Source: JICA Study Team based on TEDI's survey

Figure 2.3.2 Transition of the population and the employed population in Hanoi on "Hanoi Urban Railway Construction Investment Project" (2020 to 2030)
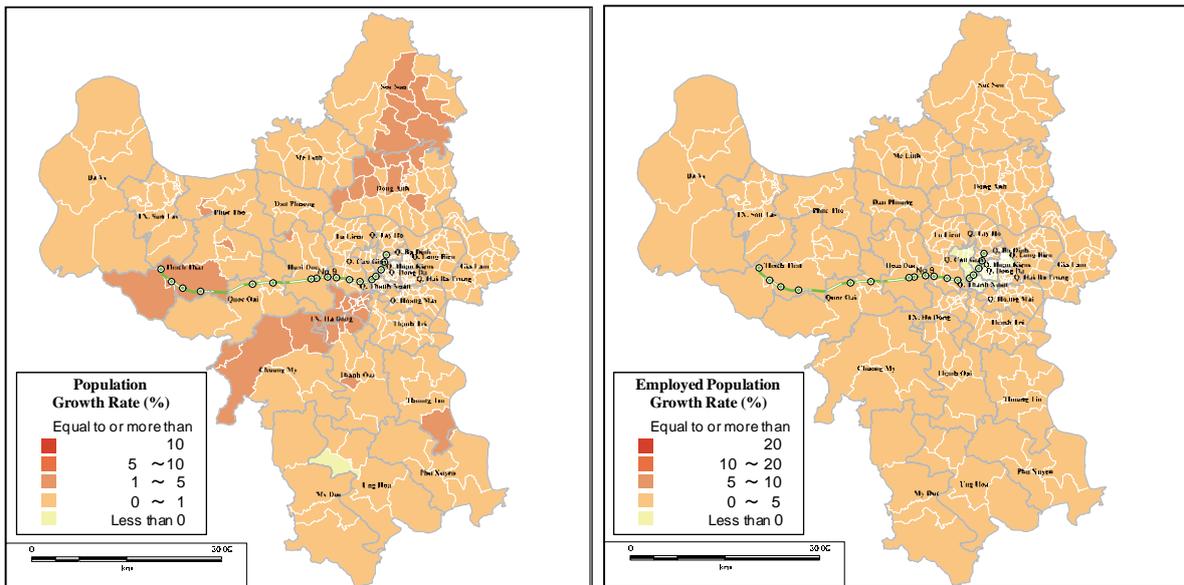
Source: JICA Study Team based on TEDI's survey

Figure 2.3.3 Transition of the population and the employed population in Hanoi on "Hanoi Urban Railway Construction Investment Project" (2030 to 2050)

2) Preconditioned Development Projects

It cannot be checking how much population and employed population are contained in each development project in the prediction of the future population and employed population.

The zones considered that development projects are included based on the rate of increase (2011-2020) of the population and the employed population are extracted as followings.

The extracted zones of 53 where the population growth rate exceeds 5% show the very high increase-in-population tendency compared with the rate of the whole Hanoi region. It is thought that various large and small development projects are included in these zones.

Table 2.3.1 Rapid population-increase zones considered that development projects are included.

Zone Name				Population					Average Growth Rate (%)				Share (%)				
				2011	2020	2030	2040	2050	20/11	30/20	40/30	50/30	2011	2020	2030	2040	2050
		Total in Hanoi		6,779,294	7,956,200	9,135,300	9,874,323	10,712,200	1.8	1.4	0.8	0.8	100.00	100.00	100.00	100.00	100.00
1	283	Thị trấn Tây Đằng	○	16,382	92,169	225,548	257,028	292,902	21.2	9.4	1.3	1.3	0.24	1.16	2.47	2.60	2.73
2	284	Xã Phú Cường		7,120	33,210	81,269	92,612	105,538	18.7	9.4	1.3	1.3	0.11	0.42	0.89	0.94	0.99
3	286	Xã Tân Hồng	◎	25,907	98,674	213,991	242,579	274,985	16.0	8.0	1.3	1.3	0.38	1.24	2.34	2.46	2.57
4	257	Phường La Khê		10,331	38,641	23,184	23,877	24,589	15.8	-5.0	0.3	0.3	0.15	0.49	0.25	0.24	0.23
5	258	Phường Phú La		11,077	41,430	24,858	25,600	26,365	15.8	-5.0	0.3	0.3	0.16	0.52	0.27	0.26	0.25
6	256	Phường Quang Trung		4,769	17,837	10,702	11,022	11,351	15.8	-5.0	0.3	0.3	0.07	0.22	0.12	0.11	0.11
7	268	Phường Lê Lợi		8,690	27,500	33,000	36,783	41,000	13.7	1.8	1.1	1.1	0.13	0.35	0.36	0.37	0.38
8	307	Xã Tân Lĩnh		5,909	16,813	22,595	24,961	27,576	12.3	3.0	1.0	1.0	0.09	0.21	0.25	0.25	0.26
9	306	Xã Thuần Mỹ		20,497	57,081	73,943	81,499	89,827	12.1	2.6	1.0	1.0	0.30	0.72	0.81	0.83	0.84
10	252	Phường Mộ Lao		6,466	17,959	15,378	16,399	17,487	12.0	-1.5	0.6	0.6	0.10	0.23	0.17	0.17	0.16
11	144	Xã Việt Long		13,150	34,392	45,914	52,270	59,506	11.3	2.9	1.3	1.3	0.19	0.43	0.50	0.53	0.56
12	151	Xã Phú Cường		12,979	33,945	45,317	51,590	58,732	11.3	2.9	1.3	1.3	0.19	0.43	0.50	0.52	0.55
13	145	Xã Xuân Giang		16,075	42,042	56,126	63,896	72,742	11.3	2.9	1.3	1.3	0.24	0.53	0.61	0.65	0.68
14	143	Xã Tiên Dược		13,359	34,938	46,643	53,100	60,451	11.3	2.9	1.3	1.3	0.20	0.44	0.51	0.54	0.56
15	156	Xã Xuân Nộn		17,472	45,695	61,004	69,449	79,063	11.3	2.9	1.3	1.3	0.26	0.57	0.67	0.70	0.74
16	142	Xã Tân Dân		12,275	32,103	42,858	48,791	55,546	11.3	2.9	1.3	1.3	0.18	0.40	0.47	0.49	0.52
17	154	Xã Xuân Thu		10,239	26,778	35,749	40,698	46,332	11.3	2.9	1.3	1.3	0.15	0.34	0.39	0.41	0.43
18	152	Xã Phù Minh		32,252	84,347	112,605	128,193	145,940	11.3	2.9	1.3	1.3	0.48	1.06	1.23	1.30	1.36
19	140	Xã Quang Tiến		14,721	38,498	51,396	58,511	66,611	11.3	2.9	1.3	1.3	0.22	0.48	0.56	0.59	0.62
20	270	Phường Ngô Quyền		31,630	72,685	48,992	51,917	55,016	9.7	-3.9	0.6	0.6	0.47	0.91	0.54	0.53	0.51
21	269	Phường Phú Thịnh		32,032	73,609	49,615	52,577	55,715	9.7	-3.9	0.6	0.6	0.47	0.93	0.54	0.53	0.52
22	139	Xã Tân Minh		29,041	62,463	83,389	94,933	108,076	8.9	2.9	1.3	1.3	0.43	0.79	0.91	0.96	1.01
23	223	Xã Tứ Hiệp		15,389	33,017	49,525	54,702	60,420	8.9	4.1	1.0	1.0	0.23	0.41	0.54	0.55	0.56
24	172	Xã Cổ Loa		8,447	17,817	24,829	25,752	26,709	8.6	3.4	0.4	0.4	0.12	0.22	0.27	0.26	0.25
25	164	Xã Vân Nội		16,952	35,756	49,828	51,680	53,601	8.6	3.4	0.4	0.4	0.25	0.45	0.55	0.52	0.50
26	181	Xã Yên Viên		11,521	24,301	33,864	35,122	36,428	8.6	3.4	0.4	0.4	0.17	0.31	0.37	0.36	0.34
27	166	Xã Việt Hùng		15,230	32,124	44,765	46,429	48,155	8.6	3.4	0.4	0.4	0.22	0.40	0.49	0.47	0.45
28	165	Xã Liên Hà		12,703	26,793	37,337	38,725	40,164	8.6	3.4	0.4	0.4	0.19	0.34	0.41	0.39	0.37
29	180	Xã Yên Thường		11,687	24,650	34,351	35,627	36,951	8.6	3.4	0.4	0.4	0.17	0.31	0.38	0.36	0.34
30	167	Xã Kim Nỗ		9,673	20,402	28,431	29,487	30,583	8.6	3.4	0.4	0.4	0.14	0.26	0.31	0.30	0.29
31	179	Thị trấn Yên Viên		4,517	9,527	13,276	13,770	14,281	8.6	3.4	0.4	0.4	0.07	0.12	0.15	0.14	0.13
32	300	Xã Cẩm Lĩnh		41,133	77,910	140,684	155,532	171,947	7.4	6.1	1.0	1.0	0.61	0.98	1.54	1.58	1.61
33	254	Phường Vạn Phúc		7,813	14,176	19,629	21,522	23,663	6.8	3.3	0.9	0.9	0.12	0.18	0.21	0.22	0.22
34	250	Xã Tráng Việt		7,146	12,966	17,953	19,712	21,643	6.8	3.3	0.9	0.9	0.11	0.16	0.20	0.20	0.20
35	271	Phường Quang Trung		52,599	94,331	145,205	159,951	176,194	6.7	4.4	1.0	1.0	0.78	1.19	1.59	1.62	1.64
36	272	Phường Sơn Lộc		29,138	51,059	70,188	77,047	84,575	6.4	3.2	0.9	0.9	0.43	0.64	0.77	0.78	0.79
37	217	Thị trấn Văn Điển		9,924	17,264	25,896	28,603	31,593	6.3	4.1	1.0	1.0	0.15	0.22	0.28	0.29	0.29
38	218	Xã Tân Triều		20,164	35,076	52,614	58,114	64,189	6.3	4.1	1.0	1.0	0.30	0.44	0.58	0.59	0.60
39	129	Thị trấn Sóc Sơn		20,308	35,192	88,771	107,168	129,378	6.3	9.7	1.9	1.9	0.30	0.44	0.97	1.09	1.21
40	316	Xã Vân Phúc		23,507	40,363	33,706	35,529	37,451	6.2	-1.8	0.5	0.5	0.35	0.51	0.37	0.36	0.35
41	311	Xã Vân Hòa		42,821	73,527	61,399	64,720	68,221	6.2	-1.8	0.5	0.5	0.63	0.92	0.67	0.66	0.64
42	315	Xã Vân Hà		20,476	35,159	29,359	30,947	32,622	6.2	-1.8	0.5	0.5	0.30	0.44	0.32	0.31	0.30
43	312	Xã Yên Bài		38,610	66,296	55,361	58,355	61,512	6.2	-1.8	0.5	0.5	0.57	0.83	0.61	0.59	0.57
44	313	Xã Khánh Thượng		32,098	55,114	46,023	48,513	51,137	6.2	-1.8	0.5	0.5	0.47	0.69	0.50	0.49	0.48
45	176	Xã Tầm Xá		26,198	44,559	62,094	64,402	66,796	6.1	3.4	0.4	0.4	0.39	0.56	0.68	0.65	0.62
46	163	Xã Uy Nỗ		15,917	27,072	37,726	39,128	40,582	6.1	3.4	0.4	0.4	0.23	0.34	0.41	0.40	0.38
47	305	Xã Cam Thượng		53,070	89,258	80,129	85,752	91,770	5.9	-1.1	0.7	0.7	0.78	1.12	0.88	0.87	0.86
48	318	Xã Xuân Phú		50,600	82,813	64,678	69,063	73,746	5.6	-2.4	0.7	0.7	0.75	1.04	0.71	0.70	0.69
49	320	Xã Sen Chiểu		47,567	77,849	60,802	64,924	69,325	5.6	-2.4	0.7	0.7	0.70	0.98	0.67	0.66	0.65
50	317	Xã Vân Nam		50,591	82,798	64,667	69,051	73,732	5.6	-2.4	0.7	0.7	0.75	1.04	0.71	0.70	0.69
51	290	Xã Phú Đông		31,781	51,038	96,263	111,024	128,048	5.4	6.6	1.4	1.4	0.47	0.64	1.05	1.12	1.20
52	309	Xã Minh Quang		25,735	40,699	34,299	36,469	38,776	5.2	-1.7	0.6	0.6	0.38	0.51	0.38	0.37	0.36
53	291	Xã Phú Phương		88,074	138,997	177,161	198,522	222,460	5.2	2.5	1.1	1.1	1.30	1.75	1.94	2.01	2.08

(Note) ◎ : Zone including HoaLac   ○: HoaLac's neighboring zones

Source: JICA Study Team based on TEDI's survey

Table 2.3.2 Rapid the employed population -increase zones considered that development projects are included.

		Zone Name	Employed Population					Average Growth Rate (%)				Share (%)				
			2011	2020	2030	2040	2050	20/11	30/20	40/30	50/30	2011	2020	2030	2040	2050
		Total in Hanoi	1,831,722	4,044,415	5,273,770	5,684,725	6,164,692	9.2	2.7	0.8	0.8	100.00	100.00	100.00	100.00	100.00
1	177	**Xã Mai Lâm**	50	2,201	2,873	2,882	2,891	**52.3**	2.7	0.0	0.0	0.00	0.05	0.05	0.05	0.05
2	252	Phường Mộ Lao	9	342	446	638	914	**49.8**	2.7	3.7	3.7	0.00	0.01	0.01	0.01	0.01
3	175	**Xã Võng La**	106	3,444	4,495	4,510	4,524	**47.2**	2.7	0.0	0.0	0.01	0.09	0.09	0.08	0.07
4	184	Xã Dương Hà	69	2,163	2,824	2,833	2,842	**46.6**	2.7	0.0	0.0	0.00	0.05	0.05	0.05	0.05
5	168	Xã Kim Chung	73	1,952	2,548	2,556	2,564	**44.1**	2.7	0.0	0.0	0.00	0.05	0.05	0.04	0.04
6	179	Thị trấn Yên Viên	90	2,138	2,791	2,800	2,809	**42.2**	2.7	0.0	0.0	0.00	0.05	0.05	0.05	0.05
7	170	Xã Đại Mạch	53	1,256	1,639	1,644	1,650	**42.1**	2.7	0.0	0.0	0.00	0.03	0.03	0.03	0.03
8	169	Xã Dục Tú	186	4,177	5,453	5,470	5,488	**41.3**	2.7	0.0	0.0	0.01	0.10	0.10	0.10	0.09
9	172	Xã Cổ Loa	388	7,484	9,770	9,801	9,832	**38.9**	2.7	0.0	0.0	0.02	0.19	0.19	0.17	0.16
10	164	Xã Vân Nội	629	11,960	15,612	15,662	15,712	**38.7**	2.7	0.0	0.0	0.03	0.30	0.30	0.28	0.25
11	180	Xã Yên Thường	464	8,777	11,458	11,494	11,531	**38.6**	2.7	0.0	0.0	0.03	0.22	0.22	0.20	0.19
12	281	Xã Sơn Đồng ○	1,098	20,296	26,494	28,549	30,764	**38.3**	2.7	0.7	0.7	0.06	0.50	0.50	0.50	0.50
13	280	Xã Kim Sơn	669	12,049	15,729	16,949	18,264	**37.9**	2.7	0.7	0.7	0.04	0.30	0.30	0.30	0.30
14	183	Xã Đình Xuyên	146	2,623	3,424	3,435	3,446	**37.8**	2.7	0.0	0.0	0.01	0.06	0.06	0.06	0.06
15	166	Xã Việt Hùng	408	7,261	9,478	9,508	9,538	**37.7**	2.7	0.0	0.0	0.02	0.18	0.18	0.17	0.15
16	176	Xã Tầm Xá	2,246	38,790	50,635	50,795	50,957	**37.2**	2.7	0.0	0.0	0.12	0.96	0.96	0.89	0.83
17	167	Xã Kim Nỗ	218	3,755	4,901	4,917	4,932	**37.2**	2.7	0.0	0.0	0.01	0.09	0.09	0.09	0.08
18	171	Xã Vĩnh Ngọc	970	16,635	21,715	21,783	21,853	**37.1**	2.7	0.0	0.0	0.05	0.41	0.41	0.38	0.35
19	133	Xã Nam Sơn	276	4,550	5,940	6,636	7,415	**36.5**	2.7	1.1	1.1	0.02	0.11	0.11	0.12	0.12
20	134	Xã Trung Giã	831	12,880	16,813	18,785	20,988	**35.6**	2.7	1.1	1.1	0.05	0.32	0.32	0.33	0.34
21	181	Xã Yên Viên	1,094	15,653	20,432	20,497	20,562	**34.4**	2.7	0.0	0.0	0.06	0.39	0.39	0.36	0.33
22	136	Xã Minh Phú	678	9,606	12,540	14,010	15,653	**34.3**	2.7	1.1	1.1	0.04	0.24	0.24	0.25	0.25
23	132	Xã Hồng Kỳ	497	6,987	9,121	10,190	11,385	**34.1**	2.7	1.1	1.1	0.03	0.17	0.17	0.18	0.18
24	173	Xã Hải Bối	837	11,724	15,304	15,353	15,401	**34.1**	2.7	0.0	0.0	0.05	0.29	0.29	0.27	0.25
25	163	Xã Uy Nỗ	4,030	55,636	72,625	72,856	73,087	**33.9**	2.7	0.0	0.0	0.22	1.38	1.38	1.28	1.19
26	130	Xã Bắc Sơn	1,284	17,414	22,732	25,397	28,375	**33.6**	2.7	1.1	1.1	0.07	0.43	0.43	0.45	0.46
27	182	Xã Ninh Hiệp	1,238	16,610	21,682	21,751	21,820	**33.4**	2.7	0.0	0.0	0.07	0.41	0.41	0.38	0.35
28	174	Xã Xuân Canh	1,221	16,361	21,357	21,425	21,493	**33.4**	2.7	0.0	0.0	0.07	0.40	0.40	0.38	0.35
29	178	Xã Đông Hội	5,905	77,480	101,140	101,461	101,783	**33.1**	2.7	0.0	0.0	0.32	1.92	1.92	1.78	1.65
30	208	Xã Minh Khai	62	803	1,048	1,129	1,217	**32.9**	2.7	0.7	0.7	0.00	0.02	0.02	0.02	0.02
31	279	Phường Trung Sơn Trầm ○	1,665	21,415	27,955	30,123	32,460	**32.8**	2.7	0.7	0.7	0.09	0.53	0.53	0.53	0.53
32	278	Xã Thanh Mỹ	1,649	21,187	27,657	29,803	32,115	**32.8**	2.7	0.7	0.7	0.09	0.52	0.52	0.52	0.52
33	160	Xã Nam Hồng	19	243	331	371	416	**32.7**	3.1	1.2	1.2	0.00	0.01	0.01	0.01	0.01
34	165	Xã Liên Hà	1,124	13,974	18,241	18,299	18,357	**32.3**	2.7	0.0	0.0	0.06	0.35	0.35	0.32	0.30
35	282	Xã Cổ Đông	1,881	23,166	30,240	32,586	35,114	**32.2**	2.7	0.7	0.7	0.10	0.57	0.57	0.57	0.57
36	261	Xã Yên Nghĩa	277	3,338	4,358	4,696	5,060	**31.9**	2.7	0.7	0.7	0.02	0.08	0.08	0.08	0.08
37	135	Xã Tân Hưng	2,715	29,092	37,976	42,429	47,404	**30.2**	2.7	1.1	1.1	0.15	0.72	0.72	0.75	0.77
38	129	Thị trấn Sóc Sơn	2,341	22,843	29,818	33,315	37,221	**28.8**	2.7	1.1	1.1	0.13	0.56	0.57	0.59	0.60
39	219	Xã Thanh Liệt	282	2,640	3,446	3,713	4,001	**28.2**	2.7	0.7	0.7	0.02	0.07	0.07	0.07	0.06
40	146	Xã Mai Đình	130	1,211	1,649	1,849	2,074	**28.1**	3.1	1.2	1.2	0.01	0.03	0.03	0.03	0.03
41	137	Xã Phù Linh	7,095	65,884	86,003	96,088	107,355	**28.1**	2.7	1.1	1.1	0.39	1.63	1.63	1.69	1.74
42	310	Xã Ba Vì	465	4,285	8,390	10,440	12,990	**28.0**	7.0	2.2	2.2	0.03	0.11	0.16	0.18	0.21
43	213	Xã Tây Mỗ	400	3,647	4,761	5,130	5,528	**27.8**	2.7	0.7	0.7	0.02	0.09	0.09	0.09	0.09
44	214	Xã Mễ Trì	185	1,673	2,184	2,354	2,536	**27.7**	2.7	0.7	0.7	0.01	0.04	0.04	0.04	0.04
45	131	Xã Minh Trí	6,843	59,560	77,748	86,865	97,051	**27.2**	2.7	1.1	1.1	0.37	1.47	1.47	1.53	1.57
46	158	Xã Bắc Hồng	465	4,022	5,479	6,145	6,892	**27.1**	3.1	1.2	1.2	0.03	0.10	0.10	0.11	0.11
47	138	Xã Bắc Phú	13,069	111,180	145,131	162,149	181,163	**26.9**	2.7	1.1	1.1	0.71	2.75	2.75	2.85	2.94
48	263	Xã Phú Lãm	691	5,753	7,510	8,093	8,720	**26.6**	2.7	0.7	0.7	0.04	0.14	0.14	0.14	0.14
49	140	Xã Quang Tiến	209	1,725	2,350	2,636	2,956	**26.4**	3.1	1.2	1.2	0.01	0.04	0.04	0.05	0.05
50	308	Xã Ba Trại	786	6,051	11,847	14,741	18,342	**25.5**	7.0	2.2	2.2	0.04	0.15	0.22	0.26	0.30
51	220	Xã Tả Thanh Oai	385	2,951	3,852	4,151	4,473	**25.4**	2.7	0.7	0.7	0.02	0.07	0.07	0.07	0.07
52	162	Xã Vân Hà	397	2,993	4,077	4,572	5,128	**25.2**	3.1	1.2	1.2	0.02	0.07	0.08	0.08	0.08
53	154	Xã Xuân Thu	273	2,040	2,778	3,116	3,495	**25.0**	3.1	1.2	1.2	0.01	0.05	0.05	0.05	0.06
54	204	Xã Đông Ngạc	653	4,854	6,336	6,828	7,357	**25.0**	2.7	0.7	0.7	0.04	0.12	0.12	0.12	0.12
55	141	Xã Hiền Ninh	285	2,111	2,876	3,225	3,618	**24.9**	3.1	1.2	1.2	0.02	0.05	0.05	0.06	0.06
56	294	Xã Đồng Thái	406	2,953	3,854	4,153	4,476	**24.7**	2.7	0.7	0.7	0.02	0.07	0.07	0.07	0.07
57	309	Xã Minh Quang	382	2,777	5,437	6,765	8,417	**24.7**	7.0	2.2	2.2	0.02	0.07	0.10	0.12	0.14
58	149	Xã Đông Xuân	738	5,338	7,271	8,155	9,146	**24.6**	3.1	1.2	1.2	0.04	0.13	0.14	0.14	0.15
59	305	Xã Cam Thượng	1,161	8,181	16,018	19,931	24,800	**24.2**	7.0	2.2	2.2	0.06	0.20	0.30	0.35	0.40
60	267	Xã Biên Giang	673	4,647	6,066	6,536	7,043	**23.9**	2.7	0.7	0.7	0.04	0.11	0.12	0.11	0.11
61	255	Phường Yết Kiêu	139	955	1,246	1,784	2,553	**23.9**	2.7	3.7	3.7	0.01	0.02	0.02	0.03	0.04
62	297	Xã Vật Lại	581	3,980	5,195	5,599	6,033	**23.8**	2.7	0.7	0.7	0.03	0.10	0.10	0.10	0.10
63	225	Xã Vĩnh Quỳnh	518	3,506	4,577	4,932	5,314	**23.7**	2.7	0.7	0.7	0.03	0.09	0.09	0.09	0.09
64	283	Thị trấn Tây Đằng ○	235	1,588	5,529	6,661	8,025	**23.7**	13.3	1.9	1.9	0.01	0.04	0.10	0.12	0.13
65	298	Xã Chu Minh	287	1,877	2,450	2,640	2,845	**23.2**	2.7	0.7	0.7	0.02	0.05	0.05	0.05	0.05
66	221	Xã Hữu Hoà	353	2,188	2,856	3,078	3,317	**22.5**	2.7	0.7	0.7	0.02	0.05	0.05	0.05	0.05
67	210	Xã Phú Diễn	1,634	10,029	13,091	14,107	15,202	**22.3**	2.7	0.7	0.7	0.09	0.25	0.25	0.25	0.25
68	292	Xã Phú Châu	803	4,895	6,390	6,886	7,420	**22.2**	2.7	0.7	0.7	0.04	0.12	0.12	0.12	0.12
69	142	Xã Tân Dân	580	3,527	4,804	5,388	6,043	**22.2**	3.1	1.2	1.2	0.03	0.09	0.09	0.09	0.10
70	205	Xã Thụy Phương	223	1,342	1,751	1,887	2,034	**22.1**	2.7	0.7	0.7	0.01	0.03	0.03	0.03	0.03
71	306	Xã Thuần Mỹ	956	5,723	11,206	13,944	17,350	**22.0**	7.0	2.2	2.2	0.05	0.14	0.21	0.25	0.28
72	211	Xã Xuân Phương	625	3,740	4,882	5,261	5,669	**22.0**	2.7	0.7	0.7	0.03	0.09	0.09	0.09	0.09
73	156	Xã Xuân Nộn	886	5,295	7,212	8,089	9,073	**22.0**	3.1	1.2	1.2	0.05	0.13	0.14	0.14	0.15
74	262	Xã Kiến Hưng	709	4,171	5,445	5,867	6,322	**21.8**	2.7	0.7	0.7	0.04	0.10	0.10	0.10	0.10
75	202	Xã Thượng Cát	2,370	13,754	17,953	19,346	20,847	**21.6**	2.7	0.7	0.7	0.13	0.34	0.34	0.34	0.34
76	224	Xã Yên Mỹ	634	3,676	4,798	5,171	5,572	**21.6**	2.7	0.7	0.7	0.03	0.09	0.09	0.09	0.09
77	148	Xã Thanh Xuân	1,216	7,039	9,588	10,754	12,061	**21.5**	3.1	1.2	1.2	0.07	0.17	0.18	0.19	0.20
78	215	Xã Đại Mỗ	1,541	8,713	11,374	12,256	13,207	**21.2**	2.7	0.7	0.7	0.08	0.22	0.22	0.22	0.21
79	223	Xã Tứ Hiệp	1,144	6,428	8,390	9,041	9,743	**21.1**	2.7	0.7	0.7	0.06	0.16	0.16	0.16	0.16
80	203	Xã Liên Mạc	1,963	10,884	14,207	15,309	16,497	**21.0**	2.7	0.7	0.7	0.11	0.27	0.27	0.27	0.27
81	155	Thị trấn Đông Anh	1,399	7,744	10,549	11,831	13,270	**20.9**	3.1	1.2	1.2	0.08	0.19	0.20	0.21	0.22
82	206	Xã Tây Tựu	3,985	22,006	28,725	30,954	33,355	**20.9**	2.7	0.7	0.7	0.22	0.54	0.54	0.54	0.54
83	216	Xã Trung Văn	2,005	11,039	14,410	15,528	16,733	**20.9**	2.7	0.7	0.7	0.11	0.27	0.27	0.27	0.27
84	212	Xã Mỹ Đình	3,720	20,213	26,386	28,433	30,639	**20.7**	2.7	0.7	0.7	0.20	0.50	0.50	0.50	0.50
85	207	Xã Xuân Đỉnh	3,397	18,385	23,999	25,861	27,867	**20.6**	2.7	0.7	0.7	0.19	0.45	0.46	0.45	0.45
86	151	Xã Phú Cường	1,467	7,930	10,802	12,115	13,588	**20.6**	3.1	1.2	1.2	0.08	0.20	0.20	0.21	0.22
87	153	Xã Phù Lỗ	1,230	6,605	8,997	10,091	11,318	**20.5**	3.1	1.2	1.2	0.07	0.16	0.17	0.18	0.18
88	201	Thị trấn Cầu Diễn	7,733	41,390	54,029	58,221	62,738	**20.5**	2.7	0.7	0.7	0.42	1.02	1.02	1.02	1.02
89	209	Xã Cổ Nhuế	2,932	15,504	20,239	21,809	23,501	**20.3**	2.7	0.7	0.7	0.16	0.38	0.38	0.38	0.38
90	217	Thị trấn Văn Điển	652	3,431	4,479	4,827	5,201	**20.3**	2.7	0.7	0.7	0.04	0.08	0.08	0.08	0.08
91	250	Xã Tráng Việt	239	1,254	1,637	2,343	3,354	**20.2**	2.7	3.7	3.7	0.01	0.03	0.03	0.04	0.05
92	147	Xã Đức Hoà	2,337	12,205	16,625	18,646	20,913	**20.2**	3.1	1.2	1.2	0.13	0.30	0.32	0.33	0.34
93	226	Xã Ngũ Hiệp	711	3,668	4,788	5,159	5,559	**20.0**	2.7	0.7	0.7	0.04	0.09	0.09	0.09	0.09
94	144	Xã Việt Long	1,864	9,598	13,074	14,664	16,447	**20.0**	3.1	1.2	1.2	0.10	0.24	0.25	0.26	0.27

(Note) ◎ : Zone including HoaLac   ○: HoaLac's neighboring zones

Source: JICA Study Team based on TEDI's survey

3) Development projects along the No.5 Line

About the HoaLac high-tech park in connection with this business, the population and the employed population are made into the precondition of the demand forecast as followings.

HoaLac is located near No.14 Station of No. 5 line, and Xã Tản Hồng（286）and Phường Trung Sơn Trầm （279）are corresponding as zones.

Though population of Xã Tản Hồng is 25,000 as of 2011, it will be expanded to about 100,000 by 2020 and also will reach the twice by 2030. The pace of expansion in this zone has far exceeded the average of the whole Hanoi region. In addition, although the growth becomes slow in 2030 and afterwards, a pace of expansion is higher than the average.

The employed population in this zone shows the same tendency and will increase more than 10% of an annual rate till 2030.
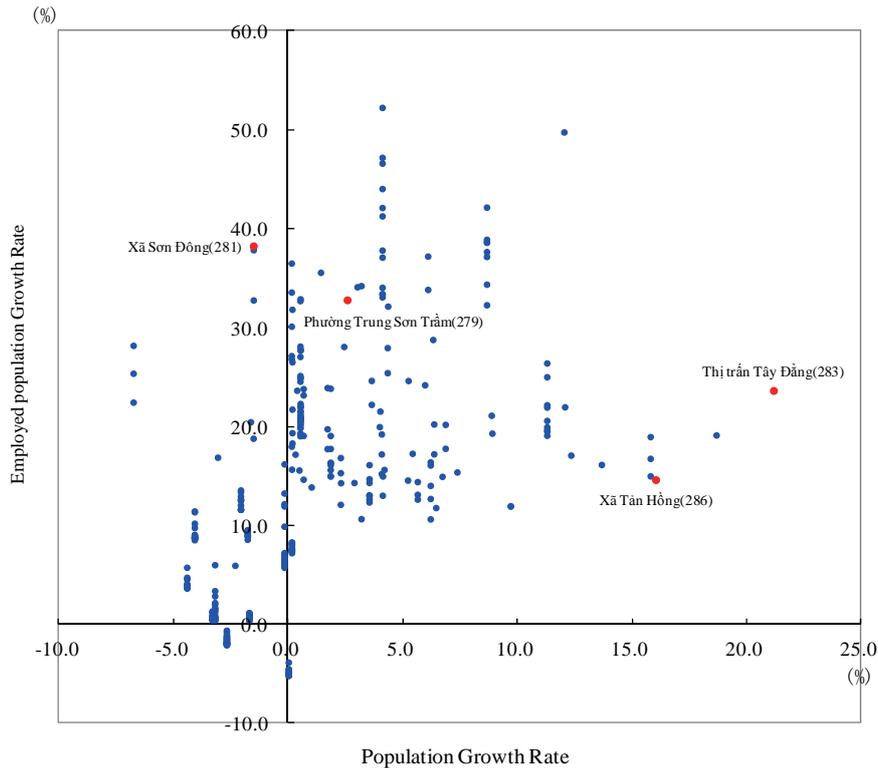
Source: JICA Study Team based on TEDI's survey

Figure 2.3.4 Increase rates of the population and of the employed population in each zone in Hanoi(2011 to 2020)
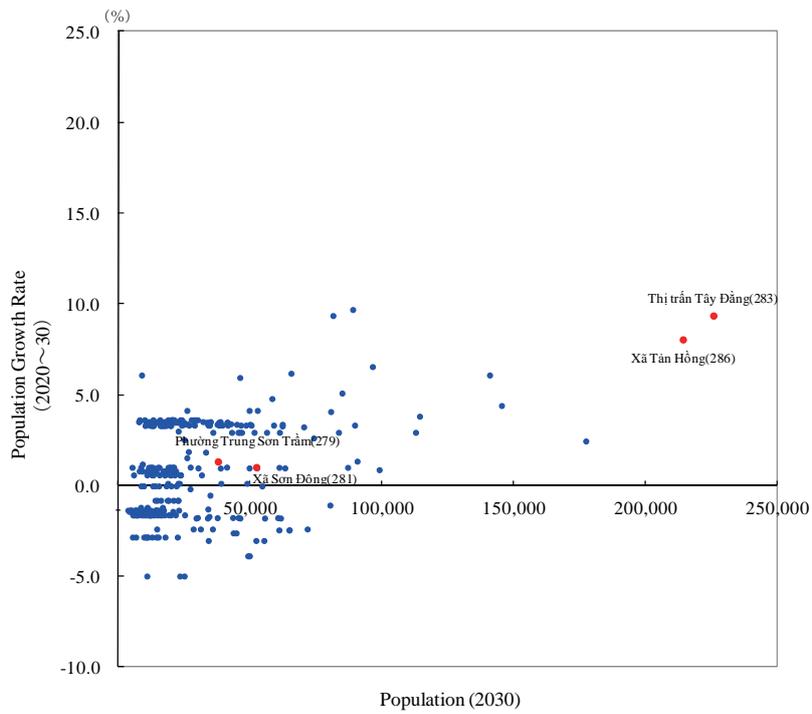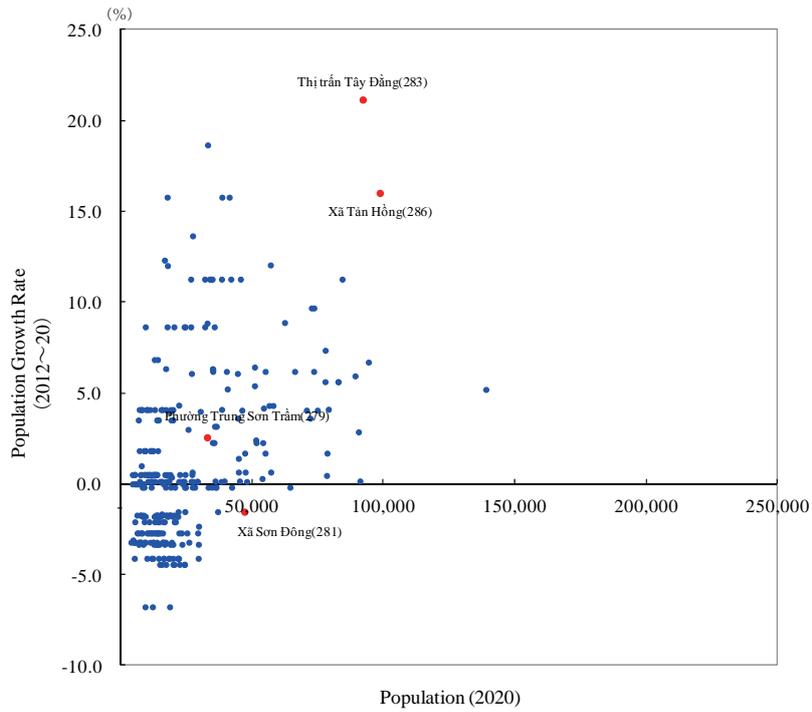
Source: JICA Study Team based on TEDI's survey
Figure 2.3.5 The population and the growth rate in each zone in Hanoi
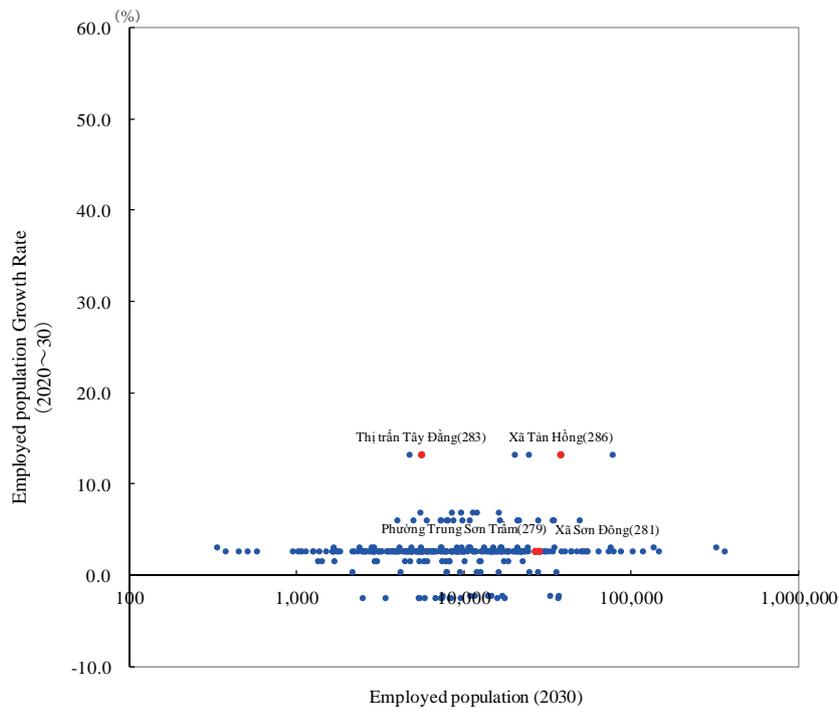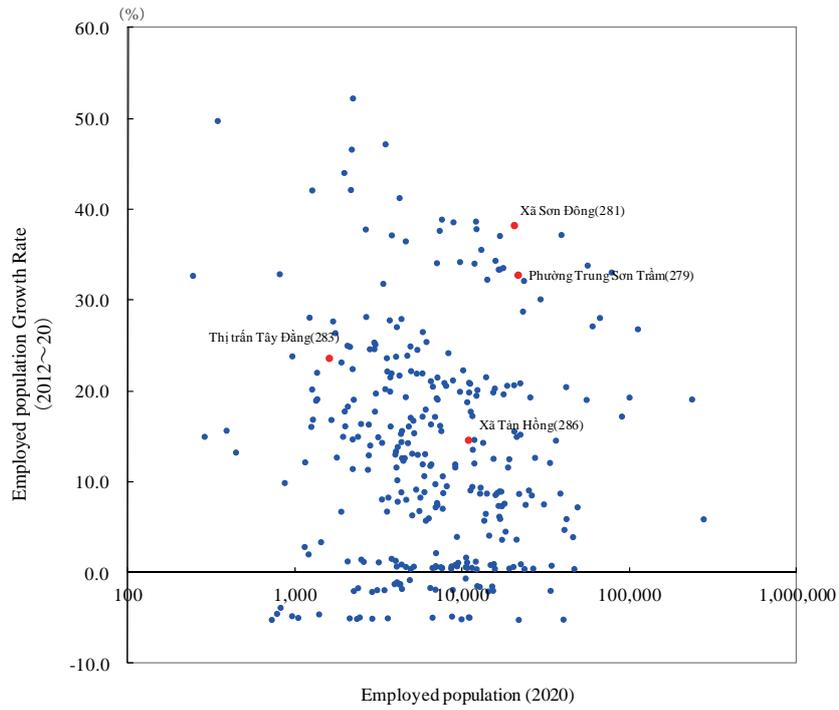
Source: JICA Study Team based on TEDI's survey

Figure 2.3.6 The employed population and the growth rate in each zone in Hanoi

(2) Amount of Traffic Generation

The amount of generation and the amount of concentration by all the purposes and all the means of transportation between each zone are dependent on the size of the population and the employed population. Since both of them are equivalent to the round trip and basically the same in figure. For this, the amount of generation (Z), total amount of each OD from the zone, is expressed followings with the population (X) and the employed population(Y).

$$Z = f(X,Y)$$
$$log(Z) = a \cdot log(X) + b \cdot log(Y) + c$$
$$Z = c \cdot X^a Y^b$$

The amount of generation (Z) from the latest person trip survey is explained by population (X) and employed population (Y) as followings. Explanatory and reappearant models are derived and statistically appropriate on t-value and a coefficient of determination (R^2).
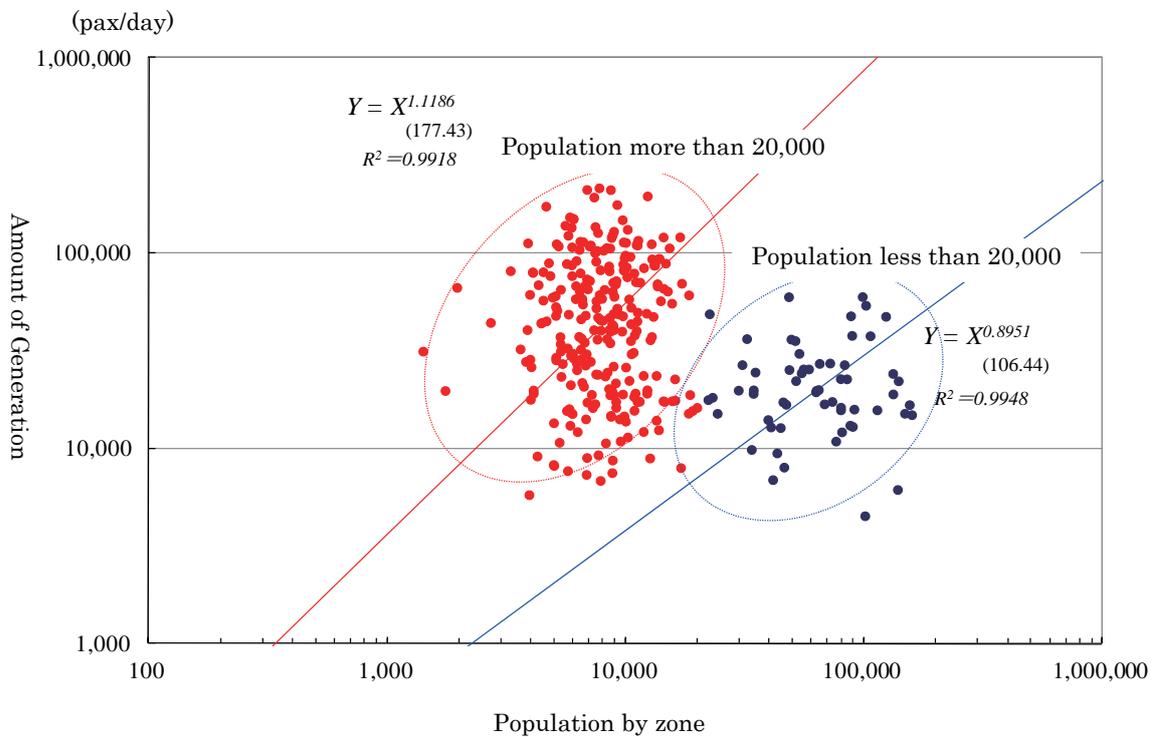
Figure 2.3.7 Amount of generation according to population in each zone (2011)

The present and future figures of amount of generation in each zone are estimated based on the preposition of population and employed population with the forecasting models. They are followings.
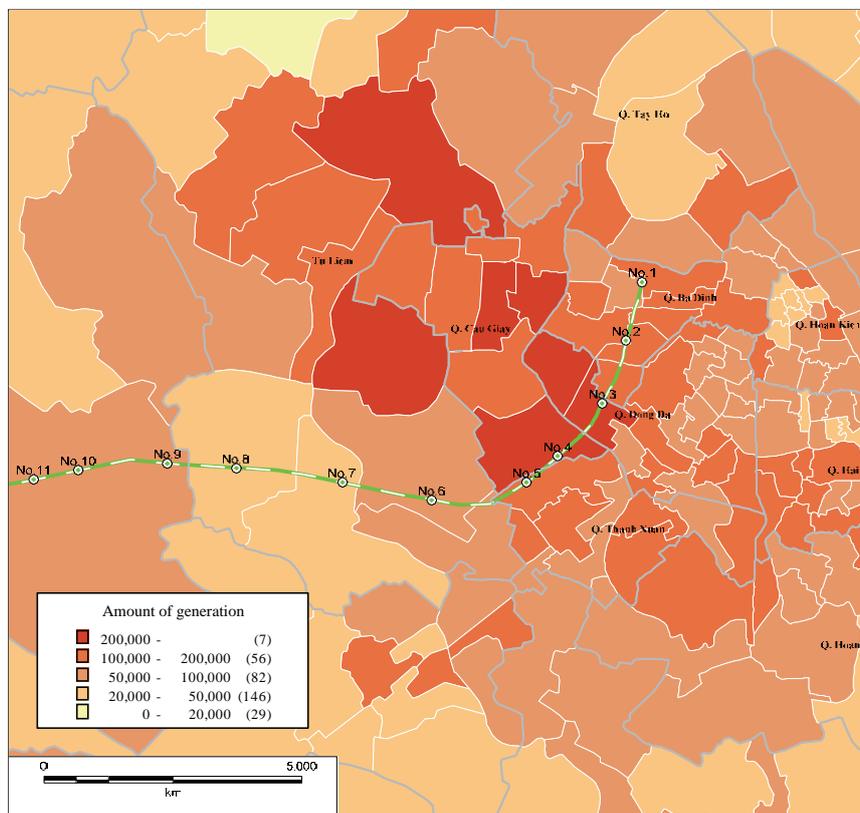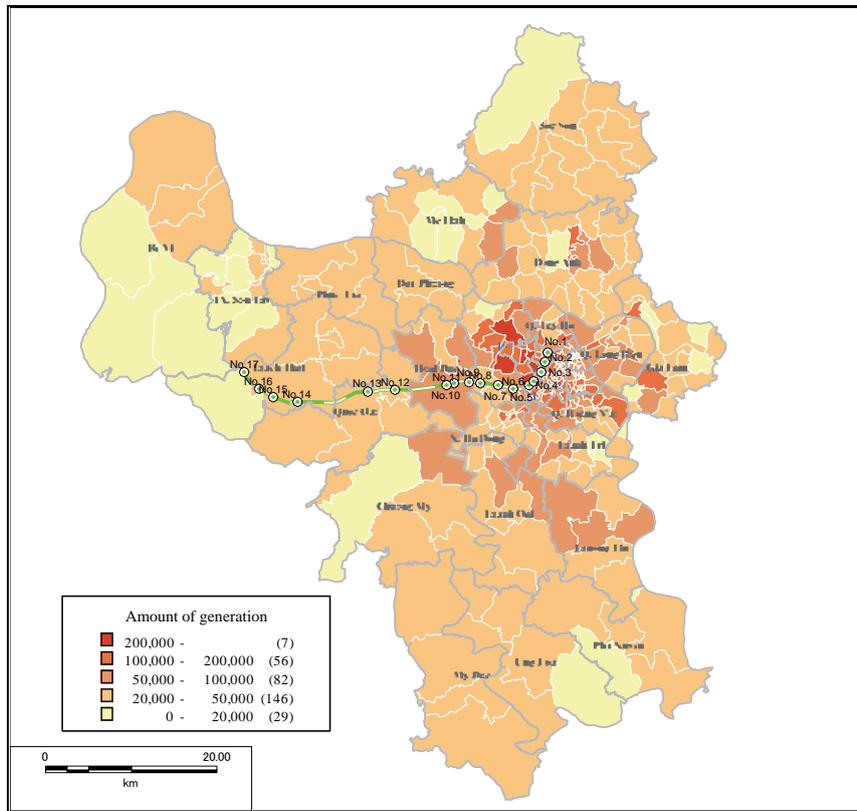
Source: JICA Study Team based on TEDI's survey

Figure 2.3.8 Amount of generation in each zone in Hanoi (2011)
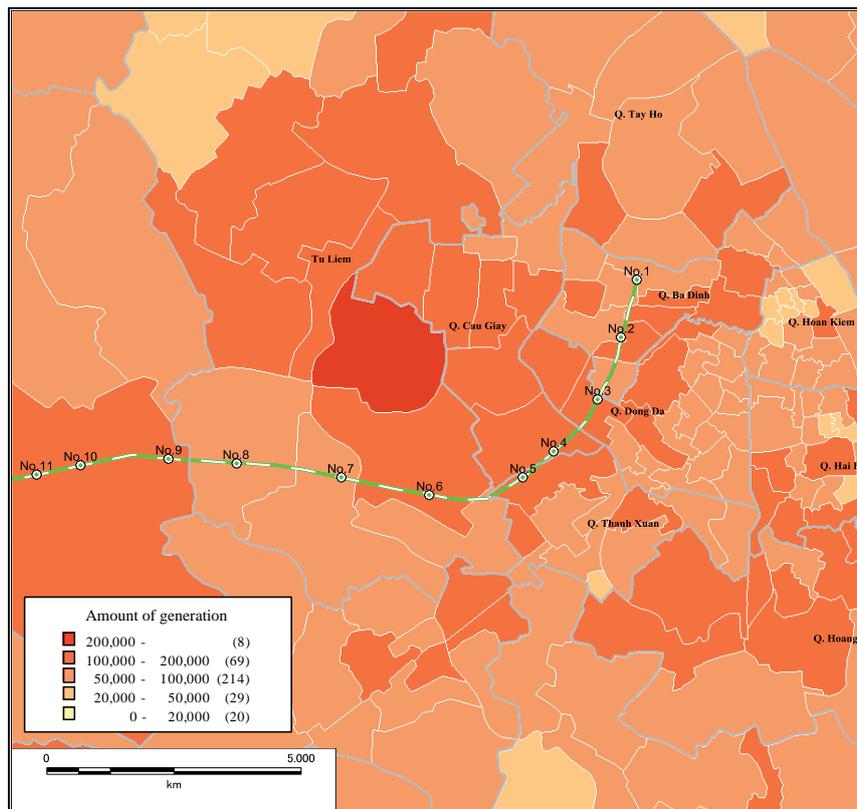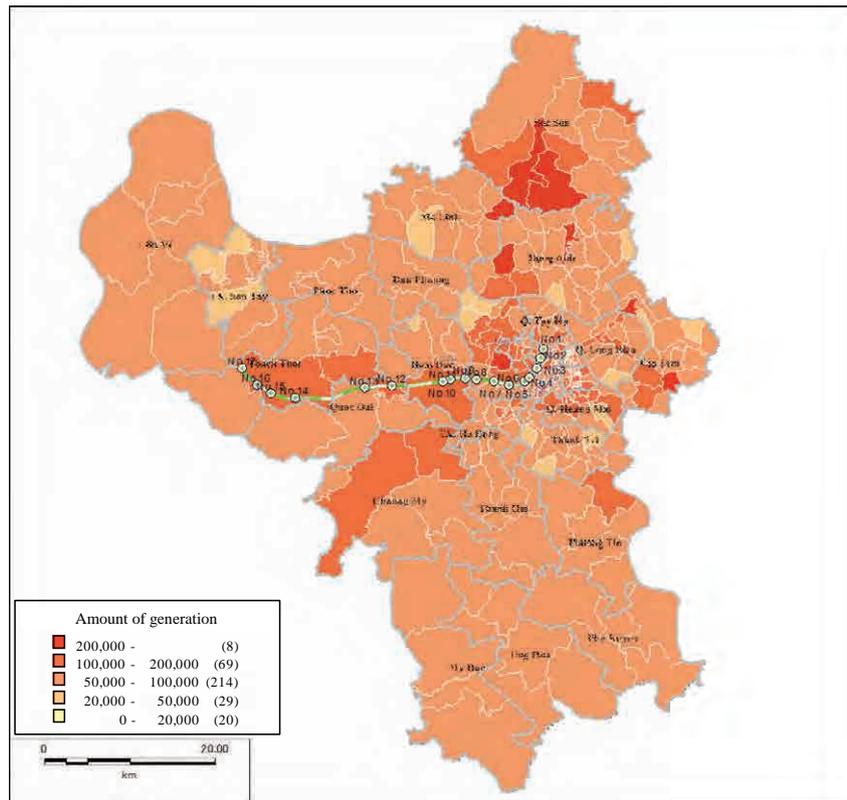
Source: JICA Study Team based on TEDI's survey
Figure 2.3.9 Amount of generation in each zone in Hanoi (2030)

On the amount of the generation in each zone, followings are pointed out with the comparison of the present (2012) and the future (2030).

- Under the present condition (2012), zones with much amount of generation are concentrated in the central part of the city. Along the No. 5 line, many zones where No.3 to No.5 stations located have much amounts of generation.
- In the future (2030), zones with much amount of generation will expand in the suburban part. The zones with many amount of generation will be concentrating to the southwest part including Hoa Lac, northern part and southeast part.
- The amount of generation will expand with more than 10% increase rate in Xã Tản Hồng (286) where Hoa Lac is located and in its neighboring Phường Trung Sơn Trầm (279).
- In the future (2030), amount of generation are decreasing in some zones in central part s of the city rather than figures (2012).

Since the amount of generation in each zones depends on the size of the population and the employed population, the above-mentioned is considered reflecting the tendency of the suburbanization of population.

2.4 Preconditions of demand forecast

(1) Station converge area

The station coverage area for railway demand forecasting is based on the shape of 2km circle in radius centering on the No.1 to No.11 stations supposing the moveable area on foot in central part of the city. About No.12 to No.17 station, supposing the formation of the feeder transportation network connecting to the railway stations by a bus, considering the distance between stations, the station coverage area is based on the of 6km circle in radius.
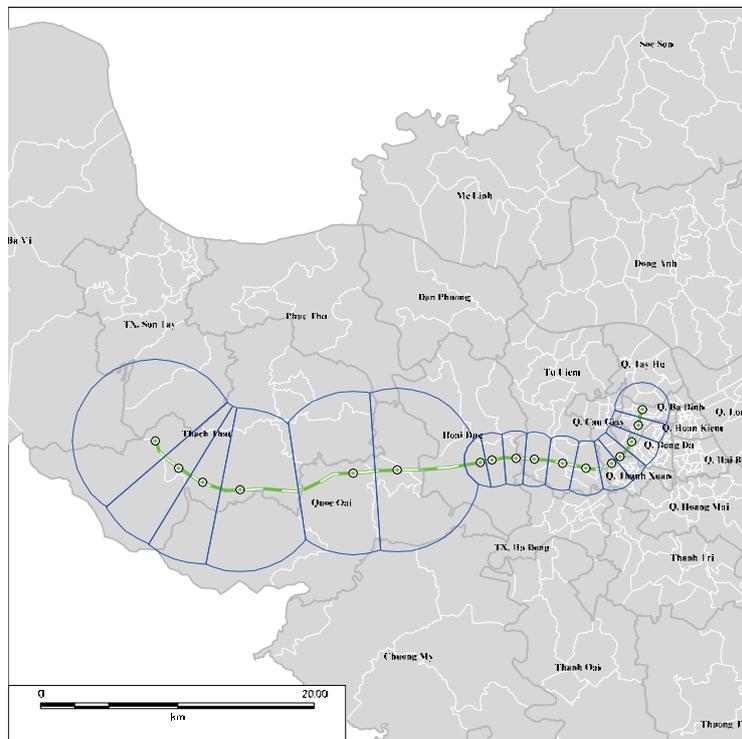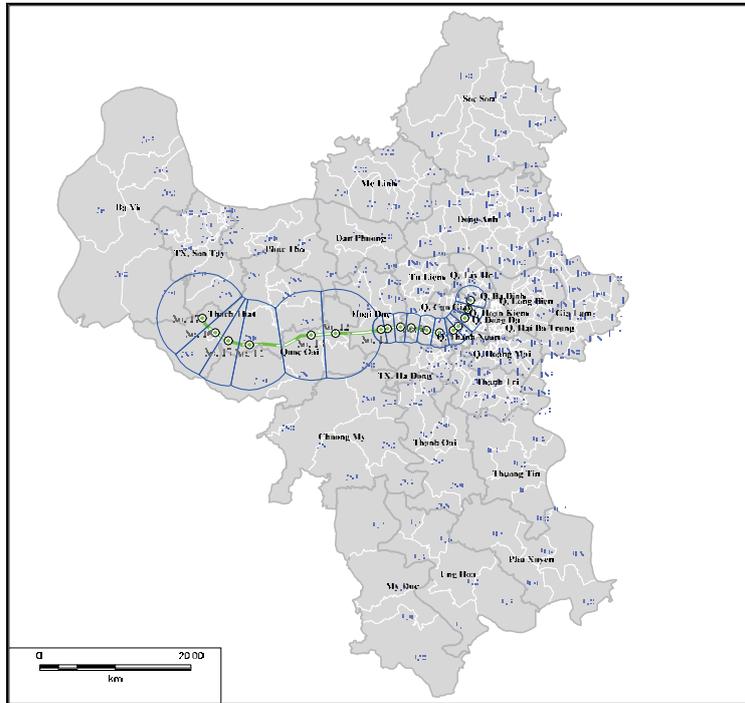
Source: JICA Study Team

Figure 2.4.1 Station coverage area for demand forecasting
(Concentric circles divided by Voronoi method)

In order to predict the connection passengers with the Hanoi No. 2 line connecting at No.1 station of the Hanoi No. 5 line and No. 3 line connecting at No.2 station, station coverage area of these two lines are set the range 2 km in radius in the same way of Hanoi No.5 line.

The area along No. 2 line and No. 3 line are divided into "A:No. 2 line (a northern part)", "B:No. 3 line (a western part)" and "C:No. 2 line and a No. 3 line (an eastern part and a southern part)" and the relation with No.5 line is set as followings.

In the section between No.1 to No.11 station of No. 5 line, it is supposed that passengers will not generating because the section is parallel to sections B and C and stations of those sections are very close to each other. Then only the connection passengers between section of No.12 to No.17 station of No.5 line (the suburban section) and the sections B and C, the demand will be counted as a demand.

The demand between section A and No.5 line will be counted all because the section A and No.5 line extend toward different directions.
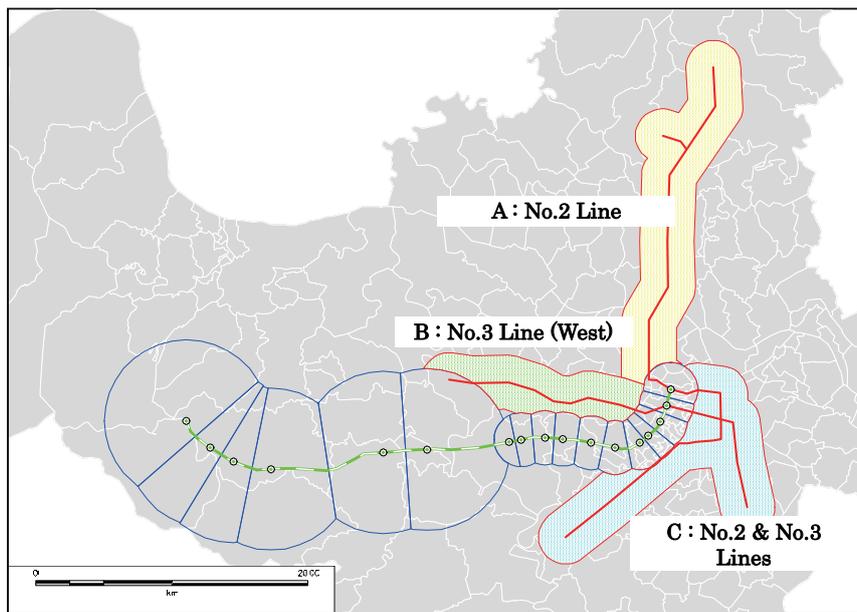
Source: JICA Study Team

Figure 2.4.2 Station coverage area for demand forecasting (No.2 line and No.3 line)

Table 2.4.1 Connecting passengers between No.5 line and other lines

	A:No.2 line (North)	B:No.3 line (West)	C: No.2 and No.3 line (East and South)
Central part along No.5 line (No.1 to No.11 Station)	○	No counts (movable on foot or by bus)	No counts (movable on foot or by bus)
Suburban part along No.5 line (No.12 to No.17 Station)	○	○	○

(note) ○: Count connecting passengers

Source: JICA Study Team

The area set by the above method overlap neighboring area each other without blank area along lines. Since the distance between stations is especially short in the central part, the parts of overlapping become large. Then it is assumed that the demand will be predicted excessively.

For this reason, the bases of the above-mentioned area are so divided that the demands of passengers in the overlapping area are contained the nearest station coverage area with Volonoi diagram. It is known as the method of the quantitative geography which divides area by the perpendicular bisector of the line segment connects between 2 points.

(2) Zone divided by station coverage area

Each station coverage area includes two or more zones divided administratively. In "Hanoi Urban Railway Construction Investment Project" by TEDI, amounts of generation in every OD between 320 zones are counted and predict the figures in the future.

In this survey, in order to convert ODs according to the zones into ODs according to each station coverage area, zones are divided on the boundary of each station coverage area. Then proportional share contained by station coverage area are calculated to multiple to ODs according to zones and derive ODs according to each station coverage area.
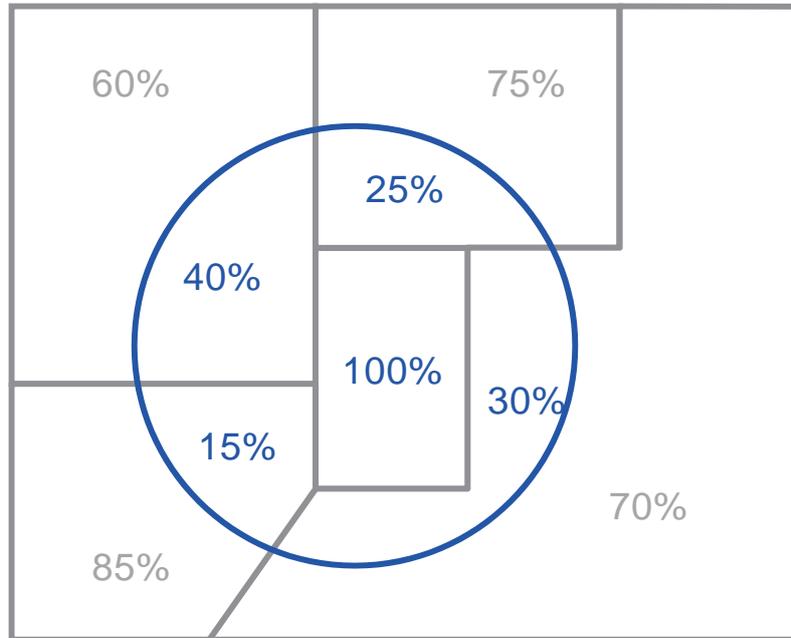
Source: JICA Study Team

Figure 2.4.3 Division of zone by each station coverage area (area proportional division)

(3) Transport shares

Transport share is a parameter for deriving the demand of railway passengers from the amount of generation OD estimated by each station coverage area.

In cities where existing transportation, buses, railways, motor vehicles and bikes are already improved, it is possible to derive the change of transport shares mathematically if the conditions either a time or cost factor of them will be changed. For example, it is a method of figuring out the transport shares that using the function model estimated by present condition of total costs (defined "sacrifice") consists of time and costs (fare) and deriving the transport shares respond to the change of costs and time.

In this survey, it is not possibly to apply the method directly because of not being urban railway system in Hanoi. However the share of urban railway system is trying to be estimated based on the present share and conditions of buses, only one of the public transportation in Hanoi. From this, when an average fare is 0.5USD (2012 price), the share of urban railway system will become about 15%.

Moreover, in this survey, the target value (20.5%) of urban railway system (UMRT) in "HIDEP" and the cities in other Asian countries are taken into consideration.

Although the share of the urban railway system is exceeding 30% only in Japan, the share in Singapore where the urban transportation is highly sophisticated is 12%, the shares in Manila and in Jakarta are only 2%.

It is considered that the share of No. 5 line should be set more conservatively than the figure of HAIDEP.
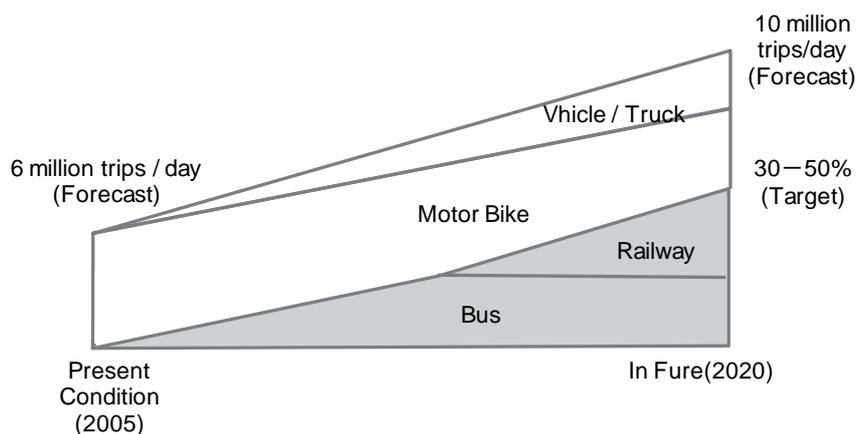
Source: HAIDEP

Figure 2.4.4 The present shares and the future target figures in Hanoi

Table 2.4.2 The present shares and the future target figures in Hanoi

Mode		2005		2020			
				with UMRT		without UMRT	
		(1000 trips / day)	(%)	(1000 trips / day)	(%)	(1000 trips / day)	(%)
Private Mode	Bicycle	1,579	25.3	374	3.8	372	3.8
	Motre Bike	3,396	63.2	5,777	58.7	5,206	52.9
	Vehicle/Taxi	227	3.6	1,921	19.5	1,555	15.8
	Others	69	1.1	350	3.5	350	3.5
	Sub total	5,811	93.3	8,422	86.5	6,896	70.0
Public Mode	UMRT	—	—	—	—	2,012	20.5
	Bus	420	6.7	1,426	14.5	940	9.5
	Sub Total	420	6.7	1,426	14.5	2,364	30.0
Total		6,321	100.0	9,848	100.0	9,848	100.0

Source: HAIDEP

Table 2.4.3 The comparison of the transit shares in Asian countries

City / Mode		Hanoi 2005	HCMC 2002	Manira 1996	Jakarta 2002	Singapore 1993	Tokyo 1998
Private Mode		**93.3**	**94**	**22**	**42**	**34**	**64.1**
	Bicycle	25.3	17	—	4	—	—
	Motre Bike	63.2	75	1	21	6	21.5
	Vehicle/Taxi	3.6	1	25	15	19	42.6
	Othres	1.1	1	2	2	9	—
Public Mode		**6.2**	**6**	**78**	**58**	**66**	**35.9**
	Bus	6.7	2	17			
	UMRT	—	—	2	—	—	—
	Others	—	4	53	—	—	—
Road Ratio (km/km^2)		4.2	—	10.7	—	—	—
Urban Railway Length (km)		— (142)	— (29)	43.9 (30)	— (170)	109	300 (657)

(Notes) 1) Only in Urban areas.

2) Figures in parenthesis are referd to as a part of the length of some inter-city railways in the city

3) Only in Tokyo 23-wards. Total length in Tokyo Metropolitan Area is 2,100km.

4) Original Source : JICA(HCMC, Manira, Jakarta) / Tokyo Metropolitan Area's Person-Trip Survey, etc.

Source: HAIDEP

In addition, the fare level and per capita GDP of main countries in Asia are compared as one of the setting bases. In Singapore, where the total amount of motor traffic is regulated and use of public traffic is promoted, the fare of the urban railway is controlled politically low level to the

level of the Per capita GDP.

When setting a fare level, it will be also takes into consideration about the consumption of the purchase, maintenance and fuel cost of the motorbike as a daily means of transportation.

Table 2.4.4 The fare level of the urban transport of the Asian countries

	Hong Kong	South Korea (Seoul)	Singapore	Thailand (Bangkok)	Indonesia (Jakarta)	Vietnam (Settings)
①Average Fare Level (Mean)	1.95	1.05	1.04	0.75	0.37	0.50
②Per capita GDP	31,500	20,600	43,100	4,990	9,896	1,170
Index(①/②)	0.006 %	0.005 %	0.002 %	0.015 %	0.0037 %	0.042 %

Source: JICA Study Team

2.5 Result of demand forecast

In order to figure out the future prediction after the project will be operating.

(1) Railway passenger demand

The railway passenger demand of No.5 line demand (the first phase section) at the 2021 will be 171,000 passengers / day including connection passengers with a No. 2 and No.3 line. The demand at 2030 when the second phase section started to operate will be 432,000 pax / day containing the effect of population increase in Hoa Lac.

Table2.5.1 Result of demand forecast　　(thousand pax / day)

Sections ＼ Time	2011	2021	2030	2040	2040 (share up)	2040 [Trial*]
No.5 Line passengers (Station.1 to St.10)	166.5	157.7	226.9	228.0	(321.7)	[227.8]
No.2 Line connecting passengers	16.6	13.5	11.1	11.2	(16.9)	[11.2]
No.5 & No.2 Lines connecting passengers	183.1	171.3	238.1	239.3	(338.6)	[239.0]
No.5 Line passengers (Station.1 to St.17)	199.1	221.3	399.6	410.6	(565.1)	[409.6]
No.2 & No.3Lines connecting passengers	30.0	30.4	32.1	33.0	(49.5)	[32.5]
No5.Line pax No.2 & No.3Line connecting pax	229.1	251.7	431.8	443.6	(614.6)	[442.1]

(Note1) "2040 (share up)" is the estimated value in case of each share added 5 points.
　　(Ref. Table 2.5.2)
(Note2) The trial calculation value based on the updated estimate of population (November, 2012) by TEDI.

Source: JICA Study Team

(Supplement)

The traffic OD compatible with the Hanoi construction master plan (the 2011 status quo, the 2020 prediction, and 2030 forecast) was received from TEDI by study team in June 2012. The demand forecast of the Hanoi No. 5 line is induced by the OD.

In addition, the data of the population and employed population in Hanoi according to 500 zones (in 2011 status quo, 2020, 2030, and 2050) is also received. The forecast in 2040, in the middle point between 2030 and 2040, is estimated with using the supplement of the population and employed population in 2040.

In November 2012, the study team was informed the population data (in 2020, 2030, and 2050) updated by TEDI and received the data. The traffic OD according to 320 zones in 2020 and 2050 estimated by TEDI is not updated in November 2012. However it is possible that the OD will be updated for the conclusion of the Hanoi construction master plan

For this reason, the study team tested the difference between the former estimation and the re-estimation with the updated data on demand forecast of the Hanoi Line 5 (Refer to Table 2.5.1). As a result, since the difference is very as slight as about 100 passenger a day, it can be judged that the influence on the operation program and the revenue and expenditure are negligible.

The transport share of railway passengers is set 10% at the beginning of the operation with considering the cases in Asian countries.　The share is set 15% at the beginning of the operation on the second phase section in 2030 with the assumption of the urban railway's becoming

established and the substantial feeder networks.

In addition, the share between neighboring stations in central part of the city is set 5% at the beginning and 10% in 2030 because the distance between stations are about 1 or 2 km within the area on foot.

Table 2.5.2 Preconditions and the transport shares for the demand forecast　　(%)

Sections / Time	2012	2021	2030	2040	2040 (share up)
No.5 Line except between neighboring stations	10.0	10.0	15.0	15.0	(20.0)
No.5 Line between neighboring stations	5.0	5.0	10.0	10.0	(15.0)
No.2 and No.3 Lines	10.0	10.0	10.0	10.0	(15.0)

Source: JICA Study Team

(2) Difference between this study's result and the result by TEDI

Although the common data on the amount of generation (OD) is used for these two demand forecasts, that of this study and that of TEDI, TEDI's is more than 3 or 4 times bigger than that of this study in figures.

The reason why this difference is occurred is followings.

- TEDI's uses the OD between each zone directly. This study's uses the station coverage area and considers that the amount of generation in outside of each station coverage area will not realize.
- TEDI's applies the HIDEP's target figures as the transportation share (20-30%). This study's considers it 10% at the beginning of operation and 15% after 2030 with referring the case in Asian countries.

(3) Demand in OD matrix between stations

On demand forecast in OD matrix between stations in figures, the demand of No.13 or No.14 station will be expanded rapidly in 2021 to 2030. It is thought that the amount of generation expanded especially No.14 station because of the population growth by the development in Hoa Lac.

Between stations in central part of the city, there are some sections declining the demand in 2020 to 2030.

Table 2.5.3 Demand in OD matrix of present reproduction

(pax / day)

Railway Pssenger Demand (2011)

Org\Dst.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	A	B	C	No.1~10	No.1~17	Total
1	0	8,858	9,717	4,108	3,383	821	697	186	258	106	99	567	186	94	51	21	47	0	0	0	28,135	29,201	29,201
2	9,149	0	7,896	5,697	4,368	1,089	1,032	261	145	123	67	538	232	61	27	25	57	2,951	0	0	29,760	30,768	33,719
3	9,954	8,178	0	4,427	7,209	1,351	1,243	323	323	190	137	739	185	53	26	31	114	3,272	0	0	33,198	34,482	37,754
4	4,304	5,671	4,448	0	5,800	1,414	828	259	262	133	121	391	158	40	21	22	39	993	0	0	23,119	23,912	24,905
5	3,703	4,625	7,458	5,879	0	2,076	2,359	354	323	200	179	599	154	42	23	23	40	1,094	0	0	26,977	28,036	29,130
6	828	1,291	1,935	1,734	2,074	0	1,405	586	160	16	15	238	129	52	21	8	14	153	0	0	10,030	10,508	10,661
7	791	1,322	1,714	1,072	2,207	1,407	0	340	251	33	33	290	224	88	34	10	15	155	0	0	9,137	9,832	9,987
8	174	268	363	278	365	593	345	0	316	105	106	225	19	7	4	3	6	42	0	0	2,806	3,176	3,218
9	203	149	396	316	361	160	251	316	0	153	284	642	43	20	12	14	7	32	0	0	2,306	3,328	3,360
10	106	123	190	133	199	16	33	104	152	0	259	630	39	18	11	13	5	9	0	0	1,056	2,032	2,041
11	99	67	137	121	178	15	33	105	284	259	0	571	38	18	11	13	4	7	104	157	1,298	1,952	2,220
12	692	398	742	393	747	232	275	224	642	631	571	0	1,435	305	134	105	80	232	1,755	2,013	4,976	7,607	11,607
13	186	232	184	159	154	87	141	19	44	39	38	1,458	0	1,050	360	281	174	50	554	725	1,245	4,606	5,935
14	94	61	53	41	42	40	64	7	20	18	18	317	1,059	0	878	513	337	19	142	258	440	3,562	3,981
15	52	27	19	21	19	22	35	4	12	11	11	138	365	878	0	429	335	8	50	102	226	2,382	2,541
16	21	25	31	18	20	8	10	3	14	13	13	105	281	513	429	0	507	7	24	57	164	2,012	2,100
17	47	54	114	35	36	14	15	7	7	5	4	81	175	337	335	506	0	24	44	178	335	1,773	2,018
A	0	2,654	2,844	975	1,074	150	156	42	32	9	7	233	50	19	8	7	24	0	0	0	7,936	8,283	8,283
B	0	0	0	0	0	0	0	0	0	0	99	1,749	903	177	50	24	42	0	0	0	0	3,044	3,044
C	0	0	0	0	0	0	0	0	0	0	155	1,997	726	258	102	57	177	0	0	0	0	3,471	3,471
No.1~10	29,212	30,485	34,118	23,643	25,967	8,928	8,194	2,728	2,192	1,058	1,300	4,860	1,369	475	230	171	345	8,700	0	0	166,525	175,207	183,976
No.1~17	30,403	31,350	35,404	24,428	27,165	9,345	8,768	3,097	3,213	2,035	1,956	7,529	4,722	3,577	2,377	2,018	1,783	9,046	2,674	3,489	175,207	199,169	214,377
Total	30,403	34,005	38,247	25,403	28,238	9,495	8,924	3,139	3,245	2,043	2,217	11,508	6,401	4,030	2,536	2,105	2,026	9,046	2,674	3,489	183,143	213,966	229,175

Source: JICA Study Team

Table 2.5.4 Demand in OD matrix in future forcaste

(pax / day)

Railway Pssenger Demand (2021)

Org\Dst.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	A	B	C	No.1~10	No.1~17	Total
1	0	8,634	8,236	3,507	3,067	933	924	201	230	115	99	655	306	139	71	42	81	0	0	0	25,846	27,239	27,239
2	8,786	0	6,983	4,964	4,003	1,142	1,149	243	165	119	80	609	322	105	49	42	82	2,548	0	0	27,553	28,842	31,391
3	8,369	7,168	0	4,161	6,555	1,522	1,328	292	247	143	111	691	280	95	46	45	106	2,137	0	0	29,786	31,158	33,295
4	3,603	4,955	4,178	0	5,093	1,617	1,098	278	216	106	94	449	224	71	35	32	53	800	0	0	21,144	22,104	22,903
5	3,236	4,174	6,796	5,141	0	2,162	2,582	357	275	150	132	636	252	82	41	37	61	858	0	0	24,872	26,113	26,971
6	973	1,307	1,868	1,807	2,176	0	2,184	638	217	43	39	375	202	77	34	19	32	216	0	0	11,212	11,990	12,205
7	1,030	1,368	1,603	1,260	2,547	2,190	0	463	372	64	59	421	262	98	42	21	32	228	0	0	10,899	11,834	12,062
8	203	244	298	279	357	631	461	0	417	99	94	316	65	22	11	9	15	59	0	0	2,989	3,520	3,579
9	211	168	272	234	288	213	366	417	0	225	430	1,004	106	39	19	18	17	36	0	0	2,395	4,028	4,065
10	118	122	146	108	151	42	63	100	225	0	433	974	83	30	15	14	11	14	0	0	1,075	2,636	2,650
11	101	82	113	95	134	38	58	95	430	433	0	916	77	28	13	13	10	11	105	160	1,580	2,637	2,914
12	744	548	710	461	719	368	406	320	1,006	975	917	0	3,605	680	191	153	159	309	2,038	2,474	6,256	11,961	16,782
13	321	338	291	233	260	168	211	67	109	85	78	3,644	0	2,791	806	543	439	129	646	1,184	2,082	10,383	12,342
14	146	111	99	75	85	69	85	23	41	31	29	699	2,803	0	2,656	1,518	1,157	47	170	400	765	9,628	10,245
15	75	51	47	35	41	34	42	11	20	15	14	196	810	2,656	0	1,374	1,176	19	61	156	372	6,598	6,834
16	44	45	46	30	35	19	21	9	19	15	13	154	542	1,517	1,374	0	1,671	16	39	108	283	5,553	5,715
17	83	81	107	51	58	31	31	16	17	11	10	156	434	1,150	1,172	1,666	0	47	81	286	487	5,075	5,489
A	0	2,466	2,009	794	847	203	220	60	36	14	11	310	128	46	18	16	49	0	0	0	6,648	7,226	7,226
B	0	0	0	0	0	0	0	0	0	0	103	2,025	794	183	60	38	80	0	0	0		3,283	3,283
C	0	0	0	0	0	0	0	0	0	0	155	2,399	1,134	380	149	104	283	0	0	0		4,605	4,605
No.1~10	26,530	28,140	30,379	21,462	24,237	10,452	10,155	2,989	2,362	1,065	1,569	6,130	2,102	759	363	280	490	6,895			157,771	169,465	176,360
No.1~17	28,044	29,396	31,792	22,442	25,568	11,180	11,009	3,531	4,004	2,630	2,630	11,896	10,372	9,581	6,575	5,548	5,101	7,474	3,140	4,768	169,596	221,300	236,682
Total	28,044	31,862	33,801	23,236	26,415	11,383	11,229	3,591	4,040	2,644	2,899	16,630	12,428	10,191	6,803	5,705	5,513	7,474	3,140	4,768	176,244	236,413	251,795

Railway Pssenger Demand (2030)

Org\Dst.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	A	B	C	No.1~10	No.1~17	Total
1	0	14,744	9,301	3,987	3,680	1,370	1,561	283	271	162	128	978	630	258	126	103	173	0	0	0	35,360	37,754	37,754
2	14,804	0	10,927	5,748	4,850	1,562	1,657	299	242	152	122	894	565	226	109	88	148	2,138	0	0	40,242	42,393	44,531
3	9,385	11,127	0	6,876	7,887	2,221	1,848	350	253	146	120	853	533	209	100	81	130	1,394	0	0	40,093	42,120	43,514
4	4,025	5,752	6,900	0	7,918	2,390	1,855	390	238	114	97	666	403	156	74	60	93	630	0	0	29,582	31,131	31,761
5	3,756	4,988	8,192	7,965	0	3,918	3,670	470	311	151	132	881	516	196	92	74	116	659	0	0	33,422	35,429	36,089
6	1,474	1,731	2,372	2,459	3,972	0	5,674	901	374	137	119	741	395	144	67	53	84	282	0	0	19,095	20,698	20,979
7	1,713	1,849	1,979	1,911	3,797	5,700	0	1,072	695	152	131	772	396	142	65	52	84	310	0	0	18,868	20,509	20,819
8	307	295	327	366	458	876	1,046	0	933	123	111	560	251	85	38	30	46	77	0	0	4,730	5,850	5,927
9	287	244	254	235	308	361	675	935	0	557	817	1,966	311	96	40	32	48	38	0	0	3,856	7,166	7,204
10	170	160	151	118	155	134	147	126	558	0	901	1,888	214	63	25	20	30	21	0	0	1,718	4,861	4,882
11	135	129	126	101	135	116	128	114	818	902	0	1,840	191	55	21	17	25	16	100	161	2,704	4,853	5,131
12	1,040	956	894	696	910	731	755	579	1,977	1,892	1,842	0	10,822	1,834	346	282	385	383	2,185	2,941	10,431	25,941	31,450
13	689	621	574	432	546	401	397	266	325	223	198	10,893	0	8,815	2,179	1,286	1,322	292	695	1,820	4,473	29,167	31,974
14	285	251	228	169	209	148	144	91	102	67	58	1,866	8,827	0	9,428	5,284	4,599	102	188	586	1,694	31,755	32,630
15	138	120	108	79	98	68	65	40	42	27	22	353	2,179	9,424	0	5,138	4,773	40	69	227	784	22,673	23,008
16	112	97	86	64	78	53	52	32	33	21	17	284	1,280	5,275	5,134	0	6,406	33	56	190	627	19,023	19,301
17	179	154	133	96	117	81	79	47	48	30	25	372	1,289	4,547	4,743	6,385	0	84	130	433	964	18,324	18,971
A	0	2,225	1,417	636	659	256	288	80	38	20	15	386	287	100	39	34	91	0	0	0	5,619	6,570	6,570
B	0	0	0	0	0	0	0	0	0	0	99	2,155	659	177	65	53	132	0	0	0		3,341	3,341
C	0	0	0	0	0	0	0	0	0	0	154	2,800	1,676	533	208	177	427	0	0	0		5,976	5,976
No.1~10	35,921	40,890	40,403	29,665	33,024	18,532	18,133	4,826	3,875	1,694	2,679	10,198	4,213	1,575	736	594	953	5,550	0	0	226,965	247,912	253,462
No.1~17	38,499	43,216	42,550	31,302	35,117	20,131	19,753	5,995	7,222	4,855	4,841	25,806	28,801	31,524	22,587	18,986	18,462	6,500	3,422	6,358	248,641	399,647	415,927
Total	38,499	45,441	43,967	31,938	35,777	20,387	20,041	6,075	7,260	4,875	5,109	31,147	31,424	32,334	22,899	19,250	19,112	6,500	3,422	6,358	254,260	415,535	431,814

Railway Pssenger Demand (2040)

Org\Dst.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	A	B	C	No.1~10	No.1~17	Total
1	0	14,885	9,297	3,973	3,678	1,418	1,615	294	280	166	132	1,003	652	268	131	108	183	0	0	0	35,605	38,081	38,081
2	14,945	0	10,799	5,660	4,789	1,599	1,697	307	247	154	123	907	578	232	112	92	155	2,138	0	0	40,196	42,394	44,533
3	9,381	10,997	0	6,717	7,727	2,256	1,877	357	256	146	121	858	540	213	102	83	135	1,394	0	0	39,715	41,768	43,163
4	4,011	5,665	6,741	0	7,742	2,426	1,881	395	240	114	98	669	407	159	75	62	97	630	0	0	29,215	30,781	31,411
5	3,755	4,926	8,028	7,788	0	4,034	3,780	483	318	153	134	892	525	201	94	77	121	659	0	0	33,263	35,306	35,966
6	1,524	1,772	2,410	2,496	4,088	0	5,986	952	394	143	124	774	416	153	71	57	91	282	0	0	19,765	21,451	21,732
7	1,772	1,894	2,011	1,938	3,909	6,013	0	1,131	732	159	137	806	416	150	69	56	90	310	0	0	19,560	21,283	21,594
8	318	303	333	372	470	925	1,104	0	985	128	116	585	264	90	40	32	49	77	0	0	4,938	6,115	6,192
9	297	249	257	237	314	379	711	988	0	576	844	2,034	325	101	42	34	51	38	0	0	4,008	7,441	7,479
10	174	162	152	118	156	140	154	132	577	0	931	1,951	223	66	26	21	32	21	0	0	1,764	5,015	5,037
11	138	131	126	101	137	122	133	119	846	931	0	1,901	199	57	22	18	27	16	100	161	2,785	5,009	5,286
12	1,067	970	900	699	921	764	789	605	2,046	1,955	1,902	0	11,327	1,943	363	298	411	383	2,185	2,941	10,715	26,959	32,468
13	713	635	581	437	556	422	418	280	340	232	206	11,401	0	9,385	2,307	1,381	1,426	292	695	1,820	4,614	30,720	33,527
14	296	258	232	172	214	157	152	97	108	70	61	1,976	9,397	0	9,990	5,688	4,963	102	188	586	1,755	33,830	34,705
15	144	123	110	81	100	72	69	42	45	28	24	371	2,306	9,985	0	5,535	5,151	40	69	227	813	24,185	24,520
16	117	100	88	65	81	57	55	34	35	22	18	301	1,375	5,678	5,531	0	6,940	33	56	190	655	20,498	20,777
17	190	161	138	99	122	87	86	50	51	32	26	398	1,389	4,906	5,118	6,918	0	84	130	433	1,017	19,772	20,419
A	0	2,247	1,417	635	660	267	299	84	40	20	15	399	299	105	41	36	98	0	0	0	5,670	6,663	6,663
B	0	0	0	0	0	0	0	0	0	0	102	2,224	686	185	68	56	141	0	0	0		3,462	3,462
C	0	0	0	0	0	0	0	0	0	0	159	2,877	1,736	553	216	186	453	0	0	0		6,179	6,179
No.1~10	36,177	40,853	40,027	29,298	32,874	19,189	18,805	5,037	4,029	1,741	2,760	10,479	4,346	1,632	763	621	1,005	5,550	0	0	228,030	249,636	255,186
No.1~17	38,842	43,230	42,202	30,953	35,005	20,870	20,506	6,265	7,499	5,011	4,997	26,825	30,340	33,587	24,094	20,459	19,923	6,500	3,422	6,358	250,384	410,609	426,889
Total	38,842	45,477	43,620	31,589	35,665	21,137	20,805	6,349	7,539	5,031	5,273	32,324	33,061	34,429	24,419	20,737	20,616	6,500	3,422	6,358	256,054	426,913	443,193

Source: JICA Study Team

(4) Demand in section between stations

The demand in section between stations will become the maximum between No.2 and No.5 station. The figure in 2030 will reach in 60,000 pax/day (for one of the two). Assuming 20% of the concentration ratio in peak hours, demand in section will become 12,000 pax/day (for one of the two) in peak hours.

Table 2.5.5 Demand in section (according to concentration ratio)

Passenger Demand in Section (2011)

Section	Pax/Day	Pax/hour			Section	Pax/Day	Pax/hour		
		10%	20%	30%			10%	20%	30%
1 → 2	36,071	3,607	**7,214**	10,821	10 → 9	1,065	107	**213**	320
2 → 3	45,169	4,517	**9,034**	13,551	9 → 8	3,098	310	**620**	930
3 → 4	39,778	3,978	**7,956**	11,933	8 → 7	5,105	511	**1,021**	1,532
4 → 5	33,267	3,327	**6,653**	9,980	7 → 6	13,144	1,314	**2,629**	3,943
5 → 6	16,746	1,675	**3,349**	5,024	6 → 5	18,982	1,898	**3,796**	5,695
6 → 7	12,012	1,201	**2,402**	3,604	5 → 4	36,535	3,653	**7,307**	10,960
7 → 8	4,915	491	**983**	1,474	4 → 3	42,540	4,254	**8,508**	12,762
8 → 9	2,986	299	**597**	896	3 → 2	47,439	4,744	**9,488**	14,232
9 → 10	1,067	107	**213**	320	2 → 1	37,912	3,791	**7,582**	11,374

Passenger Demand in Section (2021)

Section	Pax/Day	Pax/hour			Section	Pax/Day	Pax/hour		
		10%	20%	30%			10%	20%	30%
1 → 2	32,494	3,249	**6,499**	9,748	10 → 9	1,090	109	**218**	327
2 → 3	40,161	4,016	**8,032**	12,048	9 → 8	3,071	307	**614**	921
3 → 4	37,182	3,718	**7,436**	11,155	8 → 7	5,086	509	**1,017**	1,526
4 → 5	32,164	3,216	**6,433**	9,649	7 → 6	14,423	1,442	**2,885**	4,327
5 → 6	18,124	1,812	**3,625**	5,437	6 → 5	19,692	1,969	**3,938**	5,908
6 → 7	13,628	1,363	**2,726**	4,088	5 → 4	34,378	3,438	**6,876**	10,313
7 → 8	5,044	504	**1,009**	1,513	4 → 3	39,084	3,908	**7,817**	11,725
8 → 9	3,027	303	**605**	908	3 → 2	41,598	4,160	**8,320**	12,479
9 → 10	1,078	108	**216**	323	2 → 1	33,425	3,343	**6,685**	10,028

Passenger Demand in Section (2030)

Section	Pax/Day	Pax/hour			Section	Pax/Day	Pax/hour		
		10%	20%	30%			10%	20%	30%
1 → 2	47,313	4,731	**9,463**	14,194	17 → 16	18,971	1,897	**3,794**	5,691
2 → 3	64,262	6,426	**12,852**	19,279	16 → 15	25,481	2,548	**5,096**	7,644
3 → 4	64,225	6,423	**12,845**	19,268	15 → 14	28,702	2,870	**5,740**	8,611
4 → 5	61,431	6,143	**12,286**	18,429	14 → 13	22,776	2,278	**4,555**	6,833
5 → 6	46,965	4,696	**9,393**	14,089	13 → 12	27,573	2,757	**5,515**	8,272
6 → 7	43,937	4,394	**8,787**	13,181	12 → 11	31,587	3,159	**6,317**	9,476
7 → 8	30,944	3,094	**6,189**	9,283	11 → 10	32,406	3,241	**6,481**	9,722
8 → 9	29,275	2,927	**5,855**	8,782	10 → 9	30,984	3,098	**6,197**	9,295
9 → 10	29,787	2,979	**5,957**	8,936	9 → 8	30,416	3,042	**6,083**	9,125
10 → 11	31,216	3,122	**6,243**	9,365	8 → 7	31,937	3,194	**6,387**	9,581
11 → 12	30,419	3,042	**6,084**	9,126	7 → 6	45,708	4,571	**9,142**	13,713
12 → 13	26,707	2,671	**5,341**	8,012	6 → 5	49,329	4,933	**9,866**	14,799
13 → 14	22,461	2,246	**4,492**	6,738	5 → 4	64,107	6,411	**12,821**	19,232
14 → 15	28,684	2,868	**5,737**	8,605	4 → 3	66,724	6,672	**13,345**	20,017
15 → 16	25,571	2,557	**5,114**	7,671	3 → 2	66,308	6,631	**13,262**	19,892
16 → 17	19,112	1,911	**3,822**	5,734	2 → 1	48,178	4,818	**9,636**	14,453

Passenger Demand in Section (2040)

| Section	Pax/Day	Pax/hour			Section	Pax/Day	Pax/hour		
		10%	20%	30%			10%	20%	30%
1 → 2	47,833	4,783	**9,567**	14,350	17 → 16	20,419	2,042	**4,084**	6,126
2 → 3	64,702	6,470	**12,940**	19,411	16 → 15	27,337	2,734	**5,467**	8,201
3 → 4	64,579	6,458	**12,916**	19,374	15 → 14	30,522	3,052	**6,104**	9,157
4 → 5	61,959	6,196	**12,392**	18,588	14 → 13	24,016	2,402	**4,803**	7,205
5 → 6	48,173	4,817	**9,635**	14,452	13 → 12	28,578	2,858	**5,716**	8,573
6 → 7	45,334	4,533	**9,067**	13,600	12 → 11	32,258	3,226	**6,452**	9,677
7 → 8	31,945	3,194	**6,389**	9,583	11 → 10	33,083	3,308	**6,617**	9,925
8 → 9	30,233	3,023	**6,047**	9,070	10 → 9	31,599	3,160	**6,320**	9,480
9 → 10	30,750	3,075	**6,150**	9,225	9 → 8	31,023	3,102	**6,205**	9,307
10 → 11	32,240	3,224	**6,448**	9,672	8 → 7	32,577	3,258	**6,515**	9,773
11 → 12	31,428	3,143	**6,286**	9,428	7 → 6	46,754	4,675	**9,351**	14,026
12 → 13	27,891	2,789	**5,578**	8,367	6 → 5	50,188	5,019	**10,038**	15,056
13 → 14	23,797	2,380	**4,759**	7,139	5 → 4	64,276	6,428	**12,855**	19,283
14 → 15	30,579	3,058	**6,116**	9,174	4 → 3	66,718	6,672	**13,344**	20,015
15 → 16	27,494	2,749	**5,499**	8,248	3 → 2	66,384	6,638	**13,277**	19,915
16 → 17	20,616	2,062	**4,123**	6,185	2 → 1	48,521	4,852	**9,704**	14,556

Source: JICA Study Team

2.6 Sensitivity of price and estimation of income
(1) Sensitivity of price

Judging from the price elasticity based on the demand and the fare level of the No. 5 line, an income of fare will be mostly constant in the range of USD 0.5-2.0.

The income of fare = Average fare　＊　Demand of passenger

In order to expand the income, it is necessary to expand the demands quantitatively.
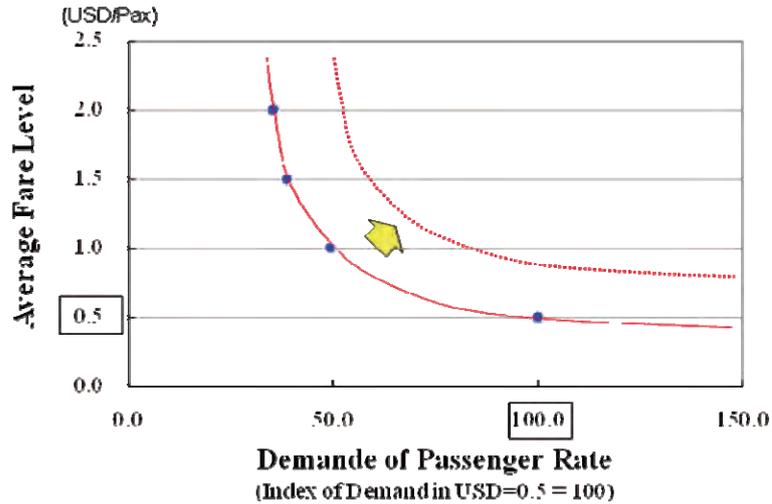
Source: JICA Study Team

Figure 2.6.1 Pricing sensitivity of demand

(2) Total fare revenue

The total annual fare revenue is calculated based on the demand forecast with setting 0.5 USD as average of the fare considering the present price level and present bus charge in Vietnam. The figure will become 2.4 billion yen in 2021 (St.1 to St.10), 6.0 billion yen in 2030 (St.1 to St.17) at the constant price (2011). Including the connection passengers demand of No2 and No.3 lines with setting 0.25 USD as the average of the fare, the total annual fare revenue is calculated 2.5 billion yen in 2021, 6.3 billion yen in 2030 at the constant price (2011).

In addition, the figures considering the price escalation are followings, 4.5 billion yen in 2021 (the average fare 0.94USD), 12.1 billion yen in 2030 (the average fare 1.78USD) at each current price. Including the connection passengers demand of No2 and No.3 lines, the figures are 4.7 billion yen in 2021, 12.4 billion yen in 2030 at each current price.

In urban railways it is common that an operation cost far exceeds this level. On Hanoi No. 5 line, it is necessary for the railway operation unit (Vietnam Government) to set the service fee so that the operation unit will manage sustainably and to expend the difference between the service fee and the total fare revenue as the expense for public works.

Table 2.6.1 Fare income based on demand forecast　(Billion Yen / year)

Sections / Time	Constant figures (price at 2011)		Current figures (considering CPI)	
	2021	2030	2021	2030
No.5 line passenger only	2.4	6.0	4.5	12.1
No.5 line passengers & connecting passengers	2.5	6.3	4.7	12.4

Source: JICA Study Team