

WALTAIR DIVISION

KORAPUT - KIRAUNDAUL (BROAD GAUGE SINGLE LINE)																
YEAR OF CONSTRUCTION - 1967																
TRACK STRUCTURE - Ballasted, 60 Kg RAIL, PSC SLEEPER																
NO VENTILATION ARRANGEMENT																
LIGHTING ARRANGEMENT EXISTS IN TUNNEL HAVING LENGTH MORE THAN 100 M																
DETAILS OF TUNNEL																
Sl. No.	Tunnel No.	Section	Tunnel No.	Chainage (EM)		Chainage(Km)		Length(m)	Lined Length (m)	Unlined Length (m)	Curved length (m)	Staright Length (m)	Degree of Curve	No. of Trolley Refuges	No. of Man Refuges	Geological strata
				From	To	From	To									
1	1	BDVR-SLPM (BODAVARA - SIBLING PURAM)	1	36/5	36/11	36.156	36.328	149	149	0	92	57	8	1	NIL	LINED TUNNEL
2	1A		1A	36/12	36/16	36.382	36.466	84	84	0	84	0	8	NIL	NIL	LINED TUNNEL
3	02		02	36/29	37/8	36.825	37.251	426	346	80	391	35	8	4	10	MOSTLY ROCK IN LAYERS
4	03		03	37/31	38/8	37.876	38.194	330	243	87	299	31	8	3	8	PARTLY IN HARD ROCK AND PARTLY ROCK IN LAYERS
5	04		04	39/35	40/13	39.978	40.348	370	370	0	326	44	7	4	12	LINED TUNNEL
6	05		05	41/13	41/18	41.45	41.544	94	94	0	0	94	ST	NIL	NIL	LINED TUNNEL
7	06		06	44/12	44/20	44.362	44.559	197	82	115	91	106	8	2	1	HARD ROCK
8	07		07	44/32	45/1A	44.9	45.027	127	88	39	127	0	8	1	1	PARTLY HARD ROCK AND PARTLY HIGHLY BROKEN ROCK
9	08	SLPM-TXD (SIBLINGPURAM - TYADA)	08	46/20	46/25	46.554	46.667	113	113	0	74	39	8	1	1	LINED TUNNEL
10	09		09	46/27	47/4	46.857	47.1	234	68	166	147	87	8	1	1	HARD ROCK
11	10		10	48/19	49/3	48.655	49.031	376	159	217	301	75	8	4	4	GOOD ROCK AND GRAPHITE.
12	11		11	49/28	50/2	49.782	50.015	233	76	157	232	1	8	2	2	HARD ROCK
13	12		12	50/11	50/18	50.045	50.635	185	77	108	185	0	6	2	2	HARD ROCK (CHARNOCKITE)
14	13		13	51/5	51/15	51.211	51.478	267	137	130	258	9	8	2	NIL	LOWER FACE HARD ROCK UPPER FACE WEATHERED AND CRUSHED KHONDALITE

Sl. No.	Tunnel No.	Section	Tunnel No.	Chainage (EM)		Chainage(Km)		Length(m)	Lined Length (m)	Unlined Length (m)	Curved length (m)	Staright Length (m)	Degree of Curve	No. of Trolley Refuges	No. of Man Refuges	Geological strata
				From	To	From	To									
15	14	TXD-CMDP (TYADA - CHIMIDIPALLI)	14	52/15	52/27	52.469	52.867	398	116	282	130	268	5	4	4	HARD ROCK
16	15		15	53/9	53/15	53.264	53.421	157	46	111	157	0	8	2	2	HARD ROCK
17	16		16	54/1	54/15	54.039	54.424	385	385	0	385	0	8	4	9	LINED TUNNEL
18	17		17	55/17	55/22	55.223	55.624	401	121	280	378	23	8	4	4	HARD MASSIVE ROCK
19	18		18	56/17	56/28	56.507	56.825	318	146	172	164	154	8	4	6	HARD MASSIVE ROCK
20	19		19	56/29	57/5	56.866	57.102	236	91	145	0	236	ST	1	4	QUARTZITE IN SOILD FORMATION
21	20		20	57/8	57/17	57.324	57.549	225	225	0	225	0	8	2	1	LINED TUNNEL
22	21		21	57/33	58/4	58.006	58.083	77	77	0	77	0	8	NIL	2	LINED TUNNEL
23	22 & 23		22 & 23	58/9	58/33	58.251	58.952	701	416	285	87	614	8	5	5	KHONDALITE IN WEATHERED STATE & PARTLY IN HARD ROCK
24	23A		23A	59/7	59/12	59.203	59.331	128	128	0	128	0	8	1	2	LINED TUNNEL
25	23B		23B	59/18	59/24	59.576	59.721	145	145	0	142	3	8	1	4	LINED TUNNEL
26	24		24	59/29	60/12	59.841	60.346	512	512	0	286	226	8	5	NIL	LINED TUNNEL
27	25		25	60/14	60/31	60.427	60.945	518	398	120	396	122	8	5	NIL	WEATHERED KHONDALITE
28	26		26	61/4	61/15	61.088	61.268	180	180	0	69	111	8	1	NIL	LINED TUNNEL
29	27		27	61/21	62/3	61.687	62.033	346	226	120	26	320	8	3	8	HARD ROCK AND WEATHERED ROCK
30	28		28	62/18	62/27	62.514	62.737	224	73	151	213	11	8	1	3	HARD ROCK
31	29		29			64.448	64.633	185	81	104	159	26	8	1	NIL	HARD ROCK
32	30	CMDP-BG HU (CHIMIDIPALLI _ BORAGOHALU)	30	64/32	65/13	64.903	65.363	460	107	353	460	0	8	2	NIL	HARD ROCK
33	31		31	65/18	65/29	65.526	65.828	302	141	161	301	1	8	3	NIL	HARD ROCK
34	31A		31A	66/2	66/5	66.054	66.114	60	60	0	53	7	8	NIL	NIL	LINED TUNNEL
35	31B		31B	66/8	66/11	66.323	66.397	74	74	0	17	57	8	NIL	NIL	LINED TUNNEL
36	31C		31C	66/15	66/20	66.541	66.664	123	123	0	51	72	8	NIL	NIL	LINED TUNNEL
37	31D		31D	66/24	66/33	66.825	66.853	28	28	0	28	0	8	NIL	NIL	LINED TUNNEL
38	32		32	67/5	67/18	67.146	67.464	318	136	182	138	180	8	3	1	PARTLY HARD ROCK AND PARTLY MASSIVE SHATTERED ROCK
39	33		33	67/25	68/1	67.74	67.976	236	58	178	109	127	8	2	2	HARD ROCK
40	34		34	68/2	68/10	68.052	68.261	209	37	172	129	80	3	3	NIL	HARD ROCK
41	35 & 36		35 & 36	68/11	69/9	68.367	69.263	896	436	460	845	51	8	6	5	HARD ROCK AND HARD ROCK HIGHLY BROKEN
42	37		37	69/35	70/9	69.995	70.239	244	244	0	244	0	8	2	1	LINED TUNNEL
43	38		38	70/17	70/25	70.506	70.7	194	194	0	135	59	8	1	4	LINED TUNNEL
44	38A		38A	71/1	71/4	70.031	71.082	51	51	0	51	0	8	NIL	NIL	LINED TUNNEL
45	38B		38B	71/18	71/24	71.486	71.62	134	134	0	88	46	8	NIL	NIL	LINED TUNNEL
46	39		39	76/16	76/28	76.403	76.691	288	288	0	232	56	8	1	2	LINED TUNNEL

Sl. No.	Tunnel No.	Section	Tunnel No.	Chainage (EM)		Chainage(Km)		Length(m)	Lined Length (m)	Unlined Length (m)	Curved length (m)	Staright Length (m)	Degree of Curve	No. of Trolley Refuges	No. of Man Refuges	Geological strata
				From	To	From	To									
47	40	BGHU-KVLS (BORAGOHALU - KARKAVALLSA)	40	77/22	78/4	77.827	78.082	255	255	0	0	255	ST	2	8	LINED TUNNEL
48	41		41	79/10	79/20	79.392	79.63	239	239	0	239	0	8	2	8	LINED TUNNEL
49	41A		41A	79/21	79/24	79.696	79.734	38	38	0	38	0	8	NIL	NIL	LINED TUNNEL
50	42		42	80/11	80/18	80.363	80.549	186	186	0	88	98	8	NIL	NIL	LINED TUNNEL
51	43		43	80/18	81/1	80.634	80.975	341	341	0	38	303	8	3	11	LINED TUNNEL
52	44		44	81/17	81/25	81.606	81.83	224	224	0	140	84	8	2	2	LINED TUNNEL
53	44A	GPJ-DPC (GORAPUR - DARLIPUT)	44A	118/5	118/8	118/5-8		67	67	0	67	0	8	NIL	NIL	LINED TUNNEL
54	45	JRT-MVG (JARTI - MALLIGURA)	45	207/22	207/29	207/22-29		177	177	0	177	0	8	NIL	NIL	LINED TUNNEL
55	45A		45A	209/10	209/18	209/10-18		213	213	0	213	0	8	NIL	NIL	LINED TUNNEL
56	45B		45B	211/11	211/14.5	211/11-14.5		107	107	0	105	2	8	NIL	NIL	LINED TUNNEL
57	45C		45C	212/11	212/15	212/11-15		85	85	0	85	0	8	NIL	NIL	LINED TUNNEL
58	46		46	216/8	216/16	216/8-16		216	216	0	199	17	8	NIL	NIL	LINED TUNNEL

TOTAL	14086	9711	4375	9899	4187
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LINED LENGTH = 9711 m

UNLINED LENGTH = 4375 m

CURVED LENGTH = 9899 m

STRAIGHT LENGTH = 4187 m

TOTAL LENGTH OF TUNNEL. = 14086 M

TUNNEL DETAILS
OF
KOTAVALSA - KIRAUNDAL RAILWAY LINE
&
KORAPUT - RAYAGADA RAILWAY LINE

EAST COAST RAILWAY
LIST OF ITEMS LOADED IN MANSOON RELIEF TRAIN

COACH -General sitting

SI NO	DESCRIPTION OF ITEM	UNIT	QTY	REMARKS
1	Jack Hammer	Nos	9	
2	2'7" drill rod	Nos	9	
3	5'4" drill rod	Nos	2	
4	Drill rod 1'	Nos	1	
5	pan iron motor (gamela)	Nos	2	
6	Nylon rope	Bandle	1	
7	wooden skid	Nos	2	
8	Generator	Nos	2	
9	Grinding machine	Nos	1	
10	Grinding hose pipe	Nos	1	
11	Belcha(showel)	Nos	1	
12	Hammer big	Nos	2	
13	Rock splitter rod	Nos	2	
14	Tarpalin	Nos	1	
15	E.Oil	Nos	10	
16	Tapping rid	Nos	2	
17	Crow bar	Nos	2 + 25	
18	Strecher	Nos	1	
19	Halogen bulb 1000w	Nos	3	
20	Halogen bulb 500w	Nos	1	
21	Powrah	Nos	2	
22	Safety belts	Nos	11	
23	Exploder	Nos	2	
24	Cable drum with cable	Nos	1	
25	Safety Helmates	Nos	20	
26	Wooden Box	Nos	1	
27	Crack powder	Nos	15	
28	Empty cable drum	Nos	1	
29	Coupling	Sets	2 sets(5+3)	
30	Rock splitter pipe	Set	1	
31	Kabuli tent with kit	Nos	1	
32	Fire extinguisher	Nos	4	
33	Lifting jockie	Nos	1	
34	HSD Oil	Ltrs	180	
35	K.Oil	Ltrs	20	
36	Tool kit	Set	1	
37	Pionjar box	Nos	2	
38	Field telephone	Nos	1	
39	Continuityb tester	Nos	1	
40	Flag (Red + Green)	Nos	1+1	
41	Coupling (M +F)	Nos	2	

42	Rock splitter bit	Nos	1	
43	First aid box	Nos	1	

	ART	One at KRPU and ONE at VSKP
	ARME	One at KRPU and ONE at VSKP

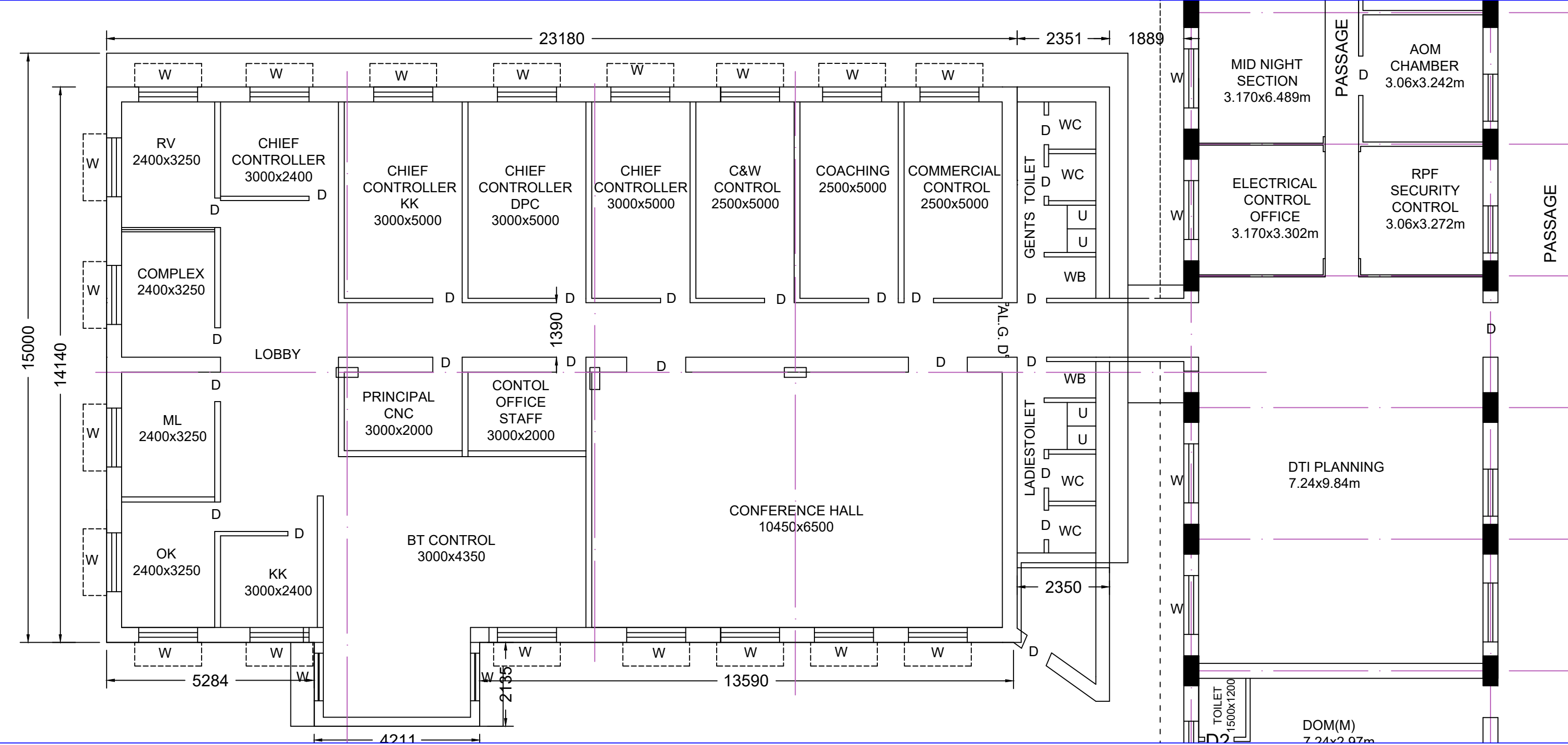
EAST COAST RAILWAY
LIST OF ITEMS LOADED IN MANSOON RELIEF TRAIN

BCNA WAGON

SI NO	DESCRIPTION OF ITEM	UNIT	QTY	REMARKS
1	Hose pipe	Nos	9	
2	AL.Ladder	Nos	2	
3	Gi sheet	Nos	11	
4	Para	Nos	42	
5	Showel	Nos	4	
6	Beater	Nos	50	
7	Pickaxe	Nos	33	
8	Thattalu	Nos	190	
9	ECP Bags	Nos	212	
10	Channels	Nos	2	
11	Sleepers wooden	Nos	4	
12	Stool wooden	Nos	1	
13	Gamela	Nos	18	
14	Tapraulin	Nos	1	
15	Safety Rope	Nos	1	
16	Chair	Nos	2	
17	Splitter	Set	1	
18	Grease splitter	Nos	1	
19	Oil measuring can	Nos	1	
20	Bucket	Nos	2	
21	Manila rope	Nos	1	

BRN

SI NO	DESCRIPTION OF ITEM	UNIT	QTY	REMARKS
1	Wooden Sleepers	Nos	4	
2	Atlas Copco XA 175 Compressor	Nos	1	



List of Tunnels as on 30.10.2020 on KR line

Railways	S.No	Tunnel No.	Name of Tunnel	Division	Block section	B.G/M.G./N.G	EM		CH		Length (m)	Year of construction	Up/Dn/S/L	Shape of tunnel	Lined/Unlined		Track Structure	Ventilation arrangement	Defects Noticed	Proposed Remedial Measures	Number of		Soil met with
							From	To	From	To											TR	MR	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20			
															Lined	Unlined							
E.Co. Railway	1	1	1	WAT	BGUA-KKGM	B.G	40/11	41/02	40.559	41.046	487	1992	SL	Semi circle	223	264	ST+Cur with 52Kg	Not Available	Leakages observed from U/L portions	Proposed for diverting the same into side drain by providing PVC Funnels	8	4	Mixed Strata of Rock
E.Co. Railway	2	2	2	WAT	KKGM-LKMR	B.G	50/19	51/13	50.920	51.662	732	1992	SL	Semi circle	108.5	623.5	ST+Cur with 52Kg	Not Available			11	4	Mixed Strata of Rock
E.Co. Railway	3	3	3	WAT	KKGM-LKMR	B.G	53/02	53/09	53.143	53.476	333	1992	SL	Semi circle	136	197	ST+Cur with 52Kg	Not Available	Observed boulderfall from springing level at some portions	Constructed RR Masonry retainers	4	5	Mixed Strata of Rock
E.Co. Railway	4	4	4	WAT	KKGM-LKMR	B.G	57/14	58/13	57.75	58.697	951	1992	SL	Semi circle	487	464	Straight with 52 Kg	Not Available	Boulder fall observed from unlined portion at some locations	Proposed for SHORTCRETING	12	7	Granite with cleavages
E.Co. Railway	5	5	5	WAT	TKRI-RUL	B.G	86/16	86/21	86.127	86.64	513	1993	SL	Semi circle	85	428	Straight with 60 Kg	Not Available			9		Hard Rock
E.Co. Railway	6	6	6	WAT	TKRI-RUL	B.G	86/24	86/29	86.833	86.981	148	1993	SL	Semi circle	148	-	Curve with 60kg	Not Available			1	4	
E.Co. Railway	7	7	7	WAT	TKRI-RUL	B.G	88/12	88/16	88.039	88.493	453	1993	SL	Semi circle	165	288	ST+Cur with 60Kg	Not Available			7	2	Mixed Strata of Rock
E.Co. Railway	8	8	8	WAT	TKRI-RUL	B.G	89/24	90/16	90.008	90.501	493	1993	SL	Semi circle	493	-	ST+Cur with 60Kg	Not Available			5	4	
E.Co. Railway	9	9	9	WAT	TKRI-RUL	B.G	91/14	91/16	91.492	91.574	82	1994	SL	Semi circle	82	-	Curve with 60kg	Not Available				1	
E.Co. Railway	10	10	10	WAT	TKRI-RUL	B.G	91/18	92/01	91.766	92.051	286	1994	SL	Semi circle	115	171	Curve with 60kg	Not Available			4		Mixed Strata of Rock
E.Co. Railway	11	11	11	WAT	TKRI-RUL	B.G	93/22	93/28	92.99	93.84	848	1994	SL	Semi circle	63	785	ST+Cur with 60Kg	Not Available	Boulder fall observed from unlined portion at some locations	Proposed for SHORTCRETING	15		Hard Rock
E.Co. Railway	12	12	12	WAT	TKRI-RUL	B.G	94/03	94/15	94.105	94.451	344	1992	SL	Semi circle	112	232	Curve with 60kg	Not Available			5		Mixed Strata of Rock
E.Co. Railway	13	13	13	WAT	RUL - LLGM	B.G	95/36	96/00	95.836	95.918	84	1993	SL	Semi circle	84	-	Curve with 52kg	Not Available				2	
E.Co. Railway	14	14	14	WAT	RUL - LLGM	B.G	96/28	97/08	96.968	97.209	248	1992	SL	Semi circle	158	90	ST+Cur with 52Kg	Not Available	Boulder fall observed from unlined portion at some locations	Proposed for SHORTCRETING	2	1	Mixed with soft Rock
E.Co. Railway	15	15	15	WAT	RUL - LLGM	B.G	97/18	97/23	97.482	97.695	213	1992	SL	Semi circle	213	-	Curve with 52kg	Not Available			1	5	
E.Co. Railway	16	16	16	WAT	RUL - LLGM	B.G	99/03	99/07	99.117	99.232	115	1992	SL	Semi circle	80	35	Straight with 52 Kg	Not Available				2	Hard Rock
E.Co. Railway	17	17	17	WAT	RUL - LLGM	B.G	104/26	105/01	104.818	104.933	115	1993	SL	Semi circle	115	-	Curve with 60kg	Not Available					
E.Co. Railway	18	18	18	WAT	RUL - LLGM	B.G	106/25	106/27	106.815	107.162	346	1993	SL	Semi circle	346	-	Curve with 60kg	Not Available					
E.Co. Railway	19	19	19	WAT	RUL - LLGM	B.G	108/09	108/17	108.385	108.624	239	1994	SL	Semi circle	239	-	Curve with 60kg	Not Available					
E.Co. Railway	20	20	20	WAT	RUL - LLGM	B.G	109/04	109/11	109.140	109.324	184	1995	SL	Semi circle	184	-	Straight with 60 Kg	Not Available					
E.Co. Railway	21	21	21	WAT	RUL - LLGM	B.G	109/16	109/20	109.601	109.678	77	1993	SL	Semi circle	77	-	Curve with 60kg	Not Available					Hard Rock
E.Co. Railway	22	22	22	WAT	RUL - LLGM	B.G	110/17	110/24	110.620	110.808	188	1993	SL	Semi circle	188	-	Straight with 60 Kg	Not Available					Hard Rock
E.Co. Railway	23	23	23	WAT	LLGM-BLMK	B.G	112/38	114/12	112.803	114.425	1599	1994	SL	Semi circle	1032	567	ST+Cur with 60Kg	Not Available	Leakages observed from U/L portions	Proposed for diverting the same into side drain by providing PVC Funnels	12	13	Khondalite , Charnokite
E.Co. Railway	24	24	24	WAT	LLGM-BLMK	B.G	115/24	116/02	115.801	116.045	252	1995	SL	Semi circle	252	-	ST+Cur with 60Kg	Not Available					
E.Co. Railway	25	25	25	WAT	LLGM-BLMK	B.G	119/02	120/18	119.071	120.530	1458	1994	SL	Semi circle	675	783	ST+Cur with 60Kg	Not Available	Leakages observed from U/L portions	Proposed for diverting the same into side drain by providing PVC Funnels	1	3	Weathered Khondalite, & Granite

E.Co. Railway	26	26	26	WAT	BLMK-SKPI	B.G	134/06	134/11	134.290	134.418	128	1994	SL	Semi circle	128	-	Straight with 52 Kg	Not Available				1	Weathered Khondalite, & Granite
E.Co. Railway	27	27	27	WAT	BLMK-SKPI	B.G	137/01	137/02	137.058	137.122	64	1995	SL	Semi circle	64	-	Curve with 52kg	Not Available					Khondalite
E.Co. Railway	28	28	28	WAT	BLMK-SKPI	B.G	137/17	137/18	137.344	137.503	160	1994	SL	Semi circle	160	-	Curve with 52kg	Not Available			2	3	Khondalite
E.Co. Railway	29	29	29	WAT	SKPI-KTGA	B.G	139/20	140/4	139.623	140.142	547	1995	SL	Semi circle	270	277	Curve with 52kg	Not Available			10		Weathered Khondalite, & Granite
E.Co. Railway	30	30	30	WAT	SKPI-KTGA	B.G	141/01	141/11	141.049	141.318	269	1994	SL	Semi circle	200	69	Curve with 52kg	Not Available	Leakages observed from U/L portions	Proposed for diverting the same into side drain by providing PVC Funnels	2	5	Schistose Gneiss
E.Co. Railway	31	31	31	WAT	SKPI-KTGA	B.G	144/08	144/13	144.309	144.415	107	1994	SL	Semi circle	107	-	Curve with 52kg	Not Available					Khondalite
E.Co. Railway	32	32	32	WAT	SKPI-KTGA	B.G	145/05	145/18	145.273	145.525	251	1995	SL	Semi circle	150	101	Curve with 52kg	Not Available	Boulder fall observed from unlined portion at some locations	Proposed for SHORTCRETING			Partly Khondalite & Partly Granite
E.Co. Railway	33	33	33	WAT	SKPI-KTGA	B.G	146/05	146/11	146.174	146.313	139	1994	SL	Semi circle	139	-	Curve with 52kg	Not Available					
E.Co. Railway	34	34	34	WAT	SKPI-KTGA	B.G	146/12	146/16	146.403	146.514	111	1992	SL	Semi circle	11	100	Curve with 52kg	Not Available					Khondalite
E.Co. Railway	35	35	35	WAT	SKPI-KTGA	B.G	148/15	148/20	148.659	148.832	173	1992	SL	Semi circle	173	-	Straight with 52 Kg	Not Available					Charkonite, Khondalite Granite, Gneiss Etc..
E.Co. Railway	36	36	36	WAT	KTGA-SPRD	B.G	155/16	156/00	155.841	156.028	186	1992	SL	Semi circle	186	-	Curve with 52kg	Not Available	Leakages observed from U/L portions	Proposed for diverting the same into side drain by providing PVC Funnels			Weathered Khondalite with Horizontal and Vertical cleavages

WALTAIR DIVISION
KORAPUT - RAYAGADA (BROAD GAUGE SINGLE LINE)
YEAR OF COMMISSIONING - 1995
TRACK STRUCTURE - Ballasted, 52Kg/60Kg, Rail, PSC Sleeper
NO VENTILATION ARRANGEMENT
LIGHTING ARRANGEMENT EXISTS IN TUNNEL HAVING LENGTH MORE THAN 100 M

DETAILS OF TUNNEL

S.No	Tunnel No.	Block section	Tunnel No.	EM		CH		Length (m)	Lined (m)	Unlined (m)	Curved length (m)	Straight length (m)	Dgree of curve (m)	Number of		Geological Strata
				From	To	From	To							T/R	M/R	
1	1	BRGA - KKGM (BAIGUDA - KAKRIGUMA)	1	40/11	41/02	40.559	41.046	487	223	264	206	281	5	8	4	Mixed Strata of Rock
2	2	KKGM - LKMR (KAKRIGUMA - LAXMIPUR)	2	50/19	51/13	50.920	51.662	732	109	623	87	645	5	11	4	Mixed Strata of Rock
3	3		3	53/02	53/09	53.143	53.476	333	136	197	109	224	5	4	5	Mixed Strata of Rock
4	4		4	57/14	58/13	57.75	58.697	951	487	464	3	948	5	12	7	Granite with cleavages
5	5	TKRI - RUL (TIKRI - RAULI)	5	86/16	86/21	86.127	86.64	513	85	428	0	513	5	9		Hard Rock
6	6		6	86/24	86/29	86.833	86.981	148	148	0	148	0	5	1	4	LINED
7	7		7	88/12	88/16	88.039	88.493	453	165	288	200	253	5	7	2	Mixed Strata of Rock
8	8		8	89/24	90/16	90.008	90.501	493	493	0	300	193	5	5	4	LINED
9	9		9	91/14	91/16	91.492	91.574	82	82	0	82	0	5	NIL	1	LINED
10	10		10	91/18	92/01	91.766	92.051	286	115	171	286	0	5	4	NIL	Mixed Strata of Rock
11	11		11	93/22	93/28	92.99	93.84	848	63	785	340	508	5	15	NIL	Hard Rock
12	12		12	94/03	94/15	94.105	94.451	344	112	232	344	0	5	5	NIL	Mixed Strata of Rock
13	13	RUL - LLGM (RAULI - LILIGUMA)	13	95/36	96/00	95.836	95.918	84	84	0	84	0	5		2	LINED
14	14		14	96/28	97/08	96.968	97.209	248	158	90	170	78	5	2	1	Mixed with soft Rock
15	15		15	97/18	97/23	97.482	97.695	213	213	0	213	0	5	1	5	LINED
16	16		16	99/03	99/07	99.117	99.232	115	80	35	0	115	5		2	Hard Rock
17	17		17	104/26	105/01	104.818	104.933	115	115	0	115	0	5	NIL	NIL	LINED
18	18		18	106/25	106/27	106.815	107.162	346	346	0	346	0	5	NIL	NIL	LINED
19	19		19	108/09	108/17	108.385	108.624	239	239	0	239	0	5	NIL	NIL	LINED
20	20		20	109/04	109/11	109.140	109.324	184	184	0	0	184	ST	NIL	NIL	LINED
21	21		21	109/16	109/20	109.601	109.678	77	77	0	77	0	5	NIL	NIL	LINED
22	22		22	110/17	110/24	110.620	110.808	188	188	0	0	188	ST	NIL	NIL	LINED

S.No	Tunnel No.	Block section	Tunnel No.	EM		CH		Length (m)	Lined (m)	Unlined (m)	Curved length (m)	Straight length (m)	Dgree of curve	Number of		Geological Strata
				From	To	From	To							T/R	M/R	
23	23	LLGM - BLMK (LILLIGUMA _ BALMASKA)	23	112/38	114/12	112.803	114.425	1599	1032	567	600	999	5	12	13	Khondalite , Charnokite
24	24		24	115/24	116/02	115.801	116.045	252	252	0	130	122	5	NIL	NIL	LINED
25	25		25	199/02	120/18	119.071	120.530	1458	675	783	270	1188	5	1	3	Weathered Khondalite, & Granite
26	26	BLMK-SKPI (BALMASKA - SIKARPAI)	26	134/06	134/11	134.290	134.418	128	128	0	128	0	5	NIL	1	LINED
27	27		27	137/01	137/02	137.058	137.122	64	64	0	64	0	5	NIL		LINED
28	28		28	137/17	137/18	137.344	137.503	160	160	0	160	0	5	2	3	LINED
29	29	SKPI-KTGA (SIKARPAI - KEVITIGUDA)	29	139/20	140/4	139.623	140.142	547	270	277	508	39	5	10	NIL	Weathered Khondalite, & Granite
30	30		30	141/01	141/11	141.049	141.318	269	200	69	269	0	5	2	5	Schistose Gneiss
31	31		31	144/08	144/13	144.309	144.415	107	107	0	107	0	5	NIL	NIL	LINED
32	32		32	145/05	145/18	145.273	145.525	251	150	101	251	0	5	NIL	NIL	Partly Khondalite & Partly Granite
33	33		33	146/05	146/11	146.174	146.313	139	139	0	139	0	5	NIL	NIL	LINED
34	34		34	146/12	146/16	146.403	146.514	111	11	100	111	0	5	NIL	NIL	Khondalite
35	35		35	148/15	148/20	148.659	148.832	173	173	0	173	0	5	NIL	NIL	LINED
36	36	KTGA-SPRD (KEVITIGUDA - SINGAPURAM ROAD)	36	155/16	156/00	155.841	156.028	186	186	0	186	0	5	NIL	NIL	LINED

TOTAL 12923 7449 5474 6445 6478

LINED LENGTH = 7449 m
 UNLINED LENGTH = 5474 m
 CURVED LENGTH = 6445 m
 STRAIGHT LENGTH = 6478 m
TOTAL LENGTH OF TUNNEL. = 12923 M

WALTAIR DIVISION

KORAPUT - SINGAPUR (BROAD GAUGE SINGLE LINE)

YEAR OF CONSTRUCTION - 1995

TRACK STRUCTURE - Ballasted, 52 kg, PSC Sleeper

NO VENTILATION ARRANGEMENT

LIGHTING ARRANGEMENT EXISTS IN TUNNEL MORE THAN - 100M

List of Tunnels as on 30.10.2020 on KR line

List of Tunnels as on 30.10.2020 on KF

Railways	S.No	Tunnel No.	Name of Tunnel	Division	Block section	B.G/M.G/N.G	EM		CH		Length (m)	Year of construction
							From	To	From	To		
1	2	3	4	5	6	7	8	9	10	11	12	13
E.Co. Railway	1	1	1	WAT	BGUA-KKGM	B.G	40/11	41/02	40.559	41.046	487	1992
E.Co. Railway	2	2	2	WAT	KKGM-LKMR	B.G	50/19	51/13	50.920	51.662	732	1992
E.Co. Railway	3	3	3	WAT	KKGM-LKMR	B.G	53/02	53/09	53.143	53.476	333	1992
E.Co. Railway	4	4	4	WAT	KKGM-LKMR	B.G	57/14	58/13	57.75	58.697	951	1992
E.Co. Railway	5	5	5	WAT	TKRI-RUL	B.G	86/16	86/21	86.127	86.64	513	1993
E.Co. Railway	6	6	6	WAT	TKRI-RUL	B.G	86/24	86/29	86.833	86.981	148	1993
E.Co. Railway	7	7	7	WAT	TKRI-RUL	B.G	88/12	88/16	88.039	88.493	453	1993
E.Co. Railway	8	8	8	WAT	TKRI-RUL	B.G	89/24	90/16	90.008	90.501	493	1993
E.Co. Railway	9	9	9	WAT	TKRI-RUL	B.G	91/14	91/16	91.492	91.574	82	1994
E.Co. Railway	10	10	10	WAT	TKRI-RUL	B.G	91/18	92/01	91.766	92.051	286	1994
E.Co. Railway	11	11	11	WAT	TKRI-RUL	B.G	93/22	93/28	92.99	93.84	848	1994
E.Co. Railway	12	12	12	WAT	TKRI-RUL	B.G	94/03	94/15	94.105	94.451	344	1992
E.Co. Railway	13	13	13	WAT	RUL - LLGM	B.G	95/36	96/00	95.836	95.918	84	1993
E.Co. Railway	14	14	14	WAT	RUL - LLGM	B.G	96/28	97/08	96.968	97.209	248	1992
E.Co. Railway	15	15	15	WAT	RUL - LLGM	B.G	97/18	97/23	97.482	97.695	213	1992
E.Co. Railway	16	16	16	WAT	RUL - LLGM	B.G	99/03	99/07	99.117	99.232	115	1992
E.Co. Railway	17	17	17	WAT	RUL - LLGM	B.G	104/26	105/01	104.818	104.933	115	1993
E.Co. Railway	18	18	18	WAT	RUL - LLGM	B.G	106/25	106/27	106.815	107.162	346	1993
E.Co. Railway	19	19	19	WAT	RUL - LLGM	B.G	108/09	108/17	108.385	108.624	239	1994
E.Co. Railway	20	20	20	WAT	RUL - LLGM	B.G	109/04	109/11	109.140	109.324	184	1995
E.Co. Railway	21	21	21	WAT	RUL - LLGM	B.G	109/16	109/20	109.601	109.678	77	1993

E.Co. Railway	22	22	22	WAT	RUL - LLGM	B.G	110/17	110/24	110.620	110.808	188	1993
E.Co. Railway	23	23	23	WAT	LLGM-BLMK	B.G	112/38	114/12	112.803	114.425	1599	1994
E.Co. Railway	24	24	24	WAT	LLGM-BLMK	B.G	115/24	116/02	115.801	116.045	252	1995
E.Co. Railway	25	25	25	WAT	LLGM-BLMK	B.G	119/02	120/18	119.071	120.530	1458	1994
E.Co. Railway	26	26	26	WAT	BLMK-SKPI	B.G	134/06	134/11	134.290	134.418	128	1994
E.Co. Railway	27	27	27	WAT	BLMK-SKPI	B.G	137/01	137/02	137.058	137.122	64	1995
E.Co. Railway	28	28	28	WAT	BLMK-SKPI	B.G	137/17	137/18	137.344	137.503	160	1994
E.Co. Railway	29	29	29	WAT	SKPI-KTGA	B.G	139/20	140/4	139.623	140.142	547	1995
E.Co. Railway	30	30	30	WAT	SKPI-KTGA	B.G	141/01	141/11	141.049	141.318	269	1994
E.Co. Railway	31	31	31	WAT	SKPI-KTGA	B.G	144/08	144/13	144.309	144.415	107	1994
E.Co. Railway	32	32	32	WAT	SKPI-KTGA	B.G	145/05	145/18	145.273	145.525	251	1995
E.Co. Railway	33	33	33	WAT	SKPI-KTGA	B.G	146/05	146/11	146.174	146.313	139	1994
E.Co. Railway	34	34	34	WAT	SKPI-KTGA	B.G	146/12	146/16	146.403	146.514	111	1992
E.Co. Railway	35	35	35	WAT	SKPI-KTGA	B.G	148/15	148/20	148.659	148.832	173	1992
E.Co. Railway	36	36	36	WAT	KTGA-SPRD	B.G	155/16	156/00	155.841	156.028	186	1992

2 line

Up/ Dn/S L	Shape of tunnel	Lined/Unlined		Track Structure	Ventilation arrangement	Number of	
14	15	16		17	18	TR	MR
		Lined	Unlined				
SL	Semi circle	223	264	ST+Cur with 52Kg	Not Available	8	4
SL	Semi circle	108.5	623.5	ST+Cur with 52Kg	Not Available	11	4
SL	Semi circle	136	197	ST+Cur with 52Kg	Not Available	4	5
SL	Semi circle	487	464	Straight with 52 Kg	Not Available	12	7
SL	Semi circle	85	428	Straight with 60 Kg	Not Available	9	
SL	Semi circle	148	-	Curve with 60kg	Not Available	1	4
SL	Semi circle	165	288	ST+Cur with 60Kg	Not Available	7	2
SL	Semi circle	493	-	ST+Cur with 60Kg	Not Available	5	4
SL	Semi circle	82	-	Curve with 60kg	Not Available		1
SL	Semi circle	115	171	Curve with 60kg	Not Available	4	
SL	Semi circle	63	785	ST+Cur with 60Kg	Not Available	15	
SL	Semi circle	112	232	Curve with 60kg	Not Available	5	
SL	Semi circle	84	-	Curve with 52kg	Not Available		2
SL	Semi circle	158	90	ST+Cur with 52Kg	Not Available	2	1
SL	Semi circle	213	-	Curve with 52kg	Not Available	1	5
SL	Semi circle	80	35	Straight with 52 Kg	Not Available		2
SL	Semi circle	115	-	Curve with 60kg	Not Available		
SL	Semi circle	346	-	Curve with 60kg	Not Available		
SL	Semi circle	239	-	Curve with 60kg	Not Available		
SL	Semi circle	184	-	Straight with 60 Kg	Not Available		
SL	Semi circle	77	-	Curve with 60kg	Not Available		

SL	Semi circle	188	-	Straight with 60 Kg	Not Available		
SL	Semi circle	1032	567	ST+Cur with 60Kg	Not Available	12	13
SL	Semi circle	252	-	ST+Cur with 60Kg	Not Available		
SL	Semi circle	675	783	ST+Cur with 60Kg	Not Available	1	3
SL	Semi circle	128	-	Straight with 52 Kg	Not Available		1
SL	Semi circle	64	-	Curve with 52kg	Not Available		
SL	Semi circle	160	-	Curve with 52kg	Not Available	2	3
SL	Semi circle	270	277	Curve with 52kg	Not Available	10	
SL	Semi circle	200	69	Curve with 52kg	Not Available	2	5
SL	Semi circle	107	-	Curve with 52kg	Not Available		
SL	Semi circle	150	101	Curve with 52kg	Not Available		
SL	Semi circle	139	-	Curve with 52kg	Not Available		
SL	Semi circle	11	100	Curve with 52kg	Not Available		
SL	Semi circle	173	-	Straight with 52 Kg	Not Available		
SL	Semi circle	186	-	Curve with 52kg	Not Available		

Soil met with
Mixed Strata of Rock
Mixed Strata of Rock
Mixed Strata of Rock
Granite with cleavages
Hard Rock
Mixed Strata of Rock
Mixed Strata of Rock
Hard Rock
Mixed Strata of Rock
Mixed with soft Rock
Hard Rock
Hard Rock

Hard Rock
Khondalite , Charnokite
Weathered Khondalite, & Granite
Weathered Khondalite, & Granite
Khondalite
Khondalite
Weathered Khondalite, & Granite
Schistose Gneiss
Khondalite
Partly Khondalite & Partly Granite
Khondalite
Charkonite,Khondalite Granite,Gneiss Etc..
Weathered Khondalite with Horizontal and Vertical cleavages

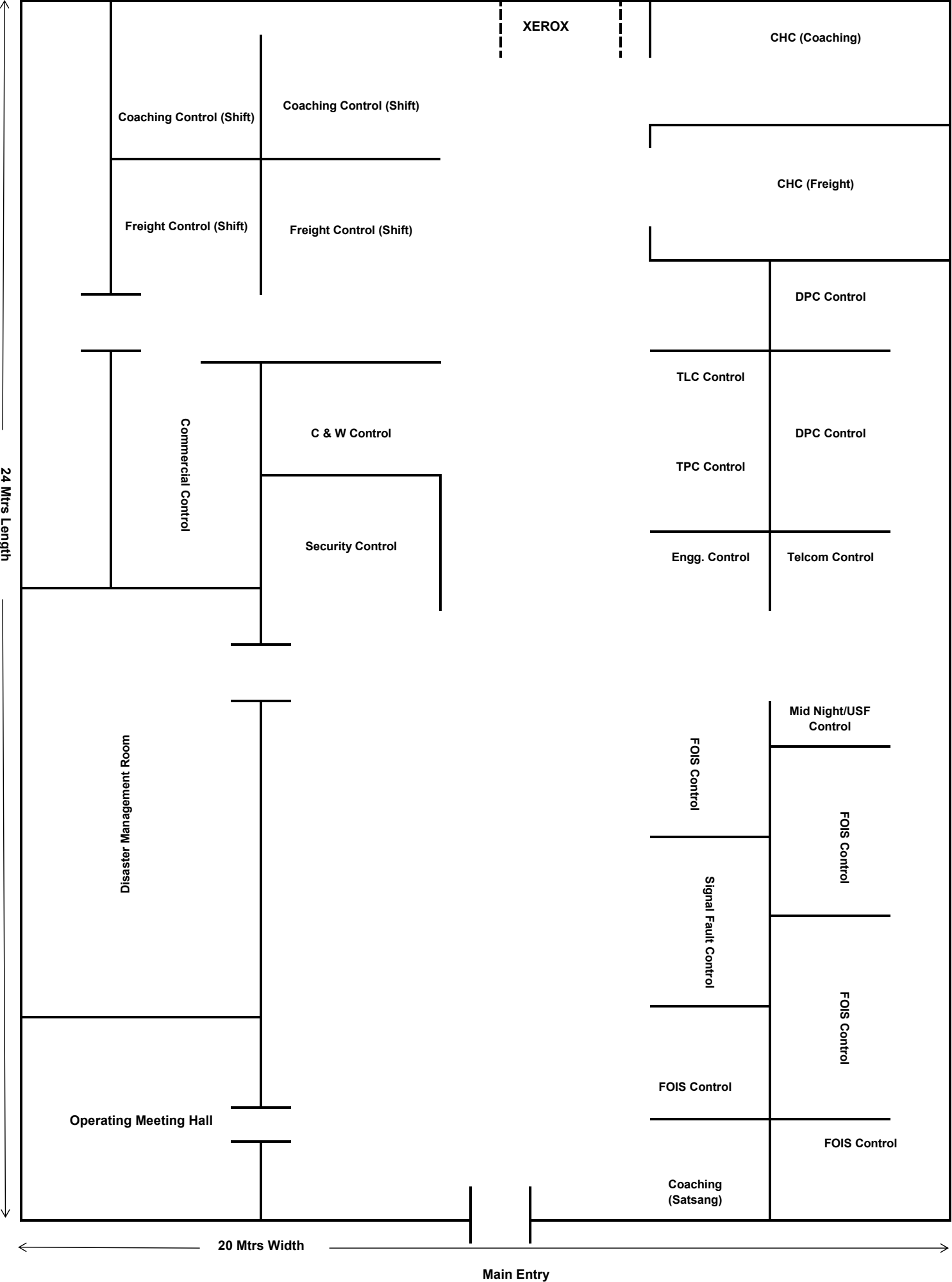
Asset details at Central Control

Name of the Control	No. of Cells	Rly. Telephone	BSNL Telephone	Intercom Phone	CUG	Personal Computer	NTES Terminal	Printer	Line Printer	UPS	XEROX	FAX	VDU	Wi-Fi AP	Digital Clock	Railnet / FOIS / UTN / DL Link
CHC(Coaching)	1	2	2	1	1	2	0	1		2	1	0	0	3	3	Railnet
Coaching Shift	2	2	1	1	1	2	0	2		2		0	0			Railnet
Coaching Satsang	1	1	0	0	0	1	0	1		1		0	0			Railnet
CHC(Freight)	1	2	1	1	1	2	0	1		2		1	0			Railnet
Freight Shift	2	2	1	1	1	2	0	2		2		0	0			Railnet
FOIS Control	6	6	0	1	1	11	0	5		11		0	0			Railnet / FOIS
Mid Night Control	1	1	0	0	0	1	0	1	2	1		0	0			FOIS
Commercial Control	1	1	1	1	1	1	1	2	0	2		0	0			UTN
Diesel Power Control	2	2	0	1	1	3	0	1	0	3		0	0			Railnet/FOIS
C &W Control	2	2	0	1	1	3	0	1	0	3		0	0			Railnet
TPC Control	1	1	0	1	1	1	0	1	0	1		0	0			Railnet
TLC Control	1	1	1	1	1	1	0	1	0	1		0	0			Railnet
Signal Fault Control	2	2	0	1	1	2	0	1	0	2		0	0			Railnet / Data logger
Telecom Control	1	1	0	0	1	1	0	1	0	1		0	0			Railnet
Security Control	3	2	2	1	1	3	0	2	0	3		1	2			Railnet
Total :		28	9	12	13	36	1	23	2	37	1	2	2	3	3	

Asset details at Disaster Management Room

Name of the Control	Audio Conference System	Satellite Phone	Rly. Telephone	BSNL Telephone(With ISD 2Nos+1 No)	BSNLT oll Free	Intercom Phone	Hot Line Phone (KUR, WAT & SBP)	CUG	Personal Computer	ALL IN ONE PRINTER	FAX	UPS	TV	DTH	Projector	Projector Screen	Digital Clock	Multiple Mobile Charging point	Wi- Fi Acess Point
Disaster Management Room	1	2	3	3	1	2	3	2	3	1	1	2	2	2	1	1	1	1	1
Total :	1	2	3	3	1	2	3	2	3	1	1	2	2	2	1	1	1	1	1

Schematic layout of Central Control



Coaching Control (Shift)

Freight Control (Shift)

Commercial Control

Chapter-17

Chemical Disasters

17.2.4.1 Safety Concerns relating to manufacturing, storage, transportation and handling of hazardous chemicals:

Operating & Commercial department:

1. Inventories at Parcels/goods handling stations should be checked from time to time where the stock of hazardous chemicals is kept. All precautions stipulated in Red Tariff and Commercial Manual must be taken while dealing with such hazardous chemicals like ammonium nitrate ,etc.,
2. All staff dealing with parcel /goods traffic are instructed to take due precautions as stipulated in Red Tariff, Commercial Manual while dealing with the hazardous chemicals like ammonium nitrate ,etc., for their safe transport and immediate disposal.
3. Staff of railway and private sidings where petroleum products or any other hazardous commodities are handled should be sensitized and should be counseled intensively to follow all the related to safe of hazardous materials.
4. All train passing staff be counseled to be more vigilant to detect any unusual occurrences during the passage of trains and expeditious action must invariably be taken , if any unusual occurrences with special emphasis on fire related incidents are noticed during train passage.

Mechanical Department:

1. Hazardous and explosive materials like Ammonium Nitrate (if any) , DA gas, Kerosene oil, Paints & HSD oil etc. used in POH activities at workshops/Store depot to be indentified and mapping should be done for these items. All precautions to be taken for their preservation, storage, transportation and handling.
2. Hazardous waste generated, if any and obsolete/unused hazardous and explosives in the workshop should be timely disposed off.
3. Safety Audits by the authorised agents to be done regularly as the workshop is certified under ISO 9001:2015, ISO 14001: 2015 & OHSAS 18001:2007 which include preventing pollution and mitigation of hazards.
4. Regular patrolling of Security Personnel (RPF) and Safety Officers/Supervisors inside the workshop which comes under Factories Act., around the scrap yards, work premises, stores area inside and along the workshop to avoid any fire and other hazards.
5. Counselling of all supervisors and staff regarding usage, storage and handling of hazardous chemicals/gases should be done regularly.

CHAPTER-22

DISASTER IN TUNNELS/ DEEP CUTTINGS OR IN A WATER BODY

22.1 Expertise To handle Rail Disasters in Tunnels etc. :

The Railways have no expertise or infrastructure to handle a train disaster if it occurs in a tunnel or in a deep cutting not approachable by land. No machinery, or earth moving equipment is available on the Indian Railways which could be mobilized for this job.

22.2 Handling Rail Disasters in a Lake, River, Sea etc. :

The Railways neither has the equipment (cranes operated from barges) nor trained manpower to extricate bodies from a train or coaches fallen down from a bridge on to a water body, viz lake, river or sea etc.

22.3 Assistance of NDRF and State Governments :

The Zonal Railway has to contact the respective NDRF Battalion for assistance; or if trained manpower along with equipment is available then even the resources of the State Government can be made use of.

Knowing that, the railways have no expertise or infrastructure to handle a train disaster if it occurs in a tunnel or in a deep cutting not approachable by land and no machinery or earth moving equipments are available on the Indian Railways which would be mobilized for this job. Therefore, the help of other stake holders or of NDRF has to be taken for this. However all the machinery and earth moving equipment available with private agencies shall also be requisitioned on war footing basis by Engineering Department to be made available at the earliest for meeting such eventualities. The following aspects need to be addressed:

- a) Ventilation requirements for passengers and workmen.
- b) Adequacy of tunnel cross-section from considerations of passenger evacuation in emergencies and restoration in case of derailments
- c) Track structure including ballastless track in tunnels on the pattern of Konkan Railways and track maintenance
- d) Illumination inside the tunnels.
- e) Safety measures and precautions.
- f) Communication facilities.
- g) Availability of High Powered Winch (Pulling Devices) in the ARTs nominated for such sections.

22.4 On East Coast Railways in WAT division,

- (a) The total no of tunnels between Kottavalasa Jn. – Kirandul section (K- K Line) is 58. The list of the tunnels with various geometrical features including its location at Railway Chainage is enclosed as Annexure-A. In this section the no of tunnels having length more than 1 km is Nil, no of tunnels having length between 500m to 1 km is 03 & no of tunnels having length less than 500m is 55 nos.
- (b) Similarly total no of tunnels between Koraput Jn. – Rayagada section (K- R Line) is 36. The list of the tunnels with various geometrical features including its location at Railway Chainage is enclosed as Annexure-B. In this section the no of tunnels having length of more than 1 km is 02, no of tunnels having length between 500m to 1 km is 05 & no of tunnel having length of less than 500m is 29 nos.

22.5 Tunnel should be kept clear of all materials and obstructions all times.

22.6 Division should be in full preparedness for temporary lighting of all tunnels irrespective of availability of permanent lighting in any tunnel in working condition.

22.7 Division should have location (GPS Co-Ordinates) of nearest approach roads for all tunnels in Engineering Control to facilitate the movement of the rescue team and machinery by Road. Division should approach the state authority for proper maintenance and upkeep of approach roads maintained by state govt. particularly for all tunnels. The list of nearest villages as well as the nearest level crossings that are located near each tunnel should be available in the Divisional control room, Working Time Table (WTT) and Divisional Disaster Management Plan.

22.8 Division should explore the provision of ballastless track as provided in Konkan Railway inside the tunnels for atleast few tunnels.

22.9 Ventilation arrangements in Tunnels :

No additional (Forced) ventilation arrangement except natural ventilation is available in any of the tunnels in ECoR.

22.10 Safety In Tunnels

The important factors which have a direct bearing on the safe operations of the trains inside long tunnels are enumerated below:

- a) Tunnel cross-section
- b) Track structure & Maintenance strategy
- c) Lighting inside the tunnels
- d) Availability/Barriers of Communication
- e) Approach roads
- f) Fire fighting equipment inside the tunnels and in the trains
- g) Auxiliary Medical Facilities near the tunnels
- h) Self propelled Accident Relief Medical Van & ARTs
- k) Motor Trolleys
- l) Ventilation of long tunnels
- m) Evacuation and Rescue of passengers

- n) Alarm Chain Pulling
- o) Stalling of trains inside the tunnels
- p) Application of Dynamic Brakes
- q) Instructions to Drivers / Guards and other staff
- r) Additional provisions in the Subsidiary Rules

22.11 Communication

The arrangement of providing telephone sockets at entrance and exit of tunnels in K-K line & K-R line in ECoR have been made. This will mean availability of communication circuits the train crew & guard will be able to contact the Divisional Control in case of emergencies.

22.12 Firefighting Equipment

The objective world over is more to minimize the damage to human life and property. As a precaution to avoid a train on fire either entering a tunnel or stopping inside the tunnel. It is proposed to install a special track-side indicator board W/T short of tunnels longer than 800 m in length. On observing this indicator Loco Pilot will give a long continuous whistle and as a response to this the Asst. Loco Pilot and the Guard will keep a sharp look-out to detect any fire or unsafe feature on the train. If fire is noticed anywhere on the train the Asst. Loco Pilot will alert the Loco pilot. The Loco Pilot shall sound frequent short whistles to alert the staff on the track side as well as in the train of the apprehension of the danger. The loco pilot shall stop the train, if possible, before entering the tunnel. If it is not possible to stop the train before entering the tunnel the loco pilot will make all efforts to go through the tunnel and then stop the train out in the open. Stoppage of a 'train on fire' inside any tunnel shall be avoided. For the firefighting on the train, the tunnels and the trains are to be provided with requisite equipments.

(a) Equipment inside the Tunnels

In all the tunnels trolley refuge and man refuges are equipped and details are enclosed at annexure-

(b) On board the Trains:

Running trains are provided with fire extinguishers to the following scale :

- i. Each locomotive
- ii. Each brake van
- iii. AC coaches
- v. Pantry car
- vi. Generator Van
- vii. Departmental Coaches
- vii. D.M.Us/MEMUs
- viii. D.M.U. Push-Pull.

ix. Insp. Carriages:

- Loco Pilot / Guards / Asst. Loco Pilot / Passenger Assts. / Coach Attendants/ Ventilation Controllers/ SM's & ASM's of stations shall be trained in the usage of the fire extinguishers kept in the tunnel as well as in the trains. Their proficiency in this should be tested during Refresher Course of the all concerned.

© . Auxiliary Medical Facilities in the vicinity of tunnels

Divn	Location	Scale	Facilities Available
VSKP	VSKP	Scale-I	3 Coach SPARME with higher capacity HRD equipment & Plasma cutting equipment.
	KRPU	Scale-I	3 Coach SPARME with higher capacity HRD equipment & Plasma cutting equipment.
	RGDA	Scale-I	3 Coach SPARME with higher capacity HRD equipment & Plasma cutting equipment.
	ARK	Scale-II	
	KRDL	Scale-II	
	JDB	Scale-II	
	LKMR	Scale-II	

- In the nearest stations of Tunnels an imprest of medical equipment and medicines as per POMKA scale shall be maintained.
- POMKA scale medical equipments in Health Units available in K-K line at ARK, KRPU, JDB, BCHL, KRDL and K-R line at RGDA & LKMR. Emergency Telephone numbers for health units is available at Annexure-2.

(d) Availability of Accident Relief Train (ARTs) & 140/120 T Cranes:

Divn	Location	Class	Facilities Available
WAT	VSKP	A	140 T & 120 T Diesel BD Crane with HRE Equipment
	RGDA	B	With Hydraulic Re-railing Equipment (140 T BD Crane will be stationed at RGDA shortly)
	KRPU	A	140 T+120 T Diesel BD Crane with HRE Equipment
	KRDL	A	120 T Diesel BD Crane with HRE Equipment

- All ARTs are equipped with 60T Pulling device in the standard list for pulling out derailed vehicles out from the tunnels.

The inspection, maintenance and operation of these vans shall be under the Breakdown organization under the overall control of Mechanical Department. The Medical part of the equipment shall be periodically checked by the nominated medical officer. The schedule of inspections of these vans shall be the same as for breakdown trains.

As per the experience gained in the tunnel derailment in between Darlapudi-Gorapur stations on dt 18/12/2012, and as per the recommendations of SAG level committee, the experienced break down staff should be immediately moved to the site in case of derailments/accidents inside a tunnel.

4. Ventilation of long tunnels.

Provision of Ventilation in K-K line and K-R line are enclosed at *Annexure-35 &36*

5. Evacuation and Rescue of passengers

It should be ensured by plying vestibule rakes over K-K & K-R lines as far as possible.

It is to be ensured that the vestibules are maintained in order and the rolling shutters between the coaches are kept OPEN during the train's journey on the K-R & K-K lines as far as possible.

a. In case of fire on a coach/coaches and train coming to a halt inside a tunnel

1. The Passenger Assistants shall immediately evacuate the passengers to the adjacent coaches through the vestibules. The TTEs/OBHS staff/ AC attendants/ Escorting Staff of adjacent coaches shall commence the operation of putting off the fire simultaneously. After complete evacuation the rolling shutters of coaches on fire to be closed to contain the spread of fire.
2. After the train comes to a halt the LP / ALP and Guard will immediately intimate the Divisional Control / Adjacent Stations through the available communication modes.
3. On receipt of this information the Divisional Control shall inform the SM's of the adjacent stations to inform the local Fire Brigades and hospitals consulting them to render necessary assistance.
4. After that they shall detach the rear part of the train (behind the coach on fire) and pull the train ahead - if possible the front part of the train shall be taken out of the tunnel by securing the affected coach/coaches. They shall put on the lights inside the tunnel .Following this they will detach the coaches on fire and move the front portion further ahead clear of the zone of fire.
5. The ALP and Guard shall protect the portions of the train and secure them keeping in mind the gradient of the section.
6. In the mean while the Coach Attendants / Train Superintendent / TTEs/ OBHS staff/AC attendants/ Escorting Staff shall continue the fire fighting operation and rescue any entrapped / injured passengers.
7. The passengers in the rear portion of the train left in the tunnel shall be evacuated via the nearest opening of tunnel.
In case it is not possible to pull out the front portion of the train from inside the tunnel and/or detach the rear part of the train the passengers in the rear portion should be evacuated through the vestibules to the rearest coach of the train and those in the front portion through the vestibules towards the front most coach of the train.
8. The Divisional Control on receipt of the information shall immediately alert the adjacent stations, SPARMEs/ARTs, Ambulances and issue instructions for their movement towards the site.
9. The Medical Officers in-charge of the SPARMEs/ Ambulance shall move to the site along with the Ambulances or SPARMEs. They shall carry with them paramedical staff.

10. The Divisional Control shall clear the adjacent yards of any stabled loads or trains to facilitate receipt and dispatch of relief trains. The Control shall also arrange one additional Diesel loco on either side expeditiously to facilitate pulling out of the parts of the affected train.
11. Station Masters of adjacent stations shall immediately alert local hospitals and request for doctors and ambulances. They shall also request help from the local fire brigades.

(b) Derailments inside a tunnel:

In case of derailment of passenger carrying train inside the tunnel, procedure identical to the above shall be implemented.

- (i) LP / ALP / Guard shall provide illumination by operating switches provided inside the tunnel. After obtaining permission from the Guard, the unaffected front portion shall be uncoupled and drawn ahead of the tunnel.
- (ii) TS / TTEs// OBHS staff/ AC attendants/ Escorting Staff shall assist in evacuating passengers to the front or the rear coach through the use of vestibules and transshipped to the unaffected coaches and First aid rendered to the injured.

(c) Fire on a train coming to a halt outside a tunnel:

In such cases the same drill as in (a) above shall apply. The only difference being evacuation of passengers from the tunnel which is an arduous task which will not be necessary.

6. Stalling of Train inside a tunnel

In case the loco is unable to haul the train, the train should be brought to a halt outside the tunnel, the train is protected and help sought by contacting the Divisional Control. If the train stalls inside the tunnel, under no circumstances the loco pilot shall resort to repeated and sudden notching up as this will cause excessive emission of smoke in Diesel Locomotives. In such instances the loco pilot and Guard shall secure the train and protect it and thereafter switch on the tunnel lights and contact the Divisional Control and seek necessary assistance. In case of a passenger carrying train, the staff shall explain the situation to the passengers to avoid panic. Evacuation of passengers shall be decided only after consulting the Divisional Control.

8 Application of Dynamic Brakes

Application of dynamic brakes in Diesel loco generates heavy smoke emissions. Loco pilots during the 'Learning of the Road' shall be explained this phenomenon and directed not to make use of dynamic brakes in Diesel loco inside the tunnels.

9 Sign boards inside tunnels.

Schematic representation of various signs (exit, light, fire extinguisher, phone socket) to be painted on tunnel walls with luminous paint for clear indication of the railway servants and passengers.

10 Instructions to LP / ALP working in tunnels:

- i. Ensure that personal and engine equipment are complete.

- ii. Avail of complete and adequate rest before joining the duty.
- iii. Be conversant with speed restrictions in force and go through Safety Circulars before taking over charge.
- iv. Examine the engine for road worthiness.
- v. Ensure Sanding gears, wipers are in working order.
- vi. Note that application of Rheostatic brakes in Diesel Locos is not permitted inside tunnels.
- vii. Check the brake power for effective control of the train.
- viii. Check and ensure that headlights, flasher lights & marker lights are focused and burn brightly. Carry spare bulbs for emergency use.
- ix. Exchange all right signals with station staff and Guard to assure yourselves that the train is following complete and in a safe manner.

- x. Use engine whistle while approaching "W/T" Engineering indicator board.
- xi. Indicator erected to intimate that the train is approaching long tunnel.
- xii. Look back to ensure that the train is running in a safe and proper manner exchange all right signal with Guard.
- xiii. Be alert on the run, keep the engine headlight & marker lights burning while entering and passing through tunnels.
- xiv. Never detach the train from the formation in the block section without permission of the Guard and unless the load is secured by pinning of hand brakes to avoid rolling of load.

Chapter- 2

Objectives (New Addendum)

2.8.1 Disaster Risk Reduction (DRR):

The collection of data and formulation of vulnerability Atlas is a prime step to work towards Disaster Risk Reduction (DRR). During the Asian Ministerial conference in Nov'2016, Indian Government committed on disaster related issues and Prime Minister of India announced a Ten Point Agenda outlining the Indian Government's commitment to Disaster Risk Reduction (DRR). As a follow up action vulnerability Atlas was launched on 2nd March 2019 by Building Material Technology Promotion Council (BMTPC).

This ten point agenda has become a guiding factor for all Disaster Risk Reduction (DRR) activities and Programmes. National Disaster Management Authority (NDMA) has finalised the National Disaster Management Plan-2019 giving special emphasis to the ten point agenda.

Ten Point Agenda is given as under:

Sl.No	Agenda points of PM Ten point Agenda	Suggested Actions taken
1	Agenda- 1: All development sectors must imbibe the principles of disaster risk management	The preparedness action plan, responsibility in disaster risk management is included in chapters no- 4,10,11,12,13,14,15,17,20,22,24 DM plan 2020.
2	Agenda- 2: Risk coverage must include all, starting from poor households to SMEs to multi –national corporations to nation states	Based on NDMA guidelines & important provisions exist in section 35, 36, 37 the said subject is being addressed & is included in all types of disasters discussed in chapter No 1 of DM Plan.
3	Agenda- 3: Women's leadership and greater involvement should be central to disaster risk management	All officers and railway staff including women officers and staff will be part of the disaster management teams in Division, HQs as detailed in chapter no 20 &

		30 and in Divisional and Central Hospitals.
4	Agenda- 4: Invest in risk mapping globally to improve global understanding of Nature and disaster risks	The vast subject of nature and disaster risk has to be understood with the available infrastructure to face and meet these disasters and therefore coordination with approach/Response of all depts including the national agency and state agency viz., NDRF & ODRAF, IMD etc., have been placed in DM plan in chapters related to natural disasters, chemical disasters and medical disasters.
5	Agenda- 5: Leverage technology to enhance the efficiency of disaster risk management efforts.	The existing technology including the standard protocol as usual followed for addressing the situation have been already placed in Zonal DM plan where ever required. Information is shared with concerned departments by making joint Whatsapp groups for making the decisions and dissemination of informations contained in decisions is made faster.
6	Agenda-6: Develop a network of universities to work on disaster related issues	The importance of Disaster management related training to officers & staff is taken care of by effective disaster management Institutions established by Railways viz., IRITM , IRIDM &

		<p>NAIR and ZTIs ,STCs & MDTIs for the staff.</p> <p>The curriculum is also included in the other centralized training institutes like IREEN,IRSEN,IRISET, IRIMEE ,etc.</p>
7	Agenda-7: Utilise the opportunities provided by social media and mobile technologies for disaster risk reduction	<p>The subject as said is the part of disaster communication management & has been included in DM plan. And information about various disasters, their causes and lessons learnt along with still photographs, videos and repercussions are shared with other railways and divisions to take corrective action and strengthen the safety systems.</p>
8	Agenda-8: Build on local capacity and initiative to enhance disaster risk reduction.	<p>Learning from the past experiences of facing and dealing with cyclones and super cyclones, local capacity available in the market to meet the exigencies have been kept in the preparedness plan of the DM plan and is available in annexure No 7 &12 and in chapters no11.These have also been included in the Divisional Disaster Plan Chapters and Annexures too .</p>
9	Agenda-9: Make use of every opportunity to learn from disasters and,	<p>Lessons learnt from the past disasters haven been made a part</p>

	to achieve that, there must be studies on the lessons after every disaster.	of the relevant chapters of DM plan and are being discussed elaborately in the refresher training programs conducted for various categories of the staff of all open line departments and case studies are taught to them too in ZTIs ,STCs & MDTIs.
10	Agenda-10: Bring about greater cohesion in international response disasters	The joint exercise for Disaster Management on National level (NDRF) & State level (ODRAF) with full scale mock drill is being undertaken as matter of inter coordination agency communication in order to strengthen the disaster risk governance and testing of the preparedness. All those materials facts relating to the agenda having relevancy on the Disaster Management in Railway are incorporated in the Zonal Disaster Plan for active guidance & reference.

Chapter-31

Provision/Continuation of activities of Station, Division Control Room & Head Quarter Control Room in case they are affected by Disasters.

Contingency Plan for Station Disasters:

Following Emergency situations may arise at station in general.

- Major Fire/Smoke in station buildings / station periphery.
- Fire/Smoke in or under the Train in station yard.
- Natural Disasters- Severe cyclone, Land fall, Earthquake, Floods, Snow fall and land slide, etc.,
- Chemical Disasters and Medical Disasters
- Major Derailment, Collision, Structural Collapse at station including FOB/FUB.
- Civil Disorder / strike.
- Bomb Threat, Flammable/Combustible Liquid/ Vapour Intrusion/ Gas leakage, etc.,
- Power Grid failure/ Power Companies strike & Total communication failure.

All on duty Station Masters and other staff should be aware of emergency contact telephone numbers of local resources and stake holders likely to be contacted to meet the above emergency situations. Such particulars may be available in a chart-form in front of SM / wall painting of SM building and Disaster Management Plan.

At the time of any emergency situation, on duty SM shall arrange announcement / ring the warning bell to attract the attention of all Railway staff of all departments, passengers and other public. All shall be told to assemble at the assembly spot / Circulating area of the station in search, relief, rescue & restoration of activities under direction of SM or senior official/officer in station after assessing the actual damages.

In case of Fire:-

Prompt action is required to shift entrapped passengers and try to extinguish fire by using fire buckets & fire extinguishers initially according to the procedure as discussed in Chapter of Fire disaster. To control the fire, nearest Fire Brigade may be contacted to send the fire tenders.

In case of natural disaster:- SOP for concerned disaster may be adopted as discussed in concerned disaster management chapters.

Major Derailment, Collision, Structural Collapse:-Following steps to be ensured by SM , when an accident takes place in station limit and station building is affected.

- Inform Section Controller, TPC controller and all other concerned with requirement of assistance after assessing the gravity/damage of accident systematically as prescribed in rules. (If Control telephone is out of order then advise both adjacent and other major stations with the help of CUG mobile phones or other means of communications)
- Take the assistance from non-Railway stake holders if available near the station. Ask assistance from NDRF, State Disaster response force through Divisional Officers, fire team, local administration & police etc.
- Ensure that no train enters the affected section. Affected sections as well as adjacent lines is protected.
- Call all the off-duty staff of all departments in station and allot them specific duties for relief & rescue.
- Render medical aid locally through nearest hospitals, dispensaries and doctors. Take help from local transportation agencies, Local Civil Authorities & Police.
- Arrange protection of Railway & public property.
- Arrange opening of Help Booths/Helplines with manning for round the clock for giving ready information to public regarding names & address of injured /dead passengers and regulation of trains.
- Provide all sort of assistance to affected passengers such as food, drinking water, free message to relatives with the help of commercial dept and NGOs.
- Arrange for the sectional clearance of unaffected vehicles for restoration except the accidents suspected to be sabotage.

In case of Civil Disorder / strike /Riot:- Any breach of the peace by a group of people assembled in one area or gathering of unruly mob which may develop into a riot. The riot may result into violence by setting fire, looting, attacking civilians / passengers.

The station area & premises should be protected by Security Personnel of RPF, GRP, Civil Defense & private Security by classifying the Zones according to SOPs of Railway Protection Force (RPF).

Hot Zone- Un stable, Potentially unsafe.

Warm zone- The area is relatively safe for emergency.

Cold Zone- Safe Area with little likelihood of unrest.

Bomb Threat, Flammable/Combustible Liquid/ Vapour Intrusion/Gas Leakage:-

- Ensure that no train enters the affected section. An affected section as well as adjacent lines is protected and inform section controller.
 - RPF/ GRP and Local Police along with Dog squad, Bomb Squad and Inspector of Explosives to be informed immediately.
 - It should be ensured by repeated announcements that, the immediate vicinity of suspect object area is vacated so as to reduce loss of lives in the eventuality of explosion before Bomb Disposal Squad reaches the spot. Local Police/ GRP/ RPF should carry out the following.
 - Clean / evacuate the area.
 - Screen the suspect object by putting sand bags around it.
 - Ensure that no one touches or approaches the suspect object.
 - Ensure that all emergency exit paths are open & clear of obstructions.
 - Ensure proper and periodic announcements.
- (Precaution:- Luggage scanner & analytic CC Camera reports may be reviewed in the mean time Bomb Squad and Dog Squad arrives.)

Immediate Temporary Arrangements:-

Structural Failure/ damage:- Temporary arrangement for shelters will be organized by works department (Engineering) by engaging tent houses and other materials locally available on purchase / rent for immediate functioning of Station, if no alternative service building is available in the vicinity. If a surplus service building can be indentified a temporary station working may be commissioned with connection to section control & TPC.

Power Grid Failure & Total communication failure:- In case of Power Grid Failure & Total communication failure, the same will be arranged by Electrical department immediately by organizing / arranging DG sets departmentally or locally on rent basis till the permanent restoration. Similarly, alternate means of communication facilities to be organized by S&T department.

Responsibilities of various Departments.

Activity	Responsibility (Department)
Rescue operation	Mechanical & Medical
Relief operation including care for dead/injured/critical	Commercial, Medical & Security
Structure	Engineering (Works)
Lighting /Electrification	Electrical
Communication net works	S&T
Crowd control, Law & order	Security
Restoration of rolling stocks	Mechanical
Restoration of Fixed structures like Track, OHE etc	Concerned departments

Media Management	Site Manager, Public Relations and Commercial
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Contingency Plan for Division Control Room & HQ Control Room Disasters:

Emergency Preparedness Concept:

This consists of two phases such as Preventive Phase and Responsive Phase. The Preventive phase consists of preventing the occurrence of the incident or accident. The Responsive phase consists of response once an incident has occurred and with minimizing its effect.

Short Term: If the control room in division or at Head Quarter is disturbed or interrupted due to cyclones, earth quakes or due to any Medical Disasters, etc., the following steps may be taken for emergency and smooth train operations:

In case of exigencies like earthquake/Cyclone/Chemical disaster/Biological disaster or any other similar disaster wherein there is damage to the existing control room & could not function in the normal way necessitating provision of an alternate temporary control room so as to ensure that the safe train movement is not affected.

In such exigencies it is imperative that Divisional control as well as Headquarter control should have provisions of alternative arrangements of temporary control rooms for which following arrangement should be kept in place by respective departments at divisions/HQ to meet the exigencies.

CIVIL Engineering:

Civil engineering department at divisions and Headquarter should identify alternative locations for setting of temporary control rooms in and around existing controls depending upon the situation prevailing at the time of disaster. A plan of temporary control room duly approved by GM/DRM showing dimensioned space for each department should be available. Accordingly provision of POTA CABINS of adequate capacity shall be kept in their maintenance contract so as to cater for temporary control room during aforementioned disaster. Apart from this, they should arrange the following items for operation of temporary control.

- a. Hard & Soft copies of all miniature yard plans, system maps, time table.
- b. Manning of the temporary control office.
- c. Office stationeries

Electrical Department:

The electrical department of the Division as well as Headquarter should arrange the following items.

- a. DG sets of adequate capacity for power supply to the control rooms along with Diesel.
- b. Transformers, Switch Gears to be arranged for emergency Electric Wiring and cabling for general lighting and electrical supply to other appliances.

S & T Department:-

The S&T department of the Division as well as Headquarter should arrange the following items.

Telecom works to be carried out as following:

For Divisions:

- a. PVC cable to be laid from existing control office/near exchange telecom room to newly identified area consisting of POTA cabins/tents in which all sectional boards and control phones to be connected.
- b. New Headquarter equipments along with 12 volt power pack, mike and speakers to be connected parallel so that all boards can work immediately without intervention of S & T department.
- c. Headphones to be provided to all controllers.
- d. To extend rail net, adequate number of LAN extender setups to be connected from exchange rail net room to identified new areas. Their local LAN wiring is to be done temporarily to use rail net for all users/controllers as per the demand.

e. 24 port manageable switches to be installed at exchange room that is one for COA and one each for FOIS/ COIS through OFC can be extended to all control boards and for USF controllers also. The identified new areas to be facilitated with fibre termination so that rail net can be used on the same fibre.

f. All telephones viz., Auto & intercom phones related to control boards to be shifted as per the demand by users.

g. One 50 pair PVC cable to be laid to newly identified areas for further use of communication as per demand for divisions.

h. Relevant Sketch & List of Materials/equipments required for Division are enclosed at **Annexure-34**.

i. **For Head Quarter Control Rooms:**

a) PVC cable to be laid from existing control office/near exchange telecom room to newly identified areas in the chosen service building consisting in which all sectional boards and control phones to be connected.

b) New Headquarter equipments along with 12 volt power pack, mike and speakers to be connected parallel so that all boards can work immediately without intervention of S & T department.

c) Headphones to be provided to all controllers.

d) To extend rail net, as per requirement LAN extender to be connected from exchange/ rail net room to identified new areas from their local LAN wiring to be done temporarily to use rail net for all users/controllers as per the demand.

e) 24 port manageable switches to be installed at exchange room that is one for COA and one each for FOIS/COIS through OFC can be extended to all department controls. The identified new areas to be facilitated through fibre termination so that rail net can be used on the same fibre.

f) All telephones viz., Auto & intercom phones related to departmental controls to be shifted as per the demand by users.

g) Adequate 50 pair PVC cable to be laid to newly identified areas for further use of communications as per demand.

h) Relevant Sketch & List of Materials/equipments required for Head Quarters are enclosed at ***Annexure-35***.

Store Department:-

- VDUs/PCs/Monitors/ Desk tops, Printers, Zerox machines to be provided on hire basis.
- The store department of the Division as well as Headquarter should arrange the furniture & other peripherals/office stationeries for the temporary control room for all departments of control room on hire basis.

Commercial Department:

1. Arrange hired buses/taxis to be provided into service with RPF staff available in the buses /coordinate with local police for transportation of control staff from their home to work places to attend duties during disasters.
2. Arrangement of food and temporary accommodation for the control staff to stay long duration due to absence /impracticability of arriving the relieving staff reaching place of work.

Distribution of Houses by Predominant Materials of Roof and Wall and Level of Damage Risk

ANDHRA PRADESH

Wall / Roof		Census Houses		Level of Risk under								
		No. of Houses	%	EQ Zone				Wind Velocity m/s				Flood Prone Area in %
				V	IV	III	II	55 & 50	47	44 & 39	33	
				Area in %				Area in %				
						35.3	64.7	30.1	8.2	46.9	14.9	9.9
WALL												
A1 - Mud & Unburnt Brick Wall	Rural	1,420,062	10.0									
	Urban	227,015	1.6									
	Total	1,647,077	11.6			M	L	VH	H	M	L	VH
A2 - Stone Wall not packed with mortar	Rural	473,780	3.3									
	Urban	151,495	1.1									
	Total	625,275	4.4			M	L	H	M	L	VL	VH
Total - Category - A		2,272,352	16.0									
B - Burnt Bricks Wall & Stone wall packed with mortar	Rural	6,973,104	49.0									
	Urban	3,478,467	24.5									
	Total	10,451,571	73.5			L	VL	H	M	L	VL	H/M
Total - Category - B		10,451,571	73.5									
C1 - Concrete Wall	Rural	114,705	0.8									
	Urban	126,292	0.9									
	Total	240,997	1.7			VL	VL	L	VL	VL	VL	L/VL
C2 - Wood Wall	Rural	108,667	0.8									
	Urban	14,975	0.1									
	Total	123,642	0.9			VL	VL	VH	H	M	L	H
Total - Category - C		364,639	2.6									
X - Other Materials	Rural	992,759	7.0									
	Urban	139,931	1.0									
	Total	1,132,690	8.0			VL	VL	VH	H	M	L	VH
Total - Category - X		1,132,690	8.0									
TOTAL HOUSES*		14,221,252										

ROOF												
R1 - Light Weight Sloping Roof	Rural	3,481,149	24.5									
	Urban	953,728	6.7									
	Total	4,434,877	31.2			L	VL	VH	VH	H	M	VH
R2 - Heavy Weight Sloping Roof	Rural	2,034,889	14.3									
	Urban	407,105	2.9									
	Total	2,441,994	17.2			L	VL	H	M	L	VL	H
R3 - Flat Roof	Rural	4,567,039	32.1									
	Urban	2,777,342	19.5									
	Total	7,344,381	51.6	Damage Risk as per that for the Wall supporting it								
TOTAL HOUSES*		14,221,252										

Housing Category : Wall Types

Category - A : Buildings in field-stone, rural structures, unburnt brick houses, clay houses

Category - B : Ordinary brick building; buildings of the large block & prefabricated type, half-timbered structures, building in natural hewn stone

Category - C : Reinforced building, well built wooden structures

Category - X : Other materials not covered in A,B,C. These are generally light.

Notes : 1. Flood prone area includes that protected area which may have more severe damage under failure of protection works. In some other areas the local damage may be severe under heavy rains and choked drainage.

2. Damage Risk for wall types is indicated assuming heavy flat roof in categories A, B and C (Reinforced Concrete) building

3. Source of Housing Data : Census of Housing, GOI, 2011

Housing Category : Roof Type

Category - R1 - Light Weight (Grass, Thatch, Bamboo, Wood, Mud, Plastic, Polythene, GI Metal, Asbestos Sheets, Other Materials)

Category - R2 - Heavy Weight (Tiles, Stone/Slate)

Category - R3 - Flat Roof (Brick, Concrete)

EQ Zone V : Very High Damage Risk Zone (MSK > IX)

EQ Zone IV : High Damage Risk Zone (MSK VIII)

EQ Zone III : Moderate Damage Risk Zone (MSK VII)

EQ Zone II : Low Damage Risk Zone (MSK < VI)

Level of Risk : VH = Very High; H = High;

M = Moderate; L = Low; VL = Very Low

* Total No.of Houses excluding Vacant/Locked Houses

Distribution of Houses by Predominant Materials of Roof and Wall and Level of Damage Risk

CHHATTISGARH

Wall / Roof		Census Houses		Level of Risk under								Flood Prone Area in %
		No. of Houses	%	EQ Zone				Wind Velocity m/s				
				V	IV	III	II	55 & 50	47	44 & 39	33	
				Area in %				Area in %				
STATE - CHATTISGARH						18.6	81.4			100		
WALL												
A1 - Mud & Unburnt Brick Wall	Rural	3,515,942	55.3									
	Urban	403,885	6.3									
	Total	3,919,827	61.6			M	L			M		
A2 - Stone Wall not packed with mortar	Rural	110,865	1.7									
	Urban	14,730	0.2									
	Total	125,595	1.9			M	L			L		
Total - Category - A		4,045,422	63.6									
B - Burnt Bricks Wall & Stone wall packed with mortar	Rural	1,133,013	17.8									
	Urban	983,896	15.5									
	Total	2,116,909	33.3			L	VL			L		
Total - Category - B		2,116,909	33.3									
C1 - Concrete Wall	Rural	25,793	0.4									
	Urban	26,695	0.4									
	Total	52,488	0.8			VL	VL			VL		
C2 - Wood wall	Rural	30,451	0.5									
	Urban	7,147	0.1									
	Total	37,598	0.6			VL	VL			M		
Total - Category - C		90,086	1.4									
X - Other Materials	Rural	80,836	1.3									
	Urban	27,858	0.4									
	Total	108,694	1.7			VL	VL			M		
Total - Category - X		108,694	1.7									
TOTAL HOUSES*		6,361,111										

ROOF												
R1 - Light Weight Sloping Roof	Rural	533,256	8.4									
	Urban	268,487	4.2									
	Total	801,743	12.6			L	VL			H		
R2 - Heavy Weight Sloping Roof	Rural	3,758,281	59.1									
	Urban	490,440	7.7									
	Total	4,248,721	66.8			L	VL			L		
R3 - Flat Roof	Rural	605,363	9.5									
	Urban	705,284	11.1									
	Total	1,310,647	20.6	<i>Damage Risk as per that for the Wall supporting it</i>								
TOTAL HOUSES*		6,361,111										

Housing Category : Wall Types

Category - A : Buildings in field-stone, rural structures, unburnt brick houses, clay houses

Category - B : Ordinary brick building; buildings of the large block & prefabricated type, half-timbered structures, building in natural hewn stone

Category - C : Reinforced building, well built wooden structures

Category - X : Other materials not covered in A,B,C. These are generally light.

Notes : 1. Flood prone area includes that protected area which may have more severe damage under failure of protection works. In some other areas the local damage may be severe under heavy rains and choked drainage.

2. Damage Risk for wall types is indicated assuming heavy flat roof in categories A, B and C (Reinforced Concrete) building

3. Source of Housing Data : Census of Housing, GOI, 2011

Housing Category : Roof Type

Category - R1 - Light Weight (Grass, Thatch, Bamboo, Wood, Mud, Plastic, Polythene, GI Metal, Asbestos Sheets, Other Materials)

Category - R2 - Heavy Weight (Tiles, Stone/Slate)

Category - R3 - Flat Roof (Brick, Concrete)

EQ Zone V : Very High Damage Risk Zone (MSK > IX)

EQ Zone IV : High Damage Risk Zone (MSK VIII)

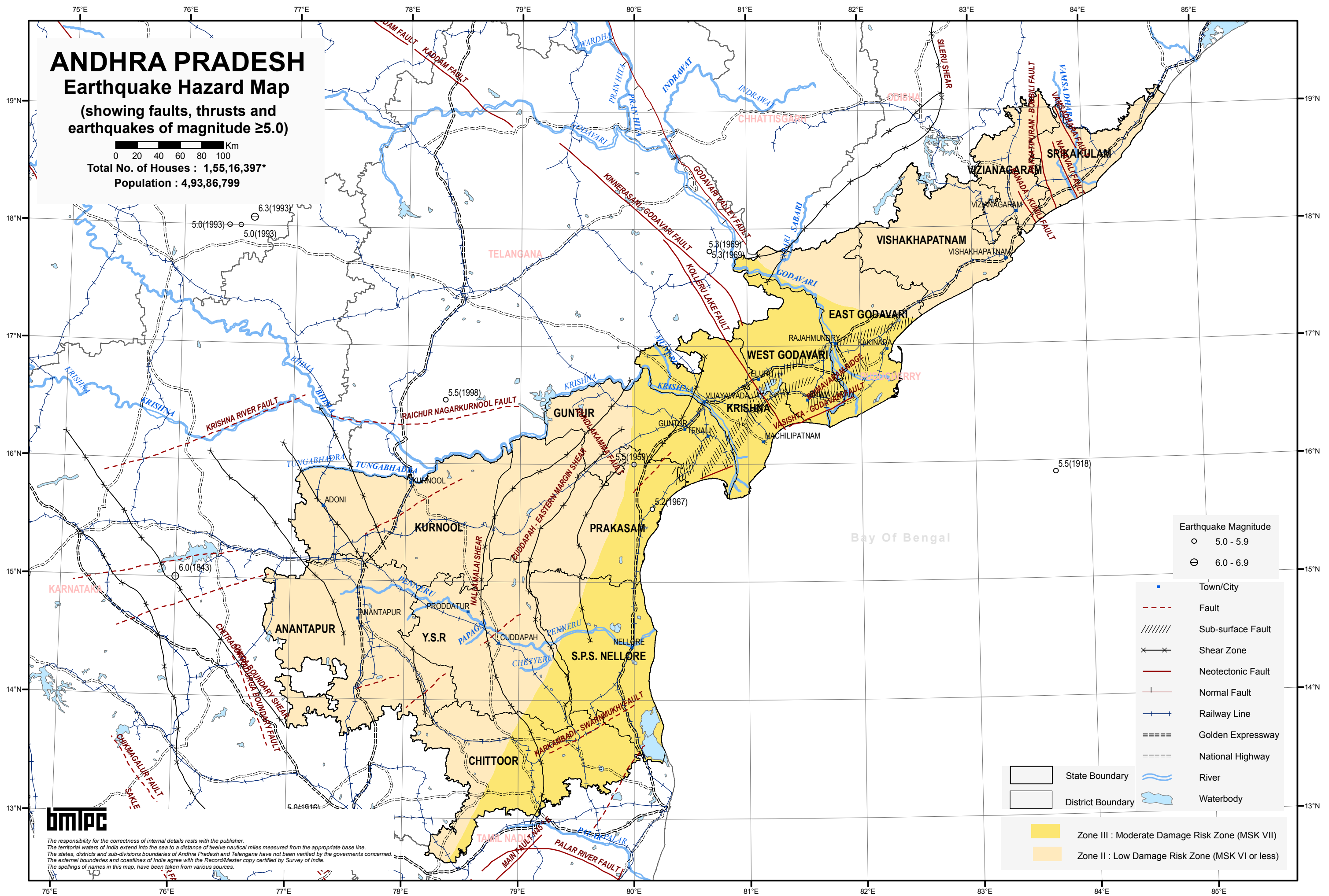
EQ Zone III : Moderate Damage Risk Zone (MSK VII)

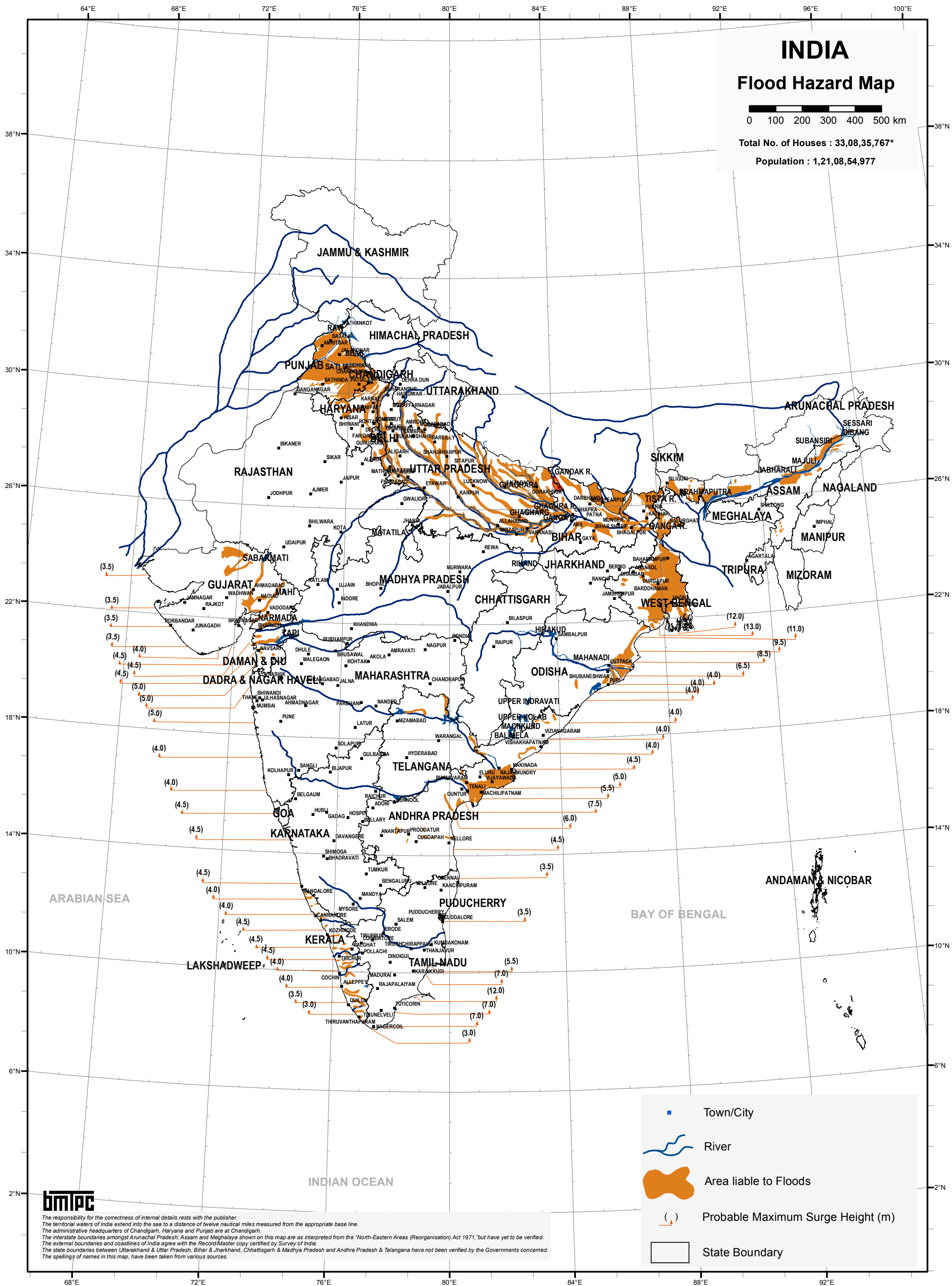
EQ Zone II : Low Damage Risk Zone (MSK < VI)

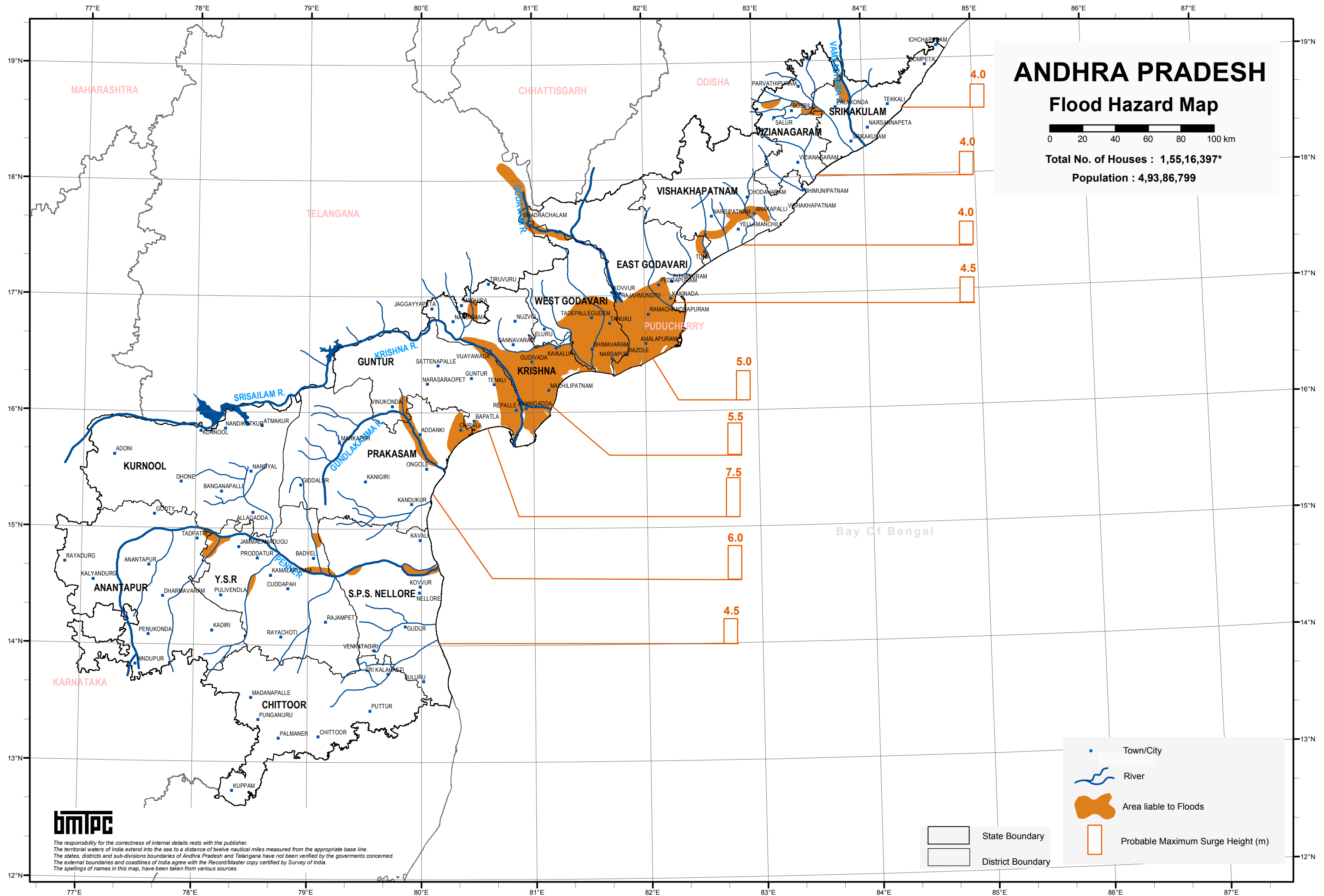
Level of Risk : VH = Very High; H = High;

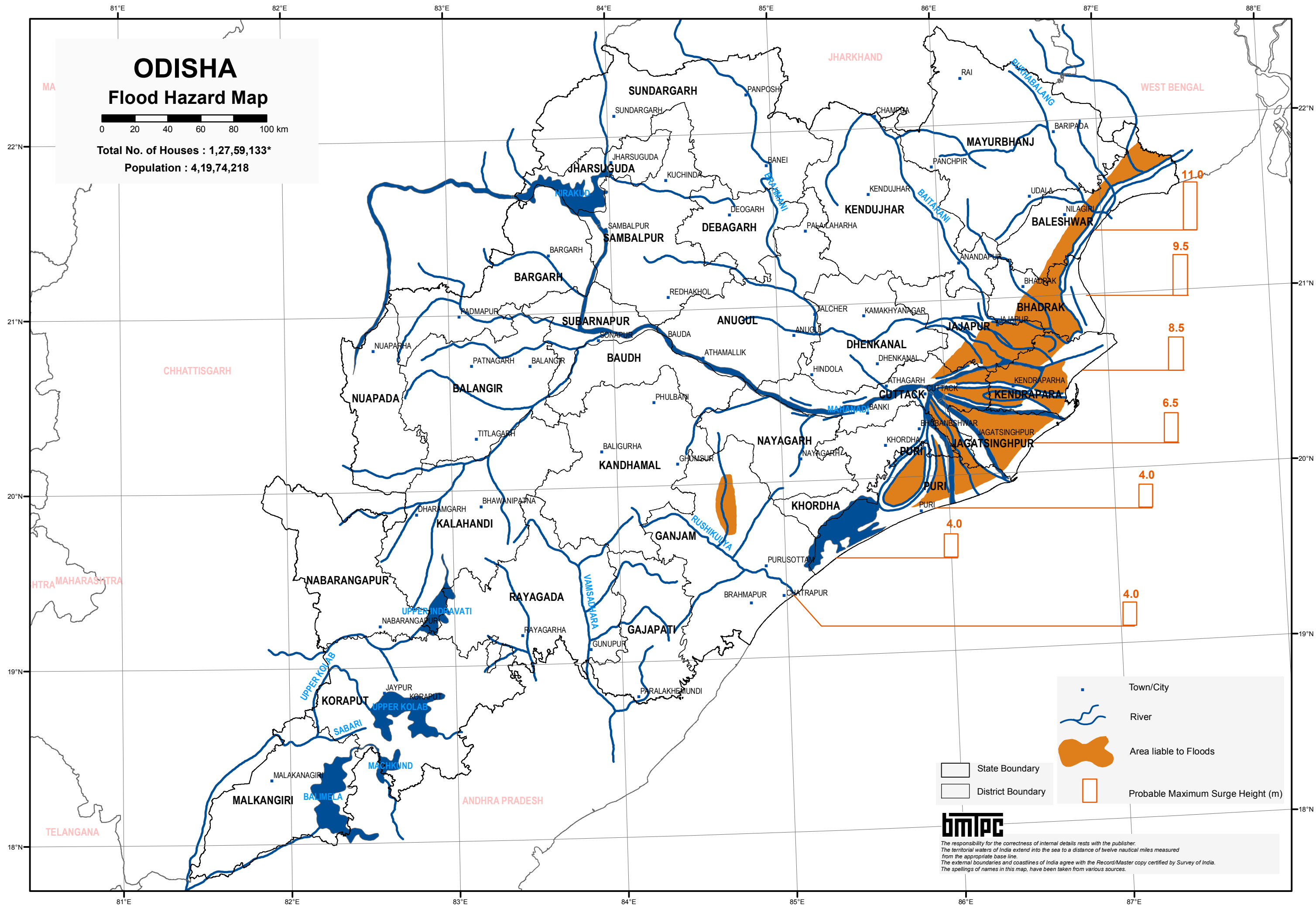
M = Moderate; L = Low; VL = Very Low

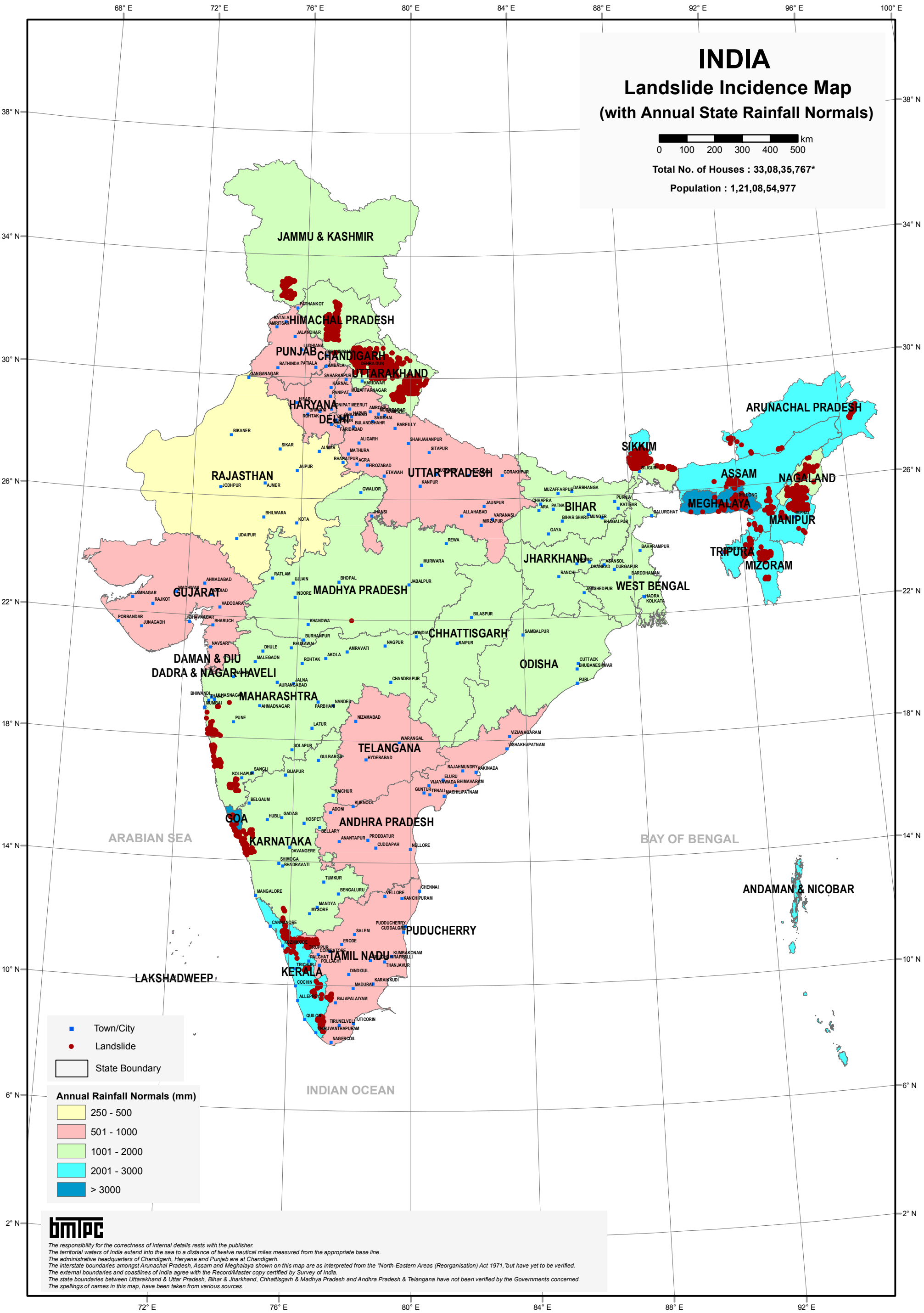
* Total No. of Houses excluding Vacant/Locked Houses











BMTPC: Vulnerability Atlas - 3rd Edition: Peer Group, MoHUA,GOI: Map is Based on digitised data of SOI; Landslide Incidence data GSI; Annual Rainfall data IMD. Houses/Population as per Census 2011;
* Houses including vacant & locked houses. Disclaimer: The maps are solely for thematic presentation.

Distribution of Houses by Predominant Materials of Roof and Wall and Level of Damage Risk

ODISHA

Wall / Roof		Census Houses		Level of Risk under										Flood Prone Area in %
		No. of Houses	%	EQ Zone				Wind Velocity m/s						
				V	IV	III	II	55 & 50	47	44 & 39	33			
				Area in %				Area in %						
STATE - ODISHA						14.8	85.2	30.2	25.0	44.8		4.9		
WALL														
A1 - Mud & Unburnt Brick Wall	Rural	4,883,041	40.6											
	Urban	334,112	2.8											
	Total	5,217,153	43.4			M	L	VH	H	M		VH		
A2 - Stone Wall not packed with mortar	Rural	155,681	1.3											
	Urban	27,780	0.2											
	Total	183,461	1.5			M	L	H	M	L		VH		
Total - Category - A		5,400,614	44.9											
B - Burnt Bricks Wall & Stone wall packed with mortar	Rural	3,685,752	30.7											
	Urban	1,400,296	11.7											
	Total	5,086,048	42.4			L	VL	H	M	L		H/M		
Total - Category - B		5,086,048	42.3											
C1 - Concrete Wall	Rural	118,647	1.0											
	Urban	87,545	0.7											
	Total	206,192	1.7			VL	VL	L	VL	VL		L/VL		
C2 - Wood wall	Rural	294,534	2.5											
	Urban	32,928	0.3											
	Total	327,462	2.8			VL	VL	VH	H	M		H		
Total - Category - C		533,654	4.4											
X - Other Materials	Rural	910,213	7.6											
	Urban	88,160	0.7											
	Total	998,373	8.3			VL	VL	VH	H	M		VH		
Total - Category - X		998,373	8.3											
TOTAL HOUSES*		12,018,689												

ROOF												
R1 - Light Weight Sloping Roof	Rural	5,177,844	43.1									
	Urban	761,014	6.3									
	Total	5,938,858	49.4			L	VL	VH	VH	H		VH
R2 - Heavy Weight Sloping Roof	Rural	2,957,391	24.6									
	Urban	259,301	2.2									
	Total	3,216,692	26.8			L	VL	H	M	L		H
R3 - Flat Roof	Rural	1,912,633	15.9									
	Urban	950,506	7.9									
	Total	2,863,139	23.8	<i>Damage Risk as per that for the Wall supporting it</i>								
TOTAL HOUSES*		12,018,689										

Housing Category : Wall Types

Category - A : Buildings in field-stone, rural structures, unburnt brick houses, clay houses

Category - B : Ordinary brick building; buildings of the large block & prefabricated type, half-timbered structures, building in natural hewn stone

Category - C : Reinforced building, well built wooden structures

Category - X : Other materials not covered in A,B,C. These are generally light.

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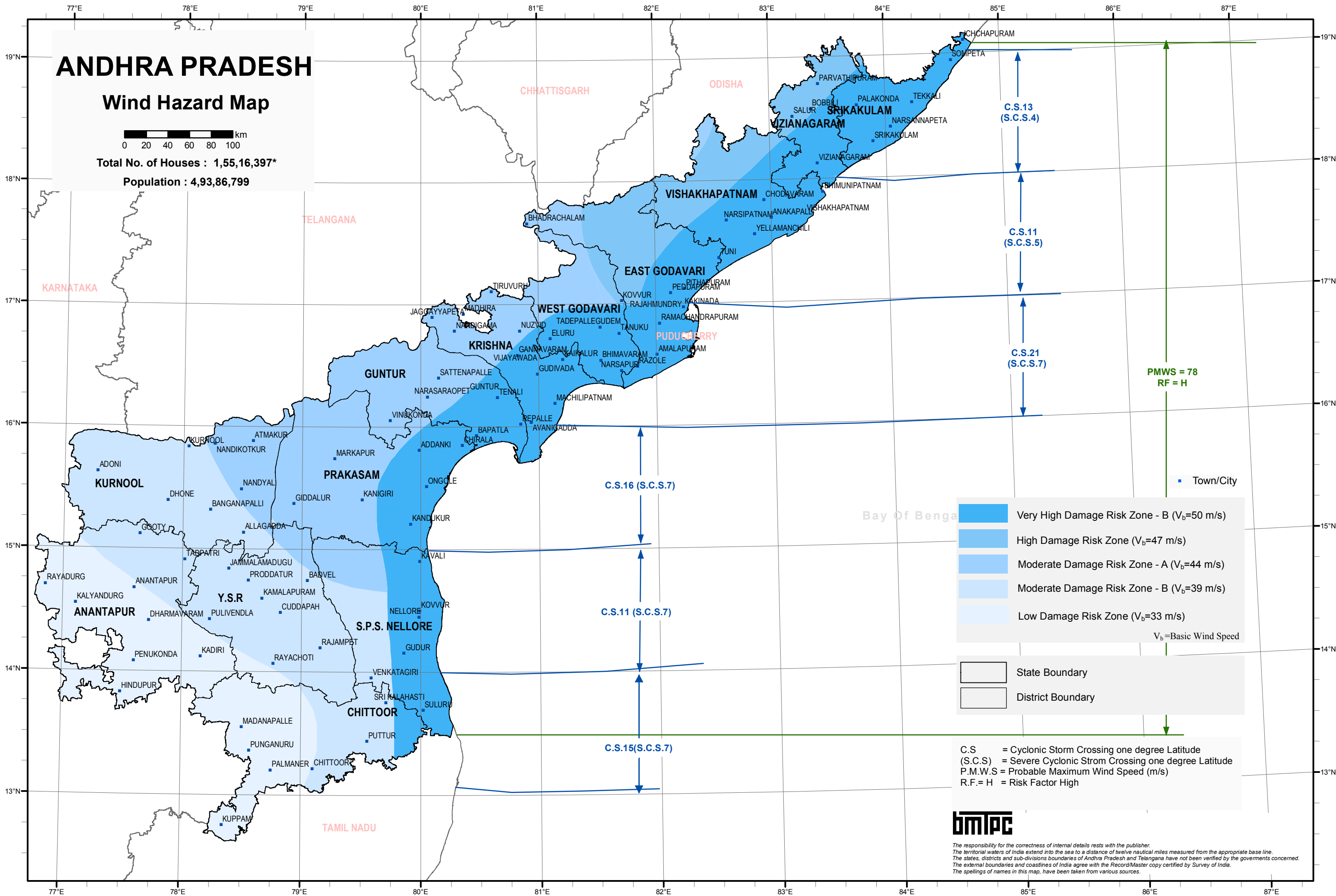
EQ Zone II : Low Damage Risk Zone (MSK < VI)

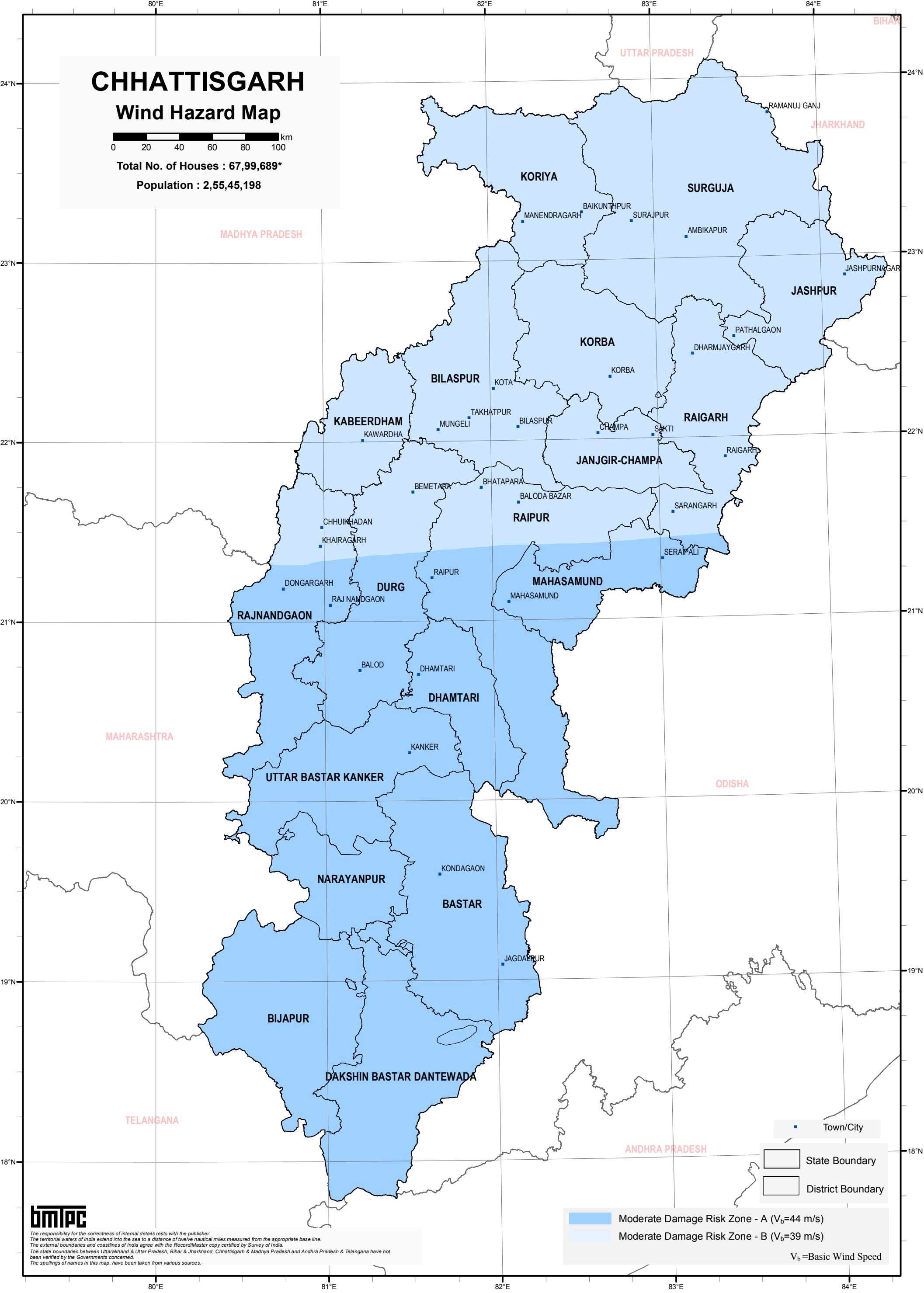
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* Total No. of Houses excluding Vacant/Locked Houses







BMTPC : Vulnerability Atlas - 3rd Edition; Peer Group, MoHUA; Map is Based on digitised data of SOI, GOI; Basic Wind Speed Map National Building Code 2016. Houses/Population as per Census 2011; *Houses including vacant & locked houses.Disclaimer: The maps are solely for thematic presentation.

