

APPENDIX 3 SELECTION OF CANDIDATE CITIES FOR DEMONSTRATION PROJECT

Table A3-1 Long List Cities (No.1-No.62: “abc” city name order)

Capital: National Capital City
 Others: CR: Capital Region City
 SMC: Second Large Mega City EQ: Earthquake
 NUT: Naypyitau Union Territory TS: Tsunami
 NCR: Philippines Capital Region FL: Flood
 CYW: Cyclone (Typhoon/Monsoon)-Wind
 CYS: Cyclone (Typhoon/Monsoon)-Surge
 IA: Major Industrial Area
 Infra: Key Regional Infrastructure

No.	Code	Name	latitude	longitude	Population	Capital /Others	Natural Hazard					Exposure	
							EQ	TS	FL	CYW	CYS	IA	Infra
1	BRN01	Brunei Muara	4.930	114.950	21,484	Capital	4	0	0	0	0	3	2
2	BRN02	Kuala Belait	4.584	114.221	21,163		2	0	0	0	0	2	0
3	BRN03	Seria	4.610	114.331	21,082		2	0	0	0	0	2	0
4	BRN04	Tutong	4.810	114.640	13,049		4	0	0	0	0	2	0
5	KHM01	Bättâmbâng	13.092	103.196	140,533		2	0	8	0	0	0	0
6	KHM02	Kâmpóng Cham	11.992	105.464	47,300		2	0	10	0	0	0	0
7	KHM03	Kâmpóng Chhnâng	12.254	104.668	43,130		2	0	10	0	0	0	0
8	KHM04	Kâmpóng Spœ	11.462	104.521	46,850		2	0	8	0	0	0	0
9	KHM05	Kâmpóng Thum	12.711	104.889	31,871		2	0	10	0	0	0	2
10	KHM06	Kâmpôt	10.610	104.180	38,819		2	0	8	0	0	2	0
11	KHM07	Kaôh Kông	11.607	102.982	23,377		2	0	4	0	0	3	0
12	KHM08	Kêb	10.542	104.319	4,678		2	0	8	0	0	0	0
13	KHM09	Krâchéh	12.487	106.017	29,033		2	0	6	0	0	0	0
14	KHM10	Pailin	12.855	102.609	15,674		2	0	0	0	0	0	0
15	KHM11	Paôy Pêt	13.655	102.561	89,549		2	0	6	0	0	2	0
16	KHM12	Phnom Pénh	11.570	104.920	1,242,992	Capital	2	0	10	0	0	1	3
17	KHM13	Pôuthisât	12.539	103.919	25,650		2	0	8	0	0	0	0
18	KHM14	Preâh Vihear	13.807	104.979	10,679		2	0	6	0	0	0	0
19	KHM15	Prey Vêng	11.486	105.325	14,548		2	0	10	0	0	1	0
20	KHM16	Sâmpông	14.175	103.507	18,694		2	0	6	0	0	0	0
21	KHM17	Siêm Réab	13.358	103.855	168,662		2	0	0	0	0	0	2
22	KHM18	Sihanoukville	10.620	103.524	89,447		2	0	0	0	0	3	2
23	KHM19	Sisôphôn	13.585	102.974	61,631		2	0	6	0	0	0	0
24	KHM20	Stôeng Trêng	13.526	105.970	17,022		2	0	6	0	0	0	0
25	KHM21	Suông	11.912	105.652	42,340		2	0	8	0	0	0	0
26	KHM22	Svay Riêng	11.080	105.800	17,029		2	0	10	0	0	3	0
27	KHM23	Ta Khmau	11.482	104.945	80,141		2	0	10	0	0	1	2
28	KHM24	Takéo	10.988	104.783	14,456		2	0	10	0	0	2	0
29	IDN01	Balikpapan	-1.275	116.838	605,096		2	0	0	0	0	0	3
30	IDN02	Banda Aceh	5.550	95.320	249,499		8	10	8	0	0	0	1
31	IDN03	Bandar Lampung	-5.410	105.258	1,167,101		8	10	0	0	0	0	2
32	IDN04	Bandung City	-6.910	107.600	657,769		8	0	0	0	0	1	2
33	IDN05	Banjar City	-7.374	108.542	51,766		8	0	8	0	0	0	0
34	IDN06	Batam	1.140	104.006	1,141,816		4	0	0	0	0	3	0
35	IDN07	Batu	-7.883	112.533	198,608		6	0	0	0	0	0	0
36	IDN08	Bau-bau	-5.470	122.598	139,157		2	0	0	0	0	0	0
37	IDN09	Bekasi City	-6.220	106.970	682,878		8	0	0	0	0	3	1
38	IDN10	Binjai	3.611	98.492	261,490		6	0	0	0	0	0	1
39	IDN11	Bitung	1.443	125.193	202,204		6	0	0	0	0	0	2
40	IDN12	Blitar	-8.096	112.169	136,903		6	0	8	0	0	0	0
41	IDN13	Bogor City	-6.593	106.793	249,933		8	0	0	0	0	0	0
42	IDN14	Bontang	0.121	117.480	155,880		2	0	0	0	0	1	0
43	IDN15	Bukittinggi	-0.310	100.370	118,260		8	0	0	0	0	0	0
44	IDN16	Cimahi City	-6.897	107.536	160,317		10	0	0	0	0	0	2
45	IDN17	Cirebon City	-6.710	108.560	80,983		8	0	0	0	0	2	0
46	IDN18	Denpasar	-8.650	115.220	880,600		8	10	0	0	0	0	1
47	IDN19	Depok City	-6.390	106.830	526,004		8	0	0	0	0	1	0
48	IDN20	Dumai	1.680	101.450	280,109		6	0	0	0	0	0	2
49	IDN21	Gorontalo	0.537	123.061	197,970		6	0	8	0	0	0	0
50	IDN22	Gunungsitoli	1.279	97.608	134,196		8	2	0	0	0	0	0
51	IDN23	Jakarta Barat	-6.180	106.830	2,430,410	Capital	8	0	0	0	0	1	2
52	IDN24	Jakarta Pusat	-6.180	106.830	910,381	Capital	8	0	0	0	0	1	2
53	IDN25	Jakarta Selatan	-6.180	106.830	2,164,070	Capital	8	0	0	0	0	1	2
54	IDN26	Jakarta Timur	-6.180	106.830	2,817,994	Capital	8	0	0	0	0	1	2
55	IDN27	Jakarta Utara	-6.180	106.830	1,729,444	Capital	8	0	0	0	0	1	2
56	IDN28	Kediri	-7.810	112.010	278,072		6	0	8	0	0	0	0
57	IDN29	Kendari	-3.973	122.515	308,439		2	8	0	0	0	0	0
58	IDN30	Kota Ambon	-3.694	128.181	395,423		10	6	0	0	0	0	0
59	IDN31	Kota Banjar Baru	-3.451	114.816	227,500		2	0	0	0	0	0	0
60	IDN32	Kota Banjarmasin	-3.324	114.592	666,223		2	0	8	0	0	0	2
61	IDN33	Kota Bengkulu	-3.793	102.262	342,876		10	10	0	0	0	0	0
62	IDN34	Kota Bima	-8.452	118.725	156,400		6	0	0	0	0	0	0

BRN: Brunei Darussalam, KHM: Cambodia, IDN: Indonesia, LAO: Lao PDR, MYS: Malaysia, MMR: Myanmar, PHL: Philippines, SGP: Singapore, THA: Thailand, VNM: Viet Nam

Source: JICA Project Team

Table A3-2 Long List Cities (No.63-No.124: “abc” city name order)

Capital: National Capital City
 Others: CR: Capital Region City
 SMC: Second Large Mega City EQ: Earthquake
 NUT: Nappytai Union Territory TS: Tsunami
 NCR: Philippines Capital Region FL: Flood
 CYW: Cyclone (Typhoon/Monsoon)-Wind
 CYS: Cyclone (Typhoon/Monsoon)-Surge
 IA: Major Industrial Area
 Infra: Key Regional Infrastructure

No.	Code	Name	latitude	longitude	Population	Capital /Others	Natural Hazard					Exposure	
							EQ	TS	FL	CYW	CYS	IA	Infra
63	IDN35	Kota Cilegon	-5.970	106.001	405,303		8	0	0	0	0	3	0
64	IDN36	Kota Jambi	-1.592	103.617	568,062		4	0	8	0	0	0	0
65	IDN37	Kota Jayapura	-2.530	140.717	275,694		8	6	0	0	0	0	1
66	IDN38	Kota Kupang	-10.179	123.598	368,199		6	0	0	0	0	0	0
67	IDN39	Kota Magelang	-7.464	110.223	120,373		6	0	0	0	0	0	0
68	IDN40	Kota Mataram	-8.587	116.129	441,064		4	10	0	0	0	0	0
69	IDN41	Kota Pekalongan	-6.885	109.675	293,704		6	0	6	0	0	0	0
70	IDN42	Kota Pontianak	-0.026	109.341	598,097		2	0	0	0	0	0	2
71	IDN43	Kota Salatiga	-7.334	110.506	181,193		6	0	0	0	0	0	0
72	IDN44	Kota Semarang	-6.970	110.420	1,672,999		6	0	8	0	0	3	3
73	IDN45	Kota Serang	-6.110	106.150	631,101		8	0	0	0	0	1	0
74	IDN46	Kota Singkawang	0.910	108.980	202,196		2	0	0	0	0	0	0
75	IDN47	Kota Sorong	-0.867	131.250	218,800		6	2	0	0	0	0	2
76	IDN48	Kota Sungai Penuh	-2.069	101.415	86,220		8	0	0	0	0	0	0
77	IDN49	Kota Surakarta	-7.570	110.820	510,077		6	0	8	0	0	0	2
78	IDN50	Kota Tangerang	-6.180	106.630	1,999,894		8	0	10	0	0	3	2
79	IDN51	Kota Tangerang Selatan	-6.180	106.630	1,492,999		8	0	10	0	0	3	2
80	IDN52	Kota Tegal	-6.860	109.130	244,998		6	0	8	0	0	0	0
81	IDN53	Kota Tual	-5.627	132.752	65,882		4	8	0	0	0	0	0
82	IDN54	Kotamobagu	0.729	124.310	117,019		6	0	0	0	0	0	0
83	IDN55	Langsa	4.477	97.964	162,814		8	0	0	0	0	0	0
84	IDN56	Lhokseumawe	5.179	97.149	187,455		6	10	0	0	0	0	0
85	IDN57	Lubuk Linggau	-3.300	102.857	216,270		8	0	0	0	0	0	0
86	IDN58	Madiun	-7.624	111.534	174,373		6	0	8	0	0	0	0
87	IDN59	Makassar	-5.133	119.415	1,408,072		2	10	0	0	0	2	2
88	IDN60	Malang	-7.989	112.627	845,973		6	0	0	0	0	0	0
89	IDN61	Manado	1.493	124.842	423,257		6	0	0	0	0	0	1
90	IDN62	Medan	3.590	98.670	2,191,140		6	0	0	0	0	3	2
91	IDN63	Metro	-5.118	105.312	161,830		8	0	6	0	0	0	0
92	IDN64	Mojokerto	-7.470	112.430	124,719		6	0	8	0	0	1	0
93	IDN65	Padang	-0.951	100.356	876,670		8	10	0	0	0	0	1
94	IDN66	Padang Panjang	-0.466	100.399	49,536		8	0	0	0	0	0	0
95	IDN67	Padangsidempuan	1.378	99.271	206,496		8	0	0	0	0	0	0
96	IDN68	Pagar Alam	-4.045	103.228	132,498		8	0	0	0	0	0	0
97	IDN69	Palangka Raya	-2.210	113.920	244,500		2	0	6	0	0	0	0
98	IDN70	Palembang	-2.990	104.750	1,558,494		6	0	10	0	0	0	2
99	IDN71	Palopo	-2.994	120.196	160,819		4	0	0	0	0	0	0
100	IDN72	Palu	-0.900	119.851	362,202		8	10	8	0	0	1	0
101	IDN73	Pangkalpinang	-2.131	106.115	191,994		4	0	0	0	0	0	0
102	IDN74	Pare-pare	-4.009	119.629	135,192		2	10	6	0	0	0	0
103	IDN75	Pariaman	-0.609	100.136	82,636		8	10	0	0	0	0	0
104	IDN76	Pasuruan	-7.639	112.907	193,329		6	0	6	0	0	0	0
105	IDN77	Payakumbuh	-0.225	100.632	123,654		6	0	6	0	0	0	0
106	IDN78	Pekanbaru	0.508	101.440	1,011,467		6	0	8	0	0	0	2
107	IDN79	Pematangsiantar	2.965	99.062	245,104		6	0	0	0	0	0	0
108	IDN80	Prabumulih	-3.433	104.240	174,477		6	0	0	0	0	0	0
109	IDN81	Probolinggo	-7.753	113.215	226,777		6	0	0	0	0	0	0
110	IDN82	Sabang	5.880	95.336	32,739		4	4	0	0	0	2	0
111	IDN83	Samarinda	-0.500	117.150	797,006		2	0	8	0	0	0	0
112	IDN84	Sawahlunto	-0.597	100.735	58,972		8	0	4	0	0	0	0
113	IDN85	Sibolga	1.740	98.780	86,166		8	10	0	0	0	0	0
114	IDN86	Solok	-0.789	100.655	63,541		8	0	0	0	0	0	0
115	IDN87	Subulussalam	2.645	98.014	73,708		8	0	0	0	0	0	0
116	IDN88	Sukabumi City	-6.920	106.920	84,668		8	0	0	0	0	0	0
117	IDN89	Surabaya	-7.240	112.740	2,833,924		6	0	10	0	0	3	2
118	IDN90	Tanjungbalai	2.970	99.801	164,675		6	0	6	0	0	0	0
119	IDN91	Tanjungpinang	0.918	104.446	199,723		4	0	0	0	0	0	0
120	IDN92	Tarakan	3.308	117.583	218,800		2	0	0	0	0	0	0
121	IDN93	Tasikmalaya City	-7.329	108.219	175,982		8	0	0	0	0	0	0
122	IDN94	Tebing Tinggi	3.327	99.158	154,804		6	0	0	0	0	0	0
123	IDN95	Temate	0.789	127.386	207,789		6	0	0	0	0	0	0
124	IDN96	Tidore Kepulauan	0.665	127.431	95,813		6	0	0	0	0	0	0

BRN: Brunei Darussalam, KHM: Cambodia, IDN: Indonesia, LAO: Lao PDR, MYS: Malaysia, MMR: Myanmar, PHL: Philippines, SGP: Singapore, THA: Thailand, VNM: Viet Nam

Source: JICA Project Team

Table A3-3 Long List Cities (No.125-No.186: “abc” city name order)

Capital: National Capital City
 Others: CR: Capital Region City
 SMC: Second Large Mega City EQ: Earthquake
 NUT: Naypyitau Union Territory TS: Tsunami
 NCR: Philippines Capital Region FL: Flood
 CYW: Cyclone (Typhoon/Monsoon)-Wind
 CYS: Cyclone (Typhoon/Monsoon)-Surge
 IA: Major Industrial Area
 Infra: Key Regional Infrastructure

No.	Code	Name	latitude	longitude	Population	Capital /Others	Natural Hazard					Exposure	
							EQ	TS	FL	CYW	CYS	IA	Infra
125	IDN97	Tomohon	1.323	124.841	98,686		6	0	0	0	0	0	0
126	IDN98	Yogyakarta	-7.796	110.369	400,467		6	0	0	0	0	0	2
127	LAO01	Anouvong (Xaysomboun SR)	18.899	103.093	23,700		4	0	0	2	0	0	0
128	LAO02	Bolikhanh (bolikh)	18.561	103.723	49,400		4	0	4	4	0	0	2
129	LAO03	Huoxiai (Bokeo)	20.268	100.416	70,200		6	0	6	0	0	2	0
130	LAO04	Lamarm (Sekong)	15.348	106.724	35,000		2	0	6	6	0	0	0
131	LAO05	Luangprabang (luang)	19.892	102.136	90,300		4	0	10	0	0	0	2
132	LAO06	Nambak (luang)	20.632	102.462	68,900		6	0	6	0	0	0	0
133	LAO07	Namtha (Luangnamtha)	20.998	101.407	54,100		6	0	8	0	0	0	0
134	LAO08	Nonghed (xiengk)	19.496	103.987	37,600		4	0	0	4	0	0	0
135	LAO09	Outhoomphone (sav)	16.675	104.982	91,100		2	0	0	0	0	1	0
136	LAO10	Pakse (cham)	15.121	105.802	77,900		2	0	10	0	0	0	2
137	LAO11	Paksong (cham)	15.177	106.239	81,200		2	0	0	4	0	0	0
138	LAO12	Pakxane (bolikh)	18.395	103.656	45,000		4	0	8	6	0	0	1
139	LAO13	Parklai (xaya)	18.219	101.410	68,200		6	0	6	0	0	0	0
140	LAO14	Phongsaly (Phongsaly)	21.685	102.105	23,300		4	0	0	0	0	0	0
141	LAO15	Phonsavan (Pek / xiengk)	19.450	103.192	75,600		4	0	0	6	0	0	0
142	LAO16	Samakkhixay (Attapeu/Attapeu)	14.812	106.830	36,400		2	0	6	4	0	0	0
143	LAO17	Saravane (Saravane)	15.716	106.422	100,900		2	0	6	6	0	0	0
144	LAO18	Savannakhet (Kaysone Phomvihane)	16.570	104.750	125,700		2	0	8	0	0	2	0
145	LAO19	Thalhek (kham)	17.399	104.804	90,800		2	0	10	6	0	2	0
146	LAO20	Thoulakhom (Vien Prov)	18.436	102.532	53,400		6	0	6	0	0	0	0
147	LAO21	Vangvieng (Vien Prov)	18.922	102.448	55,500		4	0	0	0	0	0	0
148	LAO22	Vientiane City	17.970	102.610	820,900	Capital	4	0	10	0	0	3	2
149	LAO23	Xamneua (huaphanh)	20.413	104.048	56,900		4	0	0	6	0	1	0
150	LAO24	Xanakharm (Vien Prov)	17.913	101.678	40,000		4	0	8	0	0	0	0
151	LAO25	Xay (Oudomxay)	20.692	101.982	79,500		6	0	0	0	0	0	0
152	LAO26	Xayaboury (xaya)	19.256	101.711	75,700		4	0	8	0	0	0	0
153	MYS01	Alor Gajah	2.382	102.209	17,688		4	0	0	0	0	2	1
154	MYS02	Alor Setar	6.110	100.370	186,433		2	2	10	0	0	3	0
155	MYS03	Ampang Jaya	3.150	101.770	478,613		4	0	0	0	0	3	0
156	MYS04	Batu Pahat	1.850	102.930	124,269		4	0	6	0	0	2	0
157	MYS05	Dungun	4.755	103.416	50,206		2	0	4	0	0	2	0
158	MYS06	George Town (penang CC)	5.421	100.341	500,000		4	10	6	0	0	3	1
159	MYS07	Johor Bahru	1.480	103.750	642,944		2	0	0	0	0	3	2
160	MYS08	Kajang	2.980	101.770	205,694		4	0	6	0	0	3	0
161	MYS09	Kemaman	4.235	103.421	63,159		2	0	6	0	0	3	2
162	MYS10	Kluang (Kluang)	2.030	103.318	134,150		4	0	4	0	0	3	0
163	MYS11	Kota Bharu	6.120	102.240	251,801		2	0	8	0	0	3	0
164	MYS12	Kota Kinabalu	5.970	116.070	306,920		4	0	0	0	0	3	3
165	MYS13	Kuala Lumpur	3.160	101.701	1,768,000	Capital	4	0	0	0	0	3	1
166	MYS14	Kuala Terengganu	5.330	103.140	255,518		2	0	6	0	0	3	0
167	MYS15	Kuantan	3.812	103.327	288,727		2	0	6	0	0	3	2
168	MYS16	Kuching	3.820	103.340	422,240		2	0	0	0	0	3	2
169	MYS17	Kulai	1.661	103.604	48,546		2	0	0	0	0	3	2
170	MYS18	Kulim	5.371	100.506	117,488		4	0	0	0	0	3	0
171	MYS19	Langkawi	6.321	99.849	94,777		2	4	0	0	0	2	1
172	MYS20	Miri	4.421	114.013	169,005		2	0	0	0	0	2	1
173	MYS21	Muar	2.049	102.571	103,238		4	0	2	0	0	1	0
174	MYS22	Nilai	2.820	101.800	31,468		4	0	0	0	0	3	1
175	MYS23	Parit Raja	1.863	103.109	16,953		4	0	0	0	0	3	0
176	MYS24	Pasir Gudang	1.450	103.890	90,742		4	0	0	0	0	2	1
177	MYS25	Petaling Jaya	3.100	101.620	432,619		4	0	0	0	0	3	2
178	MYS26	Port Dickson	2.530	101.800	68,923		4	0	0	0	0	3	0
179	MYS27	Port Kelang	3.040	101.450	626,699		4	0	10	0	0	3	2
180	MYS28	Selayang Baru	3.261	101.652	174,628		4	0	0	0	0	3	1
181	MYS29	Seremban	2.710	101.950	290,709		4	0	0	0	0	3	0
182	MYS30	Shah Alam	3.070	101.560	314,440		4	0	8	0	0	3	2
183	MYS31	Sibu	2.300	111.830	167,427		2	0	8	0	0	2	0
184	MYS32	Subang Jaya	3.150	101.530	447,183		4	0	0	0	0	3	2
185	MYS33	Sungai Petani (Kuala Muda)	5.650	100.480	174,962		4	0	0	0	0	3	0
186	MYS34	Taiping	4.860	100.720	199,489		4	6	0	0	0	3	0

BRN: Brunei Darussalam, KHM: Cambodia, IDN: Indonesia, LAO: Lao PDR, MYS: Malaysia, MMR: Myanmar, PHL: Philippines, SGP: Singapore, THA: Thailand, VNM: Viet Nam

Source: JICA Project Team

Table A3-4 Long List Cities (No.187-No.248: "abc" city name order)

Capital: National Capital City
 Others: CR: Capital Region City
 SMC: Second Large Mega City EQ: Earthquake
 NUT: Naypyitau Union Territory TS: Tsunami
 NCR: Philippines Capital Region FL: Flood
 CYW: Cyclone (Typhoon/Monsoon)-Wind
 CYS: Cyclone (Typhoon/Monsoon)-Surge
 IA: Major Industrial Area
 Infra: Key Regional Infrastructure

No.	Code	Name	latitude	longitude	Population	Capital /Others	Natural Hazard					Exposure	
							EQ	TS	FL	CYW	CYS	IA	Infra
187	MYS35	Tawau	4.260	117.880	213,745		4	0	0	0	0	3	0
188	MYS36	Teluk Intan	4.023	101.022	60,716		4	0	8	0	0	0	0
189	MMR01	Ahlon-WY	16.782	96.128	55,482	2MC(Yangon)	4	8	10	10	2	3	1
190	MMR02	Amarapura	21.903	96.049	237,618		10	0	10	0	0	3	0
191	MMR03	Ann	19.795	94.048	119,714		6	0	6	6	0	0	0
192	MMR04	Aunglan	19.359	95.217	235,222		6	0	8	0	0	0	0
193	MMR05	Aungmyethazan	21.993	96.097	265,779		10	0	8	0	0	3	0
194	MMR06	Ayadaw	22.285	95.451	155,769		10	0	0	0	0	0	0
195	MMR07	Bago	17.336	96.484	491,434		6	0	10	8	0	1	0
196	MMR08	Bahan-WY	16.815	96.156	96,732	2MC(Yangon)	4	8	10	10	2	3	2
197	MMR09	Banmauk	24.400	95.858	112,668		10	0	0	6	0	0	0
198	MMR10	Bawlakhe	19.174	97.337	10,996		8	0	6	0	0	0	0
199	MMR11	Bhamo	24.255	97.234	135,877		4	0	8	6	0	0	0
200	MMR12	Bilin	17.211	97.230	181,075		6	0	6	6	0	0	0
201	MMR13	Bogale	16.295	95.397	322,665		4	8	0	8	2	0	0
202	MMR14	Bokpyin	11.263	98.761	81,718		2	2	0	0	2	0	0
203	MMR15	Bothtaung-EY	16.772	96.170	40,995	2MC(Yangon)	4	8	10	10	2	3	1
204	MMR16	Budalin	22.389	95.149	123,539		10	0	0	0	0	0	0
205	MMR17	Buthidaung	20.875	92.525	55,545		8	0	4	8	0	0	0
206	MMR18	Chanayethazan (mandalay)	21.975	96.095	197,175		10	0	8	0	0	3	0
207	MMR19	Chanmyathazi	21.939	96.096	283,781		10	0	8	0	0	3	0
208	MMR20	Chauk	20.903	94.821	185,189		8	0	10	0	0	0	0
209	MMR21	Chaung-U	21.957	95.274	105,955		8	0	6	0	0	0	0
210	MMR22	Chaungzon	16.351	97.550	122,126		4	10	0	0	0	1	0
211	MMR23	Chipwi	25.886	98.130	20,039		10	0	0	0	0	0	0
212	MMR24	Cocokyun-SY	14.128	93.373	1,940	2MC(Yangon)	2	4	0	4	2	0	0
213	MMR25	Dagon Seikkan Myothit-EY	16.840	96.273	167,448	2MC(Yangon)	6	4	0	6	2	3	1
214	MMR26	Dagon-WY	16.795	96.147	25,082	2MC(Yangon)	4	8	10	10	2	3	1
215	MMR27	Daik-U	17.790	96.670	202,530		6	0	6	6	0	0	0
216	MMR28	Dala-SY	16.759	96.143	172,857	2MC(Yangon)	4	8	10	10	2	2	1
217	MMR29	Danubyu	17.255	95.596	179,353		6	0	8	6	0	0	0
218	MMR30	Dawbon-EY	16.782	96.184	75,325	2MC(Yangon)	4	8	10	10	2	3	1
219	MMR31	Dawei	14.077	98.190	146,964		2	10	8	0	0	0	0
220	MMR32	Dedaye	16.408	95.885	202,926		4	0	0	8	0	0	0
221	MMR33	Demoso	19.538	97.159	79,201		8	0	0	0	0	0	0
222	MMR34	Detkhinathiri	19.719	96.067	51,328	Capital (NUT)	8	0	0	0	0	0	0
223	MMR35	East Dagon Myothit-EY	16.913	96.213	165,628	2MC(Yangon)	6	2	8	10	2	3	2
224	MMR36	Einme	16.896	95.180	194,101		6	0	8	8	0	0	0
225	MMR37	Falam	22.911	93.680	48,077		10	0	0	4	0	0	0
226	MMR38	Gangaw	22.174	94.136	133,295		10	0	8	6	0	0	0
227	MMR39	Gwa	17.594	94.580	66,015		6	8	0	4	2	0	0
228	MMR40	Gyobingauk	18.230	95.653	117,433		6	0	4	8	0	0	0
229	MMR41	Hakha	22.640	93.605	48,352		10	0	0	6	0	0	0
230	MMR42	Hinthada	17.650	95.458	338,435		6	0	10	8	0	2	0
231	MMR43	Hkamti	25.992	95.695	47,658		10	0	2	4	0	0	0
232	MMR44	Hlaingbwe	17.126	97.819	265,883		6	0	2	0	0	0	0
233	MMR45	Hlaingtharya-NY	16.854	96.069	687,867	2MC(Yangon)	4	8	6	8	2	3	2
234	MMR46	Hlaing-WY	16.848	96.125	160,307	2MC(Yangon)	4	8	8	10	2	3	2
235	MMR47	Hlegu-NY	17.099	96.227	270,741	2MC(Yangon)	6	0	6	6	0	1	0
236	MMR48	Hmawbi-NY	17.100	96.042	244,607	2MC(Yangon)	6	0	0	6	0	1	0
237	MMR49	Homalin	24.864	94.911	258,206		10	0	6	6	0	0	0
238	MMR50	Hopang	23.425	98.750	61,100		6	0	4	0	0	0	0
239	MMR51	Hopong	20.797	97.170	112,348		8	0	0	0	0	0	0
240	MMR52	Hpa-An	16.881	97.637	421,575		4	0	6	0	0	2	0
241	MMR53	Hpakant	25.613	96.312	331,708		10	0	4	4	0	0	0
242	MMR54	Hpapun	18.065	97.445	35,085		8	0	4	0	0	0	0
243	MMR55	Hpasawng	18.871	97.316	25,594		8	0	4	0	0	0	0
244	MMR56	Hpruso	19.413	97.123	29,374		8	0	0	0	0	0	0
245	MMR57	Hsawlaw	26.153	98.271	6,518		8	0	0	0	0	0	0
246	MMR58	Hsenwi	23.307	97.974	56,662		4	0	8	0	0	0	0
247	MMR59	Hsihseng	20.158	97.251	153,032		10	0	0	0	0	0	0
248	MMR60	Hsipaw	22.619	97.298	176,158		4	0	8	0	0	0	0

BRN: Brunei Darussalam, KHM: Cambodia, IDN: Indonesia, LAO: Lao PDR, MYS: Malaysia, MMR: Myanmar, PHL: Philippines, SGP: Singapore, THA: Thailand, VNM: Viet Nam

Source: JICA Project Team

Table A3-5 Long List Cities (No.249-No.310: "abc" city name order)

Capital: National Capital City
 Others: CR: Capital Region City
 SMC: Second Large Mega City EQ: Earthquake
 NUT: Naypyitau Union Territory TS: Tsunami
 NCR: Philippines Capital Region FL: Flood
 CYW: Cyclone (Typhoon/Monsoon)-Wind
 CYS: Cyclone (Typhoon/Monsoon)-Surge
 IA: Major Industrial Area
 Infra: Key Regional Infrastructure

No.	Code	Name	latitude	longitude	Population	Capital /Others	Natural Hazard					Exposure	
							EQ	TS	FL	CYW	CYS	IA	Infra
249	MMR61	Htantabin (Tanugoo District)	18.840	96.499	117,276		6	0	6	0	0	0	0
250	MMR62	Htantabin-NY	18.840	96.499	145,792	2MC(Yangon)	6	0	6	0	0	0	0
251	MMR63	Indaw	24.223	96.142	120,266		10	0	6	6	0	0	0
252	MMR64	Ingapu	17.810	95.269	214,384		6	0	6	0	0	0	0
253	MMR65	Injyangyang	25.830	97.727	1,732		8	0	0	0	0	0	0
254	MMR66	Insein-NY	16.902	96.096	305,283	2MC(Yangon)	6	8	8	10	2	3	2
255	MMR67	Kalaw	20.624	96.559	186,083		10	0	0	0	0	0	0
256	MMR68	Kale	23.193	94.030	348,573		10	0	6	8	0	0	0
257	MMR69	Kalewa	23.200	94.300	56,432		10	0	6	4	0	0	0
258	MMR70	Kamayut-WY	16.828	96.132	84,569	2MC(Yangon)	4	8	10	10	2	3	2
259	MMR71	Kamma	19.029	95.096	75,195		6	0	8	6	0	0	0
260	MMR72	Kanbalu	23.203	95.519	295,561		10	0	0	0	0	0	0
261	MMR73	Kangyidaunt	16.933	94.895	177,990		6	0	8	6	0	0	0
262	MMR74	Kani	22.433	94.848	134,541		10	0	8	0	0	0	0
263	MMR75	Kanpetlet	21.193	94.057	21,493		8	0	0	4	0	0	0
264	MMR76	Katha	24.182	96.332	167,734		10	0	0	6	0	0	0
265	MMR77	Kawa	17.090	96.461	197,363		6	0	8	6	0	0	0
266	MMR78	Kawhmu	16.546	96.062	119,050		4	0	6	6	0	0	0
267	MMR79	Kawkareik	16.556	98.240	278,280		6	0	4	0	0	0	0
268	MMR80	Kawlin	23.790	95.683	145,297		10	0	8	0	0	0	0
269	MMR81	Kawnglangphu	27.058	98.360	11,655		4	0	0	0	0	0	0
270	MMR82	Kawthaung	9.982	98.549	140,020		2	2	0	0	0	0	0
271	MMR83	Kayan-SY	16.905	96.560	158,019	2MC(Yangon)	6	0	0	8	0	0	0
272	MMR84	Kengtung	21.292	99.604	171,620		8	0	0	0	0	0	0
273	MMR85	Khin-U	22.770	95.621	146,457		10	0	6	0	0	0	0
274	MMR86	Konkyan	23.829	98.539	60,062		8	0	0	0	0	0	0
275	MMR87	Kungyangon=SY	16.439	96.012	111,632	2MC(Yangon)	4	2	8	8	0	0	0
276	MMR88	Kunhing	21.301	98.424	53,403		6	0	6	0	0	0	0
277	MMR89	Kunlong	23.407	98.645	58,774		6	0	2	0	0	0	0
278	MMR90	Kutkai	23.459	97.943	174,652		4	0	0	0	0	0	0
279	MMR91	Kyaiklat	16.444	95.726	193,340		4	0	6	8	0	0	0
280	MMR92	Kyaikmaraw	16.370	97.724	195,810		4	0	6	0	0	1	0
281	MMR93	Kyaikto	17.309	97.011	184,532		6	10	4	8	0	0	0
282	MMR94	Kyainseikgyi	16.041	98.123	196,911		4	0	8	0	0	0	0
283	MMR95	Kyangin	18.340	95.239	96,083		6	0	8	8	0	0	0
284	MMR96	Kyaukkyi	18.328	96.772	113,329		6	0	0	6	0	0	0
285	MMR97	Kyaukme	22.542	97.037	172,109		4	0	0	0	0	0	0
286	MMR98	Kyaukpadaung	20.842	95.132	261,908		8	0	0	0	0	0	0
287	MMR99	Kyaukpyu	19.424	93.554	165,352		6	10	6	6	2	0	2
288	MMR100	Kyaukse	21.613	96.130	257,907		10	0	6	0	0	0	1
289	MMR101	Kyauktada-WY	16.774	96.162	29,853	2MC(Yangon)	4	8	10	10	2	3	1
290	MMR102	Kyauktaga (Bago District)	18.159	96.614	251,212		6	0	0	6	0	0	0
291	MMR103	Kyauktan-SY	16.634	96.324	167,448	2MC(Yangon)	6	6	6	6	0	1	1
292	MMR104	Kyauktaw	20.844	92.973	173,100		8	0	8	8	0	0	0
293	MMR105	Kyaunggon	17.108	95.190	163,035		6	0	8	8	0	0	0
294	MMR106	Kyethi	21.925	97.819	74,364		4	0	0	0	0	0	0
295	MMR107	Kyimyindaing-WY	16.815	96.122	111,514	2MC(Yangon)	4	8	10	10	2	3	2
296	MMR108	Kyonpyaw	17.300	95.200	235,727		6	0	8	8	0	0	0
297	MMR109	Kyunhla	23.320	95.532	104,087		10	0	0	0	0	0	0
298	MMR110	Kyunsu	12.471	98.455	171,753		2	8	6	0	0	1	0
299	MMR111	Labutta	16.146	94.759	315,218		4	6	0	8	2	0	0
300	MMR112	Lahe	26.326	95.441	48,526		10	0	0	2	0	0	0
301	MMR113	Laihka	21.270	97.665	48,831		6	0	0	0	0	0	0
302	MMR114	Langkho	20.342	98.004	33,481		6	0	8	0	0	0	0
303	MMR115	Lanmadaw-WY	16.780	96.142	47,160	2MC(Yangon)	4	8	10	10	2	2	1
304	MMR116	Lashio	22.953	97.747	323,405		4	0	0	0	0	0	0
305	MMR117	Latha-WY	16.777	96.151	25,057	2MC(Yangon)	4	8	10	10	2	3	1
306	MMR118	Laukkang	23.692	98.764	94,850		8	0	0	0	0	0	0
307	MMR119	Launglon	13.978	98.121	118,317		2	10	0	0	0	0	0
308	MMR120	Lawksawk	21.247	96.865	164,730		8	0	6	0	0	0	0
309	MMR121	Lemyethna	17.600	95.175	103,024		6	0	6	6	0	0	0
310	MMR122	Leshi (Lay Shi)	25.445	94.951	16,322		10	0	0	0	0	0	0

BRN: Brunei Darussalam, KHM: Cambodia, IDN: Indonesia, LAO: Lao PDR, MYS: Malaysia, MMR: Myanmar, PHL: Philippines, SGP: Singapore, THA: Thailand, VNM: Viet Nam

Source: JICA Project Team

Table A3-6 Long List Cities (No.311-No.372: "abc" city name order)

Capital: National Capital City
 Others: CR: Capital Region City
 SMC: Second Large Mega City EQ: Earthquake
 NUT: Naypyitau Union Territory TS: Tsunami
 NCR: Philippines Capital Region FL: Flood
 CYW: Cyclone (Typhoon/Monsoon)-Wind
 CYS: Cyclone (Typhoon/Monsoon)-Surge
 IA: Major Industrial Area
 Infra: Key Regional Infrastructure

No.	Code	Name	latitude	longitude	Population	Capital /Others	Natural Hazard					Exposure	
							EQ	TS	FL	CYW	CYS	IA	Infra
311	MMR123	Letpadan	17.779	95.745	177,407		6	0	4	6	0	0	0
312	MMR124	Lewe	19.635	96.110	284,393	Capital	8	0	8	0	0	0	0
313	MMR125	Loikaw	19.674	97.210	128,401		8	0	8	0	0	0	0
314	MMR126	Loilem	20.925	97.566	124,557		6	0	0	0	0	0	0
315	MMR127	Mabein	23.473	96.629	47,398		8	0	4	0	0	0	0
316	MMR128	Machanbaw	27.284	97.589	8,858		10	0	6	0	0	0	0
317	MMR129	Madaya	22.210	96.106	258,001		10	0	6	0	0	0	0
318	MMR130	Magway	20.140	94.927	289,247		8	0	10	0	0	0	0
319	MMR131	Mahaaungmyay	21.959	96.091	241,113		10	0	8	0	0	3	0
320	MMR132	Mahlaing	21.099	95.647	139,427		10	0	0	0	0	0	0
321	MMR133	Manaung	18.854	93.729	56,966		6	10	0	6	2	0	0
322	MMR134	Mansi	24.120	97.293	52,945		4	0	0	4	0	0	0
323	MMR135	Mantong	23.252	97.120	38,601		4	0	0	0	0	0	0
324	MMR136	Matman	21.962	98.866	19,732		8	0	0	0	0	0	0
325	MMR137	Matupi	21.605	93.441	51,351		8	0	0	4	0	0	0
326	MMR138	Maubin	16.730	95.649	314,093		4	0	8	8	0	0	0
327	MMR139	Maungdaw	20.819	92.368	40,785		6	10	0	8	4	0	0
328	MMR140	Mawkmai	20.231	97.724	33,810		8	0	4	0	0	0	0
329	MMR141	Mawlaik	23.635	94.412	51,314		10	0	6	4	0	0	0
330	MMR142	Mawlamyine	16.485	97.626	289,388		4	10	4	0	0	2	0
331	MMR143	Mawlamyinegyun	16.379	95.263	311,340		4	0	0	8	2	0	0
332	MMR144	Mayangon-WY	16.866	96.143	198,113	2MC(Yangon)	4	8	8	10	2	3	2
333	MMR145	Meiktila	20.882	95.863	309,663		10	0	10	0	0	1	0
334	MMR146	Mese	18.671	97.664	6,319		8	0	0	0	0	0	0
335	MMR147	Minbu	20.172	94.875	188,182		8	0	8	0	0	0	0
336	MMR148	Minbya	20.365	93.273	169,208		8	0	6	8	4	0	0
337	MMR149	Mindat	21.372	93.974	42,600		8	0	0	4	0	0	0
338	MMR150	Mindon	19.346	94.732	59,357		6	0	6	0	0	0	0
339	MMR151	Mingaladon-NY	17.046	96.139	331,586	2MC(Yangon)	6	0	4	6	0	1	1
340	MMR152	Mingalar Taungnyunt-EY	16.789	96.168	132,494	2MC(Yangon)	4	8	10	10	2	3	1
341	MMR153	Mingin	22.878	94.494	104,363		10	0	8	0	0	0	0
342	MMR154	Minhla (Thayarwady District)	17.974	95.709	122,491		4	0	4	8	0	0	0
343	MMR155	Minhla (Thayet District)	17.974	95.709	146,082		4	0	4	8	0	0	0
344	MMR156	Mogaung	25.303	96.940	132,608		10	0	8	6	0	0	0
345	MMR157	Mogok	22.921	96.505	167,149		8	0	0	0	0	0	0
346	MMR158	Mohnyin	24.779	96.373	209,292		10	0	0	6	0	0	0
347	MMR159	Momauk	24.256	97.346	62,914		4	0	0	4	0	0	0
348	MMR160	Monghpyak	20.878	99.923	30,556		6	0	8	0	0	0	0
349	MMR161	Monghsat	20.505	99.247	104,649		4	0	4	0	0	0	0
350	MMR162	Monghsu	21.905	98.360	72,752		4	0	0	0	0	0	0
351	MMR163	Mongkhet	21.750	99.464	44,528		8	0	4	0	0	0	0
352	MMR164	Mongkung	21.611	97.527	74,294		4	0	6	0	0	0	0
353	MMR165	Mongla	21.673	100.019	43,068		8	0	6	0	0	0	0
354	MMR166	Mongmao	22.967	98.967	70,683		8	0	0	0	0	0	0
355	MMR167	Mongmit	23.114	96.670	63,330		8	0	6	0	0	0	0
356	MMR168	Mongnai	20.514	97.871	39,436		6	0	4	0	0	0	0
357	MMR169	Mongpan	20.319	98.354	32,756		6	0	0	0	0	0	0
358	MMR170	Mongping	21.350	99.026	68,833		6	0	0	0	0	0	0
359	MMR171	Mongton	20.304	98.900	70,089		4	0	0	0	0	0	0
360	MMR172	Mongyai	22.424	98.039	59,376		4	0	0	0	0	0	0
361	MMR173	Mongyang	21.842	99.687	107,645		8	0	0	0	0	0	0
362	MMR174	Mongyawng	21.182	100.359	79,890		6	0	0	0	0	1	0
363	MMR175	Monyo	18.027	95.512	127,570		6	0	8	6	0	0	0
364	MMR176	Monywa	22.122	95.140	372,095		10	0	10	0	0	0	0
365	MMR177	Mrauk-U	20.592	93.188	189,630		8	10	0	8	4	0	0
366	MMR178	Mudon	16.258	97.725	190,737		4	2	0	0	0	0	0
367	MMR179	Muse	23.990	97.902	165,022		4	0	8	6	0	0	0
368	MMR180	Myaing	21.613	94.854	225,771		8	0	0	0	0	0	0
369	MMR181	Myanaung	18.287	95.318	218,581		6	0	10	8	0	0	0
370	MMR182	Myaung	21.833	95.421	106,411		10	0	10	0	0	0	0
371	MMR183	Myaungmya	16.599	94.930	298,637		6	0	0	8	0	2	0
372	MMR184	Myawaddy	16.688	98.511	210,540		6	0	6	0	0	1	0

BRN: Brunei Darussalam, KHM: Cambodia, IDN: Indonesia, LAO: Lao PDR, MYS: Malaysia, MMR: Myanmar, PHL: Philippines, SGP: Singapore, THA: Thailand, VNM: Viet Nam

Source: JICA Project Team

Table A3-7 Long List Cities (No.373-No.434: "abc" city name order)

Capital: National Capital City
 Others: CR: Capital Region City
 SMC: Second Large Mega City EQ: Earthquake
 NUT: Naypyitau Union Territory TS: Tsunami
 NCR: Philippines Capital Region FL: Flood
 CYW: Cyclone (Typhoon/Monsoon)-Wind
 CYS: Cyclone (Typhoon/Monsoon)-Surge
 IA: Major Industrial Area
 Infra: Key Regional Infrastructure

No.	Code	Name	latitude	longitude	Population	Capital /Others	Natural Hazard					Exposure	
							EQ	TS	FL	CYW	CYS	IA	Infra
373	MMR185	Myebon	20.047	93.374	137,193		8	10	4	6	4	0	0
374	MMR186	Myeik	12.441	98.610	284,489		2	4	8	0	0	2	0
375	MMR187	Myingyan	21.457	95.392	276,096		10	0	10	0	0	2	0
376	MMR188	Myinmu	21.925	95.576	106,986		10	0	10	0	0	0	0
377	MMR189	Myitkyina	25.387	97.390	317,604		10	0	8	8	0	0	0
378	MMR190	Myittha	21.424	96.131	195,629		10	0	8	0	0	0	0
379	MMR191	Myothit	20.199	95.447	159,511		8	0	6	0	0	0	0
380	MMR192	Namhkan	23.837	97.682	113,821		4	0	6	6	0	0	0
381	MMR193	Namhsan	22.964	97.161	72,204		4	0	0	0	0	0	0
382	MMR194	Namphan	22.603	99.098	116,180		8	0	0	0	0	0	0
383	MMR195	Namtu	23.094	97.400	50,423		4	0	8	0	0	0	0
384	MMR196	Nansang	20.889	97.720	116,961		6	0	0	0	0	0	0
385	MMR197	Nanyun	26.980	96.167	51,980		10	0	0	2	0	0	0
386	MMR198	Natmauk	20.353	95.400	206,996		8	0	6	0	0	0	0
387	MMR199	Natogyi	21.424	95.654	177,078		10	0	0	0	0	0	0
388	MMR200	Nattalin	18.428	95.547	172,141		6	0	0	8	0	0	0
389	MMR201	Nawngkhio	22.330	96.799	149,842		6	0	0	0	0	0	0
390	MMR202	Ngape	20.075	94.468	52,142		8	0	4	2	0	0	0
391	MMR203	Ngapudaw	16.545	94.692	324,479		6	10	2	6	2	0	0
392	MMR204	Ngazun	21.897	95.685	124,233		10	0	8	0	0	0	0
393	MMR205	Nogmung	27.505	97.818	7,123		8	0	4	0	0	0	0
394	MMR206	North Dagon Myothit-EY	16.878	96.191	203,948	2MC(Yangon)	6	8	8	10	2	3	2
395	MMR207	North Okkalapa-EY	16.919	96.163	333,293	2MC(Yangon)	6	2	0	8	2	3	2
396	MMR208	Nyaungdon	17.049	95.634	215,906		6	0	8	6	0	0	0
397	MMR209	Nyaunglebin	17.953	96.722	199,483		6	0	8	6	0	0	0
398	MMR210	Nyaungshwe	20.660	96.932	189,407		10	0	8	0	0	0	0
399	MMR211	Nyaung-U	21.195	94.910	239,947		8	0	10	0	0	0	0
400	MMR212	Okpho	18.130	95.672	126,662		6	0	6	8	0	0	0
401	MMR213	Oktwin	18.833	96.414	159,828		6	0	0	2	0	0	0
402	MMR214	Ottarathiri	19.891	96.043	81,620	Capital (NUT)	10	0	0	0	0	0	0
403	MMR215	Pabedan-WY	16.777	96.156	33,336	2MC(Yangon)	4	8	10	10	2	3	1
404	MMR216	Padaung	18.718	95.154	144,214		6	0	8	6	0	1	0
405	MMR217	Pakokku	21.335	95.082	290,139		8	0	0	0	0	0	0
406	MMR218	Palaw	12.975	98.646	129,992		2	2	2	0	0	0	0
407	MMR219	Pale	21.934	94.875	144,006		10	0	0	0	0	0	0
408	MMR220	Paletwa	21.304	92.855	97,053		8	0	4	6	0	0	0
409	MMR221	Pangsang	22.180	99.151	105,972		8	0	2	0	0	0	0
410	MMR222	Pangwaun	23.035	99.316	97,097		10	0	0	0	0	0	0
411	MMR223	Pantanaw	16.982	95.466	264,596		6	0	8	6	0	0	0
412	MMR224	Patheingyi	16.779	94.733	380,985		6	0	10	10	0	2	0
413	MMR225	Patheingyi	22.013	96.154	263,725		10	0	8	0	0	3	0
414	MMR226	Pauk	21.452	94.474	171,514		8	0	8	6	0	0	0
415	MMR227	Paukkhaung	18.903	95.548	124,856		6	0	0	6	0	0	0
416	MMR228	Pauktaw	20.181	93.068	145,957		8	10	2	8	4	1	0
417	MMR229	Paung	16.617	97.457	218,459		6	2	0	0	0	0	0
418	MMR230	Paungbyin	24.268	94.817	112,694		10	0	6	6	0	0	0
419	MMR231	Paungde	18.489	95.507	137,561		6	0	0	8	0	0	0
420	MMR232	Pazundaung-EY	16.780	96.174	48,455	2MC(Yangon)	4	8	10	10	2	3	1
421	MMR233	Pekon	19.863	97.008	103,590		8	0	2	0	0	0	0
422	MMR234	Pindaya	20.942	96.663	79,303		8	0	0	0	0	0	0
423	MMR235	Pinlaung	20.124	96.782	192,257		10	0	0	0	0	0	0
424	MMR236	Pinlebu	24.081	95.370	111,968		10	0	6	4	0	0	0
425	MMR237	Pobbathiri	19.806	96.183	116,491	Capital (NUT)	8	0	8	0	0	0	0
426	MMR238	Ponnagyun	20.332	93.004	129,753		8	10	2	6	4	2	0
427	MMR239	Putao	27.299	97.416	61,075		10	0	2	4	0	0	0
428	MMR240	Pwintbyu	20.363	94.669	163,692		8	0	8	0	0	1	0
429	MMR241	Pyapon	16.284	95.683	314,122		4	0	0	8	2	0	0
430	MMR242	Pyawbwe	20.595	96.051	260,293		10	0	4	0	0	0	0
431	MMR243	Pyay	18.822	95.221	251,643		6	0	8	8	0	2	0
432	MMR244	Pyigyidagun	21.902	96.104	237,698		10	0	6	0	0	3	0
433	MMR245	Pyinmana	19.736	96.209	187,565	Capital (NUT)	8	0	8	0	0	0	0
434	MMR246	Pyinoolwin	22.014	96.456	255,508		8	0	0	0	0	0	0

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Source: JICA Project Team

Table A3-8 Long List Cities (No.435-No.496: "abc" city name order)

Capital: National Capital City
 Others: CR: Capital Region City
 SMC: Second Large Mega City EQ: Earthquake
 NUT: Naypyitau Union Territory TS: Tsunami
 NCR: Philippines Capital Region FL: Flood
 CYW: Cyclone (Typhoon/Monsoon)-Wind
 CYS: Cyclone (Typhoon/Monsoon)-Surge
 IA: Major Industrial Area
 Infra: Key Regional Infrastructure

No.	Code	Name	latitude	longitude	Population	Capital /Others	Natural Hazard					Exposure	
							EQ	TS	FL	CYW	CYS	IA	Infra
435	MMR247	Pyu	18.484	96.436	257,273		8	0	6	6	0	0	0
436	MMR248	Ramree	19.092	93.862	97,891		6	10	0	4	2	0	0
437	MMR249	Rathedaung	20.488	92.754	111,974		8	10	0	8	4	0	0
438	MMR250	Sagaing	21.880	95.962	307,194		10	0	10	0	0	3	1
439	MMR251	Salin	20.577	94.659	236,033		8	0	6	0	0	1	0
440	MMR252	Salingyi	21.974	95.088	121,808		8	0	8	0	0	0	0
441	MMR253	Sanchaung-EY	16.804	96.137	99,619	2MC(Yangon)	4	8	10	10	2	3	1
442	MMR254	Saw	21.150	94.156	68,697		8	0	0	4	0	0	0
443	MMR255	Seikgyi Kanaungto-SY	16.758	96.116	34,003	2MC(Yangon)	4	8	10	10	2	1	1
444	MMR256	Seikkan-WY	16.770	96.155	2,826	2MC(Yangon)	4	8	10	10	2	3	1
445	MMR257	Seikphyu	20.907	94.792	102,769		8	0	10	0	0	0	0
446	MMR258	Shadaw	19.632	97.521	6,742		6	0	0	0	0	0	0
447	MMR259	Shwebo	22.570	95.698	266,807		10	0	0	0	0	0	0
448	MMR260	Shwedaung	18.705	95.214	121,671		6	0	10	8	0	1	0
449	MMR261	Shwegu	24.207	96.806	94,784		8	0	8	6	0	0	0
450	MMR262	Shwegyin	17.923	96.878	107,462		6	0	8	6	0	0	0
451	MMR263	Shwepyithar-NY	16.955	96.083	343,526		4	0	6	8	2	3	2
452	MMR264	Sidoktaya	20.447	94.246	47,526		8	0	0	4	0	0	0
453	MMR265	Sinbaungwe	19.727	95.166	117,844		6	0	6	0	0	0	0
454	MMR266	Singu	22.550	95.999	157,585		10	0	8	0	0	0	0
455	MMR267	Sintgaing	21.731	96.104	148,918		10	0	6	0	0	0	1
456	MMR268	Sittwe	20.137	92.886	147,899		8	10	0	10	4	0	0
457	MMR269	South Dagon Myothit=EY	16.840	96.226	371,646	2MC(Yangon)	6	4	8	10	2	3	1
458	MMR270	South Okkalapa-EY	16.846	96.180	161,126	2MC(Yangon)	4	8	8	10	2	3	2
459	MMR271	Sumpabum	26.544	97.568	2,546	2MC(Yangon)	10	0	0	0	0	0	0
460	MMR272	Tabayin	22.685	95.321	140,815		10	0	4	0	0	0	0
461	MMR273	Tachileik	20.453	99.884	177,313		4	0	6	0	0	0	0
462	MMR274	Tada-U	21.819	95.974	138,617		10	0	8	0	0	3	1
463	MMR275	Taikkyl-NY	17.313	95.963	277,268	2MC(Yangon)	6	0	4	8	0	0	0
464	MMR276	Tamu	24.211	94.315	114,869		10	0	0	6	0	0	0
465	MMR277	Tamwe-EY	16.810	96.176	165,313	2MC(Yangon)	4	8	10	10	2	3	1
466	MMR278	Tanai	26.358	96.717	60,019		10	0	6	6	0	0	0
467	MMR279	Tangyan	22.498	98.397	172,805		4	0	0	0	0	0	0
468	MMR280	Tanintharyi	12.087	99.011	106,853		2	0	4	0	0	0	0
469	MMR281	Tatkon	20.130	96.203	217,093	Capital	10	0	6	0	0	2	0
470	MMR282	Taungdwingyi	20.002	95.546	259,860		8	0	0	0	0	0	0
471	MMR283	Taunggyi	20.775	97.036	438,056		8	0	0	0	0	0	0
472	MMR284	Taungoo	18.940	96.433	262,056		6	0	8	0	0	0	0
473	MMR285	Taungtha	21.276	95.445	216,642		8	0	0	0	0	1	0
474	MMR286	Taze	22.944	95.374	165,110		10	0	6	0	0	0	0
475	MMR287	Tedim	23.371	93.656	87,623		10	0	0	6	0	0	0
476	MMR288	Thabaung	17.047	94.806	154,400		6	0	8	8	0	0	0
477	MMR289	Thabeikkyin	22.886	95.975	163,702		10	0	6	0	0	0	0
478	MMR290	Thaketa-EY	16.793	96.203	220,556	2MC(Yangon)	6	8	10	10	2	3	1
479	MMR291	Thanatpin	17.289	96.577	145,287		6	0	8	6	0	0	0
480	MMR292	Thanbyuzayat	15.967	97.733	170,536		4	2	0	0	0	0	0
481	MMR293	Thandaunggyi	19.073	96.675	96,052		8	0	0	0	0	0	0
482	MMR294	Thandwe	18.471	94.372	133,484		6	10	8	6	2	0	0
483	MMR295	Thanlyin-SY	16.764	96.252	268,063	2MC(Yangon)	6	4	2	8	2	3	2
484	MMR296	Thantlang	22.698	93.428	50,374		10	0	0	6	0	0	0
485	MMR297	Thaton	16.920	97.368	238,106		6	0	0	4	0	0	0
486	MMR298	Thayarwady	17.654	95.786	151,104		6	0	8	8	0	0	0
487	MMR299	Thayet	19.322	95.177	104,347		6	0	8	0	0	0	0
488	MMR300	Thayetchaung	13.867	98.265	105,662		2	10	0	0	0	0	0
489	MMR301	Thazi	20.850	96.058	202,680		10	0	6	0	0	1	0
490	MMR302	Thegon	18.647	95.417	130,957		6	0	6	6	0	0	0
491	MMR303	Thingangyun-EY	16.831	96.193	209,486	2MC(Yangon)	6	8	10	10	2	3	2
492	MMR304	Thongwa-SY	16.759	96.523	157,876	2MC(Yangon)	6	0	0	8	0	0	0
493	MMR305	Tigyain	23.755	96.148	129,955		10	0	8	6	0	0	0
494	MMR306	Tilin	21.696	94.093	48,866		8	0	2	6	0	0	0
495	MMR307	Tonzang	23.603	93.692	31,878		10	0	6	4	0	0	0
496	MMR308	Toungup	18.858	94.243	158,341		6	10	0	6	4	0	0

BRN: Brunei Darussalam, KHM: Cambodia, IDN: Indonesia, LAO: Lao PDR, MYS: Malaysia, MMR: Myanmar, PHL: Philippines, SGP: Singapore, THA: Thailand, VNM: Viet Nam

Source: JICA Project Team

Table A3-9 Long List Cities (No.497-No.558: “abc” city name order)

Capital: National Capital City
 Others: CR: Capital Region City
 SMC: Second Large Mega City EQ: Earthquake
 NUT: Naypyitau Union Territory TS: Tsunami
 NCR: Philippines Capital Region FL: Flood
 CYW: Cyclone (Typhoon/monsoon)-Wind
 CYS: Cyclone (Typhoon/monsoon)-Surge
 IA: Major Industrial Area
 Infra: Key Regional Infrastructure

No.	Code	Name	latitude	longitude	Population	Capital /Others	Natural Hazard					Exposure	
							EQ	TS	FL	CYW	CYS	IA	Infra
497	MMR309	Twantay-SY	16.707	95.930	226,836	2MC(Yangon)	4	0	0	8	0	1	0
498	MMR310	Waingmaw	25.351	97.443	125,544		10	0	6	6	0	0	0
499	MMR311	Wakema	16.604	95.180	289,106		6	0	6	8	0	0	0
500	MMR312	Waw	17.477	96.682	176,014		6	0	8	6	0	0	0
501	MMR313	Wetlet	22.367	95.788	196,216		10	0	8	0	0	0	0
502	MMR314	Wundwin	21.097	96.030	229,760		10	0	0	0	0	1	0
503	MMR315	Wuntho	23.898	95.689	73,395		10	0	0	0	0	0	0
504	MMR316	Yamethin	20.431	96.137	258,091		10	0	4	0	0	0	0
505	MMR317	Yankin-EY	16.836	96.162	70,946	2MC(Yangon)	4	8	8	10	2	3	2
506	MMR318	Ye	15.252	97.854	263,624		4	2	6	0	0	0	0
507	MMR319	Yebyu	14.246	98.203	122,633		2	0	8	0	0	0	0
508	MMR320	Yedashe	19.157	96.342	213,593		6	0	4	0	0	0	0
509	MMR321	Yegyí	17.345	95.121	194,100		6	0	8	8	0	0	0
510	MMR322	Yenangyaung	20.458	94.873	134,227		8	0	10	0	0	0	0
511	MMR323	Yesagyo	21.633	95.242	215,352		8	0	8	0	0	0	0
512	MMR324	Ye-U	22.769	95.430	118,290		10	0	8	0	0	0	0
513	MMR325	Yinmabin	22.078	94.900	141,480		10	0	0	0	0	0	0
514	MMR326	Ywangan	21.163	96.442	82,532		8	0	0	0	0	0	2
515	MMR327	Zabuthir	19.764	96.061	110,459	Capital (NUT)	8	0	0	0	0	0	0
516	MMR328	Zalun	17.478	95.557	168,203		6	0	8	8	0	1	0
517	MMR329	Zeyarthiri	19.862	96.309	111,293	Capital (NUT)	8	0	0	0	0	0	0
518	MMR330	Zigon	18.338	95.623	67,523		6	0	0	8	0	0	0
519	PHL01	Alaminos	16.155	119.980	85,025		8	4	0	6	6	2	0
520	PHL02	Angeles city	15.145	120.589	326,336		10	0	8	8	0	3	2
521	PHL03	Antipolo	14.590	121.170	677,741		10	0	0	8	0	2	1
522	PHL04	Bacolod city	10.630	122.970	511,820		8	0	0	8	0	0	1
523	PHL05	Bacoar city	14.413	120.974	520,216		10	10	0	8	0	3	1
524	PHL06	Bago city	10.490	122.989	163,045		8	0	0	6	0	0	0
525	PHL07	Baguio city	16.415	120.589	318,676		8	0	0	8	0	2	0
526	PHL08	Bais city	9.592	123.123	74,722		8	0	0	4	0	0	0
527	PHL09	Balanga	14.679	120.541	87,920		10	10	8	8	0	1	0
528	PHL10	Batac	18.056	120.564	53,542		8	2	0	8	2	0	1
529	PHL11	Batangas city	13.756	121.058	305,607		10	10	0	8	0	3	2
530	PHL12	Bayawan	9.363	122.806	114,074		8	0	0	4	0	0	0
531	PHL13	Baybay	10.674	124.804	102,841		10	0	0	6	0	0	0
532	PHL14	Bayugan	8.716	125.755	99,361		10	0	0	4	0	0	0
533	PHL15	Binan	14.333	121.082	283,396		10	0	0	8	0	3	1
534	PHL16	Bislig	8.187	126.354	96,578		10	4	0	6	0	0	0
535	PHL17	Bogo	11.048	124.004	69,911		6	0	0	4	0	0	0
536	PHL18	Borongon	11.609	125.436	64,457		10	2	0	6	0	0	0
537	PHL19	Butuan city	8.948	125.541	309,709		10	4	8	6	2	0	0
538	PHL20	Cabadbaran	9.122	125.533	69,241		10	4	4	6	2	2	0
539	PHL21	Cabanatuan city	15.487	120.973	272,676		10	0	10	8	0	0	0
540	PHL22	Cabuyao city	14.251	121.134	248,436		10	0	8	10	0	3	0
541	PHL23	Cadiz city	10.953	123.275	151,500		8	0	0	6	0	0	0
542	PHL24	Cagayan de oro city	8.485	124.651	602,088		8	0	8	6	0	1	2
543	PHL25	Calamba	14.206	121.156	389,377		10	0	0	8	0	3	0
544	PHL26	Calapan	13.413	121.178	124,173		10	10	6	8	0	0	0
545	PHL27	Calbayog city	12.069	124.596	172,778		10	0	0	6	0	0	0
546	PHL28	Caloocan city	14.757	121.042	1,489,040	CR (NCR)	10	8	0	10	0	3	1
547	PHL29	Candon	17.191	120.448	57,884		10	2	2	8	2	0	0
548	PHL30	Canlaon city	10.387	123.219	50,627		6	0	0	6	0	0	0
549	PHL31	Carcar	10.104	123.640	107,323		6	0	0	6	0	1	0
550	PHL32	Catbalogan	11.778	124.883	94,317		10	0	0	8	0	0	0
551	PHL33	Cauayan	16.936	121.766	122,335		4	0	8	8	0	0	0
552	PHL34	Cavite city	14.479	120.897	101,120		10	10	10	8	0	3	1
553	PHL35	Cebu city	10.320	123.900	866,171		8	0	0	8	0	3	3
554	PHL36	Cotabato city	7.222	124.252	271,786		8	0	8	4	0	0	0
555	PHL37	Dagupan city	16.043	120.333	163,676		8	10	8	6	2	0	0
556	PHL38	Danao city	10.520	124.027	119,252		8	0	0	6	0	1	0
557	PHL39	Dapitan city	8.651	123.421	77,441		8	0	0	2	0	0	0
558	PHL40	Dasmariñas	14.315	120.966	575,817		10	0	0	8	0	3	0

BRN: Brunei Darussalam, KHM: Cambodia, IDN: Indonesia, LAO: Lao PDR, MYS: Malaysia, MMR: Myanmar, PHL: Philippines, SGP: Singapore, THA: Thailand, VNM: Viet Nam

Source: JICA Project Team

Table A3-10 Long List Cities (No.559-No.620: “abc” city name order)

Capital: National Capital City
 Others: CR: Capital Region City
 SMC: Second Large Mega City EQ: Earthquake
 NUT: Naypyitau Union Territory TS: Tsunami
 NCR: Philippines Capital Region FL: Flood
 CYW: Cyclone (Typhoon/Monsoon)-Wind
 CYS: Cyclone (Typhoon/Monsoon)-Surge
 IA: Major Industrial Area
 Infra: Key Regional Infrastructure

No.	Code	Name	latitude	longitude	Population	Capital /Others	Natural Hazard					Exposure	
							EQ	TS	FL	CYW	CYS	IA	Infra
559	PHL41	Davao city	7.110	125.630	1,449,296		10	2	8	6	0	3	3
560	PHL42	Digos	6.750	125.355	149,891		10	8	0	4	0	0	0
561	PHL43	Dipolog city	8.587	123.340	120,460		8	0	0	4	0	0	0
562	PHL44	Dumaguete city	9.307	123.305	120,883		6	0	0	6	0	0	0
563	PHL45	El salvador	8.559	124.517	44,848		8	0	0	4	0	0	2
564	PHL46	Escalante	10.841	123.499	93,005		6	0	0	6	0	0	0
565	PHL47	Gapan	15.308	120.946	101,488		10	0	0	8	0	0	0
566	PHL48	General santos city	6.110	125.179	538,086		8	0	8	6	0	0	3
567	PHL49	Gingog city	8.824	125.102	117,908		10	4	0	4	0	0	0
568	PHL50	Guihulngan	10.118	123.270	93,675		6	0	0	4	0	0	0
569	PHL51	Himamaylan	10.097	122.870	103,006		8	0	0	4	0	0	0
570	PHL52	Ilagan city	8.229	124.241	135,174		8	0	2	6	0	0	0
571	PHL53	Iligan city	8.229	124.241	322,821		8	0	2	6	0	0	0
572	PHL54	Iloilo city	10.697	122.569	424,619		8	0	0	8	0	0	2
573	PHL55	Imus city	14.406	120.939	301,624		10	10	0	8	0	3	1
574	PHL56	Iriga city	13.421	123.410	105,919		10	0	8	8	0	1	0
575	PHL57	Isabela	10.204	122.988	97,857		8	0	6	6	0	0	0
576	PHL58	Kabankalan	9.992	122.812	167,666		8	0	8	4	0	0	0
577	PHL59	Kidapawan	7.011	125.091	125,447		10	0	0	4	0	0	0
578	PHL60	Koronadal	6.500	124.844	158,273		8	0	0	4	0	0	0
579	PHL61	La carlota city	10.425	122.921	63,852		8	0	0	6	0	0	0
580	PHL62	Lamitan	6.661	122.138	68,996		8	0	0	0	0	0	0
581	PHL63	Laoag city	18.200	120.590	104,904		8	2	8	8	2	0	2
582	PHL64	Lapu-lapu city	10.321	123.970	350,467		8	0	0	8	0	3	3
583	PHL65	Las pinas	14.444	120.993	552,573	CR (NCR)	10	10	10	10	0	3	2
584	PHL66	Legazpi city	13.147	123.754	182,201		10	0	8	8	0	0	2
585	PHL67	Ligao	13.242	123.537	104,914		10	0	0	8	0	0	1
586	PHL68	Lipa city	13.941	121.160	283,468		10	0	2	8	0	3	0
587	PHL69	Lucena city	13.941	121.623	246,392		10	10	0	8	0	0	0
588	PHL70	Maasin	10.134	124.846	81,250		10	2	0	6	0	0	0
589	PHL71	Mabalacat city	15.220	120.574	215,610		10	0	8	8	0	3	2
590	PHL72	Makati	14.555	121.024	529,039	CR (NCR)	10	10	10	10	0	3	3
591	PHL73	Malabon	14.670	120.964	353,337	CR (NCR)	10	10	10	10	0	3	2
592	PHL74	Malaybalay	8.155	125.128	153,085		10	0	0	4	0	0	0
593	PHL75	Malolos	14.850	120.810	234,945		10	10	10	8	0	3	0
594	PHL76	Mandaluyong	14.579	121.036	328,699	CR (NCR)	10	10	10	10	0	3	3
595	PHL77	Mandaue city	10.330	123.930	331,320		8	0	0	8	0	3	3
596	PHL78	Manila	14.620	120.970	1,652,171	Capital	10	10	10	10	0	3	2
597	PHL79	Marawi city	8.000	124.290	187,106		8	0	8	4	0	0	0
598	PHL80	Marikina	14.650	121.103	424,150	CR (NCR)	10	2	0	10	0	2	1
599	PHL81	Masbate	12.369	123.619	85,227		10	0	0	6	0	0	0
600	PHL82	Mati	6.952	126.218	126,143		10	2	0	6	0	0	0
601	PHL83	Meycauayan	14.749	120.973	199,154		10	10	10	10	0	3	1
602	PHL84	Muntinlupa	14.410	121.047	459,941	CR (NCR)	10	4	8	8	0	3	1
603	PHL85	Muñoz-science city	15.714	120.903	75,462		8	0	4	8	0	0	0
604	PHL86	Naga (cebu)	13.622	123.194	101,571		10	0	10	10	0	1	0
605	PHL87	Naga city (bicol)	10.208	123.758	174,931		6	0	0	6	0	2	1
606	PHL88	Navotas	14.667	120.941	249,131	CR (NCR)	10	10	10	10	0	3	2
607	PHL89	Olongapo city	14.820	120.280	221,178		10	10	8	8	0	3	3
608	PHL90	Ormoc city	11.006	124.608	191,200		10	0	0	8	0	1	0
609	PHL91	Oroquieta city	8.484	123.806	68,945		8	0	0	4	0	0	0
610	PHL92	Ozamis city	8.149	123.850	131,527		8	0	0	4	0	0	0
611	PHL93	Pagadian city	7.823	123.438	186,852		8	0	0	4	0	0	0
612	PHL94	Palayan city	15.583	121.116	37,219		8	0	6	6	0	0	0
613	PHL95	Panabo	7.308	125.683	174,364		10	8	4	6	0	1	1
614	PHL96	Paranaque	14.477	121.020	588,126	CR (NCR)	10	10	6	10	0	3	2
615	PHL97	Pasay city	14.536	121.001	392,869	CR (NCR)	10	10	10	10	0	3	3
616	PHL98	Pasig	14.576	121.086	669,773	CR (NCR)	10	4	8	10	0	3	2
617	PHL99	Passi	11.107	122.643	79,663		8	0	0	6	0	0	0
618	PHL100	Pateros	14.542	121.064	6,417	CR (NCR)	10	10	10	10	0	3	2
619	PHL101	Puerto princesa city	9.741	118.737	222,673		4	0	0	0	0	0	2
620	PHL102	Quezon city	14.674	121.044	2,761,720	CR (NCR)	10	6	10	10	0	3	1

BRN: Brunei Darussalam, KHM: Cambodia, IDN: Indonesia, LAO: Lao PDR, MYS: Malaysia, MMR: Myanmar, PHL: Philippines, SGP: Singapore, THA: Thailand, VNM: Viet Nam

Source: JICA Project Team

Table A3-11 Long List Cities (No.621-No.682: “abc” city name order)

Capital: National Capital City
 Others: CR: Capital Region City
 SMC: Second Large Mega City EQ: Earthquake
 NUT: Naypyitau Union Territory TS: Tsunami
 NCR: Philippines Capital Region FL: Flood

CYW: Cyclone (Typhoon/Monsoon)-Wind
 CYS: Cyclone (Typhoon/Monsoon)-Surge
 IA: Major Industrial Area
 Infra: Key Regional Infrastructure

No.	Code	Name	latitude	longitude	Population	Capital /Others	Natural Hazard					Exposure	
							EQ	TS	FL	CYW	CYS	IA	Infra
621	PHL103	Roxas city	11.583	122.750	156,197		8	0	6	6	0	0	0
622	PHL104	Sagay city	10.944	123.425	140,740		6	0	0	4	0	0	0
623	PHL105	Samal	14.769	120.543	95,874		10	10	8	8	0	2	0
624	PHL106	San carlos city (Ilocos)	15.927	120.348	175,103		8	0	8	8	2	0	0
625	PHL107	San carlos city (NegrolOc)	10.483	123.421	129,981		6	0	0	4	0	0	0
626	PHL108	San fernando (C Luzon)	16.616	120.317	285,912		10	2	6	8	2	2	0
627	PHL109	San fernando (Ilocos)	15.030	120.690	114,963		10	0	10	8	0	2	0
628	PHL110	San jose city	10.749	121.941	129,424		8	0	0	6	0	0	0
629	PHL111	San jose del monte	14.814	121.045	454,553		10	0	0	10	0	3	0
630	PHL112	San juan	14.600	121.037	121,430	CR (NCR)	10	10	10	10	0	3	3
631	PHL113	San pablo city	14.064	121.323	248,890		10	0	8	8	0	1	0
632	PHL114	San pedro	14.350	121.038	294,310		10	0	8	8	0	3	1
633	PHL115	Santa rosa	14.285	121.088	284,670		10	0	8	10	0	3	0
634	PHL116	Santiago	16.689	121.547	132,804		4	0	8	8	0	0	0
635	PHL117	Silay city	10.798	122.975	120,999		8	0	0	6	0	0	2
636	PHL118	Sipalay	9.749	122.403	67,403		8	0	0	2	0	0	0
637	PHL119	Sorsogon	12.970	124.005	155,144		10	0	0	8	0	0	0
638	PHL120	Surigao city	9.789	125.492	140,540		10	4	0	6	2	1	0
639	PHL121	Tabaco	13.359	123.729	125,083		10	0	0	8	0	0	0
640	PHL122	Tabuk	17.414	121.441	103,912		10	0	2	6	0	0	0
641	PHL123	Tacloban city	11.249	125.002	221,174		10	4	0	8	0	2	0
642	PHL124	Tacurong	6.682	124.677	89,188		8	0	0	4	0	0	0
643	PHL125	Tagaytay city	14.115	120.962	62,030		10	0	0	6	0	1	0
644	PHL126	Tagbilaran city	9.643	123.856	96,792		6	0	0	6	0	0	0
645	PHL127	Taguig city	14.517	121.053	644,473	CR (NCR)	10	10	10	10	0	3	2
646	PHL128	Tagum	7.448	125.809	242,801		10	2	4	6	0	0	0
647	PHL129	Talisay (negros oriental)	10.740	122.970	97,571		8	0	0	8	0	0	2
648	PHL130	Talisay (sebu)	10.245	123.840	200,772		6	0	0	6	0	2	2
649	PHL131	Tanauan	14.084	121.150	152,393		10	0	0	8	0	3	0
650	PHL132	Tandag	9.074	126.195	52,114		10	6	6	4	2	0	0
651	PHL133	Tangub city	8.063	123.749	59,892		8	0	0	4	0	0	0
652	PHL134	Tanjay	9.517	123.157	79,098		8	0	0	4	0	0	0
653	PHL135	Tarlac	15.485	120.591	318,332		8	0	8	8	0	3	0
654	PHL136	Tayabas	14.025	121.596	91,428		10	0	0	8	0	0	0
655	PHL137	Toledo city	10.380	123.640	157,078		6	0	0	6	0	1	0
656	PHL138	Trece martires city	14.282	120.868	104,559		10	0	0	8	0	3	0
657	PHL139	Tuguegarao city	17.613	121.725	138,865		8	0	10	8	0	0	0
658	PHL140	Urdaneta	15.980	120.570	125,451		8	0	8	8	0	0	0
659	PHL141	Valencia	7.905	125.091	181,556		10	0	6	4	0	0	0
660	PHL142	Valenzuela	14.702	120.979	575,356	CR (NCR)	10	10	10	10	0	3	1
661	PHL143	Victorias	10.902	123.072	88,299		8	0	0	6	0	0	1
662	PHL144	Vigan	17.571	120.387	49,747		10	10	6	8	8	0	0
663	PHL145	Zamboanga city	6.920	122.080	807,129		8	0	0	0	0	1	3
664	SGP01	Ang Mo Kio	1.370	103.846	174,770		4	0	0	0	0	3	2
665	SGP02	Bedok	1.325	103.927	289,750		4	0	0	0	0	3	2
666	SGP03	Bishan	1.351	103.848	90,700		4	0	0	0	0	3	3
667	SGP04	Boon Lay	1.339	103.706	30		4	0	0	0	0	3	1
668	SGP05	Bukit Batok	1.359	103.764	139,270		4	0	0	0	0	3	2
669	SGP06	Bukit Merah	1.282	103.823	155,840		4	0	0	0	0	3	3
670	SGP07	Bukit Panjang	1.377	103.771	139,030		4	0	0	0	0	3	2
671	SGP08	Bukit Timah	1.329	103.802	74,470		4	0	0	0	0	3	3
672	SGP09	Central Water Catchment	1.358	103.799	10		4	0	0	0	0	3	3
673	SGP10	Changi	1.346	103.983	2,530		4	0	0	0	0	3	2
674	SGP11	Choa Chu Kang	1.384	103.747	174,330		4	0	0	0	0	3	2
675	SGP12	Clementi	1.317	103.765	91,630		4	0	0	0	0	3	3
676	SGP13	Downtown Core	1.286	103.853	3,720		4	0	0	0	0	3	3
677	SGP14	Geylang	1.320	103.891	116,960		4	0	0	0	0	3	3
678	SGP15	Hougang	1.360	103.886	222,310		4	0	0	0	0	3	2
679	SGP16	Jurong East	1.308	103.733	84,980		4	0	0	0	0	3	3
680	SGP17	Jurong West	1.341	103.708	272,660		4	0	0	0	0	3	1
681	SGP18	Kallang	1.313	103.864	101,210		4	0	0	0	0	3	3
682	SGP19	Lim Chu Kang	1.430	103.717	90		2	0	0	0	0	3	2

BRN: Brunei Darussalam, KHM: Cambodia, IDN: Indonesia, LAO: Lao PDR, MYS: Malaysia, MMR: Myanmar, PHL: Philippines, SGP: Singapore, THA: Thailand, VNM: Viet Nam

Source: JICA Project Team

Table A3-12 Long List Cities (No.683-No.744: “abc” city name order)

Capital: National Capital City
 Others: CR: Capital Region City
 SMC: Second Large Mega City EQ: Earthquake
 NUT: Naypyitau Union Territory TS: Tsunami
 NCR: Philippines Capital Region FL: Flood
 CYW: Cyclone (Typhoon/Monsoon)-Wind
 CYS: Cyclone (Typhoon/Monsoon)-Surge
 IA: Major Industrial Area
 Infra: Key Regional Infrastructure

No.	Code	Name	latitude	longitude	Population	Capital /Others	Natural Hazard					Exposure	
							EQ	TS	FL	CYW	CYS	IA	Infra
683	SGP20	Mandai	1.427	103.824	2,120		4	0	0	0	0	3	2
684	SGP21	Marine Parade	1.302	103.897	48,730		4	0	0	0	0	3	2
685	SGP22	Museum	1.296	103.848	380		4	0	0	0	0	3	3
686	SGP23	Newton	1.308	103.840	6,920		4	0	0	0	0	3	3
687	SGP24	North-Eastern Islands	1.406	104.032	60		4	0	0	0	0	3	2
688	SGP25	Novena	1.321	103.842	47,990		4	0	0	0	0	3	3
689	SGP26	Orchard	1.305	103.833	920		4	0	0	0	0	3	3
690	SGP27	Outram	1.282	103.842	22,080		4	0	0	0	0	3	3
691	SGP28	Pasir Ris	1.372	103.949	139,890		4	0	0	0	0	3	2
692	SGP29	Paya Lebar	1.351	103.899	40		4	0	0	0	0	3	3
693	SGP30	Pioneer	1.317	103.676	100		2	0	0	0	0	3	1
694	SGP31	Punggol	1.400	103.907	109,750		4	0	0	0	0	3	2
695	SGP32	Queenstown	1.297	103.789	98,050		4	0	0	0	0	3	3
696	SGP33	River Valley	1.296	103.836	9,190		4	0	0	0	0	3	3
697	SGP34	Rochor	1.305	103.851	14,590		4	0	0	0	0	3	3
698	SGP35	Seletar	1.419	103.866	270		4	0	0	0	0	3	2
699	SGP36	Sembawang	1.450	103.819	76,530		4	0	0	0	0	3	2
700	SGP37	Sengkang	1.390	103.894	206,680		4	0	0	0	0	3	2
701	SGP38	Serangoon	1.364	103.866	120,670		4	0	0	0	0	3	2
702	SGP39	Singapore River	1.288	103.846	2,720		4	0	0	0	0	3	3
703	SGP40	Southern Islands	1.254	103.820	1,480		4	0	0	0	0	3	2
704	SGP41	Sungei Kadut	1.407	103.757	850		2	0	0	0	0	3	3
705	SGP42	Tampines	1.350	103.955	261,230		4	0	0	0	0	3	2
706	SGP43	Tanglin	1.308	103.822	19,000		4	0	0	0	0	3	3
707	SGP44	Tengah	1.354	103.731	10		4	0	0	0	0	3	2
708	SGP45	Toa Payoh	1.335	103.856	124,940		4	0	0	0	0	3	3
709	SGP46	Tuas	1.295	103.630	70		2	0	0	0	0	3	1
710	SGP47	Western Water Catchment	1.392	103.690	900		2	0	0	0	0	3	2
711	SGP48	Woodlands	1.439	103.789	250,290		2	0	0	0	0	3	3
712	SGP49	Yishun	1.429	103.836	201,970		4	0	0	0	0	3	2
713	THA01	Angsila	13.324	100.930	291,721		2	0	4	0	0	1	0
714	THA02	Ban Suan	13.356	100.999	60,797		2	0	0	0	0	2	0
715	THA03	Bang Mueang	13.623	100.601	92,286		2	0	10	0	0	3	2
716	THA04	Bang Pu	13.507	100.743	104,922		2	0	6	0	0	3	1
717	THA05	Bangkok	13.756	100.502	5,782,159	Capital	2	0	10	0	0	3	2
718	THA06	Chao Phraya Surasak	13.154	100.991	109,983		2	0	0	0	0	3	1
719	THA07	Chiang Mai	18.800	98.980	174,235		2	0	8	0	0	0	2
720	THA08	Chiang Rai	19.910	99.830	64,817		4	0	8	0	0	0	2
721	THA09	Dan Samrong	13.659	100.583	53,911		2	0	10	0	0	3	2
722	THA10	Hat Yai	7.000	100.470	157,467		2	0	6	0	0	1	1
723	THA11	Khelang Nakhon	13.761	101.023	60,646		2	0	8	0	0	2	0
724	THA12	Khet Udomsakdi	12.628	100.928	53,107		2	0	0	0	0	1	2
725	THA13	Khon Kaen	16.420	102.830	129,581		2	0	6	0	0	2	0
726	THA14	Koh Samui	9.523	100.056	60,781		2	0	0	0	0	0	2
727	THA15	Laem Chabang	13.104	100.916	69,202		2	0	0	0	0	3	2
728	THA16	Lampang	18.287	99.500	69,226		2	0	6	0	0	0	0
729	THA17	Lat Luang	14.170	100.358	73,196		4	0	8	0	0	0	0
730	THA18	Mae Sot	16.712	98.575	52,350		6	0	6	0	0	1	0
731	THA19	Nakhon Pathom	13.820	100.060	93,088		4	0	4	0	0	0	0
732	THA20	Nakhon Ratchasima	14.974	102.084	174,332		2	0	8	0	0	2	0
733	THA21	Nakhon Sawan	15.699	100.120	95,237		4	0	8	0	0	2	0
734	THA22	Nakhon Si Ayutthaya	14.342	100.552	60,919		2	0	10	0	0	2	0
735	THA23	Nonthaburi	13.859	100.521	270,609		2	0	10	0	0	1	1
736	THA24	Om Noi	13.706	100.299	51,455		2	0	8	0	0	1	0
737	THA25	Pak Kret	13.911	100.499	152,881		2	0	10	0	0	2	0
738	THA26	Pak Phanang	8.348	100.200	85,487		2	0	4	0	0	0	0
739	THA27	Pathum Thani	14.020	100.524	154,412		2	0	8	0	0	3	0
740	THA28	Pattaya City	12.926	100.876	84,727		2	0	0	0	0	1	1
741	THA29	Phitsanulok	16.820	100.270	89,480		2	0	8	0	0	0	0
742	THA30	Phuket City	7.877	98.394	72,380		2	2	0	0	0	0	0
743	THA31	Puchao Saming Phrai	13.646	100.578	77,976		2	0	10	0	0	2	2
744	THA32	Rangsit	13.988	100.616	77,661		2	0	8	0	0	3	0

BRN: Brunei Darussalam, KHM: Cambodia, IDN: Indonesia, LAO: Lao PDR, MYS: Malaysia, MMR: Myanmar, PHL: Philippines, SGP: Singapore, THA: Thailand, VNM: Viet Nam

Source: JICA Project Team

Table A3-13 Long List Cities (No.745-No.806: “abc” city name order)

Capital: National Capital City
 Others: CR: Capital Region City
 SMC: Second Large Mega City EQ: Earthquake
 NUT: Naypyitau Union Territory TS: Tsunami
 NCR: Philippines Capital Region FL: Flood
 CYW: Cyclone (Typhoon/Monsoon)-Wind
 CYS: Cyclone (Typhoon/Monsoon)-Surge
 IA: Major Industrial Area
 Infra: Key Regional Infrastructure

No.	Code	Name	latitude	longitude	Population	Capital /Others	Natural Hazard					Exposure	
							EQ	TS	FL	CYW	CYS	IA	Infra
745	THA33	Ranot	7.778	100.322	62,220		2	0	6	0	0	0	0
746	THA34	Rayong	12.680	101.280	56,010		2	0	8	0	0	1	0
747	THA35	Sakon Nakhon	17.161	104.148	51,245		2	0	6	4	0	0	0
748	THA36	Samut Prakan	13.595	100.607	72,343		2	0	10	0	0	2	1
749	THA37	Samut Sakhon	13.550	100.275	58,826		4	0	8	0	0	3	0
750	THA38	Saraburi	14.519	100.899	67,858		6	0	6	0	0	2	0
751	THA39	Surat Thani	9.140	99.330	78,359		2	0	8	0	0	0	1
752	THA40	Trang	7.560	99.610	63,433		2	0	6	0	0	0	0
753	THA41	Ubon Ratchathani	15.236	104.855	105,081		2	0	10	0	0	0	0
754	THA42	Udon Thani	17.410	102.790	155,339		2	0	4	0	0	2	2
755	THA43	Wiang Sa	18.570	100.751	67,861		6	0	6	0	0	0	0
756	THA44	Yala	6.550	101.290	77,045		2	0	8	0	0	0	0
757	VNM01	Anh Khe	13.953	108.661	63,118		2	0	6	4	0	0	0
758	VNM02	Bắc Giang	21.280	106.190	66,678		2	0	10	6	0	3	0
759	VNM03	Bạc Liêu	9.288	105.722	109,529		2	10	8	0	0	0	0
760	VNM04	Bắc Ninh	21.177	106.063	96,408		2	0	8	6	0	3	0
761	VNM05	Bảo Lộc	11.544	107.812	92,036		2	0	0	4	0	2	0
762	VNM06	Bến Tre	10.241	106.376	61,968		2	0	8	0	0	3	0
763	VNM07	Biên Hòa	10.950	106.820	652,646		2	0	8	4	0	3	0
764	VNM08	Buôn Ma Thuột (12.680	108.040	211,891		2	0	0	6	0	1	0
765	VNM09	Cà Mau	9.180	105.150	129,896		2	0	10	0	0	2	0
766	VNM10	Cam Ranh	11.914	109.137	85,507		2	6	8	4	2	0	0
767	VNM11	Cần Thơ	10.030	105.780	731,545		2	0	10	0	0	3	2
768	VNM12	Cao Lãnh	10.455	105.634	91,218		2	0	10	0	0	2	0
769	VNM13	Đà Lạt	11.960	108.440	184,755		2	0	8	6	0	0	0
770	VNM14	Đà Nẵng	16.070	108.210	770,911		2	6	8	8	2	3	3
771	VNM15	Điện Biên Phủ	21.392	103.016	46,362		6	0	8	0	0	0	0
772	VNM16	Đồng Hà	16.814	107.101	81,951		2	0	8	6	2	2	0
773	VNM17	Đồng Hới	17.470	106.620	76,058		2	8	10	6	2	2	0
774	VNM18	Hà Giang	22.830	104.988	34,486		2	0	8	0	0	2	0
775	VNM19	Hà Long	20.970	107.080	201,990		2	0	6	6	2	3	2
776	VNM20	Hà Nội	21.030	105.840	2,316,772	Capital	2	0	10	8	0	3	1
777	VNM21	Hà Tĩnh	18.340	105.903	63,415		2	8	8	6	2	0	0
778	VNM22	Hải Dương	20.947	106.329	170,420		2	0	8	8	0	3	0
779	VNM23	Hải Phòng	20.860	106.680	769,739		2	0	10	8	2	3	2
780	VNM24	Hòa Bình	20.829	105.338	65,377		4	0	10	6	0	0	0
781	VNM25	Hội An	15.880	108.340	69,222		2	8	10	6	2	2	0
782	VNM26	Huế	16.480	107.580	302,983		2	6	10	8	2	1	0
783	VNM27	Hưng Yên	20.655	106.058	48,019		2	0	10	6	0	1	0
784	VNM28	Kon Tum	14.355	108.007	86,362		2	0	8	4	0	2	0
785	VNM29	Lạng Sơn	21.860	106.760	65,754		2	0	8	6	0	0	0
786	VNM30	Lào Cai	22.496	103.968	76,836		4	0	8	0	0	0	0
787	VNM31	Long Xuyên	10.390	105.430	245,699		2	0	10	0	0	2	0
788	VNM32	Móng Cái	21.531	107.963	48,986		2	0	6	6	2	2	0
789	VNM33	Mỹ Tho	10.360	106.360	130,081		2	0	10	0	0	3	0
790	VNM34	Nam Định	20.430	106.170	193,768		4	0	10	6	0	3	0
791	VNM35	Nha Trang	12.250	109.190	292,693		2	6	10	6	2	1	0
792	VNM36	Ninh Bình	20.251	105.974	92,111		4	0	8	6	0	1	0
793	VNM37	Phan Rang Tháp Chàm	11.576	108.991	152,906		2	6	8	6	0	1	0
794	VNM38	Phan Thiết	10.930	108.110	189,619		2	2	8	6	2	2	0
795	VNM39	Phố Hồ Chí Minh	10.780	106.690	5,880,615	2MC	2	0	10	8	0	3	3
796	VNM40	Phủ Lý	20.540	105.920	40,139		4	0	8	6	0	3	0
797	VNM41	Pleiku	13.972	108.015	162,051		2	0	0	6	0	2	0
798	VNM42	Quảng Ngãi	15.120	108.810	95,537		2	10	8	6	2	3	0
799	VNM43	Qui Nhơn	13.783	109.220	255,463		2	10	10	6	2	3	0
800	VNM44	Rạch Giá	10.011	105.086	210,784		2	8	10	0	0	0	0
801	VNM45	Sóc Trăng	9.602	105.974	136,018		2	0	10	0	0	2	0
802	VNM46	Sơn La	21.327	103.914	56,848		6	0	0	4	0	0	0
803	VNM47	Tam Kỳ	15.565	108.481	81,396		2	6	6	6	0	1	0
804	VNM48	Tân An	10.540	106.410	98,157		2	0	8	0	0	2	0
805	VNM49	Thái Bình	20.450	106.340	106,915		2	0	6	6	0	3	0
806	VNM50	Thái Nguyên	21.592	105.834	199,732		2	0	10	6	0	1	0

BRN: Brunei Darussalam, KHM: Cambodia, IDN: Indonesia, LAO: Lao PDR, MYS: Malaysia, MMR: Myanmar, PHL: Philippines, SGP: Singapore, THA: Thailand, VNM: Viet Nam

Source: JICA Project Team

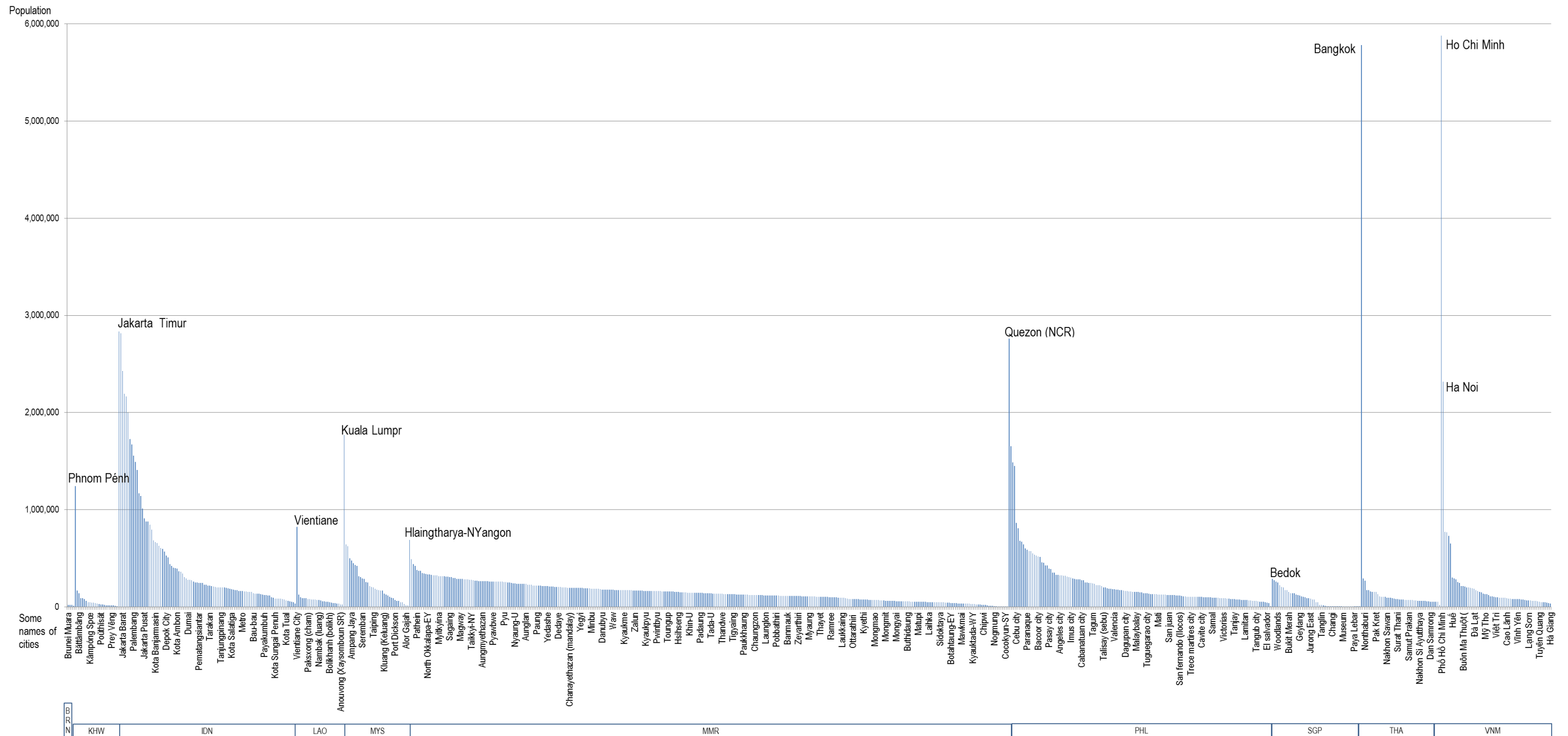
Table A3-14 Long List Cities (No.807-No.817: “abc” city name order)

Capital: National Capital City
 Others: CR: Capital Region City
 SMC: Second Large Mega Cty EQ: Earthquake
 NUT: Naypyitau Union Territory TS: Tsunami
 NCR: Philippines Capital Region FL: Flood
 CYW: Cyclone (Typhoon/Monsoon)-Wind
 CYS: Cyclone (Typhoon/Monsoon)-Surge
 IA: Major Industrial Area
 Infra: Key Regional Infrastructure

No.	Code	Name	latitude	longitude	Population	Capital /Others	Natural Hazard					Exposure	
							EQ	TS	FL	CYW	CYS	IA	Infra
807	VNM51	Thanh Hóa	19.810	105.780	147,559		4	0	8	6	2	2	0
808	VNM52	Trà Vinh	9.940	106.340	81,549		2	0	8	0	0	2	0
809	VNM53	Tuy Hoà	13.090	109.300	122,838		2	8	8	6	2	1	0
810	VNM54	Tuyên Quang	21.820	105.210	52,927		2	0	8	6	0	1	0
811	VNM55	Vì Thanh	9.778	105.466	41,713		2	0	10	0	0	0	0
812	VNM56	Việt Trì	21.304	105.415	99,147		2	0	8	4	0	2	0
813	VNM57	Vinh	18.665	105.690	215,577		2	2	10	6	2	2	0
814	VNM58	Vinh Long	10.250	105.970	103,067		2	0	10	0	0	3	0
815	VNM59	Vinh Yên	21.320	105.610	79,547		2	0	6	6	0	3	0
816	VNM60	Vũng Tàu	10.350	107.080	282,415		2	2	8	4	0	2	0
817	VNM61	Yên Bái	21.710	104.870	78,016		2	0	8	6	0	0	0

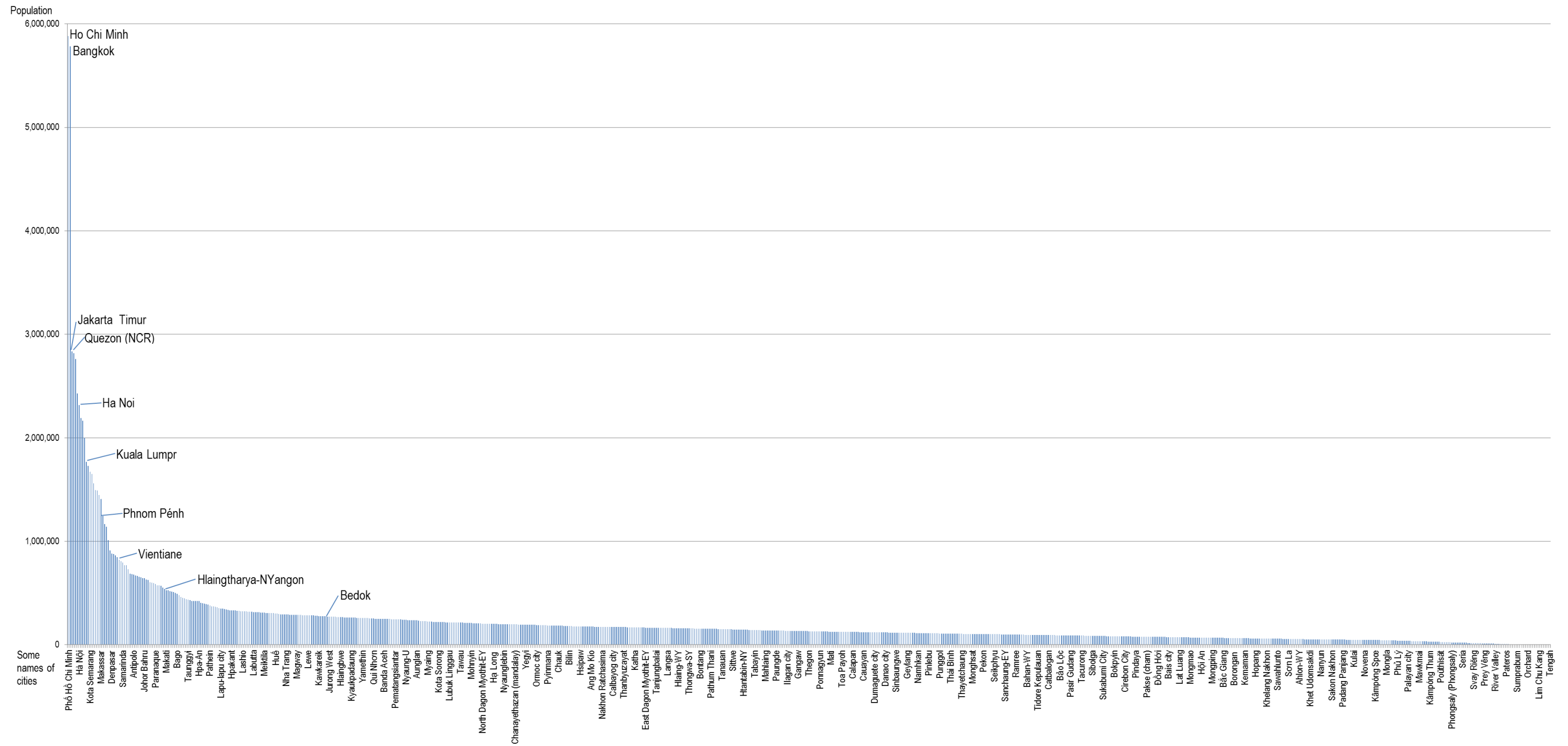
BRN: Brunei Darussalam, KHM: Cambodia, IDN: Indonesia, LAO: Lao PDR, MYS: Malaysia, MMR: Myanmar, PHL: Philippines, SGP: Singapore, THA: Thailand, VNM: Viet Nam

Source: JICA Project Team



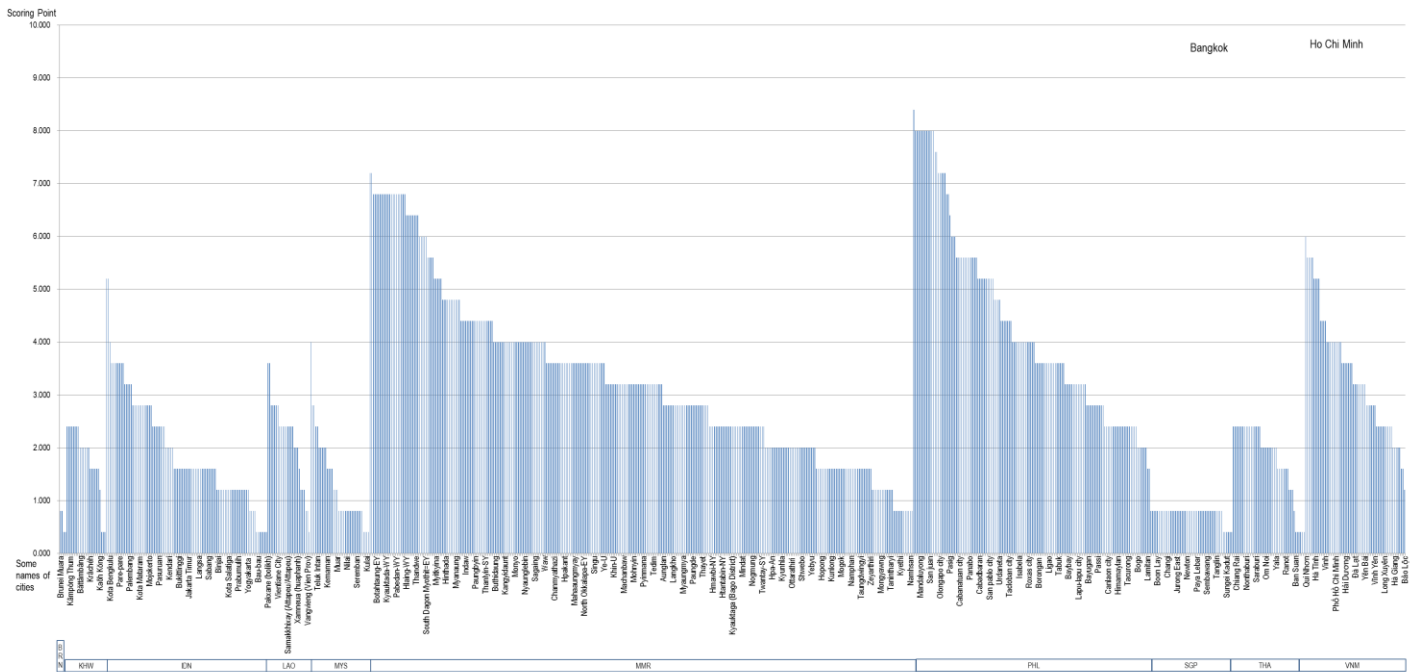
Source: JICA Project Team

Figure A3-1 Distribution of Long List Cities by Order in Number of Population within each ASEAN Member of States



Source: JICA Project Team

Figure A3-2 Distribution of Long List Cities by Order in Number of Population for Whole ASEAN Member of States



Source: JICA Project Team

Figure A3-3 Distribution of Long List Cities by Order of Ranking for Potential Hazard Intensity (Earthquake, Tsunami, Tropical Cyclone-Surge & Wind) within each ASEAN Member of States

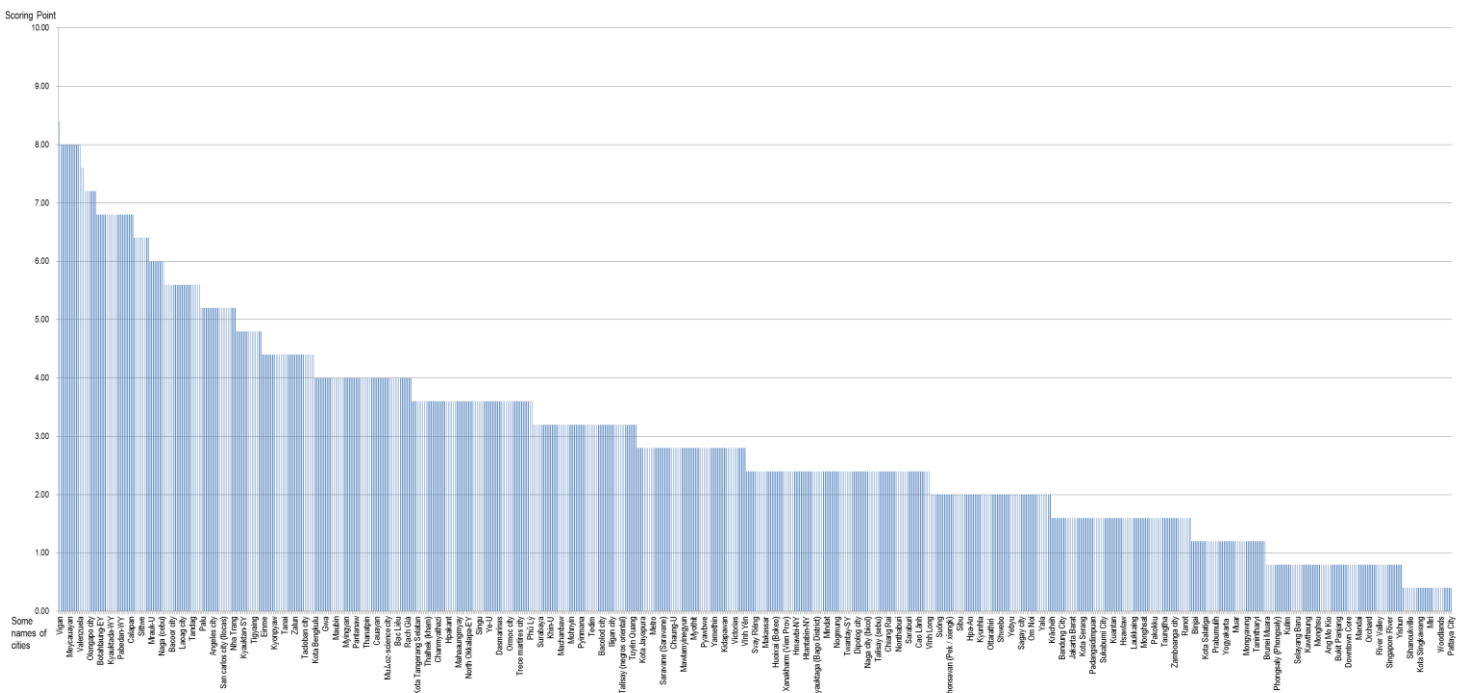


Figure A3-4 Distribution of Long List Cities by Order of Ranking for Potential Hazard Intensity for Whole ASEAN Member of States

APPENDIX 3.2 MIDDLE LIST CITIES

Table A3.2.1 Middle List Cities (No.1~No.42)

No.	Serial No.	Code	Name	latitude	longitude	Population	Natural Hazard					Exposure	
							EQ	TS	FL	CYW	CYS	IA	Infra
1	5	KHM01	Băttămbăng	13.092	103.196	140,533	2	0	8	0	0	0	0
2	6	KHM02	Kămpóng Cham	11.992	105.464	47,300	2	0	10	0	0	0	0
3	16	KHM12	Phnom Pénh	11.570	104.920	1,242,992	2	0	10	0	0	1	3
4	30	IDN02	Banda Aceh	5.550	95.320	249,499	8	10	8	0	0	0	1
5	31	IDN03	Bandar Lampung	-5.410	105.258	1,167,101	8	10	0	0	0	0	2
6	39	IDN11	Bitung	1.443	125.193	202,204	6	0	0	0	0	0	2
7	46	IDN18	Denpasar	-8.650	115.220	880,600	8	10	0	0	0	0	1
8	49	IDN21	Gorontalo	0.537	123.061	197,970	6	0	8	0	0	0	0
9	58	IDN30	Kota Ambon	-3.694	128.181	395,423	10	6	0	0	0	0	0
10	62	IDN34	Kota Bima	-8.452	118.725	156,400	6	0	0	0	0	0	0
11	72	IDN44	Kota Semarang	-6.970	110.420	1,672,999	6	0	8	0	0	3	3
12	111	IDN83	Samarinda	-0.500	117.150	797,006	2	0	8	0	0	0	0
13	131	LAO05	Luangprabang (luang)	19.892	102.136	90,300	4	0	10	0	0	0	2
14	138	LAO12	Pakxane (bolikh)	18.395	103.656	45,000	4	0	8	6	0	0	1
15	145	LAO19	Thalhek (kham)	17.399	104.804	90,800	2	0	10	6	0	2	0
16	153	MYS01	Kota Setar (Alor Setar)	6.110	100.370	366,787	2	2	10	0	0	3	0
17	158	MYS06	Timur Laut (George Town)	5.421	100.341	520,242	4	10	6	0	0	3	1
18	166	MYS14	Kuala Terengganu	5.330	103.140	343,284	2	0	6	0	0	3	0
19	171	MYS19	Langkawi	6.321	99.849	94,777	2	4	0	0	0	2	1
20	183	MYS31	Sibu	2.300	111.830	247,995	2	0	8	0	0	2	0
21	185	MYS33	Kuala Muda (Sungai Petani)	5.650	100.480	456,605	4	0	0	0	0	3	0
22	190	MMR02	Amarapura	21.903	96.049	237,618	10	0	10	0	0	3	0
23	229	MMR41	Hakha	22.640	93.605	48,352	10	0	0	6	0	0	0
24	256	MMR68	Kale	23.193	94.030	348,573	10	0	6	8	0	0	0
25	287	MMR99	Kyaukpyu	19.424	93.554	165,352	6	10	6	6	2	0	2
26	295	MMR107	Kyimyindaing-WY	16.815	96.122	111,514	4	8	10	10	2	3	2
27	321	MMR133	Manaung	18.854	93.729	56,966	6	10	0	6	2	0	0
28	365	MMR177	Mrauk-U	20.592	93.188	189,630	8	10	0	8	4	0	0
29	375	MMR187	Myingyan	21.457	95.392	276,096	10	0	10	0	0	2	0
30	399	MMR211	Nyaung-U	21.195	94.910	239,947	8	0	10	0	0	0	0
31	428	MMR240	Pwintbyu	20.363	94.669	163,692	8	0	8	0	0	1	0
32	437	MMR249	Rathedaung	20.488	92.754	111,974	8	10	0	8	4	0	0
33	496	MMR308	Toungup	18.858	94.243	158,341	6	10	0	6	4	0	0
34	529	PHL11	Batangas city	13.756	121.058	305,607	10	10	0	8	0	3	2
35	537	PHL19	Butuan city	8.948	125.541	309,709	10	4	8	6	2	0	0
36	552	PHL34	Cavite city	14.479	120.897	101,120	10	10	10	8	0	3	1
37	555	PHL37	Dagupan city	16.043	120.333	163,676	8	10	8	6	2	0	0
38	572	PHL54	Iloilo city	10.697	122.569	424,619	8	0	0	8	0	0	2
39	581	PHL63	Laoag city	18.200	120.590	104,904	8	2	8	8	2	0	2
40	595	PHL77	Mandaue city	10.330	123.930	331,320	8	0	0	8	0	3	3
41	601	PHL83	Meycauayan	14.749	120.973	199,154	10	10	10	10	0	3	1
42	607	PHL89	Olongapo city	14.820	120.280	221,178	10	10	8	8	0	3	3

Note: Cities by blue letters and figures were recommended by member's state of AMS

EQ: Earthquake, TS: Tsunami, FL: Flood, CYW: Tropical cyclones (Typhoon/Monsoon)-Wind, CYS: Tropical cyclones (Typhoon/Monsoon)-Surge, IA: Industrial agglomerate area, Infra: Key regional infrastructure (key seaport and airport)

KHM: Cambodia, IDN: Indonesia, LAO: Lao PDR, MYS: Malaysia, MMR: Myanmar, PHL: Philippines

Note: Some population figures in the middle list cities were modified from the long list cities due to spatial data availability for the preliminary risk assessment for short list cities.

Source: JICA Project Team

Table A3.2.2 Middle List Cities (No.42~No.56)

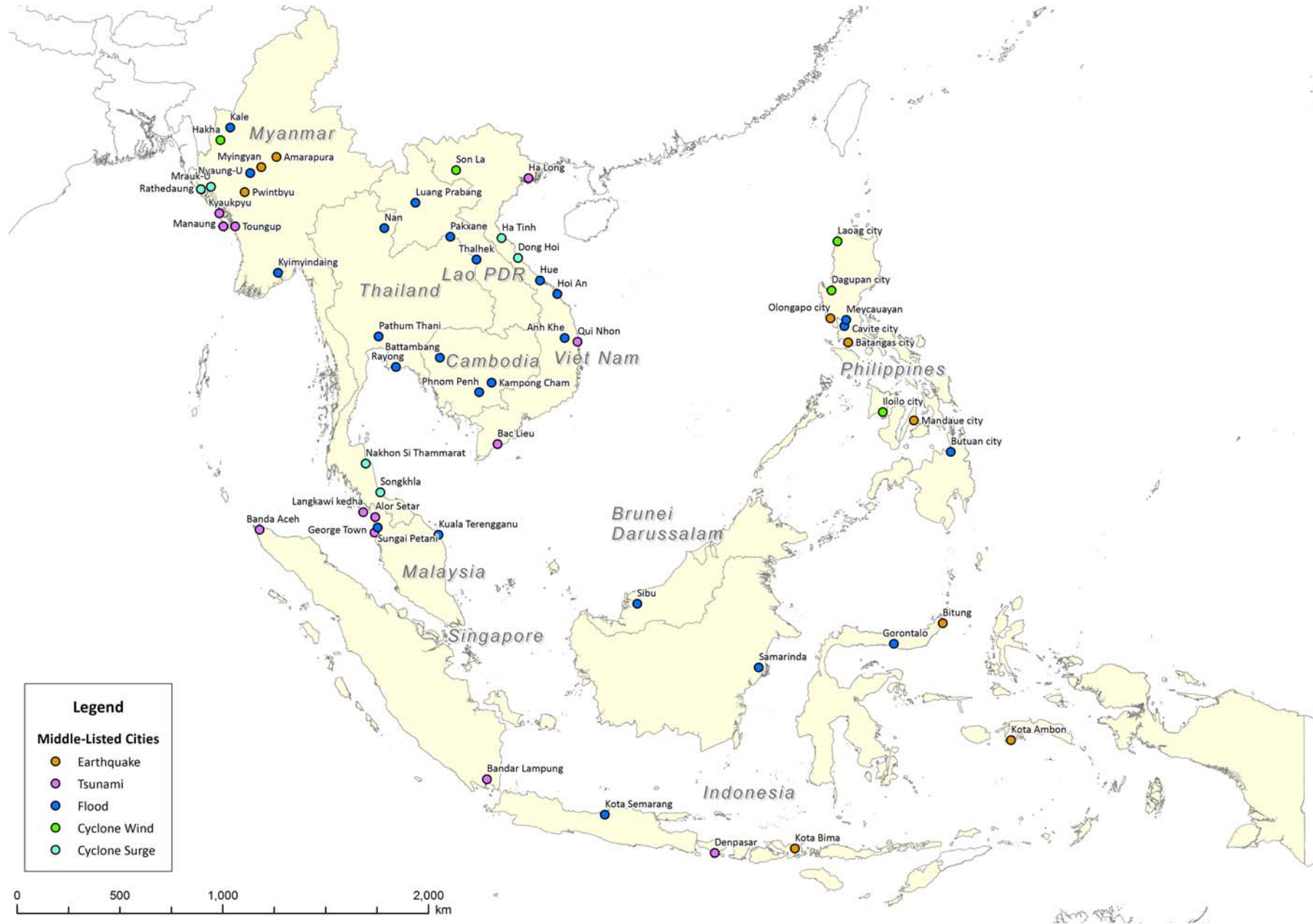
No.	Serial No.	Code	Name	latitude	longitude	Population	Natural Hazard					Exposure	
							EQ	TS	FL	CYW	CYS	IA	Infra
43	738	THA26	Nakhon Si Thammarat Province / Pak Phanang District	8.348	100.200	85,487	2	0	4	0	0	0	0
44	740	THA28	Pathum Thani Province / Pathum Thani District	14.020	100.524	220,154	2	0	8	0	0	3	0
45	745	THA33	Songkla Province / Ranot District	7.778	100.322	62,220	2	0	6	0	0	0	0
46	746	THA34	Rayong Province / Rayong District	12.680	101.280	364,544	2	0	8	0	0	1	0
47	755	THA43	Nan Province / Wiang Sa District	18.570	100.751	67,861	6	0	6	0	0	0	0
48	757	VNM01	Anh Khe	13.953	108.661	63,118	2	0	6	4	0	0	0
49	759	VNM03	Bạc Liêu	9.288	105.722	109,529	2	10	8	0	0	0	0
50	773	VNM17	Đồng Hới	17.470	106.620	76,058	2	8	10	6	2	2	0
51	775	VNM19	Hạ Long	20.970	107.080	201,990	2	0	6	6	2	3	2
52	777	VNM21	Hà Tĩnh	18.340	105.903	63,415	2	8	8	6	2	0	0
53	781	VNM25	Hội An	15.880	108.340	69,222	2	8	10	6	2	2	0
54	782	VNM26	Huế	16.480	107.580	302,983	2	6	10	8	2	1	0
55	799	VNM43	Qui Nhơn	13.783	109.220	255,463	2	10	10	6	2	3	0
56	802	VNM46	Sơn La	21.327	103.914	56,848	6	0	0	4	0	0	0

Note: Cities by blue letters and figures were recommended by member's state of AMS

EQ: Earthquake, TS: Tsunami, FL: Flood, CYW: Tropical cyclones (Typhoon/Monsoon)-Wind, CYS: Tropical cyclones (Typhoon/Monsoon)-Surge, IA: Industrial agglomerate area, Infra: Key regional infrastructure (key seaport and airport)
KHM: Cambodia, IDN: Indonesia, LAO: Lao PDR, MYS: Malaysia, MMR: Myanmar, PHL: Philippines

Note: Some population figures in the middle list cities were modified from the long list cities due to spatial data availability for the preliminary risk assessment for short list cities.

Source: JICA Project Team



Source: JICA Project Team

Figure 3.2.1 Distribution of Middle Listed Cities by Natural Hazard Type in AMS

A3.3 MAJOR INFRASTRUCTURE IN MIDDLE LIST CITIES

Table A3.3.1 Summary of Key Transport and Infrastructures with the Middle List Cities

No.	Code*1	Name	Population	Transport Infrastructure				
				Airport*2	Port*3	Access Road*4	Railway*5	
							Station	Line
1	KHM	Phnom Pénh	1,242,992	○	○	○	○	○
2	KHM	Băttâmbâng	140,533	○	×	○	○	○
3	KHM	Kâmpóng Cham	47,300	○	○	○	×	×
4	IDN	Kota Semarang	1,672,999	○	○	○	○	○
5	IDN	Bandar Lampung	1,167,101	×	○	○	○	○
6	IDN	Denpasar	880,600	○	○	○	×	×
7	IDN	Samarinda	797,006	○	○	○	×	×
8	IDN	Kota Ambon	395,423	○	○	○	×	×
9	IDN	Banda Aceh	249,499	○	○	○	×	×
10	IDN	Bitung	202,204	×	○	○	×	×
11	IDN	Gorontalo	197,970	×	○	○	×	×
12	IDN	Kota Bima	156,400	○	○	○	×	×
13	LAO	Luangprabang (luang)	90,300	○	○	○	×	×
14	LAO	Thalhek (kham)	90,800	×	○	○	×	×
15	LAO	Pakxane (bolikh)	45,000	×	○	○	×	×
16	MYS	Timur Laut District (George Town)	520,242	○	○	○	×	×
17	MYS	Kuala Terengganu District	343,284	○	×	○	×	×
18	MYS	Sibu District	247,995	○	○	○	×	×
19	MYS	Kuala Muda District (Sungai Petani)	456,605	×	×	○	○	○
20	MYS	Kota Setar District (Alor Setar)	366,787	○	×	○	○	○
21	MYS	Langkawi Kedha District	94,777	○	○	○	×	×
22	MMR	Kalay	348,573	○	×	○	○	○
23	MMR	Myingyan	276,096	×	○	○	×	○
24	MMR	Nyaung-U	239,947	○	○	○	○	○
25	MMR	Amarapura	237,618	○	○	○	○	○
26	MMR	Mrauk-U	189,630	×	○	○	×	×
27	MMR	Kyaukpyu	165,352	○	○	○	×	×
28	MMR	Pwintbyu	163,692	×	×	○	×	○
29	MMR	Toungup	158,341	×	○	○	×	×
30	MMR	Rathedaung	111,974	×	○	○	○	○
31	MMR	Kyimyindaing-WY	111,514	○	○	○	○	○
32	MMR	Manaung	56,966	○	×	○	×	×
33	MMR	Hakha	48,352	×	○	○	×	×
34	PHL	Batangas city	305,607	×	○	○	×	×
35	PHL	Butuan city	309,709	○	○	○	×	×

No.	Code*1	Name	Population	Transport Infrastructure				
				Airport*2	Port*3	Access Road*4	Railway*5	
							Station	Line
36	PHL	Cavite city	101,120	○	○	○	×	×
37	PHL	Dagupan city	163,676	×	○	○	×	×
38	PHL	Iloilo city	424,619	○	○	○	×	×
39	PHL	Laoag city	104,904	○	×	○	×	×
40	PHL	Mandaue city	331,320	○	○	○	×	×
41	PHL	Meycauayan	199,154	×	○	○	×	×
42	PHL	Olongapo city	221,178	○	○	○	×	×
43	THA	Pak Phanrang District	85,487	×	×	○	×	×
44	THA	Ranot District	62,220	×	×	○	×	×
45	THA	Rayong District	364,544	○	○	○	×	○
46	THA	Pathum Thani District	220,154	○	×	○	×	×
47	THA	Wiang Sa District	67,861	×	×	○	×	×
48	VNM	Huế	302,983	○	×	○	○	○
49	VNM	Qui Nhon	255,463	×	○	○	○	○
50	VNM	Hạ Long	201,990	×	○	○	×	×
51	VNM	Bạc Liêu	109,529	×	×	○	×	×
52	VNM	Đồng Hới	76,058	○	×	○	○	○
53	VNM	Hội An	69,222	×	×	○	×	×
54	VNM	Hà Tĩnh	63,415	×	×	○	×	×
55	VNM	Anh Khe	63,118	×	×	○	×	×
56	VNM	Sơn La	56,848	○	×	○	×	×

Source: JICA Project Team

Note: ○ - Exists at present, × - Does not exist at present

*1 - KHM: Cambodia, IND: Indonesia, Lao: Lao PDR, MYS: Malaysia, MMR: Myanmar, PHL: Philippines, THA: Thailand, VNM: Viet Nam

*2 - Airport located within a 20km radius from the city center

*3 - Port located within a 20km radius from the city

*4 - National Highway and Provincial road

*5 - Subway is not included.

Table A3.3.2 Airport with the Middle List Cities

No.	Code	City Name	Airport						Runway			
			Name	Type	Location	Distance (km)	latitude	longitude	Number	Length (m)	Width (m)	Pavement
1	KHM	Phnom Pénh	Phnom Pénh International Airport	Inter & Domestic	Phnom Pénh	About 8km west of the city center	11.54639°N	104.84389°E	1	3,000	50	Concrete
2	KHM	Bättåmbång	Bättåmbång Airport	Domestic	Bättåmbång	About 3km from the city center	13.09556°N	103.22444°E	1	1,400	40	Bitumen
3	KHM	Kåmpóng Cham	Kåmpóng Cham Airport	Domestic	Kåmpóng Cham	About 5km north of the city center	12.02889°N	105.44111°E	1	1,189	30	Asphalt
4	IDN	Kota Semarang	Achmad Yani International Airport	Inter & Domestic	Kota Semarang	About 5km from the city center	6.97139°S	110.37417°E	1	2,680	45	Asphalt
5	IDN	Bandar Lampung	Radin Inten II Airport (Branti Airport)	Domestic	Bandar Lampung	About 23km from the city center	5.242339°S	105.17894°E	1	3,200	30	Asphalt
6	IDN	Denpasar	Ngurah Rai International Airport	Inter & Domestic	Denpasar	About 13km south of the city center	8.74817°S	115.16717°E	1	2,984	45	Asphalt
7	IDN	Samarinda	Samarinda International Airport	Inter & Domestic	Samarinda	About 20km north east from the city center	0.37361°S	117.25556°E	1	3,000	60	Asphalt
			Temindung Airport	Domestic		Almost city center	0.48453°S	117.15711°E	1	937	23	Asphalt
8	IDN	Kota Ambon	Patimura Airport	Domestic	Ambon	About 12km west of the city center	3.71026°S	128.08914°E	1	2,500	45	Asphalt
9	IDN	Banda Aceh	Sultan Iskandarmuda International Airport	Inter & Domestic	Banda Aceh	About 13.5km southeast from the city center	5.52352°N	95.42037°E	1	3,000	45	Asphalt
10	IDN	Bitung	No airport within the city boundary (the nearest airport is Sam Ratulangi International Airport in Manado about 28km west from the city center.)									
11	IDN	Gorontalo	Jalaluddin Airport	Domestic	Gorontalo	About 25km west from the city center	0.63712°N	22.84986°E	1	2,500	45	Asphalt
12	IDN	Kota Bima	Sultan Muhammad Salahuddin Airport	Domestic	Bima	About 10km south from the city center	8.53972°N	18.68722°E	1	2,500	45	Asphalt
13	LAO	Luangprabang (luang)	Luangprabang Airport	Inter & Domestic	Luangprabang	About 4km west from the city center	19.8979°N	102.1608°E	1	2,200	45	Asphalt
14	LAO	Thalhek (kham)	No airport within the city boundary (the nearest airport is Nakhon Phanom Airport in Nakhon Phanom, Thailand.)									
15	LAO	Pakxane (bolikh)	No airport within the city boundary (the nearest airport is Wattay International Airport in Vientiane about 130km west from the city center.)									
16	MYS	Timur Laut (George Town)	Penang International Airport	Inter & Domestic	Bayan Lepas	About 14km south of George Town	5.29714°N	00.27686°E	1	3,352	46	Asphalt
17	MYS	Kuala Terengganu	Sultan Mahmud Airport	Domestic	Kuala Terengganu	About 8km from the city center	5.37936°N	03.10546°E	1	2,012	46	Asphalt
18	MYS	Sibu	Sibu Airport	Domestic	Sarawak	23 km east south east of Sibu	2.26417°N	111.98250°E	1	2,754	45	Asphalt
19	MYS	Kuala Muda (Sungai Petani)	RMAF Butterworth	Military Airport	Butterworth	About 25km south west of the city center	5.46611°N	00.39111°E	1	2,438	46	Asphalt
20	MYS	Kota Setar (Alor Setar)	Sultan Abdul Halim Airport	Domestic	Alor Setar	About 15km away from the city center	6.19444°N	100.40083°E	1	2,745	45	Asphalt
21	MYS	Langkawi Kedha	Langkawi International Airport	Inter & Domestic	Kuah in Langkawi District	About 13km west of the city center	6.32973°N	99.72867°E	1	3,810	45	Asphalt
22	MMR	Kalay	Kalaymyo Airport	Domestic	Kalay (Kalaymyo)	About 1km south of the city center	23.18861°N	94.05083°E	1	1,677	31	Bitumen
23	MMR	Myingyan	No airport within the city boundary (the nearest airport is Mandalay International Airport in Mandalay about 70km north east from the city.)									
24	MMR	Nyaung-U	Nyaung-U Airport	Domestic	Nyaung-U	About 2km south of the city center	21.17861°N	94.93000°E	1	2,591	30	Asphalt
25	MMR	Amarapura	Nyaung-U Airport	Domestic	Nyaung-U	About 6km north east of the city center	21.17861°N	94.93000°E	1	2,591	30	Asphalt
26	MMR	Mrauk-U	No airport within the city boundary (the nearest airport is Sittwe Airport in Sittwe about 60km south west from the city center.)									
27	MMR	Kyaukpyu	Kyaukpyu Airport	Domestic	Kyaukpyu	About 2km west of the city center	19.42639°N	93.53472°E	1	1,402	30	Bitumen
28	MMR	Pwintbyu	No airport within the city boundary (the nearest airport is Magwe Airport in Magwe about 35km south east from the city center.)									
29	MMR	Toungup	No airport with in the city boundary									
30	MMR	Rathedaung	No airport within the city boundary (the nearest airport is Sittwe Airport in Sittwe about 40km south west from the city center.)									
31	MMR	Kyimyindaing-WY	Yangon International Airport	Inter & Domestic	Yangon	About 7.5km north east of the city center	16.90731°N	96.13322°E	1	3,414	61	Asphalt
32	MMR	Manaung	Manaung Airport	Domestic	Manaung	About 5km west from the city center	18.84638°N	93.68327°E	1	1,245		Concrete
33	MMR	Hakha	No airport within the city boundary (the nearest airport is Kalaymyo Airport in Kalaymyo about 80km north east from the city center.)									

No.	Code	City Name	Airport					Runway				
			Name	Type	Location	Distance (km)	latitude	longitude	Number	Length (m)	Width (m)	Pavement
34	PHL	Batangas city	No airport within the city boundary (the nearest airport is Ninoy Aquino International Airport.)									
35	PHL	Butuan city	Bancasi Airport	Domestic	Butuan city	About 7km west from the city center	8.95111°N	25.47778°E	1	1,966	46	Concrete
36	PHL	Cavite city	Daniilo Atienza Air Base	Military Airport	Cavite city	About 1.5km north from the city center	4.49583°N	20.90501°E	1	2,368	46	Asphalt
37	PHL	Dagupan city	No airport within the city boundary (the nearest airport is Loakan-Baguio Airport in Baguio about 50km north east from the city center.)									
38	PHL	Iloilo city	Iloilo International Airport	Inter & Domestic	Cabatuan in Iloilo city	About 18km north from Iloilo city center	10.71304°N	22.54530°E	1	2,500	45	Asphalt
39	PHL	Laoag city	Laoag International Airport	Inter & Domestic	Laoag city	About 7km west from the city center	18.17809°N	20.53152°E	1	2,780	45	Concrete
40	PHL	Mandaue city	Mactan - Cebu International Airport	Inter & Domestic	Lapu - Lapu city	About 6km south east from the city center	10.30754°N	23.97944°E	1	3,300	45	Asphalt
41	PHL	Meycauayan	Ninoy Aquino International Airport	Inter & Domestic	Metro Manila	About 25km south from the city center	14.50865°N	21.01958°E	2	3,737 & 2,367	60 & 45	Asphalt
42	PHL	Olongapo city	Subic Bay International Airport	Domestic	Morong	About 5.5km south from the city center	14.79445°N	20.27136°E	1	2,728	45	Asphalt
43	THA	Pak Phanrang	Nakhon Si Thammarat Airport	Domestic	Nakhon Si Thammarat	About 35 km from the city center	8.53962°N	99.94475°E	1	2,600	45	Asphalt
44	THA	Ranot	Songkhla Airport	Military Airport	Songkhla	About 80km southeast of the city center	7.18656°N	00.60803°E	1	1,510	45	Asphalt
			Hat Yai International Airport	Inter & Domestic	Hat Yai	About 90km south of the city	6.93321°N	00.39298°E	1	3,050	45	Asphalt
45	THA	Rayong	U-Tapao International Airport	Inter & Domestic	Rayong city	About 16km west from the city center	12.67994°N	01.00503°E	1	3,505	60	Asphalt
46	THA	Pathum Thani	Don Mueang Airport	Inter & Domestic	Pathum Thani	About 15km north east from the city center	13.9125°N	00.60667°E	2	3,700 & 3,500	60 & 45	Asphalt
47	THA	Wiang Sa	Nan Airport	Domestic	Nan	About 25km north from the city center	18.80791°N	00.78342°E	1	2,000	45	Asphalt
48	VNM	Huế	Phu Bai International Airport	Domestic	Huế	About 14km east from the city center	16.40167°N	07.70278°E	1	2,675	40	Asphalt
49	VNM	Qui Nhon	Phu Cat Airport	Domestic	Qui Nhon	About 30km north west of the city	13.95500°N	09.04222°E	1	3,051	45	Concrete
50	VNM	Hà Long	No airport within the city boundary (the nearest airport is Cat Bi International Airport in Hai Phong about 33km south west from the city center.)									
51	VNM	Bạc Liêu	No airport within the city boundary (the nearest airport is Ca Mau Airport in Ca Mau about 65km west from the city center.)									
52	VNM	Đồng Hới	Đồng Hới Airport	Domestic	Đồng Hới	About 6 km north from the city center	17.51500°N	06.59056°E	1	2,400	45	Concrete
53	VNM	Hội An	No airport within the city boundary (the nearest airport is Da Nang International Airport in Da Nang about 23km north west from the city center.)									
54	VNM	Hà Tĩnh	No airport within the city boundary (the nearest airport is Vinh Airport in Vinh about 45km north west from the city center.)									
55	VNM	Anh Khe	No airport within the city boundary (the nearest airport is Phu Cat Airport in Qui Nhon about 45km east from the city center.)									
56	VNM	Son La	Na San Airport	Domestic	Son La	About 18km south east of the city	21.21472°N	04.03528°E	1	2,409	-	Paved

Source: Provided by JICA Project Team based on articles on targeted cities and airports of each country in “Wikipedia”, “List of Airports” in each country in ASEAN, “World Aero Data” and “Google Map”

Table A3.3.3 Port (Sea and River) with the Middle List Cities

No	Code	City Name	Port							Max size of Vessel (feet)	Max draft (m)
			Name	Location	Distance	Water Location	Port Type	Port Size	Authority		
1	KHM	Phnom Pénh	Phnom Pénh Autonomous Port	Phnom Pénh	Within urbanized area of the city	Tonle Sap river	River port	Not found	Phnom Pénh Autonomous Port		
2	KHM	Băttămbăng	No port within 20km from the city center								
3	KHM	Kămpông Cham	Kămpông Cham Port	Kămpông Cham	Within urbanized area of the city	Mekong river	River port	Not found	Not found		
4	IDN	Kota Semarang	Tanjung Emas Port	Semarang	Within urbanized area of the city	Java Sea	Sea port	Medium	Tanjung Emas Semarang Port Authority		
5	IDN	Bandar Lampung	Port of Panjang	Bandar Lampung	Within urbanized area of the city	Java Sea	Seaport	Small	Indonesia Port Corporation II	Over 500 feet in length	
6	IDN	Denpasar	Port of Benoa	Denpasar	Within urbanized area of the city	Bali Sea	Seaport	Very Small	Indonesia Port Corporation III	Over 500 feet in length	
7	IDN	Samarinda	Port of Samarinda	Samarinda	Within urbanized area of the city	Mahakam River	River Port	Small	Indonesia Port Corporation IV	Up to 500 feet in length	
8	IDN	Kota Ambon	Port of Ambon	Ambon	Within urbanized area of the city	Banda Sea	Seaport	Small	Indonesia Port Corporation IV	Over 500 feet in length	
9	IDN	Banda Aceh	Port of Banda Aceh	Banda Aceh	Within urbanized area of the city	Andaman Sea	Sea port	Small	Not found		12m
10	IDN	Bitung	Port of Bitung	Bitung	Within urbanized area of the city	Molucca Sea	Seaport	Small	Indonesia Port Corporation IV	Over 500 feet in length	
11	IDN	Gorontalo	Port of Gorontalo	Gorontalo	Within urbanized area of the city	Molucca Sea	Seaport	Small	Indonesia Port Corporation IV	Up to 500 feet in length	10m
12	IDN	Kota Bima	Port of Bima	Bima	Within urbanized area of the city	Java Sea	Seaport	Small	Indonesia Port Corporation III	Over 500 feet in length	
13	LAO	Luangprabang (luang)	Luangprabang Ferry Landing	Luangprabang	Within urbanized area of the city	Mekong river	River port		Local government		
14	LAO	Thakhek (kham)	Thakhek Ferry Landing	Thakhek	Within urbanized area of the city	Mekong river	River port		Local government		
15	LAO	Pakxane (bolikh)	Pakxane Ferry Landing	Pakxane	Within urbanized area of the city	Mekong river	River port		Local government		
16	MYS	Timur Laut (George Town)	Port of Penang	George Town and Butterworth	Within urbanized area of the city	Malacca Strait	Seaport	Large	Port Klang Authority	Over 500 feet in length	13.4m
17	MYS	Kuala Terengganu	No port within 20km from the city center								
18	MYS	Kuala Muda (Sungai Petani)	No port within 20km from the city center								
19	MYS	Kota Setar (Alor Setar)	No port within 20km from the city center								
20	MYS	Langkawi Kedha	Teluk Ewa Jetty	Teluk Ewa in Langkawi	about 10km north from the city	Malacca Strait	Seaport	Small	Kedah Cement Sdn Bhd		
21	MYS	Sibu	Port of Sibu (Rajang)	Sibu	Within urbanized area of the city	Rajang River	River port	Small	Local government	Up to 500 feet in length	8.5m
22	MMR	Kalay	No port within 20km from the city center								
23	MMR	Myingyan	No port within 20km from the city center								
24	MMR	Nyaung-U	No port within 20km from the city center								
25	MMR	Amarapura	No port within 20km from the city center								
26	MMR	Mrauk-U	No port within 20km from the city center								
27	MMR	Kyaukpyu	Port of Kyaukpyu	Kyaukpyu	Within urbanized area of the city	Bay of Bengal	Seaport		Myanmar Port Authority		
28	MMR	Pwintbyu	No port within 20km from the city center								
29	MMR	Toungup	No port within 20km from the city center								
30	MMR	Rathedaung	No port within 20km from the city center								
31	MMR	Kyimyindaing-WY	Port of Yangon	Kyimyindaing in Yangon	Within urbanized area of the city	Yangon River	River port	Medium	Myanmar Port Authority		
32	MMR	Manaung	No port within the Cheduba Island where Manaung is situated.								
33	MMR	Hakha	No port within 20km from the city center								
34	PHL	Batangas city	Batangas Port	Batangas city	Within urbanized area of the city	West Philippine Sea	Seaport	Medium	Philippine Ports Authority, PMO Batangas	Over 500 feet in length	
35	PHL	Butuan city	Masao Port	Butuan city	about 8km north from the city center	Inland Sea (Bohol Sea)	Seaport	Very Small	Philippine Ports Authority, PMO Cagayan De Oro	Up to 500 feet in length	15.2m
36	PHL	Cavite city	Cavite Port	Cavite city	Within urbanized area of the city	South China Sea	Seaport	Very Small	Not found		
37	PHL	Dagupan city	Dagupan Ferry Port	Dagupan city	Within urbanized area of the city	Dagupan River	River port	Not found	Not found		
38	PHL	Iloilo city	Iloilo Port	Iloilo city	Within urbanized area of the city	Inland Sea (Iloilo Strait)	Seaport	Medium	Philippine Ports Authority, PMO Iloilo	Over 500 feet in length	10.5m

No	Code	City Name	Port							Max size of Vessel (feet)	Max draft (m)
			Name	Location	Distance	Water Location	Port Type	Port Size	Authority		
39	PHL	Laoag city	No port within 20km from the city center								
40	PHL	Mandaue city	Cebu Port	Cebu city	about 3~5km from Mandaue city center	Inland Sea (Mactan Channel)	Seaport	Medium	Cebu Port Authority	Over 500 feet in length	
41	PHL	Meycauayan	Manila Port	Manila	about 15km south from the center of Meycauayan	West Philippine Sea	Seaport	Very Large	Philippine Ports Authority, PDO Manila/Northern Luzon	Over 500 feet in length	13.4m
42	PHL	Olongapo city	Subic Bay Port	Subic and Olongapo City	Within urbanized area of the city	West Philippine Sea	Seaport	Medium	Subic Bay Metropolitan Authority	Over 500 feet in length	
43	THA	Pak Phanrang	No port within 20km from the city center								
44	THA	Ranot	No port within 20km from the city center								
45	THA	Rayong	Port of Map Ta Phut	Mueang Rayong District	Within urbanized area of the district	Gulf of Thailand	Seaport	Medium	Industrial Estate Authority of Thailand (IEAT)	Over 500 feet in length	11.9m
			Port of Rayong					Small			
46	THA	Pathum Thani	No port within 20km from the city center								
47	THA	Wiang Sa	No port within 20km from the city center								
48	VNM	Huế	No port within 20km from the city center								
49	VNM	Quy Nhon	Quy Nhon City	Quy Nhon Port	Within urbanized area of the city	South China Sea	Seaport		Quy Nhon Port Joint Stock Company	up to 30,000DWT	13.8m
50	VNM	Hà Long	Hà Long City	Quang Ninh Port	Within urbanized area of the city	Gulf of Tonkin	Seaport	Small	Port Authority of Quang Ninh	Up to 500 feet in length	
51	VNM	Bac Liêu	No port within 20km from the city center								
52	VNM	Đồng Hới	No port within 20km from the city center								
53	VNM	Hội An	No port within 20km from the city center (The nearest port is Danang Port, about 25km north from the city center.)								
54	VNM	Hà Tĩnh	No port within 20km from the city center								
55	VNM	Anh Khe	No port within 20km from the city center								
56	VNM	Son La	No port within 20km from the city center								

Source: Provided by JICA Project Team based on articles on targeted cities and ports of each country in “Wikipedia”, “World Port Source”, “Ports.com”, “SeaRate.com” and “Google Map”

Table A3.3.4 Access Road & Railway with the Middle List Cities

No	Code	Name	Population	Access Road		Railway	
				National Road	Provincial Road	Station	Line
1	KHM	Phnom Pénh	1,242,992	NR1, 2, 3, 4, 5, 6A		Phnom Penh	Northern Line & Southern Line
2	KHM	Báttámbáŋg	140,533	NR5, NR57		Battambang	Northern Line
3	KHM	Kámpóng Cham	47,300	NR7	PR223	No station	No line
4	IDN	Kota Semarang	1,672,999	NR1, 14	Semarang - Purwodadi Rd.	Semarang Tawang, Besar Semarang Poncol	Jakarta - Surabaya - Banyuwangi
5	IDN	Bandar Lampung	1,167,101	Banda Aceh - Medan - Palembang - Bandar Lampung - Bakauheni	Jl. Imam Bonjol & Jl. Insinyur Sutami	Kereta Api Tanjung Karang, Labuhan Ratu, Gedung Ratu	Bandar Lampung - Palembang - Lahat - Linggau
6	IDN	Denpasar	880,600	Primary road between Gilimanuk and Denpasar		No station	No line
7	IDN	Samarinda	797,006	Primary road between Bontang and Balikpapan through Samarinda		No station	No line
8	IDN	Kota Ambon	395,423	Jl. Propinsi		No station	No line
9	IDN	Banda Aceh	249,499	Banda Aceh - Medan - Palembang - Bandar Lampung - Bakauheni	Banda Aceh - Calang - Meulaboh - Singkil	No station	No line
10	IDN	Bitung	202,204	Jl.Raya Manad - Bitung		No station	No line
11	IDN	Gorontalo	197,970	Jl. Trans Sulawesi		No station	No line
12	IDN	Kota Bima	156,400	Jl. Sultan Muhamad Salahuddin & Jl. Lintas Bima - Sape		No station	No line
13	LAO	Luangprabang (luang)	90,300	NR1 & NR13		No station	No line
14	LAO	Thalhek (kham)	90,800	NR12 & NR13		No station	No line
15	LAO	Pakxane (bolikh)	45,000	NR13		No station	No line
16	MYS	Timur Laut (George Town)	520,242	NR6 and NR3113		No station	No line
17	MYS	Kuala Terengganu	343,284	NR3, NR14 NR3685		No station	No line
18	MYS	Sibu	247,995	AH150 NR3105, NR3310, NR6308B		No station	No line
19	MYS	Kuala Muda (Sungai Petani)	456,605	AH2, NR1, NR67		Sungai Petani	KTM West Coast Line
20	MYS	Kota Setar (Alor Setar)	366,787	AH2, NR1, NR7 & NR 175		Alor Setar	KTM West Coast Line
21	MYS	Langkawi Kedha	94,777	NR110 & NR112		No station	No line
22	MMR	Kalay (Kalaymyo)	348,573		Thangmual Rd. & Road from Gangaw	Kalay	Line from/to Mandalay
23	MMR	Myingyan	276,096	NR2		No station	Line from/to Mandalay
24	MMR	Nyaung-U	239,947	NR2		Bagan	Line from/to Mandalay
25	MMR	Amarapura	237,618	NR1, Nr7		Amarapura	Line from/to Mandalay
26	MMR	Mrauk-U	189,630		Road connecting Chaungthit and Myaung Bway	No station	No line
27	MMR	Kyaukpyu	165,352		Road to Ma-ei	No station	No line
28	MMR	Pwintbyu	163,692		Seikphyu - Salin - Pwintbyu - Minbu Rd.	No station	Line from/to Naypyitaw
29	MMR	Toungup	158,341		Toungup Rd. & Ann Toungup Rd.	No station	No line
30	MMR	Rathedaung	111,974		Road to Maungdaw	No station	No line
31	MMR	Kyimyindaing-W Y	111,514		Insein Rd.	Kyimyindaing, PanHlaing & Ha Thar Waddy	Yangon Circular Railway
32	MMR	Manaung	56,966		Kyun Pat Lan Rd. (circular road)	No station	No line
33	MMR	Hakha	48,352		Hakha - Mindat Rd., Hakha - Gangaw Rd.	No station	No line
34	PHL	Batangas city	305,607	Southern Tagalog Arterial Road, President Jose Laurel Hwy.	Palico - Balayan - Batangas Rd.	No station	No line
35	PHL	Butuan city	309,709	AH26	Butuan - Cagayan Oro - Iligan Rd.	No station	No line
36	PHL	Cavite city	101,120		Manila - Cavite Road	No station	No line

No	Code	Name	Population	Access Road		Railway	
				National Road	Provincial Road	Station	Line
37	PHL	Dagupan city	163,676		Calasiao - Urdaneta Rd. & Malasiqui - Calasiao Rd.	No station	No line
38	PHL	Iloilo city	424,619		Old Iloilo - Capiz Rd., Iloilo - Antique Rd. & Iloilo - Antique Rd. S	No station	No line
39	PHL	Laoag city	104,904	AH26 & Dona Josefa Llanes Escoda National Hwy.	Manor & Laoag - Sarrat - Piddig - Solsona Rd.	No station	No line
40	PHL	Mandaue city	331,320	Central National Hwy & Cebu Transcentral Hwy	Cebu South Rd. & U.N. Ave.	No station	No line
41	PHL	Meycauayan	199,154	AH26 & R9		No station	No line
42	PHL	Olongapo city	221,178	Subic - Tipo Expy. & RH5 Subic Baraca National Hwy.	Jose Abad Santos Avenue	No station	No line
43	THA	Pak Phanrang	85,487		R4013 & R4020,	No station	No line
44	THA	Ranot	62,220		R408 & R4080	No station	No line
45	THA	Rayong	56,010	R3 & R36	R3574	No station	Map Taphut Freight Line of East Line
46	THA	Pathum Thani	154,412		R307, R346	No station	No line
47	THA	Wiang Sa	67,861		R101, R1026 & R1243	No station	No line
48	VNM	Huế	302,983	AH1 (QL1) & QL49	TL4, TL8B &	Huế	North-South Line
49	VNM	Qui Nhon	255,463	QL1D		Qui Nhon	Diêu Trì - Qui Nhon Line (Branch line of N - S Line)
50	VNM	Hạ Long	201,990	QL18 & QL279		No station	No line
51	VNM	Bạc Liêu	109,529	QL1A	TL1	No station	No line
52	VNM	Đồng Hới	76,058	AH1 (QL1A) & QL16		Đồng Hới	North-South Line
53	VNM	Hội An	69,222		TL608 & Nguyen Tat Thanh	No station	No line
54	VNM	Hà Tĩnh	63,415	AH1 (QL1A)	TL3, TL9 & TL22	No station	No line
55	VNM	Anh Khe	63,118	QL19	TL669	No station	No line
56	VNM	Son La	56,848	AH13 (QL6)	TL106	No station	No line

Source: Provided by JICA Project Team based on articles on road network and railway of each country in “Wikipedia” and “Google Map”

A3.4 DAMAGE TO INFRASTRUCTURE IN MIDDLE LIST CITIES

DAMAGE AND INFLUENCE TO INFRASTRUCTURE IN MIDDLE LIST CITIES

Country	Name of city	Name of disaster	Occurrence date	Interruption period of public services				Note
				electricity	gas	water supply	public transportation	
PHL	Batangas	TYPHOON SANTI	31 OCTOBER 2009	-	-	-	NO ALTERNATIVE ROUTE AVAILABLE	
PHL	Cavite	-	-	-	-	-	-	
PHL	Iloilo City	Typhoon Frank	2008/6/21	2 weeks	5 days	2 weeks	2 days	
PHL	OLONGAPO CITY	2013 Typhoon Odette / Habagat Flooding	2013/9/23	1 day	n/a	1 day	All major roads and bridges unpassable on 09/23/2013	
PHL	Laoag	-	-	-	-	-	-	
LAO	Paksan	2015 Flood	-	-	-	-	2-3 Days	
VNM	An Khê	Cơn bão số 15 gây ra trên địa bàn tỉnh (Typhoon No. 15 caused the province)	from 14 to 17-11-2013	3 Days	-	-	-	
VNM	An Khê	Đợt mưa lũ lịch sử 14-16/11/2013 (Historic flooding rains 14-16 / 11/2013)	14-16/11/2013	2 Days	-	-	-	
VNM	Bạc Liêu	Storm No. 2 of 2007	from 31/7/2007 to 10/8/2007	1 Days	-	-	-	
VNM	Bạc Liêu	(Storm No. 1 of 2014)	In 2014	2 Days	-	-	-	
VNM	Dong Hoi	Cơn bão số 10 (Wutip) (Typhoon No. 10 Wutip)	30/9/2013	2 Days	-	-	-	
VNM	Dong Hoi	Cơn bão Nari (bão số 11) (Typhoon Nari (Typhoon No. 11))	14 and 15/10/2013	2 Days	-	-	-	
VNM	Dong Hoi	Bão số 14 Haiyan (Typhoon No. 14 Haiyan)	11/11/2013	1 Days	-	-	01 day	
VNM	Ha Long	Tropical Jebi storm	8/3/2013	0.5 Days	0 day	0 day	0 day	
VNM	Ha Long	Bão số 14 Haiyan (Typhoon No. 14 Haiyan)	11/11/2013	1 days	-	-	No transportation in Bai Chay bridge during the storm	
VNM	Ha Long	Most terrified flood during the last 40 years	28/7/2015	3 Days	-	-	01 day	
VNM	Ha Tinh	Cơn bão số 2 (Storm No.2)	9/8/2007	3 Days	-	-	-	
VNM	Ha Tinh	Cơn bão 5 (Lekima Storm) (Hurricane 5 (Lekima Storm))	3/10/2007	2 Days	-	-	-	
VNM	Ha Tinh	Cơn bão số 7 (Typhoon No. 7)	30/9/2008	2 Days	-	-	01 days	
VNM	Hội An	Cơn bão số 10 (Wutip) mạnh nhất 28 năm qua (Typhoon No. 10 (Wutip) of maximum 28 years)	2013	3 Days	-	-	02 days	
VNM	Hội An	Bão số 6 Xangsane (Typhoon No. 6 Xangsane)	Sep-06	3 Days	-	-	-	
VNM	Hội An	Ketsana storm	10/7/2009	1 Days	-	-	0.5 days	
VNM	Hue	Bão số 6 Xangsane (Typhoon No. 6 Xangsane)	1/10/2006	2 Days	-	-	03 days	
VNM	Hue	Cơn bão số 10 (Wutip storm) (Typhoon No. 10 (Wutip storm))	2013	3 Days	-	-	-	Strongest in the last 28 years
VNM	Hue	Cơn bão Nari (bão số 11) (Typhoon Nari (Typhoon No. 11))	14 pm and all day 15-10-2013	2 Days	-	-	-	
VNM	Quy Nhơn	Cơn bão số 11 (Mirinae storm) (Typhoon No. 11 (Mirinae storm))	11/2/2009	3 Days	-	-	02 days	strongest in the last 34 years
VNM	Quy Nhơn	Bão số 4 (Typhoon No. 4)	2014	2 Days	-	-	01 day	
VNM	Quy Nhơn	Bão số 9 Ketsana storm (Typhoon Ketsana storm 9)	2009/10/7	2 Days	-	-	-	strongest in the last 40 years
VNM	Son La	KUJIRA storm	23 - 25 June 2015	3 Days	-	-	-	
VNM	Son La	-	26/7 - 2/8/2015	2 Days	-	-	-	

APPENDIX 3.5 RESULT OF SECOND RISK ASSESSMENT

Result of Second Risk Assessment in Cambodia

Legend	
Red letter	Recommendation city by JICA Project Team
shaded	Excluded cities by the result of the 2nd Preliminari Risk Assessment

Flood

City Name	Population	Exposure Population	Rate per Population	Exposure GDP	Infrastructure	Infrastructure with hazard risk	Lack of Capacity	Remarks
Phnom Penh	1,242,992	1,229,819	99%	5,531	4	2	68	
Battambang	140,533	140,533	100%	473	0	0	62	
Kampong Cham	47,300	47,300	100%	223	0	0	60	

The Project Team recommends Phnom Penh city as representative of flood hazard.

Result of Second Risk Assessment in Indonesia

Legend	
Red letter	Recommendation city by JICA Project Team
shaded	Excluded cities by the result of the 2nd Preliminary Risk Assessment

Earthquake

City Name	Population	Exposure Population	Rate per Population	Exposure GDP	Infrastructure	Infrastructure with hazard risk	Lack of Capacity	Remarks
Bandar Lampung	1,167,101	233,441	20%	2,961	2	2	28	
Ambon	395,423	197,712	50%	875	0	0	32	
Denpasar	880,600	176,120	20%	871	1	3	41	
Banda Aceh	249,499	49,900	20%	783	1	1	53	
Bima	156,400	30,906	20%	572	0	0	16	
Bitung	202,204	0	0%	0	2	1	33	
Gorontalo	197,970	0	0%	0	0	0	51	
Kota Semarang	1,672,999	0	0%	0	6	0	36	
Samarinda	797,006	0	0%	0	0	0	38	

The Project Team recommends Bandar Lampung or Ambon as representative of earthquake hazard.

Tsunami

City Name	Population	Exposure Population	Rate per Population	Exposure GDP	Infrastructure	Infrastructure with hazard risk	Lack of Capacity	Remarks
Bandar Lampung	1,167,101	438,239	38%	5,520	2	2	28	
Banda Aceh	249,499	185,414	74%	2,908	1	1	53	
Ambon	395,423	384,192	97%	1,708	0	0	32	
Denpasar	880,600	288,601	33%	1,427	1	3	41	
Bima	156,400	59,995	38%	1,320	0	0	16	
Bitung	202,204	169,907	84%	838	2	1	33	
Gorontalo	197,970	10,735	5%	236	0	0	51	
Samarinda	797,006	495	0%	6	0	0	38	
Kota Semarang	1,672,999	0	0%	0	6	0	36	

The Project Team recommends Bandar Lampung or Banda Aceh as representative of tsunami hazard.

Flood

City Name	Population	Exposure Population	Rate per Population	Exposure GDP	Infrastructure	Infrastructure with hazard risk	Lack of Capacity	Remarks
Samarinda	797,006	709,164	89%	9,136	0	0	38	
Gorontalo	197,970	169,810	86%	3,876	0	0	51	
Banda Aceh	249,499	217,095	87%	3,405	1	1	53	
Bandar Lampung	1,167,101	0	0%	0	2	2	28	
Bitung	202,204	0	0%	0	2	1	33	
Denpasar	880,600	0	0%	0	1	3	41	
Ambon	395,423	0	0%	0	0	0	32	
Bima	156,400	0	0%	0	0	0	16	
Kota Semarang	1,672,999	0	0%	0	6	0	36	

The Project Team recommends Samarinda city as representative of flood hazard.

Result of Second Risk Assessment in Lao PDR

Legend	
Red letter	Recommendation city by JICA Project Team
shaded	Excluded cities by the result of the 2nd Preliminari Risk Assessment

Flood

City Name	Population	Exposure Population	Rate per Population	Exposure GDP	Infrastructure	Infrastructure with hazard risk	Lack of Capacity	Remarks
Thakhek	90,800	90,446	100%	2,471	2	2	94	
Paxane	45,000	44,937	100%	2,185	0	0	89	
Luangprabang	90,300	82,976	92%	1,113	2	1	94	

The Project Team recommends Thakhek city as representative of flood hazard.

Result of Second Risk Assessment in Malaysia

Legend	
Red letter	Recommendation city by JICA Project Team
shaded	Excluded cities by the result of the 2nd Preliminari Risk Assessment

Tsunami

City Name	Population	Exposure Population	Rate per Population	Exposure GDP	Infrastructure	Infrastructure with hazard risk	Lack of Capacity	Remarks
Timur Laut	520,242	453,042	87%	29,832	4	0	36	
Kuala Terengganu	343,284	236,596	69%	8,385	3	0	38	
Langkawi kedha	94,777	81,571	86%	1,976	4	0	27	
Kota Setar	366,787	20,401	6%	588	3	1	21	
Kuala Muda	456,605	5,702	1%	101	3	1	24	
Sibu	247,995	1,556	1%	40	3	0	44	

The Project Team recommends Timur Laut(George Town) as representative of tsunami hazard.

Flood

City Name	Population	Exposure Population	Rate per Population	Exposure GDP	Infrastructure	Infrastructure with hazard risk	Lack of Capacity	Remarks
Kota Setar	366,787	354,883	97%	12,502	3	1	21	
Kuala Muda	456,605	87,470	19%	2,436	3	1	24	
Kuala Terengganu	343,284	65,154	19%	2,123	3	0	38	
Sibu	247,995	35,099	14%	1,389	3	0	44	Some project had conducted
Timur Laut	520,242	0	0%	0	4	0	36	
Langkawi kedha	94,777	0	0%	0	4	0	27	

The Project Team recommends Kota Setar city as representative of flood hazard.

Result of Second Risk Assessment in Myanmar

Legend	
Red letter	Recommendation city by JICA Project Team
shaded	Excluded cities by the result of the 2nd Preliminary Risk Assessment

Earthquake

City Name	Population	Exposure Population	Rate per Population	Exposure GDP	Infrastructure	Infrastructure with hazard risk	Lack of Capacity	Remarks
Amarapura	237,618	172,608	73%	1,253	2	2	62	
Kale	348,573	278,860	80%	998	2	1	59	
Myingyan	276,096	138,048	50%	964	2	1	66	
Nyaung-U	239,947	66,854	28%	424	0	0	56	
Pwinbyu	163,692	37,980	23%	210	0	0	49	
Rathedaung	111,974	16,779	15%	174	0	0	56	
Mrauk-U	189,630	37,926	20%	166	0	0	52	
Hakha	48,352	26,390	55%	120	0	0	54	
Kyaukpyu	165,352	0	0%	0	2	3	42	
Kyimyindaing	111,514	0	0%	0	5	3	60	Considering the Sagaing fault and the back up function for Yangon area
Manaung	56,966	0	0%	0	0	0	49	
Taungup	158,341	0	0%	0	0	0	55	

The Project Team recommends Amarapura or Kyimyindaing as representative of earthquake hazard.

Tsunami

City Name	Population	Exposure Population	Rate per Population	Exposure GDP	Infrastructure	Infrastructure with hazard risk	Lack of Capacity	Remarks
Rathedaung	111,974	72,195	64%	750	0	0	56	
Kyaukpyu	165,352	134,800	82%	540	2	3	42	
Kyimyindaing	111,514	12,324	11%	389	5	3	60	
Manaung	56,966	34,629	61%	186	0	0	49	
Taungup	158,341	63,374	40%	185	0	0	55	
Mrauk-U	189,630	15,220	8%	67	0	0	52	
Amarapura	237,618	0	0%	0	2	2	62	
Hakha	48,352	0	0%	0	0	0	54	
Kale	348,573	0	0%	0	2	1	59	
Myingyan	276,096	0	0%	0	2	1	66	
Nyaung-U	239,947	0	0%	0	0	0	56	
Pwinbyu	163,692	0	0%	0	0	0	49	

The Project Team recommends Rathedaung or Kyaukpyu as representative of tsunami hazard.

Flood

City Name	Population	Exposure Population	Rate per Population	Exposure GDP	Infrastructure	Infrastructure with hazard risk	Lack of Capacity	Remarks
Amarapura	237,618	216,678	91%	1,543	2	2	62	
Myingyan	276,096	178,089	65%	1,345	2	1	66	
Kale	348,573	315,297	90%	1,128	2	1	59	
Mrauk-U	189,630	178,450	94%	780	0	0	52	
Nyaung-U	239,947	113,865	47%	763	0	0	56	
Pwinbyu	163,692	132,003	81%	730	0	0	49	
Rathedaung	111,974	40,544	36%	421	0	0	56	
Taungup	158,341	132,467	84%	387	0	0	55	
Hakha	48,352	11,200	23%	51	0	0	54	
Kyaukpyu	165,352	0	0%	0	2	3	42	
Kyimyindaing	111,514	0	0%	0	5	3	60	
Manaung	56,966	0	0%	0	0	0	49	

The Project Team recommends Amarapura city as representative of flood hazard.

Cyclone/Wind

City Name	Population	Exposure Population	Rate per Population	Exposure GDP	Infrastructure	Infrastructure with hazard risk	Lack of Capacity	Remarks
Rathedaung	111,974	67,208	60%	698	0	0	56	
Nyaung-U	239,947	92,239	38%	579	0	0	56	
Pwinbyu	163,692	81,846	50%	452	0	0	49	
Mrauk-U	189,630	94,815	50%	415	0	0	52	
Kyaukpyu	165,352	82,676	50%	334	2	3	42	
Taungup	158,341	79,171	50%	231	0	0	55	
Manaung	56,966	28,805	51%	155	0	0	49	
Hakha	48,352	18,157	38%	83	0	0	54	
Amarapura	237,618	0	0%	0	2	2	62	
Kale	348,573	0	0%	0	2	1	59	
Kyimyindaing	111,514	0	0%	0	5	3	60	
Myingyan	276,096	0	0%	0	2	1	66	

Cyclone/Surge

City Name	Population	Exposure Population	Rate per Population	Exposure GDP	Infrastructure	Infrastructure with hazard risk	Lack of Capacity	Remarks
Kyimyindaing	111,514	111,514	100%	3,826	5	3	60	
Rathedaung	111,974	101,961	91%	1,059	0	0	56	
Kyaukpyu	165,352	165,351	100%	668	2	3	42	
Taungup	158,341	156,238	99%	456	0	0	55	
Mrauk-U	189,630	99,303	52%	434	0	0	52	
Manaung	56,966	51,158	90%	275	0	0	49	
Amarapura	237,618	0	0%	0	2	2	62	
Hakha	48,352	0	0%	0	0	0	54	
Kale	348,573	0	0%	0	2	1	59	
Myingyan	276,096	0	0%	0	2	1	66	
Nyaung-U	239,947	0	0%	0	0	0	56	
Pwinbyu	163,692	0	0%	0	0	0	49	

The Project Team recommends Rathedaung city as representative of cyclone hazard.

Result of Second Risk Assessment in Philippines

Legend	
Red letter	Recommendation city by JICA Project Team
shaded	Excluded cities by the result of the 2nd Preliminari Risk Assessment

Earthquake

City Name	Population	Exposure Population	Rate per Population	Exposure GDP	Infrastructure	Infrastructure with hazard risk	Lack of Capacity	Remarks
Meycauayan	199,154	99,577	50%	7,158	4	7	55	
Butuan City	309,709	244,745	79%	4,007	0	0	31	
Mandaue City	331,320	66,264	20%	1,331	6	4	20	
Dagupan City	163,676	79,860	49%	1,240	0	0	26	
Iloilo City	424,619	57,783	14%	1,008	2	2	51	
Laoag City	104,904	49,677	47%	664	2	3	52	
Batangas City	305,607	120,484	39%	553	5	4	22	Considering active fault close to Batangas city and expected Maximum PGA
Olongapo City	221,178	65,081	29%	290	6	4	14	
Cavite city	101,120	46,700	46%	115	4	7	57	

The Project Team recommends Meycauayan or Butuan as representative of earthquake hazard.

Flood

City Name	Population	Exposure Population	Rate per Population	Exposure GDP	Infrastructure	Infrastructure with hazard risk	Lack of Capacity	Remarks
Butuan City	309,709	251,969	81%	4,515	0	0	31	
Laoag City	104,904	96,954	92%	1,350	2	3	52	
Dagupan City	163,676	53,663	33%	783	0	0	26	
Batangas City	305,607	0	0%	0	5	4	22	
Cavite city	101,120	0	0%	0	4	7	57	
Iloilo City	424,619	0	0%	0	2	2	51	
Mandaue City	331,320	0	0%	0	6	4	20	
Meycauayan	199,154	0	0%	0	4	7	55	
Olongapo City	221,178	0	0%	0	6	4	14	

The Project Team recommends Butuan city as representative of flood hazard.

Cyclone/Wind

City Name	Population	Exposure Population	Rate per Population	Exposure GDP	Infrastructure	Infrastructure with hazard risk	Lack of Capacity	Remarks
Meycauayan	199,154	199,154	100%	14,315	4	7	55	
Mandaue City	331,320	331,320	100%	6,657	6	4	20	
Iloilo City	424,619	318,464	75%	5,516	2	2	51	
Butuan City	309,709	232,282	75%	3,783	0	0	31	
Dagupan City	163,676	163,676	100%	2,540	0	0	26	
Laoag City	104,904	104,904	100%	1,407	2	3	52	
Batangas City	305,607	305,607	100%	1,402	5	4	22	
Olongapo City	221,178	221,178	100%	997	6	4	14	
Cavite city	101,120	101,120	100%	249	4	7	57	

Cyclone/Surge

City Name	Population	Exposure Population	Rate per Population	Exposure GDP	Infrastructure	Infrastructure with hazard risk	Lack of Capacity	Remarks
Butuan City	309,709	183,197	59%	3,563	0	0	31	
Dagupan City	163,676	163,676	100%	2,540	0	0	26	
Laoag City	104,904	80,276	77%	1,200	2	3	52	
Batangas City	305,607	0	0%	0	5	4	22	
Cavite city	101,120	0	0%	0	4	7	57	
Iloilo City	424,619	0	0%	0	2	2	51	
Mandaue City	331,320	0	0%	0	6	4	20	
Meycauayan	199,154	0	0%	0	4	7	55	
Olongapo City	221,178	0	0%	0	6	4	14	

The Project Team recommends Butuan city as representative of cyclone hazard, too.

Result of Second Risk Assessment in Thailand

Legend	
Red letter	Recommendation city by JICA Project Team
shaded	Excluded cities by the result of the 2nd Preliminari Risk Assessment

Flood

City Name	Population	Exposure Population	Rate per Population	Exposure GDP	Infrastructure	Infrastructure with hazard risk	Lack of Capacity	Remarks
Pak Phanang	85,487	85,407	100%	3,535	0	0	58	
Rayong	364,544	132,703	36%	3,213	1	0	35	
Wiang Sa	67,861	46,771	69%	783	0	0	54	
Ranot	62,220	15,917	26%	626	0	0	48	
Pathum Thani	220,154	0	0%	0	3	1	53	

The Project Team recommends Pak Phanang and Rayong cities as representative of flood hazard.

Cyclone/Surge

City Name	Population	Exposure Population	Rate per Population	Exposure GDP	Infrastructure	Infrastructure with hazard risk	Lack of Capacity	Remarks
Pak Phanang	85,487	0	0%	0	0	0	58	
Pathum Thani	154,412	0	0%	0	3	1	53	
Ranot	62,220	0	0%	0	0	0	48	
Rayong	56,010	0	0%	0	1	0	35	
Wiang Sa	67,861	0	0%	0	0	0	54	

Result of Second Risk Assessment in Viet Nam

Legend	
Red letter	Recommendation city by JICA Project Team
shaded	Excluded cities by the result of the 2nd Preliminary Risk Assessment

Tsunami

City Name	Population	Exposure Population	Rate per Population	Exposure GDP	Infrastructure	Infrastructure with hazard risk	Lack of Capacity	Remarks
Qui Nhon	255,463	203,954	80%	1,855	3	1	55	
Ha Long	201,990	193,708	96%	450	5	4	46	
Hoi An	69,222	48,921	71%	363	2	2	65	
Ha Tinh	63,415	4,386	7%	54	0	0	65	
Bac Lieu	109,529	13,148	12%	42	0	0	52	
Dong Hoi	76,058	7,069	9%	32	2	1	59	
Anh Khe	63,118	0	0%	0	0	0	70	
Hue	302,983	0	0%	0	1	1	63	
Son La	56,848	0	0%	0	0	0	67	

The Project Team recommends Qui Nhon, Ha Long or Hoi An as representative of tsunami hazard.

Flood

City Name	Population	Exposure Population	Rate per Population	Exposure GDP	Infrastructure	Infrastructure with hazard risk	Lack of Capacity	Remarks
Hue	302,983	302,983	100%	1,137	1	1	63	
Ha Tinh	63,415	63,415	100%	759	0	0	65	
Qui Nhon	255,463	87,596	34%	675	3	1	55	
Hoi An	69,222	61,278	89%	442	2	2	65	
Bac Lieu	109,529	109,529	100%	308	0	0	52	
Anh Khe	63,118	51,692	82%	160	0	0	70	
Dong Hoi	76,058	13,635	18%	30	2	1	59	
Son La	56,848	5,153	9%	8	0	0	67	
Ha Long	201,990	0	0%	0	5	4	46	

The Project Team recommends Hue city as representative of flood hazard.

Cyclone/Wind

City Name	Population	Exposure Population	Rate per Population	Exposure GDP	Infrastructure	Infrastructure with hazard risk	Lack of Capacity	Remarks
Qui Nhon	255,463	191,597	75%	1,720	3	1	55	
Hue	302,983	227,237	75%	853	1	1	63	
Ha Tinh	63,415	47,561	75%	569	0	0	65	
Hoi An	69,222	51,917	75%	376	2	2	65	
Ha Long	201,990	151,493	75%	352	5	4	46	
Dong Hoi	76,058	57,044	75%	215	2	1	59	
Son La	56,848	28,424	50%	193	0	0	67	
Anh Khe	63,118	47,339	75%	144	0	0	70	
Bac Lieu	109,529	0	0%	0	0	0	52	

Cyclone/Surge

City Name	Population	Exposure Population	Rate per Population	Exposure GDP	Infrastructure	Infrastructure with hazard risk	Lack of Capacity	Remarks
Hue	302,983	263,781	87%	1,016	1	1	63	
Ha Tinh	63,415	63,415	100%	759	0	0	65	
Hoi An	69,222	69,217	100%	502	2	2	65	
Ha Long	201,990	197,701	98%	459	5	4	46	
Dong Hoi	76,058	64,518	85%	246	2	1	59	
Qui Nhon	255,463	18,402	7%	52	3	1	55	
Anh Khe	63,118	0	0%	0	0	0	70	
Bac Lieu	109,529	0	0%	0	0	0	52	
Son La	56,848	0	0%	0	0	0	67	

The Project Team recommends Hue city as representative of cyclone hazard, too.

A3.6 Short List Cities and Candidate Cities

Short listed cities and a candidate city in eight ASEAN Member States (AMS) have been selected through discussion with National Project Coordinator (NPC) based on the 2nd Preliminary Disaster Risk Assessment shown in 2.4 and A3.6.

A3.6.1 Selection of Short List Cities and Candidate Cities

(1) Cambodia

Phnom Penh, national capital in Cambodia, has the appropriateness of the demonstration project, because it has quite large size of exposed population and GDP. It also has important existing infrastructure to sustain national function. However, many studies and projects have been implemented.

Battambang is still developing, but it is located in the strategic location along the National Road No. 5 which forms economic corridor connecting Ho Chi Minh City in Viet Nam, Phnom Penh in Cambodia, and Bangkok in Thailand. Development potential in Battambang will increase, so disaster risk will be higher near future. In this sense, Battambang is the most appropriate for a candidate city in Cambodia.

Table A3.7.1 Short List Cities and Candidate City in Cambodia

Country	Short List Cities	Candidate City
Cambodia	Battambang (F)	Battambang(F)

() shows the main disaster type for the cities. (C): Cyclone, (E): Earthquake, (F): Flood, (T): Tsunami

Source: JPT

(2) Indonesia

Among the middle listed cities for Flood, Tsunami, and Earthquake, three cities were selected as the short list cities in Indonesia. One city out of the three short list cities was selected as a candidate city for the demonstration project in Indonesia.

Flood: Semarang was selected because the city experiences inundation resulting from recent land subsidence and overflow from upstream. The situation is more serious than other cities.

Tsunami: Denpasar was selected because development potential is high and it is one of the most important tourist destinations in Indonesia and ASEAN. To compare with Banda Aceh which has also high disaster risk, investment of disaster risk reduction in Denpasar is lower than Banda Aceh.

Earthquake: Bima was selected as one of the short list cities because the Mayor of the city understands significance of disaster risk reduction and feasibility of the demonstration project is higher than other cities. Bima experienced large earthquake which scale was M 6.5 in 2007.

After discussion with JPT, BNPB had internal discussion and concluded that Denpasar was selected as the candidate city of the demonstration project. It is because Denpasar has large economic impact to the eastern part of Indonesia. Economic damage in the eastern part of Indonesia will be serious once serious disaster attacks the city. The city is the popular destination for tourists around the world. Not only the lives of Indonesian residents but also the lives of tourists from foreign countries will be jeopardized. As such, BNPM judged that Denpasar should be more prioritized than other two cities.

Table A3.7.2 Short List Cities and Candidate City in Indonesia

Country	Short List Cities	Candidate City
Indonesia	Bima (E), Semarang (F), Denpasar (T)	Denpasar (T)

() shows the main disaster type for the cities. (C): Cyclone, (E): Earthquake, (F): Flood, (T): Tsunami

Source: JPT

(3) Lao PDR

Among the three middle list cities, Luang Prabang is the most important in the context of ASEAN because it is one of the representative tourist destinations in ASEAN. The impact of disaster in the city is not limited to the citizens but also to visitors from both other areas in Lao PDR and foreign countries. The city grows the fastest among the three middle list cities, so disaster risk in the city is increasing.

Table A3.7.3 Short List Cities and Candidate City in Philippines

Country	Short List Cities	Candidate City
Lao PDR	Luang Prabang (F)	Luang Prabang (F)

() shows the main disaster type for the cities. (C): Cyclone, (E): Earthquake, (F): Flood, (T): Tsunami

Source: JPT

(4) Malaysia

Both NADMA (National Disaster Management Agency) and JICA Project Team (JPT) agreed that Kuala Terengganu (Flood) and George Town (Tsunami) were selected as short-listed cities, since east coast including Kuala Terengganu has been frequently affected by flood, and NADMA is currently focusing on the flood disaster mitigation on the east coast area. In addition, Kuala Terengganu was selected as a candidate city for the pilot project, considering and expecting the dissemination to other cities on the east coast.

Table A3.7.4 Short List Cities and Candidate City in Malaysia

Country	Short List Cities	Candidate City
Malaysia	Kuala Terengganu (F), George Town (T)	Kuala Terengganu (F)

() shows the main disaster type for the cities. (C): Cyclone, (E): Earthquake, (F): Flood, (T): Tsunami

Source: JPT

(5) Myanmar

JPT explained the results of 2nd preliminary risk assessment. Out of 12 selected middle-listed cities, which were agreed by the RRD (Relief and Resettlement Department) in February 2016, two cities such as Amarapura (Earthquake and Flood) and Rathedaung (Tsunami and Cyclone) were recommended as the short-listed cities, and Rathedaung as a candidate city for the pilot project, based on the assessment by the JPT.

Through the discussions, JPT changed recommendation of short-listed city and candidate city from Rathedaung to Kyimyindaing, considering capacity limitation and security problem in Rathedaung.

As a result of internal discussion within RRD, RRD selected Kyimyindaing as the candidate city for the demonstration project.

Table A3.7.5 Short List Cities and Candidate City in Myanmar

Country	Short List Cities	Candidate City
Myanmar	Amarapura (E), (F), Kyimyindaing (T), (C)	Kyimyindaing (C)

() shows the main disaster type for the cities. (C): Cyclone, (E): Earthquake, (F): Flood, (T): Tsunami

Source: JPT

(6) Philippines

JICA Study Team explained the results of 2nd preliminary risk assessment. Out of nine selected middle-listed cities, which were agreed by the OCD (Office of Civil Defense) in February 2016, two cities such as Butuan, and Meycauayan were selected by JPT as the candidate short-listed cities, and Butuan city would be a candidate city for the pilot project.

OCD agreed that Butuan and Meycauayan were selected short-listed cities, and Butuan city as a candidate city for the pilot project, since Butuan has a high risk of disaster based on the results of 2nd preliminary risk assessment, and currently considered as one of the important cities in Mindanao Island.

Table A3.7.6 Short List Cities and Candidate City in Philippines

Country	Short List Cities	Candidate City
Philippines	Butuan (F), Meycauayan (E)	Butuan (F)

() shows the main disaster type for the cities. (C): Cyclone, (E): Earthquake, (F): Flood, (T): Tsunami
Source: JPT

(7) Thailand

Among the five middle listed cities, Pathumtani and Rayong were selected as the short list cities by considering fairly large scale of the cities such population and GRDP. Recently the industrial estates have been developed in these cities. Pathumtani has more economic impact than Rayon in case disaster attacks, so Pathumtani was selected as a candidate city of the demonstration project.

Table A3.7.7 Short List Cities and Candidate City in Thailand

Country	Short List Cities	Candidate City
Thailand	Pathumthani (F), Rayong (F)	Pathumthani (F)

() shows the main disaster type for the cities. (C): Cyclone, (E): Earthquake, (F): Flood, (T): Tsunami
Source: JPT

(8) Vietnam

To follow the recommendation by JPT, Qui Nhon, Hue, and Ha Long were selected as short list cities by considering exposed population, exposure GDP, and risks of multi-hazard. Considering the trend of recent disaster and climate change and existing coping capacity in Vietnam, disaster risk reduction for cyclone along the coastal cities is very important. As such, Qui Nhon is selected as a candidate city for the demonstration project.

Table A3.7.8 Short List Cities and Candidate City in Vietnam

Country	Short List Cities	Candidate City
Vietnam	Qui Nhon(T),(C), Hue(F), Ha Long (T)	Qui Nhon (C)

() shows the main disaster type for the cities. (C): Cyclone, (E): Earthquake, (F): Flood, (T): Tsunami
Source: JPT

A3.6.2 List of Short List Cities in ASEAN

Two types of short list are shown in the following tables. One short list is classified by country, and the other short list is classified by disaster type.

Table A3.7.9 Short List by Country

Country	Short List Cities
Cambodia	1. Battambang (F)
Indonesia	1. Bima (E) 2. Semarang (F) 3. Denpasar (T)
Lao PDR	1. Luang Prabang (F)
Malaysia	1. Kuala Terengganu (F) 2. George Town (T)
Myanmar	1. Amarapura (E), (F) 2. Kyimyindaing (T),(C)
Philippines	1. Butuan (F) 2. Meycauayan (E)
Thailand	1. Pathumthani (F) 2. Rayong (F)
Viet Nam	1. Qui Nhon (T), (C) 2. Hue (F) 3. Ha Long (T)

() shows the main disaster type for the cities. (C): Cyclone, (E): Earthquake, (F): Flood, (T): Tsunami
Source: JPT

Table A3.7.10 Short List by Disaster Type

Disaster Type	Short List Cities, Country
Cyclone	1. Kyimyindaing, Myanmar 2. Qui Nhon, Vietnam
Flood	1. Battambang, Cambodia 2. Semarang, Indonesia 3. Luang Prabang, Lao PDR 4. Kuala Terengganu, Malaysia 5. Amarapura, Myanmar 6. Butuan, Philippines 7. Pathumthani, Thailand 8. Rayong, Thailand 9. Hue, Vietnam
Earthquake	1. Bima, Indonesia 2. Amarapura, Myanmar 3. Meycauayan, Philippines
Tsunami	1. Denpasar, Indonesia 2. George Town, Malaysia 3. Kyimyindaing, Myanmar 4. Qui Nhon, Vietnam 5. Ha Long, Vietnam

Source: JPT

A3.6.3 List of Candidate Cities in ASEAN

Two types of list of candidate cities are shown in the following tables. One list is classified by country, and the other list is classified by disaster type.

Table A3.7.11 List of Candidate Cities by Country

Country	Candidate Cities
Cambodia	Battambang (F)
Indonesia	Denpasar (T)
Lao PDR	Luang Prabang (F)
Malaysia	Kuala Terengganu (F)
Myanmar	Kyimyindaing (C)
Philippines	Butuan (F)
Thailand	Pathumthani (F)
Viet Nam	Qui Nhon (C)

() shows the main disaster type for the cities. (C): Cyclone, (E): Earthquake, (F): Flood, (T): Tsunami
Source: JPT

Table A3.7.12 List of Candidate Cities by Disaster Type

Disaster Type	Short List Cities, Country
Cyclone	1. Kyimyindaing, Myanmar 2. Qui Nhon, Vietnam
Flood	1. Battambang, Cambodia 2. Luang Prabang, Lao PDR 3. Kuala Terengganu, Malaysia 4. Butuan, Philippines 5. Pathumthani, Thailand
Earthquake	1. Denpasar, Indonesia*
Tsunami	

* Denpasar was selected due to high risk of Tsunami, but JPT proposed that disaster risk of earthquake will be considered in conjunction with disaster risk of Tsunami in the demonstration project
Source: JPT

APPENDIX 3.7 COLLECTED DATA IN GIS DATABASE

(1) Data List of Using for Risk Assessment

Table A3.7-1 Data List of GIS Database (1-1)

Category	Sub-category	Source	File Name	Type	Year	Explanation		
11	Administrative Boundary	JICA Project Team	MiddleListedCities_Boundary	Polygon	2016	Administrative boundary data of 56 middle-listed cities in ASEAN		
12	City	JICA Project Team	LongListedCities	Point	2016	City center point of 813 long-listed cities, 56 middle-listed cities, and 8 candidate cities of demonstration project in ASEAN		
			MiddleListedCities	Point	2016			
			CandidateCities	Point	2016			
13	Infrastructure	JICA Project Team	AgglomIndustrialArea	Point	2016	Names and coordinates of agglomerate industrial area/zone/park, totally 1046 sites in ASEAN		
	Airport	former JICA study	Airport_Location_ASEAN	Point	2015	Names and coordinates of airport, totally 64 sites in ASEAN		
	Seaport	former JICA study	Port_Location_ASEAN	Point	2015	Names and coordinates of seaport, totally 45 sites in ASEAN		
14	Natural Hazard	Eartquake	GSHAP (former JICA study)	Globe_gshap	GeoTiff	1999	475-years frequency (10% in 50 years), evaluated in PGA (Peak Ground Accelation)	
			JICA Project Team	EQ_gshap_ASEAN	Polygon	1999	This data has values of PGA as attribution.	
	Tsunami	GAR	Tsunami_RunUp_RP 500	Tsunami_RunUp_RP 500	Polygon	2015	Run up extent of Tsunami with 500 years return period	
			GRDP	ts_frequency	GeoTiff	2009	Frequency (%) of 500 years return period	
	Flood	GAR	Hazard_500_50	Hazard_500_50	Grid	2015	50 years return period data with inundation depth (cm) value	
			JICA Project Team	500_FL50	Polygon	2015	These data has value of inundation depth as attribution.	
			JICA Project Team	Flood500_ASEAN	Polygon	2015		
			GAR	Hazard_500_25	Hazard_500_25	Grid	2015	25 years return period data
				Hazard_500_100	Hazard_500_100	Grid	2015	100 years return period data
				Hazard_500_200	Hazard_500_200	Grid	2015	200 years return period data
			JICA Project Team	500_FL25	500_FL25	Polygon	2015	Each data has value of inundation depth (cm) as attribution.
				500_FL100	500_FL100	Polygon	2015	
				500_FL200	500_FL200	Polygon	2015	
				Flood250_ASEAN	Flood250_ASEAN	Polygon	2015	
	Flood	GRDP	Flood100_ASEAN	Flood100_ASEAN	Polygon	2015	Combine to one data in ASEAN	
			Flood200_ASEAN	Flood200_ASEAN	Polygon	2015		
			FL_mortalityRisk	FL_mortalityRisk	GeoTiff	2011		Flood mortality risk (low, moderate, medium, high, extreme)
	Cyclone Wind	GAR	VIENTO_MUNDO_TR50_INTI	VIENTO_MUNDO_TR50_INTI	Grid	2015	50 years return period data with wind speed (km/h) value	
			JICA Project Team	CYW50_gar	Polygon	2015	This data has value of wind speed (km/h) as attribution.	
			GRDP	CY_mortalityRisk	GeoTiff	2012	Cyclones/Typhoon hazard mortality risk (low, moderate, medium, high, extreme)	
Cyclone Surge	GRDP	cs_frequency	cs_frequency	GeoTiff	2009	Tropical cyclones/Typhoon surge's frequency data based on past event which occurred from 1975 to 2007.		
		JICA Project Team	CYS_ASEAN	Polygon	2009	This data has value of annual frequencies (divide by 100,000 to obtain the actual value)		

Note: 'xxx' in the file name replace three-letters ISO country code in each ASEAN country; BRN, KHM, IDN, LAO, MYS, MMR, PHL, SGP, THA, and VNM.

GSHAP: Global Seismic Hazard Assessment Program (<http://www.seismo.ethz.ch/static/GSHAP/>),

GAR: Global Assessment Report on Disaster Risk Reduction 2015 (<http://risk.preventionweb.net/capreviewer/main.jsp?countrycode=g15>),

GRDP: Global Risk Data Platform (<http://preview.grid.unep.ch/index.php?preview=home&lang=eng>)

Source: JICA Project Team

Table A3.7-2 Data List of GIS Database (1-2)

Category	Sub-category	Source	File Name	Type	Year	Explanation
15 Exposure	Original (point)	GAR	gar_exp_***	Point	2015	This data has a lot of attributions including population and GDP with five kilometers mesh.
	Processing (polygon)	JICA Project Team	gar_exp_mesh_***	Polygon	2015	JICA Project Team creates mesh data that each mesh contains a point one by one for evaluating risks by mesh data.
		JICA Project Team	GAR_mesh_MLCities	Polygon	2016	JICA Project Team selects Middle-listed city's mesh and appends natural hazard risk values.
16 Capacity	-	JICA Project Team	Capacity Evaluation	Excel	2016	This table based on the result of questionnaires that conducted on middle-listed cities with subcontract survey.
			ASEAN Lack of Capacity in Middle-listed Cities	PDF	2017	Evaluation of lack of capacity in each middle-listed cities
17 Risk Assessment Result	Preliminary Risk Assessment	JICA Project Team	PreliminaryRiskAssessment_Result	Excel	2016	This table represents the result of preliminary risk assessment for Long-listed 813 cities.
	Secondary Risk Assessment	JICA Project Team	SecondaryRiskAssessment_Result	Excel	2016	This table represents the result of secondary risk assessment for Middle-listed 56 cities.
18 Map	Location map	JICA Project Team	ASEAN Middle-listed Cities Location Map	PDF	2017	Location map of middle listed cities with candidate cities of demonstration project
			ASEAN Whole Map	PDF	2017	Whole map of ASEAN countries with long, middle and short listed cities
	Hazard map	JICA Project Team	ASEAN_Hazard Map (Earthquake)	PDF	2017	Supposed peak ground acceleration in 475 years (source: GSHAP)
			ASEAN_Hazard Map (Tsunami)	PDF	2017	Supposed inundation area in 500 years (source: GAR)
			ASEAN_Hazard Map (Flood)	PDF	2017	Supposed flood depth (cm) in 50 years return period (source: GAR)
			ASEAN_Hazard Map (Cyclone Wind)	PDF	2017	Supposed wind speed (km/h) in 50 years return period (source: GAR)
			ASEAN_Hazard Map (Cyclone Surge)	PDF	2017	Surge affected area in past event from 1975 to 2007 (source: GRDP)
			ASEAN Preliminary Risk Assessment (Earthquake)	PDF	2017	Result of preliminary risk assessment (Earthquake) based on GSHAP data
			ASEAN Preliminary Risk Assessment (Tsunami)	PDF	2017	Result of preliminary risk assessment (Tsunami) based on GRDP 'ts_frequency' data
			ASEAN Preliminary Risk Assessment (Flood)	PDF	2017	Result of preliminary risk assessment (Flood) based on GRDP 'FL_mortalityRisk' data
			ASEAN Preliminary Risk Assessment (Cyclone Wind)	PDF	2017	Result of preliminary risk assessment (Cyclones/Typhoon Wind) based on GRDP 'CY_mortalityRisk' data
ASEAN Preliminary Risk Assessment (Cyclone Surge)	PDF	2017	Result of preliminary risk assessment (Cyclones/Typhoon Surge) based on GRDP 'cs_frequency' data			

Note: '***' in the file name replace three-letters ISO country code in each ASEAN country; BRN, KHM, IDN, LAO, MYS, MMR, PHL, SGP, THA, and VNM.

Source: JICA Project Team

(2) Data List of Existing and Additional Data

1. Brunei Darussalam

Table A3.7-3 Data List of GIS Database (2-1 Brunei Darussalam)

Category	Source	File Name	Type	Year	Explanation
21 Administrative Boundary	former JICA study	BRN_adm0	Polygon	-	Country boundary
		BRN_adm1	Polygon	-	District boundary
		BRN_adm2	Polygon	-	Mukim boundary
23 Water	former JICA study	BRN_water_area	Polygon	-	Inland water
		BRN_water_line	Polyline	-	River
24 Infrastructure	former JICA study	BRN_Road	Polyline	-	Road
		BRN_Railway	Polyline	-	Railway
	OCHA HDX	BRN_airport_location	Point	-	Airport
25 Populations	WorldPop	BRN_PPP2000	GeoTiff	2016	1 kilometer mesh populatuin data in 2000
		BRN_PPP2005	GeoTiff	2016	1 kilometer mesh populatuin data in 2005
		BRN_PPP2010	GeoTiff	2016	1 kilometer mesh populatuin data in 2010
		BRN_PPP2015	GeoTiff	2016	1 kilometer mesh populatuin data in 2015
		BRN_PPP2020	GeoTiff	2016	Assumed 1 kilometer mesh population in 2020
		BRN_P2015_Ayyzz_F/M	GeoTiff	2016	Population data of 1 kilometer square mesh in 2015. Separate into 28 classes in the country (male and female, five years age classes)
27 Elevation	NASA	BRN_srtm3_dem	GeoTiff	2014	Elevation data of 3 arcseconds (about 90 m)
28 Map	JICA Project Team	Brunei Darussalam Whole Map	PDF	2017	Boundary, City, Water and Infrastructure map based on DEM and ESRI World map
		Brunei Darussalam Population	PDF	2017	Population in 2015 per km2 with boundary and road

Note: 'yyzz' in the file name replace five years age class (e.g. '2025' means from 20 years old to 25 years old), and 'M/F' will replace 'M' or 'F' that means male or female.

OCHA HDX: United Nations Office for the Coordination of Humanitarian Affairs Humanitarian Data Exchange (<https://data.humdata.org/>)

NASA: National Aeronautics and Space Administration, SRTM: Shuttle Radar Topography Mission

Files of 'BRN_PPP2000', 'BRN_PPP2005', 'BRN_PPP2010' and 'BRN_PPP2020' are stored as compression file named 'BRN_Pop'.

Source: JICA Project Team

2. Cambodia

Table A3.7-4 Data List of GIS Database (2-2 Cambodia)

Category	Source	File Name	Type	Year	Explanation
21 Administrative Boundary	former JICA study	KHM adm0	Polygon	-	Country boundary
		KHM adm1	Polygon	-	Province boundary
		KHM adm2	Polygon	-	District boundary
		KHM adm3	Polygon	-	Commune boundary
		KHM adm4	Polygon	-	Village boundary
	OCHA HDX	khm admbndl adm0 gov	Polyline	2014	Another country boundary (line)
		khm admbnda adm1 gov	Polygon	2014	Another province boundary
		khm admbnda adm2 gov	Polygon	2014	Another district boundary
		khm admbnda adm3 gov	Polygon	2014	Another commune boundary
22 Location	OCHA HDX	khm pplp adm1 gov	Point	2014	Province capital locations in Cambodia
		khm pplp adm2 gov	Point	2014	District capital locations in Cambodia
		khm pplp adm3 gov	Point	2014	Commune capital locations in Cambodia
		khm pplp adm4 gov	Point	2014	Village capital locations in Cambodia
		KHM edufacp gov	Point	2012	School locations in Cambodia
23 Water	former JICA study	KHM water area	Polygon	-	Inland water
		KHM water line	Polyline	-	River
	OCHA HDX	KHM rivl gov	Polyline	2008	Another river data
		KHM canall gov	Polyline	-	Canal
		KHM lakea gov	Polygon	2008	Another Inland water data
24 Infrastructure	former JICA study	KHM Road	Polyline	-	Road
		KHM Railway	Polyline	-	Railway
	OCHA HDX	KHM rdsl gov	Polyline	2008	Another road data
		KHM rlwl gov	Polyline	2008	Another railway data
		KHM daml gov	Polyline	2008	Dam data
		KHM airport location	Point	-	Airport
25 Populations	WorldPop	KHM_PPP2000	GeoTiff	2016	1 kilometer mesh populatuin data in 2000
		KHM_PPP2005	GeoTiff	2016	1 kilometer mesh populatuin data in 2005
		KHM_PPP2010	GeoTiff	2016	1 kilometer mesh populatuin data in 2010
		KHM_PPP2015	GeoTiff	2016	1 kilometer mesh populatuin data in 2015
		KHM_PPP2020	GeoTiff	2016	Assumed 1 kilometer mesh population in 2020
		KHM_P2015_Ayyzz_F/M	GeoTiff	2016	Population data of 1 kilometer square mesh in 2015. Separate into 28 classes in the country (male and female, five years age classes)
26 Hazard	OCHA HDX	KHM lev0	Polygon	2016	Province level boundary
		KHM lev1	Polygon	2016	District level boundary
		KHM lev2	Polygon	2016	Commune level boundary
		DI_Report-Cambodia	Excel	2016	Disaster record from 2011 to 2016
27 Elevation	NASA	KHM_srtm3_dem	GeoTiff	2014	Elevation data of 3 arcseconds (about 90 m)
28 Map	JICA Project Team	Cambodia Whole Map	PDF	2017	Boundary, City, Water and Infrastructure map based on DEM and ESRI World map
		Cambodia Population	PDF	2017	Population in 2015 per km2 with boundary and road

Note: 'yyzz' in the file name replace five years age class (e.g. '2025' means from 20 years old to 25 years old), and 'M/F' will replace 'M' or 'F' that means male or female.

Files of 'KHM_PPP2000', 'KHM_PPP2005', 'KHM_PPP2010' and 'KHM_PPP2020' are stored as compression file named 'KHM_Pop'.

Source: JICA Project Team

3. Indonesia

Table A3.7-5 Data List of GIS Database (2-3 Indonesia)

Category	Source	File Name	Type	Year	Explanation
21 Administrative Boundary	former JICA study	IDN adm0	Polygon	-	Country boundary
		IDN adm1	Polygon	-	Province boundary
		IDN adm2	Polygon	-	Regency/City boundary
22 Location	OCHA HDX	Indonesia Capitals	Point	2013	Regency/City capital location
23 Water	former JICA study	IDN water area	Polygon	-	Inland water
		IDN water line	Polyline	-	River
24 Infrastructure	former JICA study	IDN Road	Polyline	-	Road
		IDN Railway	Polyline	-	Railway
	OCHA HDX	IDN airport location	Point	-	Airport
25 Populations	WorldPop	IDN PPP2000	GeoTiff	2016	1 kilometer mesh populatuin data in 2000
		IDN PPP2005	GeoTiff	2016	1 kilometer mesh populatuin data in 2005
		IDN PPP2010	GeoTiff	2016	1 kilometer mesh populatuin data in 2010
		IDN PPP2015	GeoTiff	2016	1 kilometer mesh populatuin data in 2015
		IDN PPP2020	GeoTiff	2016	Assumed 1 kilometer mesh population in 2020
		IDN_P2015_Ayyzz_F/M	GeoTiff	2016	Population data of 1 kilometer square mesh in 2015. Separate into 28 classes in the country (male and female, five years age classes)
26 Hazard	OCHA HDX	IDN lev0	Polygon	2014	Province level boundary
		IDN lev1	Polygon	2014	Regency level boundary
		IDN lev2	Polygon	2014	District level boundary
		IDN disasterloss record	Excel	2014	Disaser record mainly after 2000's
27 Elevation	NASA	IDN srtm3 dem	GeoTiff	2014	Elevation data of 3 arcseconds (about 90 m)
28 Map	JICA Project Team	Indonesia Whole Map	PDF	2017	Boundary, City and Infrastructure map based on DEM and ESRI World map
		Indonesia Population	PDF	2017	Population in 2015 per km2 with boundary and road

Note: 'yyzz' in the file name replace five years age class (e.g. '2025' means from 20 years old to 25 years old), and 'M/F' will replace 'M' or 'F' that means male or female.

Files of 'IDN_PPP2000', 'IDN_PPP2005', 'IDN_PPP2010' and 'IDN_PPP2020' are stored as compression file named 'IDN_Pop'.

Source: JICA Project Team

4. Lao PDR

Table A3.7-6 Data List of GIS Database (2-4 Lao PDR)

Category	Source	File Name	Type	Year	Explanation
21 Administrative Boundary	former JICA study	LAO adm0	Polygon	-	Country boundary
		LAO adm1	Polygon	-	Province boundary
		LAO adm2	Polygon	-	District boundary
23 Water	former JICA study	LAO water area	Polygon	-	Inland water
		LAO water line	Polyline	-	River
24 Infrastructure	former JICA study	LAO_Road	Polyline	-	Road
	OCHA HDX	LAO airport location	Point	-	Airport
25 Populations	WorldPop	LAO PPP2000	GeoTiff	2016	1 kilometer mesh populatuin data in 2000
		LAO PPP2005	GeoTiff	2016	1 kilometer mesh populatuin data in 2005
		LAO PPP2010	GeoTiff	2016	1 kilometer mesh populatuin data in 2010
		LAO PPP2015	GeoTiff	2016	1 kilometer mesh populatuin data in 2015
		LAO PPP2020	GeoTiff	2016	Assumed 1 kilometer mesh population in 2020
		LAO_P2015_Ayyzz_F/M	GeoTiff	2016	Population data of 1 kilometer square mesh in 2015. Separate into 28 classes in the country (male and female, five years age classes)
27 Elevation	NASA	LAO srtm3 dem	GeoTiff	2014	3 arcseconds, about 90 meters, mesh elevation data
28 Map	JICA Project Team	Lao PDR Whole Map	PDF	2017	Boundary, City, Water and Infrastructure map based on DEM and ESRI World map
		Lao PDR Population	PDF	2017	Population in 2015 per km2 with boundary and road

Note: Files of 'LAO_PPP2000', 'LAO_PPP2005', 'LAO_PPP2010' and 'LAO_PPP2020' are stored as compression file named 'LAO_Pop'.

Source: JICA Project Team

5. Malaysia

Table A3.7-7 Data List of GIS Database (2-5 Malaysia)

Category	Source	File Name	Type	Year	Explanation
21 Administrative Boundary	former JICA study	MYS adm0	Polygon	-	Country boundary
		MYS adm1	Polygon	-	State boundary
		MYS adm2	Polygon	-	District boundary
23 Water	former JICA study	MYS water area	Polygon	-	Inland water
		MYS water line	Polyline	-	River
24 Infrastructure	former JICA study	MYS Road	Polyline	-	Road
		MYS Railway	Polyline	-	Railway
	OCHA HDX	MYS airport location	Point	-	Airport
25 Populations	WorldPop	MYS PPP2000	GeoTiff	2016	1 kilometer mesh populatuin data in 2000
		MYS PPP2005	GeoTiff	2016	1 kilometer mesh populatuin data in 2005
		MYS PPP2010	GeoTiff	2016	1 kilometer mesh populatuin data in 2010
		MYS PPP2015	GeoTiff	2016	1 kilometer mesh populatuin data in 2015
		MYS PPP2020	GeoTiff	2016	Assumed 1 kilometer mesh population in 2020
		MYS_P2015_Ayyzz_F/M	GeoTiff	2016	Population data of 1 kilometer square mesh in 2015. Separate into 28 classes in the country (male and female, five years age classes)
27 Elevation	NASA	MYS srtm3 dem	GeoTiff	2014	Elevation data of 3 arcseconds (about 90 m)
28 Map	JICA Project Team	Malaysia Whole Map	PDF	2017	Boundary, City, Water and Infrastructure map based on DEM and ESRI World map
		Malaysia Population	PDF	2017	Population in 2015 per km2 with boundary and road

Note: Files of 'MYS_PPP2000', 'MYS_PPP2005', 'MYS_PPP2010' and 'MYS_PPP2020' are stored as compression file named 'MYS_Pop'. Source: JICA Project Team

6. Myanmar

Table A3.7-8 Data List of GIS Database (2-6 Myanmar)

Category	Source	File Name	Type	Year	Explanation
21 Administrative Boundary	former JICA study	MMR adm0	Polygon	-	Country boundary
		MMR adm1	Polygon	-	Region/State boundary
		MMR adm2	Polygon	-	District boundary
		MMR adm3	Polygon	-	Township boundary
	MIMU	mmr admbnda adm0 mimu	Polygon	2013	Another country boundary
		mmr admbnda adm1 mimu	Polygon	2013	Another region/state boundary
		mmr admbnda adm2 mimu	Polygon	2015	Another district boundary
		mmr admbnda adm3 mimu	Polygon	2014	Another township boundary
mmr admbnda adm4 mimu	Polygon	2013	Village boundary without Shan and Kachin state		
22 Location	MIMU	mmr village location	Point	2012	Village capital location
23 Water	former JICA study	MMR water area	Polygon	-	Inland water
		MMR water line	Polyline	-	River
24 Infrastructure	former JICA study	MMR Road	Polyline	-	Road
		MMR Railway	Polyline	-	Railway
	MIMU	MMR rdsl mimu	Polyline	-	Another road data
		MMR rlwl mimu	Polyline	-	Another railway data
OCHA HDX	MMR airport location	Point	-	Airport	
25 Populations	WorldPop	MMR PPP2000	GeoTiff	2016	1 kilometer mesh populatuin data in 2000
		MMR PPP2005	GeoTiff	2016	1 kilometer mesh populatuin data in 2005
		MMR PPP2010	GeoTiff	2016	1 kilometer mesh populatuin data in 2010
		MMR PPP2015	GeoTiff	2016	1 kilometer mesh populatuin data in 2015
		MMR PPP2020	GeoTiff	2016	Assumed 1 kilometer mesh population in 2020
		MMR_P2015_Ayyzz_F/M	GeoTiff	2016	Population data of 1 kilometer square mesh in 2015. Separate into 28 classes in the country (male and female, five years age classes)
27 Elevation	NASA	MMR srtm3 dem	GeoTiff	2014	Elevation data of 3 arcseconds (about 90 m)
28 Map	JICA Project Team	Myanmar Whole Map	PDF	2017	Boundary, City, Water and Infrastructure map based on DEM and ESRI World map
		Myanmar Population	PDF	2017	Population in 2015 per km2 with boundary and road

Note: Files of 'MMR_PPP2000', 'MMR_PPP2005', 'MMR_PPP2010' and 'MMR_PPP2020' are stored as compression file named 'MMR_Pop'.

MIMU: Myanmar Information Management Unit (<http://www.themimu.info/>)

Source: JICA Project Team

7. Philippines

Table A3.7-9 Data List of GIS Database (2-7 Philippines)

Category	Source	File Name	Type	Year	Explanation
21 Administrative Boundary	former JICA study	PHL adm0	Polygon	-	Country boundary
		PHL adm1	Polygon	-	Province boundary
		PHL adm2	Polygon	-	Municipality/City boundary
		PHL adm3	Polygon	-	Barangay boundary
	OCHA HDX	PHL ocha adm1_psa	Polygon	2016	Region boundary
		PHL ocha adm2_psa	Polygon	2016	Another province boundary
		PHL ocha adm3_psa	Polygon	2016	Another municipality/city boundary
22 Location	OCHA HDX	phl schp deped	Point	2008	School location
23 Water	former JICA study	PHL water area	Polygon	-	Inland water
		PHL water line	Polyline	-	River
		PHL rivl NAMRIA	Polyline	2013	Another river data
24 Infrastructure	former JICA study	PHL Road	Polyline	-	Road
		PHL Railway	Polyline	-	Railway
		PHL rdsl NAMRIA	Polyline	2007	Another road data including railway
	OCHA HDX	PHL airport location	Point	-	Airport
25 Populations	WorldPop	PHL PPP2000	GeoTiff	2016	1 kilometer mesh populatuin data in 2000
		PHL PPP2005	GeoTiff	2016	1 kilometer mesh populatuin data in 2005
		PHL PPP2010	GeoTiff	2016	1 kilometer mesh populatuin data in 2010
		PHL PPP2015	GeoTiff	2016	1 kilometer mesh populatuin data in 2015
		PHL PPP2020	GeoTiff	2016	Assumed 1 kilometer mesh population in 2020
		PHL_P2015_Ayyzz_F/M	GeoTiff	2016	Population data of 1 kilometer square mesh in 2015. Separate into 28 classes in the country (male and female, five years age classes)
27 Elevation	NASA	PHL srtm3 dem	GeoTiff	2014	Elevation data of 3 arcseconds (about 90 m)
28 Map	JICA Project Team	Philippines Whole Map	PDF	2017	Boundary, City, Water and Infrastructure map based on DEM and ESRI World map
		Philippines Population	PDF	2017	Population in 2015 per km2 with boundary and road

Note: 'yyzz' in the file name replace five years age class (e.g. '2025' means from 20 years old to 25 years old), and 'M/F' will replace 'M' or 'F' that means male or female.

Files of 'PHL_PPP2000', 'PHL_PPP2005', 'PHL_PPP2010' and 'PHL_PPP2020' are stored as compression file named 'PHL_Pop'.

Source: JICA Project Team

8. Singapore

Table A3.7-10 Data List of GIS Database (2-8 Singapore)

Category	Source	File Name	Type	Year	Explanation
21 Administrative Boundary	former JICA study	SGP_adm0	Polygon	-	Country boundary
23 Water	former JICA study	SGP water area	Polygon	-	Inland water
		SGP water line	Polyline	-	River
24 Infrastructure	former JICA study	SGP Road	Polyline	-	Road
		SGP Railway	Polyline	-	Railway
	OCHA HDX	SGP airport location	Point	-	Airport
25 Populations	WorldPop	SGP PPP2000	GeoTiff	2016	1 kilometer mesh populatuin data in 2000
		SGP PPP2005	GeoTiff	2016	1 kilometer mesh populatuin data in 2005
		SGP PPP2010	GeoTiff	2016	1 kilometer mesh populatuin data in 2010
		SGP PPP2015	GeoTiff	2016	1 kilometer mesh populatuin data in 2015
		SGP PPP2020	GeoTiff	2016	Assumed 1 kilometer mesh population in 2020
		SGP_P2015_Ayyzz_F/M	GeoTiff	2016	Population data of 1 kilometer square mesh in 2015. Separate into 28 classes in the country (male and female, five years age classes)
27 Elevation	NASA	SGP srtm3 dem	GeoTiff	2014	Elevation data of 3 arcseconds (about 90 m)
28 Map	JICA Project Team	Singapore Whole Map	PDF	2017	Boundary, City and Infrastructure map based on DEM and ESRI World map
		Singapore Population	PDF	2017	Population in 2015 per km2 with boundary and road

Note: Files of 'SGP_PPP2000', 'SGP_PPP2005', 'SGP_PPP2010' and 'SGP_PPP2020' are stored as compression file named 'SGP_Pop'.

Source: JICA Project Team

9. Thailand

Table A3.7-11 Data List of GIS Database (2-9 Thailand)

Category	Source	File Name	Type	Year	Explanation
21 Administrative Boundary	former JICA study	THA_adm0	Polygon	-	Country boundary
		THA_adm1	Polygon	-	Changwat (province) boundary
		THA_adm2	Polygon	-	Amphoe (district) boundary
		THA_adm3	Polygon	-	Tambon (sub-district) boundary
	OCHA HDX	THA_ocha_admbnda Region	Polygon	2005	Region boundary
		THA_ocha_admbnda Province	Polygon	2005	Another province boundary
		THA_ocha_admbnda Amphoe	Polygon	2005	Another amphoe boundary
		THA_ocha_admbndl	Polyline	2005	Polyline data with amphoe level
23 Water	former JICA study	THA_water_area	Polygon	-	Inland water
		THA_water_line	Polyline	-	River
	OCHA HDX	THA_Stream	Polyline	2005	Another river data
		THA_Wtr_body	Polygon	2005	Another inland water
24 Infrastructure	former JICA study	THA_Road	Polyline	-	Road
		THA_Railway	Polyline	-	Railway
		THA_Trans	Polyline	2005	Another road data including railway
	OCHA HDX	THA_airport_location	Point	-	Airport
25 Populations	WorldPop	THA_PPP2000	GeoTiff	2016	1 kilometer mesh populatuin data in 2000
		THA_PPP2005	GeoTiff	2016	1 kilometer mesh populatuin data in 2005
		THA_PPP2010	GeoTiff	2016	1 kilometer mesh populatuin data in 2010
		THA_PPP2015	GeoTiff	2016	1 kilometer mesh populatuin data in 2015
		THA_PPP2020	GeoTiff	2016	Assumed 1 kilometer mesh population in 2020
		THA_P2015_Ayyzz_F/M	GeoTiff	2016	Population data of 1 kilometer square mesh in 2015. Separate into 28 classes in the country (male and female, five years age classes)
27 Elevation	NASA	THA_srtm3_dem	GeoTiff	2014	Elevation data of 3 arcseconds (about 90 m)
28 Map	JICA Project Team	Thailand Whole Map	PDF	2017	Boundary, City, Water and Infrastructure map based on DEM and ESRI World map
		Thailand Population	PDF	2017	Population in 2015 per km2 with boundary and road

Note: 'yyzz' in the file name replace five years age class (e.g. '2025' means from 20 years old to 25 years old), and 'M/F' will replace 'M' or 'F' that means male or female.

Files of 'THA_PPP2000', 'THA_PPP2005', 'THA_PPP2010' and 'THA_PPP2020' are stored as compression file named 'THA_Pop'.

Source: JICA Project Team

10. Viet Nam

Table A3.7-12 Data List of GIS Database (2-10 Viet Nam)

Category	Source	File Name	Type	Year	Explanation
21 Administrative Boundary	former JICA study	VNM adm0	Polygon	-	Country boundary
		VNM adm1	Polygon	-	Region boundary
		VNM adm2	Polygon	-	Province boundary
		VNM adm3	Polygon	-	District boundary
		VNM adm4	Polygon	-	Commune/Ward boundary
	OCHA HDX	vnm polbnda adm1 pdc	Polygon	2015	Another province boundary
		vnm polbnda adm2 pdc	Polygon	2015	Another district boundary
vnm polbnda adm3 pdc		Polygon	2015	Another commune/ward boundary	
22 Location	OCHA HDX	vnm pplp 2015 OSM	Point	2015	Settlement
23 Water	former JICA study	VNM water area	Polygon	-	Inland water
		VNM water line	Polyline	-	River
24 Infrastructure	former JICA study	VNM Road	Polyline	-	Road
		VNM Railway	Polyline	-	Railway
	OCHA HDX	vnm rdsl 2015 OSM	Polyline	2015	Another road data
		vnm rlwl 2015 OSM	Polyline	2015	Another railway data
25 Populations	WorldPop	VNM PPP2000	GeoTiff	2016	1 kilometer mesh populatuin data in 2000
		VNM PPP2005	GeoTiff	2016	1 kilometer mesh populatuin data in 2005
		VNM PPP2010	GeoTiff	2016	1 kilometer mesh populatuin data in 2010
		VNM PPP2015	GeoTiff	2016	1 kilometer mesh populatuin data in 2015
		VNM PPP2020	GeoTiff	2016	Assumed 1 kilometer mesh population in 2020
		VNM_P2015_Ayyzz_F/M	GeoTiff	2016	Population data of 1 kilometer square mesh in 2015. Separate into 28 classes in the country (male and female, five years age classes)
27 Elevation	NASA	VNM srtm3 dem	GeoTiff	2014	Elevation data of 3 arcseconds (about 90 m)
28 Map	JICA Project Team	Viet Nam Whole Map	PDF	2017	Boundary, City, Water and Infrastructure map based on DEM and ESRI World map
		Viet Nam Population	PDF	2017	Population in 2015 per km2 with boundary and road

Note: Files of 'VNM_PPP2000', 'VNM_PPP2005', 'VNM_PPP2010' and 'VNM_PPP2020' are stored as compression file named 'VNM_Pop'.

Source: JICA Project Team

11. Whole ASEAN

Table A3.7-13 Data List of GIS Database (2-11 Whole ASEAN)

Category	Source	File Name	Type	Year	Explanation
21 Administrative Boundary	former JICA study	ASEAN adm0	Polygon	-	Country boundary in ASEAN
		ASEAN adm0 light	Polygon	-	Simplified country boundary in ASEAN
		Countries	Polygon	-	Country boundary in the world
22 Location	JICA Project Team GMS	CapitalCity ASEAN	Point	2016	Capital cities in ASEAN
		gms cities	Point	-	Major cities in GMS
		gms tourist main	Point	-	Major tourist sites in GMS
23 Water	GMS	gms river	Polyline	-	Major rivers in GMS
		gms major basin	Polygon	-	Major basins in GMS
24 Infrastructure	former JICA study	PowerStation Location ASEAN	Point	-	Power station location
		HydroPowerStation_Location_ASEAN	Point	-	Hydro power station location
		DAM Location ASEAN	Point	-	DAM location
	GMS	gms economic corridor	Polyline	-	Major economic corridors in GMS
		gms railway	Polyline	-	Railways in GMS
		gms airport 2015	Point	2015	Airports in GMS
		gms seaport	Point	-	Seaports in GMS
gms SEZ	Point	-	SEZs in GMS		
27 Elevation	NASA	ASEAN srtm30	GeoTiff	2014	Elevation data of 30 arcseconds (about 1 km)
29 Others	GMS	gms forest 2009	GeoTiff	2009	
		gms soil	Polygon	-	
		gms protectrd area	Polygon	-	

GMS: Greater Mekong Sub-region

Source: JICA Project Team

(3) Data List of Collecting on Subcontract Survey**1. Cambodia****Table A3.7-14 Data List of GIS Database (3-1 Cambodia)**

Sub-Folder1	Sub-Folder2	File Type	Explanation / File Names
Battambang	Map project	mxd	Thematic map files (link of the files doesn't work well)
	GIS files	Shape	Administrative boundary, Infrastructure (Road, Water-supply, pipeline), Landuse (Existing and Future), and Population density
		IMG	Topomap (with coordinates)
Maps	JPEG	Administrative maps, Infrastructure maps, Land use plan maps, Population density maps, and Poverty rate maps	
Report	DFR	PDF	JICA Draft report
	Others	PDF	- Subnational Poverty Rate 2004-2012 English, - Technical Report on Land Use Master Plan BTB 2009 English and France

Source: JICA Project Team

2. Indonesia**Table A3.7-15 Data List of GIS Database (3-2 Indonesia (1))**

Sub-Folder1	Sub-Folder2	File Type	Explanation / File Names
31_Banda Aceh	Map	JPEG	Infrastructure (JICA Project Team add coordinates)
	Plans and Regulations	PDF	Collected plans and regulations concerned with disaster management and risk assessment (mainly written in Bahasa)
		Report	PDF
		Excel	Attachments (1-7) on the survey: Attachment1 - Master Attachment2 - City Information Attachment3 - Disaster Vulnerability Check List (Flood / Earthquake) Attachment4 - Capacities for Disaster Response Attachment5 - Land Use and Development Plan on Cities Attachment6 - Infrastructure and building facilities for disaster prevention Attachment 7 - Institutional System for Disaster Prevention
32_Bandar Lampung	Maps	JPEG, PNG	Hazard, Landuse, Spatial pattern, Topographic, Spatial structure, Earthquake zoning, and Infrastructure (JICA Project Team add coordinates)
		PDF, Word	Collected plans and regulations concerned with disaster management and risk assessment (mainly written in Bahasa)
	Report	PDF	Main report
		Excel	Attachments on the survey (same with Banda Aceh)
33_Bitung	Maps	JPEG, PNG	Topographic map, Infrastructure, Landuse, and Spatial pattern (JICA Project Team add coordinates)
		PDF, PPT	Collected plans and regulations concerned with disaster management and risk assessment (mainly written in Bahasa)
	Record	Excel	Record of past five years earthquake
	Report	PDF	Main report
		Excel	Attachments on the survey (same with Banda Aceh)
34_Denpasar	Maps	JPEG, PNG, PDF	Infrastructure, Tsunami, Evacuation, Spatial pattern, and Landuse (JICA Project Team add coordinates)
		PDF, Word	Collected plans and regulations concerned with disaster management and risk assessment (mainly written in Bahasa)
	Record	Excel	Record of hazards and involved population
	Report	PDF	Main report
		Excel	Attachments on the survey (same with Banda Aceh)
	35_Gorontalo	Map	JPEG
Plans and Regulations		PDF, JPEG	Collected plans and regulations concerned with disaster management and risk assessment (mainly written in Bahasa)
		Report	PDF
		Excel	Attachments on the survey (same with Banda Aceh)

Source: JICA Project Team

Table A3.7-16 Data List of GIS Database (3-2 Indonesia (2))

Sub-Folder1	Sub-Folder2	File Type	Explanation / File Names
36_Ambon	Maps	JPEG	Landuse, Topographic, and Infrastructure (JICA Project Team add coordinates)
		PDF	Earthquake (Risk, Hazard)
	Plans and Regulations	PDF	Collected plans and regulations concerned with disaster management and risk assessment (mainly written in Bahasa)
	Report	PDF	Main report
		Excel	Attachments on the survey (same with Banda Aceh)
37_Bima	Maps	JPEG, PNG	Landuse, Topographic, Spatial pattern, Evacuation route plan, Disaster prone, Spatial structure, and Infrastructure (JICA Project Team add coordinates)
		Plans and Regulations	PDF, Word
	Report	PDF	Main report
		Excel	Attachments on the survey (same with Banda Aceh)
	38_Semarang	GIS files	Shape
Disaster Prone map		JPEG, PDF	Written in Bahasa
Maps		JPEG, PDF	Topographic, Disaster, Infrastructure, Land use, and Spatial pattern (JICA Project Team add coordinates)
		Plans and Regulations	PDF, Word
Report		PDF	Main report
		Excel	Attachments on the survey (same with Banda Aceh)
39_Samarinda	Maps	JPEG, PNG	Landuse, Spatial pattern, and Infrastructure (JICA Project Team add
		PDF	Album Map & Matrix Risk Assessment
	Plans and Regulations	PDF, Word	Collected plans and regulations concerned with disaster management and risk assessment (mainly written in Bahasa)
	Record	Excel	Record of three major past flood disaster
	Report	PDF	Main report
		Excel	Attachments on the survey (same with Banda Aceh)
GIS files	-	Shape	Infrastructures (Administrative office, Airport, Port, City park, District police office, Police office, Fire station, Hotel, Industrial park, Major commercial center, Power station, and Sport center) in middle-listed cities.

Source: JICA Project Team

3. Lao PDR

Table A3.7-17 Data List of GIS Database (3-3 Lao PDR)

Sub-Folder1	Sub-Folder2	File Type	Explanation / File Names
Report	-	PDF	Laos_Disaster Survey_Final Report_Draft

Source: JICA Project Team

4. Malaysia

Table A3.7-18 Data List of GIS Database (3-4 Malaysia)

Sub-Folder1	Sub-Folder2	File Type	Explanation / File Names
31_Kota Setar (Alor Setar)	-	mxd	Thematic map files (link of the file doesn't work well)
	Boundary	Shape	State boundary and District boudary
	Infrastructure	Shape, kmz	Agglomerated, Evacuation center and Infrastructure with attribution of their name, type and address
		Word	List of evacuation center and industrial area
	Facility	Shape, kml	Administrative office, Balai polis, Commercial center, Fire station, Hotel, Park and Sports facility with attribution of their name, address and phone number
Hazard	Shape	Flood and Tsunami	
32_Timur Lau (Georgetown)	-	mxd	Thematic map files (link of the file doesn't work well)
	Boundary	Shape	State boundary, District boudary and River line
	Infrastructure	Shape, kmz	Agglomerated, Evacuation center and Infrastructure with attribution of their name, type and address
		Word	List of evacuation center and industrial area
	Facility	Shape, kml	Administrative office, Commercial center, Fire station, Hotel, Park, Police station and Sports facility with attribution of their name, address and phone number
Hazard	Shape	Flood and Tsunami	
33_Kuala Terengganu	-	mxd	Thematic map files (link of the file doesn't work well)
	Boundary	Shape	State boundary, District boudary and River line
	Infrastructure	Shape, kmz	Agglomerated, Evacuation center and Infrastructure with attribution of their name, type and address
		Word	List of evacuation center and industrial area
	Facility	Shape, kml	Administrative office, Balai bomba, Balai polis, Commercial center, Hotel, Park and Sports facility with attribution of their name, address and phone number
Hazard	Shape	Flood location	
34_Langkawi	-	mxd	Thematic map files (link of the file doesn't work well)
	Boundary	Shape	State boundary, District boudary and River line
	Infrastructure	Shape, kmz	Agglomerated, Evacuation center and Infrastructure with attribution of their name, type and address
		Word	List of evacuation center and industrial area
	Facility	Shape, kml	Administrative office, Balai bomba, Balai polis, Commercial center, Hotel, Park and Sports facility with attribution of their name, address and phone number
Hazard	Shape	Flood and Tsunami	
35_Sibu	-	mxd	Thematic map files (link of the file doesn't work well)
	Boundary	Shape	State boundary, District boudary and River line
	Infrastructure	Shape, kmz	Agglomerated, Evacuation center and Infrastructure with attribution of their name, type and address
		Word	List of evacuation center and industrial area
	Facility	Shape, kml	Administrative office, Balai bomba, Balai polis, Commercial center, Hotel, Park and Sports facility with attribution of their name, address and phone number
Hazard	Shape	Flood location	
36_Kuala Muda (Sungai Petani)	-	mxd	Thematic map files (link of the file doesn't work well)
	Boundary	Shape	State boundary, District boudary and River line
	Infrastructure	Shape, kmz	Agglomerated, Evacuation center and Infrastructure with attribution of their name, type and address
		Word	List of evacuation center and industrial area
	Facility	Shape, kml	Administrative office, Balai polis, Commercial center, Fire station, Hotel, Park and Sports facility with attribution of their name, address and phone number
Hazard	Shape	Flood location	
Report	-	PDF	JICA_Draft Final Report

Source: JICA Project Team

5. Myanmar

Table A3.7-19 Data List of GIS Database (3-5 Myanmar)

Sub-Folder1	Sub-Folder2	File Type	Explanation / File Names
GIS files	Amarapura	Shape	- Boundary (bdy) - Water area (drgpl) with attribution of Name and Type - Road line (rdn) with attribution of Name - Facility point (infp) with attribution of Name, Type (Bank, Bridge, Company, Religious, Factory, Government, Hospital, Market, Park, School, Station, University and so on) and their located coordinates and elevation
	Hakha	Shape	Same with Amarapura
	Kale	Shape	Same with Amarapura
	Kyaukpyu	Shape	Add Facility polygon (infp) such as play ground, market and lake
	Kyimyindaing	Shape	Same with Amarapura
	Manaung	Shape	Same with Kyaukpyu
	Mrauk-U	Shape	Same with Kyaukpyu
	Myingyan	Shape	Boundary, Road and Facility
	Nyaung-U	Shape	Same with Kyaukpyu
	Pwinbyu	Shape	Same with Amarapura
Rathedaung	Shape	Add Facility polygon (infp) and Water line (drgl)	
Taungup	Shape	Same with Rathedaung	
Report	-	Word	Draft Final Report_v1

Source: JICA Project Team

6. Philippines

Table A3.7-20 Data List of GIS Database (3-6 Philippines (1))

Sub-Folder1	Sub-Folder2	File Type	Explanation / File Names
Batangas City	GIS files	Shape	Flooded area, Landslide, Tsunami
	Maps	JPEG	Hazard map
	Plan	PDF	Socio Economic and Political Plan (CY2014)
	Documents	PDF, Word, JPEG	Organizations, MOAs, MOUs, National Building Code
	Report	Word	Survey form
Butuan City	Maps	JPEG	Drainage, Facilities (Power supply, Transport, Urban and Water), Topographic (JICA Project Team add coordinates)
		PDF	Hazard maps
	Risk Assessment	WMF	Basemap, Landslide, Flood
		PDF	Flood, Landslide, Multihazard
		Excel	Hotspot, Population at risk,
		PowerPoint	Risk Maps
	Plan	Word	DRR plan 2014
	Documents	PDF, Word, JPEG	Ordinances, Organizations, Certifications, Environmental Management, CCA activities, DRR activities
Report	Word	Survey form	
Cavite City	Hazard files	Shape	Earthquake, Flash flood, Flood, Ground rupture, Ground shaking, Liquefaction, Landslide, Storm surge, Tsunami
	Maps	PDF	Cavite maps
	Plans	PDF, Word	Development strategy, Comprehensive land and coastal use plan
	Documents	PDF, Word, JPEG	EOs, Resources, Profile, Population by age group, Population by barangay
	Report	Word	Survey form
Daupan City	Maps	JPEG	Infrastructure, River system, Hazard (Flood, Liquefaction, Storm surge, Tsunami) (JICA Project Team add coordinates)
	Plan	PDF	CDRRM Plan
	Documents	PDF, Word, JPEG	Appendix of Attachment, Organization, Evacuation drill
	Report	Word	Survey form

Source: JICA Project Team

Table A3.7-21 Data List of GIS Database (3-6 Philippines (2))

Sub-Folder1	Sub-Folder2	File Type	Explanation / File Names
Iloilo City	Maps	JPEG	Existing landuse, Future landuse, Zoning, Flood hazard (JICA Project Team add coordinates)
		Word	Railway, Water distribution, Evacuation
	Plans	PDF, Word	Iloilo City Disaster Risk Reduction Management Plan 2013-2016, Summary of disaster occurrence, Land use plan
	Documents	PDF, Word, Excel, Powerpoint, JPEG	Attachments, DOs, Evacuation areas and guidelines, Ordinances, Disaster occurrence records, MOAs
	Report	Word	Survey form
Laoag City	Maps	JPEG	Political boundary, Hazard prone (Landslide, Fault, Flood, Tsunami) (JICA Project Team add coordinates)
		PowerPoint	Hazard Maps and Climate Map
	Plan	PDF	Contingency plan
	Documents	PDF, Excel, JPEG	Gawad Kalasag 2015, Organizations, Cyclone records in 2011-2014, Orders, Acts
	Report	Word	Survey form
Manduae City	Maps	JPEG, PDF	Topographic, Waterway, Water resource, Geology, Slope, Soil, Geohazard, Flood prone, Hazard map (JICA Project Team add coordinates)
	Documents	PDF, Word	Disaster Preparedness Manual, Landuse plan, MMs, DRRM plans, Disaster/Incident reports
	Report	Word	Survey form
Meycauyan City	Maps	PDF	Hazard maps (Flash flood, Ground shaking, Liquefaction, Rain induced landslide, Tsunami)
		JPEG	JICA Project Team convert above PDF files to JPEG files and add coordinates
	Documents	PDF, Word, JPEG	Certifications, Landuse plan, Contingency plan, Fire drill, Flood plan, activity report, and so on
	Report	Word	Survey form
Olongapo City	Location map	JPEG	Road, Location (School, Hospital, Police station, Fire station, Bus terminal), Topographic, Landuse, Critical infra
	Hazard map	JPEG	Flood, Landslide, Multihazard, Liquefaction, Tsunami, Storm surge, Earthquake
	Documents	PDF	Annual reports, Climate change action plan, Landuse plan, Contingency plan, DRRM plan, Incident action plans, MOAs, Ordinances, Tsunami RA and evacuation plan, National building code
	Report	Word	Survey form

Source: JICA Project Team

7. Thailand

Table A3.7-22 Data List of GIS Database (3-7 Thailand)

Sub-Folder1	Sub-Folder2	File Type	Explanation / File Names
GIS files	-	Shape	Study area, Landmark, Trans and Landuse of five selected area and polygon of Bangkadi Industrial Park
	-	Word	data dictionary (Explanation of shape files)
Maps	-	JPEG	Location of five selected area and their expansionary map
	-	Word	Selection area of each district
Report	-	PDF	Report of five selected area (mainly in Thai)

Source: JICA Project Team

8. Viet Nam

Table A3.7-23 Data List of GIS Database (3-8 Viet Nam)

Sub-Folder1	Sub-Folder2	File Type	Explanation / File Names
GIS files	Infrastructures	Shape	Industrial zones, School, Airport, Port, Office, Hospital, Dam, Power station, Hydro power station, Major commercial, Hotel, Park, Railway, Main road, Station, Bus station, Infrastructure, Water treatment plant and WWTPS
	Structural prevention and mitigation	Shape	River/Sea dyke, Storage reservoir, Control dam, Evacuation facilities, Drainage pump station, River bank protection and Stations to measure water level (existing/construction/project)
	Maps	JPEG	'Infrastructure' map and 'natural disaster prevention and mitigation' maps of each city
Lansuse maps	-	JPEG, DWG,	Existing landuse map
References	English	PDF, Word	Reference files of whole Viet Nam written in English
	Vietnamese	PDF, Word	Reference files of nine cities, attachment 2 and whole Viet Nam written in Vietnamese
Report	-	Word	JICA resilient project- Final report, Appendix
	-	Excel	Attachment 1-8

Source: JICA Project Team

APPENDIX 3.8 ATTRIBUTIONS OF COLLECTED GIS DATA

(1) Administrative Boundary

Table A3.8-1 Attributions of GIS Data about Administrative Boundary

File Name: xxx_adm0

(xxx replace BRN, KHM, IDN, LAO, MYS, MMR, PHL, SGP, THA, and VNM)

Coordinate System: GCS_WGS_1984 (EPSG4326)

Source: Former JICA study

(Major attribute)

Field Name	Data Type	Explanation
ISO	Text(3)	ISO code of the country with three alphabets
NAME	Text	Country name in various languages
ISO2	Text(4)	ISO code of the country with two alphabets
ISON	Double	ISO code of the country with numeric number

File Name: xxx_adm1

(xxx replace BRN, KHM, IDN, LAO, MYS, MMR, PHL, THA, and VNM)

Coordinate System: GCS_WGS_1984 (EPSG4326)

Source: Former JICA study

(Major attribute)

Field Name	Data Type	Explanation
NAME_0	Text(75)	Name of the country
NAME_1	Text(75)	Name of the adm1 level
ENGTYP_1	Text(50)	Type of the adm1 in English*

*Brunei Darussalam: District, Cambodia: Province, Indonesia: Province, Lao PDR: Province, Malaysia: State, Myanmar: State, Philippines: Province, Thailand: Province, Viet Nam: Region

File Name: xxx_adm2

(xxx replace BRN, KHM, IDN, LAO, MYS, MMR, PHL, THA, and VNM)

Coordinate System: GCS_WGS_1984 (EPSG4326)

Source: Former JICA study

(Major attribute)

Field Name	Data Type	Explanation
NAME_0	Text(75)	Name of the country
NAME_1	Text(75)	Name of the adm1 level
NAME_2	Text(75)	Name of the adm2 level
ENGTYP_2	Text(50)	Type of the adm2 in English**

**Brunei Darussalam: Mukim, Cambodia: District, Indonesia: Regency/City, Lao PDR: District, Malaysia: District, Myanmar: District, Philippines: Municipality/City, Thailand: District, Viet Nam: Province

File Name: xxx_adm3

(xxx replace KHM, MMR, PHL and VNM)

Coordinate System: GCS_WGS_1984 (EPSG4326)

Source: Former JICA study

(Major attribute)

Field Name	Data Type	Explanation
NAME_0	Text(75)	Name of the country
NAME_1	Text(75)	Name of the adm1 level
NAME_2	Text(75)	Name of the adm2 level
NAME_3	Text(75)	Name of the adm3 level
ENGTYP_3	Text(50)	Type of the adm3 in English***

***Cambodia: Commune, Myanmar: Township, Philippines: Barangay, Viet Nam: District

File Name: xxx_adm4

(xxx replace KHM and VNM)

Coordinate System: GCS_WGS_1984 (EPSG4326)

Source: Former JICA study

(Major attribute)

Field Name	Data Type	Explanation
NAME_0	Text(75)	Name of the country
NAME_1	Text(75)	Name of the adm1 level
NAME_2	Text(75)	Name of the adm2 level
NAME_3	Text(75)	Name of the adm3 level
NAME_4	Text(75)	Name of the adm4 level
ENGTYP_4	Text(50)	Type of the adm4 in English****

****Cambodia: Village, Viet Nam: Commune

Source: JICA Project Team

Table A3.8-2 Attributions of GIS Data about Water**File Name: xxx_water_line**

(xxx replace BRN, KHM, IDN, LAO, MYS, MMR, PHL, SGP, THA, and VNM)

Coordinate System: GCS_WGS_1984 (EPSG4326)

Source: Former JICA study

(Major attribute)

Field Name	Data Type	Explanation
HYC_DESCRI	Text(254)	Permanent / Intermittent / Fluctuating
NAM	Text(254)	Name of the river
ISO	Text(7)	ISO code of the country

File Name: xxx_water_area

(xxx replace BRN, KHM, IDN, LAO, MYS, MMR, PHL, SGP, THA, and VNM)

Coordinate System: GCS_WGS_1984 (EPSG4326)

Source: Former JICA study

(Major attribute)

Field Name	Data Type	Explanation
ISO	Text(7)	ISO code of the country
HYC_DESCRI	Text(254)	Permanent / Intermittent / Fluctuating
NAME	Text(254)	Name of the inland water

Source: JICA Project Team

Table A3.9-3 Attributions of GIS Data about Infrastructure**File Name: xxx_Road**

(xxx replace BRN, KHM, IDN, LAO, MYS, MMR, PHL, SGP, THA, and VNM)

Coordinate System: GCS_WGS_1984 (EPSG4326)

Source: Former JICA study

(Major attribute)

Field Name	Data Type	Explanation
RTT_DESCRI	Text(254)	Type of the road (primary / secondary)
F_CODR_DES	Text(254)	Type of the infrastructure (road / railway)

File Name: xxx_Railway

(xxx replace BRN, KHM, IDN, LAO, MYS, MMR, PHL, SGP, THA, and VNM)

Coordinate System: GCS_WGS_1984 (EPSG4326)

Source: Former JICA study

(Major attribute)

Field Name	Data Type	Explanation
F_CODR_DES	Text(254)	Type of infrastructure (road / railway)

File Name: xxx_airport_location

Coordinate System: GCS_WGS_1984 (EPSG4326)

Source: OurAirports

(Major attribute)

Field Name	Data Type	Explanation
type	Text(254)	Type of the airport (large, middle, small)
name	Text(254)	Name of the airport
elevation	Long Integer	Elevation of the airport
municipali	Text(254)	Located municipality

Source: JICA Project Team

Table A3.8-4 Attributions of GIS Data about Long/Middle-Listed City**File Name: LongListedCities**

Coordinate System: GCS_WGS_1984 (EPSG4326)

Source: JICA Study Team

Field Name	Data Type	Explanation
No	Long Integer	Identification number of each city
Code	Text(254)	ISO code of the country with three alphabets
Name	Text(254)	Name of the city
Latitude	Double	Latitude of the city
Longitude	Double	Longitude of the city
Population	Long Integer	Population of the city
EQ	Long Integer	Evaluation value of earthquake in preliminary risk assessment
TS	Long Integer	Evaluation value of tsunami in preliminary risk assessment
FL	Long Integer	Evaluation value of flood in preliminary risk assessment
CYW	Long Integer	Evaluation value of cyclones/typhoon wind in preliminary risk assessment
CYS	Long Integer	Evaluation value of cyclones/typhoon surge in preliminary risk assessment
IA	Long Integer	Evaluation value of industrial agglomerated area in preliminary risk assessment
Infra	Long Integer	Evaluation value of infrastructure in preliminary risk assessment

File Name: MiddleListedCities

Coordinate System: GCS_WGS_1984 (EPSG4326)

Source: JICA Study Team

Field Name	Data Type	Explanation
M_ID	Long Integer	Identification number of each middle-listed city
Country	Text(254)	ISO code of the country with three alphabets
L_ID	Long Integer	Identification number data of long-listed city
L_Code	Text(254)	Country code and ID of long-listed city
Name	Double	Name of the city
Latitude	Double	Latitude of the city
Longitude	Double	Longitude of the city
Population	Long Integer	Population of the city
HazardType	Text(20)	Selected hazard type of the city
CapaPoint	Long Integer	Capacity point of the city (depend on attachment of subcontract survey)
LackCapP	Long Integer	Lack of capacity point of the city (depend on attachment of subcontract survey)

Source: JICA Project Team

Table A3.8-5 Attributions of GIS Data about Exposure Mesh of Middle-Listed City**File Name: GAR_mesh_MLCities**

Coordinate System: GCS_WGS_1984 (EPSG4326)

Type: Polygon

Source: JICA Study Team

(Major attribute)

Field Name	Data Type	Explanation
ID	Text(10)	Identification number of each mesh
Name	Text(20)	Name of the city located in the mesh
id_5x	Text(10)	Identification number of GAR exposure grid correspondent with the mesh
tot_pob	Double	Total population in the mesh
tot_val	Double	Total exposure in the mesh
EQ_PGA2	Float	Max peak ground acceleration of earthquake in the mesh
Tsu_inu2	Short Integer	Tsunami inundation area (1) or not (0)
FL25_Max	Short Integer	Max flood depth in 25 years return period in the mesh
FL50_Max	Short Integer	Max flood depth in 50 years return period in the mesh
FL100_Max	Short Integer	Max flood depth in 100 years return period in the mesh
FL200_Max	Short Integer	Max flood depth in 200 years return period in the mesh
CYW_Max	Short Integer	Max cyclones/typhoon wind speed in 50 years return period in the mesh
CYS_Max	Long Integer	Max cyclones/typhoon surge frequency in the mesh

Source: JICA Project Team

APPENDIX 4 DRAFT TERMS OF REFERENCE FOR DEMONSTRATION PROJECT

A4.1 Results of 1st Workshop

A.4.1.1 Introduction

The 1st workshop was held at Lao Plaza Hotel in Vientiane, Lao PDR on December 8, 2016 as a 2nd day of the 5th Meeting of the Project Steering Committee (PSC) for the Project. 45 national and regional staffs from 8 ASEAN countries from Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, Philippines, Thailand and Vietnam were participated in the workshop, who are in charge of disaster risk management and urban planning (see **Attachment-1 Participants List**).

Objectives of the workshop are 1) to deepen understanding about what is Disaster Risk Assessment and how to utilize the result for urban resilience project, and 2) to discuss issue and solution on implementing urban resilience project and disaster risk assessment.

There are several agenda in the workshop (see **Attachment-2 Agenda & Schedule**). Of these, major agenda are listed below.

- 1) Introduction to Disaster Risk Assessment
- 2) Introduction on Disaster Risk Assessment for Flood/Cyclone
- 3) Introduction on Disaster Risk Assessment for Tsunami/Earthquake
- 4) Group Work (Discussion & Presentation)

A.4.1.2 Introduction to Disaster Risk Assessment

Introduction to disaster risk assessment was undertaken by the JICA Expert.

As an “Introduction”,

- 1) Definition of Disaster Risk,
- 2) Basic Approach for Disaster Risk Management (DRM), and
- 3) Framework for Disaster Risk Reduction, were explained,

as a “Procedure of Disaster Risk Assessment (DRA)”,

- 1) Hazard Assessment,
- 2) Risk Assessment,
- 3) Capacity (Fragility Curve)
- 4) Results of Disaster Risk Assessment, were explained, and

as a “How to utilize results of DRA? (Sendai Framework)”,

- 1) Formulation of Disaster Risk Management Plan,
- 2) Implementation of Prevention & Mitigation, and
- 3) Preparation of Disaster Response, were explained (see **Attachment-3 Presentation Materials for Introduction to Disaster Risk Assessment**).

A.4.1.3 Introduction on Disaster Risk Assessment for Flood/Cyclone

Introduction on disaster risk assessment for flood/cyclone was made by the JICA Expert.

- 1) What is a Risk Assessment of Flood Disaster?,
- 2) Objectives of Risk Assessment for Flood Disaster,
- 3) Items for Risk Assessment of Flood Disaster,
- 4) Procedure for Risk Assessment of Flood Disaster,
- 5) Risk Assessment of General Asset,
- 6) Risk Assessment of Human Loss,
- 7) Fragility Curve in this Project,
- 8) Development Method of Fragility Curve,
- 9) How to Use Fragility Curve / Adaption of Risk Assessment to Various City Planning in ASEAN Countries, and
- 10) Example of Fragility Curve in Japan, were explained (see **Attachment-4 Presentation Materials for Introduction on Disaster Risk Assessment for Flood/Cyclone**).

A.4.1.4 Introduction on Disaster Risk Assessment for Tsunami/Earthquake

Introduction on disaster risk assessment for Tsunami/Earthquake was conducted by the JICA Expert.

- 1) Introduction on Earthquake and Tsunami in ASEAN, and Objectives,
- 2) Hazard Assessment,
- 3) Inventory of Assets for Risk Assessment,
- 4) Fragility Curve,
- 5) Result on Damage Amount and Distribution, and
- 6) How to utilize Result of Risk Assessment? were explained (see **Attachment-5 Presentation Materials for Introduction on Disaster Risk Assessment for Tsunami/Earthquake**).

A.4.1.5 Group Works (Discussion & Presentation)

Introduction on disaster risk reduction measures, and example of disaster management plan and evacuation/relief plant was presented by the JICA Expert (see **Attachment-6 Presentation Materials for Group Works (Discussion & Presentation), and photos below**).

Then, group work (discussion and presentation) were made by the participants (see **Attachment-7 Group Worksheet of the 1st Workshop**). As a result, the following components were mainly raised as necessary TOR for demonstration project (see **Attachment-8 Summary of WS1**):

- (1) Improvement of Contingency Plan including Update of Disaster Risk Assessment/CCA, Preparation and Utilization of Fragility Curve, Evacuation Plan, etc.
 - (1-1) Review of Existing Contingency Plan, including Existing Data on Disaster Risk Assessment/CCA, Fragility Curve, Evacuation Plan, etc.
 - (1-2) Identification of Portions to be improved in the Plan
 - (1-3) Update of Risk Assessment/CCA, Preparation and Utilization of Fragility Curve, Study on Evacuation Plan (Monitoring & Early Warning System, Evacuation Center, Road, Sign Board, etc.) by Open Source Data, etc.

(1-4) Improvement of Contingency Plan

(2) Mainstreaming Disaster Risk Reduction/CCA into Land Use and Urban Development Plan including zoning control and regulation and sector programs based on results of Disaster Risk Assessment, DRR scenario, etc.

(2-1) Review of existing urban development plan, land use plan, zoning regulations and other institutional frameworks in combination with current sector plans and investment programs. (utilities, road and transportation, public facilities, etc.)

(2-2) Identification of planning aspects and issues to be improved and revised based on the Disaster Risk Assessment by improved Contingency Plan.

(2-3) Formulation of Action Plan to recommend necessary measures for improvement of existing land use plan or formulation of new land use plan and improvement of key sector plans based on Disaster Risk Assessment

(2-4) Formulation of Action Plan to recommend necessary controls and regulations to prevent socio-economic activities in disaster risks

(3) Capacity Development for Planning Officers

(3-1) Review of Existing capacity for concerned City Offices (Planning & Development Office (PDO) and Disaster Risk Reduction Management Office (DRRMO), etc.

(3-2) Formulation of capacity development program on the Disaster Risk Assessment and its applicable measures into land use and urban development planning

(3-3) Implementation of the program and monitoring evaluation to reflect to other cities' and central government program for "mainstreaming DRR into land use and urban development planning"



Photo 1 – Participants from Cambodia



Photo 2 – Participants from Indonesia



Photo 3 – Participants from Lao PDR



Photo 4 – Participants from Viet Nam



Photo 5 – Participants from Thailand



Photo 6 – Participants from the Philippines



Photo 7 – Participants from Malaysia



Photo 8 –Participants from Myanmar

Photos of 1st Workshop Summary of Work Shop on Draft TOR

Country	Candidate City	Kind of Disaster	Background, Objectives and Components described in WS for Urban Resilience Project based on Result of Disaster Risk Assessment	Draft TOR Proposed
Cambodia	Battambang	Flood	<p>Background, Objectives and Components described in WS for Urban Resilience Project based on Result of Disaster Risk Assessment</p> <p>(Background) (1) Krong nearby Tonle sab River, Don't have infrastructure river</p> <p>(Objectives) (1) Improve infrastructure by building the capacity of water flow (2) Sharing information (3) Early warning system (4) Capacity building</p> <p>(Components) (1) Evacuation Centre/ Structural (Temple, public centre) (2) Training Centre/ Structural (3) Evacuation Planning/ Non-structural</p> <p>(Key Issues) (1) Mainstreaming Community Base Disaster Risk Reduction Management (2) Strengthening Early warning system (3) Building Capacity (4) Disaster management plan</p>	<p>(1) Improvement of Contingency Plan including Update of Disaster Risk Assessment/CCA, Preparation and Utilization of Fragility Curve, Evacuation Plan, etc.</p> <p>(1-1) Review of Existing Contingency Plan, including Existing Data on Disaster Risk Assessment/CCA, Fragility Curve, Evacuation Plan, etc.</p> <p>(1-2) Identification of Portions to be improved in the Plan</p> <p>(1-3) Update of Risk Assessment/CCA, Preparation and Utilization of Fragility Curve, Study on Evacuation Plan (Monitoring & Early Warning System; Evacuation Center, Road, Sign Board, etc.) by Open Source Data, etc.</p> <p>(1-4) Improvement of Contingency Plan</p> <p>(2) Mainstreaming Disaster Risk Reduction/CCA into Land Use and Urban Development Plan including zoning control and regulation and sector programs based on results of Disaster Risk Assessment/CCA, DRR/CCA scenario, etc.</p> <p>(2-1) Review of existing urban development plan, land use plan, zoning regulations and other institutional frameworks in combination with current sector plans and investment programs. (utilities, road and transportation, public facilities, etc.)</p> <p>(2-2) Identification of planning aspects and issues to be improved and revised based on the Disaster Risk Assessment/CCA by improved Contingency Plan.</p> <p>(2-3) Formulation of Action Plan to recommend necessary measures for</p>

				<p>improvement of existing land use and Urban Development Plan including zoning control and regulation and sector programs based on results of Disaster Risk Assessment/CCA, DRR/CCA scenario, etc.</p> <p>(3) Capacity Development for Concerned Officers</p> <p>(3-1) Review of Existing capacity for concerned City Offices (Planning & Development Office (PDO) and Disaster Risk Reduction Management Office (DRRMO), etc.</p> <p>(3-2) Formulation of capacity development program on the Disaster Risk Assessment and its applicable measures into land use and urban development planning</p> <p>(3-3) Implementation of the program and monitoring evaluation to reflect to other cities' and central government program for "mainstreaming DRR into land use and urban development planning".</p>
Indonesia	Denpasar	Tsunami	<p><u>(Background)</u></p> <p>(1) Have a lot of tourist facilities</p> <p>(2) Dense population</p> <p>(3) Have a lot heritage building</p> <p><u>(Objectives)</u></p> <p>(1) To formulate some consideration land use planning</p> <p>(2) To formulate disaster management plan as part of development plan (agglomeration)</p> <p><u>(Components)</u></p> <p>(1) Hazard and risk identification/ Non-structural</p> <p>(2) Construction break water for tsunami/ Structural</p> <p>(3) Evacuation plan/ Non-structural</p> <p>(4) Install sign board for evacuation route/Structural</p> <p>(5) Establish Siren as part of EWS/ Structural</p>	<p>(1) Validation of existing Tsunami hazard map</p> <p>(1-1) Review of Existing Tsunami hazard map</p> <p>(1-2) Identification of conditions to be improved in the Tsunami hazard assessment</p> <p>(2) Improvement of Evacuation Plan</p> <p>(2-1) Review of Existing Contingency/ Evacuation Plans</p> <p>(2-2) Identification of Portions to be improved in the Plan</p> <p>(2-3) Detailed Evacuation Planning (Monitoring & Early Warning System, Evacuation Center, Road, Sign Board, etc.) including tourist evacuation planning.</p> <p>(2-4) Improvement of Contingency Plan including</p>

			<p>(6) Contingency plan/ Non-structural</p> <p>(7) Drill and simulation regularly/ Non-structural</p> <p>(Key Issues)</p> <p>(1) gathering data for suitable scale</p> <p>(2) considering agglomeration factor</p> <p>(3) less awareness of local community</p> <p>(4) Involving active participation related agency surrounding in Denpasar community (community leader)</p>	<p>(3) Integration of Comprehensive Land Use Plan (CLUP) based on results of Disaster Risk Assessment and CCA</p> <p>(3-1) Review of Existing Disaster Risk Assessment and CCA</p> <p>(3-2) Identification of Portions to be integrated in the Plan</p> <p>(4) Capacity Development for Planning Officers</p> <p>(4-1) Review of Existing capacity for concerned City Offices (Planning & Development Office (PDO) and Disaster Risk Reduction Management Office (DRRMO), etc.</p> <p>(4-2) Formulation of capacity development program on the Disaster Risk Assessment and its applicable measures into land use and urban development planning</p> <p>(4-3) Implementation of the program and monitoring evaluation to reflect to other cities' and central government program for "mainstreaming DRR into land use and urban development planning".</p>
Lao PDR	Luang Prabang	Flood	<p>(Background)</p> <p>(1) National tourist destination</p> <p>(2) Surrounded by rivers and mountain</p> <p>(3) 130 ha (around 30ha exposed to annual flood, 2013)</p> <p>(4) More than 3 billion kip of lost and damages (in2013), 2.7 billion (in 2014), around 7 billion (Phonexay and Xiengneun)</p> <p>(Objectives)</p> <p>(1) Reduction of flood impacts</p> <p>(2) To develop city guidelines in resilient urban infrastructure</p> <p>(Components)</p>	<p>(1) Improvement of Contingency Plan including Evacuation Plan</p> <p>(1-1) Review of Existing Contingency Plan</p> <p>(1-2) Identification of Portions to be improved in the Plan</p> <p>(1-3) Detailed Evacuation Planning (Monitoring & Early Warning System, Evacuation Center, Road, Sign Board, etc.)</p> <p>(1-4) Improvement of Contingency Plan (Community Based)</p> <p>(2) Integration of DRA into Provincial Development Programme</p> <p>(2-1) Review of Existing Disaster Risk Assessment</p> <p>(2-2) Identification of Portions to be integrated in the Plan</p>

			<p>(1) Risk Assessment / Non-structural</p> <p>(2) City disaster management plan / Non-structural</p> <p>(3) Public Awareness/ Non-structural</p> <p>(4) Riverbank protection/ Structural</p> <p>(5) Watershed area protection/ Structural</p> <p><u>(Key Issues)</u></p> <p>(1) Loss of forest protection area</p> <p>(2) Obstruction of drainage and river system by uncontrolled construction</p> <p>(3) Integration of DRA into provincial development programme</p>	<p>(2-3) Update of Disaster Risk Assessment, if required</p> <p>(2-4) Integration of DRA into Provincial Development Programme</p> <p>(3) Capacity Enhancement and IEC</p> <p>(3-1) Review of Existing Capacity for Concerned City Offices (Planning & Development Office (PDO) and Disaster Risk Reduction Management Office (DRRMO), etc.</p> <p>(3-2) Implementation of Capacity Enhancement and IEC</p>
Malaysia	Kuala Terengganu	Flood	<p><u>(Background)</u></p> <p>(1) This area suffers from yearly floods occurrence resulted from north east monsoon.</p> <p>(2) The Kenyir Lake where the Kenyir Dam is located is the largest manmade lake in South East Asia. The dam is one of the main power generator for Malaysia.</p> <p>(3) The normal capacity of the lake is 13.6 billion cubic meters of water. The reservoir surface area is 369km². The distance from the lake to Kuala Terengganu is 65km. If the dam breaks, the discharge from the dam will reach the river mouth within 45 to 60 minutes. The affected area will covers the whole river basin of Sungai Terengganu with the most concentration of population and built-up areas in the State of Terengganu.</p> <p><u>(Objectives)</u></p> <p>(1) To reduce flood magnitude</p> <p>(2) To reduce the exposure to</p>	Same as Cambodia

			<p>flood</p> <p>(3) To reduce the vulnerability of population in the Kuala Terengganu River Basin</p> <p><u>(Components)</u></p> <p>(1) Evacuation Planning / Non-structural/ Upgrading of evacuation center (schools, community center, infrastructures)</p> <p>(2) Widening of Evacuation Road / Non-structural/ Main road from Hulu Terengganu to Kuala Terengganu – upgraded to dual carriageway</p> <p>(3) Awareness Program / Non-structural/ Planning and simulation at least ones a year/ Increase number of TTX (Table Talk Exercise) and FTX (Field Training Exercise)</p> <p>(4) Community based disaster management / Non-structural/ Civil Defense Emergency Response Team</p> <p>(5) Preparation of Flood Map (Inundation Map, Flood Hazard Map, Flood Risk Map)/ Non-structural</p> <p>(6) Flood Relief for flood victim (Monetary assistance) / Non-Structural</p> <p><u>(Key Issues)</u></p> <p>(1) Insufficient financial support</p> <p>(2) Insufficient of human resource</p> <p>(3) Lack of coordination among agencies (vertical dan horizontal)</p> <p>(4) Lack of integration between land use planning and disaster risk management</p> <p>(5) Lack of legislative framework governing disaster management effort</p>	
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			<p>(6) <i>Lack of proactive warning technologies</i></p> <p>(7) <i>Capacity Building</i></p>	
Myanmar	Kyimyindaing City	Cyclone	<p><u>(Background)</u></p> <p>(1) <i>Flood</i></p> <p>(2) <i>Storm Surge</i></p> <p>(3) <i>Landslide</i></p> <p>(4) <i>Infrastructure damage (School, Road, Bridge, Communication, Electricity...)</i></p> <p>(5) <i>Building damage</i></p> <p>(6) <i>Asia World Port Terminal</i></p> <p>(7) <i>Crop damage</i></p> <p>(8) <i>Water Supply System damage</i></p> <p>(9) <i>Drainage System damage</i></p> <p><u>(Objectives)</u></p> <p>(1) <i>To build the Cyclone Resilience Township</i></p> <p>(2) <i>To promote the capacity of the community</i></p> <p><u>(Components)</u></p> <p>(1) <i>Awareness Programme & Drill/ Non-structural</i></p> <p>(2) <i>Institutional Arrangement/ Non-structural</i></p> <p>(3) <i>Construction of Shelter/ Structural</i></p> <p>(4) <i>Evacuation Route construction/ Structural</i></p> <p>(5) <i>Early Warning System/ Non-structural</i></p> <p>(6) <i>Building Retaining Wall/ Structural</i></p> <p><u>(Key Issues)</u></p> <p>(1) <i>Budget, Technology, Coordination and cooperation among stakeholder, Public coordination and involvement</i></p> <p>(2) <i>Technology- JICA, YCDC, RRD, MoC</i></p>	Same as Cambodia
Philippines	Butuan	Flood	<p><u>(Background)</u></p> <p>(1) <i>Butuan City is an identified catchment basin for Agusan River.</i></p> <p>(2) <i>21 Barangays along the flood way zone of the Agusan River.</i></p> <p>(3) <i>Relocation of vulnerable residents pending the full implementation of flood</i></p>	Same as Cambodia

			<p>mitigation projects (ex. Construction of flood walls/dikes)</p> <p>(4) Availability of relocation sites fully certified by the MGB as safe area.</p> <p>(5) Cooperation and support of the affected people.</p> <p><u>(Objectives)</u></p> <p>(1) To have a safer, adaptive and flood resilient communities.</p> <p><u>(Components)</u></p> <p>(1) Evacuation plan/ Non-structural</p> <p>(2) Contingency Planning/ Non-structural</p> <p>(3) IEC/ Non-structural</p> <p>(4) Construction of Evacuation Center/ Structural</p> <p>(5) Construction of elevated road/ Structural</p> <p>(6) Capability and Capacity Enhancement/ Non-Structural</p> <p><u>(Key Issues)</u></p> <p>(1) Hiring of Technical person</p> <p>(2) Outsourcing of Funds (JICA,AusAid,UNHabitat and all other INGO's)</p> <p>(3) Full support for the CDRRMC members lead by the City Mayor as chairperson</p>	
Thailand	Pathumthani	Flood	<p><u>(Background)</u></p> <p>(1) Industrial Park</p> <p>(2) Mega flood in 2011</p> <p>(3) Wetlands</p> <p>(4) Communities adjacent Riverside</p> <p><u>(Objectives)</u></p> <p>(1) Flood hazard BCM for area</p> <p>(2) Understand risk management</p> <p><u>(Components)</u></p> <p>(1) Planning (It is required planning and SOP for various agencies during operation to reduce confusing/ Budget Support Planning for future disaster)/</p>	Same as Cambodia

			<p>Non-structural</p> <p>(2) Evacuation Planning (Precautionary evacuation and Post – impact evacuation)/ Non-structural</p> <p>(3) Emergency Trainer / Non-structural</p> <p>(4) Construction of wall / Structural</p> <p>(5) Public Education (Community Based Disaster Risk Management)/ Non-structural</p> <p><u>(Key Issues)</u></p> <p>(1) The challenge is the integrated and share best practice of BCM among public sector private sector</p>	
Vietnam	Qui Nhon	Cyclone	<p><u>(Background)</u></p> <p>(1) Quy Nhon is provincial capital of Binh Dinh province. Annualy, Quy Nhon have to face 3-4 Cyclone, which cause serious damage to human life and properties</p> <p>(2) Asset: housing, building, fishing boat, furniture, inventory stocks</p> <p>(3) Human loss: death, missing, injured</p> <p>(4) Damage agriculture products</p> <p>(5) Damage: infrastructure: bridge, water supply, electric systems, schools, hospital, environmental</p> <p><u>(Objectives)</u></p> <p>(1) Raising community awareness and Community-Base management of Natural Disaster Risk (CBDRM), especially cyclone</p> <p>(2) Develop 5 year (2016-2020) Plan for Natural disaster Prevention, response and mitigation. In which, focus for developing Hazard risk Map and Detail Evacuation Plan in</p>	Same as Cambodia

			<p>community level (wards/communes)</p> <p>(3) Propaganda, training for communities in 07 communes/wards</p> <p><u>(Components)</u></p> <p>(1) Training on CBDRA and Hazard Assessment (3 Days short training course)/ Non-structural</p> <p>(2) Developing Commune Plan for Natural Disaster Prevention and Control (Commune Plan, of which, focus on sub-plan for Cyclone Hazard Map+ Evacuation plan) / Non-structural</p> <p>(3) Evacuation Drill / Non-structural</p> <p>(4) Equipment, Facilities (Electric Generators; tents; loudspeakers; life-jackets,, for Cyclone Prevention and Control, Search and Rescue to Commune and communities)/ Structural</p> <p>(5) Watershed area protection/ Structural</p> <p><u>(Key Issues)</u></p> <p>(1) Set up PMU with fulltime staffs for implement the Project</p> <p>(2) Mobilize from: JICA, provincial/city corresponding finance and other sources</p> <p>(3) Building capacity for them through their direct participants (training,,,)</p>	
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A4.2 Draft TOR of Demonstration Project for Building Disaster and Climate Resilient Cities in ASEAN

1. Project Title: Demonstration Project for Building Disaster and Climate Resilient Cities in ASEAN

2. Project Site: Two demonstration cities out of the following candidate cities in ASEAN are the project site of demonstration project supported by JICA.

(1) Battambang, Cambodia; (2) Denpasar, Indonesia; (3) Luang Prabang, Lao PDR; (4) Kuala Trengganu, Malaysia; (5) Kyimyindaing, Myanmar; (6) Butuan, Philippines; (7) Pathumtani, Thailand; (8) Qui Nhon, Vietnam

3. Target Disaster Type:

- Flood is the target disaster type, if the demonstration city is selected from Battambang, Luang Prabang, Kuala Terengganu, Butuan, Pathumthani.
- Cyclone is the target disaster type if the demonstration city is selected from Kyimyindaing, Qui Nhon
- Tsunami is the target disaster type if the demonstration city is selected from Denpasar.

4. Background:

- Due to their climatic environment and geological property, disaster risk in ASEAN area is high and it brings number of disasters to ASEAN countries.
- By 2050, it is expected that 68 percent of the world's population would live in urban areas. This unprecedented growth of cities, particularly in countries in the ASEAN region cause problems of resource management and land use management and poses a huge challenge to disaster risk management and sustainable development. In addition, cities are highly interconnected to the global economic system. When disasters strike such economic centers, the ripple effects can be felt for thousands of miles and years to come.
- Based on Concept Note 18 (CN 18) "Building Disaster and Climate Changes in ASEAN Cities" of AADMER Work Programme Phase 2 (2011-2015) under ASEAN Committee on Disaster Management (ACDM) Working Group on Prevention and Mitigation, the implementation framework for CN 18 has been developed with the assistance by JICA.
- One of the outputs in CN18 is Evaluation of Candidate Cities and Partnership and Commitment Building for Demonstration Project on Risk Assessment of Priority Cities in ASEAN Member States. Both ASEAN and JICA identified eight candidate cities for the demonstration project through the preliminary disaster risk assessment. They conducted workshops for disaster risk assessment and mainstreaming of disaster risk reduction into urban planning. The ideas on demonstration project were discussed in the workshops.
- ACDM and ASEAN countries developed AADMER Work Programme (2016-2020) in 2016. Priority Programme 2 of the work programme is Build Safely, which objective is build

resilience into essential infrastructures and essential services for ASEAN Community to thrive and operate despite disasters and climate impacts.

5. Objectives:

The demonstration projects aims at materializing the priority actions of Sendai Framework for Disaster Risk Reduction through:

- (1) to understand disaster risk by conducting disaster risk assessment
- (2) to enhance disaster preparedness for effective response by improving contingency plan
- (3) to prepare for investing in disaster risk reduction by formulating action plan for mainstreaming disaster risk reduction in urban planning
- (4) to strengthen disaster risk governance to manage disaster risk by developing capacity for disaster risk assessment, formulating of contingency plan, resilient city planning, and strengthening cooperation among the concerned government organizations
- (5) to share acquired knowledge and skills for above objectives (1) to (4) with other ASEAN cities

6. Project Component:

- (1) Establishment of project implementation framework in demonstration cities and demonstration AMS where a demonstration city belongs
- (2) Review and Analysis of the current situations of demonstration AMS and demonstration city shown in below.

- 1) Current policy, legal and regulatory framework
- 2) Natural conditions and socio-economic conditions
- 3) Damages in past disasters
- 4) Existing contingency plan, including existing data on disaster risk assessment/CCA (Climate Change Adaptation), fragility curve, evacuation plan, etc.
- 5) Existing urban development plan, land use plan, zoning regulations and other institutional frameworks in combination with current sector plans and investment programs. (utilities, road and transportation, public facilities, etc.)
- 6) Current capacity of concerned city government organizations (Planning & Development Office (PDO) and Disaster Risk Reduction Management Office (DRRMO), etc. by using checklists prepared in CN18

- (3) Conducting of disaster risk assessment with climate change projection including worst case scenario by utilizing existing hazard assessment results and available open source data

- 1) Climate change projection appropriately downscaled to the local condition
- 2) Review of existing hazard assessment results and available data
- 3) Disaster risk assessment integrated with the projected climate change
- 4) Formulation of scenarios of disaster damages and impacts including the worst case

- (4) Action Plan and Recommendation for Building Resilient Cities

A. For Improving Contingency Plan

- 1) Identification of portions to be improved in the contingency plan
- 2) Preliminary study on possible structural measures at city level
- 3) Action Plan to improve contingency plan and Recommendation
- 4) Update of GIS Database developed in CN18

B. For Improving Land Use and Development Plan

- 1) Identification of planning aspects and issues to be improved and revised reflecting from improved contingency plan.
- 2) Action Plan to improve existing land use and urban development plan including zoning control and regulation and sector programs based on results of disaster risk assessment, DRR scenario, etc., and Recommendation

(5) Capacity development for concerned officials in charge of disaster risk reduction and urban planning

- 1) Confirm priority area for capacity development by utilizing checklist
- 2) On-the Job Training on the above (2) to (4)
- 3) holding of national seminar for sharing experiences

(6) Sharing experiences with other ASEAN cities

Holding of regional seminar (ASEAN Urban Resilience Forum) for sharing experience

7. Coordinating/Implementing Agency

- Regional Level: Co-chairs of ACDM Working Group on Prevention and Mitigation (Lao PDR, Thailand), ASEAN Secretariat, AHA Centre
- National Level and Local Level: National Disaster Management Organization and Local Government for the demonstration cities and AMS.

The followings are candidate agencies for the demonstration project.

	National Level (Coordination Agency)	Local Level (Implementing Agency)
Cambodia	National Disaster Management Centre (NDMC)	Battambang Provincial Government
Indonesia	National Disaster Prevention and National Disaster Management Authority (BNPB)	Denpasar City Government
Lao PDR	Ministry of Labor and Social Welfare	Luang Prabang Provincial Government
Malaysia	National Disaster Management Agency (NADMA)	State Government of Terengganu,
Myanmar	Relief and Resettlement Department, Ministry of Social Welfare	Yangon Region Government
Philippines	Office of Civil Defense (OCD)	Butuan City Government
Thailand	Department of Disaster Prevention and Mitigation, Ministry of Interior	Pathumtani Provincial Government
Vietnam	Department of Natural Disaster Prevention and Control (DNDPC), Ministry of Agriculture and Rural Development	Qui Nhon City Government

8. Project Period: 7 months

9. Reports/Products:

(1) Reports

- Inception Report (2)
- Draft Final Report (2)
- Final Report

(2) Products

- Disaster Risk Assessment Report for each demonstration city (compiled in Draft Final Report and Final Report)
- Action Plan and Recommendation to improve Contingency Plan

- Action Plan and Recommendation to improve Land Use and Development Plan or to formulate basic policy and strategy for land use and urban development in case of no existing plan
- Updated Database (DVD-ROM)

These products are compiled in the draft final report and final report mentioned above. Guidebook for Urban Resilience including Checklists will be revised based on the feedback during the demonstration project.

10. Schedule:

	1st month	2nd month	3rd month	4th month	5th month	6th month	7th month
0 Preparatory Work							
1 Establishment of Project Implementation Framework							
2 Review and Analysis of the current situations							
3 Conducting of Disaster Risk Assessment/CCA							
4 Formulation of Action Plan and Recommendations							
A. For Improving Contingency Plan							
B. For Improving Land Use and Development Plan							
7 Capacity Development							
Report	○ IC/R (2)					○ DF/R (2)	○ F/R
PSC	▲ 8th PSC					▲ 9th PSC	
Seminar					△ National Seminar	▲ 3rd AURF	

- After selecting the demonstration cities, the above schedule will be revised based on national holidays of the AMS where the demonstration cities belong.
- National disaster management organizations and city/provincial government for the demonstration cities will be invited to the 8th and 9th PSCs.

End of the document

A.4.3 EXPLANATORY NOTE OF DRAFT TERMS OF REFERENCE FOR DEMONSTRATION PROJECT

A.4.3.1 Introduction

In CN18 in AADEMER Work Programme Phase-2, work items for demonstration project were proposed for the following five (5) issues:

- 1) Risk Assessment of Natural Disaster
- 2) Study on Improvement of Existing Urban Development Plan and Land Use Regulation
- 3) Study on Risk Finance and Financial Plan by Insurance
- 4) Preparation of Action Plan for Urban Development in Demonstration City
- 5) Formulation of National Level Strategy for Disaster Resilient Cities

As explained in Chapter A4.1, contents of draft TOR for demonstration project were discussed among participants of ASEAN countries in the workshop on December 8-9, 2017. As a result, several components for the demonstration project were proposed, in which major components are shown below:

- (1) Improvement of Contingency Plan including Update of Disaster Risk Assessment/CCA, Preparation and Utilization of Fragility Curve, Evacuation Plan, etc.
- (2) Mainstreaming Disaster Risk Reduction/CCA into Land Use and Urban Development Plan including zoning control and regulation and sector programs based on results of Disaster Risk Assessment, DRR scenario, etc.
- (3) Capacity Development for Planning Officers

In the next chapter, details of the above are shown as explanatory note.

A.4.3.2 Improvement of Contingency Plan including Update of Disaster Risk Assessment/CCA, Preparation and Utilization of Fragility Curve, Evacuation Plan, etc.

Most of the municipalities has a contingency plan including existing data on disaster risk assessment/CCA, fragility curve, evacuation plan, etc., which is normally composed of the following components:

- 1) Description/understanding of Disaster Situation (including hazard analysis, risk assessment, etc.)
- 2) Scenario Building for Projected Worst-Case of Disaster
- 3) Strategy for Disaster Management
- 4) Activities for Disaster Management before, during and after Disaster
- 5) Standard Operating Procedures and Evacuation Plan
- 6) Structure of Executing/Related Agencies
- 7) Procedures for Feedback, Upgrading, and Future Actions, etc.

Review of the above shall be undertaken for improvement, and identification of portions to be improved in the plan shall be made. Then, update of risk assessment/CCA, preparation and utilization of fragility curve, study on evacuation plan (monitoring & early warning system, evacuation center, road, sign board, etc.) by open source data, etc., shall be conducted for improvement.

A.4.3.3 Mainstreaming Disaster Risk Reduction/CCA into Land Use and Urban Development Plan including zoning control and regulation and sector programs based on results of Disaster Risk Assessment, DRR scenario, etc.

Existing urban development plan, land use plan, zoning regulations and other institutional frameworks in combination with current sector plans and investment programs (utilities, road and transportation, public facilities, etc.) shall be reviewed first.

There are various planning aspects and issues to be improved/ revised which shall be identified based on the disaster risk assessment by improved contingency plan.

Then, action plan to recommend necessary measures for improvement of existing land use plan or new land use plan/ improvement of key sector plans, and necessary controls/ regulations to prevent socio-economic activities in disaster risk shall be formulated based on disaster risk assessment.

A.4.3.4 Capacity Development for Planning Officers

Existing capacity for concerned city offices (Planning & Development Office (PDO) and Disaster Risk Reduction Management Office (DRRMO), etc. shall be reviewed first.

There are various activities for capacity development. Major activities are presented as follow:

- 1) Formation/Strengthening of Disaster Management Organization/Staff
- 2) Workshop for Contingency Planning Formulation/Improvement (Hazard Mapping, Evacuation Planning, etc.)
- 3) Promotion of Proper Community-Based Solid Waste Management
- 4) Community-Based Early Warning System
- 5) Formation and Training of Rescue Team

From the above, capacity development program on the disaster risk assessment and its applicable measures into land use and urban development planning shall be formulated.

Then, implementation of the program and monitoring evaluation shall be undertaken to reflect to other cities' and central government program for "mainstreaming DRR into land use and urban development planning".

APPENDIX 5: INPUT INFORMATION FOR DEVELOPING TOOLS ON BUILDING RESILIENT CITIES

A5.1 DAMAGES CAUSED BY NATURAL DISASTERS

Table A5.1.1 Record of Flood & Typhoon (Cambodia)

Place	Date	Damage
Cambodia		
Flood	Aug 1999	The flash floods, triggered by torrential rains during the first week of August, caused significant damage in the provinces of Sihanoukville, Koh Kong and Kam Pot. As of 10 August, four people were killed, some 8,000 people were left homeless, and 200 meters of railroads were washed away. More than 12,000 hectares of rice paddies were flooded in Kam Pot province alone.
Floods	Nov 1999	Continued torrential rains during October and early November caused flash floods and affected five southern provinces: Takeo, Kandal, Kampong Speu, Phnom Penh Municipality and Pursat. The report indicates that the floods affected 21,334 families and around 9,900 ha of rice field. IFRC's situation report dated 9 November stated that 3,561 houses are damaged/destroyed. So far, there has been no report of casualties.
Flood	Aug 2000	The second floods has caused serious damages on provinces in the North, the East and the South, especially in Takeo Province. Three provinces along Mekong River (Stung Treng, Kratie and Kompong Cham) and Municipality of Phnom Penh have declared the state of emergency. 121,000 families have been affected, more than 170 people were killed, and some \$10 million in rice crops has been destroyed. Immediate needs include food, shelter, and the repair or replacement of homes, household items, and sanitation facilities as water levels in the Delta continue to fall.
Flood	Aug25th 2001	Floods triggered by the deluge of the Mekong River killed at least 10 people in Cambodia
Flood	Aug27th 2002	While southern provinces of Cambodia are still facing severe drought conditions, northeastern, eastern and southwestern provinces located along the Mekong River are now being affected by floods. According to media reports, one million people have been affected by the floods, 14 people have been killed and around 450,000 people have been displaced.
Floods	Aug22th 2006	In Cambodia, torrential rains swelling the annual Mekong floods have killed at least eight Cambodians and damaged several thousand hectares (acres) of paddy fields, officials said.
Typhoon	Sep30th 2009	At least nine people have died in Kampong Thom province in central Cambodia due to Typhoon Ketsana on 30 September 2009.
Flash Flood	Oct14th 2010	Continuouce heavy rain since 11 October 2010 in the catchment area of Pursat River caused flash flooding along the Pursat River.
Flash Flood	Oct15th 2010	The report from Banteay Meanchey province, Cambodia indicated that at 7:40PM on 15 October 2010, rain flooding and water flooding from the collapse of the K5 dike caused floodwater to reach up to the roof of houses in Kaun Damrey village, O'Chrov district.
Flood	Sep10th 2011	At least 14 Cambodians died in flooding that was caused by heavy rain falls just in a week.
Floods since the	Sep2nd 2013	Since then 13 people have died and as many as 10,000 people have been

monsoon		displaced. The worst affected areas are Banteay Meanchey, Preah Vihear, Kampong Thom, and Kratie. The floods have also damaged at least 20,000 hectares of rice paddy fields.
Typhoon Flood	Sep24th 2013	Heavy monsoon rains exacerbated by Typhoon Usagi have pounded parts of Vietnam and Cambodia killing at least 36 people.
Flood	Sep30th 2013	Heavy rains since the third week of September have resulted in floods in at least 10 provinces throughout the north-west and along the Mekong River in central Cambodia. 30 confirmed deaths, more than 81,000 households affected and more than 9,500 households evacuated to safe areas.
flooding of the Mekong river and heavy rainfall	Oct3rd 2013	In their statement, they said: <ul style="list-style-type: none"> · The recent flooding has claimed 39 lives · 13 of the country's 24 cities and provinces have been affected · 100,000 families affected by the floods · 89,200 houses have been damaged by the floods · Around 10,000 families have been forced to flee their homes · 533 schools have been damaged · 291 Buddhist pagodas also suffered flood damage · 100,000 hectares (247,000 acres) of rice fields destroyed
Floods	Aug8th 2014	4,400 families have been evacuated after the flooding along the Mekong river and also in the Tonlé Sap lake and river area. So far at least 6 provinces have been affected. Most of the families were evacuated from Stung Treng, Kratie, Kampong Cham and Tbong Khmum. Ratanakiri and Prey Veng have also been affected. Reports say that at least 4 and as many as 8 people have died in the flooding over the last few days.

Source: JICA Project Team based on Information of ADRC, Floodlist and AHA Centre

Table A5.1.2 Record of Flood, Storm Surge and Cyclone (Indonesia)

Place	Date	Damage
Indonesia		
Flood	May 2000	Floods caused by heavy rain over the last 3 days, have drenched the southern part of Belu district in West Timor, Indonesia. The affected area is flat and very low-lying, and forms a major rice growing area with an estimated 100,000 people living in the region. The rains continue and the death toll is expected to rise. According to unconfirmed information, 125 people have died as a result of the floods. In all, an estimated 20,000 people have been affected and 100 houses have been destroyed.
Flood	20 th - Nov 2000	The torrential downpour over the last few days has wrought havoc in Aceh, northern Sumatra Island, Indonesia. No official information is available to date, an estimated of 100 people are thought to have perished, with at least 4,200 families having lost their homes.
Flood & Land Slide	10 th Feb. 2001	A Landslide and Flood are happened at Lebak in East Java, affected more than 100 people are dead
Flood	26 th June 2001	Three days of heavy rain led to flooding in inhabited areas of Los Palos in Lautem District (Population: 55,000), in the east of East Timor.
Flood	31 th Dec	Flooding triggered by heavy rain has hit Indonesia's North Sumatra province, an important area for commodity output, leaving at least 3 people dead, 17 people missing and forcing thousands more to flee their homes.
Flash Flood	11 th Jan. 2002	A flash flood killed 21 people as it swept through a village on the Indonesian island of Sumatra while residents were sleeping
Flood	14 th Jan. 2002	Floods in the Indonesian city of Medan have killed at least four people, left seven others missing and closed the airport.
Flood	14 th Feb. 2002	Heavy rain showers lashed Jakarta on Thursday causing more floods as health workers said at least 16 people, mostly children, had died in the capital of diseases brought on by the recent downpours.
Flood & Land Slide	17 th Feb. 2002	Landslides triggered by torrential rain have killed at least seven people in Indonesia's central Java capital of Semarang and more are feared dead,
Flood & Land Slide	8 th Mar. 2002	Flood hit Sulawesi on 8 Mar. Damaged houses were estimated 190 houses. Two people were killed in a landslide in West Java. The Jakarta Post reported at least four people were killed on 12 Mar in Central Java.
Flash Flood	28 th mar. 2002	Flash floods following heavy rain have killed at least nine people and destroyed dozens of homes in Indonesia's Nias island,
Flood & Land	27 th Dec. 2002	Heavy rains caused floods and landslides in a hilly region of southern

Slide		Sumatra island, leaving at least 11 people dead and one missing.
Flood	15 th Jan. 2003	Floods which have hit Singkawang district in West Kalimantan province, one hour flight west of Jakarta, have paralysed almost all parts of the city. According to updated records from the local administration, No casualties have been reported but the flood disaster has displaced 1,410 families or some 4,711 people.
Flood	13 th Feb. 2003	Thousands of homes in the Indonesian capital Jakarta are under water after torrential rains overnight triggered serious floods. Floods influenced more than 10 million people.
Flash Flood	3 rd Nov. 2003	A flash flood caused by heavy rain has swept through a tourist resort on the Indonesian island of Sumatra, killing at least 100 people, rescue officials say.
Flash Flood	27 th Apr. 2004	Flash floods occurred in the tsunami-hit Indonesian province of Aceh when river banks burst after heavy rain, killing at least 15 people.
Land Slide & Flash Flood	18 th Oct. 2005	A number of landslides and flash floods hit the tsunami-devastated Indonesia's Aceh province, killing at least 16 people with several others still missing.
Flash Flood	2 nd Jan. 2006	Flash floods swept away houses and schools in central Indonesia early Monday, 2 January 2006 killing at least 24 people, said a government official, predicting the toll would rise.
Flood & Land Slide	21 st Feb. 2006	At least 24 people have been killed in floods and landslides triggered by several hours of torrential rain in the city of Manado, Indonesia's eastern province of North Sulawesi.
Flash Flood & Land Slide	20 th Apr. 2006	Flash floods and landslides triggered by heavy rain have killed at least 23 people on Indonesia's main island of Java, state news agency Antara reported.
Flood	20 th Jun. 2006	Rescuers searching for survivors on an Indonesia island ravaged by floods and landslide retrieved scores of bodies on 21 June 2006, bringing the death toll to 94, officials said.
Flood	24 th Dec. 2006	Floods in Indonesia's Aceh and North Sumatra provinces have left at least 30 people dead and forced tens of thousands to flee their homes, Health Ministry official Rustam Pakaya said on 25 Dec.
Flood	3 rd Feb. 2007	Floods in Indonesia's capital, Jakarta, have killed five people and forced about 100,000 to leave their homes.
Flood	19 th Feb. 2007	On February 2007, landslides triggered by torrential rain hit two places on Indonesia's main Java island over the weekend, leaving eight people dead and six missing.
Flood & Land Slide	23 rd Jul. 2007	At least seven people have been killed and many thousands forced to flee their homes because of floods and landslides on the Indonesian island of Sulawesi.
Flood & Land Slide	7 th Feb. 2008	Two people were killed and five more were missing after heavy rainfall triggered a landslide on the Indonesian island of Java, an official said.
Storm Surge	4 th Jun. 2008	Residents in the Indonesian capital, Jakarta, braced for further flooding after a high tide of over 2 metres resulted in flooding in parts of the city on Wednesday (4 June 2008).
Flood	27 th Oct. 2008	More than 11,000 Indonesians have fled their homes because of floods caused by torrential rain in Gorontalo city on Sulawesi Island, an official said on Monday, 27 October 2008.
Flood	24 th Feb. 2009	More than 4,000 people have fled their homes in Java island of Indonesia after floods hit the areas since 24 February 2009.
Flash Flood	27 th Mar. 2009	A dam on the outskirts of the Indonesian capital, Jakarta, burst on 27 March 2009, killing 28 people and flooding hundreds of houses nearby, officials said.
Flash Flood	16 th Sept. 2009	At least 38 people have been killed as flash floods struck six villages in a remote region of Indonesia. Dozens more are missing after the floods swept through an area of the Madina district in North Sumatra province early on Tuesday.
Flood	24 th Jul. 2010	A flood hit five villages in Tanah Bambu district, South Kalimantan, on 24 July 2010 following heavy rains over the past few days.
Flash Flood	5 th Oct. 2010	Flash floods and landslides triggered by several days of heavy rain in Indonesia have killed at least 26 people.
Flood	8 th Mar. 2011	A heavy flood crushed five sub districts in South Garut district in West Java, Indonesia, killing nine people.

Flood	1 st Jun. 2012	Entering in January as the peak rainfall for most parts of Indonesia, the threat of flooding will also be increased. Ten areas are flooded in almost the same time.
Cyclone	29 th Jun. 2012	Cyclone Iggy killed fourteen people and another 60 were injured in Indonesia over a four-day period
Flash Flood	25 th Aug. 2012	Three people died on 25 August 2012 after flash flooding struck Parigi Moutong regency, in the province of Central Sulawesi, Indonesia.
Flash Flood	8 th Nov. 2012	At least 11 people were killed and seven missing after a flash flood triggered by heavy rains hit a village on Indonesia's Sulawesi island.
Flood	15 th Jun. 2013	Floodwaters have inundated Jakarta, Indonesia since 15 January 2013, claiming one life and displacing some 6,000 residents.
Flood & Land slide	17 th Feb. 2013	On 17 February 2013, thousands of people fled their homes in Manado, Indonesia and surrounding areas to escape the floods.
Flood	14 th Dec. 2013	Heavy rainfall affected the island of Java on 14-15 December 2013, causing floods, overflow rivers and landslides. Approximately 5,000 households have been affected.
Heavy Rain & Flood	13 th Jun. 2014	At least 8,064 people in 10 districts across Jakarta were affected by the flooding on 13 January 2014.
Flood	1 st Nov. 2014	Continued flooding occurred from 1 to 3 November 2014 in Aceh, northern Sumatra, Indonesia. About 53,000 people are affected.
Flood	Jan. 2015	Floods were reported in several parts of Indonesia. In West Sumatra and West Kalimantan, over 12,800 people were affected.
Flood & Land Slide	19 th Jan. 2016	Floods were reported in Sumatra, Java and Sulawesi of Indonesia between 19 and 23 January 2016. Some 4,900 houses were inundated.
Flash Flood & Landslide	1 st Feb. 2016	Torrential rains during the first week of February have caused severe flooding in eight provinces in Indonesia, heavily affecting Aceh, North and West Sumatra, Riau and Bangka Belitung. The floods isolated more than 89,000 people and forced them to evacuate to safer areas.
Flood	29 th Feb. 2016	Local authorities report one fatality in Cengkareng district (Jakarta city) and over 34 000 people affected in East Java province, as of 29 February early morning (UTC). Local media also report hundreds evacuated in Jakarta due to the overflow of the river Cengkareng.
Flood	8 th mar. 2016	2 People Died and 3 people missing, 3,000 people displaced. A total of 5,900 families / 24,000 inhabitants affected by the floods. March 15, 2016, flood condition in Bandung regency slowly began to recede. Weather in the area of Bandung regency looks bright.
Flood & Land slide	27 th Mar. 2016	High rainfall intensity has triggered flooding in West Sumatra Province. In Padang City, the flood has caused 1 death and submerged about 11,500 houses. Moreover, flood also inundated 1,800 houses in Padang Pariaman District. Flood in Nabire, Papua Province has affected 7,800 people. Flood also affected Cirebon, West Java Province. Media said that around 2,000 houses were submerged by the flood. In Sarolangun District, Jambi Province, flood has affected 300 houses. Flood also submerged 200 houses in North Barito, Central Kalimantan Province. 209 families were reportedly affected. Landslide occurred in Banjarnegara District, Central Java Province. The incident has damaged 21 houses. Responding to the situation, the local government evacuated 283 people to the evacuation centre.
Flood in Bekasi	Apr21th 2016	The continuous rain has caused Cikeas River in Bekasi, West Java Province to overflow. Hundreds of houses were reportedly inundated by water. Impact: 600 families or 9,000 people were reportedly affected 500 houses were lightly damaged
Padang Flood	Mar29th 2016	The high rainfall intensity has triggered flooding in Pariaman city and Padang Pariaman District, West Sumatera Province. Based on the local authority report, 1,857 families were affected in both location. Local government included the BPBD as well as other responding organisation have provided assistance. Impact: Estimated families affected 1,857 (823 in Padang Pariaman district and 1,034 in Pariaman City) 41 houses damaged (38 in Padang Pariaman district and 3 in Pariaman city) 1 people dead in Padang Pariaman District 8 bridges damaged
Flood in	Mar22th 2016	Heavy rainfall on 22 March 2016 has caused flooding in Padang , West

Padang-West		Sumatera Province and affected 3 subdistricts which are . The flood has inundated numbers of houses, damaged 2 bridges and also caused 2 people dead. Impact: 11,500 houses innudated (est.). Water level of the flooding 11.2 m. There are 2 bridges were damaged in Pasia Nan Tigo and Bungus Timbalun Village. 1 people dead and 1 missing.
Flooding in Nabire	Mar22th 2016	Heavy rains resulted to flooding on 22 March 2016 LOCATION: Nabire, Papua, Indonesia Impact: 7,868 people were affected 1 bridge was damaged
Flood in Bireun	Jan11th 2016	Heary rain has triggered flooding in Pandrah and Jeunib subdistrict, Bireun, Aceh Province. The flood has inundated numbers of houses and agriculture lands. Based on the report, the affected area in Pandrah included village of Meunasah Garot, Meunasah Panton, Pandrah Kandeh, Pandrah Janeng, Gampong Blang, Meunasah Reudep and Lancok Ulim. While in Jeunieb, the flood has inundated village of Cot Geulumpang Tunong, Cot Geulumpang Baroh, Janggot Sengkoe, Ulee Rabo, Meunasah Tambue, Meunasana Keutapang, Lheu Simpang, Meunasah Kupula and Meunasah Dayah. Impact: at least 27 houses were submerged in Gampong Janggot Senkoe about 234 ha of paddy fields were inundated
Flood Affecting Kuantan	Jan7th 2016	Based on the Social Office Province of Riau, flooding has affected 10 sub-districts in Kuantan Singingi District. The affected sub-districts are Kuantan Hilir Seberang, Sentajo Jaya, Kuantan Mudik, Gunung Toar, Kuantan Tengah, Pangean, Benai, Kuantan Hilir, Inuman and Cerenti. Impact: 4,552 houses were affected
Flood in Sijunjung	Jan6th 2016	Due to torrential rains, flood occurred in the District of Sijunjung, West Sumatra. There were also landslides that buried a portion of the road at Kilo 159 from Kota Padang to Pekanbaru, Riau. Impact: 271 houses inundated (total) 47 houses in Nagari Sungai Lansek (52 families) 23 houses in Kamang (26 families) 201 houses in Si Aua (221 families) 299 families affected
Flood affected west Kotawaringin	Jan4th 2016	The Disaster Management Agency of West Kotawaringin, Central Kalimantan Province reported that 600 families being affected by flood that triggered by the overflow of Arut River. The flood also inundated houses in Pangkut, Panahan, Riam, Nanga Mua, Pandau, Sukarami, Penyombaan, Sambu, Gandis and Kerabu villages. Impact: 600 families were affected 596 houses were inundated
Flashflood hit Pematang	Decfirst 2015	Torrential rain has triggered flashflood and landslide in Pematang Siantar City, Province of North Sumatra. The local authority reported that the incident has killed two men and damaged several houses. Impact: 2 death 29 houses were damaged 11 families/40 people were evacuated
Flood in South Jakarta	Marfirst 2015	The rainfall in the upstream area has sent huge volume of water to the downstream. This situation has triggered flooding in the lower area, particularly in South Jakarta. 16 villages were reportedly inundated. Impact: 2,581 families/7,232 people were affected.
Flood affecting Pidie	Jan15th 2015	Continuous rain has caused flooding in nine (9) subdistricts in Pidie, Aceh Province. The affected areas are Pidie, Sigli, Mila, Delima, Padang Tigi, Kembang Tanjung, Sakti, Grung-grung and Mutiara subdistrict. Impact: 4,000 houses were inundated 10,000 ha of crops and fish pond were submerged
Flooding affected Tebing Tiggi and Langkat	Jan13th 2015	Flood occurred in Tebing Tinggi, North Sumatra Province. The incident was triggered by the heavy rainfall over the last days. Meanwhile, flood has been widely affected Langkat's area since 13 January 2015. Five (5) subdistrict in Langkat were inundated, namely Tanjungpura, Sawit, Batang Serangan, Hinai, Wampu and Simalungun district. Impact: 700 houses in Padang Hulu subdistrict were submerged 7,178 families were affected in Langkat over 557 ha of agriculture area were inundated
Flood in Manado	Jan11th 2015	Due to the high rainfall intensity, flood affecting Manado City, Province of North Sulawesi. The affected areas are Singkil, Tuminting, Wenang, Bunaken, Paal and Tikala subdistrict. Impact: 3,000 people were displaced hundreds of homes were submerged
Flood affected	Jan9th 2015	The high rainfall intensity has caused Rokan River to overflow.

Rokan Hilir		Consequently, water flooded the many houses in Rokan Hilir District, Riau Province. Impact: 11,880 people were affected 1,980 houses were inundated
Flood in South Sulawesi	Jansecond 2015	Flooding affecting Barru District and Makassar City in South Sulawesi Province. The incident was triggered by heavy rain that poured the area. Impact: : 899 houses were inundated and 3,484 people were affected in Barru. In Makassar, the flood submerged 417 houses and affected 1,474 people.
Flooding in Jakarta	Apr21th 2013	Three thousand people have been affected by flooding in Jakarta on April 19 and 20. The floods were a direct result of heavy rainfall on Wednesday.
Floods in Sulawesi	Jul29th 2013	Severe floods have now spread to northern Sulawesi. Gorontalo saw extreme heavy rainfall on 26th July which resulted in the deaths of 4 people, with a further 3 still missing. Over 200 people have been evacuated from the region.
Eastern Indonesia Floods	Jul30th 2013	8 people have been killed and 10 injured in a landslide after flooding and heavy rain in eastern Indonesia. The tragedy was in city of Ambon on the Maluku chain of islands.
Floods in North Sumatra	Oct18th 2013	Thousands of families had to evacuate their homes after severe flooding in North Sumatra, Indonesia, over the last few days. Heavy rainfall led to flash floods inundating thousands of homes in the area, forcing people to evacuate and head for higher ground.
Flash Floods in Jakarta	Nov15th 2013	The heavy rainfall began late on Wednesday 13 November, and continued for several hours. According to the Jakarta Globe, at least 3 districts of the city were flooded, affecting around 2,770 people. The city's drainage system again came under criticism as it yet again failed to deal with the heavy rainfall.
Flash Floods in West Papua	Nov15th 2013	As many as 12 rivers in the area have overflowed, worsening the situation for local residents. According to local media reports, 100s of homes were destroyed and victims had to evacuate. For many living on this peninsula, ferry boat was the quickest and safest route away from the flood zone.
Floods and landslide	Decfirst 2013	Heavy rains and floods caused a landslide that killed 9 people, including four children, in Indonesia on Saturday 30 November 2013.
heavy rainfall in Sukabumi regency	Dec17th 2013	The heavy rain caused flooding in East Java, where as many as 43 villages were inundated. Around 20,000 people had to be evacuated from their homes in the areas around Bojonegoro, Tuban, Gresik and Mojokerto. One person was reported as missing. Around 1,800 hectares of rice fields have been inundated. The heavy rainfall is expected to continue.
Flood in Java Island	Dec18th 2013	Initially the floods in East Java affected around 43 villages. Indonesia's National Disaster Mitigation Agency today said that figure is now closer to 100 villages, all located in the areas around Bojonegoro, Tuban, Gresik, Mojokerto and also Lamongan.
Floods in Jakarta	Jan11th 2014	The Jakarta Disaster Mitigation Agency (BPBD) reported that 20 locations had suffered flooding, varying from 10 centimeters to 80 cm, half of which were located in West Jakarta, with traffic on Jl. Mangga Dua Raya paralyzed as the floodwaters reached 50 cm.
Flooding in North Sulawesi	Jan15th 2014	Two days of heavy rainfall in North Sulawesi province, Indonesia, has brought severe flooding, killing at least 1 person and forcing around 2,000 people from their homes. The worst affected area is Manado, although the victim died in a landslide in Minahasa district. One person is still missing.
More Floods in Jakarta	Jan20th 2014	Widespread flooding continues to affect Jakarta, the capital of Indonesia, over the weekend, with the number of people forced to leave their homes jumping from less than 5,000 on Saturday 18 January 2014 to more than 30,000 on Sunday after heavy rain fell overnight.
Floods in district of Kudus in central Java	Jan24th 2014	Most recently affected has been the district of Kudus in central Java, where heavy rain since Friday 17 January has caused floods and landslides that have left 13 people dead. As many as 4,000 people had to evacuate their homes to take shelter in 20 relief centres. Five rivers in the region have overflowed, flooding surrounding villages, leaving some areas of Kudus under 1.5 metres of flood water.
Flash floods in Siau island North Sulawesi	Jan27th 2014	Flash floods on remote Siau island, North Sulawesi, killed at least 2 people and left 27 missing. The fatalities occurred after flash floods surged down a mountain side. The force of the flood water was so strong that it capsized a boat in the sea below. Eight people managed to escape the boat.

Floods in Jakarta	Jan30th 2014	Many areas of Jakarta, particularly East Jakarta, were under water yet again after heavy rainfall caused widespread flooding in the city. Some affected areas were under as much as 60cm of water, and in Pondok Jaya area in Mampang Prapatan, South Jakarta, floodwaters reached a depth of 100 cm.
Floods and Landslides in East Java	Feb3rd 2014	It is believed he was working on the river banks at the time. Landslides have also been seen in Pujon subdistrict. Overall the floods have affected 1,100 families. In Jombang, a massive landslide has killed at least 12 people. Two people are still missing and two were rescued.
Floods in Jakarta and Semarang	Feb5th 2014	Jakarta Heavy rain that lasted from Monday through to Wednesday 5 February has left many of the usual flood prone areas of Jakarta under as much as 70cm of water and some areas as high as 150cm. Remarkably, this is not usual in Jakarta in recent times. Areas of West Jakarta have been worst hit so far this time around. Semarang Flash flooding struck in Semarang, Central Java on Tuesday 4 February after 2 days of heavy rain. The floods and rainfall caused a landslide in Tinjomoyo, Banyumanik district which left one person dead.
Floods in Jakarta	Feb25th 2014	Over 2,300 people have been evacuated in these areas, except the sub-district in Central Jakarta, where Junaedi is reported to have said that the water level "is not too high".
Floods in Sulawesi	Aug11th 2014	In a statement made by the Central Sulawesi Disaster Mitigation Office (BPBD) earlier today, severe flooding in Banggai, Central Sulawesi province has forced over 15,000 people from their homes, seeking temporary accommodation in safer areas. Many of them are now living in tents in relief camps provided by Banggai Regency.
Floods in Bogor	Aug16th 2014	Elsewhere in Indonesia, heavy rain also caused flash floods in the Bone Bolango regency of Gorontalo province where 600 had to evacuate their homes for safer ground. Several houses were damaged or completely destroyed in the deluge. Rail and road infrastructure has also been damaged. The floods came after a nearby river had burst its banks.
Floods in Medan	Oct6th 2014	The flooding was a result of heavy rainfall that began on Friday 03 October and soon forced the rivers of Babura and Deli to overflow, inundating nearby houses in and around Medan. Some areas were said to be under 1.5 metres of flood water by Saturday. Aur village in Aur subdistrict, Medan Maimun, was reported as the worst hit.
Floods in Borneo and Sumatra	Jan20th 2014	Heavy rainfall in Borneo and Sumatra over the last 3 days has left parts of Malaysia and Indonesia struggling with yet more flooding. Malaysia is still recovering from the floods of December 2014 in the north of the country, which were some of the worst flooding seen in years.
Flash floods in the province of West Sumatra	Jan28th 2014	However the floods have severely damaged 2,600 homes in the area, as well as 2 schools, roads and several bridges. Over 200 hectares of agricultural land has also been damaged by the flooding.
Floods in Papua	Jan30th 2015	Papua, East and West Java and Sulawesi have all seen increased levels of rainfall. Surabaya in East Java had 113.1 mm of rain in 24 hours 28 to 29 January 2015. In South Sulawesi, 107.1 mm of rain fell in Makassar during the same period. In Timika, Papua, 183 mm fell between 29 and 30 January 2015.
Floods	Feb2nd 2015	Bali Floods and landslides killed two people in Karangasem district, Karangasem, Bali on 31 January 2015. Two others were injured in the landslide which occurred after heavy rainfall in the region. West Nusa Tenggara Floods have damaged at least 4,000 houses in the Dompu and Woja districts, West Nusa Tenggara.
Floods	Feb8th 2015	Over 80 homes were damaged by floods in Gorontalo Province in the north of the island of Sulawesi on the Minahassa Peninsula, Indonesia, on 6 February 2015.
Floods in Jakarta	Feb9th 2015	Some areas were said to have flood water up to 80cm deep. West, north and central areas of the city have been worst affected. Even the president got to experience the flooding, as areas in front of the presidential palace in central Jakarta's Medan Merdeka Utara area were under 30cm of water.

Floods	Feb12th 2015	Heavy rain is also affecting other areas of south-east Asia, notably Indonesia. As many as 6,000 people were evacuated earlier this week. Parts of the capital city, Jakarta, have been under water for the last 4 days. Floods remain in northern and western parts of the city.
Floods in Jakarta	Marsecond 2015	Parts of Jakarta, Indonesia, were once again under water on 28 February 2015, just 2 weeks after severe flooding forced thousands to evacuate their homes.
Floods	May4th 2015	West Nusa Tenggara West Lombok regency has been the worst affected area in the province of West Nusa Tenggara where a river overflowed after 2 days of heavy rain. Three people have been reported injured in the floods. Central Java There have also been reports of some flooding in Grobogan regency in the southwestern part of the Central Java province. Affected areas include Mlangi, Kendalsari, Tajemsari and Karangpasar.
Floods in Aceh	July17th 2015	BNPD figures say that the flooding has affected 25,765 inhabitants, and damaged 7,904 houses. Roads and bridges have also been damaged, although no casualties have been reported.
Sumatra Floods	Dec4th 2015	BNPB's latest report says that 2 bodies have been recovered from the landslide that is up to 5 metres deep in places. A further 15 people are still missing, and one person has been found alive but with serious injuries. All of the victims are thought to be workers from a gold mine in the area.
Floods in Aceh	Dec17th 2015	The National Disaster Management Authority – Badan Nasional Penanggulangan Bencana (BNPB) – in Indonesia report that flooding in Aceh Province since 11 December 2015 has affected over 50,000 people and left at least one person dead.
Floods in parts of East Java	Jan20th 2016	Floods in parts of East Java, Indonesia, have forced at least 500 people to evacuate their homes. Meanwhile in North Aceh, the floods that affected 12 districts have started to recede.
Floods and Landslides in Central Java and West Sumatra	Feb8th 2016	Two landslides have left at least 9 people dead and 4 missing in Indonesia after four days of heavy rain. The rain has also caused flooding that has forced 4,000 people from their homes.
Floods	Marfirst 2016	Parts of East and West Java, including Jakarta, Indonesia, experienced heavy rain that began on 25 February 2016, causing floods in the two provinces that have left one person dead and affected over 35,000.
Floods	Mar16th 2016	The Citarum River in Bandung regency, West Java province, Indonesia, once again overflowed causing flooding in as many as 15 districts in the area. At least 2 people have died in the floods.
Floods in the city of Padang and Padang Regency	Mar22th 2016	Meanwhile, floods in Magelang Regency in Central Java have left at least 1 person dead and several injured.

Source: JICA Project Team based on Information of ADRC, Floodlist and AHA Centre

Table A5.1.3 Record of Flood (Lao PDR)

Place	Date	Damage
Lao PDR		
Flood	14 th Aug. 2008	Four people have been killed in flooding and landslides in Laos, where the Mekong river has hit its highest level in at least 100 years after several months of unusually heavy rain, officials said on 15 August 2008.
Typhoon	30 th Sept. 2009	Dead: 15, Missing: 1, Injured: 91, Affected household: 27,836 HHs Displaced household: 9,602 HHs Completely damaged houses: 1,023, Affected houses: 825
Flood	24 th Jun. 2011	The Lao Red Cross will provide regular food and relief assistance to more than 5,000 people who were severely affected by tropical storm Haima. At least 35,000 people have been affected, with 19 deaths confirmed by the government.
Tropical Storm	29 th Jul. 2011	In the first week of August, Tropical Storm Nock-Ten brought heavy rains, flash flooding and landslides to Lao PDR's central and northern provinces. At least 165,247 people were affected, with some 21,800 hectares of rice fields damaged.
heavy rains flood the Nam Xan river in the Bolikhamsai Province of Laos	June 28 th 2013	Around 5,000 people have been affected in around 9 villages, although no casualties have been reported. The worst affected area is the Borikhan district of Bolikhamsai.
Heavy Rain & Flood	Jun. 2013	The heavy rainfall in Lao PDR that began in June 2013 has continued unabated and has resulted in widespread flooding, particularly in the Northern and Central parts of the country. Over 20 people have been killed by the flood.
floods between 16 th and 19 th September	Sep 24 2013	Overall the worst affected area was Soukhouma District in Champasak Province, where 1 person is reported as missing in the floods, and a further 14 injured. The floods affected more than 2,000 families in 38 villages across Soukhouma District. As many as 227 families in 21 different villages in Saravane Province were also badly affected by the flooding.
Monsoon rain	Aug 07 2014	One person has died in the floods there. The worst affected area is Soukhoum district, where over 30 villages are under water. Over 6,000 hectares of rice fields are also flooded.
Strong winds and heavy rainfall	Sep 11 th 2015	Lao news agency, KPLP, are reporting that floods and landslides in northern parts of the country have left 2 people dead in the district of Nan district, Luang Prabang province. Two people were killed in a landslide in Nafay village and destroyed 9 houses. As of 10 September 2015, two more people were still missing.
Flood	7 th Aug. 2015	In Lao PDR, continuous rains since early Aug triggered flooding in 118 villages in 12 districts in Houphan, Bolikhamsay, Khammoune and Luangnamtha provinces, over 47,800 people affected.
Flashflood and Landslide	Sep 15 th 2015 Sep 8 th 2015	Flashflood and Landslide occurred in Nan District, Luangprabang Province. Five villages were reportedly affected. According to the Disaster Management Division, Ministry of Labour and Social Welfare, the incident has caused death and damages to the property. Impact: 4 death 44 families or 221 people were affected 9 houses were totally destroyed and 35 houses were damaged Cost of damages is about 3.8 trillion LAK (484,712 USD) Response: National and local government have responded to the situation by providing relief items and financial support to the victims.

Source: JICA Project Team based on Information of ADRC, Floodlist and AHA Centre

Table A5.1.4 Record of Flood (Malaysia)

Place	Date	Damage
Malaysia		
Flood	20 th – Nov. 2000	Floods triggered by torrential rain since November 20 have killed at least 15 people at Kelantan and Trengganu district in North Malaysia and nearby areas of Southern Thai. (as of 11/24)
Flood	23 rd Dec. 2001	11 person were killed and thousands evacuated after torrential rain and strong winds hit three states in east Malaysia.
Flood	5 th Oct. 2003	More than 10,000 people have fled their homes, after three days of incessant rain sparked massive floods in northern Malaysia. No casualties

		have been reported, though an eight-year-old boy was missing after he was last seen near a swollen river.
Flood	11 th Dec. 2004	More than 4,500 people have been evacuated and at least four people drowned in the worst floods in 40 years on the east coast of peninsula Malaysia, reports and police said on 12 December.
Flood	18 th Dec. 2005	Kedah and Perlis are facing their worst floods in 30 years, with more than 16,000 people relocated to 113 evacuation centres in both States since last Saturday. Two-thirds of Perlis and most of northern Kedah have been inundated by non-stop rain over a three-day period since last Friday. The floods have destroyed an estimated 25,000ha of padi fields in Muda Agricultural Development Authority (Mada) areas in Kedah and Perlis and non-Mada areas. Losses are estimated at over RM81 million.
Flood	23 rd Dec. 2006	Malaysia's worst floods in 37 years have displaced nearly 100,000 people amid food shortages, looting and criticism on Saturday of the government's handling of the crisis.
Flood	14 th Jan. 2007	Malaysian health officials are on alert for outbreaks of disease as a second wave of floods hits southern areas, forcing more than 90,000 people to flee their homes and seek shelter at crowded relief centres.
Flood	19 th Dec. 2007	Floods in Malaysia's south, central and northeast have killed 28 people and driven 34,000 people from their homes, local media reported on 19 December, 2007.
Flood	2 nd Nov. 2010	Four people have been killed and almost 50,000 have been forced out of their homes and into relief camps as floods hit northern Malaysia, state media said Friday 5 November.
Floods	31 st Jan. 2011	Two people died and nearly 30,000 were forced to evacuate their homes on 31 January 2011 after heavy rains closed major roads and caused rivers to overflow in Malaysia's southernmost state of Johor.
Flood	25 th Dec. 2012	Heavy rain coinciding with high tide flooded hundreds of homes in three northeastern states of Malaysia -- Terengganu, Pahang and Kelantan -- with some 13,746 people moved to evacuation centres.
Flood	3 rd Dec. 2013	Floods in Malaysia caused by heavy rains have left one dead and some 19,000 people have been relocated to evacuation centres set up in schools in the east coast states of Pahang and Terengganu and Johor in the south.
Flood	16 th Dec. 2014	A total of 3,930 people have fled their homes in several areas of Kelantan due to flooding caused by two days of heavy rains. In the adjacent state of Terengganu, 4,209 people fled to evacuation centres.
Flood	24 th Nov. 2015	In Malaysia, at least 1,421 people were affected by the floods and had to move out of their homes in five different States of Sabah, Perak, Sarawak, Pahang and Kedah.
Sabah	Jan 20 th 2015	Flood has affected people in Sabah State. As reported, water inundated many areas in Beaufort, Sipitang and Tenom District. The situation was triggered by high rainfall intensity. Impact: 4,134 people were evacuated Response: The government moved the affected families to the evacuation centre and provided assistance.
Sarawak	Jan 17 th 2015	High rainfall intensity has caused another flooding in Sarawak State. National Security Council stated that flood affected district of Kuching, Samarahaan, Mukah and Limbang. Impact: 3,892 people were evacuated Response: The government provided evacuation centre and distributed relief items for the victims.
Flood (West Coast)	Nov 29 th 2014	Due to heavy rainfall in the past week, several flood situations have occurred in the Western Coast State of Malaysia. The affected area includes: Alor Gajah in Melaka, Johor and Selangor additionally landslide also occur in Daerah Seremban, Negeri Sembilan Impact: S 1 death 120 families or 436 people were evacuated Response: S local authorities provided the temporary shelter and relief items to the affected population
Flood (Several Districts)	Nov 23 th 2014	Due to continuous heavy rainfall caused by the beginning of Southeast Monsoon in the area, several states have experienced flooding. The affected states/provinces include: Perlis, Selangor and Kedah Impact: 562 people or 222 families evacuated in 18 evacuation centre

		<p>Most impacted area is in Padang Besar, Perlis indicated by number of people evacuated (297 people) Response: S Local authorities responded to this situation by providing relief and temporary evacuation.</p>
Flood (Kelantan & Terengganu)	Nov 19 th 2014	<p>Continuous rain has created flooding situation in Kelantan and Terengganu. Impact: 2 death 1,189 families or 4,756 people were evacuated Response: The authority conducted evacuation to the exposed communities and set up evacuation centres</p>
Heavy Rain & Flash Flood (Cameron Highland)	Nov 5 th 2014	<p>Heavy rain has generated flashflood and landslide incident in Cameron Highland, Pahang. Residents of Bertam Valley and Kampung Baru were suffered due to the incident. Impact: 3 death and 5 injured. 47 families or 203 people were affected. 150 people were evacuated. 20 houses were damaged. Response: Local authorities conducted search and rescue operation, and evacuation.</p>
Flood (Perlis & Kedah State)	Sep 16 th 2015	<p>The continuous rain has triggered flooding in Perlis and Kedah State . The National Security Council (MKN) was reported to have evacuated several families due to the situation. Impact: 127 families were affected in Perlis At least, 1,000 people were affected by flood in Changlun, Kedah 438 people were evacuated to 12 evacuation centres in Perlis. Response: The local government has responded to the situation and evacuated the victims.</p>
Flood (Kelantan)	Dec 16 th 2014	<p>Due to heavy rainfall caused by Seasonal Moonsoon, flood has occurred in Kelantan. Impact: S: 4,677 persons were affected Response: : local authorities responded to this situation and provides emergency evacuation shelters</p>
Kuala Lumpur	Apr10th2013	<p>Reports from Kuala Lumpur have said there was a massive thunderstorm on the early evening of 10th April, from around 17:30. The storm and heavy downpour that accompanied it lasted for about 1 hour. Incredibly the rainfall was so heavy during that short time that it wreaked havoc across the city of Kuala Lumpur. In particular the roads and transport system generally has suffered.</p>
Kuala Lumpur	Sep2th 2013	<p>After heavy rainfall on Sunday 1st September, flash floods affected several parts of Kuala Lumpur. There have been no reported casualties. The worst to suffer the city's commuters as several major highways were closed, including the Federal Highway. Some roads became impassable due to flood waters, others became blocked by stranded vehicles. Fallen trees were also a problem, and the Selangor Fire and Rescue service had to send out teams to help clear various roads. However, Kuala Lumpur is making some progress in flood prevention and protection, and currently has a project providing flood water ponds located in Batu, Jinjang and Kepong, able to accommodate high water levels of the Gombak River when necessary. Kuala Lumpur also has the SMART Tunnel (Stormwater Management and Road Tunnel), which opened in 2007 and is an innovative solution to the city's flood and traffic problems. The submerged tunnel can carry both flood water and vehicles.</p>
Sabah	Sep9th 2013	<p>Flash floods struck yesterday in the Malaysian state of Sabah after around 2 hours of heavy rainfall. The worst affected areas are around the state capital, Kota Kinabalu, and suburbs and nearby areas including many parts of Penampang. Rains were expected to ease over the next few hours. Plans have been drawn up to develop flood defences for areas most at risk. However flood mitigation has not yet gone beyond the planning and discussion stage with the Penampang District Council. Perhaps these recent floods will stress the need for flood defences to be developed. One local politician, Moyog Assemblyman, Terrence Siambun said "The mitigation plan must be implemented now. Natural disasters strike at any time and we cannot just sit and wait for something terrible to happen before taking action."</p>
Kulim	Oct21th 2013	<p>Heavy rainfall on 20th October brought flash floods which inundated villages around Kulim, in Kedah state, Malaysia. Around 200 people had to be evacuated from their homes immediately yesterday. A further</p>

		300 have also since been evacuated today after rising water levels of rivers posed a further threat to residents' safety. The displaced are currently taking shelter in temporary accommodation in 9 relief centres.
Perak & Kedah	Oct23th 2013	Around 1,000 people had to be evacuated in Manjung district of Perak state. Continuous heavy rainfall since 20th October led to flooding in the district. However the situation was worsened by an unusually high tide. Some reports claimed the flood water was as high as 1.6 metres in some areas of the district. Flood water levels in Sungai Batu were up to 1.5 metres and 1.6 metres in Padang Serai. Kampung Tebuk Yan also saw some flooding, with flood waters as up to 1 metre deep.
Pahang , Kedah & Perak	Oct24th 2013	Pahang State At least two people have died and another remains missing in Cameron Highlands after the Bertam River overflowed. It is understood that the flooding of the river was caused by the release of water from a nearby dam. At least 80 houses were destroyed in the flooding. Kedah State Meanwhile, flooding in Kedah, Malaysia appears to have worsened in some areas. It was believed that the flood waters were receding, but further heavy rainfall, particularly in the Pendang district, has meant that a further 200 or more people have needed evacuate their homes and take refuge in relief centres. Perak State Elsewhere in Malaysia, flooding that had previously led to the evacuation of around 1,000 people in Perak state now appears to be receding. However, there are still over 700 people staying at relief centres and this time of year often sees heavy rainfall that could soon change the situation in Perak, as it did in Kedah state.
Cameron	Nov15th 2013	In October 2013, flash-flooding in the catchment of the Ringlet reservoir coupled with existing siltation resulted in a rapid rise in the water level, necessitating such a step. Unfortunately, even the controlled release of water resulted in the flooding of 100 houses in the village Kg Bertam Valley on the Sundai Bertam below the dam, and led to the death of four people.
Pahang & Sarwak	Dec2th 2013	There have been 2 reports of recent flooding in Malaysia. On 26 November, there were flash floods in Kampung Long Busang in Sarawak, affecting an estimated 513 people from around 70 or more families from the village, which is so remote it takes an 8 hour boat ride upstream of the Bakun dam to get there. Homes and a primary school were damaged in the floods.
Worsen	Dec3th 2013	Pahang As reported by FloodList yesterday, the area of Rompin in Pahang, Malaysia suffered flooding after prolonged heavy rainfall. Around 100 people, mostly the residents of the village of Kampung Kesing Orang Asli, were evacuated. Since then, the rainfall has continued and the floods worsened, affecting a wider area. Today it was announced that over 5,000 people have since been evacuated from Rompin, Kuantan, Pekan and Maran. Flood relief centers have been set up for all of those displaced. The heavy rainfall in Pahang is continuing and the floods are expected to worsen. Johor Over 1,000 people needed to be evacuated from floods in Johor state. Around 16 villages in the area around Mersing have been affected. This is a coastal area, and yesterday's floods were in part caused by the high tide of 3.3 meters. It is expected to be at least one week before the water fully subsides. Terengganu There were also reports of some flooding in the low lying areas of district of Kemaman, Terengganu, where around 20 people had to be evacuated last night. However, the situation today is much worse and around 450 people have evacuated and are now in a flood relief camp. Numbers evacuated so far: •Kelantan – 232

		<p>• Terengganu – 2811 (1 person reported killed in the floods, another missing)</p> <p>• Penang – 9030 (2 people reported killed)</p> <p>• Johor – 5,659</p>
Penang, Terengganu, Kelantan & Johor		<p>Penang 1 dead, 2 missing 38,323 evacuated and staying in relief centres 122 relief centres across seven districts Kuantan worst affected, with 30,307 staying in relief centres there Rompin (4,289 evacuated), Pekan (3,037), Maran (637), Jerantut (25) Lipis (21) and Temerloh (7) have also been affected. As much as 243.6 mm of rain fell in 24 hours in Kuantan on 3 December</p> <p>Terengganu 1 dead 7,780 evacuated 101 relief centres Floods have now struck in Besut district Kemaman district worst affected, with 3,840 victims in relief centres there Dungun (2,130 evacuated), Hulu Terengganu (1,654) and Marang (54) are also badly affected.</p> <p>Kelantan 986 evacuated Kuala Krai is the worst affect, with 646 evacuated. Machang (71 evacuated), Pasir Mas (24), Pasir Puteh (109) and Tanah Merah (136) also affected. River levels are of most concern in Kelantan, in particular Sungai Lebir, Sungai Kelantan and Sungai Golok. On 5 December, the river levels were: Sungai Lebir at Tualang – 36.19ms (danger level 35m) Sungai Kelantan at Tangga Krai – 25.35m (danger level 25m) Sungai Golok at Rantau Panjang – 10.21m (danger level 9m)</p> <p>Johor 8,250 evacuated Mersing was the worst affected, with 5,694 people at relief centres Segamat (1,081), Kluang (975), Kota Tinggi (212), Muar (217) and Batu Pahat (71) were also affected.</p>
Johor	Dec9th 2013	As of yesterday, 8 December, there were 65,956 people displaced by the floods across much of eastern Malaysia, staying in 217 relief centres that were set up by the authorities. It is thought that with the improvements of the situations in Kelantan and Johor, that number may now have fallen. The figure for Johor is now thought to have fallen from 1,024 to 602 still in the relief centres.
Sabah	Dec20th 2013	Local media are reporting that around 22 villages have been flooded. The worst affected area is the sub-district of Kemabong, in particular Kg Gumisi, where around 44 families were evacuated. Evacuations were also necessary in Kuala Tomani and Kg Bangkulin, although it is understood this involved around only 10 families. There have been no reports of any injuries or fatalities in the flooding.
Kuching City	Jan6th 2014	Continuous heavy rainfall on Sunday 5 January 2014 left areas of Kuching, the city in the Malaysian state of Sarawak, suffering from flash floods. Many roads were said to be under water. According to The Malay Online the worst affected areas of the city were Batu Kawa, Matang and Gita.
Kelantan	Jan11th 2014	Two districts of the state – Jeli and Tanah Merah have been worst hit. Over 1,000 people have been evacuated in Jeli. The evacuees are being sheltered in 4 special relief centres that have been set up. More than 200 people have been displaced in Tanah Merah.
Sabah	Feb17th 2014	Floods that struck the Sabah region of Malaysia on 13 February 2014 have now affected around 50,000 people. The recent flooding has been described as the worst in the region for 30 years.
Kuala Lumpur	Oct2nd 2014	Just 90 minutes of heavy rain on 01 October 2014 brought traffic in parts of Kuala Lumpur to a standstill and turned a parking lot in the Jalan Pinang area into a lake. (Flash Floods)

Sabah	Oct7th 2014	Kota Kinabalu, the capital of the state of Sabah, located in East Malaysia, saw 147 mm of rain fall in the 24 hour period between 06 and 07 October 2014.
Cameron Highlands	Nov6th 2014	The Cameron Highlands in Malaysia has once again experienced deadly flooding, just over a year after 4 people died in floods in the same region. (Flash Floods)
Thailand-Malaysia Border	Dec19th 2014	Across the region a total of four people have been reported as killed in the floods and 14,000 people evacuated (12,000 in Malaysia). Two people remain missing in the floods in Thailand.
Sabah, Kelantan, Terengganu and Pahang	Dec23th 2014	Currently 20,468 people have evacuated their homes in Kelantan. Over 6,000 people remain in relief centres in Terengganu. In Pahang over 3,000 have been displaced. Kuantan is the worst hit district, with 1,623 people being housed at 20 relief centres. Malan district has also been badly hit and over 1,000 people have been displaced there.
Sarawak	Jan19th 2015	The Malaysian Government said yesterday that 3,485 people have been evacuated in the state of Sarawak after flooding in the area.
Borneo & Sumatra	Jan20th 2015	In Borneo, over 5,000 people have been evacuated in the flood-hit state of Sarawak. This figure has dropped slightly from almost 7,000 earlier today. 38 relief centres have been set up to house those displaced by the floods. The worst affected area is around the state capital of Kuching, where at one point almost 5,000 were staying in temporary accommodation. Just over 1,000 people have been displaced in Padawan.
parts of Negeri Sembilan state	Dec15th 2015	Malaysia's National Disaster Management Agency (NDMA) report that flooding in several states has forced almost 3,000 people to evacuate since 11 December 2015.
Johor, Melaka, Negri Sembilan & Sarawak	Feb9th 2016	Floods in the states of Johor, Melaka, Negri Sembilan and Sarawak in Malaysia have displaced at least 1,600 people. Two people are reported to have died in the floods in separate incidents in Johor.

Source: JICA Project Team based on Information of ADRC, Floodlist and AHA Centre

Table A5.1.5 Record of Flood (Myanmar)

Place	Date	Damage
Myanmar		
Cyclone	28 th May. 2004	On 19 May, a storm that formed over the Bay of Bengal crossed the southwest coast in Myanmar near the border with Bangladesh. The storm with winds of over 160 km per hour caused tidal surges and flooding in the four towns of Pauktaw, Myebon, Sittway and Kyaukpyu in Rakhine State. This storm killed at least 140 people in Myanmar and left 18,000 homeless
Tropical Cyclone	4 th May. 2006	Another 14 people were still missing after the storm swept inland on April 29 and struck Kyangin Township, 130 miles (210 km) northwest of the capital, Yangon, the Kyemon newspaper said.
Flood	11 th Oct. 2006	At least 57 people have been killed and thousands forced to abandon their homes as the worst floods in recent memory wreaked havoc across Thailand and Burma on Thursday. One official says Burmese authorities evacuated 500 homes on the outskirts of the central city of Mandalay after floodwaters rose overnight, while residents say about 10,000 people had fled to emergency shelters.
Flood	6 th May. 2007	At least five people have died in the main commercial city of military-ruled Myanmar after the heaviest rainfall in at least four decades, state media and government officials said on Sunday.
Cyclone	2 nd May. 2008	A tropical cyclone has killed at least 22,500 people in Myanmar and 41,000 people are missing.
Flood	4 th Jul. 2009	Over 1,000 people have been affected and are in need of support following a landslide due to heavy rains in northern Myanmar.
Flood	16 th Jun. 2010	Heavy rain in Myanmar has triggered floods and landslides, washing away bridges, blocking roads and killing at least 25 people
Cyclone	22 nd Oct. 2010	The Government has reported that at least 45 people are dead or missing to date, while 101,923 people remain homeless and at least 20,380 houses were completely destroyed, with a total of at least 260,000 people (52,000 households) affected.
Flood	7 th Aug. 2011	In Toungoo, 3,122 persons from 621 households were evacuated to 11

		relief camps.
Flood	20 th Oct. 2011	Rainfall in Magway Region, Myanmar on 20 October 2011 caused 59 death toll and 47 missing destroying cattle, crops and buildings by the flood.
Flood	Aug. 2012	More than 68,000 people are staying in 308 camps around the country, according to the Social Welfare, Relief and Resettlement Ministry.
Flood	29 th Jul. 2013	As of 2 August, the Relief and Resettlement Department (RRD) report 38,316 people displaced by monsoon floods in Kayin, Mon, Tanintharyi and Rakhine States and the Ayeyawadi Region.
Flood	5 th Aug. 2014	Continuous rains has caused flooding in Bago Region. As of 8 Aug, the Department of Relief and Resettlement reports around 15,850 people from Bago, Kawao, Thanatpin and Wah townships are in temporary shelters.
Flood & landslide	2 nd Jul. 2015	Over the past several days, increasing heavy rains have caused severe flooding in the western state of Rakhine, Myanmar. It is estimated that 13,000 people were affected by the floods, with over 8,500 evacuated so far.
Heavy Rain & Flood	19 th Jul. 2015	Torrential rains have triggered flooding in Kachin State and Sagaing Region, Myanmar. Some 57,000 people were affected in Sagaing with 2,000 people affected in Kachin.
Heavy Rain & Flash Flood	9 th Jun. 2016	Heavy rains triggered flash floods in Kawlin, Wuntho and Pinlebu townships in Sagaing Region, Myanmar on 9 June 2016. More than 25,000 people were affected in Kawlin.
Flood	5 th Jul. 2016	130 people affected by flood in Myanmar's western Rakhine state.
Flooding	Jul28th 2015	Myanmar has experienced torrential rains starting from the end of June. The rains are associated with the Southwest Monsoon, which marks the start of the rainy season in Myanmar. Monsoon season usually begins in May or June and continues until October. The development of a tropical storm over the Bay of Bengal has also enhanced the situation by creating more heavy downpour and thunderstorm over the last days of July. The flooding affected 13 states and regions in Myanmar, which include: Rakhine, Sagaing, Magway, Chin, Ayeyarwady, Bago, Mandalay, Kayin, Kachin, Shan, Mon, Yangon and Tanintharyi. Based on most recent information from NNDMC (15 August), the flood incidents have claimed for Impact: 110 death 1,615,335 people were affected 333,178 people were displaced 16,095 houses were damaged Over 1.4 million acres (or 566,000 ha) of farm land were inundated and 910,000 acres (370,000 ha) were damaged by the floods.
Flood in several states	Jun25th 2015	The Southwest Monsoon which marks the start of the rainy season (May/June to October) has triggered flooding in Myanmar. The flood has affected several districts and townships in Rakhine State, Tanintharyi Region, Kayin State, Ayeyarwaddy Region and Bago. Impact: 7 death 14,426 were affected 2,453 houses were affected 69 ha of agricultural land was damaged in Arakan
Typhoon Kalmaegi	Sep18th 2014	Relief and Resettlement Dept (RRD) of Myanmar reported flooding and basin erosion as the effect of Typhon Kalmaegi. The affected area were: - Tachileik in Shan State - Katha in Sagaing Region - Singu in Mandalay Region - Ingapu in Ayeyarwaddy Region Impact: as of 23 September 2014 6 death 1,267 families were affected 4,905 people were displaced and stayed inside 6 evacuation centres 1,298 houses were damaged
Flashflood in Tachileik	Sep6th 2014	Due to torrential rain in the mountainous area, causing flash flooding in Tachileik of Shan State Impact: 1079 families affected 4109 people evacuated 900 houses inundated
Flooding	Aug23th 2013	As many as 25,000 people were evacuated after heavy rainfall brought floods to Karen, Mon and Rakhine states. Around 80 relief camps were set up for those displaced. Flooding continued into August in various areas of the country, including Rangoon, but especially in the border regions with Thailand.
Flooding	Sep25th 2013	In Myanmar flooding has been caused by the overflowing Ayeyarwaddy River. Particularly badly hit is the Hinthala Township, Ayeyarwaddy Region, where around 1,000 people have been displaced.

Floods	Aug5th 2014	Heavy monsoon rain has flooded 5 villages near Hlegu, Yangon (Rangoon) region, Myanmar. Local media say that around 3,000 people have been affected, with some areas under as much as 1 metre of flood water. The heavy rain flooded the nearby Bago (Pegu) river and Ngamoeyeik creek, which inundated the villages of Ngwenanthar, Malit, Sinhpon, Sitpinmyauk and Yaekyaw.
Flooding	Jul3rd 2015 Jul22th 2015	The ASEAN Coordinating Centre for Humanitarian Assistance on disaster management (AHA Centre) is reporting that floods caused by heavy rain since 15 July have affected around 60,000 people in Kachin State and Sagaing Region in Myanmar.
Cyclone Komen	Aug3rd 2015	According to initial figures from the Government's Relief and Resettlement Department (RRD), as of 01 August, 2015, over 156,000 people have been affected across Sagaing, Kachin, Shan, Mandalay, Chin, Rakhine, Kayin, Mon, Bago, Magway, Ayeyarwady and Yangon.

Source: JICA Project Team based on Information of ADRC, Floodlist and AHA Centre

Table A5.1.6 Record of Flood (Philippines)

Place	Date	Damage
Philippines		
Typhoon	Sep-Oct. 1998	Massive flooding, brought about by rising waters in the lowlying areas, caused the death of 27 persons. Extensive floods triggered by back-to-back typhoons have affected a wide area on the main island of Luzon, Philippines
Typhoon	Dec.1998	Typhoon Faith hit Philippine on 12 Dec 1998, and caused damage in 17 provinces. 8 people have been killed, 5 people habve been injured by 15 Dec 1998. Dead: 8 Injured: 5 Missing: 17 Provinces affected: 17 Displaced populations: 9,214 families or 51,785 people
Flood	4th Feb. 1999	Flash floods occurred along the Lampan river on 21 February. The floods were caused by continuous rains in the province of Lanao del Norte in Mindanao.
Flood & Land Slide	Aug. 1999	The heavy rainfall have been pouring down for a week. It have provoked lethal floods and landslides in the Metropolitan Manila and nearly provinces. Most severely affected is the Rizal Province. Other provinces, such as Pangasinan, Pampanga or Bulacan have also been inundated. Heavy monsoon rains left 177 people dead and 1.3 billion pesos (33 million dollars) in damage.
Flood	2nd Jan. 2000	A week of torrential rain at the end of January 2000 has caused flash floods on the island of Mindanao in the southern Philippines. Affected population is 153,885, evacuated population is 14,460, fatalities is 34, missing persons is 16. Houses totally destroyed is 55.
Tropical Cyclone	4-10th Jul. 2000	Tropical Depression Edeng in conjunction with the southwest monsoon has brought heavy rains over the entire area of Luzon and the Visayas in the Philippines. According to a report issued by the Philippine National Disaster Coordinating Council (NDCC) on 6 July 2000, 12 persons have been killed, 5 persons have been injured and 1 person is missing. Meanwhile, the local news agency reports that 22 people have been killed so far.
Typhoon	4th Jul. 2001	Typhoon Utor has killed at least 163people, injured 180 people and left 60 others missing in the Philippines.
Typhoon	7th Nov.2001	At least 22 people were killed and more than 100 were missing as tropical storm Lingling slammed across the Philippines' central and southern regions.
Flood	21st Nov. 2001	Rising flood waters forced 29,000 people from their homes, washed out several roads and damaged 66 houses after several days of heavy rains in the central Philippines
Tropical Strom	1st Dec. 2001	Tropical Storm Nanang cut a wide swathe of destruction in Central Visayas, where damage to agriculture, fishery, livestock and infrastructure reached P364.3 million, the biggest amount in recent catastrophes, said the final report of the Regional Disaster Coordinating Council
Flood	7th Dec. 2001	Tropical storm Kajiki departed the Philippines on Friday leaving two people dead and more than 6,400 people displaced by flashfloods and landslides.
Flash Flood	5th Jan. 2002	Seven people have been killed and three others are missing after flash

		floods caused by heavy rains hit the southern city of Davao.
Flash Flood	27th Mar. 2002	Twenty-eight people were killed and two others were missing after flashfloods triggered by heavy rains swept through two southern Philippine provinces Dead: at least 35 people Missing: 4 people More than 55,000 people displaced. Damaged: nearly 1,000 homes More than 50 bridges were damaged.
Flood & Landslide	7th Jul. 2002	At least 27 people were killed in the Philippines when monsoon rains triggered floods and landslides and forced more than 24,000 people to flee their homes.
Flood	13th July 2002	At least 50 people have died in rain and floods brought by a succession of typhoons and tropical storms over the past week
Flood	21st Jul. 2002	Three people drowned in floods and a landslide buried alive a family of three as heavy rains pummelled the Philippines' main island of Luzon, including Manila.
Strom Flood	26th Jul. 2002	A week of heavy rains and flooding has left 18 people dead in the Philippines
Floods	12th Aug. 2002	At least 17 people have been killed as torrential rains unleashed floods over a wide area of the Philippines.
Flash Flood	5th Nov. 2002	Three people were killed and 40 others were missing when a Dolbo passenger bus loaded with 60 passengers capsized in a flashflood while trying to go through the temporary overflow bridge along the Daang Maharlika at Siffu River in this province
Flash Flood	25th Mar. 2003	A family of five drowned in a flash flood that hit three interior barangays of Malita, Davao del Sur
Tropical Storm	26th May. 2003	A tropical storm lashed the northern Philippines for a third day on Wednesday, raising the death toll to 10 and causing widespread flooding. Death toll:37 people Injured:16 people Missing:1 people Displaced:8,000 people Sheltered:3,704 thousand people
Tropical Storm	14th Jun. 2003	Landslides and floods caused by tropical storm "Soudelor" hit central and northern Philippines and 11 people were killed, three were injured and two others remain missing. DEATHS: 12 MISSING: 2 INJURED: 3 AFFECTED FAMILIES: 18,832 AFFECTED PERSONS: 49,489 HOUSES DESTROYED: 176 TOTAL DAMAGE PROPERTIES (AGRI/LS, FISHERIES, INFRA): 4.299 MILLION PESOS (81,116 Thousand Dollars)
Typhoon	22th Jul. 2003	On 22 July 2003 Typhoon Imbudo which was centered about 360 kilometers (225 miles) southeast of Aparri town in Cagayan province, hit the Philippines with peak sustained winds of nearly 200 kilometers (nearly 120 miles) an hour, rescuers and radio reports said. Typhoon Imbudo has reportedly killed 21 people in the Philippines this week.
Tidal Waves	23th Jan. 2004	Giant waves occurred in the province of La Union of the Philippines on 23 January 2004. Four fishermen have been confirmed dead and 23 are still missing.
Typhoon	18th May. 2004	Landslides set off by a super typhoon "NIDA" (Dindo) have destroyed hundreds of houses in an eastern coastal town of the Philippines, on May 18, 2004. Typhoon Nida killed at least 19 people and displaced thousands.
Typhoon	30th Jun. 2004	Rescuers in the Philippines have recovered the bodies of five more victims from typhoon Mindulle, raising the death toll to 30, with 12 others still missing and feared dead.
Typhoon	26th Aug. 2004	Death toll rose to at least 29 and 1.3 million people have been affected in the Philippines as heavy rain whipped up by two typhoons caused floods and landslides in Manila and neighbouring areas. Disaster officials said the death toll rose to at least 29 on Monday. About 1.3 million people have been affected by floods and landslides during five days of heavy rain caused by two typhoons churning north of Philippine .
Typhoon	20th Nov. 2004	At least three people were killed and more than 3,300 others evacuated after a typhoon, Muifa, hammered the northern Philippines. At least 65 people have died and thousands were left homeless in the Philippines as fresh rains and flooding from a tropical storm on Tuesday compounded the misery and damage from a typhoon over the weekend.
Typhoon	30th Nov. 2004	The death toll from landslides and flash floods in the eastern Philippines jumped to nearly 350 with 150 others missing Tuesday, most of them from a region still reeling from last week's deadly typhoon.

Tropical Storm	17th Mar. 2005	Two passenger ferries capsized during a fierce tropical storm in the central Philippines on Thursday, killing at least three people and leaving eight missing, officials said. The death toll from a tropical storm that hit the central Philippines this week has risen to 15, with at least 16 people still missing. Local officials say a fishing boat sunk off Tarangan town on the eastern island of Samar, killing eight crew members and leaving up to 15 missing.
Flood	19th Sep 2005	Floods, landslides and a boat accident following days of heavy rains have left at least seven people dead in the Philippines, officials said. The Office of the Civil Defense said the flooding affected more than 25,900 people, including 2,242 who were evacuated from their communities in seven northern provinces and Metro Manila. Many have since returned home. The OCD said 43 villages in Pampanga and Nueva Ecija were still underwater on Saturday. Officials blamed garbage-clogged drains for the quick rise and slow recession of floodwaters in Metro Manila. The seasonal monsoon rains that drenched wide areas of Luzon were aggravated by a low-pressure system that swept through the region.
Typhoon	23rd Sep. 2005	At least 16 people were killed and about 20,000 people are staying in shelters after Typhoon Damrey swept the main Philippines island of Luzon on Friday.
Flood	6 th Dec. 2005	Two people were killed and nearly 50,000 were displaced by floods triggered by continuous monsoon rains in the Philippines. Affected: 192,946 (42,843 families) In shelters: 6,995 (1,399 families) Houses totally destroyed: 29 Houses partially damaged: 47
Flash Flood	14 th Feb. 2006	Philippine social welfare officials say six people have now died in flashfloods that hit four provinces in the south of the country.
Typhoon	13 th May. 2006	Typhoon "Chanchu" whipped through the northwestern Philippines on Saturday, after killing six people in stormy seas and leaving more than 10,000 people stranded as air and ferry services were suspended. At least 37 people are thought to have died in tropical storm Chanchu, now heading towards southern China.
Typhoon	13 th Jul. 2006	Tropical storm Bilis became a full-fledged typhoon after killing at least nine people in the northern Philippines as it headed toward Taiwan, dumping heavy rains and shutting down schools and offices.
Flood	15 th Aug. 2006	Floods and landslides triggered by heavy monsoon rains have killed 16 people in the southern Philippines and displaced tens of thousands, a disaster official said on Tuesday. Tens of thousands were displaced by the floodwaters and landslides. Eight people, including two children, were reported missing when soil, loosened by almost five days of rain, buried a cluster of shacks in the southwestern province of Zamboanga del Sur on Monday.
Typhoon	27 th Sep. 2006	On September 28, 2006, at least eight people have been killed and several are missing in the Philippines after Typhoon Xangsane brought fierce winds and rain.
Typhoon	30 th Oct. 2006	Typhoon Cimaron battered the northern Philippines on Monday, killing at least 10 people in a barrage of landslides and flooding, officials said.
Typhoon	6 th Dec. 2006	Tens of thousands of people spent the night in makeshift shelters as Typhoon Utor plowed through the central Philippines on Sunday, killing three and causing blackouts and cutting communication lines in the archipelago.
Flood Landslide	9 th Aug. 2007	On 9 August, three people were killed, 17 wounded and 13 were missing as tropical storm Wutip left the Philippines, after causing floods and landslides in parts of the north. Tropical storm Wutip kills 3 in Philippines, 17 hurt
Flood Landslide	19 th Nov. 2007	Landslides caused by a tropical storm LANDO, have killed people 13 in the central and southern Philippines on 19-20 November 2007. 9 Dead 5 Injured 18,084 Affected 11 Houses totally damaged 7 Houses partially damaged
Typhoon	25 th Nov. 2007	Heavy rain from an approaching Typhoon Mitag lashed the Philippines on 25 November, 2007, killing at least 12 people and destroying homes and rice paddies.
Floods	7 th Jan. 2008	Due to northeast monsoon affecting eastern and southern Luzon, the Philippines, rains and floods caused 2 missing and 2,330 affected. Dead: 1

		Injured: 4 Missing: 0 Affected: 29,184 Affected families: 7,435
Flood Landslide	12 th Feb. 2008	There were 35 persons reported dead and 27 injured while 10 are still missing due to flooding and landslide in the Philippines. 597,077 affected
Typhoon	12 th May. 2008	Although typhoon Rammasun (Butchoy) did not cross mainland, the southwest monsoon and rains it brought about has triggered floodings and minor landslides in Metro Manila, Region 4-B, 6,7,12, and ARMM, the Philippines. A total of 54,252 persons were affected and 1,710 persons evacuated.
Typhoon	17 th May. 2008	A total of 416,697 persons were affected by flooding, storm surge and landslide triggered by tropical storm Halong in Regions 1, 3, 6 and CAR, the Philippines.
Flash Flood	5 th Jun. 2008	Authorities say flash floods have killed two men and sent 1,000 residents fleeing their southern Philippine riverside village.
Typhoon	Typhoon	Typhoon Fengshen has killed 155 people in the Philippines in a torrent of flashfloods and landslides, the head of the Philippines Red Cross, Richard Gordon, told local radio on Sunday. Dead: 557 Missing: 87 Injured: 826 Affected: 4,784,634 Totally damaged houses: 81,510 Partially damaged houses: 326,321
Typhoon	14 th Jul. 2008	Typhoon Kalmaegi (Helen) has caused 2 deaths killed and 31,129 people affected in the Philippines as of 18 July 2008.
Typhoon	20 th Aug 2008	Landslides and floods triggered by Typhoon Nuri in the northern Philippines have killed seven people before it started moving toward Hong Kong. Dead: 14 Missing: 23 Injured: 13 Affected: 352,135 Totally damaged houses: 706 Partially damaged houses: 7,874
Floods	7 th Sep. 2008	Rescue workers pulled eight bodies buried under tonnes of mud after days of monsoon rains loosened soil and buried about 20 makeshift houses near a mining town in the southern Philippines, an army spokesman said on Sunday. Dead: 24 Missing: 2 Injured: 31 Totally damaged houses: 83
Typhoon	19 th Sep. 2008	Typhoon Hagupit entered the Philippine Area of Responsibility as a Tropical Depression on September 19, 2008. It intensified into a typhoon, although it did not make landfall, enhanced the southwest monsoon and brought rains over southern Luzon and Visayas particularly over the western sections. Dead: 11 Missing: 17 Injured: 23 Totally damaged houses: 170 Partially damaged houses: 933
Flash Flood	21 st Nov. 2008	The population affected by the continuous heavy rains that triggered flashfloods in the provinces of Cagayan and Isabela, the Philippines on 21 November 2008 now reached 32,575 families/136,490 persons. Dead: 14 Missing: 15 Evacuated: 23,771 persons (32,049 families) Affected: 412,209 persons (87,350 families)
Flood	8 th Dec. 2008	The continuous rains on 8 December 2008 has caused flooding in Northern and Oras of Eastern Samar, the Philippines. Two persons were reported dead due to drowning and 6,485 families were affected. 10 persons died due to the flooding in Region 8 while 8 persons were injured and 143,309 persons (26,073 families) were affected.
Flood	7 th Jan. 2009	Nearly 200,000 people have been displaced by severe flooding caused by heavy rains from 7 to 13 January 2009 across the eastern coasts of the Philippines, according to disaster relief officials. So far, nine people have been killed, either by drowning or in landslides, while nine more are missing. Dead: 53 persons Missing: 12 persons Injured: 18 persons Affected: 248,307 families / 1,186,880 persons Totally damaged houses: 2,570 Partially damaged houses: 9,733
Flash Floods	5 th May. 2009	Flash floods and landslides triggered by heavy rains dumped by a typhoon have killed 20 people and left three missing in the Philippines, the country's disaster agency said on Monday. Dead: 27 Missing: 1 Injured: 5 Affected: 246,170 Totally damaged houses: 20 Partially damaged houses: 17 Damaged agricultural land: 19,012.68 ha
Typhoon	8 th May. 2009	Fifteen people were killed when a typhoon pounded the northern Philippines, triggering mudslides and tearing roofs off houses before weakening, officials said on 8 May 2009. Dead: 47 Missing: 15 Injured: 42 Affected: 161,020 Totally damaged houses: 6,084 Partially damaged houses: 17,242
Tropical Cyclone	23-25 th Jun. 2009	The Philippines was struck by the tropical cyclone "Nangka" from 23 to 25 June 2009. 7 people were killed, 8 people are missing, and approximately

		53,897 people were affected. Dead 7 Missing 8 Injured 5 Affected 53,897 Totally damaged houses 320 Partially damaged houses 2,428
Floods	30 th Jul. 2009	On 30 July, 2009, flooding affects 160,000 in southern Philippines. Heavy rains across the southern Philippines have resulted in massive flooding in many low-lying areas of Mindanao Island. Some 159,775 people in central Mindanao or about 31,955 families have been affected so far, and while flooding in some areas has subsided, large parts remain inundated.
Typhoon	8 th Aug. 2009	The fringes of Typhoon Morakot killed 10 people and injured 18 others in the Philippines, a spokeswoman for the National Disaster Coordinating Council told CNN. Dead: 22 Missing: 4 Injured: 18 Affected: 192,211 (18,618 families) Evacuated: 11,216 (2,925 families)
Flood	26 th Sep. 2009	Torrential rains and subsequent flooding from Tropical Storm Ketsana have claimed at least 50 lives in the Philippines, a government official said Sunday. Dead: 464 Missing: 37 Injured: 529 Affected: 4,730,153
Typhoon	4 th Oct. 2009	Typhoon Parma crossed the northern tip of the already storm-battered Philippines over the weekend, triggering landslides that killed at least 12 people. Dead: 465 Missing: 47 Injured: 207 Affected: 4,478,284 Totally damaged houses: 6,038 Partially damaged houses: 50,780
Typhoon	30 th Oct. 2009	The fourth storm, Typhoon Mirinae, in a month to hit the Philippines has lashed the eastern coastal province of Quezon, bringing heavy rain and winds to the region. At least seven people have been killed and several others are missing. Dead: 34 Missing: 5 Injured: 20 Affected: 802,155 Totally damaged houses: 9,868 Partially damaged houses: 57,843
Flood	24 th Nov. 2009	Agusan del Norte experienced flooding due to swelling and overflowing of Puyo and Celopan Rivers of the Philippines due to continuous rains for 5 days since 20 November 2009. 4 persons were dead and 13 were injured. A total of 12,326 families / 48,129 persons were affected in Region X and in CARAGA. 148 families / 1,132 persons were affected and displaced and are currently staying in 3 designated evacuation centers.
Typhoon	14 th Jul. 2010	Parts of Manila may be without power until Friday after Typhoon Conson hit the Philippines' main island of Luzon, killing at least 11 people with more than 50 missing.
Typhoon	18 th Oct. 2010	A fisherman is dead and two others were missing Monday as Typhoon Megi wreaked havoc in the Philippines.
Flood	3 rd Nov. 2011	Heavy rains caused flooding in Region 2, 3 and CAR of the Philippines. Seven were killed and three remain missing.
Flood	31 th Dec. 2011	Heavy rains and flooding in the Philippines have killed two people and displaced many thousands more.
Flood, Landslide	13 th Jan. 2011	The Low Pressure Area (LPA) which prevailed since January 31, 2011 to February 04, 2011 brought widespread rains over Visayas and Mindanao
Flash Flood	3 rd Jul. 2011	On 3 July 2011, a flashflood occurred in Gen. Santos City, Region 7 of the Philippines due to heavy rains and affected 866 persons.
Typhoon	28 th Jul. 2011	Typhoon Muifa affected in Regions I, III, IV-A, VI and NCR of Philippines, causing floods and landslides.
Typhoon	28 th Aug. 2011	Typhoon Nanmadol kills at least eight people in the Philippines.
Typhoon	27 th Sep. 2011	Typhoon Nesat crossed the Philippines main island late on Tuesday, leaving behind at least seven dead after it lashed crop-growing provinces and brought the capital to a near standstill as it flooded roads and villages and cut power supplies.
Flood	9 th Dec. 2011	Heavy rain and floods by the effects of Low Pressure Area have affected more than 18,000 people in the Philippines.
Typhoon, Flood	16 th Dec. 2011	Typhoon Washi (Sendong), with winds gusting up to 90km/h (56 mph), hit Mindanao late on 16 December, bringing heavy rain. More than 250 people were killed.
Flood	25 th Dec. 2011	Low Pressure Areas (LPA) and Northeast monsoon in Luzon and Visayas, the Philippines caused heavy rainfall, triggering flooding. Ten people were killed and 2 missing.
Typhoon	2 nd Jun. 2012	On 2 June 2012, Tropical Storm (later Typhoon) Ambo (Mawar) has gained strength as it moves along the eastern coast of northern Luzon in the Philippines. Flooding and landslide have occurred and four people were missing.
Flashflood	12 th Jun. 2012	On 12 June 2012, two persons died and at least 3,154 families were

		affected by flashfloods brought about by the shallow low pressure area that affected a large part of Soccsksargen Region in the Philippines.
Flash Flood, Landslide	28 th Jun. 2012	In the Philippines, Tropical Storm Dindo (Doksuri) has maintained its strength as it continues to move towards extreme northern Luzon. A flashflood occurred on 26 June 2012, 5:00 PM, affecting in Valencia Bukidnon. A total of 295 families were evacuated.
Typhoon	30 th Jul. 2012	Typhoon Saola swept past the Philippines, bringing heavy rains to large parts of the country. 8 people were killed and over 8,400 took shelter in 43 evacuation centers by 31 July.
Heavy Rain, Flood	7 th Aug. 2012	Torrential rains brought the Philippines capital to a standstill 7 August 2012, forcing at least 20,000 people to flee their homes.
Typhoon	10 th Oct. 2012	Tropical Storm Son-Tinh (Ofel) has crossed the southern part of Mindoro Island of the Philippines. Five people were killed and nine missing.
Typhoon	4 th Dec. 2012	Typhoon Bopha hit the southern Phillipine island of Mindanao early on 4 December 2012. Dead: 1,067 Injured: 2,666 Missing: 834 Affected: 6,243,998
Typhoon	12 th Aug. 2013	Typhoon Utor made landfall in the north of the main island of Luzon early on 12 August 2013, bringing winds of up to 200km/h (124 mph) and torrential rain. At least 23 fishermen were left missing.
Flood, Landslide	18 th Aug. 2013	Heavy monsoon rains aggravated by Tropical Storm Trami (locally known as Maring) caused flooding and landslides in 11 provinces and Metro Manila on the Luzon island. Three persons were reported dead and more than 94,200 persons have been affected.
Typhoon	21 st Sep. 2013	Typhoon Usagi (known locally as Odette) struck land on Saturday morning in the southern part of the Itbayat Island of the Philippines, leaving two killed, three missing and more than 19,900 people affected.
Typhoon	12 th Oct. 2013	Typhoon Nari (Santi) pounded the northern Philippines early Saturday 12 October 2013, killing 13 people.
Typhoon	8 th Nov. 2013	Typhoon Haiyan (Yolanda), the strongest storm on earth this year, slammed into the Philippines' central islands on 8 November forcing millions of people to move to safer ground and storm shelters.
Heavy Rain, Flood, Landslide	10 th Jan. 2014	Heavy rains set off floods and landslides in the southeastern Philippines, leaving at least 20 people dead, 13 missing and thousands displaced, officials said Monday, 13 January 2014.
Flood	13 th Jun. 2014	On 13 June 2014, a flooding incident occurred in Maguindanao Province due to persistent rainshowers and thunderstorms. More than 85,000 people have been affected by the flooding.
Typhoon	15 th Jul. 2014	Typhoon Rammason or Glenda in the Philippines hit eastern Rapu-Rapu island on 15 July 2014. Thousands evacuated from coastal villages. Killed: 106 Missing: 5 Injured: 1,250 Affected: 4,653,716 Totally damaged houses: 112,067 Partially damaged houses: 521,613
Typhoon	15 th Sep. 2014	Typhoon Kalmaegi swept out of the Philippines on 15 September 2014 after causing chest-deep floods in some rural areas. About 7,800 people sheltered from the typhoon in government evacuation centres. Killed: 4 Missing: 1 Injured: 5 Affected: 371,394 Totally damaged houses: 211 Partially damaged houses: 607
Typhoon	6 th Dec. 2014	Typhoon Hagupit (known locally as Ruby) made the landfall Eastern Samar province as a category 2 at 9:15 p.m. on 6 December, passing through the central Philippines. So far 2 persons were killed and about one million persons were affected. Dead: 18 persons Affected: 902,291 families/ 3,852,672 persons Injured: 916 persons Totally collapsed houses: 39,384 Partially collapsed houses: 214,040
Tropical Storm, Flood, Landslide	29 th Dec. 2014	At least 53 people have died in flooding and landslides caused by tropical storm Jangmi in the southern and central Philippines. Dead: 66 Missing: 6 Injured: 43 Affected: 124,305 families/ 578,549 persons Totally damaged houses: 610 Partially damaged houses: 2,687
Typhoon	10 th May. 2015	More than 2,000 people were fleeing their homes as Typhoon Noul struck the northern Philippines 10 May 2015, triggering warnings of possible flash floods, landslides and tsunami-like storm surges. Killed: 2 Affected: 4,523 Pre-emptively evacuated: 3,803

Flood	23-24 th Jun.2015	Due to continuous heavy rainfall from 23 to 24 June 2015, the people in low-lying areas of the Region XII (Central Visaya) in the Philippines experienced flooding. 4 people were killed and more than 20,000 people were affected. 7 dead 6 injured 126,338 affected 72 houses totally damaged 175 houses partially damaged
Tropical Storm	4 th Jul. 2015	Severe Tropical Storm (STS) "EGAY" made landfall over Palanan, Isabela in Philippines on 4 July 2015 and has moved northward. Landslides and flooding incidents were reported due to STS "EGAY". 55,567 affected 7 houses totally damaged 198 houses partially damaged
Flood	9 th Jul. 2015	Tropical Storm Linfa enhanced the southwest monsoon in Manila, causing floods in several Philippine towns in provinces. As of 09 July 2015, 1818 persons were affected and 5 persons were reported dead. 16 dead 11 injured 41,029 affected
Typhoon	21 st Aug. 2015	Ten people were killed while thousands fled to higher ground as powerful typhoon Goni brought torrential rains to the northern Philippines on 21 August 2015. Killed: 27 Injured: 22 Missing: 13 Affected: 318,359 Totally damaged house: 188 Partially damaged house: 5,554
Typhoon	1 st Oct. 2015	Tropical Storm Mujigae (Kabayan), caused several incidents of landslides, flooding, vehicular and maritime accidents in the Philippines. More than 22,000 persons were affected as of 5 October 2015. Killed: 1 Missing: 27 Injured: 2 Affected: 22,368 Totally damaged house: 27 Partially damaged house: 104
Typhoon	14 th Dec. 2015	Typhoon Melor (local name: Nona), which made a landfall in Central Philippines on 14 December 2015, caused severe damage to wide areas in the Philippines. Preemptive Evacuees: 742,991 People in Shelters: 287,227 Dead: 42 Injured: 24 Missing: 4 Totally Destroyed Houses: 98,371 Partially Destroyed Houses: 181,116 Flooded Area: 130 areas Economic Damage: PHP 6,455 million Power interruption: 7 cities and 59 municipalities
Tropical Depression	17 th Dec. 2015	Strong wind and heavy rain triggered by the Tropical Depression "Onyok" affected the CARAGA region, northeast Mindanao island, southern part of the Philippines on 17 December 2015. Preemptive Evacuees: 18,402 People in Shelters: 0, Totally Destroyed Houses: 5 Partially Destroyed Houses: 3
Heavy Rain, Flood & Landslide	8 th Jul. 2016	Typhoon Nepartak (locally called Butchoy) caused flooding in the Philippines. At least 7,500 families had been affected.
Typhoon 'Melor'	Dec 14 th 2015	The Typhoon 'Melor' or local name 'Nona' entered the Philippines Area of Responsibilities (PAR) in the morning of 12 December 2015. It made several landfalls on 14 – 15 December 2015 with sustained wind peaking up to 160 kph. On 19 December, the typhoon was gradually weakened and dissipated. Impact: As of 21 December 2015, the Philippine's National Disaster Risk Reduction and Management Council (NDRRMC) reported 40 people have died and more than 199,854 houses are damaged. So far, 362,753 people were served inside and outside evacuation centres in five affected regions in the central part of the Philippines Based on the most recent information from NDRRMC (Situation Report No 16, 21 December 2015), the Typhoon have claimed 40 lives and 199,854 houses were destroyed. There are 362,753 people were served inside and outside evacuation centres in Regions III, IVA, IVB, V and VIII. Three days after the typhoon dissipated, flooding are still reported in in Regions I, III, IVB and NCR. Floodings were reported in 425 areas where 150 of them are already subsided. An estimation cost of damage to infrastructure and agriculture from the typhoon, amounted to PHP 4,967,229,199 (USD 64 million) Four (4) cities and 16 municipalities are still experiencing power interruption. Communication network in most of affected areas are fully restored, but still limited in some areas. A total of 31 roads and 19 bridges are still not passable in Region II, III, IVA, IVB, V, VIII and CAR.
Typhoon Koppu	Oct 16 th 2015	Tropical Storm Koppu (Lando) began to form in the Pacific Ocean on Tuesday, 13 October 2015. The westward-moving storm continued to intensify as it moved across the open waters until it became a major typhoon on Friday, 16 October 2015. The typhoon made landfall in

		<p>Casiguran, Aurora Province, Philippines (16.2°N, 122.2°E) on 18 October 2015 at 1:00 AM local time (GMT+8) with maximum sustained winds of 175 kph and gustiness of 210 kph. Typhoon Koppu (Lando) steadily weakened to a low pressure area (LPA). The LPA is forecasted to linger until the weekend and bring light to moderate rains over northern Luzon provinces in the Ilocos Region, Cordillera Administrative Region (CAR), and Cagayan Valley</p> <p>Impact: (as of 29 October 2015) As of today, 29 October 2015, Typhoon Koppu (Lando) has left 48 people dead, 83 people injured, and 4 people still missing. Total affected families reached 696,027 families (3,041,979 people) in Regions I, II, III, IVA, V, National Capital Region (NCR), and the Cordillera Administrative Region (CAR).</p>
Typhoon Dujuan	Sep 27 th 2015	<p>Typhoon Dujuan (Jenny) which entered the Philippines Area of Responsibility on 23 September 2015 has enhanced the effect of the Southwest Monsoon. Many areas in Luzon, including Metro Manila, Ilocos Region, Cagayan Valley, Cordillera, Central Luzon, Calabarzon and Provinces of Mindoro and Palawan, were reported to have more rains due to the Southwest Monsoon enhanced by the typhoon. The NDRRMC have reported flashflood incident in Zamboanga del Sur as well as people being affected in Negros Occidental .</p> <p>Impact: 2 missing in Zamboanga del Sur 2,561 families/12,781 people were affected in Negros Occidental 13 houses were damaged</p>
Typhoon Goni	Aug 18 th 2015	<p>Typhoon GONI or Ineng has entered the Philippines on 18 August 2015 and exited on 23 August 2015. GONI has affected the northern Luzon with wind sustained up to 160 kph. The National Disaster Risk Reduction and Management Council has reported flooding and landslide occurrence in Region I, II, III, IV-A, IV-B and CAR.</p> <p>Impact: 21 death, 23 injured and 15 missing. 23,965 families/ 102,488 people were evacuated in Region I, II, IVA, IVB and CAR. 11,115 people stayed inside evacuation centre. 1,638 houses were damaged. Cost of damages is estimated to be USD 10 million.</p>
Southwest Monsoon	Jul 10 th 2015	<p>The National Disaster Risk Reduction and Management Centre reported several flashflood and landslides in Ilocos Region and Benguet Province which triggered by Monsoon rains. (As of 14 July 2015)</p> <p>Impact: 16 death, 11 injured and 4 missing. 8,611 families/41,029 persons were affected Region III, IVA, NCR and CAR. 172 persons served inside evacuation centre and 315 persons outside evacuation centre. 7 houses were damaged. No more reported stranded passengers, vessels and motorbancas in all ports nationwide. 7 road sections in La Union, Bulacan, Benguet and Oriental Mindoro were closed due flooding.</p>
Southwest Monsoon	Jul 7 th 2015	<p>The Intertropical Convergence Zone (ITCZ) has affected Mindanao since 22 June 2015. Hence, moderate and heavy rainshowers to thunderstorms were experienced in Region IX, XII and ARMM causing flashflood and flooding particularly in the low-lying areas. (NDRRMC Sitrep no.5, 7 July 2015)</p> <p>Impact: 7 death and 6 injured. 25,876 families/126,338 persons were affected in 199 barangays (villages) in Region XII and ARMM. 377 persons were served inside evacuation centre while 99,044 persons were outside. 247 houses were damaged.</p>
Storm Linfa	Jul 4 th 2015	<p>The Tropical Storm Linfa (Egay) which crossed the northern part of Luzon has triggered landslide and flood incidents. As reported by the National Disaster Risk Reduction and Management Council (NDRRMC), landslide happened in Palawan, Benguet and Apayao, where flood occurred in La Union, Palawan, Apayao, Mandaluyong City, Marikina City and Pasay City.</p> <p>Impact: 11,751 families or 48,307 people were affected in Region I, IVB and CAR. 424 people were served inside evacuation centre. 95 houses were damaged.</p>
Storm Linfa	Jul 4 th 2015	<p>Storm Linfa or Egay has caused flooding in Region I, IV-B and CAR.</p> <p>Impact: 13,280 families/55,567 people were affected 13,447 people were evacuated 205 houses were damaged Cost of damages is estimated to be USD 4.7 million</p>
Tropical Storm "JANGMI"	Dec30th 2014	<p>Tropical Storm "JANGMI" or "Seniang" has made landfall in Mindanao and move Northwest towards Cebu, Philippines. Although this is not a</p>

		<p>typhoon but this Tropical Storm still maintained 65 kph wind near the centre with moderate to heavy rainfall 7.5 to 15 mm per hour within 300 km of the Tropical Storm. Incidents of Flood, flashflood and landslide have been recorded in several areas in the Philippines. These include the following areas: Flooding: San Agustin, Hinatuan, Lingig, Bisig (Surigao del Sur) Butuan city (Agusan del Norte) Sibagat Bunawan, Bayugan, Prosperidad, Esperanza, Talacogon, San Luis (Agusan del Sur) Flashflood: Lanao del Sur (ARMM) Landslide: Hinatuan, Bisig (Surigao del Sur) Sibagat, Bunawan, Bayugan (Agusan del Sur) Tanauan (Leyte) Sogod (Southern Leyte)</p> <p>Impact: S 5,529 families or 23,269 persons affected 868 families preemptively evacuated to 31 evacuation centres 1 dead 1 missing 13 damaged houses 18 roads and 6 bridges are not passable in Region VIII and CARAGA Power interruption experienced in the following provinces: Bohol, Leyte, Samar, Eastern Samar, Northern Samar, Agusan del Sur and Surigao del Sur</p>
Tropical Storm Sinlaku	Dec26th 2014	<p>A tropical storm named Sinlaku or Queenie in local naming, enter Philippines Area of Responsibilities (PAR) and made a landfall on 26 November 2014 in Surigao del Sur. This Tropical Storm exit PAR by 28 November 2014. The impacted areas includes the following region: IVB, VI, VII, X, XI and CARAGA</p> <p>Impact: Based on the latest NDRRMC situation report on 1 Dec 2014 4 death 2 injured 8 missing 9,406 families or 46,954 person affected 295 families or 1,362 person in 12 evacuation centre 2,993 houses damaged</p>
Typhoon Hagupit	Dec 6 th 2014	<p>Typhoon Hagupit, or locally named as Ruby, which has developed since 1 December in Ocean Pacific, has made its first landfall over Eastern Samar area on 6 December evening. The wind speed was 160 kph and gustiness up to 195 kph. Though it was much weaker than the initial forecast, yet it has caused significant damages to the infrastructure and loss of live. Based on the NDRRMC Report No.9 on 8 December 2014, the impacts are as follows:</p> <p>Impact: 2 death 232,948 families or 1,074,080 people were affected in 35 province and cities in Region IVA, IVB, V, VI, VII, VII and XIII (CARAGA) 1,066,141 people were served inside and outside evacuation centres Airport closure for Naga city, Lagazpi, Masbate, Tacloban and Calbayog Power outage is experienced in 16 province</p>
Mindanao	Oct5th 2014	<p>Due to heavy rains caused by Intertropical Convergence Zone, flooding occurred in Cagayan de Oro city and Jasaan of Misamis Oriental province.</p> <p>Impact: S more than 69 families were affected more than 950,000 USD total cost of casualties were estimated from damaged houses</p>
Sultan Kudarat	Sep21th 2014	<p>Due to continuous rain flash flood occur in the municipality of Bagumbayan, Sultan Kudarat</p> <p>Impact: 61 families or 305 persons affected 305 persons evacuated 1 house damaged 1 bridge, dike and roads were partially damaged</p>
Storm FUNG WONG	Sep18 the2014	<p>Glide: TC-2014-000128-PHL Tropical Storm Fung-Wong (Mario) has created significant impact in Philippines since 18 Sept 2014. Tropical Fung-Wong with wind speed up to 85 km/h has triggered flooding and landslide incidents that affected Region I, II, III, IVA, IVB, V, VII, CAR and NCR.</p> <p>Impact: (25 Sept) 419,592 families/1,904,537 people were affected, mostly in Cebu, Camarines Sur, Pangasinan and Bulacan 59,307 people were displaced (previously 129,676 people) 17 death, 16 injured and 4 missing 5,697 houses were damaged Power outline still experienced in some parts of Region I,IVB and CAR Cost of Damage: 33.8 million USD Cost of Assistance: 635,000 USD</p>
Typhoon KALMAEGI	Sep14th 2014	<p>Glide: TC-2014-000124-PHL Typhoon KALMAEGI (Luis) has made a landfall on 14 September in the Northern Luzon with the wind speed 120 km/h. The typhoon caused flood and landslide in several regions in the North Luzon (Region 1, IV-A, IV-B, CAR and NCR).</p> <p>Impact: S Based on NDRRMC Situation Report No.11 19 Sept 2014 100,267 families or 431,085 people were affected. The most affected area is Pangasinan in Region 1 with 275,000 people. At the same time, about 10,000 people being affected in NCR, including Metro Manila. 10,524 people were served inside Evacuation Centre 4 death 1 injured 1,895</p>

		houses were damaged Cost of damage: 18.3 million USD Cost if assistance: 193,000 USD
Storm Leepi	Jun21st 2013	Cotabato, Sultan Kudarat, Sarangani and Davao. Nearly 100,000 people have been displaced by floods in the southern Philippines. Over 60,000 of those have been evacuated from their homes as a result of floods in Maguindanao, although earlier reports had the numbers much higher.
Floods in Mindanao	July21st 2013	Floods in Mindanao, Philippines, have affected nearly 500,000 people since 21st July. 3 people have been reported as killed in the floods. Heavy rain continues in the region, making the treat of floods and landslides worse.
Tropical Storm Trami	Aug20th 2013	The aftermath of Tropical Storm Trami (known as Maring locally) combined with seasonal monsoon storms to bring torrential rains that caused widespread flooding across Luzon, the largest island in the Philippines. Particularly badly hit has been the capital Manila, with some reports claiming that around half of the city is now under water.
Tropical Storm Wilma	Nov7th 2013	Tropical Storm “Wilma” (TS30W) made landfall on the morning of Monday 4 November 2013 in Surigao del Sur province on the island of Mindanao in the Republic of Philippines, thereafter weakening into a tropical depression.
Typhoon Haiyan	Nov8th 2013	Despite days of preparation for the arrival of Category 5 Super-typhoon Haiyan (referred to as ‘Yolanda’ by meteorologists in the Philippines), early reports indicate at least four people have died in storm-related incidents since its landfall 650km southeast of Manila in the Philippines earlier today, Friday 8 November 2013.
Floods in Mindanao	Jan13th 2014	A low pressure areas brought huge amounts of rainfall to Mindanao, southern Philippines, causing flash flooding and landslides. 13 people have been reported as killed as a result of floods or landslides and over 4,500 have been evacuated.
Tropical Depression Agaton	Jan21nd 2014	Instead it has been moving slowly and changing direction regularly, remaining unpredictable whilst still causing steady rainfall over the adjacent regions of Mindanao, Davao and Caraga, affecting over 800,000 people, with 42 deaths and 203,022 people displaced to 565 evacuation centres.
Tropical Storm Kajiki, named “Basyang”	Feb5th 2014	According to a February 4 update by the National Disaster Risk Reduction and Management Council (NDRRMC), the death toll from Tropical Storm Basyang stands at seven people, with more than 5,000 persons displaced and still staying in evacuation centres.
Tropical Depression Caloy	Mar21st 2014	According to the National Disaster Risk Reduction and Management Council (NDRRMC) bulletin of Friday morning 21 March, approximately 16,935 people in 3,387 households have been affected so far, with 330 families from the two municipalities having been evacuated as a precaution.
Tropical Depression “Domeng”	April17th 2014	Philippines News Agency (PNA) announced that 3 people are missing after the severe weather struck. The three, thought to be a couple with a young child, went missing in their boat during the storm. The heavy rain also cause flooding and landslides across the region. Around 1,800 families in low-lying areas have been affected. The PNA said the villages affected include:
flash floods struck in Carmen, Davao del Norte	April 22th 2014	The Philippines National Disaster Risk Reduction and Management Council (NDRRMC) confirmed in a statement yesterday that 1,302 families had to be evacuated from their homes after flash floods struck in Carmen, Davao del Norte after heavy rainfall over the weekend.
Floods in Mindanao	July8th 2015	Philippines National Disaster Risk Reduction and Management Council (NDRRMC) reported on Tuesday 07 July that 126,000 have been affected by flooding in Mindanao, with around 99,000 staying in evacuation centres. As many as 72 houses have been completely destroyed and a further 175 damaged.
Flash floods in Mindanao	Aug6th 2015	Heavy rain and flash floods in Mindanao, southern Philippines, have left at least 7 people dead and 2 missing. The cities of Malaybalay and Valencia are among the worst affected. Philippines National Disaster Risk Reduction and Management Council (NDRRMC) say that at least 880 people have been evacuated and 41

		homes have been damaged.
Tropical Cyclone Koppu	Oct20th 2015	At least 12 people have died in the Philippines after Tropical Cyclone Koppu brought heavy rainfall, strong winds, storm surge of up to 1.5 metres along its path.
Tropical Cyclone Melor	Dec21th 2015	Melor caused widespread destruction, substantial damage, and deaths in several areas, including the provinces of Albay, Northern Samar, Oriental Mindoro, Romblon and Sorsogon. Media reported that 11 people died in the cyclone, many of them from the island of Mindoro, where flood waters were as deep as 2 metres in some places.

Source: JICA Project Team based on Information of ADRC, Floodlist and AHA Centre

Table A5.1.7 Record of Flood (Singapore)

Place	Date	Damage
Singapore		
Floods	Sep5th2013	Many parts of Singapore, including central areas, suffered from flash floods during the morning of Thursday 5th September. The flash floods were caused by thunderstorms and unusually heavy rainfall. The floods blocked roads and caused difficulties for commuters.

Source: JICA Project Team based on Information of ADRC, Floodlist

Table A5.1.8 Record of Flood (Thailand)

Place	Date	Damage
Thailand		
Floods	11 th Aug. 2001	A flash flood swept down a mountainside through villages in Lomsak district of Phetchabun province, in northern Thailand. At least 48 people were killed, and 79 remain still missing.
Flash Flood	24 th Dec. 2001	Thousands of people in southern Thailand fled their houses after heavy rains triggered floods believed to have caused thousands of 296,800 dollars-worth of damage.
Storm	29 th Apr. 2002	A freak tropical storm has killed five people at Thailand's largest refugee camp. Around 40,000 Karen people live in shelters near the Myanmar border. The storm made damaged about 300 bamboo shelters as it tore through the camp some 540 km (338 miles) north of Bangkok.
Heavy Rain	3 rd Sep. 2002	At least 14 people were killed and more than 20 were missing after their makeshift houses on the banks of an overflowing stream collapsed after heavy rain in northern Thailand.
Flood	4 th Oct. 2002	Residents of the Thai capital, Bangkok, are bracing themselves for severe flooding following forecasts that floodwaters coming from the north of the country where more than 100 people have died could submerge the city.
Flood	26 th Oct. 2003	Five days of heavy monsoon rains have brought severe floods to Thailand, killing a 13-year-old boy, forcing hundreds of people from their homes and disrupting road and rail transport, officials said.
Flood	14 th Dec. 2003	Floods in Thailand have killed at least eight people and damaged tens of thousands of homes. Floodwaters in many parts of the South have begun to recede but the overall situation was likely to improve only temporarily, as the meteorological office in Songkhla has predicted another round of heavy downpour. Eight more people have died in flood-related accidents in the region since Thursday.
Flood	31 st Aug. 2005	Over 100,000 families have been affected by severe flooding in Northern Thailand in the middle of August. Torrential rains which earlier in August hammered Chiang Rai, Chiang Mai and Mae Hong Sorn inundated more than 4 500 villagers' homes in these three provinces alone leaving 11 people dead and making several roads impassable to small vehicles.
Torrential monsoon rains	18 th Dec. 2005	Torrential monsoon rains have wreaked havoc across Thailand's south, killing 12 people and leaving two missing in the past week, officials said on Sunday. Seven of the victims died in two mudslides.
Flash Flood, Mud Slide	23 th May. 2006	Heavy monsoon rains unleashed flash floods and mudslides in northern Thailand which killed at least 10 people, left 47 missing and thousands homeless, officials said on Tuesday.
Flood	9 th Oct. 2006	More than 32 dead in Thai floods since August 2006, reported on October 10. In Thailand, the death toll from flooding caused by heavy rain in the wake of typhoon Xangsane rose to 44. Ministry of Health officials say

		260,000 people are suffering from flood-related diseases.
Flash Flood	14 th Apr. 2007	Flash floods killed at least 23 holidaymakers and injured more than 20 at three waterfalls in the southern Thai province of Trang on Saturday as they celebrated the Thai New Year, disaster officials said.
Flood	5 th Sep. 2007-	The flood started on 2007-09-05 and ended on 2007-10-28, with a duration of 54 days. This flood has severity class 1. The main cause is Monsoonal rain. The recurrence interval is 13.
Flood	27 th Apr. 2008	Rains have continued pouring in Thak province, Thailand at least four consecutive days. Over 1,000 people are currently homeless.
Flood	15 th Aug. 2008	The disaster prevention special command center in Nakhon Phanom province is in the midst of assessing damage caused by inundation in 12 districts. More than 100,000 people have been affected by flooding. Meanwhile death toll has reportedly stood at 1.
Flood	8 th Sep. 2008	Heavy downpours due to a low pressure trough and the south-western monsoon in the past week have triggered more flash floods and inundated villages and farmland in north and northeast Thailand. According to disaster officials, five people have been killed, 114,345 (34,182 families) have been affected.
Heavy Rain	28 th Sep. 2008	In Thailand, the death toll from floods triggered by heavy monsoon rains has risen to 18, while nearly 190,000 people have been treated for water-related illnesses and injuries.
Flood	19 th Nov. 2008	201,434 people affected, 10 people died and 190 families homeless (685 persons) from haevy rain in southern Thailand.
Flash Flood	8 th Dec. 2008	After heavy rains in southern Yala province, Thailand, the Disasters' Prevention Special Command Centre in Yala has issued warnings on 8 December 2008 to the people in the area to be cautious of potential hazards and flash floods after over 3,000 local families being affected.
Flood	7 th Nov. 2009	The flooding which started in the southern border province in Thailand so far killed 10 people
Flood	13 th Aug. 2010	The flood struck the northern province of Lampang on Friday night (13 August 2010) with the water level as high as one meter. Over 1,200 households and 36 villages in 7 districts have been affected. The DDPM reports that a total of 13,085 households in 25 districts of 9 provinces were hit by floods last week. The stricken provinces include Chiang Rai, Chiang Mai, Lampang, Phrae, Nan, Rayong, Trat, and Lamphun.
Flash Flood	16 th Oct. 2010	Nakhon Ratchasima, Northeast of Thailand and its provincial capital have been ravaged as flash floods wreak havoc in the Northeast and Central Plains following heavy weekend monsoon rains. 8,970,653 people and 2,612,472 households were affected, and 258 people died. Out of 51 provinces that have been flooded so far, 2 provinces remain flooded.
Flash Flood	27 th Mar. 2011	Since 23 March 2011 there has been a prolonged heavy rainfall causing flash floods in many provinces in the South. Dead: 64 Affected household: 628,998 Affected people: 2,094,595
Tropical Storm, Flood	3 rd Aug. 2011	Tropical Storm Nock Ten has caused continuous rainfalls in the north and the northeast of Thailand, causing floods in 15 provinces. Killed: 744 Missing: 3 Affected: 4,176,763 (current)
Heavy Rain, Flood	6 th Jun. 2012	Continuous rain has caused flooding in five districts in Surat Thani province of southern Thailand, affecting 8,500 households and over 27,000 residents. On 7 June 2012, rain fell all day in Surat Thani in all areas, making the Phum Duang River overflow and flood a nearby community, with the water level as high as 2-3 meters.
Flood	12 th Sep. 2012	Thousands have fled their homes in Northern Thailand after heavy rain caused a major river to overflow at the start of September. The Department of Disaster Prevention and Mitigation (DDPM) has announced that 15 provinces have fallen victim to the monsoon flooding, which has rampaged several parts of the country in the past weeks. 235,545 people from 88,438 families have been hit hard by severe flooding induced by recent heavy downpours.
Flood	18 th Jul. 2013	Heavy rain has caused flooding in Trat and Ranong province, Thailand. Over 500 residents of Trat province have been affected.
Flood	17 th Sep. 2013	Two million people in 30 provinces of Thailand have been affected by floods since 17 September 2013. The widespread deluge has damaged over 30,000 homes. 80 people have been killed during the floods. The

		Department of Disaster Prevention and Mitigation revealed that 22 provinces nationwide continued to suffer from flooding and nearly 675,000 households remained affected.
Flood	5 th Dec. 2013	Floods in Thailand's South have intensified with heavy rains lashing towns and water levels rising. Water has been flowing down from nearby mountain ranges to Mueang district and affected approximately 16,500 households.
Flood, Landslide	10 th Jul. 2014	In Thailand, the northernmost province of Chiang Rai has been hit again by landslides and flash floods following three days of abundant raining. As many as a thousand families in 8 districts of the province have reportedly been afflicted.
Typhoon	21 st Jul. 2014	Rivers across several communities in northeastern Thailand have overflowed due to the effects of Typhoon Rammasun, which has caused heavy rains throughout the area.
Flood	30 th Jul. 2014	Due to the heavy rainfall in the Northeast, flooding has occurred in Sakhon Nakhon and Ubon Ratchathani provinces, Thailand, affecting 19,183 households.
Flood, Landslide	14 th Dec. 2014	Since 14 December 2014, Thailand's seven provinces in the south have been affected by floods and landslides. Seven people died and three were injured. Nearly 170 schools are closed and nearly 2,400 people were evacuated.
Heavy Rain, Storm, Flood	7 th Apr. 2015	Seasonal storms pounded about 50 villages in 11 districts of eight provinces in Thailand on 7 and 8 April 2015, damaging more than 900 houses.
Flood	6 th Aug. 2015	Several areas in the North, North East and South of Thailand have reportedly been flooded by overflowing rivers after several days of rainfall. In Nakhon Phanom, more than 3,000 homes and 30,000 rai of rice paddies have been inundated.
Flooding in Chiang Rai	Aug5th2015	Intense rains which poured Chiang Rai and Nakhom Phanom has caused flooding. Impact: 3,000 houses were reportedly inundated in Nakhon Phanom. Nearly 5,000 ha of agriculture areas were inundated.
Flashflood hit Trang	Nov10th2014	Heavy rain has generated flashflood incident in Trang Province. Indeed, the consecutive days of rain has created flooding in southern provinces of Thailand since last week. (see also http://adinet.ahacentre.org/reports/view740) Impact: Over 200 families were affected in Trang 5,000 ha of farmland have been submerged
Flood in Southern Thailand	Nov7th2014	Due to continuous heavy rainfall, flood was affecting several Southern provinces including Pattani (Muang), Nakhon si Thammarat (Phra phrom, Chang Klang) and Surat thani Impact: S 2408 households or 7,237 people were affected 2,000 acres of agricultural lands were inundated
Flooding hits Lampang	Oct20th 2014	Heavy rain has caused the Lam Huai Mae River to overflow. Consequently, flood inundated more than 200 houses in Thoen District, Lampang Province. Impact: over 200 families were affected more than 200 houses were inundated
Flood affected several provinces	Oct7th2014	Due to heavy rain since 6 October 2014, Several provinces in Central and South of Thailand. The affected provinces include: Petchaburi (6 districts), Rachaburi (2 districts), Prachuap khiri khan, Krabi (2 districts), Satun (5 districts), Suratthani (2 districts) Impact: S more than 4,700 families or more than 20,000 people affected (estimated)
Flood in Chantaburi	Octfirst2014	Due to heavy rainfall, flood is affecting Chantaburi Povice Impact: 100 families affected
Flood in Chiang Mai	Sep29th 2014	Due to continuous heavy rain, Fang District of Chiang Mai is affected by flood, Chai Nat province was also affected Impact: S 55 houses damaged 94 houses affected in Chai Nat province
Flood in Northern Provinces	Aug31th 2014	Due to heavy rainfall, several provinces in Norther Thailand experienced flooding. As of 5 September, the affected areas are 1. Nan Province: Nanoy and Namoen district 2. Sukhothai Province: Muang, Srisuchanalai,

		Srinakorn and Tung Saleam. 500 houses are still inundated. 3. Chaiyaphum Province: 80 houses are submerged. 4. Tak Province 5. Nakhonsawan Province: 30 houses are inundated. Impact: 7,404 families or (estimated) 15,000 people 17,479 ha agricultural fields damaged 3,000 ha of rice fields damaged
Floods in Thailand	Jun14th 2013	Later, on 12th June, The National Disaster Warning Center (NDWC) issued an urgent warning for residents in 6 southern coastal provinces to brace for flash floods, forest runoffs and mudslides over the next few days.
Southern Thailand	Jul4th 2013	it is also feared that the heavy rain and floods may result in landslides, particularly in those communities near a hilly region. The National Disaster Warning Centre said that in Chanthaburi, the districts most at risk were Muang, Khlung, Makhm, Khao Khitchakut and Soi Da. In Trat, the areas at risk are Bor Rai, Khao Saming and Koh Chang districts
Floods	Aug2nd2013	Chanthaburi Province Flood warnings were issued for the region – in particular Trat and Chanthaburi, where flooding was expected from 17th July to 19th July 2013. A few days later flood waters in streets of areas of Chanthaburi province were said to be between 30cm and 80cm. Nakhon Ratchasima Province The floods then moved northwards. Torrential rain during the night of Monday 22nd July 2013 brought floods to the city of Nakhon Ratchasima (also known as Korat) in north eastern Thailand. Chiang Rai Province In Chiang Rai Province, flash floods struck around 30th July 2013. A young child was swept away in the floods and at the time of writing was still reported as missing. Chiang Rai Disaster Prevention and Mitigation Office said that the flooding also killed 2 people and injured one other. 20 houses were damaged, as well as roads and bridges, and also around 8,000 hectares of crops. Thirteen districts of Chiang Rai Province are expected to be designated disaster zones which will help with getting financial assistance to the region. Over the last few days the flooding has been mainly in northern Thailand, most recently especially around the border area with Myanmar. Kanchanaburi Province In Kanchanaburi province, a flash flood on 29th July damaged a 100 metre long section of the Mon Bridge (Uttamanusorn Bridge) which crosses the Songkalia River. The bridge has something of an iconic status in Thailand. It was built in 1986 and is 850 metres long. It links the Mon community at the Thai-Myanmar border with Sangkhlaburi. The damaged bridge was closed until repairs could be made.
Floods in Thailand	Sep22nd 2013	A disaster zone has been declared for Khok Soong district in Sa Kaeo province, after flooding affected nearly 1000 families there.
Floods in Ratchadapisek, Ranintra and Phahonyothin	Oct4th 2013	Heavy rainfall overnight on Thursday 3rd October 2013, left some minor roads in Bangkok flooded. The main areas affected were Ratchadapisek, Ranintra and Phahonyothin. The flooding wasn't severe and did not affect any major roads. The floods slowed traffic, but the city's drainage system appears to be coping and according to reports, the flood waters soon receded.
Floods in Southern Thailand	Nov26th2013	Four districts in the Surat Thani province have also been declared disaster zones, with 4,070 households affected and 41 roads and 21 bridges left damaged or impassable.
	Dec5th2013	Phatthalung Overflowing rivers, and runoff from mountainous areas after heavy monsoon rainfall brought flooding to the districts of Kong Ra, Srinagarindra, Tamot, Pabon and Muang in Phatthalung province on Thursday 5 December 2013. Homes, farmland, including rubber and fruit plantations, and roads have all been inundated in the area. Authorities are offering assistance and rescue boats, but have warned that the floods are likely to continue as heavy rain is expected over the next 3 days. Narathiwat As many as thirteen districts have been hit by flooding in Narathiwat province, scene of the recent bomb blast. In similar circumstances to Phatthalung, monsoon rain caused swollen rivers and mountain runoff,

		<p>making the floods more severe and widespread. Waeng and Sri Sakhon districts saw the heaviest rain (around 223 mm in 24 hours). Range and Rue So districts have also been affected.</p> <p>The Sungai Kolok and Bang Nara rivers have both broken their banks. Local media reports claim 137 people have been evacuated as a result. Flood waters in the streets around these areas was as high as 1 metre.</p> <p>Songkhla 16,500 households are believed to have been affected by flooding in Songkhla province after heavy rainfall. Mueang district is the worst affected area, where roads have been badly flooded making them impassable for many.</p>
Floods in Northern and central areas of Thailand	Dec16th2013	Thailand's Department of Disaster Prevention and Mitigation (DDPM) announced yesterday that the floods that had affected much of the country's southern region has now receded in 10 provinces, but remain in Phuthalung and Trang. The DDPM said that as many as 6,000 people are still affected by flooding in these two provinces.
Floods in Narathiwat	Jan13th 2014	The rainfall increased levels of the Buketa Canal until it eventually overflowed, flooding around 20 villages and leaving around 1,088 homes under 50cm to 100cm of water.
Floods	Jul24th2014	Thailand's Department of Disaster Prevention and Mitigation reported earlier today that, after several days of steady rain, flooding is affecting the 5 provinces of Sakon Nakhon, Prachin Buri, Si Sa Ket, Ubon Ratchathani and Yasothon. Ubon Ratchathani saw over 80 mm of rain fall 24 hours between 22 and 23 July 2014.
Floods and Landslides in Chiang Rai	Jul29th2014	Sakon Nakhon province was one of the worst hit, where floods have affected around 4,000 families. Elsewhere, flooding has damaged homes and roads in Si Sa Ket and Ubon Ratchathani provinces. Access to several parts of Si Sa Ket has been difficult for the last few days. At one stage flood waters were so high the Provincial Electricity Authority (PEA) had to cut power supply in the Benchalak district as a safety measure.
Floods	Augfirst 2014	Thailand has been seeing heavy rainfall for the last 7 days. On 23 July, the 5 provinces of Sakon Nakhon, Prachin Buri, Si Sa Ket, Ubon Ratchathani and Yasothon were badly affected by flooding.
	Aug21st 2014	The Mekong river in the north eastern Thai province of Amnat Charoen has overflowed and submerged several villages on 31 July 2014, damaging over 1,000 houses. The province was later declared disaster zone amid the possibility of more floods.
		Heavy rain in Nan province in northern Thailand caused local rivers to overflow earlier this week, flooding several districts in the province. Further flood warnings have been issued for 20 provinces, especially in northern and north eastern areas.
Floods	Sep2nd2014	One person is said to be missing in Thung Chang district after being swept away by the flood water. Flooding has particularly affected the districts of Thung Chang, Muang and Song, where around 50 houses and areas of farmland have been damaged.
Floods	Sep2nd2014	Thailand's Department of Disaster Prevention and Mitigation (DDPM) reported on Monday 01 September 2014 that at least 17 provinces have been affected by recent flooding. Six people have been killed and at least 1 person remains missing.
Floods	Octsecond2014	Heavy rainfall has caused deadly floods in northern Thailand over the last few days. Since yesterday, the heavy rain has moved south, to affect central and southern areas of the country.
		Further heavy rain and possible flooding and landslides have been forecast by Thailand's Meteorological Department. The Department of Drainage and Sewerage has installed over 1,000 additional pumps across Bangkok in preparation.
		Chiang Mai and Chainat According to the Thai News Agency NNT, Chiang Mai Province saw continuous heavy rain and flash floods between 28 September and 01 October 2014. Three people tragically drowned in the flooding in Fang District. Fang district chief Manas Khansai said 22-year-old villager Natae Jahae and her two daughters, one aged 12 and the other four months, drowned in the flood on Monday night. More than 50 homes in the district have been damaged by the floods. The situation is now reported as

		<p>returning to normal with the rain ceasing and flood waters quickly receding.</p> <p>In Chai Nat Province, flooding was so severe that authorities had to make emergency rescues in Hunkha District. Nearly 100 homes have been damaged on the province and help is being provided by local authorities for those affected.</p> <p>Phuket and Songkhla</p> <p>Flooding has also affected parts of southern Thailand, including the popular tourist area of Phuket earlier today. However the flood water soon subsided and no flood warnings have been issued by Department of Disaster Prevention and Mitigation (DDPM).</p> <p>Also in southern Thailand, Hat Yai City of Songkhla Province, saw several roads flooded in the downtown after the downpours overwhelmed the capacity of the city's storm drains. Traffic was congested into the evening. Local authorities had to deploy water pumps to clear the roads.</p> <p>Bangkok</p> <p>In similar circumstances to the flash floods seen yesterday in Kuala Lumpur, heavy rainfall and ensuing flash floods brought Bangkok traffic to a standstill on 30 September 2014. The city's drainage system was unable to cope, with some reports claiming parts of the sewerage network was blocked with trash.</p>
Floods in 5 villages in Lampang Province	Oct22nd 2014	<p>Around 200 families in 5 different villages in the area have been severely affected, although no injuries have been reported. Homes of the families are said to have been completely inundated and officials from Thailand's Disaster Prevention and Mitigation Department (DDPM) are coordinating distribution of food, water and other supplies. DDPM officials were hopeful that the flood water could soon recede should there be no further heavy rain.</p>
Floods	Nov14th2014	<p>Trang Province</p> <p>Trang province in southern Thailand has been one of the worst affected areas after persistent heavy rain over the last 4 days caused flash floods across several southern provinces.</p> <p>Around 1,000 villagers in Trang have been evacuated since the flooding began. Houses and farmland have been damaged. The flood water level was almost two meters high, according to NNT.</p> <p>Nakhon Si Thammarat</p> <p>At least 5 districts – Chawang, Chang Klang, Pipoon, Lan Ska, and Phra Phrom in Nakhon Si Thammarat also experienced severe floods that first began around 07 November 2014. More than 4,400 households and 12,000 people have been affected in the province.</p>
Floods in Southern Thailand	Dec15th2014	<p>Floods in the southern Thai provinces of Nakhon Si Thammarat and Phatthalung have forced evacuations in as many as 50 villages, some of which are under more than 1 metre of water. One person is reported as missing after being swept away by the floods in Phrom Khiri district, Nakhon Si Thammarat.</p>
Floods	Dec17th2014	<p>Narathiwat</p> <p>National News Bureau Thailand (NNT) say that floods in Narathiwat have been caused by heavy rain over the last 4 days and run-off from the Sankalakhiri mountain range flowing down to the Su-ngai Kolok River. Houses along the river have been inundated. Flooding has also affected over 300 families in the districts of Sukhirin, Waeng and Su-ngai Kolok.</p> <p>Yala</p> <p>Over 100 mm of rain fell in 24 hours in Yala, Yala Province, yesterday. Many low lying areas of the province are already seeing some flooding, and more is expected after Yala Provincial Disaster Prevention and Mitigation (DPM) Office said that the water levels in the Saiburi River and the Pattani River is on the rise due to the heavy rain over the past 3 to 4 days. There is also a high risk of landslides in the the foothill areas of the Betong, Than To, and Bannang Sata districts.</p> <p>Nakhon Si Thammarat and Phatthalung</p> <p>Earlier this week floods struck in the provinces of Nakhon Si Thammarat and Phatthalung, also in southern Thailand. Two people have been reported as missing after being swept away in the floods – one in Nakhon Si Thammarat, the other in Phatthalung.</p>

Floods	Dec19th2014	Across the region a total of four people have been reported as killed in the floods and 14,000 people evacuated (12,000 in Malaysia). Two people remain missing in the floods in Thailand.
Bangkok Floods	Jun8th2015	The top of the flood wall stands three meters above mean sea level. City Hall officials believe the height of the flood wall is adequate for keeping out floodwater, they were concerned with the low water level in the Chao Phraya River at present. To prevent a weakening of the flood wall due to the low water level, officials were reinforcing the bases of the flood wall with large stones.
Thailand Floods	Aug6th2015	In Nakhon Phanom, more than 3,000 homes and 30,000 rai of rice paddies have been inundated in Sri Songkram district after the Songkram River overflowed the embankment and flooded surrounding areas. Residents were forced out of their homes, and had to take refuge on the street.

Source: JICA Project Team based on Information of ADRC, Floodlist and AHA Centre

Table A5.1.9 Record of Flood (Viet Nam)

Place	Date	Damage
Viet Nam		
Flood	Oct. 1998	Heavy rains and floods in the coastal provinces of central Vietnam in mid-October caused significant damage.
Typhoon	Nov. 1998	A low-pressure front in the south of the South China Sea developed into typhoon Dawn on 19 November 1998. The wind velocity reached 8 to 9 of the Beaufort scale.
Flood	Nov-Dec. 1998	Floods by heavy rains in mid October caused severe damage in coastal central Vietnam. On 16 Dec.typhoon Gil struck coastal central Vietnam. Typhoon Faith exercised an overwhelming in the Philippines caused more damage in Vietnam.
Flood	Aug. 1999	The rapid rise of the water level of several rivers in the north, the centre and the south of Viet Nam, has caused serious flooding in the four Provinces of Binh Thuan, Lam Dong, Dac Lac and Dong Nai. The DMU reports that 40 people were killed.
Flood	Nov. 1999	On 01 - 03 November 1999, due to the effect of strong cold air front in combination with the activities of a tropical conversion, there were heavy-to-very heavy rains in the Central Provinces from Quang Binh to Binh Dinh. Heavy rain, concentrating in a short period of time, caused flash flood in some places in mountainous areas of Quang Nam Province and Thua Thien-Hue Province, and caused large flooding on river banks from Quang Nam to Binh Dinh Provinces. The floods killed nearly 600 people and caused damage of around \$250 million.
Flood	Dec. 1999	One month after the central coastal provinces of Vietnam were inundated by the worst floods the country has experienced this century, the same region has suffered heavy rains and new, extensive flooding. These new floods occurred just as rehabilitation measures were being undertaken in order to help stabilize the lives of the people in the central provinces. The new floods caused by heavy rainfall from 1 to 6 December once again attained historical water levels in some rivers in the central provinces from Thua Thien Hue to Khanh Hoa
Flood	Sep. 2000	The water levels in the Mekong river system have been rising rapidly, causing a deterioration in the flood situation in Viet Nam. The average amount of rainfall in the centre and downstream of the Mekong river delta during the last two months has been much higher than during the same period last year. As of 12 September, the floods have caused damage in the provinces of Long An, Kien Giang, An Giang, Can Tho and Dong Thap.Total estimated economic loss is USD 182 million.There have been 211 children among the 280 people killed by the floods
Flood	6 th Jul. 2001	Heavy rains (for the first time in 40years) caused flooding in north Vietnam at killing 30 people and displacing a few persons.
Storm	10 th Aug. 2001	Far South of Viet Nam, the Kamau Peninsula was hit by the heavy storm and was killed at least 7 people.
Flood	29 th Aug. 2001	Floods kill 24 people in Vietnam

Flood	14 th Sep. 2001	Floods in Vietnam's Mekong Delta have killed 256 people, 203 victims were children. Dead: 326 persons (Children: 243 persons)
Typhoon	12 th Nov. 2001	The strongest typhoon to hit Vietnam in 15 years has killed at least two people, destroyed houses and uprooted trees on Monday after killing hundreds in the neighboring Philippines, local officials said. Dead: 20 persons Injured: 83 people Evacuated: 562 families Destroyed: 2,636 houses Damaged: 12,000 houses Close to 30,000 ha of rice paddy and other crops have been ruined. Some 145 boats have reportedly been washed away. Approximately 650 schools have been destroyed or damaged.
Flood	10 th Dec. 2001	In central Vietnam on Monday they had located 14 fishermen sheltering from heavy weather caused by tropical storm Kajiki, but were still awaiting news of 149 others aboard 12 missing fishing vessels.
Flash Flood	1 st Aug. 2002	Flash flooding in northern Vietnam has left at least ten people dead.
Flood	17 th Aug. 2002	Floods and landslides in Vietnam have killed at least four people.
Flood	11 th Sep. 2002	Nine people, including five children, have drowned in Vietnam's Mekong Delta region in the last three days and more flooding is forecast.
Flash Flood, Land Slide	21 st Sep. 2002	Flash floods and landslides killed at least 21 people in central Vietnam this week while another 13, mostly children, drowned in Mekong Delta floods that have left thousands short of food.
Flood	9 th Oct. 2002	Floods have killed 116 people, including 104 children, in Vietnam's Mekong Delta provinces. Floods also caused damages estimated at more than 115.4 billion Vietnamese dong (VND) (US\$7.69 million).
Flood	18 th Oct. 2003	Floods and torrential rains have killed at least 38 people and marooned thousands of families in central Vietnam, officials said on Saturday.
Flood	14 th Nov. 2003	Floods sweeping much of Vietnam in the past two days have killed at least 33 people, blocked traffic on the north-south highway and halted coffee harvesting in the Central Highlands.
Typhoon	13 th Jun. 2004	The Prime Minister has decided to provide 36 billion VND in aid for localities devastated by Typhoon Chanthu claiming 11 lives and injuring nine others.
Flash Flood, Land Slide	21 st Jul. 2004	Death toll rises to 20 after a flash flood in the northern mountainous province of Ha Giang. The flooding injured 10 people, swept away 16 houses, and damaged many road sections as well as residents' property and crops.
Flood	5 th Oct. 2004	The death toll from flooding in Vietnam's southern Mekong Delta has claimed 27 lives, while another nine people were killed when heavy storms lashed the region, a disaster relief official said today. In the three provinces of Dong Thap, An Giang and Can Tho, 4,361 houses were inundated, forcing local people to evacuate urgently. Seventy-eight schools with 625 classrooms have had to close, affecting more than 17,400 pupils.
Flash Flood	27 th Nov. 2004	Flash floods triggered by Typhoon Muifa have killed at least 25 people in central Vietnam, officials said on Saturday. Floods and landslides have killed at least 40 people in Vietnam and 42 are missing, officials said on Monday, and elderly wooden houses inundated at a world heritage site are in danger of collapsing.
Flood	10 th Sep. 2005	At least eight people were killed and about 30,000 people have been displaced after seasonal flooding has stricken Vietnam's southern Mekong Delta. Floods have killed at least nine people in Vietnam's Mekong Delta, seven of them children, and officials said on Monday more danger loomed with the waters not expected to peak until late this month. More than 32,000 people were evacuated from inundated villages and areas at risk from landslides in three Mekong Delta provinces, An Giang, Long An and Dong Thap, disaster management officials said.
Typhoon	28 th Sep. 2005	The death toll from Typhoon Damrey has risen sharply to more than 30 as flash floods and landslides caused by the storm hit the Vietnam's northern mountainous areas. Most of the deaths are in the province of Yen Bai, 180 km (110 miles) northwest of Hanoi.
Flood	28 th Oct. 2005	Heavy rains have caused widespread flooding in central Vietnam, killing at least 67 people and damaging 3,200 houses in the most severely hit Binh Dinh province (1,050 kilometers south of Hanoi). Rising water levels have also submerged over 3,560 houses in Long An province.
Typhoon	2 nd Nov. 2005	A powerful typhoon Kai-Tak has hit central Vietnam, killing at least 18

		people in provinces on the coast.
Flash Flood	14 th Dec. 2005	Flash floods triggered by prolonged rains have killed at least 11 people in central Vietnam and delayed the coffee harvest in the Central Highlands, state media and officials said on 14 December.
Typhoon	19 th May. 2006	The Asia-wide death toll from Tropical Storm Chanchu stands at nearly 90, with almost 200 Vietnamese fisherman still missing at sea, as the storm weakened Saturday off southern Japan.
Floods and landslides	20 th Aug. 2006	Flooding, landslides and lightning have killed 15 people and left one missing since Friday night in Vietnam, bringing the country's toll in a week of torrential rain to 42, reports said on Sunday.
Typhoon	1 st Oct. 2006	At least 15 people in Vietnam are now known to have died as a result of Typhoon Xangsane, which buffeted central provinces over the weekend (by Oct.1,2006).
Typhoon	5 th Dec. 2006	At least 37 people have died as Tropical Storm Durian lashed Vietnam, sweeping away fishing boats, destroying houses and downing power lines. The national flood and storm control center said 67 people were confirmed dead and 31 were missing in the aftermath of Typhoon Durian.
Heavy Rain	6 th Aug. 2007	Vietnamese rescuers are moving thousands of people to higher ground on Tuesday after a storm dumped heavy rain in the central region, killing 14 people, officials said. Another 15 people were missing.
Typhoon	5 th March. 2007	On 5 October, 2007, Ten people died and six were missing after a typhoon blew strong winds and heavy rains into central Vietnam, triggering floods, blocking traffic and threatening the lives of thousands, officials said. More than 80,000 people had been evacuated before typhoon Lekima hit on the night of 3 Oct.
Flash Flood, Flood	28 th Oct. 2007	Flash floods killed at least 13 people and injured 31 in central Vietnam this week and more heavy rain over the next few days could add to the damage, the government said on 1 November 2007. Flooding triggered by torrential rains in Vietnam's central region killed 35 local people, left six missing, and injured 28 between Nov. 10 and 14, according to the country's Central Steering Committee for Flood and Storm Prevention on Thursday. The floods also inundated some 376,000 houses, damaged over 2, 500 hectares of paddy rice, and isolated some areas in the region.
Flash Flood	9 th Aug. 2008	Heavy rain and flash floods brought by tropical storm Kammuri killed at least 61 people and left dozens missing in northern Vietnam, officials said on Saturday. Dead: 130 Missing: 32 Injured: 90 Collapsed and drifted away houses: 982 Flooded and damaged houses: 10,526
Flood	26 th Aug. 2008	Continuous heavy rain from 26 to 28 August 2008 in Ha Giang and Phu Tho provinces, Vietnam triggered partial flooding and landslides, causing eleven people killed and four injured.
Typhoon	28 th Sep. 2008	In Vietnam, the death toll from flash floods and landslides triggered by typhoon Hagupit has jumped to 32 with another five people missing, official reports said on 28 September 2008.
Typhoon	29 th Sep. 2008	According to the official report, 12 people were found dead and five were missing in Vietnam by Typhoon Mekkhala as of 3 October 2008. Dead: 12 Missing: 5 Injured: 13 Collapsed and washed away houses: 25 Flooded and damaged houses: 6,462
Flash Flood	18 th Oct. 2008	Flash floods from heavy rains in central Vietnam in October have killed at least seven people, the government said.
Floods	1 st Nov. 2008	Floods in Vietnam have killed at least 65 people, including several in the capital, Hanoi, which has suffered its heaviest rains for two decades.
Tropical Storm	21 st Nov. 2008	Tropical storm Noul and subsequent torrential rains have killed 15 people and left two others missing and eight injured in central provinces of Vietnam, said Central Committee for Flood and Storm Control (CCFSC) on 22 November 2008.
Floods	3 rd Jan. 2009	Unseasonal floods brought by rains this week have killed at least five people in central Vietnam while 10 others remained missing, the government and state-run media said on Saturday.
Flood	5 th Jul. 2009	Heavy rains triggering floods and landslides in mountainous northern regions of Vietnam have killed at least 15 people, destroyed houses and damaged roads, the government and state-run radio said on 5 July 2009. Dead: 22 Missing: 13 Injured: 2 Collapsed houses: 19 Flooded houses: 509
Flood	25 th Sep. 2009	As of Saturday (26 September 2009) 18 people in the north-central

		provinces of Vietnam have been killed in floods and heavy rains caused by a tropical low hitting the region on Friday (25 September 2009). Seven people are missing.
Typhoon	29 th Sep. 2009	A powerful typhoon slammed into central Vietnam on Tuesday (29 September 2009), killing 32 people and flooding towns and villages along the country's long coastline.
Flood	2 nd Nov. 2009	Wide-scale floods in central Vietnam have killed at least 13 people after tropical storm Mirinae wreaked havoc in the region. Dead: 122 Missing: 2 Injured: 145
Floods	13 th May. 2010	Disaster officials say floods triggered by heavy rains killed 16 people in central Vietnam this week, including five children.
Typhoon	18 th Jul. 2010	Vietnamese troops evacuated thousands of people from their homes in the north of the country on Sunday due to threats of flash flooding and landslides, as the death toll from Typhoon Conson rose to more than 70.
Storm	24 th Aug. 2010	Storm Mindulle, which battered north-central provinces in Vietnam on August 24, has killed 10 people and injured 64 others.
Flood	3 rd Oct. 2010	Floods caused by heavy weekend rain killed six people in central Vietnam, the government said on 3 October 2010. Floods North-Central Vietnam From CCFSC comprehensive report, as of October 14; deaths: 66, missing: 19, injured: 114 and houses flooded: 148,711
Floods	18 th Oct. 2010	At least 46 people have died and 21 missing in severe flooding in Vietnam. From CCFSC flash report, as of 7pm October 22; death: 77 people, missing: 5 people, injured: 42 people and houses flooded: 276,481.
Flood	5 th Nov. 2010	Floods caused by heavy rainfall and a low pressure zone have caused 18 deaths, 6 injured and 6 missing in south-central Vietnam. Floods in South-Central Vietnam have cost the lives of 29 people and more than 39,212 flooded or damaged houses.
Flood	14 th Nov. 2010	Over the last 48h, a tropical depression caused heavy rainfall and consequent flooding in provinces in Central Vietnam and the Central Highlands. Due to heavy rainfall and floods, 19 people were killed with 6 missing. 31 people were injured. 29,651 ouses were flooded or damaged.
Flood	29 th Nov. 2010	Over the last 48h, provinces in South-Central Vietnam have been affected by heavy rainfall and consequent flooding.
Heavy rain	26 th Jun. 2011	Vietnamese authorities say four days of heavy rain in northern Vietnam has left at least 16 people dead and submerged more than 10,000 hectares of rice and other food crops.
Typhoon, Flood	30 th Sep. 2011	Typhoon Nesat is forecast to hit Viet Nam in the afternoon of 30 September 2011 and cause heavy seas and rainfall in central coastal provinces.
Flood	6 th Nov. 2011	Heavy rain in central areas of Vietnam for days caused 7 death. In some provinces, traffic system was blocked and many house holds were isolated. Continual heavy rains in the recent few days causing large-scale floods in Vietnam's central provinces killed at least 22 and made another two missing as of Wednesday, according to updated report by the local Storm and Flood Control Center (SFCC).
Typhoon	1 st Apr. 2012	After slamming into the southern coast of Vietnam on 1 April 2012, tropical storm Pakhar weakened quickly and caused great property damage to the south-eastern region. The storm destroyed 418 houses, damaged 4,477 others sank 36 boats and flooded more than 6,700ha of rice.
Typhoon	18 th Aug. 2012	Typhoon Kai-Tak made landfall in Vietnam on 18 August 2012, bringing intense rain and strong winds. At least 27 people have been killed.
Heavy Rain, Flood	3 rd Sep. 2012	Torrential rains since Monday in coastal areas of Veitnam have killed at least six people and left three others missing, the Central Steering Committee for Flood and Storm Control reported on the morning of 7 September 2012.
Typhoon	28 th Oct. 2012	On the night of 28 October 2012, the North and Nothern central parts of Viet Nam were affected by heavy rainfall and strong winds caused by Typhoon Son-Tinh. At least two were killed and two went missing.
Flood, Landslide	6 th Sep. 2013	At least 21 people have been killed as flash floods and landslides ravaged mountainous areas in northern Vietnam.
Typhoon, Flood	24 th Sep. 2013	Heavy monsoon rains exacerbated by Typhoon Usagi have pounded parts of Vietnam and Cambodia killing at least 36 people.
Typhoon	30 th Sep. 2013	In the afternoon of 30 September, Typhoon Wutip made landfall on the

		north-central provinces of Viet Nam with a Category 1 level, leaving 3 dead and 35 injured.
Typhoon	15 th Oct. 2013	Typhoon Nari damaged hundreds of houses in central Vietnam early on 15 October 2013, forcing the evacuation of tens of thousands of people.
Typhoon	10 th Nov. 2013	More than 600,000 people were evacuated as super typhoon Haiyan veered towards Vietnam, authorities said on 10 November 2013. Killed:13 Injured:81 People evacuated:756,022
Flood	14 th Nov. 2013	Devastating floods have killed at least 34 people and left 11 others missing in central Vietnam, local authorities said Sunday 17 November 2013, describing the deluge as the worst for over a decade.
Typhoon	19 th Jul. 2014	Typhoon Rammasun made its landfall in Quang Ninh province of Viet Nam in the noon of 19 July 2014, causing whirlwind and heavy rain in a number of the northern localities. Nearly 200,000 residents had been evacuated from high-risk areas in coastal localities in the north. Extreme weather caused by Typhoon Rammasun has killed 27 people in Vietnam.
Flood	26 th Jul. 2015	At least 14 people have been killed in the worst flooding for 40 years in Vietnam's northern Quang Ninh province. Damaged Houses: Approx. 8,000 houses
Storm Vamco	Sep15th 2015	Tropical Storm VAMCO (Typhoon No.3 in Viet Nam), which developed 13 September 2015, has weakened and eventually dissipated on 15 September 2015. The Government of Viet Nam, in their initial assessment report, mentioned damages to the properties and agricultures in Danang City and Provinces of Ha Tinh, Quang Ngai, Quang Nam, Quang Binh, Binh Dinh, Hoa Binh, Phu Tho, Thanh Hoa and Nghe An as a result of the heavy rains. The impact of Storm Vamco is as follows Impact: 12 death 1 missing 4 injured 4,231 houses were damaged and inundated at least 15,000 ha of agricultural lands were affected (as reported by the affected provinces) fisheries were also affected.
Flood and Landslides	Jul29th 2015	On 29 July 2015, the Viet Nam Central Steering Committee for Natural Disaster Prevention and Control reported flooding in the Quang Ninh Province. On early August, the flooding has expanded to the northern provinces including Ha Giang, Dien Bien, Tuyen Quang, Thai Nguyen, Bac Giang, Lang Son, Lai Chau, Cao Bang, Yen Bai, Lao Cai, Bac Kan, Son La, Thanh Hoa and Thai Binh. Impact: 32 death, 6 injured and 24 missing (including 17 death in Quang Ninh) About 4,556 families or 18,224 people were affected 7,735 houses were damaged at least 20,000 ha of crops were submerged
Storm Kujira	Jun25th 2015	Storm Kujira has affected Thuan Chau and Yean Chau District in Son La Province. Kujira is the first storm to hit this year. Impact: 7 death and 4 missing 1 injured in Hai Phong City 23 houses and 80 ha of crops were damaged
Tropical Storm Sinlaku	Nov30th 2014	Due to the effect of Tropical Storm Sinlaku that passed the Coastal province of Southern Viet Nam caused impact to several provinces as follow: Bin Dinh and Phu Yen Impact: initial impact as of 30 Nov 2014 based on CCFSC, 155 houses damaged (100 collapsed and 55 unroofed) 3,983 ha rice field inundated 340 tons harvested rice soaked and damaged Electrical outage experienced by several districts in Phu Yen
Flooding	Oct30th 2014	Heavy rain has damaged Ha Dong dam in Quang Ninh Province. The dam cannot sustain for massive volume of water. This incident has caused flooding in Dam Ha District. Impact: 88 families or 200 people were evacuated. Over 100 ha of paddy field and 25 ha of fish pond were affected. Roads were inundated.
Flooding in Southern Provinces	Oct9th 2014	Intense rain triggered flooding in several areas in Binh Thuan, Binh Duong, Soc Trang, Can Tho, Long An Province. Impact: 1 death and 41 houses were damaged in Long An 135 houses 705 ha of crops were affected in Soc Trang Over 1,112 ha of agriculture area were inundated in Binh Thuan and Can Tho
Flood affected Phu Tho	Sep20th 2014	Heavy rain that poured in Phu Tho for the last 2 days has created flashflood and landslide. Impact: 1 missing 212 houses were damaged 1,417 ha of agriculture area were affected
Typhoon	Sep16th 2014	Typhoon Kalmaegi that crossing northern provinces of Viet Nam on 16

Kalmaegi		September has caused casualties and property damages. Based on the Central Committee for Flood and Storm Control (CCFSC) report, the affected 12 provinces are Lang Son, Lao Cai, Hai Phong, Quang Ninh, Ha Giang, Bac Giang, Bac Kan, Thai Nguyen, Phu Tho, Cao Bang, Tuyen Quang and Thai Binh. Impact: 14 death, including 8 people in Lang Son 1 missing 10 injured 2,194 houses were severely damaged, mostly in Ha Giang 1,083 houses were submerged, mostly in Ha Giang about 78,484 ha of agriculture area were affected 329 families were evacuated
Flood Submerged Houses in Tan Chau	Sep10th 2014	Flood affecting Tan Chau, Tay Ninh Province and submerging hundreds of houses. Impact: 1 injured 2 collapsed houses 430 houses were submerged 222 ha of crop and 4 ha of fish pond were inundated
Floods	Augfirst 2013	In Vietnam 5 people have been killed in the recent flooding. The deaths were in in the province of Son La, where two people die trying to cross a river. There were also deaths in the provinces of Lao Cai, Yen Bai and Dien Bien.
Floods	Sep5th 2013	The Central Committee for Flood and Storm Control in Vietnam have reported that floods and landslides in northern Vietnam over the last 2 days have resulted in 8 deaths. 10 other people are still missing, and 14 people have been injured. The flooding and landslides occurred in Ha Giang province , Lai Chau and Lao Cai, where 4 of the victims died. Several houses – some reports claim around 12 – have been damaged and crops decimated. The Committee reported that almost 120 hectares of crops and fish ponds have been affected, although other reports claim it is now as much as 1,700 hectares.
Floods	Sep13th 2013	Further flooding and landslides have been predicted for Quang Ninh, Lang Son, Cao Bang, Bac Can , Thai Nguyen and Phu Tho. As many as 25 people have been reported as killed in the floods and landslides. A total of 38 houses have been destroyed and nearly 7,000 hectares of rice and farmland devastated. Vinh Phuc province suffered the worst crop destruction.
Flash Floods	Sep24th 2013	At least 20 people have been killed in flash floods in central Vietnam on Tuesday 24th September. A further 6 people are reported as missing, with more fatalities a possibility. A tropical depression in the region brought torrential rain and strong winds across the central parts of the country, including Dak Lak, Ha Tinh, Nghe An, Quang Nam, Quang Ngai, Ha Tinh, Quang Binh and Quang Tri Provinces . The tropical depression has also caused severe flooding in Laos over the last few days.
Tropical Cyclone Haiyan	Nov16th 2013	Earlier today, official reports from Vietnam's state media claim that at least 5 people have been killed, and that 64,500 people had to be evacuated from their homes in Quang Ngai province, and a further 4,000 in Quang Nam province. More recent media reports say that as of today, Saturday 16 November 2013, as many as 18 people have now been killed in the floods, with a further 7 people missing.
Ho Chi Minh High Tide	Nov30th 2013	Residents of Ho Chi Minh City are facing severe flooding as a result of an unusually high tide of the Saigon River.
Typhoon Rammason	Jul21th 2014	One local media report claims that as many as 6,000 homes have been flooded in the city of Lang Son. Flooding has also caused widespread damage to rice fields.
flash floods province of Lai Chau	Aug13th 2014	At least 6 people have been killed in the floods. A family of five – 2 parents and their 3 children – were killed in their home when it was washed away by raging flood water. The worst affected area is the village of Thac Can and surrounding area of Tam Duong district. Several other people are still missing.
High Tide Floods	Nov11th 2014	Some areas of Ca Mau Province in southern Vietnam are under 50cm (20 inches) of water after unusually high tides over the past few days.
Floods in Quang Ngai	Mar30th 2015	Floods in 3 provinces of central Vietnam have left 3 people dead. Two victims died in floods in Quang Ngai and one in neighbouring Quang Nam province. Thua Thien-Hue province has also been affected, although no deaths have been reported. Damage to crops, in particular rice, has been

		reported in all three provinces.
Tropical Cyclone Kujira	Jun26th 2015	Officials say that at least 7 people have died as a result, with a further 4 people still missing. Around 23 houses have been washed away in the flooding. Around 80 hectares of crops and farms in the province have also been damaged.
Flooding in Son La province	Jul29th 2015	At least 15 people have died after 3 days of torrential rain, landslides and floods in Quang Ninh Province, northern Vietnam. Flooding has also been reported in Son La province, where at least 30 houses have been damaged.
Floods	Aug4th 2015	Flooding has continued in Vietnam over the last few days, resulting in the deaths of three people, bringing the total number of recent flood-related deaths in Vietnam to at least 20 people. Earlier, heavy rain between 25 and 28 July, 2015, had caused severe flooding in the province of Quang Ninh. At least 15 people were killed in the floods. Later local media reports said the death toll had increased to 17, with as many as 8 people injured.
Floods	Sep11th 2015	VNS, the Vietnamese news agency, say that 3 people are missing after floods hit the mountainous province of Ha Giang in northern Vietnam. The floods occurred in Minh Tien village in Vi Xuyen District on Monday 07 September, 2015.

Source: JICA Project Team based on Information of ADRC, Floodlist and AHA Centre

Earthquake

Table A5.1.10 Record of Earthquake (Indonesia)

Place	Date	Damage
Indonesia		
Earthquake	29 th Nov. 1998	Earthquake of magnitude 7.6 struck on 29 November 1998 at 14:10 GMT. Some had been dead, and many houses were damaged. Tsunami warning were issued at every place.
Earthquake	May. 2000	A strong earthquake hit the eastern part of Sulawesi island and neighbouring small islands in Indonesia on 4 May 2000. According to the United States Geological Survey, the earthquake measured 7.3 on the Richter scale with the epicentre situated at latitude 0.9 degrees south and longitude 123.4 degrees east. It occurred at 04.21 hrs GMT, or 12.21 hrs local time. Several aftershocks and a tidal wave reportedly followed the quake. The death toll rose to 46. More than 14,000 houses and 237 government buildings were damaged, with at least 500 totally destroyed.
Earthquake	June. 2000	A powerful earthquake rocked the Indonesian island of Sumatra. The quake was recorded at 7.9 on the Richter scale by the United States Geological Survey (USGS) According to the provincial government's report, 90 people were killed and 352 houses were completely destroyed.
Earthquake	14 th Feb. 2001	On Feb. 14, an earthquake is occurred again in the Province of Bengkulu, Indonesia. The epicenter is in the Indian Ocean, 21 km from Manna City. According to the Meteorology and Geophysics Agency of Indonesia, the earthquake is at M.5, but the Australian Geological Survey predicted for M7.3.
Earthquake	10 th Oct. 2002	A powerful quake that caused widespread damage in Indonesia's easternmost Papua province has left one policeman dead.
Earthquake	2 nd Nov. 2002	Emergency crews in Indonesia are treating at least 35 people injured after a massive earthquake struck the island of Sumatra.
Earthquake	20 th Jan. 2003	An earthquake measuring 5.0 on the Richter scale made 2,000 people homeless, and damaged 500 homes and small buildings in eastern Indonesia.
Earthquake	25 th March. 2003	A strong earthquake shook parts of central Indonesia on Tuesday, injuring at least 20 people and damaging several houses.
Earthquake	27 th May. 2003	At 2.23 a.m. on Tuesday, May 27, 2003, a strong earthquake, estimated magnitude 6.4, hit Indonesia. 1 person were killed.
Earthquake	2 nd Jan. 2004	At least one person was killed and nine injured when an earthquake and aftershocks shook tourists and residents from their beds early on Friday on the Indonesian resort islands of Bali and neighbouring Lombok.
Earthquake	6 th Feb. 2004	A powerful earthquake hit in Nabire, Papua province, Indonesia, Saturday,

		Feb. 7, 2004. Authorities said, leaving more than 30 people dead and hundreds injured,
Earthquake	16 th Feb. 2004	At least five people have been killed on the Indonesian island of Sumatra after it was hit by an earthquake. The magnitude 5.6 quake struck near the town of Padangpanjang, about 1,000 km (625 miles) north-west of Jakarta.
Earthquake	11 th Nov. 2004	A major earthquake occurred on Thursday, November 11, 2004. The magnitude 7.3 event has been located in KEPULAUAN ALOR, INDONESIA. The earthquake killed at least 17 people. Dead: 23; seriously injured: 116; slightly injured: 118. Destroyed houses: 781; badly damaged houses: 3,733; fairly damaged houses: 3,883.
Earthquake	26 th Nov. 2004	A strong earthquake rocked Indonesia's West Papua province Friday, killing at least 11 people and causing dozens of buildings and homes to collapse, officials said.
Earthquake, Tsunami	26 th Dec. 2004	At least 94,081 people dead, 7,191 people missing, in the aftermath of a tsunami triggered by the most powerful earthquake (9.0-magnitude) since 1964. Dead: 126,732 Missing: 93,652 Displaced: 533,770
Earthquake	24 th Jan. 2005	A strong earthquake has hit the Indonesian island of Sulawesi, causing panic among thousands of people who fled their homes fearing a tsunami. The earthquake, measuring 6.2, damaged several buildings in the town of Palu. One person died after the tremor struck.
Earthquake	28 th March. 2005	A magnitude 8.7 earthquake struck the West coast of Sumatra in Indonesia centered near the island of Nias. More than 290 people were feared killed on the island.
Earthquake	14 th March. 2006	A strong earthquake of Magnitude 6.7 on the Richter scale has struck eastern Indonesia on 14 March. The quake triggered 5 meter tidal wave which killed two persons and injured one.
Earthquake	27 th May. 2006	On 27 May 2006 at 5:54 AM Local time (5/26/2006 10:54:00 PM UTC) an M6.3 earthquake has struck the very highly populated region of Yogyakarta, 275 miles east of Jakarta, Indonesia. The death toll continues to climb and is currently estimated between 5,775 and 6,234 and the number of injured is between 46,000 and 53,000.
Earthquake, Tsunami	17 th Jul. 2006	A strong undersea earthquake, which had a magnitude of 7.7, struck off the southern coast of Indonesia's Java island on Monday, triggering a tsunami that swept away wooden buildings and killed at least 500 people.
Earthquake	18 th Dec. 2006	An earthquake has struck Indonesia's Sumatra island, killing at least seven people and wounding around 100 others. Three moderate earthquakes struck Indonesia's Sumatra island on Monday, killing four people in one area including a child and triggering landslides, officials said.
Earthquake	6 th March. 2007	A strong earthquake followed by an almost equally strong aftershock rocked Sumatra in western Indonesia on Tuesday, 6 March 2007, killing at least 30 people.
Earthquake	12 th Sep. 2007	Some powerful earthquake had struck off the western Indonesian island of Sumatra. The tremor had a magnitude of 7.9, according to the Indonesian Meteorological Institute. Dead of 9 people had reported.
Earthquake	25 th Oct. 2007	On 25 October, 2007, the quake had a preliminary magnitude of 7.1 and struck 135 kilometers (85 miles) west of Bengkulu, a coastal town off Sumatra island, the U.S. Geological Survey said. It hit 30 kilometers (18 miles) beneath the ocean floor.
Earthquake	25 th Nov. 2007	On 25 November, 2007, at least three people were killed when powerful earthquakes (M6.4) struck off the coast of Sumbawa island in central Indonesia. 1800 injured were reported on 27 November.
Earthquake	20 th Feb. 2008	A8.5 magnitude quake whose epicentre was near the island of Simeulue, 319km (198 miles) off the coast of Sumatra, struck off Indonesia's Aceh province on 20 February 2008. At least three people have been killed and 25 seriously injured by the quake.
Earthquake	17 th Nov. 2008	A 7.5-magnitude earthquake jolted Indonesia early Monday, leaving two people dead and 37 injured.
Earthquake	4 th Jan. 2009	A series of quakes including the quake of Magnitude 7.6 off the northern coast of the Indonesian island of Papua early on Sunday, 4 January 2009, killed four people and injured several others, officials and local television said.
Earthquake	12 th Feb. 2009	February 12, 2009, a series of earthquakes shook far northeastern Indonesia Thursday, injuring at least 42 people and damaging about 500

		homes and other buildings, officials said.
Earthquake	2 nd Sep	A magnitude 7.0 earthquake occurred in Java, Indonesia at 2:55 pm local time on 2 September 2009.
Earthquake	19 th Sep. 2009	On September 2009, an earthquake registering magnitude 5.8 struck the Indonesian island resort of Bali, injuerd seven people.
Earthquake	30 th Sep. 2009	A powerful earthquake (Magnitude 7.6) off the coast of Sumatra island of Indonesia has killed more than 529 people on 30 September 2009.
Earthquake	9 th Nov. 2009	At least one person has been killed and several others injured after a strong undersea earthquake, magnitude 6.7, hit the remote Indonesian island of Sumbawa.
Earthquake	7 th Apr. 2010	The 7.2 magnitude earthquake in Simelue regency, Aceh, had injured 20 people as of 3 p.m., a statement from the Health Ministry said.
Earthquake	16 th Jun. 2010	The earthquake occurred in Indonesia on 16 June, killed at least 17 people and displaced 10,000 people in Yapen, Papua.
Earthquake, Tsunami	25 th Oct. 2010	On 25 October, the islands were struck by a 3m-high tsunami triggered by a 7.7 magnitude earthquake off the coast of western Sumatra, which left 509 people dead, 21 missing, destroyed 550 houses and damaged another 200, the country's National Disaster Management Agency reported.
Earthquake, Tsunami	11 th Apr. 2012	Centre for Health Crisis MOH reported the death of 8 persons, hospitalization of 6 patients with major injuries; 101 persons were treated at the outpatient clinics from minor injuries. The damage of health facilities were 39.
Earthquake	2 nd Jul. 2013	Government reports number of IDPs has risen to 53,339. The death toll has risen to 42, six persons are still missing. The number of damaged houses and public buildings has climbed to 20,401.
Earthquake	25 th Sep. 2015	More than 60 people were injured and 200 houses damaged Friday when a powerful earthquake rocked remote eastern Indonesia, a disaster agency official said, and warned the number of victims could rise.
Earthquake	2 nd March. 2016	Local authorities initially issued a tsunami warning but lifted it several hours later, and there were no immediate reports of casualties or damage. The 7.8 magnitude undersea quake struck at a depth of 24 kilometres (15 miles) at about 6:50 pm (1250 GMT), the US Geological Survey said.
Earthquake	2 nd Jun. 2016	Subsequent assessment showed that 856 houses were damaged in Pesisir Selatan District, and 56 in Mukomuko District. 16 people were injured in West Sumatra Province. The same number of people were injured in Bengkulu Province.
Great Banda Sea Earthquake	Nov4th 1963	The Banda Sea earthquake of November 4, 1963 is one of the largest (Mw = 8.3) intraplate events. It involved oblique thrusting at an intermediate depth within the subducted lithosphere near the abrupt bend in the southeastern Banda arc (6.86[deg] S, 129.58[deg] E). To better understand the tectonic significance of this earthquake, the detailed source process of the Banda Sea event was determined by body wave analysis. The rupture history was established by deconvolving source time functions from long-period P wave seismograms, using both individual station and multi-station time-domain deconvolution methods. The seismic moment release occurred within the first 50 s of rupture, initiating at a depth near 120 km and expanding laterally and downdip over a vertical extent of about 50 km. Slip and moment release were concentrated in one main region near the hypocenter, at depths between 110 and 130 km. The along-strike rupture length was only about 100 km, so it is difficult to resolve any horizontal directivity. The compressional stress orientation inferred from the focal mechanism parallels the strike of the slab, and reflects the importance of contortion of the lithosphere in this region. The Banda Sea event may be part of a major detachment at the leading edge of the subducted Australian continental shelf.
Papua	Jun25th 1976	M7.1, Fatalities 5,000 Directly after the earthquake the casualty count was assessed as 350 dead. However, landslides soon occurred in the affected area, leading to 72 more casualties. 5,000–9,000 were missing after the landslides, and were assumed dead. A total six villages were demolished in the area. The west sector of Irian and eastern New Guinea also reported that the earthquake was felt significantly in their region.
Sumba	Aug19th 1977	The 1977 Sumba earthquake (also called the Sumbawa earthquake)

Earthquake		<p>occurred approximately 290 kilometres (180 mi) south of Bima, Sumbawa, and beneath the Indian Ocean, at 14:08 local time on 19 August. With a moment magnitude of 8.3, the earthquake is notable for having an unusually great magnitude for a shock with a normal faulting focal mechanism. The shock occurred near the southern section of the Sunda Trench where several other tsunami-generating earthquakes have occurred. The earthquake was at the time the largest outer-rise earthquake ever recorded in Indonesia, and aftershocks along the trench extended about 130 kilometres (81 mi) eastward and 110 kilometres (68 mi) westward from the epicenter.</p> <p>Although damage from the earthquake was limited to Indonesia, ground movement was reportedly felt as far afield as Albany in Australia, and the power supply was briefly cut in Port Hedland.[5] A tsunami was generated with observed run-up heights of up to 5.8 meters (19 ft) and inundation distances of up to 1,200 metres (3,900 ft) at several locations on Sumba and Sumbawa. The combined number of victims from both the earthquake and tsunami in Indonesia was at least 107 confirmed dead and several dozen others missing, presumed dead; several sources combine the two for a total casualty figure of approximately 180 deaths and 1,100 injuries.</p>
Irian Jaya Earthquake	Jan19th 1981	<p>On January 19, 1981, eastern Indonesia was struck by an earthquake known as the 1981 Irian Jaya earthquake. Registering a magnitude of 6.8 on the Richter scale, it killed more than 300 people, damaging structures and buildings across the Irian Jaya province.</p> <p>Spawning enormous landslides, the earthquake left at least 305 people dead and more than 1,000 missing. Entire villages were covered by debris. It was described as "strong" by The New York Times.</p> <p>The earthquake caused huge landslides, which cascaded into the villages below the mountains, destroying more than 150 homes. The debris from these flows blocked transportation by road, "cutting off more than 2,000 area residents". Relief efforts took several days.</p>
Flores Earthquake and Tsunami	Nov12th 1992	<p>The 1992 Flores earthquake occurred on December 12 on the island of Flores in Indonesia. With a magnitude of 7.8, it was the largest and also the deadliest earthquake in 1992.</p> <p>The quake hit at 05.29 UTC and was followed by several serious aftershocks. At least 2,500 people were killed or missing near Flores, including 1,490 at Maumere and 700 on Babi. More than 500 people were injured and 90,000 were left homeless. Nineteen people were killed and 130 houses were destroyed on Kalaotoa. Damage was assessed at exceeding US\$100 million.</p>
Liwa Earthquake	Feb15th 1994	<p>The 1994 Liwa earthquake occurred on February 16 at 00:07 local time. It was located in southern Sumatra, Indonesia. The magnitude of the earthquake was put at Mw 6.9, Mw 7.0, or Ms 7.2, according to different sources.</p> <p>The earthquake caused 207 deaths and 2000 injuries. There was damage from landslides, mudslides, and fires in Lampung Province. Power outage occurred in western Lampung. Six-thousand buildings were damaged or destroyed by landslides in the Liwa area. In addition to southern Sumatra, the earthquake could be felt in western Java and Singapore. Intense smoke and gas activity was observed in the Suwoh volcanic area.[</p>
Java Earthquake and Tsunami	Jun third 1994	<p>This earthquake occurred with a moment magnitude of 7.8 in a region which is characterized as having a weak seismic coupling. Earthquakes with slow rupture velocities are the most efficient tsunami generators, and this earthquake was classified as a tsunami earthquake.</p> <p>Tsunami</p> <p>The tsunami reached Java and Bali, with runups up to 14 m (46 ft) on the east Java coast and up to 5 m (16 ft) on the southwestern Bali coast. More than 200 people were killed in the tsunami. The shock could be felt strongly across Bali, central and eastern Java, Lombok, and Sumbawa.</p>
Biak Earthquake and Tsunami	Feb17th 1996	<p>The 1996 Biak earthquake, or the 1996 Irian Jaya earthquake, occurred on February 17 at 14:59:30 local time near Biak Island, Indonesia. The earthquake had a moment magnitude of 8.2 and a maximum Mercalli intensity of VIII (Severe). The run-up height of the generated tsunami reached 7 meters (23 ft). One-hundred and sixty-six people were reported</p>

		<p>dead, 423 were injured, and 5,090 were made homeless.</p> <p>This earthquake was a thrust in a very oblique subduction zone. It ruptured at least 270 km (170 mi) along the New Guinea trench. The slip distribution is very nonuniform. The largest slip was ~12 m near the hypocentral depth, and the mean slip over a 230 km by 100 km fault area was 4 m.</p> <p>Tsunami 7m(23ft), Casualties 166 dead, 423 injured, 5,090 displaced</p>
Enggano Earthquake	Jun4th 2000	<p>The 2000 Enggano earthquake struck at 23:28 local time on June 4 with a moment magnitude of 7.9 and a maximum Mercalli intensity of VI (Strong). The strike-slip event occurred off the coast of southern Sumatra, Indonesia near Enggano Island. There were more than 100 fatalities and up to 2,585 injuries. Over 730 aftershocks shocked the area afterwards, one just eleven minutes after the mainshock.</p> <p>Extensive damage and landslides populated the Bengkulu area, with minor injuries and damage on Enggano Island. In the village worst struck, several hundred structures were reported in ruins. Peter Walker of the International Federation of Red Cross and Red Crescent Societies in Geneva denied the earthquake as the major cause of death, instead blaming disease. "...the actual damage from the earthquake isn't that great; the houses are wooden structures so they don't collapse much. But what he found was an endemic problem of rampant malaria, rampant communicable diseases and levels of mortality and morbidity that are totally unacceptable. That is the disaster, not the earthquake." An aftershock measuring 6.2 struck on June 7.</p> <p>Casualties 103 dead 2,174-2,585 injured</p>
Nabire Earthquake	Feb7th 2004	<p>The 2004 Nabire earthquake occurred on November 26 in Papua, Indonesia. The strike-slip event had a moment magnitude of 7.1 and a maximum Mercalli intensity of VIII (Severe). Total deaths for the event amounted to 32, and the total number of injured (as reported by various agencies) was 130–213.</p> <p>Dozens of buildings collapsed and nearly two hundred homes, businesses, and a church were lost. Some infrastructure was damaged, including three bridges and a government telecommunications building.</p> <p>Casualties 32 dead 130-213 injured</p>
Indian Ocean Earthquake	Dec26th 2004	<p>According to the country's National Disaster Relief Coordination Agency, 250,000 people are dead and 37,063 are missing. In addition, the UN estimates that 655,000 people are homeless and sheltering in scattered refugee camps across the province.</p> <p>As of January 23, 2005 the Health Ministry reported 173,981 dead while the Social Affairs Ministry registered 114,978 killed. On 25 January Health Minister Fadilah Supari updated the estimated death total to 220,000. The death toll is now (2011) estimated at 230,000 that died in the tsunami.</p>
Nias–Simeulue Earthquake	Mar28th 2005	<p>On the Indonesian island of Nias, off the coast of Sumatra, hundreds of buildings were destroyed. The death toll on Nias was at least one thousand, with 220 dying in Gunungsitoli, the island's largest town. Nearly half of Gunungsitoli's population (27,000) fled.</p> <p>Portions of Thailand's southern coast were evacuated as a precaution, and NOAA advised an evacuation of 965 kilometres (600 mi) of coastline in Sumatra. Evacuations occurred in the northern Malaysian states of Penang and Kedah, as well as the eastern coast of Sri Lanka, where ten people were killed in the confusion of the evacuation. Many of the southern states of India were put on high alert; all of these areas had seen significant damage from December's tsunami. After the detection of a minor tsunami south of the epicenter, including a 30 cm tsunami on Australia's Cocos Islands, the island states of Mauritius, Madagascar, and the Seychelles in the Indian Ocean issued warnings to their populations. Although tsunami warning systems for the region had been actively discussed before the December 2004 earthquake, none had yet been implemented in the Indian Ocean.</p>
Yogyakarta Earthquake	May27th 2006	<p>The 2006 Yogyakarta earthquake (also known as the Bantul earthquake) occurred at 05:54 local time on 27 May with a moment magnitude of 6.4 and a maximum intensity of IX (Destructive) on the Medvedev–Sponheuer–Karnik scale. The shock occurred on the southern coast of Java near the Indonesian city of Yogyakarta, and caused a</p>

		disproportionate number of casualties, with more than 5,700 deaths and 37,000 injuries, and financial losses of (Rp 29.1 Trillion (\$3.1B)). The eruption of Mount Merapi, a stratovolcano that was entering a period of unrest, was originally thought to have a connection with the earthquake. With a lack of instruments in the area, the shock was initially attributed with the Opak Fault that lies to the east of the affected areas, but later InSAR analysis revealed that another previously unknown fracture was responsible for the sequence of shocks.
Pangandaran Earthquake and Tsunami	Jul17th 2006	An abnormally slow rupture at the Sunda Trench and a tsunami that was unusually strong relative to the size of the earthquake were both factors that led to it being categorized as a tsunami earthquake. Several thousand kilometers to the southeast, surges of several meters were observed in northwestern Australia, but in Java the tsunami runups (height above normal sea level) were typically 5–7 meters (16–23 ft) and resulted in the deaths of more than 600 people. Other factors may have contributed to exceptionally high peak runups of 10–21 m (33–69 ft) on the small and mostly uninhabited island of Nusa Kambangan, just to the east of the resort town of Pangandaran, where damage was heavy and a large loss of life occurred.
Sumatra Earthquakes	Sep12th 2007	The tremors of the 8.5 Mw earthquake lasted for several minutes. It caused buildings to sway in Jakarta, and some buildings were reported to have collapsed in the city of Bengkulu, Bengkulu Province, about 100 km from the epicenter. Tremors felt in Jakarta were described as being "violent". It was reported that several high-rise buildings were evacuated. The earthquake also led to a power outage in Bengkulu, which crippled communications. The death toll of the earthquakes is 21 with 88 people injured. Tremors were felt in neighbouring countries as far away as Southern Thailand. In Singapore, which is about 670 km from the epicenter, the tremor was felt at around 11:10 UTC (19:10 local time). Most of the Central and Eastern part of Singapore has felt the tremor. In Peninsular Malaysia, tremors were reported after 19:15 local time, including Kuala Lumpur, Putrajaya, Johor Bahru, Malacca and Penang. Like Singapore, the tremors were most severe on high-rises, resulting in minor panic and evacuations. No casualties were reported in the country, as of 13 September.
West Java Earthquake	Sepsecond 2009	The 2009 West Java earthquake occurred on September 2 at 14:55 local time in West Java, Indonesia. The magnitude 7.0 earthquake killed at least 79 people, injured over 1,250, and displaced over 210,000 (including more than 140,000 in Tasikmalaya regency). The quake was felt in the capital Jakarta, although damage there was minimal, and it was Indonesia's deadliest earthquake since the 2006 Pangandaran earthquake and tsunami. Buildings in Bandung and Tasikmalaya, the town closest to the epicenter, were damaged, and hundreds of people were injured. An estimated 18,300 homes and offices were earlier thought to have been damaged. This figure later rose to 87,000. The quake was felt in Jakarta, Indonesia's capital; causing evacuation in many office buildings and hotels. Several office buildings along major thoroughfares in Central Jakarta suffered damage. At least 11 houses were covered by a landslide in Cianjur.
Sumatra Earthquake	Apr6th 2010	The April 2010 Sumatra earthquake occurred on April 7 at 5:15 AM local time with a moment magnitude of 7.8 and a maximum Mercalli intensity of VIII (Severe). The shock occurred near Banyak Islands, off the island of Sumatra in Indonesia. A tsunami watch was issued according to the Pacific Tsunami Warning Center in Honolulu which was later canceled. A 40 cm surge was reported in the Banyak Islands an hour after the quake, along with 62 injuries. Power outages were reported throughout the province of North Sumatra as well as in Aceh. This quake is one of the sequence of large earthquakes along the Sunda megathrust in 2000s.
Sumatra Earthquake and Tsunami	Oct25th 2010	The earthquake's worst effects were felt on the remote Mentawai Islands. On the island of South Pagai, the tsunami that followed the earthquake reached a height of 3 m (9 ft) and swept as far as 600 m (1800 ft) inland. According to Indonesian officials, more than 20 villages were hit by the

		<p>tsunami, displacing more than 20,000 people and affecting about 4,000 households. The coastal village of Betu Monga on South Pagai was reported to have been destroyed with many residents still missing. Many residents of the villages of Peurogat and Beleerakso were also reported to be missing. Eighty percent of the houses in the North Pagai village of Muntei Baru were reported damaged or destroyed.</p> <p>Tsunami</p> <p>Many villages on the islands were affected by the tsunami, which reached a height of 3 m (9 ft) and swept as far as 600 m (1800 ft) inland. The tsunami caused widespread destruction that displaced more than 20,000 people and affected about 4,000 households. 435 people were reported to have been killed, with over 100 more still missing. The subsequent relief effort was hampered by bad weather and the remoteness of the islands, which led to delays in the reporting of casualties.</p>
Indian Ocean Earthquakes	Apr 11th 2012	<p>Four people in their 60s and 70s in Banda Aceh, and a 39-year-old man in Lhokseumawe died from heart attacks or shock. Injuries were reported in Aceh Singkil, including a child who was critically injured by a falling tree. The quake prompted people in Indonesia, Thailand and India to leave their homes and offices in fear of tsunamis. People headed for higher ground in parts of Indonesia and Malaysia. In Aceh, where 31,000 people were killed in the 2004 Indian Ocean earthquake and tsunami, people were reported weeping. Some people used cars and motorcycles to reach higher ground. Patients were reportedly wheeled out of hospitals, some with drips attached to their arms. One hotel guest was slightly injured when he jumped out of his window.</p> <p>The earthquake was felt over a large area, including Indonesia, the Maldives, Sri Lanka, India, Nepal, Bhutan, China, Bangladesh, Burma, Thailand, Malaysia, Laos, Cambodia, Singapore, and Vietnam. The quake was felt across the eastern coast of India including Chennai, Bangalore, Kochi, Bhubaneswar, Vizag and Kolkata. The Metro Rail services were suspended in Kolkata, and passengers were asked to leave stations. In peninsular Malaysia, shaking was felt in Penang and Kuala Lumpur. The tremor was felt in Colombo, Sri Lanka, where people in some high-rise buildings were evacuated. In China, the earthquake was felt in Tibet. However, it was not reported to be felt in places closer to the epicenter such as Yunnan and Guangxi.</p>

Source: JICA Project Team based on Information of ADRC and AHA Centre

Table A5.1.11 Record of Earthquake (Malaysia)

Place	Date	Damage
Myanmar		
Tsunami	26 th Dec. 2004	At least 68 people were killed, 6 people are missing with hundreds injured in the aftermath of a tsunami triggered by the most powerful earthquake (9.0-magnitude) since 1964. Dead: 68 Missing: 6 Displaced: 8,000
Earthquake, Landslide	5 th Jun. 2015	Magnitude 6.0 earthquake occurred in Sabah State, Malaysia in the morning on 4 June 2015. The earthquake triggered a series of landslides in Mount Kinabalu, killing at least 11 people.

Source: JICA Project Team based on Information of ADRC

Table A5.1.12 Record of Earthquake (Myanmar)

Place	Date	Damage
Myanmar		
Tsunami	26 th Dec. 2004	At least 90 people were killed in Myanmar by a tsunami that wreaked death and destruction along the coasts of the Indian Ocean.
Earthquake	24 th March. 2011	A large 6.8 magnitude earthquake struck Myanmar near the border with northern Thailand on 24 March 2011. Initial findings of a rapid assessment indicate that at least 18,000 people residing in 90 villages are affected by the earthquake. The local authorities in Tarlay have reported that a total of 836 houses were damaged in the affected areas.
Earthquake	11 th Nov. 2012	On 11 November 2012, an earthquake registering 6.8 on the Richter scale was recorded 50 kilometers north of Shwebo Township in Sagaing Region, 115 kilometers north of Mandalay. The Government indicates at least 16

		people were killed and 52 other injured in the earthquake. The Government reports that over 400 houses, 65 schools and 100 religious buildings were damaged.
Myanmar earthquake	Mar24th 2011	Temporary evacuations of tall buildings took place in Chiang Rai of Thailand, Menghai County in Yunnan, Nanning in Guangxi Zhuang Autonomous Region of China, and in Hanoi of Vietnam. At least one bridge is reported collapsed in Myanmar. In total, 390 residential homes, 14 monasteries and 9 government buildings were destroyed. In Monglin, at least 128 homes were reduced to rubble. According to the United States Geological Survey's population exposure data, the final damages from the earthquake are most likely to be slightly under USD \$100 million.

Source: JICA Project Team based on Information of ADRC and AHA Centre

Table A5.1.13 Record of Earthquake (Philippines)

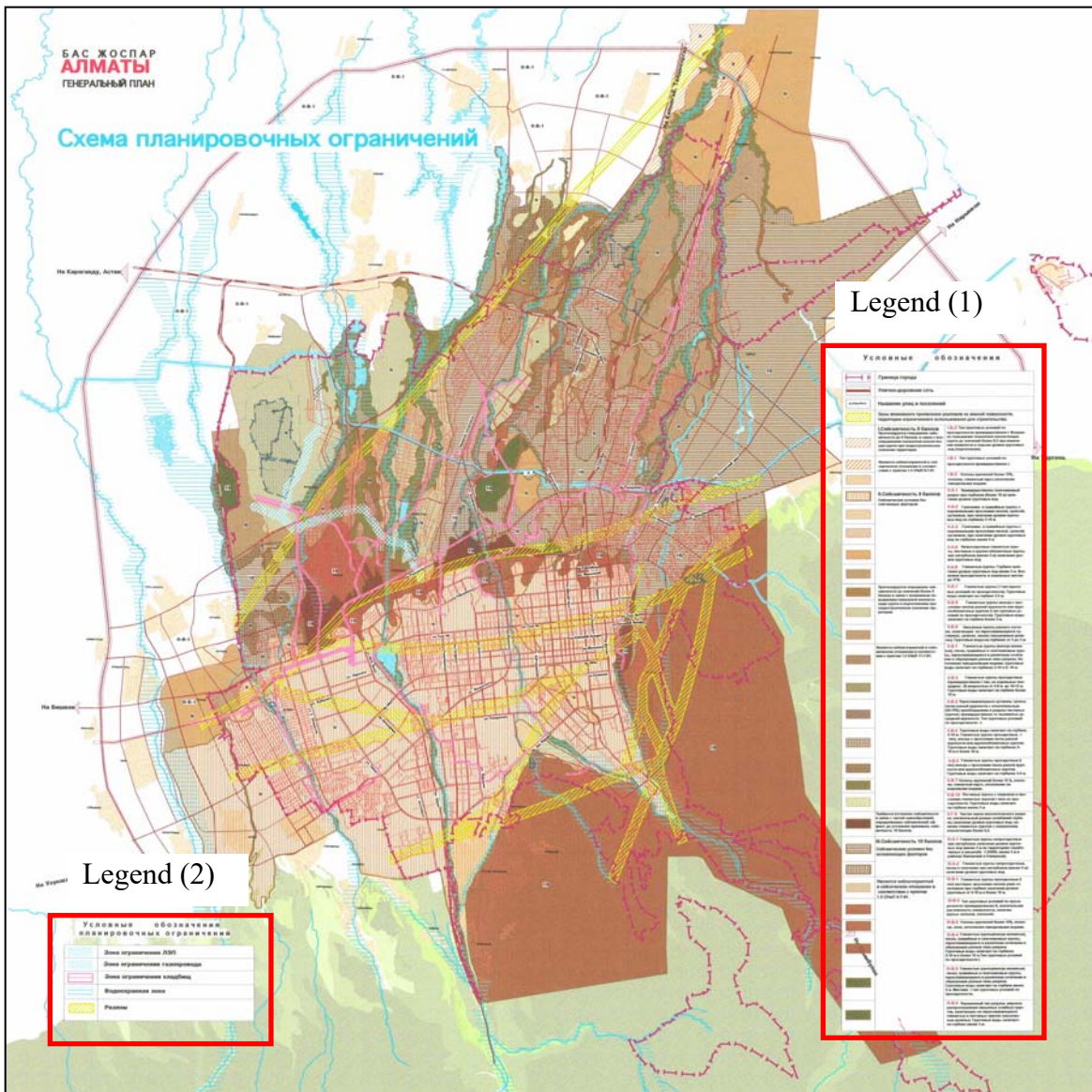
Place	Date	Damage
Philippines		
Earthquake	12 th Dec. 1999	A strong earthquake hit Luzon 12 December 1999, at 02:03 hrs local time. The earthquake measured 6.8 on the Richter scale.. The main quake lasted for more than 20 seconds and was followed by a series of strong aftershocks. Six people were reportedly killed and at least 40 people were injured, mostly by debris falling from damaged walls and roofs in their homes. Initial estimates for damage caused by the quake were not yet available although at least 30 houses were partially destroyed in Zambales. Several bridges, water pumping stations and public buildings in Manila and Pangasinan suffered "minor damage" .
Earthquake	6 th March. 2002	A strong earthquake has shaken philippines, killing at least 4 people and injuring some people.
Earthquake	16 th Feb 2003	Two strong earthquakes struck the central Philippines just hours apart, damaging houses and knocking out power.
Earthquake	19 th Nov.2003	A strong earthquake with a preliminary magnitude of 6.6 struck the central Philippines early Wednesday, killing a child and collapsing several small buildings
Earthquake	6 th Feb 2012	A M6.9 earthquake occurred offshore Negros Oriental (Tayasan) in the Philippines at 11:49 am, 6 February 2012. 15 people were killed. Killed: 51 Missing: 62 Injured: 112 Affected: 320,165 Totally damaged houses: 6,352 Partially damaged houses: 9,435
Earthquake	15 th Oct. 2013	An earthquake measuring 7.2 hit the central Philippines on 15 October 2013, killing at least six people. Killed: 222 Injured: 796 Missing: 8 Affected: 3,221,248
Moro Gulf Earthquake and Tsunami	Aug16th 1976	The initial earthquake was widespread and was felt as far as the central Philippine islands of the Visayas. A massive tsunami devastated 700 kilometers of coastline bordering the Moro Gulf in the North Celebes Sea, resulting in destruction and death in the coastal communities of the Sulu Archipelago and southern Mindanao, including Zamboanga City and Pagadian City. At least 5,000 people died during the earthquake and tsunami, with thousands more remaining missing. Some reports say that as many as 8,000 people lost their lives in total, with ninety percent of all deaths the result of the following tsunami. Initially over 8,000 people were officially counted as killed or missing, 10,000 injured, and 90,000 homeless, making it one of the most devastating disasters in the history of the Philippine Islands. After the initial earthquake the people were unaware of the need to move to higher ground; when the tsunami hit it sucked most of the victims out to sea. Based on the investigation on the affected region it was confirmed that the waves reached up to 4 to 5 metres (13 to 16 ft) when they hit the areas. There were reports of weak tsunami activity as far as Japan.
Baguio City Earthquake	Jul16th 1990	Looking back, it was exactly 4:26 p.m. on Monday, 16 July 1990, that a killer earthquake unexpectedly hit and extensively devastated the City of Baguio. As reported, the powerful temblor measured 7.7 in the open-ended Richter scale and lasted for 45 seconds. It was said to be the most destructive earthquake on record within the Cordillera Region. There were numerous aftershocks that followed and the strongest, which occurred at 3:15 a.m. of July 18, lasted for eight seconds ... and measured 5.3 on the

		<p>Richer scale.</p> <p>Fearing for their lives, many of Baguio's 120,000 people slept outdoors on Monday night. The city suffered the most in terms of destruction to properties and numerous deaths. Many commercial and government buildings, hotels, inns, and residences were heavily damaged. The death toll continued to rise as rescuers pulled more bodies from the rubbles. It was estimated that as many as 1,000 people were trapped and killed in damaged buildings.</p> <p>The five-star Hyatt Terraces Plaza sustained the worst damage when its terraced front collapsed onto the lobby area, killing about 50 people. The Baguio Park Hotel along Harrison Road was a total wreck. The luxurious Nevada Hotel which is located right across from the main gate of Camp John Hay was ripped in half by the quake, leaving a huge gash in the middle of the structure. The Saint Vincent Catholic Church along Naguilian Road was spared by the strong quake, however a portion of its retaining wall and parking area was damaged and collapsed to the road below. The church, which has withstood typhoons, bombings during the 2nd World War, and other disasters, suffered only minor damage.</p>
Mindoro Earthquake	Nov15th 1994	<p>The epicenter of this earthquake was located in the Verde Island Passage, a strait separating Luzon and Mindoro. The focal mechanism showed predominantly right-lateral strike-slip faulting. The released seismic moment was about 5.12×10^{19} Nm.</p> <p>Tsunami</p> <p>The earthquake generated a tsunami, which affected Mindoro, the Verde Island, the Baco Islands, and Luzon. Some concrete structures also suffered moderate damage in the tsunami. In Baco Islands, the vertical run-up reached 8.5 meters (28 ft). The tsunami was also recorded in Lobo. The tsunami was larger than expected considering the strike-slip movement of the earthquake.</p> <p>Casualties 78 killed</p>
Mindanao Earthquakes	Jul23th 2010	<p>The 2010 Mindanao earthquakes occurred in the Southern Philippines in the Moro Gulf. The sequence of events took place over several days in late July, and consisted of three primary shocks that were all over M7, but there were no reports of damage or casualties as they occurred far too deep (over 500 kilometres (310 mi)) to pose any serious threat.</p>
Visayas Earthquake	Fb6th 2012	<p>The 2012 Visayas earthquake occurred on February 6 at 11:49 PST with a moment magnitude of 6.7 and a maximum intensity of VII (Destructive) off the coast of Negros Oriental, Philippines. The epicenter of the undersea blind thrust earthquake was approximately 72 kilometres (45 mi) north of Dumaguete, Negros Oriental.</p> <p>Tsunami</p> <p>The Philippine Institute of Volcanology and Seismology (PHIVOLCS) gave a level two tsunami alert, indicating that the public should be on watch for "unusual waves", but did not call for any evacuation. Despite this, in Cebu City, panic erupts and many residents fled towards higher ground due to rumors that a tsunami had hit the coastal villages of Ermita, Mambaling and Pasil. Residents of Dumaguete also scrambled to the mountain town of Valencia because of the scare. These rumors were later confirmed to be false. PHIVOLCS announced the tsunami alert at 14:30 PST.</p> <p>Casualties 51 dead, 112 injured, 62 missing</p>
Bohol Earthquake	Oct15th2013	<p>The earthquake struck as the Philippines was observing the Muslim holiday of Eid-al-Adha. The public holiday had closed schools, some businesses, and offices which helped reduce the number of casualties.</p> <p>A total of ₱2.25 billion worth of damage to public buildings, roads, bridges, and flood controls was reported in Bohol and Cebu. A total of 671,103 families or more than 3.2 million people were affected by the quake. Out of the total number of affected, 71,822 families or more than 348,000 people were displaced.</p>

Source: JICA Project Team based on Information of ADRC and AHA Centre

A5.2 ZONING CODE OF ALMATY CITY, REPUBLIC OF KAZAKHSTAN

Building Code (specially seismic code), Development Permission Criteria belong to this group. Figure A9.1.1 is zoning code (Urban Planning) of Almaty City (Republic of Kazakhstan). This zoning code informs the location of active fault and soft ground area. If land owner constructs new building on soft ground area, he must attention the regulation of earthquake-resistant strength. Construction work is limited on active fault.the point of good practices is connection of zoning code and geologic map. It is effective for strong city to earthquake.



Source: JICA Project Team

Figure A5.2.1 Building Control of Almaty City

Legend (1)

The City Boundary	
Street and Road Network	
Names of streets and settlements	
Zones of possible faults on the ground surface and the construction restricted area	
I. Seismicity – 8 points (Earthquake Intensity 8) Predicted increase of seismicity to 9 points due to possible increase of the soil consistency index during town-planning development of the area.	I-B-2 Subsidence soil conditions –Type 1 predominantly. Possible increase of the soil consistency index to the value over 0,5 at mositure changes, and rise of the ground water level (underflooding)
Unfavorable in seismic respect according to Item 1.5 of Building Regulations (SNiP) 11-7-81	I-B-1 Subsidence soil conditions –Type 1 predominantly I-B-3 Slope gradient – over 15%, landslide, clay karst, flood
II. Seismicity – 9 points (Earthquake Intensity 9) Seismic conditions without any external agent	II-A-1 Predomomently pebbel section; deep (over 10 m) ground water level. II-A-2 Pebble and gravel interlaid with sand, sandy loam, loamy soil; ground water level – 5-10 m II-A-3 Pebble and gravel interlaid with sand, sandy loam, loamy soil; ground water level – below 5m II-A-6 Non-subsiding clay soil, sandy and coarse-grained rock at shallow (below 5 m) ground water level II-A-8 Loamy soil. The ground water level below 5 m. Possible subsidence to UGV in some places
Predicted increase of seismicity to over 9 points due to possible increase of the soil consistency index and underflood during town-planning development of the area.	II-B-1 Loamy soil (Type 1 subsidence soil conditions). Ground water level – 2-5 m II-B-5 Loamy soil sometimes interlaid with different coarse sand or coarse-grained rock(Type 1 subsidence soil conditions). Ground water level over 3 m. II-B-6 Ground water level – 3-5 m. Fill-up ground of different constitution occurring on interlaid sandy loam, clay loam, sand (filled-up valleys).Ground water level – 3-5 m
It is unfavorable in seismic respect according to Item 1.5 of Building Regulations (SNiP) 11-7-81	II-B-1 Loamy soil (sometimes silty), sand, gravel and pebble interlaid in various proportion and forming different types of sections. Underflood, the ground water level – 5-10m and over 10m. II-B-2 Loamy subsiding soil (Type I predominantly and Type II in some places) between 5-6 m and 10-12 m deep. Ground water level – over 10m. II-B-3 Loamy soil, clay loam and different coarse sand with relative (50-70%) sandy soil prevailing in the section: mainly from sandy silt to medium sand. (Type 1 subsidence soil conditions). II-B-4 Loamy subsiding soil (Type I), sometimes interlaid with different coarse sand or coarse-grained rock Ground water level – 5-10 m and over 10m. II-B-5 Loamy subsiding soil (Type I), sometimes interlaid with different coarse sand or coarse-grained rock. Ground water level – 3-50 m. II-B-7 Slope gradient over 15%, landslide, clay karst, flooding II-B-10 Sandy soil with loamy soil (Type I) blanket and parting; Ground water level – below 5 m.
Updating of seismicity is required due to frequent change of conditions determining seismic effect; before updating seismicity of 10 points shall be applied.(Earthquake Intensity 10)	II-G-3 Frequent change of lithologic section; the ground water level varies greatly; presence of loamy soil with consistency index over 0,5.
III. Seismicity 10 points Seismic conditions without any external agent	III-A-1 Loamy non-subsiding soil at shallow ground water level ((below 5 m on the area surveyed at a scale of 1:25000; below 3m in the area of the BAK and the Northern). III-A-2 Loamy non-subsiding soil, sand and pebble at shallow ground water level ((below 5 m)
Unfavorable in seismic respect according to Item 1.5 of Building Regulations (SNiP) 11-7-81	III-B-1 Loamy subsiding soil (TypeI), interlaid with sand and rarely with pebbles; ground water level: 5-10m and over 10m. III-B-2 Soil subsidence conditions: predominantly of Type II; dissected relief; presence of steep slopes and mudslide. III-B-3 Slope gradient – over 15%, landslide, clay karst, flood III-B-4 Loamy soil (sometimes silty), sand, gravel and pebble interlaid in various proportion and forming different types of sections. Ground water level: 5-10 and over 10m. Subsidence soil

	<p>conditions of Type 1</p> <p>III-B-5 Loamy soil (sometimes silty), sand, gravel and pebble interlaid in various proportion and forming different types of sections. Ground water level: below 5m. In some places subsidence soil conditions of Type 1.</p> <p>III-B-6 Variable type of section, wide-spread of filled-up (soft) soil occurring in interlaid loamy and sandy soil (filled-up valleys). Ground water level: below 3m.</p>
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Source:JICA Project Team

Legend (2)

Legend for Conservation Area

	The Conservation Area of Power Transmission Lines
	The Conservation Area of Gas Pipeline
	The Conservation Area of Cemeteries
	The Water Conservation Zone
	The Fault area

Source:JICA Project Team

A5.3 Literature List Related to Fragility Function (tentative)

Title	Organization / Author	Year
国・自治体の地震被害想定における被害予測手法の調査（平成 25 年度調査）／Survey for the Damage Calculation Method on the Earthquake Risk Assessment by the National Government and Local Government	損害保険料率算出機構／General Insurance Rating Organization of Japan	2014
南海トラフ巨大地震の被害想定について／Damage Assessment on Nankai Megathrust Earthquakes	内閣府／Cabinet Office, Government of Japan	2013
Predicting Collapse of Steel and Reinforced-Concrete Frame Buildings in Different Types of Ground Motions	Song, Shiyang	2012
Prediction of Collapse from PGV and PGD	Song, Shiyang	2012
Vulnerability Study of Electric Power Grid in Different Intensity Area in Wenchuan Earthquake	Liu, Rushan	2012
Seismic Assessment Method for Indoor Injury Risk and its Application	Endo, Tomoya	2012
Developing vulnerability and risk theory for seismic risk management	Bogdanova, et al.	2007
Analytically derived fragility curves for unreinforced masonry buildings in urban contexts	D'Ayala, D Kishali, E	2012
Proposed Damage Function for Existing RC Residential Buildings in Almaty, Republic of Kazakhstan	Inoue, Akira	2012
Development of Analytical Seismic Fragility Curves for Ordinary Highway Bridges in Turkey	Ö, AvSAR.	2012
Development of Seismic Fragility Curves for Hospital Equipment	Zolfaghari, Mohammad R	2012
Fragility Estimates for RC and PT Flat Slab-Column Connections Subjected to Lateral Drifts	Narayanan, A R Vijaya	2012
Seismic vulnerability of RC buildings considering SSI and aging effects	Fotopoulou, S	2012
Use of regression analysis for the construction of empirical fragility curves	Ioannou, I Rossetto, T Grant, D N	2012
Analytical formulations of fragility functions with applications to probabilistic seismic risk analysis	Lu, D G Yu, X H Jia, M M	2012
Earthquake Vulnerability Assessment of Buildings for Catastrophic Risk Analysis in Urban Areas	Hurtado, A I	2012
Development of f Fragility y Functions for Seismic Dam age Assessment Using Kernel Smoothing Methods	Noh, H Kire, A S	2012
Rubbed stone masonry wooden floors stiff floors	Michel, C	2012
Evaluation of Seismic Damage for Tehran Hospitals by HAZUS Methodology	Salehi, Esmail	2012

Seismic Risk Assessment of an Industrial Steel Building Part 2: Fragility and Failure Probabilities	Petruzzelli, F Iervolino, I Corte, G Della	2012
Predicting Damage of Wooden Houses Considering the Characteristic of Earthquake Response Spectra and the Frequency Characteristic of Wooden House	Ikemoto, Toshikazu	2012
Vulnerability functions for buildings due to liquefaction	Nino, Mauro	2012
Scaling bias and record selection for fragility analysis	Mehdizadeh, M. Mackie, K.R. Nielson, B.G.	2012
Development of Damage Fragility Functions for URM Chimneys and Parapets	Krawinkler, H, et al.	2012
Evaluation of analytical methodologies used to derive vulnerability functions	Silva, V, et al.	2014
Seismic Fragility Functions of Stone Masonry Buildings	Tsionis, Georgios	2012
A global building inventory for earthquake loss estimation and risk management	Jaiswal, et al.	2010
WHE-PAGER Project: A new initiative in estimating global building inventory and its seismic vulnerability	Porter, et al.	2008
An empirical model for Global Earthquake fatality estimation	Jaiswal, et al.	2010
Creating a Global Building Inventory for Earthquake Loss Assessment and Risk Management: U.S. Geological Survey Open-File Report	Jaiswal, K.S. Wald, D.J.	2008
Probabilistic Modeling System for Assessing Flood Risks, Natural Hazards	Apel, H., Thielen, A.H., Mertz, B., and Bloschl, G.A.	2006
Comparative Risk Assessments for the City of Colgne –Storm Floods, Earthquake, Natural Hazards	Grunthal, G., Thielen, A.H., Schwaz, J., Radtke, K. S., Smolka, A. and Merz, B.	2006
Flood Risk Curves and Uncertainty Bounds, Natural Hazards	Mertz, B. and Thielen, A.H.	2009
Development of Sysytem for Producing Flood Risk Curve	Fujimi	2010
Study on Alteration of Flood Risk Curve by River Improvement	-	2013
Methodology for Flood Risk Assessment in Tokyo Metropolitan Area	-	2013
Flood Risk Assessment based on Flood Risk Curve in Tokyo Metropolitan Area	-	2013
Guideline for Analysis of Flood Damage Indicators (trial version in 2013)	-	2015
Assessment of Flood Inundation Risk and Mitigation Effect based on Response Scenarios for River-Structures Group System for Various Flood Scale	-	-
Study on Regional Comprehensive Disaster Prevention	-	-

Source: JICA Project Team

APPENDIX 5.4 PRELIMINARY IDEA OF UTILIZATION FOR FRAGILITY FUNCTION

For making resilience, target soft and hard measures have to be identified by risk assessment. As an illustration, Figure A5.4.1 shows the flow of making Resilience Plan in Japan.

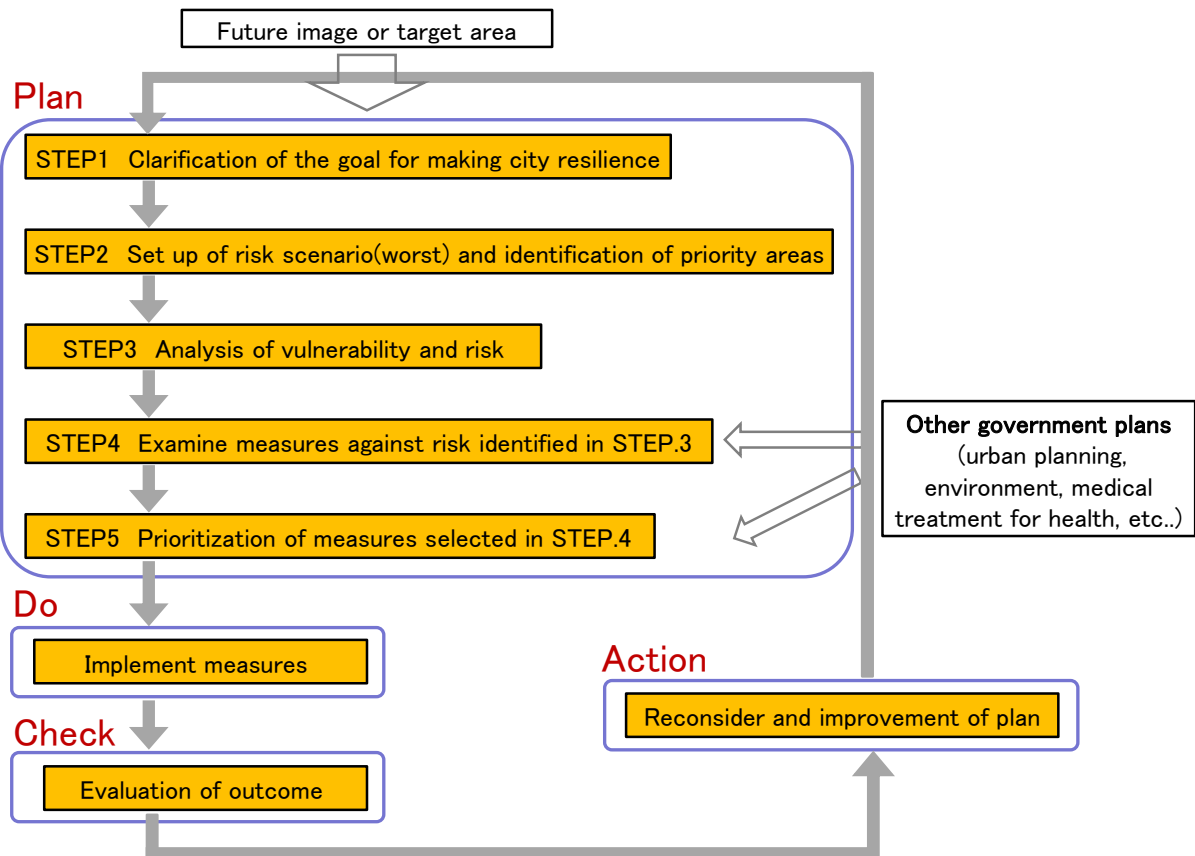


Figure A5.4.1 Flow of making resilience plan in Japan

Source: JICA Project Team

On the step 2 to 4 in Figure A5.4.1, more accurate and precise risk assessment can identify the vulnerability of target area and lead to more effective disaster risk management plan.

Figure A5.4.2 shows the flow of risk assessment of earthquake and tsunami. This risk assessment can be divided into following three steps:

- 1) Firstly, earthquake and tsunami hazard assessment calculate the possible distribution of seismic motion and inundation depth.
- 2) Secondly, physical damage such as building, lifeline and transportation facility is estimated using result of hazard assessment and fragility function.
- 3) Thirdly, human casualty and economic impact can be assessed using result of physical damage assessment and fragility function.

Here, fragility function is used to calculate the probability of damage under the condition of given force, deformation, or other engineering parameter.

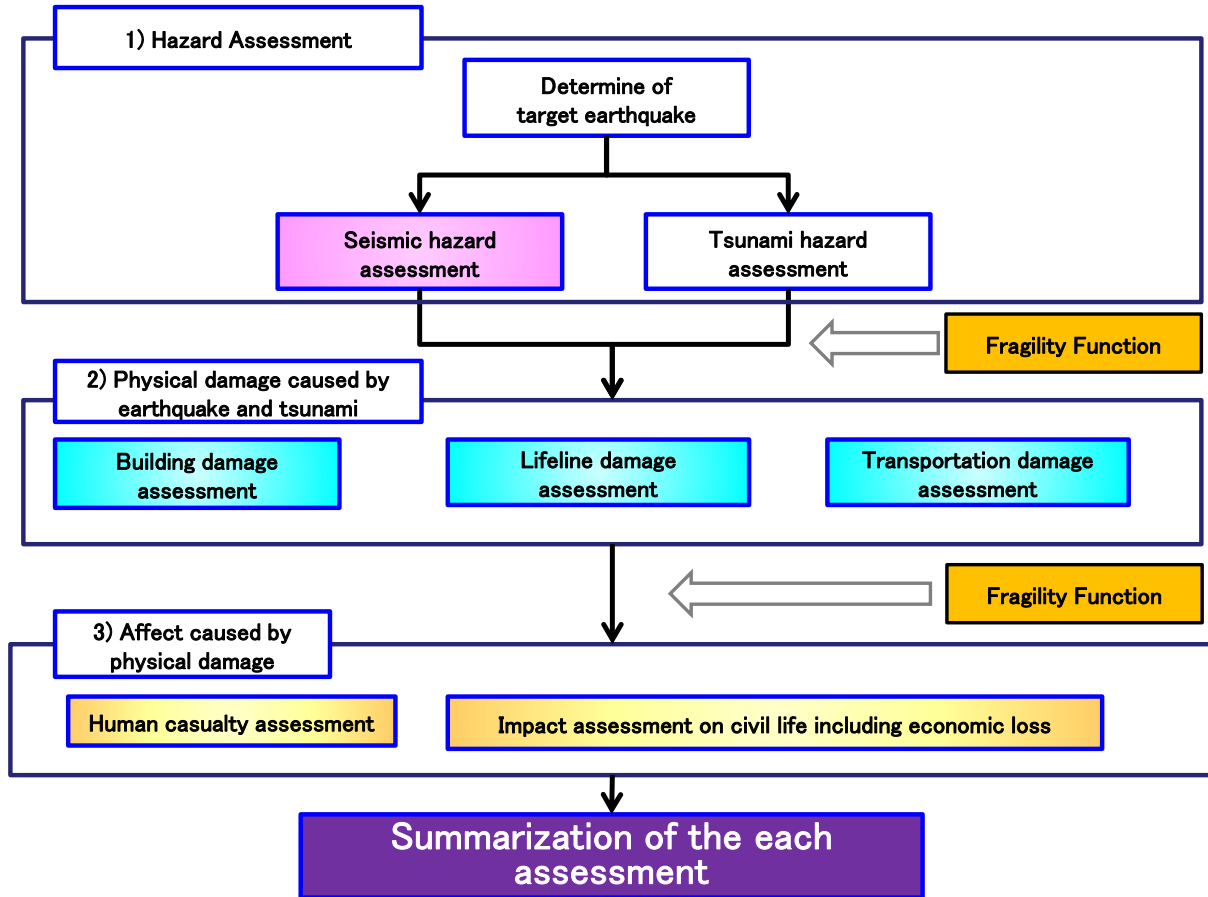


Figure A5.4.2 Flow of the risk assessment of earthquake and tsunami

Source: JICA Project Team

As an example, Figure A5.4.3 illustrates the flow of building damage assessment and how the fragility function can be used. Possibility damage of each building can be calculated by inputting building type and seismic intensity to fragility function.

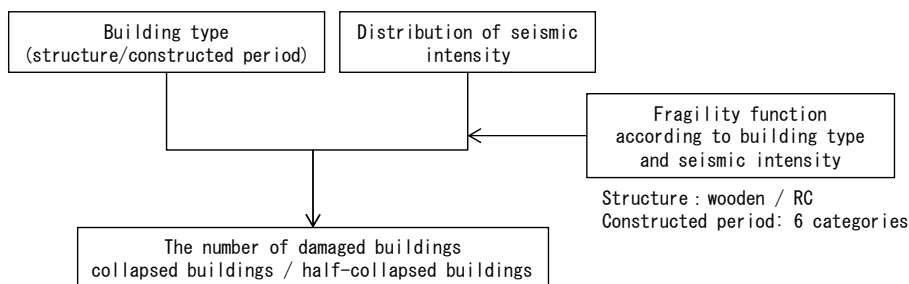


Figure A5.4.3 Flow of the building damage assessment of earthquake

Source: JICA Project Team

Figure A5.4.4 shows the fragility function of building damage in Japan. This indicates that building damage ratio can be calculated by inputting seismic intensity to fragility function according to building type. Fragility function differs according to building type such as structure and constructed period as this figure shows.

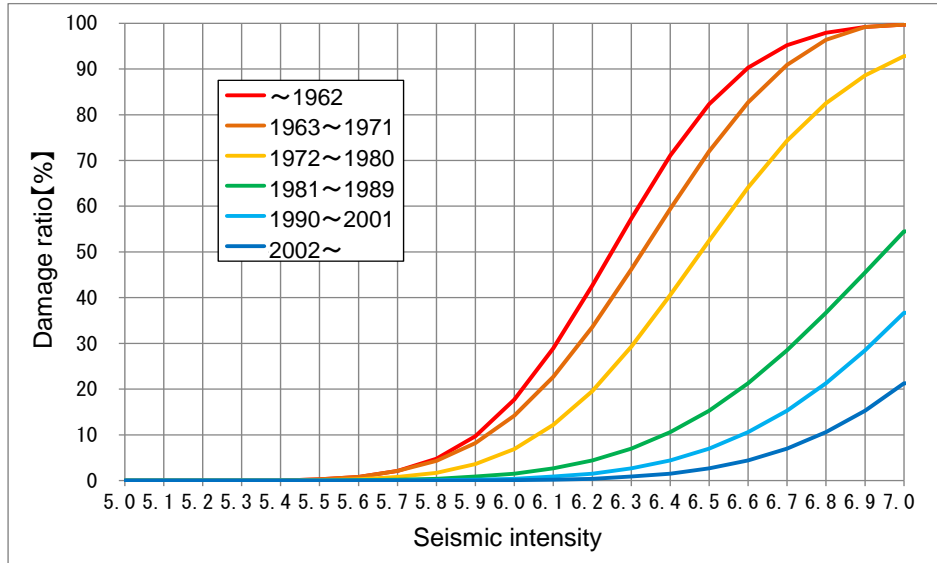


Figure A5.4.4 Example of fragility curve in Japan

Source: JICA Project Team

In addition, fragility function can estimate the effect of disaster risk reduction by the measures such as building reinforcement. Figure A5.5.5 shows the comparison of estimated building damage and human casualty between current situation and future situation with building retrofitting.

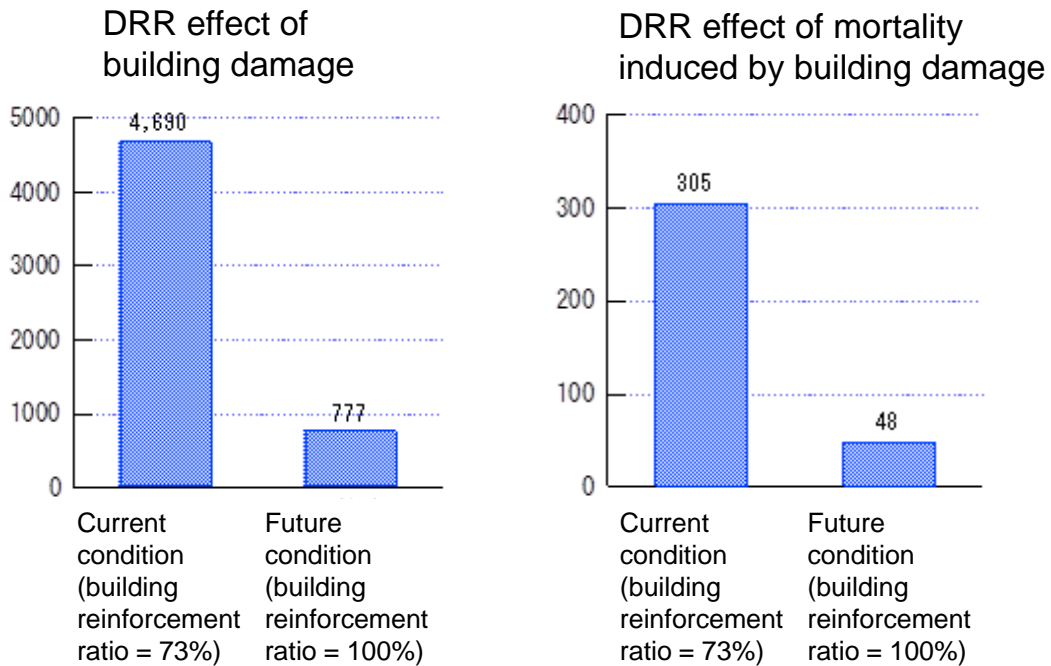


Figure A5.5.5 Illustration of estimated effect by building reinforcement

Source: JICA Project Team

A5.5 RESULTS OF INFRASTRUCTURE DAMAGE AND DESIGN CODE SURVEYS

1. Infrastructure Damage by each hazard type

By collecting and analyzing documents related to natural disaster in ASEAN countries, infrastructure damage in ASEAN region was summarized. Target countries in this section are eight, namely Cambodia, Indonesia, Lao PDR, Myanmar, Malaysia, Philippines, Thailand and Vietnam.

On collecting disaster related documents, only disasters occurred after 1990 were targeted considering rapid infrastructure development in ASEAN region. On the other hand, target hazard are as follows: Flood, Cyclone/Typhoon, Tsunami and Earthquake.

Table A5.5-1 summarizes overview of infrastructure damage caused by natural disaster based on the documents collected through this survey. Total number of target disasters is forty-eight: twenty flood disasters, eleven cyclones, seven tsunamis and ten earthquakes. Out of these 48 disasters, infrastructure damage was confirmed on only 17 disasters.

Table A5.5-1 Confirmed Infrastructure Damage in the Past Disasters

Hazard type	Number of disasters with infrastructure damage confirmed	Number of target disasters
Flood	5(25%)	20
Cyclone/Typhoon	4(36%)	11
Tsunami	4(57%)	7
Earthquake	4(40%)	10
Total	17	48

Source: JICA Project Team

This fact indicates less information about infrastructure damage was reported than disaster itself. It is difficult to identify whether infrastructure damage was actually few or only not documented.

(1) Infrastructure Damage Caused by Flood

Infrastructure damage due to tsunami was confirmed in four countries, namely Indonesia, Cambodia, Thailand and Vietnam.

- In Indonesia, right embankment along west discharge channel in Jakarta was broken due to the flood in 2013.
- In Cambodia, 46 bridges got damaged by the flood in 2013. In addition, infrastructure in wide area was inundated in 2011 flood including 363km for country road, 4470km for rural road and 177 bridges. However there was no structural damage on road.
- In Thailand, a wide area was inundated for a long period due to the break of embankment from Chao Phraya Dam to Ayutthaya.

- In Vietnam, Route 1 was partially closed due to road collapse on upper stream of Rao Nan River. In addition, this flood collapsed one earth dam. However, it is considered that this collapse was induced by crack due to plant root invaded into dam body.

(2) Infrastructure Damage Caused by Cyclone/Typhoon

Infrastructure damage caused by Cyclone/Typhoon was confirmed in Cambodia, Philippines and Malaysia.

- In Cambodia, several infrastructures such as road, bridge, railway, water supply, sewage, electricity, airport and port were damaged by Cyclone KETSANA in 2009.
- In Philippines, three road bridges in Leyte Island were damaged by Typhoon Haiyan in 2013. Out of these three bridges, one was collapsed, another one was damaged except for one lane and the other kept its function. At seaport, quay wall and some facilities such as gantry crane, tank and some buildings got damaged. In addition, embankment of Agno River was broken by storm surge in 2009.
- In Malaysia, surge caused by Cyclone "NARGIS" affected road, water channel, railway, airport and port as well as wharf and its connecting bridge in Yangon port.

(3) Infrastructure Damage Caused by Tsunami

Infrastructure damage due to tsunami was confirmed on three disasters in Indonesia and one in Thailand.

- In Indonesia, Pangandaran earthquake and tsunami in 2006 caused damage on thermal power plant. Indian Ocean earthquake and tsunami in 2004 caused serious damage on infrastructure in Aceh province including 226 bridges, road with 5403km, 8 seaports, 85 percentage of total water supply facilities, 92 percentage of total sewage facilities, and so on. In addition, Flores earthquake and tsunami in 1992 affected seaport. In this occasion, depression of quay wall due to liquefaction enlarged tsunami damage.
- In Thailand, damage on wharf and seaport facilities was confirmed on Indian Ocean earthquake and tsunami in 2004.

(4) Infrastructure Damage Caused by Earthquake

Infrastructure damage caused by earthquake was confirmed on two disasters in Indonesia and one in the Philippines.

- In Indonesia, Sumatra earthquake in 2009 caused partial damage to water supply, gas and electricity in Padang city. In Yogyakarta earthquake in 2006, light damage on one road-bridge and subsidence of airport facility due to liquefaction were reported. In addition, 2005 Nias–Simeulue earthquake caused road subsidence due to liquefaction, road closure due to pavement crack and damage on bridge foundation due to lack of ground bearing capacity.
- In Philippines, 1990 Luzon earthquake triggered liquefaction with damage on water supply and sewage facilities, lateral movement of river embankment and collapse of Magsaysay Bridge.

(5) Cause of Infrastructure damage

It is common phenomena in ASEAN countries as well as any counties in the world that critical infrastructure such as embankment, road, bridge, railway, utilities, airport and port get damaged by natural disaster and lose their function. Main cause of infrastructure damage can be assumed as follows:

- 1) Phenomena which was not considered in design was occurred such as ground damage caused by liquefaction and loss of structural soundness due to deterioration.
- 2) Larger external force than designed force was generated by external acting force of earthquake, Tsunami wave force and hydraulic pressure by flood, cyclone and tsunami.
- 3) Design method and structural details was not proper such as inappropriate calculation method and structural regulation.

In order to make infrastructure resilience, it is essential to investigate damage cause after disaster occurs and feedback to design condition, design method, construction method and maintenance method. This is critical issue not only in ASEAN countries but also all over the world.

Especially in ASEAN countries, investigation on damaged infrastructure after disaster is not implemented enough. This fact indicates that it is quite important to keep a detail record of infrastructure damage and evaluate load bearing capacity of infrastructure based on analysis on damage cause

The survey result illustrates that same tendency shows on infrastructure damage in each ASEAN countries. Therefore, sharing following information can contribute to infrastructure resilience:

- Knowledge and technology about damage prevention and mitigation on each stage of planning, design, construction and operation.
- Quick recovery method of damaged infrastructure such as emergency safety measures, quick recovery measures including temporary construction.

2. Infrastructure Design Code in ASEAN Countries and Possibility of Infrastructure Damage

(1) Current Situation of Design Code in ASEAN Countries

As described in the previous section, one of the causes of infrastructure damage is unexpected external force by disaster larger than design requirement. Based on this background, JICA Project Team conducted questionnaire survey about infrastructure design code to private sector such as engineering consultant in each ASEAN countries. Table A5.5-2 shows questionnaire items.

Table A5.5-2 Questionnaire Items about Infrastructure Design Code

	Existence of design standard	If the standards exists,						If not,
		Name of standards	Link on website (if opened to public)	Availability of hardcopy	Issue year	Latest revised year and major revised points	Comment on the application to design	How to design without standard
Example	(YES) / NO	Bridge Design Specification	http://...	Available at the bookstore	1990	2010 • seismic loads • calculation method	• Not applied to actual design • Not enough items to design structures	• Based on my/engineers' experiences • Use AASHTO/BS etc

Source: JICA Project Team

Target infrastructures in this questionnaire are bridge, road structure and port facilities which widely exist in each ASEAN countries.

Questionnaire survey was conducted to eight countries, namely Cambodia, Indonesia, Lao PDR, Myanmar, Malaysia, Philippines, Thailand and Vietnam. Out of these eight countries, five countries including Cambodia, Indonesia, Philippines, Thailand and Vietnam answered the questionnaire. From Table A5.5-3 to A5.5-7 shows the result of questionnaire.

As summarized in A5.5-8, while some countries develop own design code, other countries apply design code developed by other country.

Table A5.5-8 Design Code and Its Application Situation in Each ASEAN Country

Type of Infrastructure	Cambodia	Indonesia	Philippines	Thailand	Vietnam
Bridge	Own Spec. but not applied to actual design (Use AASHTO/BS)	Own Spec.	Own Spec. and AASHTO	AASHTO	Own Spec.
Road structure	Ditto	ditto	AASHTO	AASHTO	Ditto
Port facilities	ditto	ditto	N/A	BS	Ditto

Source: JICA Project Team

In Indonesia and Vietnam, own infrastructure design code is developed and applied to actual design. On the other hand, Cambodia has own design code but other design code such as AASHTO developed by United States is applied to actual design.

On the contrary, Philippines and Thailand use design code developed by other country. In addition, Thailand answered that design is implemented based on experience of designing engineers in case design code was not introduced.

Table A5.5-3 Questionnaire Result (Cambodia)

	Existence of design standard	If the standards exists,						If not,
		Name of standards	Link on website (if opened to public)	Availability of hardcopy	Issue year	Latest revised year and major revised points	Comment on the application to design	
Bridge	<input checked="" type="radio"/> YES <input type="radio"/> NO	MPWT Standard AASHTO LRFD Bridge Design Specifications	N/A	Ministry of Public Works and Transport (MPWT)	2003	N/A	Not applied to actual design	Use AASHTO/BS etc
Road structure	<input checked="" type="radio"/> YES <input type="radio"/> NO	MPWT Standard AASHTO Road Design Overseas Road Note 31	N/A	Ministry of Public Works and Transport (MPWT)	2003	N/A	Not applied to actual design	Use AASHTO/BS etc
Port facilities	<input checked="" type="radio"/> YES <input type="radio"/> NO	MPWT Standard	N/A	Ministry of Public Works and Transport (MPWT)	2003	N/A	Not applied to actual design	Use AASHTO/BS etc

Table A5.5-4 Questionnaire Result (Indonesia)

	Existence of design standard	If the standards exists,						If not,
		Name of standards	Link on website (if opened to public)	Availability of hardcopy	Issue year	Latest revised year and major revised points	Comment on the application to design	
Bridge	<input checked="" type="radio"/> YES <input type="radio"/> NO	Loading Standard for Bridge (<i>Standar Pembebanan untuk Jembatan</i> , RSNI T-02-2005)	http://jdih.bpk.go.id/wp-content/uploads/2011/03/SNI-T-02-2005tm.pdf	Available at BSN (National Standardization Agency)	2005	2005	* In general the standard can be applied for design * The standard can be adjusted depend on technical information of location	
		Design Standard of Earthquake for Bridge (<i>Standar Perencanaan Ketahanan Gempa untuk Jembatan</i> , SNI 2833-2008)	http://www.pu.go.id/uploads/services/service20130717121434.pdf	Available at BSN (National Standardization Agency)	2008	2008		
		Design of Concrete Structure for Bridge (<i>Perencanaan Struktur Beton untuk Jembatan</i> , RSNI T-12-2004)	http://www.erwinrommel.staf.fumm.ac.id/files/2010/01/R_SNI-T-12-2004-Perenc-Str.Jembatan-Beton1.pdf	Available at BSN (National Standardization Agency)	2004	2004		
		Design of Steel Structure for Bridge (<i>Perencanaan Struktur Baja untuk Jembatan</i> , RSNI T-03-2005)	http://www.pu.go.id/uploads/services/service20130717123329.pdf	Available at BSN (National Standardization Agency)	2005	2005		
Road structure	<input checked="" type="radio"/> YES <input type="radio"/> NO	Guideline for Design of Flexible Pavement Thickness (<i>Pedoman Perencanaan Tebal Perkerasan Lentur</i> , Pt T-01-2002-B)	http://www.pu.go.id/uploads/services/service20130717124247.pdf	Available at Ministry of Public Works	2002	2002	* In general the standard can be applied for design * The standard can be adjusted depend on technical information of location	AASHTO Guide for Design of Pavement Structures, 1993 http://www.adecsystem.com/NmathegAll/9.pdf
		Rigid Pavement Design (<i>Perencanaan Perkerasan Jalan Beton Semen</i> , Pd T-14-2003)	http://www.pu.go.id/uploads/services/infopublik20120831133154.pdf	Available at Ministry of Public Works	2003	2003		
		Design of Additional Layer Thickness of Flexible Pavement with Deflection Method (<i>Perencanaan Tebal Lapis Tambah Perkerasan Lentur dengan Metode Lentutan</i> , Pd T-05-2005)	http://www.pu.go.id/uploads/services/infopublik20120904150555.pdf	Available at Ministry of Public Works	2005	2005		
Port facilities	<input checked="" type="radio"/> YES <input type="radio"/> NO	National Harbour Arrangement (<i>Tatanan Kepelelabuhan Nasional</i> , No. KM 53 Year 2002)			2002	2002	* In general the standard can be applied for design * The standard can be adjusted depend on technical information of location	* Technical Standards and Commentaries for Port and Harbour Facilities in Japan, 2009 * UNTAD (United Nations Conference on Trade and Development), Port Development, a handbook for planners in developing countries, 1985
		Standard Design Criteria for Ports in Indonesia			1984	1984		

Table A5.5-5 Questionnaire Result (Philippines)

	Existence of design standard	If the standards exists,						If not,
		Name of standards	Link on website (if opened to public)	Availability of hardcopy	Issue year	Latest revised year and major revised points	Comment on the application to design	
Bridge	<input checked="" type="radio"/> YES / NO	1. AASHTO LRFD Bridge Design Specifications 2012		by order from AASHTO committee	2012	2012, loadings		need to design based on standards
	<input checked="" type="radio"/> YES / NO	2. NSCP Vol. 2. 2nd Edition, 1997 – Bridges 4		Out-of-stock	1997		Used if the information needed is not available in AASHTO LRFD 2012	
Road structure	<input checked="" type="radio"/> YES / NO	AASHTO : A Policy on Geometric Design of Highways and Streets, 2011, 6th Edition		by order from AASHTO committee	2011			need to design based on standards
Port facilities	YES / NO							

Additional references for design standards

1. Alignment Design: Geometric Design of Highways and Streets 2004
2. Pavement Structure: AASHTO Guide for Design of Pavement Structures (4th Edition, 1993)
3. Tunnels: AASHTO Technical Manual for Design and Construction of Road Tunnels – Civil Elements (FHWA-NHI-10-034)
4. DPWH Highway Design Guidelines, Criteria and Standards
5. DPWH Standard Specifications
6. National Structural Code of the Philippines (Vol. 1 and 2)

Table A5.5-6 Questionnaire Result (Thailand)

	Existence of design specification	If the specification exists,						If not,
		Name of specifications	Link on website (if opened to public)	Availability of hardcopy	Issue year	Latest revised year and major revised points	Comment on the application to design	
Bridge	<input checked="" type="radio"/> YES / NO	•AASHTO LRFD Bridge Design Specifications	www.transportation.org	•Available on the https://bookstore.transportation.org •Available at the bookstore	2014	2015		Based on engineers' experiences
Road structure	<input checked="" type="radio"/> YES / NO	•AASHTO A Policy on Geometric Design of Highways and Streets •Transportation Research Board "Highway Capacity Manual" •Asphalt Institute •Portland Cement Association (PCA)	www.transportation.org	•Available on the https://bookstore.transportation.org •Available at the bookstore	2011 1994 1970 1984			Based on engineers' experiences
Port facilities	<input checked="" type="radio"/> YES / NO	BS. Std. Use BS Std. for major port. For small port use Harbour Dept Regulation.						Base on Engineer experience and regulation of Harbour Dept.

Table A5.5-7 Questionnaire Result (Vietnam)

	Existence of design specification	If the specification exists,					Comment on the application to design	If not, How to design without specification
		Name of specifications	Link on website (if opened to public)	Availability of hardcopy	Issue year	Latest revised year and major revised points		
Bridge	(YES) NO	Bridge Design Standard 22TCN 272-05	http://cttttt.ute.edu.vn/?q=thuvien/c%3AAu%20chu%20H%20A%20n-22tcn-272-05	Available at the bookstore	2005	N/A	*Applied to actual design *Enough items to design structures	
Road structure	(YES) NO	1. Urban roads - Specification for design TCXDVN 104 : 2007 2. High way - Specification for design TCVN 4054:2005 3. Express way - Specification for design TCVN 5729 : 2012	http://cucqkd.gov.vn/quy-chuan-tieu-chuan/chi-tiet/23 http://cucqkd.gov.vn/media/documents/tcvn_4054_2005.pdf http://cucqkd.gov.vn/media/documents/tcvn_5729_2012_duong_cao_toc_yeu_cau_thiet_ke.pdf	Available at the bookstore	1. 2007 2. 2005 3. 2012		*Applied to actual design *Enough items to design structures	
Port facilities	(YES) NO	1. River port facilities. Design standard 22 TCN 219 - 94 2. Sea port facilities. Design standard. 22 TCN 207 - 92	http://thuvienphapluat.vn/TCVN/Giao-thong/22TCN-219-1994-Cong-trinh-ben-cang-song-Tieu-chuan-thiet-ke-910638.aspx http://mt.gov.vn/khcn/Pages/hethongtieuchuannhanh.aspx?tcID=194	Available at the bookstore	1. 1994 2. 1992			

(2) Possibility of infrastructure damage

Since the detail of design code in each ASEAN country was not confirmed in this survey, it is not clear that Cambodia, Philippines and Thailand use appropriate loading conditions on applying other country's design code.

As described in Chapter.1, the past disasters caused infrastructure damage and affected socio-economic activity. Though it is difficult to relate disaster damage to design code, the past severe damage indicates that it is inevitable to prepare design code suitable for condition of own country and to install reviewing standard securing safety against load value considering frequency of occurrence.

Even in Indonesia and Vietnam which develop and apply own design code, infrastructure damage occurred in the past flood and earthquake. Since damage mechanism changes with urban development, it is inevitable to continue to develop design code with learning from disaster damage. At least Indonesia and Vietnam which have own design code can develop it according to change of disaster trend.

For the reference, Figure A5.5-1 and A5.5-2 compare seismic load for bridge regulated in the latest seismic code and seismic risk based on earthquake risk assessment in Denpasar which is one of candidate cities for future demonstration project. While former design load is between 0.26 and 0.3 in PGA, latter seismic load is between 0.16 and 0.24. This indicates seismic load in design code ensures enough safety against seismic risk in Denpasar.



Figure A5.5-1 Design seismic load regulated in bridge seismic design code of Indonesia

Source: Design Standard of Earthquake for Bridge (Standar Perencanaan Ketahanan Gempa untuk Jembatan, SNI 2833-2008)

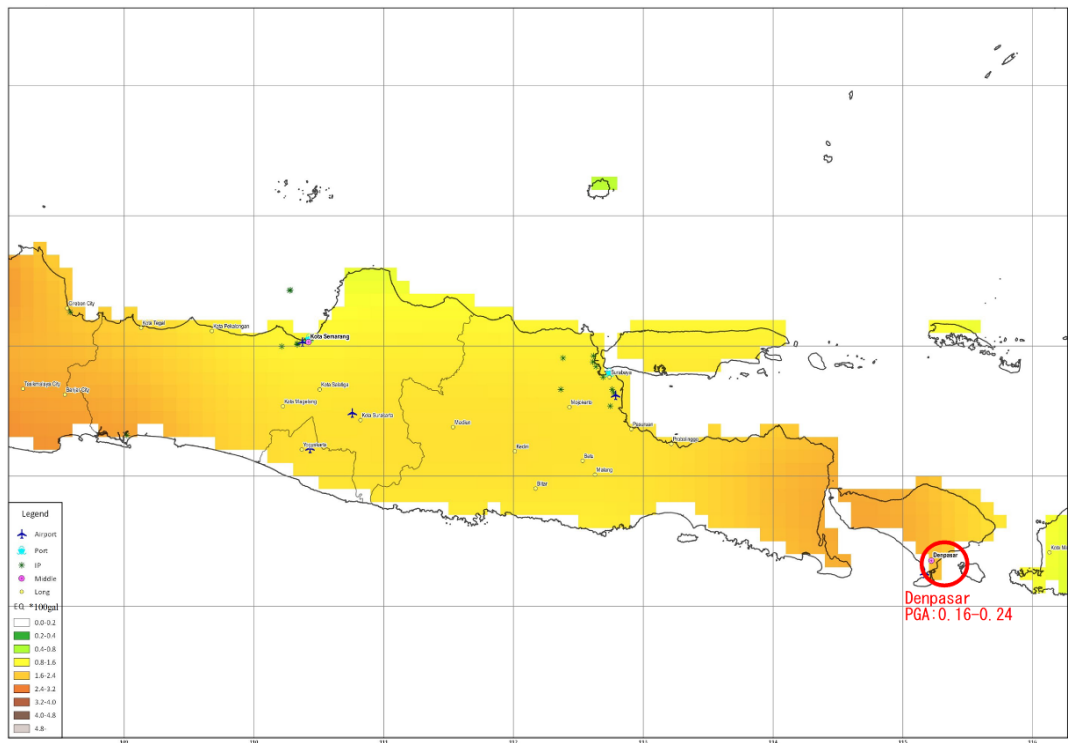


Figure A5.5-2 Distribution Map of Seismic Risk including Denpasar Based on Earthquake Risk Assessment

Source: JICA Project Team based on the Global Seismic Hazard Assessment Program(GSHAP)

A5.6 RESULTS OF 2ND-4TH WORKSHOPS FOR URBAN RESILIENCE

Questionnaire Survey on the Workshops for Checklist

(1) Questionnaire Survey on the Workshops for Trial Implementation of Checklist

- Q1: Profile of respondents of three cities (38 p/Luan Prabang-LaoPDR, 42 p/Pathum Thani-Thailand, 46 p/Bima-Indonesia)
- Q2-1/2/3: The results of these questions were selected by one answer to be chose.
- Q2-4/5, Q3-1/2: The results of these questions f were selected from five (5) choices as value ranks from the highest value point (5) to the lowest value point (1).

Table A5.6-1 The Aggregated Results of for Trial Implementation of Checklist on Three Cities

Item of Question	Q2-1 Purpose of Checklist	Q2-2 Respondent of Checklist	Q2-3 Frequency of Checklist	
Overall Assessment				
	Q2-4 Overall Assessment			
	Q2-5 Important Utilization			
Assessment on Questions	Q3-1 Questions on Land Use & Development Planning			
	Q3-2 Questions on Disaster Risk Reduction			

Source: JICA Project Team

Table A5.6-2 The Result of the Questionnaire Survey for Trial Implementation of Checklist on Three Cities

Item of Question		LAO	THA	IDN
Profile	No. of participants	38 participants	42 participants	46 participants
Overall Assessment	Q2-1 Purpose of Checklist			
	Q2-2 Respondent of Checklist			
	Q2-3 Frequency of Checklist			
	Q2-4 Overall Assessment	<p>LAO</p>	<p>THA</p>	<p>IDN</p>
Q2-5 Important Utilization	LAO			
	THA			

Table A5.6-3 - continued -

Item of Question		LAO	THA	IDN
Overall Assessment	Q2-5 Important Utilization	IDN		
			Assessment on Questions	Q3-1 Questions on Land Use & Development Planning
THA				
IDN				
Q3-2 Questions on Disaster Risk Reduction	LAO			
	THA			
	IDN			

Note: LAO: Luan Prabang, THA: Pathum Thani, IDN: Bima

Source: JICA Project Team

(2) Questionnaire Survey on the 3/4th Workshop for Proposed Checklist (and Guidebook)

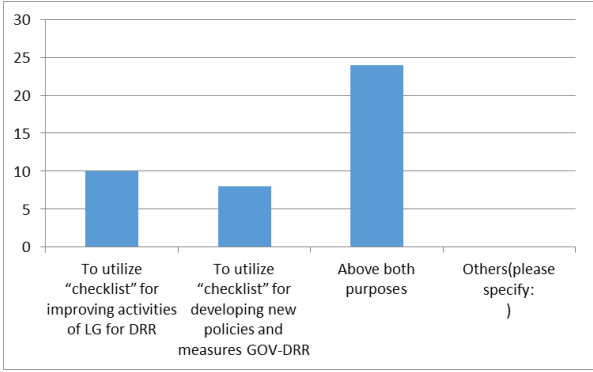
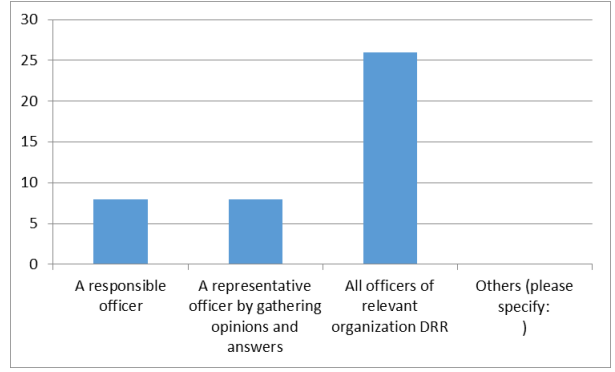
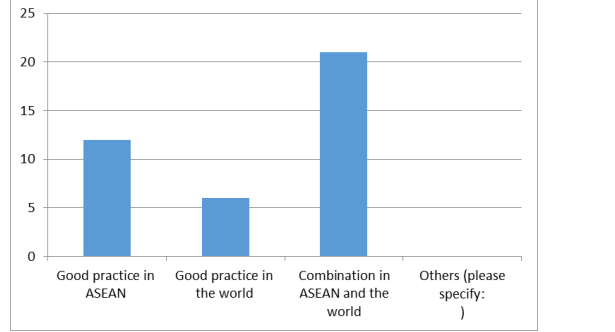
- Q1: Profile of respondents (44 p from nine AMS: KHM, IDN, LAO, MYS, MMR, PHL, SGP, THA, VNM)
- Q2-1/2/3: The results of these questions were selected from four (4) choices as value ranks from the highest value point (4) to the lowest value point (1).
- Q2-1/, Q3-1/2/3: The results of these questions were selected by one answer to be chose.

Table A5.6-4 The Result of the Questionnaire Survey on Proposed Checklist

<p>1-1 Overall Impression on “Checklists both of A & B”</p> <p>0% 20% 40% 60% 80% 100%</p> <p>Understandings on the significance</p> <p>Usability of checking by excel</p> <p>Easiness of understanding the contents</p> <p>Appropriateness of the volume</p> <p>Difficulty to select the listed criteria</p> <p>Appropriateness of Rader Chart</p> <p>Appropriateness of the Issue List</p> <p>Appropriateness of the Action List</p> <p>Others (Please specify:)</p>	<p>1-2 Assessment on “Checklist A: Disaster Risk Management”</p> <p>0% 20% 40% 60% 80% 100%</p> <p>Understandable composition</p> <p>Appropriateness of the contents</p> <p>Acceptability of the volume</p> <p>Difficulty to understand the criteria</p> <p>Difficulty to respond immediately the criteria</p> <p>Others (Please specify:)</p>
<p>1-3 Assessment on “Checklist B: Resilient Urban Development ”</p> <p>0% 20% 40% 60% 80% 100%</p> <p>Understandable composition</p> <p>Appropriateness of the contents</p> <p>Acceptability of the volume</p> <p>Difficulty to understand the criteria</p> <p>Difficulty to respond immediately the criteria</p> <p>Others (Please specify:)</p>	<p>Q1-4 Suggestions or comments regarding the assessment of Checklist</p> <p><u>Extracting comments only for improvement</u></p> <ul style="list-style-type: none"> • Will be helpful if there's introduction of checklist purpose & manual to explain the score • Some criteria need to be modified based on the local context • Definition can be incorporated & instruction must be included • Make it simple question and more info how to give answer • Many QA need to be answered
<p>Q2-1 Most considerable measure to improve both of Checklists A & B</p> <p>16</p> <p>14</p> <p>12</p> <p>10</p> <p>8</p> <p>6</p> <p>4</p> <p>2</p> <p>0</p> <p>Decrease the number of questions</p> <p>Simplify the criteria and the way of answers</p> <p>Change the method of answers to ordinal</p> <p>Elaborate the way of outputs of the Lists</p> <p>Others (please specify:)</p>	<p>Q2-2 Suggestions or comments regarding the utilization of Checklist</p> <ul style="list-style-type: none"> • Good to have simplified version • Definition of term must be considered • Example may be incorporated • Should be quantifiable

Source: JICA Project Team

Table A5.6-5 - continued -

<p>Q3-1 Purpose of Checklist</p> 	<p>Q3-2 Respondent of Checklist:</p> 
<p>Q3-3 Frequency of Checklist</p> 	<p>Q3-4 Suggestions or comments regarding the utilization of Checklist</p> <p><u>In case of once year to utilize Checklist</u></p> <ul style="list-style-type: none"> • Update data is necessary each year • Updating data on year basis is vital • Compare the progress and gap over years • need to revise per year because of changes of disaster pattern and its impact • to effectively evaluation & monitor the possible revision of checklist • to ensure issue do not fall under the radar • Appropriately with Thailand condition • Due to fiscal year starting from Oct-Sept • Updating data especially for urbanization • Support prioritize activity and for budget plan <p><u>In case of other frequency</u></p> <ul style="list-style-type: none"> • Along with mid -term development planning • 5 years • In our country can't collect data many times
<p>Q4-1 Contents of Guidebook</p> 	<p>Q4-3 Expectation or Opinion on Good Practices by Location</p> 
<p>Q4-2 Your Expectation on Proposed Table of Contents</p> 	

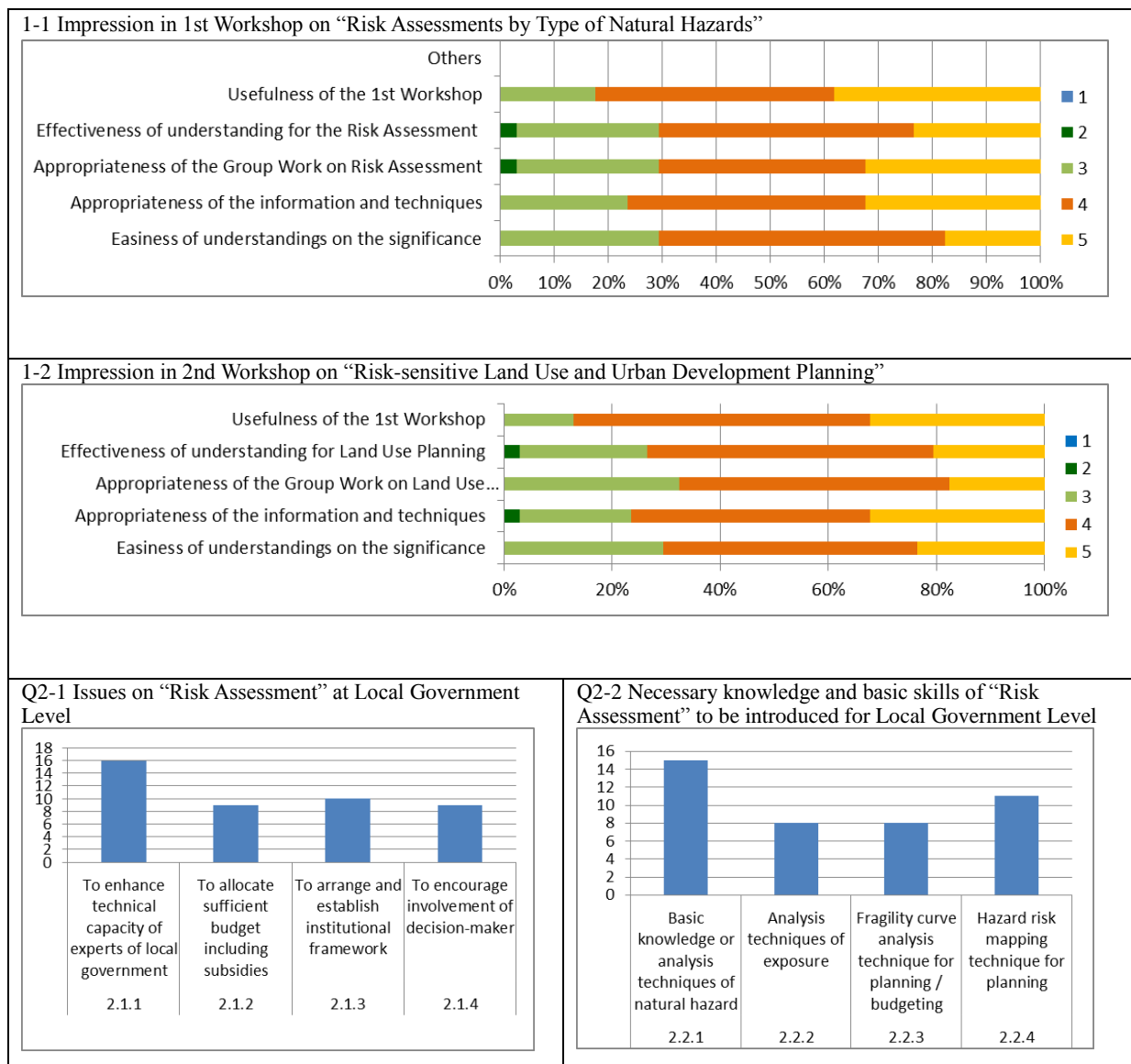
Source: JICA Project Team

3. Questionnaire Survey on the Workshops for Risk Assessment and Risk-sensitive Land Use and Urban Development Planning

Questionnaire Survey on the Workshop for Risk Assessment, and Risk-sensitive Land Use and Urban Development Planning

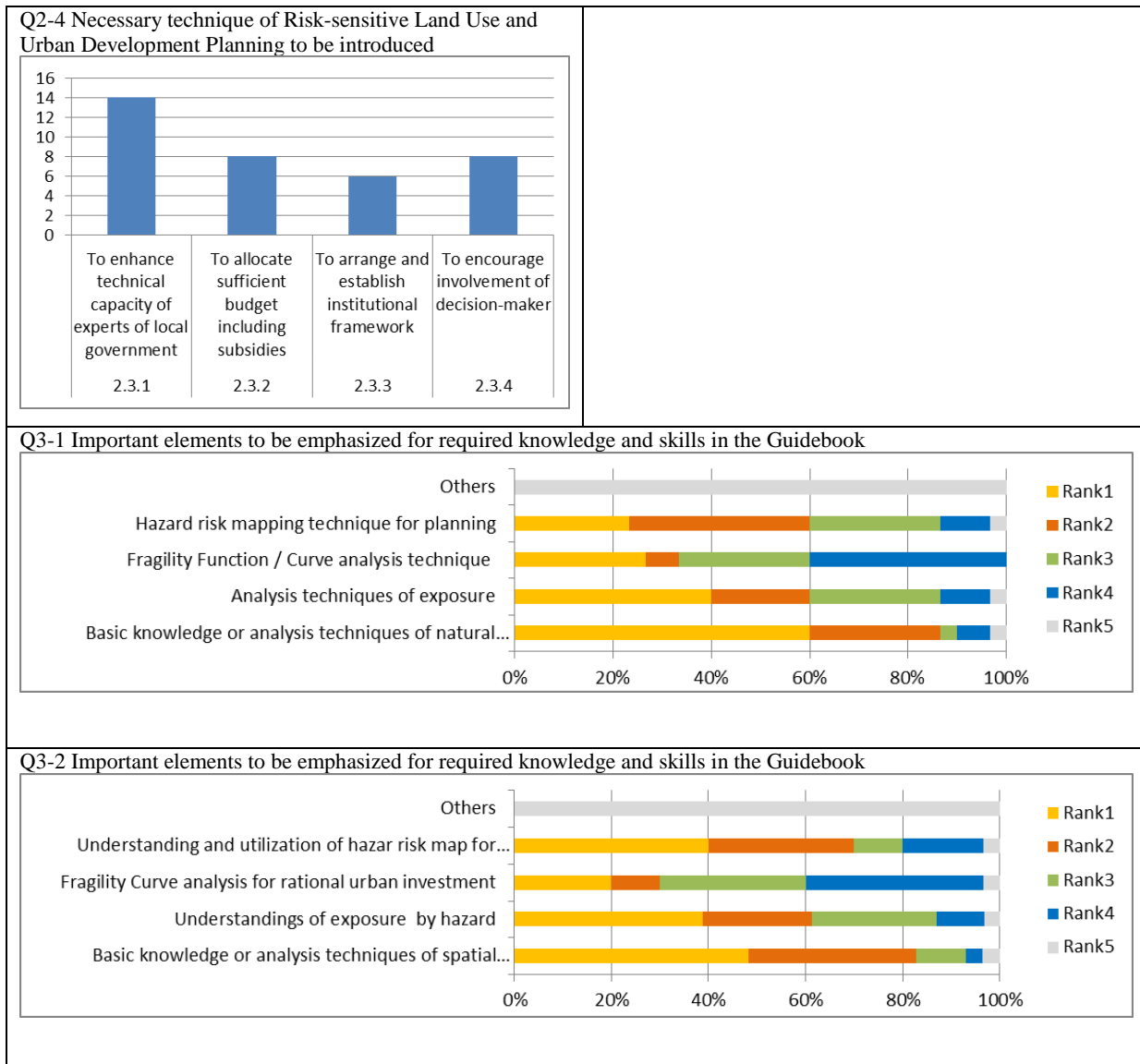
- Profile of respondents of the Workshop (45 p/ from eight AMS: KHM, IDN, LAO, MYS, MMR, PHL, THA, VNM)
- Q1-1//2/3: The results of these questions f were selected from five (5) choices as value ranks from the highest value point (5) to the lowest value point (1).
- Q2-1/2/3/4: The results of these questions were selected by one answer to be chose.
- Q3-1/2: The results of these questions were answered by the raking order (no.one (1) as the highest value to no. five (5) as the lowest.

Table A5.6-6 The Result of the Questionnaire Survey for Risk Assessment and Risk-sensitive Land Use



Source: JICA Project Team

Table A5.6-7 - continued -



Source: JICA Project Team