VIABILIADADE PARA A CONSTRUÇÃO DA ESTRADA DE ACESSO AO PORTO DE NACALA
- Definição do Traçado -

Exmos. Senhores,

De acordo com o assunto em epígrafe, e no seguimento do encontro de auscultação sobre o traçado da estrada de acesso ao Porto de Nacala realizado no passado dia 24 de Junho de 2015, temos a informar o seguinte:

1) Após a análise de várias alternativas de traçado e tomando em consideração as vossas sugestões/comentários, foram seleccionadas três variantes representadas no mapa em anexo.

2) O traçado final será definido durante o trabalho a ser efectuado no terreno pela equipe constituída pelo Consultor, ANE e Conselho Municipal da Cidade de Nacala, tendo como premissas a redução do tempo de trânsito, minimização do reassentamento de infraestruturas e custos de construção.

3) De modo a permitir a execução plena das actividades previstas no estudo, solicitamos a indicação de técnicos que acompanharão o Consultor e a ANE na execução do trabalho de campo que consistirá na implantação dos marcos e recenseamento das infraestruturas e seus proprietários a serem abrangidas pelo traçado, com início dos trabalhos previsto para o dia 4 de Setembro de 2015.

Sem mais de momento, endereçamos os nossos melhores cumprimentos.

O Director Geral

/Atanásio Muguinhe/

REPÚBLICA DE MOÇAMBIQUE ANE Direcção Geral

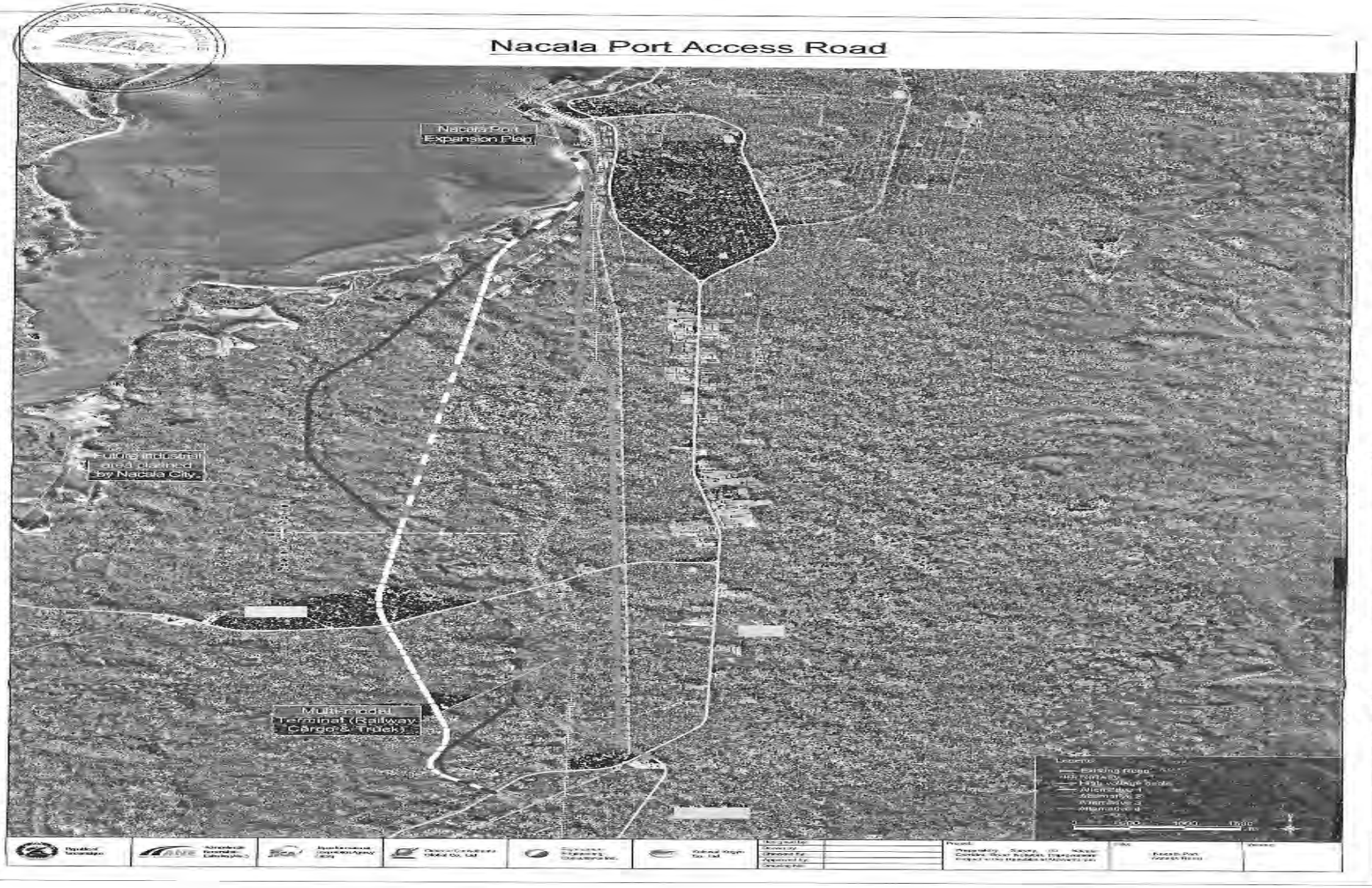
Anexo: Comentários as Sugestões do CMC de Nacala
Mapa com as alternativas do traçado

Av. de Moçambique nº 1225 · Caixa Postal 14 39 · Telefone nº 476163/7 · Telefax nº 47 58 62 · Maputo · Moçambique

ADMINISTRAÇÃO NACIONAL DE ESTRADAS

Comentários as Sugestões do Conselho Municipal da Cidade de Nacala

No	Sugestões do Conselho Municipal da Cidade de Nacala	Comentários da ANE
1	Existem três áreas concessionadas e habitações de algumas comunidades do bairro da Matola na proposta de alinhamento apresentada na reunião de auscultação e de modo a evitar custos com reassentamento, propomos o desvio parcial do traçado apresentado.	• Na definição da variante final do traçado da via serão analisadas as sugestões do Município de modo a sua acomodação sempre que possível. • No estudo em curso deverá ser evitada a interferência do traçado da via com as áreas concessionadas. • A definição do traçado da estrada tem como premissas básicas a minimização do reassentamento de infraestruturas, tempo de trânsito e custo de construção. • O Estudo de Impacto Ambiental é uma das componentes do presente estudo, pelo que está em curso o processo de contratação de uma firma para o efeito. • Louvamos a iniciativa do Conselho Municipal de Nacala em paralisar o início das obras antes da aprovação do traçado final da estrada, de modo a evitar obstáculos para o projecto.
2	Cabe à V. Excias fazer as avaliações técnicas necessárias neste desvio, incluindo a Avaliação do Impacto Ambiental, para a aprovação do traçado proposto ou a manutenção do apresentado na reunião.	
3	É de realçar que as obras das áreas concessionadas não poderão ser executadas antes da aprovação do traçado final.	


Nacala Port Access Road
Nacala Port Expansion Plan
Future industrial area planned by Nacala City
Multi-modal Terminal (Railway, Cargo & Truck)

Devido ao facto da vossa Proposta atravessar uma Zona Concessionada assim como uma zona de povoacao, achamos por bem fazer um desvio e evitar possiveis conflitos de terra e Custos de indemnizacoes.

Appendix-4 Results of Consultation with Local Administrative Governments (Nampula Southern Bypass Road)

(1) Minutes of Meeting

(2) Participant List

(3) Letter from Nampula Municipality to ANE

(4) Letter from ANE to Nampula Municipality

Minute
of
the Consultation Meeting
for
the Preparatory Survey
for
Nacala Corridor Road Network Improvement Project
in
the Republic of Mozambique
(EPCoNa-MeRR)

Nampula Southern Bypass Road

Nampula, June 23th, 2015

Consultation Meeting

The Consultation Meeting for the "Preparatory Survey for Nacala Corridor Road Network Improvement Project" (hereinafter referred to as "the Study") regarding the "Nampula Southern Bypass Road" (hereinafter referred to as "the Bypass Road") was held below:

(i) Date and Time: 23rd June 2015, 10:30am – 12:00am
(ii) Place: Meeting Room of the Urban Planning Department of Nampula City Municipal Council (hereinafter referred to as "CMC").
(iii) Participants: CMC
National Road Administration (hereinafter referred to as "ANE")
JICA Study Team
See attached Annex 1
(iv) Chairperson: Mr. Paulo BAUQUE, Project Coordinator of ANE

(1) Opening Speech
Mr. Paulo BAUQUE opened the meeting and welcomed the Consultation Meeting members. And he explained that the Bypass Road is one of the most important and priority projects defined in the PEDEC-Nacala Plan for development of Nacala Corridor. Also, he stated that the objective of this Consultation Meeting was to hear from the local authority comments and suggestions to help selection of the Bypass Road alignment.

(2) Presentation
JICA Study Team presented the study contents, study background, study policy & strategy, basic design criteria, evaluation criteria for route selection and the study schedule. The presentation was used the slides as shown in Annex 2.

(3) Questions & Answers, Suggestions & Opinions session
After the presentation, Mr. Paulo BAUQUE opened the questions & answers, suggestions & opinions etc. below:

(a) CMC mentioned that the Bypass Road have effective to reduce the traffic congestion in the city. And CMC requested to indicate the alignment.

ANE answered that since the Bypass Road alignment study has not been completed, the final alignment is not inform today. After ANE will fix the road alignment, ANE will inform CMC by official letter.

CMC understood.

(b) CMC commented the residential area near the beer factory and CMC recommended that the road alignment passes in the south side of the cemetery.

ANE answered that the opinion will be compared with the others alternatives, and ANE will indicate the best alignment.

CMC understood.

(c) CMC commented that the bypass road passing thought Nampaco was planned in the old Land Use Plan (PEU) of 1992, but this area was occupied and located the residential area. The new proposed alignment (in the southern part of the city) seems the better

alignment. So, CMC requested that ANE consider the urban development plan along Bypass Road Area.

ANE answered that the opinion will be considered.

(d) CMC commented that since the Bypass Road will be passed at the main national roads such as N1, the traffic congestion will be reduced in Nampula City.

(e) CMC requested that ANE should compensate for the resettlement houses etc. and also ANE should consider to ensure the resettlement sites.

JICA Study Team answered that the Resettlement Action Plan (RAP) will be prepared according to the Mozambique and JICA guidelines. And ANE consider this request in the project.

(f) CMC requested that ANE consider the protection method against illegal occupation within the road reserved area.

ANE answered that ANE will consider this request in the project.

(g) JICA Study Team commented that JICA Study Team will consider the extended alignment to N13 by Rapale District. However, JICA Study Team is estimating that this alternative is very difficult due to high project cost and out of PEDEC-Nacala plan.
So, JICA Study Team suggested that the extended alignment until Rapale District should be considered as a next stage project.

Closing Remarks

The members agreed that suggestions and opinions by CMC shall be sent directly to ANE General Direction by formal letter until July 03, 2015.

Control points shall be sent by kml file and suggestion & opinions shall be included reasons. Two letters will be sent: 1 letter from Nampula Municipal and 1 letter from Rapale District.

The meeting was closed at 12:00.

ANNEX 1
List of Attendees

OCGLOBAL

Lista de Participantes (Participant List)

Reunião de Consulta: Nampula (Nampula Consultation Meeting) **Data (Date): 23/Jun/2015**

No.	Nome (Name)	Organização (Organization)	Cargo (Position)	Email	Telefone (Telephone)	Assinatura (Signature)
1	Assucénia M. Aliera	CMCN	Geógrafa		825307705	Assucénia
2	João dos S. Salazar	CMCN	Topógrafo	isalazardossouto.mabvi@gmail.com	846387980	[signature]
3	Lino N Mateus	CMCN	"	LinoNelson.Mateus1@Gmail.Com.	845687422	[signature]
4	Tapia Abdul S.M. Kara	CMCN	Geógrafo	T.Kara100@gmail.Com	828289940	[signature]
5	Sérgio D. Sabão	CMCN	Planificador	SERGIO.SABAO@GMAIL.COM	843129754	[signature]
6	Sérgio A. Amando	CMCN	Cartografo	Sergioanibal.armando@gmail.com	844499800	Sérgio Anibal
✓ 7	Pedroso Paulo	CMCN	Dir. Urbanização	Pedrosopaulo@yahoo.com.br	825798538	[signature]
✓ 8	Paulo Baique	ANE	Coordenador do Projecto	pbaique@ane.gov.mz	848731506	[signature]
✓ 9	António O. Sousa	BDPI-Rapale	Substituto director	antohungsoo@gm	842997741	[signature]

Lista de Participantes (Participant List)

Reunião de Consulta: Nampula (Nampula Consultation Meeting)

Data (Date): 23/Jun/2015

No.	Nome (Name)	Organização (Organization)	Cargo (Position)	Email	Telefone (Telephone)	Assinatura (Signature)
10	Dino da Silva	ANE	Focal Point	dynesilver@gmail.com	840657678	[signature]
11	João MUTOTI	Briantal consultants	Assistant do projecto	Jonsa81@yahoo.co.uk	828578189	[signature]
12	[illegible] Welsh	CMN	Vereador	welih726@yahoo.com [illegible]	842010039	[signature]
13						
14						
15						
16						
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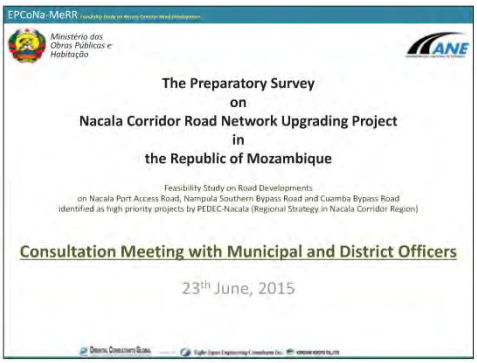
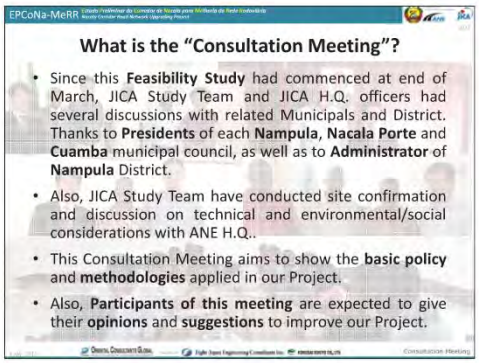
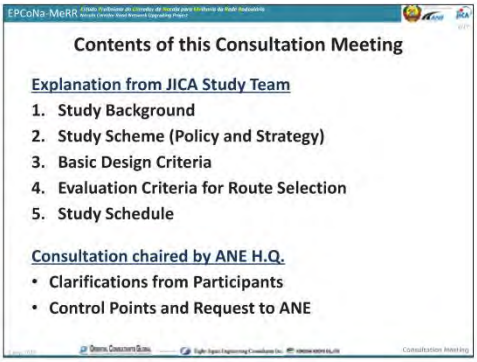
18						

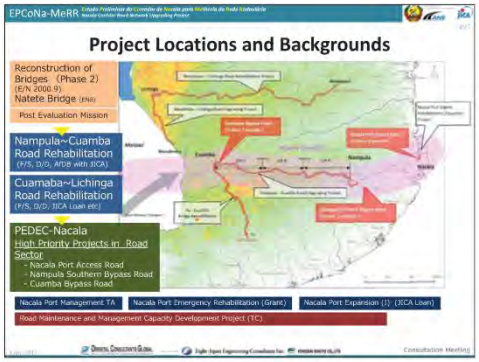
Appendix 4-6

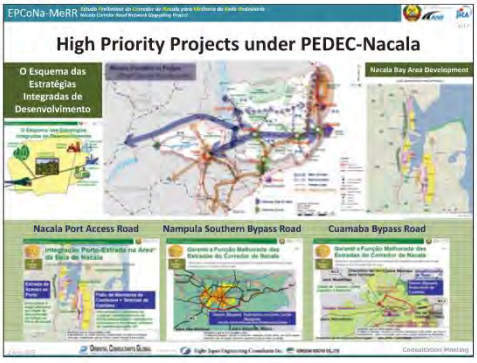
ANNEX 2
Presentation Slides

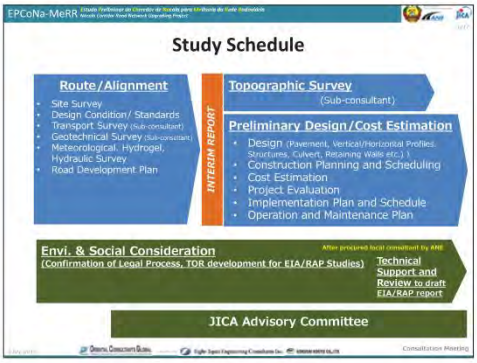


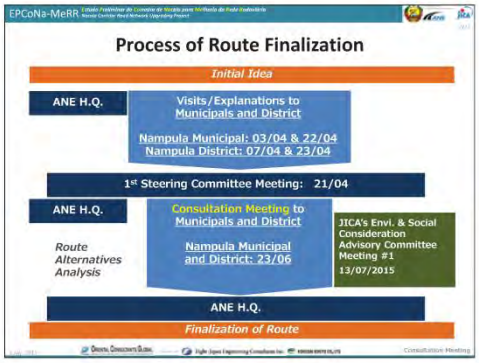












EPCoNa-MeRR

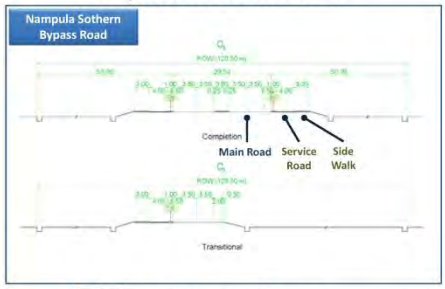
Basic Design Conditions

- Each road forms a part of Urban Area;

- ✓ Applied Road Design Standards: "**ANE's Design Standards (Draft)**"
- ✓ Road Class: **Primary Road** of asphalt pavement Design Speed: **100 km/hour**
- ✓ Operational Speed Limited: **80 km/hour**
- ✓ Right of way (ROW) : **Mozambique Law**
- ✓ Construction Methods: **Stage Construction**

EPCoNa-MeRR

Proposed Road Cross Section



EPCoNa-MeRR

Control Points (1)

- **Public Facilities**
  - Schools,
  - Hospitals,
  - High voltage transmission lines,
  - Pipeline, etc.
- **Religious Sites**
  - Churches, Mosques,
  - Cemetery, etc.

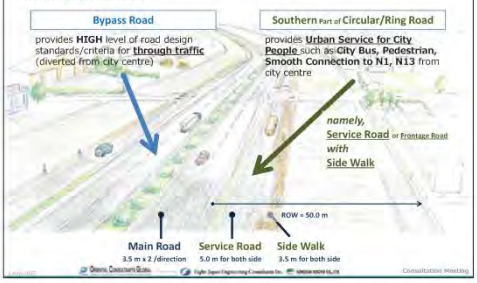
EPCoNa-MeRR

Control Points (2)

- **Natural Obstacles**
  - Rivers,
  - Rock formations,
  - Flood zones, etc.
- **Particular Properties**
  - Houses, Stores,
  - Railways,
  - Industrial Areas,
  - Cargo Terminal, etc.

EPCoNa-MeRR

Image of Nampula Southern Bypass Road



EPCoNa-MeRR

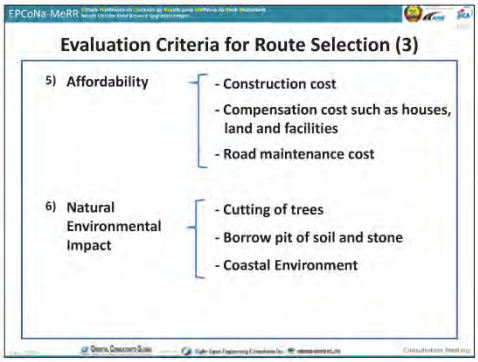
Evaluation Criteria for Route Selection (1)

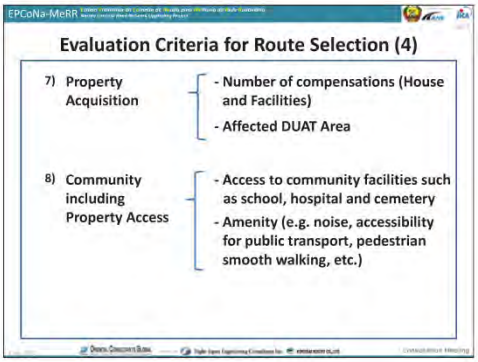
1) **Consistency to Integrated Development Plan**
   - Consistency for PEDEC-Nacala
   - Consistency for Urban Planning (PEU)
   - Other Infrastructure Development Plan (e.g. High-voltage Electric Line Plan, Plans by municipal, etc.)
2) **Benefits to Traffic and Congestion Relief**
   - Reduction of transport cost
   - Reduction of travel time

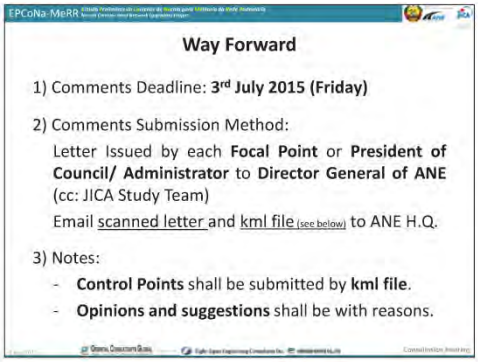
EPCoNa-MeRR

Evaluation Criteria for Route Selection (2)

3) **Benefits to Urban Development and Residence**
   - Urban development along the road with generated traffic demand
   - Enhancement of urban activities functions for residence along the road
4) **Road Safety**
   - Safety for drivers
   - Safety for residents


EPCoNa-MeRR
Evaluation Criteria for Route Selection (3)
5) Affordability
- Construction cost
- Compensation cost such as houses, land and facilities
- Road maintenance cost
6) Natural Environmental Impact
- Cutting of trees
- Borrow pit of soil and stone
- Coastal Environment


EPCoNa-MeRR
Evaluation Criteria for Route Selection (4)
7) Property Acquisition
- Number of compensations (House and Facilities)
- Affected DUAT Area
8) Community including Property Access
- Access to community facilities such as school, hospital and cemetery
- Amenity (e.g. noise, accessibility for public transport, pedestrian smooth walking, etc.)


EPCoNa-MeRR
Way Forward
1) Comments Deadline: 3rd July 2015 (Friday)
2) Comments Submission Method:
Letter Issued by each Focal Point or President of Council/ Administrator to Director General of ANE (cc: JICA Study Team)
Email scanned letter and kml file (see below) to ANE H.Q.
3) Notes:
- Control Points shall be submitted by kml file.
- Opinions and suggestions shall be with reasons.

Lista de Participantes (Participant List)

Reunião de Consulta: Nampula (Nampula Consultation Meeting) **Data (Date): 23/Jun/2015**

No.	Nome (Name)	Organização (Organization)	Cargo (Position)	Email	Telefone (Telephone)	Assinatura (Signature)
1	Assucenia M. Aliera	CMCN (Nampula City Municipal Council)	Geographer	—	825-307-705	
2	Joao dos S. Salazar	CMCN	Surveyor	jsalazardossantos.mabvi@gmail.com	846-587-980	
3	Lino N. Mateus	CMCN	Surveyor	linonelson.mateus1@gmail.com	845-689-422	
4	Tapu Abdul S. H. Kara	CMCN	Geographer	t.kara100@gmail.com	820-289-940	
5	Sergio R. Sabao	CMCN	Planner	sergiosabao@gmail.com	843-129-754	
6	Sergio A. Armando	CMCN	Cartographer	sergioanibal.armando@gmail.com	844-499-300	
7	Piedoso Pamela	CMCN	Urbanization Director	piedosocarlosalfredopamela@gmail.com	825-798-538	
8	Paulo Bauque	ANE	Project Coordinator	pbauque@ane.gov.mz	848-731-506	
9	Antonio H. Soo	BDPI (Rapale)	Director Substitute	antohungsoo@gmail.com	842-997-741	

Lista de Participantes (Participant List)

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No.	Nome (Name)	Organização (Organization)	Cargo (Position)	Email	Telefone (Telephone)	Assinatura (Signature)
10	Dino da Silva	ANE	Focal Point	dynesilver@gmail.com	840-657-678	
11	João M. Mutoti	Study Team	Support Staff	jonso81@yahoo.com	828-578-189	
12	Faustino Fernando Weliha	CMCN	Alderman	weliha72@yahoo.com.br	842-010-039	
13	Takao Inami	Study Team	Deputy Team Lider			
14	Lucas Jun Kase Kiso	Study Team	Bridge Design (Assistant)			
15						
16						
17						
18						

From:

Sent:

To:

Cc:

Subject: ANEL VIÁRIO NA CIDADE DE NAMPULA - BYPASS

Boa Tarde!

No âmbito do encontro tido no dia 23 de junho no Departamento de Urbanização entre a equipe do CMCN, ANE e a Consultora, a equipe do Conselho municipal pronuncia-se da seguinte maneira:

É de louvar pela contemplação deste projecto a nossa Urbe e entendemos que o mesmo é parte de solução de alguns problemas de mobilidade existentes e que surgiram com o tempo após o inicio da exploração efetiva da ferrovia pela concessionaria;

A proposta colocada para o traçado é estratégica não só pelo comprimento da mesma, mas também pelo facto de interceptar todas as redes viárias nacionais que cruzam o município, e afetam significativamente a todos os postos administrativos;

As políticas apresentadas vão de acordo com aquelas que são empregues pela edilidade em casos semelhantes e acreditamos que dará as mesmas respostas positivavas previstas.

Mas também, queremos subicidiar no que diz respeito a 2 aspectos momeadamente:

1. Traçado da Via;

Entendemos que na definição do traçado da via, temos que ter em conta não só a mobilidade, mas também o travamento de assentamentos informais. Neste contexto sugerimos que este anel / traçado, deve envolver todas as áreas planificadas / ordenadas e não planificadas/ com assentamento desordenados; Não passando entre áreas densamente habitadas de maneira desordenadas ou dividindo as áreas planificadas.
Neste sentido possibilitara não só o travamento dos assentamentos informais, mas também minimizara o numero de infraestruturas impactadas;

1. Planificação ao Longo da Via

Um dos principais atrativo para infraestruturação é a existência de vias de acesso convencionais. A medida em que a via for definida a procura de espaços a berma ou próximo a estrada será maior, ocasionando aquisições e ocupações desordenadas ao longo deste magnifico projecto.
Motivos pela qual sugerimos que o nosso pensamento seja não só a definição do traçado, mas também a planificação de ocupações ao longo do traçado;

Existem questões que acreditamos que seram ultrapassadas nos passos subsequente, mas, gostaríamos de partilhar novamente com a vossa Excia.

Tendo o projecto duas faichas de rodagens, a primeira fase de execusao sera apenas uma,em consideração as diversas situações de invasões que existem nessas faixas, há que pensar no tratamento das mesmas.

Sem mas no momento, endereçamos as nossas cordiais saudações.

P.Pamela
Dir. Urbanização
Conselho Municipal da Cidade de Nampula – Moçambique

ADMINISTRAÇÃO NACIONAL DE ESTRADAS

Comentários as Sugestões do Conselho Municipal da Cidade de Nampula

No	Sugestões do Conselho Municipal da Cidade de Nampula	Comentários da ANE
1	Entendemos que na definição do traçado da via, temos que ter em conta não só a mobilidade, mas também o travamento de assentamentos informais. Neste contexto sugerimos que este anel/traçado, deve envolver todas as áreas planificadas/ordenadas e não planificadas/com assentamentos desordenados, não passando entre áreas densamente habitadas de maneira desordenada ou dividindo as áreas planificadas. Neste sentido possibilitará que não só o travamento dos assentamentos informais, mas também minimizará o número de infraestruturas impactadas.	• Na definição da variante final do traçado da via serão analisadas as sugestões do Município de modo a sua acomodação sempre que possível. • O desenvolvimento da zona urbana ao longo do traçado da futura estrada deverá ter em consideração o Plano de Estrutura Urbana do Município, o qual em nosso entender deverá merecer ajustes derivados pela definição do traçado da via.
2	Um dos principais atractivos para a infraestruturação é a existência de vias de acesso convencionais. A medida em que a via for definida a procura de espaços na berma ou próximo da estrada será maior, ocasionando aquisições e ocupações desordenadas ao longo deste magnifico projecto. Motivos pela qual sugerimos que o nosso pensamento seja não só a definição do traçado mas também a planificação de ocupações ao longo do traçado.	• A definição do traçado da estrada tem como premissas básicas a minimização do reassentamento de infraestruturas, tempo de trânsito e custo de construção. • De modo a evitar a ocupação desordenada das áreas de reserva da futura estrada, serão tomadas medidas tais como a sua delimitação e recenseamento das infraestruturas que se encontrarem na área a ser expropriada. • Em relação a vossa proposta de traçado, verificamos que a mesma aumenta a distância em mais 10 km o que tem implicações no tempo de trânsito e custos de construção.

20 Augustus 2015
02:39 PM

ADMINISTRAÇÃO NACIONAL DE ESTRADAS
DIRECÇÃO DE PROJECTOS

DEPARTAMENTO DE ESTUDOS

E

PROJECTOS

Para:
Conselho Municipal da Cidade de Nampula
Att: Sr. Mahamudo Amurane
Presidente

Nampula

Sua referência	Sua comunicação de	Nossa referência	Nossa comunicação de
		495/RE/DEP/DIPRO/2015	17/08/2015

ASSUNTO: ESTUDO DE VIABILIADADE PARA A CONSTRUÇÃO DO BY- PASS À CIDADE DE NAMPULA
- Definição do Traçado -

Exmos. Senhores,

De acordo com o assunto em epígrafe, e no seguimento do encontro de auscultação sobre o traçado do by-pass à cidade de Nampula realizado no passado dia 23 de Junho de 2015, temos a informar o seguinte:

1) Após a análise de várias alternativas de traçado e tomando em consideração as vossas sugestões/comentários, foram seleccionadas três variantes representadas no mapa em anexo.

2) O traçado final será definido durante o trabalho a ser efectuado no terreno pela equipe constituída pelo Consultor, ANE e Conselho Municipal da Cidade de Nampula, tendo como premissas a redução do tempo de trânsito, minimização do reassentamento de infraestruturas e custos de construção.

3) De modo a permitir a execução plena das actividades previstas no estudo, solicitamos a indicação de técnicos que acompanharão o Consultor e a ANE na execução do trabalho de campo que consistirá na implantação dos marcos e recenseamento das infraestruturas e seus proprietários a serem abrangidas pelo traçado, com início dos trabalhos previsto para o dia 25 de Agosto de 2015.

Sem mais de momento, endereçamos os nossos melhores cumprimentos.

O Director Geral

/Atanásio Muguinhe/

REPÚBLICA DE MOÇAMBIQUE ANE Direcção Geral

Anexo: Comentários as Sugestões do CMC de Nampula
Mapa com as alternativas do traçado


Nampula Southern Bypass Road
N13
N1
N1
N104
R686
Beer Factory
New Cemitery

Appendix-5 Results of Consultation with Local Administrative Governments (Cuamba Bypass Road)

(1) Minutes of Meeting

(2) Participant List

(3) Letter from Cuamba Municipality to ANE

(4) Letter from ANE to Cuamba Municipality

Minute
of
the Consultation Meeting
for
the Preparatory Survey
for
Nacala Corridor Road Network Improvement Project
in
the Republic of Mozambique
(EPCoNa-MeRR)

Cuamba Bypass Road

Cuamba, June 26th, 2015

Consultation Meeting

The Consultation Meeting for the "Preparatory Survey for Nacala Corridor Road Network Improvement Project" (hereinafter referred to as "Study") regarding "Cuamba Bypass Road" (hereinafter referred to as "Bypass Road") was held below:

(i) Date and Time: 26th June 2015, 10:30am – 11:45am
(ii) Place: Conference room of Cuamba Municipal Council (hereinafter referred to as "CMC").
(iii) Participants: CMC
National Road Administration (hereinafter referred to as "ANE")
JICA Study Team
See attached Annex 1
(iv) Chairperson: Mr. Paulo BAUQUE, Project Coordinator of ANE

(1) Opening Speech

Mr. Zacarias FILIPE, Mayor of Cuamba, opened the meeting and welcomed the Consultation Meeting members.

Mr. Paulo BAUQUE explained that the Bypass Road is one of the most important and priority projects defined in the PEDEC-Nacala Plan for development of Nacala Corridor. Also, he stated that the objective of this Consultation Meeting was to hear from the local authority comments and suggestions to help of the Bypass Road alignment.

(2) Presentation

JICA Study Team presented the study contents, study background, study policy & strategy, basic design criteria, evaluation criteria for route selection and study schedule. The presentation was used the slides as shown in Annex 2.

(3) Questions & Answers, Suggestions & Opinions session

After the presentation, Mr. Paulo BAUQUE opened the questions & answers, suggestions & opinions etc. below:

(a) CMC mentioned that he Bypass Road have effective to reduce the traffic congestion in the city. And CMC requested that ANE indicate the alignment.

ANE answered that since the Bypass Road alignment study has not been completed, ANE cannot indicate the final alignment today. After ANE will fix the road alignment, ANE will inform CMC by official letter.

(b) CMC requested to avoid the cemeteries (near Muanda river area). Therefore, CMC suggested the alternative alignment pass through in the north side of Cuamba.

ANE answered that cemeteries will be avoided and a north side route will be considered.

JICA Study Team requested that CMC send the locations of cemeteries by kml file.

(c) CMC would like to explain the Bypass Road to Cuamba citizens.

ANE answered that the explanation will be done during the Resettlement Action Plan

(RAP) Study.

(d) CMC requested that the Bypass Road alignment should be considered according to the Land Use Plan (PEU).

ANE answered that the consistency of the PEU will be checked and feedback will be done.

(e) CMC requested that resettlement shall be minimized.

ANE answered that project road shall be minimized the number of resettlement. And ANE will consider during RAP study.

(e) CMC comment that Cassiano Bridge has been destroyed by the heavy rains in this January and CMC requested the reconstruction of the bridge in this project.

ANE answered that the reconstruction of the bridge in this project is very difficult due to the limited budget. And ANE suggested to seek other budget.

(f) CMC mentioned that CMC don't have enough budgets to compensate the resettlement houses etc.

ANE answered that the central government will be prepared the compensations budget.

Closing Remarks

CMC's members agreed that suggestions and opinions shall be sent directly to ANE General Direction by formal letter until July 06, 2015.

Control points shall be sent by kml file and suggestion & opinions shall be included reasons. One letter will be sent by CMC.

The meeting was closed at 11:45.

ANNEX 1
List of Attendees

OC GLOBAL

Lista de Participantes (Participant List)

Reunião de Consulta: Cuamba (Cuamba Consultation Meeting)

Data (Date): 26/Jun/2015

No.	Nome (Name)	Organização (Organization)	Cargo (Position)	Email	Telefone (Telephone)	Assinatura (Signature)
1	Joaquim Patrício Loaise	Conselho Municipal	Vereador da área de Ed. Cult. Juventude e desporto	patriciolaise@gmail.com	824741440 876635072	[illegible]
2	Carlota Pedro	Conselho Municipal	Tecnica de Estradas		826594417 868742878	[illegible]
3	Carlos Ernesto Bamamo	Consultive	Focal	[illegible]	828930480	[illegible]
4	Bangue Afonso	C.M.C.C	Vereador de Saúde Mulher e Acção Social	[illegible]	828203170 863992146	[illegible]
5	Silvério Picunha	C.M.C.C.	Vereador da urbanização, construção e infra-estrutura		826766450 863103979	[illegible]
6	Alberto M. Nahopa	C.M.C.C.	Vereador de Actividades económica	albertomarromeu@gmail	861806761	[illegible]
7	ORESTE ZEZELA	AXE/XILAGRA	~~CHEFE DEPTO~~ TÉCNICO	ozezela@gmail.com	828469870 866104612	[illegible]
8	MÁRIO DE ALBERTO	C.M.C.C.	TÉCNICO	[illegible]	868357272	[illegible]
9	Abel Oscar Demelo	CMCC	Técnico		840463377	[illegible]

OCGLOBAL

Lista de Participantes (Participant List)

Reunião de Consulta: Cuamba (Cuamba Consultation Meeting)

Data (Date): 26/Jun/2015

No.	Nome (Name)	Organização (Organization)	Cargo (Position)	Email	Telefone (Telephone)	Assinatura (Signature)
10	Bandeira	C.M.C.C	Planificador F	[illegible] @gmail.com	86-8706660	[illegible]
11	Paulo [illegible]	ANE	Coordenador do Projecto	[illegible]	848731586	[illegible]
12	Fátima [illegible]	C.M.C.C	Tequinica		861803795	
13	Maria Teresa	CMCC	Tecnica	[illegible]	841055 3931	[illegible]
14	[illegible] Luís	CMCC	Técnico	[illegible]	84 39 22 367	[illegible]
15	Gabriel da C. Pio	C.M.C.C	Técnico	gabrielpio36@gmail.com	84 49 45 434	[illegible]
16	Fidorino [illegible]	C.M.C.C	Técnico		827750029	[illegible]
17	Jordão de Jesus	C.M.C.C	Tecnico	jordaojesus@yahoo.com.br	829957332	[illegible]
18	Orlando Estevão	C.M.C.C.	Técnico	Estevão Orlando [illegible]	866036166	[illegible]

Appendix 5-6

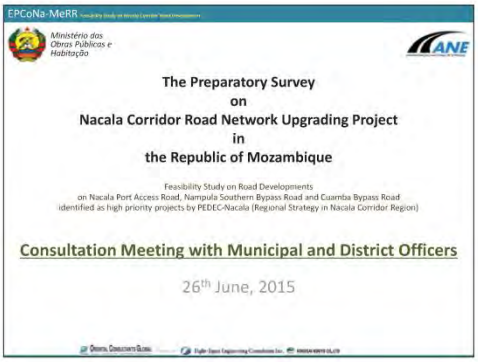
OC GLOBAL

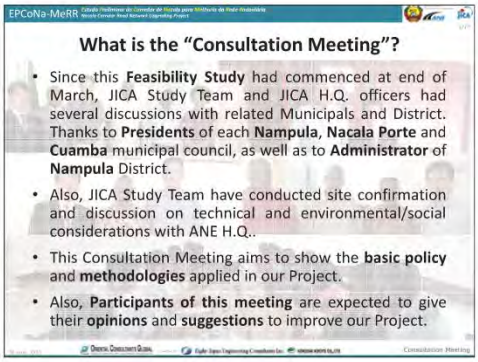
Lista de Participantes (Participant List)

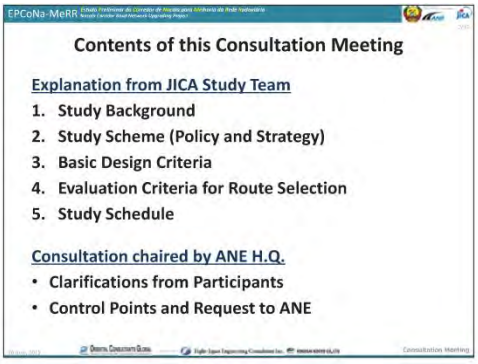
Reunião de Consulta: Cuamba (Cuamba Consultation Meeting) **Data (Date): 26/Jun/2015**

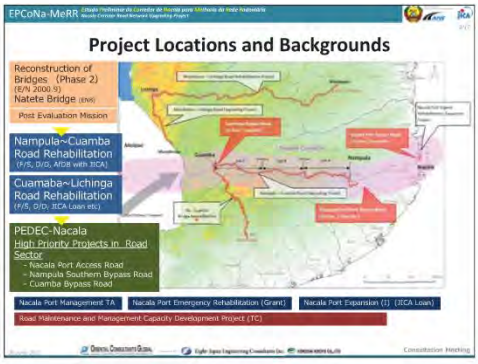
No.	Nome (Name)	Organização (Organization)	Cargo (Position)	Email	Telefone (Telephone)	Assinatura (Signature)
19	Luis Impasse	CMCC	Chefe Local		866833508	
20	Gabriel M. Carneiro	SDPI - Obras Pub	Técnico Const. Civil	gabriel.carneiro@gmail.com	825065409	
21	Emilia Gonçalves Bonanima	Consultor	Fiscal	e.bonanima@gmail.com	828931480	
22	Adolfo Silvério	CMCC	Tesoureiro	adolfosilverio@hotmail.com	869168940 821575546	
23	Zacarias Filipe	CMCC	Presidente	zfilipecc@gmail.com	828174480 842707253 861798521	
24						
25						
26						
27						

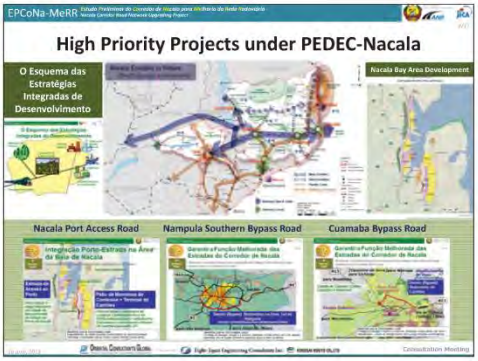
ANNEX 2
Presentation Slides











EPCoNa-MeRR

Basic Design Conditions

- Each road forms a part of Urban Area;

- ✓ Applied Road Design Standards: "**ANE's Design Standards (Draft)**"
- ✓ Road Class: **Primary Road** of asphalt pavement Design Speed: **100 km/hour**
- ✓ Operational Speed Limited: **80 km/hour**
- ✓ Right of way (ROW) : **Mozambique Law**

EPCoNa-MeRR

Proposed Road Cross Section

EPCoNa-MeRR

Control Points (1)

- **Public Facilities**
  - Schools,
  - Hospitals,
  - High voltage transmission lines,
  - Pipeline, etc.
- **Religious Sites**
  - Churches, Mosques,
  - Cemetery, etc.

EPCoNa-MeRR

Control Points (2)

- **Natural Obstacles**
  - Rivers,
  - Rock formations,
  - Flood zones, etc.
- **Particular Properties**
  - Houses, Stores,
  - Railways,
  - Industrial Areas,
  - Cargo Terminal, etc.

EPCoNa-MeRR

EPCoNa-MeRR

Evaluation Criteria for Route Selection (1)

1) **Consistency to Integrated Development Plan**
   - Consistency for PEDEC-Nacala
   - Consistency for Urban Planning (PEU)
   - Other Infrastructure Development Plan (e.g. High-voltage Electric Line Plan, Plans by municipal, etc.)
2) **Benefits to Traffic and Congestion Relief**
   - Reduction of transport cost
   - Reduction of travel time

EPCoNa-MeRR

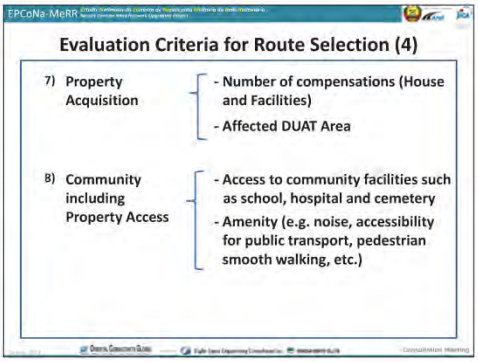
Evaluation Criteria for Route Selection (2)

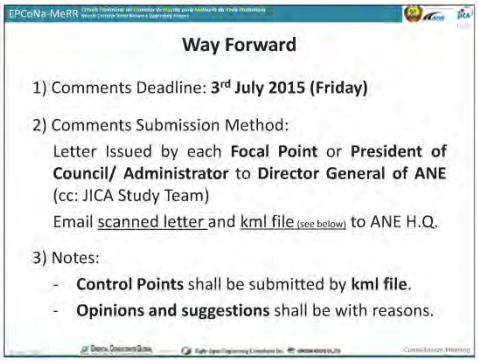
3) **Benefits to Urban Development and Residence**
   - Urban development along the road with generated traffic demand
   - Enhancement of urban activities functions for residence along the road
4) **Road Safety**
   - Safety for drivers
   - Safety for residents

EPCoNa-MeRR

Evaluation Criteria for Route Selection (3)

5) **Affordability**
   - Construction cost
   - Compensation cost such as houses, land and facilities
   - Road maintenance cost
6) **Natural Environmental Impact**
   - Cutting of trees
   - Borrow pit of soil and stone
   - Coastal Environment


EPCoNa-MeRR
Evaluation Criteria for Route Selection (4)
7) Property Acquisition
- Number of compensations (House and Facilities)
- Affected DUAT Area
8) Community including Property Access
- Access to community facilities such as school, hospital and cemetery
- Amenity (e.g. noise, accessibility for public transport, pedestrian smooth walking, etc.)


EPCoNa-MeRR
Way Forward
1) Comments Deadline: 3rd July 2015 (Friday)
2) Comments Submission Method:
Letter Issued by each Focal Point or President of Council/ Administrator to Director General of ANE (cc: JICA Study Team)
Email scanned letter and kml file (see below) to ANE H.Q.
3) Notes:
- Control Points shall be submitted by kml file.
- Opinions and suggestions shall be with reasons.

Lista de Participantes (Participant List)

Reunião de Consulta: Cuamba (Cuamba Consultation Meeting) **Data (Date): 26/Jun/2015**

No.	Nome (Name)	Organização (Organization)	Cargo (Position)	Email	Telefone (Telephone)	Assinatura (Signature)
1	Joaquim Patricio Laisse	Municipal Council	Alderman of Sports and Youth Cultural Education	patriciolaisse@gmail.com	876-635-072 824-7454-40	
2	Carlota Tebro	Municipal Council	Road Technical	—	868-742-878 828-594-417	
3	Carlos Erenesto Baramac	Consultec (Private Company)	(Construction) Supervisor	c.barama@gmail.com	828-930-480	
4	Bauque Afonso	CMCC	Alderman of Health and Social Care	charibanque@gmail.com	828-203-170 863-992-146	
5	Silverio Picunha	CMCC	Alderman of Urbanization, Construction and Infrastructure	—	863-103-979 826-766-450	
6	Alberto M.Nahopa	CMCC	Alderman of Economic Activities	albertomarromeu@gmail.com	861-806-761	
7	Oreste Zezela	ANE/Niassa	Technical Department Head	ozezela@gmail.com	866-104-612 828-469-870	
8	Mario de Alberto	CMCC	Technical	mariofelixlazaro55@gmail.com	861-351-277	
9	Abel Oscar Demelo	CMCC	Technical	—	840-463-377	

Lista de Participantes (Participant List)

Reunião de Consulta: Cuamba (Cuamba Consultation Meeting) **Data (Date): 26/Jun/2015**

No.	Nome (Name)	Organização (Organization)	Cargo (Position)	Email	Telefone (Telephone)	Assinatura (Signature)
10	Luis Bandeira Castro	CMCC	Urban Planner	luiscastrobandeira@gmail.com	868-706-660	
11	Paulo Bauque	ANE	Project Coordinator	pbauque@ane.gov.mz	848-731-586	
12	Fatima Aldo M	CMCC	Technical	—	861-803-195	
13	Marta Teresa	CMCC	Technical	mariabartolomeu@ymail.com	840-553-931	
14	Laurinda Luis	CMCC	Technical	laurindaluis3@gmail.com	843-922-367	
15	Gabriel da C.Pio	CMCC	Technical	gbrielpio36@gmail.com	844-945-434	
16	Fiorino Paulino	CMCC	Technical	—	827-750-029	
17	Jordao de Jesus	CMCC	Technical	jordaojrsus@yahoo.com.br	829-957-332	
18	Orlando Estevao	CMCC	Technical	etevao.olando@yahoo.br	866-036-166	

Lista de Participantes (Participant List)

Reunião de Consulta: Cuamba (Cuamba Consultation Meeting) **Data (Date): 26/Jun/2015**

No.	Nome (Name)	Organização (Organization)	Cargo (Position)	Email	Telefone (Telephone)	Assinatura (Signature)
19	Luis Mapussale	CMCC	Local Head	—	866-833-508	
20	Gabriel Mouricio Comacoma	SDPI Public Works	Technical	gabrielcomacoma@gmail.com	825-065-409	
21	Adolfo Silveiro	CMCC	Treasurer	adolfosilveiro@rockbrasil.com	869-168-940 821-575-546	
22	Zacarias Filipe	CMCC	Mayor	zfilipe@gmail.com	828-174-400 842-707-253 861-798-521	
23	Takao Inami	Study Team	Deputy Team Lider			
24	Lucas Jun Kase Kiso	Study Team	Bridge Design (Assistant)			
25	João M. Mutoti	Study Team	Support Staff			
26						

Município da Cidade de Cuamba

CONSELHO MUNICIPAL DA CIDADE DE CUAMBA

GABINETE DO PRESIDENTE

N/ref n.º/256/CMCC/GP/ 993 /2015

Data: 13 de Julho de 2015 Para: Director Geral da ANE

Assunto: ENVIO DA CARTA DE RECOMENDAÇÕES E OBSERVAÇÕES PARA A DEFINIÇÃO DO TRAÇADO FINAL DA CIRCULAR NORTE DE CUAMBA.

Queira antes de mais, aceitar as nossas cordiais saudações em meu nome pessoal e em nome do Municipio da Cidade de Cuamba. Estamos todos muito gratos pela vinda do projecto da circular da nossa Cidade, acto que irá contribuir para o desenvolvimento da Cidade e criarà melhor gestão do trafego, que se espera intenso pela urbe uma vez que, Cuamba é um potencial corredor de pesados.

Como forma de contribuir na implementação da circular, apresentamos e arolamos as seguintes recomendações e observações, que esperamos que se tomem em conta na definição final do traçado:

- Sugerimos por unanimidade que a definição final do traçado da circular passe do lado norte dos Institutos de Formações e venha a sobre-sair no povoado de Teteriane, por forma a potenciar o crescimento do povoado de Teteriane, visto que a estrada é um grande impulcionador de desenvolvimento.
- Considerando que a circular vai passar entre os dois bairros de Njato e Adine 3, bairros estes que tem a comunicação deficitária devido a inexistência de uma ponte sobre o rio Muanda (Cassiano), que permita a comunicação entre os dois bairros,

Conselho Municipal da Cidade de Cuamba Av: Eduardo Mondlane n. Contacto: Tel: 27-162737 – Fax: 27-162542 Caixa Postal - 041

achamos conveniente que o projecto da circular abarque a construção de uma ponte que facilite a comunicação entre os dois povoados.

- Propomos que haja igualmente atenção especial do lado norte do rio Muanda, onde se encontram localizados 3 cemitèrios comunitários àte agora identificados.
- Exortamos para que se respeite e se faça cumprir fielmente todas as directrizes e normas emanadas no Plano de Estrutura Urbana relativamente na defenição do traçado da circular, por forma a fazer cumprir a implementação do Plano e potenciar os aglomerados criados nos povoados de Njato e teteriane, povoados por onde vai passar a circular.

Certos de que o assunto em epigrafe merecerá especial atenção por parte da V.Excia sub escrevemo-nos com os nossos melhores comprimentos.

Cuamba aos 13 de Julho de 2015

O Presidente

/Zacarias Filipe/

ITP N1

20 Augustus 2015
02:43 PM

ADMINISTRAÇÃO NACIONAL DE ESTRADAS

DIRECÇÃO DE PROJECTOS

DEPARTAMENTO DE ESTUDOS

E

PROJECTOS

Para:
Conselho Municipal da Cidade de Cuamba
Att: Sr. Zacarias Filipe
Presidente

Cuamba

Sua referência	Sua comunicação de	Nossa referência	Nossa comunicação de
		497/RE/DEP/DIPRO/2015	17/08/2015

ASSUNTO: ESTUDO DE VIABILIADADE PARA A CONSTRUÇÃO DO BY- PASS À CIDADE DE CUAMBA
- Definição do Traçado -

Exmos. Senhores,

De acordo com o assunto em epígrafe, e no seguimento do encontro de auscultação sobre o traçado do by-pass à cidade de Cuamba realizado no passado dia 26 de Junho de 2015, temos a informar o seguinte:

1) Após a análise de várias alternativas de traçado e tomando em consideração as vossas sugestões/comentários, foram seleccionadas três variantes representadas no mapa em anexo.

2) O traçado final será definido durante o trabalho a ser efectuado no terreno pela equipe constituída pelo Consultor, ANE e Conselho Municipal da Cidade de Cuamba, tendo como premissas a redução do tempo de trânsito, minimização do reassentamento de infraestruturas e custos de construção.

3) De modo a permitir a execução plena das actividades previstas no estudo, solicitamos a indicação de técnicos que acompanharão o Consultor e a ANE na execução do trabalho de campo que consistirá na implantação dos marcos e recenseamento das infraestruturas e seus proprietários a serem abrangidas pelo traçado, com início dos trabalhos previsto para o dia 4 de Setembro de 2015.

Sem mais de momento, endereçamos os nossos melhores cumprimentos.

O Director Geral

/Atanásio Mtgunhe/

REPÚBLICA DE MOÇAMBIQUE ANE Direcção Geral

Anexo: Comentários as Sugestões do CMC de Cuamba
Mapa com as alternativas do traçado

Av. de Moçambique nº 1225 · Caixa Postal 14 39 · Telefone nº 476163/7 · Telefax nº 47 58 62 · Maputo · Moçambique

ADMINISTRAÇÃO NACIONAL DE ESTRADAS

Comentários as Sugestões do Conselho Municipal da Cidade de Cuamba

No	Sugestões do Conselho Municipal da Cidade de Cuamba	Comentários da ANE
1	Sugerimos que a definição final do traçado da circular passe do lado norte dos Institutos de Formação e venha a sobressair no povoado de Teteriane, por forma a potenciar o crescimento do povoado de Teteriane, visto que a estrada é um grande impulsionador de desenvolvimento.	• Concordamos que o traçado final se desenvolva pelo lado norte dos Institutos de Formação, pelo que será considerado. • A ponte sobre o rio Cassiano que permite a ligação entre os bairros Njato e Adine 3, é de vital importância para a expansão da cidade de Cuamba. • Dadas as dificuldades que as populações enfrentam para a travessia da ponte, é importante a sua consideração, pelo que a sua inclusão no projecto foi equacionada. • Entretanto dado que ainda não existem fundos para o efeito e num cenário de constrangimento financeiro, a ponte está sendo analisada priorizando-se antes de tudo o próprio "by-pass", não havendo para já garantias de financiamento, tanto do "by-pass" como da Ponte de Cassiano. • Assim, de modo a minorar urgentemente o sofrimento que a população enfrenta na travessia do rio Cassiano, sugerimos que sejam encontradas outras fontes de financiamento para a reconstrução imediata da ponte. • Recebemos do Município a localização dos seis cemitérios existentes e informamos que o traçado final não irá afectar os mesmos. • As normas emanadas no Plano de Estrutura Urbana do Município da Cidade de Cuamba serão seguidas sempre que se mostrarem equivalentes as normas em vigor na ANE. E em relação às variantes de traçado propostas, as mesmas foram elaboradas tomando em conta o PEU e conectar os polos de desenvolvimento.
2	Considerando que a circular vai passar entre os bairros de Njato e Adine 3, bairros estes que têm a comunicação deficitária devido a inexistência de uma ponte sobre o rio Muanda (Cassiano), que permita a comunicação entre os dois bairros, achamos conveniente que o projecto abarque a construção de uma ponte que facilite a comunicação entre os dois povoados.	
3	Propomos que haja igualmente atenção especial do lado norte do rio Muanda, onde se encontram localizados 3 cemitérios comunitários até agora identificados.	
4	Exortamos para que se respeite e se faça cumprir fielmente todas as directrizes e normas emanadas no Plano de Estrutura Urbana relativamente na definição do traçado da circular, por forma a fazer cumprir a implementação do Plano e potenciar os aglomerados criados nos povoados criados nos povoados de Njato e Teteriane, povoados por onde vai passar a circular.	

Appendix 5-18

Appendix-6 Maps of Alternatives and Selected Route/Alignment

(1) Nacala Port Access Road (Alternative Routes)

(2) Nacala Port Access Road (Selected Route)

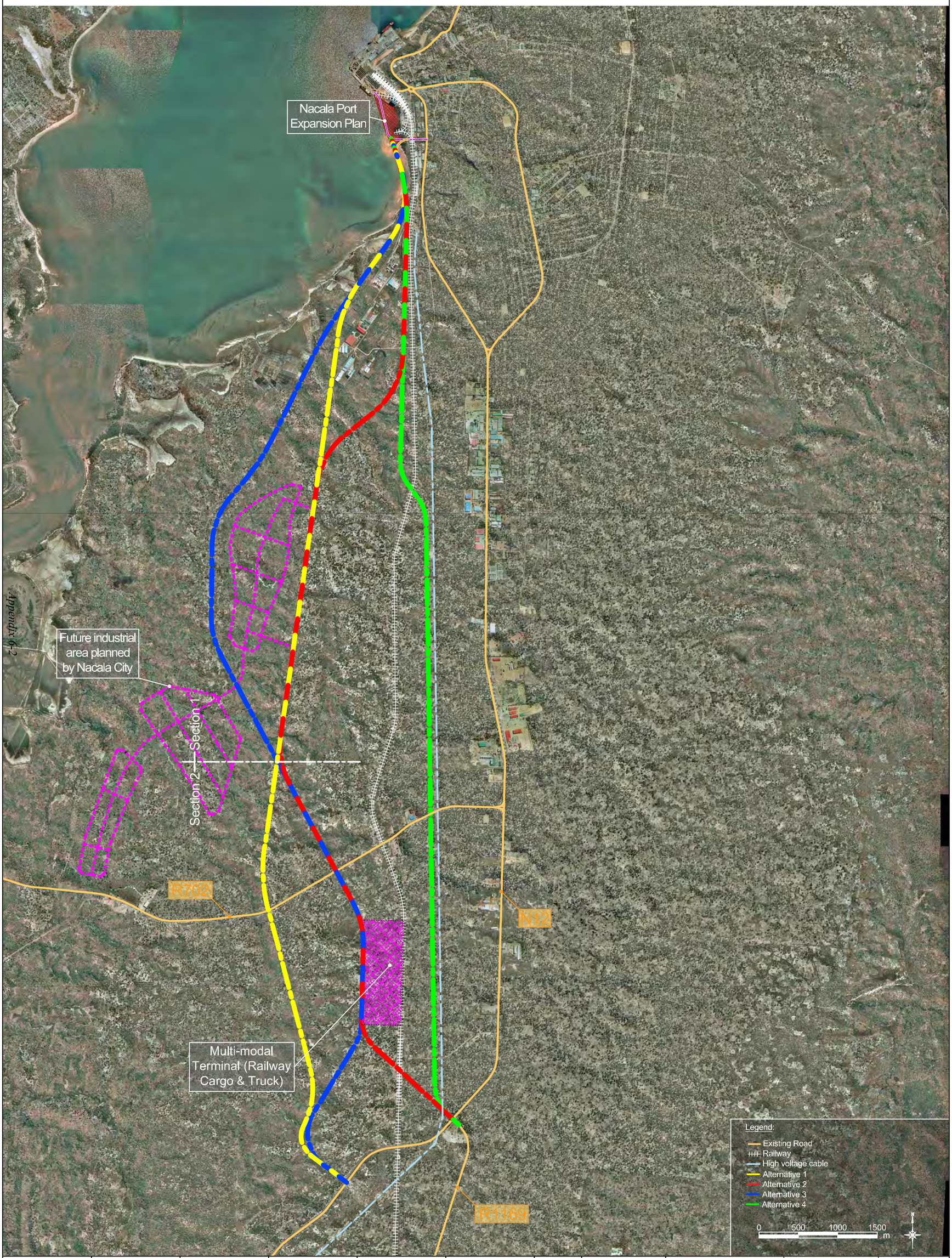
(3) Nampula Southern Bypass Road (Alternative Routes)

(4) Nampula Southern Bypass Road (Selected Route)

(5) Cuamba Bypass Road (Alternative Routes)

(6) Cuamba Bypass Road (Selected Route)

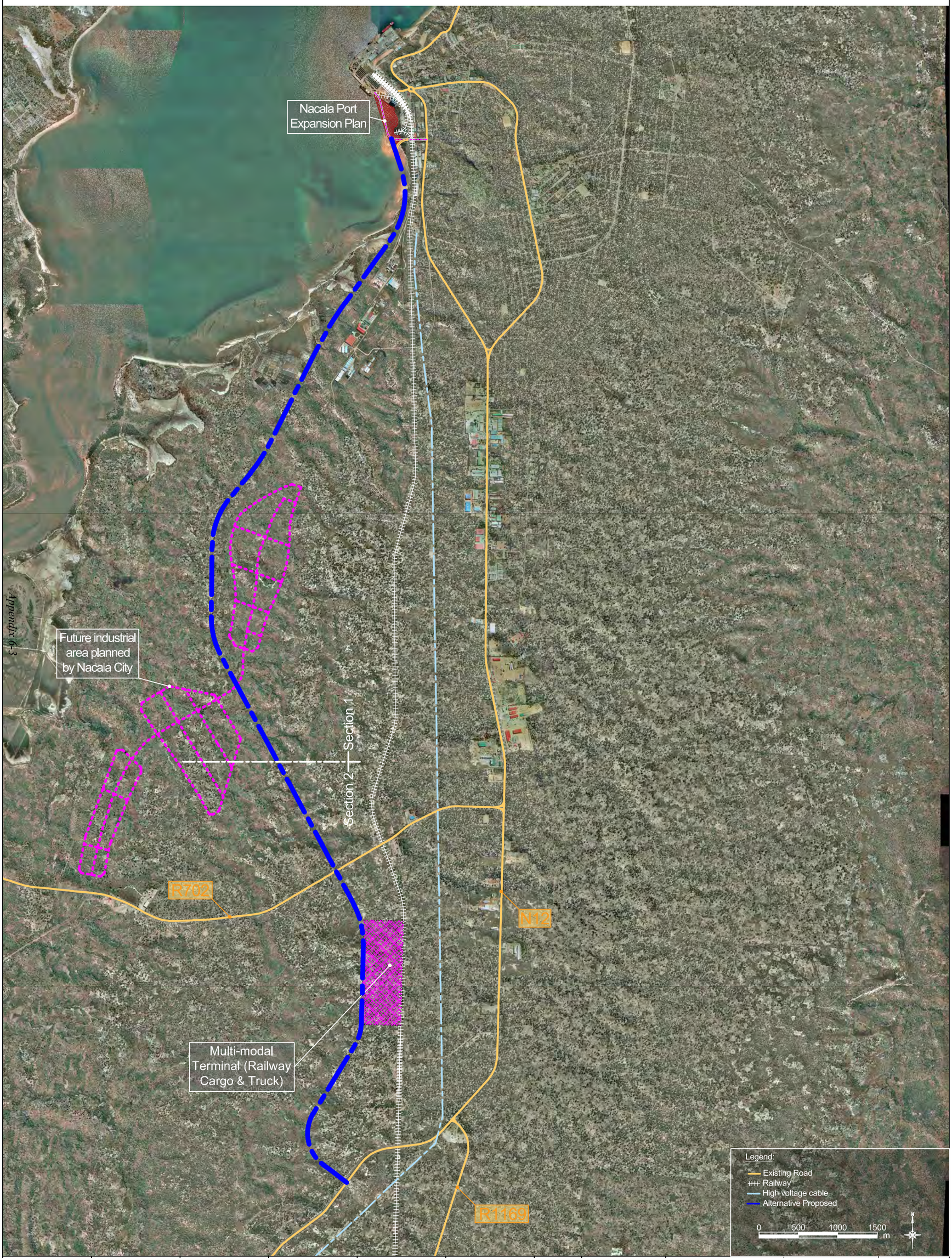
Nacala Port Access Road



Appendix 6-2

Republic of Mozambique	Administração Nacional de Estradas (ANE)	Japan International Cooperation Agency (JICA)	Oriental Consultants Global Co., Ltd	Eight-Japan Engineering Consultants Inc.	Kokusai Kogyo Co., Ltd	Designed by: Drawn by: Checked by: Approved by: Drawing No:	Project: Preparatory Survey for Nacala Corridor Road Network Improvement Project in the Republic of Mozambique	Title: Nacala Port Access Road	Version:

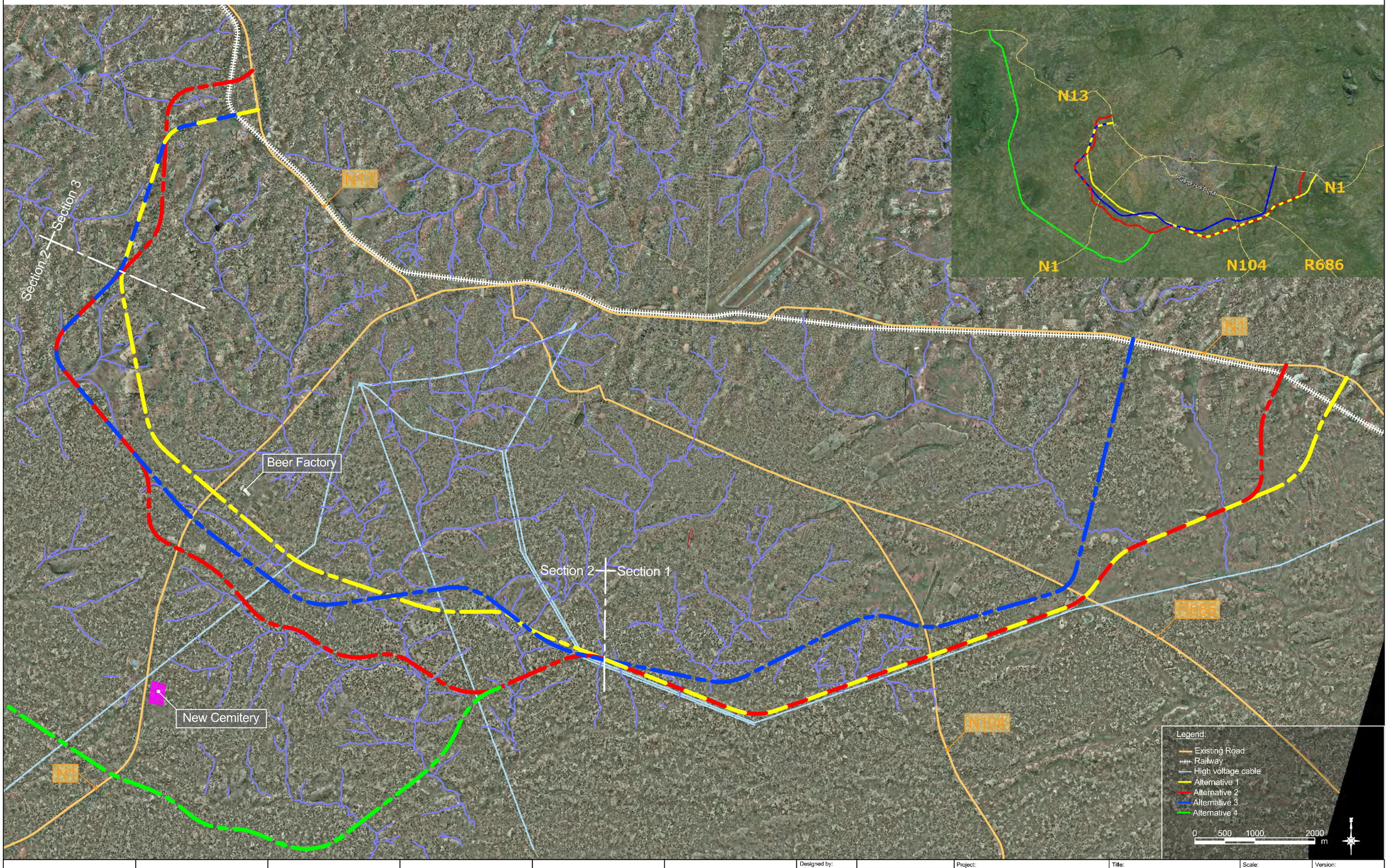
Nacala Port Access Road



Appendix 6-3

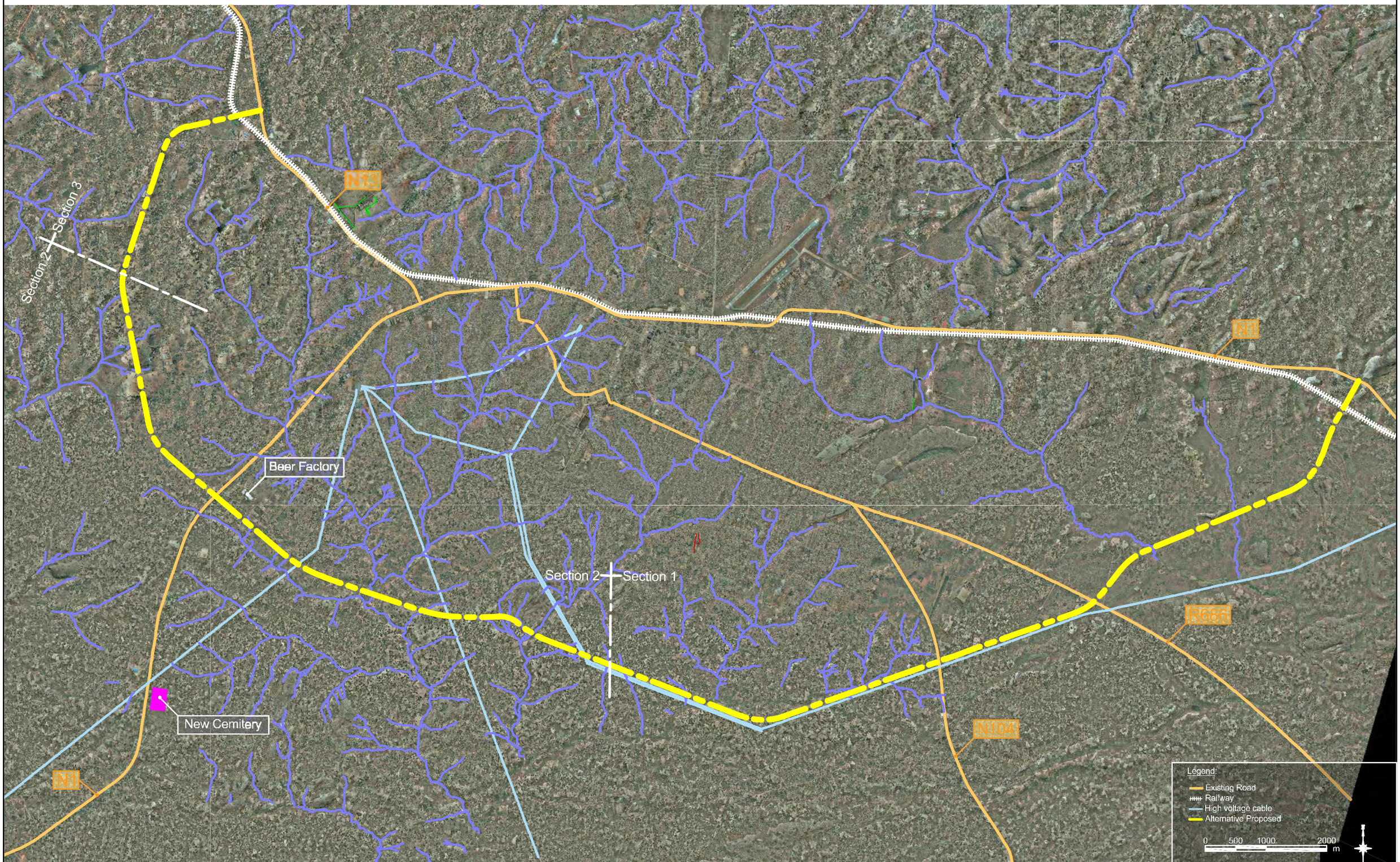
Republic of Mozambique	Administração Nacional de Estradas (ANE)	Japan International Cooperation Agency (JICA)	Oriental Consultants Global Co., Ltd	Eight-Japan Engineering Consultants Inc.	Kokusai Kogyo Co., Ltd	Designed by: Drawn by: Checked by: Approved by: Drawing No:		Project: Preparatory Survey for Nacala Corridor Road Network Improvement Project in the Republic of Mozambique	Title: Nacala Port Access Road	Version:

Nampula Southern Bypass Road



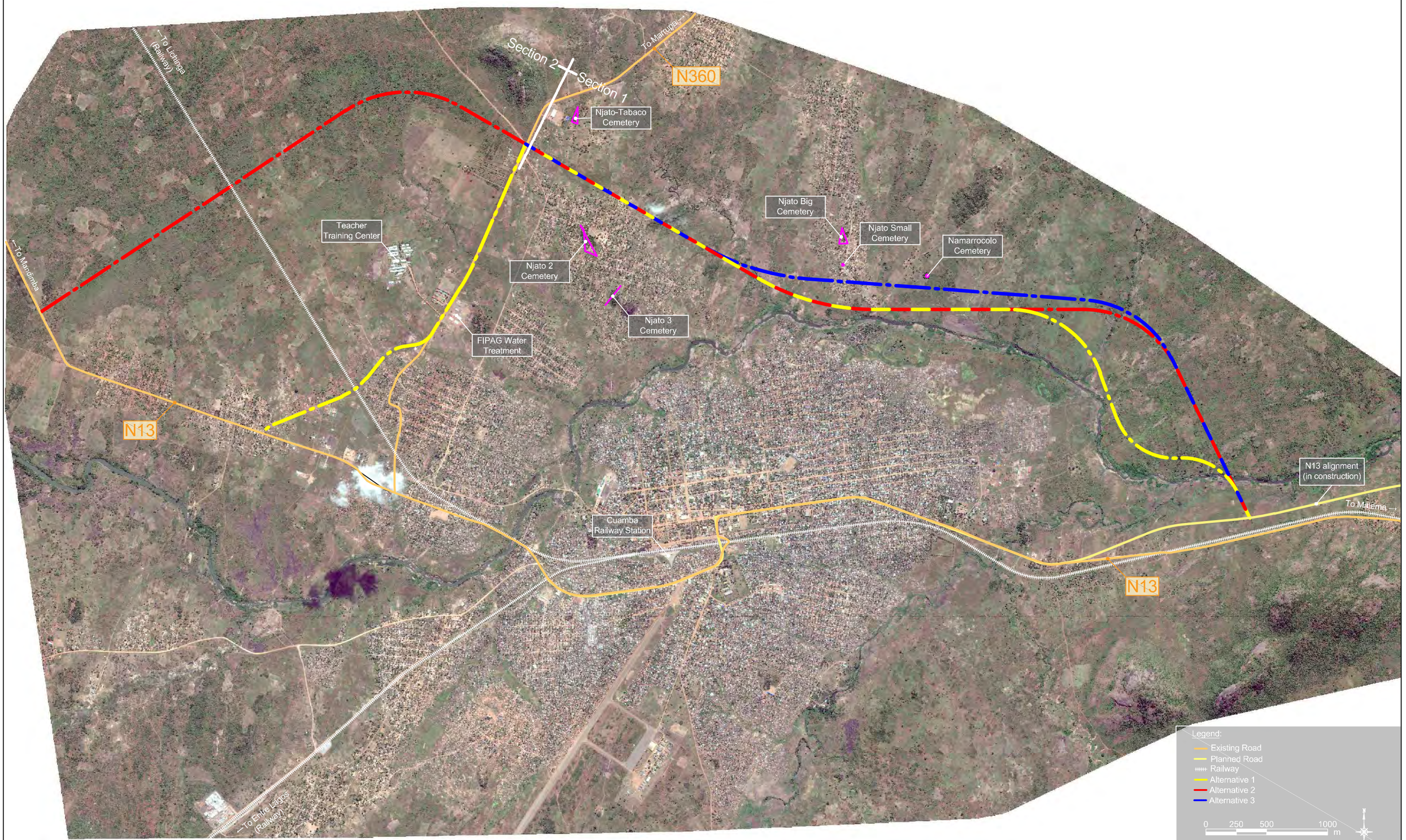
Republic of Mozambique	Administração Nacional de Estradas (ANE)	Japan International Cooperation Agency (JICA)	Oriental Consultants Global Co., Ltd	Eight-Japan Engineering Consultants Inc.	Kokusai Kogyo Co., Ltd	Designed by: / Drawn by: / Checked by: / Approved by: / Drawing No:		Project: Preparatory Survey for Nacala Corridor Road Network Improvement Project in the Republic of Mozambique	Title: Nampula Southern Bypass Road	Scale: N.T.S. / Version:

Nampula Southern Bypass Road



Republic of Mozambique	Administração Nacional de Estradas (ANE)	Japan International Cooperation Agency (JICA)	Oriental Consultants Global Co., Ltd	Eight-Japan Engineering Consultants Inc.	Kokusai Kogyo Co., Ltd	Designed by: Drawn by: Checked by: Approved by: Drawing No:		Project: Preparatory Survey for Nacala Corridor Road Network Improvement Project in the Republic of Mozambique	Title: Nampula Southern Bypass Road	Scale: N.T.S.	Version:

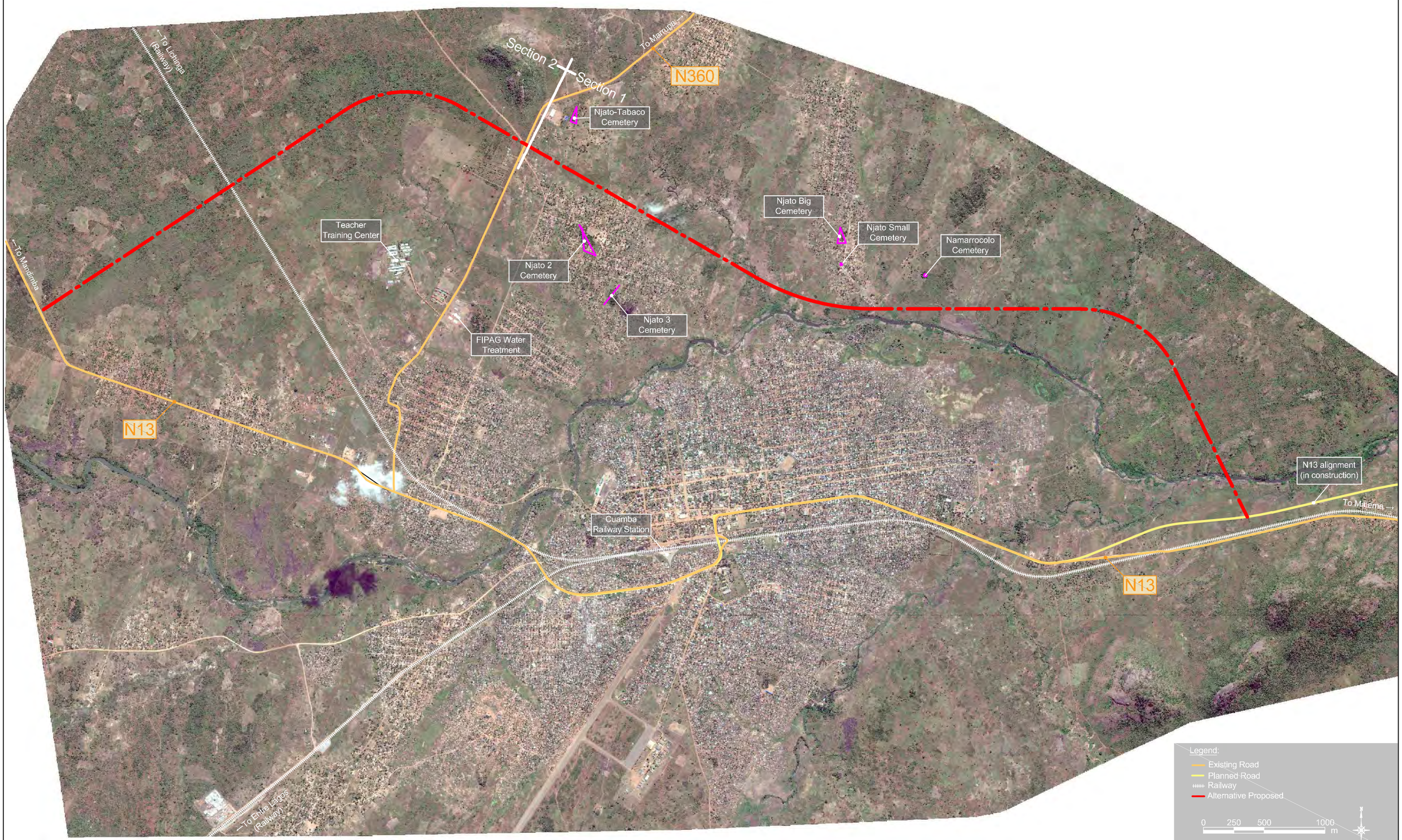
Cuamba Bypass Road



Republic of Mozambique	Administração Nacional de Estradas (ANE)	Japan International Cooperation Agency (JICA)	Oriental Consultants Global Co., Ltd	Eight-Japan Engineering Consultants Inc.	Kokusai Kogyo Co., Ltd	Designed by:		Project: Preparatory Survey for Nacala Corridor Road Network Improvement Project in the Republic of Mozambique	Title: Cuamba Bypass Road	Scale: N.T.S.	Version:
						Drawn by:					
						Checked by:					
						Approved by:					
						Drawing No:					

Appendix 6-6

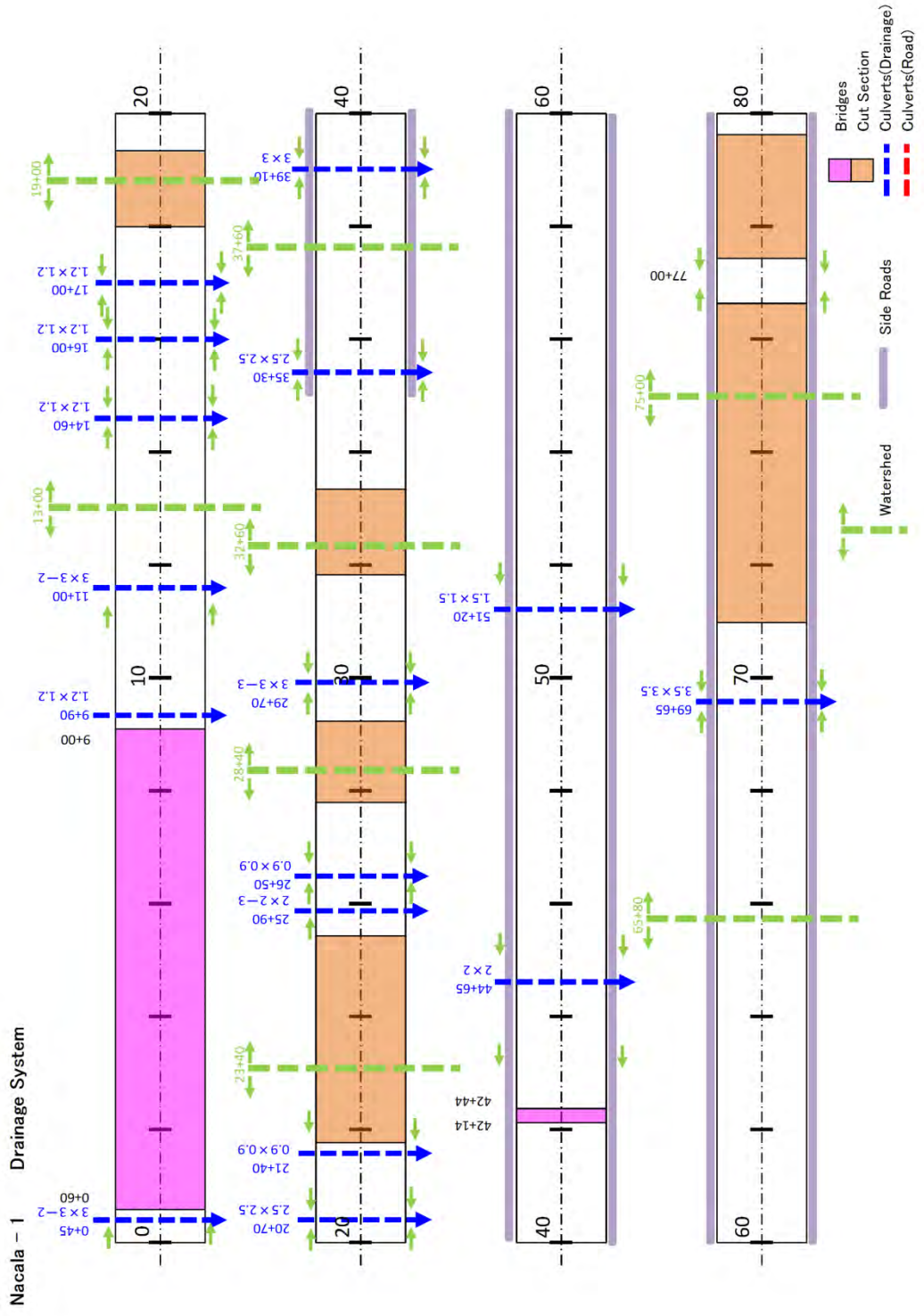
Cuamba Bypass Road

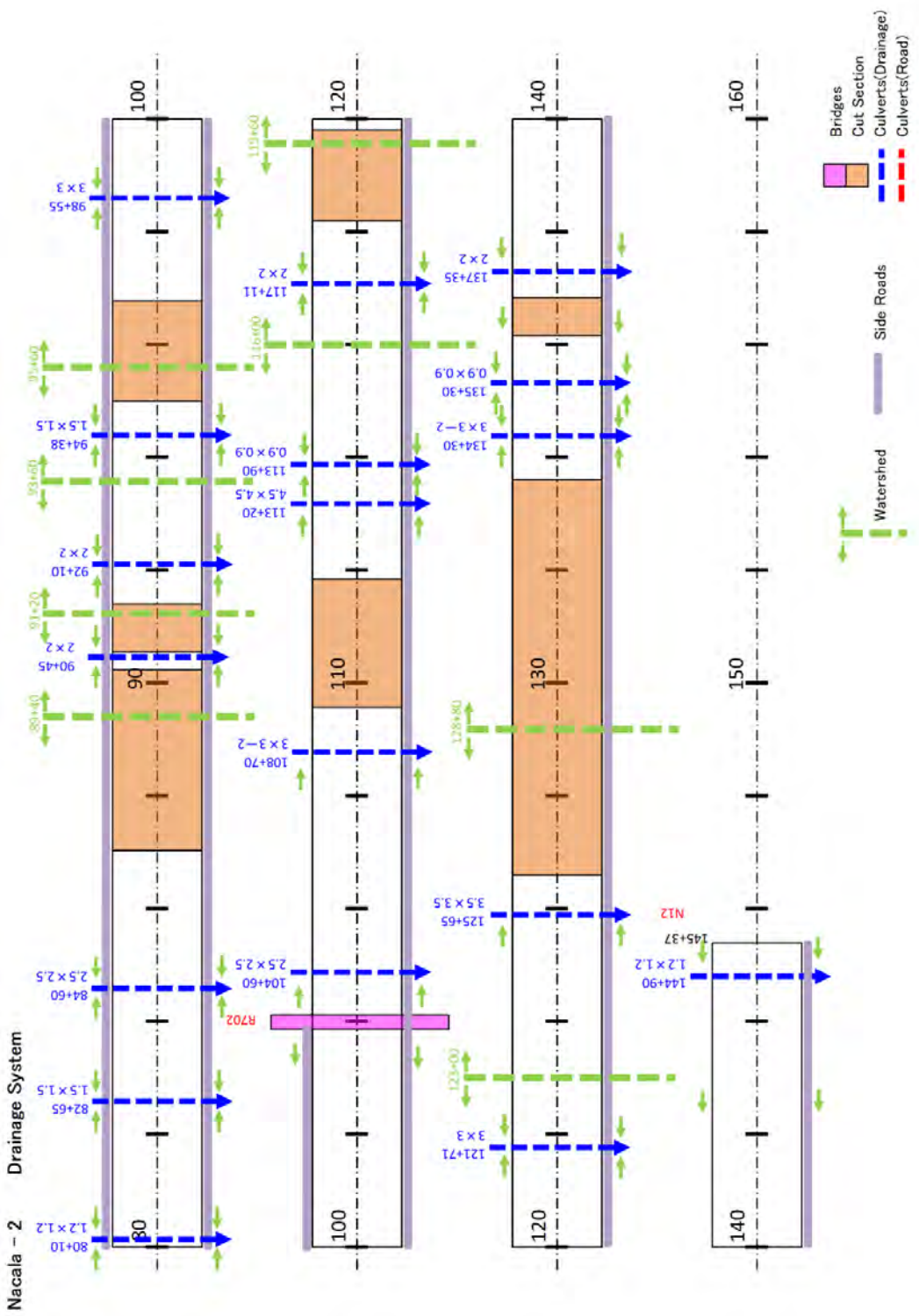


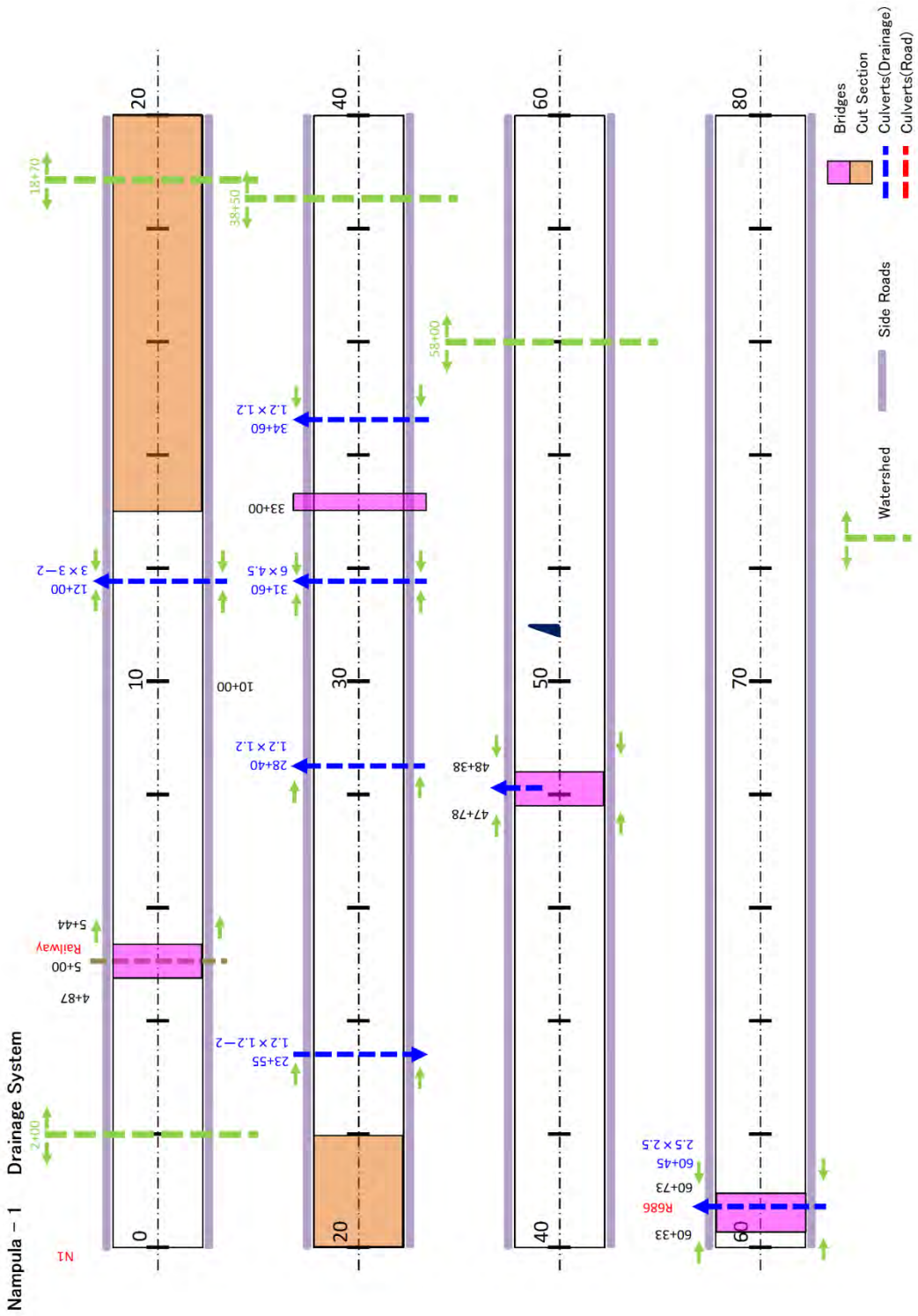
Republic of Mozambique	Administração Nacional de Estradas (ANE)	Japan International Cooperation Agency (JICA)	Oriental Consultants Global Co., Ltd	Eight-Japan Engineering Consultants Inc.	Kokusai Kogyo Co., Ltd	Designed by:		Project: Preparatory Survey for Nacala Corridor Road Network Improvement Project in the Republic of Mozambique	Title: Cuamba Bypass Road
						Drawn by:			
						Checked by:			Scale: N.T.S.
						Approved by:			
						Drawing No:			Version:

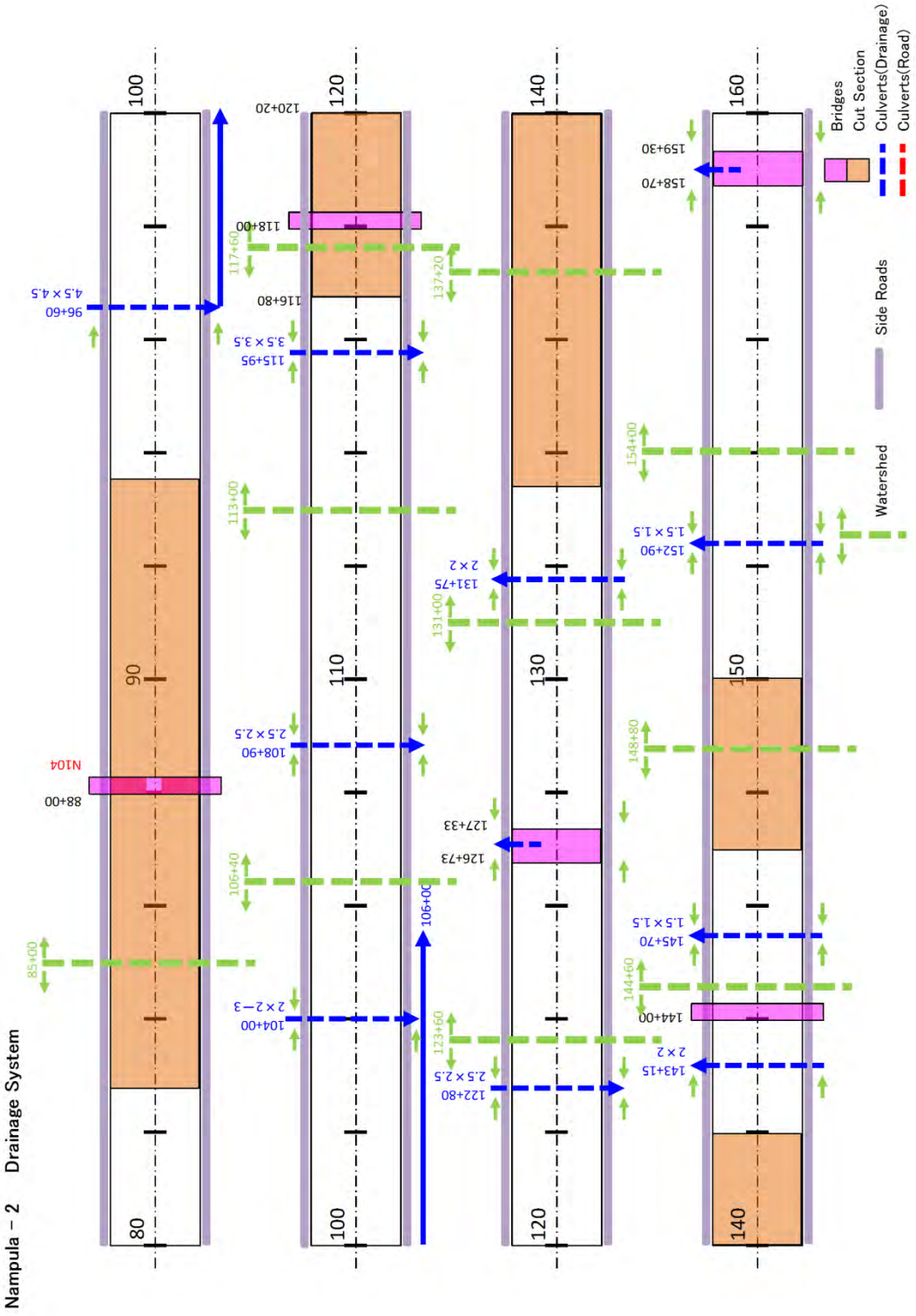
Appendix 6-7

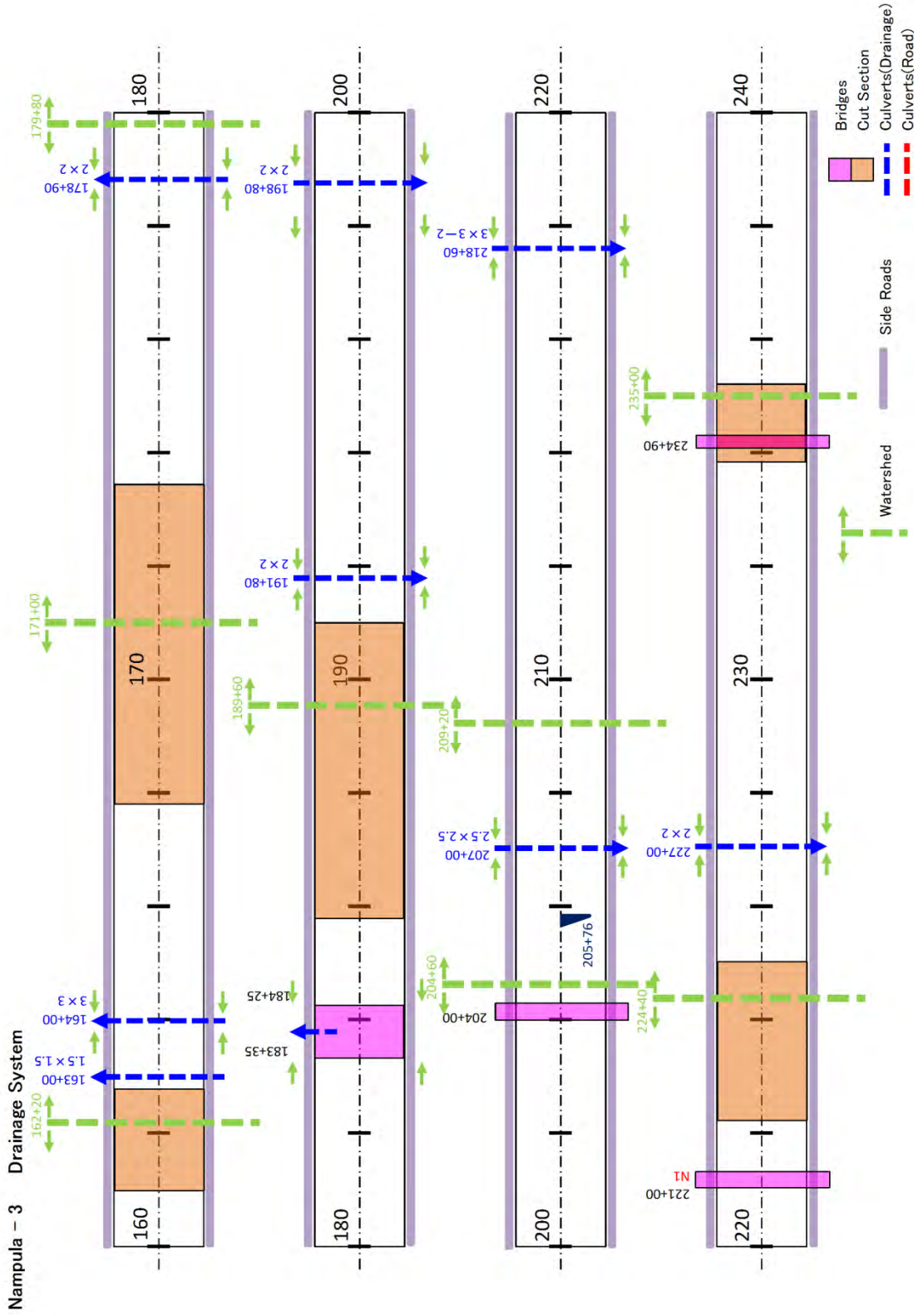
Appendix-7 Layout of Culverts (Drainage and Pedestrian Way)

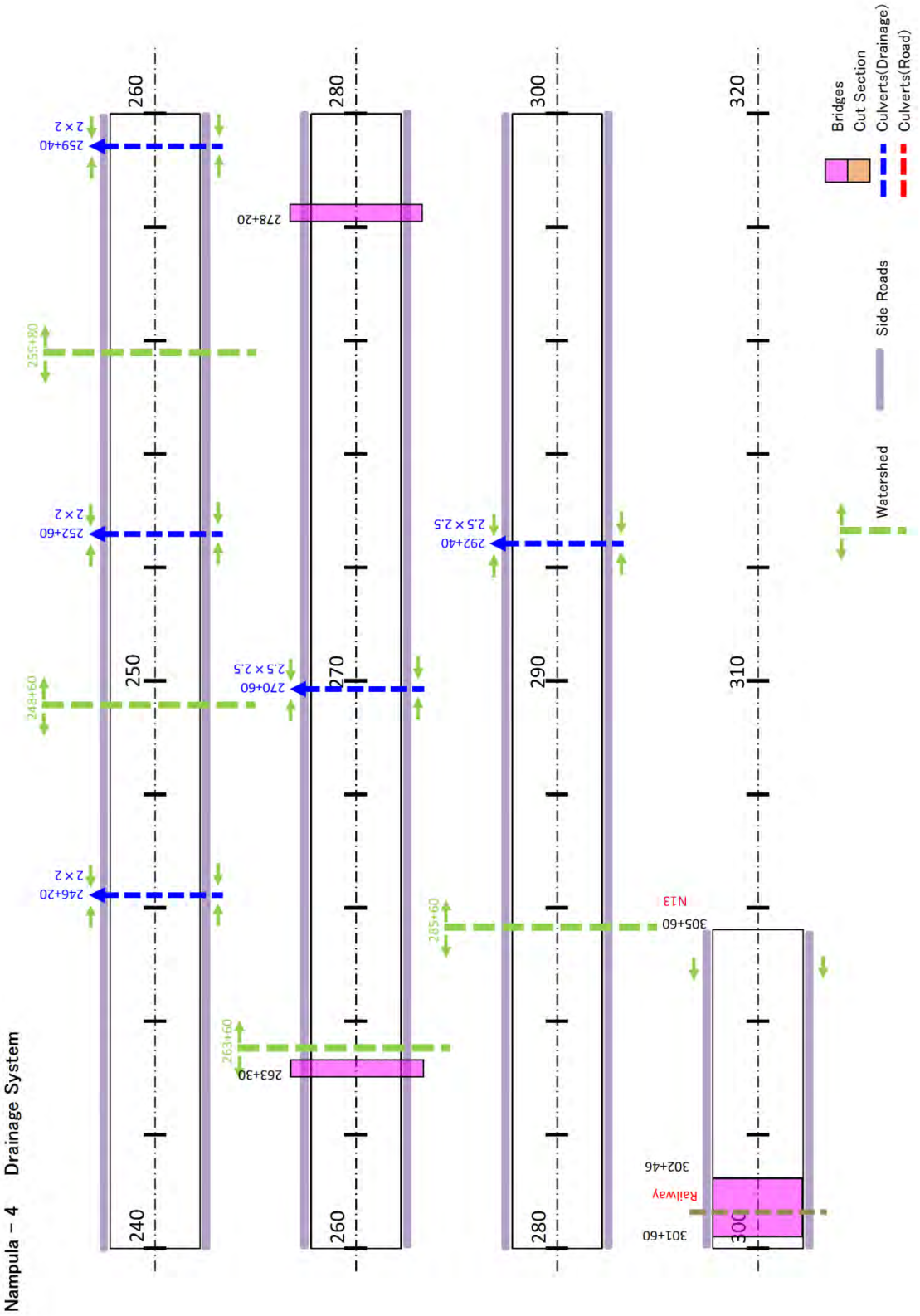


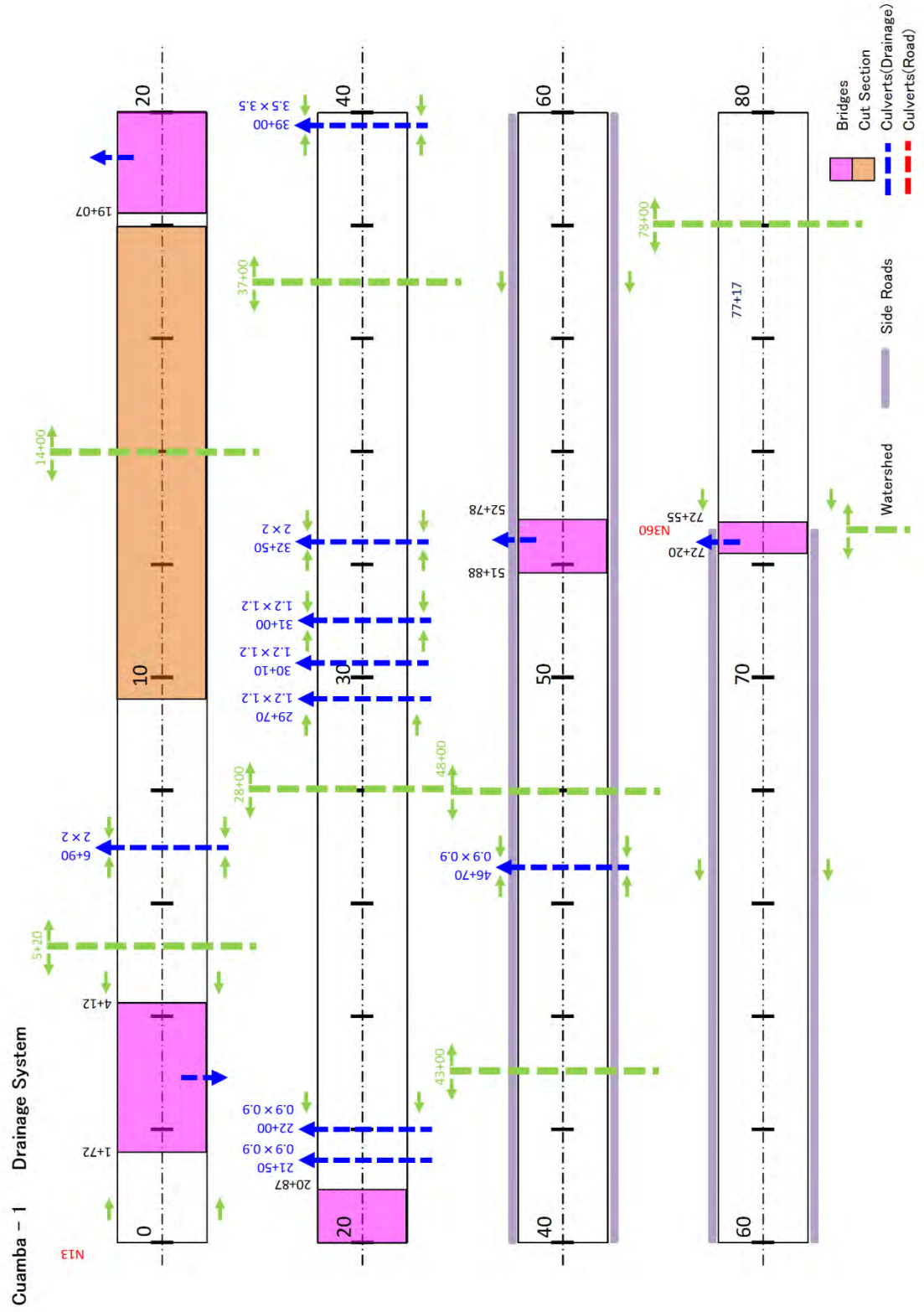

Nacala – 2 Drainage System
Bridges
Cut Section
Culverts(Drainage)
Culverts(Road)
Side Roads
Watershed
80
90
100
110
120
130
140
150
160
80+10
1.2 × 1.2
82+65
1.5 × 1.5
84+60
2.5 × 2.5
90+45
2 × 2
92+10
2 × 2
94+38
1.5 × 1.5
98+55
3 × 3
100+60
104+60
2.5 × 2.5
108+70
3 × 3—2
113+20
4.5 × 4.5
113+90
0.9 × 0.9
117+11
2 × 2
119+60
121+71
3 × 3
123+00
125+65
3.5 × 3.5
128+80
134+30
3 × 3—2
135+30
0.9 × 0.9
137+35
2 × 2
140+60
144+90
1.2 × 1.2
145+37
R702
N12

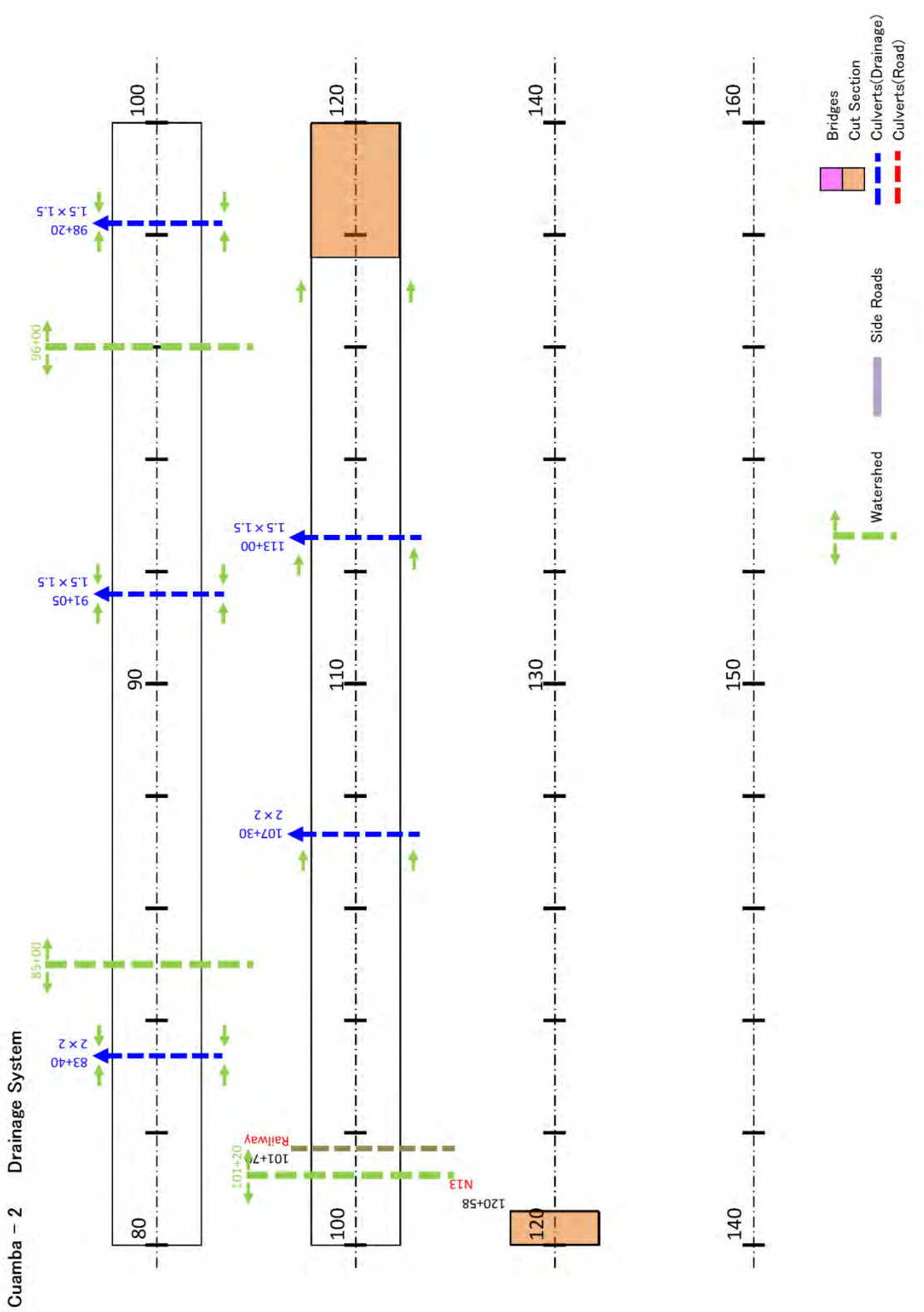

Nampula – 1 Drainage System
Bridges
Cut Section
Culverts(Drainage)
Culverts(Road)
Side Roads
Watershed
0
10
20
30
40
50
60
70
80
N1
2+00
4+87
5+00
Railway
5+44
10+00
12+00 3 × 3 – 2
18+70
23+55 1.2 × 1.2 – 2
28+40 1.2 × 1.2
31+60 6 × 4.5
33+00
34+60 1.2 × 1.2
38+50
47+78
48+38
58+00
60+33
R686
60+73
60+45 2.5 × 2.5


Nampula – 2 Drainage System
Bridges
Cut Section
Culverts(Drainage)
Culverts(Road)
Side Roads
Watershed
80
90
100
110
120
130
140
150
160
88+00
N104
96+60
4.5 × 4.5
104+00
2 × 2 – 3
106+40
108+90
2.5 × 2.5
113+00
115+95
3.5 × 3.5
116+80
117+60
118+00
120+20
122+80
2.5 × 2.5
123+60
126+73
127+33
131+75
2 × 2
131+00
137+20
143+15
2 × 2
144+00
144+60
145+70
1.5 × 1.5
148+80
152+90
1.5 × 1.5
154+00
158+70
159+30


Nampula – 3 Drainage System
Bridges
Cut Section
Culverts(Drainage)
Culverts(Road)
Side Roads
Watershed
160
170
180
190
200
210
220
230
240
162+20
163+00
1.5 × 1.5
164+00
3 × 3
171+00
178+90
2 × 2
179+80
183+35
184+25
189+60
191+80
198+80
204+00
204+60
205+76
207+00
2.5 × 2.5
209+20
218+60
3 × 3 – 2
221+00
N1
224+40
227+00
234+90
235+00


Nampula – 4 Drainage System
Bridges
Cut Section
Culverts(Drainage)
Culverts(Road)
Side Roads
Watershed
240
250
260
270
280
290
300
310
320
259+40
2 × 2
255+80
252+60
2 × 2
248+60
246+20
2 × 2
278+20
270+60
2.5 × 2.5
263+30
263+60
292+40
2.5 × 2.5
285+60
305+60
N13
302+46
Railway
301+60


Cuamba – 1 Drainage System
Bridges
Cut Section
Culverts(Drainage)
Culverts(Road)
Side Roads
Watershed
N13
N360
0
10
20
30
40
50
60
70
80
1+72
4+12
19+07
20+87
22+00
21+50
0.9 × 0.9
29+70
30+10
31+00
32+50
2 × 2
1.2 × 1.2
39+00
3.5 × 3.5
37+00
28+00
48+00
43+00
46+70
51+88
52+78
72+20
72+55
77+17
78+00
6+90
5+20
14+00

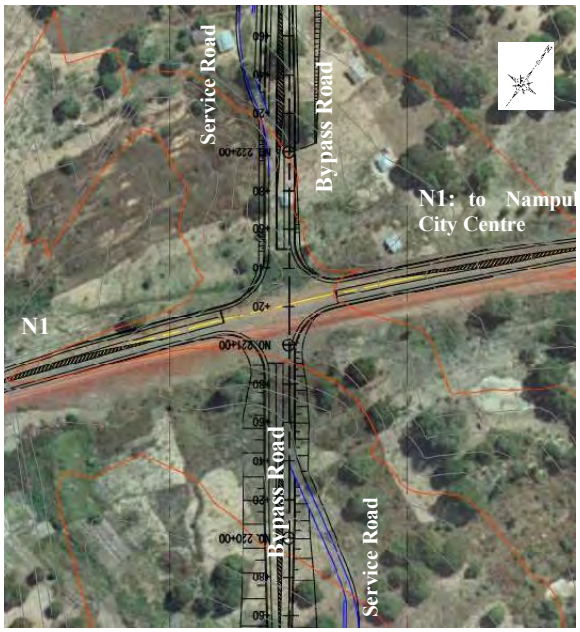
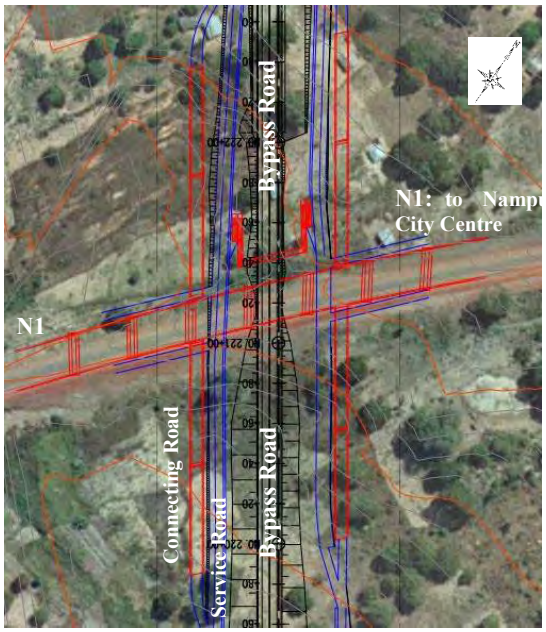
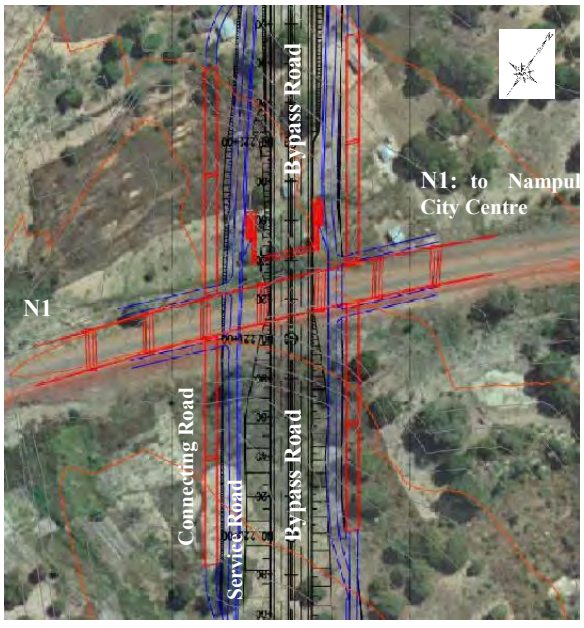

Cuamba – 2 Drainage System
Bridges
Cut Section
Culverts(Drainage)
Culverts(Road)
Side Roads
Watershed
Railway
N13
98+20
1.5 × 1.5
96+00
91+05
1.5 × 1.5
113+00
1.5 × 1.5
107+30
2 × 2
85+00
83+40
2 × 2
101+70
101+20
120+58
80
90
100
110
120
130
140
150
160

Appendix-8 Detailed Information for Flyover Bridge

(1) Supporting Information (For reference of Nampula Southern Bypass Road)

The difference of design between "Basic Option" and "High-Specification Option" at initial stage as well as completion stage for Nampula Southern Bypass Road at the crossing with N1 west point is depicted in Table 1. Note that since the surface level of N1 is higher than ground level, flyover should be constructed on the N1 road side.

Table 1 Difference of Design Level for Initial Stage (Basic, High-Spec.) and Completion Stage

<table>
<tr><td>1-1. Basic Option (Initial Stage)</td><td>1-2. High-spec Option (Initial Stage)</td></tr>
<tr><td> 
</td><td> 
</td></tr>
<tr><td>2. Completion Stage</td><td rowspan="2">Deference of design level
1. Initial Stage (Bypass road: 1 lane/direction)
1-1. Basic Option
- At-grade crossing with N1 road
1-2. High-spec. Option
- Flyover Bridge is constructed on the N1 road side.
- Connection with N1 road from/to the bypass road is formed on the flyover bridge.
- Bypass road provides the connecting road to Flyover Bridge.
2. Completion Stage (Bypass road: 2 lanes/direction)
- Bypass road is upgraded for widening to 2 lanes for each direction within same ROW.</td></tr>
<tr><td> 
</td></tr>
</table>

The traffic lane configuration at completion stage is illustrated to the Figure 1. Note it is suggested that the traffic signal control should be installed to the flyover bridge to avoid traffic accidents. In addition, pedestrian bridge should be installed on the West side of bypass road as shown in the diagram.

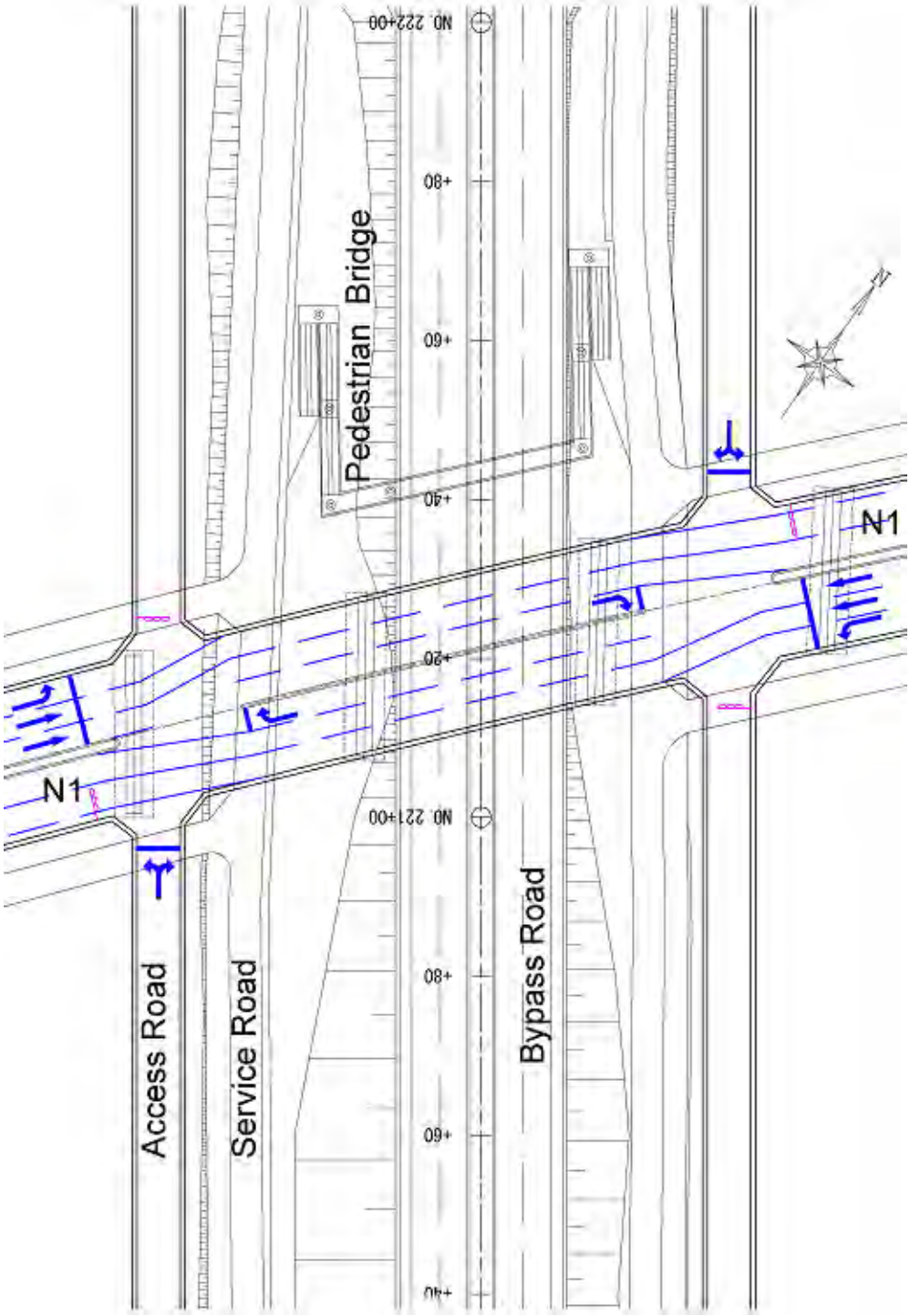
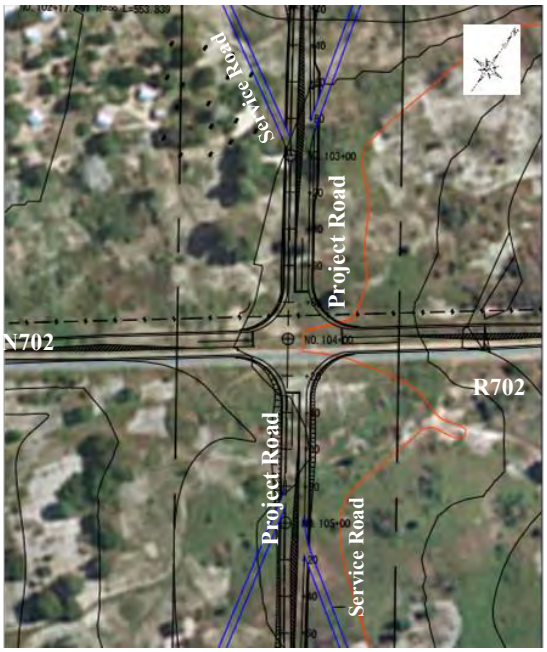
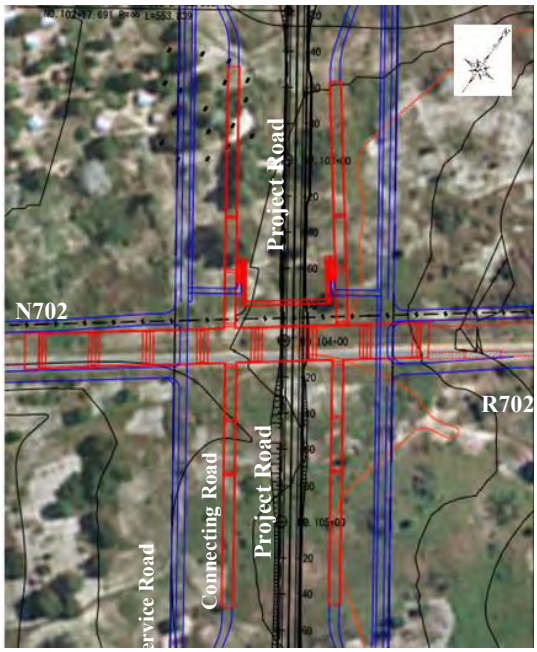
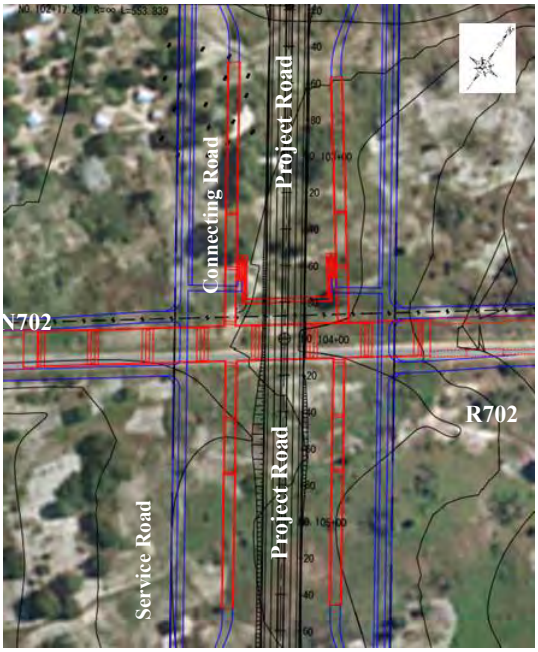


Figure 1 Traffic Lane Configuration at the Flyover Bridge for connecting with N1 and Bypass Road

(2) Supporting Information (For reference of Nacala Port Access Road)

In the case of Nacala Port Access Road, the Project road crosses the R702. The difference of design between "Basic Option" and "High-Specification Option" at initial stage as well as completion stage is depicted in Table 2. Note that considering the ground level condition of R702 and the Project road, installation of flyover bridge at R702 side is the economical solution.

Table 2 Difference of Design Level for Initial Stage (Basic, High-Spec.) and Completion Stage

<table>
<tr><td>1-1. Basic Option (Initial Stage)</td><td>1-2. High-spec Option (Initial Stage)</td></tr>
<tr><td> 
</td><td> 
</td></tr>
<tr><td>2. Completion Stage</td><td rowspan="2">Deference of design level
1. Initial Stage (Project road: 1 lane/direction)
1-1. Basic Option
- At-grade crossing with R702 road
1-2. High-spec. Option
- Flyover Bridge is constructed on the R702 road side.
- Connection with R702 road from/to the project road is formed on the flyover bridge.
- Project road provides the connecting road to Flyover Bridge.
2. Completion Stage (Project road: 2 lanes/direction)
- Project road is upgraded for widening to 2 lanes for each direction within same ROW.</td></tr>
<tr><td> 
</td></tr>
</table>

The traffic lane configuration at completion stage is illustrated to the Figure 2. Note it is suggested that the traffic signal control should be installed to the flyover bridge to avoid traffic accidents. In addition, pedestrian bridge should be installed on the North side of bypass road as shown in the diagram.

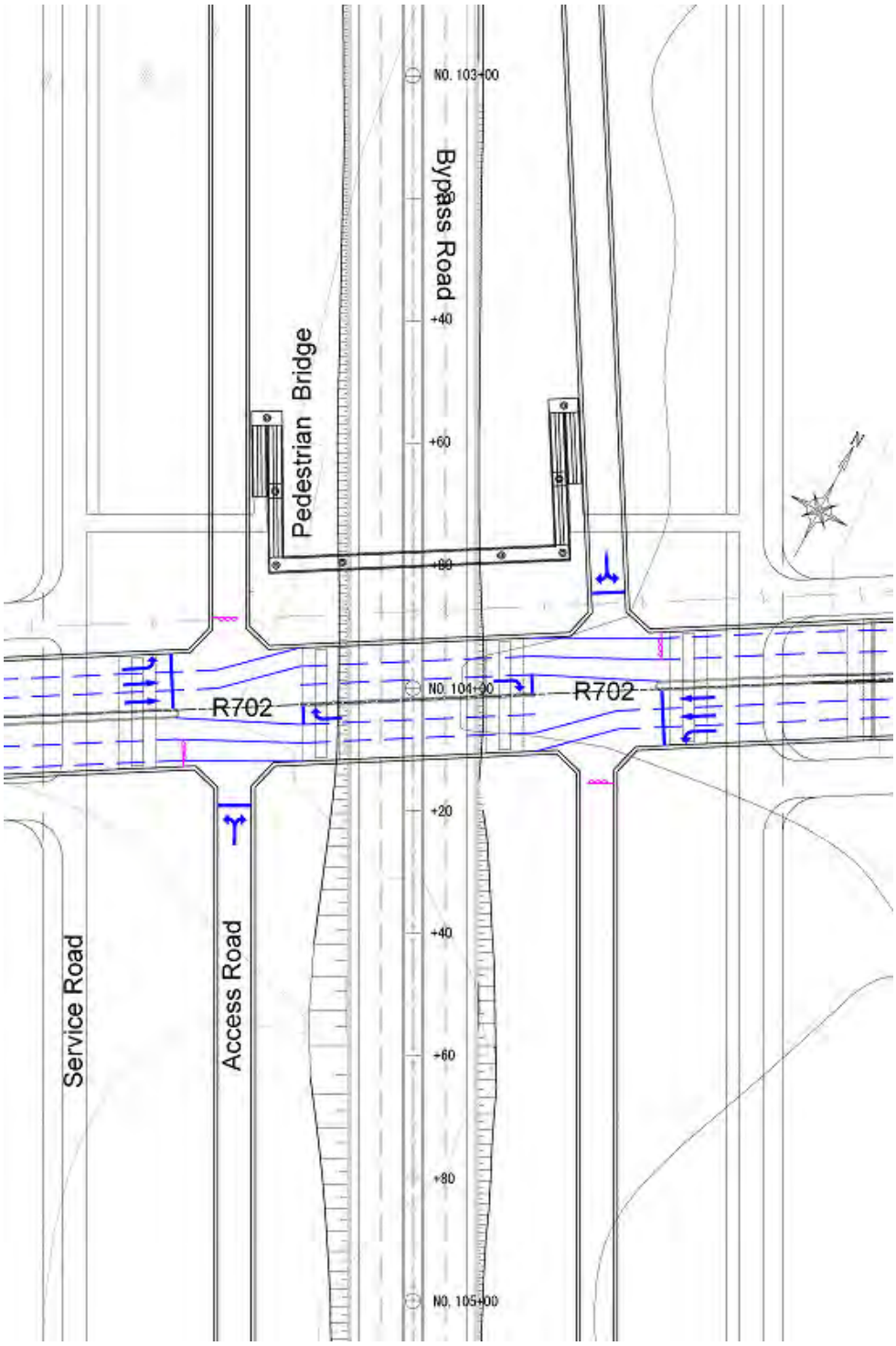


Figure 2 Traffic Lane Configuration at the Flyover Bridge for connecting with R702 and Project Road

Appendix-9 Result of Weathering Exposure Test

Weathering Steel Exposure Test Report of Preparatory Survey for Nacala Corridor Road Network Improvement Project

Apr. 2018

Table of Contents

1 Objectives

Weathering steel is the steel for structural use containing a little amount of copper, chromium, and nickel which are effective for improving weathering performance of steel itself.

Dense rust layer peculiar to weathering steel is produced on the surface of steel. This rust layer protects the surface of steel and reduces the corrosion loss amount during the long term.

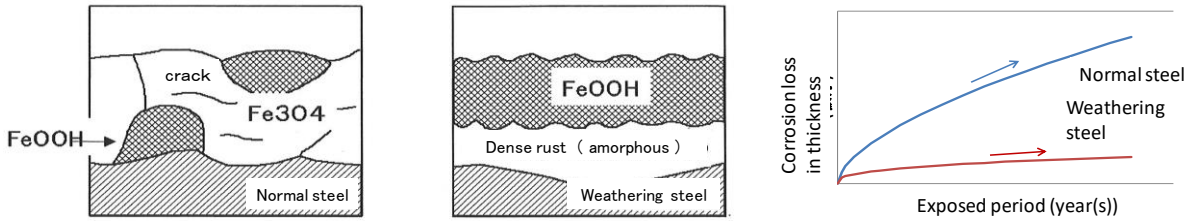


Figure 1 Schematic figure on weathering steel performance

Weathering steel could be used without painting under the proper condition. Moreover, due to the high corrosion protection performance of steel itself, prolonged service life of the painting is also expected by painted use of the weathering steel. Corrosion progress from the paint defect could be saved because the anti-corrosion performance of weathering steel is higher than that of normal steel.

Thus, whether unpainted use or painted use, it could be expected that application of weathering steel minimize the Life Cycle Cost (LCC) because maintenance activities such as re-painting work could be reduced drastically.

However, weathering steel could not be applied in any place. Moderate wet and dry cycles are required for producing the dense and protective rust layer. It is well known that abnormal rust which does not protect the steel surface will be produced under the constant wet condition. Therefore, considerations for local environmental condition and structural improvement avoiding constant wet condition are required for applying weathering steel to bridge structure.

The major environmental aspects affecting weathering performance of weathering steel are as follows.

1) Air borne salt
2) Air pollutant (NOx, SOx)
3) Climate condition (Air temperature, Humidity, and Amount of rainfall, e.t.c.)

In Japan, cooperative research on the application of weathering steel for bridge structure including nationwide (44 sites) 9-year exposure test by three organizations (Public Works Research Institute under Ministry of Construction, Japan Association of Steel Bridge Construction, and Steel Club(Japan Iron & Steel Federation) had been conducted.

According to these broad research results based on the 9-year exposure test, abnormal rust is not produced and the corrosion loss after 50-year exposure is estimated less than 0.3mm (This is equivalent to 0.5mm after 100-year exposure), if air borne salt amount is less than 0.05mdd ($mg/100cm^2/day$).

Moreover, it made clear that air borne salt increase or decrease depending on the distance from the coastline. If the distance from the coastline becomes large, amount of air borne salt is decreased. By using this knowledge, applicability judgment method by the distance from the coastline is commonly used in Japan. In this method, as shown in the below figure, Japanese coastal area is classified into five areas and the applicable area judged by distance from the coastline in each area is specified. For example, in the Pacific coast area, if the structure is located 2 km or more away from the coastline, since air borne salt becomes less than 0.05mdd, so that application of weathering steel is enabled.

Regional partition		Applicable region
Coastal area along the sea of Japan	I	The area over 20km far from the coast line
	II	The area over 5km far from the coast line
Coastal area along the Pacific coast		The area over 2km far from the coast line
Coastal area along the Seto inland sea coast		The area over 1km far from the coast line
Okinawa		No applicable region

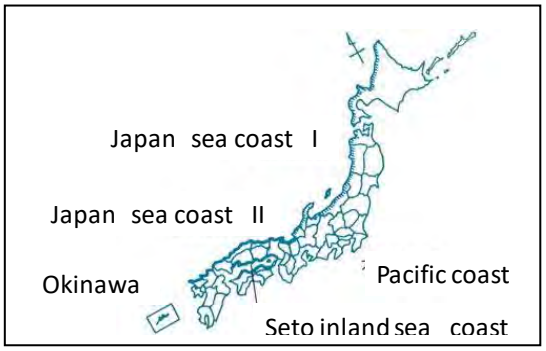


Figure 2 Guidance for applicable region of weathering steel to road bridges in Japan

In this manner, it is preferable to conduct the confirmation test for weathering performance under the climate and weather of the bridge construction site in Mozambique. Since Japan is the land having high temperature and humidity, it could be thought that Japan is the one of the most severe condition land for steel corrosion in the world. Thus, it also could be thought that Japan's experience on weathering steel application is effective for that of other countries. However, Republic of Mozambique, where application of weathering steel is planned this time, has different climate (tropical) and weather from that of Japan. Thus, we have conducted to confirm the applicability of weathering steel by exposure test in Mozambique.

2 Exposure Button Test Method

As confirm the applicability of weathering steel for bridge spanning project over Nacala Corridor Road, we conduct the following research and test.

Button test specimen is 50mm square, 2mm thick steel sheet. For exposure test, this steel sheet is attached to the existing structure. In this test, weight change of the specimen is accurately measured for calculation because the corrosion loss of the specimen could be measured accurately by the weight change. Due to this accurate measurement, one year exposure test give us the criterion of the applicability judgment of the weathering steel. By using this test method, reliable data could be obtained in the short term because this method could consider the effect of local condition in the actual structure.

In this test, button shaped specimens shown below had been manufactured and the one side of the specimen had been attached to the structure with both-side adhesive tape.

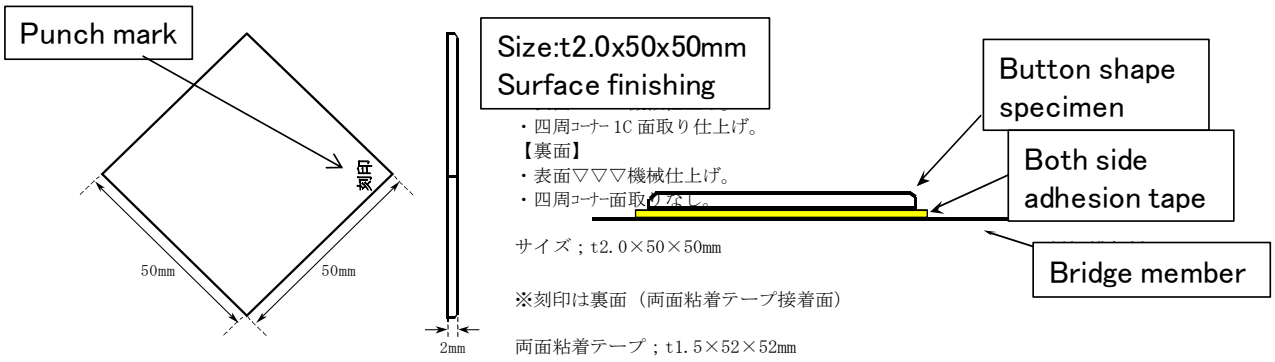


Figure 3　Button test specimen

3　Exposure Button Test Plan

Exposure Button test has been conducted widely in Japan nationwide. As the result of this test, it is well known that the corrosion loss of weathering steel could be estimated less than 0.5mm after 100 year exposure, if the corrosion loss of the first 1 year becomes less than 0.03mm.　The climate of Mozambique is different from that of Japan, but it could be presumed that the anti-corrosion performance of weathering steel based on the Japanese experience.

The result obtained from one year exposure is expected to evaluate the application.　In addition, confirming the reliability of corrosion rate data in the long term, three specimens per one steel grade were exposed in common.　Then, 1 and 2 years data have been collected to evaluate the corrosion tendency.

3.1　Type of Exposure Test Specimen

Bare weathering steel (SMA-W / JIS G3114 : **J**apanese **I**ndustrial **S**tandards : Japanese national standard that industrial products must meet in order to be legal) has been exposed.

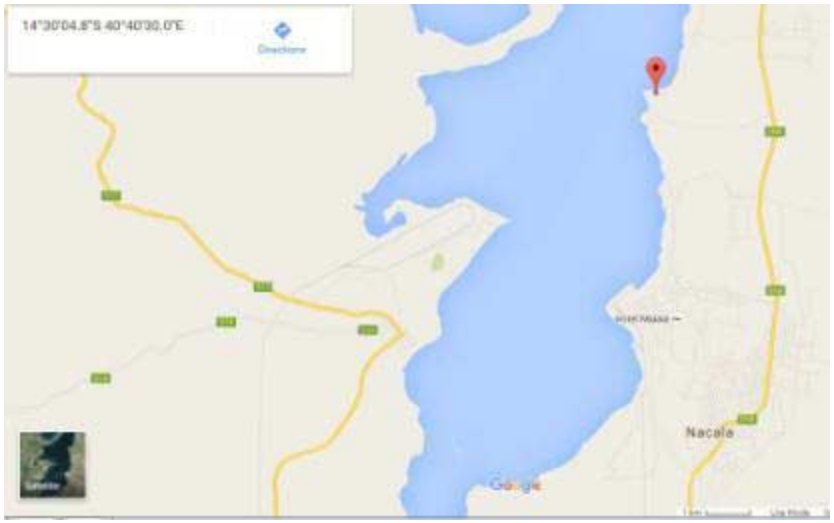
In addition, another two types of Nickel-added High-performance Weathering Steel (1%Ni NAW-TEN V12 and 3%Ni NAW-TEN V15) have been also exposed for comparison, which are available to suit out of the applicable region of weathering steel in Japan(fig.3).　Because, this time, there were some test sites where are close to the coast line.

3.2 Type Exposure Test Site

Test site is shown at four locations as follow.

Figure 4 Four Locations of Test site

Table 1 Four Locations of Test site

Location	Map	Aerial photo
Location-1 ANE Nampula Office		 https://goo.gl/maps/hm5pjuQryoM2 15°08'24.9"S 39°17'24.7"E
Location-2 ANE Guest House in Nacala Bay		 https://goo.gl/maps/AtvR9Vugd952 14°30'04.8"S 40°40'30.0"E

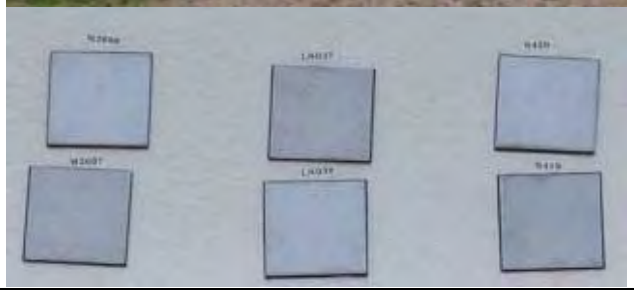
Location	Map	Aerial photo
Location-3 Katembe Bridge Project. Office In Maputo		 https://goo.gl/maps/E2AFPZVJR542 25°57'27.0"S 32°33'18.4"E
Location-4 ANE Head office In Maputo		

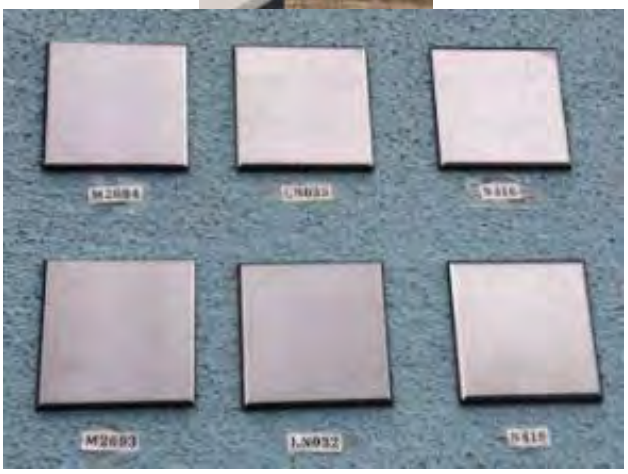
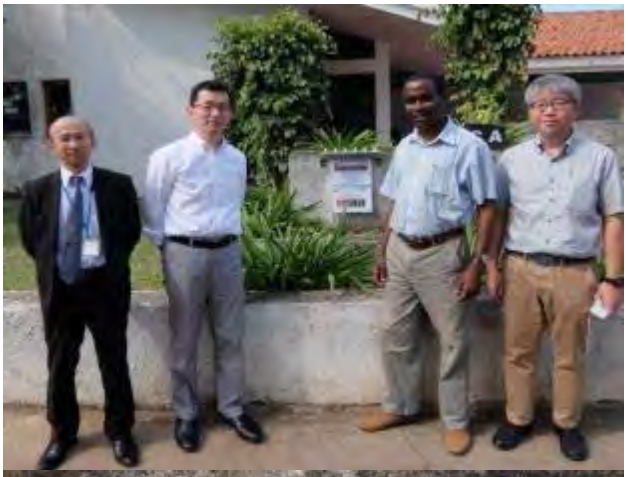
Appendix 9-9

4 Amount of Exposure Test Specimen

Amount of exposure test is shown in the below table.

Table 2 Amount of Exposure Test

Location	Collection Timing	Steel Grade	Number of Specimens	Photo
Location-1 ANE Nampula Office in Nampula	1 year later	SMA-W	M2695	
		1% Ni	LN034	
		3% Ni	N417	
	2 years later	SMA-W	M2696	
		1% Ni	LN035	
		3% Ni	N418	
	Total		6	
Location-2 ANE Guest House in Nacala	1 year later	SMA-W	M2697	
		1% Ni	LN036	
		3% Ni	N419	
	2 years later	SMA-W	M2698	
		1% Ni	LN037	
		3% Ni	N420	
	Total		6	

Location	Collection Timing	Steel Grade	Number of Specimens	Photo
Location-3 Catembe Bridge project Office (CRBC) in Maputo	1 year later	SMA-W	M2693	
		1% Ni	LN028	
		3% Ni	N415	
	2 years later	SMA-W	M2694	
		1% Ni	LN029	
		3% Ni	N416	
	Total		6	
Location-4 ANE Head Office in Maputo	1 year later	SMA-W	M2691	
		1% Ni	LN030	
		3% Ni	N413	
	2 years later	SMA-W	M2692	
		1% Ni	LN031	
		3% Ni	N414	
	Total		6	
Grand Total			24	

5 Schedule of Exposure Test

Schedule of exposure test is shown in the below table.

Table 3 Schedule of Exposure Test

	Schedule	Test
Test Start	Jan 9-10,2016 : L-1 Nampula and L-2 Nacala Jan 11, 2016 : L-3 and L-4 Maputo	Installation of test specimen at site
1st year	Jan 16,2017 : L-1 and L-2 Jan 13,2017 : L-3 and L-4	1) 1st collection of test specimen 2) Measurement of rust thickness 3) Judgment on the applicability
2nd years	Feb 16,2018 : L-1, L-2, L-3, and L-4	1) 2nd collection of test specimen 2) Measurement of rust thickness 3) Further judgment on the applicability

6 Evaluation Results

6.1 Summary of Evaluation Results

Summary of exposure test results is shown in Table 4.

Table 4 Summary of Evaluation Results

Test Location	Steel Type	Test No. (2year)	Visual Inspection		Rust Thickness (μm)		Surface Salinity (mg/m^2)		Iron Transfer Resistance (kΩ)		Rust Abrasion (mm)	
			1 year	2 year	1 year	2 year	1 year	2 year	1 year	2 year	1 year	2 year
Location-1 ANE Nampula Office in Nampula	3% Ni	N418	5	5	68	90	25	1	0.49	1.35	0.021	0.028
	1% Ni	LN035	5	5	84	109	12	3	0.68	0.46	0.027	0.046
	SMA-W	M2696	5	5	92	113	12	2	0.94	1.67	0.034	0.041
Location-2 ANE Guest House in Nacala	3% Ni	N420	5	5	34	47	20	1	0.03	0.05	0.007	0.010
	1% Ni	LN037	5	5	41	45	17	2	0.04	0.06	0.008	0.012
	SMA-W	M2698	5	5	44	69	18	1	0.04	0.12	0.008	0.012
Location-3 Catembe Bridge project Office (CRBC) in Maputo	3% Ni	N416	5	5	16	27	14	0	0.05	0.40	0.004	0.005
	1% Ni	LN033	5	5	21	24	17	0	0.08	0.27	0.005	0.006
	SMA-W	M2694	5	5	33	37	23	3	0.08	0.24	0.006	0.007
Location-4 ANE Head Office in Maputo	3% Ni	N414	5	5	87	96	9	0	0.36	1.02	0.021	0.022
	1% Ni	LN031	5	5	126	124	9	0	0.40	0.67	0.027	0.029
	SMA-W	M2692	5	5	131	126	12	12	0.53	0.96	0.029	0.033

6.2 Rating of Rust by Visual Inspection (Surface Appearance Photo)

Surface photo is shown in Table 5～Table 8. Rating of Rust by Visual Inspection is shown Table 4. Rating of Rust by Visual Inspection is scored “5” of all locations and each steel type due to the Rust particle of fine state.

Table 5　Surface Appearance Photo（Location-1）

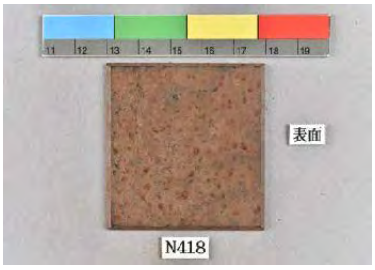
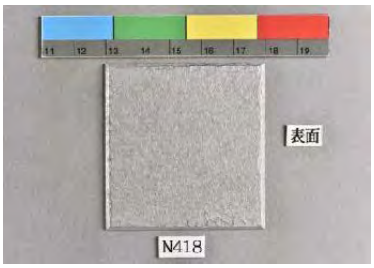
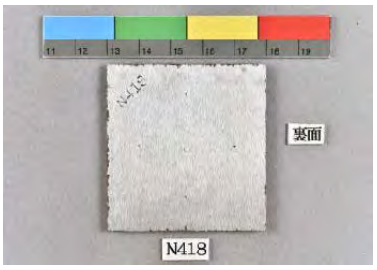
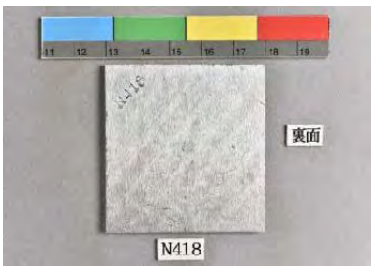
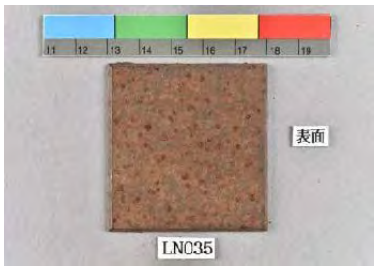
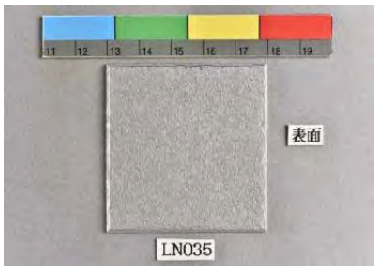
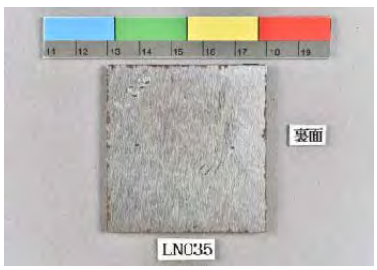
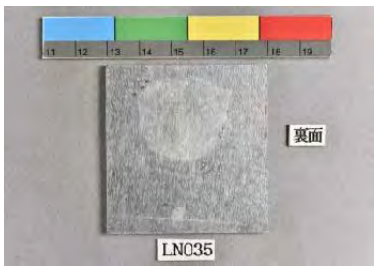
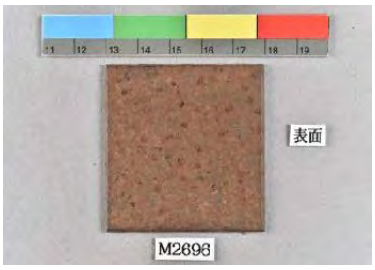
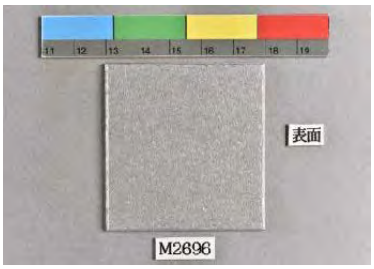
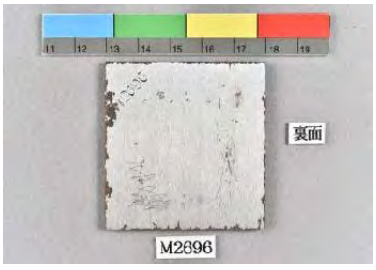
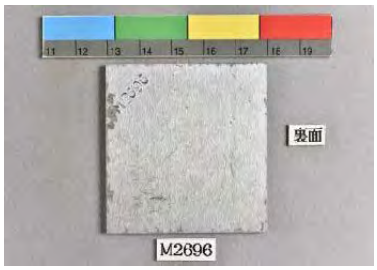
Location	Term	Type	Test No.	Side	曝露後　after exposure	さび除去後 rust removed
Location-1 ANE Nampula Office in Nampula	2 year later	3% Ni	N418	front		
				back		
		1% Ni	LN035	front		
				back		
		SMA-W	M2696	front		
				back		

Table 6　Surface Appearance Photo（Location-2）

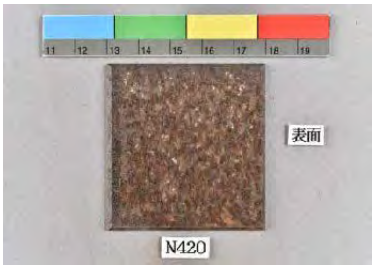
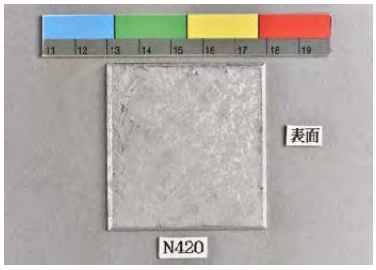
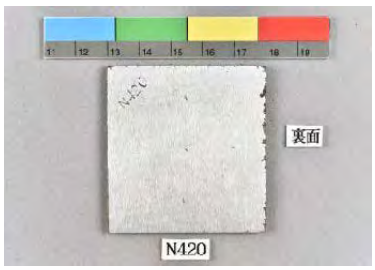
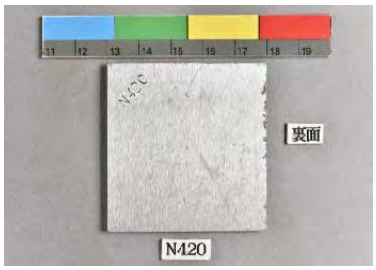
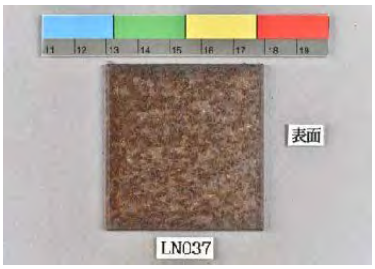
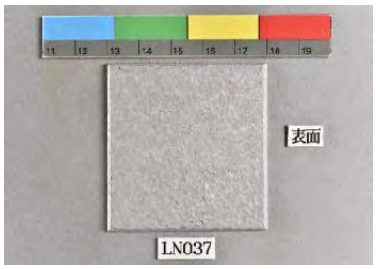
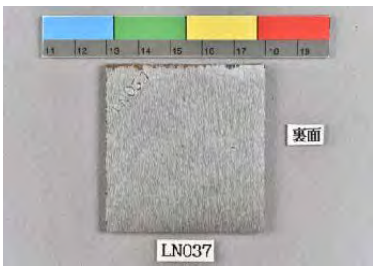
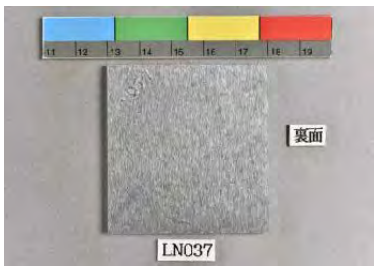
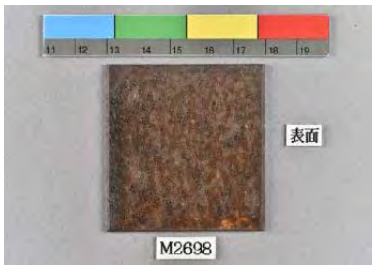
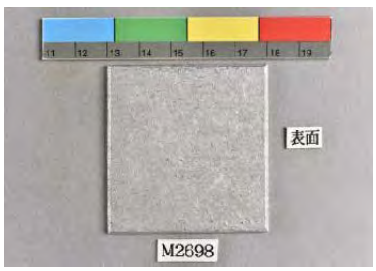
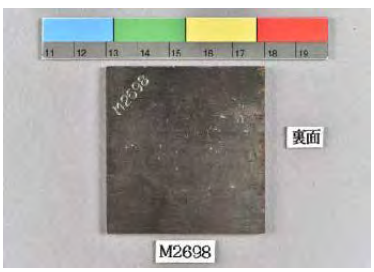
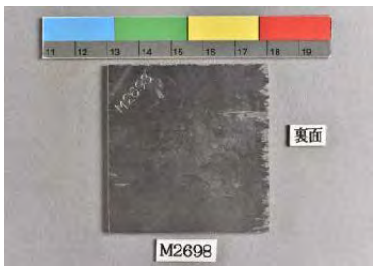
Location	Term	Type	Test No.	Side	曝露後　after exposure	さび除去後 rust removed
Location-2 ANE Guest House in Nacala	2 year later	3% Ni	N420	front		
				back		
		1% Ni	LN037	front		
				back		
		SMA-W	M2698	front		
				back		

Table 7　Surface Appearance Photo（Location-3）

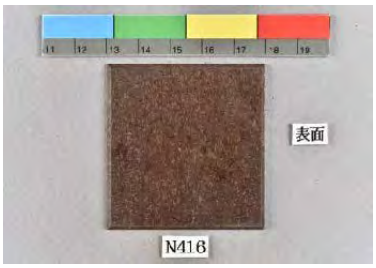
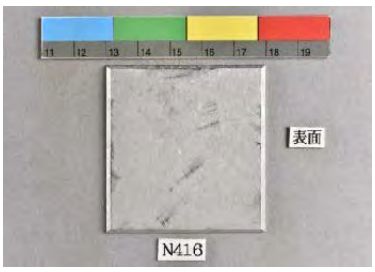
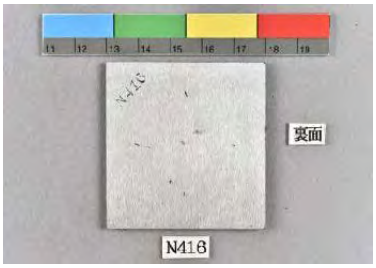
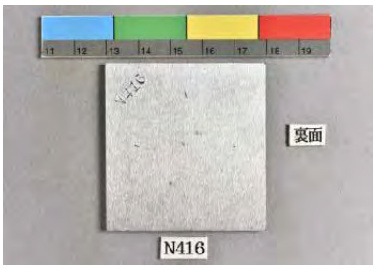
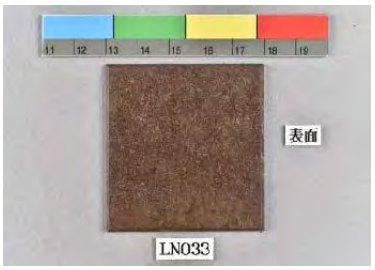
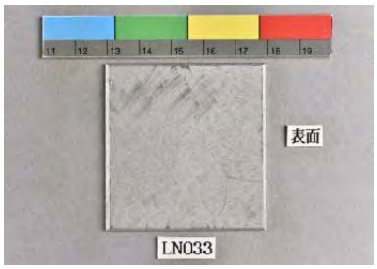
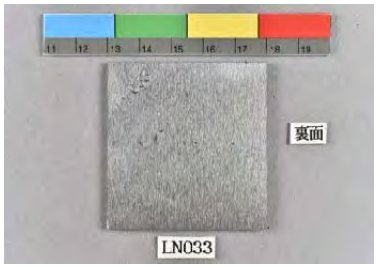
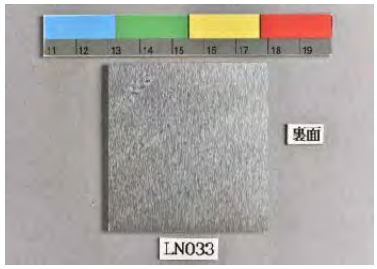
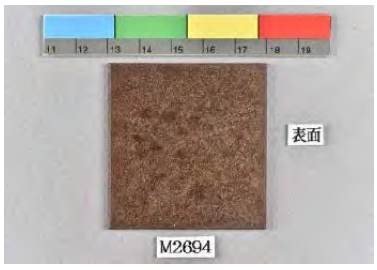
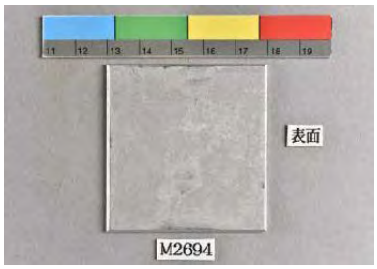
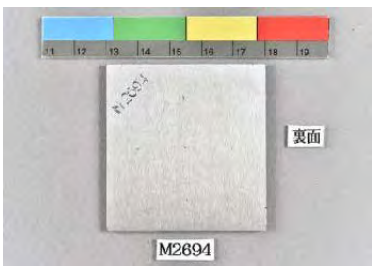
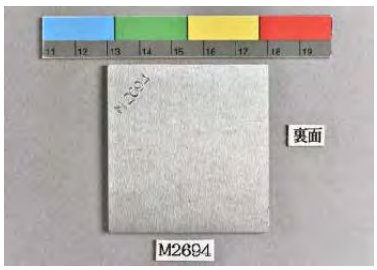
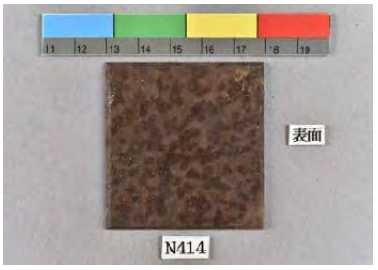
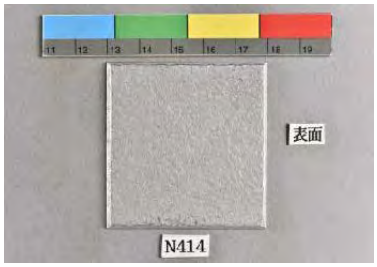
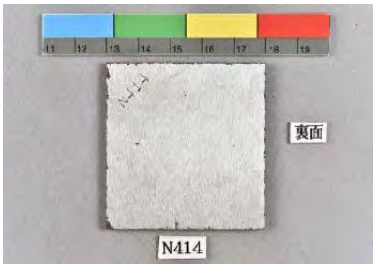
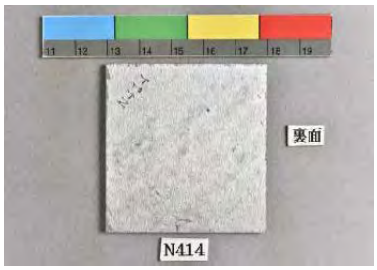
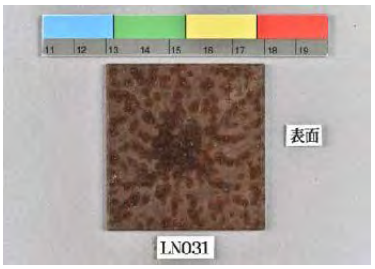
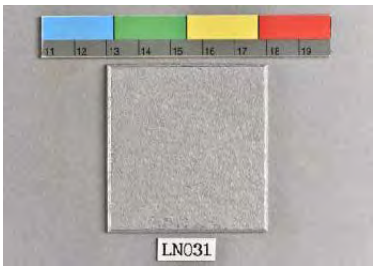
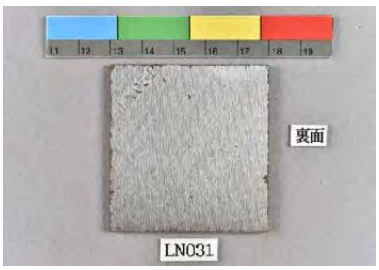
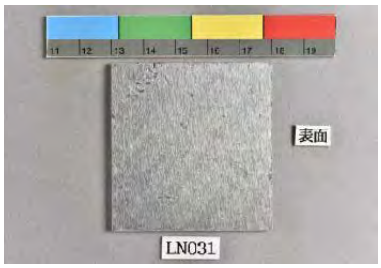
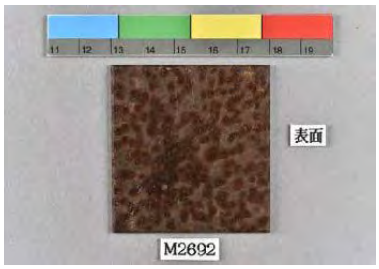
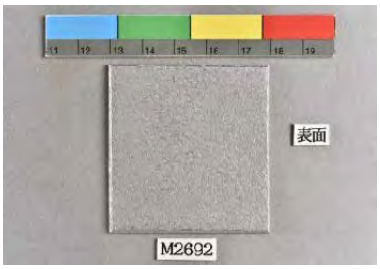
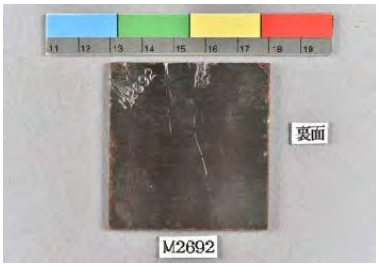
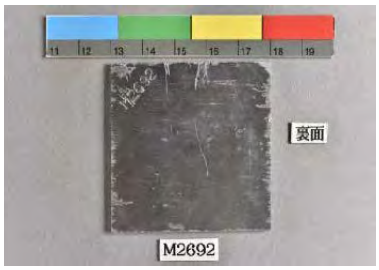
Location	Term	Type	Test No.	Side	曝露後　after exposure	さび除去後 rust removed
Location-3 Catembe Bridge project Office (CRBC) in Maputo	2 year later	3% Ni	N416	front		
				back		
		1% Ni	LN033	front		
				back		
		SMA-W	M2694	front		
				back		

Table 8　Surface Appearance Photo（Location-4）

Location	Term	Type	Test No.	Side	曝露後　after exposure	さび除去後 rust removed
Location-4 ANE Head Office in Maputo	2 year later	3% Ni	N414	front		
				back		
		1% Ni	LN031	front		
				back		
		SMA-W	M2692	front		
				back		

6.3 Iron Transfer Resistance Method

Iron Transfer Resistance Method is shown in Table 4, and Relation between rust thickness and iron transfer resistance is shown in Figure 5.

According to Figure 5, almost locations and steel types are located in the area of "I-5 Rust under Forming" which will be good condition in the future.

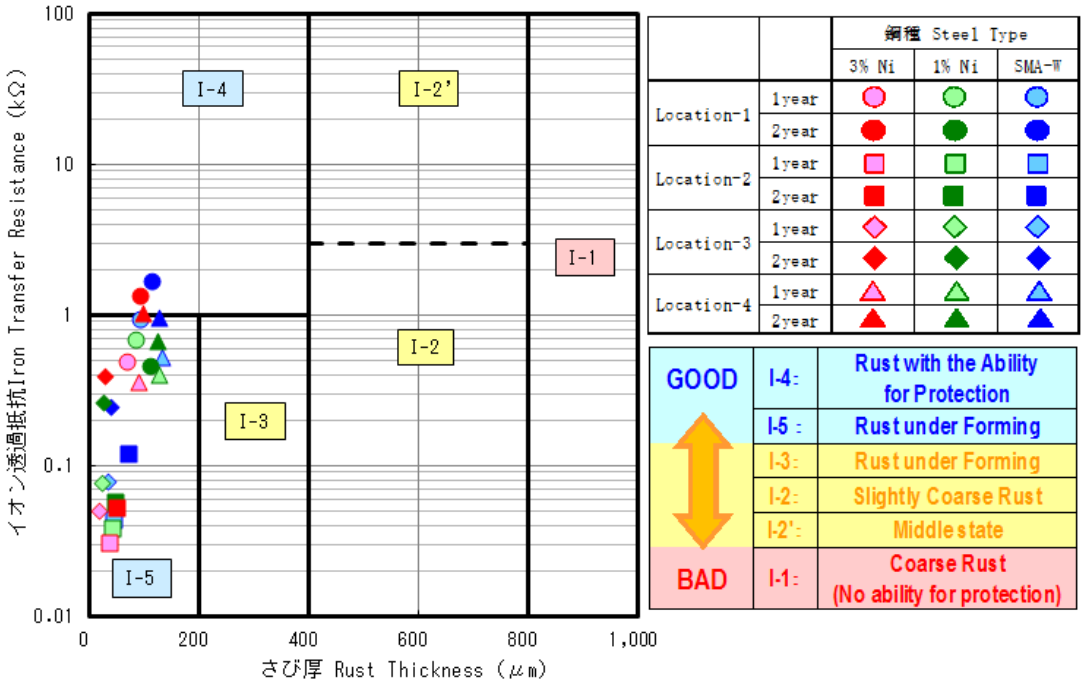


Figure 5 Relation between Rust Thickness and Iron Transfer Resistance

6.4 Rust Abrasion

The results of Rust Abrasion are shown in Table 4 and Figure 6.

According to the Figure 6, Location-2 and Location-3 are shown an ideal value. On the other hand, Location-1 and Location-4 are shown a slightly higher value due to the test specimens placed horizontally.

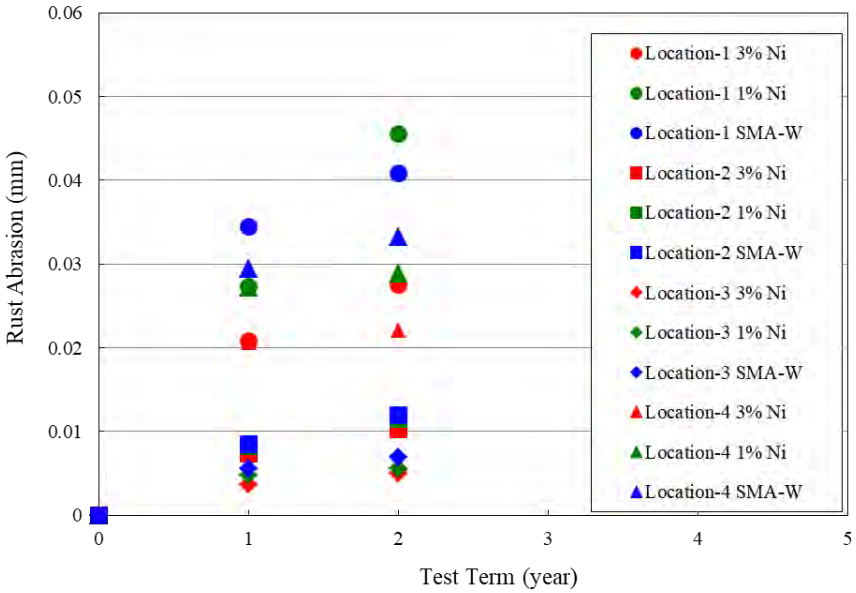


Figure 6 Rust Abrasion

6.5 Estimated Rust Abrasion after 100 years

Estimated Rust Abrasion after 50 years and 100 years are shown Table 9, and Estimated Rust Abrasion after 100 years are Figure 7～Figure 11. Rust Abrasion are predicted to be nearly less than 0.5mm/100years on all locations and steel types

Table 9 Estimated Rust Abrasion after 50 years and 100 years

Test Location	Steel Type	Rust Abrasion (mm)		Estimated Rust Abrasion (mm)	
		1 year	2 years	after 50 years	after 100 years
Location-1 ANE Nampula Office in Nampula	3% Ni	0.021	0.028	0.170	0.245
	1% Ni	0.027	0.046	0.346	0.529
	SMA-W	0.034	0.041	0.367	0.561
Location-2 ANE Guest House in Nacala	3% Ni	0.007	0.010	0.080	0.120
	1% Ni	0.008	0.012	0.124	0.198
	SMA-W	0.008	0.012	0.188	0.323
Location-3 Catembe Bridge project Office (CRBC) in Maputo	3% Ni	0.004	0.005	0.059	0.097
	1% Ni	0.005	0.006	0.097	0.166
	SMA-W	0.006	0.007	0.156	0.282
Location-4 ANE Head Office in Maputo	3% Ni	0.021	0.022	0.143	0.205
	1% Ni	0.027	0.029	0.229	0.340
	SMA-W	0.029	0.033	0.296	0.450

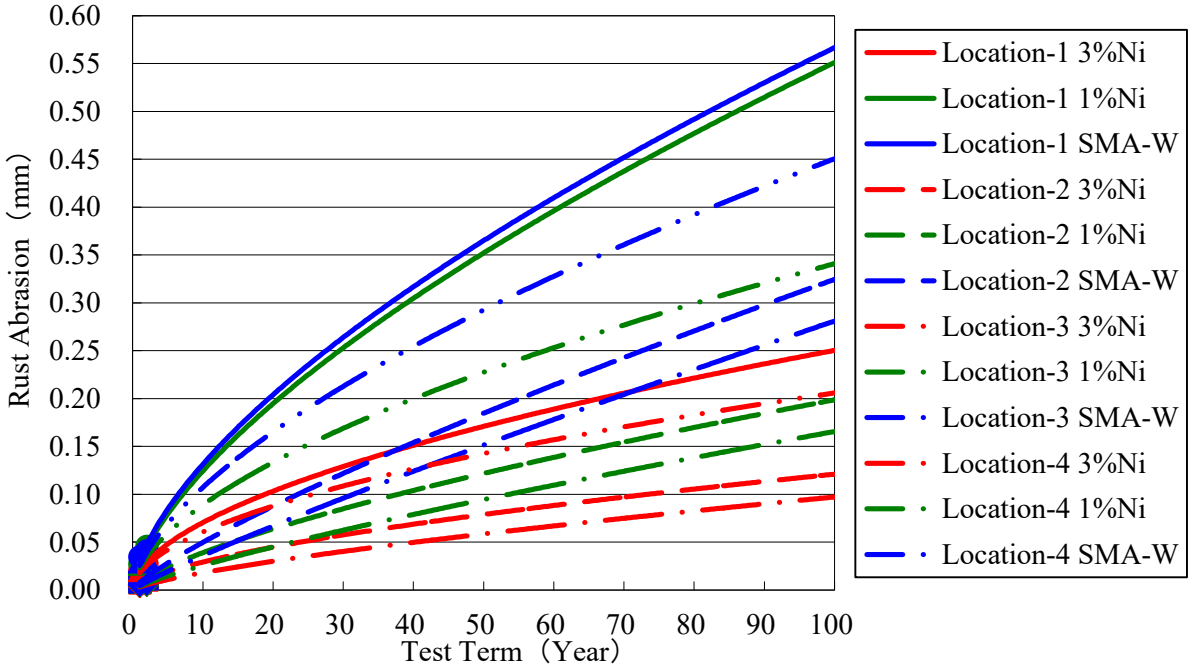


Figure 7　Estimated Rust Abrasion after 100 years

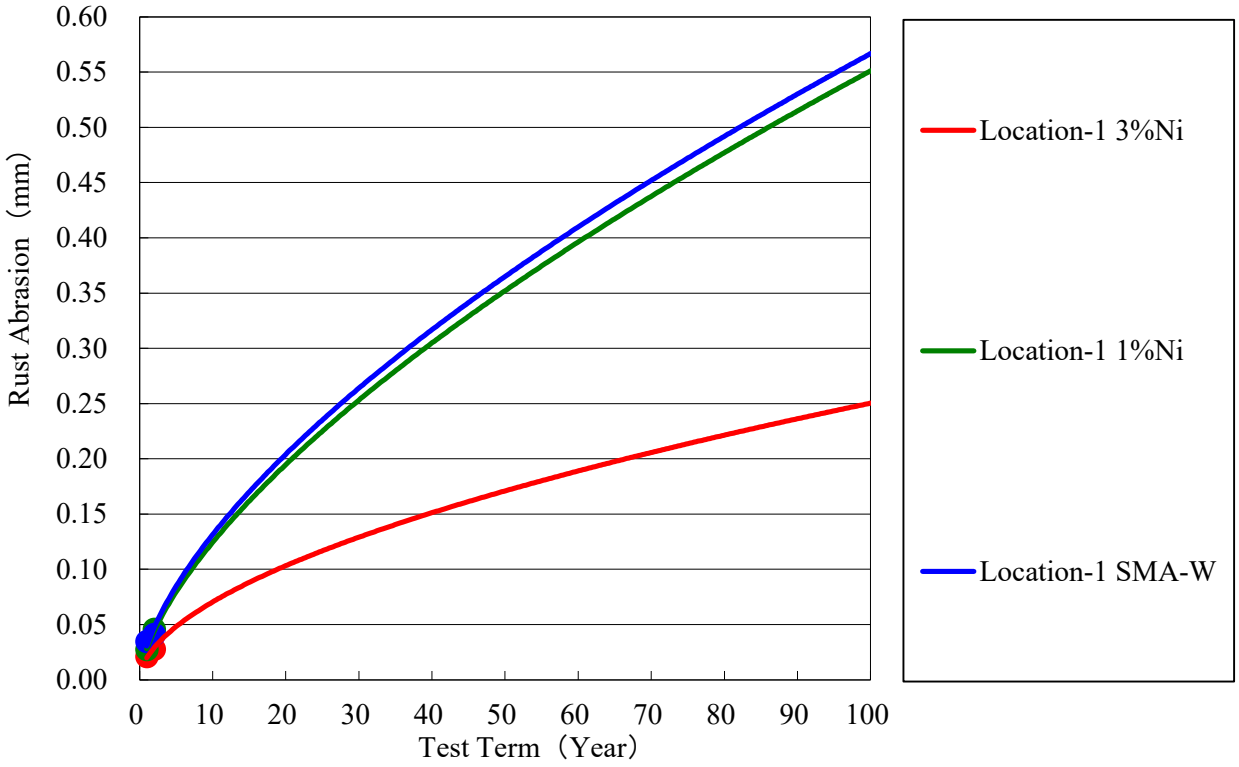


Figure 8　Estimated Rust Abrasion after 100 years（Location-1）

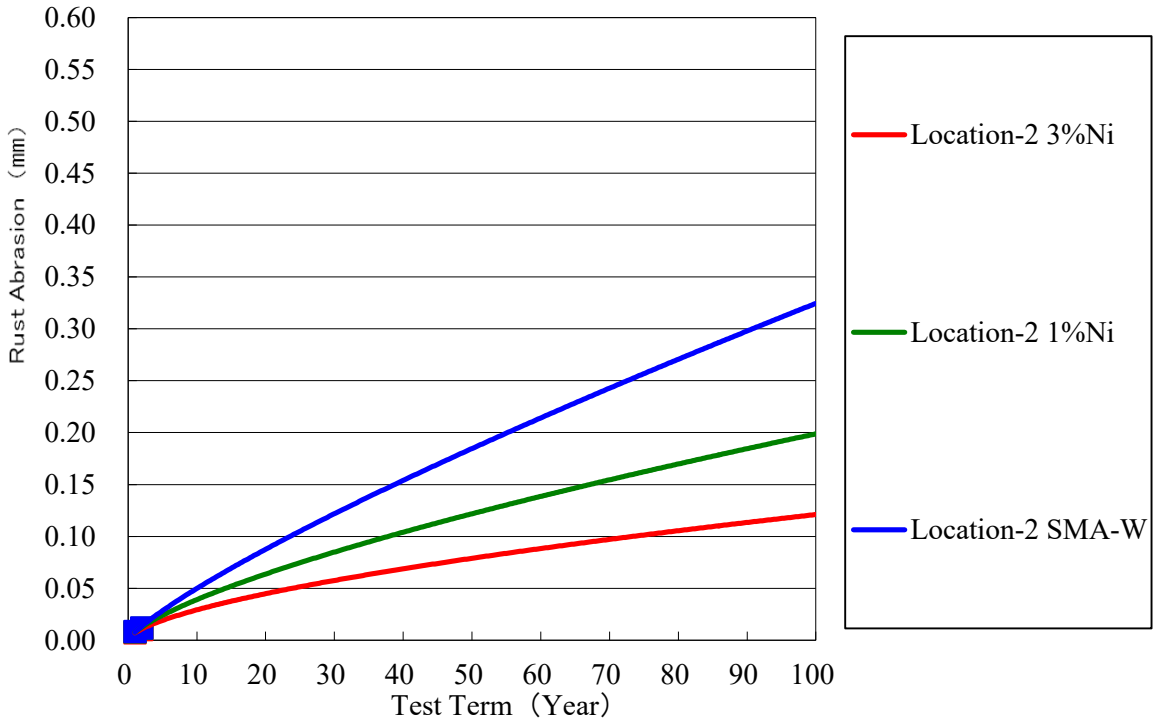


Figure 9　Estimated Rust Abrasion after 100 years（Location-2）

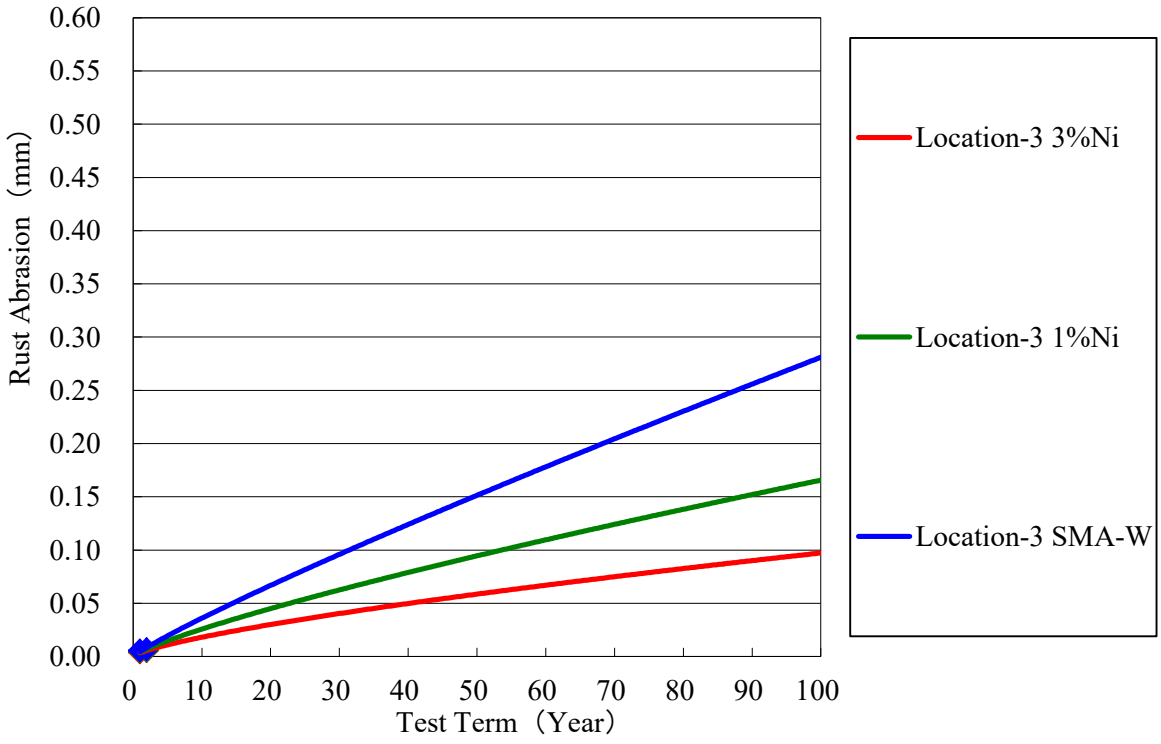


Figure 10　Estimated Rust Abrasion after 100 years（Location-3）

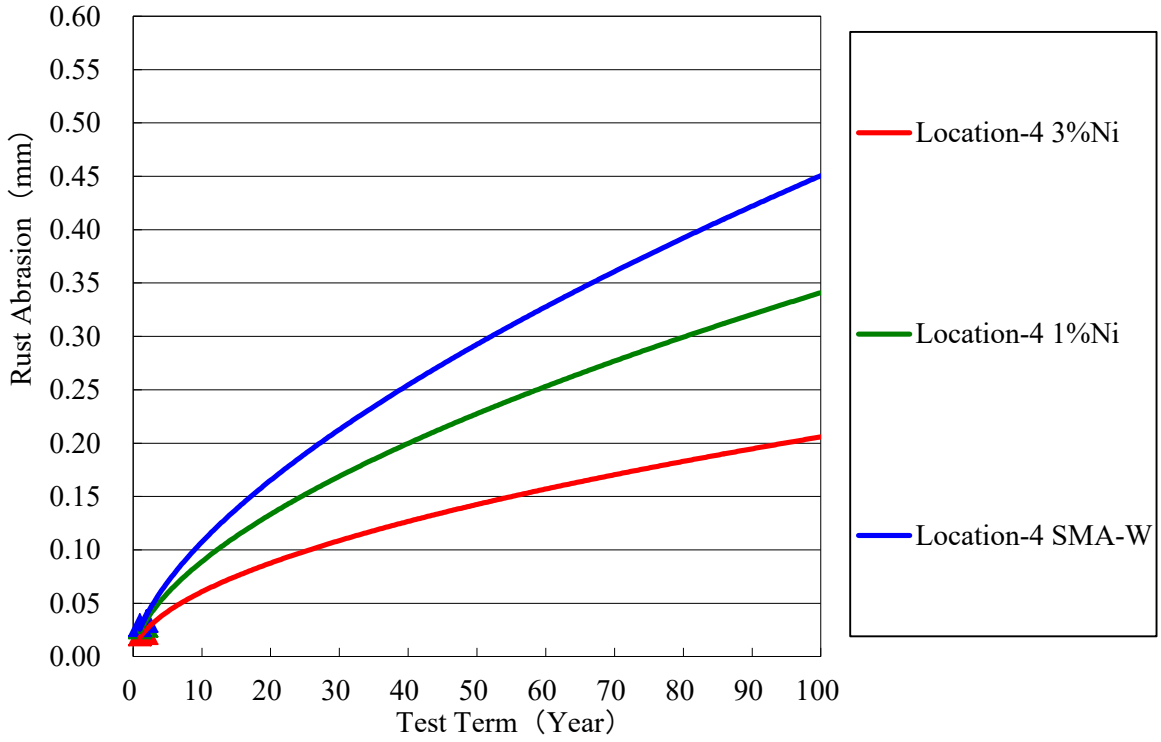


Figure 11　Estimated Rust Abrasion after 100 years（Location-4）