SUPPORTING REPORT 5

WATER RESOURCES SUB-SECTOR DEVELOPMENT PLAN

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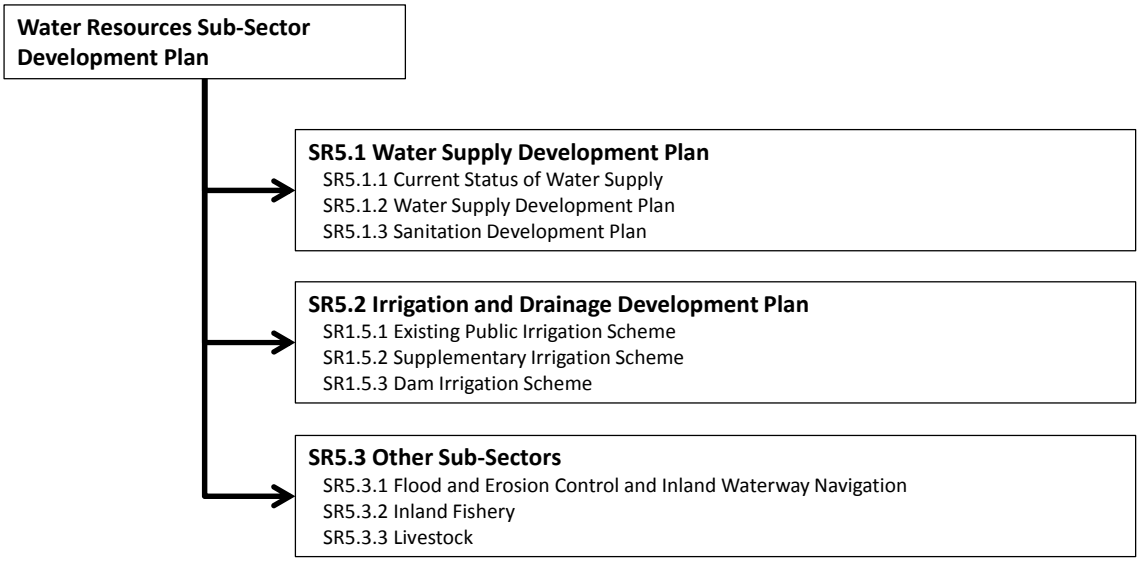

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SR5 WATER RESOURCES SUB-SECTOR DEVELOPMENT PLAN

SR5.1 Water Supply and Sanitation Development Plan

SR5.1.1 Current Status of Water Supply

(1) Existing Water Treatment Facility of Surface Water

Table SR5.1-1 shows exsisting water treatment facilities of surface water in Nigeria as of 2010, including simplified treatment such as disinfection only.

Table SR5.1-1 Existing Water Treatment Facility of Surface Water as of 2010

No	Name	State	LGA	Source	Capacity (m3/day)		PEI
					Installed	Operating	(%)
1	Aba (WTW)	Abia	Aba South	Aba Riv.	53,000	10,600	20.0
2	Ganye	Adamawa	Ganye	Gallery (Subsurface)	1,000	500	50.0
3	Hong	Adamawa	Hong	Gallery (Subsurface)	500	125	25.0
4	Garkida	Adamawa	Hong	Gallery (Subsurface)	1,000	500	50.0
5	Jada-1	Adamawa	Jada	Gallery (Subsurface)	2,000	1,000	50.0
6	Jada-2	Adamawa	Jada	Gallery (Subsurface)	1,000	500	50.0
7	Michika -1	Adamawa	Michika	Gallery (Subsurface)	1,500	750	50.0
8	Michika -2	Adamawa	Michika	Gallery (Subsurface)	1,000	0	0.0
9	Mubi (WTW)	Adamawa	Mubi North	Yedseram Riv.	12,000	3,000	25.0
10	Mubi	Adamawa	Mubi North	Gallery (Subsurface)	1,000	500	50.0
11	Numan (WTW)	Adamawa	Numan	Benue Riv.	12,000	2,000	16.7
12	Shelleng	Adamawa	Shelleng	Gallery (Subsurface)	1,000	500	50.0
13	Jimeta (WTW)	Adamawa	Yola North	Benue Riv.	28,000	8,167	29.2
14	Yola (WTW)	Adamawa	Yola South	Benue Riv.	24,000	7,000	29.2
15	Imo-Awka (Non WTW)	Anambra	Awka South	Unknown	2,500	0	0.0
16	Ihiala/Akazi (Non WTW)	Anambra	Ihiala	Unknown	1,500	0	0.0
17	Greater Onitsha (WTW)	Anambra	Onitsha North	Nkisi Riv.	42,000	0	0.0
18	Bauchi/Gubi (WTW)	Bauchi	Bauchi	Gubi Dam	40,000	29,200	73.0
19	Bauchi/Gubi (P-WTW)	Bauchi	Bauchi	Gubi Dam	10,000	7,300	73.0
20	Igumale (Non WTW)	Benue	Ado	River/Steam(Unknown)	216	0	0.0
21	Ugbokpo (Non WTW)	Benue	Apa	River/Steam(Unknown)	210	0	0.0
22	Buruku (Non WTW)	Benue	Buruku	River/Steam(Unknown)	420	0	0.0
23	Adi/Abakwa/Tyowanye (Non WTW)	Benue	Buruku	River/Steam(Unknown)	420	0	0.0
24	Gboko Water Scheme (WTW)	Benue	Gboko	River/Steam(Unknown)	9,450	0	0.0
25	Agasha (Non WTW)	Benue	Guma	River/Steam(Unknown)	160	0	0.0
26	Ikpayongo (Non WTW)	Benue	Gwer East	River/Steam(Unknown)	216	0	0.0
27	Naka (Non WTW)	Benue	Gwer West	River/Steam(Unknown)	100	0	0.0
28	Katsina-Ala Old (WTW)	Benue	Katsina-Ala	Katsina-Ala Riv.	5,400	0	0.0
29	Tse-Agberadba (Non WTW)	Benue	Konshisha	River/Steam(Unknown)	160	0	0.0
30	Korinya (Non WTW)	Benue	Konshisha	River/Steam(Unknown)	160	0	0.0
31	Adikpo (Non WTW)	Benue	Kwande	River/Steam(Unknown)	840	0	0.0
32	Makurdi Old (WTW)	Benue	Makurdi	Benue Riv.	18,000	9,000	50.0
33	Oju/Obusa/Owokwu (Non WTW)	Benue	Oju	River/Steam(Unknown)	840	0	0.0
34	Ogbokolo (Non WTW)	Benue	Okpokwu	River/Steam(Unknown)	100	0	0.0
35	Otobi Old (WTW)	Benue	Oturkpo	Otobi Riv.	5,400	0	0.0
36	Adoka (Non WTW)	Benue	Oturkpo	River/Steam(Unknown)	109	0	0.0
37	Uba	Borno	Askira/Uba	Gallery (Subsurface)	1,000	500	50.0
38	Lassa	Borno	Askira/Uba	Gallery (Subsurface)	1,000	500	50.0
39	Shara	Borno	Askira/Uba	Gallery (Subsurface)	1,000	500	50.0
40	Maidugri (WTW)	Borno	Maiduguri	Alau Dam	67,000	30,000	44.8
41	Ugep/Ediba (WTW)	Cross River	Abi	Cross Riv.	48,000	9,600	20.0
42	Itigidi (Partial WTW)	Cross River	Abi	Cross Riv.	450	0	0.0
43	Akamkpa (WTW)	Cross River	Akamkpa	Calabar Riv.	10,000	1,000	10.0
44	Calabar (WTW)	Cross River	Calabar-Municipal	Great Kwa Riv.	80,000	28,000	35.0
45	Ikom (WTW)	Cross River	Ikom	Cross Riv.	900	0	0.0
46	Obubra (WTW)	Cross River	Obubra	Cross Riv.	450	0	0.0
47	Obudu (WTW)	Cross River	Obudu	Abe? Riv.	450	0	0.0
48	Ogoja (Old, WTW)	Cross River	Ogoja	Aya Riv.	450	0	0.0
49	Ogoja (New, WTW)	Cross River	Ogoja	Aya Riv.	3,450	0	0.0
50	Ishielu/Ezzilo WTW	Ebonyi	Ishielu	Dam (Unknown)	25,380	10,930	43.1
51	Orejami (WTW)	Edo	Akoko-Edo	Orejami Dam	2,000	800	40.0
52	Ewohimi/Iyagun (WTW)	Edo	Esan South East	Iyagun? Riv.	3,000	1,800	60.0
53	Benin/Ikpoba (WTW)	Edo	Ikpoba-Okha	Ikpoba Riv.	15,000	6,000	40.0
54	Ado/Ureje (WTW)	Ekiti	Ado Ekiti	Ureje Dam	10,000	6,000	60.0
55	Egbe/Little-Osse (WTW)	Ekiti	Aiyekire(Gbonyin)	Egbe Dam	66,000	26,400	40.0
56	Efon-Alaye (WTW)	Ekiti	Efon	Oni Stream	675	675	100.0
57	Itapaji (WTW)	Ekiti	Ikole	Itapaji Dam	5,000	3,000	60.0
58	Ero (WTW)	Ekiti	Moba	Ero Dam	104,500	31,350	30.0
59	Ajalli (WTW)	Enugu	Ezeagu	Ajalli Riv.(?)	77,000	23,100	30.0
60	Nafada (M-WTW)	Gombe	Nafada	Gallery (Subsurface)	1,000	500	50.0
61	Dadin-Kowa (WTW)	Gombe	Yamaltu/Deba	Dadin-Kowa Dam	50,000	45,000	90.0
62	Okigwe (M-WTW)	Imo	Okigwe	Imo Riv. (Unuimo LGA)	45,000	4,500	10.0
63	Owerri/Otamiri (WTW)	Imo	Owerri North	Otamiri Riv.	60,000	18,000	30.0
64	Birnin-Kudu (WTW)	Jigawa	Birnin Kudu	Birnin Kudu Dam	4,560	0	0.0
65	Kazaure/Zoma (WTW?)	Jigawa	Kazaure	Zoma Dam	10,000	7,200	72.0

No	Name	State	LGA	Source	Capacity (m3/day)		PEI
					Installed	Operating	(%)
66	Bagoma (WTW)	Kaduna	Birnin Gwari	Bagoma Dam	2,600	917	35.3
67	Ikara (WTW)	Kaduna	Ikara	Ikara(?) Dam	7,680	830	10.8
68	Kwoi (WTW)	Kaduna	Jaba	Gurara Riv.	12,300	1,291	10.5
69	Kafanchan (WTW)	Kaduna	Jema'a	River/Steam(Unknown)	13,200	9,100	68.9
70	Kaduna North/Old (WTW)	Kaduna	Kaduna North	Kaduna Riv.	90,000	55,000	61.1
71	Kaduna North/New (WTW)	Kaduna	Kaduna North	Kaduna Riv.	150,000	52,000	34.7
72	Kaduna South (WTW)	Kaduna	Kaduna South	Kaduna Riv.	27,000	13,600	50.4
73	Saminaka (WTW)	Kaduna	Lere	River/Steam(Unknown)	3,500	1,700	48.6
74	Zaria New (WTW)	Kaduna	Sabon-Gari	Galma Dam	50,000	39,200	78.4
75	Zaria Old (WTW)	Kaduna	Zaria	Galma Riv.	10,000	3,200	32.0
76	Chiromawa (P-WTW)	Kano	Bebeji	Kano Riv. (Subsurface)	2,400	1,600	66.7
77	Watari Old (P-WTW)	Kano	Bichi	Watari Dam	9,600	0	0.0
78	Joda (P?-WTW)	Kano	Gabasawa	Hadejia Riv.	9,600	4,500	46.9
79	Kafin Chiri (P-WTW)	Kano	Garko	Kafin Chiri Dam	4,800	4,800	100.0
80	Pada (Partial WTW)	Kano	Gwarzo	Pada Dam	6,400	4,000	62.5
81	Mainika (Mobile-WTP)	Kano	Gwarzo	Unknown	300	200	66.7
82	Guzu-Guzu (Disinfection)	Kano	Kabo	Guzu-Guzu Dam	7,200	6,000	83.3
83	Magaga (P-WTW)	Kano	Kabo	Magaga Dam	4,800	4,000	83.3
84	Kusalla (WTW)	Kano	Karaye	Karaye Dam	15,000	12,500	83.3
85	G. Kano/Challawa1 (WTW)	Kano	Kumbotso	Challawa Riv.	20,000	10,000	50.0
86	G. Kano/Challawa2 (WTW)	Kano	Kumbotso	Challawa Riv.	90,000	66,000	73.3
87	G. Kano/Challawa3 (WTW)	Kano	Kumbotso	Challawa Riv.	90,000	45,000	50.0
88	G. Kano/Tamburawa Old (WTW)	Kano	Kumbotso	Kano Riv. (Subsurface)	20,000	0	0.0
89	Gari (P-WTW)	Kano	Kunchi	Gari Dam	4,800	3,400	70.8
90	Kura (Mobile-WTP)	Kano	Kura	Unknown	300	200	66.7
91	Tomas (P-WTW)	Kano	Makoda	Tomas Dam	2,400	1,000	41.7
92	Tiga-Tiga & Tiga-Rano (Disinfection)	Kano	Rano	Tiga Dam	9,600	3,600	37.5
93	Tudun Wada (P-WTW)	Kano	Tudun Wada	Tudun Wada Dam	2,400	1,000	41.7
94	Wudil (WTW)	Kano	Wudil	Wudil Riv.	20,000	13,000	65.0
95	Katsina/Ajiwa (WTW)	Katsina	Batagarawa	Ajiwa Dam	50,000	37,500	75.0
96	Daura/Buja (WTW)	Katsina	Daura	Sabke Dam	7,000	0	0.0
97	Dutsin-Ma (WTW)	Katsina	Dutsin-Ma	Dutsin-Ma Dam	3,380	2,030	60.1
98	Zobe (WTW)	Katsina	Dutsin-Ma	Zove Dam	80,000	0	0.0
99	Funtua/Mairua Old (WTW)	Katsina	Funtua	Funtua Dam	5,000	1,300	26.0
100	Funtua/Mairua New (WTW)	Katsina	Funtua	Funtua Dam	13,500	2,150	15.9
101	Jibia (WTW)	Katsina	Jibia	Jibia Dam	6,000	360	6.0
102	Malumfashi (WTW)	Katsina	Malumfashi	Malumfashi Dam	4,500	0	0.0
103	Argungu (WTW)	Kebbi	Argungu	Sokoto Riv.	8,000	6,500	81.3
104	Birnin-Kebbi/Duku (WTW)	Kebbi	Birnin Kebbi	Sokoto Riv.	61,000	36,000	59.0
105	Yauri/Yelwa (WTW)	Kebbi	Yauri	Niger Riv.	12,600	5,000	39.7
106	Zuru (WTW)	Kebbi	Zuru	Zuru Dam	6,200	4,000	64.5
107	Ankpa (WTW)	Kogi	Ankpa	Maboro Riv.	1,350	250	18.5
108	Dekina (WTW)	Kogi	Dekina	Iteme Riv.	3,375	2,250	66.7
109	Aynigba (WTW)	Kogi	Dekina	Ofu Riv.	2,500	100	4.0
110	Idah (WTW)	Kogi	Idah	Niger Riv.	13,500	6,750	50.0
111	Lokoja Old (WTW)	Kogi	Lokoja	Niger Riv.	3,500	2,500	71.4
112	Ekuku (WTW)	Kogi	Okene	Ekuku Dam	6,750	1,515	22.4
113	Okene (WTW)	Kogi	Okene	Okene Dam	2,250	757	33.6
114	Abeju-Kolo (WTW)	Kogi	Omala	Amala Riv.	3,375	1,591	47.1
115	Isanlu (WTW)	Kogi	Yagba East	Isanlu Dam	2,250	1,125	50.0
116	Egbe (WTW)	Kogi	Yagba West	Egbe Dam	1,350	150	11.1
117	Ilorin/Agba Old (WTW)	Kwara	Ilorin East	Agba Dam	4,500	2,250	50.0
118	Ilorin/Agba New (WTW)	Kwara	Ilorin East	Agba Dam	9,000	4,500	50.0
119	Ilorin/Sobi Old (WTW)	Kwara	Ilorin East	Sobi Dam	4,500	2,250	50.0
120	Ilorin/Sobi New (WTW)	Kwara	Ilorin East	Sobi Dam	4,500	2,250	50.0
121	Ilorin/Asa (WTW)	Kwara	Illorin West	Asa Dam	114,750	91,800	80.0
122	Offa/Oyun (Old, WTW)	Kwara	Oyun	Oyun Dam	4,500	3,600	80.0
123	Offa/Oyun (New, WTW)	Kwara	Oyun	Oyun Dam	15,750	12,600	80.0
124	Adiyan (WTW)	Lagos	Ifako-Ijaye	Ogun Riv.(Akute)	318,220	190,932	60.0
125	Iju (WTW)	Lagos	Ifako-Ijaye	Ogun Riv.(Akute)	204,570	153,428	75.0
126	Isashi (WTW)	Lagos	Ojo	Owo Riv.	18,184	0	0.0
127	Keffi/Mada (WTW)	Nasarawa	Akwanga	Mada Riv.	45,000	0	0.0
128	Doma (WTW)	Nasarawa	Doma	Doma Dam	9,000	7,200	80.0
129	Lafia (WTW)	Nasarawa	Lafia	River/Steam(Unknown)	13,500	8,100	60.0
130	Nasarawa (WTW)	Nasarawa	Nasarawa	Uke Riv.	2,250	0	0.0
131	Nasarawa-Eggon (WTW)	Nasarawa	Nasarawa-Eggon	Arikya Riv.	1,125	0	0.0
132	Agaie (Package WTW)	Niger	Agaie	River/Steam(Unknown)	3,270	0	0.0
133	Bida (WTW)	Niger	Bida	Mana (Gbako?) Riv.	27,000	10,800	40.0
134	New Bussa (WTW)	Niger	Borgu	Kainji Dam	10,000	2,400	24.0
135	Chanchaga Old (WTW)	Niger	Bosso	Gbako Riv.	2,250	1,350	60.0
136	Chanchaga (WTW)	Niger	Bosso	Gbako Riv.	77,000	51,200	66.5
137	Bosso (Package WTW)	Niger	Bosso	Bosso Dam	2,250	900	40.0
138	Badeggi (Package WTW)	Niger	Katcha	River/Steam(Unknown)	1,579	790	50.0
139	Katcha (Package WTW)	Niger	Katcha	River/Steam(Unknown)	1,123	0	0.0
140	Kontagora (WTW)	Niger	Kontagora	Kotagora (Matandi?) Dam	4,500	1,400	31.1
141	Lapai (Package WTW)	Niger	Lapai	River/Steam(Unknown)	3,250	0	0.0
142	Suleja (WTW)	Niger	Suleja	Suleja Dam	50,000	35,000	70.0
143	Abeokuta Old (WTW)	Ogun	Abeokuta South	Ogun Riv.	15,000	3,890	25.9
144	Abeokuta New (WTW)	Ogun	Abeokuta South	Ogun Riv.	82,000	37,060	45.2
145	Ota Old (WTW)	Ogun	Ado-Odo/Ota	River/Steam(Unknown)	2,450	0	0.0
146	Ota New (WTW)	Ogun	Ado-Odo/Ota	River/Steam(Unknown)	6,750	1,210	17.9
147	Ilaro (Package WTW)	Ogun	Egbado South	River/Steam(Unknown)	240	75	31.3

No	Name	State	LGA	Source	Capacity (m3/day)		PEI
					Installed	Operating	(%)
148	Ajilete (Package WTW)	Ogun	Egbado South	River/Steam(Unknown)	810	0	0.0
149	Ifo Akinsede/Papalanto(WTW)	Ogun	Ifo	River/Steam(Unknown)	12,000	6,000	50.0
150	Itele (WTW)	Ogun	Ijebu East	River/Steam(Unknown)	1,800	180	10.0
151	Ijebu-Igbo/Apoje (WTW)	Ogun	Ijebu North	Osun Riv.	18,500	9,250	50.0
152	Ijebu-Ode/Yemoji (WTW)	Ogun	Ijebu Ode	River/Steam(Unknown)	18,000	9,000	50.0
153	Ogere (WTW)	Ogun	Ikenne	River/Steam(Unknown)	6,700	3,350	50.0
154	Imeko (WTW)	Ogun	Imeko-Afon	River/Steam(Unknown)	2,400	315	13.1
155	Owode-Egba (WTW)	Ogun	Obafemi-Owode	River/Steam(Unknown)	1,700	0	0.0
156	Abiji (WTW)	Ogun	Ogun Waterside	River/Steam(Unknown)	1,800	30	1.7
157	Akaka (WTW)	Ogun	Remo North	River/Steam(Unknown)	1,800	0	0.0
158	Shagamu (WTW)	Ogun	Shagamu	River/Steam(Unknown)	6,500	0	0.0
159	Awara (WTW)	Ondo	Akoko North East	Awara Dam	1,800	600	33.3
160	Owena/Ondo-Road (WTW)	Ondo	Idanre	Owena Riv.	19,600	6,533	33.3
161	Owena/Igbara-Oke (WTW)	Ondo	Ifedore	Owena Riv.	5,450	1,817	33.3
162	Okeigbo (WTW)	Ondo	Ile-Oluji-Okeigbo	Oni Riv.	2,275	0	0.0
163	Araromi-Obu (WTW?)	Ondo	Odigbo	River/Steam(Unknown)	450	150	33.3
164	Ido-Ani (WTW)	Ondo	Ose	Ogbasa Riv.	990	330	33.3
165	Ose Owo (WTW)	Ondo	Owo	Ose Owo Dam	3,900	1,300	33.3
166	Uso-Ogbese (WTW)	Ondo	Owo	Ogbese Riv.	450	150	33.3
167	Orile-Owu (Mini-WTW)	Osun	Aiyedade	River/Steam(Unknown)	600	0	0.0
168	Odeyinka (Mini-WTW)	Osun	Aiyedade	River/Steam(Unknown)	300	0	0.0
169	Ile-Ogbo/Kuta (Mini-WTW)	Osun	Aiyedire	River/Steam(Unknown)	200	40	20.0
170	Oluponna (Mini-WTW)	Osun	Aiyedire	River/Steam(Unknown)	300	60	20.0
171	Iperindo (Mini-WTW)	Osun	Atakumosa East	River/Steam(Unknown)	300	0	0.0
172	Ifewara (WTW?)	Osun	Atakumosa East	River/Steam(Unknown)	420	150	35.7
173	Ifewara (Mini-WTW)	Osun	Atakumosa West	River/Steam(Unknown)	200	0	0.0
174	Osu/Ilesha (Mini-WTW)	Osun	Atakumosa West	River/Steam(Unknown)	1,800	0	0.0
175	Igbajo (WTW?)	Osun	Boluwaduro	River/Steam(Unknown)	1,800	450	25.0
176	Otan/Iresi (Mini-WTW)	Osun	Boluwaduro	River/Steam(Unknown)	600	120	20.0
177	Igbajo/Oke-Irun (Mini-WTW)	Osun	Boluwaduro	River/Steam(Unknown)	600	120	20.0
178	Iree/Eripa (Mini-WTW)	Osun	Boripe	River/Steam(Unknown)	600	120	20.0
179	Ada (Mini-WTW)	Osun	Boripe	River/Steam(Unknown)	200	40	20.0
180	Ede/Old (WTW)	Osun	Ede North	Ede Dam	9,000	0	0.0
181	Ede/New (WTW)	Osun	Ede North	Ede Dam	180,000	27,500	15.3
182	Ejigbo (Mini-WTW)	Osun	Ejigbo	River/Steam(Unknown)	2,400	480	20.0
183	Ife-Odan (Mini-WTW)	Osun	Ejigbo	River/Steam(Unknown)	300	0	0.0
184	Mokuro (WTW?)	Osun	Ife East	River/Steam(Unknown)	1,000	450	45.0
185	Famia/Oyere (Mini-WTW)	Osun	Ife North	River/Steam(Unknown)	200	0	0.0
186	Alajue (Mini-WTW)	Osun	Ife North	River/Steam(Unknown)	200	0	0.0
187	Ifetedo (WTW?)	Osun	Ife South	River/Steam(Unknown)	3,700	950	25.7
188	Aye-Oba (Mini-WTW)	Osun	Ife South	River/Steam(Unknown)	600	120	20.0
189	Omifunfun (Mini-WTW)	Osun	Ife South	River/Steam(Unknown)	600	0	0.0
190	Mefoworade (Mini-WTW)	Osun	Ife South	River/Steam(Unknown)	200	0	0.0
191	Ora (Mini-WTW)	Osun	Ifedayo	River/Steam(Unknown)	200	0	0.0
192	Eko-Ende (WTW)	Osun	Ifelodun	Eko-Ende Dam	12,000	2,000	16.7
193	Dagbolu (Mini-WTW)	Osun	Ifelodun	River/Steam(Unknown)	200	40	20.0
194	Iba (Mini-WTW)	Osun	Ifelodun	River/Steam(Unknown)	150	30	20.0
195	Ila/Orangun (WTW?)	Osun	Ila	River/Steam(Unknown)	2,200	380	17.3
196	Ilesha (WTW)	Osun	Ilesha East	Efon-Alaaye, Ekiti State	0	0	0.0
197	Ibodi/Oscoed (Mini-WTW)	Osun	Ilesha East	River/Steam(Unknown)	600	120	20.0
198	Asejire (Mini-WTW)	Osun	Irewole	River/Steam(Unknown)	1,200	0	0.0
199	Iwo/Ayiba (WTW)	Osun	Iwo	Ayiba Dam	9,080	2,500	27.5
200	Esa-Odo (WTW)	Osun	Obokun	Esa-Odo Dam	5,000	2,000	40.0
201	Oyan (WTW?)	Osun	Odo-Otin	River/Steam(Unknown)	230	0	0.0
202	Okuku (Mini-WTW)	Osun	Odo-Otin	River/Steam(Unknown)	600	120	20.0
203	Igbaye (Mini-WTW)	Osun	Odo-Otin	River/Steam(Unknown)	300	60	20.0
204	Inisa (Mini-WTW)	Osun	Odo-Otin	River/Steam(Unknown)	600	120	20.0
205	Tootoo/Igere (Mini-WTW)	Osun	Ola-Oluwa	River/Steam(Unknown)	200	40	20.0
206	Ajagunlase (Mini-WTW)	Osun	Ola-Oluwa	River/Steam(Unknown)	600	0	0.0
207	Ikeji-Ile (WTW?)	Osun	Oriade	River/Steam(Unknown)	2,200	750	34.1
208	Esa-Oke (Mini-WTW)	Osun	Oriade	River/Steam(Unknown)	200	40	20.0
209	Iwara/Igangan (Mini-WTW)	Osun	Oriade	River/Steam(Unknown)	300	0	0.0
210	Ikeji-Arakeji (Mini-WTW)	Osun	Oriade	River/Steam(Unknown)	300	0	0.0
211	Oke-Osun/Abere (Mini-WTW)	Osun	Osogbo	River/Steam(Unknown)	200	40	20.0
212	Ibadan/Asejire (WTW)	Oyo	Egbeda	Asejire Dam	186,000	28,249	15.2
213	Ibadan/Osegere (WTW)	Oyo	Egbeda	Asejire Dam	13,500	0	0.0
214	Ibadan/Eleyele (WTW)	Oyo	Ibadan North West	Eleyele Dam	27,240	3,668	13.5
215	Eruwa (WTW)	Oyo	Ibarapa East	Eruwa Dam	3,300	914	27.7
216	Owode (WTW)	Oyo	Ido	River/Steam(Unknown)	900	0	0.0
217	Kishi (WTW)	Oyo	Irepo	Kishi Dam	720	410	56.9
218	Iseyin (WTW)	Oyo	Iseyin	River/Steam(Unknown)	1,200	240	20.0
219	Lalupon (Partial-WTW)	Oyo	Lagelu	Osun Riv.	436	0	0.0
220	Ogbomoso/Oba (WTW)	Oyo	Ogbomoso North	Oba Dam	6,400	456	7.1
221	Igbetti/Afowose (Partial-WTW)	Oyo	Olorunsogo	Igbetti Dam	1,000	103	10.3
222	Igboho/Sanya (WTW)	Oyo	Orelope	Igboho Dam	1,000	26	2.6
223	Oyo/Erelu (WTW)	Oyo	Oyo East	Erelu Dam	7,500	754	10.1
224	Ago Amodu (P-WTW)	Oyo	Saki East	Ago Amodu Dam	500	32	6.4
225	Saki/Fofo (WTW)	Oyo	Saki West	Saki Dam	1,333	94	7.1
226	Jos/Lamiga (WTW)	Plateau	Jos North	Liberty Dam	18,000	0	0.0
227	Bukuku/Yakubu-Gowon (WTW)	Plateau	Jos South	Yakubu-Gowon Dam	90,000	45,000	50.0
228	Langtang (WTW)	Plateau	Langtang North	Langtang Dam	18,000	9,000	50.0
229	Pankshin (WTW)	Plateau	Pankshin	Pankshin Dam	4,500	2,250	50.0

No	Name	State	LGA	Source	Capacity (m3/day)		PEI
					Installed	Operating	(%)
230	Sokoto Old (WTW)	Sokoto	Sokoto North	Sokoto Riv.	54,000	24,000	44.4
231	Sokoto New (WTW)	Sokoto	Sokoto North	Sokoto Riv.	103,500	74,250	71.7
232	Sokoto/Biwater (WTW)	Sokoto	Sokoto North	Sokoto Riv.	27,000	15,750	58.3
233	Gassol (P-WTW)	Taraba	Gassol	Gellery (Subsurface)	450	0	0.0
234	Ibi/Wukari (WTW)	Taraba	Ibi	Benue Riv.	20,900	4,750	22.7
235	Gembu (WTW)	Taraba	Sardauna	Leme Riv.	1,980	950	48.0
236	Fikyu (P-WTW)	Taraba	Ussa	Gellery (Subsurface)	450	0	0.0
237	Bantaji (M-WTW)	Taraba	Wukari	Gellery (Subsurface)	450	350	77.8
238	Gusau (WTW)	Zamfara	Gusau	Gusau Dam	45,000	27,000	60.0
239	Kaura Namoda (WTW)	Zamfara	Kaura Namoda	Kaura Namoda Dam	1,350	743	55.0
240	Maradun (P-WTW)	Zamfara	Maradun	Bakolodi Dam	900	540	60.0
241	Talata Mafara (P-WTW)	Zamfara	Talata Mafara	Bakolodi Dam	1,125	0	0.0
242	Abuja/Usuma1 (WTW)	FCT Abuja	Bwari	Lower Usuma Dam	120,000	84,000	70.0
243	Abuja/Usuma2 (WTW)	FCT Abuja	Bwari	Lower Usuma Dam	120,000	84,000	70.0
					4,239,776	**1,915,820**	**45.2**

PEI: Production Efficiency Index
WTW: Water Treatment Works P-WTW: Package WTW M-WTW: Mini/Micro WTW
Source: State Governments and Agencies

(2) Existing Water Treatment Facility of Surface Water commenced between 2011 and 2012

Table SR5.1-2 shows the exsisting water treatment facilities of surface water, which were commenced between 2011 and 2012.

Table SR5.1-2 Existing Water Treatment Facility of Surface Water commenced between 2011 and 2012

No	Name	State	LGA	Source	Capacity (m3/day)		PEI
					Installed	Operating	(%)
1	Katsina-Ala New (WTW)	Benue	Katsina-Ala	Katsina-Ala Riv.	15,000	11,000	73.3
2	Greater Makurdi New(WTW)	Benue	Makurdi	Benue Riv.	100,000	25,000	25.0
3	Otobi New (WTW)	Benue	Oturkpo	Otobi Riv.	15,000	10,000	66.7
4	Northern Ishan (WTW)	Edo	Esan Central	Ugbalo Riv.	9,000	3,600	40.0
5	Watari New (P-WTW)	Kano	Bichi	Watari Dam	75,000	30,000	40.0
6	G. Kano/Tamburawa New (WTW)	Kano	Kumbotso	Kano Riv.	150,000	120,000	80.0
7	Mahuta (WTW)	Kebbi	Fakai	Rafin Stamiya Riv.	1,000	450	45.0
8	Greater Lokoja (WTW)	Kogi	Ajaokuta	Niger Riv.	45,000	20,000	44.4
9	Mangu (WTW)	Plateau	Mangu	Mangu Dam	10,000	0	0.0
					420,000	**220,050**	**52.4**

PEI: Production Efficiency Index
WTW: Water Treatment Works P-WTW: Package WTW M-WTW: Mini/Micro WTW
Source: State Governments and Agencies

(3) Ongoing or Planned Project of Water Treatment Facility of Surface Water as of 2013

Table SR5.1-3 shows ongoing or planned projects of water treatment facilities of surface water as of 2013, which will be basically included in the water supply development plan.

Table SR5.1-3 Ongoing or Planned Projects of Water Treatment Facility of Surface Water as of 2013

No	Name	State	LGA	Source	Design Capacity (m3/day)	Remarks
1	Fufore (M-WTW)	Adamawa	Fufore	Benue Riv.	5,000	Plan
2	Maiha (Gallery)	Adamawa	Maiha	Gallery (Subsurface)	1,000	Plan
3	Mayo-Belwa	Adamawa	Mayo-Belwa	Gallery (Subsurface)	1,000	Plan
4	Mubi North	Adamawa	Mubi North	Gallery (Subsurface)	2,000	Plan
5	Shelleng (M-WTW)	Adamawa	Shelleng	Kiri Dam	5,000	Plan
6	Toungo	Adamawa	Shelleng	Gallery (Subsurface)	1,000	Plan
7	Yola (WTW)	Adamawa	Yola South	Benue Riv.	68,800	Plan
8	Greater Awka (WTW)	Anambra	Awka South	Mamu(Ezu) Riv.	100,000	Plan
9	Ihiala Regional (WTW)	Anambra	Ihiala	Ntamili Riv.	43,000	Plan
10	Nnewi Regional (WTW)	Anambra	Nnewi North	Ubor Riv.	82,000	Plan
11	Greater Onitsha (WTW)	Anambra	Onitsha North	Niger Riv.	240,000	Ongoing
12	Bauchi/Gubi (WTW)	Bauch	Bauchi	Waya Dam	20,000	Plan
13	Biu (WTW)	Borno	Biu	Biu Dam	12,000	Plan
14	Maiduguri/Bulunkutu	Borno	Maiduguri	Alau Dam	9,000	Plan
15	Itigidi (WTW)	Cross River	Abi	Cross River	3,000	Plan
16	Ikom Phase-1 (WTW)	Cross River	Ikom	Cross River	9,300	Plan
17	Ikom Phase-2 (WTW)	Cross River	Ikom	Cross River	15,560	Plan
18	Obubra (WTW)	Cross River	Obubra	Cross River	3,000	Plan
19	Obudu Phase-1 (WTW)	Cross River	Obudu	Obudu Dam	3,000	Plan
20	Obudu Phase-2 (WTW)	Cross River	Obudu	Obudu Dam	3,550	Plan
21	Ogoja Phase-1 (WTW)	Cross River	Ogoja	Aya Riv.	8,144	Plan
22	Ogoja Phase-2 (WTW)	Cross River	Ogoja	Aya Riv.	9,336	Plan
23	Okpoma (WTW)	Cross River	Yala	Onwu Riv.	3,000	Plan
24	Oferekpe (WTW)	Ebonyi	Ikwo	Cross River	100,000	Ongoing
25	Ohafia-Ukawu (WTW)	Ebonyi	Onicha	Unknown	100,000	Ongoing
26	Ojirami (WTW)	Edo	Akoko-Edo	Ojirami Dam	6,000	Ongoing
27	Efon-Alaye (WTW)	Ekiti	Efon	Oni Stream	7,200	Ongoing
28	Itapaji (WTW)	Ekiti	Ikole	Itapaji Dam	5,000	Plan
29	Ado/Ogbesse (WTW)	Ekiti	Ise/Orun	Ogbesse Dam	84,000	Plan
30	Oji-River Regional (WTW)	Enugu	Oji-River	Unknown	4,000	Plan
31	Balanga (WTW)	Gombe	Balanga	Balanga	38,000	Plan
32	Dadin-Kowa (WTW)	Gombe	Yamaltu/Deba	Dadin-Kowa	25,000	Plan
33	Kachia (WTW)	Kaduna	Kachia	Unknown	11,000	Plan
34	Zaria (WTW)	Kaduna	Sabon-Gari	Galma Dam	150,000	Plan
35	Chiromawa (WTW)	Kano	Bebeji	Kano Riv.	7,200	Plan
36	Joda-1 (WTW)	Kano	Gabasawa	Hadjia Riv.	7,200	Plan
37	Joda-2 (WTW)	Kano	Gabasawa	Hadjia Riv.	90,000	Plan
38	Kafin Chiri (WTW)	Kano	Garko	Kafin Chiri Dam	3,600	Plan
39	Guzu-Guzu (WTW)	Kano	Kabo	Guzu-Guzu Dam	20,000	Plan
40	Challawa (WTW)	Kano	Karaye	Challawa Riv.	67,667	Plan
41	Tamburawa New (WTW)	Kano	Kumbotso	Kano Riv.	180,000	Plan
42	Gari Regional (P-WTW)	Kano	Kunchi	Gari Dam	3,600	Plan
43	Madobi (P-WTW)	Kano	Madobi	Tube well	12,000	Plan
44	Tomas Regional (WTW)	Kano	Makoda	Tomas Dam	3,600	Plan
45	Tiga-Tiga & Tiga-Rano Regional (Disinfection)	Kano	Rano	Tiga Dam	10,000	Plan
46	Tudun Wada (WTW)	Kano	Tudun Wada	Tudun Wada Dam	3,600	Plan
47	Wudil New (WTW)	Kano	Wudil	Wudil Riv.	90,000	Plan
48	Zobe Regional (WTW)	Katsina	Dutsin-Ma	Zobe Dam	27,500	Plan
49	Yewa Phase-1 (WTW, Desalination)	Lagos	Badagry	Yewa Riv.	227,300	Plan
50	Yewa Phase-2 (WTW, Desalination)	Lagos	Badagry	Yewa Riv.	227,300	Plan
51	Otta Ikosi (WTW)	Lagos	Epe	Aye Riv.	18,184	Ongoing
52	Odomola Phase-1 (WTW)	Lagos	Epe	Osun Riv.	113,650	Plan
53	Odomola Phase-2 (WTW)	Lagos	Epe	Osun Riv.	409,140	Plan
54	Odomola Phase-3 (WTW)	Lagos	Epe	Osun Riv.	431,870	Plan
55	Adiyan-2 (WTW)	Lagos	Ifako-Ijaye	Ogun Riv.	318,220	Plan
56	Adiyan-3 (WTW)	Lagos	Ifako-Ijaye	Ogun Riv.	318,220	Plan
57	Ibesha (WTW, Desalination)	Lagos	Ikorodu	Lagos Lagoon	227,300	Plan
58	Ishashi Expansion-1 (WTW)	Lagos	Ojo	Owo Riv.	36,368	Plan
59	Ishashi Expansion-2 (WTW)	Lagos	Ojo	Owo Riv.	104,558	Plan
60	Doma (WTW)	Nasarawa	Doma	Doma Dam	29,000	Plan
61	Nasarawa (WTW)	Nasarawa	Nasarawa	Uke Riv.	13,500	Plan
62	Agaie (P-WTW)	Niger	Agaie	Unknown	3,000	Ongoing
63	Bida (P-WTW)	Niger	Bida	Gbako Riv.	3,000	Ongoing
64	Gurara (P-WTW)	Niger	Gurara	Gurara Riv.	3,000	Ongoing
65	Kontagora (P-WTW)	Niger	Kontagora	Kontagora Dam	3,000	Ongoing
66	Lapai (P-WTW)	Niger	Lapai	Unknown	3,000	Ongoing
67	Mokwa (WTW)	Niger	Mokwa	River	3,000	Ongoing
68	Zungeru/Wushishi (WTW)	Niger	Wushishi	Kaduna Riv.	4,500	Plan
69	Ota Old (WTW)	Ogun	Ado-Ado/Ota	Unknown	2,450	Plan
70	Ota New (WTW)	Ogun	Ado-Ado/Ota	Unknown	6,750	Plan
71	Yewa Regional-1 (WTW)	Ogun	Egbado South	Yewa Riv.	100,000	Plan
72	Yewa Regional-2 (WTW)	Ogun	Egbado South	Yewa Riv.	100,000	Plan
73	Apoje Regional-1 (WTW)	Ogun	Ijebu North	Osun Riv.	200,000	Plan
74	Apoje Regional-2 (WTW)	Ogun	Ijebu North	Osun Riv.	200,000	Plan
75	Mokoloki Regional Phase-1 (WTW)	Ogun	Obafemi-Owode	Ogun Riv.	250,000	Plan
76	Mokoloki Regional Phase-2 (WTW)	Ogun	Obafemi-Owode	Ogun Riv.	250,000	Plan
77	Mokoloki Regional Phase-3 (WTW)	Ogun	Obafemi-Owode	Ogun Riv.	200,000	Plan
78	Awara (WTW)	Ondo	Akoko North East	Awara Dam	4,500	Ongoing
79	Awara-Olyinmo (WTW)	Ondo	Akoko North West	Dam	5,000	Plan
80	Owena Dam (WTW)	Ondo	Ile-Oluji-Okeigbo	Owena Dam	60,000	Ongoing

No	Name	State	LGA	Source	Design Capacity (m3/day)	Remarks
81	Ido-Ani (WTW)	Ondo	Ose	Ogbasa Riv.	1,000	Ongoing
82	Ose Owo (WTW)	Ondo	Owo	Ose Owo Dam	4,500	Ongoing
83	Ilesha (WTW)	Osun	Atakumosa West	Unknown	60,000	Plan
84	Ife (WTW)	Osun	Ife Central	Unknown	30,000	Plan
85	Afijio (WTW)	Oyo	Afijio	Unknown	3,000	Plan
86	Akinyele (WTW)	Oyo	Akinyele	Unknown	6,000	Plan
87	Ago-Are/Tede (WTW)	Oyo	Atigbo	Dam	3,000	Plan
88	Ayete (WTW)	Oyo	Oyo	Ayete Dam	3,000	Ongoing
89	Ido (WTW)	Oyo	Ido	Unknown	5,000	Plan
90	Iganna (WTW)	Oyo	Iwajowa	Unknown	3,000	Plan
91	Ilero (WTW)	Oyo	Kajola	Ilrero Dam	3,000	Ongoing
92	Okeho (WTW)	Oyo	Kajola	Okeho Dam	3,000	Plan
93	Lagelu (WTW)	Oyo	Lagelu	Osun Riv.	8,000	Plan
94	Ogo Otuwa (WTW)	Oyo	Ogo Otuwa	Unknown	2,000	Plan
95	Oluyole	Oyo	Oluyole	Unknown	3,000	Plan
96	Ona-Ara (WTW)	Oyo	Ona-Ara	Osun Riv.	8,000	Plan
97	Ibadan/Odedele-1 (WTW)	Oyo	Ona-Ara	Odedele Dam (Osun Riv.)	120,000	Plan
98	Ibadan/Odedele-2 (WTW)	Oyo	Ona-Ara	Odedele Dam (Osun Riv.)	120,000	Plan
99	Ibadan/Odedele-3 (WTW)	Oyo	Ona-Ara	Odedele Dam (Osun Riv.)	120,000	Plan
100	Oriowo-Owode	Oyo	Oyo West	Unknown	7,000	Plan
101	Surulere/Oko (WTW)	Oyo	Surulere	Unknown	4,000	Plan
102	Jos/Barikin (WTW)	Plateau	Barikin Ladi	New dam	43,750	Plan
103	Gembu (WTW)	Taraba	Sardauna	Lemei Riv.	1,020	Plan
104	Takum/Kashimbilla (WTW)	Taraba	Takum	Kashimbilla Dam	60,000	Plan
105	Fika/Gadaka (M-WTW)	Yobe	Fika	Ngeji Riv.	4,000	Plan
106	Talata Mafara (WTW)	Zamfara	Talata Mafara	Bakolodi Dam	45,000	Ongoing
107	Abaji (WTW)	FCT Abuja	Abaji	Agena Riv.	5,000	Ongoing
108	Karshi (WTW)	FCT Abuja	Abuja Municipal (Amac)	Unknown	3,000	Plan
109	Abuja/Usuma3 (WTW)	FCT Abuja	Bwari	Lower Usuma & Gurara Dam	240,000	Ongoing
110	Abuja/Usuma4 (WTW)	FCT Abuja	Bwari	Lower Usuma & Gurara Dam	240,000	Ongoing
111	Kuje (WTW)	FCT Abuja	Kuje	Usuma Riv.	5,000	Plan
112	Kwali (WTW)	FCT Abuja	Kwali	Bobo Riv.	3,000	Plan
					6,745,937	

WTW: Water Treatment Works P-WTW: Package WTW M-WTW: Mini/Micro WTW
Source: State Governments and Agencies

SR5.1.2 Water Supply Development Plan

(1) Water Supply Development Plan

To meet the future water demand projected in the Project, the Project calculates state-wise water supply development for both hydrological balance and facility planning in the target year 2030, as shown in Table SR5.1-4 and Table SR5.1-5.

Figure SR5.1-1 shows demand and supply graph in water development plan in facility planning in each state.

Table 5.1-4 Water Supply Development Plan for Hydrological Balance (1/6)

Scheme	Category	Existing Capacity (2010)	Pre-MP Period (2011-2014)	MP Period (2015-2030)	**Total (2030)**
Nationwide					
Rehabilitation	Urban, SU/ST (SW)	1,870	-	1,388	**3,257**
	Urban, SU/ST (GW)	5,667	425	1,761	**7,852**
	Rural (GW)	718	126	430	**1,274**
	Sub-Total	**8,254**	**551**	**3,578**	**12,383**
Newly Construction	Urban, SU/ST (SW)		964	3,317	**4,280**
	Urban, SU/ST (GW)		1,109	4,449	**5,558**
	Rural (GW)		379	1,276	**1,655**
	Sub-Total		**2,452**	**9,041**	**11,493**
Total	**(MLD)**	**8,254**	**3,003**	**12,620**	**23,876**
1. Abia					
Rehabilitation	Urban, SU/ST (SW)	24	-	18	**42**
	Urban, SU/ST (GW)	172	16	57	**245**
	Rural (GW)	15	1	5	**22**
	Sub-Total	**211**	**17**	**81**	**309**
Newly Construction	Urban, SU/ST (SW)		-	-	**-**
	Urban, SU/ST (GW)		35	126	**161**
	Rural (GW)		6	19	**24**
	Sub-Total		**41**	**145**	**186**
Total	**(MLD)**	**211**	**58**	**226**	**495**
2. Adamawa					
Rehabilitation	Urban, SU/ST (SW)	39	-	30	**69**
	Urban, SU/ST (GW)	10	0	1	**11**
	Rural (GW)	11	0	2	**13**
	Sub-Total	**60**	**1**	**33**	**93**
Newly Construction	Urban, SU/ST (SW)		-	67	**67**
	Urban, SU/ST (GW)		39	136	**175**
	Rural (GW)		15	48	**62**
	Sub-Total		**53**	**251**	**305**
Total	**(MLD)**	**60**	**54**	**284**	**398**
3. Akwa Ibom					
Rehabilitation	Urban, SU/ST (SW)	-	-	-	**-**
	Urban, SU/ST (GW)	204	33	122	**360**
	Rural (GW)	20	6	19	**45**
	Sub-Total	**225**	**39**	**142**	**405**
Newly Construction	Urban, SU/ST (SW)		-	-	**-**
	Urban, SU/ST (GW)		33	122	**156**
	Rural (GW)		10	35	**45**
	Sub-Total		**44**	**157**	**201**
Total	**(MLD)**	**225**	**82**	**299**	**606**
4. Anambra					
Rehabilitation	Urban, SU/ST (SW)	-	-	-	**-**
	Urban, SU/ST (GW)	147	7	42	**196**
	Rural (GW)	10	1	3	**15**
	Sub-Total	**157**	**8**	**45**	**211**
Newly Construction	Urban, SU/ST (SW)		-	372	**372**
	Urban, SU/ST (GW)		12	74	**86**
	Rural (GW)		11	35	**45**
	Sub-Total		**23**	**480**	**503**
Total	**(MLD)**	**157**	**31**	**526**	**714**
5. Bauchi					
Rehabilitation	Urban, SU/ST (SW)	23	-	17	**40**
	Urban, SU/ST (GW)	132	24	88	**244**
	Rural (GW)	19	4	13	**35**
	Sub-Total	**174**	**28**	**118**	**320**
Newly Construction	Urban, SU/ST (SW)		-	16	**16**
	Urban, SU/ST (GW)		41	147	**188**
	Rural (GW)		22	72	**93**
	Sub-Total		**62**	**235**	**297**
Total	**(MLD)**	**174**	**91**	**352**	**617**
6. Bayelsa					
Rehabilitation	Urban, SU/ST (SW)	-	-	-	**-**
	Urban, SU/ST (GW)	3	1	3	**8**
	Rural (GW)	6	2	7	**14**
	Sub-Total	**9**	**3**	**10**	**22**
Newly Construction	Urban, SU/ST (SW)		-	-	**-**
	Urban, SU/ST (GW)		57	185	**242**
	Rural (GW)		3	8	**11**
	Sub-Total		**60**	**193**	**253**
Total	**(MLD)**	**9**	**63**	**203**	**275**

Table 5.1-4 Water Supply Development Plan for Hydrological Balance (2/6)

Scheme	Category	Existing Capacity (2010)	Pre-MP Period (2011-2014)	MP Period (2015-2030)	**Total (2030)**
7. Benue					
Rehabilitation	Urban, SU/ST (SW)	17	-	13	**31**
	Urban, SU/ST (GW)	157	13	60	**230**
	Rural (GW)	28	6	19	**53**
	Sub-Total	**202**	**19**	**92**	**313**
Newly Construction	Urban, SU/ST (SW)		104	-	**104**
	Urban, SU/ST (GW)		13	60	**73**
	Rural (GW)		14	47	**61**
	Sub-Total		**131**	**107**	**239**
Total	**(MLD)**	**202**	**150**	**200**	**552**
8. Borno					
Rehabilitation	Urban, SU/ST (SW)	32	-	24	**56**
	Urban, SU/ST (GW)	151	8	30	**189**
	Rural (GW)	16	1	3	**20**
	Sub-Total	**199**	**9**	**57**	**265**
Newly Construction	Urban, SU/ST (SW)		-	17	**17**
	Urban, SU/ST (GW)		54	198	**253**
	Rural (GW)		18	60	**78**
	Sub-Total		**72**	**276**	**348**
Total	**(MLD)**	**199**	**81**	**333**	**613**
9. Cross River					
Rehabilitation	Urban, SU/ST (SW)	62	-	48	**110**
	Urban, SU/ST (GW)	38	12	48	**99**
	Rural (GW)	6	8	24	**38**
	Sub-Total	**107**	**20**	**121**	**247**
Newly Construction	Urban, SU/ST (SW)		-	46	**46**
	Urban, SU/ST (GW)		12	48	**61**
	Rural (GW)		8	24	**32**
	Sub-Total		**20**	**119**	**139**
Total	**(MLD)**	**107**	**39**	**240**	**386**
10. Delta					
Rehabilitation	Urban, SU/ST (SW)	-	-	-	-
	Urban, SU/ST (GW)	171	58	198	**427**
	Rural (GW)	18	6	21	**45**
	Sub-Total	**189**	**64**	**219**	**472**
Newly Construction	Urban, SU/ST (SW)		-	-	-
	Urban, SU/ST (GW)		47	162	**209**
	Rural (GW)		7	25	**32**
	Sub-Total		**55**	**186**	**241**
Total	**(MLD)**	**189**	**119**	**406**	**713**
11. Ebonyi					
Rehabilitation	Urban, SU/ST (SW)	11	-	9	**20**
	Urban, SU/ST (GW)	64	-	-	**64**
	Rural (GW)	13	1	3	**17**
	Sub-Total	**88**	**1**	**12**	**101**
Newly Construction	Urban, SU/ST (SW)		131	-	**131**
	Urban, SU/ST (GW)		-	-	-
	Rural (GW)		9	29	**37**
	Sub-Total		**140**	**29**	**168**
Total	**(MLD)**	**88**	**141**	**40**	**270**
12. Edo					
Rehabilitation	Urban, SU/ST (SW)	9	-	7	**16**
	Urban, SU/ST (GW)	247	-	-	**247**
	Rural (GW)	10	0	2	**12**
	Sub-Total	**266**	**0**	**9**	**275**
Newly Construction	Urban, SU/ST (SW)		7	5	**12**
	Urban, SU/ST (GW)		43	169	**212**
	Rural (GW)		10	32	**42**
	Sub-Total		**60**	**206**	**266**
Total	**(MLD)**	**266**	**61**	**214**	**541**
13. Ekiti					
Rehabilitation	Urban, SU/ST (SW)	84	-	64	**148**
	Urban, SU/ST (GW)	50	3	29	**83**
	Rural (GW)	16	4	12	**31**
	Sub-Total	**150**	**7**	**105**	**262**
Newly Construction	Urban, SU/ST (SW)		6	71	**77**
	Urban, SU/ST (GW)		3	29	**33**
	Rural (GW)		4	12	**16**
	Sub-Total		**13**	**113**	**126**
Total	**(MLD)**	**150**	**20**	**218**	**388**

Table 5.1-4 Water Supply Development Plan for Hydrological Balance (3/6)

Scheme	Category	Existing Capacity (2010)	Pre-MP Period (2011-2014)	MP Period (2015-2030)	**Total (2030)**
14. Enugu					
Rehabilitation	Urban, SU/ST (SW)	35	-	27	**62**
	Urban, SU/ST (GW)	34	5	17	**56**
	Rural (GW)	10	2	5	**16**
	Sub-Total	**78**	**7**	**49**	**134**
Newly Construction	Urban, SU/ST (SW)		-	3	**3**
	Urban, SU/ST (GW)		82	273	**355**
	Rural (GW)		10	32	**42**
	Sub-Total		**92**	**308**	**400**
Total	**(MLD)**	**78**	**99**	**357**	**534**
15. Gombe					
Rehabilitation	Urban, SU/ST (SW)	23	-	18	**41**
	Urban, SU/ST (GW)	36	9	35	**80**
	Rural (GW)	8	2	7	**17**
	Sub-Total	**67**	**11**	**60**	**138**
Newly Construction	Urban, SU/ST (SW)		-	50	**50**
	Urban, SU/ST (GW)		19	71	**90**
	Rural (GW)		9	31	**40**
	Sub-Total		**28**	**152**	**181**
Total	**(MLD)**	**67**	**40**	**212**	**319**
16. Imo					
Rehabilitation	Urban, SU/ST (SW)	47	-	37	**84**
	Urban, SU/ST (GW)	88	8	29	**125**
	Rural (GW)	20	2	7	**29**
	Sub-Total	**155**	**10**	**72**	**238**
Newly Construction	Urban, SU/ST (SW)		-	-	**-**
	Urban, SU/ST (GW)		71	249	**320**
	Rural (GW)		14	46	**60**
	Sub-Total		**85**	**295**	**380**
Total	**(MLD)**	**155**	**95**	**368**	**618**
17. Jigawa					
Rehabilitation	Urban, SU/ST (SW)	7	-	2	**8**
	Urban, SU/ST (GW)	217	3	12	**232**
	Rural (GW)	41	4	13	**58**
	Sub-Total	**265**	**7**	**27**	**298**
Newly Construction	Urban, SU/ST (SW)		-	-	**-**
	Urban, SU/ST (GW)		50	187	**237**
	Rural (GW)		9	32	**41**
	Sub-Total		**60**	**218**	**278**
Total	**(MLD)**	**265**	**66**	**245**	**576**
18. Kaduna					
Rehabilitation	Urban, SU/ST (SW)	166	-	128	**293**
	Urban, SU/ST (GW)	174	6	50	**229**
	Rural (GW)	55	10	36	**101**
	Sub-Total	**394**	**16**	**213**	**622**
Newly Construction	Urban, SU/ST (SW)		-	129	**129**
	Urban, SU/ST (GW)		6	50	**55**
	Rural (GW)		10	36	**46**
	Sub-Total		**16**	**214**	**230**
Total	**(MLD)**	**394**	**31**	**427**	**852**
19. Kano					
Rehabilitation	Urban, SU/ST (SW)	136	-	102	**238**
	Urban, SU/ST (GW)	453	17	145	**615**
	Rural (GW)	39	4	13	**56**
	Sub-Total	**629**	**20**	**260**	**909**
Newly Construction	Urban, SU/ST (SW)		152	383	**534**
	Urban, SU/ST (GW)		17	145	**162**
	Rural (GW)		31	105	**136**
	Sub-Total		**199**	**633**	**832**
Total	**(MLD)**	**629**	**220**	**893**	**1,741**
20. Katsina					
Rehabilitation	Urban, SU/ST (SW)	72	-	42	**114**
	Urban, SU/ST (GW)	81	9	30	**119**
	Rural (GW)	33	4	13	**50**
	Sub-Total	**186**	**13**	**85**	**284**
Newly Construction	Urban, SU/ST (SW)		-	22	**22**
	Urban, SU/ST (GW)		85	293	**378**
	Rural (GW)		20	67	**87**
	Sub-Total		**105**	**382**	**487**
Total	**(MLD)**	**186**	**117**	**467**	**770**

Table 5.1-4 Water Supply Development Plan for Hydrological Balance (4/6)

Scheme	Category	Existing Capacity (2010)	Pre-MP Period (2011-2014)	MP Period (2015-2030)	**Total (2030)**
21. Kebbi					
Rehabilitation	Urban, SU/ST (SW)	40	-	31	**70**
	Urban, SU/ST (GW)	55	14	50	**119**
	Rural (GW)	19	5	17	**41**
	Sub-Total	**114**	**19**	**98**	**231**
Newly Construction	Urban, SU/ST (SW)		1	-	**1**
	Urban, SU/ST (GW)		30	108	**138**
	Rural (GW)		11	36	**46**
	Sub-Total		**42**	**143**	**185**
Total	**(MLD)**	**114**	**61**	**241**	**416**
22. Kogi					
Rehabilitation	Urban, SU/ST (SW)	18	-	14	**32**
	Urban, SU/ST (GW)	79	17	61	**157**
	Rural (GW)	14	3	11	**28**
	Sub-Total	**111**	**21**	**86**	**217**
Newly Construction	Urban, SU/ST (SW)		36	-	**36**
	Urban, SU/ST (GW)		40	139	**179**
	Rural (GW)		10	32	**42**
	Sub-Total		**85**	**171**	**256**
Total	**(MLD)**	**111**	**106**	**257**	**473**
23. Kwara					
Rehabilitation	Urban, SU/ST (SW)	71	-	55	**126**
	Urban, SU/ST (GW)	64	11	43	**118**
	Rural (GW)	16	3	10	**29**
	Sub-Total	**151**	**14**	**108**	**273**
Newly Construction	Urban, SU/ST (SW)		-	-	**-**
	Urban, SU/ST (GW)		15	61	**76**
	Rural (GW)		3	12	**15**
	Sub-Total		**19**	**72**	**91**
Total	**(MLD)**	**151**	**32**	**181**	**364**
24. Lagos					
Rehabilitation	Urban, SU/ST (SW)	244	-	188	**433**
	Urban, SU/ST (GW)	1,145	-	-	**1,145**
	Rural (GW)	8	1	4	**13**
	Sub-Total	**1,397**	**1**	**192**	**1,591**
Newly Construction	Urban, SU/ST (SW)		15	1,323	**1,338**
	Urban, SU/ST (GW)		-	-	**-**
	Rural (GW)		1	4	**6**
	Sub-Total		**16**	**1,327**	**1,343**
Total	**(MLD)**	**1,397**	**17**	**1,519**	**2,934**
25. Nasarawa					
Rehabilitation	Urban, SU/ST (SW)	29	-	20	**49**
	Urban, SU/ST (GW)	48	9	38	**95**
	Rural (GW)	10	3	10	**23**
	Sub-Total	**87**	**12**	**68**	**167**
Newly Construction	Urban, SU/ST (SW)		-	34	**34**
	Urban, SU/ST (GW)		9	38	**47**
	Rural (GW)		4	14	**19**
	Sub-Total		**14**	**86**	**100**
Total	**(MLD)**	**87**	**26**	**154**	**267**
26. Niger					
Rehabilitation	Urban, SU/ST (SW)	82	-	63	**146**
	Urban, SU/ST (GW)	140	16	72	**228**
	Rural (GW)	31	4	16	**51**
	Sub-Total	**253**	**21**	**151**	**425**
Newly Construction	Urban, SU/ST (SW)		14	4	**18**
	Urban, SU/ST (GW)		19	84	**103**
	Rural (GW)		10	35	**45**
	Sub-Total		**44**	**123**	**167**
Total	**(MLD)**	**253**	**65**	**274**	**592**
27. Ogun					
Rehabilitation	Urban, SU/ST (SW)	79	-	61	**139**
	Urban, SU/ST (GW)	225	-	-	**225**
	Rural (GW)	15	3	9	**26**
	Sub-Total	**319**	**3**	**69**	**391**
Newly Construction	Urban, SU/ST (SW)		5	272	**277**
	Urban, SU/ST (GW)		-	-	**-**
	Rural (GW)		9	30	**38**
	Sub-Total		**14**	**302**	**316**
Total	**(MLD)**	**319**	**17**	**371**	**707**

Table 5.1-4 Water Supply Development Plan for Hydrological Balance (5/6)

Scheme	Category	Existing Capacity (2010)	Pre-MP Period (2011-2014)	MP Period (2015-2030)	**Total (2030)**
28. Ondo					
Rehabilitation	Urban, SU/ST (SW)	16	-	12	**28**
	Urban, SU/ST (GW)	157	15	63	**235**
	Rural (GW)	24	6	19	**49**
	Sub-Total	**197**	**20**	**94**	**311**
Newly	Urban, SU/ST (SW)		56	4	**60**
Construction	Urban, SU/ST (GW)		15	63	**77**
	Rural (GW)		9	29	**37**
	Sub-Total		**79**	**96**	**175**
Total	**(MLD)**	**197**	**100**	**189**	**486**
29. Osun					
Rehabilitation	Urban, SU/ST (SW)	110	-	84	**194**
	Urban, SU/ST (GW)	115	3	36	**154**
	Rural (GW)	33	5	19	**57**
	Sub-Total	**258**	**8**	**139**	**406**
Newly	Urban, SU/ST (SW)		-	72	**72**
Construction	Urban, SU/ST (GW)		3	36	**39**
	Rural (GW)		5	19	**24**
	Sub-Total		**8**	**127**	**135**
Total	**(MLD)**	**258**	**17**	**266**	**541**
30. Oyo					
Rehabilitation	Urban, SU/ST (SW)	113	-	87	**201**
	Urban, SU/ST (GW)	299	-	-	**299**
	Rural (GW)	45	6	24	**75**
	Sub-Total	**458**	**6**	**111**	**575**
Newly	Urban, SU/ST (SW)		5	331	**336**
Construction	Urban, SU/ST (GW)		-	-	**-**
	Rural (GW)		10	38	**48**
	Sub-Total		**15**	**368**	**383**
Total	**(MLD)**	**458**	**21**	**479**	**959**
31. Plateau					
Rehabilitation	Urban, SU/ST (SW)	56	-	14	**70**
	Urban, SU/ST (GW)	59	12	42	**112**
	Rural (GW)	9	2	7	**18**
	Sub-Total	**123**	**14**	**63**	**200**
Newly	Urban, SU/ST (SW)		8	35	**43**
Construction	Urban, SU/ST (GW)		26	94	**120**
	Rural (GW)		14	45	**59**
	Sub-Total		**48**	**174**	**222**
Total	**(MLD)**	**123**	**62**	**237**	**422**
32. Rivers					
Rehabilitation	Urban, SU/ST (SW)	-	-	-	**-**
	Urban, SU/ST (GW)	329	48	172	**548**
	Rural (GW)	26	4	14	**43**
	Sub-Total	**355**	**51**	**185**	**591**
Newly	Urban, SU/ST (SW)		-	-	**-**
Construction	Urban, SU/ST (GW)		79	285	**364**
	Rural (GW)		13	46	**59**
	Sub-Total		**92**	**331**	**423**
Total	**(MLD)**	**355**	**144**	**516**	**1,014**
33. Sokoto					
Rehabilitation	Urban, SU/ST (SW)	83	-	64	**148**
	Urban, SU/ST (GW)	88	18	72	**179**
	Rural (GW)	25	7	24	**57**
	Sub-Total	**197**	**26**	**161**	**384**
Newly	Urban, SU/ST (SW)		-	-	**-**
Construction	Urban, SU/ST (GW)		18	72	**91**
	Rural (GW)		7	24	**32**
	Sub-Total		**26**	**97**	**122**
Total	**(MLD)**	**197**	**51**	**258**	**506**
34. Taraba					
Rehabilitation	Urban, SU/ST (SW)	11	-	8	**19**
	Urban, SU/ST (GW)	22	1	4	**28**
	Rural (GW)	6	0	1	**8**
	Sub-Total	**39**	**2**	**14**	**55**
Newly	Urban, SU/ST (SW)		-	49	**49**
Construction	Urban, SU/ST (GW)		30	107	**138**
	Rural (GW)		12	38	**49**
	Sub-Total		**42**	**194**	**236**
Total	**(MLD)**	**39**	**44**	**208**	**291**

Table 5.1-4 Water Supply Development Plan for Hydrological Balance (6/6)

Scheme	Category	Existing Capacity (2010)	Pre-MP Period (2011-2014)	MP Period (2015-2030)	**Total (2030)**
35. Yobe					
Rehabilitation	Urban, SU/ST (SW)	-	-	-	**-**
	Urban, SU/ST (GW)	71	15	51	**136**
	Rural (GW)	13	3	9	**25**
	Sub-Total	**84**	**17**	**60**	**161**
Newly Construction	Urban, SU/ST (SW)		-	3	**3**
	Urban, SU/ST (GW)		28	99	**127**
	Rural (GW)		8	28	**36**
	Sub-Total		**37**	**130**	**166**
Total	**(MLD)**	**84**	**54**	**190**	**327**
36. Zamfara					
Rehabilitation	Urban, SU/ST (SW)	22	-	17	**39**
	Urban, SU/ST (GW)	124	9	40	**174**
	Rural (GW)	24	2	8	**35**
	Sub-Total	**171**	**12**	**65**	**247**
Newly Construction	Urban, SU/ST (SW)		36	-	**36**
	Urban, SU/ST (GW)		16	68	**84**
	Rural (GW)		12	41	**53**
	Sub-Total		**64**	**109**	**173**
Total	**(MLD)**	**171**	**76**	**174**	**420**
37. FCT Abuja					
Rehabilitation	Urban, SU/ST (SW)	108	-	84	**192**
	Urban, SU/ST (GW)	20	3	20	**42**
	Rural (GW)	2	1	2	**5**
	Sub-Total	**130**	**3**	**106**	**239**
Newly Construction	Urban, SU/ST (SW)		388	9	**397**
	Urban, SU/ST (GW)		59	470	**529**
	Rural (GW)		3	13	**16**
	Sub-Total		**450**	**492**	**942**
Total	**(MLD)**	**130**	**453**	**598**	**1,182**

Source: JICA Project Team

Table 5.1-5 Water Supply Development Plan for Facility Planning /Installed Capacity (1/6)

Scheme	Category	Existing Capacity (2010)	Pre-CMP Period (2011-2014)	CMP Period (2015-2030)	**Total (2030)**
Nationwide					
Rehabilitation	Urban, SU/ST (SW)	1,870	-	1,388	**3,257**
	Urban, SU/ST (GW)	5,667	425	1,761	**7,852**
	Rural (GW)	718	126	430	**1,274**
	Sub-Total	**8,254**	**551**	**3,578**	**12,383**
Newly Construction	Urban, SU/ST (SW)		1,204	4,146	**5,350**
	Urban, SU/ST (GW)		1,386	5,561	**6,947**
	Rural (GW)		474	1,595	**2,069**
	Sub-Total		**3,065**	**11,302**	**14,367**
Total	**(MLD)**	**8,254**	**3,616**	**14,880**	**26,750**
1. Abia					
Rehabilitation	Urban, SU/ST (SW)	24	-	18	**42**
	Urban, SU/ST (GW)	172	16	57	**245**
	Rural (GW)	15	1	5	**22**
	Sub-Total	**211**	**17**	**81**	**309**
Newly Construction	Urban, SU/ST (SW)		-	-	**-**
	Urban, SU/ST (GW)		44	158	**202**
	Rural (GW)		7	24	**30**
	Sub-Total		**51**	**181**	**232**
Total	**(MLD)**	**211**	**68**	**262**	**542**
2. Adamawa					
Rehabilitation	Urban, SU/ST (SW)	39	-	30	**69**
	Urban, SU/ST (GW)	10	0	1	**11**
	Rural (GW)	11	0	2	**13**
	Sub-Total	**60**	**1**	**33**	**93**
Newly Construction	Urban, SU/ST (SW)		-	84	**84**
	Urban, SU/ST (GW)		48	171	**219**
	Rural (GW)		18	60	**78**
	Sub-Total		**67**	**314**	**381**
Total	**(MLD)**	**60**	**67**	**346**	**474**
3. Akwa Ibom					
Rehabilitation	Urban, SU/ST (SW)	-	-	-	**-**
	Urban, SU/ST (GW)	204	33	122	**360**
	Rural (GW)	20	6	19	**45**
	Sub-Total	**225**	**39**	**142**	**405**
Newly Construction	Urban, SU/ST (SW)		-	-	**-**
	Urban, SU/ST (GW)		42	153	**195**
	Rural (GW)		13	43	**56**
	Sub-Total		**54**	**196**	**251**
Total	**(MLD)**	**225**	**93**	**338**	**656**
4. Anambra					
Rehabilitation	Urban, SU/ST (SW)	-	-	-	**-**
	Urban, SU/ST (GW)	147	7	42	**196**
	Rural (GW)	10	1	3	**15**
	Sub-Total	**157**	**8**	**45**	**211**
Newly Construction	Urban, SU/ST (SW)		-	465	**465**
	Urban, SU/ST (GW)		15	92	**107**
	Rural (GW)		13	43	**57**
	Sub-Total		**29**	**600**	**629**
Total	**(MLD)**	**157**	**37**	**646**	**840**
5. Bauchi					
Rehabilitation	Urban, SU/ST (SW)	23	-	17	**40**
	Urban, SU/ST (GW)	132	24	88	**244**
	Rural (GW)	19	4	13	**35**
	Sub-Total	**174**	**28**	**118**	**320**
Newly Construction	Urban, SU/ST (SW)		-	20	**20**
	Urban, SU/ST (GW)		51	184	**235**
	Rural (GW)		27	90	**117**
	Sub-Total		**78**	**293**	**372**
Total	**(MLD)**	**174**	**106**	**411**	**691**
6. Bayelsa					
Rehabilitation	Urban, SU/ST (SW)	-	-	-	**-**
	Urban, SU/ST (GW)	3	1	3	**8**
	Rural (GW)	6	2	7	**14**
	Sub-Total	**9**	**3**	**10**	**22**
Newly Construction	Urban, SU/ST (SW)		-	-	**-**
	Urban, SU/ST (GW)		72	231	**303**
	Rural (GW)		3	10	**14**
	Sub-Total		**75**	**241**	**316**
Total	**(MLD)**	**9**	**78**	**251**	**338**

Table 5.1-5 Water Supply Development Plan for Facility Planning /Installed Capacity (2/6)

Scheme	Category	Existing Capacity (2010)	Pre-CMP Period (2011-2014)	CMP Period (2015-2030)	**Total (2030)**
7. Benue					
Rehabilitation	Urban, SU/ST (SW)	17	-	13	**31**
	Urban, SU/ST (GW)	157	13	60	**230**
	Rural (GW)	28	6	19	**53**
	Sub-Total	**202**	**19**	**92**	**313**
Newly	Urban, SU/ST (SW)		130	-	**130**
Construction	Urban, SU/ST (GW)		16	75	**92**
	Rural (GW)		18	59	**77**
	Sub-Total		**164**	**134**	**298**
Total	**(MLD)**	**202**	**183**	**227**	**612**
8. Borno					
Rehabilitation	Urban, SU/ST (SW)	32	-	24	**56**
	Urban, SU/ST (GW)	151	8	30	**189**
	Rural (GW)	16	1	3	**20**
	Sub-Total	**199**	**9**	**57**	**265**
Newly	Urban, SU/ST (SW)		-	21	**21**
Construction	Urban, SU/ST (GW)		68	248	**316**
	Rural (GW)		22	76	**98**
	Sub-Total		**90**	**345**	**435**
Total	**(MLD)**	**199**	**99**	**402**	**700**
9. Cross River					
Rehabilitation	Urban, SU/ST (SW)	62	-	48	**110**
	Urban, SU/ST (GW)	38	12	48	**99**
	Rural (GW)	6	8	24	**38**
	Sub-Total	**107**	**20**	**121**	**247**
Newly	Urban, SU/ST (SW)		-	58	**58**
Construction	Urban, SU/ST (GW)		15	61	**76**
	Rural (GW)		9	30	**40**
	Sub-Total		**25**	**149**	**173**
Total	**(MLD)**	**107**	**44**	**270**	**421**
10. Delta					
Rehabilitation	Urban, SU/ST (SW)	-	-	-	-
	Urban, SU/ST (GW)	171	58	198	**427**
	Rural (GW)	18	6	21	**45**
	Sub-Total	**189**	**64**	**219**	**472**
Newly	Urban, SU/ST (SW)		-	-	-
Construction	Urban, SU/ST (GW)		59	202	**261**
	Rural (GW)		9	31	**40**
	Sub-Total		**68**	**233**	**301**
Total	**(MLD)**	**189**	**133**	**452**	**774**
11. Ebonyi					
Rehabilitation	Urban, SU/ST (SW)	11	-	9	**20**
	Urban, SU/ST (GW)	64	-	-	**64**
	Rural (GW)	13	1	3	**17**
	Sub-Total	**88**	**1**	**12**	**101**
Newly	Urban, SU/ST (SW)		164	-	**164**
Construction	Urban, SU/ST (GW)		-	-	-
	Rural (GW)		11	36	**47**
	Sub-Total		**175**	**36**	**211**
Total	**(MLD)**	**88**	**176**	**48**	**312**
12. Edo					
Rehabilitation	Urban, SU/ST (SW)	9	-	7	**16**
	Urban, SU/ST (GW)	247	-	-	**247**
	Rural (GW)	10	0	2	**12**
	Sub-Total	**266**	**0**	**9**	**275**
Newly	Urban, SU/ST (SW)		9	6	**15**
Construction	Urban, SU/ST (GW)		54	211	**265**
	Rural (GW)		12	40	**52**
	Sub-Total		**75**	**257**	**332**
Total	**(MLD)**	**266**	**76**	**265**	**607**
13. Ekiti					
Rehabilitation	Urban, SU/ST (SW)	84	-	64	**148**
	Urban, SU/ST (GW)	50	3	29	**83**
	Rural (GW)	16	4	12	**31**
	Sub-Total	**150**	**7**	**105**	**262**
Newly	Urban, SU/ST (SW)		7	89	**96**
Construction	Urban, SU/ST (GW)		4	37	**41**
	Rural (GW)		4	15	**20**
	Sub-Total		**16**	**141**	**157**
Total	**(MLD)**	**150**	**23**	**247**	**419**

Table 5.1-5 Water Supply Development Plan for Facility Planning /Installed Capacity (3/6)

Scheme	Category	Existing Capacity (2010)	Pre-CMP Period (2011-2014)	CMP Period (2015-2030)	**Total (2030)**
14. Enugu					
Rehabilitation	Urban, SU/ST (SW)	35	-	27	**62**
	Urban, SU/ST (GW)	34	5	17	**56**
	Rural (GW)	10	2	5	**16**
	Sub-Total	**78**	**7**	**49**	**134**
Newly	Urban, SU/ST (SW)		-	4	**4**
Construction	Urban, SU/ST (GW)		103	341	**444**
	Rural (GW)		12	40	**52**
	Sub-Total		**115**	**385**	**500**
Total	**(MLD)**	**78**	**122**	**434**	**634**
15. Gombe					
Rehabilitation	Urban, SU/ST (SW)	23	-	18	**41**
	Urban, SU/ST (GW)	36	9	35	**80**
	Rural (GW)	8	2	7	**17**
	Sub-Total	**67**	**11**	**60**	**138**
Newly	Urban, SU/ST (SW)		-	63	**63**
Construction	Urban, SU/ST (GW)		24	89	**113**
	Rural (GW)		12	39	**50**
	Sub-Total		**35**	**191**	**226**
Total	**(MLD)**	**67**	**47**	**250**	**364**
16. Imo					
Rehabilitation	Urban, SU/ST (SW)	47	-	37	**84**
	Urban, SU/ST (GW)	88	8	29	**125**
	Rural (GW)	20	2	7	**29**
	Sub-Total	**155**	**10**	**72**	**238**
Newly	Urban, SU/ST (SW)		-	-	**-**
Construction	Urban, SU/ST (GW)		88	311	**399**
	Rural (GW)		17	58	**75**
	Sub-Total		**106**	**369**	**475**
Total	**(MLD)**	**155**	**116**	**441**	**713**
17. Jigawa					
Rehabilitation	Urban, SU/ST (SW)	7	-	2	**8**
	Urban, SU/ST (GW)	217	3	12	**232**
	Rural (GW)	41	4	13	**58**
	Sub-Total	**265**	**7**	**27**	**298**
Newly	Urban, SU/ST (SW)		-	-	**-**
Construction	Urban, SU/ST (GW)		63	233	**296**
	Rural (GW)		11	40	**51**
	Sub-Total		**74**	**273**	**347**
Total	**(MLD)**	**265**	**81**	**299**	**645**
18. Kaduna					
Rehabilitation	Urban, SU/ST (SW)	166	-	128	**293**
	Urban, SU/ST (GW)	174	6	50	**229**
	Rural (GW)	55	10	36	**101**
	Sub-Total	**394**	**16**	**213**	**622**
Newly	Urban, SU/ST (SW)		-	161	**161**
Construction	Urban, SU/ST (GW)		7	62	**69**
	Rural (GW)		13	45	**57**
	Sub-Total		**19**	**268**	**287**
Total	**(MLD)**	**394**	**35**	**481**	**909**
19. Kano					
Rehabilitation	Urban, SU/ST (SW)	136	-	102	**238**
	Urban, SU/ST (GW)	453	17	145	**615**
	Rural (GW)	39	4	13	**56**
	Sub-Total	**629**	**20**	**260**	**909**
Newly	Urban, SU/ST (SW)		189	478	**668**
Construction	Urban, SU/ST (GW)		21	181	**202**
	Rural (GW)		39	131	**170**
	Sub-Total		**249**	**791**	**1,040**
Total	**(MLD)**	**629**	**270**	**1,051**	**1,949**
20. Katsina					
Rehabilitation	Urban, SU/ST (SW)	72	-	42	**114**
	Urban, SU/ST (GW)	81	9	30	**119**
	Rural (GW)	33	4	13	**50**
	Sub-Total	**186**	**13**	**85**	**284**
Newly	Urban, SU/ST (SW)		-	28	**28**
Construction	Urban, SU/ST (GW)		106	367	**472**
	Rural (GW)		25	83	**108**
	Sub-Total		**131**	**477**	**608**
Total	**(MLD)**	**186**	**143**	**562**	**892**

Table 5.1-5 Water Supply Development Plan for Facility Planning /Installed Capacity (4/6)

Scheme	Category	Existing Capacity (2010)	Pre-CMP Period (2011-2014)	CMP Period (2015-2030)	**Total (2030)**
21. Kebbi					
Rehabilitation	Urban, SU/ST (SW)	40	-	31	**70**
	Urban, SU/ST (GW)	55	14	50	**119**
	Rural (GW)	19	5	17	**41**
	Sub-Total	**114**	**19**	**98**	**231**
Newly Construction	Urban, SU/ST (SW)		1	-	**1**
	Urban, SU/ST (GW)		38	135	**172**
	Rural (GW)		13	44	**58**
	Sub-Total		**52**	**179**	**231**
Total	**(MLD)**	**114**	**71**	**277**	**462**
22. Kogi					
Rehabilitation	Urban, SU/ST (SW)	18	-	14	**32**
	Urban, SU/ST (GW)	79	17	61	**157**
	Rural (GW)	14	3	11	**28**
	Sub-Total	**111**	**21**	**86**	**217**
Newly Construction	Urban, SU/ST (SW)		45	-	**45**
	Urban, SU/ST (GW)		49	174	**223**
	Rural (GW)		12	40	**52**
	Sub-Total		**107**	**214**	**320**
Total	**(MLD)**	**111**	**127**	**299**	**537**
23. Kwara					
Rehabilitation	Urban, SU/ST (SW)	71	-	55	**126**
	Urban, SU/ST (GW)	64	11	43	**118**
	Rural (GW)	16	3	10	**29**
	Sub-Total	**151**	**14**	**108**	**273**
Newly Construction	Urban, SU/ST (SW)		-	-	**-**
	Urban, SU/ST (GW)		19	76	**95**
	Rural (GW)		4	15	**19**
	Sub-Total		**23**	**91**	**114**
Total	**(MLD)**	**151**	**37**	**199**	**387**
24. Lagos					
Rehabilitation	Urban, SU/ST (SW)	244	-	188	**433**
	Urban, SU/ST (GW)	1,145	-	-	**1,145**
	Rural (GW)	8	1	4	**13**
	Sub-Total	**1,397**	**1**	**192**	**1,591**
Newly Construction	Urban, SU/ST (SW)		18	1,654	**1,672**
	Urban, SU/ST (GW)		-	-	**-**
	Rural (GW)		2	5	**7**
	Sub-Total		**20**	**1,659**	**1,679**
Total	**(MLD)**	**1,397**	**21**	**1,851**	**3,270**
25. Nasarawa					
Rehabilitation	Urban, SU/ST (SW)	29	-	20	**49**
	Urban, SU/ST (GW)	48	9	38	**95**
	Rural (GW)	10	3	10	**23**
	Sub-Total	**87**	**12**	**68**	**167**
Newly Construction	Urban, SU/ST (SW)		-	43	**43**
	Urban, SU/ST (GW)		12	48	**59**
	Rural (GW)		5	18	**23**
	Sub-Total		**17**	**108**	**125**
Total	**(MLD)**	**87**	**29**	**176**	**292**
26. Niger					
Rehabilitation	Urban, SU/ST (SW)	82	-	63	**146**
	Urban, SU/ST (GW)	140	16	72	**228**
	Rural (GW)	31	4	16	**51**
	Sub-Total	**253**	**21**	**151**	**425**
Newly Construction	Urban, SU/ST (SW)		18	5	**23**
	Urban, SU/ST (GW)		24	105	**129**
	Rural (GW)		13	44	**57**
	Sub-Total		**55**	**154**	**209**
Total	**(MLD)**	**253**	**76**	**305**	**633**
27. Ogun					
Rehabilitation	Urban, SU/ST (SW)	79	-	61	**139**
	Urban, SU/ST (GW)	225	-	-	**225**
	Rural (GW)	15	3	9	**26**
	Sub-Total	**319**	**3**	**69**	**391**
Newly Construction	Urban, SU/ST (SW)		7	340	**347**
	Urban, SU/ST (GW)		-	-	**-**
	Rural (GW)		11	37	**48**
	Sub-Total		**18**	**377**	**395**
Total	**(MLD)**	**319**	**20**	**446**	**786**

Table 5.1-5 Water Supply Development Plan for Facility Planning /Installed Capacity (5/6)

Scheme	Category	Existing Capacity (2010)	Pre-CMP Period (2011-2014)	CMP Period (2015-2030)	**Total (2030)**
28. Ondo					
Rehabilitation	Urban, SU/ST (SW)	16	-	12	**28**
	Urban, SU/ST (GW)	157	15	63	**235**
	Rural (GW)	24	6	19	**49**
	Sub-Total	**197**	**20**	**94**	**311**
Newly Construction	Urban, SU/ST (SW)		70	5	**75**
	Urban, SU/ST (GW)		18	78	**97**
	Rural (GW)		11	36	**47**
	Sub-Total		**99**	**119**	**219**
Total	**(MLD)**	**197**	**119**	**213**	**530**
29. Osun					
Rehabilitation	Urban, SU/ST (SW)	110	-	84	**194**
	Urban, SU/ST (GW)	115	3	36	**154**
	Rural (GW)	33	5	19	**57**
	Sub-Total	**258**	**8**	**139**	**406**
Newly Construction	Urban, SU/ST (SW)		-	90	**90**
	Urban, SU/ST (GW)		4	45	**49**
	Rural (GW)		7	23	**30**
	Sub-Total		**11**	**159**	**169**
Total	**(MLD)**	**258**	**19**	**298**	**575**
30. Oyo					
Rehabilitation	Urban, SU/ST (SW)	113	-	87	**201**
	Urban, SU/ST (GW)	299	-	-	**299**
	Rural (GW)	45	6	24	**75**
	Sub-Total	**458**	**6**	**111**	**575**
Newly Construction	Urban, SU/ST (SW)		6	413	**419**
	Urban, SU/ST (GW)		-	-	**-**
	Rural (GW)		13	47	**60**
	Sub-Total		**19**	**460**	**479**
Total	**(MLD)**	**458**	**25**	**571**	**1,054**
31. Plateau					
Rehabilitation	Urban, SU/ST (SW)	56	-	14	**70**
	Urban, SU/ST (GW)	59	12	42	**112**
	Rural (GW)	9	2	7	**18**
	Sub-Total	**123**	**14**	**63**	**200**
Newly Construction	Urban, SU/ST (SW)		10	44	**54**
	Urban, SU/ST (GW)		33	117	**150**
	Rural (GW)		17	56	**73**
	Sub-Total		**60**	**217**	**277**
Total	**(MLD)**	**123**	**74**	**280**	**477**
32. Rivers					
Rehabilitation	Urban, SU/ST (SW)	-	-	-	**-**
	Urban, SU/ST (GW)	329	48	172	**548**
	Rural (GW)	26	4	14	**43**
	Sub-Total	**355**	**51**	**185**	**591**
Newly Construction	Urban, SU/ST (SW)		-	-	**-**
	Urban, SU/ST (GW)		99	356	**455**
	Rural (GW)		17	57	**74**
	Sub-Total		**115**	**414**	**529**
Total	**(MLD)**	**355**	**167**	**599**	**1,120**
33. Sokoto					
Rehabilitation	Urban, SU/ST (SW)	83	-	64	**148**
	Urban, SU/ST (GW)	88	18	72	**179**
	Rural (GW)	25	7	24	**57**
	Sub-Total	**197**	**26**	**161**	**384**
Newly Construction	Urban, SU/ST (SW)		-	-	**-**
	Urban, SU/ST (GW)		23	90	**113**
	Rural (GW)		9	30	**40**
	Sub-Total		**32**	**121**	**153**
Total	**(MLD)**	**197**	**58**	**282**	**537**
34. Taraba					
Rehabilitation	Urban, SU/ST (SW)	11	-	8	**19**
	Urban, SU/ST (GW)	22	1	4	**28**
	Rural (GW)	6	0	1	**8**
	Sub-Total	**39**	**2**	**14**	**55**
Newly Construction	Urban, SU/ST (SW)		-	61	**61**
	Urban, SU/ST (GW)		38	134	**172**
	Rural (GW)		15	47	**62**
	Sub-Total		**53**	**242**	**295**
Total	**(MLD)**	**39**	**54**	**256**	**350**

Table 5.1-5 Water Supply Development Plan for Facility Planning /Installed Capacity (6/6)

Scheme	Category	Existing Capacity (2010)	Pre-CMP Period (2011-2014)	CMP Period (2015-2030)	**Total (2030)**
35. Yobe					
Rehabilitation	Urban, SU/ST (SW)	-	-	-	**-**
	Urban, SU/ST (GW)	71	15	51	**136**
	Rural (GW)	13	3	9	**25**
	Sub-Total	**84**	**17**	**60**	**161**
Newly Construction	Urban, SU/ST (SW)		-	4	**4**
	Urban, SU/ST (GW)		36	123	**159**
	Rural (GW)		10	35	**45**
	Sub-Total		**46**	**162**	**208**
Total	**(MLD)**	**84**	**63**	**222**	**369**
36. Zamfara					
Rehabilitation	Urban, SU/ST (SW)	22	-	17	**39**
	Urban, SU/ST (GW)	124	9	40	**174**
	Rural (GW)	24	2	8	**35**
	Sub-Total	**171**	**12**	**65**	**247**
Newly Construction	Urban, SU/ST (SW)		45	-	**45**
	Urban, SU/ST (GW)		20	85	**105**
	Rural (GW)		15	51	**66**
	Sub-Total		**80**	**136**	**216**
Total	**(MLD)**	**171**	**92**	**201**	**463**
37. FCT Abuja					
Rehabilitation	Urban, SU/ST (SW)	108	-	84	**192**
	Urban, SU/ST (GW)	20	3	20	**42**
	Rural (GW)	2	1	2	**5**
	Sub-Total	**130**	**3**	**106**	**239**
Newly Construction	Urban, SU/ST (SW)		485	11	**496**
	Urban, SU/ST (GW)		74	588	**662**
	Rural (GW)		4	16	**20**
	Sub-Total		**563**	**615**	**1,178**
Total	**(MLD)**	**130**	**566**	**721**	**1,417**

Source: JICA Project Team

Nationwide

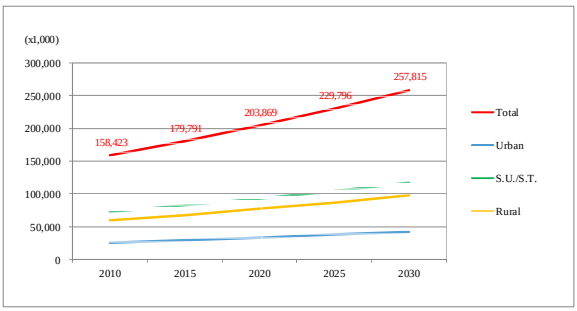


Figure N-1 Population Growth by Settlement Category

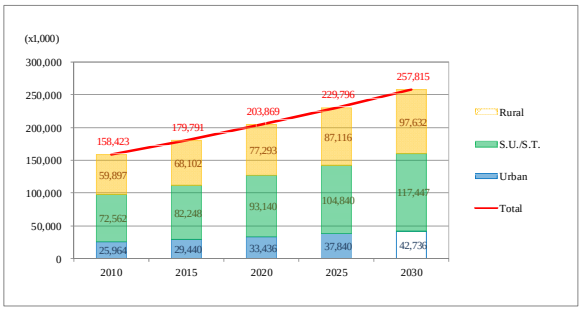


Figure N-2 Population Growth with Distribution of Settlement Category

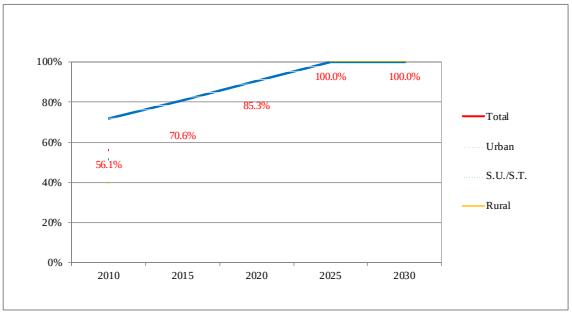


Figure N-3 Sanitation Coverage by Settlement Category

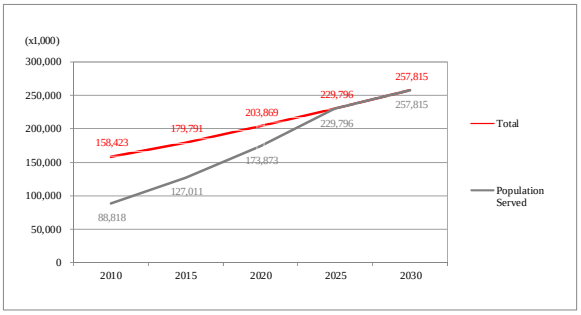


Figure N-4 Population and Population Served

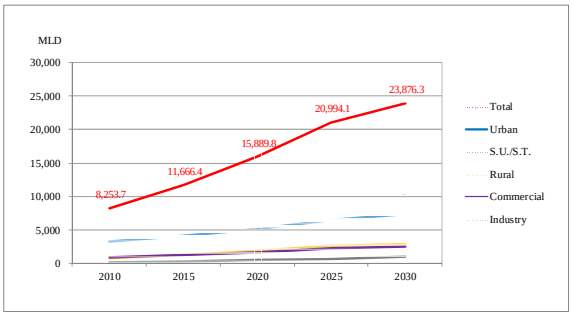


Figure N-5 Water Demand Growth by Water Use Category

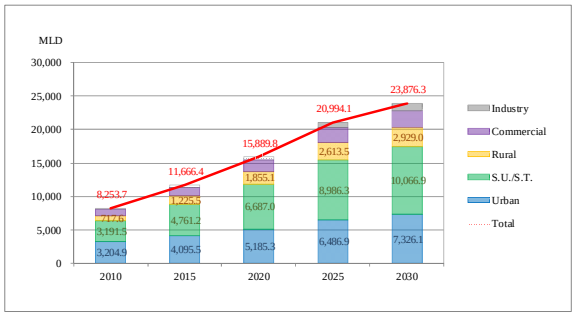


Figure N-6 Water Demand Growth with Distribution of Water Use Category

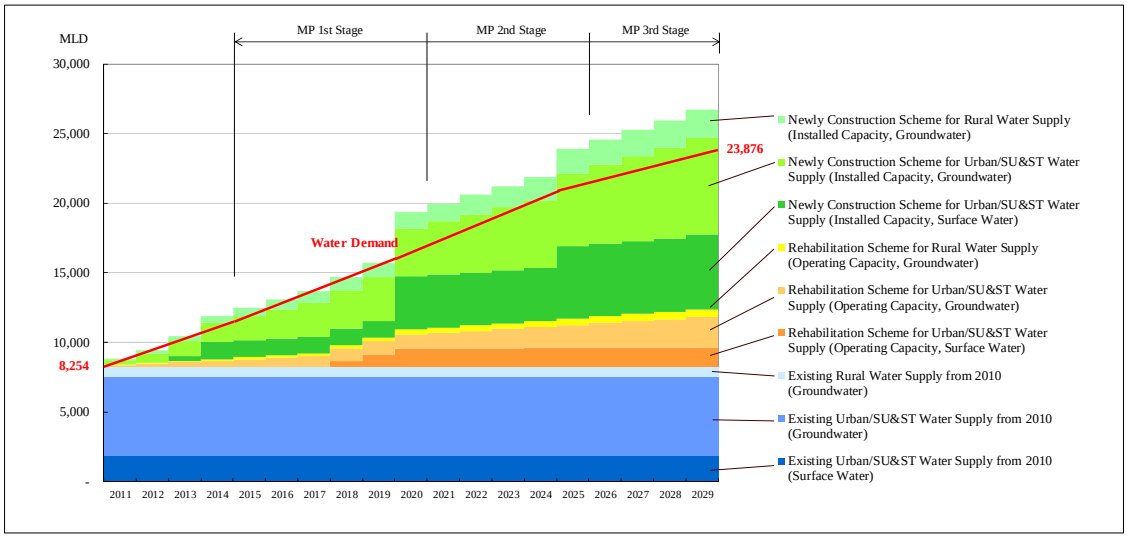


Figure N-7 Demand and Supply in Water Supply Development Plan for Facility Planning

Source: JICA Project Team

Figure 5.1-1 Demand and Supply in Water Supply Development Plan for Facility Planning (1/38)

1. Abia

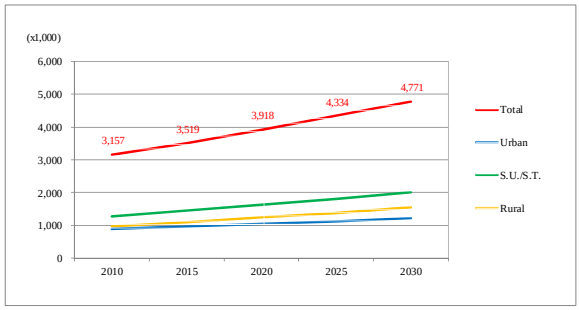


Figure 1-1 Population Growth by Settlement Category

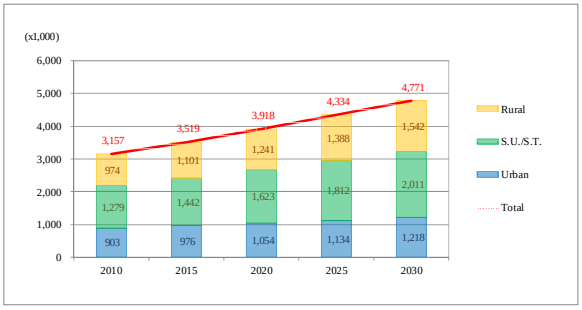


Figure 1-2 Population Growth with Distribution of Settlement Category

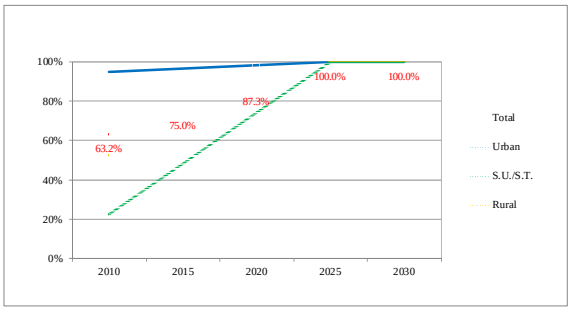


Figure 1-3 Water Supply Coverage by Settlement Category

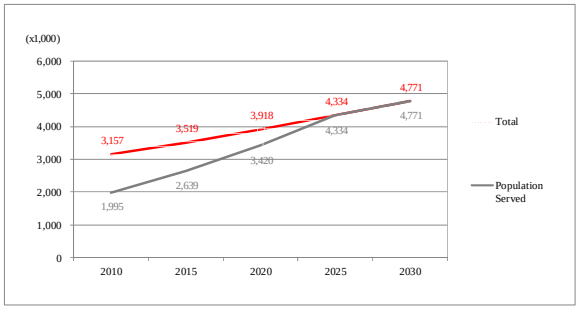


Figure 1-4 Population and Population Served

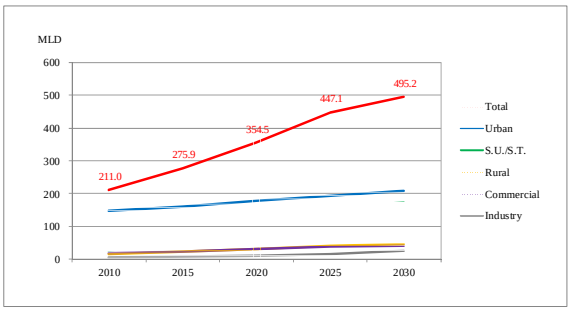


Figure 1-5 Water Demand Growth by Water Use Category

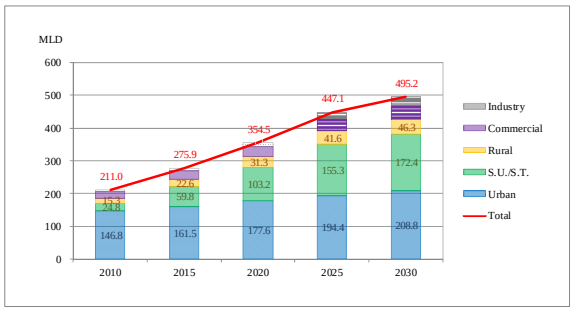


Figure 1-6 Water Demand Growth with Distribution of Water Use Category

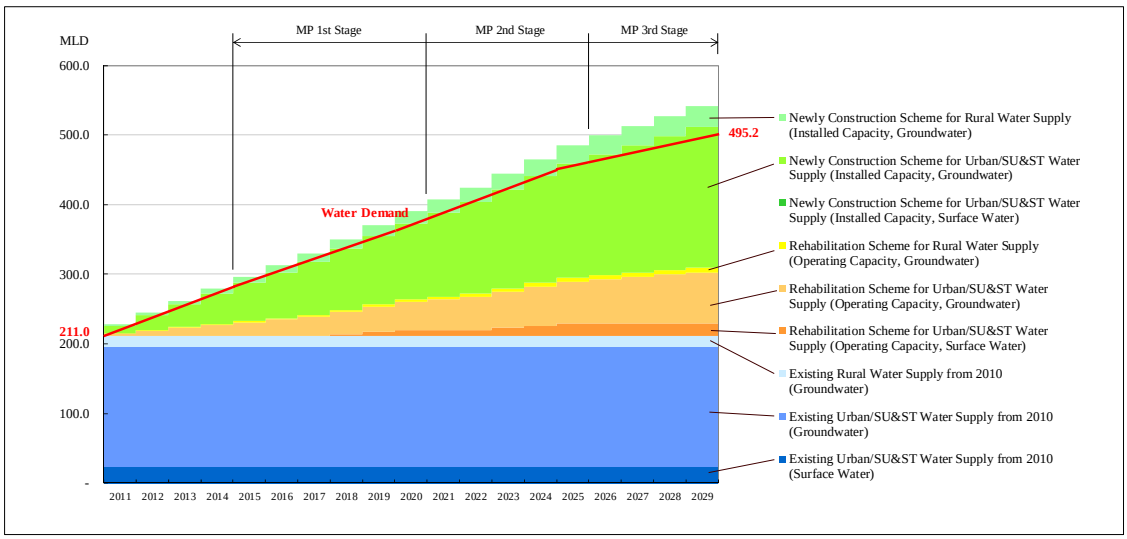


Figure 1-7 Demand and Supply in Water Supply Development Plan for Facility Planning

Source: JICA Project Team

Figure 5.1-1 Demand and Supply in Water Supply Development Plan for Facility Planning (2/38)

2. Adamawa

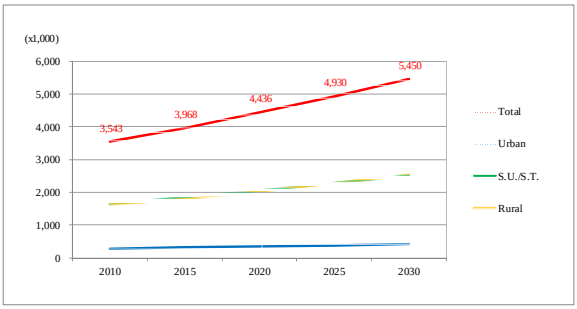


Figure 2-1 Population Growth by Settlement Category

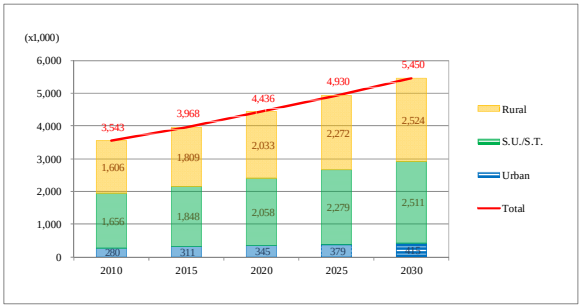


Figure 2-2 Population Growth with Distribution of Settlement Category

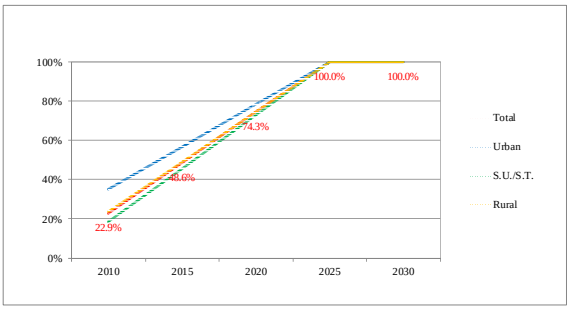


Figure 2-3 Water Supply Coverage by Settlement Category

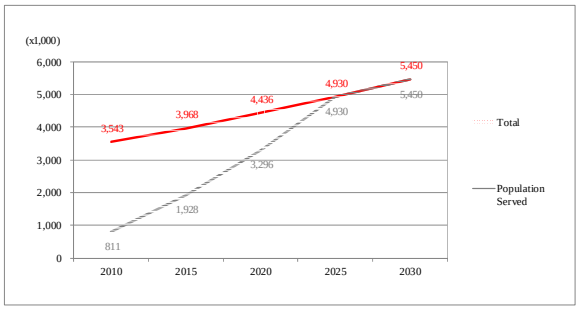


Figure 2-4 Population and Population Served

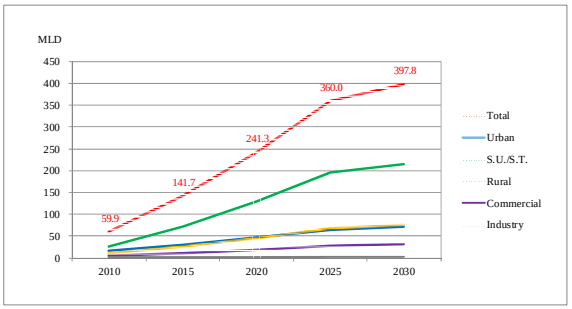


Figure 2-5 Water Demand Growth by Water Use Category

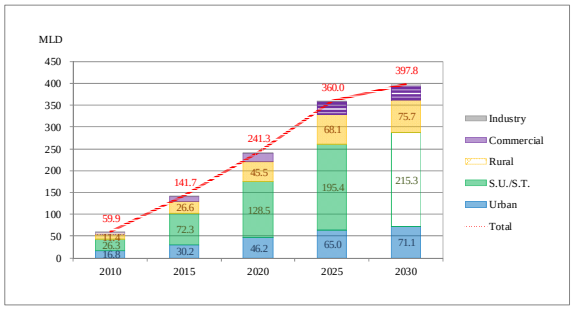


Figure 2-6 Water Demand Growth with Distribution of Water Use Category

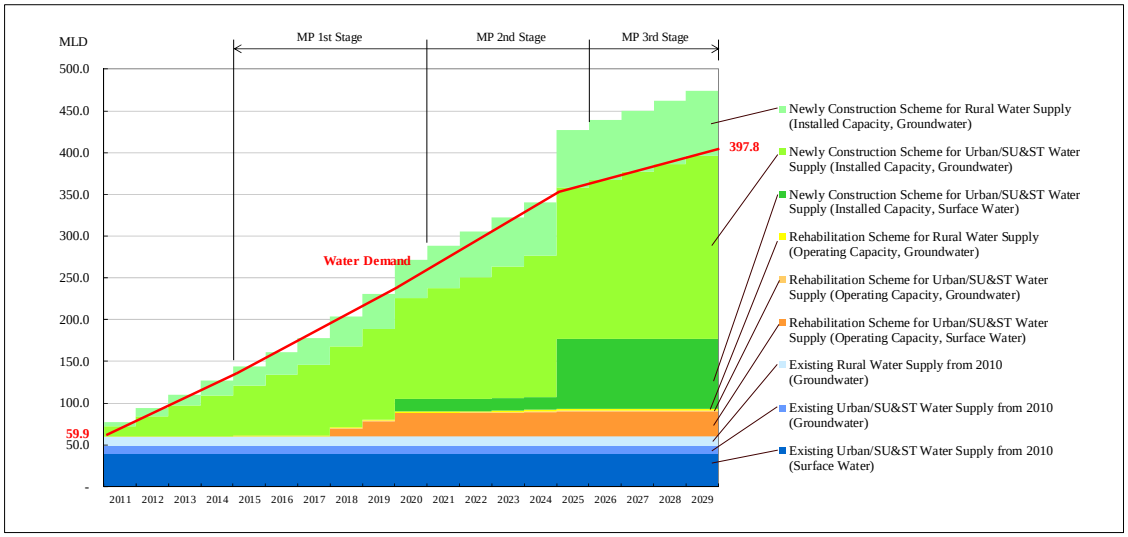


Figure 2-7 Demand and Supply in Water Supply Development Plan for Facility Planning

Source: JICA Project Team

Figure 5.1-1 Demand and Supply in Water Supply Development Plan for Facility Planning (3/38)

3. Akwa Ibom

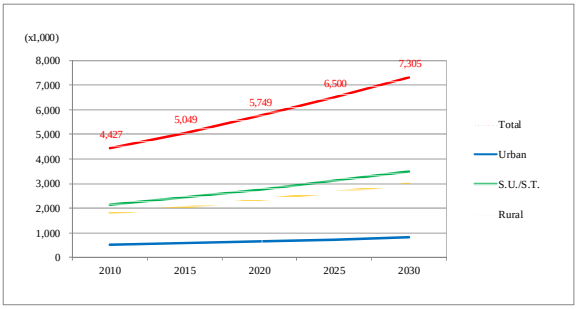


Figure 3-1 Population Growth by Settlement Category

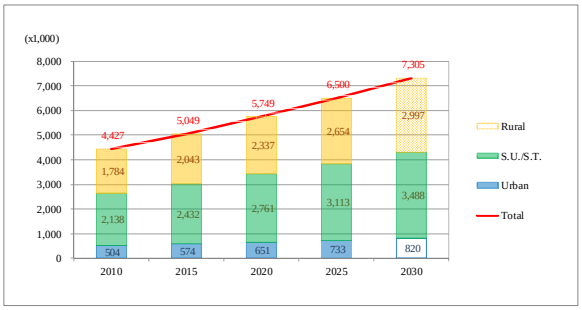


Figure 3-2 Population Growth with Distribution of Settlement Category

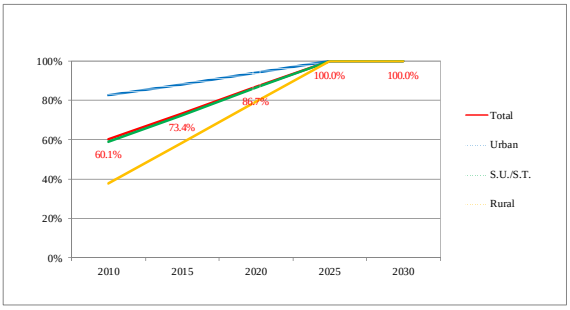


Figure 3-3 Water Supply Coverage by Settlement Category

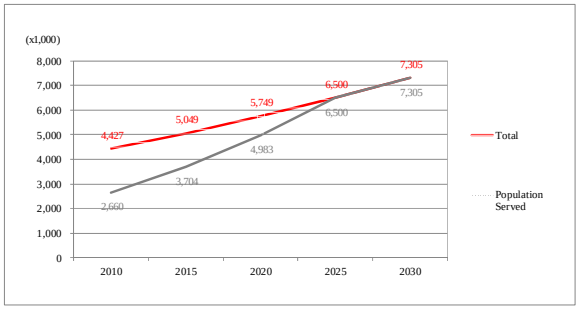


Figure 3-4 Population and Population Served

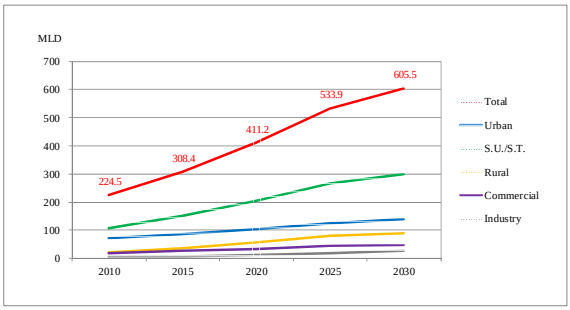


Figure 3-5 Water Demand Growth by Water Use Category

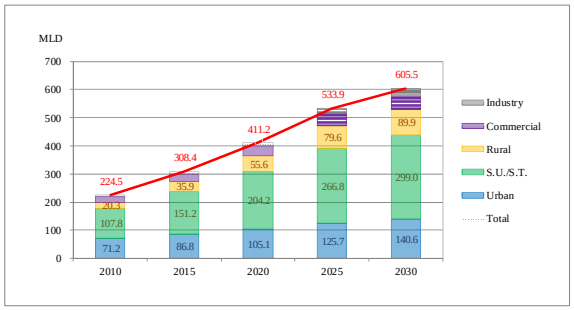


Figure 3-6 Water Demand Growth with Distribution of Water Use Category

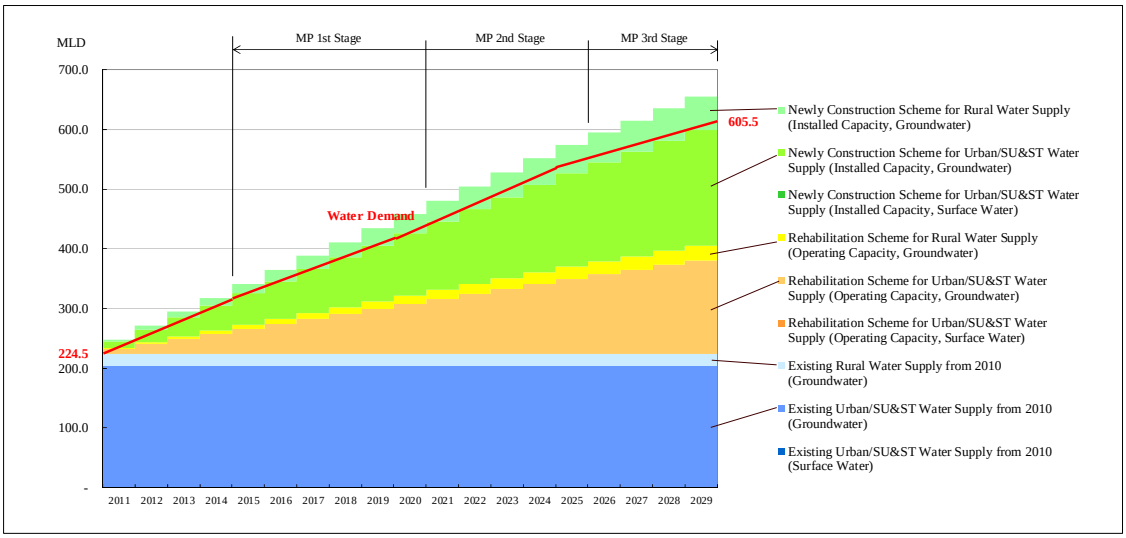


Figure 3-7 Demand and Supply in Water Supply Development Plan for Facility Planning

Source: JICA Project Team

Figure 5.1-1 Demand and Supply in Water Supply Development Plan for Facility Planning (4/38)

4. Anambra

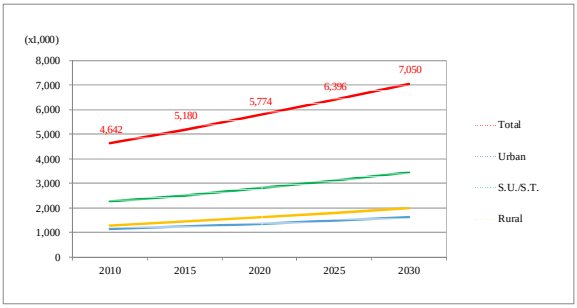


Figure 4-1 Population Growth by Settlement Category

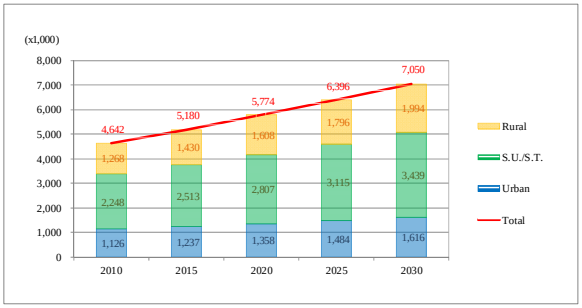


Figure 4-2 Population Growth with Distribution of Settlement Category

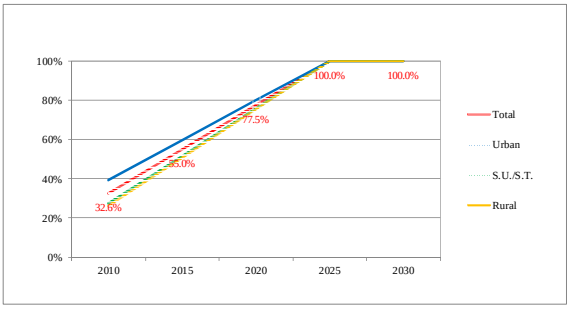


Figure 4-3 Water Supply Coverage by Settlement Category

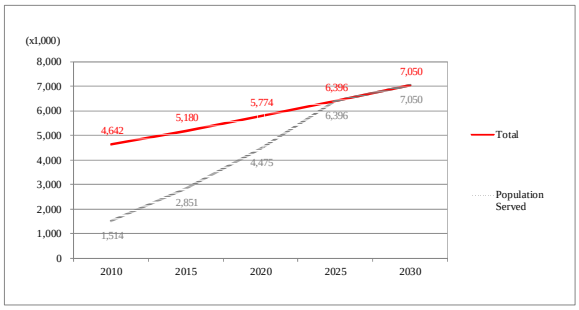


Figure 4-4 Population and Population Served

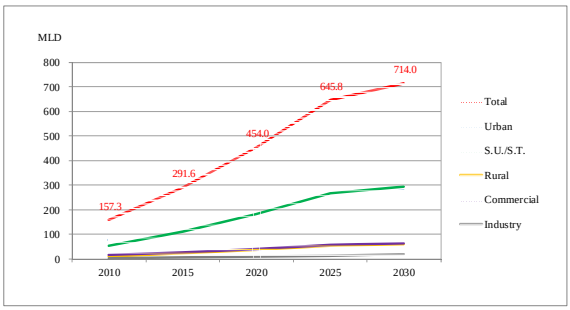


Figure 4-5 Water Demand Growth by Water Use Category

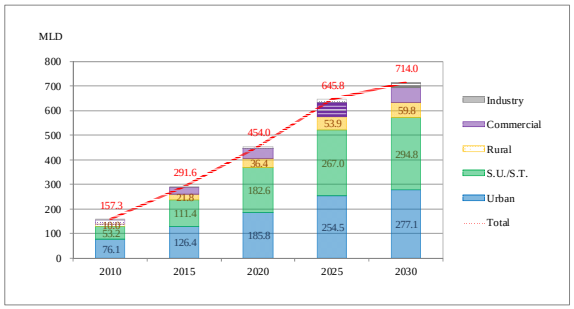


Figure 4-6 Water Demand Growth with Distribution of Water Use Category

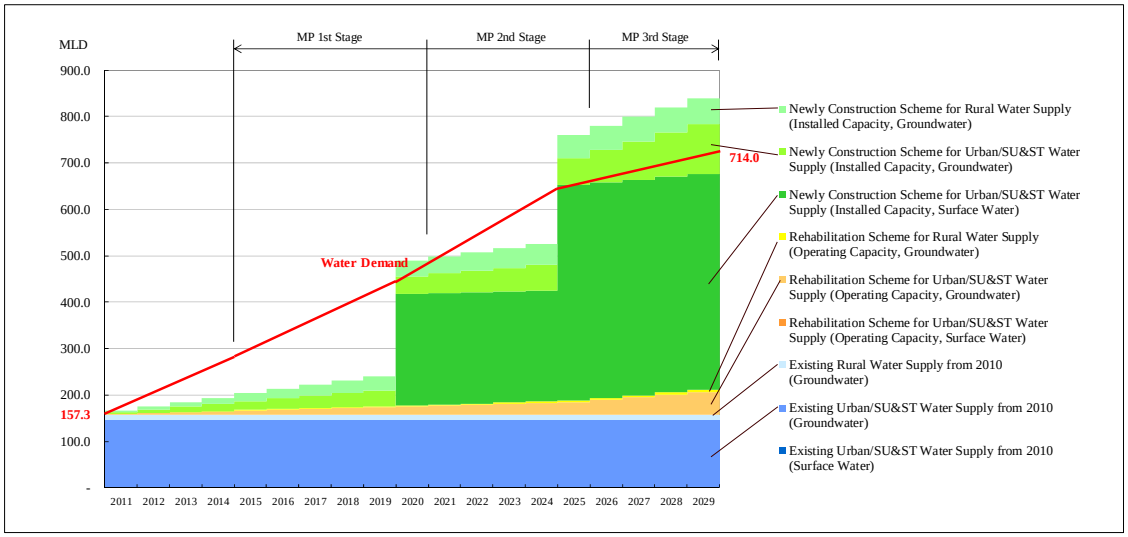


Figure 4-7 Demand and Supply in Water Supply Development Plan for Facility Planning

Source: JICA Project Team

Figure 5.1-1 Demand and Supply in Water Supply Development Plan for Facility Planning (5/38)

5. Bauchi

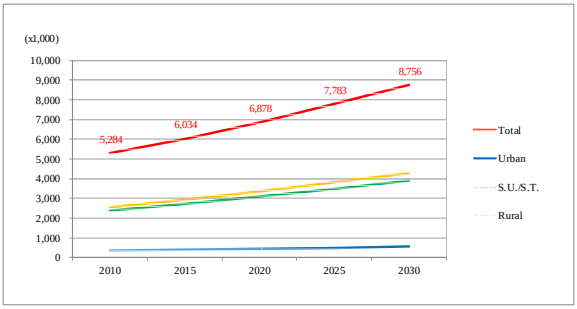


Figure 5-1 Population Growth by Settlement Category

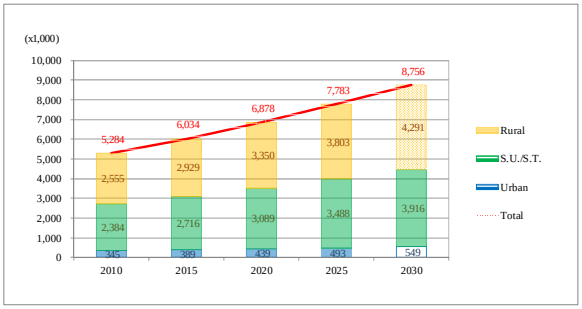


Figure 5-2 Population Growth with Distribution of Settlement Category

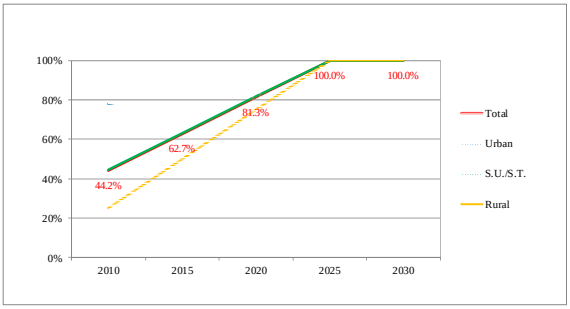


Figure 5-3 Water Supply Coverage by Settlement Category

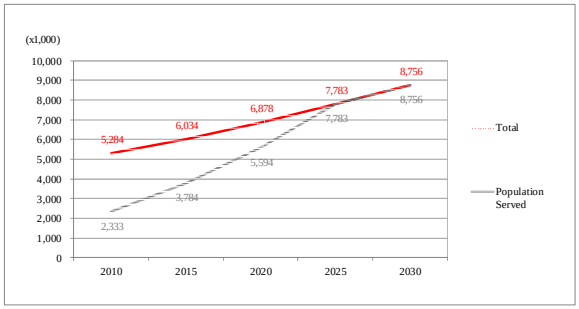


Figure 5-4 Population and Population Served

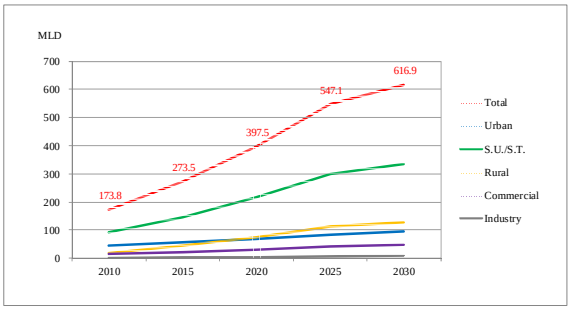


Figure 5-5 Water Demand Growth by Water Use Category

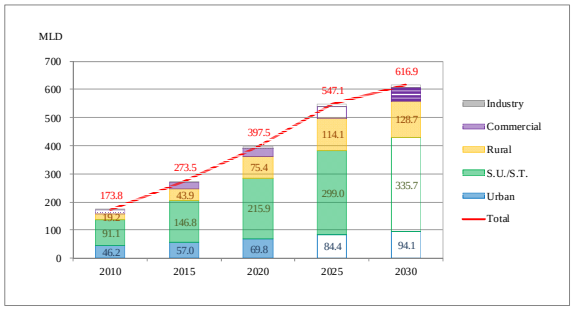


Figure 5-6 Water Demand Growth with Distribution of Water Use Category

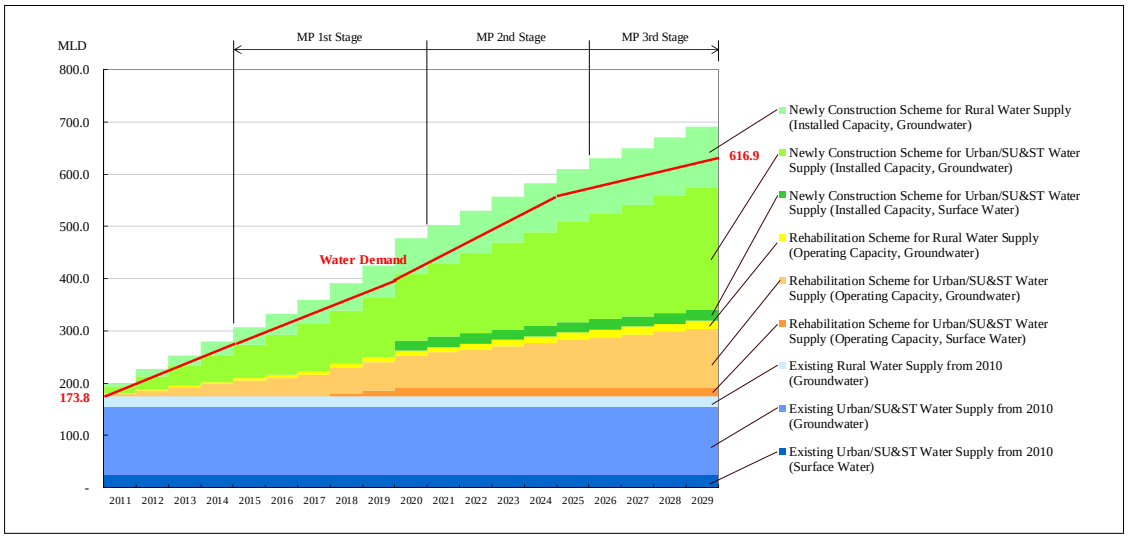


Figure 5-7 Demand and Supply in Water Supply Development Plan for Facility Planning

Source: JICA Project Team

Figure 5.1-1 Demand and Supply in Water Supply Development Plan for Facility Planning (6/38)

6. Bayelsa

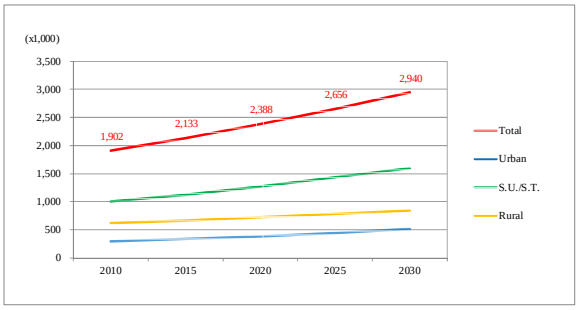


Figure 6-1 Population Growth by Settlement Category

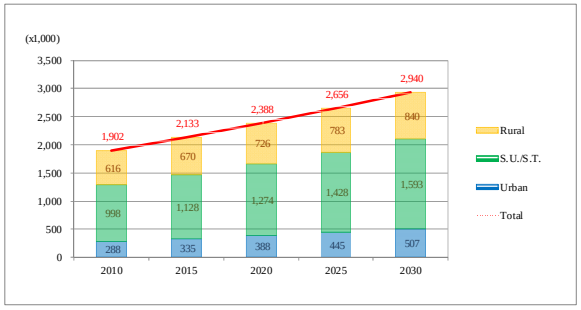


Figure 6-2 Population Growth with Distribution of Settlement Category

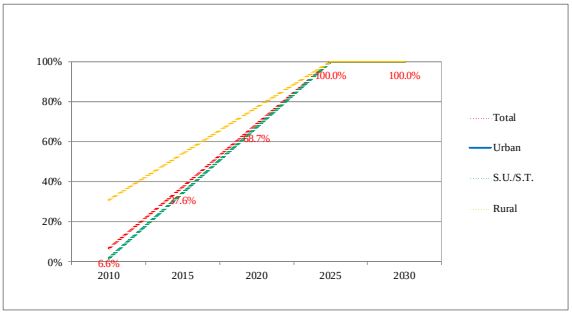


Figure 6-3 Water Supply Coverage by Settlement Category

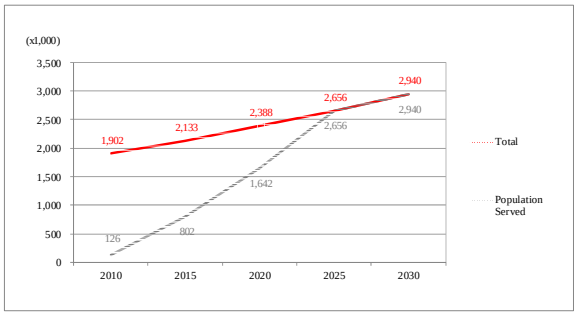


Figure 6-4 Population and Population Served

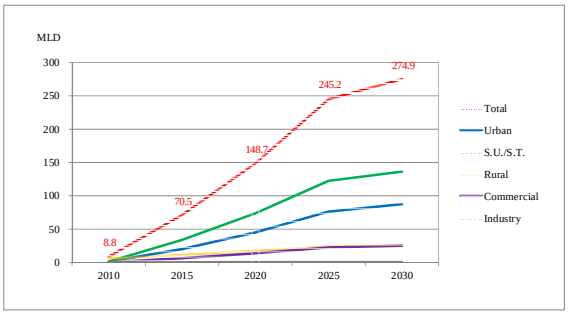


Figure 6-5 Water Demand Growth by Water Use Category

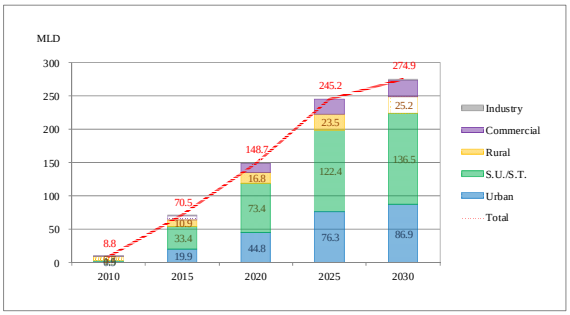


Figure 6-6 Water Demand Growth with Distribution of Water Use Category

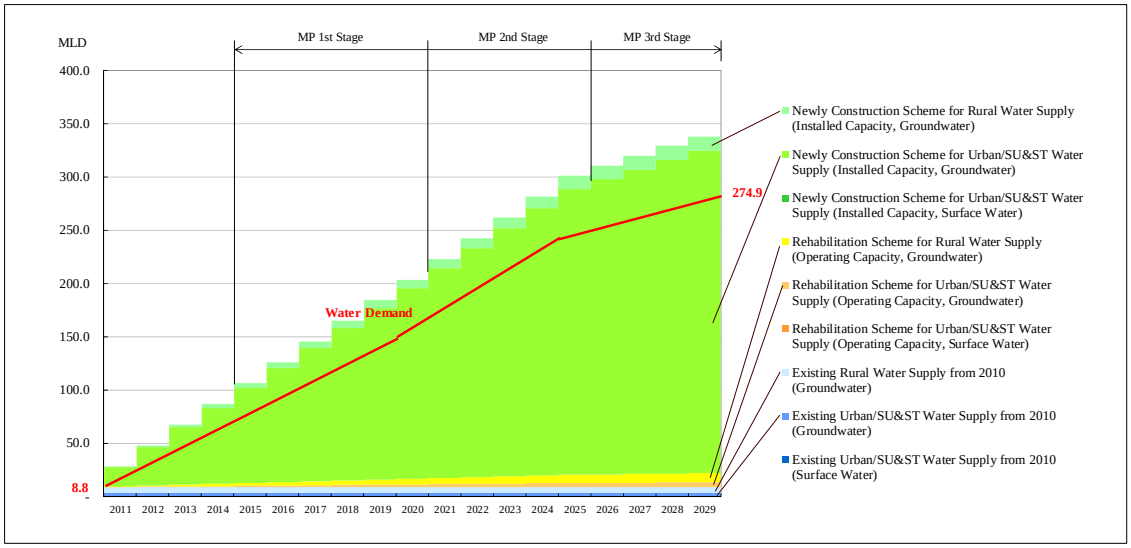


Figure 6-7 Demand and Supply in Water Supply Development Plan for Facility Planning

Source: JICA Project Team

Figure 5.1-1 Demand and Supply in Water Supply Development Plan for Facility Planning (7/38)

7. Benue

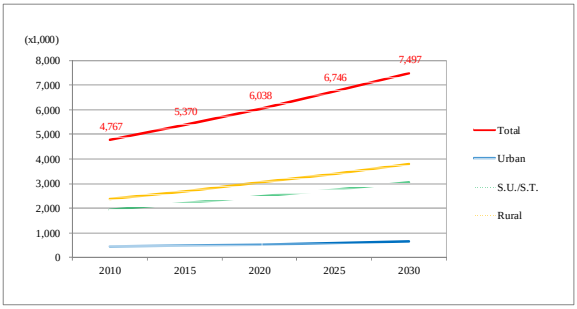


Figure 7-1 Population Growth by Settlement Category

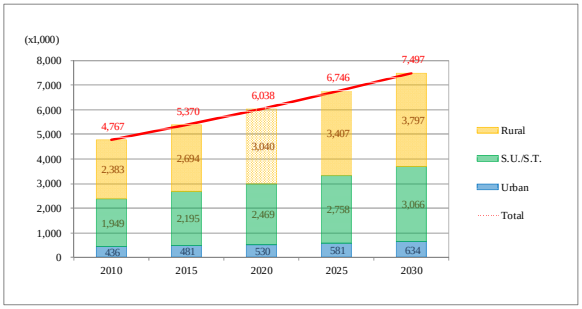


Figure 7-2 Population Growth with Distribution of Settlement Category

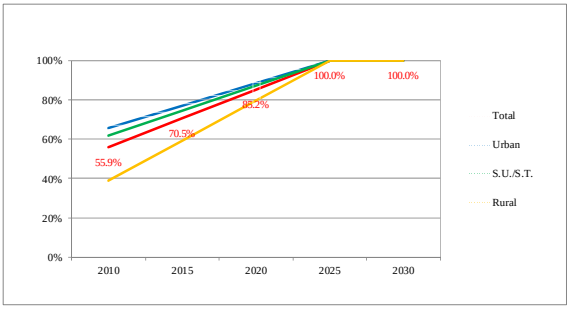


Figure 7-3 Water Supply Coverage by Settlement Category

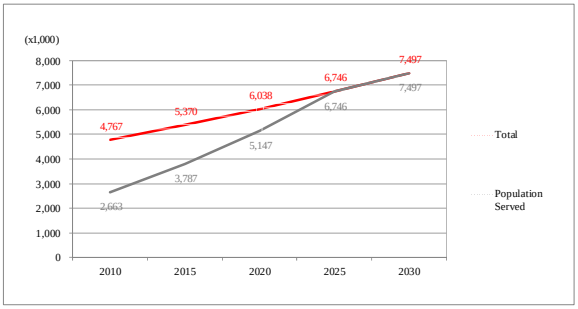


Figure 7-4 Population and Population Served

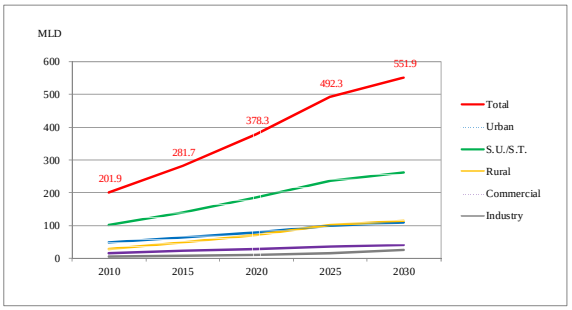


Figure 7-5 Water Demand Growth by Water Use Category

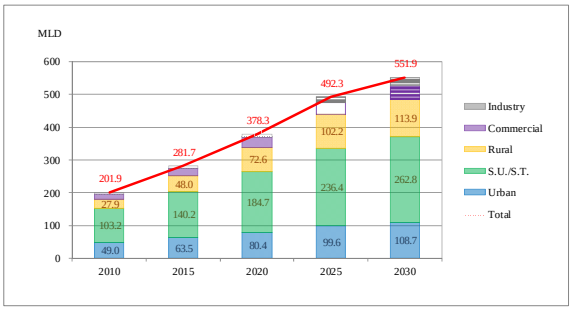


Figure 7-6 Water Demand Growth with Distribution of Water Use Category

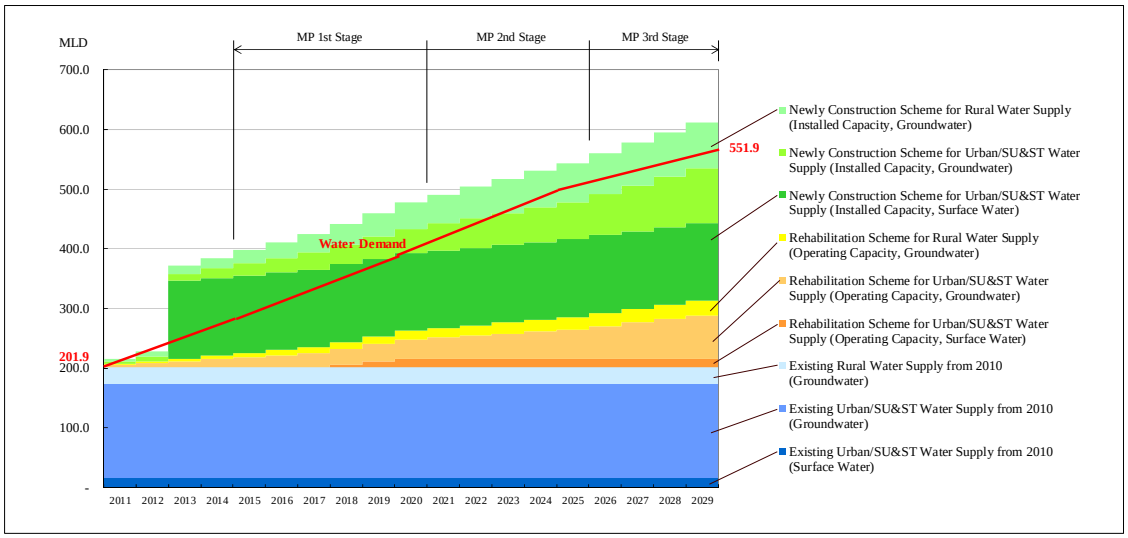


Figure 7-7 Demand and Supply in Water Supply Development Plan for Facility Planning

Source: JICA Project Team

Figure 5.1-1 Demand and Supply in Water Supply Development Plan for Facility Planning (8/38)

8. Borno

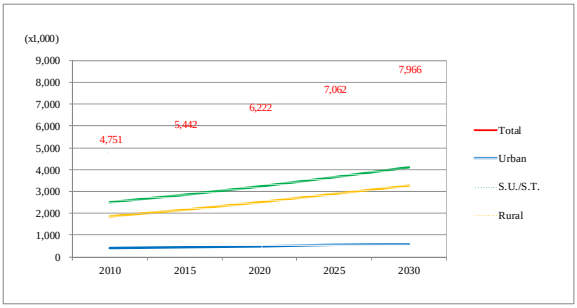


Figure 8-1 Population Growth by Settlement Category

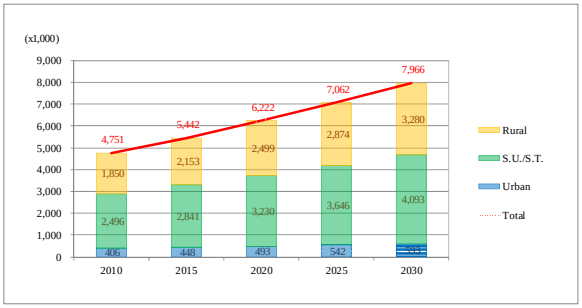


Figure 8-2 Population Growth with Distribution of Settlement Category

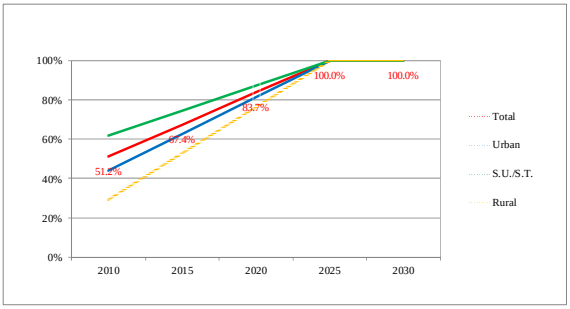


Figure 8-3 Water Supply Coverage by Settlement Category

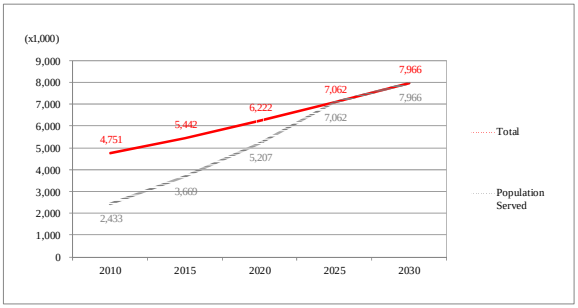


Figure 8-4 Population and Population Served

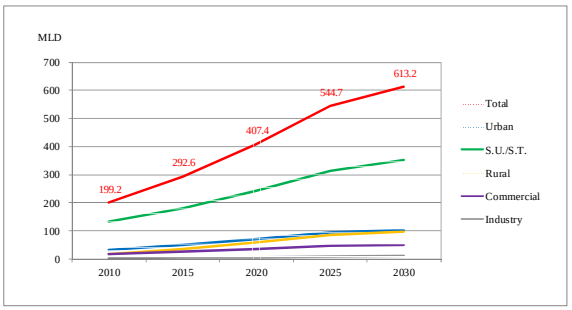


Figure 8-5 Water Demand Growth by Water Use Category

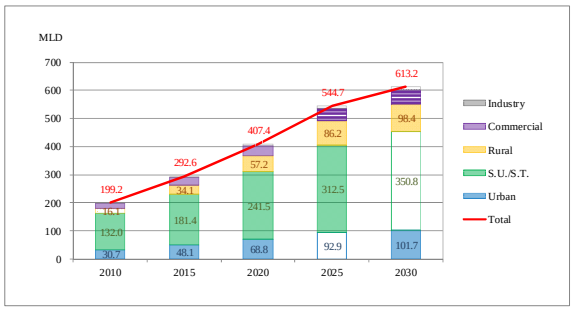


Figure 8-6 Water Demand Growth with Distribution of Water Use Category

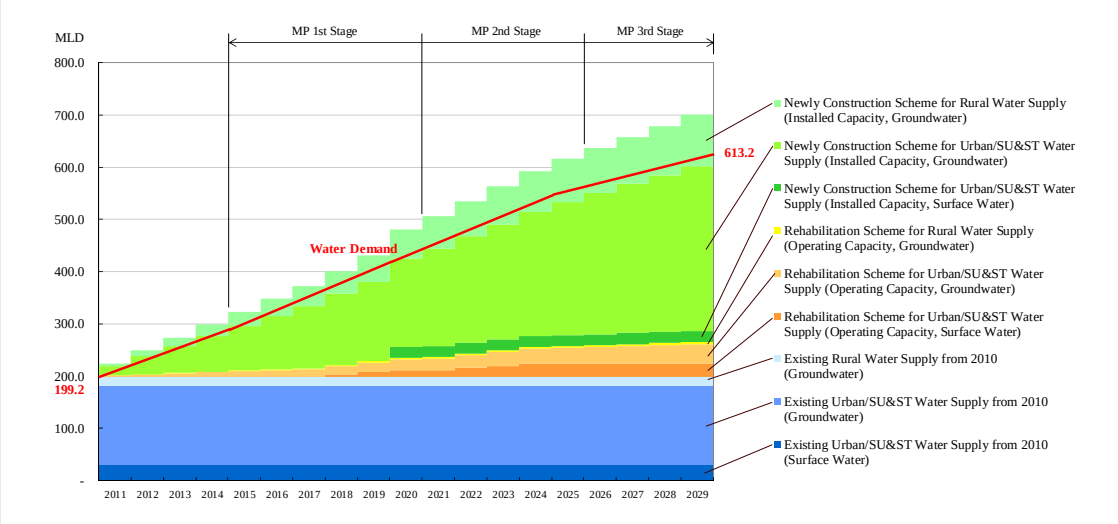


Figure 8-7 Demand and Supply in Water Supply Development Plan for Facility Planning

Source: JICA Project Team

Figure 5.1-1 Demand and Supply in Water Supply Development Plan for Facility Planning (9/38)

9. Cross River

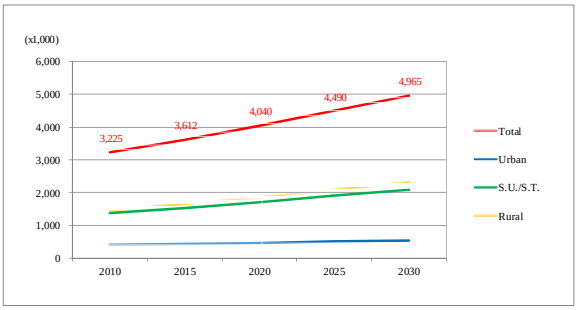


Figure 9-1 Population Growth by Settlement Category

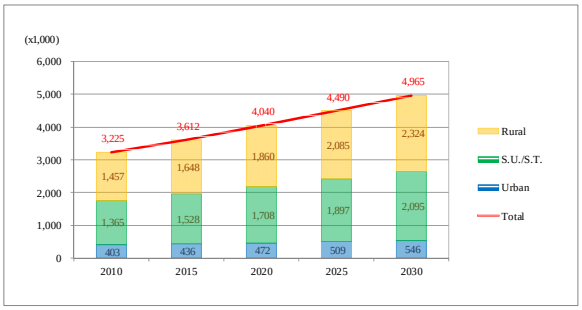


Figure 9-2 Population Growth with Distribution of Settlement Category

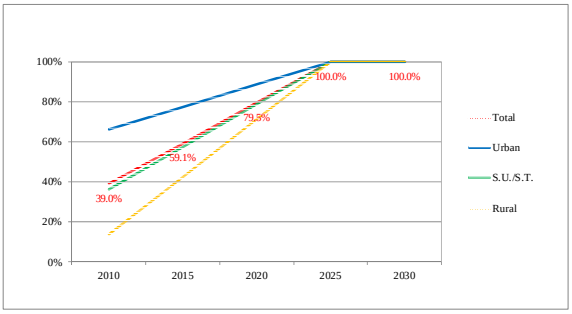


Figure 9-3 Water Supply Coverage by Settlement Category

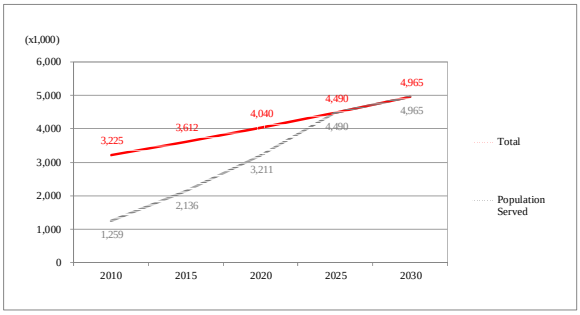


Figure 9-4 Population and Population Served

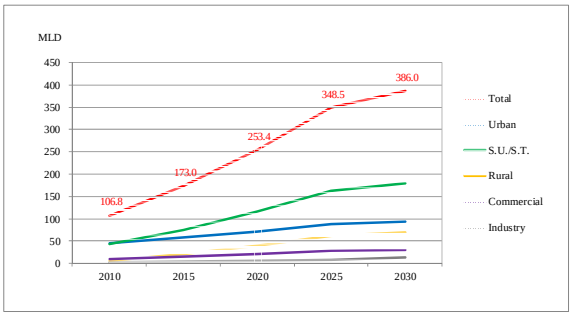


Figure 9-5 Water Demand Growth by Water Use Category

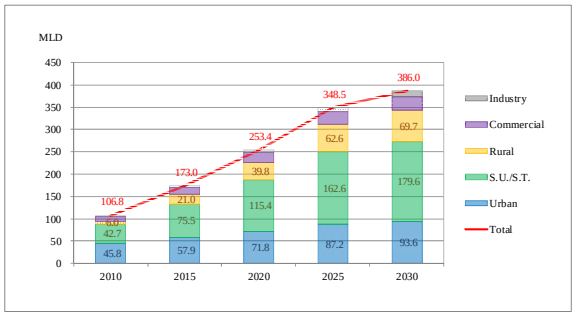


Figure 9-6 Water Demand Growth with Distribution of Water Use Category

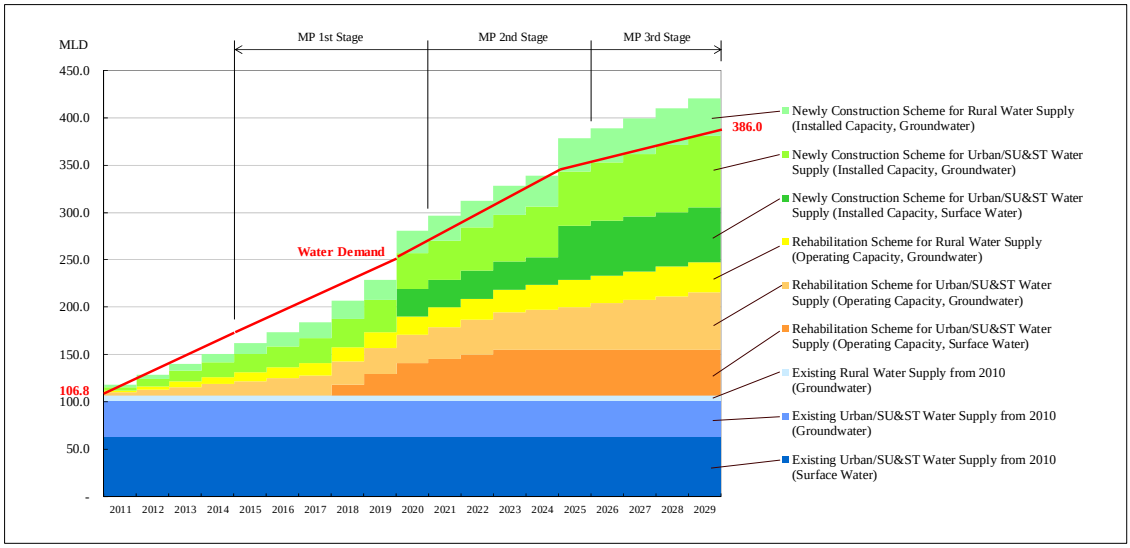


Figure 9-7 Demand and Supply in Water Supply Development Plan for Facility Planning

Source: JICA Project Team

Figure 5.1-1 Demand and Supply in Water Supply Development Plan for Facility Planning (10/38)

10. Delta

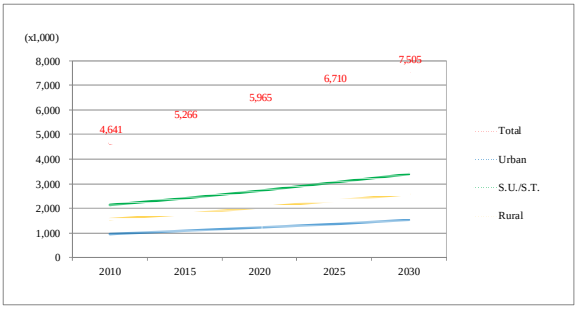


Figure 10-1 Population Growth by Settlement Category

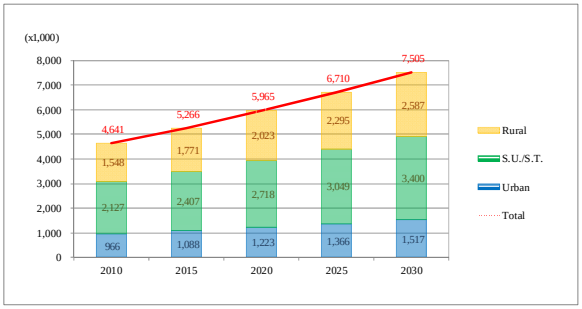


Figure 10-2 Population Growth with Distribution of Settlement Category

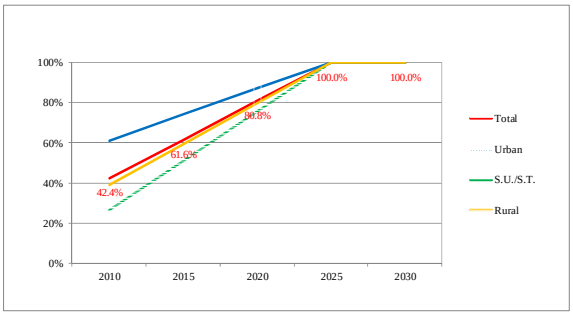


Figure 10-3 Water Supply Coverage by Settlement Category

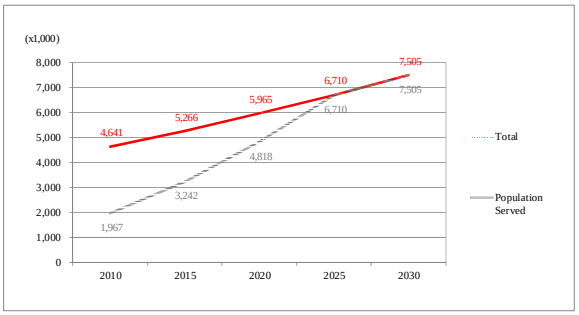


Figure 10-4 Population and Population Served

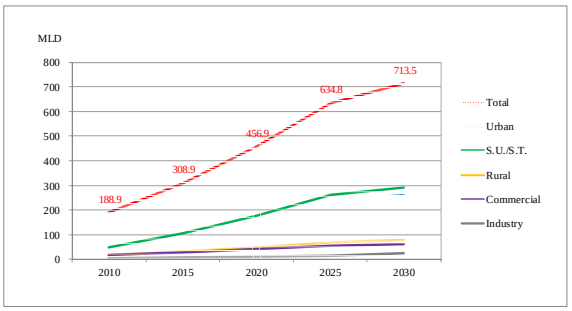


Figure 10-5 Water Demand Growth by Water Use Category

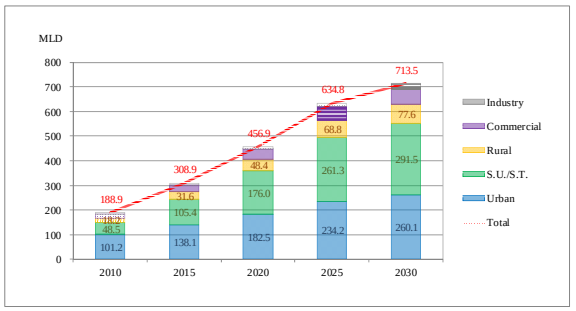


Figure 10-6 Water Demand Growth with Distribution of Water Use Category

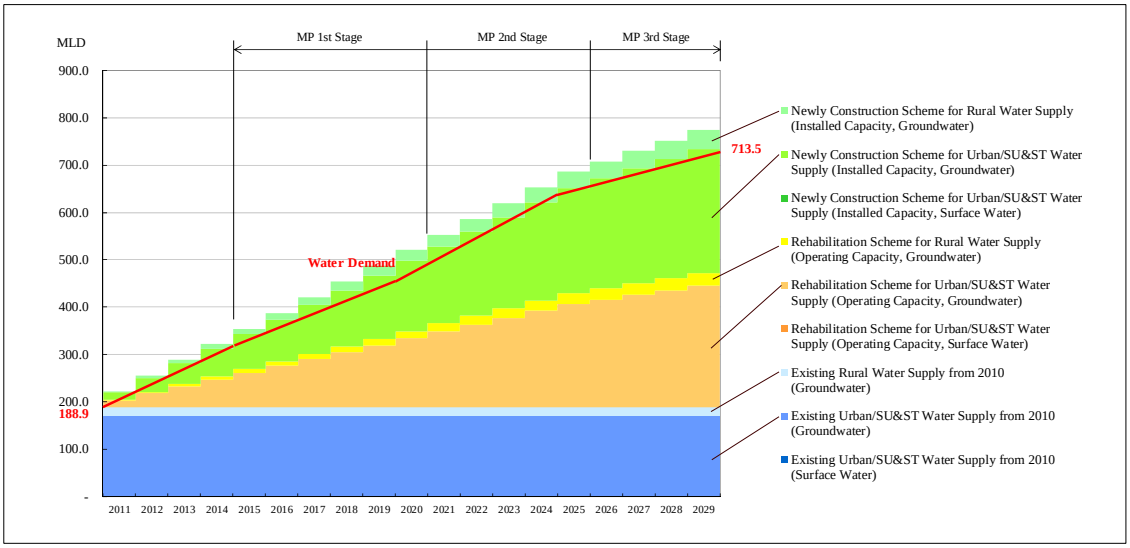


Figure 10-7 Demand and Supply in Water Supply Development Plan for Facility Planning

Source: JICA Project Team

Figure 5.1-1 Demand and Supply in Water Supply Development Plan for Facility Planning (11/38)

11. Ebonyi

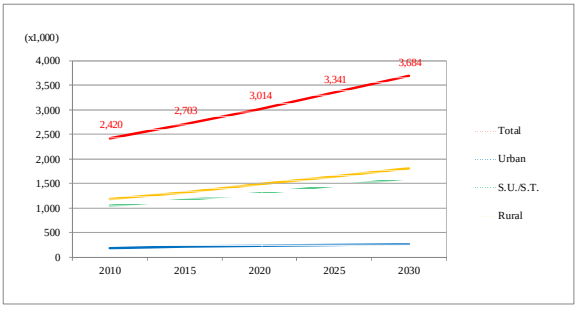


Figure 11-1 Population Growth by Settlement Category

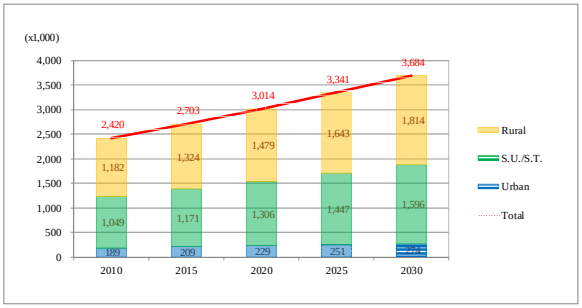


Figure 11-2 Population Growth with Distribution of Settlement Category

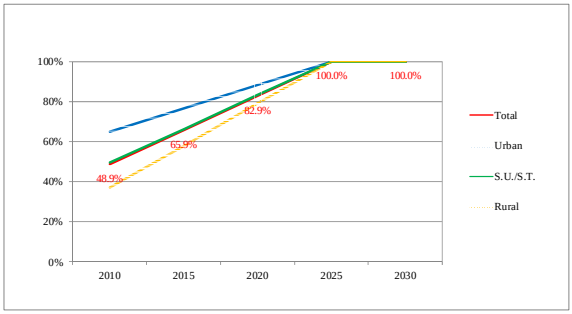


Figure 11-3 Water Supply Coverage by Settlement Category

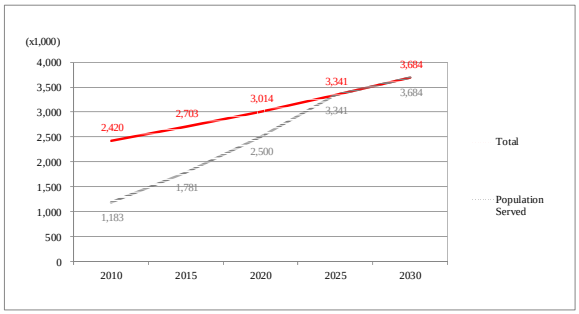


Figure 11-4 Population and Population Served

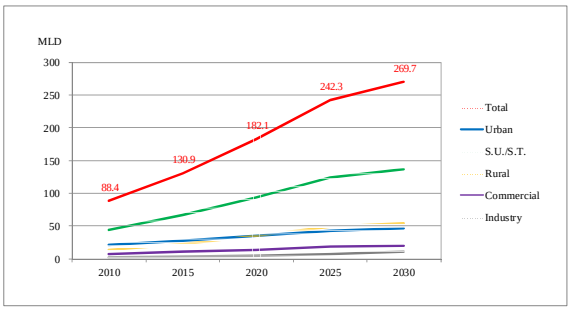


Figure 11-5 Water Demand Growth by Water Use Category

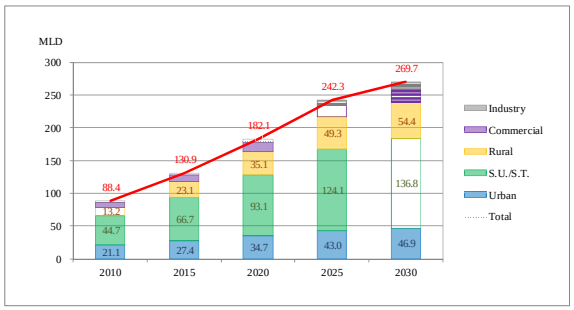


Figure 11-6 Water Demand Growth with Distribution of Water Use Category

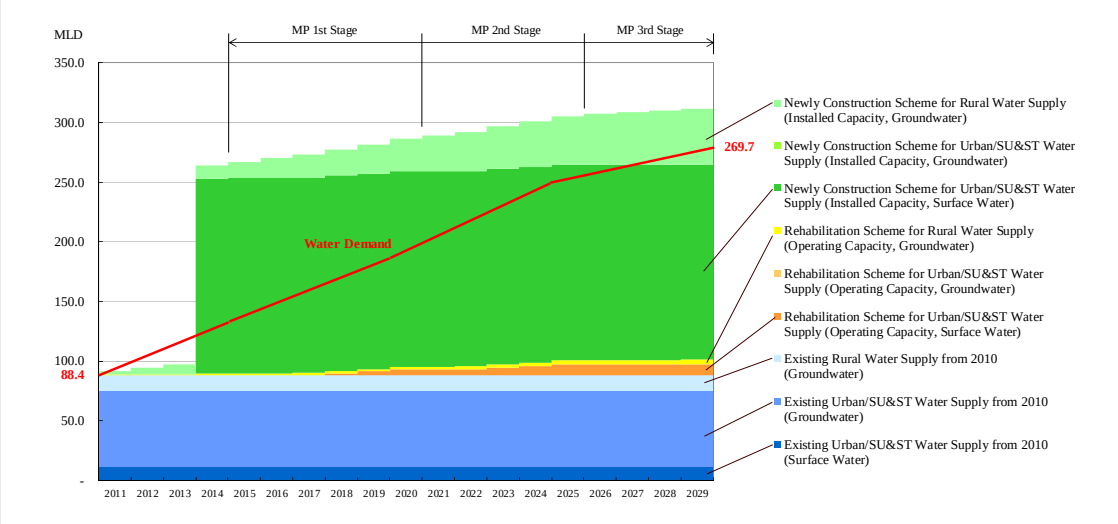


Figure 11-7 Demand and Supply in Water Supply Development Plan for Facility Planning

Source: JICA Project Team

Figure 5.1-1 Demand and Supply in Water Supply Development Plan for Facility Planning (12/38)

12. Edo

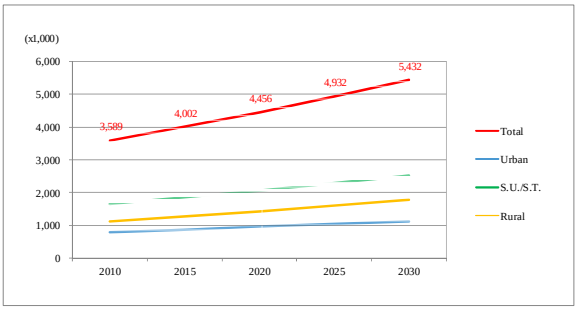


Figure 12-1 Population Growth by Settlement Category

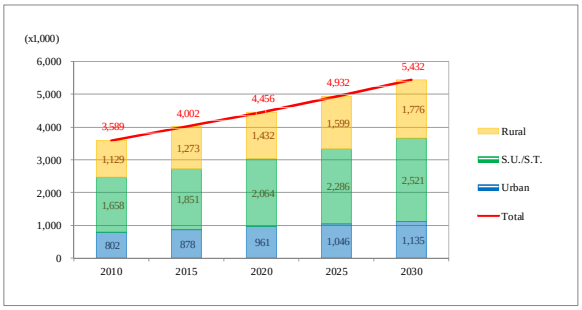


Figure 12-2 Population Growth with Distribution of Settlement Category

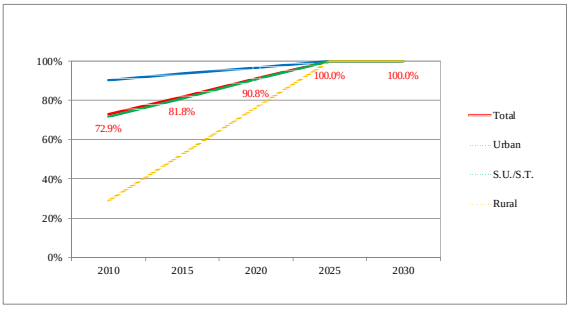


Figure 12-3 Water Supply Coverage by Settlement Category

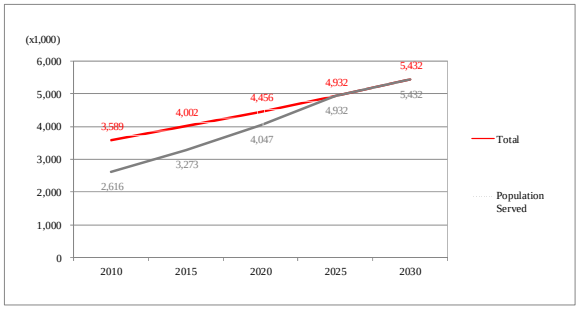


Figure 12-4 Population and Population Served

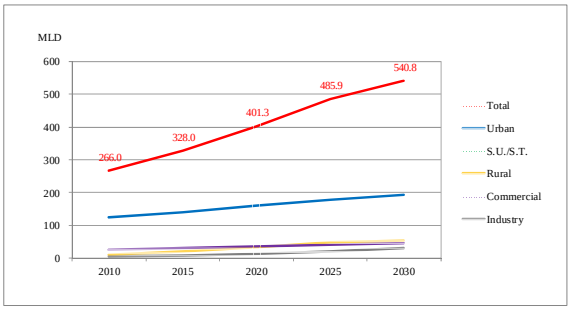


Figure 12-5 Water Demand Growth by Water Use Category

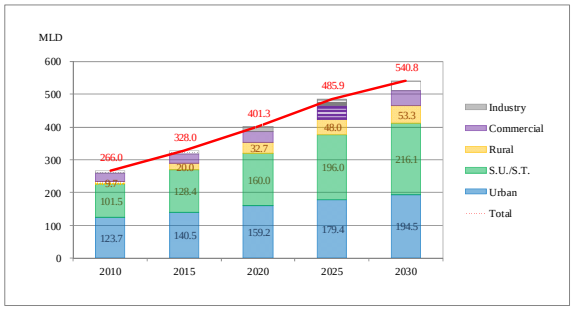


Figure 12-6 Water Demand Growth with Distribution of Water Use Category

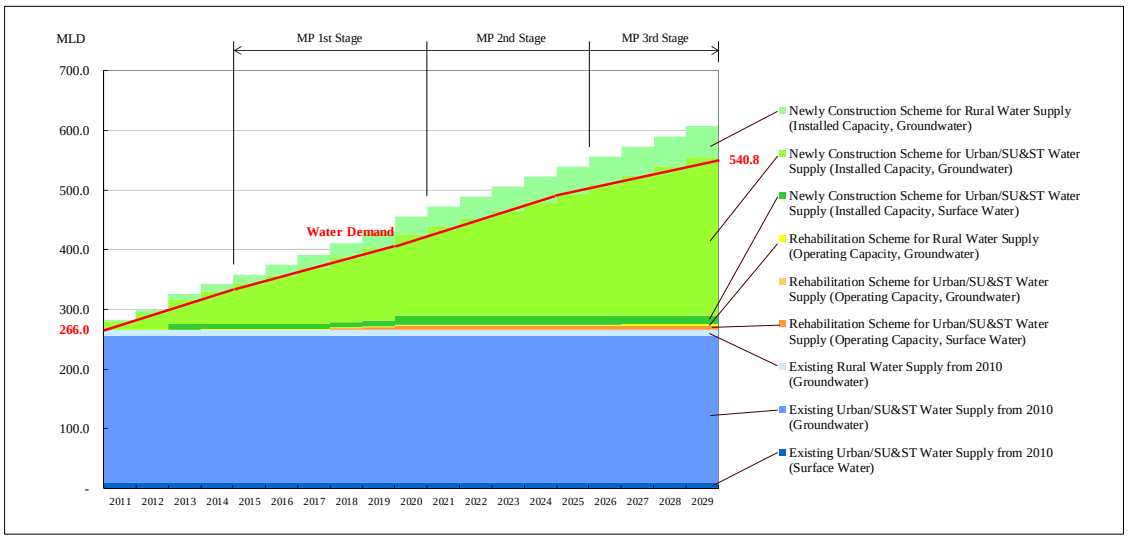


Figure 12-7 Demand and Supply in Water Supply Development Plan for Facility Planning

Source: JICA Project Team

Figure 5.1-1 Demand and Supply in Water Supply Development Plan for Facility Planning (13/38)

13. Ekiti

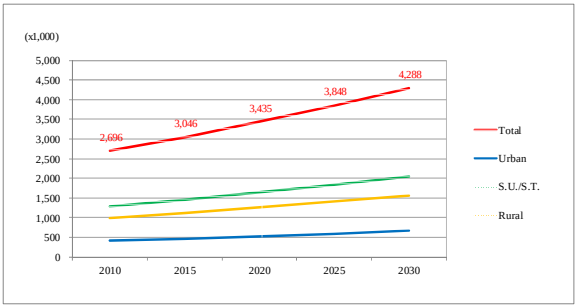


Figure 13-1 Population Growth by Settlement Category

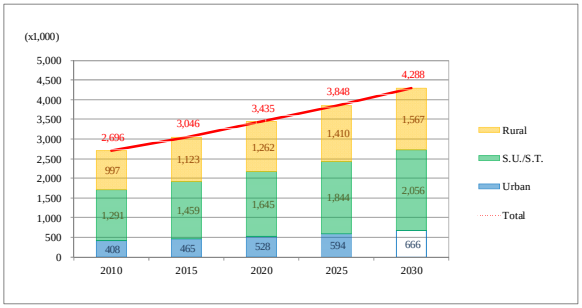


Figure 13-2 Population Growth with Distribution of Settlement Category

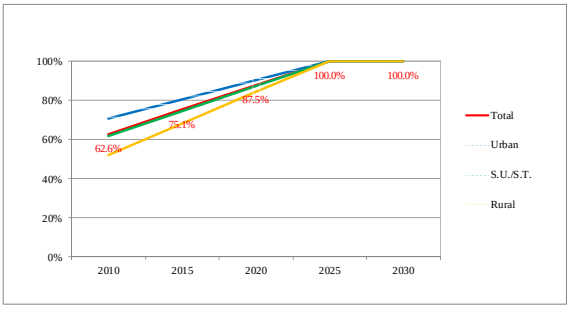


Figure 13-3 Water Supply Coverage by Settlement Category

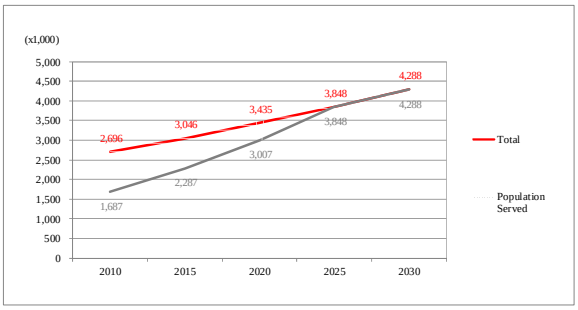


Figure 13-4 Population and Population Served

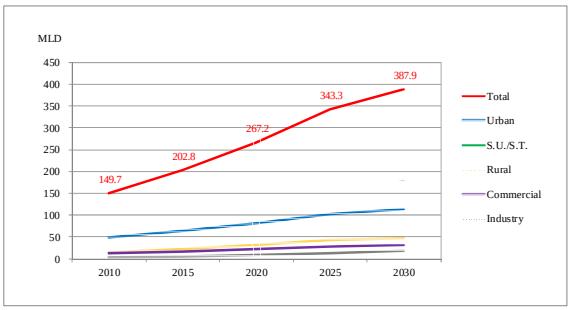


Figure 13-5 Water Demand Growth by Water Use Category

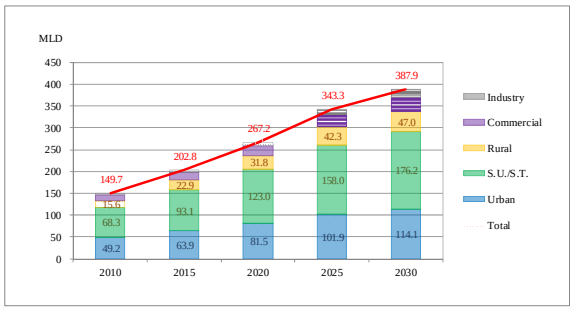


Figure 13-6 Water Demand Growth with Distribution of Water Use Category

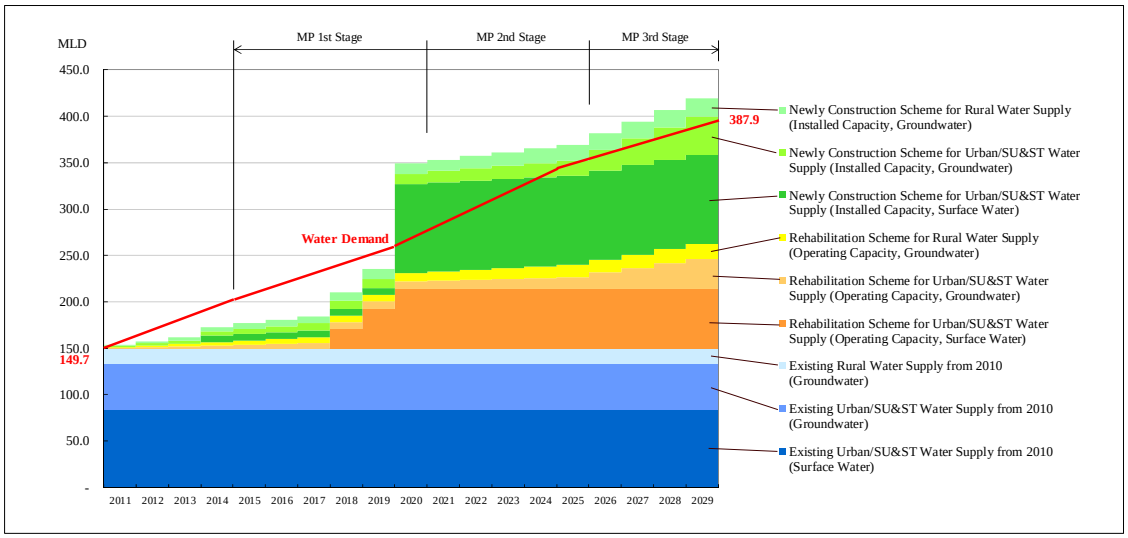


Figure 13-7 Demand and Supply in Water Supply Development Plan for Facility Planning

Source: JICA Project Team

Figure 5.1-1 Demand and Supply in Water Supply Development Plan for Facility Planning (14/38)

14. Enugu

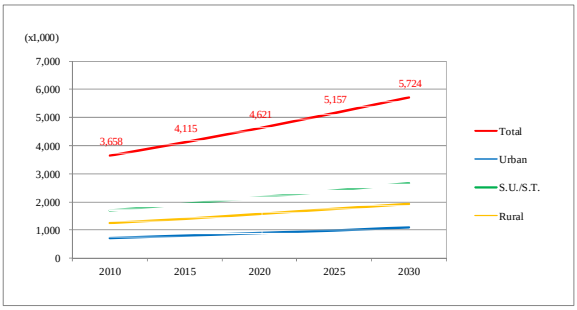


Figure 14-1 Population Growth by Settlement Category

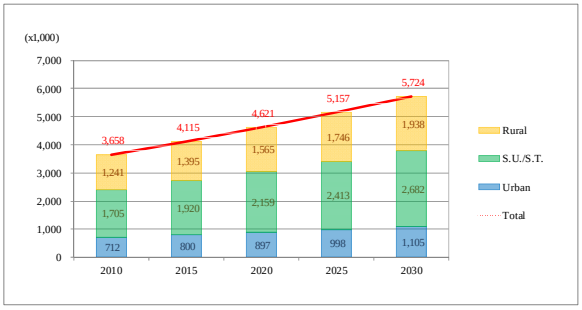


Figure 14-2 Population Growth with Distribution of Settlement Category

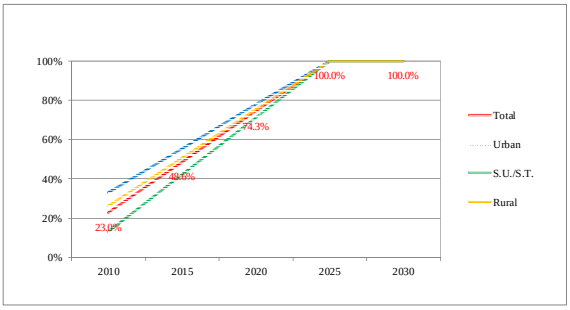


Figure 14-3 Water Supply Coverage by Settlement Category

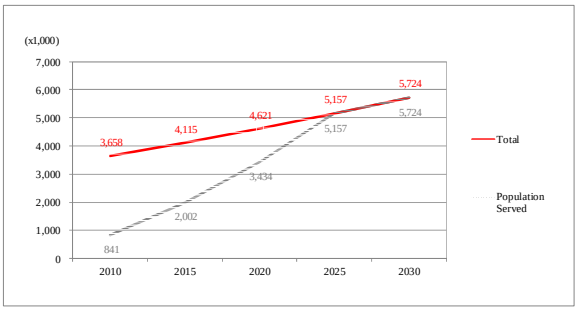


Figure 14-4 Population and Population Served

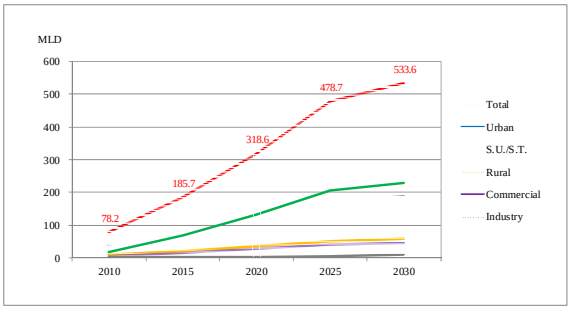


Figure 14-5 Water Demand Growth by Water Use Category

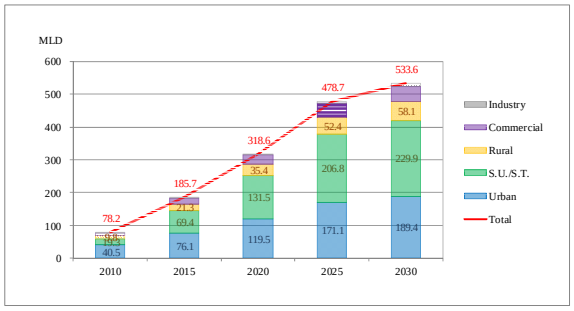


Figure 14-6 Water Demand Growth with Distribution of Water Use Category

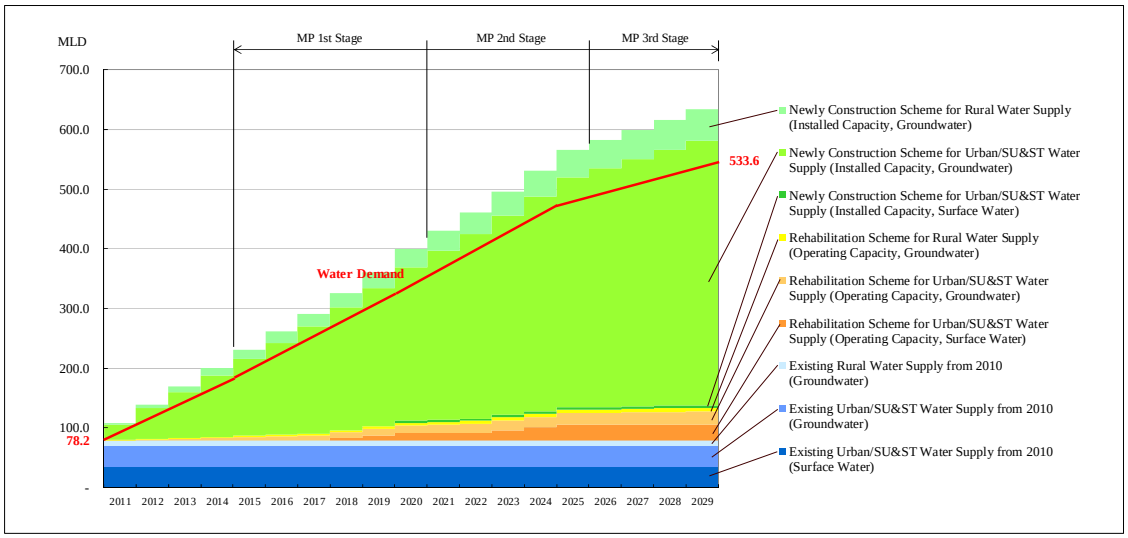


Figure 14-7 Demand and Supply in Water Supply Development Plan for Facility Planning

Source: JICA Project Team

Figure 5.1-1 Demand and Supply in Water Supply Development Plan for Facility Planning (15/38)

15. Gombe

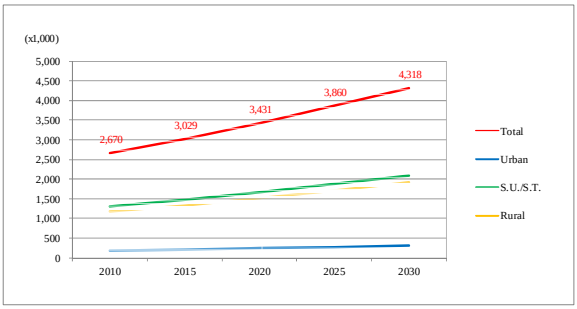


Figure 15-1 Population Growth by Settlement Category

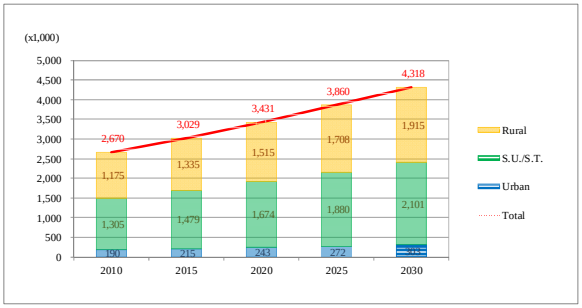


Figure 15-2 Population Growth with Distribution of Settlement Category

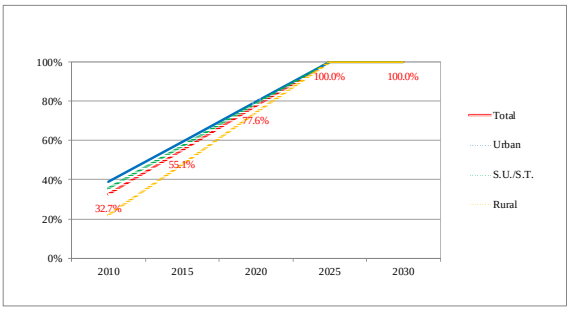


Figure 15-3 Water Supply Coverage by Settlement Category

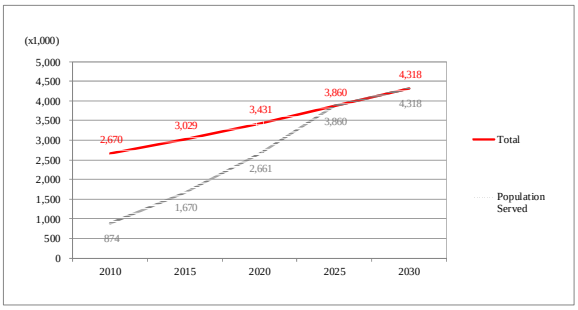


Figure 15-4 Population and Population Served

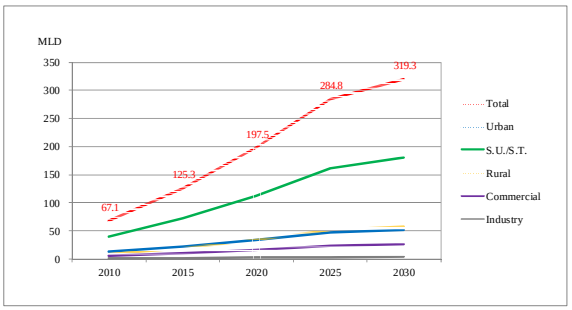


Figure 15-5 Water Demand Growth by Water Use Category

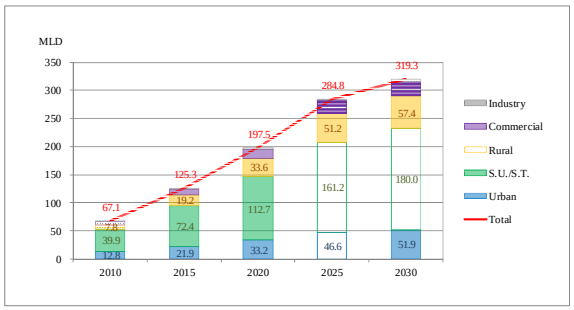


Figure 15-6 Water Demand Growth with Distribution of Water Use Category

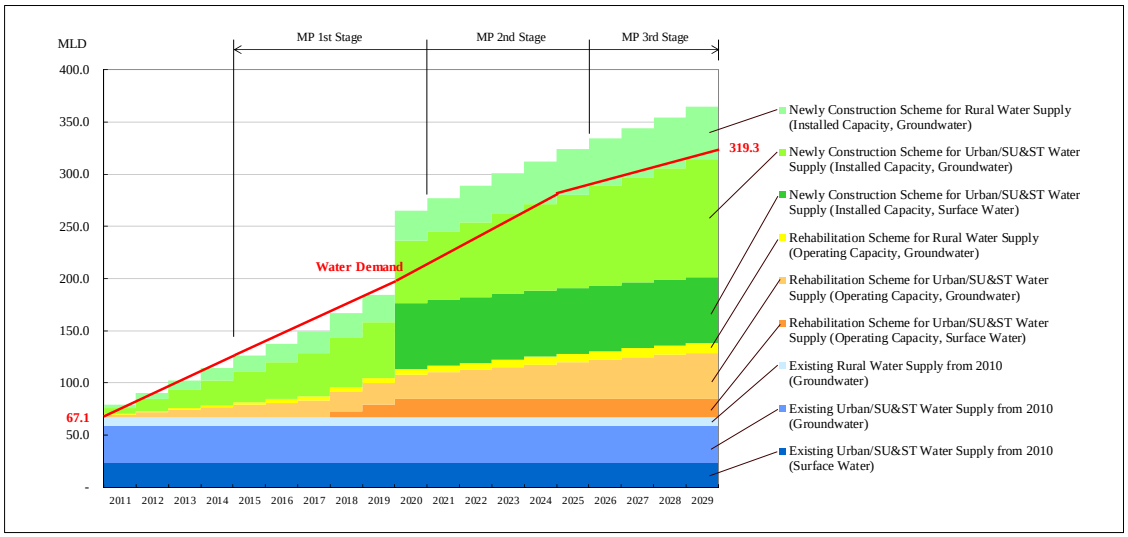


Figure 15-7 Demand and Supply in Water Supply Development Plan for Facility Planning

Source: JICA Project Team

Figure 5.1-1 Demand and Supply in Water Supply Development Plan for Facility Planning (16/38)

16. Imo

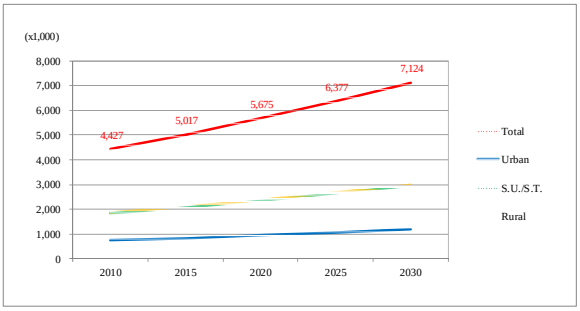


Figure 16-1 Population Growth by Settlement Category

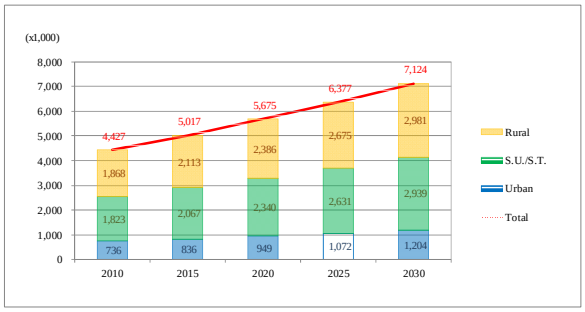


Figure 16-2 Population Growth with Distribution of Settlement Category

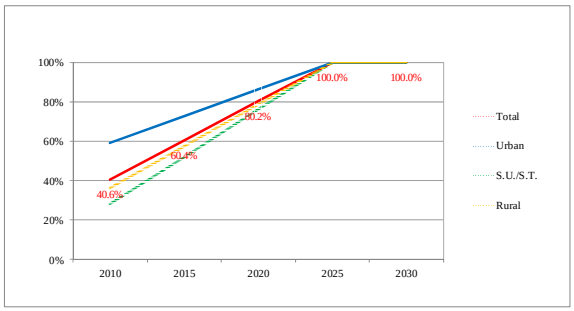


Figure 16-3 Water Supply Coverage by Settlement Category

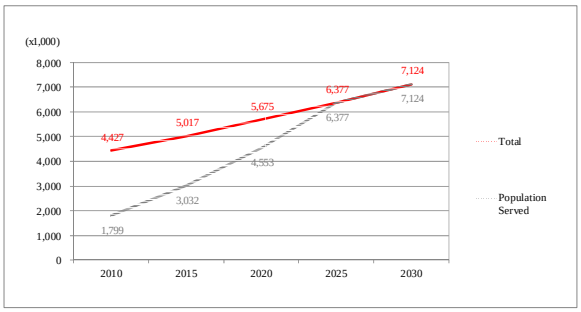


Figure 16-4 Population and Population Served

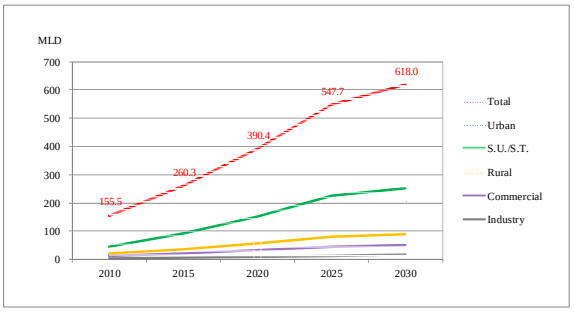


Figure 16-5 Water Demand Growth by Water Use Category

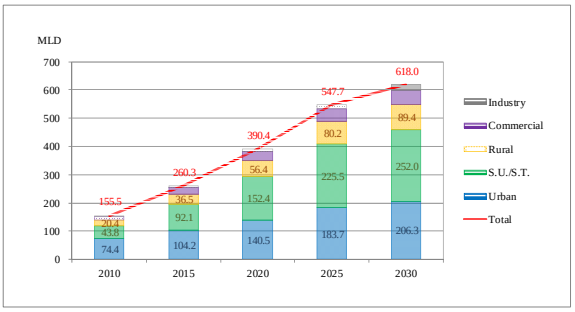


Figure 16-6 Water Demand Growth with Distribution of Water Use Category

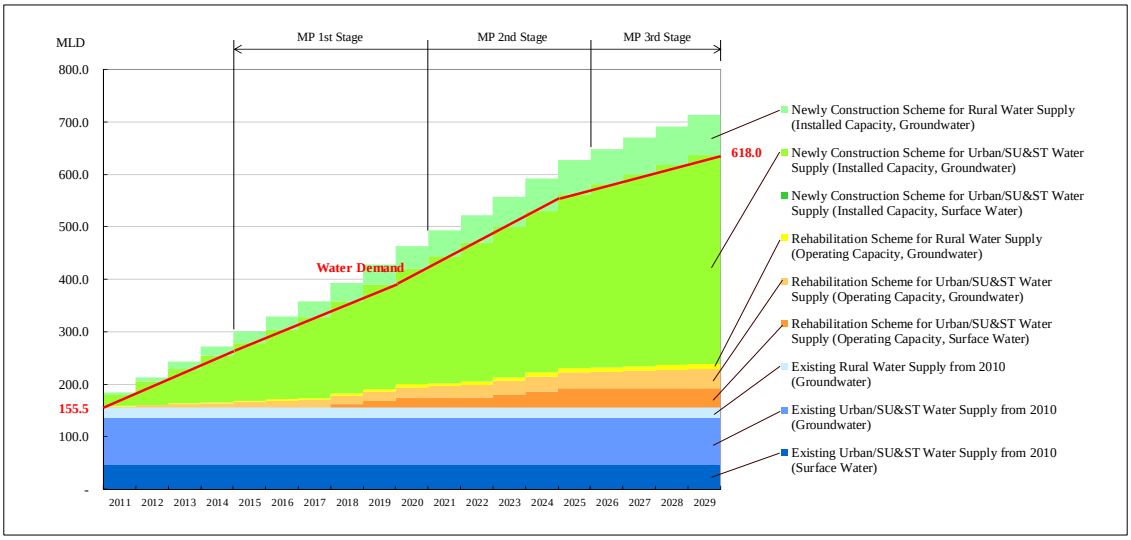


Figure 16-7 Demand and Supply in Water Supply Development Plan for Facility Planning

Source: JICA Project Team

Figure 5.1-1 Demand and Supply in Water Supply Development Plan for Facility Planning (17/38)

17. Jigawa

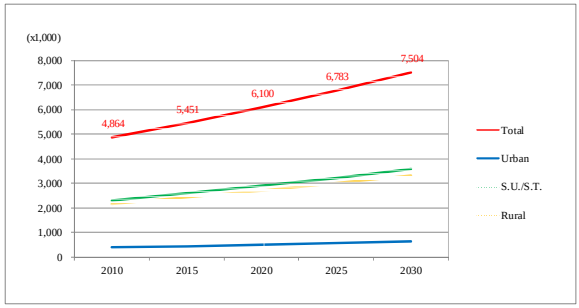


Figure 17-1 Population Growth by Settlement Category

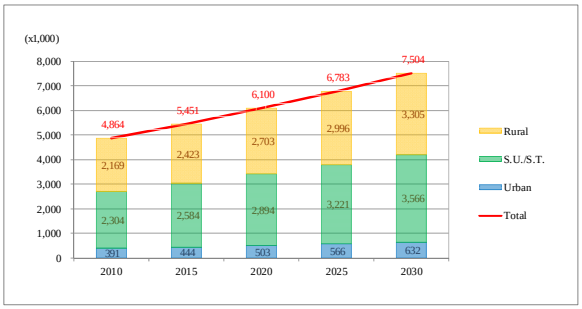


Figure 17-2 Population Growth with Distribution of Settlement Category

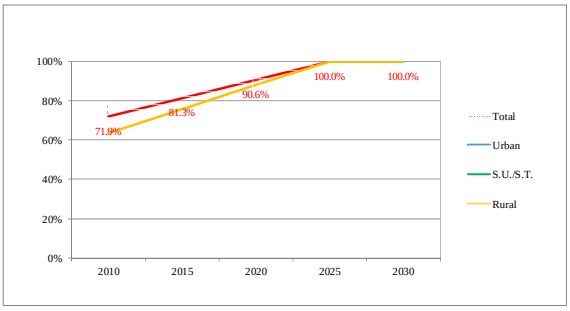


Figure 17-3 Water Supply Coverage by Settlement Category

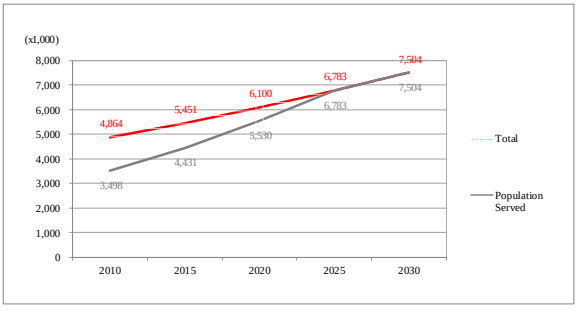


Figure 17-4 Population and Population Served

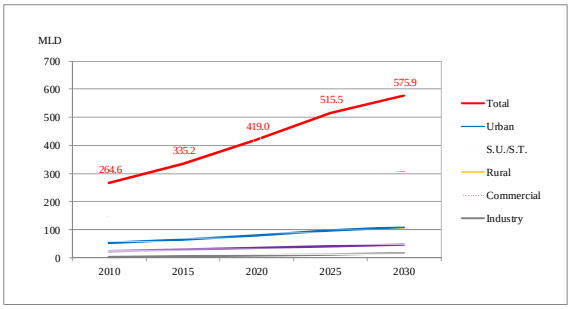


Figure 17-5 Water Demand Growth by Water Use Category

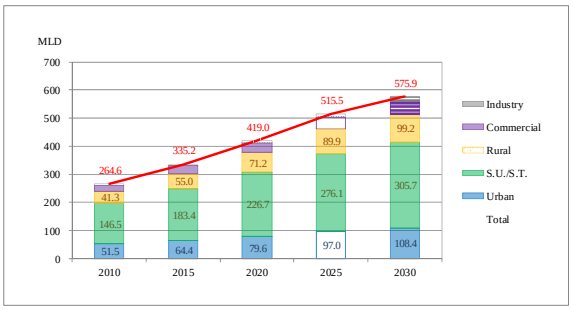


Figure 17-6 Water Demand Growth with Distribution of Water Use Category

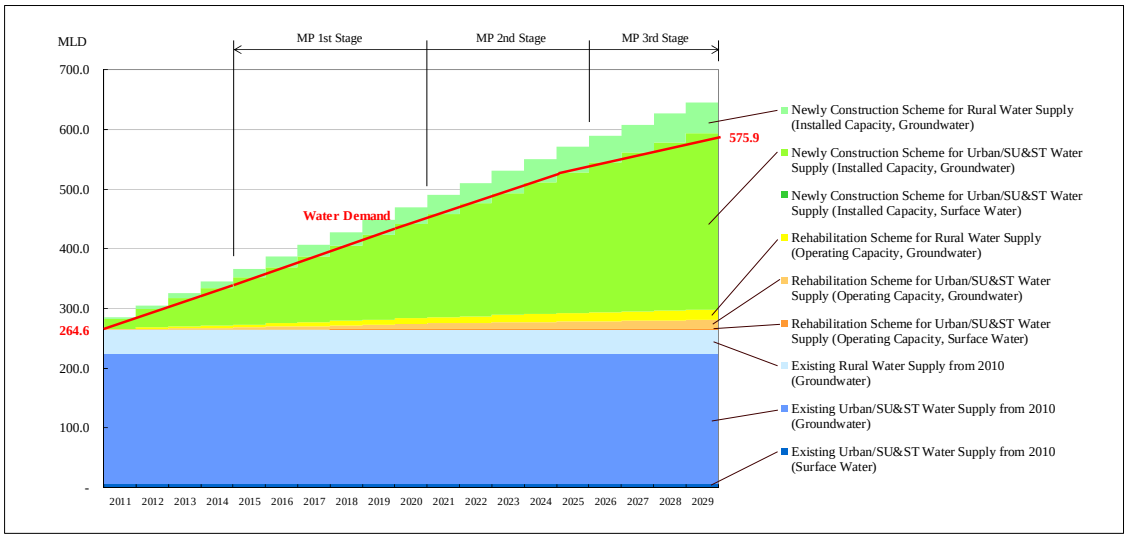


Figure 17-7 Demand and Supply in Water Supply Development Plan for Facility Planning

Source: JICA Project Team

Figure 5.1-1 Demand and Supply in Water Supply Development Plan for Facility Planning (18/38)

18. Kaduna

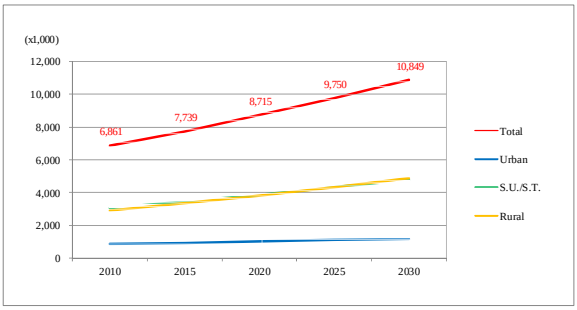


Figure 18-1 Population Growth by Settlement Category

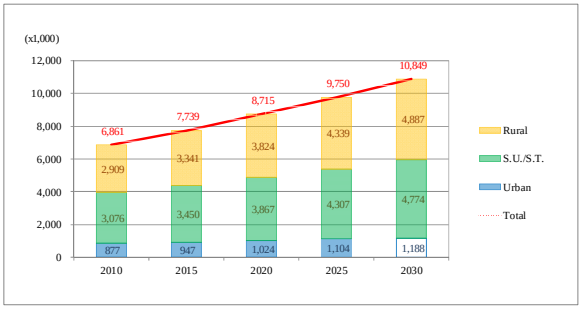


Figure 18-2 Population Growth with Distribution of Settlement Category

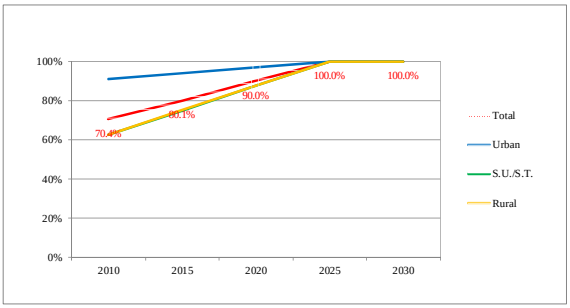


Figure 18-3 Water Supply Coverage by Settlement Category

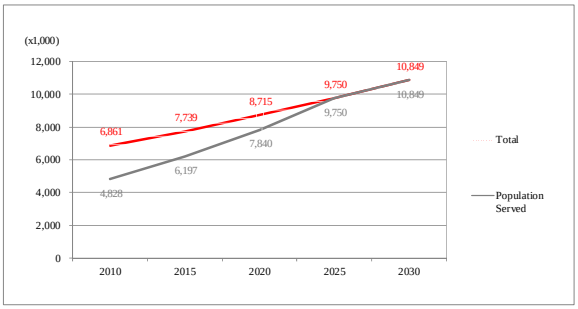


Figure 18-4 Population and Population Served

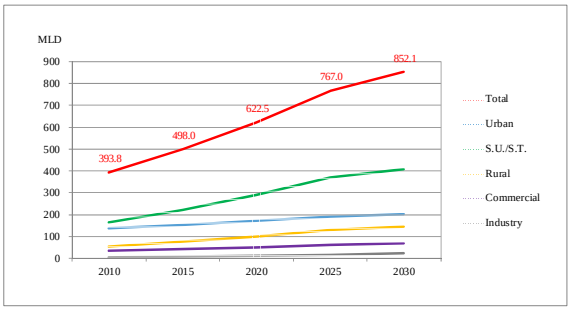


Figure 18-5 Water Demand Growth by Water Use Category

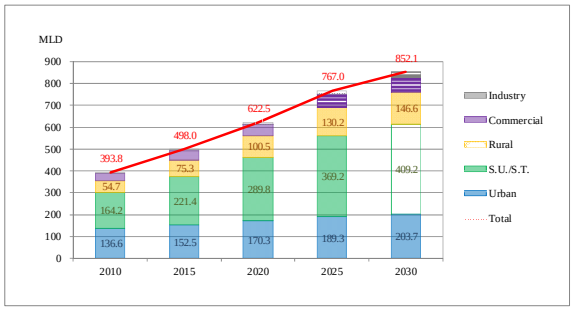


Figure 18-6 Water Demand Growth with Distribution of Water Use Category

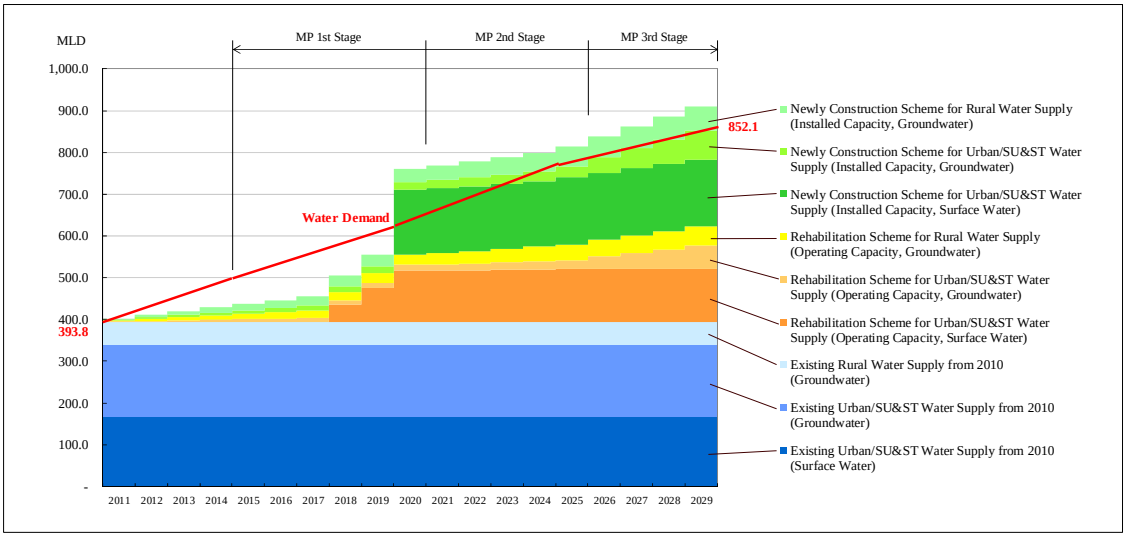


Figure 18-7 Demand and Supply in Water Supply Development Plan for Facility Planning

Source: JICA Project Team

Figure 5.1-1 Demand and Supply in Water Supply Development Plan for Facility Planning (19/38)

19. Kano

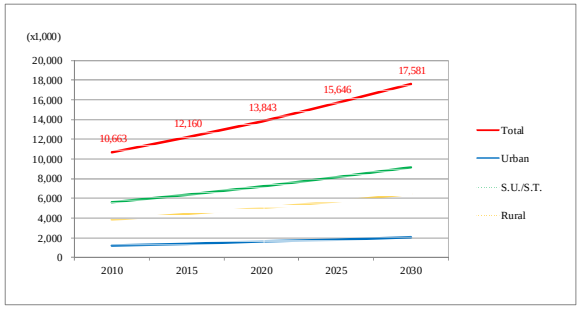


Figure 19-1 Population Growth by Settlement Category

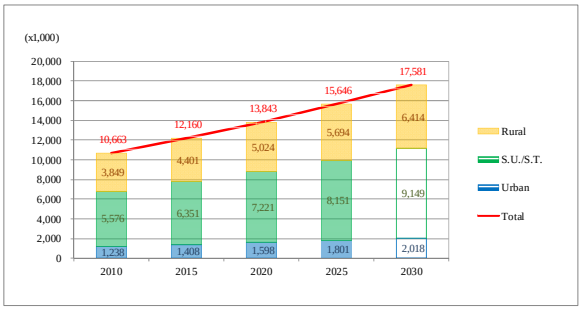


Figure 19-2 Population Growth with Distribution of Settlement Category

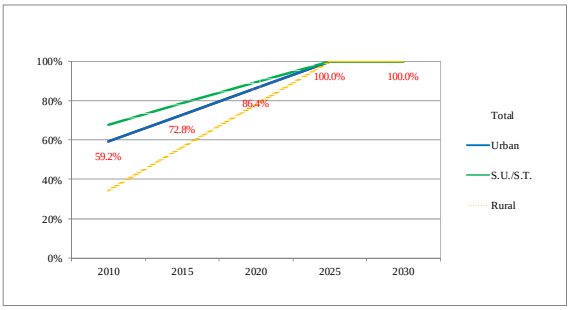


Figure 19-3 Water Supply Coverage by Settlement Category

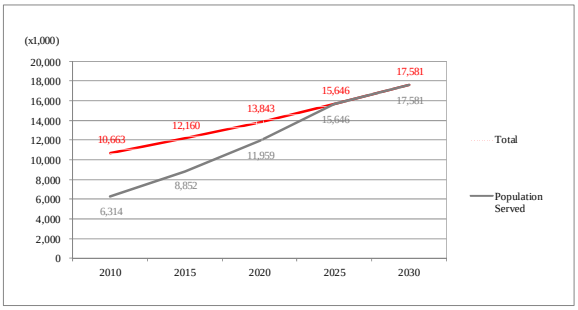


Figure 19-4 Population and Population Served

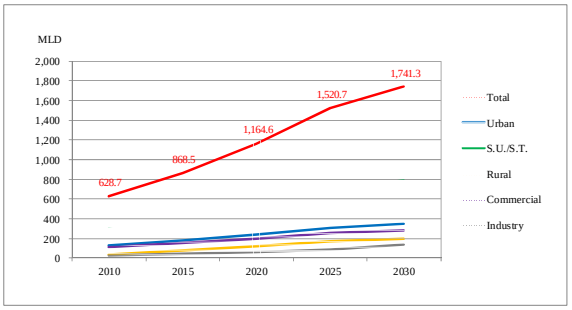


Figure 19-5 Water Demand Growth by Water Use Category

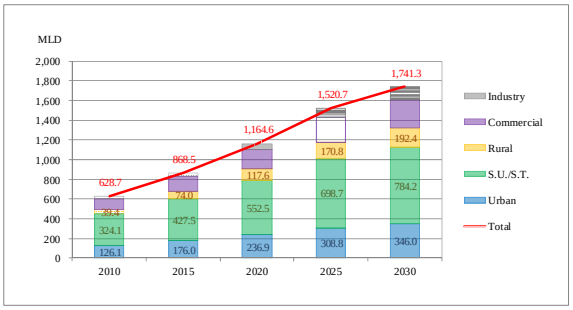


Figure 19-6 Water Demand Growth with Distribution of Water Use Category

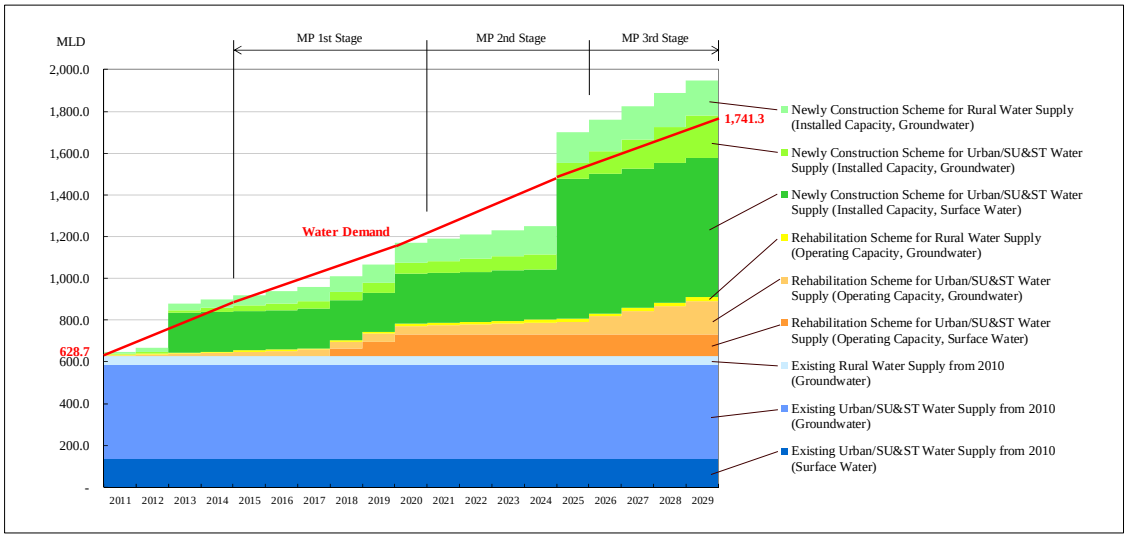


Figure 19-7 Demand and Supply in Water Supply Development Plan for Facility Planning

Source: JICA Project Team

Figure 5.1-1 Demand and Supply in Water Supply Development Plan for Facility Planning (20/38)

20. Katsina

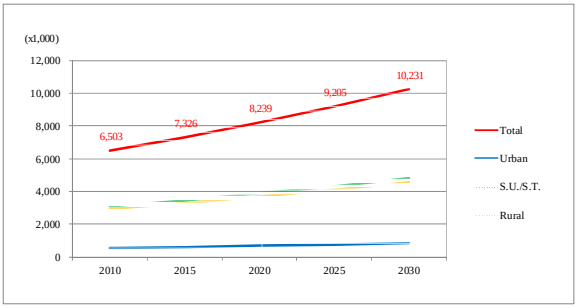


Figure 20-1 Population Growth by Settlement Category

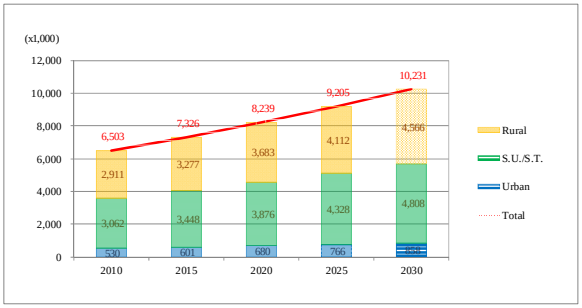


Figure 20-2 Population Growth with Distribution of Settlement Category

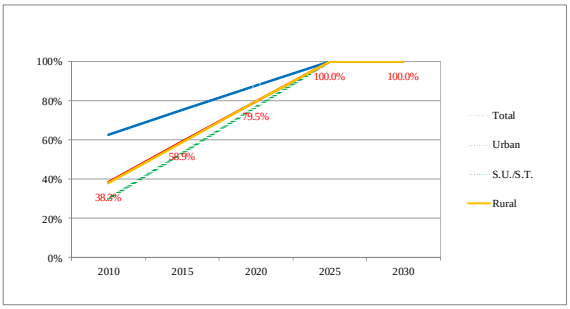


Figure 20-3 Water Supply Coverage by Settlement Category

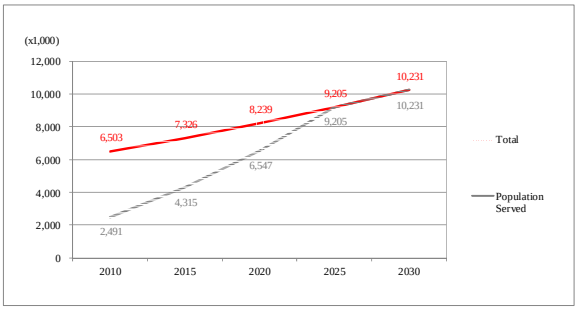


Figure 20-4 Population and Population Served

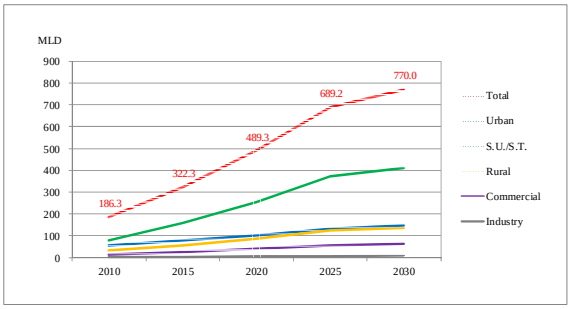


Figure 20-5 Water Demand Growth by Water Use Category

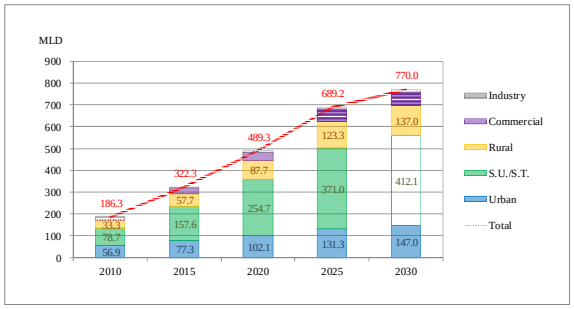


Figure 20-6 Water Demand Growth with Distribution of Water Use Category

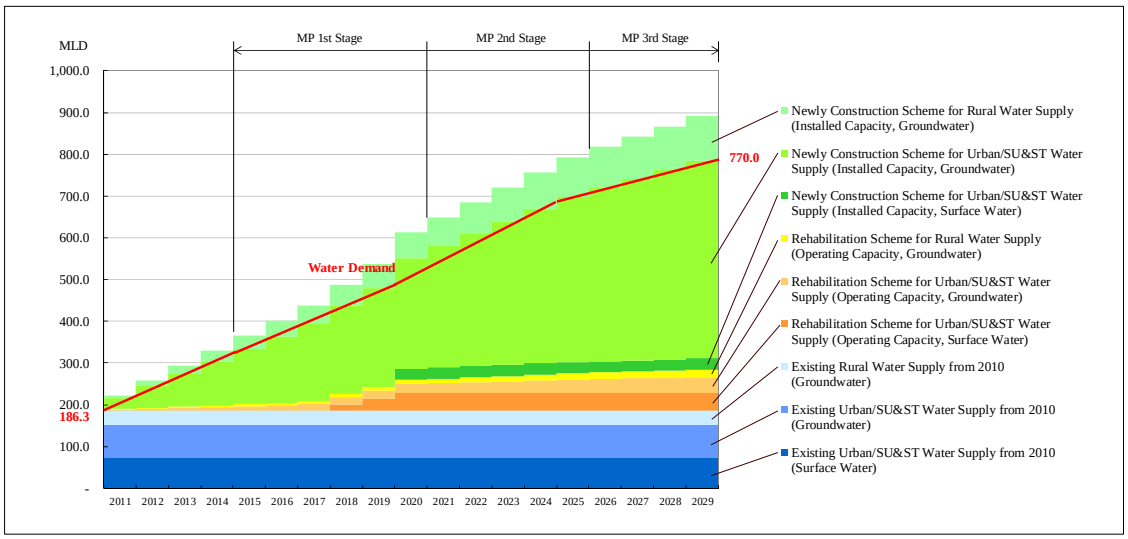


Figure 20-7 Demand and Supply in Water Supply Development Plan for Facility Planning

Source: JICA Project Team

Figure 5.1-1 Demand and Supply in Water Supply Development Plan for Facility Planning (21/38)

21. Kebbi

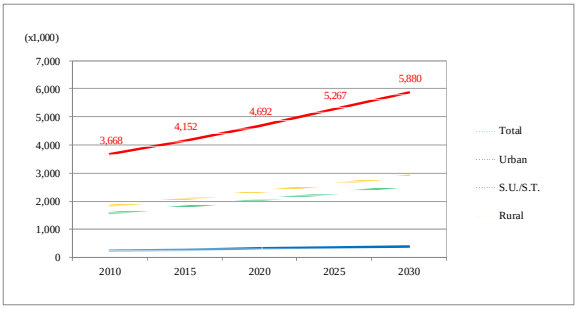


Figure 21-1 Population Growth by Settlement Category

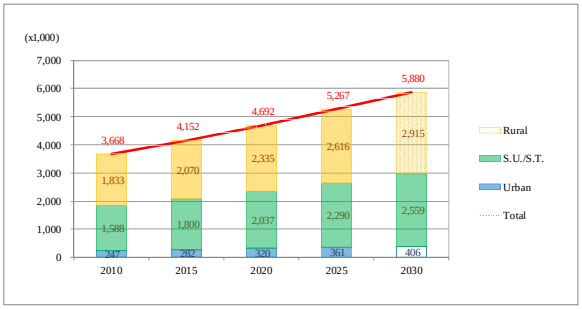


Figure 21-2 Population Growth with Distribution of Settlement Category

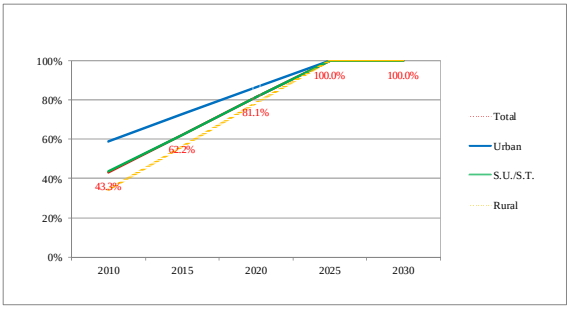


Figure 21-3 Water Supply Coverage by Settlement Category

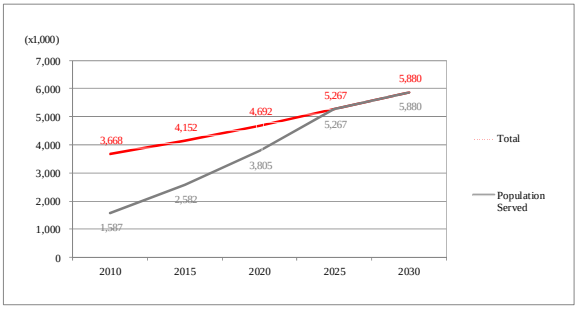


Figure 21-4 Population and Population Served

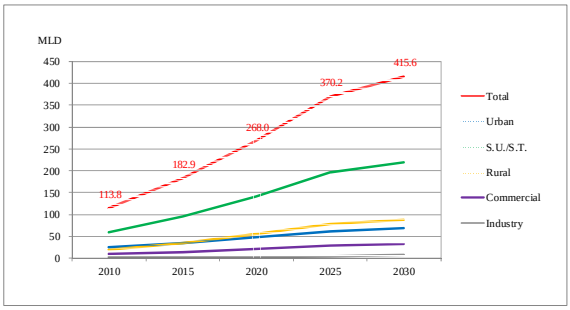


Figure 21-5 Water Demand Growth by Water Use Category

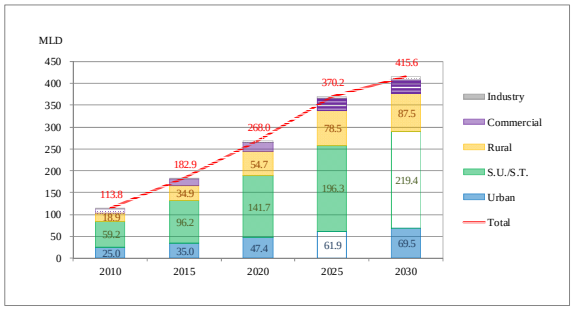


Figure 21-6 Water Demand Growth with Distribution of Water Use Category

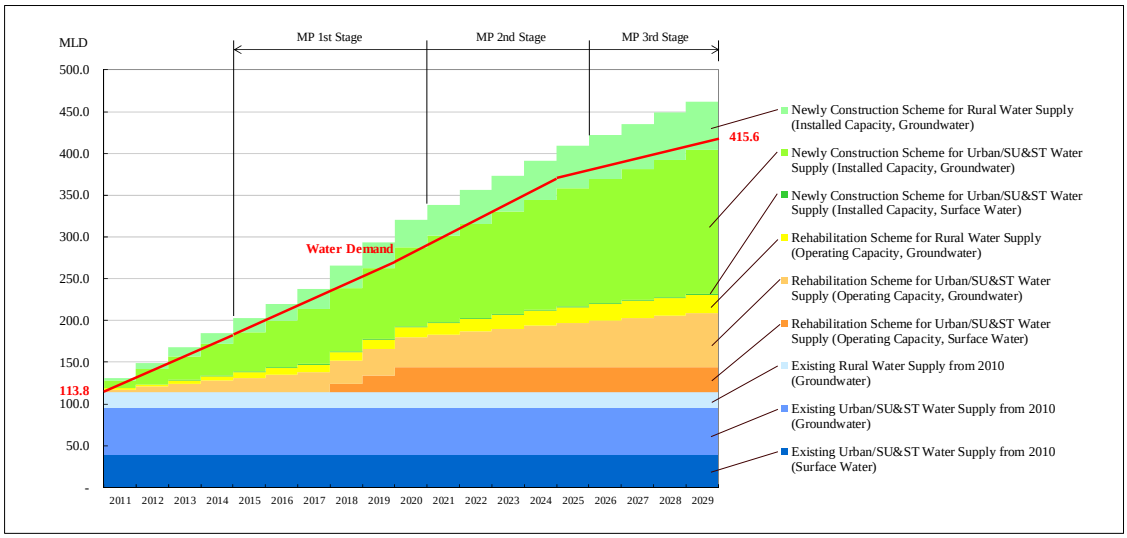


Figure 21-7 Demand and Supply in Water Supply Development Plan for Facility Planning

Source: JICA Project Team

Figure 5.1-1 Demand and Supply in Water Supply Development Plan for Facility Planning (22/38)

22. Kogi

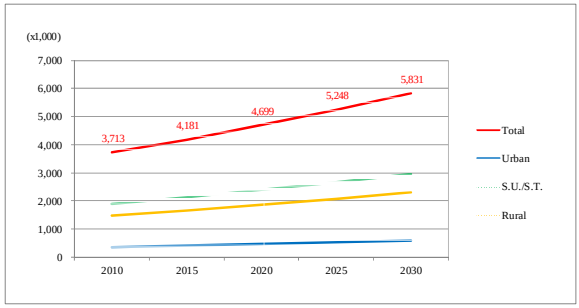


Figure 22-1 Population Growth by Settlement Category

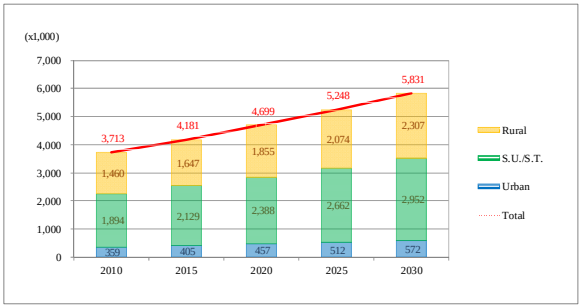


Figure 22-2 Population Growth with Distribution of Settlement Category

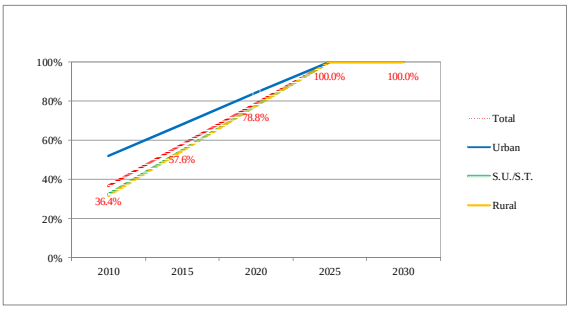


Figure 22-3 Water Supply Coverage by Settlement Category

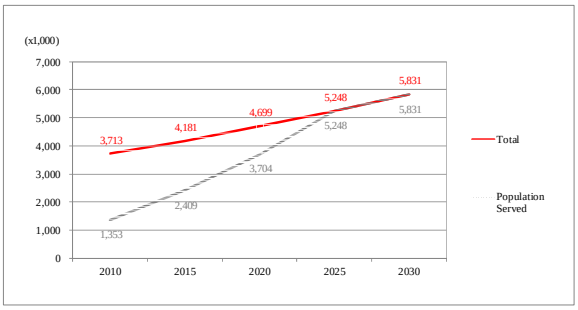


Figure 22-4 Population and Population Served

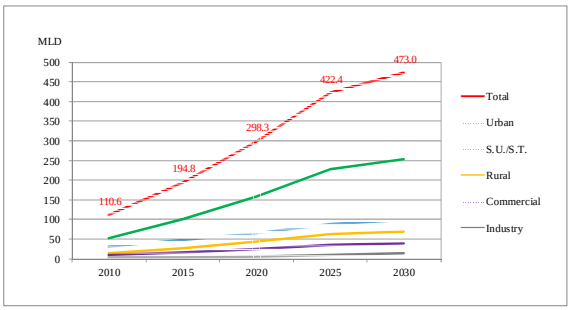


Figure 22-5 Water Demand Growth by Water Use Category

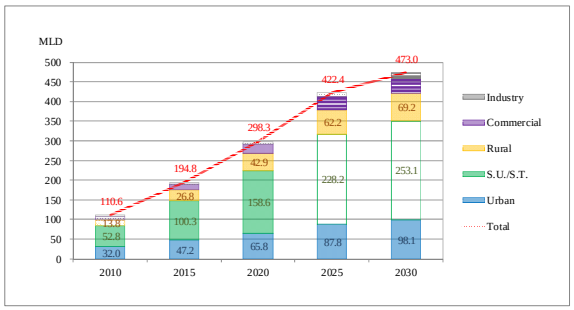


Figure 22-6 Water Demand Growth with Distribution of Water Use Category

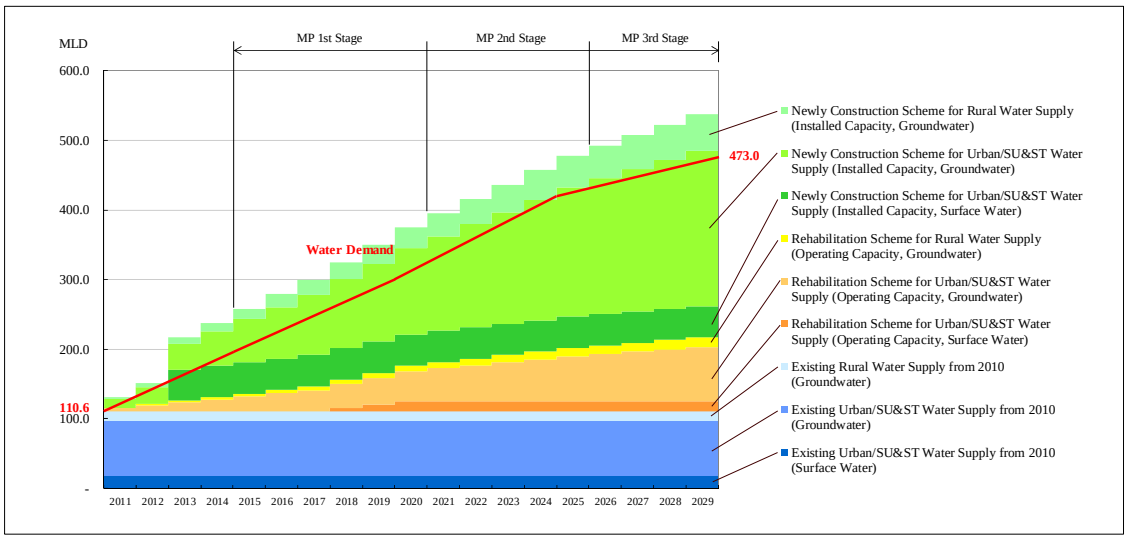


Figure 22-7 Demand and Supply in Water Supply Development Plan for Facility Planning

Source: JICA Project Team

Figure 5.1-1 Demand and Supply in Water Supply Development Plan for Facility Planning (23/38)

23. Kwara

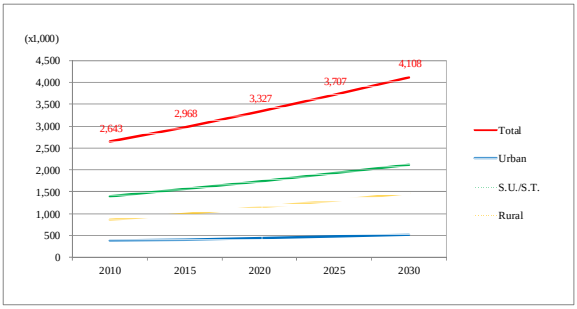


Figure 23-1 Population Growth by Settlement Category

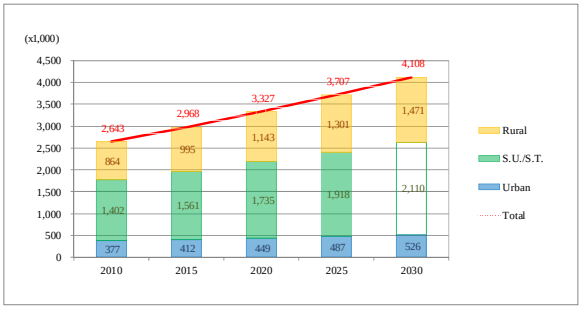


Figure 23-2 Population Growth with Distribution of Settlement Category

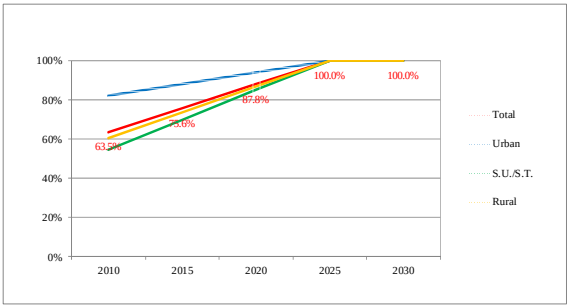


Figure 23-3 Water Supply Coverage by Settlement Category

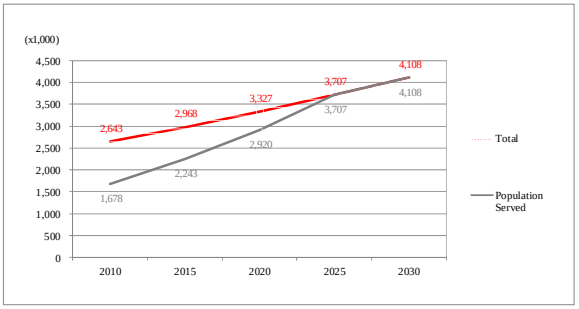


Figure 23-4 Population and Population Served

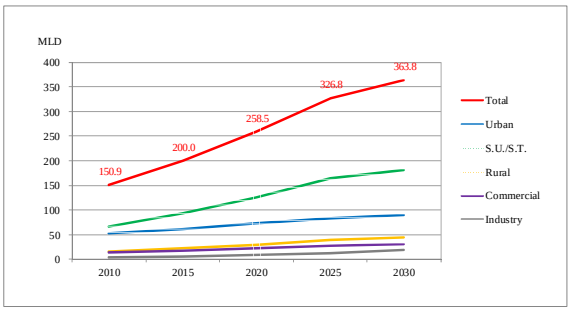


Figure 23-5 Water Demand Growth by Water Use Category

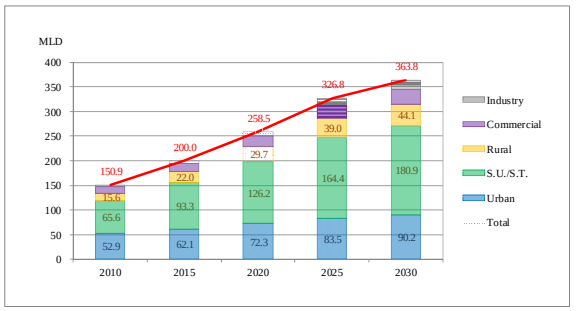


Figure 23-6 Water Demand Growth with Distribution of Water Use Category

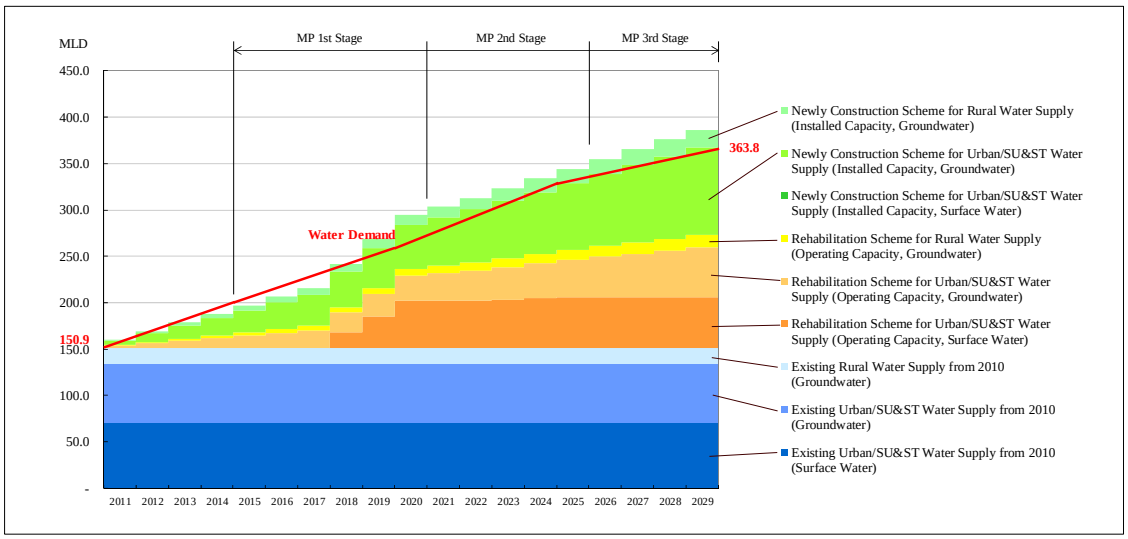


Figure 23-7 Demand and Supply in Water Supply Development Plan for Facility Planning

Source: JICA Project Team

Figure 5.1-1 Demand and Supply in Water Supply Development Plan for Facility Planning (24/38)

24. Lagos

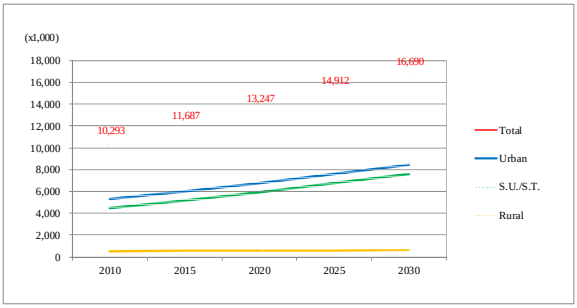


Figure 24-1 Population Growth by Settlement Category

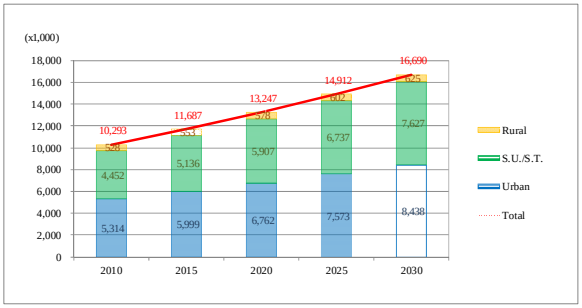


Figure 24-2 Population Growth with Distribution of Settlement Category

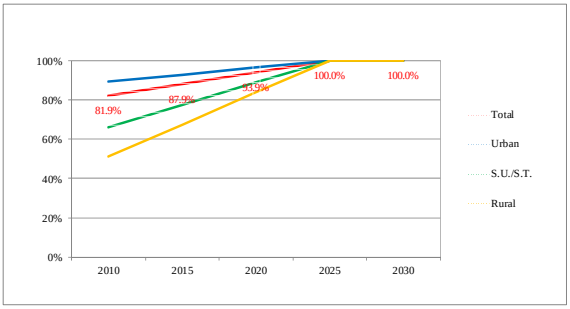


Figure 24-3 Water Supply Coverage by Settlement Category

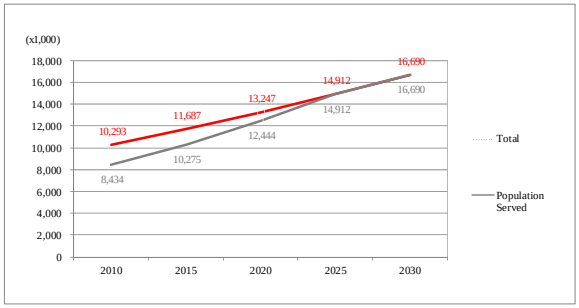


Figure 24-4 Population and Population Served

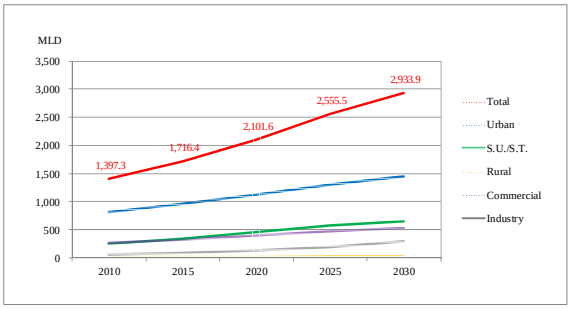


Figure 24-5 Water Demand Growth by Water Use Category

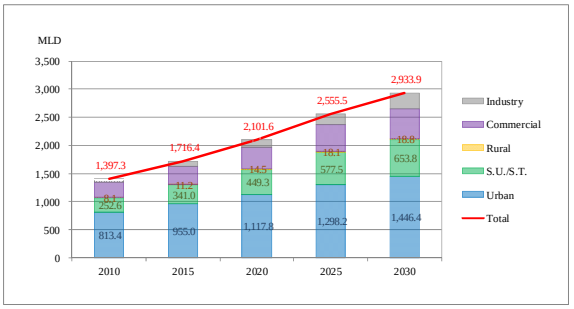


Figure 24-6 Water Demand Growth with Distribution of Water Use Category

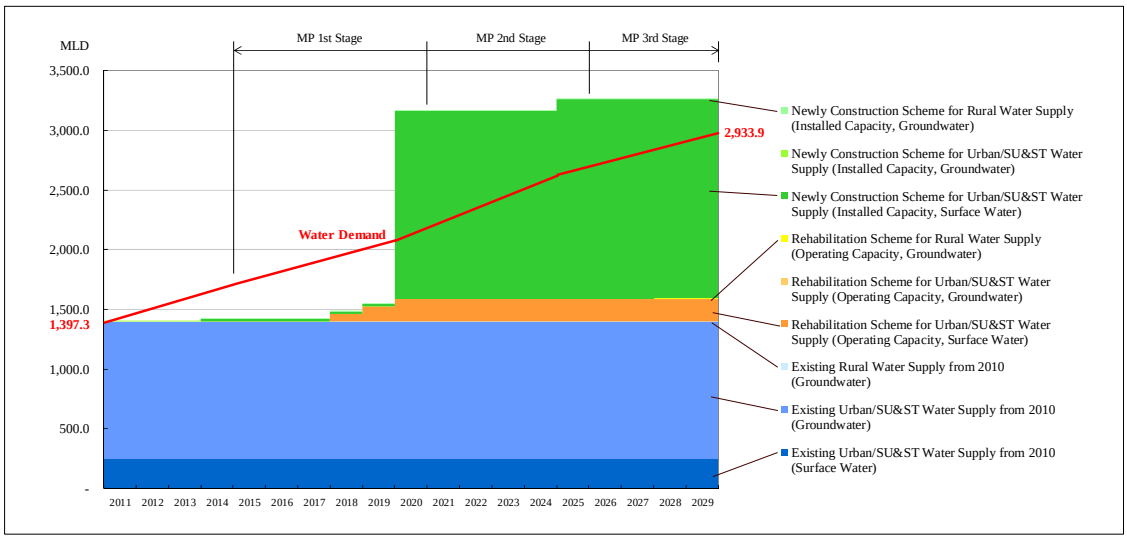


Figure 24-7 Demand and Supply in Water Supply Development Plan for Facility Planning

Source: JICA Project Team

Figure 5.1-1 Demand and Supply in Water Supply Development Plan for Facility Planning (25/38)

25. Nasarawa

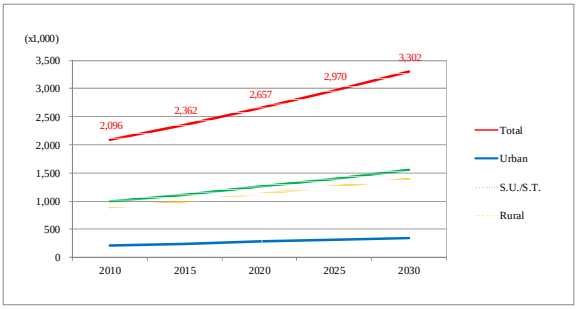


Figure 25-1 Population Growth by Settlement Category

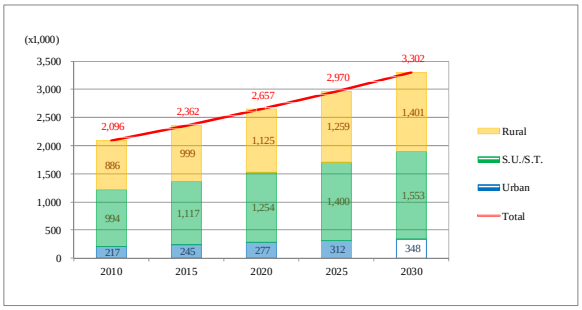


Figure 25-2 Population Growth with Distribution of Settlement Category

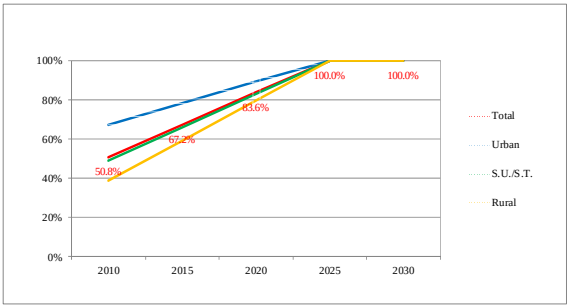


Figure 25-3 Water Supply Coverage by Settlement Category

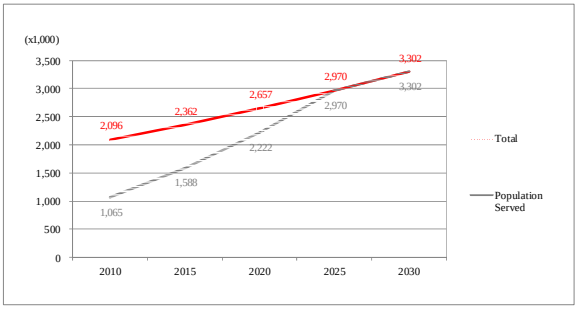


Figure 25-4 Population and Population Served

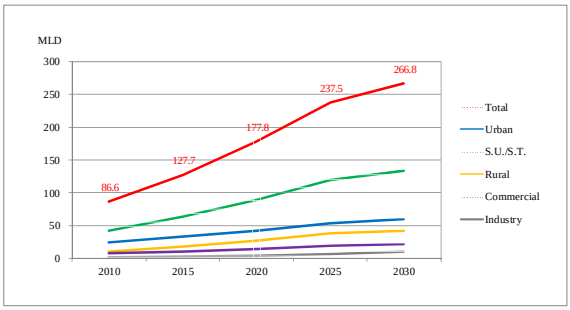


Figure 25-5 Water Demand Growth by Water Use Category

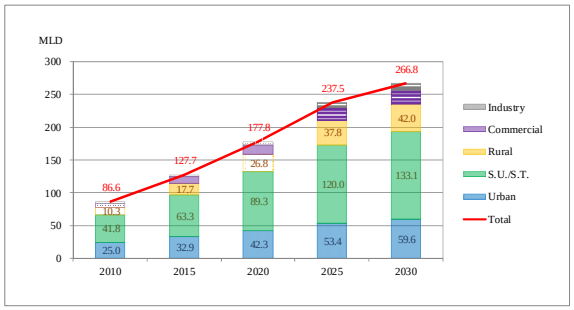


Figure 25-6 Water Demand Growth with Distribution of Water Use Category

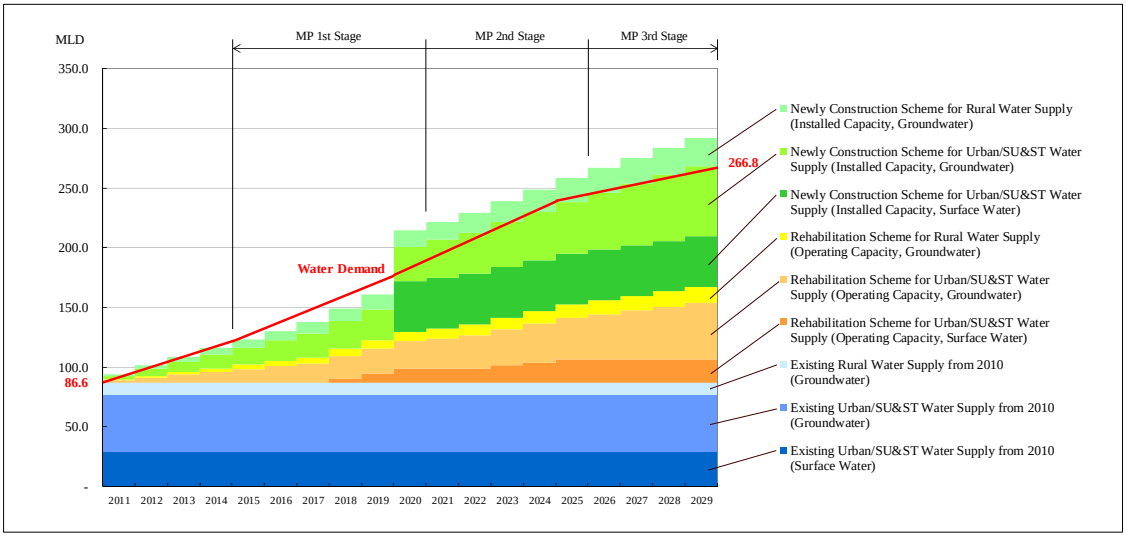


Figure 25-7 Demand and Supply in Water Supply Development Plan for Facility Planning

Source: JICA Project Team

Figure 5.1-1 Demand and Supply in Water Supply Development Plan for Facility Planning (26/38)

26. Niger

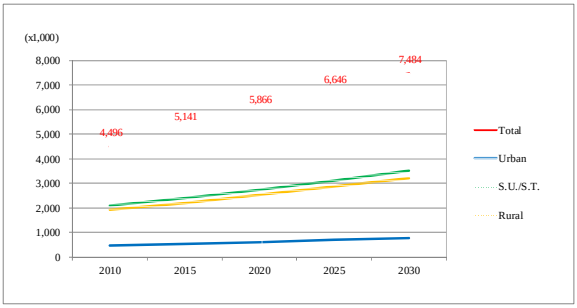


Figure 26-1 Population Growth by Settlement Category

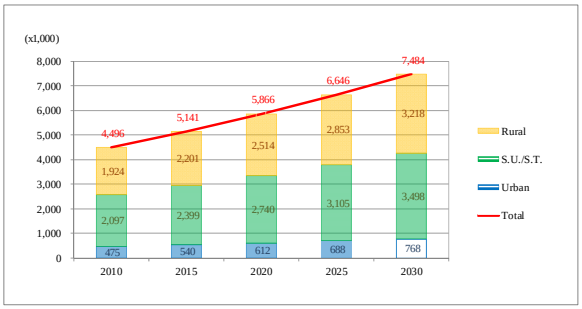


Figure 26-2 Population Growth with Distribution of Settlement Category

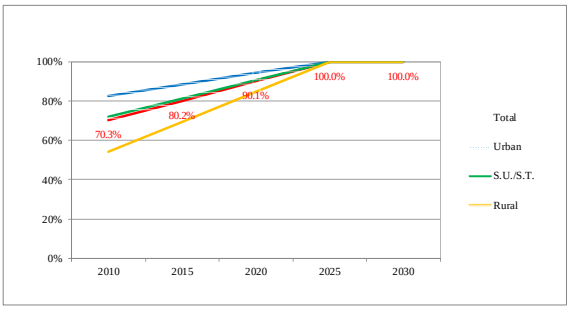


Figure 26-3 Water Supply Coverage by Settlement Category

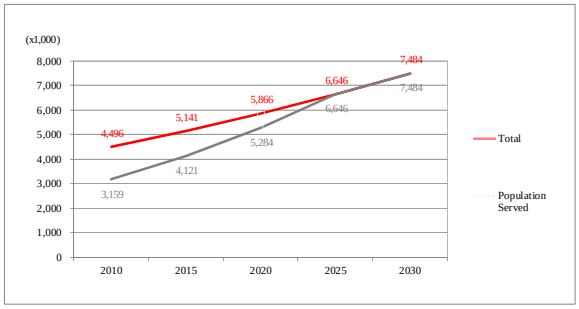


Figure 26-4 Population and Population Served

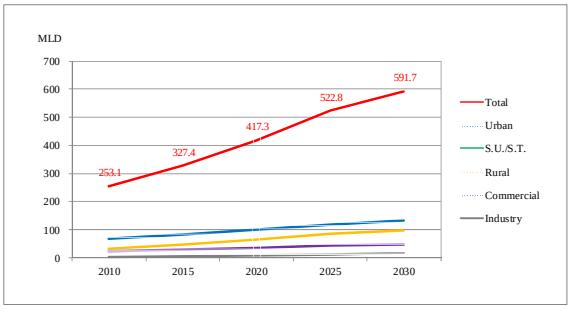


Figure 26-5 Water Demand Growth by Water Use Category

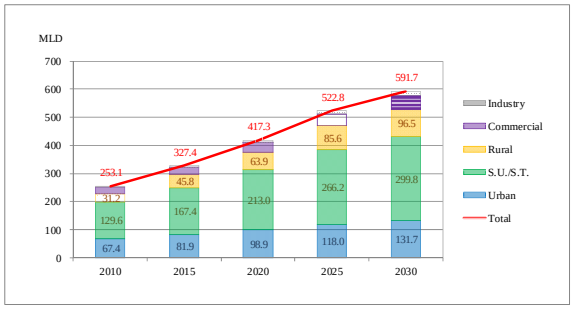


Figure 26-6 Water Demand Growth with Distribution of Water Use Category

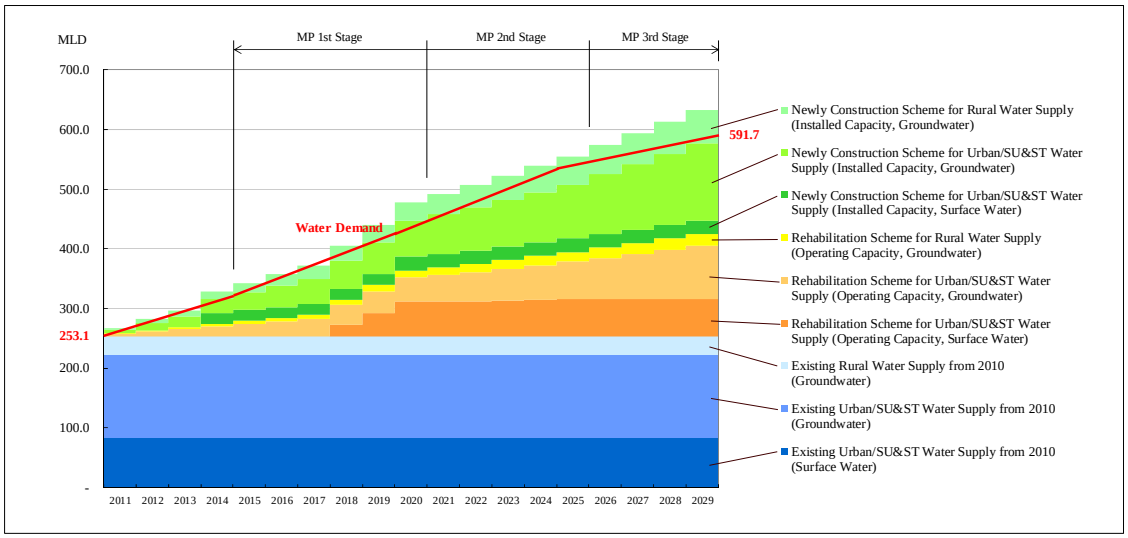


Figure 26-7 Demand and Supply in Water Supply Development Plan for Facility Planning

Source: JICA Project Team

Figure 5.1-1 Demand and Supply in Water Supply Development Plan for Facility Planning (27/38)

27. Ogun

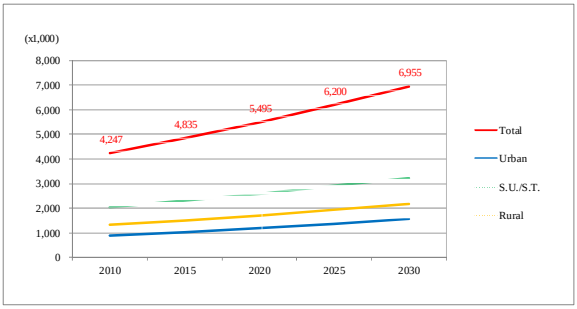


Figure 27-1 Population Growth by Settlement Category

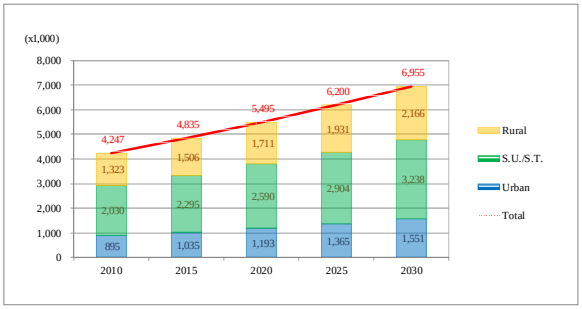


Figure 27-2 Population Growth with Distribution of Settlement Category

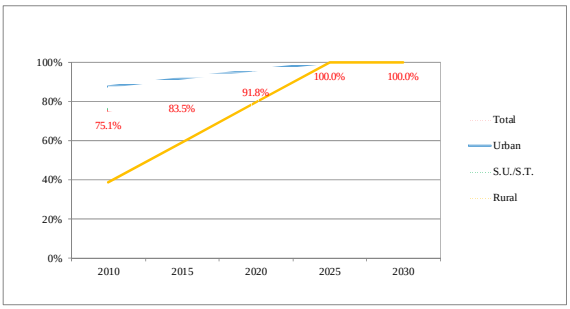


Figure 27-3 Water Supply Coverage by Settlement Category

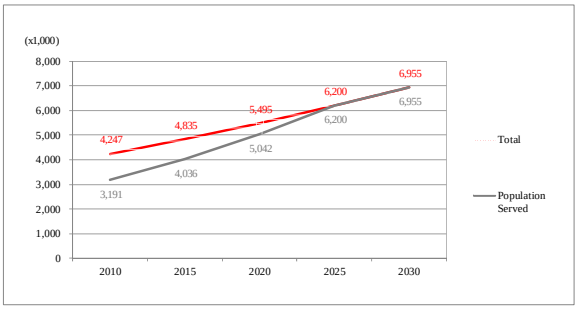


Figure 27-4 Population and Population Served

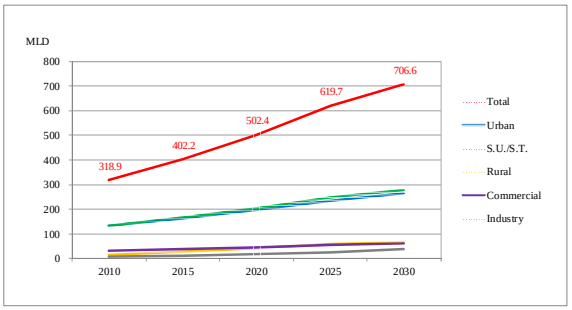


Figure 27-5 Water Demand Growth by Water Use Category

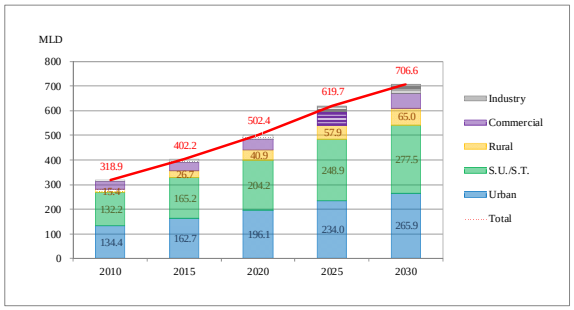


Figure 27-6 Water Demand Growth with Distribution of Water Use Category

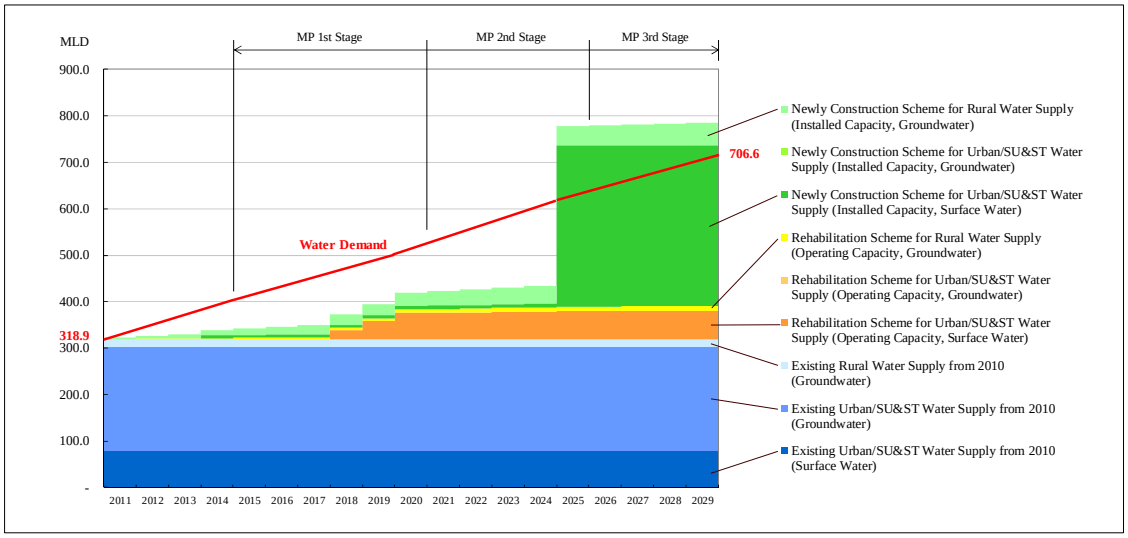


Figure 27-7 Demand and Supply in Water Supply Development Plan for Facility Planning

Source: JICA Project Team

Figure 5.1-1 Demand and Supply in Water Supply Development Plan for Facility Planning (28/38)

28. Ondo

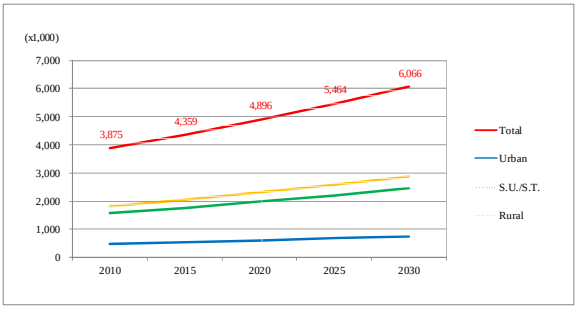


Figure 28-1 Population Growth by Settlement Category

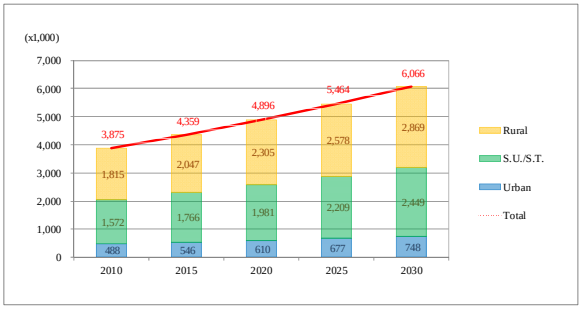


Figure 28-2 Population Growth with Distribution of Settlement Category

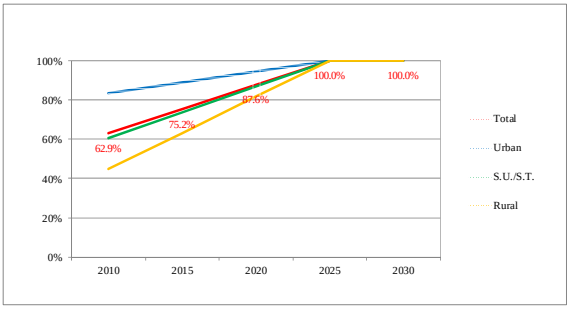


Figure 28-3 Water Supply Coverage by Settlement Category

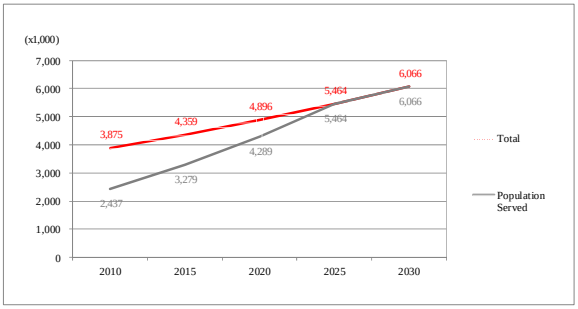


Figure 28-4 Population and Population Served

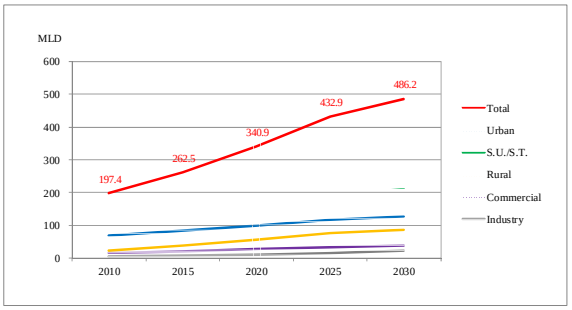


Figure 28-5 Water Demand Growth by Water Use Category

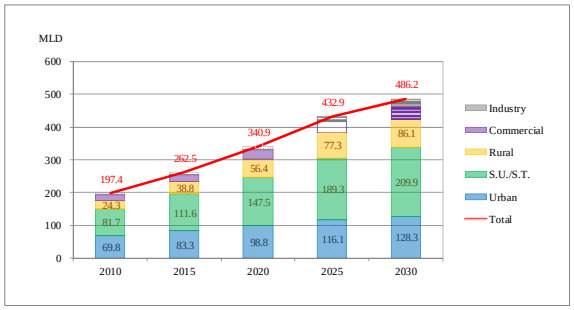


Figure 28-6 Water Demand Growth with Distribution of Water Use Category

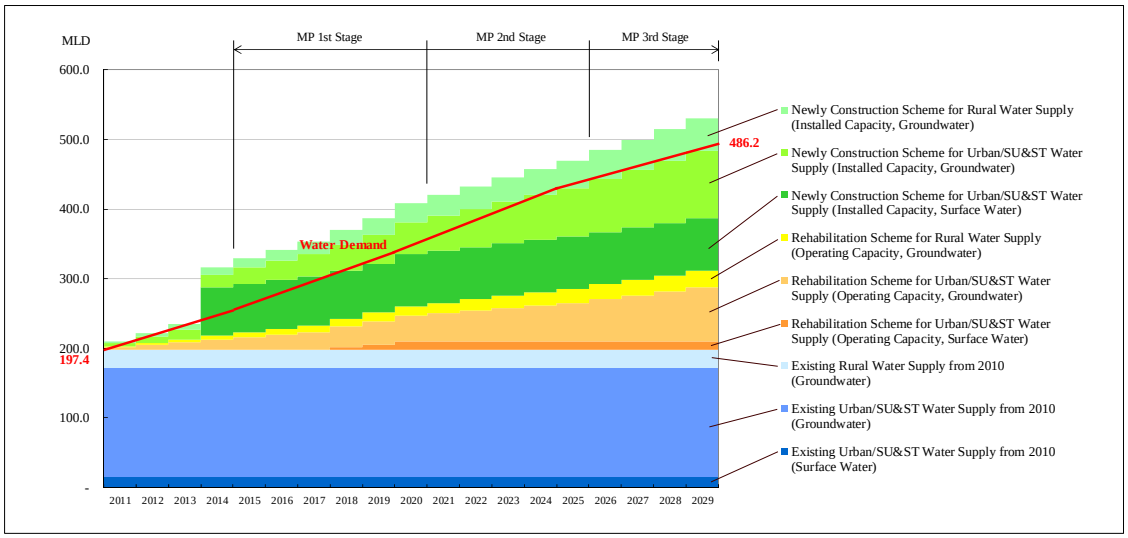


Figure 28-7 Demand and Supply in Water Supply Development Plan for Facility Planning

Source: JICA Project Team

Figure 5.1-1 Demand and Supply in Water Supply Development Plan for Facility Planning (29/38)

29. Osun

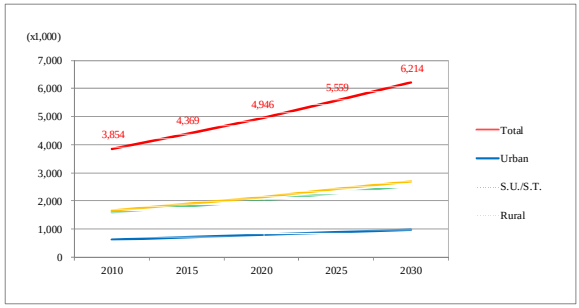


Figure 29-1 Population Growth by Settlement Category

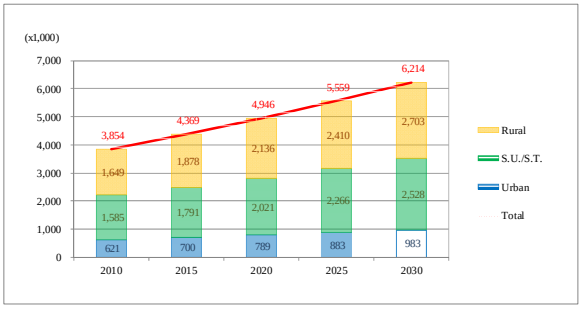


Figure 29-2 Population Growth with Distribution of Settlement Category

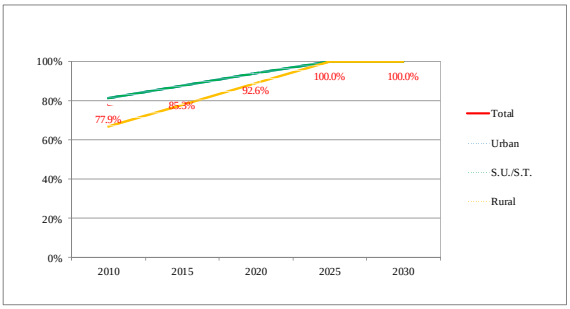


Figure 29-3 Water Supply Coverage by Settlement Category

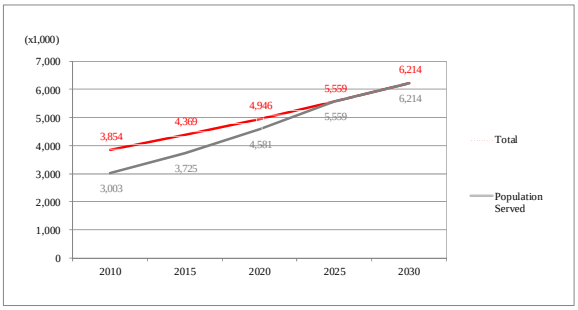


Figure 29-4 Population and Population Served

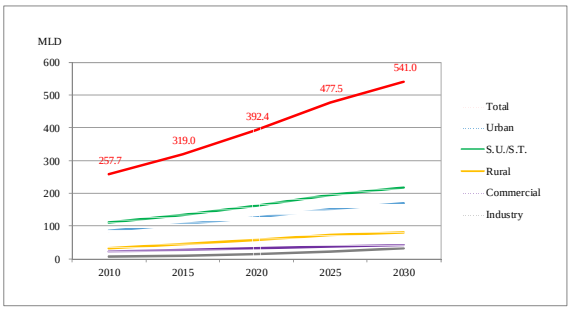


Figure 29-5 Water Demand Growth by Water Use Category

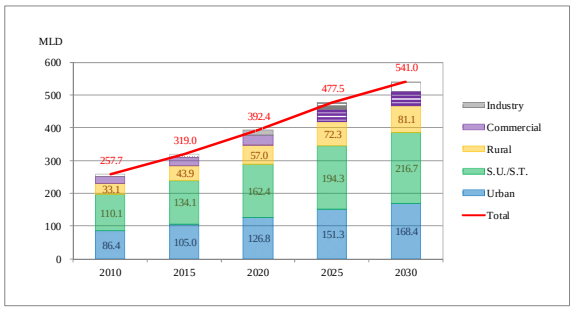


Figure 29-6 Water Demand Growth with Distribution of Water Use Category

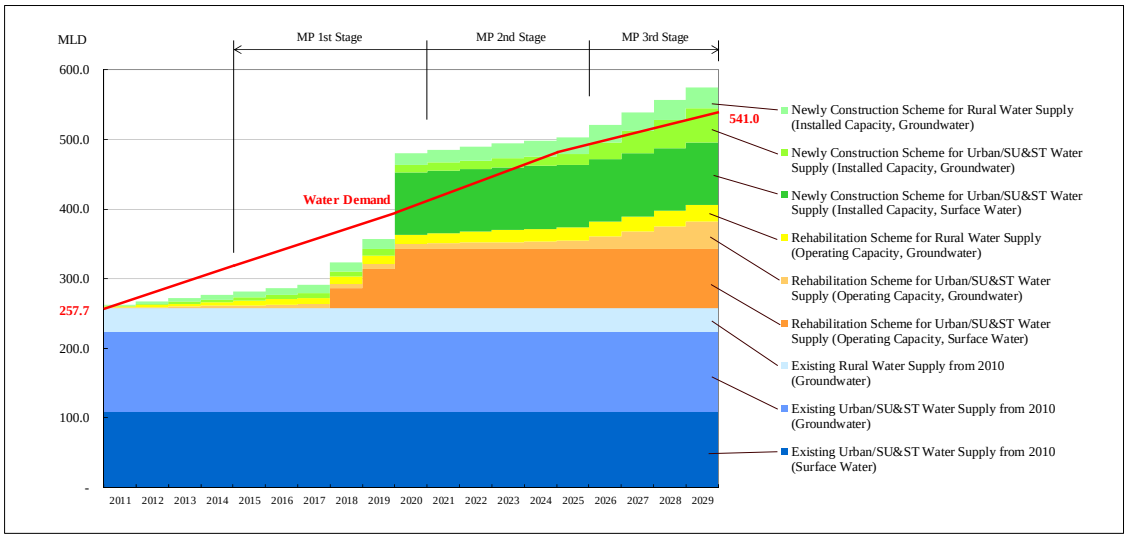


Figure 29-7 Demand and Supply in Water Supply Development Plan for Facility Planning

Source: JICA Project Team

Figure 5.1-1 Demand and Supply in Water Supply Development Plan for Facility Planning (30/38)

30. Oyo

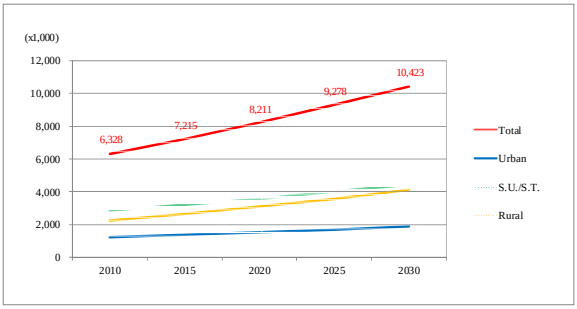


Figure 30-1 Population Growth by Settlement Category

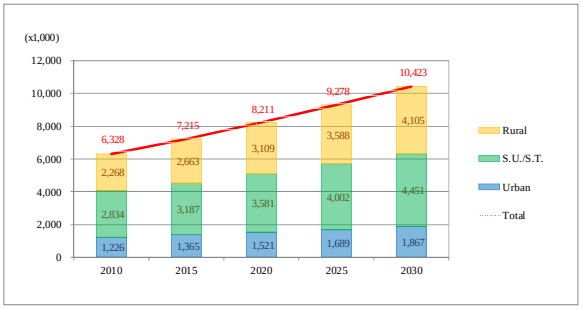


Figure 30-2 Population Growth with Distribution of Settlement Category

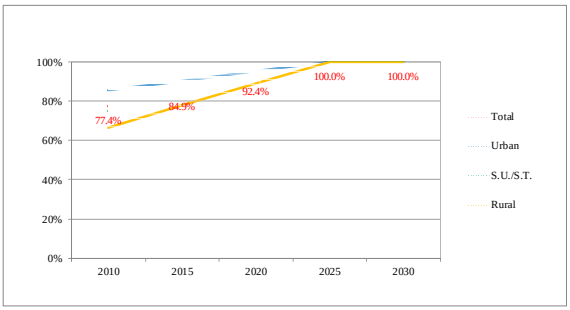


Figure 30-3 Water Supply Coverage by Settlement Category

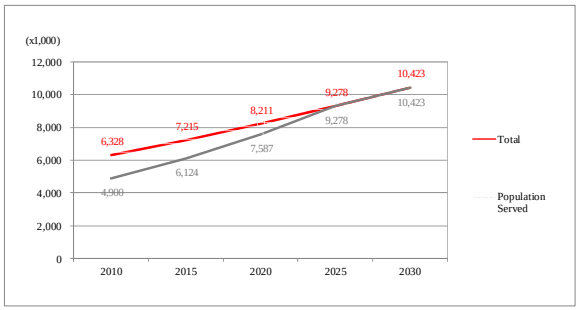


Figure 30-4 Population and Population Served

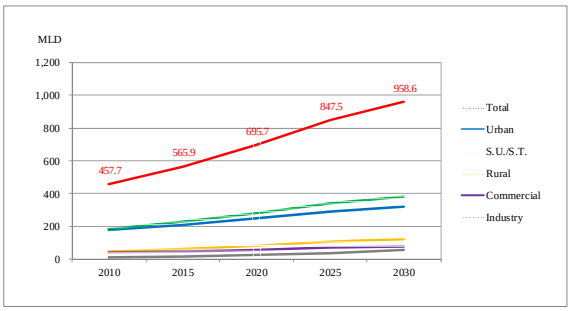


Figure 30-5 Water Demand Growth by Water Use Category

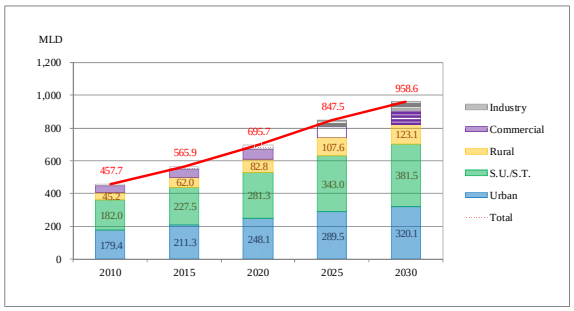


Figure 30-6 Water Demand Growth with Distribution of Water Use Category

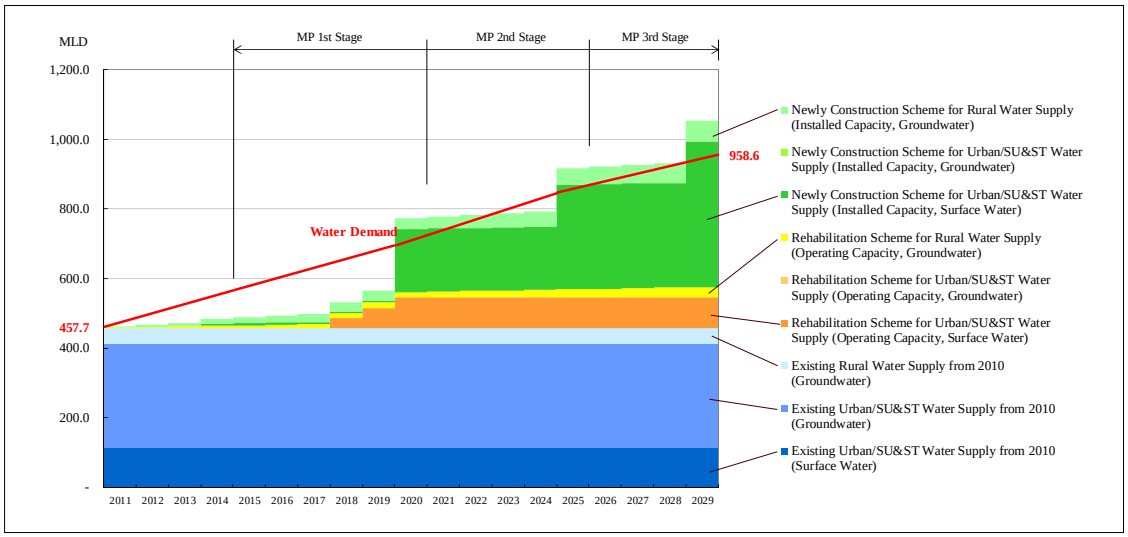


Figure 30-7 Demand and Supply in Water Supply Development Plan for Facility Planning

Source: JICA Project Team

Figure 5.1-1 Demand and Supply in Water Supply Development Plan for Facility Planning (31/38)

31. Plateau

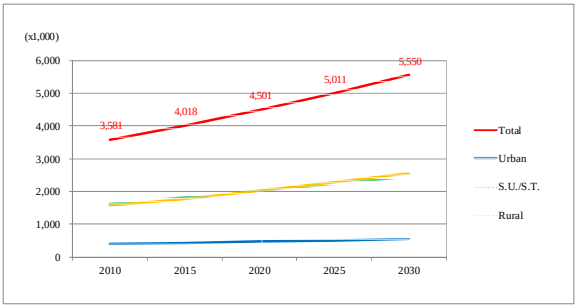


Figure 31-1 Population Growth by Settlement Category

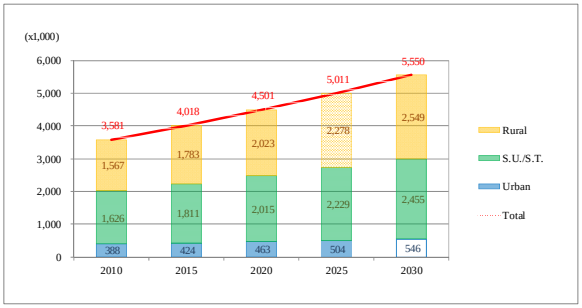


Figure 31-2 Population Growth with Distribution of Settlement Category

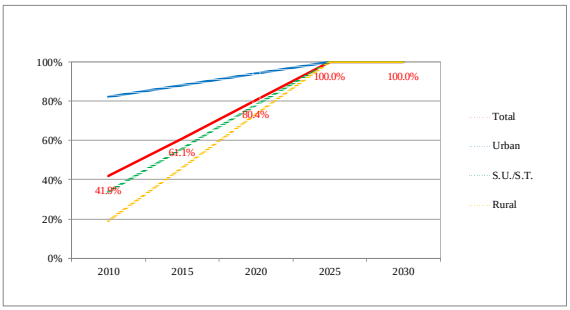


Figure 31-3 Water Supply Coverage by Settlement Category

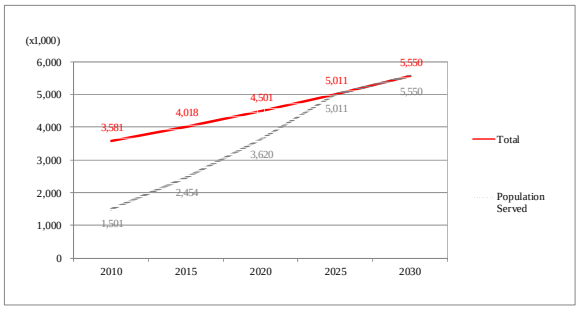


Figure 31-4 Population and Population Served

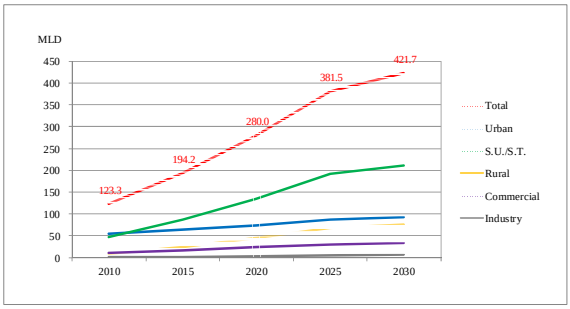


Figure 31-5 Water Demand Growth by Water Use Category

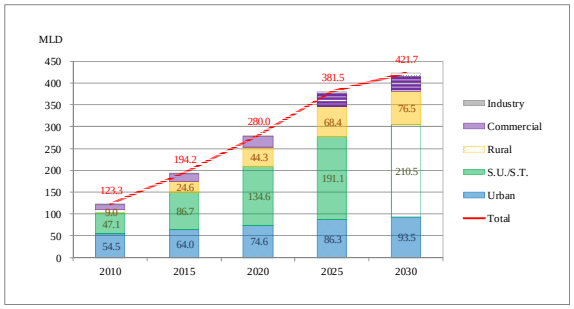


Figure 31-6 Water Demand Growth with Distribution of Water Use Category

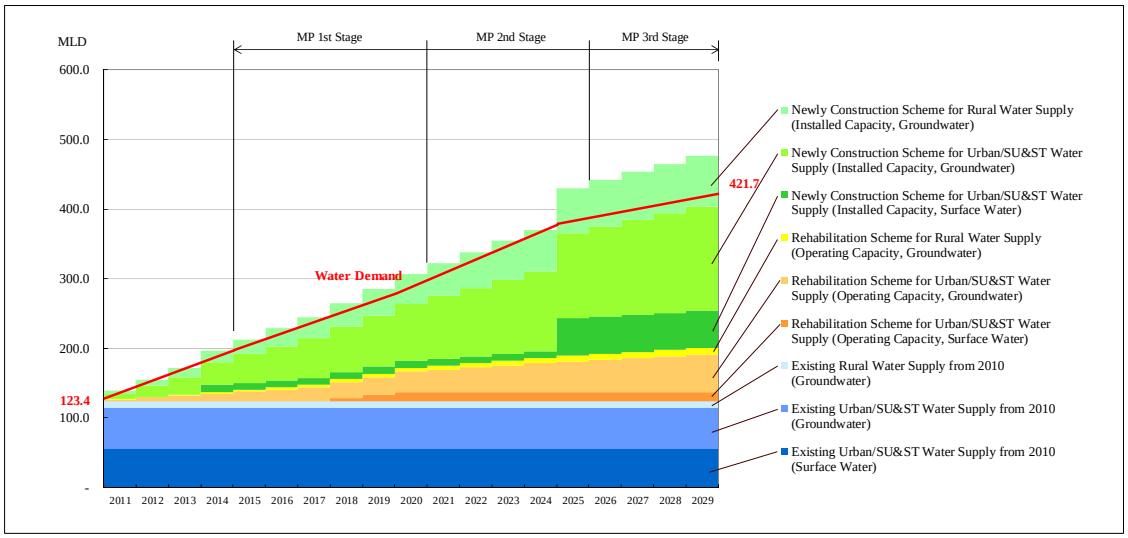


Figure 31-7 Demand and Supply in Water Supply Development Plan for Facility Planning

Source: JICA Project Team

Figure 5.1-1 Demand and Supply in Water Supply Development Plan for Facility Planning (32/38)

32. Rivers

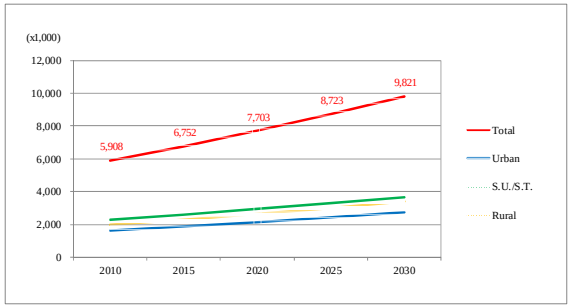


Figure 32-1 Population Growth by Settlement Category

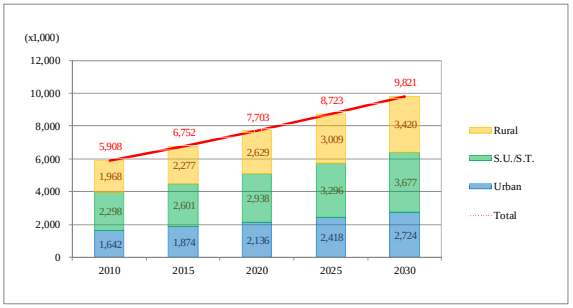


Figure 32-2 Population Growth with Distribution of Settlement Category

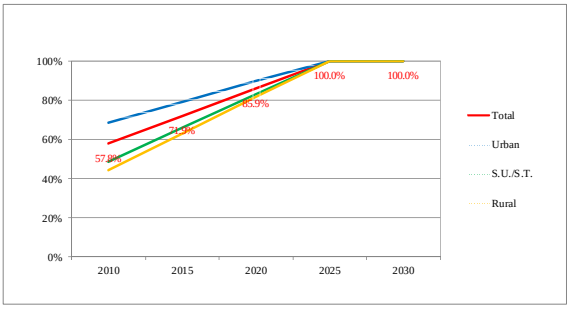


Figure 32-3 Water Supply Coverage by Settlement Category

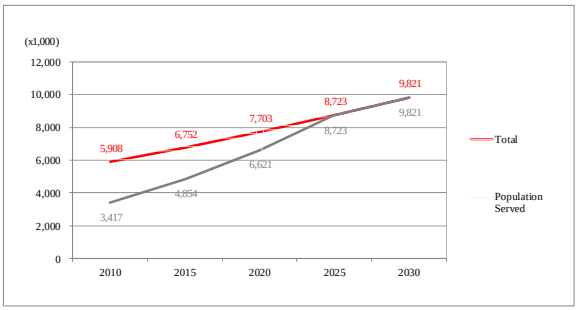


Figure 32-4 Population and Population Served

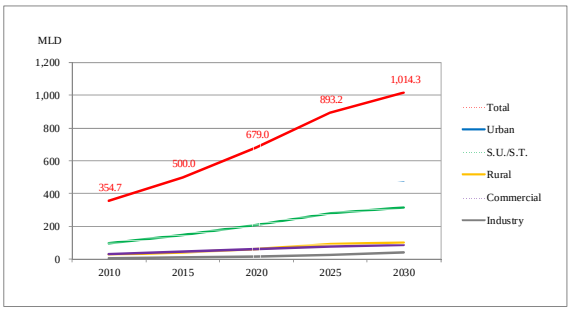


Figure 32-5 Water Demand Growth by Water Use Category

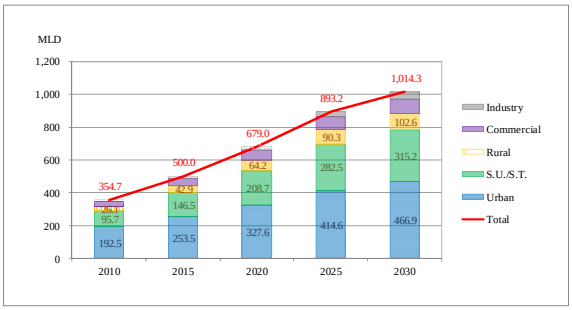


Figure 32-6 Water Demand Growth with Distribution of Water Use Category

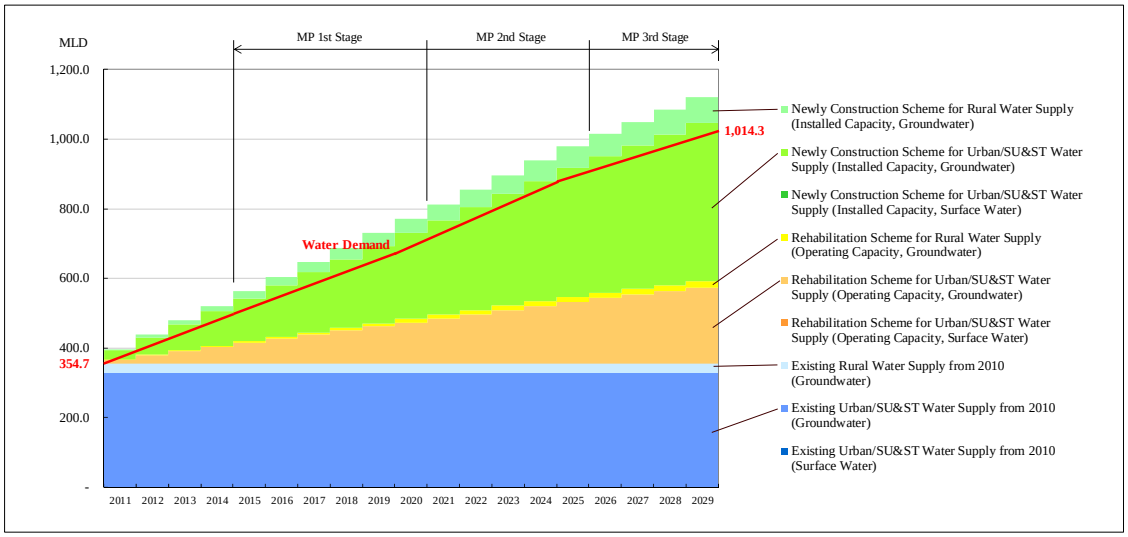


Figure 32-7 Demand and Supply in Water Supply Development Plan for Facility Planning

Source: JICA Project Team

Figure 5.1-1 Demand and Supply in Water Supply Development Plan for Facility Planning (33/38)

33. Sokoto

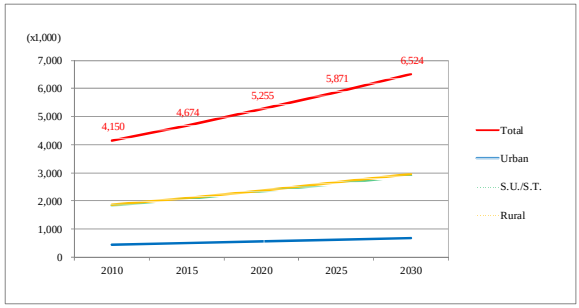


Figure 33-1 Population Growth by Settlement Category

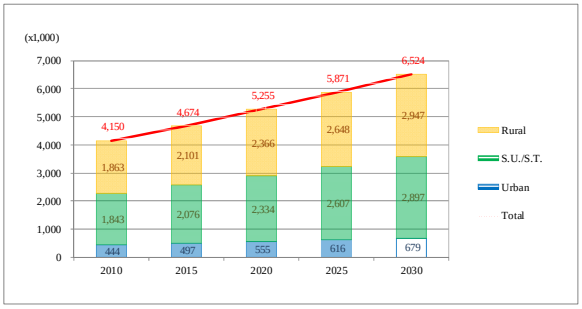


Figure 33-2 Population Growth with Distribution of Settlement Category

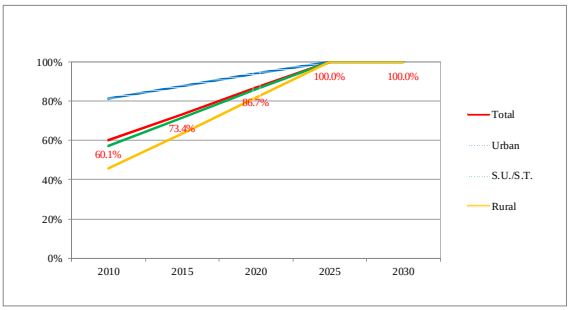


Figure 33-3 Water Supply Coverage by Settlement Category

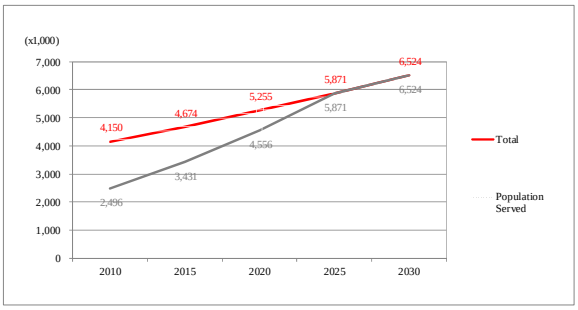


Figure 33-4 Population and Population Served

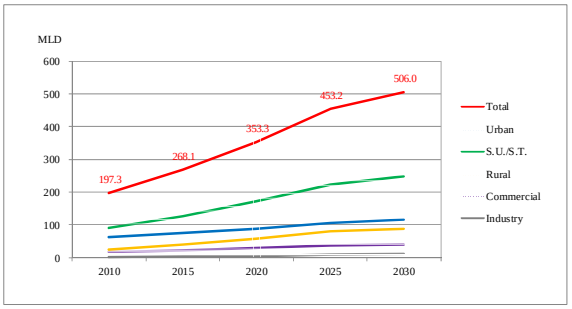


Figure 33-5 Water Demand Growth by Water Use Category

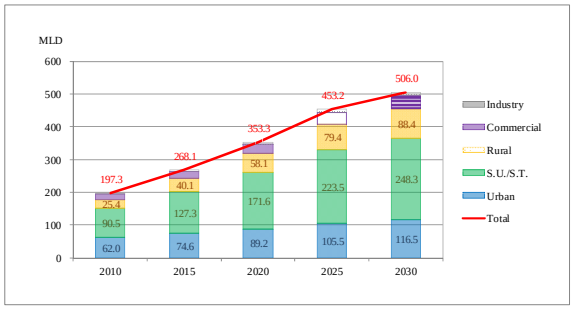


Figure 33-6 Water Demand Growth with Distribution of Water Use Category

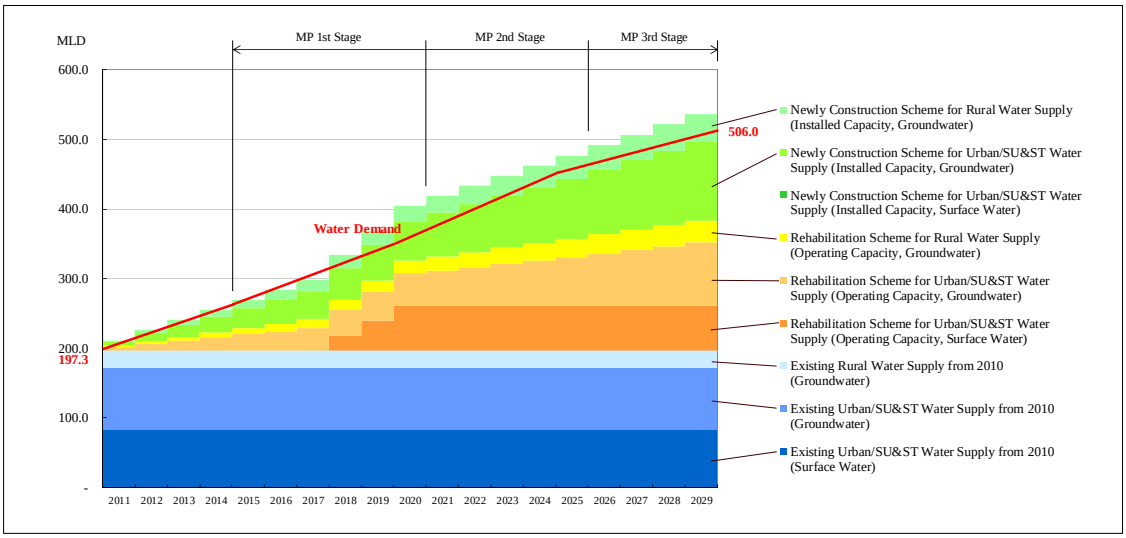


Figure 33-7 Demand and Supply in Water Supply Development Plan for Facility Planning

Source: JICA Project Team

Figure 5.1-1 Demand and Supply in Water Supply Development Plan for Facility Planning (34/38)

34. Taraba

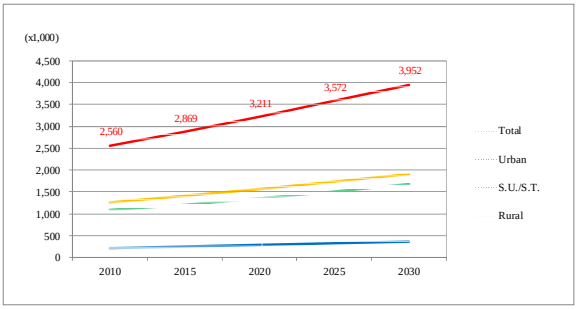


Figure 34-1 Population Growth by Settlement Category

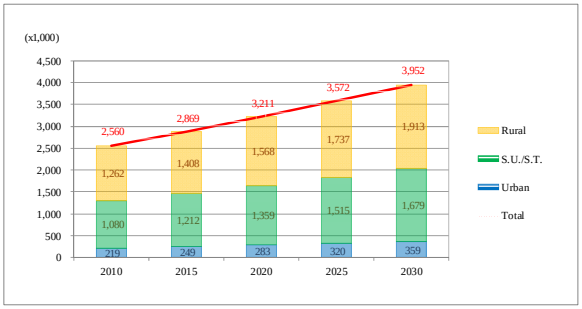


Figure 34-2 Population Growth with Distribution of Settlement Category

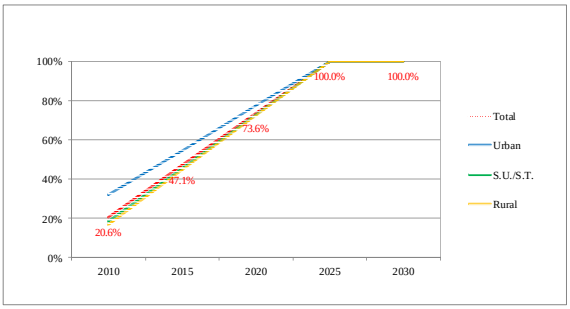


Figure 34-3 Water Supply Coverage by Settlement Category

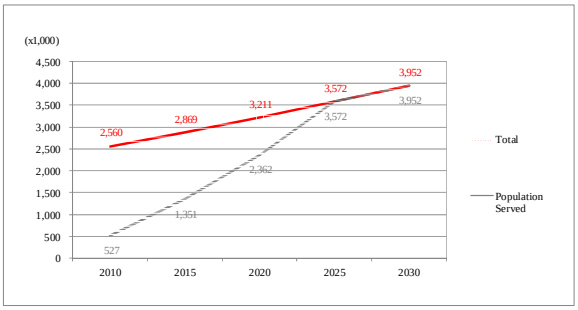


Figure 34-4 Population and Population Served

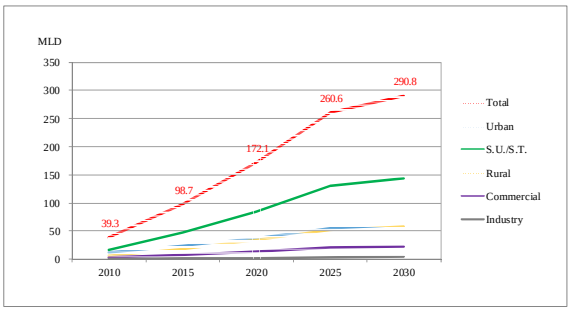


Figure 34-5 Water Demand Growth by Water Use Category

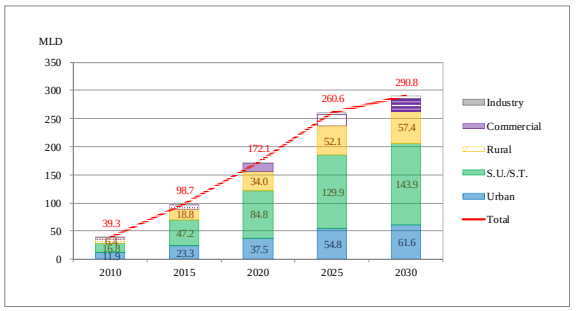


Figure 34-6 Water Demand Growth with Distribution of Water Use Category

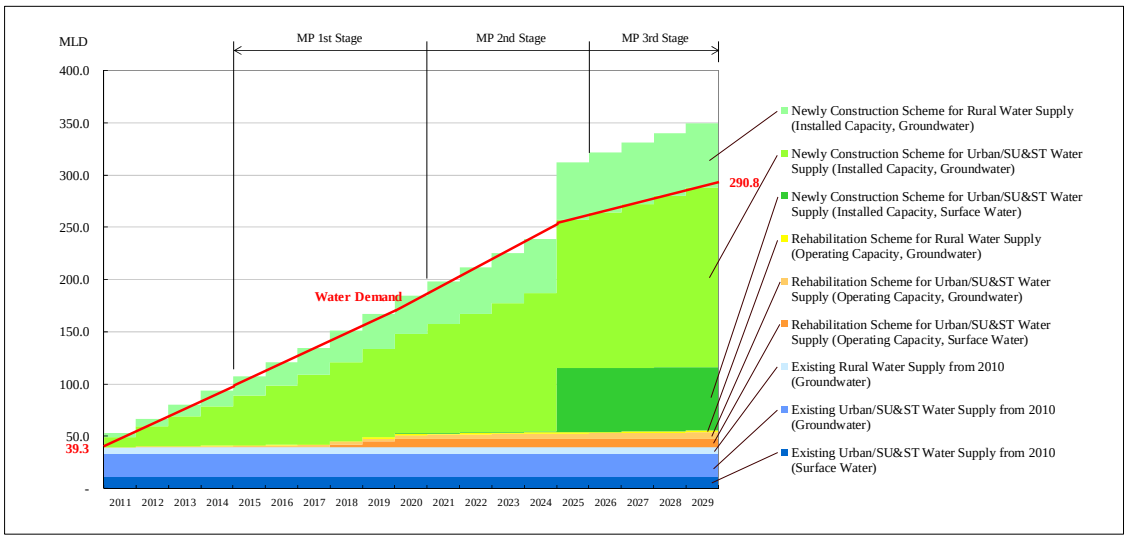


Figure 34-7 Demand and Supply in Water Supply Development Plan for Facility Planning

Source: JICA Project Team

Figure 5.1-1 Demand and Supply in Water Supply Development Plan for Facility Planning (35/38)

35. Yobe

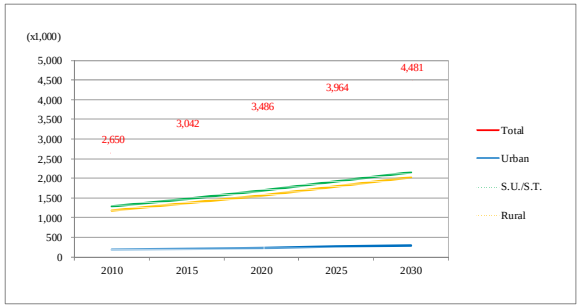


Figure 35-1 Population Growth by Settlement Category

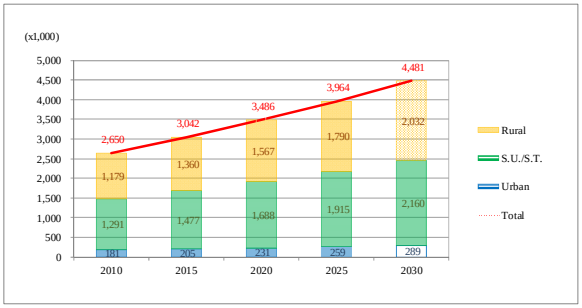


Figure 35-2 Population Growth with Distribution of Settlement Category

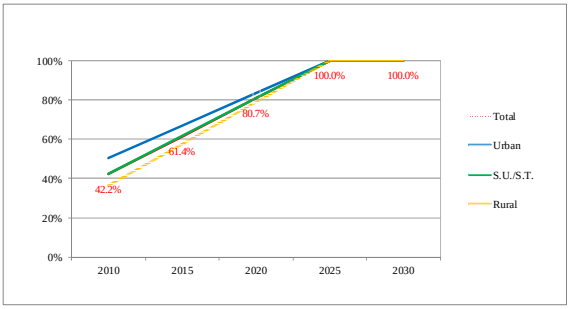


Figure 35-3 Water Supply Coverage by Settlement Category

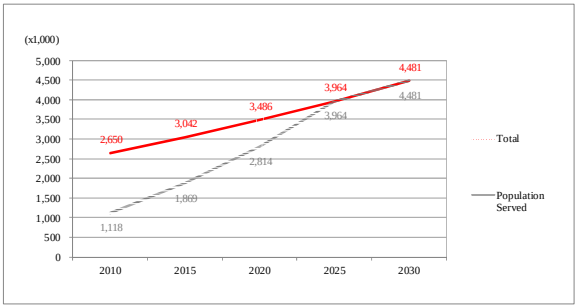


Figure 35-4 Population and Population Served

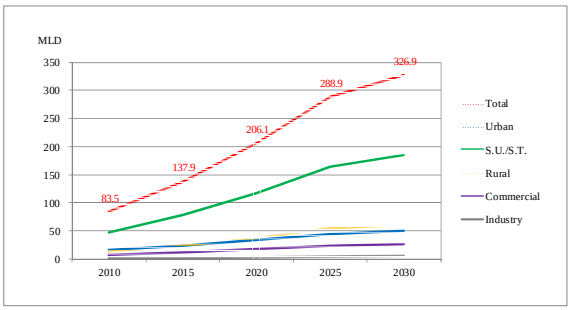


Figure 35-5 Water Demand Growth by Water Use Category

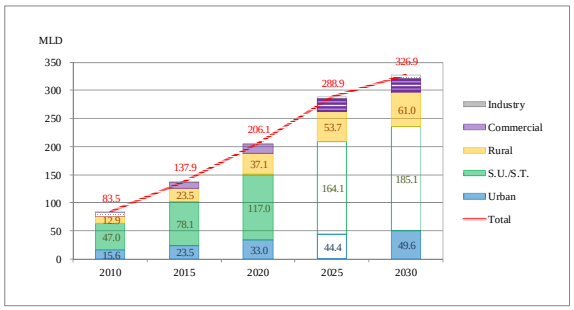


Figure 35-6 Water Demand Growth with Distribution of Water Use Category

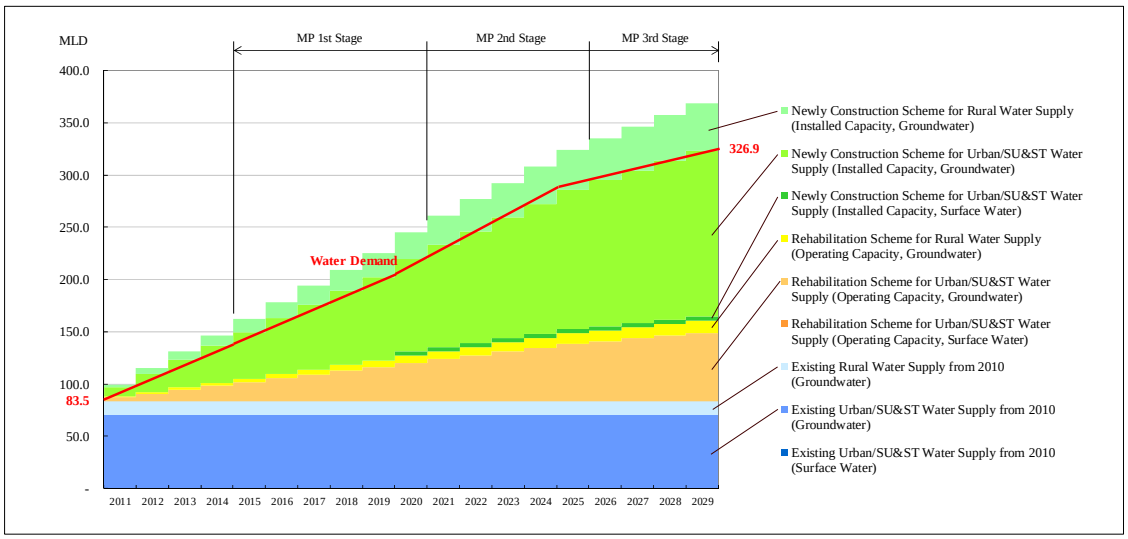


Figure 35-7 Demand and Supply in Water Supply Development Plan for Facility Planning

Source: JICA Project Team

Figure 5.1-1 Demand and Supply in Water Supply Development Plan for Facility Planning (36/38)

36. Zamfara

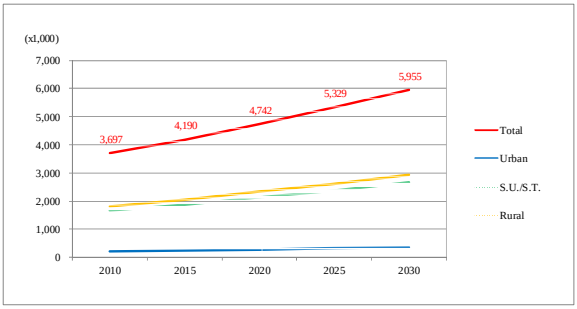


Figure 36-1 Population Growth by Settlement Category

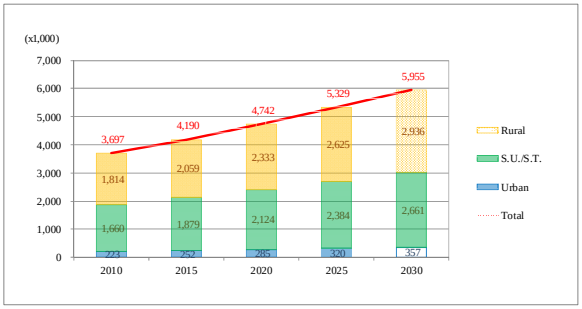


Figure 36-2 Population Growth with Distribution of Settlement Category

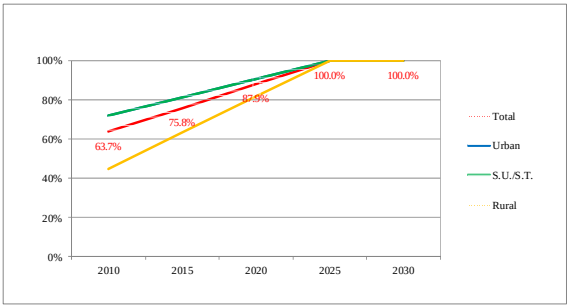


Figure 36-3 Water Supply Coverage by Settlement Category

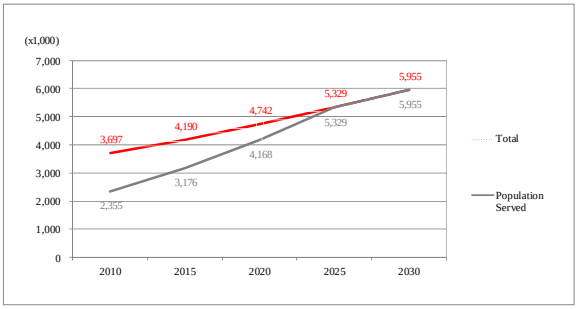


Figure 36-4 Population and Population Served

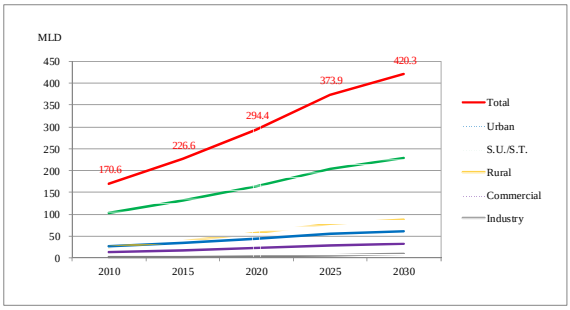


Figure 36-5 Water Demand Growth by Water Use Category

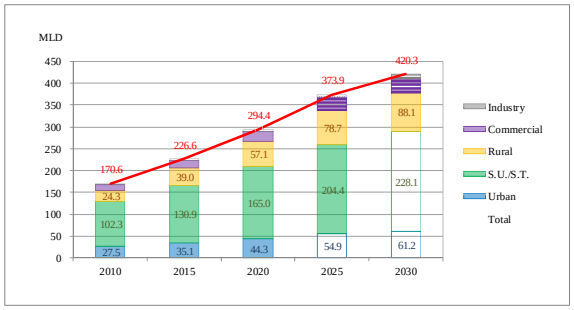


Figure 36-6 Water Demand Growth with Distribution of Water Use Category

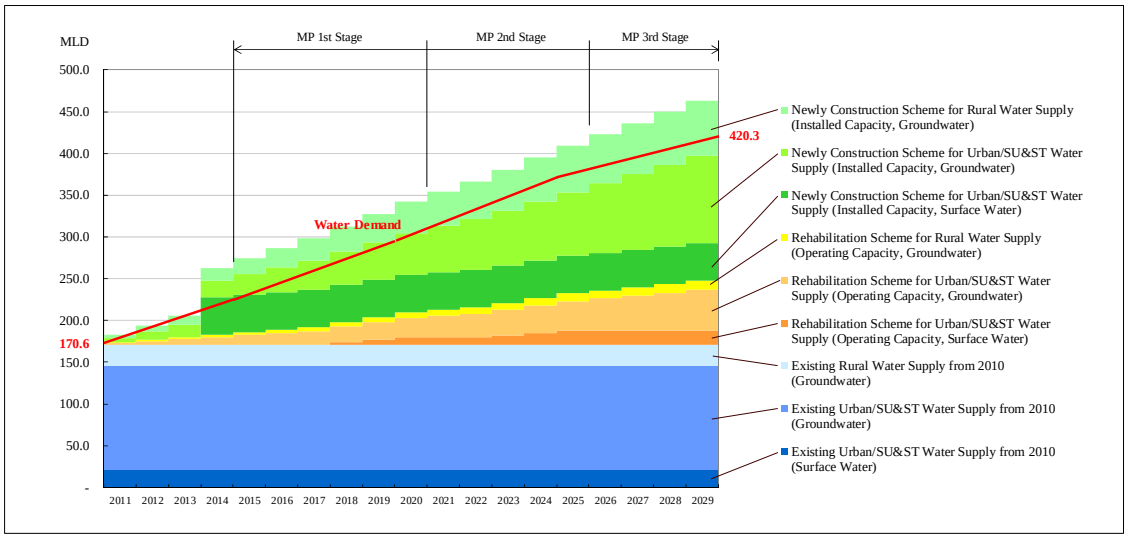


Figure 36-7 Demand and Supply in Water Supply Development Plan for Facility Planning

Source: JICA Project Team

Figure 5.1-1 Demand and Supply in Water Supply Development Plan for Facility Planning (37/38)

37. FCT Abuja

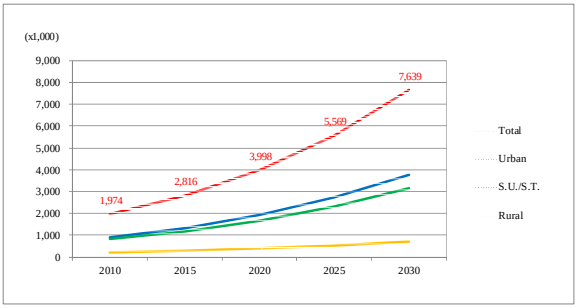


Figure 37-1 Population Growth by Settlement Category

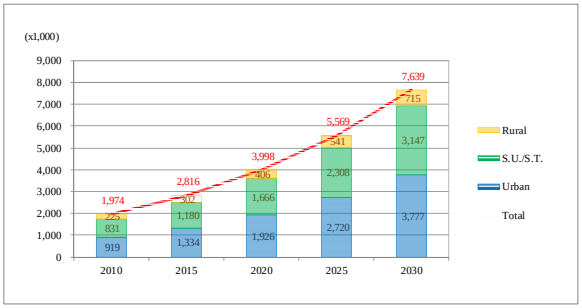


Figure 37-2 Population Growth with Distribution of Settlement Category

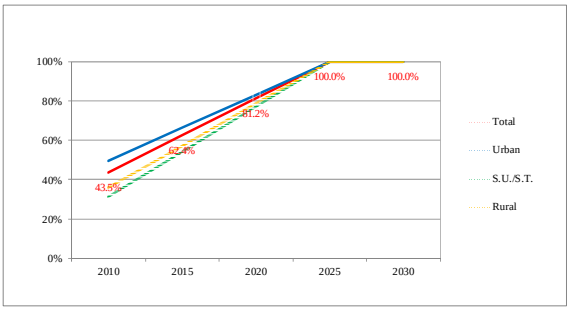


Figure 37-3 Water Supply Coverage by Settlement Category

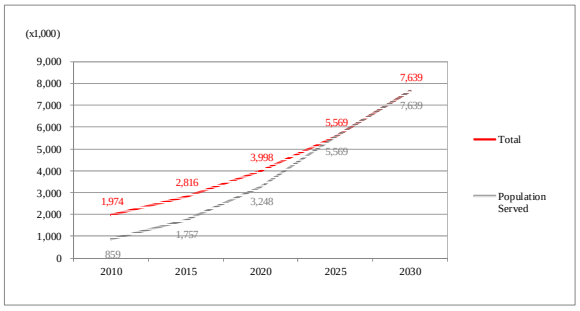


Figure 37-4 Population and Population Served

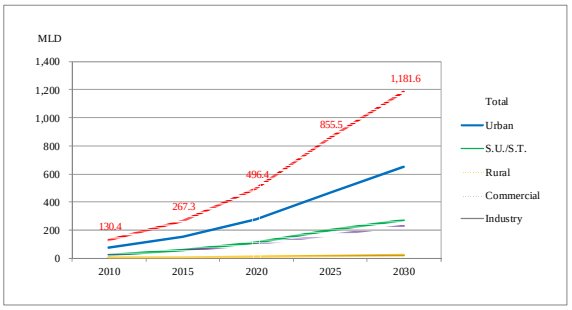


Figure 37-5 Water Demand Growth by Water Use Category

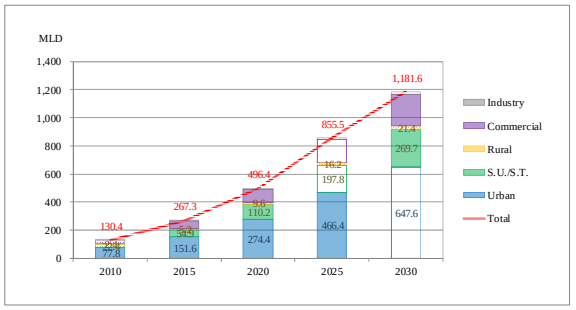


Figure 37-6 Water Demand Growth with Distribution of Water Use Category

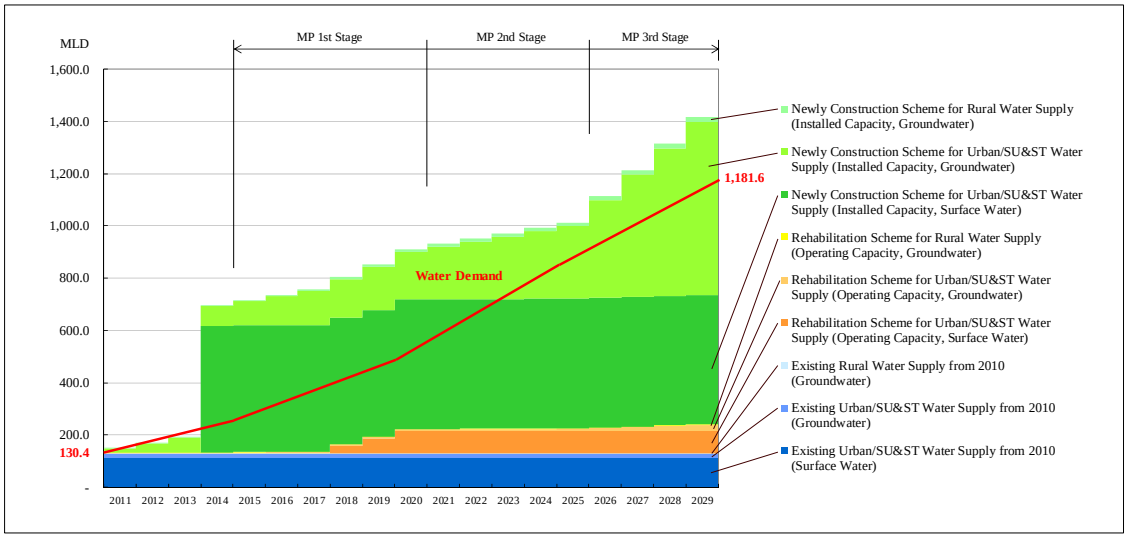


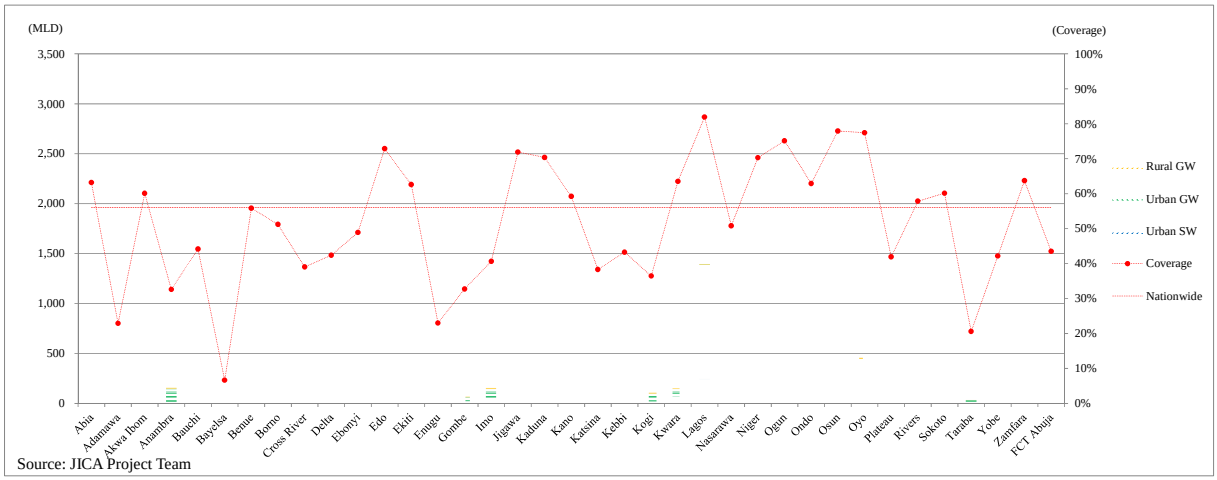
Figure 37-7 Demand and Supply in Water Supply Development Plan for Facility Planning

Source: JICA Project Team

Figure 5.1-1 Demand and Supply in Water Supply Development Plan for Facility Planning (38/38)

(2) Water Supply in 2010

Figure SR5.1-2 shows water supply in 2010.

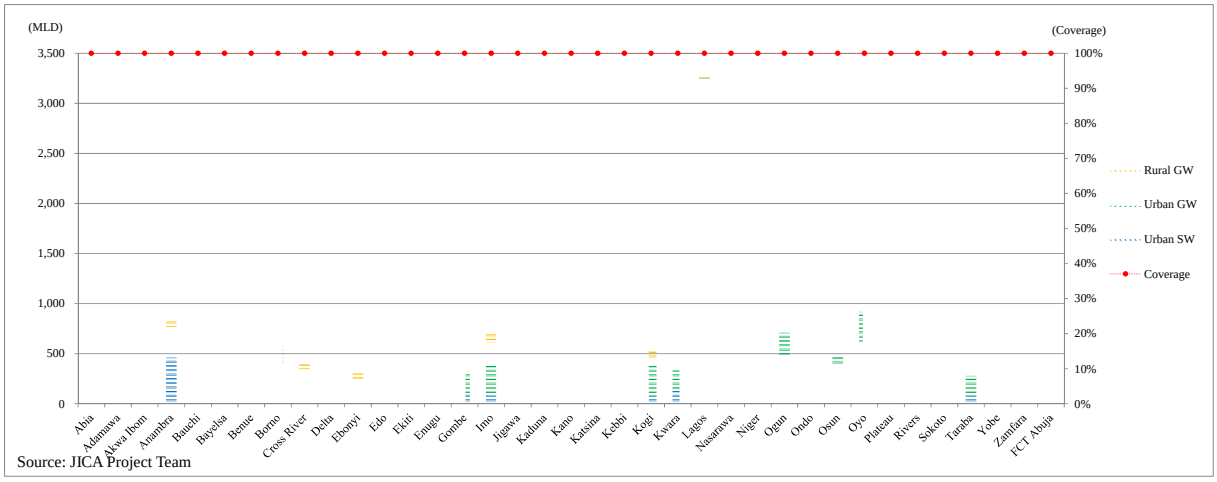


Source: JICA Project Team

Figure SR5.1-2 Water Supply in 2010

(3) Water Supply in 2030

Figure SR5.1-3 shows water supply in 2030.

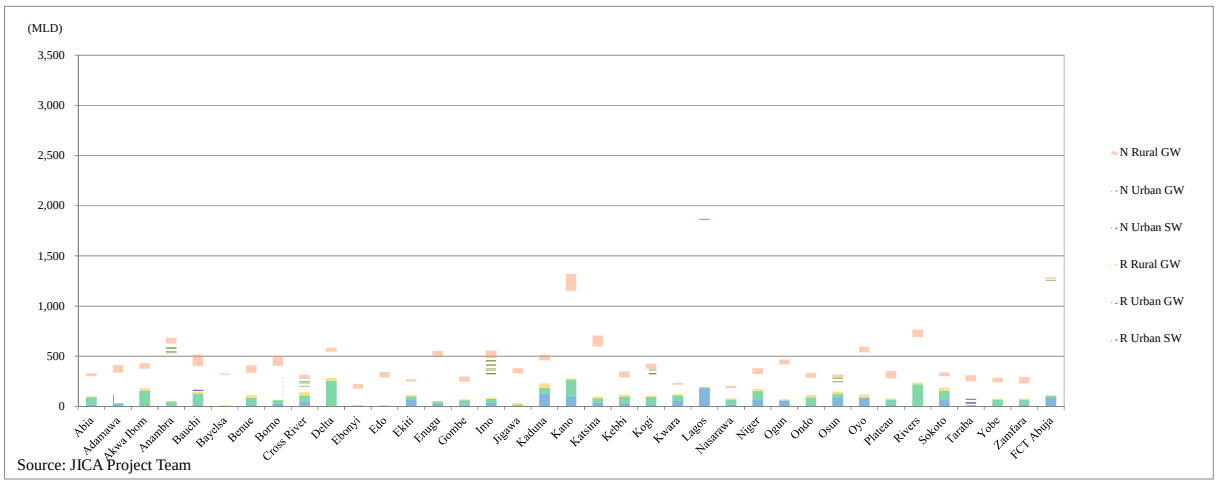


Source: JICA Project Team

Figure SR5.1-3 Water Supply in 2030

(4) Water Demand Increase from 2010 to 2030

Figure SR5.1-4 shows water supply increase from 2010 to 2030.

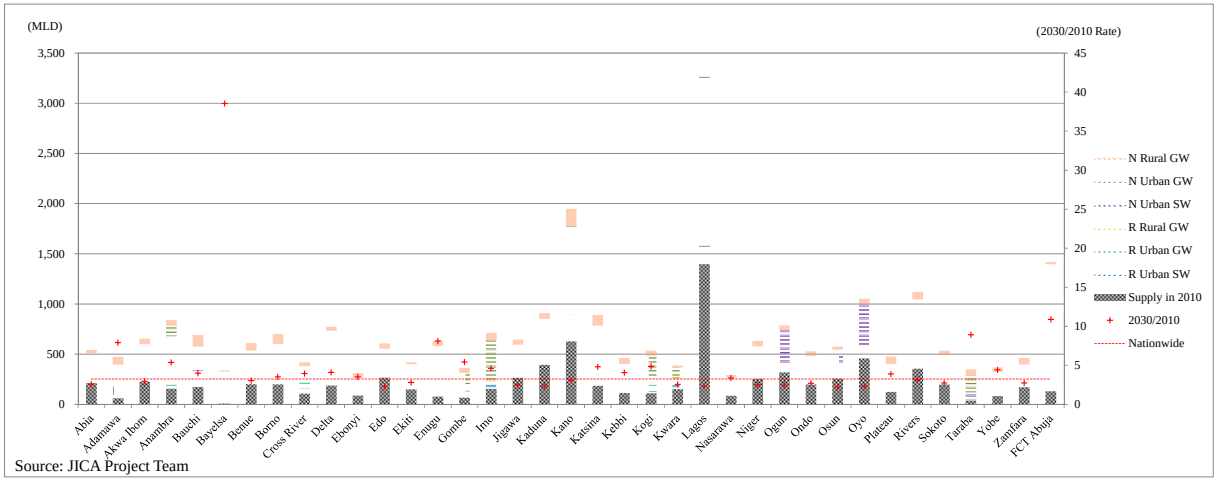


Source: JICA Project Team

Figure SR5.1-4 Water Supply Increase from 2010 to 2030

(5) Water Supply Increase Ratio

Figure SR5.1-5 shows water supply increase (2030/2010) ratio.

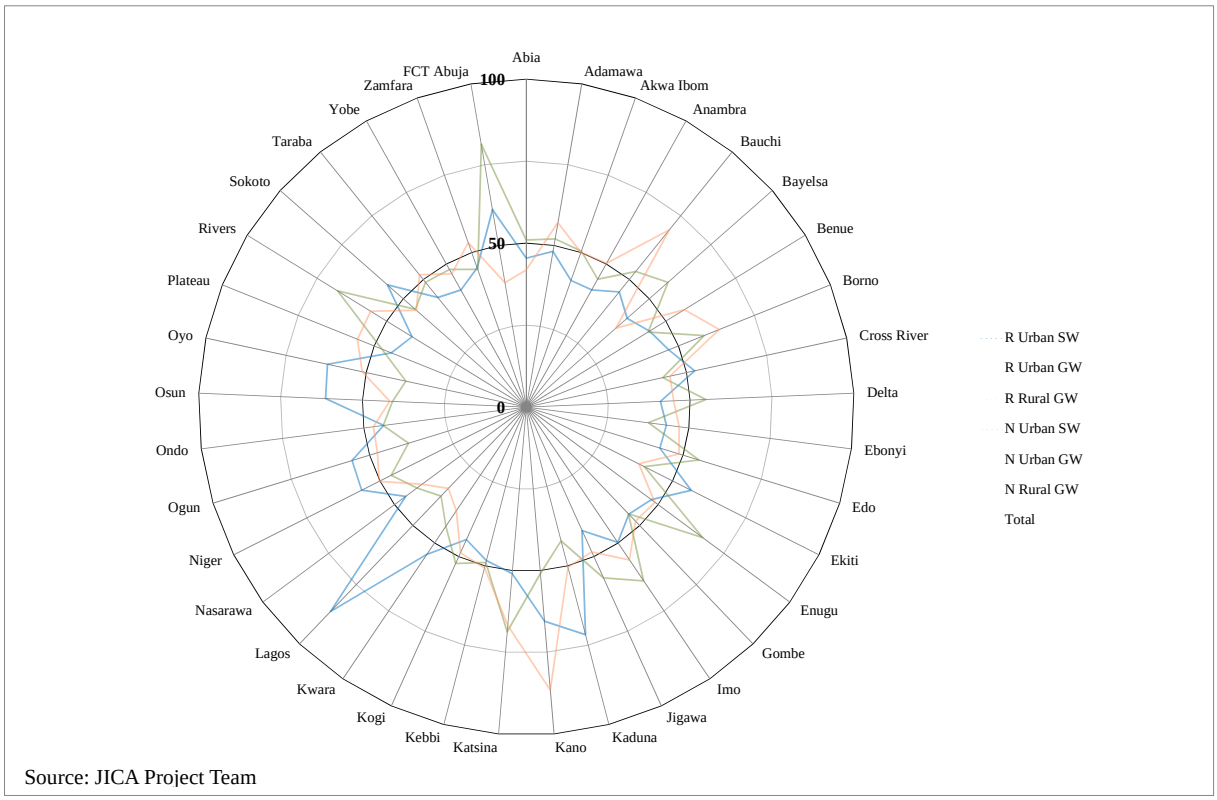


Source: JICA Project Team

Figure SR5.1-5 Water Supply Increase (2030/2010) Ratio

(6) Deviation Score of Water Supply Increase

Figure SR5.1-6 shows deviation score of water supply increase from 2010 to 2030 among states for reference.



Source: JICA Project Team

Figure SR5.1-6 Deviation Score of Water Supply Increase from 2010 to 2030

SR5.1.3 Sanitation Development Plan

(1) Sanitation Development Plan of All States

To meet the future sanitation demand projected in the Project, the Project calculates state-wise sanitation development in the target year 2030, as shown in Table SR5.1-6.

On the other hand, the Project estimates required development of domestic sanitation facilities (toilet or latrine) in the target period of sanitation development plan from 2015 to 2030, as shown in Table SR5.1-7 and SR5.1-8.

Table SR5.1-6 Sanitation Development Plan

		Sanitation Development Pre-MP Period (2010-2014)						Sanitation Development MP Period (2015-2030)						Total Sanitation Development until 2030					
		Public Toilet (Nos)		Final Septage	Sewarage	Hygiene Promotion (for HH)		Public Toilet (Nos)		Final Septage	Sewarage	Hygiene Promotion (for HH)		Public Toilet (Nos)		Final Septage	Sewarage	Hygiene Promotion (for HH)	
		Urban	SU/ST	Facility/Site (for HH)	System (m3)	SU/ST	Rural	Urban	SU/ST	Facility/Site (for HH)	System (m3)	SU/ST	Rural	Urban	SU/ST	Facility/Site (for HH)	System (m3)	SU/ST	Rural
1	Abia	-	-	-	-	70,250	53,834	244	202	320,553	-	328,704	252,680	244	202	320,553	-	398,953	306,514
2	Adamawa	-	-	-	-	65,973	64,998	83	252	69,150	-	293,810	298,581	83	252	69,150	-	359,783	363,579
3	Akwa Ibom	-	-	-	-	89,193	75,649	165	349	160,794	-	431,163	375,587	165	349	160,794	-	520,355	451,236
4	Anambra	-	-	-	-	97,560	56,307	324	344	359,144	-	450,992	265,127	324	344	359,144	-	548,553	321,434
5	Bauchi	-	-	-	-	86,194	93,374	110	392	80,750	-	411,894	454,184	110	392	80,750	-	498,088	547,557
6	Bayelsa	-	-	-	-	55,885	32,941	102	160	103,449	-	256,731	130,900	102	160	103,449	-	312,616	163,841
7	Benue	-	-	-	-	81,944	100,730	127	307	103,975	-	374,302	465,104	127	307	103,975	-	456,246	565,834
8	Borno	-	-	-	-	112,570	86,921	119	410	111,962	-	539,145	442,546	119	410	111,962	-	651,715	529,468
9	Cross River	-	-	-	-	87,574	94,767	110	210	133,195	-	389,870	436,059	110	210	133,195	-	477,444	530,826
10	Delta	-	-	-	-	144,076	106,833	304	341	421,431	-	671,664	518,159	304	341	421,431	-	815,741	624,991
11	Ebonyi	-	-	-	-	50,673	57,336	55	160	51,642	-	224,553	255,756	55	160	51,642	-	275,226	313,092
12	Edo	-	-	-	-	96,705	67,214	227	253	273,572	48,543	436,217	311,417	227	253	273,572	48,543	532,922	378,631
13	Ekiti	-	-	-	-	102,183	78,504	134	206	208,000	-	472,802	359,108	134	206	208,000	-	574,985	437,612
14	Enugu	-	-	-	-	105,649	76,634	221	269	276,150	-	484,652	349,444	221	269	276,150	-	590,301	426,078
15	Gombe	-	-	-	-	44,136	40,003	61	211	51,280	-	212,783	195,370	61	211	51,280	-	256,919	235,373
16	Imo	-	-	-	-	74,778	76,045	241	294	267,478	-	365,333	368,017	241	294	267,478	-	440,111	444,062
17	Jigawa	-	-	-	-	85,121	79,565	127	357	97,300	-	386,298	356,174	127	357	97,300	-	471,419	435,740
18	Kaduna	-	-	-	-	66,815	66,243	238	478	114,231	-	306,735	322,851	238	478	114,231	-	373,550	389,094
19	Kano	-	-	-	-	142,945	100,307	404	915	310,485	-	721,504	511,708	404	915	310,485	-	864,449	612,015
20	Katsina	-	-	-	-	97,727	92,869	172	481	142,917	-	463,689	440,064	172	481	142,917	-	561,415	532,934
21	Kebbi	-	-	-	-	30,932	35,398	82	256	37,206	-	148,063	167,653	82	256	37,206	-	178,995	203,051
22	Kogi	-	-	-	-	122,288	94,836	115	296	146,718	-	555,069	435,183	115	296	146,718	-	677,357	530,020
23	Kwara	-	-	-	-	87,556	56,353	106	212	125,321	-	382,879	274,186	106	212	125,321	-	470,435	330,539
24	Lagos	-	-	-	-	290,879	28,873	1,688	763	2,092,658	239,273	1,437,537	102,557	1,688	763	2,092,658	239,273	1,728,416	131,430
25	Nasarawa	-	-	-	-	36,319	32,644	70	156	60,982	-	169,552	153,854	70	156	60,982	-	205,872	186,498
26	Niger	-	-	-	-	107,664	98,764	154	350	160,094	-	521,053	479,776	154	350	160,094	-	628,718	578,539
27	Ogun	-	-	-	-	166,050	109,226	311	324	484,781	-	766,513	515,919	311	324	484,781	-	932,563	625,145
28	Ondo	-	-	-	-	108,393	125,837	150	245	202,216	-	491,010	577,426	150	245	202,216	-	599,404	703,263
29	Osun	-	-	-	-	105,656	111,159	197	253	244,859	11,042	488,501	525,804	197	253	244,859	11,042	594,157	636,962
30	Oyo	-	-	-	-	191,761	161,653	374	446	462,706	34,109	870,682	824,239	374	446	462,706	34,109	1,062,443	985,892
31	Plateau	-	-	-	-	72,366	71,924	110	246	95,737	-	319,038	337,324	110	246	95,737	-	391,404	409,249
32	Rivers	-	-	-	-	129,643	115,090	545	368	619,000	-	603,678	574,595	545	368	619,000	-	733,321	689,685
33	Sokoto	-	-	-	-	63,682	64,687	136	290	135,867	-	307,582	314,209	136	290	135,867	-	371,264	378,896
34	Taraba	-	-	-	-	54,058	62,645	72	168	67,811	-	243,446	275,733	72	168	67,811	-	297,504	338,378
35	Yobe	-	-	-	-	55,872	51,810	58	216	52,555	-	272,474	259,008	58	216	52,555	-	328,346	310,818
36	Zamfara	-	-	-	-	70,259	77,154	72	267	64,955	-	330,637	366,016	72	267	64,955	-	400,896	443,169
37	FCT Abuja	-	-	-	-	58,281	14,179	756	315	614,821	140,300	520,160	114,488	756	315	614,821	140,300	578,440	128,667
	Total	**-**	**-**	**-**	**-**	**3,509,608**	**2,813,306**	**8,564**	**11,762**	**9,325,745**	**473,266**	**16,650,716**	**13,406,807**	**8,564**	**11,762**	**9,325,745**	**473,266**	**20,160,324**	**16,220,113**

Source: JICA Project Team

Table SR5.1-7 Required Development of Domestic Sanitation Facilities (Population-Basis)

		Population by Settement Category in 2010				Population with Improved Sanitation in 2010				Pop. with Improved Sani. in Pre-MP Period (2011-14)				Pop. with Improved Sani. in MP Period (2015-30)				Total Population with Improved Sanitation in 2030			
		Urban	SU/ST	Rural	Total	Urban	SU/ST	Rural	Total	Urban	SU/ST	Rural	Total	Urban	SU/ST	Rural	Total	Urban	SU/ST	Rural	Total
1	Abia	903	1,279	974	3,157	350	495	377	1,222	169	267	205	640	700	1,249	960	2,909	1,218	2,011	1,542	4,771
2	Adamawa	280	1,656	1,606	3,543	60	353	342	755	66	396	390	852	289	1,763	1,791	3,843	415	2,511	2,524	5,450
3	Akwa Ibom	504	2,138	1,784	4,427	197	834	696	1,727	107	455	386	948	516	2,199	1,915	4,630	820	3,488	2,997	7,305
4	Anambra	1,126	2,248	1,268	4,642	486	971	548	2,005	209	439	253	901	921	2,029	1,193	4,143	1,616	3,439	1,994	7,050
5	Bauchi	345	2,384	2,555	5,284	77	529	567	1,173	84	586	635	1,305	389	2,801	3,088	6,278	549	3,916	4,291	8,756
6	Bayelsa	288	998	616	1,902	18	61	38	116	82	274	161	517	408	1,258	641	2,307	507	1,593	840	2,940
7	Benue	436	1,949	2,383	4,767	63	283	346	691	108	500	614	1,223	463	2,283	2,837	5,583	634	3,066	3,797	7,497
8	Borno	406	2,496	1,850	4,751	104	639	473	1,216	91	597	461	1,149	398	2,857	2,345	5,601	593	4,093	3,280	7,966
9	Cross River	403	1,365	1,457	3,225	41	138	147	326	101	359	389	849	404	1,598	1,788	3,790	546	2,095	2,324	4,965
10	Delta	966	2,127	1,548	4,641	211	464	337	1,012	234	519	385	1,137	1,073	2,418	1,865	5,356	1,517	3,400	2,587	7,505
11	Ebonyi	189	1,049	1,182	2,420	25	137	155	317	48	269	304	620	201	1,190	1,356	2,747	274	1,596	1,814	3,684
12	Edo	802	1,658	1,129	3,589	240	496	338	1,073	171	367	255	794	724	1,658	1,183	3,565	1,135	2,521	1,776	5,432
13	Ekiti	408	1,291	997	2,696	68	216	167	450	105	327	251	683	493	1,513	1,149	3,155	666	2,056	1,567	4,288
14	Enugu	712	1,705	1,241	3,658	134	321	233	688	176	423	307	905	795	1,939	1,398	4,131	1,105	2,682	1,938	5,724
15	Gombe	190	1,305	1,175	2,670	85	585	526	1,196	38	260	236	534	180	1,255	1,153	2,588	303	2,101	1,915	4,318
16	Imo	736	1,823	1,868	4,427	387	959	983	2,329	137	337	342	816	680	1,644	1,656	3,980	1,204	2,939	2,981	7,124
17	Jigawa	391	2,304	2,169	4,864	85	502	473	1,060	96	553	517	1,166	451	2,511	2,315	5,277	632	3,566	3,305	7,504
18	Kaduna	877	3,076	2,909	6,861	253	889	841	1,983	183	695	689	1,567	751	3,190	3,358	7,299	1,188	4,774	4,887	10,849
19	Kano	1,238	5,576	3,849	10,663	784	3,530	2,436	6,750	205	929	652	1,786	1,029	4,690	3,326	9,045	2,018	9,149	6,414	17,581
20	Katsina	530	3,062	2,911	6,503	249	1,439	1,368	3,056	104	586	557	1,247	505	2,782	2,640	5,927	858	4,808	4,566	10,231
21	Kebbi	247	1,588	1,833	3,668	95	608	702	1,405	53	337	386	776	258	1,614	1,827	3,699	406	2,559	2,915	5,880
22	Kogi	359	1,894	1,460	3,713	59	311	239	609	91	477	370	938	422	2,165	1,697	4,284	572	2,952	2,307	5,831
23	Kwara	377	1,402	864	2,643	36	135	83	254	96	368	237	701	394	1,608	1,152	3,153	526	2,110	1,471	4,108
24	Lagos	5,314	4,452	528	10,293	1,265	1,059	126	2,450	1,269	1,105	110	2,484	5,904	5,463	390	11,756	8,438	7,627	625	16,690
25	Nasarawa	217	994	886	2,096	83	380	338	801	46	207	186	439	219	966	877	2,062	348	1,553	1,401	3,302
26	Niger	475	2,097	1,924	4,496	109	480	441	1,030	116	517	474	1,107	544	2,501	2,303	5,348	768	3,498	3,218	7,484
27	Ogun	895	2,030	1,323	4,247	112	254	165	531	242	531	350	1,123	1,198	2,453	1,651	5,302	1,551	3,238	2,166	6,955
28	Ondo	488	1,572	1,815	3,875	72	231	267	570	124	401	466	990	553	1,817	2,136	4,506	748	2,449	2,869	6,066
29	Osun	621	1,585	1,649	3,854	83	211	219	513	161	412	434	1,007	739	1,905	2,051	4,695	983	2,528	2,703	6,214
30	Oyo	1,226	2,834	2,268	6,328	87	201	161	449	328	767	647	1,742	1,452	3,483	3,297	8,232	1,867	4,451	4,105	10,423
31	Plateau	388	1,626	1,567	3,581	54	224	216	494	96	412	410	918	396	1,819	1,923	4,138	546	2,455	2,549	5,550
32	Rivers	1,642	2,298	1,968	5,908	322	450	386	1,158	413	570	506	1,490	1,989	2,656	2,528	7,173	2,724	3,677	3,420	9,821
33	Sokoto	444	1,843	1,863	4,150	251	1,041	1,053	2,345	75	318	323	717	353	1,538	1,571	3,462	679	2,897	2,947	6,524
34	Taraba	219	1,080	1,262	2,560	21	103	120	243	59	287	332	678	280	1,290	1,461	3,031	359	1,679	1,913	3,952
35	Yobe	181	1,291	1,179	2,650	50	354	323	726	42	307	285	634	197	1,499	1,425	3,121	289	2,160	2,032	4,481
36	Zamfara	223	1,660	1,814	3,697	61	456	499	1,017	52	386	424	863	244	1,819	2,013	4,076	357	2,661	2,936	5,955
37	FCT Abuja	919	831	225	1,974	345	312	84	742	329	286	69	684	3,103	2,549	561	6,212	3,777	3,147	715	7,639
Total (x1,000)		**25,964**	**72,562**	**59,897**	**158,423**	**7,018**	**20,649**	**16,812**	**44,479**	**6,105**	**16,827**	**13,997**	**36,928**	**29,614**	**79,971**	**66,823**	**176,407**	**42,736**	**117,447**	**97,632**	**257,815**

Source: JICA Project Team

Ta Table SR5.1-8 Required Development of Domestic Sanitation Facilities (Household-Basis = Toilet/Latrine-Basis)

		HH by Settement Category in 2010				HH with Improved Sanitation in 2010				HH with Improved Sani. in Pre-MP Period (2011-14)				HH with Improved Sani. in MP Period (2015-30)				Total HH with Improved Sanitation in 2030			
		Urban	SU/ST	Rural	Total	Urban	SU/ST	Rural	Total	Urban	SU/ST	Rural	Total	Urban	SU/ST	Rural	Total	Urban	SU/ST	Rural	Total
1	Abia	237.8	336.7	256.4	830.8	92.0	130.3	99.2	321.5	44.4	70.2	53.8	168.5	184.1	328.7	252.7	765.5	320.6	529.3	405.7	1,255.5
2	Adamawa	46.7	276.0	267.7	590.5	10.0	58.8	57.0	125.8	11.1	66.0	65.0	142.0	48.1	293.8	298.6	640.5	69.2	418.6	420.6	908.3
3	Akwa Ibom	98.9	419.3	349.9	868.0	38.6	163.5	136.5	338.5	21.1	89.2	75.6	185.9	101.2	431.2	375.6	907.9	160.8	683.9	587.7	1,432.4
4	Anambra	250.2	499.5	281.9	1,031.6	108.1	215.8	121.8	445.6	46.5	97.6	56.3	200.3	204.6	451.0	265.1	920.7	359.1	764.3	443.2	1,566.7
5	Bauchi	50.7	350.6	375.8	777.1	11.3	77.8	83.4	172.5	12.3	86.2	93.4	191.9	57.2	411.9	454.2	923.3	80.8	575.9	631.0	1,287.6
6	Bayelsa	58.8	203.7	125.7	388.2	3.6	12.4	7.7	23.7	16.7	55.9	32.9	105.5	83.2	256.7	130.9	470.8	103.4	325.0	171.5	600.0
7	Benue	71.4	319.4	390.6	781.5	10.4	46.3	56.6	113.3	17.8	81.9	100.7	200.4	75.9	374.3	465.1	915.3	104.0	502.6	622.5	1,229.0
8	Borno	76.6	470.9	349.0	896.4	19.6	120.5	89.3	229.5	17.2	112.6	86.9	216.7	75.1	539.1	442.5	1,056.8	112.0	772.3	618.8	1,503.0
9	Cross River	98.4	333.0	355.3	786.6	9.9	33.6	35.9	79.4	24.7	87.6	94.8	207.1	98.5	389.9	436.1	924.5	133.2	511.1	566.7	1,211.0
10	Delta	268.3	591.0	430.0	1,289.2	58.5	128.8	93.7	281.0	64.9	144.1	106.8	315.8	298.0	671.7	518.2	1,487.9	421.4	944.6	718.7	2,084.7
11	Ebonyi	35.7	197.8	223.0	456.6	4.7	25.9	29.2	59.8	9.0	50.7	57.3	117.0	38.0	224.6	255.8	518.3	51.6	301.1	342.3	695.1
12	Edo	210.9	436.4	297.1	944.5	63.1	130.5	88.8	282.4	44.9	96.7	67.2	208.8	190.6	436.2	311.4	938.3	298.6	663.4	467.5	1,429.5
13	Ekiti	127.5	403.3	311.6	842.5	21.3	67.4	52.0	140.7	32.7	102.2	78.5	213.4	154.0	472.8	359.1	985.9	208.0	642.3	489.7	1,340.0
14	Enugu	178.0	426.3	310.2	914.5	33.5	80.1	58.3	171.9	43.9	105.6	76.6	226.2	198.8	484.7	349.4	1,032.8	276.2	670.5	484.4	1,431.0
15	Gombe	32.2	221.2	199.1	452.5	14.4	99.1	89.2	202.7	6.4	44.1	40.0	90.5	30.4	212.8	195.4	438.6	51.3	356.0	324.6	731.9
16	Imo	163.5	405.1	415.1	983.8	86.0	213.1	218.4	517.5	30.4	74.8	76.0	181.2	151.1	365.3	368.0	884.4	267.5	653.2	662.4	1,583.1
17	Jigawa	60.2	354.4	333.7	748.3	13.1	77.3	72.7	163.1	14.8	85.1	79.6	179.4	69.4	386.3	356.2	811.9	97.3	548.7	508.5	1,154.5
18	Kaduna	84.3	295.7	279.7	659.7	24.4	85.5	80.8	190.7	17.6	66.8	66.2	150.7	72.2	306.7	322.9	701.8	114.2	459.0	469.9	1,043.2
19	Kano	190.5	857.9	592.1	1,640.5	120.6	543.0	374.8	1,038.4	31.5	142.9	100.3	274.8	158.4	721.5	511.7	1,391.6	310.5	1,407.5	986.8	2,704.8
20	Katsina	88.3	510.4	485.2	1,083.8	41.5	239.9	228.0	509.4	17.3	97.7	92.9	207.9	84.1	463.7	440.1	987.9	142.9	801.3	761.0	1,705.2
21	Kebbi	22.7	145.7	168.1	336.5	8.7	55.8	64.4	128.9	4.9	30.9	35.4	71.2	23.6	148.1	167.7	339.4	37.2	234.8	267.4	539.4
22	Kogi	92.1	485.6	374.3	952.1	15.1	79.6	61.4	156.1	23.3	122.3	94.8	240.4	108.3	555.1	435.2	1,098.5	146.7	757.0	591.4	1,495.1
23	Kwara	89.7	333.8	205.8	629.3	8.6	32.0	19.8	60.4	23.0	87.6	56.4	166.9	93.7	382.9	274.2	750.8	125.3	502.5	350.3	978.1
24	Lagos	1,398.3	1,171.5	138.9	2,708.7	332.8	278.8	33.1	644.7	334.0	290.9	28.9	653.8	1,553.6	1,437.5	102.6	3,093.7	2,220.4	2,007.2	164.5	4,392.1
25	Nasarawa	38.0	174.4	155.4	367.7	14.5	66.6	59.3	140.5	8.1	36.3	32.6	77.0	38.4	169.6	153.9	361.8	61.0	272.5	245.8	579.3
26	Niger	99.0	436.8	400.8	936.7	22.7	100.0	91.8	214.5	24.1	107.7	98.8	230.5	113.3	521.1	479.8	1,114.1	160.1	728.8	670.3	1,559.2
27	Ogun	279.6	634.3	413.3	1,327.2	34.9	79.3	51.7	165.9	75.5	166.1	109.2	350.8	374.3	766.5	515.9	1,656.8	484.8	1,011.8	676.8	2,173.4
28	Ondo	131.8	424.9	490.6	1,047.3	19.4	62.5	72.1	154.0	33.4	108.4	125.8	267.7	149.4	491.0	577.4	1,217.9	202.2	661.9	775.4	1,639.5
29	Osun	159.1	406.3	422.8	988.2	21.2	54.0	56.2	131.4	41.3	105.7	111.2	258.1	189.5	488.5	525.8	1,203.8	251.9	648.2	693.2	1,593.3
30	Oyo	306.4	708.6	567.0	1,582.0	21.8	50.3	40.3	112.3	82.0	191.8	161.7	435.4	363.1	870.7	824.2	2,058.0	466.9	1,112.8	1,026.2	2,605.8
31	Plateau	68.1	285.2	274.9	628.2	9.4	39.4	37.9	86.7	16.8	72.4	71.9	161.1	69.5	319.0	337.3	725.9	95.7	430.8	447.2	973.7
32	Rivers	373.1	522.3	447.3	1,342.7	73.1	102.4	87.7	263.2	93.9	129.6	115.1	338.6	452.0	603.7	574.6	1,630.2	619.0	835.7	777.4	2,232.0
33	Sokoto	88.9	368.5	372.6	830.0	50.2	208.2	210.5	469.0	15.0	63.7	64.7	143.3	70.7	307.6	314.2	692.5	135.9	579.5	589.4	1,304.8
34	Taraba	41.3	203.7	238.0	483.0	3.9	19.4	22.6	45.9	11.1	54.1	62.6	127.9	52.7	243.4	275.7	571.9	67.8	316.9	361.0	745.7
35	Yobe	32.9	234.6	214.3	481.8	9.0	64.3	58.7	132.0	7.6	55.9	51.8	115.3	35.9	272.5	259.0	567.4	52.6	392.6	369.5	814.7
36	Zamfara	40.5	301.8	329.9	672.2	11.1	83.0	90.7	184.9	9.4	70.3	77.2	156.8	44.4	330.6	366.0	741.0	65.0	483.9	533.9	1,082.7
37	FCT Abuja	187.5	169.5	45.8	402.9	70.5	63.7	17.2	151.5	67.2	58.3	14.2	139.7	633.2	520.2	114.5	1,267.9	770.9	642.2	145.9	1,559.0
Total (x1,000)		**5,878.0**	**14,915.9**	**11,889.0**	**32,682.9**	**1,511.3**	**3,989.0**	**3,148.9**	**8,649.3**	**1,396**	**3,510**	**2,813**	**7,719**	**6,738.7**	**16,650.7**	**13,406.8**	**36,796.2**	**9,645.8**	**24,149.3**	**19,369.0**	**53,164.2**

Source: JICA Project Team

(2) Household with Imprioved Sanitation in 2010

Figure SR5.1-7 shows household with improved sanitation (number of toilet/latrine) in 2010.

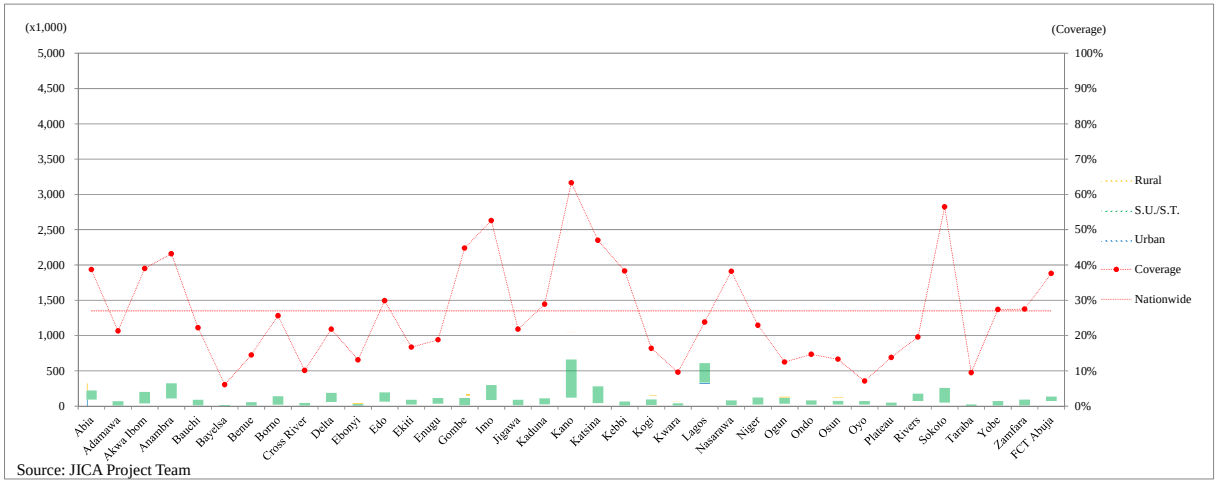


Figure SR5.1-7 Household with Improved Sanitation in 2010

(3) Household with Imprioved Sanitation in 2030

Figure SR5.1-8 shows household with improved sanitation (number of toilet/latrine) in 2030.

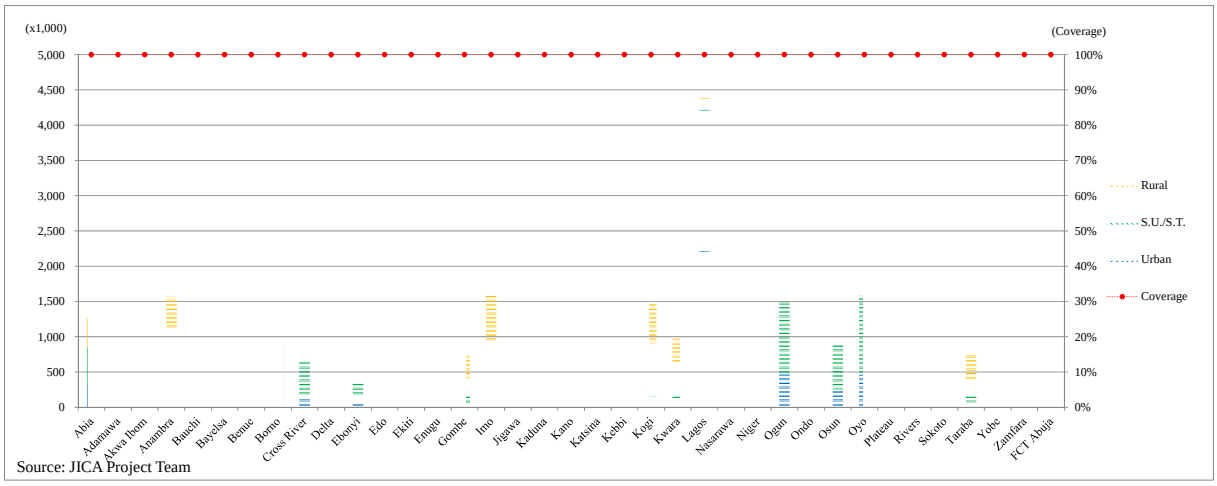


Figure SR5.1-8 Household with Improved Sanitation in 2030

(4) Increase in Improved Sanitation from 2010 to 2030

Figure SR5.1-9 shows increase in improved saniation (toilet/latrine) from 2010 to 2030.

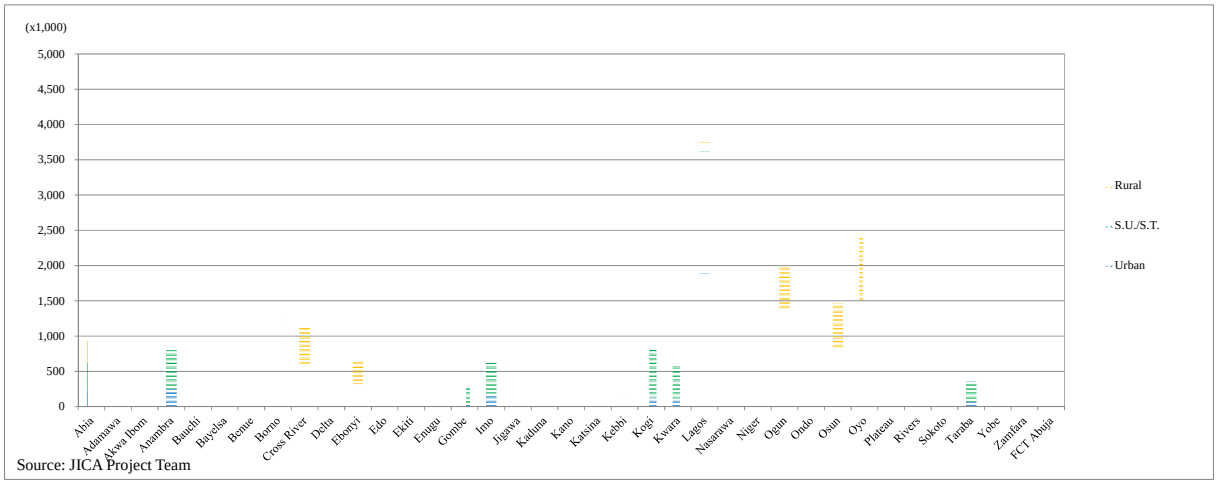
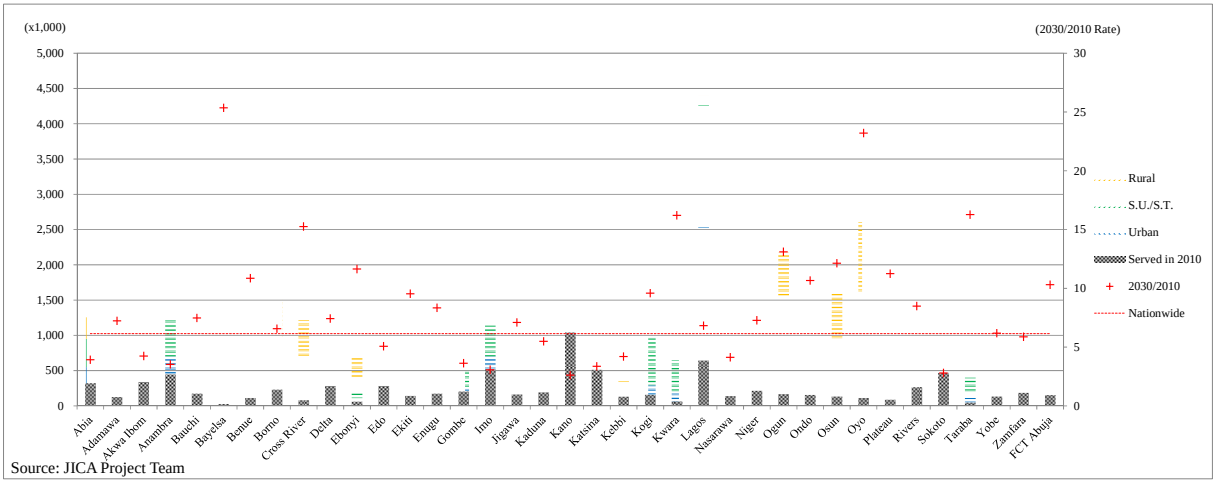


Figure SR5.1-9 Increase in Improved Sanitation from 2010 to 2030

(5) Increase Ratio of Improved Sanitation

Figure SR5.1-10 shows increase (2030/2010) ratio of improved sanitation (toilet/latrine).

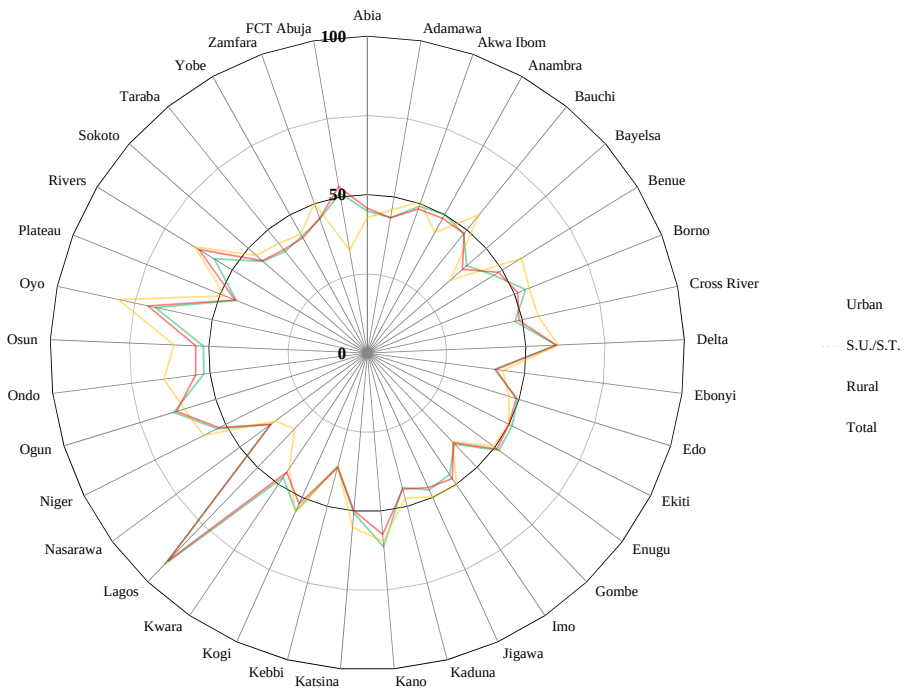


Source: JICA Project Team

Figure SR5.1-10 Increase (2030/2010) Ratio of Improved Sanitation

(6) Deviation Score of Increase in Improved Sanitation

Figure SR5.1-11 shows deviation score of increase in improved sanitation (toilet/latrine) from 2010 to 2030 among states for reference.



Source: JICA Project Team

Figure SR5.1-11 Deviation Score of Increase in Improved Sanitation from 2010 to 2030

SR5.2 Irrigation and Drainage Development Plan

SR5.2.1 Existing Public Irrigation Scheme

Table SR5.2-1 Area of Existing Public Irrigation Scheme

1.1 Large Scale: Planned Area of Existing Irrigation Project

HA	HA-1	HA-2	HA-3	HA-4	HA-5	HA-6	HA-7	HA-8	Total
Public									
RBDA	43,800	21,900	24,810	18,037	26,860	38,700	10,545	166,800	**351,452**
State	7,500	15,660	6,700	1,000	1,000	1,300	6,100	22,692	**61,952**
Sub-total	**51,300**	**37,560**	**31,510**	**19,037**	**27,860**	**40,000**	**16,645**	**189,492**	**413,404**
Private Company		9,000	16,200						**25,200**
Total	**51,300**	**46,560**	**47,710**	**19,037**	**27,860**	**40,000**	**16,645**	**189,492**	**438,604**

1.2 Large Scale: System Developed Area of Existing Irrigation Project

HA	HA-1	HA-2	HA-3	HA-4	HA-5	HA-6	HA-7	HA-8	Total
Public									
RBDA	27,988	4,245	1,160	4,327	8,783	2,984	1,331	46,608	**97,426**
State	2,250	3,498	500	0	315	1,300	1,075	7,000	**15,938**
Sub-total	**30,238**	**7,743**	**1,660**	**4,327**	**9,098**	**4,284**	**2,406**	**53,608**	**113,364**
Private Company		5,600	7,109						**12,709**
Total	**30,238**	**13,343**	**8,769**	**4,327**	**9,098**	**4,284**	**2,406**	**53,608**	**126,073**

1.3 Large Scale: Service Area of Existing Irrigation Project

HA	HA-1	HA-2	HA-3	HA-4	HA-5	HA-6	HA-7	HA-8	Total
Public									
RBDA	12,388	3,580	683	2,110	1,716	1,588	1,285	24,658	**48,008**
State	1,800	2,268	100	0	315	0	825	5,710	**11,018**
Sub-total	**14,188**	**5,848**	**783**	**2,110**	**2,031**	**1,588**	**2,110**	**30,368**	**59,026**
Private Company			609						**609**
Total	**14,188**	**5,848**	**1,392**	**2,110**	**2,031**	**1,588**	**2,110**	**30,368**	**59,635**

2.1 Medium and Small Scale: Planned Area of Existing Irrigation Project

HA	HA-1	HA-2	HA-3	HA-4	HA-5	HA-6	HA-7	HA-8	Total
Public									
RBDA	940	1,255	1,050	100	830	3,074	2,609	800	**10,658**
State	1,680	5,421	470	1,150	600	670	3,740	3,060	**16,791**
Sub-total	**2,620**	**6,676**	**1,520**	**1,250**	**1,430**	**3,744**	**6,349**	**3,860**	**27,449**
Private Company			300						**300**
Total	**2,620**	**6,676**	**1,820**	**1,250**	**1,430**	**3,744**	**6,349**	**3,860**	**27,749**

2.2 Medium and Small Scale: System Developed Area of Existing Irrigation Project

HA	HA-1	HA-2	HA-3	HA-4	HA-5	HA-6	HA-7	HA-8	Total
Public									
RBDA	940	552	365	20	363	1,113	1,681	492	**5,526**
State	971	2,973	470	650	570	350	1,975	1,248	**9,207**
Sub-total	**1,911**	**3,525**	**835**	**670**	**933**	**1,463**	**3,656**	**1,740**	**14,733**
Private Company			300						**300**
Total	**1,911**	**3,525**	**1,135**	**670**	**933**	**1,463**	**3,656**	**1,740**	**15,033**

2.3 Medium and Small Scale: Service Area of Existing Irrigation Project

HA	HA-1	HA-2	HA-3	HA-4	HA-5	HA-6	HA-7	HA-8	Total
Public									
RBDA	720	429	170	20	318	992	1,126	472	**4,247**
State	621	1,300	20	130	90	100	830	688	**3,779**
Sub-total	**1,341**	**1,729**	**190**	**150**	**408**	**1,092**	**1,956**	**1,160**	**8,026**
Private Company			300						**300**
Total	**1,341**	**1,729**	**490**	**150**	**408**	**1,092**	**1,956**	**1,160**	**8,326**

3.1 Compiled: Planned Area of Existing Irrigation Project

HA	HA-1	HA-2	HA-3	HA-4	HA-5	HA-6	HA-7	HA-8	Total
Public									
RBDA	44,740	23,155	25,860	18,137	27,690	41,774	13,154	167,600	**362,110**
State	9,180	21,081	7,170	2,150	1,600	1,970	9,840	25,752	**78,743**
Sub-total	**53,920**	**44,236**	**33,030**	**20,287**	**29,290**	**43,744**	**22,994**	**193,352**	**440,853**
Private Company		9,000	16,500						**25,500**
Total	**53,920**	**53,236**	**49,530**	**20,287**	**29,290**	**43,744**	**22,994**	**193,352**	**466,353**

3.2 Compiled: System Developed Area of Existing Irrigation Project

HA	HA-1	HA-2	HA-3	HA-4	HA-5	HA-6	HA-7	HA-8	Total
Public									
RBDA	28,928	4,797	1,525	4,347	9,146	4,097	3,012	47,100	**102,952**

State	3,221	6,471	970	650	885	1,650	3,050	8,248	**25,145**
Sub-total	**32,149**	**11,268**	**2,495**	**4,997**	**10,031**	**5,747**	**6,062**	**55,348**	**128,097**
Private Company		5,600	7,409						**13,009**
Total	**32,149**	**16,868**	**9,904**	**4,997**	**10,031**	**5,747**	**6,062**	**55,348**	**141,106**

3.3 Compiled: Service Area of Existing Irrigation Project

HA	HA-1	HA-2	HA-3	HA-4	HA-5	HA-6	HA-7	HA-8	Total
Public									
RBDA	13,108	4,009	853	2,130	2,034	2,580	2,411	25,130	**52,255**
State	2,421	3,568	120	130	405	100	1,655	6,398	**14,797**
Sub-total	**15,529**	**7,577**	**973**	**2,260**	**2,439**	**2,680**	**4,066**	**31,528**	**67,052**
Private Company			909						**909**
Total	**15,529**	**7,577**	**1,882**	**2,260**	**2,439**	**2,680**	**4,066**	**31,528**	**67,961**

Irrigation (Classification by Federal Department of Irrigation and Drainage)

Large Irrigation - Planning Area > =500ha
Medium Irrigation - 50ha =< Planning Area < 500ha
Small Irrigation - Planning Area < 50ha

Amount of Irrigation Scheme Location by HA (Unit: site)

HA	Large Scale	Medium and Small Scale	Total
1	12	16	28
2	27	49	76
3	12 (14)	8 (9)	20 (23)
4	15	11	26
5	12	9	21
6	17	21	38
7	15	27	42
8	27	23	50
Total	137 (139)	164 (165)	301 (304)

Note: The figure shown ( ) is included the Private Company Irrigation Scheme

Future Irrigation Area without Private Company

Future irrigation area means irrigable area subject to the proposed cropping pattern and safety level for water supply (1/5 years safety level)

Table SR5.2-2 Future Irrigation Area of Existing Public Irrigation Scheme

Existing Public Large Scale Irrigation Project (A)

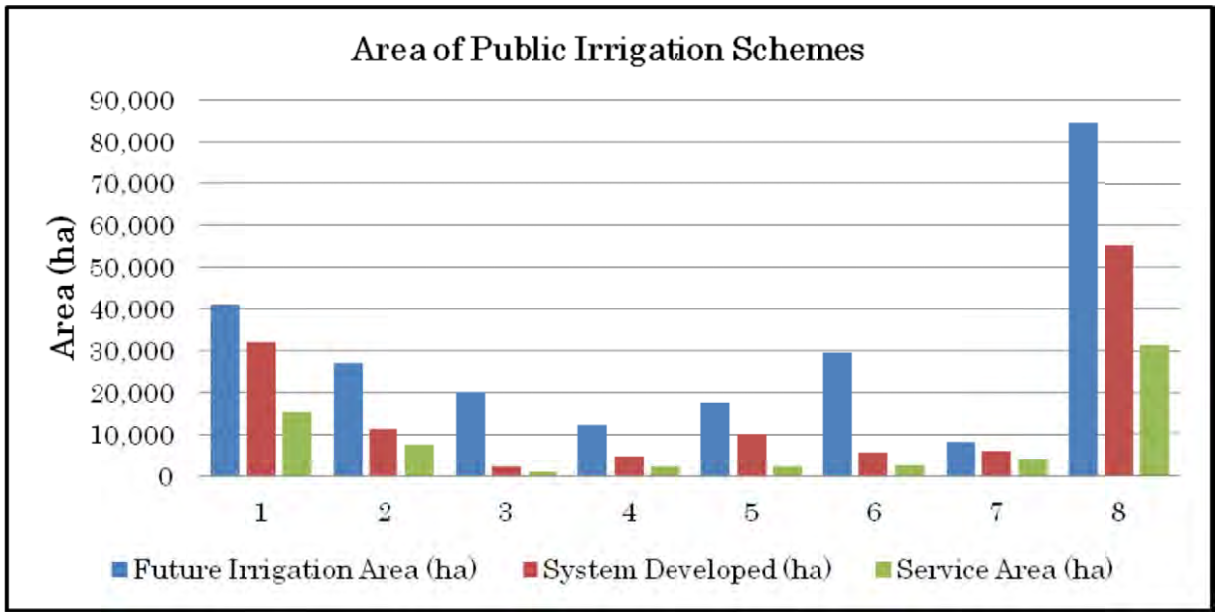
HA	Future Irrigation Area (ha)	System developed (ha)	Service Area (ha)	Intensity (%)
1	39,130	30,238	14,188	36
2	22,563	7,743	5,848	26
3	19,210	1,660	783	4
4	11,824	4,327	2,110	18
5	16,320	9,098	2,031	12
6	26,854	4,284	1,588	6
7	3,131	2,406	2,110	67
8	82,800	53,608	30,368	37
Total	221,832	113,364	59,026	27

Existing Public Medium and Small Scale Irrigation Project (B)

HA	Future Irrigation Area (ha)	System developed (ha)	Service Area (ha)	Intensity (%)
1	1,911	1,911	1,341	70
2	4,383	3,525	1,729	39
3	1,055	835	190	18
4	670	670	150	22
5	1,380	933	408	30
6	2,544	1,463	1,092	43
7	5,279	3,656	1,956	37
8	1,798	1,740	1,160	65
Total	19,020	14,733	8,026	42

Existing Public Irrigation Project (A) + (B)

HA	Future Irrigation Area (ha)	System developed (ha)	Service Area (ha)	Intensity (%)
1	41,041	32,149	15,529	38
2	26,946	11,268	7,577	28
3	20,265	2,495	973	5
4	12,494	4,997	2,260	18
5	17,700	10,031	2,439	14
6	29,398	5,747	2,680	9
7	8,410	6,062	4,066	48
8	84,598	55,348	31,528	37
Total	240,852	128,097	67,052	28



Planning area : Potential area of irrigation specified by RBDAs and State agency
Future Irrigation area : Potential area of irrigation estimated from surface water by JPT
System Developed area : Developed area already constructed major irrigation system
Irrigated Service area : Actual cropped area facilitated farm canal, etc

Table SR5.2-3 Existing Large Scale Irrigation Project (HA-1) (1/2)

SN	No.	HA	On-going	Rehabilitation	Expansion	Project Name	State	Longitude East	Latitude North	River	SHA	Agency
1	1	1	○			Jibiya	Katsina	7.26175	13.07776		1060861_i2	SRRBDA
2	2	1	○		E	Zobe	Katsina	7.45318	12.34264	Karaduwa	1060881	SRRBDA
3	3	1				Bakolori	Zamfara	6.06297	12.59716	Sokoto	106091	SRRBDA
4	4	1	○		E	Middle Rima Valley	Sokoto	5.86027	13.51345	Rima	106083	SRRBDA
5	5	1			E	Swashi Valley	Niger	4.29965	10.39572	Swashi	101	LNRBDA
6	6	1	○			Sabke	Katsina	8.15723	13.06457		106082_i2	SRRBDA
						Sub-total						
7	7	1				Ajiwa	Katsina	7.75159	12.96556		106082_i2	MANR
8	8	1		R	E	Wurno	Sokoto	5.45506	13.30017	Rima	106081_i	MANR
9	9	1				Wara	Kebbi	4.62645	10.23562	Kainji Lake	101	MANR
10	10	1		R	E	Kware	Sokoto	5.29017	13.20146	Rima	106081_i	MANR
11	11	1		R		Kalmalo	Sokoto	5.24706	13.70759	kalmalo	106081_i	MANR
12	12	1		R		Gafara	Niger	4.46507	10.58322	Kainji Lake	101	MANR
						Sub-total						
						Total						

Table SR5.2-3 Existing Large Scale Irrigation Project (HA-1) (2/2)

SN	No.	Project Name	Water Source Works	Name of Source	Irrigation Area (ha)			Irrigation Service Area (ha)		Remarks	Source	Future Irrigation Area in 2030 (ha)
					Planned Area	Area with Reliable Water Supply (*1)	System Developed	Service Area	Intensity (%)			
1	1	Jibiya	Dam	Jibiya	3,500	2,300	3,000	3,000	86		ROPISIN, Faithline	2,300
2	2	Zobe	Dam	Zobe	8,200	2,000	60	0	0	Under Construction	UNRF, 2020M/S	2,000
3	3	Bakolori	Dam	Bakolori	23,000	23,000	23,000	8,000	35		2020M/s, ROPISIN	23,000
4	4	Middle Rima Valley	Dam	Goronyo	5,000	5,000	1,188	1,188	24		ROPISIN, DID	5,000
5	5	Swashi Valley	Dam	Kubil & Swashi	2,900	2,900	200	200	7	Rice, vegetable, maize	ROPISIN	2,900
6	6	Sabke	Dam	Sabke	1,200	130	540	0	0	Under construction	UNRF, DID,	130
		Sub-total			**43,800**	**35,330**	**27,988**	**12,388**	**28**			**35,330**
7	7	Ajiwa	Dam	Ajiwa	1,900	0	500	500	26	Vegetable, maize	2020M/S, 95M/S	0
8	8	Wurno	Dam	Rima R.	1,500	1,500	700	600	40		2020M/S, Faithline	1,500
9	9	Wara	Dam	Kainji	2,000	2,000	200	200	10	Rice, wheat	2020M/S, 95M/S	200
10	10	Kware		Rima R.	800	800	300	120	15		2020M/S, 95M/S	800
11	11	Kalmalo	Pump	Natural Lake	800	800	400	230	29		2020M/S, 95M/S	800
12	12	Gafara	Dam	Kainji	500	500	150	150	30		2020M/S, 95M/S	500
		Sub-total		**Jibiya**	**7,500**	**5,600**	**2,250**	**1,800**	**24**			**3,800**
		Total			**51,300**	**40,930**	**30,238**	**14,188**	**28**			**39,130**

Table SR5.2-4 Existing Large Scale Irrigation Project (HA-2) (1/2)

SN	No.	HA	On-going	Rehabili-tation	Expansion	Project Name	State	Longitude East	Latitude North	River	SHA	Agency
13	1	2				Kontagora	Niger	4.74271	10.00910	Kontagora	218	UNRBDA
14	2	2				Omu-Aran	Kwara	5.09142	8.11812	Areja	209	UNRBDA
15	3	2				Tada Shonga	Kwara	5.16253	9.07954	Niger	209	UNRBDA
16	4	2				Kpada	Kwara	6.10515	8.61126	Kampe	20401	UNRBDA
17	5	2	○			Kampe/Omi	Kogi	5.66320	8.25268	Kampe	20401	UNRBDA
18	6	2				Ikale	Kwara	6.04446	8.59783	Kampe	20401	UNRBDA
19	7	2				Oke Oyi	Kwara	4.77037	8.61897	Oshin	209	LNRBDA
20	8	2				Oloru	Kwara	4.57321	8.65264	Awun	212	LNRBDA
21	9	2				Gerinyan	Kogi	6.72473	8.24065	Gurara	20201	LNRBDA
22	10	2				Oro-Ago	Kwara	5.20395	8.33839	Oro	209	LNRBDA
23	11	2		R		Tungan Kowa	Niger	6.09618	9.66456	Ubandawaki	20805	LNRBDA
24	12	2				Duro-Gakpan	Kwara	6.16621	8.71231	Niger	207	LNRBDA
25	13	2		R		Agaie/ Lapai	Niger	6.29707	9.01396	Gbako	206	UNRBDA
26	14	2				Adorun	Kogi			Oweh	20401	LNRBDA
						Sub-total						
27	15	2	○			Duku-Lade	Kwara	5.62888	8.78878	Duke	209	MANR
28	16	2				Rabba	Niger	5.05775	9.19502	Niger	209	MANR
29	17	2				Guzan	Niger	5.73551	9.28297	Yiko	20801	MANR
30	18	2		R	E	Kangimi	Kaduna	7.58661	10.62797	Kano	20813	MANR
31	19	2			E	E.Lapai	Niger	6.56830	9.20140	Estan	206	MANR

32	20	2			E	Bakogi	Niger	6.15492	8.85605	Bakogi	206	MANR
33	21	2				Bagoma	Niger	6.51539	10.64066	Kusheriki	20804	MANR
34	22	2				Zara	Niger	6.39019	10.50190	Zara	20804	MANR
35	23	2				Tubo	Kaduna	7.44529	10.96279	Tubo	20812	MANR
36	24	2			E	Galma	Kaduna	7.74056	11.07472	Galma	20814	MANR
37	25	2				Manta	Niger	6.42407	9.86577	Kaduna	20805	MANR
38	26	2		R		Badeggi	Niger	6.10586	9.07567	Musa	206	NSADP
39	27	2				Otibe	Kogi			Okwo	201	MANR
						Sub-total						
40	28	2				Bacita	Niger	4.96639	9.07718	Niger	209	NSC(private)
						Sub-total						
						Total						

Table SR5.2-4 Existing Large Scale Irrigation Project (HA-2) (2/2)

SN	No.	Project Name	Water Source Works	Name of Source	Irrigation Area (ha)			Irrigation Service Area (ha)		Remarks	Source	Future Irrigation Area in 2030 (ha)
					Planned Area	Area with Reliable Water Supply (*1)	System Developed	Service Area	Intensity (%)			
13	1	Kontagora	Dam	Kontagora (Auna)	2,000	2,000	250	250	13		UNRF, 2020M/S	2,000
14	2	Omu-Aran	Dam	Omu-Aran	1,300	0	400	230	18	vegetable	2020M/S, 95M/S	0
15	3	Tada Shonga	Pump	Niger R.	4,100	4,100	435	435	11		2020M/S, ROPISIN	4,100
16	4	Kpada		Kampe R.	1,500	1,500	150	150	10		95M/S	150
17	5	Kampe/Omi	Dam	Omi	4,000	4,000	1,000	1,000	25	vegetable, maize, cowpea	UNRF, ROPISIN	4,000
18	6	Ikale	Intake	Kampe R.	2,700	2,700	420	420	16		2020M/S, Faithline	420
19	7	Oke Oyi	Weir	NF	500	60	100	25	5	vegetable. maize, corpea	UNFR, ROPISIN	60
20	8	Oloru	Weir	NF	500	0	20	0	0		UNFR, ROPISIN	0
21	9	Gerinyan	Pump	Gurura R.	2,000	2,000	400	400	20	vegetable, maize, tobacco	UNFR, ROPISIN	400
22	10	Oro-Ago	Pump	NF	500	10	80	80	16		2020M/S, 95M/S	10
23	11	Tungan Kowa	Dam	Tungan Kowa	800	800	800	400	50		2020M/S, 95M/S	800
24	12	Duro-Gakpan	Pump	Niger R.	500	500	90	90	18		95M/S	90
25	13	Agaie/ Lapai		NF	1,000	1,000	20	20	2		UNRF	1,000
26	14	Adorun	Intake	NF	500	80	80	80	16		2020M/S-Annex4	80
		Sub-total			**21,900**	**18,750**	**4,245**	**3,580**	**16**			**13,110**
27	15	Duku-Lade	Weir	NF	2,000	1,200	200	50	3		UNRF, 2020M/S,	1,200
28	16	Rabba	Pump	Niger R.	2,000	2,000	110	110	6	rice	2020M/S, 95M/S	110
29	17	Guzan		NF	1,500	0	400	400	27	rice	2020M/S, 95M/S	0
30	18	Kangimi	Dam	Kangimi	1,600	1,600	1,200	120	8	wheat, maize, tomato	2020M/S, 95M/S	1,600
31	19	E.Lapai	Dam	Bakajeba	2,000	2,000	100	100	5	rice	2020M/S, 95M/S	2,000
32	20	Bakogi	Pump	NF	2,000	2,000	100	100	5		2020M/S, 95M/S	2,000
33	21	Bagoma	Dam	Bagoma	500	500	50	50	10		95M/S	500
34	22	Zara	Pump	NF	500	0	50	50	10		95M/S	0
35	23	Tubo	Dam	Kerawa	620	600	100	100	16	wheat, vegetable	2020M/S, 95M/S	600
36	24	Galma	Pump	Galma R	610	610	55	55	9	rice, wheat, vegetable, maiz	2020M/S	610
37	25	Manta	Pump	Kaduna R.	500	0	300	300	60		95M/S	0
38	26	Badeggi	Pump	NF	830	830	830	830	100	rice	2020M/S, 95M/S	830
39	27	Otibe	Pump	NF	1,000	3	3	3	0	vegetable, maize	2020M/S-Annex4	3
		Sub-total			**15,660**	**11,343**	**3,498**	**2,268**	**14**			**9,453**
40	28	Bacita	Pump	Niger R.	9,000	9,000	5,600	0	0	Private Sugar company	ROPISIN, 95M/S	9,000
		Sub-total	**Dam**	**Kontagora (Auna)**	**9,000**	**9,000**	**5,600**	**0**	**0**			**9,000**
		Total	**Dam**	**Omu-Aran**	**46,560**	**39,093**	**13,343**	**5,848**	**13**			**31,563**

Table SR5.2-5 Existing Large Scale Irrigation Project (HA-3) (1/2)

SN	No.	HA	On-going	Rehabili-tation	Expansion	Project Name	State	Longitude East	Latitude North	River	SHA	Agency
41	1	3		R		Lake Geriyo	Adamawa	12.43901	9.29489	Benue	317	UBRBDA
42	2	3				Ngalda	Yobe	11.37291	11.09015	Gongola	31409	CBDA
43	3	3	○		E	Dadin Kowa	Gombe	11.50922	10.28757	Gongola	31405	UBRBDA
44	4	3	○		E	Lower Taraba (Gassol)	Taraba	10.41873	8.56283	Taraba	30601	UBRBDA
45	5	3				Kushimaga	Borno	11.77152	10.25149	Gongola	31405	UBRBDA
46	6	3				Gari Abdullahi	Yobe	11.53307	10.91496	Gongola	31407	UBRBDA
47	7	3				Wase	Plateau	9.95512	9.10821	Wase	304	LBRBDA
48	8	3	○		E	Chouchi	Adamawa	12.54112	9.21993	Benue	317	UBRBDA
49	9	3				Gora	Borno			Gongola	31405	CBDA
50	10	3				Bagal	Bauchi	9.78133	9.98581	Bagal	31409	UBRBDA
						Sub-total						
51	11	3		R		Balanga	Gombe	11.59497	9.94130	Balonga	31405	MANR
52	12	3				Kaititingo	Bauchi	11.33712	9.84249	kaltungo	31405	MANR
						Sub-total						
53	13	3				Savannah Sugar	Adamawa	11.95182	9.62440	Gongola	311	SSC(Private
54	14	3				Savannah Integrated Farm	Gombe			Gongola	31405	SIF(Private)
						Sub-total						
						Total						

Table SR5.2-5 Existing Large Scale Irrigation Project (HA-3) (2/2)

SN	No.	Project Name	Water Source Works	Name of Source	Irrigation Area (ha)			Irrigation Service Area (ha)		Remarks	Source	Future Irrigation Area in 2030 (ha)
					Planned Area	Area with Reliable Water Supply (*1)	System Developed	Service Area	Intensity (%)			
41	1	Lake Geriyo	Pump	Benue R.	4,000	4,000	320	320	8	Rice(150),vegetable, Maize	ROPISIN, UBRBDA	4,000
42	2	Ngalda	Pump	NF	500	500	200	30	6	Wheat, Vegetable	Inventory, Faithline	200
43	3	Dadin Kowa	Dam	DadinKowa	6,660	6,660	250	70	1	rice, vegetable, maize	ROPISIN, UBRBDA	6,660
44	4	Lower Taraba (Gassol)	Pump	Taraba R.	3,000	3,000	30	3	0	vegetable	UNRF, UBRBDA	3,000
45	5	Kushimaga	Pump	Gongola R.	500	500	200	200	40		95M/S	200
46	6	Gari Abdullahi	Pump	Gongola R.	750	750	0	0	0		2020M/S, 95M/S	0
47	7	Wase	Pump	Gongola R.	500	90	100	0	0	vegetable, maize	2020M/S, 95M/S	90
48	8	Chouchi	Pump	Benue R.	1,200	1,200	0	0	0	Under construction	ROPISIN, DID	1,200
49	9	Gora	Pump	Gongola R.	2,000	2,000	50	50	3	rice	Inventory	50
50	10	Bagal	Pump	NF	5,700	760	10	10	0		2020M/S-Annex4	10
		Sub-total			**24,810**	**19,460**	**1,160**	**683**	**3**			**15,410**
51	11	Balanga	Dam	Balanga	4,400	3,800	500	100	2	rice, okura, vegetable	ROPISIN	3,800
52	12	Kaititingo		NF	2,300	0	0	0	0		2020M/S-Annex4	0
		Sub-total			6,700	3,800	500	100	1			3,800
53	13	Savannah Sugar	Dam	Kiri	12,200	12,200	7,000	500	4	sugar cane	ROPISIN	12,200
54	14	Savannah Integrated Farm	Pump	Gongola R.	4,000	4,000	109	109	3	Private company	ROPISIN	4,000
		Sub-total			**16,200**	**16,200**	**7,109**	**609**	**4**			**16,200**
		Total			**47,710**	**39,460**	**8,769**	**1,392**	**3**			**35,410**

Table SR5.2-6 Existing Large Scale Irrigation Project (HA-4) (1/2)

SN	No.	HA	On-going	Rehabili-tation	Expansion	Project Name	State	Longitude East	Latitude North	River	SHA	Agency
55	1	4				Obagaji	Benue			Benue	407	LBRBDA
56	2	4				Shendam(1)	Plateau	9.53020	8.88567		410	LBRBDA
57	3	4	○	R		Longkat	Plateau	9.36357	9.14690	Shemankar	410	LBRBDA
58	4	4		R	E	Dep	Nasarawa	8.95781	8.62384	Dep	408	LBRBDA
59	5	4		R	E	Katsina-Ala	Benue	9.29313	7.12941	Katsina-Ala	406_i	LBRBDA
60	6	4		R	E	Makurdi	Benue	8.64787	7.71592	Benue	405	LBRBDA
61	7	4			E	Doma	Nasarawa	8.29273	8.36183	Doma	404	LBRBDA
62	8	4			E	Awe	Nasarawa	9.12771	8.10529		407	LBRBDA
63	9	4				Umogidi	Benue	7.97974	7.44722	Ogabakpa	405	LBRBDA
64	10	4			E	Oguma	Kogi	7.05580	7.90464	Nyimowa-Iteme	401	LBRBDA
65	11	4			E	Jato-Aka	Benue	9.61047	6.88722	Katsina-Ala	406_i	LBRBDA
66	12	4				Bokkos	Plateau	8.97962	9.32152	Bokkos	408	LBRBDA
67	13	4				Wuse	Nasarawa	9.31127	8.35523	Dep	408	LBRBDA
68	14	4				Kiroki	Benue			Oyimora	405	LBRBDA
						Sub-total						
69	15	4				Adi	Benue	9.25383	7.19089	Katsina-Ala	406_i	MANR
						Sub-total						
						Total						

Table SR5.2-6 Existing Large Scale Irrigation Project (HA-4) (2/2)

SN	No.	Project Name	Water Source Works	Name of Source	Irrigation Area (ha)			Irrigation Service Area (ha)		Remarks	Source	Future Irrigation Area in 2030 (ha)
					Planned Area	Area with Reliable Water Supply (*1)	System Developed	Service Area	Intensity (%)			
55	1	Obagaji	Pump	Benue R.	1,000	1,000	500	500	50		2020F/S, 95M/S	500
56	2	Shendam(1)	Dam	Shendam	1,000	1,000	500	500	50		95M/S	1,000
57	3	Longkat	Pump	Pankisin	2,000	1,100	800	800	40	rice, tomato, pepper	ROPISIN, Faithline	1,100
58	4	Dep	Pump	NF	2,000	2,000	300	100	5	rice,maize,vegetable,sugar	UNRF, ROPISIN	2,000
59	5	Katsina-Ala	Pump	Katsina-Ala R.	2,000	2,000	200	3	0	hot pepper, maize,okura	2020M/S, ROPISIN:	2,000
60	6	Makurdi	Pump	Benue R.	1,000	1,000	200	0	0	rice, vegetable, maize	2020M/S, ROPISIN	1,000
61	7	Doma	Dam	Doma	2,037	2,037	1,600	0	0	Melon, okura	ROPISIN	2,037
62	8	Awe	Pump	NF	500	80	0	0	0		Faithline	110
63	9	Umogidi	Dam	Umogodi	1,500	580	0	0	0		95M/S, Fauthline	0
64	10	Oguma	Pump	NF	1,000	1,000	100	100	10	rice,vegetable,sugar cane	ROPISIN	1,000
65	11	Jato-Aka	Pump	Katsina-Ala R.	1,000	1,000	20	0	0	Flood, deterioration	ROPISIN	1,000
66	12	Bokkos	Dam	Bokkos(2)	1,000	360	18	18	2	poteto, vegetable	UNRF, ROPISIN	18
67	13	Wuse	Pump	NF	1,000	1,000	50	50	5		Faithline	50
68	14	Kiroki	Pump	NF	1,000	15	15	15	2	rice, vegetable, sugar cane	2020M/S-Annex4	15
		Sub-total			**18,037**	**14,172**	**4,303**	**2,086**	**12**			**11,800**
69	15	Adi	Pump	Katsina-Ala . R	1,000	1,000	24	24	2	rice, vegetable, maize	2020M/S-Annex4	24
		Sub-total			**1,000**	**1,000**	**24**	**24**	**2**			**24**
		Total			**19,037**	**15,172**	**4,327**	**2,110**	**11**			**11,824**

Table SR5.2-7 Existing Large Scale Irrigation Project (HA-5) (1/2)

SN	No.	HA	On-going	Rehabili-tation	Expansion	Project Name	State	Longitude East	Latitude North	River	SHA	Agency
70	1	5	○	R		Lower Anambra	Anambra	6.98647	6.51946	Anambra	50402	AIRBDA
71	2	5				Ewu	Delta	6.25511	5.23819	Forcados	500	NDBDA
72	3	5				Adoru	Kogi	7.14490	6.99972	Oweh	50402	LBRBDA
73	4	5			E	Ilush-Ega	Edo	6.63080	6.65990	Niger	50403	BORBDA
74	5	5	○		E	Isampou Rice	Delta	5.86888	5.05052	Bomadi	500	NDBDA
75	6	5	○	R		Peremabiri Rice	Bayelsa	6.09887	4.63576	Nun	500	NDBDA
76	7	5	○		E	Kolo Rice	Bayelsa	6.26613	4.86799	Orashi	500	NDBDA
77	8	5	○		E	Ejule Ojebe	Kogi	7.01792	7.36571	Ota Lake	50402	LBRBDA
78	9	5				Ofarachi	Kogi	6.88333	7.10000	Ofu Imabolo	50402	LBRBDA
79	10	5				Illahi Ebuh	Delta	6.66701	6.45086	Niger	50403	BORBDA
80	11	5	○	R	E	Ada-Rice	Enugu	7.03273	6.71501		50402	AIRBDA
						Sub-total						
81	12	5				Uzo Uwani	Enugu	7.03670	6.69972	Obina	50402	MANR
						Sub-total						
						Total						

Table SR5.2-7 Existing Large Scale Irrigation Project (HA-5) (2/2)

SN	No.	Project Name	Water Source Works	Name of Source	Irrigation Area (ha)			Irrigation Service Area (ha)		Remarks	Source	Future Irrigation Area in 2030 (ha)
					Planned Area	Area with Reliable Water Supply (*1)	System Developed	Service Area	Intensity (%)			
70	1	Lower Anambra	Pump	NF	5,000	5,000	3,850	0	0	rice	ROPISIN	5,000
71	2	Ewu	Pump	Niger R.	1,500	1,500	100	100	7	rice, vegetable	95M/S	100
72	3	Adoru	Intake	NF	500	500	100	80	16		95M/S	100
73	4	Ilush-Ega	Pump	Niger R.	5,000	5,000	3,000	300	6	rice	2020M/S, ROPISIN	5,000
74	5	Isampou Rice	Pump	Niger R.	1,280	1,280	110	70	5	rice	UNRF, POPISIN,	1,280
75	6	Peremabiri Rice	Pump	Niger R.	1,280	1,280	348	26	2	rice	2020M/S, POPISIN	1,280
76	7	Kolo Rice	Pump	Niger R.	1,300	1,300	140	140	11	rice	UNRF, POPISIN	1,300
77	8	Ejule Ojebe	Pump	NF	2,000	1,100	25	0	0	rice,okura,maize	UNRF, ROPISIN	1,100
78	9	Ofarachi	Pump	NF	1,000	520	10	0	0	maize, spinach, okura	ROPISIN	10
79	10	Illahi Ebuh	Pump	Niger R.	3,000	3,000	100	0	0	yam,cassava,poteto	UNRF, ROPISIN	100
80	11	Ada-Rice	Weir	NF	5,000	1,000	1,000	1,000	20	rice	DID	1,000
		Sub-total			**26,860**	**21,480**	**8,783**	**1,716**	**67**			**16,270**
81	12	Uzo Uwani	Weir	NF	1,000	50	315	315	32	rice	2020M/S	50
		Sub-total			**1,000**	**50**	**315**	**315**	**32**			**50**
		Total			**27,860**	**21,530**	**9,098**	**2,031**	**7**			**16,320**

Table SR5.2-8 Existing Large Scale Irrigation Project (HA-6) (1/2)

SN	No.	HA	On-going	Rehabili-tation	Expansion	Project Name	State	Longitude East	Latitude North	River	SHA	Agency
82	1	6				Upper Ogun	Oyo	3.30205	8.21856	Ofiki	604023_i	OORBDA
83	2	6				Ofiki(A)	Oyo	3.33872	8.46834	Ofiki	604023_i	OORBDA
84	3	6	○		E	Middle Ogun (I.G)	Oyo	3.72541	7.85447	Ogun	60403	OORBDA
85	4	6				Sepeteri(A)	Oyo	3.65260	8.57964	Owutu	60405	OORBDA
86	5	6	○		E	Lower Ogun (Mokoloki)	Ogun	3.34892	6.92784	Ogun	60401	OORBDA
87	6	6			E	Iwo	Osun	4.16447	7.74451	Orufu	608	OORBDA
88	7	6			E	Ilero	Oyo	3.32113	8.01052		604023_i	OORBDA
89	8	6				Otta	Ogun	3.23946	6.65463	Ore	603	OORBDA
90	9	6				Eyinwa	Ogun	3.80940	6.79970	Ondo	606	OORBDA
91	10	6				Oke-Odan	Ogun	2.90442	6.72066	Yelwa	602_i	OORBDA
92	11	6		R	E	Asa	Oyo	4.19306	8.16333	Oba	608	OORBDA
93	12	6		R	E	Okuku	Osun	4.67570	7.99350		608	OORBDA
94	13	6				Igbonla	Lagos	4.05585	6.63502	Osun	608	OORBDA
95	14	6			E	Owena	Ondo	4.99806	7.29811	Owena	612	BORBDA
96	15	6				Oye	Ekiti	5.34462	7.77780		614	BORBDA
						Sub-total						
97	16	6		R	E	Esa Odo Dam	Osun	4.81272	7.74642		608	MANR
98	17	6		R	E	New Erinle	Osun	4.52171	7.85328		608	MANR
						Sub-total						
						Total						

Table SR5.2-8 Existing Large Scale Irrigation Project (HA-6) (2/2)

SN	No.	Project Name	Water Source Works	Name of Source	Irrigation Area (ha)			Irrigation Service Area (ha)		Remarks	Source	Future Irrigation Area in 2030 (ha)
					Planned Area	Area with Reliable Water Supply (*1)	System Developed	Service Area	Intensity (%)			
82	1	Upper Ogun	Dam	Igbojaye	2,000	600	10	5	0		OORBDA, 2020M/S	10
83	2	Ofiki(A)	Dam	Ofiki(A)	2,000	60	24	24	1	yam,maize,cassava	OORBDA	24
84	3	Middle Ogun (I.G)	Pump	Ogun R.	12,000	12,000	750	520	4	Under construction	OORBDA, UNRF	12,000
85	4	Sepeteri(A)	Dam	Sepeteri(A)	2,000	30	80	80	4	yam,maize,cassava	OORBDA, UNRF	30
86	5	Lower Ogun (Mokoloki)	Dam	Oyan	12,000	12,000	500	200	2	maize,water melon,cucumber	OORBDA, UNRF	12,000
87	6	Iwo	Wier	NF	1,000	0	0	0	0		OORBDA	0
88	7	Ilero	Dam	Okeho	2,000	70	0	0	0		OORBDA	70
89	8	Otta	Pump	NF	1,000	0	340	300	30		2020M/S	0
90	9	Eyinwa	Intake	NF	1,000	10	300	300	30		2020M/S	10
91	10	Oke-Odan	Dam	Oke-Odan	600	400	250	59	10	maize, cassava	2020M/S, ROPISIN	250
92	11	Asa	Dam	Oba	500	500	0	0	0		OORBDA	500
93	12	Okuku	Dam	Okuku	600	30	0	0	0		OORBDA	30
94	13	Igbonla	Intake	Osun R.	1,000	130	130	0	0	rice	OORBDA, 2020M/S	130
95	14	Owena	Dam	Owena Multipurpo se	500	500	500	0	0		Inventry, 95M/S, BORBDA	500
96	15	Oye		NF	500	0	100	100	20		UNRF	0
		Sub-total			**38,700**	**26,330**	**2,984**	**1,588**	**4**			**25,554**
97	16	Esa Odo Dam	Dam	Esa-Odo	800	800	800	0	0		2020M/S	800
98	17	New Erinle	Dam	Erinle	500	500	500	0	0		2020M/S	500
		Sub-total			**1,300**	**1,300**	**1,300**	**0**	**0**			**1,300**
		Total			**40,000**	**27,630**	**4,284**	**1,588**	**4**			**26,854**

Table SR5.2-9 Existing Large Scale Irrigation Project (HA-7) (1/2)

SN	No.	HA	On-going	Rehabili-tation	Expansion	Project Name	State	Longitude East	Latitude North	River	SHA	Agency
99	1	7				Nkari	Akwa Ibom	7.76340	5.39992	Quaiboe	70401	CRBDA
100	2	7				Ijegu Yala	Cross River	8.69115	6.77246	Okupuka	704042	CRBDA
101	3	7	○			Abakaliki/ Iwa	Ebonyi	8.13925	6.32519		70403	CRBDA
102	4	7	○	R	E	Imo (Igwu and Ibu)	Imo	7.28360	5.78011	Ibu, Imo, Igwu	702	AIRBDA
103	5	7				Itu	Cross River	7.96650	5.21643	Cross	70401	CRBDA
104	6	7				Bausara	Cross River	8.55503	6.45474		704042	CRBDA
105	7	7				Isi-Uzo	Enugu	7.72541	6.75080	Evonyi	70402	AIRBDA
106	8	7				Itogodi	Cross River				705	CRBDA
						Sub-total						
107	9	7			E	Igbere	Abia	7.68882	5.65215	Igwu	70401	MANR
108	10	7		R		Ekoi	Akwa Ibom	7.73864	5.41865	Enyang	70401	MANR
109	11	7		R		Adim Rice	Cross River	8.03971	5.73041	stream	70401	MANR
110	12	7				Idomi	Cross River	8.10910	5.75634	stream	70401	MANR
111	13	7				Ukum	Cross River	8.65743	6.52613	Aya	704042	MANR
112	14	7				Ofodun	Cross River	8.22112	5.94336	stream	70403	MANR
113	15	7		R	E	Mbiabet	Akwa Ibom	7.96517	5.25826	Cross	70401	MANR
						Sub-total						
						Total						

Table SR5.2-9 Existing Large Scale Irrigation Project (HA-7) (2/2)

SN	No.	Project Name	Water Source Works	Name of Source	Irrigation Area (ha)			Irrigation Service Area (ha)		Remarks	Source	Future Irrigation Area in 2030 (ha)
					Planned Area	Area with Reliable Water Supply (*1)	System Developed	Service Area	Intensity (%)			
99	1	Nkari	Dam	Nkari	2,080	610	0	0	0		Faithline	0
100	2	Ijegu Yala		NF	2,000	910	80	80	4		Inventry, ROPISIN	80
101	3	Abakaliki/ Iwa		NF	1,000	1,000	1,000	1,000	100	rice	UNRF	1,000
102	4	Imo (Igwu and Ibu)	Pump	Lokpanta	1,200	0	80	80	7	rice,maize,tam,cassava	UNRF, ROPISIN	0
103	5	Itu		Cross R.	1,265	1,265	100	100	8	rice, vegetable, maize	Inventry, UNRF	100
104	6	Bausara		NF	2,000	2,000	0	0	0	rice	UNRF	0
105	7	Isi-Uzo	Pump	NF	500	360	71	25	5		UNRF, ROPISIN	71
106	8	Itogodi		NF	500	0	0	0	0	rice	UNRF	0
		Sub-total			**10,545**	**6,145**	**1,331**	**1,285**	**12**			**1,251**
107	9	Igbere		NF	1,300	440	250	50	4	rice	2020M/S,Faithline	440
108	10	Ekoi	Pump	NF	500	500	80	30	6		2020M/S, 95M/S	500
109	11	Adim Rice	Weir	NF	1,000	340	545	545	55	rice	2020M/S. Faithline	340
110	12	Idomi		NF	1,000	530	100	100	10	rice	2020M/S, Faithline	100
111	13	Ukum		NF	1,000	1,000	0	0	0	rice	2020M/S-Annex4	0
112	14	Ofodun	Pump	NF	800	800	0	0	0	rice	2020M/S-Annex4	0
113	15	Mbiabet	Pump	Cross R.	500	500	100	100	20	rice, vegetable, maize	2020M/S, 95M/S	500
		Sub-total			**6,100**	**4,110**	**1,075**	**825**	**94**			**1,880**
		Total			**16,645**	**10,255**	**2,406**	**2,110**	**13**			**3,131**

Table SR5.2-10 Existing Large Scale Irrigation Project (HA-8) (1/2)

SN	No.	HA	On-going	Rehabili-tation	Expansion	Project Name	State	Longitude East	Latitude North	River	SHA	Agency
114	1	8	○	R	E	Kano River Phase I	Kano	8.41745	11.61427	Kano	808075	HJRBDA
115	2	8		R		Kano River Phase II	Kano	8.88585	11.97657	Hadejia	808073	HJRBDA
116	3	8	○		E	Hadejia Valley	Jigawa	9.86267	12.31076	Hadejia	808073	HJRBDA
117	4	8			E	Gashua	Borno	11.2092	12.81520	Yobe	80805	CBDA
118	5	8			E	Baga Polder	Borno	13.8623	13.12501	Lake Chad	807	CBDA
119	6	8		R	E	South Chad	Borno	13.8850	12.33451	Lake Chad	80401	CBDA
120	7	8			E	Jere Bowl Rice	Borno	13.3031	11.90601	Ngadda	806	CBDA
121	8	8				South Chad Pilot	Borno	13.9120	12.23090	Ebeii	80401	CBDA
122	9	8				Michika	Adamawa	13.2596	10.27768		80403_i	CBDA
123	10	8			E	Katagum	Bauchi	10.3575	12.29615	Jamaare	808061	HJRBDA
						Sub-total						
124	11	8				Gari	Kano	8.39251	12.46267	Gari	8080721_i	MANR
125	12	8				Tomas	Kano	8.53068	12.31735	Tomas	8080721_i	WRECA
126	13	8				Jakara	Kano	8.71101	12.15560	Jakara	8080721_i	MANR
127	14	8	○			Bagwai (Watari)	Kano	8.17845	12.15578	Watari	80807421	HJRBDA
128	15	8				Abir	Jigawa	10.2862	12.57605	Hadejia	808061	MANR
129	16	8			E	Yobe	Borno	12.8501	13.41504	Yobe	80801_i	MANR
130	17	8				Dembo	Jigawa	8.28851	12.50170	Gari	8080723	MANR
131	18	8		R	E	Guzuguzu	Kano	8.12795	11.94785	Guzuguzu	8080743	MANR
132	19	8		R	E	Magaga	Kano	8.05504	11.94226	Magaga	8080743	MANR
133	20	8				Bagauda	Kano	8.39685	11.58171		808075	MANR
134	21	8				Kafin Chiri	Kano	8.85732	11.62287	Magaga	808073	MANR
135	22	8				Aguja	Jigawa	9.46840	12.17839	Hadejia	808073	MANR
136	23	8				Jaffi	Borno			Yobe	80801_i	MANR
137	24	8		R		Daya	Borno	10.3734	12.27306		808061	MANR
138	25	8				Ebeji	Borno	14.0420	12.27315	Ebeji	80401	MANR
139	26	8				Jahun	Jigawa	9.56961	12.17442	Hadejia	808073	MANR
140	27	8				Gwarzo	Kano	7.89005	11.91182	Magaga	8080745	MANR
						Sub-total						
						Total						
						Grand Total						

Table SR5.2-10 Existing Large Scale Irrigation Project (HA-8) (2/2)

SN	No.	Project Name	Water Source Works	Name of Source	Irrigation Area (ha)			Irrigation Service Area (ha)		Remarks	Source	Future Irrigation Area in 2030 (ha)
					Planned Area	Area with Reliable Water Supply (*1)	System Developed	Service Area	Intensity (%)			
114	1	Kano River Phase I	Dam	Tiga	22,000	22,000	16,000	16,000	73	wheat, maize, vegetable	HJRBDA	22,000
115	2	Kano River Phase II	Pump	Hadejia R.	40,000	15,000	203	203	1	wheat, maize, vegetable	HJRBDA	15,000
116	3	Hadejia Valley	Weir	Hadejia R.	12,500	12,500	5,255	5,255	42	rice, wheat, vegetable	HJRBDA	12,500
117	4	Gashua	Pump	Yobe R.	2,000	2,000	100	100	5		Inventory, 2020M/S	2,000
118	5	Baga Polder	Pump	Lake Chad	20,000	2,000	2,000	50	0		Inventory, ROPISIN	2,000
119	6	South Chad	Pump	Lake Chad	67,000	22,000	22,000	2,000	3	wheat, vegetable, maize	Inventory, ROPISIN	22,000
120	7	Jere Bowl Rice		NF	1,300	0	0	0	0		2020M/S, 95M/S	0
121	8	South Chad Pilot	Pump	Lake Chad	800	800	800	800	100		95M/S	800
122	9	Michika	Pump	NF	500	0	200	200	40		Inventory, UNRF	0
123	10	Katagum	Pump	Katagun R.	700	700	50	50	7		ROPISIN	700
		Sub-total			**166,800**	**77,000**	**46,608**	**24,658**	**15**			**77,000**
124	11	Gari	Dam	Gari	4,100	300	2,200	2,200	54	wheat, maize, vegetable	2020M/S, Faithline	300
125	12	Tomas	Dam	Tomas	1,100	1,000	400	400	36	wheat, maize, vegetable	2020M/S, 95M/S	400
126	13	Jakara	Dam	Jakara	2,000	430	820	820	41	wheat, vegetable	2020M/S, Faithline	430
127	14	Bagwai (Watari)	Dam	Watari	872	0	273	273	31	rice, wheat, vegetable	HJRBDA	0
128	15	Abir	Pump	Hadejia R.	1,000	1,000	130	130	13	rice, wheat, vegetable	2020M/S, 95M/S	130
129	16	Yobe	Pump	Yobe R.	2,820	2,820	637	637	23	rice, wheat	2020M/S, 95M/S	2,820

130	17	Dembo	Dam	Gari	700	0	60	60	9		95M/S	0
131	18	Guzuguzu	Dam	Guzugzu	530	0	530	0	0		2020M/S, 95M/S	0
132	19	Magaga	Dam	Magaga	600	70	300	100	17	rice, wheat, vegetable, maize	2020M/S, 95M/S	70
133	20	Bagauda	Dam	Bagauda	610	410	300	300	49		95M/S	300
134	21	Kafin Chiri	Dam	Kafin Chiri	600	200	0	0	0		2020M/S, 95M/S	0
135	22	Aguja	Pump	Hadejia R.	700	700	120	120	17	rice, wheat, vegetable	2020,M/S, 95M/S	120
136	23	Jaffi	Pump	Yobe R.	800	800	30	30	4		2020M/S, 95M/S	30
137	24	Daya	Pump	Yobe R.	960	960	960	400	42		95M/S	960
138	25	Ebeji	Pump	Lake Chad	4,000	140	140	140	4	wheat	2020M/S-Anne x4	140
139	26	Jahun	Pump	Hadejia R.	700	700	100	100	14	rice, wheat, vegetable	2020M/S-Anne x4	100
140	27	Gwarzo	Dam	Pada	600	0	0	0	0		2020M/S-Anne x4	0
		Sub-total			**22,692**	**9,530**	**7,000**	**5,710**	**25**			**5,800**
		Total			**189,492**	**86,530**	**53,608**	**30,368**	**16**			**82,800**
		Grand Total			**430,604**	**280,600**	**126,073**	**59,635**	**14**			**247,032**

Sources:

95M/S:	The Study on The National Water Resources Master Plan (NWRMP), JICA, March 1995
ROPISIN:	Review of The Public Irrigation Sector In Nigeria (ROPISIN), ENPLAN DROUP, November 2004
Faithline:	Inventory of Water Infrastructure Projects in Nigeria and Water Audit for Niger central Hydrological Basin (Hydorological Area II), FAITHLINE LIMITED, November 2010
DID:	HANDOVERNOTE May 2011, Department of Irrigation and Drainage, FMWR
HJRBDA:	Breif on Hadejia Valley Irrigation Project, HIRBDA, December 2010
BORBDA:	List of Dams and Irrigation Projects by Benin Owena RBDA, November 2011
UBRBDA:	List of Irrigation Projects by Upper Benue RBDA, December 2011and May 2012
LBRBDA:	Annual Report, Lower Benue RBDA, December 2009
NDRBDA:	List of Irrigation Projects by Niger Delta RBDA, May 2012
2020M/S:	Masterplan for Irrigation and Dam Development for 2009-2020, FMAWR
UNFR:	Utilization of Natural Resources Fund for Water Resources and Agricultural Development A jiont presentation to the National Economic Council, FMWR/ FMARD
Inventory :	Inventry Survey and response from RBDA in this time Master Plan study

Indentified Irrigation Projects and Crops for Transformation Agwngda
Priority Irrigation and Drainage Projects for Special Intervention

Note:
(*1) Evaluated by JICA Project Team with 1/5 Safety Level of Water Supply under the Assumed Cropping Pattern as well as Water Use Condition in Other Purpose such as Municipal Water Supply in 2030

Table SR5.2-11 Existing Medium and Small Scale Irrigation Project (HA-1) (1/2)

SN	No.	HA	On-going	Rehabilitation	Expansion	Project Name	State	Longitude East	Latitude North	River	SHA	Agency
1001	1	1				Rijau	Niger			Butulu	102	SRRBDA
1002	2	1				Nasko	Niger			Shodogulbi	102	SRRBDA
1003	3	1				Dongongari	Niger			Kainji Lake	101	SRRBDA
1004	4	1	○		E	Zauro Polder	Kebbi	12°35'	4°21'	Sokoto	10605	SRRBDA
1005	5	1	○			Shagari	Sokoto				10606	SRRBDA
						Sub-total						
1006	6	1				Makere	Katsina	12°34'	6°4'	Karaduwa	1060881	MANR
1007	7	1				Gagere	Katsina			Gagere	106089	MANR
1008						missing						
1009	8	1				Illo	Kebbi			Illogour	107_i	MANR
1010	9	1		R	E	Argungu/ Tabarau	Kebbi				10605	MANR
1011	10	1		R		Kwakwazo	Sokoto				10606	MANR
1012	11	1				Deberam	Katsina				106082_i2	MANR
1013	12	1				Mashigi	Katsina				106082_i2	MANR
1014	13	1				Mairuwa	Katsina			Mairuwa lake	106093	MANR
1015	14	1				Mangwal	Katsina				106082_i2	MANR
1016	15	1				Raddewa	Katsina				1060863	MANR
1017	16	1				Goronyo	Sokoto			Rima	106083	MANR
						Sub-total						
						Total						

Table SR5.2-11 Existing Medium and Small Scale Irrigation Project (HA-1) (2/2)

SN	No.	Project Name	Water Source Works	Name of Source	Irrigation Service Area (ha)		Irrigation Service Area (ha)		Remarks	Source	Future Irrigation Area in 2030 (ha)
					Planned Area	System Developed	Service Area	Intensity (%)			
1001	1	Rijau	Dam		100	100	100	100		95M/S	100
1002	2	Nasko	Dam		200	200	200	100	rice, vegetable, maize	2020M/S, 95M/S	200
1003	3	Dongongari	Pump	Kainji	320	320	320	100	rice, vegetable, maize	2020M/S, 95M/S	320
1004	4	Zauro Polder	Dam	Sokoto R.	100	100	100	100		ROPISIN, UNRF	100
1005	5	Shagari	Dam		220	220	0	0	Under construction	UNRF, DID	220
		Sub-total			**940**	**940**	**720**	**77**			**940**
1006	6	Makere	Pump	Karaduwa R.	300	100	100	33	wheat	2020M/S, 95M/S	100
1007	7	Gagere	Weir		100	0	0	0		2020M/S, 95M/S	0
1008	8	missing									
1009	9	Illo	Dam		120	0	0	0		2020M/S, 95M/S	0
1010	10	Argungu/ Tabarau		Sokoto R.	100	100	0	0		2020M/S	100
1011	11	Kwakwazo			250	250	0	0		2020M/S	250
1012	12	Deberam	Dam		240	240	240	100	wheat, vegetable, maize	2020M/S-Annex4	240
1013	13	Mashigi	Dam		150	35	35	23	wheat, maize	2020M/S-Annex4	35
1014	14	Mairuwa	Pump		100	76	76	76	wheat, vegetable, maize	2020M/S-Annex4	76
1015	15	Mangwal	Dam		100	0	0	0	wheat, maize	2020M/S-Annex4	0
1016	16	Raddewa	Dam		100	50	50	50	wheat, vegetable, maize	2020M/S-Annex4	50
1017	17	Goronyo	Pump	Rima R.	120	120	120	100	wheat	2020M/S-Annex4	120
		Sub-total			**1,680**	**971**	**621**	**37**			**971**
		Total			**2,620**	**1,911**	**1,341**	**51**			**1,911**

Table SR5.2-12 Existing Medium and Small Scale Irrigation Project (HA-2) (1/2)

SN	No.	HA	On-going	Rehabilitation	Expansion	Project Name	State	Longitude East	Latitude North	River	SHA	Agency
1018	1	2				Kerawa	Kaduna			Tubo	20812	UNRBDA
1019	2	2			E	Tafa/ Jere	Kaduna			Tafa	20203	UNRBDA
1020	3	2				Nasarawa	Niger			Kontagora	218	UNRBDA
1021	4	2				Jebba North	Niger				209	UNRBDA
1022	5	2				Wuya	Kaduna				20801	UNRBDA
1023	6	2				Pandegi	Niger				206	UNRBDA
1024	7	2				Zangon-Kataf	Kaduna				20815	UNRBDA
1025	8	2		R		Ero	Ekiti			Ero	209	BORBDA
						Sub-total						
1026	9	2		R	E	Birnin Gwari	Kaduna			Kushari	20804	MANR
1027	10	2		R	E	Kogun	Kaduna			Kogun	20806	MANR
1028	11	2				Kidandan	Kaduna			Tubo	20812	MANR
1029	12	2				S.Birni	Kaduna			Tubo	20812	MANR
1030	13	2				Shika	Kaduna			Galma	20814	MANR
1031	14	2				Kazuntu	Kaduna			Galma	20814	MANR
1032	15	2				Dawanta	Kaduna			Galma	20814	MANR
1033	16	2				Lere	Kaduna			Karami	20815	MANR
1034	17	2				G.Kurama	Kaduna			K.Kuri	20815	MANR
1035	18	2				Pambegua	Kaduna				20203	SWB
1036	19	2				Jagindi	Kaduna				20815	SWB
1037	20	2				Igabi	Kaduna				20813	FGN
1038	21	2				Doko	Niger			Kaduna	20801	MANR
1039	22	2				Kagoro	Kaduna			Kogun	20815	MANR
1040	23	2		R		Edozhigi	Niger			Kupanko/Ejiko	20801	MANR
1041	24	2		R		Odugbo	Kogi			Odugbo-Idi	20401	
1042	25	2		R		Chanchanga	Niger			chanchanga	206	MANR
1043	26	2		R		Agaie	Niger				206	MANR
1044	27	2		R		Papiri	Niger			Kanji Lake	218	MANR
1045	28	2		R		Loguma	Niger			Emi	20810	MANR
1046	29	2				Gurama/ Sarkin Fawa	Kaduna			Sarkin Pawa	20810	MANR
1047	30	2		R		Tamani	Niger			Olive	213	MANR
1048	31	2		R		Bangi	Niger				20801	MANR
1049	32	2		R		Galama	Kaduna				20810	
1050	33	2				Lafiagi	Kwara			Oro	209	
1051	34	2				Kuta	Niger			Rafin kuta	20804	MANR
1052	35	2		R		Toroko	Niger			Kanko	20804	MANR
1053	36	2				Hunkuyi	Kaduna				20205	MANR
1054	37	2				Tadanni	Kaduna				20205	MANR
1055	38	2				Aiyetoro	Kogi			Ose stream	20401	MANR
1056	39	2				Serki Noma	Kogi			Akapanioba stream	201	MANR
1057	40	2				Ajasse-Ipo	Kwara			Osha	209	MANR
1058	41	2				Shao	Kwara			Imoru	209	MANR
1059	42	2				Obbo-Ile	Kwara			Iraji	212	MANR
1060	43	2				Moshi	Kwara			Moshi	214_i	MANR
1061	44	2				Passa Elepo	Kwara			Passa	212	MANR
1062	45	2				Bussamu	Kwara			Bussamu	209	MANR
1063	46	2				Lioji	Niger			Lioji	206	MANR
1064	47	2				Zara	Niger			Bagoma	206	MANR
1065	48	2				Baratsu	Niger			Eji	20801	MANR
1066	49	2				Gongara	Katsina				20812	MANR
						Sub-total						
						Total						

Table SR5.2-12 Existing Medium and Small Scale Irrigation Project (HA-2) (2/2)

SN	No.	Project Name	Water Source Works	Name of Source	Irrigation Service Area (ha)		Irrigation Service Area (ha)		Remarks	Source	Future Irrigation Area in 2030 (ha)
					Planned Area	System Developed	Service Area	Intensity (%)			
1018	1	Kerawa	Dam		100	100	50	50	rice, maize, vegetable	UNRF, 95M/S	100
1019	2	Tafa/ Jere	Pump		355	52	52	15		ROPISIN	355
1020	3	Nasarawa	Dam	Kontagora (Aulo) Dam	100	100	27	27	wheat, tomato	UNRF, 2020M/S	100
1021	4	Jebba North		Niger R.	150	20	20	13		UNRF	20
1022	5	Wuya		Kaduna R.	100	25	25	25		UNRF	25
1023	6	Pandegi			100	25	25	25		UNRF	25
1024	7	Zangon-Kataf			150	30	30	20		UNRF	30
1025	8	Ero	Dam		200	200	200	100		BORBDA, 2020M/S	200
		Sub-total			**1,255**	**552**	**429**	**275**			**855**

1026	9	Birnin Gwari	Dam		430	200	50	12	wheat, maize, vegetable	2020M/S, 95M/S	430
1027	10	Kogun	Pump		400	150	50	13		2020M/S, 95M/S	400
1028	11	Kidandan	Dam		200	40	40	20	wheat, maize, vegetable	2020M/S, 95M/S	40
1029	12	S.Birni	Intake		200	40	40	20		95M/S	40
1030	13	Shika	Dam	Galma R.	100	80	40	40	tomato	2020M/S, 95M/S	80
1031	14	Kazuntu	Pump	Galma R.	80	65	40	50	vegetable	2020M/S, 95M/S	65
1032	15	Dawanta	Weir	Galma R.	100	40	40	40		95M/S	40
1033	16	Lere	Weir		200	40	40	20		2020M/S, 95M/S	40
1034	17	G.Kurama	Dam		200	40	40	20		2020M/S, 95M/S	40
1035	18	Pambegua	Dam		65	60	40	62		UNRF, Faithline	60
1036	19	Jagindi	Dam		100	100	10	10		UNRF, Faithline	100
1037	20	Igabi	Dam		120	120	30	25		UNRF, Faithline	120
1038	21	Doko	Pump	Kaduna R.	400	400	400	100	rice, vegetable, maize	UNRF, 2020M/S	400
1039	22	Kagoro	Intake		120	100	100	83	rice, vegetable	UNRF, 2020M/S	100
1040	23	Edozhigi	Intake		100	100	100	100	rice	UNRF, 95M/S	100
1041	24	Odugbo			150	100	0	0		2020M/S	150
1042	25	Chanchanga	Pump		302	302	0	0	vegetable	2020M/S	302
1043	26	Agaie			76	76	0	0		2020M/S	76
1044	27	Papiri	Pump	Kainji	80	80	0	0	cowpea, vegetable	2020M/S	80
1045	28	Loguma	Weir		125	100	0	0		2020M/S	125
1046	29	Gurama/ Sarkin Fawa	Pump		300	60	0	0	wheat, maize, vegetable	2020M/S	60
1047	30	Tamani	Pump		10	10	0	0	vegetable	2020M/S	10
1048	31	Bangi			50	50	0	0		2020M/S	50
1049	32	Galama			300	300	0	0		2020M/S	300
1050	33	Lafiagi	Pump		20	5	5	25	vegetable	2020M/S, 95M/S	5
1051	34	Kuta	Dam		150	30	30	20	vegetable, maize	2020F/S, UNRF	30
1052	35	Toroko	Weir		80	80	0	0	rice	2020M/S	80
1053	36	Hunkuyi			60	40	40	67	vegetable	2020M/S-Annex4	40
1054	37	Tadanni			60	4	4	7	ver, maize	2020M/S-Annex4	4
1055	38	Aiyetoro	Dam		50	3	3	6	vegetable, maize	2020M/S-Annex4	3
1056	39	Serki Noma	Weir		50	20	20	40	rice	2020M/S-Annex4	20
1057	40	Ajasse-Ipo	Pump		100	3	3	3	vegetable, Citrus	2020M/S-Annex4	3
1058	41	Shao	Pump		50	3	3	6	vegetable	2020M/S-Annex4	3
1059	42	Obbo-Ile	Pump		90	12	12	13	vegetable, maize, citrus	2020M/S-Annex4	12
1060	43	Moshi	Pump		50	5	5	10	vegetable, maize, sugar cane	2020M/S-Annex4	5
1061	44	Passa Elepo	Dam		60	17	17	28	vegetable, maize	2020M/S-Annex4	17
1062	45	Bussamu	Dam		60	9	9	15	vegetable, maize, cowpea	2020M/S-Annex4	9
1063	46	Lioji	Pump		80	40	40	50	rice, vegetable	2020M/S-Annex4	40
1064	47	Zara	Weir		80	0	0	0	rice, wheat, vegetable, maize	2020M/S-Annex4	0
1065	48	Baratsu	Weir		73	49	49	67	rice	2020M/S-Annex4	49
1066	49	Gongara	Dam		100	0	0	0	wheat, vegetable	2020M/S-Annex4	0
		Sub-total			**5,421**	**2,973**	**1,300**	**24**			**3,528**
		Total			**6,676**	**3,525**	**1,729**	**26**			**4,383**

Table SR5.2-13 Existing Medium and Small Scale Irrigation Project (HA-3) (1/2)

SN	No.	HA	On-going	Rehabilitation	Expansion	Project Name	State	Longitude East	Latitude North	River	SHA	Agency
1067	1	3				Tallum	Adamawa	9°44'	11°59'	Gongola	31403	UBRBDA
1068	2	3	○		E	Waya	Bauchi	10°17'	9°49'	Waya	31409	UBRBDA
1069	3	3				Cham	Gombe	9°44'	11°43'	Cham	311	UBRBDA
1070	4	3				Donga	Taraba			Donga	30203_i	UBRBDA
						Sub-total						
1071	5	3				Jaffi	Borno			Noivana	31404	MANR
1072	6	3		R		Dwan	Adamawa				318	MANR
1073	7	3		R	E	Dasin Hausa	Adamawa				317	MANR
1074	8	3		R	E	Mayo	Adamawa			Yedseram	316	MANR
						Sub-total						
1075	9	3				vegetablefru	Borno			Gongola	31407	VEGFRU(Priva
						Sub-total						
						Total						

Table SR5.2-13 Existing Medium and Small Scale Irrigation Project (HA-3) (2/2)

SN	No.	Project Name	Water Source Works	Name of Source	Irrigation Service Area (ha)		Irrigation Service Area (ha)		Remarks	Source	Future Irrigation Area in 2030 (ha)
					Planned Area	System Developed	Service Area	Intensity (%)			
1067	1	Tallum	Dam	Kiri	400	160	100	25		ROPISIN, 2020M/S	160
1068	2	Waya	Dam		250	30	30	12	sorghum, cowpea	UBRBDA, ROPISIN	250
1069	3	Cham	Dam		250	115	0	0	vegetable. maize	ROPISIN, Faithline	115
1070	4	Donga	Pump	Donga R.	150	60	40	27	rice, maize	2020M/S, 95M/S	60
		Sub-total			**1,050**	**365**	**170**	**64**			**585**
1071	5	Jaffi	Pump		20	20	20	100		Faithline	20
1072	6	Dwan			200	200	0	0		2020M/S	200
1073	7	Dasin Hausa		Benue R.	200	200	0	0	rice, maize, sugar cane	2020M/S	200
1074	8	Mayo	Pump		50	50	0	0	rice, vegetable, maize	2020M/S	50
		Sub-total			**470**	**470**	**20**	**4**			**470**
1075	9	vegetablefru	Pump	Gongola R.	300	300	300	100	vegetable	2020M/S, 95M/S	300
		Sub-total			**300**	**300**	**300**	**100**			**300**
		Total			**1,820**	**1,135**	**490**	**27**			**1,355**

Table SR5.2-14 Existing Medium and Small Scale Irrigation Project (HA-4) (1/2)

SN	No.	HA	On-going	Rehabilitation	Expansion	Project Name	State	Longitude East	Latitude North	River	SHA	Agency
1076	1	4				Naka	Benue	7°44'	7°33'	Ana	405	LBRBDA
						Sub-total						
1077	2	4				Gidan Adamu	Plateau			Yashi	408	MANR
1078	3	4				Awuma	Plateau			Awuma	407	MANR
1079	4	4				Akata	Benue			Katsin-Ala	406_i	MANR
1080	5	4				Mu	Benue			Mu	405	MANR
1081	6	4		R	E	Rutu	Nasarawa				404	MANR
1081	7	4		R		Loko	Nasarawa				403	MANR
1083	8	4		R		Allam	Benue			Okpo Kira	405	MANR
1084	9	4		R		Sabon Gida	Nasarawa				404	MANR
1085	10	4		R		Bassa	Nasarawa				404	MANR
1086	11	4				Ganauri	Plateau			Gwasai	404	MANR
						Sub-total						
						Total						

Table SR5.2-14 Existing Medium and Small Scale Irrigation Project (HA-4) (2/2)

SN	No.	Project Name	Water Source Works	Name of Source	Irrigation Service Area (ha)		Irrigation Service Area (ha)		Remarks	Source	Future Irrigation Area in 2030 (ha)
					Planned Area	System Developed	Service Area	Intensity (%)			
1076	1	Naka	Dam		100	20	20	20		ROPISIN, LBRBDA	20
		Sub-total			**100**	**20**	**20**	**20**			**20**
1077	2	Gidan Adamu	Pump		100	30	20	20	vegetable, maize	2020M/S, 95M/S	30
1078	3	Awuma	Pump		70	20	20	29		2020M/S, 95M/S	20
1079	4	Akata	Pump	Katsina-Ala R.	80	10	10	13		95M/S	10
1080	5	Mu	Pump		100	60	60	60	rice, vegetable	2020M/S, 95M/S	60
1081	6	Rutu			50	50	0	0		2020M/S	50
1081	7	Loko			50	50	0	0	vegetable, maize	2020M/S	50
1083	8	Allam	Pump		50	50	0	0	Rcce, maize, vegetable	2020M/S	50
1084	9	Sabon Gida			200	200	0	0		2020M/S	200
1085	10	Bassa			50	50	0	0		2020M/S	50
1086	11	Ganauri	Pump		400	130	20	5	rice,wheat, vegetable, maize	2020M/S, 95M/S	130
		Sub-total			**1,150**	**650**	**130**	**11**			**650**
		Total			**1,250**	**670**	**150**	**12**			**670**

Table SR5.2-15 Existing Medium and Small Scale Irrigation Project (HA-5) (1/2)

SN	No.	HA	On-going	Rehabilitation	Expansion	Project Name	State	Longitude East	Latitude North	River	SHA	Agency
1087	1	5	○	R		Ukhun/ Erah	Edo			Erah	50403	BORBDA
1088	2	5				Egume	Kogi			Eruku	50402	LBRBDA
1089	3	5	○			Anyama-Ogbia	Rivers			Nun	500	NDBDA
1090	4	5			E	Otuokpoti	Rivers			Nun	500	NDBDA
1091	5	5				Ewulu	Delta			Umomi	500	BORBDA
1092	6	5	○			Kpong	Rivers	4°37'	7°23'	Andori	500	NDBDA
						Sub-total						
1093	7	5				Ifite Ogwari	Anambra			Anambra	50402	MANR
1094	8	5		R	E	Enugu abor	Enugu			Mamu	50402	MANR
1095	9	5		R		Ogboji	Anambra			Mamu	50402	MANR
						Sub-total						
						Total						

Table SR5.2-15 Existing Medium and Small Scale Irrigation Project (HA-5) ¥ (2/2)

SN	No.	Project Name	Water Source Works	Name of Source	Irrigation Service Area (ha)		Irrigation Service Area (ha)		Remarks	Source	Future Irrigation Area in 2030 (ha)
					Planned Area	System Developed	Service Area	Intensity (%)			
1087	1	Ukhun/ Erah	Dam		250	50	25	10	rice, maize	2020M/S, ROPISIN	250
1088	2	Egume	Pump		100	100	100	100		Faithline	100
1089	3	Anyama-Ogbia	Pump	Niger R.	180	24	24	13	rice	NDRBDA, 2020M/S	180
1090	4	Otuokpoti	Pump	Niger R.	100	50	50	50	rice	2020M/S, 95M/S	100
1091	5	Ewulu	Pump		100	50	30	30	Pinapple, oil farm	Inventry, ROPISIN	50
1092	6	Kpong	Pump		100	89	89	89	fruits, vegetable	NDBDA, ROPISIN	100
		Sub-total			**830**	**363**	**318**	**38**			**780**
1093	7	Ifite Ogwari	Intake		120	120	30	25		2020M/S, 95M/S	120
1094	8	Enugu abor Ufuwa	Weir		350	350	30	9	rice	2020M/S, 95M/S	350
1095	9	Ogboji	Intake		130	100	30	23	rice	UNRF, 95M/S	130
		Sub-total			**600**	**570**	**90**	**15**			**600**
		Total			**1,430**	**933**	**408**	**29**		**2020M/S, ROPISIN**	**1,380**

Table SR5.2-16 Existing Medium and Small Scale Irrigation Project (HA-6) (1/2)

SN	No.	HA	On-going	Rehabilitation	Expansion	Project Name	State	Longitude East	Latitude North	River	SHA	Agency
1096	1	6				Ofiki(B)	Oyo			Ofiki	604023_i	OORBDA
1097	2	6				Sepeteri(B)	Oyo			Agbado	60405	OORBDA
1098	3	6				Eniosa	Oyo			Omi	606	OORBDA
1099	4	6			E	Ikere-Ogbese	Ekiti			Ogbese	614	BORBDA
1100	5	6				Obayantor	Edo			(boreholl)	614	BORBDA
1101	6	6				Erusu	Ondo	7°36'	5°47'	Etigbese	614	BORBDA
1102	7	6				Ayo-Kudun	Ekiti				614	BORBDA
1103	8	6				Apariko	Ekiti			Apariko	614	BORBDA
1104	9	6				Ado-Ekiti (Osin)	Ekiti				614	BORBDA
1105	10	6				Ukpok	Edo				616	BORBDA
1106	11	6				Ilah-Ebu	Delta				617	BORBDA
1107	12	6				Ewule	Delta				617	BORBDA
1108	13	6				Iju-Itaogbolu	Ondo				612	BORBDA
1109	14	6				Ijero	Ekiti				614	BORBDA
1110	15	6	○			Owiwi	Ogun				60401	OORBDA
1111	16	6	○			Itoikin	Lagos			Aye	606	OORBDA
1112	17	6				missing						
1113	18	6		R	E	Oogi	Osun			Erinle	610	OORBDA
1114	20	6		R		Ipetu-Ijesha	Osun				610	OORBDA
						Sub-total						
1115	19	6				Osun Ekiti	Osun			Awo	614	MANR
1116	21	6		R		Orile Owu	Osun				610	MANR
1117	22	6		R		Old Erinle Dam	Osun				608	MANR
						Sub-total						
						Total						

Table SR5.2-16 Existing Medium and Small Scale Irrigation Project (HA-6) (2/2)

SN	No.	Project Name	Water Source Works	Name of Source	Irrigation Service Area (ha)		Irrigation Service Area (ha)		Remarks	Source	Future Irrigation Area in 2030 (ha)
					Planned Area	System Developed	Service Area	Intensity (%)			
1096	1	Ofiki(B)	Dam		100	10	10	10		OORBDA, 95M/S	10
1097	2	Sepeteri(B)	Dam		400	0	0	0		OORBDA, 95M/S	0
1098	3	Eniosa	Dam		250	10	10	4	vegetable, maize	OORBDA, 2020M/S	10
1099	4	Ikere-Ogbese	Pump		32	32	11	34	maize okura	ROPISIN	32
1100	5	Obayantor	Pump		100	100	0	0	oil palm	ROPISIN	100
1101	6	Erusu	Dam		250	0	0	0		ROPISIN	0
1102	7	Ayo-Kudun			300	300	300	100		BORBDA	300
1103	8	Apariko	Dam		250	250	250	100		BORBDA	250
1104	9	Ado-Ekiti (Osin)	Dam		50	0	0	0	Under construction	BORBDA	0
1105	10	Ukpok			25	25	25	100		BORBDA	25
1106	11	Ilah-Ebu			50	50	50	100		BORBDA	50
1107	12	Ewule			50	50	50	100		BORBDA	50
1108	13	Iju-Itaogbolu			100	0	0	0		Inventory, BORBDA	0
1109	14	Ijero			100	100	100	100		BORBDA	100
1110	15	Owiwi	Dam		302	45	45	15		OORDBA, DID	302
1111	16	Itoikin	Intake	NF	315	141	141	45	Rice	OORBDA	315
1112	17	missing									
1113	18	Oogi	Intake		400	0	0	0		OORBDA, 2020M/S	400
1114	20	Ipetu-Ijesha	Intake		250	0	0	0		OORBDA, 95M/S	250
		Sub-total			**3,074**	**1,113**	**992**	**32**			**2,194**
1115	19	Osun Ekiti	Intake		420	100	100	24		2020F/S, 95M/S	100
1116	21	Orile Owu			100	100	0	0		2020M/S	100
1117	22	Old Erinle Dam			150	150	0	0		2020M/S	150
		Sub-total			**670**	**350**	**100**	**15**			**350**
		Total			**3,744**	**1,463**	**1,092**	**29**			**2,544**

Table SR5.2-17 Existing Medium and Small Scale Irrigation Project (HA-7) (1/2)

SN	No.	HA	On-going	Rehabilitation	Expansion	Project Name	State	Longitude East	Latitude North	River	SHA	Agency
1118	1	7		R		Ogoja	Cross River	6°37'	8°48'	Aya	704042	CRBDA
1119	2	7				Abak	Akwa Ibom	4°57'	7°48'	Abak	703	CRBDA
1120	3	7		R		Bende	Abia			Igwu	70401	AIRBDA
1121	4	7		R		Igwu-Ohafia	Abia			Igwu	70401	AIRBDA
1122	5	7				Utuma	Cross River			Cross	70401	CRBDA
1123	6	7				Obudu	Cross River	6°37'	9°10'	Abeb	704042	CRBDA
1124	7	7		R	E	Oniong Nung Nden	Akwa Ibom	4°47'	7°54'	Quo Ibou	703	CRBDA
1125	8	7			E	Obubra	Cross River			Cross	70403	CRBDA
1126	9	7				Amaeki Abam	Cross River				70405_i	CRBDA
1127	10	7				Iboko	Enugu			Aboine	704043	AIRBDA
1128	11	7				Igwu-Ndiojo Oguwo	Abia			Igwu	70401	AIRBDA
1129	12	7				Igwu-Ndiebe	Abia			Igwu	70401	AIRBDA
						Sub-total						
1130	13	7				Akaeze	Abia			Asu	70402	MANR
1131	14	7		R	E	Ihitti-Uboma	Imo				702	MANR
1132	15	7				Umlopara	Abia			Imo	702	MANR
1133	16	7		R		Nung Obong	Akwa Ibom			Abak	70401	MANR
1134	17	7		R		Owutu	Abia			Asu	70402	MANR
1135	18	7				Umuhu	Abia			Asu	70402	MANR
1136	19	7				Uzu Abam	Abia			Igwu	70401	MANR
1137	20	7				Idim Abam	Abia			Igwu	70401	MANR
1138	21	7				Ofiawu	Abia			Asu	70402	MANR
1139	22	7				Uwet	Akwa Ibom			Calabar	705	MANR
1140	23	7				Ezamgbe	Ebonyi				70402	MANR
1141	24	7			E	Ezeiyieku Esu	Ebonyi				70402	MANR
1142	25	7		R	E	Ezillo Farm	Ebonyi				70402	MANR
1143	26	7			E	Ozara Okangwu	Ebonyi				70402	MANR
1144	27	7		R	E	Item-Ikwo	Enugu				70402	MANR
						Sub-total						

Table SR5.2-17 Existing Medium and Small Scale Irrigation Project (HA-7) (2/2)

SN	No.	Project Name	Water Source Works	Name of Source	Irrigation Service Area (ha)		Irrigation Service Area (ha)		Remarks	Source	Future Irrigation Area in 2030 (ha)
					Planned Area	System Developed	Service Area	Intensity (%)			
1118	1	Ogoja	Pump		125	125	125	100	vegetable, maize	Inventry, ROPISIN	125
1119	2	Abak	Pump		92	62	62	67	vegetable. maize	UNRF, ROPISIN	62
1120	3	Bende	Intake		300	150	20	7	rice	2020M/S, Faithline	300
1121	4	Igwu-Ohafia	Intake		300	160	160	53	rice	2020F/S, Faithline	300
1122	5	Utuma	Pump	Cross R.	250	200	200	80		UNRF, 95M/S	200
1123	6	Obudu	Dam		115	30	30	26		UNRF, ROPISIN	30
1124	7	Oniong Nung Nden	Pump		400	177	177	44		ROPISIN, Faithline	400
1125	8	Obubra	Pump	Cross R.	315	315	102	32		UNRF, 95M/S	315
1126	9	Amaeki Abam	Pump		62	62	0	0	rice	2020F/S, Faithline	62
1127	10	Iboko	Intake		300	150	150	50	rice	2020F/S, Faithline	150
1128	11	Igwu-Ndiojo Oguwo	Pump		150	150	100	67	rice	2020M/S, Faithline	150
1129	12	Igwu-Ndiebe	Pump		200	100	0	0	rice	2020M/S, Faithline	100
		Sub-total			**2,609**	**1,681**	**1,126**	**43**			**2,194**
1130	13	Akaeze	Dam		200	200	100	50	rice	2020M/S, 95M/S	200
1131	14	Ihitti-Uboma	Weir		310	200	40	13	rice	2020M/S, Faithline	310
1132	15	Umlopara	Dam		300	210	50	17	rice	2020M/S, Faithline	210
1133	16	Nung Obong	Pump		200	100	30	15	cowpea, ginger	2020M/S, Faithline	200
1134	17	Owutu	Pump		480	280	280	58	rice	2020M/s, 95M/S	480
1135	18	Umuhu	Pump		400	200	100	25	rice	2020M/S, Faithline	200
1136	19	Uzu Abam	Pump		150	70	0	0	rice	2020M/S, Faithline	70
1137	20	Idim Abam	Pump		200	200	30	15	rice	2020M/P, Faithline	200
1138	21	Ofiawu	Intake		250	115	50	20	rice	2020,F/S, Faithline	115
1139	22	Uwet	Pump		100	50	50	50		Faithline	50
1140	23	Ezamgbe			200	100	100	50		2020M/S, Faithline	100
1141	24	Ezeiyieku Esu			200	0	0	0		Faithline	200
1142	25	Ezillo Farm			150	150	0	0		2020M/S, Faithline	150
1143	26	Ozara Okangwu			300	0	0	0		Faithline	300
1144	27	Item-Ikwo			300	100	0	0		2020M/S	300
		Sub-total			**3,740**	**1,975**	**830**	**22**			**3,085**
		Total			**6,349**	**3,656**	**1,956**	**31**			**5,279**

Table SR5.2-18 Existing Medium and Small Scale Irrigation Project (HA-8) (1/2)

SN	No.	HA	On-going	Rehabilitation	Expansion	Project Name	State	Longitude East	Latitude North	River	SHA	Agency
1145	1	8				Gamboru	Borno			Ebeii	80401	CBDA
1146	2	8				Jamaare(Sewa Pilot)	Bauchi	11°25'	9°58'	Sewa lake	808063	HJRBDA
1147	3	8	○			Galala	Bauchi			Galala	808063	HJRBDA
1148	4	8				Gunuar Kukaf	Jigawa			Hadejia	808073	HJRBDA
1149	5	8				Mai-alkama	Jigawa			Hadejia	808073	HJRBDA
1150	6	8				Arawa	Jigawa			Hadejia	808073	HJRBDA
						Sub-total						
1151	7	8				Tudun Wada	Kano			Waina	808077	MANR
1152	8	8				Diya	Bauchi			Lake Diya	808063	MANR
1153	9	8				Maladumba	Bauchi			Lake Maladumba	808063	MANR
1154	10	8				K.Gana	Jigawa			Katagun	808062	MANR
1155	11	8				Hantsu	Jigawa			Hadejia	808073	MANR
1156	12	8				Warwada	Jigawa			Keffin Hausa	808061	MANR
1157	13	8				Damasak	Borno			Yobe	80801_i	MANR
1158	14	8				Yau	Borno				80403_i	MANR
1159	15	8				Abadam	Borno				80403_i	MANR
1160	16	8				Ngabu	Borno				80401	
1161	17	8				Jakarade	Jigawa			Gari	8080721_i	MANR
1162	18	8				Yamidi	Jigawa			Warwade	808061	MANR
1163	19	8				Dambo	Jigawa			Gari	8080721_i	MANR
1164	20	8				Walu	Kano			Hadejia	808073	MANR
1165	21	8				Tsuwa	Kano			Hadejia	808073	MANR
1166	22	8				Joda	Kano			Hadejia	808073	MANR
1167	23	8				Mugura	Yobe			Yobe	80805	MANR
						Sub-total						
						Total						
						Grand Total						

Table SR5.2-18 Existing Medium and Small Scale Irrigation Project (HA-8) (2/2)

SN	No.	Project Name	Water Source Works	Name of Source	Irrigation Service Area (ha)		Irrigation Service Area (ha)		Remarks	Source	Future Irrigation Area in 2030 (ha)
					Planned Area	System Developed	Service Area	Intensity (%)			
1145	1	Gamboru	Pump		400	400	400	100		2020M/S, Faithline	400
1146	2	Jamaare(Sewa Pilot)	Pump		50	20	0	0	wheat	ROPISIN	20
1147	3	Galala	Dam		130	72	72	55		HJRBDA	130
1148	4	Gunuar Kukaf	Pump	Hadejia R.	80	0	0	0		2020M/S-Annex4	0
1149	5	Mai-alkama	Pump	Hadejia R.	80	0	0	0		2020M/S-Annex4	0
1150	6	Arawa	Pump	Hadejia R.	60	0	0	0		2020M/S-Annex4	0
		Sub-total			**800**	**492**	**472**	**59**			**550**
1151	7	Tudun Wada	Dam		360	0	0	0	wheat, vegetable	2020M/S, 95M/S	0
1152	8	Diya	Lake		250	30	30	12	vegetable	2020M/S, 95M/S	30
1153	9	Maladumba	Lake		250	20	20	8	vegetable	2020M/S, 95M/S	20
1154	10	K.Gana	Dam		60	40	40	67		2020M/S, 95M/S	40
1155	11	Hantsu	Pump	Hadejia R.	200	30	30	15	rice, vegetable	2020M/S, 95M/S	30
1156	12	Warwada	Dam		80	40	40	50		2020M/S, 95M/S	40
1157	13	Damasak	Pump	Yobe R.	100	30	30	30		2020M/S, 95M/S	30
1158	14	Yau	Pump		420	420	200	48		2020M/S, 95M/S	420
1159	15	Abadam	Pump		260	260	120	46		2020M/S, 95M/S	260
1160	16	Ngabu			200	200	0	0		2020M/S	200
1161	17	Jakarade	Dam	Gari	100	100	100	100	rice, wheat, vegetable	2020M/S, 95M/S	100
1162	18	Yamidi	Dam		90	0	0	0		2020M/S-Annex4	0
1163	19	Dambo	Dam	Gari	200	0	0	0	rice, wheat, vegetable	2020M/S-Annex4	0
1164	20	Walu	Pump	Hadejia R.	150	50	50	33	vegetable, wheat	2020M/S-Annex4	50
1165	21	Tsuwa	Pump	Hadejia R.	120	0	0	0	rice, wheat, vegetable	2020M/S-Annex4	0
1166	22	Joda	Pump	Hadejia R.	100	0	0	0	rice, wheat, vegetable	2020M/S-Annex4	0
1167	23	Mugura	Pump	Yobe R.	120	28	28	23	rice, wheat	2020M/S-Annex4	28
		Sub-total			**3,060**	**1,248**	**688**	**22**			**1,248**
		Total			**3,860**	**1,740**	**1,160**	**30**			**1,798**
		Grand Total			**27,749**	**15,033**	**8,326**	**30**			**19,320**

SR5.2.2 Supplementary Irrigation Scheme

New development areas are 19,000 ha for HA-5 and 29,000 ha for HA-7 corresponding to the irrigation areas omitted at the dam selection stage on "2.2 Dam Irrigation Scheme".

Table SR5.2-19 Supplementary Irrigation scheme

HA-5: A=15,000ha

SHA	Primary State	Area (km2)	Suitable Area for Agric.(ha)	Rate (%)	Future Irrigation Area (ha)	Remark
500	Bayelsa, River	19,112	0	0	0	too large unsuitable area
502	Delta	3,157	3,157	10	1,800	
50401	Delta	1,581	0	0	0	flood plain
50402	Anambra, Enugu,	14,105	14,105	42	8,100	
50403	Edo, Kogi	11,821	11,821	36	6,700	
506	Imo, Anambra	4,138	4,138	12	2,400	
Total		53,914	33,221	100	19,000	

HA-7: A=29,000ha

SHA	Primary State	Area (km2)	Suitable Area for Agric.(ha)	Rate (%)	Future Irrigation Area (ha)	Remark
702	Imo, Abia, River)	8,147	8,147	21	5,900	
703	Akwa Ibom	4,319	4,319	11	3,200	
70401	Cross River	6,055	0	0	0	too large unsuitable area
70402	Ebonyi, Enugu	7,091	7,091	18	5,200	
70403	Ebonyi	3,625	3,625	9	2,700	
704041	Ebonyi	1,236	1,236	3	900	
704042	Benue, Cross River	7,703	7,703	19	5,700	
704043	Benue	7,383	7,383	19	5,400	
70405_i	Cross River	6,028	0	0	0	too large unsuitable area
705	Cross River	5,854	0	0	0	too large unsuitable area
Total		57,440	39,504	100	29,000	

SR5.2.3 Dam Irrigation Scheme

Location of dam will be selected considering economy, possibility of suitable irrigation area at downstream of dam, dam efficiency, avoidance of competition among water supply and the existing irrigation scheme, and possibility of resettlement

Economical Indicator on Project:
252 sites are proposed as Dam Irrigation scheme nationwide based on M/P1995 and revised 2013MP. Annual cost of each dam was roughly estimated. Considering the economical cost, the cost corresponding to one third of all, which was altogether ranked in the top 84 turns of all, was indicated at 185,000Naira/ha.

Table SR5.2-20 Selection of dam Irrigation scheme (HA-1)

SN-Dam	SHA	Name	Active Storage (MCM)	Checking Existing Water Use Point	Irrigable Area with safety factor (ha)	Turn Over Rate (-)	Efficiency (ha/MCM)	Supplement for Existing Irrigation	Supplement for Municipal Water Supply	Settlement in reservoir area	Possible irrigation area	Annual Cost /Irrigation area (Naira/ha)	1:adoption 0:disqualification
2003	10602	Ka	90		18,295		204			Large		**18,202**	0
2006	104	Danzaki	43		5,674		132			Large		**95,855**	0
2011	101	Wata	45		4,736		106			Large	3000	**98,439**	0
2009	103	Kasanu	14		1,580		112				1500	**147,488**	**1**
2012	101	Utula	41		1,416	<1.0	34					282,152	0
2013	101	Shafaci	34		1,257	<1.0	37					282,688	0
2010	103	Bambiri	10		804		79					317,574	0
2005	104	Kotsu	10		853		84			Mid		325,308	0
2007	103	Wasa	27		823	<1.0	30					377,618	0
2008	103	Bakin Turu	10		154	<0.6	15					1,659,224	0
2004	105	K.Sakachi	17		185	<0.6	11			Large		1,744,249	0
2001	1060883	Karaduwa	83	14-Zobe	NA	<1.0	NA			Large		NA	0
2002	106089	Kaya	109	4-Goronyo	NA		NA					NA	0

Table SR5.2-20 Selection of dam Irrigation scheme (HA-2)

SN-Dam	SHA	Name	Active Storage (MCM)	Checking Existing Water Use Point	Irrigable Area with safety factor (ha)	Turn Over Rate (-)	Efficiency (ha/MCM)	Supplement for Existing Irrigation	Supplement for Municipal Water Supply	Settlement in reservoir area	Possible irrigation area	Annual Cost /Irrigation area (Naira/ha)	1:adoption 0:disqualification
2077	203	Baro	227		15,916		70				5000 FP	27,199	0
2058	20815	Bakin kogi	51		7,408		146			Large		47,945	0
2082	20205	Chori	28	72-Kwoi	3,496		124		5014		0	66,670	0
2032	206	Yankpako	109	140-Bida	12,606		115			Large		78,367	0
2079	20203	Takara	27		3,901		143				0	91,061	0
2025	20814	Galma(3)	36		3,716		103			Large		107,535	0
2081	20205	Marasa	20	72-Kwoi	2,447		120				0	131,573	0
2080	20205	Kuda	23	22-Gurara	2,366		104				0	136,064	0
2015	212	Ajelanwa	66		3,651		55			Large		145,949	0
2026	206	Essan	30	143-Chanchaga	2,730		92		*Minna*			146,394	0
2024	20814	Galma(2)	63		3,732	<1.0	60			Large		148,715	0
2039	20804	Ukusu	9		1,484		173				3000	172,041	**1**
2028	206	Agaie	34	25-Agaie/Lapai	2,501		73	25				173,110	0
2072	203	Kateha	20		1,688		83				0	190,674	0
2021	212	Okanle	30		1,435		48		*Ilolin*			193,360	0
2069	206	Bakoji	34	32-Bakogi	2,034		59	32				196,499	0
2057	20815	Gurza	31		2,242		72				3000	198,036	0
2018	212	Shao	21	20-Oloru	1,210	<1.0	57				0	220,184	0
2034	206	Faka	29	155-Bakajeba	2,015		70					220,299	0
2030	20805	Sanakpan	20		1,780		88					224,463	0
2017	212	Ala	38		2,197	<1.0	57					227,354	0
2020	212	Mogaji	42	34-Sobi	2,197	<1.0	52		*Ilolin*			242,511	0
2055	20815	Gambo	14	77-Saminaka	1,777		126					243,605	0

2051	20812	Gazare	20		1,285		63					250,556	0
2027	206	Eniko	15	140-Bida	1,332		90					258,425	0
2076	201	Koten karifi	28		2,018		72				1000	264,061	0
2053	20815	Karami	10		752		74					265,850	0
2041	20804	Kombou	12		1,163		99					267,144	0
2056	20815	Gora	14		1,329		94					267,327	0
2036	209	Elebu	22		1,286	<1.0	59					267,548	0
2050	20812	Kalegi	27		1,188	<1.0	43					271,070	0
2062	206	Maidna	14	140-Bida	1,049		75					275,230	0
2016	212	Yanku	37		1,872	<1.0	51					278,618	0
2045	209	Pategi	14		542	<1.0	39					286,481	0
2054	20815	Bishiwa	11	77-Saminaka	1,214		111					292,679	0
2043	209	Lade	23	27-Duke-Lade	1,219	<1.0	52	27				327,818	0
2060	20815	Atom	9		709		83					328,741	0
2074	203	Ebbo	17		1,074	<1.0	62			Large		330,867	0
2048	20812	M. dutse	27		1,029	<1.0	38					334,351	0
2066	206	Mussa	9	38-Badeggi	860		100	38				335,589	0
2031	206	Jariga	25	155-Bakajeba	1,536	<1.0	61					339,609	0
2059	20815	Zonzon	7		843		120					342,303	0
2070	206	Yewar	10	139-Agaie	831		82					347,342	0
2049	20812	Jusawo	16		670	<1.0	43					347,656	0
2046	203	Sunawa	11		1,081		99					349,010	0
2052	20812	Maraku	24		921	<1.0	38					349,417	0
2065	206	Noayma	22		1,868		85					356,444	0
2040	20804	K. Chaaruma	5		715		131					357,121	0
2047	201	Kakanda	9		773		90					359,161	0
2073	20803	Kanko	17		751	<1.0	44					384,259	0
2078	203	Nugmagi	17		969	<1.0	56					423,946	0
2075	201	Ossen Seni	11		874		80					431,996	0
2044	209	Auge	23		839	<0.6	36					449,896	0
2014	212	Jokoro	10		710		70					469,303	0
2029	206	Tungawain	18	140-Bida	1,171		65					483,543	0
2063	206	Edndnade	9	140-Bida	604		70					533,088	0
2035	209	Igporin	26		1,193		46					558,268	0
2064	206	Kondi	10	140-Bida	620		61					573,261	0
2071	205	Anbero	12	146-Katcha	549		47					586,068	0
2019	212	Oloye	10		524	<1.0	52					698,662	0
2037	209	Lasaki	11		605	<1.0	55					770,352	0
2038	209	Okunrun	9	21-Ero	299	<1.0	35		21			780,466	0
2061	206	Gadoko	5	140-Bida	337		62					856,784	0
2022	212	Okeoyi	10	20-Oloru	580	<1.0	57					899,792	0
2068	206	Esama	9	32-Bakogi	282	<0.6	30					1,142,280	0
2033	206	Nabi	20	143-Chanchaga	600		30		*Minna*			1,147,116	0
2067	206	Emiziko	12		250	<0.6	21		5026			1,152,127	0
2023	212	Faloku	15	31-Oyun	NA		NA		31	Mid		NA	0
2042	20801	Kaduna	191									#VALUE!	0

Note: SN-Dam 2077 and 2079 correspond to disqualification due to land-use condition.

Table SR5.2-20 Selection of dam Irrigation scheme (HA-3)

SN-Dam	SHA	Name	Active Storage (MCM)	Checking Existing Water Use Point	Irrigable Area with safety factor (ha)	Turn Over Rate (-)	Efficiency (ha/MCM)	Supplement for Existing Irrigation	Supplement for Municipal Water Supply	Settlement in reservoir area	Possible irrigation area	Annual Cost /Irrigation area (Naira/ha)	1:adoption 0:disqualification
2119	30203_i	Tati	8		1,462		187				VerySmall	15,187	0
2097	30202	Suntai	39		7,969		204			Large		36,215	0
2093	311	Bali	55		5,695		104		*Jalin go*			46,774	0
2091	312	Mayo Belwa	188		17,466		93			Mid	18000	55,925	1
2107	31404	Hawal D.D	94		9,395		100			Large		56,710	0
2096	30602	Sardauna	63		9,745		156			Large	5000	58,093	0
2118	30203_i	Adu	55		6,815		125			Mid	VerySmall	58,639	0
2120	30203_i	Mala	39		6,094		156				VerySmall	71,036	0
2089	316	Mayo Ine	55		8,622		158				30000	83,685	1
2083	318	Hona gombi	48		4,442		93			Mid	3500	132,427	1
2117	30203_i	Goragh	16		1,820		116			Large		140,249	0
2101	318	Song	38		2,291	<1.0	61				**0**	145,350	0
2088	316	Mukan	26		3,374		131			Mid	0	154,638	0
2112	304	Bado	23		2,216		98				7000	160,291	1
2114	307	Dankuturu	27		1,864		68				2000	172,681	0
2115	30203_i	Adashange	16		1,650		106				500	174,959	0
2111	311	Kunini	18		2,119		118				6000	178,141	0
2094	311	Mutumbu	38		2,356	<1.0	62					230,822	0
2116	30203_i	Mboosa	12		1,327		113					242,562	0
2110	311	Danwoiba	20		1,296		66					256,938	0
2106	31404	M. Faa	50		1,748	<1.0	35					273,113	0
2109	312	Zurhu	25		1,542	<1.0	62					309,528	0
2100	318	Sensen	22		1,307	<1.0	60					365,311	0
2105	31404	M. Zangula	17		927		54					371,029	0
2104	31404	M. Gerewa	25		989	<1.0	40					415,337	0
2092	312	Monkin Zin	17		1,400		81					444,006	0
2099	318	Nbumngo	14		940		67					460,695	0
2085	318	Dumne Song	12		1,026		88					464,995	0
2103	31404	M. Jamba	12		764		65					465,178	0
2087	316	Kiri Ganye	28		963	<0.6	34					495,550	0
2084	318	Mubi	12		618	<1.0	53					574,587	0
2102	315	Baunra	12		676		58			Large		574,659	0
2113	307	Loyerima	11		571	<1.0	52					583,317	0
2108	31404	M. Leningo	29		818		28					624,159	0
2086	318	Dumne	10		678		67					655,028	0
2090	31404	Askira Uba	9		649		76					718,205	0
2098	318	Nguli	5		406		74					737,587	0
2095	30601	Tella	313									#VALUE	0

Note: SN-Dam 2107, 2120 and 2088 correspond to disqualification due to land-use condition.

Table SR5.2-20 Selection of dam Irrigation scheme (HA-4)

SN-Dam	SHA	Name	Active Storage (MCM)	Checking Existing Water Use Point	Irrigable Area with safety factor (ha)	Turn Over Rate (-)	Efficiency (ha/MCM)	Supplement for Existing Irrigation	Supplement for Municipal Water Supply	Settlement in reservoir area	Possible irrigation area	Annual Cost /Irrigation area (Naira/ha)	1:adoption 0:disqualification
2124	410	Shemankar	102		15,631		154			Mid	20000	42,607	1
2137	408	Tsorom	19	67-Wuse	2,667		142			Large	1000	49,950	0
2139	407	Aneri	51		6,293		124				15000	59,969	1
2155	406_i	Ambighir	34		5,285		157				0	63,003	0
2172	404	Sanga	29	134-Keffi/Mada	5,598		194				1500	63,447	0
2169	404	Kwagiri	31	134-Keffi/Mada	4,134		132				0	91,283	0
2148	406_i	Dula	20		3,279		161				2000	98,185	1
2142	405	Kereke	27		4,505		165			Mid	2000	98,557	1
2165	404	Leizi	17		3,082		179				0	115,240	0
2171	404	Kormi	14	134-Keffi/Mada	2,188		156				0	131,922	0
2161	405	Ogari(1)	17		2,975		173			Large	2000	134,299	0
2149	406_i	Mishe	17		2,635		153				0	134,777	0
2153	406_i	Yelen(2)	23		2,405		106				0	138,488	0
2134	408	Feteruwa	20	58-Dep	2,565		126				0	138,506	0
2166	404	Kyereku(1)	12		2,043		174				0	141,295	0
2167	404	Kyereku(2)	16		2,231		143				2000	144,302	0
2126	409	Riti	23		1,901		84			Mid	1500	145,944	0
2136	404	Katari	14		1,958		139				0	147,428	0
2162	405	Ogari(2)	16		1,927		123				0	149,737	0
2122	408	Dansak	6	58-Dep	1,741		312				3000	152,992	0
2145	407	Afiae	17		1,961		114			Large		158,472	0
2146	406_i	Agbunko	10		1,470		145				10000	158,591	0
2170	404	Dongwa	20	134-Keffi/Mada	2,517		129				1000	172,019	0
2121	410	Shendam	23		3,158		135			Mid	4000	172,227	0
2154	406_i	Amber	11		1,660		152				0	180,561	0
2132	408	gudi	25	138-Nasarawa-Eggon	3,228		129				0	182,240	0
2123	410	Baushe	43		3,781		88				14000	184,974	0
2135	404	Ganye	17		1,883		110				0	188,628	0
2157	406_i	Daudu	9		1,252		146				0	195,122	0
2160	405	Kpawaju	6		1,049		168				2000	201,130	0
2130	408	Karma(1)	14	58-Dep	2,276		162					209,735	0
2168	405	Ushongu	14		1,673		119					212,260	0
2129	406_i	Ajiba	12		1,344		115					214,759	0
2163	402	Takwa	11		1,242		114					241,281	0
2159	405	Safuga	10		1,049		103					243,473	0
2144	405	Ube	10		947		93					246,242	0
2133	408	Ukon	11	58-Dep	1,385		127					256,537	0
2147	406_i	Mnyande	7		1,111		158					259,856	0
2158	405	Kamken	10		1,159		114					277,693	0
2150	405	Uchi Mbako	9		752		87	Int Dev				295,329	0
2141	406_i	Vakugu	12		1,080		92					298,133	0
2152	406_i	Yelen(1)	7		852		121					299,547	0
2140	406_i	Tsemngo	9		970		113					320,295	0
2131	408	Karma(2)	11	58-Dep	1,338		122					356,747	0

2156	406_i	Ukwye	9		1,201		140					360,306	0
2151	406_i	Dzer	9		973		113					365,172	0
2164	404	G. Shehu	11		1,414		129					376,761	0
2127	407	Uweyande	11		963		88					391,988	0
2138	407	Ovena	9		788		92					408,471	0
2128	407	Fofi	11		803	<1.0	73					511,409	0
2125	409	Ujany	10		646	<1.0	64			Mid		532,558	0
2143	405	Baa	13		684		55					600,146	0

Note: SN-Dam 2146, 2154 and 2132 correspond to disqualification due to land-use condition.

Table SR5.2-20 Selection of dam Irrigation scheme (HA-5)

SN-Dam	SHA	Name	Active Storage (MCM)	Checking Existing Water Use Point	Irrigable Area with safety factor (ha)	Turn Over Rate (-)	Efficiency (ha/MCM)	Supplement for Existing Irrigation	Supplement for Municipal Water Supply	Settlement in reservoir area	Possible irrigation area	Annual Cost /Irrigation area (Naira/ha)	1:adoption 0:disqualification
2175	50403	Obe	45		4,194		93				5000	89,979	1
2179	50402	Oforochi	16	78-Ofarachi	2,308		148	78				101,001	0
2182	50402	Ukwa, Abwa	17		2,300		134				0	106,169	0
2185	50402	Oji	14		3,091		220		5012			107,748	0
2178	50402	Nibo	43	81-Uzo Uwani	3,851		90			Large		141,231	0
2174	50403	Onado	34		2,444		71			Large	2000	168,038	0
2180	50401	Atapo	17		2,368		138				6000	173,401	0
2176	50403	Urhobo	18		2,407		134				1000	184,458	0
2181	50402	Umuleri	9		1,079		125				0	185,254	0
2177	50402	Okupo	14	80-Ada-Rice	1,282		91					190,491	0
2184	50402	Ugbio	9		985		115					236,671	0
2183	50402	Obibia	9		742		86					329,124	0
2173	50403	Ghagede	11		801		73					470,919	0

Note: SN-Dam 2182, 2178 and 2180 correspond to disqualification due to land-use condition.

Table SR5.2-20 Selection of dam Irrigation scheme (HA-6)

SN-Dam	SHA	Name	Active Storage (MCM)	Checking existing Water Use Point	Irrigable Area with safety factor (ha)	Turn Over Rate (-)	Efficiency (ha/MCM)	Supplement for Existing Irrigation	Supplement for Municipal Water Supply	Settlement in reservoir area	Possible irrigation area	Annual Cost /Irrigation area (Naira/ha)	1:adoption 0:disqualification
2223	614	Ala	16		2,440		156				0	95,540	0
2224	614	Okhuo	22		3,473		159				1500	118,253	1
2222	612	Ofosun	35		2,296		65				0	145,046	0
2194	60403	Ohu	34	79-Opeki	1,859		55				0	202,981	0
2189	606	Omi	17	90-Eyniwa	1,473		86					203,513	0
2219	610	Oni	23	161-Okeigbo	2,097		93				0	206,423	0
2213	608	Ifeodan	22	59-Asajire	1,798		82					209,951	0
2211	608	Otamakun	28	59-Asajire	1,568		56					212,431	0
2205	605	Ibu	20	157-Shagamu	1,398		69		5033& 5053			230,241	0
2215	608	Llobu	17	59-Asajire	1,378		80					257,741	0
2188	60403	Ose	23		1,818		78					305,359	0
2220	610	Oke Awo	10	161-Okeigbo	687		68					339,226	0
2198	60403	Aba	20		1,274		65					339,730	0
2221	614	Bolorunduro	10		810		80			Large		342,557	0
2190	604023 _i	Adeniji	25	81-Oyan	941	<1.0	38					377,336	0
2191	604023 _i	Egbebi	11	81-Oyan	765		70					391,881	0
2186	604023 _i	Igangan	14	81-Oyan	702		50					395,480	0
2216	608	Isaki Igbc	17	66-Erinle(EDE)	926		54					407,553	0
2210	608	Mobi	11	59-Asajire	758		69					439,118	0
2192	60403	Washinmi	20	79-Opeki	661	<1.0	34					453,579	0
2217	608	Edagun	10	59-Asajire	334	<0.6	33					465,800	0
2201	60403	Elesin	23		756	<1.0	33					469,587	0
2209	606	Opebi	23	90-Eyniwa	734	<0.6	32					514,252	0
2187	60403	Ilora	14		640	<1.0	45					538,031	0
2207	606	Ojo	11	90-Eyniwa	494	<1.0	45					606,277	0
2212	608	Ajekale	22	59-Asajire	743	<0.6	34					642,222	0
2203	60403	Atopa	11		524		48					677,490	0
2214	608	Ijimoba	9	59-Asajire	495		58					717,343	0
2206	606	Olobi	11	90-Eyniwa	549		50					788,160	0
2218	608	Adokanra	12	154-Ijebu-Igbo/Aoje	291	<0.6	25					799,924	0
2208	606	Bale	11	90-Eyniwa	402	<1.0	37					828,453	0
2197	60403	Akinmorin	11		453	<1.0	41			Large		833,901	0
2204	60401	Cuta	20		300	<0.6	15					926,256	0
2193	60403	Oko	22	79-Opeki	470	<0.6	21					944,847	0
2202	60403	Oyebode	28		447	<0.6	16					1,067,668	0
2195	60403	Eketa	18		460	<0.6	26					1,181,383	0
2196	60403	Agida	11		297	<0.6	27					1,268,786	0
2200	60403	Are Ago	9		249	<0.6	29					1,424,213	0
2199	60403	Alapa	9		228	<0.6	27					1,654,424	0

Note: SN-Dam 2223 and 2222 correspond to disqualification due to land-use condition.

Table SR5.2-20 Selection of dam Irrigation scheme (HA-7)

SN-Dam	SHA	Name	Active Storage (MCM)	Checking existing Water Use Point	Irrigable Area with safety factor (ha)	Turn Over Rate (-)	Efficiency (ha/MCM)	Supplement for Existing Irrigation	Supplement for Municipal Water Supply	Settlement in reservoir area	Possible irrigation area	Annual Cost /Irrigation area (Naira/ha)	1:adoption 0:disqualification
2226	70402	Ajide-Eko	52		4,702		91				0	40,129	0
2252	70401	Ubei	41		4,936		119				0	47,227	0
2227	70402	Emezu	70	53-Ishielu/ Ezzilo	8,929		127		**5008**			74,587	0
2239	704042	Uwebende	34		3,502		102				0	79,233	0
2229	704043	Ombi	27		3,249		119				2000	109,331	1
2250	70402	Ndeaboh	12	1012-Ivo	1,926		164		Ivo		2500	121,011	0
2245	704042	Monaya	9	52-Ogoja	1,466		171		**5007**			136,282	0
2240	704042	Konshisha	13		1,877		150				1500	153,742	1
2237	704043	Abe	10		1,274		125				1500	156,824	1
2244	704042	Moi	17	111-Ukum	2,288		133				1500	169,801	0
2231	704043	Ogege	17		2,365		138				1000	173,694	1
2247	70402	Ikem	12	105-Isi-Uzo	1,590		136	105				174,526	0
2234	70403	Ogwuawu	9	101-Abakaliki/ Iwa	877		102				1500	202,540	0
2248	70402	Agala	16		1,571		101				2000	204,935	0
2238	704042	Gbumacha	10		1,353		133				1500	205,128	0
2241	704042	Ukyoha	9		1,316		153					219,227	0
2236	70403	Ogbogbo(2)	10	101-Abakaliki/ Iwa	1,126		111					226,767	0
2232	704043	Adam East	12		1,108		95					230,405	0
2230	704043	Ugboba	10		1,086		107					235,004	0
2246	70402	Akpoga	10	105-Isi-Uzo	1,268		125	105				236,404	0
2225	704043	Okete	12	1022-Otukpo	1,259		107					238,039	0
2242	704042	Kaakya	9		1,022		119					271,501	0
2235	70403	Ogbogbo(1)	9	101-Abakaliki/ Iwa	1,019		119					272,322	0
2228	704043	Panbele	7		904		129					306,874	0
2249	70402	Okpoto	9		991		115					313,479	0
2233	704043	Ieheri	9		945		110					340,784	0
2243	704042	Adum	9		896		104					359,250	0
2251	70402	Eneagu	7		801		114					402,049	0

Note: SN-Dam 2247 corresponds to disqualification due to land-use condition.

SR5.3 Other Sectors

SR5.3.1 Flood and Erosion Control and Inland Waterway Navigation

(1) River and Floodplain Features in Nigeria

(1-1) General

Major rivers in Nigeria flow through wide floodplain in a flat valley usually, it is cretaceous sedimentary basin. The river courses position in the lowest part of the flat valley. The floodplain has been formed by the river stage fluctuation provided by rainfall and runoff, as well as marine transgression.

The flow regime is quite seasonal because of the semi-arid or sub-tropical climate and its watershed size. Such characteristics are similar to those of the Nile valley, where traditional floodplain irrigation was popular for agriculture. Also in Nigeria there remained such traditional floodplain irrigation called Fadama along the Niger and Benue and its tributaries. It is understood that in Nigeria it reflects the Nile river civilization through the migration of the Hausa.

Due to the above said river characteristics; the irrigation on floodplain was comparatively easy to make use of river water by minimum structure, so that large scale mechanical irrigation system was not so developed until recently. This indicates a clear contract to the other areas such as the Mesopotamia and the Asian Monsoon in which large scale hydraulic irrigation and strong governance were required earlier.

In Nigeria, labor intensive irrigation has remained until recently due to the above background, and also local governance (government establishment) has only short history. Resultantly, in terms of river water usage as irrigation, engineering approach with large scale structure has not been so developed in local level while water use and land protection are depending on quite local needs in general.

The inland waterway transportation in Nigeria started as the European business in eighteenth century. It is assumed that cities in southeast region were developed recently mainly depending on a few kinds of trading between the European and the inland areas. This background is quite different from that of the Northern area.

In many countries as well as Nigeria, the relation between the river and people has a long history; however, one of the special things in Nigeria is the comparatively short history of the Government involvement in the river management.

(1-2) Main Features of the Rivers in Nigeria

The land of Nigeria is separated into the mountain-highland topography which was bordered by the Niger and Benue river system whose shape has been expressed as Y-shape, and the plain-lowland topography formed by erosion and fluvial sedimentation.

The river system can be categorized into the following three (3) groups.

- The Niger river system coming from Niger country and receiving the Sokoto, Kaduna and Benue rivers and emptying the Gulf of Guinea.
- The rivers such as the Hadejia-Jama'are and Yedseram rivers, flowing northward and emptying the Lake Chad.
- The small scale rivers such as the Ogun, Osun, Ose and Cross rivers emptying the Atlantic Ocean.

The Niger and the Benue rivers are flowing with meandering shape produced by erosion and deposition due to fluvial forces on the flat area composed of sedimentation above the basement rocks.

Table SR5.3-1 shows the list of selected rivers whose longitudinal profiles were prepared in M/P1995 as the major rivers together with the information of the river name, the length in Nigeria and bed slope. Also the Table SR5.3-1 shows the name of HA which those rivers belong to. Their locations and bed slope distribution, which was calculated from SRTM3, are shown in Figure SR5.3-1.

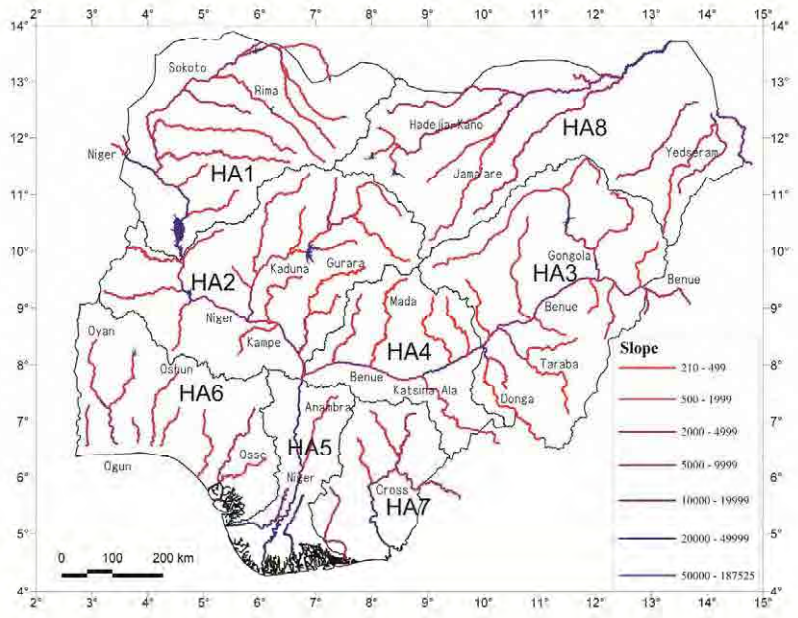
Figure SR5.3-2 and Figure SR5.3-3 show the elevation relief and the prepared cross section lines in the Niger and the Benue rivers. The cross section diagrams are shown in Figure SR5.3-4 and Figure SR5.3-5 based on the SRTM3. In the Niger and Benue rivers, the steep bank lines are quite distinctive

while the width between the exposed basement rocks is very wide such as 20-30 km. In the case of the Niger river (downstream of Jebba dam), the alignment of the rock seems to control the meandering of the channel. The Benue river in the upstream and downstream sections also has the similar tendency as that of the Niger, however the middle stream section has straight floodplain. In the wide floodplain, the area far from the normal river course has higher elevation like point bar (Ex: the right side of section N1 and N3 and the left side of section B3).

Table SR5.3-1 Features of Main Rivers in Nigeria

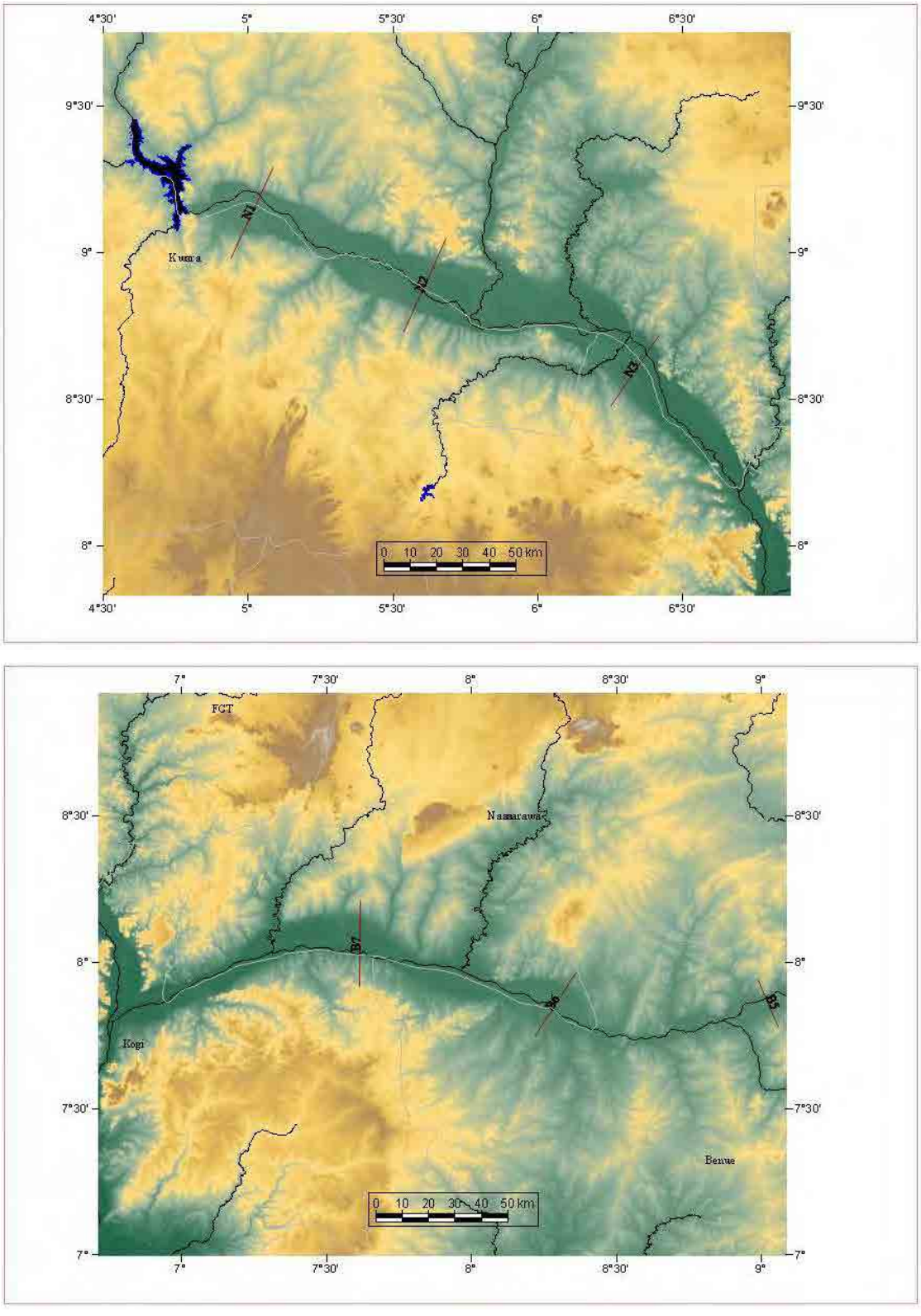
Internationality	River Name	connect to	at Bank	Length of the River in Nigeria	River Bed Slope	HA							
				km		I	II	III	IV	V	VI	VII	VIII
from Niger	Niger	Sea		1305	1/20,000-1/1,000	●	●			●			
from Cameroon	Benue	Niger	Left	783	1/8,600-1/6,000			●	●				
from Niger(partially)	Sokoto-Rima	Niger	Left	717	1/3,000-1/800	●							
	Kaduna	Niger	Left	608	1/3,600-1/70		●						
	Gurara	Niger	Left	220	1/2,500-1/250		●						
	Kampe	Niger	Right	187	1/780-1/70		●						
	Mada	Benue	Right	274	1/3,900-1/40				●				
	Gangola	Benue	Right	572	1/2,400-1/600			●					
	Donga	Benue	Left	411	1/3,700-1/200			●					
	Taraba	Benue	Left	333	1/5,300-1/50			●					
	Katsina Ala	Benue	Left	208	1/10,000-1/650				●				
	Anambra	Niger	Left	181	1/7,500-1/300					●			
from Cameroon	Cross River	Sea		350	1/16,000-1/900							●	
	Ogun	Sea		328	1/1,700-1/400						●		
	Oshun	Sea		299	1/1,800-1/200						●		
	Ofiki	Oyan	Left	205	1/650						●		
	Osse	Sea		280	1/2,300-1/320						●		
to Chad	Hadejia-Kano	Lake Chad	Right	976	1/55,000-1/60								●
to Chad	Jama'are	Lake Chad	Right	1153	1/55,000-1/570								●
	Chalawa	Hadejia		179	1/850								●
to Chad	Yedseram	Lake Chad		340	1/55,000-1/125								●

Remark:
The above rivers were tabulated from "Profile of Main River Systems, Water Resources Database Maps , JICA M/P, 1995"
The river length in Nigeria and river bed slope were based on the Profile of Main River Systems.



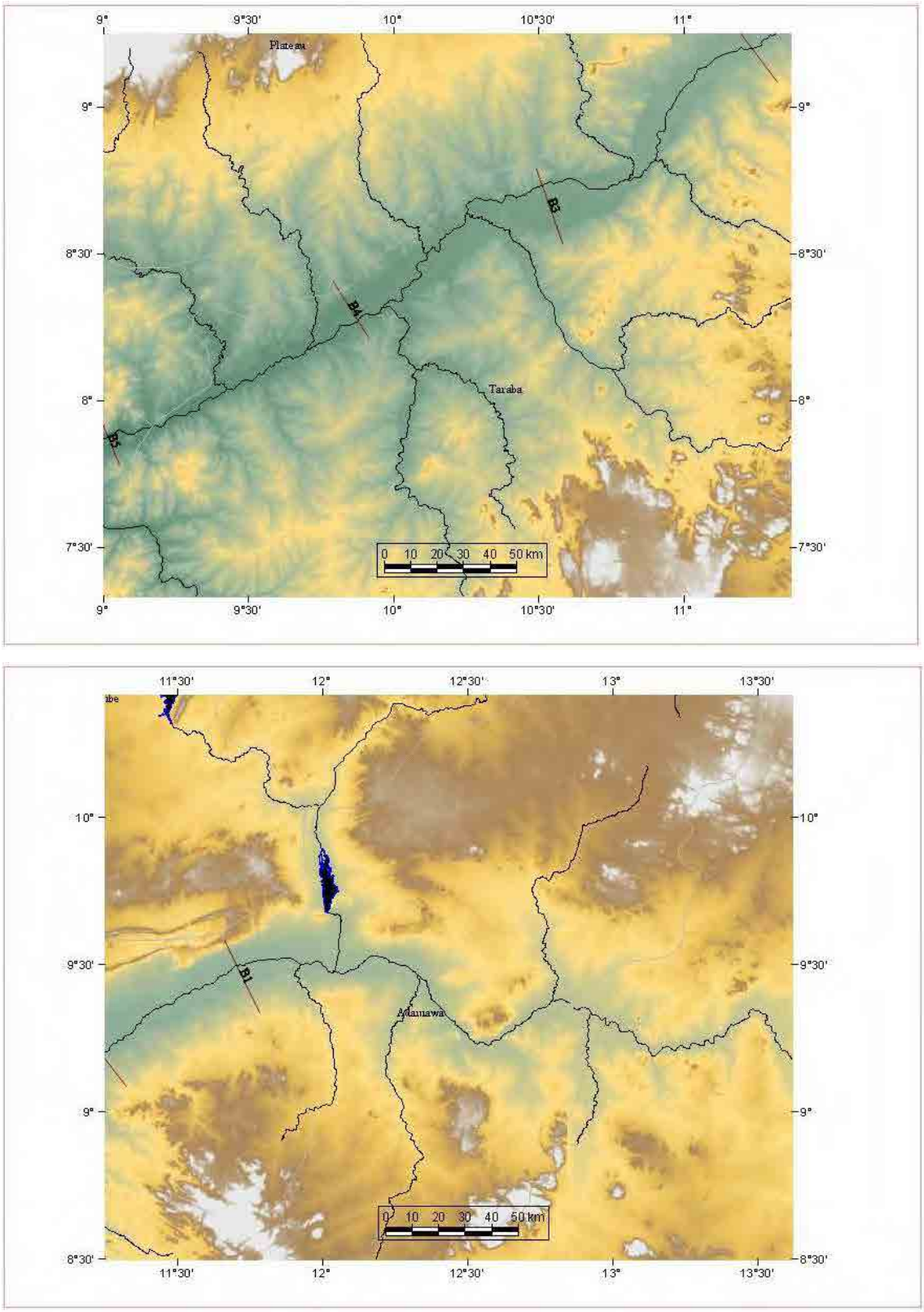
Source: JICA Project Team

Figure SR5.3-1 Location of Major Rivers and their bed slope distribution



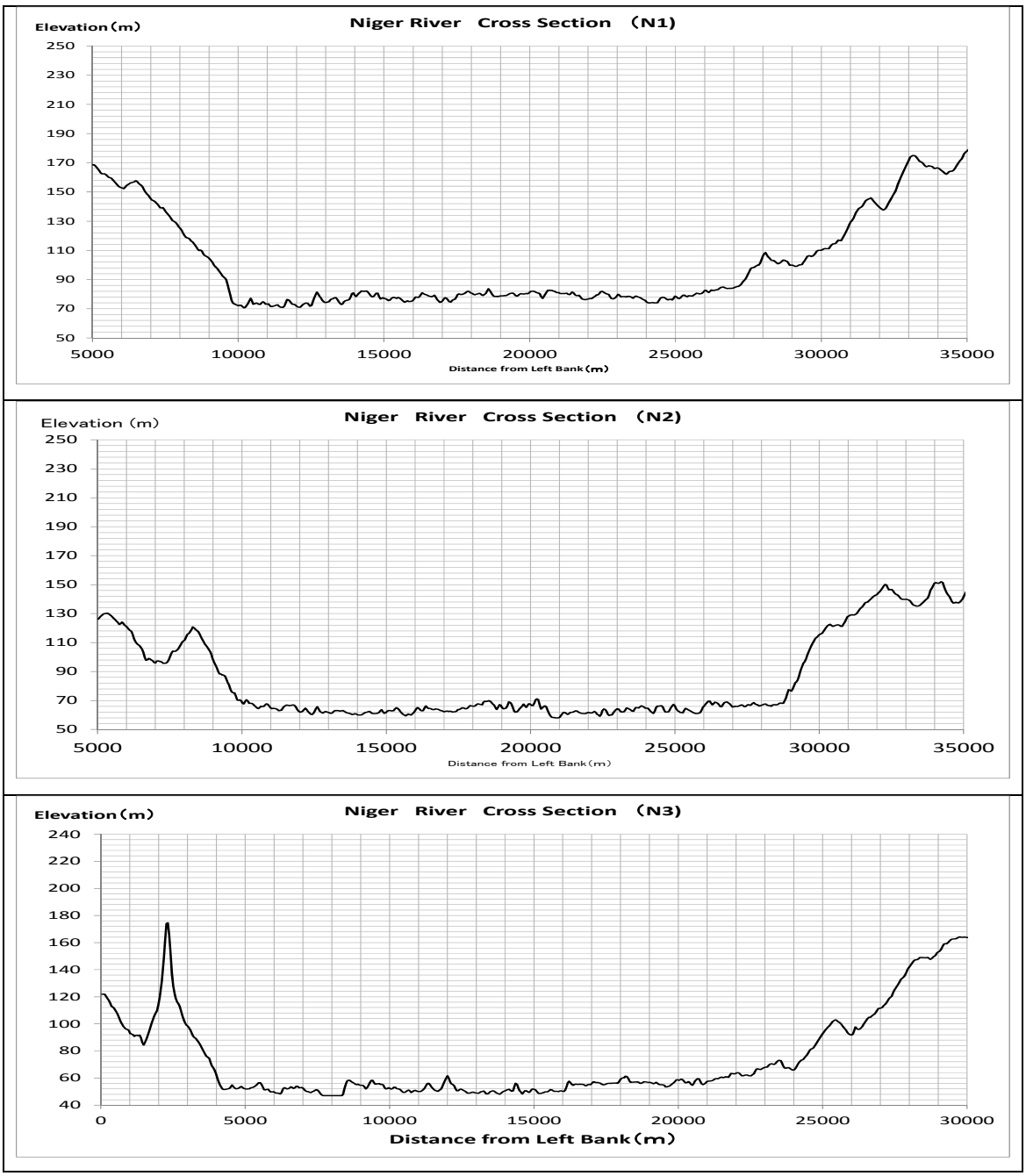
Source: JICA Project Team

Figure SR5.3-2 Elevation Relief of the Niger (top) and the Benue downstream (bottom)



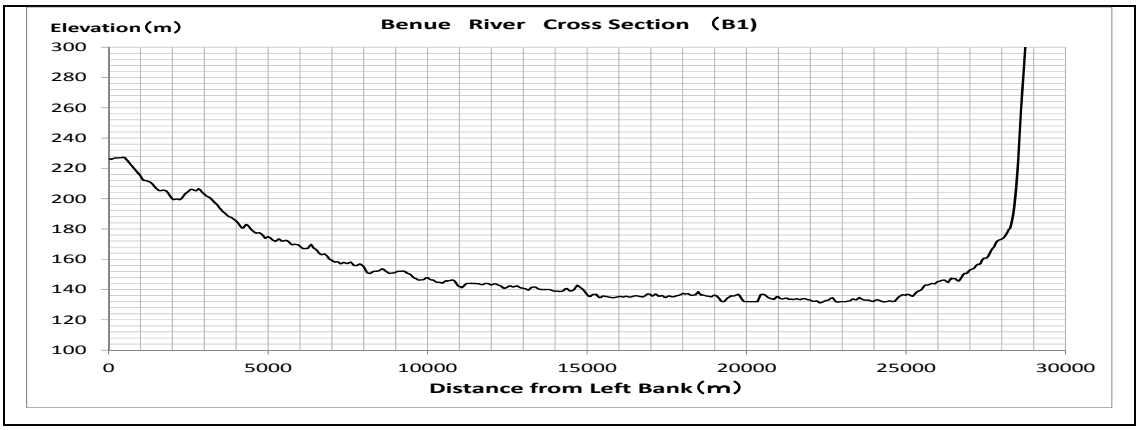
Source: JICA Project Team

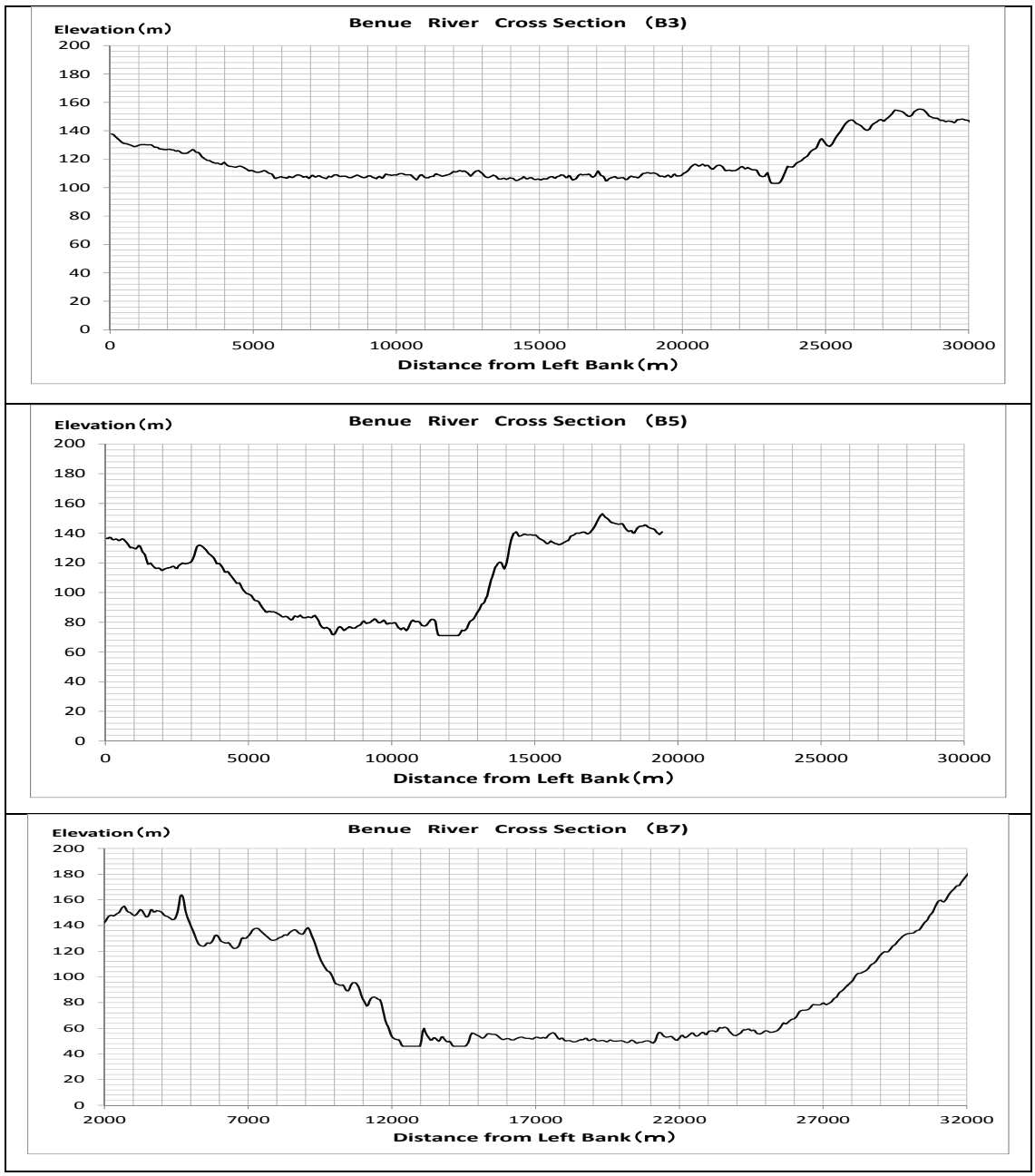
Figure SR5.3-3 Elevation Relief of the Benue middle stream (top) and the Benue upstream (bottom)



Source: JICA Project Team

Figure SR5.3-4 Cross Section of Floodplain of Niger River (looking downstream)





Source: JICA Project Team

Figure SR5.3-5 Cross Section of Floodplain of Benue River (looking downstream)

(1-3) Location of Urban Area in Nigeria

There are many Areas having Flat Topography (Figure SR5.3-6). The percentage of lowland whose elevation is below 100m above sea level is 12% of the Nigerian territory according to GIS analysis using SRTM3 (Figure SR5.3-7).

Population living below 10m above sea level is 6% of the total population[1]. In Nigeria, 70% of the total population is living in higher elevation area than 100 m above sea level (Figure SR5.3-7).

[1] In Japan, 30 % of total population is living in below 10 m above sea level.

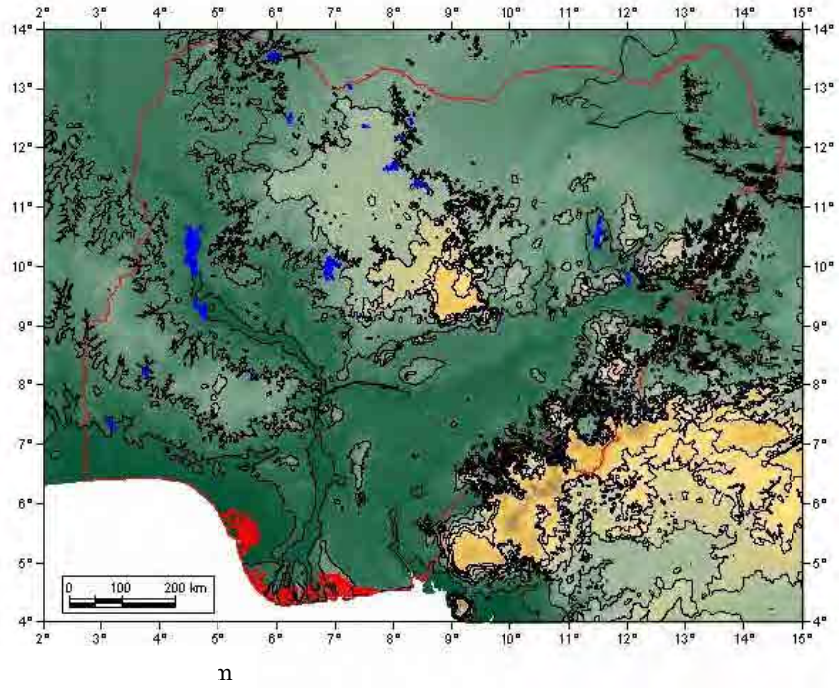


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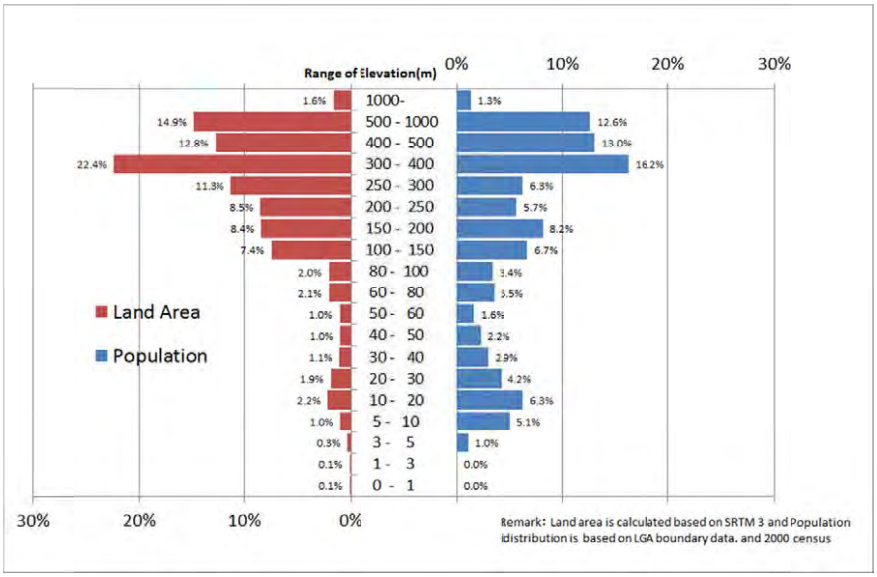
Figure SR5.3-6 Contour Line of 200 m Interval in Nigeria (The lowest contour elevation is 100 m above sea level)



Source: JICA Project Team

Figure SR5.3-7 Vertical Distribution of Land Area and Population in Nigeria

Nigeria has a vast territory having of 930,000km^2. And due to the comparatively flat topography and historical background, cities are located separated-evenly. JICA Project Team tried to categorize the location features, especially on the distance from river in capital city of each State and FCT in Nigeria in order to study the direction of flood control measures (potential flood problems) for each city .

The type of location feature was considered as follows,
Type A: Located along the major river
Type B: Located on watershed divide (SHA boundary) and/or higher place with enough distance from rivers
Type C: Located along the river bank of the delta.

The following table summarizes the location features for each State capital and FCT. For Abia State and Delta State, there are other substantial major cities within the State, therefore totally 39 cities are listed up.

For the city of Type A, it is anticipated that the riparian area in the city is affected by the river flood (waterlevel). For the city of Type B, there is no possibility of large scale flood by river, while there is concerned about urban drainage problem. For the city of Type C, it is anticipated that there is concerned about river bank erosion and effect of tide in lowland area.

Table SR5.3-2 Location Features for State capital and FCT

S/N	State	Capital City	Primary City	Type of City Location			Remarks
				A	B	C	
1	Abia	Umuahia			●		Located on boundary of HA, higher elevation
1	Abia	Aba	*		●		Located on delta, higer elevation
2	Adamawa	Yola		●			Developed along the Benue River
3	Akwa Ibom	Uyo			●		Located on boundary of HA, higher elevation
4	Anambra	Awka			●		Located on higher elevation, far from rivers
5	Bauchi	Bauchi			●		Located on boundary of HA, higher elevation
6	Bayelsa	Yenagoa				●	Delta
7	Benue	Makurdi		●			Developed along the Benue River
8	Borno	Maiduguri		●			Located on floodplain
9	Cross River	Calabar			●		Located on higher elevation
10	Delta	Asaba		●			Located on the right bank of Niger River
10	Delta	Warri	*			●	Delta
11	Ebonyi	Abakaliki			●		Higher elevation
12	Edo	Benin city			●		Located on boundary of HA, higher elevation
13	Ekiti	Ado-ekiti			●		Located on boundary of HA, higher elevation
14	Enugu	Enugu			●		Located on higher elevation
15	Gombe	Gombe			●		Located on boundary of HA, higher elevation
16	Imo	Owerri			●		Located on delta, higer elevation
17	Jigawa	Dutse			●		Located on boundary of HA, higher elevation
18	Kaduna	Kaduna		●			Located , devloped along the Kaduna River
19	Kano	Kano			●		Located on boundary of HA, higher elevation
20	Katsina	Katsina			●		Located on boundary of HA, higher elevation
21	Kebbi	Birnin-kebbi			●		Located on boundary of HA, higher elevation
22	Kogi	Lokoja		●			Developed along Niger River
23	Kwara	Ilorin		●			Developed along tributary of the Niger River
24	Lagos	Ikeja				●	Lowland , especially peri-urban area
25	Nassarawa	Lafia			●		Located on higher elevation, far from rivers
26	Niger	Minna			●		Located on higher elevation, far from rivers
27	Ogun	Abeokuta			●		Developed on valley bottom, rather than gully erosion
28	Ondo	Akure			●		Located on boundary of HA, higher elevation
29	Osun	Oshogbo			●		Located on higher elevation, far from rivers
30	Oyo	Ibadan		●			Located on higher elevation, but many middle size rivers adjoining
31	Plateau	Jos			●		Located on boundary of HA, higher elevation
32	Rivers	Port Harcourt				●	Delta
33	Sokoto	Sokoto		●			Developed along the tributary of the Sokoto River
34	Taraba	Jalingo		●			Developed along the tributary of the Benue River
35	Yobe	Damaturu		●			Developed on floodplain
36	Zamfara	Gusau		●			Developed along the tributary of the Sokoto River
37	FCT, Abuja	Abuja			●		Located on higher elevation, far from rivers

Source: JICA Project Team

(2) Hydrological Features in Nigeria on Flood

(2-1) Daily Rainfall

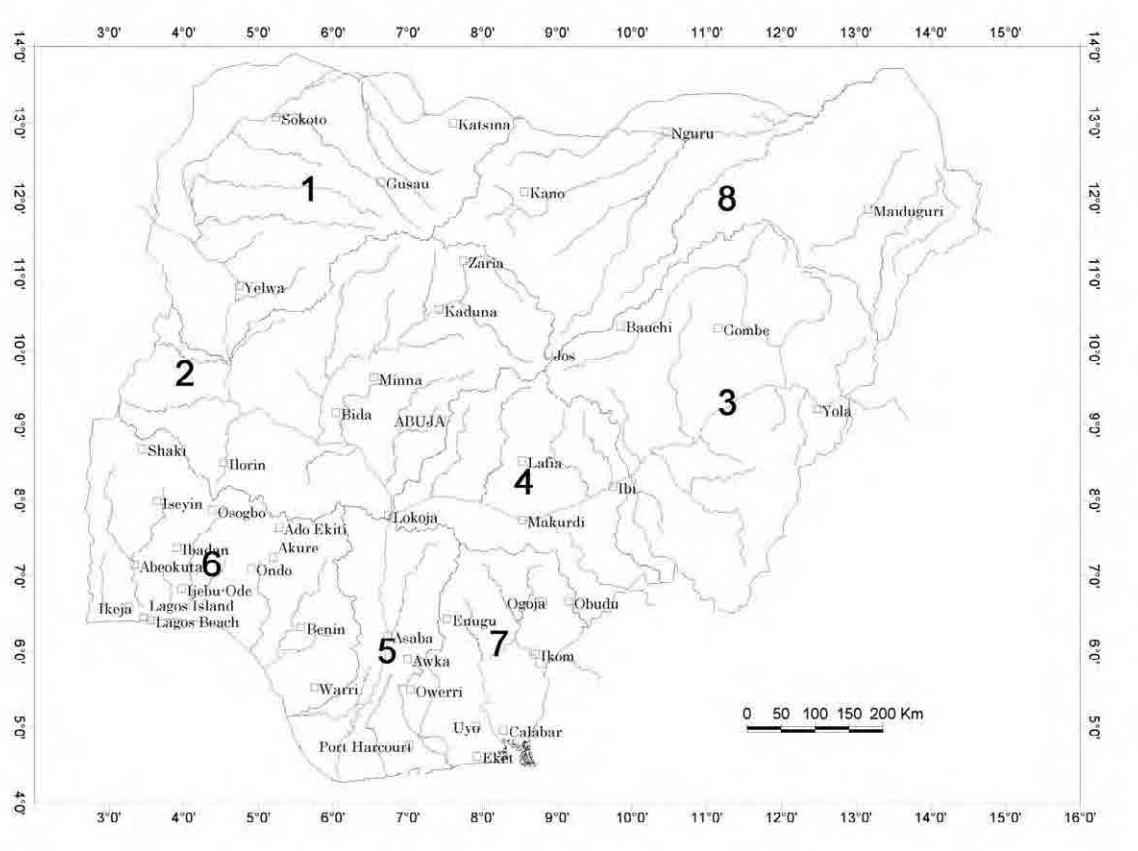
The JICA Project Team obtained the daily rainfall data since 1981 in 27 stations of NIMET as shown in

Table SR5.3-3. The locations of those 27 stations are shown in Figure SR5.3-8.

Table SR5.3-3 List of Collected Rainfall Station of NIMET and their Data Collected Period

	Station Name	State	Data Collected Period	Number of Years		Station Name	State	Data Collected Period	Number of Years
1	Yola	Adamawa	1981-2010	30	15	Katsina	Katsina	1981-2010	30
2	Bauchi	Bauchi	1981-2010	30	16	Yelwa	Kebbi	1981-2010	30
3	Makurdi	Benue	1981-2010	30	17	Lokoja	Kogi	1981-2010	30
4	Maiduguri	Borno	1981-2010	30	18	Ilorin	Kwara	1981-2010	30
5	Calbar	Cross River	1981-2010	30	19	Minna	Niger	1981-2010	30
6	Ikom	Cross River	1981-2010	30	20	Abeokuta	Ogun	1981-2010	30
7	Ogoja	Cross River	1981-2010	30	21	Akure	Ondo	1980-2010	31
8	Warri	Delta	1981-2010	30	22	Ibadan	Oyo	1981-2010	30
9	Benin	Edo	1981-2010	30	23	Jos	Plateau	1981-2010	30
10	Enugu	Enugu	1981-2010	30	24	PHC	Rivers	1981-2010	30
11	Abuja	FCT	1982-2010	29	25	Sokoto	Sokoto	1981-2010	30
12	Ikeja	Lagos	1981-2010	30	26	Ibi	Taraba	1981-2010	30
13	Owerri	Imo	1981-2010	30	27	Nguru	Yobe	1981-2010	30
14	Kaduna	Kaduna	1981-2010	30					

Source: JICA Project Team



Source: JICA Project Team

Figure SR5.3-8 Location Map of NIMET Station

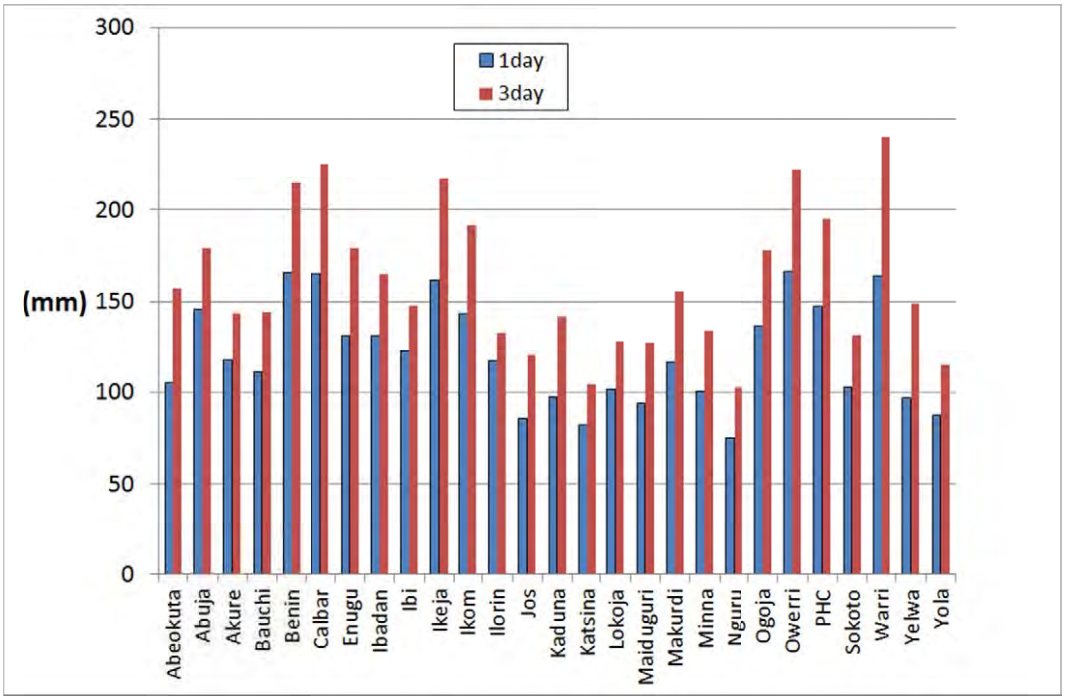
The JICA Project Team calculated probable rainfall amount for 1 day and 3 days rainfall for the 27 stations.

The applied probable distribution is as follows,

1. Exponential Distribution Exp
2. Gumbel Distribution Gumbel
3. Square root Exponential Maximum Distribution SqrtEt
4. Generalized Extreme Value Distribution Gev
5. Log Pearson Type III Distribution Real LP3Rs
6. Log Pearson Type III Distribution Log LogP3
7. Iwai Method
8. Ishihara Takase IshiTaka
9. Log Normal 3 parameters Quantile LN3Q

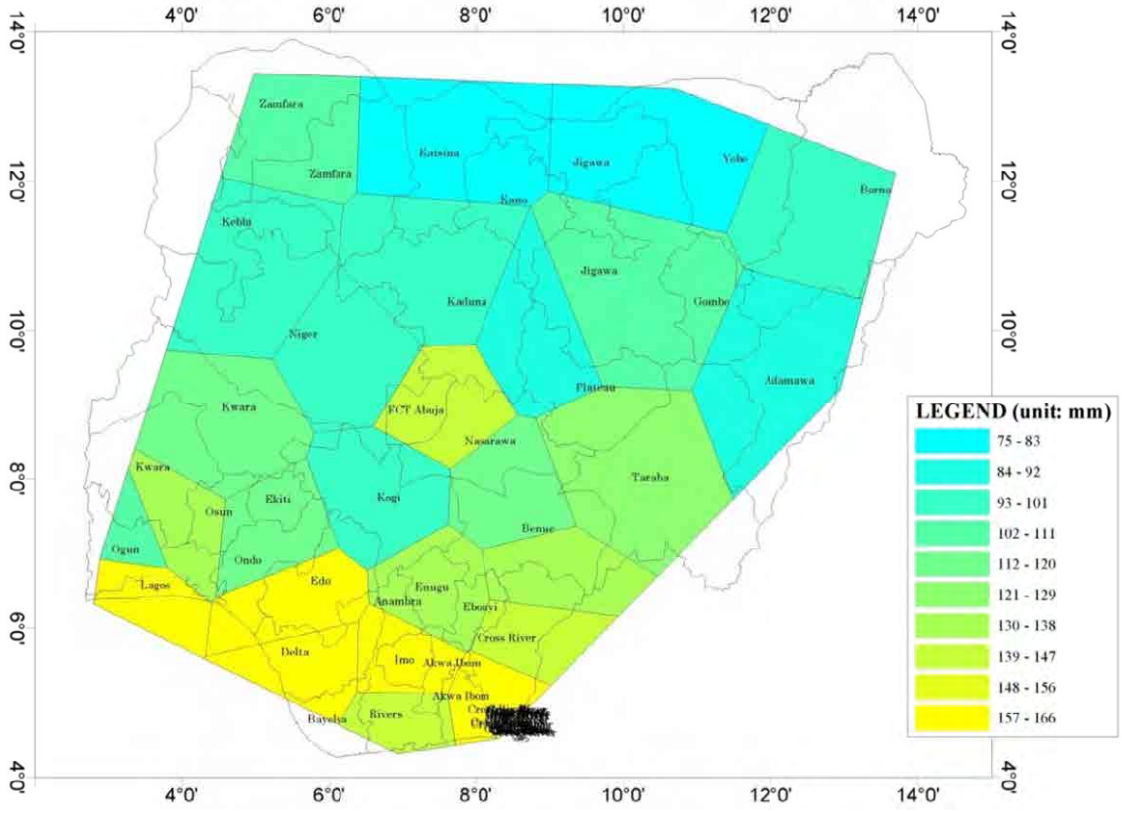
10. Log Normal 3 parameters LN3PM
11. Log Normal 3 parameters LN2LM
12. Log Normal 3 parameters LN2PM
13. Log Normal 3 parameters LN4PM

For the above each distribution, Standard Least Square Criterion (SLSC) is calculated and the probable rainfall amount with the minimum SLSC was regarded as the most likely value.



Source: JICA Project Team

Figure SR5.3-9 Probable Rainfall for 10 years return period in NIMET stations



Source: JICA Project Team

Figure SR5.3-10 Spatial Distribution of Probable Daily Rainfall for 10 years return period shown based on Voronoi diagram of 27 NIMET stations

The 1 day and 3 days probable rainfall for 10 years return period of 27 stations are shown in Figure SR5.3-9. The spatial distribution in the case of 1 day rainfall for 10 years return period is illustrated in Figure SR5.3-10 based on Voronoi diagram. In general, the areas along the coastal line have high rainfall intensity. The States located in north of the Niger and Benue rivers have relatively low rainfall except FCT (Abuja).

Table SR5.3-4 Probable Rainfall Amount for 1-Day Rainfall in NIMET Stations

No	Station	State	Year of Establishment	Year of Existence	Return Period in Year													Dist.	SLSC
					400	200	150	100	80	50	30	20	10	5	3	2	1.5	1.2	
34	Abeokuta	Ogun	1981	30	174.9	161.9	156.5	148.9	144.7	135.8	126.1	118.4	104.9	90.9	79.7	69.7	61.1	51.9	Gumbel	0.023
18	Abuja	FCT	1982	29	258.3	237.4	228.8	216.5	209.8	195.5	179.9	167.5	145.8	123.2	105.3	89.1	75.3	60.6	Gumbel	0.038
36	Akure	Ondo	1979	32	260.1	224.6	211.3	193.8	184.8	167.1	149.8	137.2	117.8	100.4	88.5	78.9	71.6	64.5	Gev	0.036
5	Bauchi	Bauchi	1941	70	188.0	173.8	167.9	159.5	154.9	145.2	134.6	126.1	111.3	95.9	83.7	72.7	63.2	53.2	Gumbel	0.023
15	Benin	Edo	1942	69	325.4	292.1	278.7	260.4	250.5	230.2	209.0	192.7	165.8	139.8	120.5	104.3	91.2	78.1	SqrtEto	0.033
9	Calbar	Cross River	1941	70	256.3	239.4	232.4	222.5	217.0	205.5	192.9	182.8	165.3	147.0	132.5	119.4	108.2	96.3	Gumbel	0.045
17	Enugu	Enugu	1941	70	226.2	206.9	199.1	188.3	182.5	170.5	157.8	147.9	131.3	114.8	102.2	91.3	82.2	72.8	Gev	0.033
39	Ibadan	Oyo	1907	104	470.3	364.6	328.5	284.3	262.8	223.3	187.8	164.3	131.6	106.1	90.7	79.6	71.8	65.0	Gev	0.034
45	Ibi	Taraba	1948	63	171.8	164.3	161.0	156.1	153.3	147.1	139.9	133.7	122.3	109.1	97.8	86.8	76.7	65.4	Gev	0.022
20	Ikeja	Lagos	1955	56	302.9	274.8	263.4	247.5	238.9	221.0	201.8	186.9	161.6	136.0	116.4	99.1	84.7	69.7	Gev	0.033
10	Ikom	Cross River	1972	39	233.8	216.9	209.9	200.0	194.6	183.1	170.5	160.4	143.0	124.7	110.2	97.2	86.0	74.1	Gumbel	0.023
29	Ilorin	Kwara	1946	65	159.5	153.3	150.5	146.3	143.9	138.6	132.4	127.0	116.9	105.1	94.8	84.8	75.5	64.9	Gev	0.024
42	Jos	Plateau	1979	32	144.3	133.3	128.8	122.3	118.8	111.3	103.2	96.8	85.8	74.8	66.7	60.3	55.7	52.1	Exp	0.030
23	Kaduna	Kaduna	1941	70	179.7	164.3	157.9	148.9	144.0	133.5	122.1	113.1	97.7	82.3	70.9	61.9	55.5	50.5	Exp	0.035
25	Katsina	Katsina	1941	70	186.2	162.3	153.1	140.8	134.3	121.3	108.0	98.1	82.3	67.5	56.9	48.1	41.0	34.1	Gev	0.045
28	Lokoja	Kogi	1942	69	142.0	135.1	132.2	128.0	125.7	120.6	114.8	110.1	101.6	92.4	84.8	77.7	71.4	64.5	Gev	0.045
8	Maiduguri	Borno	1951	60	161.5	148.9	143.7	136.3	132.3	123.7	114.3	106.8	93.8	80.2	69.4	59.7	51.4	42.6	Gumbel	0.035
7	Makurdi	Benue	1942	69	187.8	174.6	169.1	161.3	157.0	148.0	138.1	130.2	116.5	102.2	90.8	80.5	71.8	62.4	Gumbel	0.020
31	Minna	Niger	1936	75	121.7	119.1	117.9	116.0	114.9	112.3	109.1	106.2	100.4	93.1	86.2	79.1	72.1	63.8	Gev	0.026
46	Nguru	Yobe	1969	42	178.6	152.9	143.3	130.7	124.1	111.3	98.6	89.3	75.0	62.2	53.3	46.2	40.7	35.4	Gev	0.032
11	Ogoja	Cross River	1976	35	250.1	226.6	217.1	204.2	197.2	182.8	167.7	156.0	136.5	117.3	102.8	90.2	79.9	69.2	Gev	0.024
21	Owerri	Imo	1974	37	240.8	229.5	224.5	217.1	212.9	203.6	192.7	183.5	166.4	146.7	129.8	113.4	98.4	81.6	Gev	0.024
43	PHC	Rivers	1941	70	232.4	216.6	210.0	200.7	195.6	184.8	173.0	163.6	147.2	130.1	116.5	104.3	93.8	82.7	Gumbel	0.024
44	Sokoto	Sokoto	1943	68	211.3	187.1	177.7	164.9	158.1	144.4	130.4	119.8	102.7	86.4	74.4	64.4	56.4	48.3	Gev	0.022
13	Warri	Delta	1949	62	249.5	233.6	227.0	217.7	212.5	201.7	189.8	180.3	163.9	146.7	133.0	120.7	110.2	99.0	Gumbel	0.029
27	Yelwa	Kebbi	1943	68	120.8	118.0	116.7	114.6	113.4	110.5	106.9	103.6	96.9	88.4	80.3	71.8	63.4	53.3	Gev	0.026
3	Yola	Adamawa	1942	69	138.2	128.7	124.8	119.2	116.2	109.7	102.6	97.0	87.2	76.9	68.8	61.4	55.1	48.5	Gumbel	0.045

Source: JICA Project Team

Table SR5.3-5 Probable Rainfall Amount for 3-Day Rainfall in NIMET Stations

No	Station	State	Year of Establishment	Year of Existence	Return Period in Year													Dist.	SLSC
					400	200	150	100	80	50	30	20	10	5	3	2	1.5	1.2	
34	Abeokuta	Ogun	1981	30	362.4	312.1	293.1	268.1	255.1	229.6	204.3	185.9	157.2	131.3	113.2	98.8	87.5	76.6	Gev	0.034
18	Abuja	FCT	1982	29	281.1	263.6	256.2	245.5	239.5	226.6	212.1	200.2	178.8	155.7	136.5	118.8	103.1	86.0	Gev	0.023
36	Akure	Ondo	1979	32	189.8	182.7	179.6	175.0	172.3	166.5	159.8	154.1	143.5	131.4	121.0	111.0	101.9	91.6	Gev	0.043
5	Bauchi	Bauchi	1941	70	256.0	232.9	223.6	210.8	203.9	189.7	174.7	163.1	143.8	124.9	110.8	98.7	88.9	79.0	SqrtEto	0.026
15	Benin	Edo	1942	69	290.5	279.6	274.7	267.4	263.2	253.8	242.6	233.0	214.6	193.1	174.1	155.3	137.9	117.9	Gev	0.027
9	Calbar	Cross River	1941	70	294.0	283.7	279.1	272.4	268.5	260.0	250.0	241.5	225.5	207.2	191.2	175.8	161.6	145.6	Gev	0.038
17	Enugu	Enugu	1941	70	354.7	311.8	295.7	274.3	263.2	241.3	219.6	203.7	179.0	156.6	140.9	128.3	118.5	109.0	Gev	0.021
39	Ibadan	Oyo	1907	104	442.5	367.3	340.1	305.1	287.5	253.6	221.3	198.6	164.7	135.9	116.9	102.3	91.3	81.1	Gev	0.029
45	Ibi	Taraba	1948	63	236.2	219.7	212.9	203.2	197.9	186.6	174.3	164.5	147.4	129.6	115.4	102.6	91.7	80.1	Gumbel	0.041
20	Ikeja	Lagos	1955	56	449.4	398.9	379.0	351.9	337.5	308.1	277.8	254.7	216.9	180.5	153.6	130.8	112.3	93.6	Gev	0.024
10	Ikom	Cross River	1972	39	265.9	254.2	249.1	241.6	237.3	228.0	217.3	208.3	191.8	173.3	157.4	142.4	128.8	113.7	Gev	0.033
29	Ilorin	Kwara	1946	65	156.7	154.0	152.8	150.7	149.5	146.6	142.9	139.5	132.5	123.3	114.3	104.7	95.1	83.3	Gev	0.034
42	Jos	Plateau	1979	32	204.7	186.3	179.1	169.2	164.0	153.4	142.4	134.0	120.3	107.2	97.5	89.2	82.6	75.8	Gev	0.026
23	Kaduna	Kaduna	1941	70	335.0	283.4	264.6	240.4	228.2	204.5	181.9	165.9	141.9	121.3	107.6	97.0	89.0	81.5	Gev	0.033
25	Katsina	Katsina	1941	70	221.2	196.5	186.7	173.1	165.9	151.1	135.6	123.8	104.4	85.8	72.1	60.8	51.7	42.8	SqrtEto	0.029
28	Lokoja	Kogi	1942	69	189.9	178.5	173.7	167.0	163.3	155.5	146.9	140.1	128.2	115.8	106.0	97.1	89.5	81.5	Gumbel	0.034
8	Maiduguri	Borno	1951	60	246.0	222.2	212.6	199.3	192.1	177.1	161.1	148.7	127.6	106.5	90.2	76.1	64.2	51.9	Gev	0.029
7	Makurdi	Benue	1942	69	234.1	220.8	215.2	207.0	202.3	192.4	181.1	171.9	155.1	136.9	121.7	107.5	95.0	81.2	Gev	0.042
31	Minna	Niger	1936	75	202.0	189.1	183.8	176.3	172.1	163.5	154.1	146.6	133.7	120.3	109.8	100.4	92.4	83.9	Gev	0.034
46	Nguru	Yobe	1969	42	223.9	196.5	185.9	171.6	164.0	148.8	133.3	121.6	102.8	85.1	72.2	61.4	52.8	44.3	Gev	0.021
11	Ogoja	Cross River	1976	35	255.0	242.5	237.0	229.1	224.7	215.0	203.9	194.7	178.0	159.4	143.8	129.2	116.1	101.6	Gev	0.022
21	Owerri	Imo	1974	37	353.7	329.4	319.2	305.0	297.1	280.5	262.3	247.8	222.6	196.3	175.3	156.5	140.4	123.2	Gumbel	0.032
43	PHC	Rivers	1941	70	322.0	296.1	285.7	271.3	263.5	247.4	230.3	217.1	194.9	173.1	156.5	142.3	130.6	118.7	SqrtEto	0.032
44	Sokoto	Sokoto	1943	68	349.7	291.4	270.2	242.9	229.0	202.4	176.8	158.7	131.7	108.4	93.0	81.0	72.0	63.6	Gev	0.036
13	Warri	Delta	1949	62	327.3	313.7	307.8	299.0	294.1	283.1	270.5	259.8	240.1	217.7	198.6	180.3	163.6	145.0	Gev	0.032
27	Yelwa	Kebbi	1943	68	315.7	277.9	263.2	243.4	233.0	212.0	190.7	174.6	148.9	124.6	107.0	92.4	80.8	69.1	Gev	0.038
3	Yola	Adamawa	1942	69	128.2	127.2	126.6	125.7	125.2	123.7	121.7	119.7	115.1	108.2	100.5	91.4	81.5	68.1	Gev	0.024

Source: JICA Project Team

(3) National Polices on Flood and Erosion Control and Inland Waterway Navigation

When the Federal Ministry of Environment was created, the role on erosion control and flood control of the Federal Ministry of Water Resources was transferred to FME with its department. Consequently the countermeasures of erosion and flood control which was proposed in M/P1995 has been mostly implemented by FME as the materialization of the National Policy on the Environment in 1998.

(3-1) Policy on Flood and Erosion Control (National and State)

National Policy on the Environment (1998)

The National Policy on the Environment (1998), there are over 2,000 sites of active gully erosion to be controlled properly. The policy states that the following interventions are necessary.

For flooding it will be necessary to

- Enforce compliance with planning/urban laws/edicts
- Build embankments and levees along rivers and coastline prone flood
- Establish rainstorm early warning system
- Establish and monitor weather stations, river and tidal gauges
- Ensure appropriate management of dams
- Ensure proper maintenance of existing urban drainage channels
- Enforce environmental sanitation laws in towns and cities

For soil and coastal erosion it will be necessary to

- Prepare and implement a comprehensive national policy on soil and coastal erosion and flood control
- Formulate and enforce regulations for soil and water conservation especially in erosion-prone areas
- Carry put national watershed delineation and characterization for use as basis for development of an aggressive management and enforcement program me to protect and maintain the quality of the nation's lands water and coastal resources and implement the programs
- Prepare periodic master plan on the management of soil and coastline erosion and flood, and advise the Federal Government and the financial requirements for the implementation of such plans
- Carry out feasibility and scientific studies on soil erosion and related flood problems for the design of appropriate integrated remedial control measures
- Carry out public enlightenment campaigns on environmental degradation arising from poor land and water management practices
- Provide and promote training on environmental issues as they relate to flood, erosion, land degradation and water conservation
- Promote integrated ecosystem management with other agencies connected with agriculture, land use, soil and water conservation, rural development and coastal resources management including environmentally sound recreational use
- Strengthen national capacity through personal development, provision of training facilities and research on combating climate-related ecological problems
- Strengthen capacity of the Environmental Management Support System (EMSS) for Remote Sensing data gathering. GIS facilities and development of disaster environment data bank
- Support agro-forestry and integrated Coastal Zone Management
- Encourage planted fallow in abandoned farmland using soil enriching species
- Promote conservation farming and use of organic fertilizer and soil conditioners.
- Establish viable contingency plans for tackling socio-economic and other problems resulting from coastal and other erosional disasters.

Water Resources Strategy 2006 by Atkins describes about FLOOD MANAGEMENT in Nigeria as follows.

Article 1.37. It appears that floods in Nigeria are treated as "acts of God" seemingly even a collapse of a dam falling under such definition. The effects of human activities in causing such events have not been fully considered. A great deal can be done to prevent floods occurring or, in the event of them being unavoidable, mitigating the impact of the flooding. This is especially true if there are upstream dams that can be managed to absorb flood flows; but even if there are no dams, flood prevention through river training, the building of embankments and the prohibition of building on flood plains can minimize loss of life and property.

Vision 20: 2020 by National Planning Commission states as follows,

Flooding is becoming a more severe phenomenon in many parts of Nigeria, aggravated by human activities such as poor land use and watershed management practices, unplanned rapid urbanization, blockage of river/drainage channels, land clearing for agricultural purposes and deforestation. The most flood prone areas in Nigeria includes (I) low-lying coastal areas of southern Nigeria where annual rainfall is heavy, (ii) the floodplains of major rivers such as the Niger, Benue, Gongola, Sokoto, Hadejia, Katsina-Ala, Donga, Kaduna, Urara, Ogun and Anambra, etc, (iii) the flat, low-lying areas around Lake Chad. In addition many urban centers including Dutse, Enugu, Ibadan, Kaduna, Kano, Lagos, Maiduguri, Onitsha, Owerri, Port Harcourt, and Sokoto now experience more frequent floods.

Erosion results in the depletion of farmlands, loss of forest resources and reduction in agricultural outputs. It also results in loss of land resources for other developmental purposes, destruction of properties and social amenities, as well as loss of lives. There are various types of erosion, including sheet, rill and gully erosion which are becoming more prevalent in many parts of the country. Coastal erosion in particular, is aggravated by human activities such as construction of harbor protecting structures and jetties, sand mining, and deforestation of coastal vegetation. Sea level rise as well as localized subsidence also exacerbates the rates of coastal erosion. More than 50 erosion sites have been identified along 835 km coastline retreats of 2-30m per year.

Gully erosion is most visible in the south-eastern states as well as Ekiti, Gombe and Kogi states, where 33 gully sites have been identified and vast area of land have been destroyed. Sheet erosion occurs all over Nigeria in a deceitful slow process of removing surface solid layers by rainfall runoff down slopes, thereby resulting in soil degradation and impoverishment, loss of farmlands, pollution and siltation of available sources of drinking water. Wind erosion is common in northern Nigeria, particularly where the vegetation cover is scanty, causing extensive removal of topsoil. The most vulnerable areas are in Borno, Bauchi, Gombe, Jigawa, Katsina, Kano, Kebbi, Sokoto, Zamfara, Yobe and Adamawa states.

National Policy on Erosion and Flood Control

In July 2006[2], the Federal Government launched a new policy framework on the environment intended to promote programmes that could minimize soil erosion and flood disasters in the country. It seeks to protect the environment from degradation, especially loss of productive land through escalating crisis of soil erosion and flood. known as the National Policy on Erosion and Flood Control.

The goal of the National Erosion and Flood Control Policy[3] is to ensure coordinated and systematic measures in the management and control of the climate-related hazards and risks of erosion and floods to reduce their impacts on the people and the environment. Key strategies for the implementation of the policy are to: (i) evolve a mechanism for forecasting, monitoring and control of erosion and floods; (ii) review the land use laws and regulations; (iii) promote and strengthen training at all levels in erosion and flood prevention, management and control; (iv) creating public awareness to encourage participation; (iv) protection of the marginal lands by limiting utilization to their carrying capacity; (v) subjecting resources users and developers to guidelines in order to reduce the vulnerability of the environment to flood and erosion-related disasters; and (vi) providing early warning systems to avert the escalation of flood and erosion hazards. All these would have significant implications for climate change adaptation measures that would need to be adopted to increase people resilience.

(3-2) Policy on Inland Waterway Navigation

National Water Policy 2004 Page 24 the sector policy describes as follows,

Inland Navigation

National Inland Waterways Authority (NIWA) which was established in 1956 to take charge of inland navigation had in the past provided the main communication routes and access from coast to the hinterland and has accounted for more than 30 percent of our transportation.

Since 1966, the flow patterns and conditions along the Rivers Niger and Benue have deteriorated with more eroded sediments from watershed and flow reduction by upstream withdrawal.

The following strategies are pursued by the Nigerian government in order to improve inland navigation:

a) Redress the adverse situations on our large rivers, significant modifications by way of provision of capital and maintenance dredging must be pursued by National Inland Waterways Authority (NIWA).

b) Pursue the privatization and commercialization policy in this sub-sector of the economy to improve the effectiveness and efficiency of inland Navigation.

c) Harmonize the Water Resources Act 101 of 1993 with the 1988 Navigable Waterways law so that

[2] http://allafrica.com/stories/200607260056.html

[3] This paragraph is quoted from FME, National Environmental, Economic Development Study (NEEDS) For Climate Change in Nigeria, Final Draft, September 2010

there is no overlapping of responsibilities of Federal Ministry of Water Resources with those of NIWA.

d) Carry out studies on the Lower Niger River so as to provide barges for navigability of the Lower Niger Area.

e) Undertake River channel management including hydrological and morphological observation and study to a limited extent for the dredging of local critical parts and bed - regulations by groynes, training walls and bank stabilization for difficult crossings and flats.

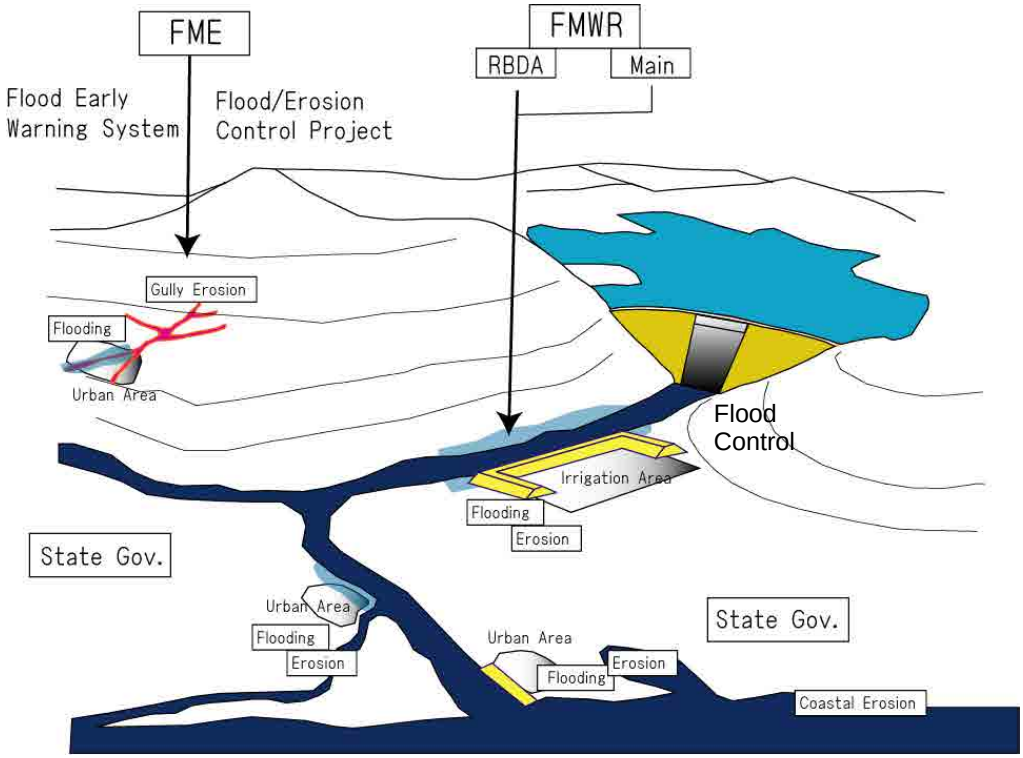
f) Establish discharge regulations from Jebba and Shiroro dams, under the management of NEPA in cooperation with Federal Ministry of Water Resources.

(3-3) Institutional Arrangement on Flood and Erosion Control

The present institutional arrangement on flood and erosion control is shown in Table SR5.3-6. In reality, most and major activities of these sectors are implemented by Federal Ministry of Environment and State governments as urban environment improvement administration. FMWR is in charge of release of dam under her jurisdiction and flood/erosion control in related to her large scale irrigation projects. Figure SR5.3-11 is the schematic image on the present institutional arrangement on flood and erosion control.

Table SR5.3-6 Present Institutional Arrangement on Flood Control and Erosion Control

Institution		Flood Control	Erosion Control
Federal Ministry of Environment	Main Ministry	Development and operation of Flood Early Warning for local area	Implementation of nationwide program on erosion control as a part of watershed management Implementation of structure measures in some local areas
Federal Ministry of Water Resources	Main Ministry	Operation of multi-purpose dam	
	RBDA	Implementation of structure measures mainly related to agricultural facility	Implementation of structure measures mainly related to agricultural facility
	NIHSA	Hydrological Monitoring	
State Governments	Environmental Management section	Implementation of structure measures	Implementation of structure measures



Source: JICA Project Team

Figure SR5.3-11 Schematic Image on Present Institutional Arrangement on Flood Control and Erosion Control

JICA Project Team collected State Government Policy documents from some States. In these policy documents, the descriptions on environment and infrastructure were extracted as summarized in Table SR5.3-7 and Table SR5.3-8. The policies in terms of flood and erosion are described in the Environment sector as overall tendency in the State documents in Nigeria.

Table SR5.3-7 Policy of State Government on Flood and Erosion Control (1/2)

	State	Source	Sectors	
			Urban Development, Housing and Environment	Infrastructure
1	Ondo	Ondo State Vision 20: 2020 First Implementation Plan 2010–2013	Programmed development of cities Improving access to land for housing development Adequate housing stock in the urban areas Address poor quality of housing in the rural areas Mainstream environmental issues across all sectors of the economy	The whole 150km of navigable waterways to be cleared and maintained
			Sustainable Environmental Development	Infrastructure Development
2	Kogi	Kogi State Economic Empowerment and Development Strategy "KOSEEDS" Main Document, 2004	Target Reduce gully erosion by 80% by 2007 Reduce flooding cases by 70% by 2007 Strategies Identification of all erosion sites and channeling the affected land areas Proper planning of settlements in the riverine areas	Target Mount pressure on the Federal Government for the execution of Lokoja and Idah river ports as well as the dredging of river Niger by 2008 Strategies Make regular contact with the appropriate federal authorities for the reconstruction/rehabilitation and maintenance of the federal roads and inland water transportation services.
			Environmental Management	Infrastructure Development
3	Ebonyi	Ebonyi State Economic Empowerment and Development Strategy "EB-SEEDS" , 2006	Target Bring environmental and waste pollution in urban centers under control by 2007 Develop and implement procedures for private sector participation in environmental protection by 2007 Strategies The drainage systems of the urban areas shall also be modernized and the monthly clean-up exercise, which already exists, should be encouraged with the backing of the State Assembly	No related with erosion, flood, inland water transportation
			Environment and Ecology	Infrastructure, Emergency Preparedness and Response Plan
4	Anambra	State Economic Empowerment and Development Strategy "SEEDS" 2nd Edition	Target Clear the drainage system in 3 urban cities of Akwa, Onitsha and Nnewi by 2008 Strategies Involve households, communities, local government and state in the joint clearance of drainages Sensitize communities on erosion control measures Seel the intervention of FGN and relevant donor agencies in the control of erosion	No related with erosion, flood. Focus on Emergency Preparedness and Response
			Environment	
5	Lagos	Highlights on Lagos State Economic Empowerment and Development Strategy "LASEEDS" 2005–2007	Target Construct, dredge and/or rehabilitate 450 drainage channels and canals by 2005	
			Environment	
6	Bayelsa	Bayelsa State Economic Empowerment and Development Strategy "BY-SEEDS"	Problems Coastal and marine erosion and land subsidence River bank erosion and flooding in the low-lying mangrove and fresh water swamps and along the flood planes of River Nun, Forcados, etc. Urban flooding in the State Capital, Yenagoa where little or no provision has been made for surface drainage The worsening of flood problems and destruction of wildlife habitats and natural communities when marshes and other wetlands are sand filled. Uncontrolled logging: the destruction of erosion control, cooling, shading and water-shed protection mechanism provided by trees when they are indiscriminately cut down. Strategies (No strategies on erosion, floods.)	
			Environment	
7	Akwa Ibom	Akwa Ibom State Economic Empowerment and Development Strategy Volume II	Priority Projects Controlling urban erosion through construction of drainage system at Nkemba trough Combatting ecological disaster caused by gully and coastal erosion and floods in the State	
			Environment	Infrastructure
8	Abia	Abia Ibom State Economic Empowerment and Development Strategy "ABSEEDS" 2005	Targets Reclaim and rehabilitate 35% of mature gully sites by end of 2007 To ensure theta Disaster Management Agency is effective and efficient. Adequate sensitization of Abians on the prevention and control of soil erosion by 2007 Regular inspection (at least once a month) and maintenance of all urban drainage system and flood routes in the State from 2005 Strategies Conduct of zonal workshops to build stakeholders capacity Training and empowering of extension workers Partner with private sector operatives on reclamation and stabilization measures Integration of erosion prevention mechanism into extension intervention programs Allocate adequate funds for regular maintenance of urban drainage systems and flood routes	No related with erosion, flood.
			Environment	
9	Delta	Delta State Vision 2020 (2011–2020)	Target Reduce coastal and marine erosion rates by 45% Increase channelization of natural waterways by 80% Strategies (no strategies on flood, erosion)	
			Environment	Emergency Management Agency
10	Oyo	Oyo State Economic Empowerment and Development Strategy "OYO-SEEDS 2" 2010–2012	Targets To prevent flooding in the State in order to protect lives and properties(5 rivers/streams in each zones in Oyo State) Strategies To prepare inventory of water bodies and hydrological maps for Oyo State To channelize 30 more rivers/streams as measures to avoid flooding in the State in order to protect lives and properties(5 rivers/streams in each zones in Oyo State)	
			Environment	
11	Gombe	Gombe State Vision 2020 (Final Edited Draft, 2010)	No plan on flood, erosion	

Table SR5.3-8 Policy of State Government on Flood and Erosion Control (2/2)

	State	Source	Sectors	
12	Niger	Niger State Vision 3:2020	Environment Issues Sheet and gully erosion Flood prone plains and settlement Urban flooding and disasters (No specific actions described)	
13	Zamfara	Zamfara State Economic Empowerment and Development Strategy "ZASEEDS" 2006-2008	Environment Target To provide sewerage and drainages To control gully erosion in the state Strategies Construct all categories of roads in towns and cities with effective drainage	
14	Nasarawa	Nasarawa State Economic Empowerment and Development Strategy "NASEEDS"	Environment Target Reduce gully erosion by 40% by 2007 Reduce flooding cases by 50% by 2007 Strategies Identify all erosion sites Canalized land areas and construct solid drainage systems where necessary Create embankments where necessary Relocate some settlements in the riverine areas Awareness campaign particularly in the riverine areas	
15	Kebbi	Kebbi State Economic Empowerment and Development Strategy "KB-SEEDS" 2006	Environment No plan on flood, erosion	
16	Adamawa	Adamawa State Economic Empowerment and Development Strategy "ADSEEDS" 2004	Environment Targets Menace of flooding to reduce by 30% by 2007 Protection and rehabilitation of flood-prone areas using the required structures e.g. construction of embankment, drainages and culverts. Identification of erosion prone areas Reclamation of already eroded land Strategies Widening of existing drainages and desalting the major storm water drainages in Yola, and 20 urban centers. Planting Bahaman grasses Provision of alternative emergency measures to victims Resettlement of affected communities	
17	Jigawa	Jigawa State Comprehensive Development Framework 2010	Environment Target Minimizing the rate of desert encroachment, land degradation e.g. erosion and flood to ensure environmental sustainability Strategies Encourage roadside planting of trees along all major state roads in the State Regeneration of forests Construction of dikes or retaining walls in order to control river banks floods	
18	Imo	Imo Vision 20:2020 Executive Summary	Environment Goals Ensure that over 70 identified erosion sites have been controlled and that new ones do not develop. Strategies Control of identified erosion sites and ensuring that new ones do not develop through the Federal Government intervention.	
19	Kwara	(No Planning Plan)		

(4) Flood Control

(4-1) Flood Damages

Most flood occurrences in Nigeria are constant or flash floods. Constant floods occur seasonally along many of the natural waterways such as the Niger, Benue, Imo and Ogun, Anambra rivers.

In Nigeria, the lands along river courses have been still used not so extensively to allow the river have enough space as natural. However, in recent decades, as urbanization with communication technology have been developed, physical damage on people due to flooding and soil erosion has been considerable as national viewpoint.

Some of the reported flood disaster events by media are Sokoto State flood in September 2010, Ibadan State flood in August 2011 and Lagos flood in July 2011. The former 2 floods events were caused by excessive overflow from dam or reservoir to result into flooding in the downstream reach, and the latter was the inundation event in urban lowland area near the coast.

Table SR5.3-9 Major Flood Disasters in Nigeria

Year/Month	State (City) / River Name	Description of Cause and Damage
1980	Oyo(Ibadan) / Ogunpa R.	274.1mm rainfall in 12 hours, 100 people died and 50,000 people homeless.
1988 August	Kano	Bagauda dam failure, destroying 18,000 houses and leaving 200,000 and 23 people dead.
1999 September	Kaduna / Kaduna and Niger R.	Killed 39 people, Submerged hundreds villages, affected 300,000 people. 23 people were killed.
2010 September 8th	Sokoto, Kebbi / Sokoto , Rima R.	Heavy rainfall and Goronyo dam release.
2011 August	Oyo(Ibadan)	120 people killed.
2011 July	Lagos, Ogun, Oyo	25 people killed. Relentless rainfall on July 10 (Sunday).
2012 August-October	33 States, especially Kogi, Adamawa and Delta / Benue, Niger R.	363 people dead, 2.2 million people were displaced, damaged several thousand ha of cropland and destroyed houses and personal properties.

Source: JICA Project Team

Table SR5.3-10 List of Past Flood Incidents obtained from various sources

Year	Month(Period)	State	Place		River Name	Description	Sources
1922		Sokoto	upstream of Sokoto	U.Lalle, Dan Gerko	Sokoto, Rima River		History of Irrigation, pp.115
1954		Borno	Chad Lake		Chad Lake	The Chad lake level was highest in 40-50 years on record.	History of Irrigation, pp.116
1960		Borno	Chad Lake		Chad Lake	Similar flood with 1922	History of Irrigation, pp.116
1974		Kwara			Niger River	rice project in Tada/Shonga submerged for 3 months. There was a high release from Kainji Dam to accommodate the reservoir waterlevel for upstream rice project.	History of Irrigation, pp.116
1980	August	Edo	Ogirami dam	Akoko-Edo LGA			History of Irrigation, pp.116
1980		Oyo	Ibadan	Agbogbon, Adamasingba, Bode, Dugbe, Elizabeth Road, Feleye, Gbagi, Molete, Odo-Ona, Oke-Ayo, Omitowoju, Oredein, Osoba, Total Garden, Salvation Army area	Ogunpa river	274.1mm rainfall in 12 hours, 100 people died and 50,000 people homeless.	History of Irrigation, pp.117
1988	August	Kano	Bagauda dam			Bagauda dam failure, destroying 18,000 houses and leaving 200,000. 23 people dead.	1.History of Irrigation, pp.117 2.http://reliefweb.int/report/nigeria/nigeria-floodsdam-burst-aug-1988-undro-information-report-1
1999	Sep.	Kaduna			Kaduna River, Niger River	killed 39 people, Submerged hundreds villages, affected 300,000 people. 23 people were killed.	BBC news
1999, 2001, 2007	August	Jigawa		Yakasawa, Auramo, Dabi, Zangon, Kanya, Yan Duste, Gilima	Hadejia River (downstream of Tiga Dam and Challawa Gorge Dam)	High intensity rainfall, release from dams	1 NIHSA handout on April 2012 2 NIHSA Hydronews Vol.2 No.1 September 2010
2007, 2008		Kwara			Asa River		Irolin News
2009	May	Edo	Benin City	Owan LGA			
2009	June	FCT, Lagos, Kaduna, Gombe, Niger, Benue, Nasarawa, Jigawa					
2009	July	Lagos	Lagos				
2009	August	Kebbi		Dakingari village		300 houses submerged, 3,000 people homeless	NiHSA Hydro News Dec. 2009
2009	October	FCT	Abuja	Kubwa			
2010	Sep. 8	Sokoto, Kebbi			Sokoto	heavy rainfall and Goronyo dam release. The annual rainfall is 550-600 mm in Sokoto, but as of 9/13, 2010, the accumulated rainfall reached 1,412.5mm.	
2011	August	Oyo	Ibadan			120 people killed.	BBC News
2011	July	Lagos, Ogun, Oyo	Lagos	Ikoyi, Victoria Island, Apapa		25 people killed. Relentless rainfall on July 10 (Sunday).	Internet New "Voice"

Source: JICA Project Team

(4-2) Past Major Floods

a) Flooding downstream of Dam

<u>September 2010 flood in Sokoto State</u>

The flooding in Sokoto state, Nigeria is a result of the Goronyo dam failing after heavy rainfall(it is said that the rainfall amount around Sokoto was 3 times as much as the normal year, according to NISHA, to be confirmed), washing away settlements and farmlands in nine local council areas; Binji, Gudu, Lllela, Silame, Tangaza, Kware, Gwadabawa, Gada and Goronyo. This flood has extended to Kebbi State which shares a common border with Sokoto; affecting Local Government Areas Augie, Argungu, Birnin Kebbi, Kalgo and Bunza. Figure SR5.3-12 is the flooded area map in this event, which is open in the web site of the International Charter.

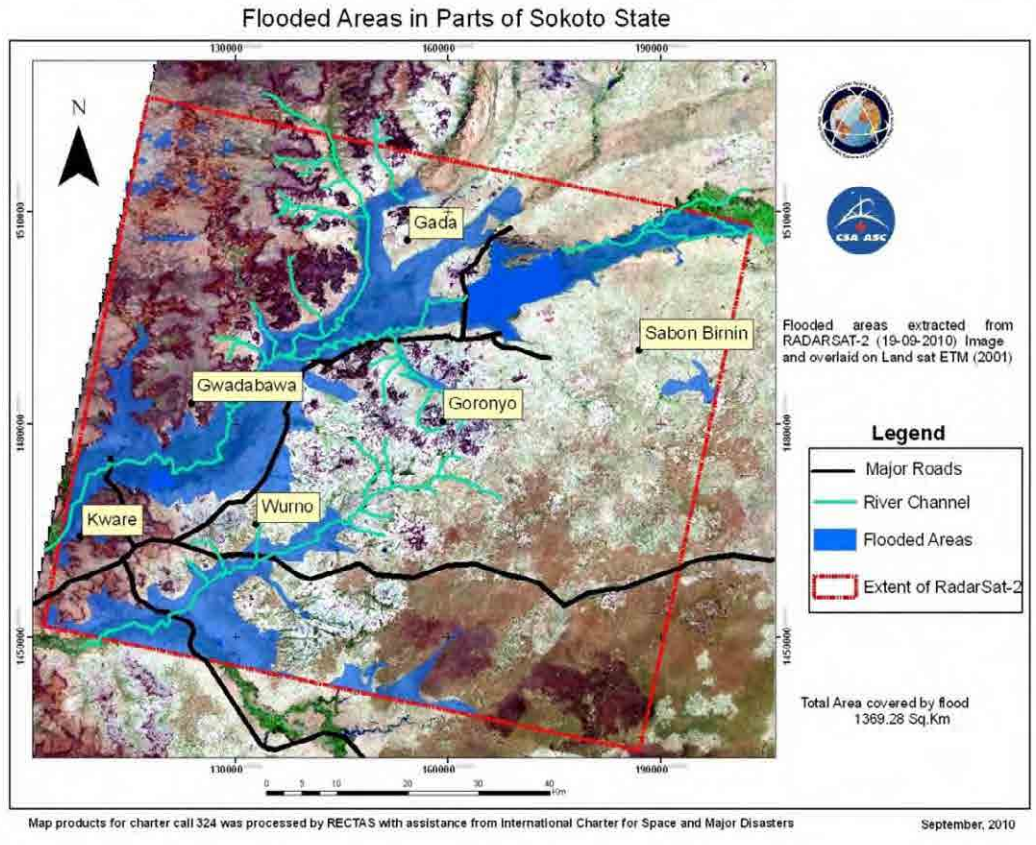


Figure SR5.3-12 Flooding Area in Sokoto State in September 2010[4]

b) Flooding in urban area

<u>August 2011 flood in Ibadan State</u>

This flood brought into inundation in urban area because of the overflow from Eleyele Lake in Ibadan State in August 2011. A devastating flood which resulted from an over spill from Lake Eleyele swept over communities in Ibadan, Nigeria. After the flood, the President visited the disaster area and media reported the event in large scale. The continues rainfall from August 26 to 27 in 2011 over 6 hours infilled the reservoir of Eleyele to result into the overflow in the midnight and flush flood like tsunami into the downstream urban areas (mostly illegal settlement). The number of evacuation was several thousand and the number of the victims was over 100. Figure SR5.3-13 is the flooded area map in this event, which is open in the web site of the International Charter.

[4]http://www.disasterscharter.org/web/charter/activation_details?p_r_p_1415474252_assetId=ACT-324

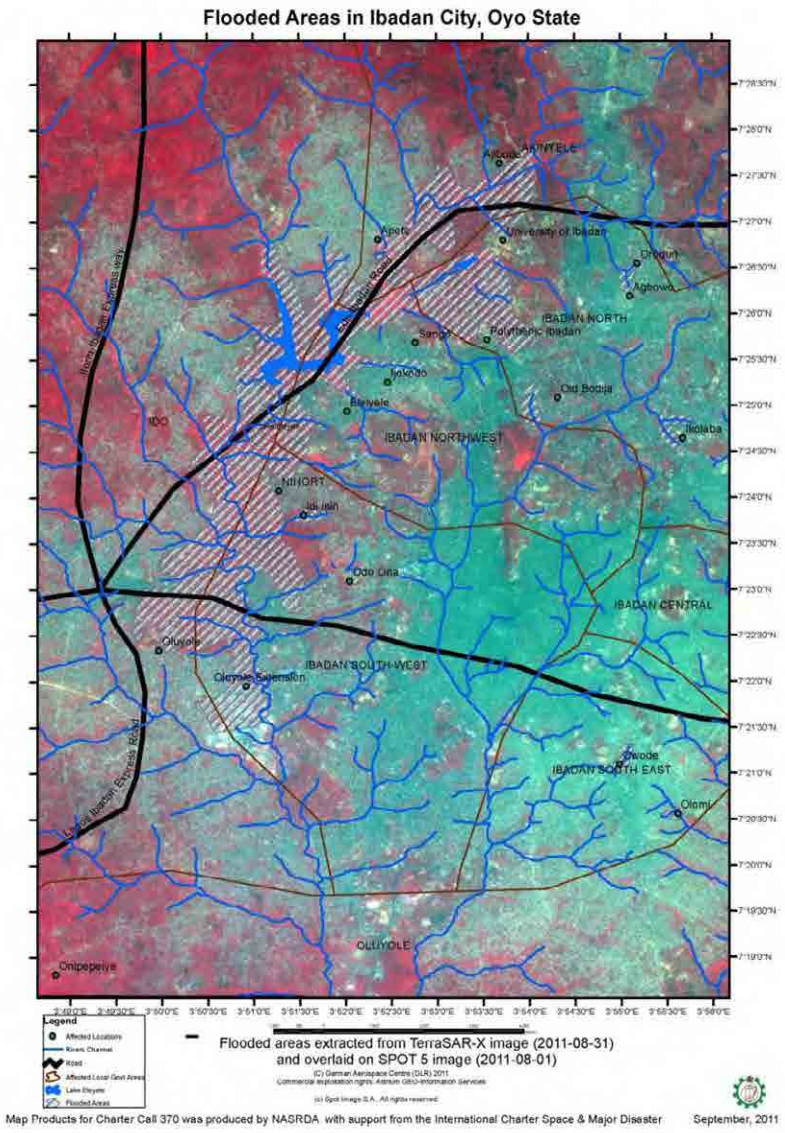


Figure SR5.3-13 Flooding Area in Ibadan State in August 2011 by overflow from Eleyele Dam[5]

Oyo State Government organized the "Oyo State Task Force on Flood Prevention and Management" in September 2011 in order to address the causes and effects of the August 2011 flood. According to the Task Force Report dated on November 2011, the recorded rainfall amount at IITA (International Institute of Tropical Agriculture) was 187.5 mm from 16:40 to 20:00 in August 26, 2011 that includes 140.63 mm within 70 minutes). If this 187.5 mm of rainfall is regarded as the daily rainfall, it can be evaluated as 30 years return period according to Table SR5.3-4.

According to the Task Force Report, the major areas affected are Odo-Ona, Odo-Ona Elewe, Orogun, Agbowo, Apata, Ajibode, University of Ibadan, Ogbere-Babanla, Ogbere Moradeyo, Onipepeye and Eleyele Dam/Water Works. The number of affected LGA is 11, and in these LGAs there were 2,105 buildings flooded by the heavy downpour of Aug 26, 2011.

The causes of the flooding in Ibadan are not only heavy rainfall but the land use factors. Notable among these factors is the indiscriminate and relentless construction of buildings on floodplains.

[5]http://www.disasterscharter.org/web/charter/activation_details?p_r_p_1415474252_assetId=ACT-370

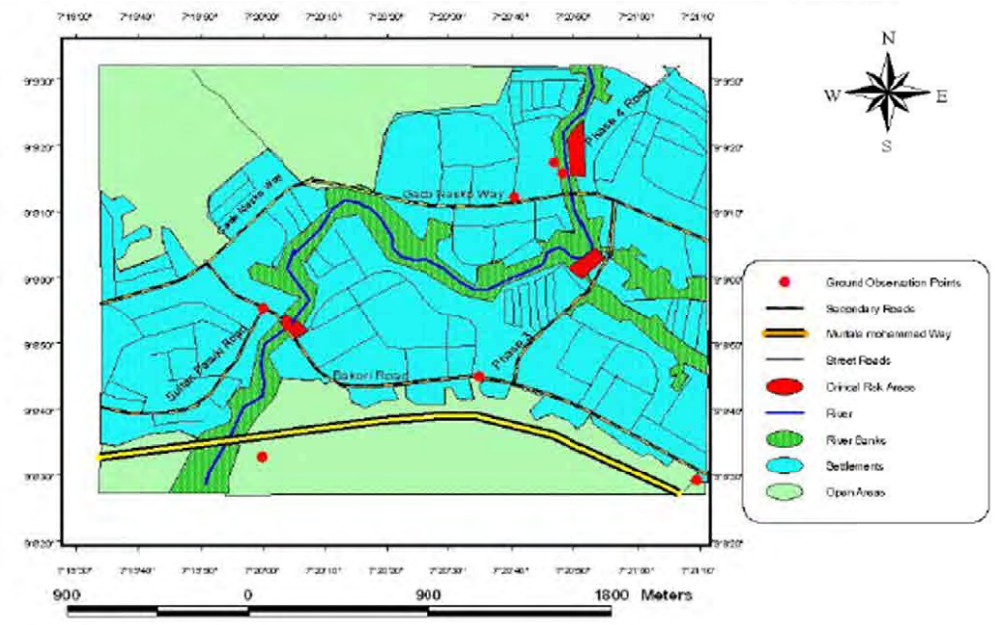
July 2011 Lagos flood

In and around Lagos city, the heavy rainfall lasted over 1 day in July 2011 caused the inundation in the city and closed the Lagos Airport. The inundation took place in Victoria Island, Ikoyi, Obalende, Orile Iganmu, Surulere, Aguda, Idi Araba, Ikorodu road and Ajegunle, Maryland.

The coastal lowland area in Nigeria such as Lagos city is facing a problem of inundation by local rainfall, especially prolonged inundation due to high tide. Consequently the waste material of communities is spilled out to create the deceased on cholera. The flood problem is a kind of obstacle for people's access to safe water.

Case of Kubwa Town (FCT, Abuja)

Kubwa Town is located on the western part of Abuja in FCT and has been suffered from flooding from the Usuma River frequently. NEMA's GIS Unit has been developing a flood hazard map for Kubwa town to identify the critical areas in terms of flood damage vulnerability.



Ssource: NEMA GIS Unit, 2010

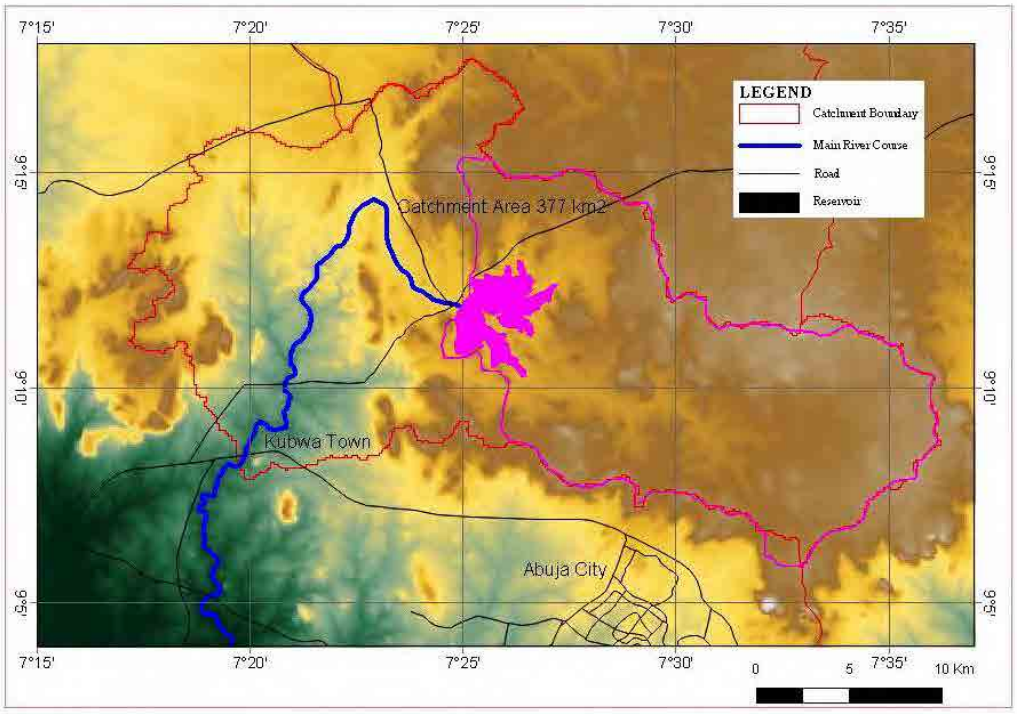
Figure SR5.3-14 GIS Based Flood Risk Assessment of Kubwa Abuja by NEMA

JICA Project Team visited the Kubwa Town with NEMA GIS Unit Team on May 18, 2012. The following is the observation by the JICA Project Team. The Kubwa Town is supposed to be one of the typical towns in terms of river flooding and urban drainage issue in Nigeria.

The catchment area of the Usuma River is 377 km^2 at the Kubwa Town. In the upper part of the catchment there is the Usuma Dam for water supply, whose catchment area is about 191 km^2. The river bed slope near Kubwa Town is about 1/350. The Dam was constructed in 1984 by SWB. Thus the flood water to Kubwa Town is composed of the release from the Usuma Dam and the runoff from the residual basin (186 km^2) of the Usuma River.

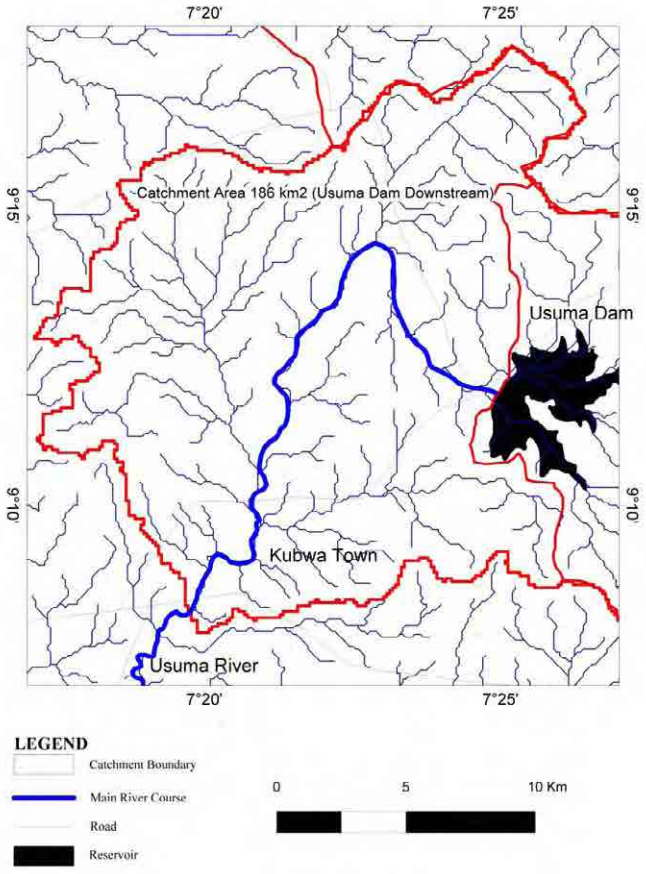
Figure SR5.3-16 shows the stream courses of the Usuma Dam downstream. It is recognized that large catchment tributaries are entering from both left side and right side just upstream of Kubwa Town. Generally this kind of stream configuration could produce sudden increase of flood level during heavy rainfall. According to local people in Kubwa Town, there was a flood 3 years ago and the flood mark is observed 2m high above the river bank surface.

Also in Kubwa Town, garbage dumping into the river and the new settlement confining the river course are serious concerns according to NEMA. Regulation of usage og the floodplain is one of the outstanding issues for NEMA.



Source: JICA Project Team

Figure SR5.3-15 Catchment Boundary and Topography of Usuma River



Source: JICA Project Team

Figure SR5.3-16 Tributaries of Pedan River downstream of Usuma Dam

Source: JICA Project Team

Figure SR5.3-17 Dumped Garbage into the river channel (Left) and Flood Mark at 2m above the river bank (Right)

c) 2012 Flood

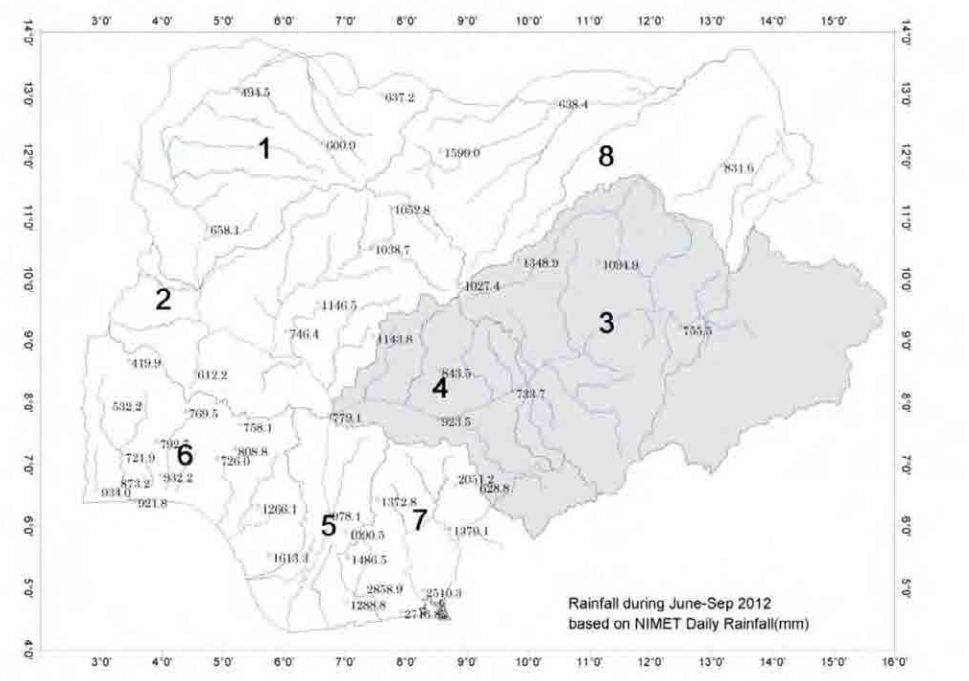
The wet season started early in February/March in the south and in early May/June in the north. Widespread flooding peaked between September and mid-October across the country and was particularly severe in the northcentral and coastal states. Nigeria experienced the worst flooding in more than 100 years. NIWA indicated that the 2012 flooding was the second highest in the country; the first and highest occurred in 1932.

The flood in 2012 was caused by more flooding of the Niger River, the Benue river and other major tributaries than normal years. Those flooding were brought by rainfall in Nigerian territory as well as the inflow from Niger and Cameroun borders. Especially the flooding extent along the Benue river was large to result into the historical flooding at Lokoja downstream where the Niger and the Benue river confluence with local rainfall. According to a media, this flooding at Lokoja was the worst in fifty years.

Usually the flood disasters in Nigeria in rainy season are destructive ones such as flash flooding over poor drainage system in urban area, however in 2012 the flood along the rivers lasted more than 2 months and brought in Nigeria a lot of damage on people, properties and sanitary conditions, and the Federal, State, Local governments and communities responded.

<u>Rainfall in 2012</u>

JICA Project Team obtained the NIMET monthly rainfall data in 2012 from the World Bank's PDNA Team (Table SR5.3-11). The cumulative rainfall from June to September is shown in Figure SR5.3-18.



Source: JICA Project Team

Figure SR5.3-18 Rainfall during June - September in 2012 in Nigeria

Table SR5.3-11 Monthly Rainfall in 2012 of NIMET stations

unit: mm

STN	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC	Total (Jan-Nov)
ABEOKUTA	0.0	27.2	57.5	76.5	183.8	350.3	147.8	34.2	189.6	283.2	8.4		1358.5
ABUJA	0.0	20.6	19.0	52.0	162.8	222.8	376.1	270.5	274.4	228.9	11.0		1638.1
ADO EKITI	2.3	69.9	45.6	155.3	145.3	329.2	207.3	39.3	182.3	265.2	67.1		1508.8
AKURE	35.6	13.8	74.1	152.1	96.8	250.5	242.3	111.9	204.1	143.1	42.0		1366.3
ASABA	0.1	15.8	20.6	164.3	68.2	209.4	294.5	328.5	145.7	296.0	104.8		1647.9
AWKA	28.3	66.5	16.5	206.1	236.7	327.6	232.0	363.5	167.4	291.7	49.8		1986.1
BAUCHI	0.0	0.0	0.0	14.4	167.9	163.8	535.0	274.8	375.3	14.6	0.0		1545.8
BENIN	47.7	53.2	74.8	157.1	383.7	490.4	395.3	124.9	255.5	285.2	189.7		2457.5
BIDA	0.0	0.0	0.0	64.5	308.6	194.0	274.3	140.9	137.2	230.2	0.0		1349.7
CALABAR	32.9	376.4	36.0	83.2	438.4	398.8	630.1	861.7	619.7	410.4	126.7		4014.3
EKET	63.2	291.8	74.6	222.0	227.7	856.3	847.0	408.6	604.9	281.9	182.8		4060.8
ENUGU	39.0	35.7	13.0	86.9	288.7	282.5	388.0	309.1	393.2	227.7	88.5		2152.3
GOMBE	0.0	0.0	0.0	10.3	64.0	222.9	337.8	356.2	178.0	28.1	0.0		1197.3
GUSAU	0.0	0.0	0.0	5.2	131.0	63.4	271.5	153.0	113.0	17.5	0.0		754.6
IBADAN	0.0	20.6	36.2	117.1	215.9	215.0	257.0	82.5	238.2	141.3	54.9		1378.7
IBI	0.0	0.0	0.0	99.1	202.7	203.6	288.9	74.4	166.8	169.3	2.6		1207.4
IJEBU-ODE	0.0	101.9	16.8	91.6	136.6	301.3	317.2	59.6	254.1	166.6	133.4		1579.1
IKEJA	10.5	122.2	78.1	64.0	134.9	477.6	147.5	34.0	214.1	138.9	123.1		1544.9
IKOM	16.4	72.5	11.3	213.7	343.6	482.6	309.5	313.7	273.3	322.3	93.1		2452.0
ILORIN	0.0	22.1	4.0	134.6	138.2	152.8	120.7	108.7	230.0	159.3	8.7		1079.1
ISEYIN	26.7	42.9	13.0	215.2	221.1	145.5	87.7	146.0	153.0	182.5	15.7		1249.3
JOS	0.0	0.0	0.0	66.6	315.4	240.3	429.0	156.9	201.2	58.6	0.0		1468.0
KADUNA	0.0	0.0	0.0	61.6	212.8	140.3	225.6	269.4	403.4	135.1	0.0		1448.2
KANO	0.0	0.0	0.0	0.0	71.9	432.6	416.6	626.3	123.5	18.6	0.0		1689.5
KATSINA	0.0	0.0	0.0	0.0	59.5	135.2	224.1	201.1	76.8	2.0	0.0		698.7
LAFIA	0.0	0.0	0.0	93.5	178.6	200.8	218.4	230.3	194.0	174.2	34.9		1324.7
LAGOS B/BEACH	1.1	61.2	28.7	161.0	221.1	476.7	250.2	10.4	184.5	229.0	0.0		1623.9
LAGOS ISLAND	0.0	61.5	47.9	158.1	196.7	582.9	236.5	13.1	101.5	336.0	0.0		1734.2
LOKOJA	0.0	11.8	0.0	86.5	253.8	166.9	283.3	180.5	148.4	209.9	2.2		1343.3
MAIDUGURI	0.0	0.0	0.0	0.0	33.8	76.9	328.0	228.6	198.1	3.4	0.0		868.8
MAKURDI	0.0	0.5	0.0	143.2	139.5	160.6	297.9	174.3	290.7	232.7	27.3		1466.7
MINNA	0.0	0.0	0.0	34.2	204.5	99.4	333.0	376.9	337.2	158.0	0.0		1543.2
NGURU	0.0	0.0	0.0	0.0	15.7	107.3	105.3	300.6	125.2	0.0	0.0		654.1
OBUDU	0.0	28.0	2.2	115.2	284.2	154.1	223.4	137.6	113.7	180.2	48.3		1286.9
OGOJA	25.4	13.5	0.0	160.4	565.1	541.6	371.4	607.5	530.7	476.7	118.9		3411.2
ONDO	4.0	93.2	24.5	92.8	158.0	187.3	249.3	102.3	187.1	247.4	95.6		1441.5
OSOGBO	3.7	61.5	35.2	134.3	178.5	202.9	171.1	99.3	296.2	219.6	124.4		1526.7
OWERRI	0.0	74.1	22.1	138.1	234.4	284.2	415.0	285.4	501.9	192.3	110.2		2257.7
PORT HARCOURT	23.4	104.0	92.7	247.2	208.0	311.8	359.0	208.6	409.4	205.5	79.0		2248.6
POTISKUM	0.0	0.0	0.0	0.0	78.6	111.7	206.6	358.5	306.9	0.0	0.0		1062.3
SHAKI	0.0	28.6	23.9	111.6	141.1	153.0	82.4	77.1	107.4	115.3	0.0		840.4
SOKOTO	0.0	0.0	0.0	0.0	54.5	83.2	178.2	140.7	92.4	64.4	0.0		613.4
USI EKITI	0.0	25.1	41.0	97.9	183.2	223.8	56.7	37.4	171.2	223.3	62.0		1121.6
UYO	163.3	321.5	29.5	148.6	336.0	699.5	911.9	720.8	526.7	498.9	270.5		4627.2
WARRI	18.8	168.0	47.1	137.6	333.4	469.9	677.5	132.9	333.0	330.0	166.4		2814.6
YELWA	0.0	28.0	0.0	56.8	168.1	50.3	254.3	163.3	190.2	41.2	0.0		952.2
YOLA	0.0	0.0	0.0	0.0	108.0	198.9	157.3	209.8	189.5	67.2	0.0		930.7
ZARIA	0.0	0.0	0.0	16.7	265.0	157.7	306.1	422.7	166.3	85.2	0.0		1419.7

Source: World Bank Post Disaster Need Assessment Team obtained from NIMET

Damages

The damage occurred in the communities on floodplain along the Niger and the Benue rivers and the Delta area as well as agricultural lands.

In 2012 from July to October, Nigeria experienced historical flood along the Benue and the Niger rivers. The flood traveled in those rivers for more than 1 month and affected the urban areas along the rivers. According to NIMET information, the flood magnitude was the worst in 80 years on record, whose causes were the inflow from Niger due to a lot of rainfall in the country and the runoff from in and outside of Nigeria due to rainfall in July. Totally 33 states among 36 states were affected by the flood. Especially 14 states were seriously affected. The number of affected people is 7.7 million during July and October. The number of victim is 33 and the 18 thousand were injured and 618 thousands of houses/building was damaged.

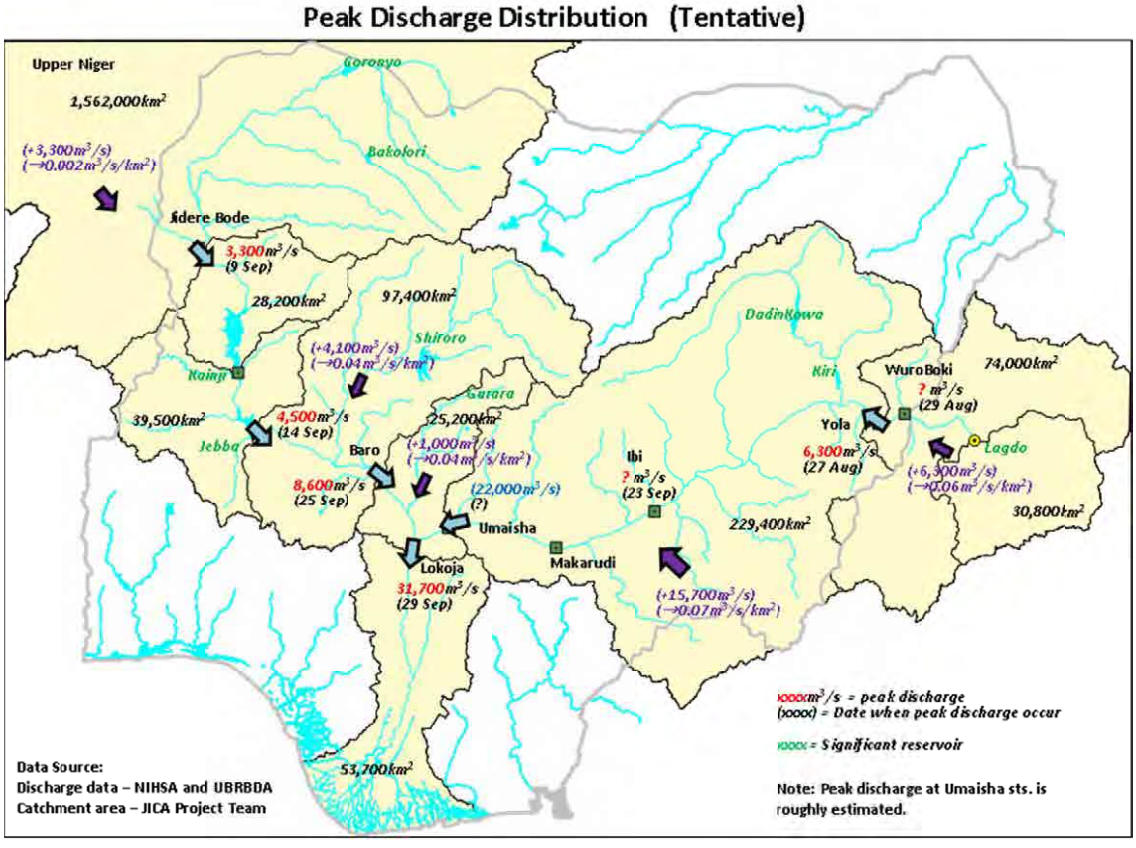
The chronology of the 2012 flood was made based on local newspapers as follows.

Table SR5.3-12 Chronology of the 2012 flood

Mid. Of August 2012	The worst flash flood in fifty years on record in Plateau State
End of August 2012	Overflow from Lagdo dam in Cameroun started in August 24 according to officials of Adamawa State. The number of victims was 15 that is the worst damage in fifty years in the State.
September 10, 2012	In Adamawa State, it was announced that 30 people dead and 120 thousand people evacuated in the eastern Adamawa State. 65 cases of cholera were recognized.
September 10, 2012	NEMA issued evacuation order to the people in the states （Niger, Kogi, Kwara, Kebbi, Anambra, Delta）along the Niger river, after the waterlevels in Kainji Dam and Jebba Dam were recorded as the highest in 29 years for this period.
September 12, 2012	The inundation in Makurdi along the Benue river started from about September 9th. About 10 thousand houses were inundated. In Lokoja, the inundation started in September 12.
September 24, 2012	Director of NIWA stated that the waterlevel in Lokoja recorded the highest since 1939.
October 19, 2012	NEMA issued flood warning in Ekiti State.

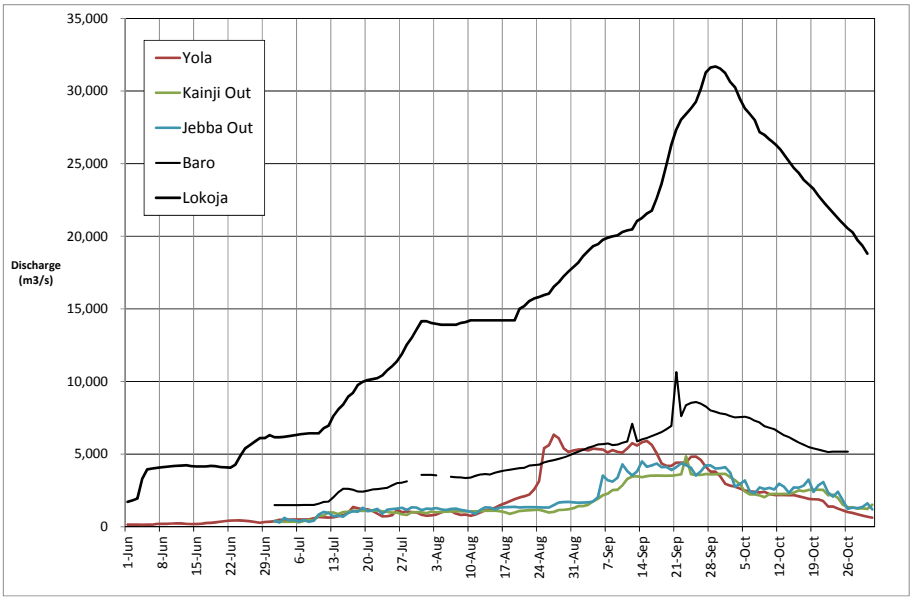
Source: JICA Project Team

JICA Project Team collected the daily discharge data in Nigeria during the 2012 flood from NIHSA. Figure SR5.3-19 shows the peak discharge and the date in major hydrological stations. Figure SR5.3-20 is the hydrograph at the major stations. The peak discharge at Lokoja, the confluence of the Niger river and the Benue river, was more than 30,000 m^3/s. Compared this with the discharge of Jebba Dam out and Yola station, the runoff volume at Lokoja station is very large, consequently it is estimated that the rainfall runoff within the Nigerian territory had great contribution to the flood in the Lower Niger section.



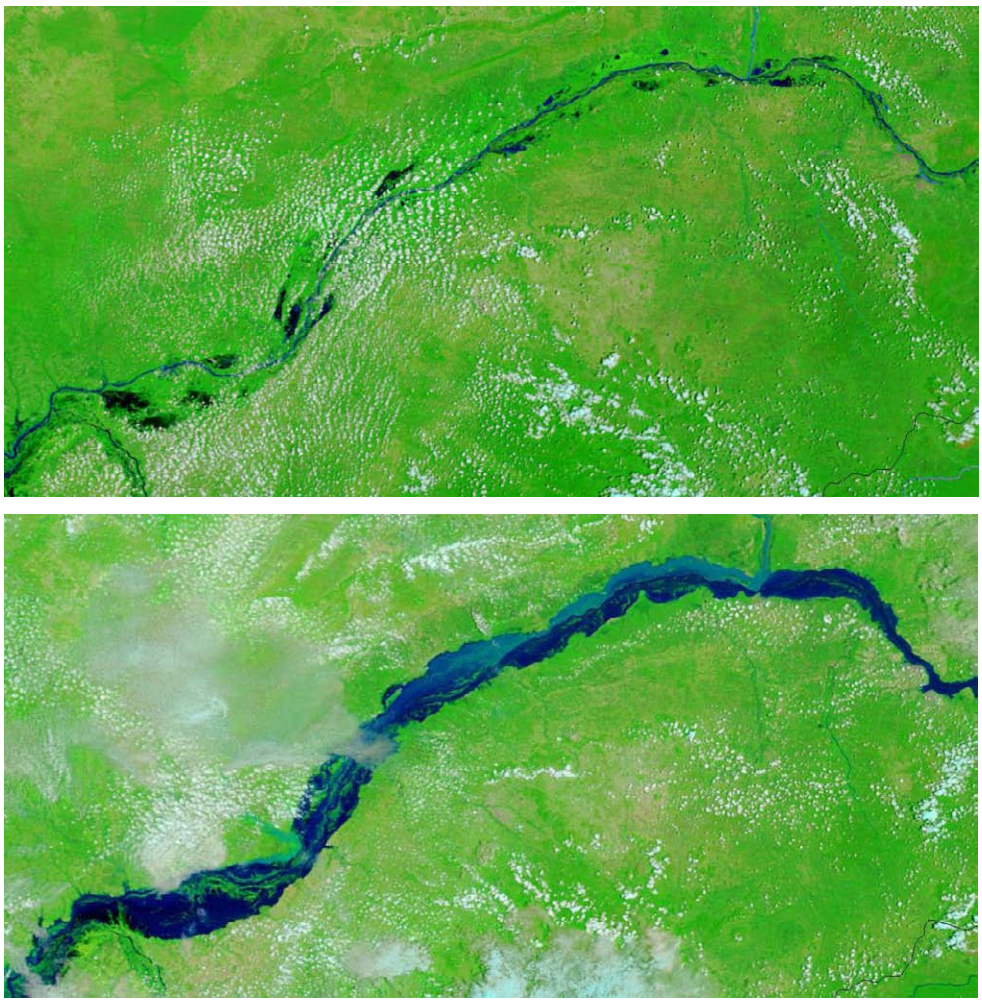
Source: JICA Project Team

Figure SR5.3-19 Peak Discharge Distribution in 2012 Flood



Source: JICA Project Team

Figure SR5.3-20 Discharge Hydrograph during June – October in 2012 of NIHSA Hydrological Station



source : NASA HP[6]

Figure SR5.3-21 Satellite Images of the Benue River near Lau (Top:2009/9/23, Bottom:2012/9/8)

[6] http://earthobservatory.nasa.gov/IOTD/view.php?id=79149

Source : NASA HP[7]

Figure SR5.3-22 Satellite Images of the confluence of the Niger and the Benue River near Lokoja (Top:2012/10/13, Bottom:2008/10/20)

Responses of Nigerian Government

President Jonathan said that the required response to the flooding and the recovery for the flood damage exceeded the capacity of Federal and relevant State Governments. The President set up Fund Promotion Committee composed of previous Presidents and economic circles and made efforts to prepare 100 billion Naira in order to support the affected people and the State Governments. (Source: News "This Day" dated on Nov. 6, 2012)

Local newspaper showed an opinion article that 2012 flood disaster had 4 factors such as insufficient experience of natural disaster management, lack of preparedness for disaster, lack of record of past

[7] http://earthobservatory.nasa.gov/IOTD/view.php?id=79404

disasters and misuse of ecological fund. (Source: The Guardian, 2012/10/9)

FMWR and FMARD stated that they need buffer dam and financial compensation scheme for farmers because food crisis was anticipated by agricultural flood damage.

NEMA pointed out that each State should have strategies for flood control (Source: Leadership, 2012/10/25).

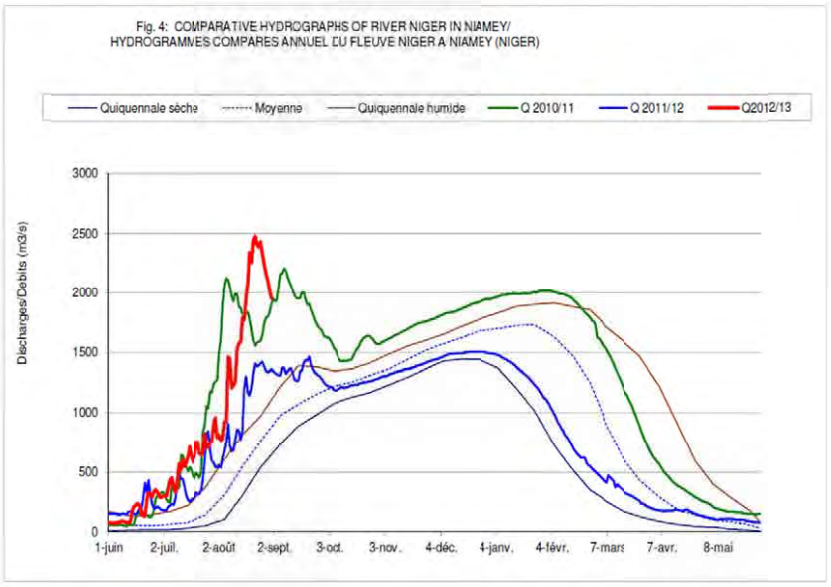


Figure SR5.3-23 Waterlevel at Niamey in Niger[8]

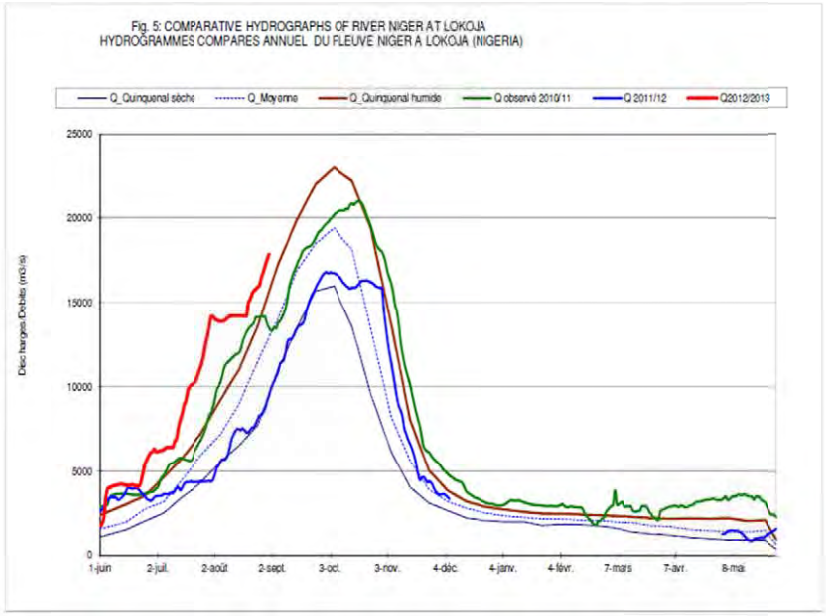


Figure SR5.3-24 Waterlevel at Lokoja[9]

[8] bulletin_hydro_Aout_2012.pdf
[9] bulletin_hydro_Aout_2012.pdf

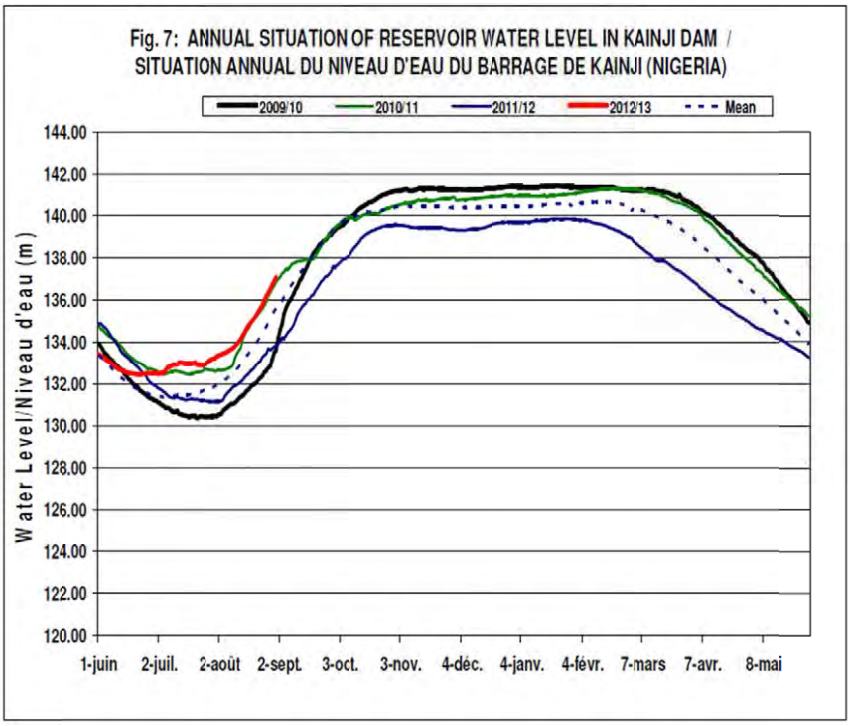


Figure SR5.3-25 Waterlevel at Kainji Dam[10]

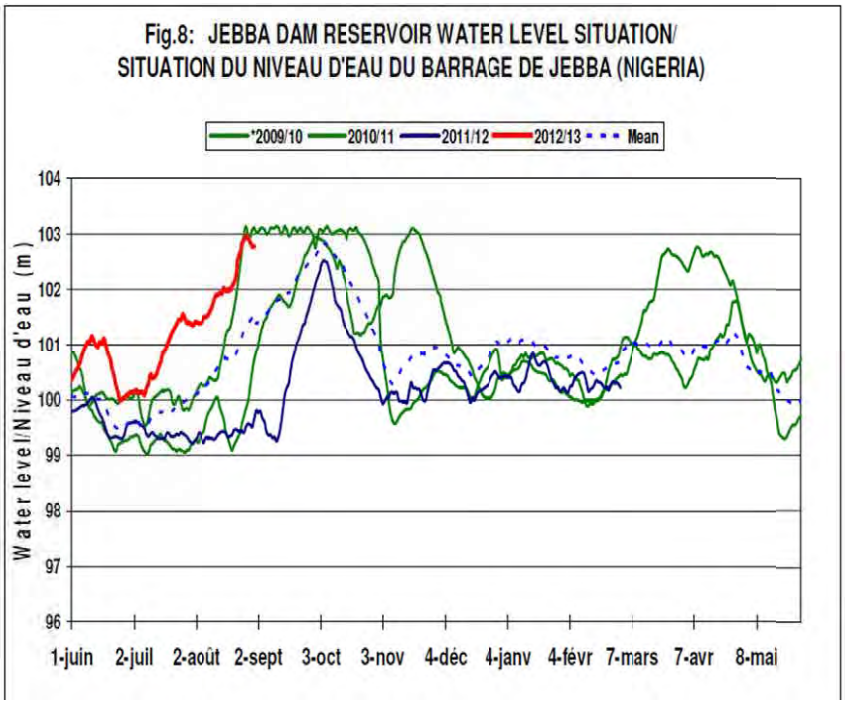


Figure SR5.3-26 Waterlevel at Jebba Dam[11]

[10] bulletin_hydro_Aout_2012.pdf
[11] bulletin_hydro_Aout_2012.pdf

(5) Flood Control

(5-1) Issues

a) History of River Usage in Nigeria

The significant usage of river in the present Nigerian territory started in nineteenth century as European countries began to trade between the West Africa and the European continent to use the Niger river as transportation route. The inland transportation in the Niger river had been active until the beginning of 20th century while some British state-owned companies exported agricultural products through the Niger and Benue rivers. After that, the inland transportation became less active because of the policy change by the British government to railway and ground transportation, as well as the losing interest in agriculture at the time of discovery of oil. Consequently the inland transportation in Nigeria has not been increasing rather decreasing whereas it has been a major sector in river management in Nigeria.

Historically the consumptive usage of river water was done in the small scale and traditional floodplain cultivation in the floodplains of the Niger and the Benue rivers as well as in the large scale irrigation and water supply by large dams. Those sectors as such the river water is used to intake by dams or weirs are the main sector in Nigeria. While some large dams were constructed during the oil boom for the purpose of flood control, those dams have not been used intentionally for flood control.

The floodplain in Nigeria has a wide variation from the riverine area along small stream whose width is several meters to run downstream in urban area to the vast flat plain of the Niger and Benue rivers confined by the pediment on the sedimentary rock complex. The urban settlement in Nigeria was developed on higher elevation areas because she has a lot of higher, flat topography, where they are not affected by river flood. It is understood that due to the above historical background they have not paid attention to flood control as well as management of floodplain. However, in HA-8 where the alluvial plain is dominant, the management of floodplain has been significant issue.

In Nigeria, while there is an inland navigation sector, there is a primary need to make use of river water by point facilities such as dam and reservoir. On the contrary, there was not much need to consider rivers longitudinally.

b) Current Situations

Even in Nigeria, urban area by population increase encroached the floodplain around existing urban area, which caused inundation along streams and bank erosion. Consequently such physical damages draw attention of society. When flood damage took place in a dam downstream section, some of the society had interest in the operation of the dam. The historical flood of the Niger and the Benue rivers in 2012 brought significant damage to the urban areas along those rivers such as Lokoja, which highlighted the river feature that it is connected longitudinally. Moreover, as the concept of environmental flow is emphasized, to regard rivers as those longitudinally connected in order to assure the flow continuity in normal time have become important. The vast floodplain of the Niger and the Benue rivers has great potential for irrigation, however it has not been made use of.

Table **SR5.3-13** shows the activities which each government level is taking to distinguish floodplain into riverine area in urban area, floodplain near urban center along rivers, and floodplain along the major rivers.

The improvement of urban environment which State governments and FMEnv area dealing with includes lining of natural stream, dredging, bank protection and flood early warning from the viewpoint of floodplain management. State governments have sections for land use planning, which are responsible for land use planning in floodplain. Federal Ministry of Niger Delta is a coordination body for relevant 9 states in Delta areas (Ondo, Edo, Delta, Bayelsa, Rivers, Imo, Abia, Akwa Ibom, Cross River). This ministry is also involved in the management of floodplain.

Table SR5.3-13 Management of Floodplain

	Subjective Floodplain			
	Riverine area in urban area		Floodplain near urban center along rivers	Floodplain along major rivers
	Area of higher elevation	Lowland area(Delta area)		
State Government	Improvement of Urban Environment Land use planning	Improvement of Urban Environment Land use planning	Improvement of Urban Environment Land use planning	Land use planning
FMEnv	Improvement of Urban Environment Flood Early Warning	Improvement of Urban Environment Flood Early Warning	Improvement of Urban Environment	―
FMWR	―	―	Regulation of Release from Dam Hydrological Monitoring	Regulation of Release from Dam Hydrological Monitoring Large scale Irrigation
FM Niger Delta	―	Improvement of Urban Environment (Delta area)	Improvement of Urban Environment (Delta area)	
FMT-NIWA	―	―	Management of Navigation Route	Management of Navigation Route

source：JICA Project Team

c) Issues

The management of floodplain in Nigeria can be defined as mitigation of flood damage, promoting of river usage in normal time and enhancement of land use, responding to the variety of river regime such as water level, discharge and velocity.

The management of floodplain should be prioritized among the national policies as well as the environmental management in urban areas.

In terms of small floodplain in urban area, State governments and FMEnv are in charge as a part of environmental administration. The sufficient fund for countermeasures and technical support such as hydrological data, planning and design methodology from Federal government are necessary.

In terms of mitigation of flood damage, FMEnv is preparing flood early warning system based on rainfall prediction in urban area. The flood early warning against flooding of major rivers such as the 2012 flood is highly expected at present.

For the food production, large scale irrigation project in floodplain of major rivers is expected. However, the basic information on such floodplain such as historical change of river bank, river cross section, soil profile and river channel flow capacity is not enough.

NIWA is in charge of navigation route of major rivers. The management covers the entire width of floodplain, however, the actual activity is not clarified.

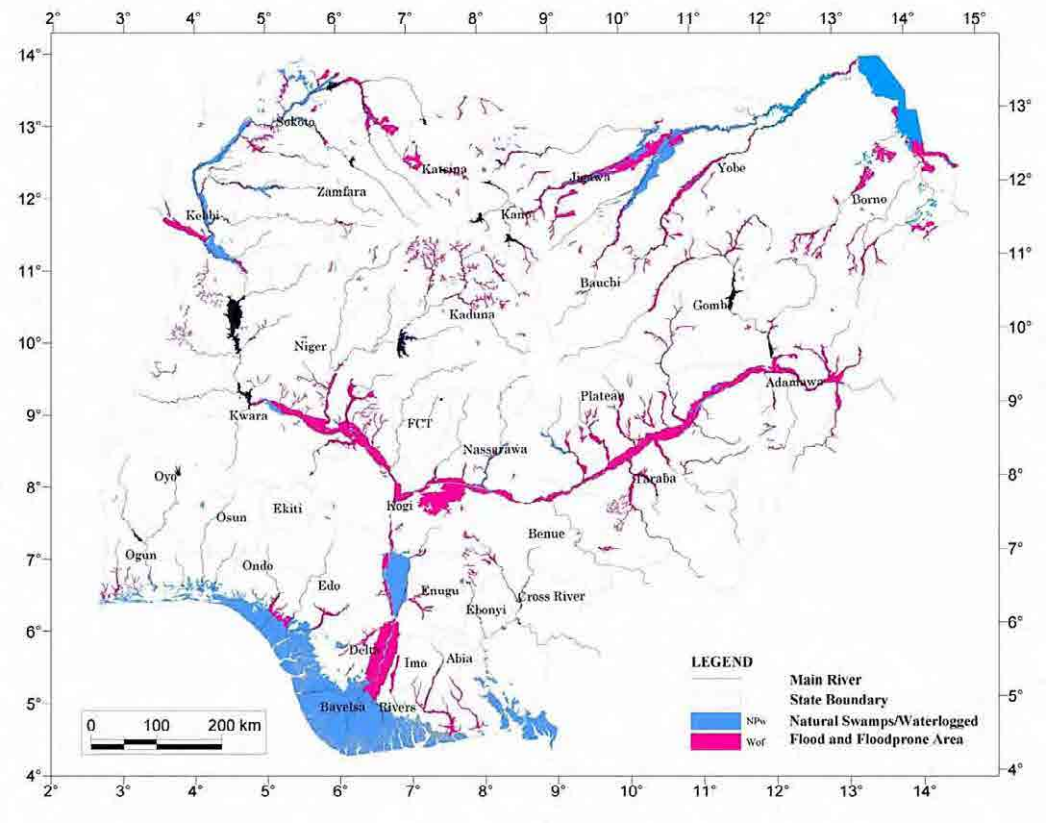


Figure SR5.3-27 Natural Swamp area and flood-prone area by FMEnv GIS Data

(5-2) Under Discussion /On-going /Project

At present in Nigeria, the discussion on flood control is very frequent in the national level as well as in States and communities, especially after the 2012 flood incident.

a) Flood Forecasting

<u>Institutional Framework of Flood Early Warning System in Nigeria</u>

At present in Nigeria the Federal Ministry of Environment (FME) is the primary stakeholder for flood early warning system. The role on flood and erosion control as well as flood early warning used to be under the former Federal Ministry of Water Resources. When the FME was created from the National Environmental Protection Agency in 1999, the role of flood and erosion control as well as flood early warning was transferred to FME together with the department.

The key stakeholders in the establishment of FEWS are

- Three tiers of Governance (Local, State and Federal Government of Nigeria)
- Federal Ministry of Environment, Housing and Urban Development
- National Emergency Management Agency
- NIMET (former Nigerian Meteorological Agency)
- NIHSA (former National Hydrological Management Agency)
- Federal Ministry of Agriculture and Water Resources
- River Basin Development Authorities in the 8 Has
- Power Holdings Company of Nigeria
- Nigerian Institute of Oceanography and Marine Research
- Nigerian Air Space Research and Development Agency
- Federal Ministry of Information and Communication
- Nigerian Communication Commission
- GSM Telecommunications Service Providers
- Nigerian Television Authority
- Print and Electronic Media
- Traditional Ruling Council Across the Country
- Vulnerable Resident Communities in the 8Has

- Red Cross Society
- International Organizations and Institutions (UNDP, UNEP, WMO, UNISDR, etc)

Main stakeholder's roles and responsibilities are as follows,

Three tiers of Governance (Local, State and Federal Government of Nigeria)

- Provision of legal and policy framework for the establishment and operation of an integrated FEWS in Nigeria
- Establishment of the FEWS as a long term national and local high priority for hydro-meteorological disaster reduction strategy
- Creation of the enabling environment for the enhancement of the institutional capacities for the sustainability of the proposed FEWS
- Integration of FEWS into the national development plan
- National commitment to the establishment of FEWS in Nigeria through appropriate funding and policy support

Federal Ministry of Environment, Housing and Urban Development

- Implementation of government policies relating to flood management
- Demonstration and presentation of the economic benefits of FEWS to senior government officials and political leaders
- Provision of a leadership and role model the establishment and operation of FEWS in Nigeria
- Facilitate the development of sustained collaboration and cooperation between FME, strategic stakeholder, Ministries, Departments and Agencies identified for the establishment and operation of the proposed FEWS
- Clearly define the roles and responsibilities of all stakeholders involved in the establishment and operation of FEWS in Nigeria
- Formulation of institutional framework that facilitate the establishment and operation of the proposed FEWS and installation of technical infrastructure for preparing and issuing timely flood warning
- Appointment of one senior government official in the Ministry empowered by law as the national decision maker on Nigeria's FEWS
- Integration of Nigeria's FEWS with regional and transboundary hydrometeorology data collection network and flood early warning initiatives
- Identify and make an inventory of all major river basins in the 8 Has as well as coastal areas and lagoons in Nigeria with significant backwater effects for the purpose of FEWS establishment
- Establishment of sustainable partnerships and relationship between all stakeholders, ministries, department and agencies involved in FEWS institutional framework and mechanism for flood disaster detection, warning generation and communication, and emergency response delivery
- Set alert and critical flood levels that will trigger the issuance of early flood warning
- Review rainfall-runoff relationships in river basins and collection of catchment characteristics data pertinent for the operation of the FEWS
- Identify and engage competent technical and human resources locally and abroad for development and sustainable operation of the FEWS
- Ensure that flood early warnings and related responses address all the relevant population especially the most vulnerable
- Provision of support to local governments and communities to develop their FEWS operational capabilities and effectively interpret flood early warning messages
- Identification and sourcing for government funding the proposed FEWS, its sustained development and institutionalization
- Identify and advocate for Public/private sectors partnerships and assistance in the establishment of Nigeria's FEWS.

National Emergency Management Agency

- Facilitate policy on all activities relating to flood disaster management in Nigeria and coordinate the plans and programs for efficient and effective response at national level
- Coordinate and promote research activities relating to flood disaster management at national level
- Monitor the state of preparedness of all organizations or agencies which may contribute to flood disaster management

- Collate data from relevant agencies so as to enhance flood disaster management
- Coordinate and facilitate the provision of necessary resources for search and rescue and emergency response upon issuance of flood early warning
- Establish flood emergency shelters
- Assist in evacuation and coordinates flood emergency response
- Coordinate the activities of all voluntary organizations engaged in flood warning emergency response and relief operations in any part of the country
- Identify and source for functional and technical aid from international organizations and nongovernmental agencies for the purpose of flood emergency response
- Collect emergency relief supply from local, foreign sources and from international and non-governmental agencies
- Distribute emergency relief materials to victims of flood disaster and assist in the rehabilitation of the victims where necessary
- Liaise with the State Emergency Management Committees to assess and monitor where necessary, the distribution of relief materials to flood victims
- Liaise with the United Nations Disaster Reduction Organization or other international bodies for the reduction of flood disasters in Nigeria
- Prepare the annual budget for flood disaster management and the emergency response component of the proposed FEWS
- Collaborate and cooperate with the FME and other stakeholders in the establishment and operation of the proposed FEWS

Federal Ministry of Water Resources

- Collaboration and partnership with FME, NEMA and other stakeholders in the establishment of the FEWS
- Collect hydrological data in river basins across the country
- Participate in the design of the proposed FEWS
- Source for and install hydrometric equipment and telemetric systems in river basins of interest
- Collaborate in the raising of community awareness of the FEWS and flood warning response
- Preform and review rainfall-runoff simulation
- Monitoring of the flow regimes of water resources in river basins across the country
- Dissemination, communication and exchange of data on flood characteristics of river basins for the operation of the FEWS

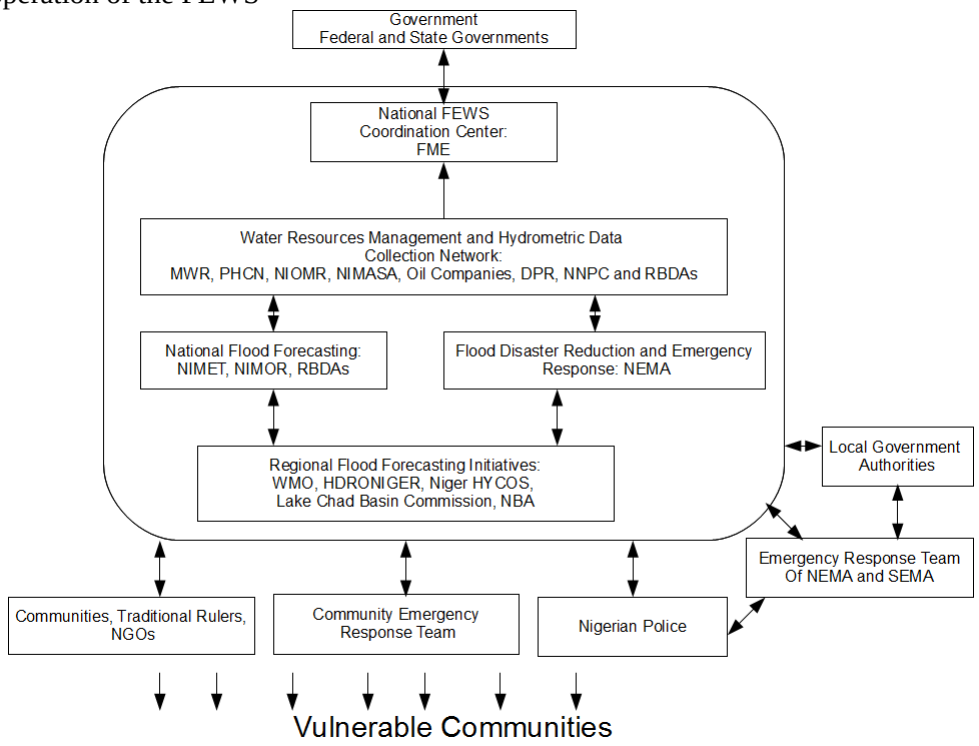


Figure SR5.3-28 Institutional Framework and Mechanism for the Establishment and Operation of Nigeria's Flood Early Warning System (source: FME)

Latest development of FEWS in Nigeria

The FME in Collaboration with other partner agencies has set up this Web based Flood Early Warning System (FEWS) to monitor various locations in the country for Flood Signs, and Issue alerts to minimize loss of lives and property. The FEWS is setup to cater for urban areas and for River basins, and Reservoirs such as Dams.

Forecast data is provided on this website for various cities in the country. The Forecast includes Rainfall, Temperature, Humidity, Atmospheric Pressure and more.

Also the FME has started the satellite-based flood monitoring system and the community-based FEWS with support of UNDP and other relevant organizations.

Web-based flood early warning

This system is the most advanced at present in Nigeria. The following information is an example for Abaji City, 5 days advanced flood forecast by FME. The information includes precipitation, humidity, wind speed, wind direction and atmospheric pressure at 1AM, 4AM, 7AM, 10AM, 1PM, 4PM, 7PM and 10PM on May 20, issued on May 17. If these parameters exceed the normal values, they are indicated with a mark "Not OK". This bulletin is issued from FME to relevant government. The government issues their own interpretation to the local.

According to FME, this 5 day's advanced forecast is implemented for 75 cities in Nigeria as of May 17, 2012. The methodology of this forecast was not disclosed to the JICA Project Team.

Date: 20 May 2012

Parameter	Normal	Max. Deviation	100HRS	400HRS	700HRS	1000HRS	1300HRS	1600HRS	1900HRS	2200HRS
Precipitation(mm)	5.50	2	0.1 [OK]	1.8 [OK]	0.0 [OK]	0.0 [OK]	14.5	16.1	0.2 [OK]	0.0 [OK]
Humidity(%)	76.8	-	86	91	90	69	83	89	92	91
Windspeed(m/s)	2.99	3	1.68 [OK]	2.24 [OK]	1.68 [OK]	1.16 [OK]	5.04 [OK]	1.68 [OK]	0.84 [OK]	0.84 [OK]
Wind Direction(°)	212	10	224	216 [OK]	181	197	118	232	277	266
Atm. Pressure	97.2	-	131.43	131.17	131.43	131.69	131.56	131.17	131.43	131.56
Hour Status	-	-	OK	OK	OK	OK	Not OK!	Not OK!	OK	OK

OTHER PARAMETERS FOR THIS DAY:

Parameter	Normal	Max. Deviation	Day Value	Status
Average Temperature	25.9	0	26.5	
Daily Temperature Range	10.00	0	7	

Figure SR5.3-29 Example of 5 Days advanced Flood Forecast for Abaji City on May 20, 2012, which was issued on May 17, 2012 by FME to State Government

- Satellite-based monitoring system

  FME has just started the satellite-based flood monitoring system in Nigeria. It has 2 ground automated stations in Ogun River whose parameters are wind speed, wind direction, air temperature, humidity and precipitation. These data are transmitted via European Organization for the Exploitation of Meteorological Satellites (Eumetsat) in hourly basis to National Flood Early Warning Center within FME, Abuja.

- Community-based FEWS

  Flood Vulnerability Assessment

  Maps from the "Flood Risk and Vulnerability Studies and Mapping in Nigeria" report sponsored by FME and UNDP) are listed below.

Table SR5.3-14 Number of Settlements with High Flood Risk

	Name of RBDA	Number of Settlements with High Flood Risk
1	Anambra-Imo	13
2	Benin Owena	17
3	Chad River	18
4	Cross River	9
5	Hadejia-Jama'are	19
6	Upper Niger River	20
7	Lower Benue River	14
8	Niger Delta	14
9	Ogun-Osun River	17
10	Sokoto-Rima River	18
11	Upper Benue River	N/A
12	Lower Niger River	8
13	The Coastal Areas	N/A

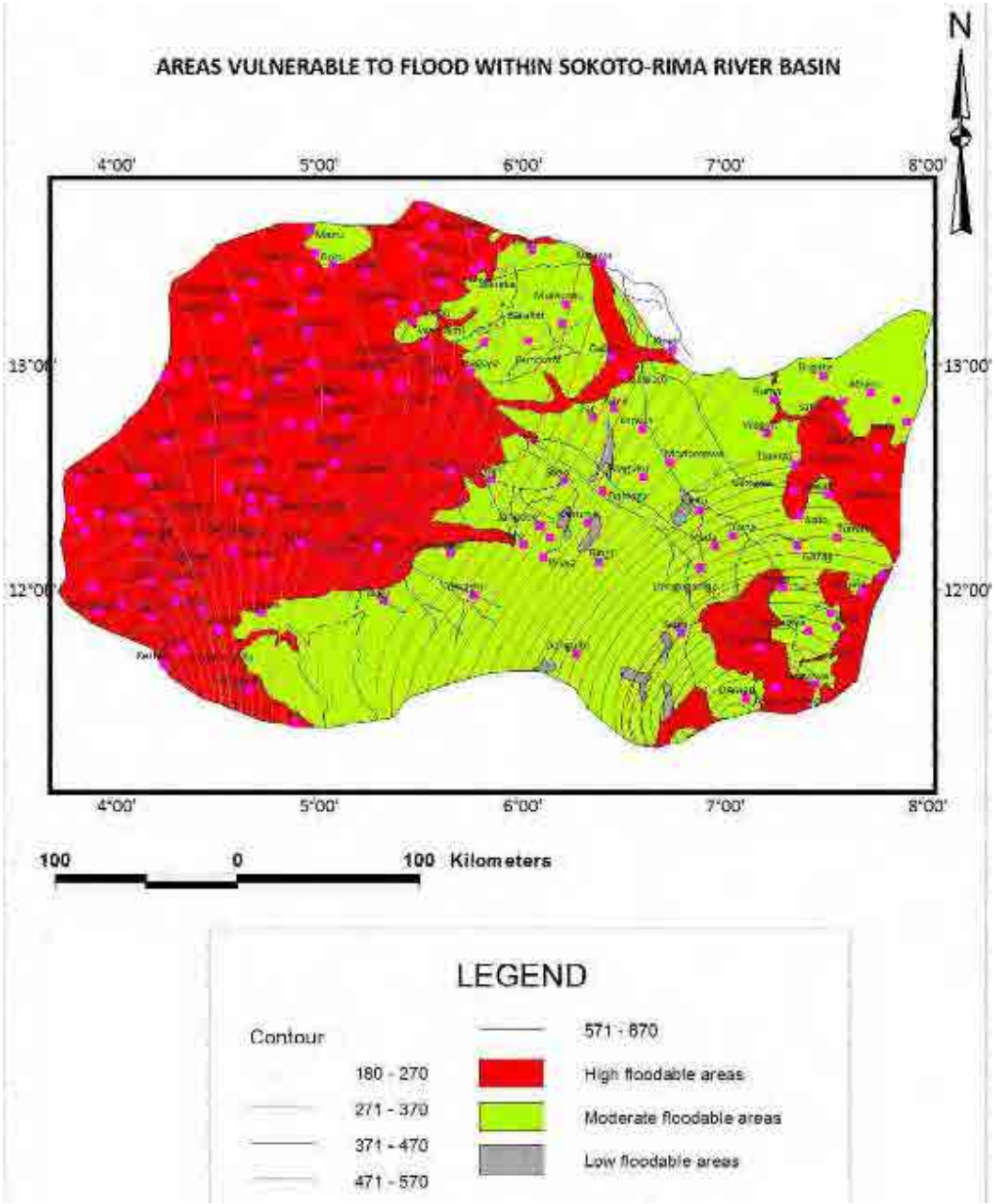


Figure SR5.3-30 Example of Mapping of Flood Vulnerable Communities in Sokoto-Rima River Basin Development Authority

It is expected that in order to implement the above system in Nigerian –nationwide, there are rainfall prediction system, Rainfall-Runoff and Routing Model, Flood Hazard Mapping Methodology (Software, Topographical Data) and National FEWS Coordinating Center.

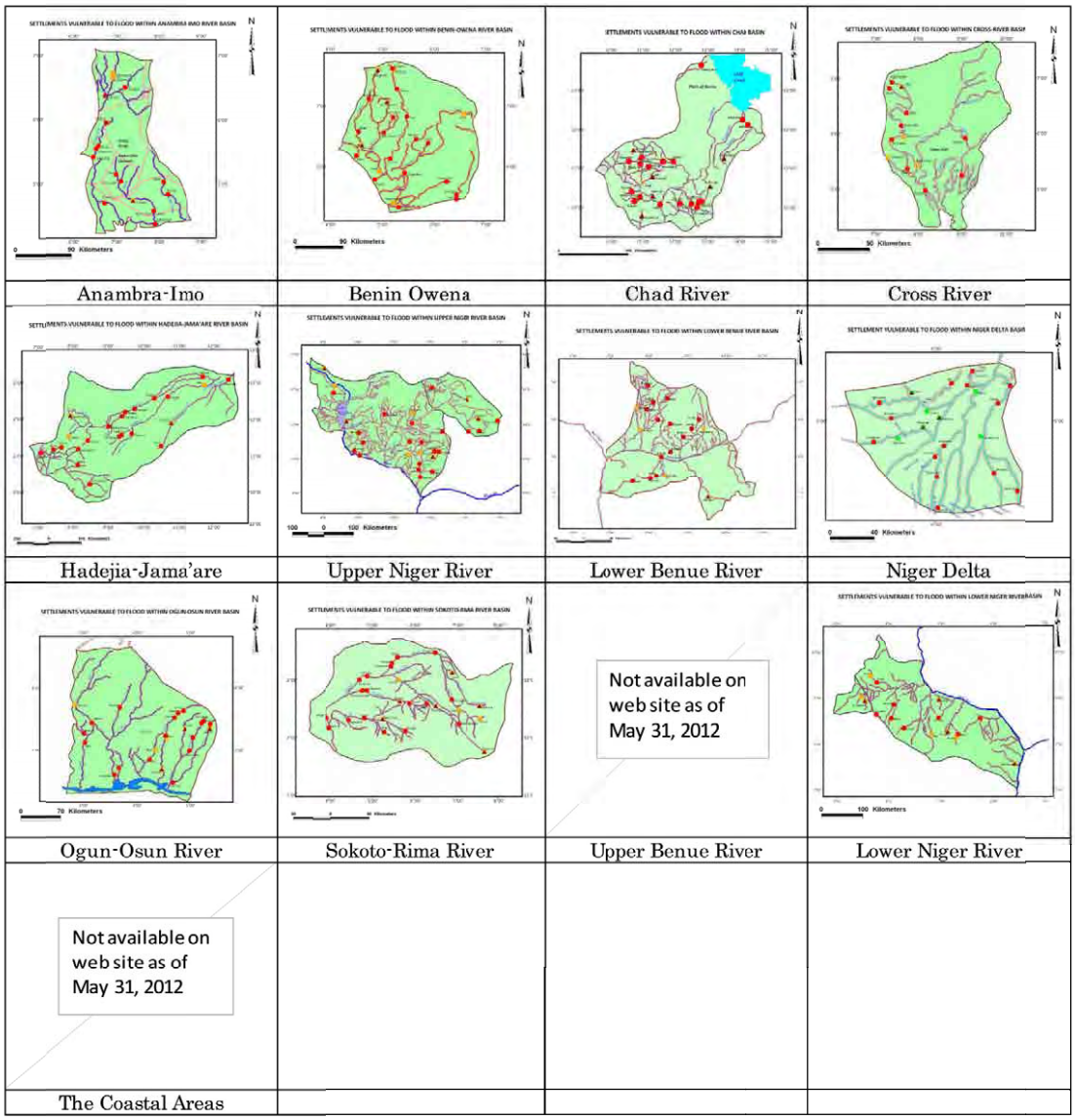


Figure SR5.3-31 Location of Flood-prone cities for each RBDA according to FME

b) Dasin Hausa Multipurpose Dam

JICA Project Team collected a Pre-F/S report entitled "Upper Benue River Basin Development Authority Yola-Nigeria, Dasin Hausa Multipurpose Project, Prefeasibility Study Volume 1-A Executive Summary, Hidroservice, 1982. While this project was studied 30 years ago when the Lagdo dam was constructed in Cameroun for the future comprehensive development for flood control, navigation and irrigation, at present the necessity of the project is discussed in Nigeria. One of the purposes of the dam is buffer function against the inflow from Cameroun. The brief feature of the dam is as follows,

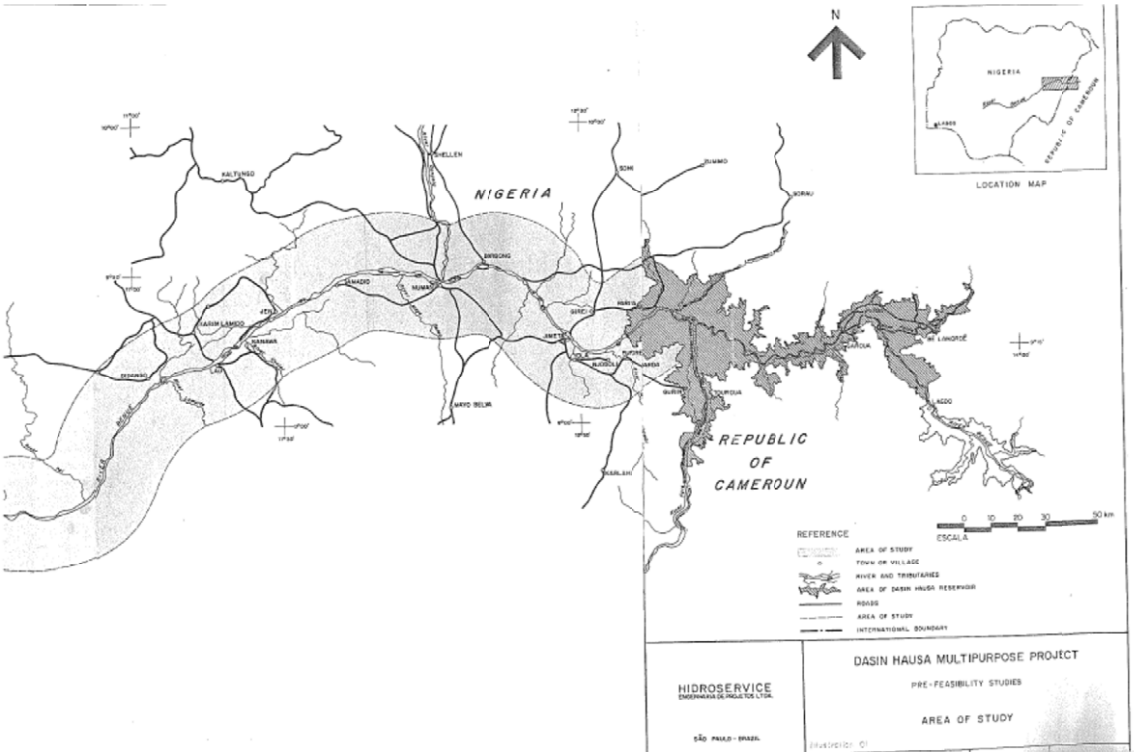


Figure SR5.3-32 Project Area and Proposed Reservoir Area in 1982 Pre-FS[12]

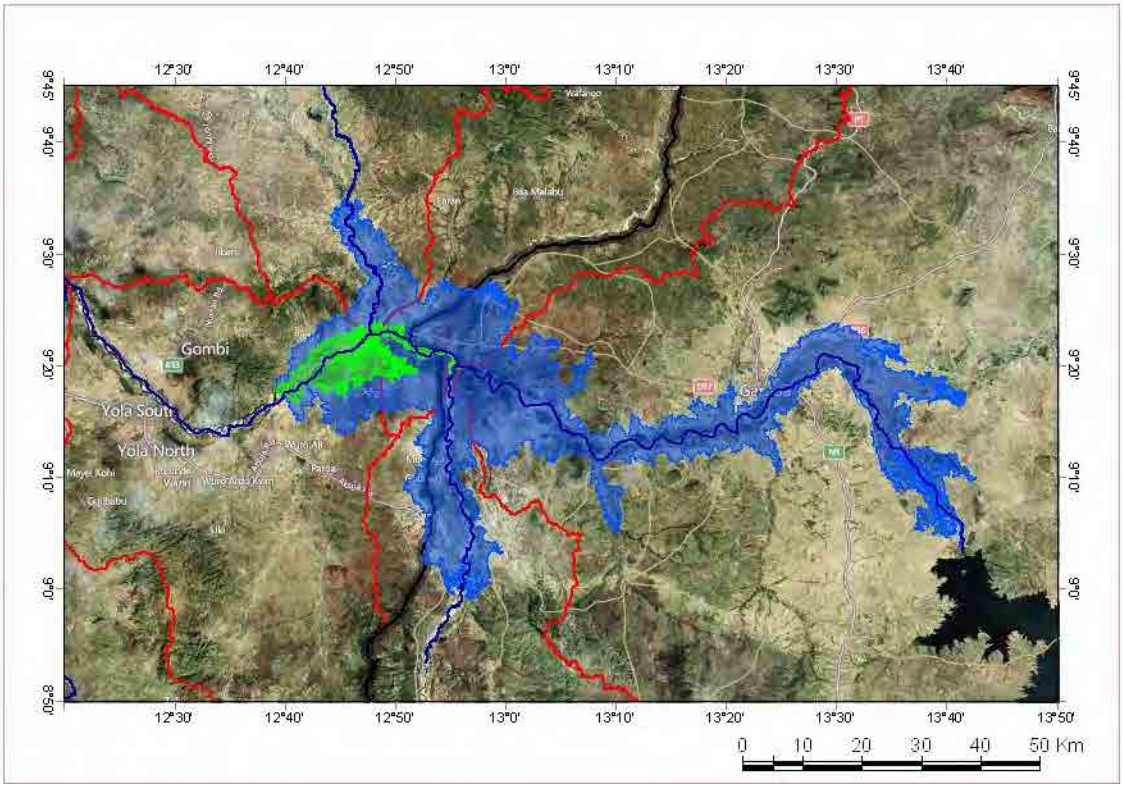
Crest Level:	190 m
Maximum Normal Water Level:	185 m
Reservoir capacity:	$16*10^9$ m^3
Reservoir Area:	1,530 km^2
Dam Height:	40 m
Dam Length:	1,350 m
Volume for flood control:	$6*10^9$ m^3

Some of the concerns on the project proposed in 1982 are as follows,

- Resettlement population is very large (50,000 people)
- Reservoir area will affect residential area, commercial area, 22 schools, 22 km of road and cultivated land of 30,000 ha, etc. (at the time of 1982).

For reference, JICA Project Team estimated the reservoir area using the digital elevation data (SRTM3) for the same dam site according to the pre-F/S in 1982. The reservoir area is shown in Figure SR5.3-33.

[12] Upper Benue River Basin Development Authority Yola-Nigeria, Dasin Hausa Multipurpose Project, Prefeasibility Study Volume 1-A Executive Summary, Hidroservice, 1982



Source：JICA Project Team

Figure SR5.3-33 Reservoir Area for 185 m (Blue color), 167 m (Green color)

(5-3) Proposed Strategies of FMWR

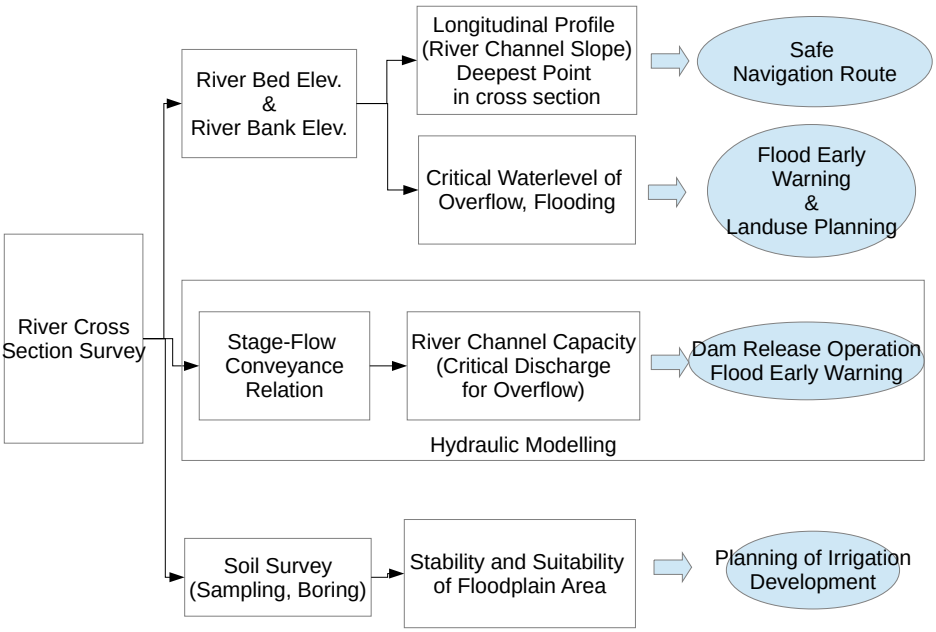
Considering the above issues, FMWR should start the basic investigation of floodplain of major rivers such as the Benue, the Niger, the Kaduna and the Sokoto-Rima Rivers which have great potential of large scale irrigation.

Table SR5.3-15 Proposed Items of Basic Investigation

Item	Contents
Historical change of river bank	Collecting of map in Colonial era、aerial photos、satellite image、to check the change of river bank and to study the channel stability
River cross section survey	Surveying of floodplain cross section、to prepare cross section drawing indicating of detailed topography. Also surveying of river channel, to confirm the location of thalweg.
Soil profile	To prepare soil profile by boring survey.
Flow capacity	Based on the cross section survey drawing, calculating of waterlevel and flow capacity, to evaluate how frequent the flooding occurs on the floodplain.

Source：JICA Project Team

By doing the proposed basic investigation, it is possible to evaluate the channel stability, inundation frequency on floodplain and urban area. Further the evaluation results can be reflected in the dam operation, planning and design of large irrigation project within floodplain, reference to navigation route management and providing of disaster information with riverine area and land use planning. Those beneficial outputs from river cross section survey are shown in Figure SR5.3-34.



Source: JICA Project Team

Figure SR5.3-34 Beneficial Output from River Cross Section Survey

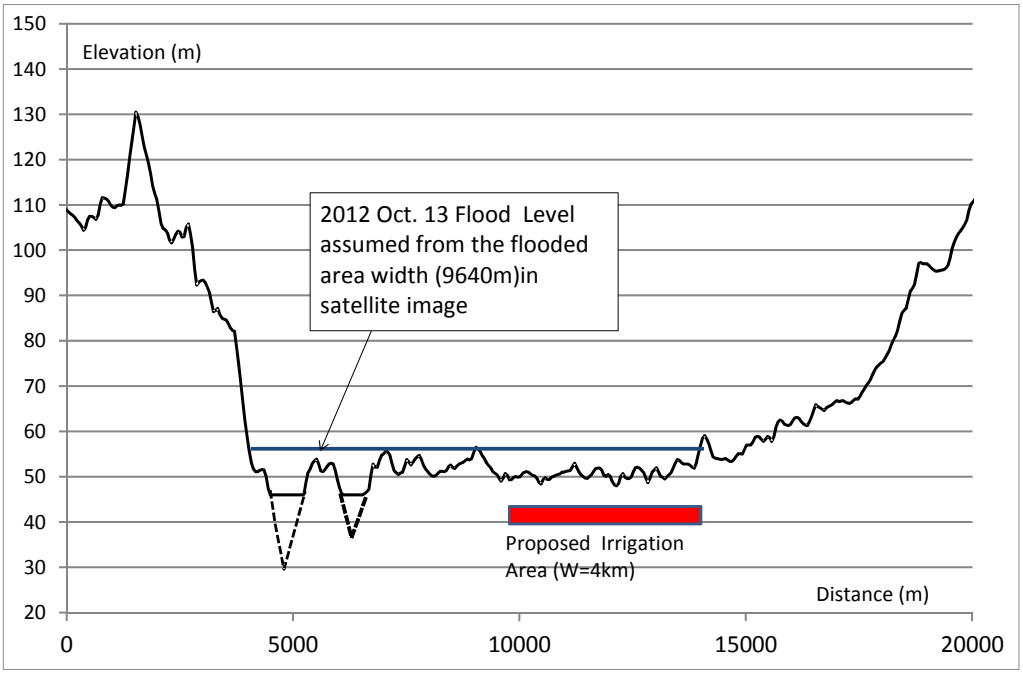
Following are examples which can explain the beneficial usage of cross section data.

Figure SR5.3-35 is the satellite image during the 2012 flooding in the Benue river downstream. The cross section extent is shown in the image. Figure SR5.3-36 is the cross section derived from SRTM3 corresponding to the cross section extent. From the satellite image, we can know approximate flooded width over the cross section. In this case, the width is 9,640 m as an estimate. According to the cross section, the flood elevation on 2012/10/13 is assumed to be around 55 m, in which the proposed irrigation area would be flooded. Also from this cross section figure, the discharge can be calculated.

Source : NASA HP[13]

Figure SR5.3-35 Satellite Images of the confluence of the Niger and the Benue River near Lokoja (2012/10/13)

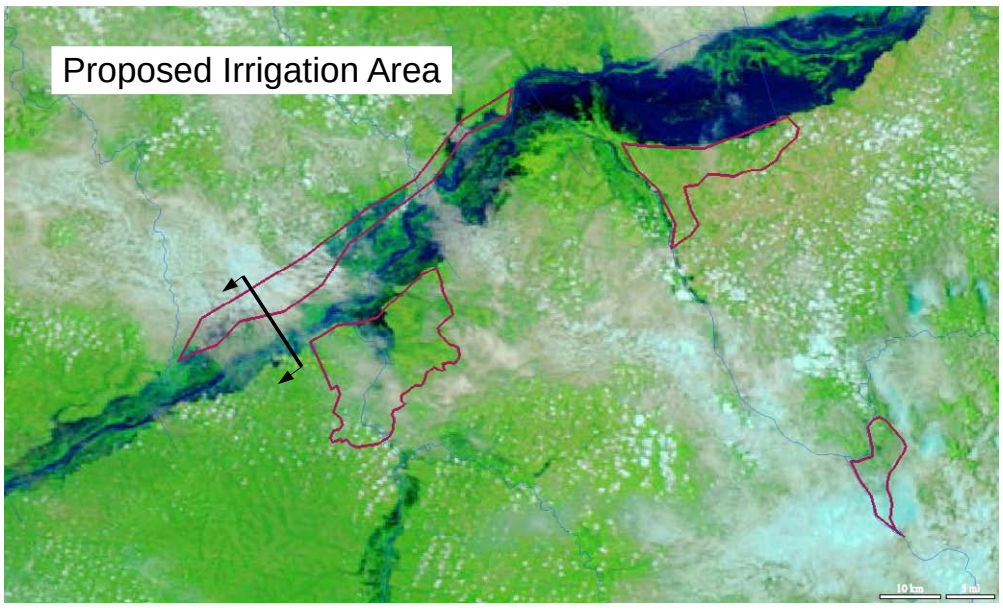
[13] http://earthobservatory.nasa.gov/IOTD/view.php?id=79404



Source：JICA Project Team

Figure SR5.3-36 Cross Section and Flooding Width (2012/10/13)

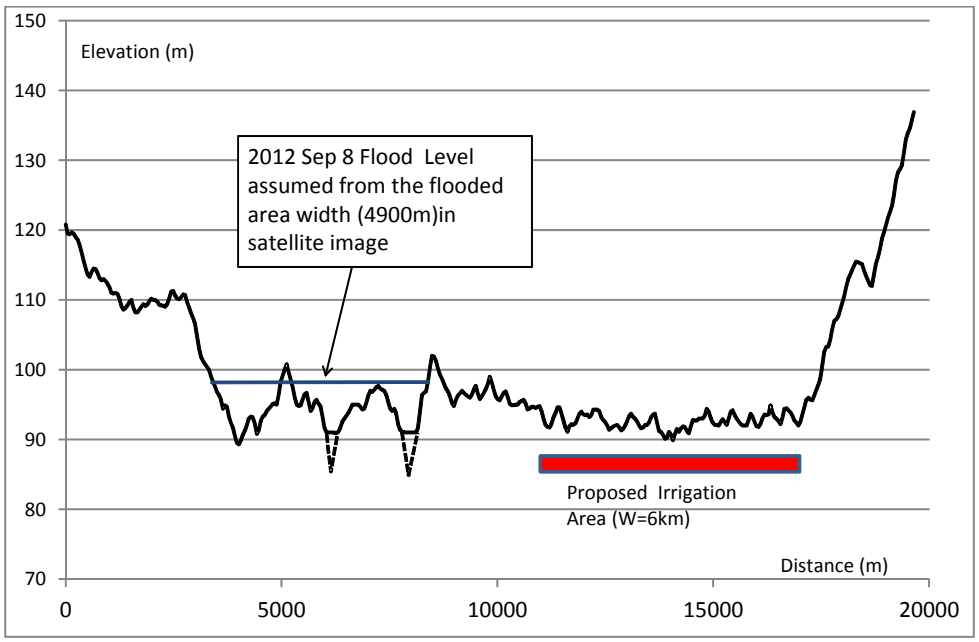
Figure SR5.3-37 is another example. This is the satellite image during the 2012 flooding in the Benue river middlestream. The cross section extent is shown in the image. Figure SR5.3-38 is the cross section derived from SRTM3 corresponding to the cross section extent. From the satellite image, we can know approximate flooded width over the cross section. In this case, the width is 4,900 m as an estimate. According to the cross section, the flood elevation on 2012/09/08 is assumed to be around 98 m, in which the proposed irrigation area would be flooded. Also from this cross section figure, the discharge can be calculated.



Source : NASA HP[14]

Figure SR5.3-37 Satellite Images of the Benue River near Lau (2012/9/8)

[14] http://earthobservatory.nasa.gov/IOTD/view.php?id=79149



Source：JICA Project Team

Figure SR5.3-38 Cross Section and Flooding Width (2012/9/8)

(5-4) Guidance to Flood Modeling for the Niger and Benue River

Introduction

The hydrological modeling for surface water was done in this JICA Project as described in Section SR2.3.3, Volume-5 Supporting Report.. The hydrological model can simulate long term flow variation on monthly basis in each SHA, which covers major tributaries of the Niger and Benue river system. The hydrological model, while to be further developed and calibrated, shall be the core tool for water resources management and development in Nigeria.

The 2012 flood in Nigeria, especially which affected the floodplain along the Benue and the Lower Niger River, revealed the flood water level at certain place should be monitored at least daily basis. This flood phenomenon for short time such as daily and week should be studied by hydrological model as well as by site investigations such as flood mark survey, flood condition interview survey.

For the flood modeling in the future in Nigeria, it is necessary to use a rainfall data set which can reflect both spatial and temporal distribution for the Niger- Benue river basin. In this report, JICA Study team introduces the satellite based rainfall data called GSMap as a reference for guidance to flood modeling.

Also, for the starting of flood modeling work, it is necessary to take into consideration of the daily observed river discharge data for the calibration. Because the model design should be depending on the location and period of such observed discharge data set as well as the dam operation data availability.

GSMaP

Global Satellite Mapping of Precipitation, hereinafter called GSMaP, is a satellite-produced spatial rainfall data set in global basis by Japan Aerospace Exploration Agency (JAXA).

The GSMaP Project was sponsored by JST-CREST and is promoted by the JAXA Precipitation Measuring Mission (PMM) Science Team, and the GSMaP products were distributed by the Earth Observation Research Center, Japan Aerospace Exploration Agency.

JICA Project Team requested GSMap data to JAXA in February 2013 through JICA for the purpose of studying of 2012 rainfall in Nigeria. JAXA provided the GSMap data in electrical form with JICA Study Team in April 2013.

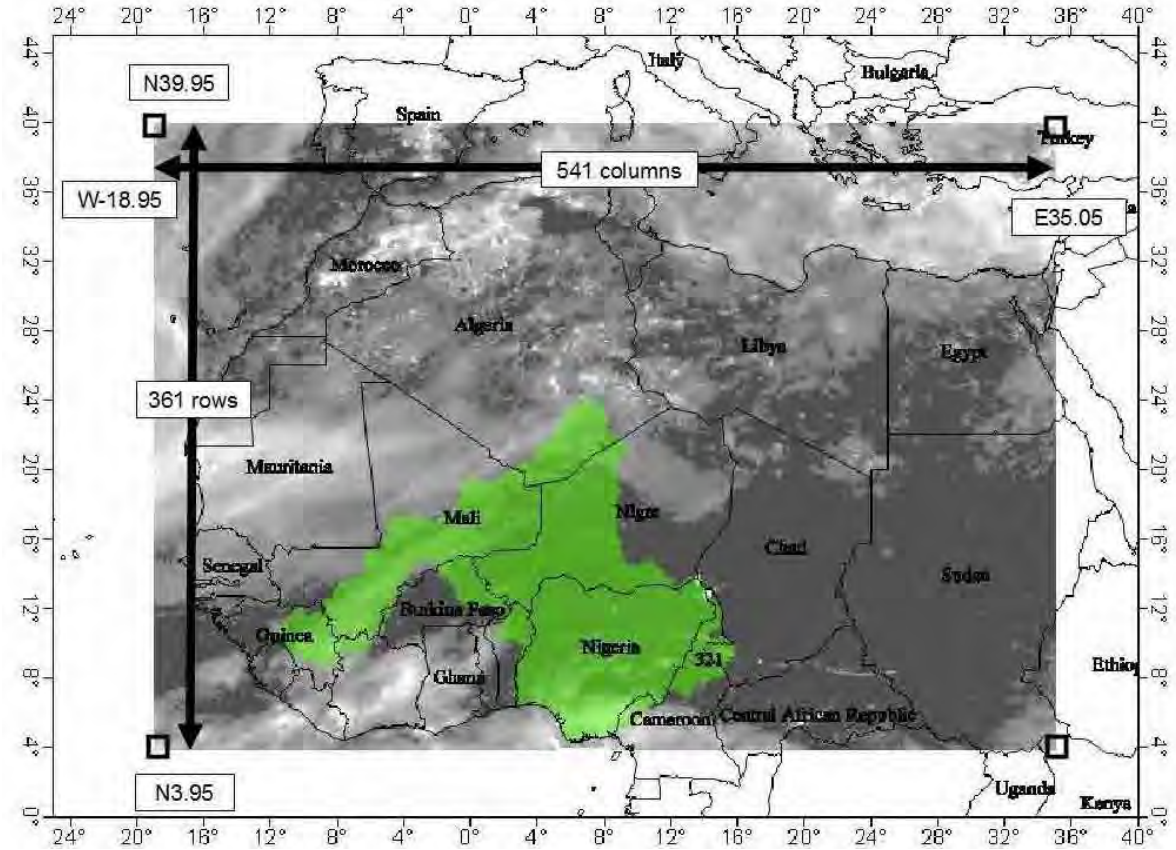
The provided GSMap Data is described in general as follows,

Table SR5.3-16 General Description of obtained GSMap Data

Item	Description	Item	Description
Data Coverage	N3.95 to N39.95 W18.95 to E35.05	Frequency	Daily Average rainfall as mm/h
Resolution	0.1 degree (541 columns and 361 rows)	Data Format	Ascii (Text)
Period	January 1, 2005 to December 31, 2012	Number of grid data	Approx. 570 million grid

Source：JICA Project Team

The data coverage of the obtained GSMap is shown in the Figure below. In the figure, the area of the Niger River Basin is added as green color area. The obtained GSMap coverage is covering the entire Niger River Basin.

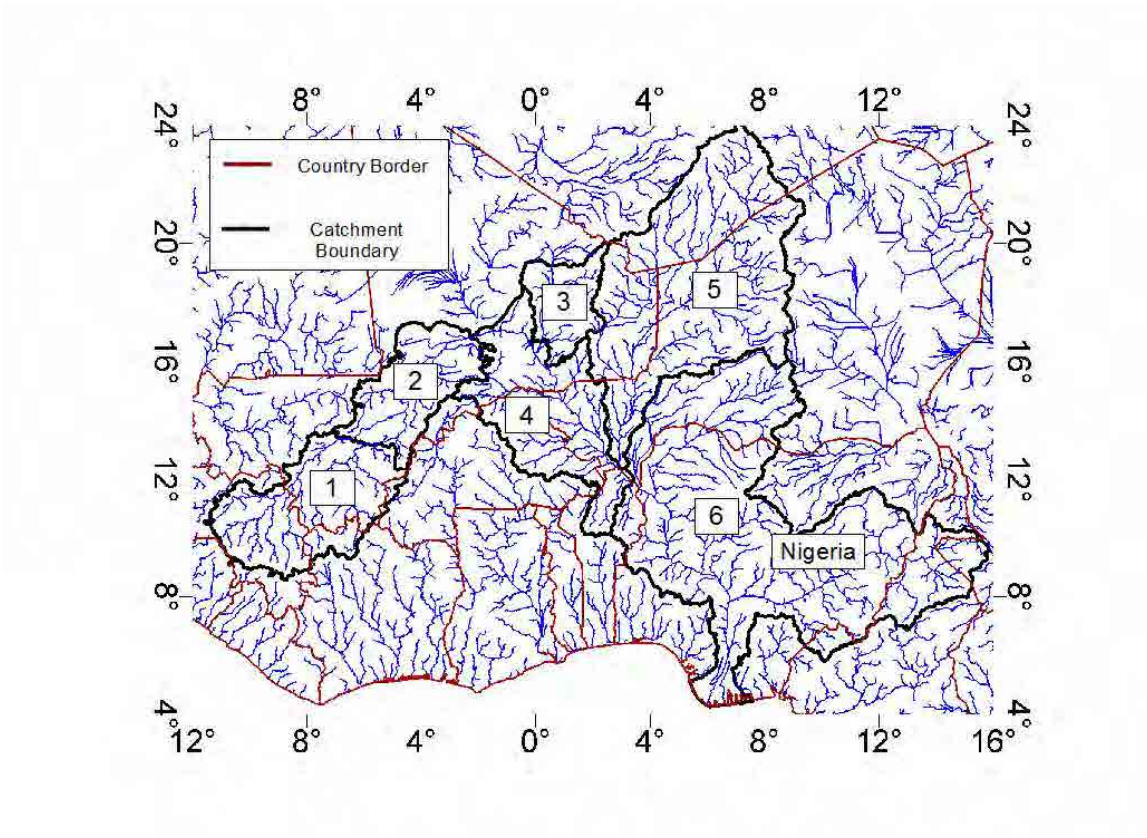


Source：JICA Project Team

Figure SR5.3-39 Data Coverage of Obtained GSMap Data

JICA Study Team processed the obtained GSMap data to observe the spatial rainfall distribution by visualization of monthly value in Hydrological Area in Niger River Basin and Nigeria.

The following Figure shows the catchment boundary of the entire Niger River Basin. The number from 1 to 5 in the figure indicates the name of sub-catchment for upstream of the Niger River for the JICA Study. The number 6 catchment is the entire Nigerian Hydrological Area including the areas belonging to adjacent countries.



Source：JICA Project Team

Figure SR5.3-40 Sub-catchment Boundary in Niger River Basin

The Table below is the monthly rainfall of average during 2005-2012 and the monthly rainfall in 2012 only for the sub-catchment for upstream of the Niger River. It is revealed that in sub-catchment 2 had 50 to 60 % higher than the average in June and July in 2012, in which Niamey in Republic of Niger was affected by floodwater in 2012. Also it is revealed that in sub-catchment 4 had 35% higher than the average in April in 2012, in which the inland delta area was affected by floodwater in 2012.

Table SR5.3-17 Ratio of 2012 Monthly Rainfall to Average (2005-2012) in Upper part of Niger River Basin

	Catchment	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Average (2005-2012)	1	2.6	10.3	26.6	81.7	184.9	259.6	253.8	287.2	249.4	132.2	11.7	2.1
	2	2.2	2.7	5.4	9.3	30.0	90.8	200.3	233.5	127.6	24.9	2.5	1.6
	4	1.2	2.6	3.5	20.2	56.8	115.5	194.5	241.8	124.3	32.6	1.0	0.6
	5	2.7	2.9	2.1	3.1	10.0	34.4	49.0	81.7	30.5	7.4	0.8	1.4
	3	3.6	3.6	2.1	3.2	11.2	35.4	71.0	100.9	35.0	7.8	1.0	1.7
2012	1	0.0	5.2	2.9	74.7	174.9	239.1	224.7	261.5	249.8	174.7	29.3	2.3
	2	0.0	2.3	0.4	6.0	23.3	139.4	323.6	259.0	152.5	27.2	0.7	0.5
	4	0.1	4.8	0.8	27.2	52.0	126.9	206.3	282.3	134.5	38.6	0.2	0.1
	5	1.9	1.6	0.2	2.1	9.1	39.5	48.9	71.4	34.9	11.1	0.0	0.1
	3	0.0	0.4	0.1	1.6	13.8	13.6	67.9	77.5	35.4	11.6	0.0	0.2
Ratio of 2012 to Average	1	0.00	0.51	0.11	0.91	0.95	0.92	0.89	0.91	1.00	1.32	2.50	1.10
	2	0.01	0.85	0.07	0.64	0.78	1.54	1.62	1.11	1.19	1.09	0.26	0.30
	4	0.05	1.89	0.22	1.35	0.92	1.10	1.06	1.17	1.08	1.18	0.20	0.21
	5	0.71	0.56	0.09	0.70	0.92	1.15	1.00	0.87	1.14	1.52	0.06	0.07
	3	0.01	0.11	0.03	0.52	1.23	0.38	0.96	0.77	1.01	1.49	0.01	0.09

source：JICA Project Team

The Table below is the monthly rainfall of average during 2005-2012 and the monthly rainfall in 2012 only for HA. It is revealed that in HA3 had 45 % higher than the average in June in 2012, in which was the runoff source from Cameroon territory to affect the Nigeria by floodwater in 2012.

Table SR5.3-18 Ratio of 2012 Monthly Rainfall to Average (2005-2012) in Hydrological Area for Nigeria

(unit:mm)

	HA	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Average (2005-2012)	1	0.3	1.0	1.2	24.9	103.3	161.5	214.8	284.3	184.2	53.6	0.6	0.4
	2	2.2	8.6	21.5	166.3	262.8	238.1	265.3	270.6	319.6	175.4	5.2	2.8
	3	1.3	5.2	12.2	121.8	245.4	268.7	286.3	331.3	289.4	199.5	10.7	2.2
	4	5.1	20.9	46.0	205.8	328.1	247.5	214.5	236.3	271.1	295.9	27.5	2.5
	5	21.7	76.0	135.3	269.5	345.4	269.1	211.0	174.2	237.7	277.4	92.0	19.0
	6	10.9	63.8	141.8	222.9	251.9	240.5	177.8	120.6	219.4	218.8	63.1	10.6
	7	29.8	100.6	179.4	332.4	437.1	311.8	232.8	218.6	309.9	407.8	122.0	15.3
	8	1.5	1.7	1.5	22.9	71.8	151.6	270.1	322.0	171.5	36.0	1.7	2.0
2012	1	0.1	2.6	0.3	28.5	114.7	111.8	222.6	212.2	238.8	53.8	0.1	0.3
	2	2.0	8.8	10.1	195.9	313.0	200.4	239.4	178.1	283.1	199.9	7.6	0.6
	3	0.8	4.7	2.3	130.7	251.1	388.6	348.1	308.1	304.1	221.0	28.8	1.0
	4	2.4	13.8	10.1	152.3	399.1	245.7	251.9	174.2	232.8	324.8	61.1	0.4
	5	12.5	113.6	70.0	265.2	264.3	234.4	175.2	107.1	203.5	293.0	152.9	16.1
	6	8.8	87.6	73.6	279.6	183.9	246.9	140.3	51.0	163.2	235.1	116.1	5.4
	7	9.6	120.5	70.3	350.4	391.5	281.7	216.7	162.0	245.1	426.5	199.9	14.2
	8	0.3	0.3	0.7	16.9	98.2	196.3	284.5	352.1	211.4	23.5	0.2	0.5
Ratio of 2012 to Average	1	0.48	2.59	0.24	1.15	1.11	0.69	1.04	0.75	1.30	1.00	0.15	0.86
	2	0.89	1.02	0.47	1.18	1.19	0.84	0.90	0.66	0.89	1.14	1.45	0.22
	3	0.62	0.89	0.18	1.07	1.02	1.45	1.22	0.93	1.05	1.11	2.69	0.44
	4	0.47	0.66	0.22	0.74	1.22	0.99	1.17	0.74	0.86	1.10	2.22	0.17
	5	0.58	1.49	0.52	0.98	0.77	0.87	0.83	0.62	0.86	1.06	1.66	0.85
	6	0.81	1.37	0.52	1.25	0.73	1.03	0.79	0.42	0.74	1.07	1.84	0.51
	7	0.32	1.20	0.39	1.05	0.90	0.90	0.93	0.74	0.79	1.05	1.64	0.93
	8	0.18	0.21	0.45	0.74	1.37	1.29	1.05	1.09	1.23	0.65	0.13	0.26

source：JICA Project Team

While the above 2 tables show only monthly basis amount, the obtained GSMap data is providing daily basis rainfall amount for spatially , produced for the upper part of the Niger River Basin, and HA as well as SHA. GSMap can provide valuable viewpoints which cannot get from conventional ground observation data.

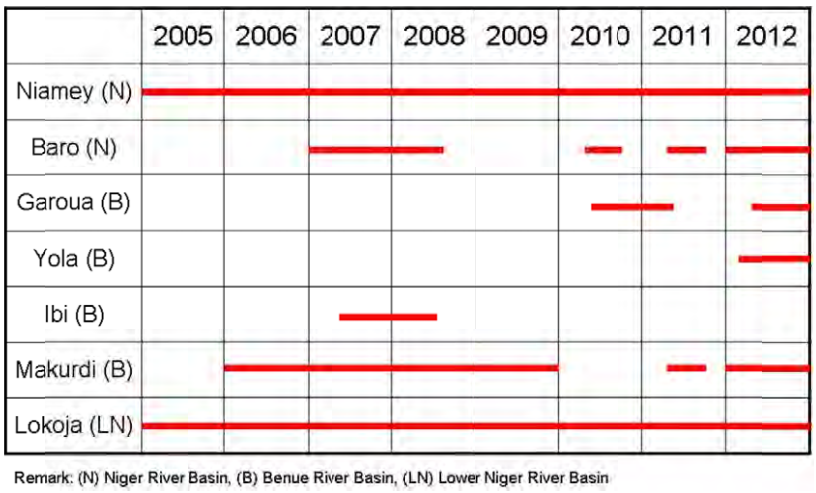
Proposed Flood Modeling for Niger – Benue river basin

In order to develop a flood model, it is necessary to select a calibration point for the flood model. Such calibration point should be located comparatively upstream, in which there are few discharge control structure such as dam, having long term period of daily discharge data. The Table below shows the daily discharge data availability in Niger-Benue river basin based on FMWR and Niger Hycos web site. As shown in the table, Niamey and Lokoja stations have comparatively long and continuous, however Niamey is located outside of Nigerian border and Lokoja is located downstream of the Niger and Benue river confluence.

In the case of Niger-Benue river basin, such appropriate location is not available.

Garoua, which is located on the Cameroun along the Benue river, has the daily discharge data in 2012, while the observed discharge had been influenced by the operation of Lagdo dam.

In Niger-Benue river flood modeling, at least more than 2years duration's daily discharge variation should be calibrated to consider dry and rainy seasons soil moisture variation which is conceived as dominant flood runoff. As of July 2013, such daily discharge data set is not available, also major dam operation data (reservoir inflow and outflow including spilling) is not available. It is difficult to model calibrate, however, assuming that such data set will be accumulated in 2014 or later, the following practical modeling concept shown below.



source：JICA Project Team

Figure SR5.3-41 Availability of Daily Discharge Data in Niger-Benue River

It is proposed that the Niger-Benue river flood model should be developed from 2 sub-models, namely, the Niger River model and the Benue river model as shown in the two figures below.

The rainfall runoff model component for the flood model shall be based on the similar concept to the surface water resources model which was developed in this JICA Project. Especially for the flood modeling, shorter period of rainfall and runoff process should be considered and the simple lumped model for SHA basis is recommended at initial modeling work phase because of the model area size, detailed data availability. For the rainfall data to be used, GSMap is a candidate resource because it provided shorter period of rainfall such as daily and high spatial resolution.

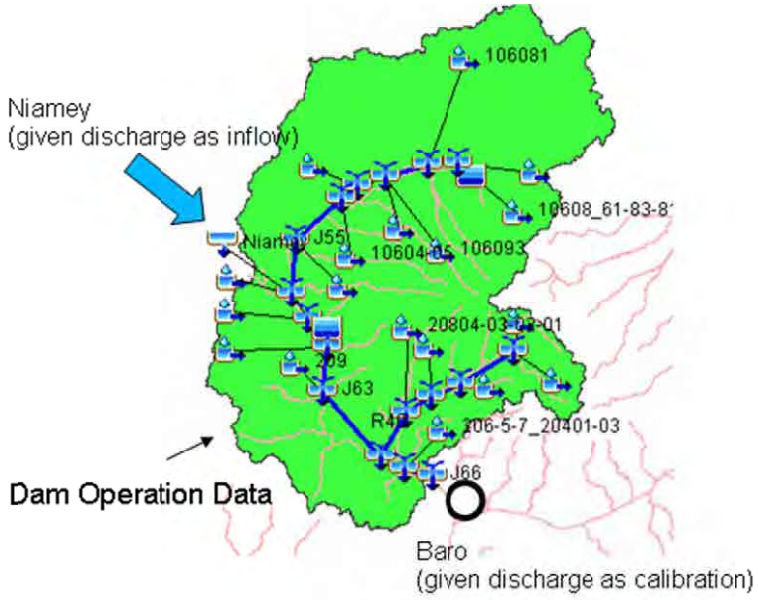


Figure SR5.3-42 Schematic Image of Niger River sub-model

The Niger river sub-model basically covers HA1 and HA2 and use the daily discharge of Niamey as only boundary conditions from outside of the model. In addition to the discharge at Niamey, the rainfall within the model area is given to simulate the runoff and flood discharge in river channel. The discharge calibration can be possible at Baro station, however, the dam operation data in Kainji, Jebba, Shiroro, Goronyo, Bakolori and others are needed to improve the discharge calibration accuracy.

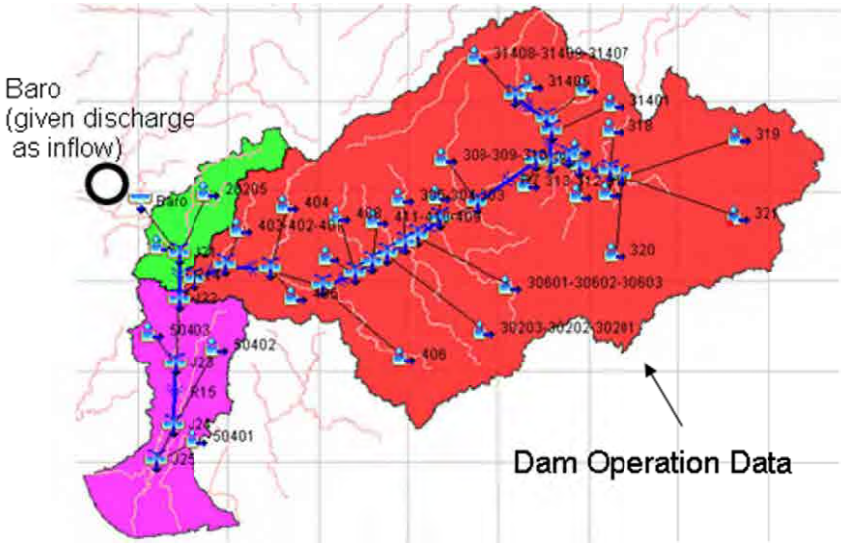


Figure SR5.3-43 Schematic Image of Benue River sub-model

The Benue river sub-model basically covers HA3 and HA4 and use the daily discharge of Baro as only boundary conditions from outside of the model. In addition to the discharge at Baro, the rainfall within the model area is given to simulate the runoff and flood discharge in river channel. The discharge calibration can be possible at Garoua, Yola, Ibi, Makurdi and Lokoja stations, however, the dam operation data in Lagdo, others along the Benue and Gongola rivers are needed to improve the discharge calibration accuracy.

The discharge at Lokoja is influenced by the discharge from the Benue river system and the discharge at Baro station. Therefore the Benue river sub-model should be calibrated at Makurdi station in advance.

Regarding the Lower Niger river reach (HA5), the discharge at Lokoja is given, the further downstream discharge can be modeled as similar way to the Niger river and the Benue river sub-models.

After the calibration of the above sub-models, they should be coupled to create the entire Niger-Benue river flood model in order to use for flood forecast and risk assessment.

(6) Erosion Control

(6-1) Erosion Problems in Nigeria

As frequently described in many documents, the topography of Nigeria is composed of high land of Pre-Cambrian basement complex and low elevated area along the Niger-Benue river system. The former is extensive erosion surface and the latter is the flattened valley infilled with Cretaceous and later sediments (fluvial). In other words, the boundary between the erosion surface of basement complex and the sediment along the rivers is terrace with cliff which was created by fluvial action when the sea level was higher than the present. The present terrace with cliff has potential to be eroded by river flow or slope failure as well as gully erosion and foot spring, to extend outerward.

The flat erosion surface of basement complex develops gully erosion if rainfall intensity is high and the land has little vegetation.

The gully erosion in Nigeria has been paid attention to since the British colonial era in 19th century. Among the sites, the Agulu-Nanka site[15] [16] in Anambra State was one of the largest (Figure SR5.3-44, approx. 1,100km^2) and some countermeasures have been applied being a symbol in terms of Nigerian gully erosion.

Gully erosion, since its scale is large, can be paid attention to, however, it should be certain that several factors are involved in the development of such large gully. In Agulu-Nanka site, it is reported

[15] Egboka, Okpoko, Gully erosion in the Agulu-Nanka region of Anambra State, Nigeria, Proceedings of the Harare Symposium, July 1984, pp.335-347

[16] Floyd, B., Soil Erosion and Deterioration in Eastern Nigeria, Nig. Geogr. J. 8(1965), pp33-43

that the road construction passing the stream source made considerable change on rainwater drainage system, resulting into the rill development as well as the gully, and produced inverse effect on the road itself[17]. The man-made activities to cause gully erosion in the Southeastern in Nigeria are construction of infrastructure such as road, quarry, cultivation, footpath, grazing and high population density.

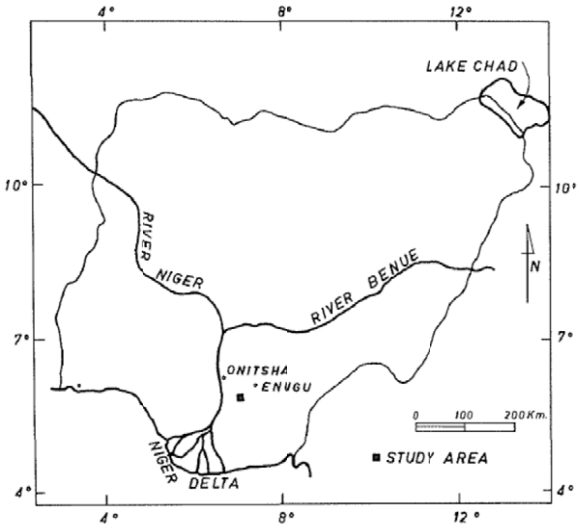


FIG.1 The location of the study area.

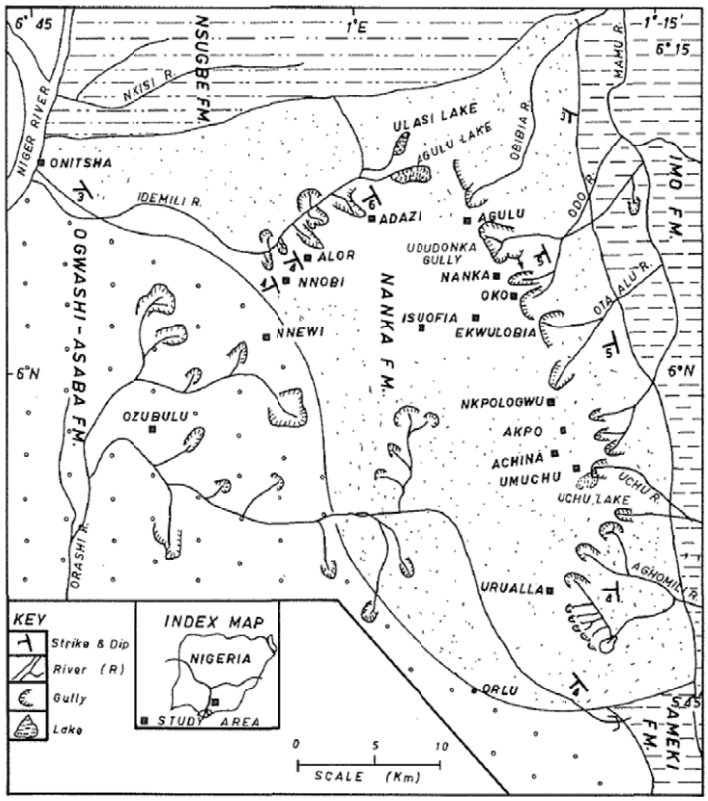


FIG.2 The geology of the study area (based on Nwajide, 1977).

Figure SR5.3-44 Agulu-Nanka site Gully Erosion Map[18]

(6-2) Erosion Control

a) Issues

The problematic phenomenon on gully erosion in Nigeria are shown in the left column of the

[17] Enuvie G. Akpokodje, Akaha C. Tse, Nnamdi Ekeocha , Gully Erosion Geohazards In Southeastern Nigeria and Management Implicatioons , Scientia Africana, Vol. 9 (No.1), March, 2010, pp 20-36

[18] Egboka, Okpoko, Gully erosion in the Agulu-Nanka region of Anambra State, Nigeria, Proceedings of the Harare Symposium, July 1984, pp.335-347

following table. This table indicates the assumed man-made factors for each problematic phenomenon on gully erosion. It is important to make comprehensive countermeasures for each man-made factor.

Table SR5.3-19 Assumed man-made factors for each problematic phenomenon on gully erosion in Nigeria

Phenomenon \ Man-made factor	Construction of Infrastructure (road)	Quarry	Cultivation	Footpath	Grazing	Urbanization
The earth surface road in urban area to be eroded easily by rainfall	●			●		●
Slope failure along main road(rill erosion)	●					
Steep slope failure just behind the residential area		●				●
Farmland loss due to sheet erosion			●		●	
Large scale gully erosion to affect downstream area (sedimentation)	●	●	●	●	●	●
River Bank erosion	●	●				●

Source：JICA Project Team

According to Floyd B.'s paper[19], since the beginning of 20 century, an effort by the Government was made to prevent surface water from directly entering the head of the gullies. Water courses, drainage ditches, sunken footpaths, and other catchment features were blocked and the water diverted. Circular soak-away pits or sumps were dug alongside footpaths to encourage runoff to disappear underground. Rainwater collected in the depressions and was thus prevented from running downs the slopes.

Shrubs and trees were planted in the holes to stabilize the land. Establishing a protective plant cover within the watershed was considered absolutely vital. Farming was prohibited in the areas immediately adjacent to the gullies and a number of shrubs and trees, capable of surviving on the dry, acid sands and sterile bare slopes were introduced. Among the plants tested were those called Acioa barteri, which acts not only to protect the soil from drop erosion, but also probably to restore fertility.

Mechanical works in the form of earth check dams across the gully floor, and stepping of walls, were also undertaken, with less favorable results. Some dams were swept away by flood waters from violent storms. Others were undermined or ruptured by the steady pressure of backed-up water. Beyond the ravines on gently sloping land where farming might be permitted, narrow-based contour terraces (Bunds) were made obligatory, and strip cropping was strongly encouraged.

Even in the time of Floyd' paper, it was pointed out that

- All methods of controlling erosion are to be capable of slowing down the pace of destruction and stabilizing the smaller gullies.
- Because of change of Government policies, there was little indication of willingness for farmers to adopt the procedures deemed necessary.
- Controversial land tenure issue (ownership over land) for effective scheme of soil conservation
- Sociological and religious considerations against soil conservation activities
- Throughout the Eastern Region, the work of soil conservationists must be supported by the efforts of agriculturists, economists, educators, politicians, even psychologists, in order to convince the people that fundamental changes in land use are essential and long overdue.

b) On-going Project/Programs

FMAWR studied in 2009 the current status of flood control and erosion control projects[20]. There are on-going projects of Federal Ministry of Environment Budget and of Ecological Fund based, which is said to be 2 % of the total Federal Government budget.

[19] Floyd, B., Soil Erosion and Deterioration in Eastern Nigeria, Nig. Geogr. J. 8(1965), pp33-43

[20] FMAWR, Water Sector Consultancy Services for National Water Resources Baseline Studies on Erosion and Flood Control, Drought Management and Desertification Control, Final Report, Flood Control System Company Limited, 2009

According to the Federal Ministry of Environment Budget in 2011, the totally 7,229 million Naira was allocated to erosion and flood control project. The following table shows the significant feature of the 2011 Budget. The total number of project (on going and new projects) is 65, so the average amount for one project is about 100 million Naira annually. However, there is a large variation in terms of the size of project, in which the largest amount for a new project was 633 million Naira.

Table SR5.3-20 Variation of Allocated Amount for Erosion and Flood Control Project in FME Budget 2011

2011 Budget	Number	The smallest amount	The largest amount
		Million Naira	Million Naira
On-going Projects	6	37	600
New Projects	59	17	633

source：JICA Project Team

According to the Federal Ministry of Environment Budget in 2012, the allocated amount for erosion and flood control project is only 1,984 million Naira. No new project was allocated. It is understood that year by year the allocated amount for erosion and flood control can change drastically in the FME.

Nigerian Erosion/ Watershed Management Project (NEWMAP)

The overall objective of the Nigeria Erosion and Watershed Management Project (NEWMAP) is to support participating states and local governments to reduce vulnerability to erosion financed by World Bank. The relevant Federal Governments are FMF, FME and FMARD.

This is to be achieved by applying a comprehensive watershed management approach and by selecting and implementing affective engineering/ecological solutions for selected erosion sites. The project will focus on nine states[21], namely Anambra, Abia, Imo, Enugu, Ebonyi and Kaduna, Kano Ogun. The project includes two major components of investments in targeted areas and institutional development and establishment of information systems for erosion management and watershed planning. The total financing is said to be 508 million US$.

Land Degradation Mapping and Assessment for the Prevention and Control of Potential Erosion Hazard in Nigeria

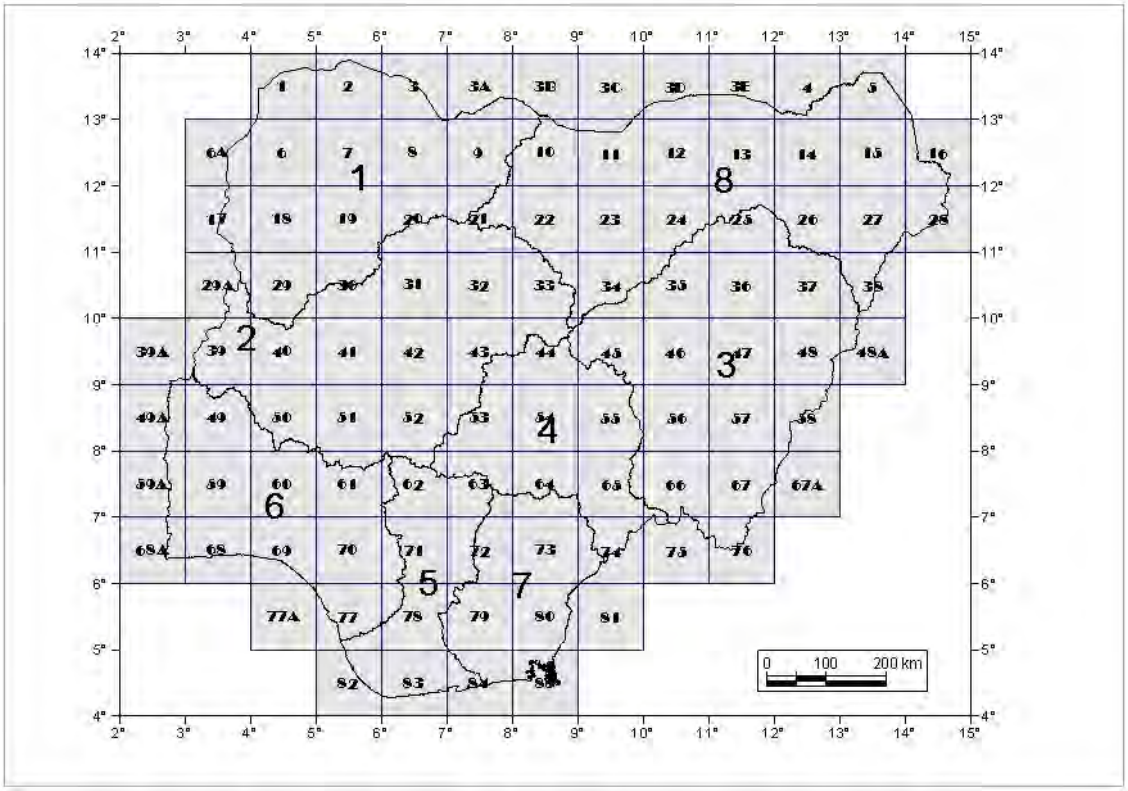
FME conducted the study on Land Degradation Mapping and Assessment for the Prevention and Control of Potential Erosion Hazard in Nigeria in 2010 in order to assess the land condition in terms of land degradation. The main output was the mapping of nationwide land degradation condition as shown in Figure SR5.3-45, separated into 99 sheets (scale 1:250,000). Table SR5.3-21 shows the category of land degradation.

Table SR5.3-21 Category of Land Degradation

Bu	Built-up areas	Pw	Water-logged areas
Cs	Salinization/alkalinization	Sn	Stable land under natural conditions
Et	Loss of topsoil by wind action	Ma	Mined/mining areas
FR	Forest Reserve	Wb	Water body
NPw	Permanent swamp/flooded areas	Wdr	Terrain deformation by gully and/or rill erosion or mass movements(red spots)
WDu	Dunes	Wd	Terrain deformation by gully and/or rill erosion or mass movements(bright spots)
WR	Rock outcrop	Wof	Stream channels and adjoining lands, seasonally flooded, also dry valleys and floodplains etc.
Pc	Compacted areas	Wt	Loss of topsoil by sheet erosion/surface wash

Source: FME, Land Degradation Mapping and Assessment for the Prevention and Control of Potential Erosion Hazard in Nigeria

[21] This Day(Newspaper) 2012 March 09



Source: JICA Project Team

Figure SR5.3-45 Index of Map Sheet of FME Land Degradation Map

The very serious gully erosion extent shown by "Wdr" is concentrating on the sheet 63, 71, 72 and 79. They are located in HA5 and HA7. And the total area of "Wdr" and "Wd" which is potential gully erosion is estimated to be about 23,000km^2.

Table SR5.3-22 Area evaluated as Serious Gully Erosion

Sheet No.	Area(km^2)	Sheet No.	Area(km^2)
62	0.5	71	36
63	57	72	524
68	2.5	78	2.4
70	0.8	79	83

Source: JICA Project Team

Table SR5.3-23 Thematic area-regional development Ministry of Environment

Priority Projects	Cost in N'm				Total
	2010	2011	2012	2013	
Erosion , Flood and Coastal Zone Management		3,246.62	3,069.72	3,332.95	9,649.29
i. Emergency call centers ii. Mobile advanced command, control and communication system(AC3s) iii. Purchase of 2 helicopters iv. seven mobile clinics		3,246.62	3,639.44	3,732.95	10,619.01

Source: NPC, The First National Implementation Plan for NV20:2020, Volume I: The Vision and Development Priorities, p.86

Table SR5.3-24 Thematic area-regional development Ministry of Niger Delta

Priority Projects	Cost in N'm				Total
	2010	2011	2012	2013	
Inland waterways transportation system		67.75	76.78	81.30	225.83
Land reclamation, shoreline protection and flood/erosion control for seven states: Azumini(Abia State), Ibakan Nsit(Akwa Ibom State), Odi(Bayelsa State), Essien Town(Cross River State), Ijaghalla(Delta State), Okhelen Awo(Edo State), Amadi Ama(Rivers State)		853.86	967.71	1,024.63	2,846.20
Feasibility studies and design on land reclamation, shoreline protection and flood/erosion control for 10 sites in Niger Delta region		27.10	30.71	32.52	90.33
Gully reclamation, slope protection, primary/secondary drain channel construction, culvert construction at Idumuje-Unor(Delta State)		6.39	7.24	7.66	21.29

Source: NPC, The First National Implementation Plan for NV20:2020, Volume I: The Vision and Development Priorities

c) Strategies

Information which was obtained by Social Survey

JICA Project Team conducted a sub-contract survey entitled "Social and Economic Survey related to Water Sectors" in 2011-2012. This survey included to request each State Government to answer the questionnaire on flood and erosion control in the State. The number of State from which the Survey collected the more or less relevant information was 17 States among the 37 States including FCT. The states which answered for the questionnaire in terms of flood and erosion control are as follows,

Table SR5.3-25 List of States from which information collected on flood and erosion

State	State	State	State
Adamawa	Cross River	Kwara	Oyo
Anambra	Delta	Nasarawa	Taraba
Bauchi	Ebonyi	Niger	
Bayelsa	Kebbi	Ogun	
Benue	Kogi	Osun	

Source: JICA Project Team

The descriptions from those States are quite various. In general, the common policies on flood and erosion in State level can be understood as follows,

Prevention: Before the onset of rains, the existing drainage system in the town is desilted to pave way for free flow of storm waters.

Mitigation: More drains are being constructed to curb the menace of flooding and erosion.

Response and Preparedness: Usually, flood early warning system is put in place. The citizens are warned through radio jingles on the rainfall pattern as predicted by NIMET. Equally, information received from other relevant agencies is also communicated to the populace.

Recovery: The SEMA is the organ of government responsible for disaster handling/management in the state including flood victims.

It can be pointed out that quite a few States concerns the blockage of drainage by garbage dumping when they are mentioning about flood and erosion. They are focusing on urban drainage issue as urban environment improvement.

Most of the State Government stresses more funding from Federal Government and technical assistance continually in order to implement their planned projects.

(7) Inland Waterway Navigation

(7-1) History of Inland Water Transport in Nigeria[22]

The inland navigation transportation in the current territory of Nigeria started in the nineteenth century as European countries started trading activities using the Niger river course with the European continent. The Niger river received a lot of interest of the world's explorers since 16th century. A lot of explores tried to enter the downstream of the Niger river from the upstream near Sahara desert, however, because of some rapids in the section between Niger and Nigeria they faced much difficulty in the course of exploration. It is very famous that Mongo Park lost his life in the Niger river in 1805.Since John Richard Lander discovered the route from the Niger delta to the ocean in 1832, the Niger river became internationally, important commercial navigation route.

In 1850's, British Government started the international trade for palm oil and others such as groundnuts, leather, tobacco, cotton, beans and elephant tusk. In 1870, the steam engine boat was introduced in Nigeria, and the British-supported companies such as United African Company did business in the Niger river, so the trade and the inland navigation became active. Moreover the Nigeria became the protectorate of the British Government in the Berlin Conference in 1885, consequently many European companies came to Nigeria to do their own business.

In 1898, the Colonial Government decided to extend the railway in Lagos to other areas and the transportation method for the trading was shifted to railway from inland navigation. The Royal Niger Company, which was called United African Company, lost the business power.

In 1906, the British unified the protectorates in the North and the South in Nigeria. Until 1912 many European trading companies also penetrated the Lower Niger from the coast and established trading stations at Aboh, Burutu, Warri, Onitsha, Lokoja, and other riverside towns. They purchased agricultural products which they exported overseas via the seaports. They also conveyed imported manufactured goods from the seaports to the hinterland.

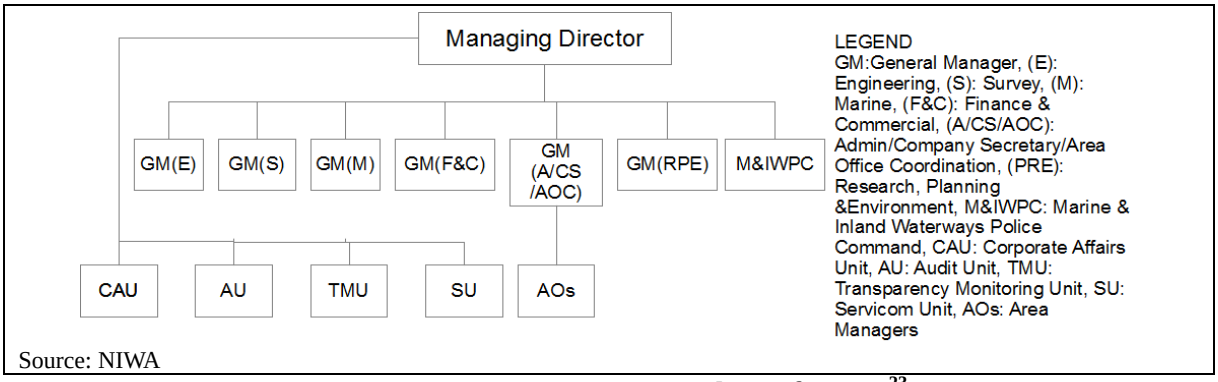
In 1912, the railway line between Lagos, Minna, Kano and Baro opened.

In 1914, the British Government unified the Northern Nigeria and the Southern Nigeria. And by 1940, the British Government put heavy investment on road network in all of the Nigeria.

In terms of the Governmental organization on inland navigation, in 1901 Government Marine Department (GMD) was established. GMS implemented dredging works in various ports from 1924 to 1939. In 1954 GMD was split into 4 departments, namely the Nigerian Ports Authority, the Nigerian Navy, Coastal Agency, and the Inland Waterways Department. The Inland Waterway Departments took over all operations concerning Nigeria's inland waterways.

However, by 1960s, trade and water transport began to decline in the Lower Niger as inland water transport experienced neglect with the shift from water to rail and road transport. The decline equally deepened when crude oil displaced agriculture as the main stay of the Nigerian economy.

In 1997, the Inland Waterway Department was again transformed into the National Inland Waterways Authority (NIWA) by Decree No. 13 of 1997, as a parastatal under the Federal Ministry of Transport. The headquarter of NIWA is located in Lokoja.



Source: NIWA

Figure SR5.3-46 Organization Chart of NIWA[23]

[22] Anthony Danladi Ali, Trade and Transport in the Lower Niger 1830-2011

(7-2) National Policy

The First National Implementation Plan for NV20:2020 (2010-2013) Volume II: Sectoral Plans and Programmes by National Planning Commission, Page 23.

Nigeria has 12 major inland navigable rivers of about 3,800 km. The country also has an extensive coastline of about 852 km. This offers great potential for the movement of goods and passengers from the coast to the hinterland, since these waterways traverse 20 out of the 36 States of the country. The Niger River and the Benue River (including its major tributaries and estuaries) are the principal waterways. The waterways are characterized by inadequate river ports, poor navigational and communication infrastructure, high rates of sediment and poor maintenance.

In order to tackle the deficiencies of the water transport sub-sector, government aims at promoting the development of the sector by eliminating the major physical constraints, promoting pricing policies (that help shift traffic back to inland waterways), restructure the supervisory agency, and provide opportunities for private sector participation in the operation and development of new inland waterways infrastructure.

The development of inland water transport will ease pressure on the over congested road sector and will enhance the mobility, welfare, and development of many remote and underprivileged communities. However, this mode of transportation has been neglected in the past three decades due to inadequate investment. Government has recently embarked on the dredging of the lower river Niger from Warri in Delta state to Baro in Niger state to enhance the all year navigability. When completed this will decongest Lagos and Port Harcourt sea ports and reduce pressure on the roads. The dredging project which spans 8 states namely: Niger, Kogi, Anambra, Imo, Edo, Delta, Rivers and Bayelsa has been divided into five lots to ensure its timely completion. They are:

Lot 1 - Warri to Bifurcation (154 km)
Lot 2 - Bifurcation to Onitsha (116 km)
Lot 3 - Onitsha to Idah (118 km)
Lot 4 - Idah to Jamata (108 km)
Lot 5 - Jamata to Baro (76 km)

Sea Ports

The seaports are of great significance for the economic development of Nigeria as they practically handle all the country's imports and exports with the potential of increasingly serving the landlocked countries of Niger and Chad. All the ports in Nigeria were owned and operated by the Nigerian Ports Authority (NPA). NPA's assets comprise 13 major ports, 11 oil terminals, and 128 jetties with a total annual cargo handling capacity of 35 million tons. Nigerian ports are dependent on imports, which constituted on the average about 70 per cent of the total cargo. The ports mainly handle imports, ranging from between 31.6 per cent and 6.7 per cent for general cargo, 53.5 per cent and 44.5 per cent for bulk cargo, and 23.6 per cent and 22.6 per cent for containerized traffic.

NPA which owns the ports on behalf of the Federal Government was established to provide infrastructure and services at the seaports. However, due to inefficiency of services, poor maintenance of infrastructure, corruption, excessive bureaucracy which made Nigerian ports uncompetitive, the government in 2001 commenced the reform and restructuring of the ports to introduce private sector participation. In April, 2006 private terminal operators took over handling operations when the ports were concessioned to private terminal operations after international competitive bidding, based on the Landlord model. The concession of the operation of the ports was done in conjunction with fundamental reforms in structure, institutional arrangements and operational modalities. NPA remains the regulatory agency supervising port operations and development.

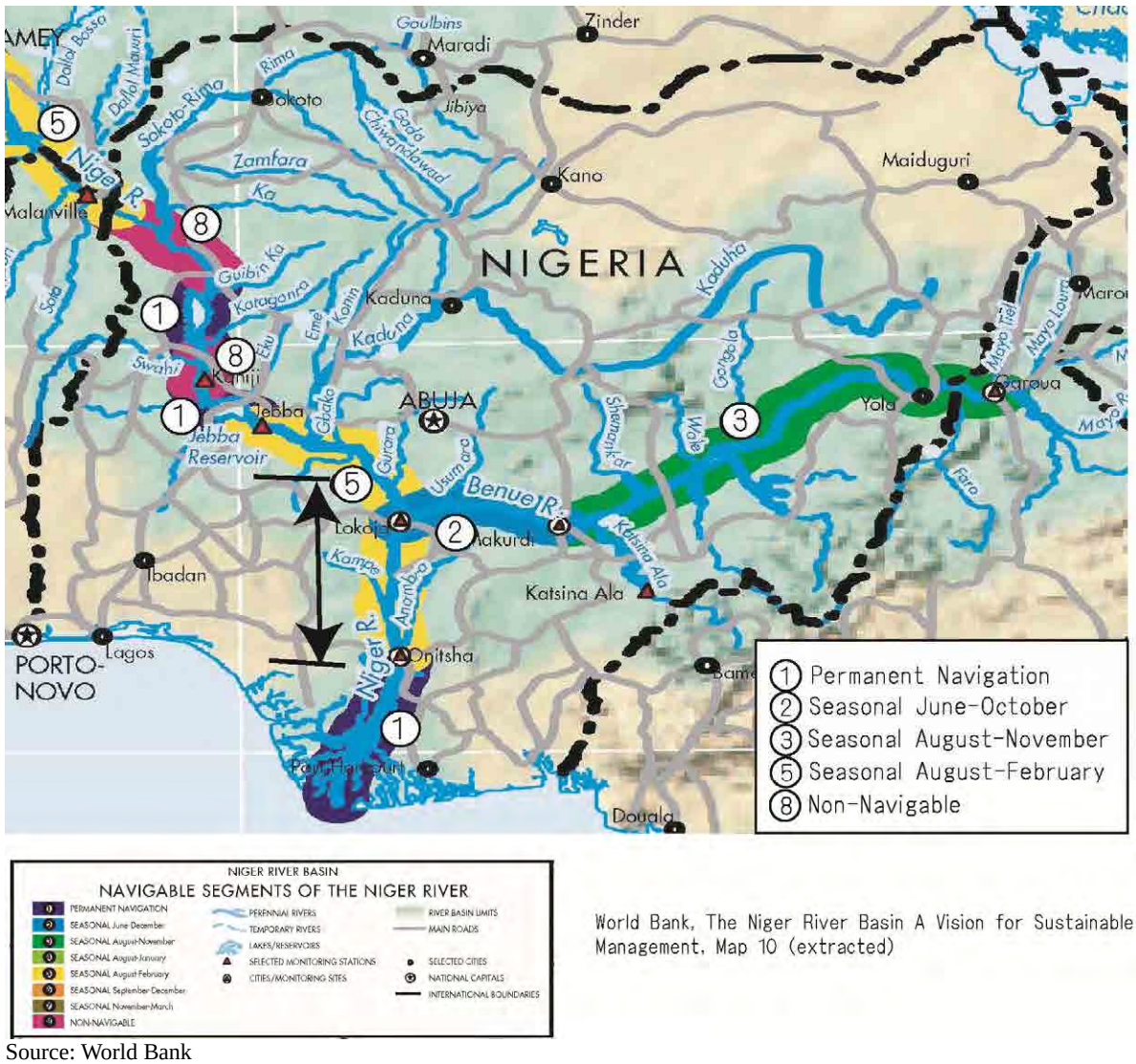
Shipping

Nigerian indigenous companies have in the past made unsuccessful attempts to participate in the carriage of Nigerian crude oil, and exploit the opportunities available. Nigerian produces and exports a daily crude oil output of approximately two million barrels a day, of which 57 per cent (fifty seven per cent) accrues directly to Nigerian National Petroleum Company by virtue of its joint venture

[23] NIWA's Charter of Service Compact(SERVICOM)

arrangement with the multi-national oil companies.

Article 2 of the National Shipping Policy Act of 1987, which is based on the recommendations of the United Nations Conference on Trade and Development (UNCTAD), makes it mandatory for indigenous shipping lines under the code cargo sharing formula of 40:40:20, to carry at least 40 per cent (forty per cent) of the cargo generated in that country. A majority of the oil producing and exporting countries in the world, either the governments or the producing and marketing organizations of those countries, adopt operational and marketing strategies that exploit the revenues and profit opportunities of all the modal interfaces of the oil marketing chain, including shipping. This will encourage foreign shipping companies to register In Nigeria and flag vessels supplied under Nigerian colors, thereby ensuring that a substantial amount of the crew are Nigerian and expanding the Nigerian Ship Registry.



Source: World Bank

（The arrow in this figure is the dredged section in 2009-2012. Some legends were improved by JICA Project Team.）

Figure SR5.3-47 Navigable Route in Niger and Benue Rivers in Nigeria

(7-3) Issues and Challenges for the Transport Sector

The key challenges facing the Nigerian Transport sector according to Vision 20:2020 are:

Dilapidated infrastructure

The railway system has almost ceased to function, with infrequent trains on a limited number of routes, and only a small percentage of locomotives remain serviceable. Many inland waterways are no longer navigable because of sedimentation, water vegetation, wrecks and other obstructions. Also relevant are inadequate port infrastructure, poor communication and navigational aids, piracy, environmental constraints, legal disagreements between State and Federal jurisdictions.

Institutional reform

The enactment of the Infrastructure Concession Regulatory Commission (ICRC) Act, 2005 has created an enabling environment for PPP participation in infrastructural development in Nigeria. Key policies and legislation will need to be created to establish the appropriate institutional framework for each mode of the transport sector. The legislation for the relevant transport modes will:

- Separate policy, regulation and operation
- Develop the economic and safety framework for the sector
- Create the environment for PPP

Inadequate funding

The public transport infrastructure lacked investment and adequate maintenance for many years, in spite of significant sums being expended in various sectors and institutional reforms. A major challenge in the transport sector is to have adequate resources required for investment in all the modes. The problem of inadequate funding is reflected in the poorly maintained roads, dilapidated rail network and rolling stock, obsolete navigational equipment for the aviation sector and waterways that are not navigable year round.

Absence of Multi-modal Integrated Transport System

The inadequate attention to other modes of transportation has led to imbalance in the distribution of traffic with roads responsible for over 90 per cent. With inadequate investment in maintenance and rehabilitation, the roads have deteriorated over the years. To correct this imbalance the government will address the following:

- Rehabilitate the rail connection to the ports
- Link the four major international airports to road and rail
- Modernize the rail system

The Objectives, Targets and Strategies are as follows.

In line with the vision, the following are the objectives for the transport sector during the first implementation plan period:

(i) To provide adequate transport infrastructure and services for even socio-economic development of the Country;
(ii) To ensure the provision of safe, efficient and cost effective transport services for the country;
(iii) Develop the capacity to sustain and continuously improve the quality of transport infrastructure and service delivery in the country
(iv) To create an enabling environment for private sector participation in the provision of transport infrastructure
(v) Develop a seamless inter-modal transport system

The target and strategies for achieving the above objectives are listed below:

Mode: Waterways

- To increase the navigable routes on the inland waterways to 3,000km
- To increase inland waterways traffic and passengers substantially
- To introduce private sector participation in the provision of inland waterway services
- Rehabilitate and construct key river ports, jetties and wharfs (Baro, Lokoja, Onitsha, Oguta, Degema and Yenagoa) by 2013

Strategies

- Dredge and reclaim the rivers Niger and Benue

- To concession routes to the private sector

Dr. Anthony Danladi Ali “Trade and Transport in the Lower Niger 1830-2011” reviewed the inland transportation in Nigeria as follows,

> In the colonial period the Lower Niger was useful to trading firms only as a means of exporting product overseas. In 1870, the motor engine was introduced to ply boat in the Lower Niger, movement has been faster and more convenient.

But when the railway and roads were constructed, the transportation on the Lower Niger River declined so that people involved in the colonial trade diverted their investment to other business.

Since the independence of Nigeria, the Nigerian Government did not take transportation in the Lower Niger seriously. Although NIWA was created in 1997 by the Federal Government, the activities of marine department completely declined and many private operators diverted the investment to other forms of business. Some Nigerians except the river side dweller think that effort at making the Lower Niger navigable all year round is not viable.

It is possible to develop transportation in the Lower Niger river to make it navigable all year round, and the Lower Niger river could serve as an alternative mode of transportation if necessary infrastructure provided.

Federal Government has failed the necessary support by ways of finance and infrastructure. The development has been focused on roads, but there are poor linkage between the roads and other modes of transportation.

The river side dwellers need to continue to use the Lower Niger river as a principal mode of transportation.

Dr.Ali's recommendations (main points) are as follows,

It is necessary for Nigerian Government to design a transportation system in response to private and public demands. The transportation network must be consistent with the health and convenience of Nigerians.

It is necessary to create an efficient navigable channel for the Lower Niger so that vessels can ply all year round. This is possible if the Federal Government pays adequate attention to the problem of silting and dredging. It is recommended that government furnish Nigeria's inland river terminals and river ports with infrastructural facilities like boats, jetties, ferries, landing, loading and unloading facilities. The Lower Niger river should be made navigable all year round through capital and maintenance dredging, hydrological and hydrographic surveys, removal of wrecks and clearance of debris and other obstructions from inland waterways.

Private operators should be encouraged on the use of inland waterways transport. Promoting transportation on the Lower Niger River would create employment opportunities in riverside settlements and thereby minimize rural-urban migration.

SR5.3.2 Inland Fishery

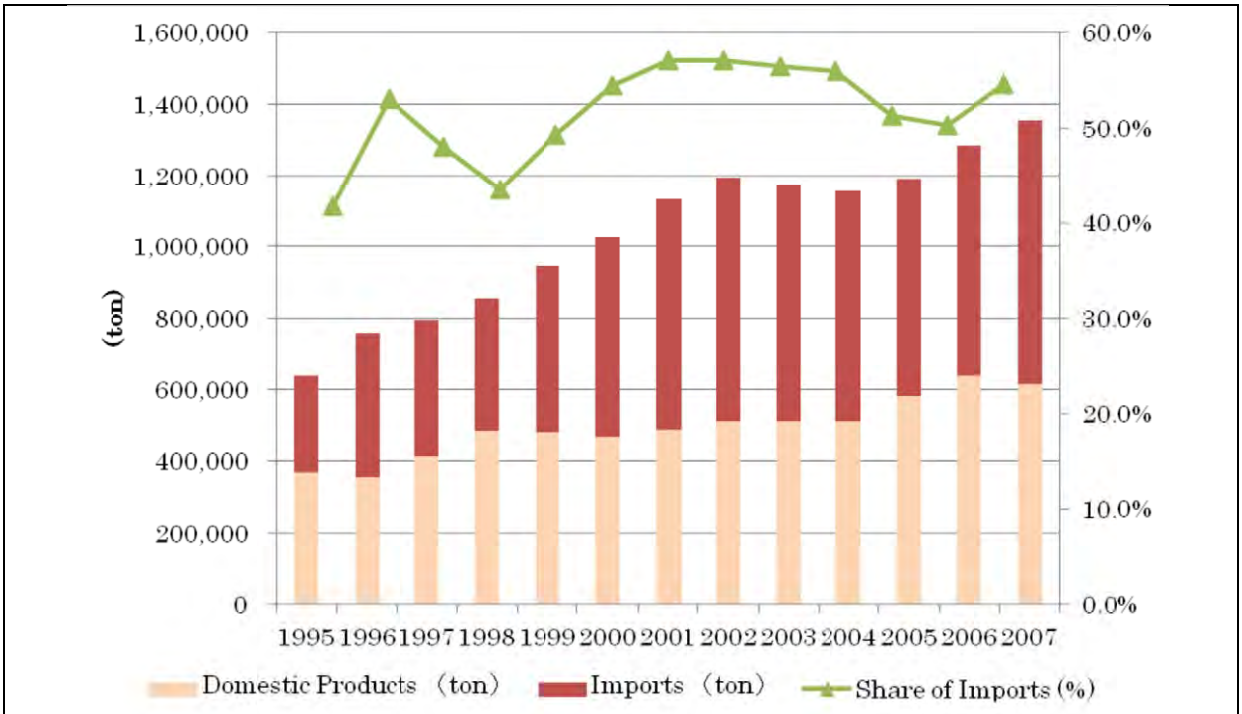
(1) Outline of Fishery Production in Nigeria

The share of fisheries production on national GNP is as small as 1.6% (2007). The Total fishery products supply in 2007 amounted to 1,355 thousand ton, consisting of 655 thousand ton of domestic catch and 740 thousand ton of imports, the latter accounting for 54.6%. In Nigeria, domestic fishery production has been in short of the domestic demand, resulting in the chronicle imports by 50-60% of the total annual supply.

In terms of domestic fisheries types on the basis of quantities of catch, small-scale artisanal fisheries has the largest share, accounting for 70-80% of the total catch in recent years. More particularly, limited to inland small-scale artisanal fisheries, its share on the total catch comes to around 35%. On the activity basis, this type accounts for 45-50% of the total inland fisheries activity. Annual domestic catch is totaled at around 250 thousand ton, thus the annual per capita consumption of fisheries products remains at 1.6kg. Conventional fish markets without refrigerating storage facility mainly deal with primarily processed sweet water fish like catfish, with very limited amount of fresh fish. Domestic artisanal type of fisheries shows a dwindling trend irrespective of whether they are small-scale, commercial basis, marine/off-shore or inland water surface, however, catch of inland water fish as well as production of fish farms have recently shown gradually increasing tendency.

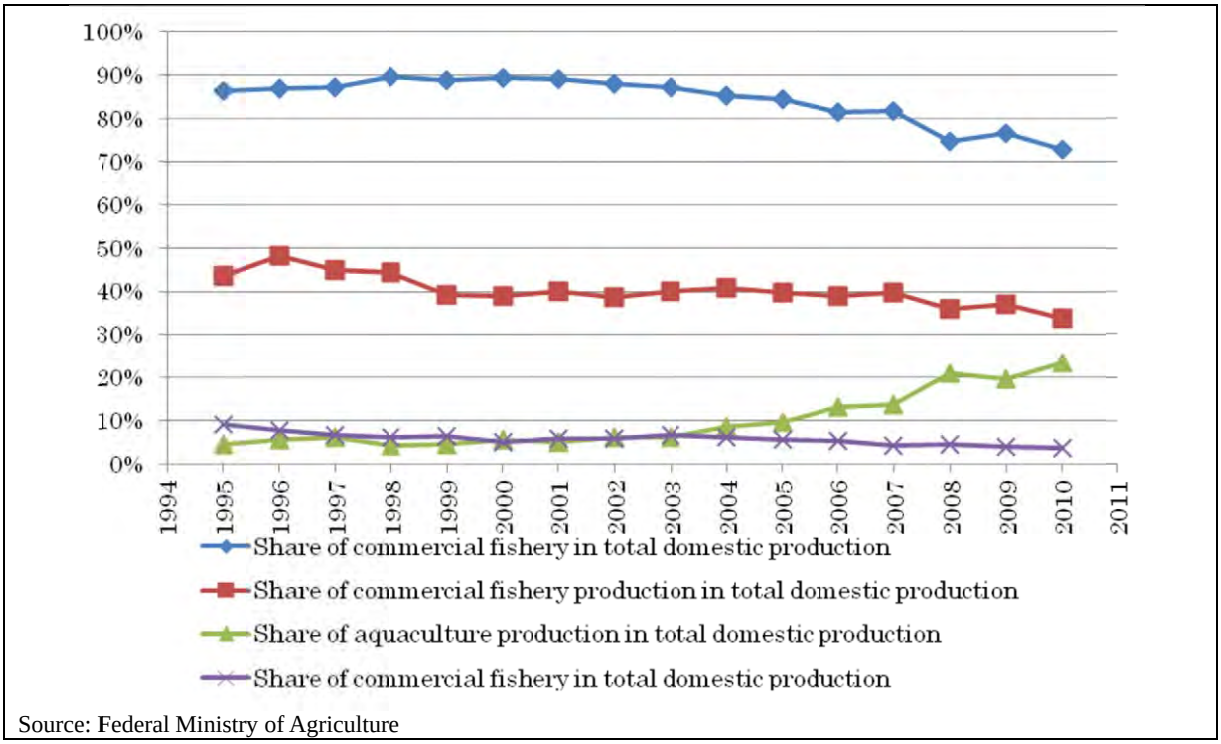
As for aquaculture, the situation shows a good contrast to the artisanal fishery, production has continued to increase since 2003. Before 2003, its share remained at only 6% or so of the total fisheries production, but in 2007 as well in 2010, it has given sharp increase 13.8% and 23.6%, respectively. Likewise, the rate of the entire catch of inland fisheries to the national total catch

accounted for 53.5% in 2007 and 57.5% in 2010, thus recently keeping the range of 55-60%. Accordingly, assuming that 50% of the total supply is derived from the domestic catch, the estimated share of fish farming in 2010 to the total supply comes to 12%, while that of inland fisheries accounts for 29% of the total.



Source: Federal Ministry of Agriculture

Figure SR5.3-48 Domestic Production and Imports of Fish



Source: Federal Ministry of Agriculture

Figure SR5.3-49 Share of Each Type of Catch on the Total Catch

(2) Current situation of Inland Fisheries

Inland fisheries have been operated mainly in rivers though it is also done in such lakes as Lake Chad. Table SR5.3-26 shows the amount of catch in major lakes/dams and streams. Artisanal fisheries (excluding fish farming) have also been operated in other rivers and lakes than those tabulated. Their main fish species include Nile tilapia, moon fish, Niger perch and catfish. Due to rampant catch by

artisanal fishermen, not only fish itself but numbers of such predators as water fowls and aquatic animals have also been diminished.

Table below gives the catch by inland fisheries.

Table SR5.3-26 Annual Catch in Major Water Body

Rivers and Lakes/Dams	Catch by Inland Fisheries (MT)
Lake Chad	22,000
Niger River	13,450
Benue River	9,750
Niger River Delta	19,000
Other rivers	45,000
Lake Kainji	10,000
Total	119,200

Source：Fishery statistics of Nigeria 4th edition 1995-2007

Meanwhile, according to the 4th edition of Fisheries Statistics of Nigeria, fish farming has been operated on 60,000 ha out of the total inland water surface area, 14 million ha, equivalent to only less than 1%. Annual fish production from aquaculture amounts to 85,000 ton though recently it has been reported to reach over 100,000 ton. It follows that the mean productivity is calculated at:

85,000 / 60,000 = 1.4 t/ha/year.

Table SR5.3-27 indicates the number of fish farm ponds and water surface area surveyed by fishery department of FMARD in 2004 excluding ponds and area that were likely brackish water culture.

Table SR5.3-27 Distribution & Number of Major Inland Fish Farms / Fish Feed Mills

State	Dams/ Ponds	Fish farms	Fish-feed mills	Area of fish Ponds ha	State	Dams/ Ponds	Fish farms	Fish-feed mills	Area of fish Ponds ha
Abia	4	40	2	50.7	Kano	17	10	1	711.6
Adamawa	16	4	0	30.2	Katsina	40	7	16	29.0
Akwa Ibom	9	98	16	57.6	Kebbi	30	56	0	57.7
Anambra	5	18	3	34.7	Kogi	35	32	0	37.1
Bauchi	33	16	0	21.9	Kwara	21	121	18	83.2
Bayelsa	16	86	4	6.3	Lagos	0	153	16	66.1
Benue	45	198	5	19.3	Nasarrawa	26	39	2	78.5
Borno	18	12	0	12.1	Niger	35	29	1	29.0
Cross River	52	191	0	385.4	Ogun	24	173	0	97.9
Delta	17	420	0	2,410.0	Ondo	8	15	3	27.6
Edo	30	138	6	2.7	Oyo	29	234	9	474.0
Ebonyi	17	12	7	14.9	Osun	7	293	26	568.6
Ekiti	6	31	35	74.5	Plateau	85	18	9	186.7
Enugu	22	4	4	4.0	Rivers	22	89	0	284.6
Abuja	15	29	1	12.3	Sokoto	15	9	1	14.2
Gombe	44	15	1	10.0	Taraba	83	8	1	2.8
Imo	9	40	16	61.5	Yobe	20	13	1	9.9
Jigawa	15	4	1	63.0	Zamfara	40	9	7	37.5
Kaduna	20	10	9	59.2	**Total**	917	2,658	215	6.126.0

Source：Inventory of Fish Farms in Nigeria, Dec.2004,
Note: All the ponds using brackish water are excluded from these pond areas.

Fish species farmed in inland fish farms generally include tilapia (*Oreochromis* spp.), clarias, carp (*Cyprinus* spp.) and mullet (*Mugil* spp.), though culture of catfish (clarias) occupies by far majority in and around major urban areas. Inland fish farms are clustered in HA-5, HA-6 and HA-7 because many ponds/ lakes and dish feed producing mills are concentrated in these areas and also fingerings are readily available. Average scale of fish ponds owned by a fish farming enterprise is said to be in the range 20-30 ha though no formal data is available on this matter. Some of the existing fish farms are operated by the states themselves concerned. In the cases of fish farming utilizing concrete basins, both farm area (mostly in the range of several hundred square meter) and water quantity can be economized and this type of basin farms are very often used by private fish farms managed by individual farmers.

(3) Factors detrimentally affecting Inland Fisheries

The following can be considered as causative factors negatively affecting inland fisherira

- Dam construction: Narrowing areas of suitable habitat owing to depleted discharges of floods and by drastic change in river flow state
- Irrigated agriculture: Diminished areas of habitats for fish due to farmland reclamation on and around floodplains
- Water pollution: Polluted water by use of agrochemicals and chemical fertilizers, drained water from mining spots
- Droughts: Water deficiency/shortage caused by frequent droughts especially frequent in northern states.

Besides, the following technical and institutional factors may serve as obstacles hindering development of inland fisheries. The most serious limiting factors include short supply of fries/fingerings, low availability of fish-feeds and lack of markets/outlets of products or refrigerated storage facilities where fish farmers can store/sell their products at remunerative prices. These are major causes why fish farming fails to diffuse into central and northern areas of the country.

- Immature fishery management,
- Inefficient fishery processing techniques,
- Retarded introduction/extension of private enterprises into fishery sector,
- Delay in human resource development among stakeholders of fisheries and
- Insufficient research performances on inland fisheries.

SR5.3.3 Livestock

(1) Outline of Livestock Industry

In Nigeria, share of livestock sub-sector in national GDP accounts for only about 2%, implying that this sub-sector is a minor economic sector. Major livestock species include fowls (including chicken, Guinea fowls and ducks), cattle, goats, sheep and pigs. The relative importance of this sub-sector is larger in northern part of the country but smaller in the south, for the climate in northern part is rather disadvantageous to crop farming thus dependency on livestock that can make use of natural grass/ rangeland is larger. Generally, local population keeps their livestock under traditional grazing that doesn't require feeding of marketed feeds. In southern states, cage rearing of poultry is also observed. Cattle have been raised throughout the country but more popular in the central and northern part thereof, mainly consisting of draught "Zebu" specie, though dairy cattle are very few. Shifting grazing is major type of husbandry practiced by nomadic population who keep goats, sheep, cattle and camels. Swine constitute a lucrative livestock that are reared in non-Islamic areas. In rural areas, they are mostly reared in small-scale traditional piggery barns, but also they are intensively raised in large-scale large piggery lots in and around large urban areas.

(2) Constraints of Livestock Development

The constraints that inhibit development of livestock industry are considered as follows:

- Low quality / productivity of livestock (slow growth rate, low milk yield or carcass rate),
- Though animal husbandry constitutes labor-intensive production system, labor force required by livestock sub-sector has been in short,
- Insufficient feed base and equipment required for livestock production including rangeland in both terms of quantity and quality,
- Epidemic diseases invade from neighbor countries because of no border in rangeland areas,
- Shortage in efficient and hygienic livestock processing/ storage facilities for meets, milk and skins,
- Lack of consolidated/ streamlined abattoirs and system of marketing/ sale.

Particularly, shortage in livestock water has not constituted any limiting factor for developing livestock industry. Since luminous livestock usually is kept around natural streams, lakes/ ponds or reservoirs, and water for pigs and fowls has been availed from rainwater and groundwater, it is likely that potable water sources for livestock are more dependent on rainwater and groundwater. Also, provision/ consolidation of water points required along major transhumant routes located in northern part of the country has been behind the time.