

Appendix J

Water Demand Projection



Appendix J WATER DEMAND PROJECTION

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Appendix J WATER DEMAND PROJECTION

J.1 Municipal Water

The demand of municipal water was projected based on population (60 % in urban and 40% in rural areas) projection and the preconditions and targets as listed below:

- 1) Population served by CEs : 95% (1996) to 100% (2025) in urban area and 20% (1996 to 2025) in rural area
- 2) Target per capita consumption : Domestic use-150 lpcd
Communal use-24 lpcd (1996) to 27 lpcd (2025)
Commercial use-19 lpcd (1996) to 25 lpcd (2025)
- 3) Other : Estimated by linear regression on past records
- 4) System loss : 35.5% (1996) to 30%(2025)
- 5) Per capita in rural water supply : 250 lpcd
(lpcd : liter per capita per day)

Population projection and number of population who will be covered with the water supply network services are as follows:

(i) Population Projection on National Level

Unit : person

Population	1996 - Current	2005	2015	2025
1) in urban area	1,178,715 (60%)	1,251,373 (60%)	1,322,513 (60%)	1,385,731 (60%)
2) in rural area	795,111 (40%)	838,336 (40%)	880,657 (40%)	918,266 (40%)
3) Total	1,973,826	2,089,709	2,203,170	2,303,997

(Figures in () show ratio of population in urban and rural areas.)

Tables J.1 to J.3 show the population projection in each municipality.

(ii) Population Projection Covered by Network Service

Unit : persons

Description	1996 - Current	2005	2015	2025
1) in urban area (by CEs)	1,119,779 (95%)	1,201,318 (96%)	1,296,063 (98%)	1,385,731 (100%)
2) in rural area (by CEs)	159,022 (20%)	167,667 (20%)	176,131 (20%)	183,653 (20%)
3) Subtotal by CEs (1 + 2)	1,278,801	1,368,985	1,472,194	1,569,384
4) in rural area (by VSs)	437,311 (55%)	503,002 (60%)	616,460 (70%)	734,613 (80%)
5) Subtotal in rural area (2+4)	596,333 (75%)	670,669 (80%)	792,591 (90%)	918,266 (100%)
6) Total (1+5)	1,716,112	1,871,987	2,088,654	2,303,997
7) Coverage Rate (Nation level)	87%	90%	95%	100%

(CEs : Communal Enterprises, VSs : Village Supplies)

From the above, demands of municipal water were projected as follows:

(iii) Water Quantity Demanded to CEs in Urban and Rural Areas

(10 ³ m ³ /year)				
Description	1996 - Current	2005	2015	2025
1) Population (persons)	1,278,801	1,368,985	1,472,194	1,569,384
Demands:				
2) Domestic household (150 lpcd)	70,014	74,952	80,603	85,924
3) Communal use (lpcd)	11,202 (24)	12,492 (25)	13,971 (26)	15,466 (27)
4) Commercial Use (lpcd)	8,868 (19)	10,493 (21)	12,359 (23)	14,321 (25)
5) Others Subtotal (2 to 5)	10,564	12,521	12,521	12,521
	100,648	110,458	119,454	128,232
6) System loss (%)	55,395 (35.5%)	56,903 (34%)	56,214 (32%)	54,957 (30%)
7) Total (2 to 6)	156,043	167,361	175,668	183,189

(iv) Water Quantity Demanded to VSs in Rural Area

(10 ³ m ³ /year)				
Description	1996 - Current	2005	2015	2025
1) Population (persons)	437,311	503,002	616,460	734,613
2) Water quantity (250lpcd)	39,905	45,899	56,252	67,033

(v) Demand Projection of Municipal Water

(10 ³ m ³ /year)				
Description	1996 - Current	2005	2015	2025
1) Demand to CEs	156,043	167,361	175,668	183,189
2) Demand To VSs	39,905	45,899	56,252	67,033
3) Total	195,948	213,260	231,920	250,222

Table J.4 shows consumption record of municipal water being divided into area and source of water including industrial water being divided into clarification and source of water at the current condition.

Demand projections of municipal water for each municipality (the former division) are tabulated in Tables J.5 to J.7 together with those of industrial water. Figure J.1 shows development directions of municipal water supply.

J.2 Agricultural Water

Agricultural water consists of irrigation water and livestock water. Therefore, agricultural water demand was projected being divided into the two, and finally combining them.

(1) Irrigation Water

(a) Cropping area projection

The cropping area was first projected on the national level, referring to National Development Strategy 1997 (NDS 1997). NDS 1997 shows the cropping area projection as follows:

Cropping Area Projection in NDS 1997

(Unit : 1,000ha)

Crop	Current (1994)	Future (2020)
1) Wheat	122	100
2) Maize	43	55
3) Tobacco	15	26
4) Tomato	7	10
5) Pepper	8	12
6) Apple	8	9
7) Plum	4	6
8) Sour cherry	3	6
9) Grape	31	40
Total	240	264

In addition to the above, data in Statistical Yearbook 1997 were referred to, and the cropping area was projected as shown in Figure J.2 and summarized as follows:

Cropping Area Projected in the Study

(Unit : 1,000ha)

Crop	1996	2005	2015	2025
1) Wheat	120	113	104	97
2) Maize	46	50	54	58
3) Tobacco	15	19	24	28
4) Tomato	9	9	10	11
5) Pepper	8	10	11	13
6) Apple	8	8	9	9
7) Plum	4	5	5	6
8) Sour cherry	3	4	5	6
9) Grape	32	35	39	43
Total	245	253	261	271

(b) Irrigation area projection

On the basis of the above cropping area projection, the irrigation area is projected with adding data from Statistical Yearbook 1997. The following table shows irrigation area projection in the cropping area and that in system's service area.

Irrigation Area in Cropping Area

(Unit : 1,000ha)

Crop	1996	2005	2015	2025
1) Wheat	109	105	101	97
2) Maize	46	50	54	58
3) Rice	4	5	6	7
4) Tobacco	15	19	24	28
5) Sunflower	9	13	16	19
6) Cabbage	3	2	2	1
7) Tomato	9	9	10	11
8) Pepper	8	10	11	13
9) Other vegetables	24	33	42	54
10) Apple	6	7	8	9
11) Plum	4	4	5	6
12) Sour cherry	3	4	5	6
13) Other orchards	7	13	19	25
14) Grape	32	35	39	43
Total	279	309	342	377

Irrigation Area in System's Service Area

(Unit : 1,000ha)

	1996	2005	2015	2025
Total	168	203	241	280

The irrigation area by cropping patterns is shown in Tables J.8 (1/9) to (9/9).

(c) Basic conditions in demand projection

For demand projection, the following conditions are set.

C1: Installation density of discharge measuring devices is increased and skill of gate operator is improved.

C2: With these conditions, irrigation efficiencies in future are assumed as Follows;

Assumption of Irrigation Efficiencies in Future

Efficiency	1996	2005	2015	2025
1) Conveyance (Ec)	0.80	0.84	0.85	0.85
2) Field canal (Eb)	0.90	0.91	0.92	0.92
3) Field application (Ea)	0.80	0.82	0.83	0.83
Overall Efficiency (E)	0.58	0.63	0.65	0.65

(d) Irrigation water demand projection

Irrigation water demand is projected with the following process;

P1: Gross unit irrigation water demand ($m^3/year/ha$) for six cropping patterns for each target year is projected, taking the effective rainfall and irrigation efficiency in future into the calculation.

P2: Irrigation water demand ($m^3/year/ha$) in the area of each cropping patterns for each target year is estimated, taking the gross unit water demand ($m^3/year/ha$) and the irrigation service area (ha) under the concerned cropping pattern into the calculation.

The irrigation area for each cropping pattern is projected below:

Irrigation Area Projected for Each Cropping Pattern

(Unit : 1,000ha)

Cropping Area No.	1996	2005	2015	2025
1	23	25	25	35
2	42	46	46	72
3a	63	80	118	120
3b	29	32	32	32
4	2	4	4	4
5	9	16	16	16
Total	168	203	241	280

Annual irrigation water demand is summarized as follows, which was projected on the basis of the average gross unit water demands of the 36 years.

Annual Irrigation Water Demand Projection

(Unit : 10⁶m³/year)

Cropping Area No.	1996	2005	2015	2025
1	128	120	111	151
2	323	301	279	414
3a	542	608	833	827
3b	311	315	312	321
4	10	19	19	19
5	71	112	107	103
Total	1,385	1,475	1,661	1,835

Gross unit irrigation demands in each climate are shown in Tables J.9 (1/8) to (8/8).

(2) Demand Projection of Livestock Water

(a) Livestock number projection

Livestock number was projected on the national level as follows, referring to National Development Strategy 1997 (NDS 1997):

Livestock Number Projection

(Unit : 1,000head)

Livestock	1996	2005	2015	2025
1) Cattle	283	289	296	304
2) Horse	62	65	68	72
3) Pig	185	247	316	384
4) Sheep	2,476	2,523	2,574	2,626
5) Poultry	4,668	4,594	4,511	4,429

(b) Livestock water demand

The livestock number was obtained by each municipality with use of the unit water requirement mentioned above and number of livestock by each municipality that was projected on an assumption that same rate as the national level could be applied.

The demand on the national level was projected as follows:

Livestock Water Demand Projection

(Unit : m³/sec)

Livestock	1996	2005	2015	2025
1) Cattle	0.31	0.32	0.32	0.32
2) Horse	0.04	0.05	0.05	0.05
3) Pig	0.05	0.07	0.09	0.10
4) Sheep	0.32	0.32	0.33	0.34
5) Poultry	0.06	0.05	0.05	0.05
Total	0.78 (24.6 x10 ⁶ m ³)	0.81 (25.5 x10 ⁶ m ³)	0.84 (26.5 x10 ⁶ m ³)	0.87 (27.4 x10 ⁶ m ³)

(Figures in () show the demand projection on annual basis)

Livestock water demand projections in each basins are shown in Tables J.10 (1/4) to (4/4).

(3) Demand Projection of Agricultural Water

Agricultural water demand was projected, summing up that of irrigation water and livestock water as follows;

Agricultural Water Demand Projection

(Unit : 10⁶m³/year)

Breakdown	1996	2005	2015	2025
1) Irrigation water	1,385	1,475	1,661	1,835
2) Livestock water	25	26	27	27
Total	1,410	1,501	1,688	1,862

Figure J.3 shows a development curve of agricultural water.

J.3 Industrial Water

Data for the period 1990 to 1996 in Subsection I.2.3 show a pronounced downward trend. However, assumptions of rather upward trend as described below were taken for the projection, following the development scenario basically prepared in the Study.

(1) Breakdown of industrial water

Industrial water was broken down to (i) potable water and (ii) raw process water for industry, which was further divided into (ii-a) that supplied from groundwater and (ii-b) that from surface water.

(2) Demand projection of potable water

Demand of potable water, which is mostly supplied from groundwater, will be increased with same ratio as that of the gross municipal water demand projection (groundwater portion). The ratio was calculated as follows:

Increase Ratio of Potable Water

Breakdown	1996	2005	2015	2025
1) Demand(10 ³ m ³ /year)(Ratio)	146,892 (1.000)	161,364 (1.099)	175,990 (1.198)	190,294 (1.295)
2) Condition	current	projected	projected	projected

(3) Demand projection of raw water for industry by groundwater

Demand of raw process water for industry from groundwater, which is used mainly in the light industry expected to become higher value-added industry in the future market driven economics, food processing industry and so on, will increase gradually from 3 to 4.5%, that is with the ratio below;

Increase Ratio of Raw Process Water

Breakdown	1996	2005	2015	2025
1) Increase	-	3.0%	3.5%	4.5%
2) Period	-	9 years	10 years	10 years
3) Ratio	1.000	1.305	1.411	1.553

$((1+0.03)^9=1.3048, (1+0.035)^{10}=1.4106, (1+0.045)^{10}=1.5529)$

(4) Demand projection of raw water for industry from surface water

Demand of raw process water for industry from surface water, which is used mainly in the heavy industry dominated in centralized economies and expected not ascending but rather declining, will keep the same level as that of the current one.

(5) Demand projection of industrial water

With the assumptions above, demand for industrial water was projected as follows;

Industrial Water Demand Projection

(Unit : 10³m³/year)

Breakdown	1996	2005	2015	2025
1) Potable water	34,920 (1.000)	38,377 (1.099)	41,834 (1.198)	45,221 (1.295)
2) Raw process water from groundwater	28,030 (1.000)	36,579 (1.305)	51,613 (1.411)	80,155 (1.553)
3) Raw process water from surface water	50,933 (1.000)	50,933 (1.000)	50,933 (1.000)	50,933 (1.000)
Total	113,883	125,889	144,380	176,309

Demand projections of industrial water for each municipality (former division) are tabulated in Tables J.4 to J.7 together with those of municipal water. Figure J.4 shows a development curve of industrial water.

J.4 Biological Minimum

The biological minimum and/or ecological need was determined, as mentioned in Subsection I.2.4 from the ecological standpoint, as being 10% of the average flow, that is around $730 \times 10^6 \text{m}^3/\text{year}$, according to the Water Economy Basis of Macedonia as mentioned in the National Development Strategy 1997.

J.5 Total Water Demand Projection

From the above, total water demand was projected as follows, including the ecological need:

Total Water Demand Projection

Sector	1996	2005	2015	2025
1) Municipal Water	196	213	232	250
2) Agricultural Water	1,410	1,501	1,688	1,862
3) Industrial Water	114	126	144	176
4) Ecological Need	730	730	730	730
Total	2,450	2,570	2,794	3,018

Table J.1 Total Population Projection for Macedonia

Municipality	Total Population - 1994 Census Definition										Total Population Projection					
	Interpolated from Census Statistics										Extrapolated by Logarithmic Regression					
	1990	1991	1992	1993	1994	1995	1996	2000	2005	2010	2015	2020	2025			
1 Skopje	519,023	525,735	532,337	538,834	545,228	551,523	557,722	581,613	609,627	635,831	660,447	683,655	705,608			
2 Gostivar	103,976	105,033	106,112	107,155	108,181	109,191	110,186	114,020	118,516	122,721	126,671	130,395	133,918			
3 Tetovo	165,315	167,071	168,798	170,498	172,171	173,818	175,440	181,690	189,019	195,875	202,315	208,387	214,130			
4 Kicevo	51,493	51,868	52,237	52,601	52,958	53,310	53,657	54,992	56,558	58,023	59,400	60,697	61,924			
5 Makedonski Brod	11,123	11,097	11,072	11,047	11,022	10,998	10,974	10,882	10,775	10,674	10,579	10,490	10,406			
6 Kumanovo	124,590	125,416	126,228	127,027	127,814	128,589	129,351	132,291	135,737	138,961	141,990	144,845	147,546			
7 Kratovo	11,118	11,061	11,006	10,952	10,898	10,845	10,793	10,593	10,358	10,138	9,932	9,738	9,553			
8 Kriva Palanka	25,627	25,500	25,374	25,251	25,129	25,009	24,891	24,437	23,904	23,406	22,937	22,496	22,078			
9 Titov Veles	65,030	65,263	65,493	65,719	65,942	66,161	66,377	67,209	68,184	69,096	69,953	70,761	71,525			
10 Sveti Nikole	21,498	21,484	21,471	21,457	21,444	21,431	21,418	21,369	21,311	21,257	21,207	21,159	21,114			
11 Stip	49,188	49,579	49,963	50,342	50,714	51,081	51,442	52,833	54,465	55,991	57,425	58,777	60,055			
12 Probitip	16,472	16,517	16,562	16,607	16,650	16,693	16,735	16,897	17,088	17,266	17,433	17,591	17,740			
13 Kocharani	47,420	47,707	47,988	48,265	48,538	48,807	49,071	50,090	51,285	52,402	53,452	54,442	55,379			
14 Vinica	18,558	18,687	18,815	18,940	19,063	19,184	19,304	19,764	20,304	20,809	21,283	21,731	22,154			
15 Delcevo	24,630	24,798	24,964	25,127	25,287	25,445	25,600	26,200	26,902	27,560	28,177	28,759	29,310			
16 Berovo	19,744	19,766	19,787	19,808	19,829	19,849	19,869	19,946	20,037	20,121	20,201	20,276	20,347			
17 Demir Hisar	10,986	10,868	10,751	10,637	10,524	10,413	10,304	9,882	9,388	8,926	8,492	8,083	7,696			
18 Krusevo	12,044	12,034	12,024	12,015	12,005	11,996	11,986	11,951	11,909	11,870	11,834	11,799	11,766			
19 Bitola	107,325	107,550	107,771	107,989	108,203	108,414	108,622	109,422	110,361	111,239	112,064	112,842	113,578			
20 Prilep	93,557	93,717	93,875	94,030	94,183	94,333	94,482	95,053	95,722	96,349	96,937	97,492	98,017			
21 Kavadarci	40,811	41,099	41,383	41,662	41,937	42,208	42,474	43,501	44,705	45,832	46,890	47,887	48,831			
22 Negotino	22,392	22,588	22,780	22,970	23,156	23,340	23,520	24,217	25,034	25,798	26,516	27,193	27,833			
23 Valandovo	11,725	11,819	11,912	12,003	12,092	12,180	12,267	12,601	12,993	13,359	13,704	14,028	14,335			
24 Gevgelija	33,753	34,025	34,293	34,557	34,817	35,073	35,324	36,295	37,433	38,497	39,497	40,439	41,331			
25 Ohrid	59,125	59,545	59,957	60,363	60,763	61,156	61,544	63,037	64,788	66,426	67,965	69,416	70,788			
26 Struga	60,639	61,162	61,676	62,181	62,679	63,169	63,651	65,511	67,691	69,731	71,647	73,453	75,162			
27 Debar	24,449	24,706	24,958	25,207	25,452	25,693	25,930	26,845	27,918	28,921	29,864	30,753	31,593			
28 Resen	17,754	17,735	17,717	17,699	17,681	17,663	17,646	17,580	17,502	17,429	17,360	17,296	17,235			
29 Radovis	29,697	29,909	30,118	30,323	30,525	30,724	30,920	31,674	32,559	33,386	34,164	34,897	35,590			
30 Strumica	88,366	89,053	89,728	90,393	91,047	91,691	92,325	94,769	97,635	100,316	102,835	105,209	107,455			
Total	1,887,427	1,902,411	1,917,152	1,931,656	1,945,932	1,959,987	1,973,827	2,027,166	2,089,709	2,148,213	2,203,170	2,254,985	2,303,997			

Table J.2 Urban Population Projection for Macedonia

Municipality	Total Population - 1994 Census Definition										Total Population Projection					
	Interpolated from Census Statistics										Extrapolated by Logarithmic Regression					
	1990	1991	1992	1993	1994	1995	1996	2000	2005	2010	2015	2020	2025			
1 Skopje	422,945	428,414	433,794	439,088	444,299	449,429	454,480	473,949	496,777	518,130	538,189	557,101	574,991			
2 Gostivar	39,414	39,822	40,224	40,619	41,008	41,391	41,768	43,221	44,926	46,520	48,017	49,429	50,764			
3 Tetovo	48,339	48,853	49,358	49,855	50,344	50,826	51,300	53,128	55,271	57,275	59,158	60,934	62,613			
4 Kicevo	24,434	24,612	24,787	24,959	25,129	25,296	25,460	26,094	26,837	27,533	28,186	28,801	29,384			
5 Makedonski Brod	0	0	0	0	0	0	0	0	0	0	0	0	0			
6 Kumanovo	70,041	70,505	70,961	71,411	71,853	72,288	72,717	74,370	76,307	78,120	79,822	81,427	82,946			
7 Kratovo	6,612	6,578	6,545	6,513	6,481	6,450	6,419	6,300	6,160	6,029	5,907	5,791	5,681			
8 Kriva Palanka	11,387	11,331	11,275	11,220	11,166	11,113	11,060	10,858	10,622	10,400	10,192	9,996	9,810			
9 Titov Veles	46,151	46,316	46,480	46,640	46,798	46,954	47,107	47,697	48,389	49,036	49,644	50,218	50,760			
10 Sveti Nikole	13,325	13,317	13,308	13,300	13,292	13,284	13,276	13,246	13,210	13,176	13,145	13,115	13,087			
11 Stip	40,474	40,796	41,112	41,424	41,730	42,032	42,329	43,474	44,816	46,072	47,252	48,364	49,416			
12 Probitip	10,092	10,120	10,147	10,174	10,201	10,227	10,253	10,353	10,469	10,578	10,681	10,778	10,869			
13 Kochani	25,757	25,912	26,065	26,216	26,364	26,510	26,653	27,207	27,856	28,463	29,033	29,571	30,080			
14 Vinica	9,707	9,775	9,841	9,907	9,971	10,034	10,097	10,338	10,620	10,884	11,132	11,366	11,588			
15 Delcevo	10,280	10,350	10,419	10,487	10,554	10,620	10,685	10,935	11,228	11,503	11,760	12,003	12,233			
16 Berovo	9,742	9,753	9,763	9,774	9,784	9,794	9,804	9,842	9,887	9,928	9,967	10,004	10,039			
17 Demir Hisar	0	0	0	0	0	0	0	0	0	0	0	0	0			
18 Krusevo	5,525	5,520	5,516	5,511	5,507	5,503	5,498	5,482	5,463	5,445	5,428	5,413	5,398			
19 Bitola	76,835	76,996	77,155	77,311	77,464	77,615	77,764	78,337	79,009	79,638	80,228	80,785	81,312			
20 Prilep	67,695	67,811	67,925	68,037	68,148	68,257	68,364	68,777	69,262	69,715	70,141	70,542	70,922			
21 Kavadarci	31,893	32,118	32,340	32,558	32,773	32,984	33,193	33,995	34,936	35,817	36,643	37,423	38,160			
22 Negotino	12,103	12,209	12,313	12,415	12,516	12,615	12,713	13,089	13,531	13,944	14,332	14,698	15,044			
23 Valandovo	4,225	4,259	4,292	4,325	4,357	4,389	4,420	4,540	4,682	4,814	4,938	5,055	5,165			
24 Gevgelija	14,516	14,634	14,749	14,862	14,974	15,084	15,192	15,610	16,099	16,557	16,987	17,392	17,775			
25 Ohrid	40,037	40,321	40,600	40,875	41,146	41,412	41,675	42,686	43,872	44,981	46,023	47,005	47,934			
26 Struga	15,515	15,649	15,780	15,910	16,037	16,162	16,286	16,762	17,319	17,841	18,331	18,794	19,231			
27 Debar	11,057	11,173	11,287	11,400	11,511	11,620	11,727	12,141	12,626	13,080	13,506	13,908	14,288			
28 Resen	8,720	8,711	8,702	8,693	8,684	8,675	8,667	8,634	8,596	8,560	8,527	8,495	8,465			
29 Radovis	14,659	14,764	14,867	14,968	15,068	15,166	15,263	15,635	16,072	16,480	16,864	17,226	17,568			
30 Strumica	33,064	33,321	33,574	33,822	34,067	34,308	34,545	35,460	36,532	37,535	38,478	39,366	40,206			
Total	1,124,543	1,133,938	1,143,180	1,152,275	1,161,226	1,170,038	1,178,715	1,212,159	1,251,373	1,288,055	1,322,513	1,355,000	1,385,731			

Table J.3 Rural Population Projection for Macedonia

Municipality	Total Population - 1994 Census Definition Interpolated from Census Statistics										Total Population Projection Extrapolated by Logarithmic Regression									
	1990	1991	1992	1993	1994	1995	1996	2000	2005	2010	2015	2020	2025	2000	2005	2010	2015	2020	2025	
1 Skopje	96,078	97,321	98,543	99,745	100,929	102,094	103,242	107,664	112,850	117,701	122,258	126,554	130,617	107,664	112,850	117,701	122,258	126,554	130,617	
2 Gostivar	64,562	65,231	65,888	66,536	67,173	67,800	68,418	70,799	73,590	76,201	78,654	80,967	83,154	70,799	73,590	76,201	78,654	80,967	83,154	
3 Tetovo	116,976	118,218	119,441	120,643	121,827	122,992	124,140	128,563	133,749	138,600	143,157	147,453	151,517	128,563	133,749	138,600	143,157	147,453	151,517	
4 Kicevo	27,059	27,256	27,450	27,641	27,829	28,014	28,196	28,898	29,721	30,491	31,214	31,896	32,541	28,898	29,721	30,491	31,214	31,896	32,541	
5 Makedonski Brod	11,123	11,097	11,072	11,047	11,022	10,998	10,974	10,882	10,775	10,674	10,579	10,490	10,406	10,882	10,775	10,674	10,579	10,490	10,406	
6 Kumanovo	54,549	54,911	55,267	55,617	55,961	56,300	56,634	57,921	59,430	60,842	62,168	63,418	64,600	57,921	59,430	60,842	62,168	63,418	64,600	
7 Kratovo	4,506	4,483	4,461	4,439	4,417	4,396	4,375	4,293	4,198	4,109	4,026	3,947	3,872	4,293	4,198	4,109	4,026	3,947	3,872	
8 Kriva Palanka	14,240	14,169	14,099	14,031	13,963	13,896	13,831	13,578	13,282	13,005	12,745	12,500	12,268	13,578	13,282	13,005	12,745	12,500	12,268	
9 Titov Veles	18,879	18,947	19,014	19,079	19,144	19,208	19,270	19,512	19,795	20,060	20,308	20,543	20,765	19,512	19,795	20,060	20,308	20,543	20,765	
10 Sveti Nikole	8,173	8,167	8,162	8,157	8,152	8,147	8,142	8,124	8,102	8,081	8,062	8,044	8,026	8,124	8,102	8,081	8,062	8,044	8,026	
11 Stip	8,714	8,783	8,851	8,918	8,984	9,049	9,113	9,359	9,648	9,919	10,173	10,412	10,639	9,359	9,648	9,919	10,173	10,412	10,639	
12 Probistip	6,380	6,398	6,415	6,432	6,449	6,466	6,482	6,545	6,619	6,688	6,752	6,814	6,871	6,545	6,619	6,688	6,752	6,814	6,871	
13 Kochani	21,663	21,794	21,923	22,049	22,174	22,297	22,417	22,883	23,429	23,939	24,419	24,871	25,299	22,883	23,429	23,939	24,419	24,871	25,299	
14 Vinica	8,851	8,913	8,974	9,033	9,092	9,150	9,207	9,426	9,684	9,925	10,151	10,364	10,566	9,426	9,684	9,925	10,151	10,364	10,566	
15 Delcevo	14,350	14,448	14,545	14,640	14,733	14,825	14,916	15,265	15,674	16,057	16,417	16,756	17,077	15,265	15,674	16,057	16,417	16,756	17,077	
16 Berovo	10,002	10,013	10,024	10,035	10,045	10,055	10,065	10,104	10,150	10,193	10,233	10,271	10,307	10,104	10,150	10,193	10,233	10,271	10,307	
17 Demir Hisar	10,986	10,868	10,751	10,637	10,524	10,413	10,304	9,882	9,388	8,926	8,492	8,083	7,696	9,882	9,388	8,926	8,492	8,083	7,696	
18 Krusevo	6,519	6,514	6,508	6,503	6,498	6,493	6,488	6,469	6,446	6,425	6,405	6,387	6,369	6,469	6,446	6,425	6,405	6,387	6,369	
19 Bitola	30,490	30,553	30,616	30,678	30,739	30,799	30,858	31,085	31,352	31,602	31,836	32,057	32,266	31,085	31,352	31,602	31,836	32,057	32,266	
20 Prilep	25,862	25,906	25,950	25,993	26,035	26,077	26,118	26,275	26,461	26,634	26,796	26,950	27,095	26,275	26,461	26,634	26,796	26,950	27,095	
21 Kavadarci	8,918	8,981	9,043	9,104	9,164	9,223	9,281	9,506	9,769	10,015	10,246	10,464	10,670	9,506	9,769	10,015	10,246	10,464	10,670	
22 Negotino	10,289	10,379	10,467	10,554	10,640	10,724	10,807	11,128	11,503	11,854	12,184	12,495	12,789	11,128	11,503	11,854	12,184	12,495	12,789	
23 Valandovo	7,501	7,561	7,620	7,678	7,735	7,791	7,847	8,061	8,311	8,546	8,766	8,974	9,170	8,061	8,311	8,546	8,766	8,974	9,170	
24 Gevgelija	19,236	19,392	19,545	19,695	19,843	19,989	20,132	20,685	21,334	21,940	22,510	23,047	23,555	20,685	21,334	21,940	22,510	23,047	23,555	
25 Ohrid	19,088	19,224	19,357	19,488	19,617	19,744	19,869	20,351	20,917	21,445	21,942	22,410	22,853	20,351	20,917	21,445	21,942	22,410	22,853	
26 Struga	45,124	45,513	45,895	46,272	46,642	47,007	47,366	48,749	50,372	51,890	53,315	54,659	55,931	48,749	50,372	51,890	53,315	54,659	55,931	
27 Debar	13,392	13,533	13,671	13,807	13,941	14,073	14,203	14,705	15,292	15,842	16,358	16,845	17,305	14,705	15,292	15,842	16,358	16,845	17,305	
28 Resen	9,034	9,025	9,015	9,006	8,997	8,988	8,979	8,945	8,906	8,869	8,834	8,801	8,770	8,945	8,906	8,869	8,834	8,801	8,770	
29 Radovis	15,038	15,145	15,251	15,355	15,457	15,558	15,657	16,039	16,487	16,906	17,300	17,671	18,022	16,039	16,487	16,906	17,300	17,671	18,022	
30 Strumica	55,302	55,732	56,155	56,571	56,980	57,383	57,780	59,310	61,103	62,781	64,357	65,843	67,249	59,310	61,103	62,781	64,357	65,843	67,249	
Total	762,884	768,473	773,971	779,381	784,706	789,949	795,111	815,007	838,336	860,158	880,657	899,984	918,266	815,007	838,336	860,158	880,657	899,984	918,266	

Table J.4 Current Demand of Municipal and Industrial Water (1996)

(unit: 10³ m³/year)

No. of Node	Municipality	(1) Municipal Water Demand (M)				(2) Industrial Water Demand (I)				(3)=(1)+(2)		
		Area		Source of Water		Classification		Source of Water		Ground-water	Surface water	Total
		Urban	Rural	Ground-water	Surface water	Potable	Raw Process	Ground-water	Surface water			
11-3	Skopje	65,457	5,181	70,638	0	70,638	13,532	20,931	34,463	0	34,463	105,101
11-1	Gostivar	5,828	3,434	9,262	0	9,262	2,100	1,578	2,223	1,455	3,678	12,940
11-2	Tetovo	8,034	6,230	14,265	0	14,265	2,654	14,410	2,704	14,360	17,064	31,329
12-1	Kichevo	3,258	1,415	4,673	0	4,673	542	2,316	2,858	0	2,858	7,531
12-2	Makedonski Brod	240	551	790	0	790	40	36	76	0	76	866
13-3	Kumanovo	8,782	2,842	11,624	0	11,624	1,209	545	1,754	0	1,754	13,378
13-2	Kratovo	762	220	981	0	981	700	0	700	0	700	1,681
13-1	Kriva Palanka	1,450	694	2,144	0	2,144	375	40	415	0	415	2,559
11-4	Veles	5,309	967	6,276	0	6,276	1,049	17,117	1,145	17,021	18,166	24,442
14-8	Sveti Nikole	1,555	409	1,964	0	1,964	149	199	348	0	348	2,312
14-7	Shtip	4,591	457	5,048	0	5,048	1,171	2,813	3,989	0	3,989	9,037
14-6	Prohishup	1,205	325	1,531	0	1,531	658	483	1,141	0	1,141	2,672
14-5	Kochani	3,255	1,125	3,723	657	4,380	549	0	549	0	549	4,929
14-4	Vinica	1,249	462	1,711	0	1,711	98	0	98	0	98	1,809
14-3	Delcevo	1,434	749	2,183	0	2,183	269	1	270	0	270	2,453
14-1	Berevo	1,237	505	1,742	0	1,742	320	7	327	0	327	2,069
15-1	Demir Hisar	225	517	742	0	742	46	0	46	0	46	788
15-2	Krushevo	712	326	1,038	0	1,038	139	0	139	0	139	1,177
15-4	Bitola	8,743	1,549	10,291	0	10,291	1,765	14,223	1,765	14,223	15,988	26,279
15-3	Prilep	7,685	1,311	8,996	0	8,996	1,125	101	1,226	0	1,226	10,222
11-5	Kavadarci	3,647	466	4,112	0	4,112	1,000	2,277	1,004	2,273	3,277	7,389
11-6	Negotino	1,555	542	2,097	0	2,097	604	1,714	717	1,601	2,318	4,415
11-8	Valandovo	630	394	1,024	0	1,024	112	0	112	0	112	1,136
11-9	Gevgelija	2,016	1,010	3,026	0	3,026	681	126	807	0	807	3,833
17-2	Ohrid	4,758	997	5,755	0	5,755	1,620	0	1,620	0	1,620	7,375
17-3	Struga	2,724	2,377	5,102	0	5,102	649	0	649	0	649	5,751
17-4	Debar	1,527	713	2,240	0	2,240	290	0	290	0	290	2,530
17-1	Resen	1,095	451	1,546	0	1,546	360	0	360	0	360	1,906
16-1	Radovish	1,926	786	2,711	0	2,711	150	1	151	0	151	2,862
16-2	Strimica	5,154	2,900	8,054	0	8,054	964	40	1,004	0	1,004	9,058
	Total	156,043	39,905	195,948	49,056	245,004	34,920	78,963	62,950	50,933	113,883	309,881

Table J.5 Demand Projection of Municipal and Industrial Water (2005)

(unit : 10³ m³/year)

No. of Node	Municipality	(1) Municipal Water Demand (M)				(2) Industrial Water Demand (I)				(3) = (1)+(2) (Total of M & I)			
		Area		Source of Water		Total (1)	Classification	Source of Water		Total (2)	Ground-water	Surface water	Total
		Urban	Rural	Ground-water	Surface water			Potable	Raw Process				
11-3	Skopje	72,296	6,179	78,475	0	14,872	27,315	42,187	0	42,187	120,662	120,662	
11-1	Gostivar	6,270	4,029	10,299	0	2,308	1,616	2,468	1,455	3,923	12,767	14,222	
11-2	Tetovo	8,651	7,323	15,974	0	2,917	14,425	2,982	14,360	17,342	18,956	33,316	
12-1	Kichevo	3,437	1,627	5,064	0	596	3,022	3,618	0	3,618	8,682	8,682	
12-2	Makedonski Brod	247	590	837	0	44	47	91	0	91	928	928	
13-3	Kumanovo	9,229	3,254	12,483	0	1,329	711	2,040	0	2,040	2,040	14,523	
13-2	Kratovo	732	230	962	0	769	0	769	0	769	769	1,731	
13-1	Kriva Palanka	1,393	727	2,120	0	412	52	464	0	464	2,584	2,584	
11-4	Veles	5,464	1,084	6,548	0	1,153	17,146	1,278	17,021	18,299	1,278	24,847	
14-8	Sveti Nikole	1,550	444	1,994	0	164	260	423	0	423	423	2,417	
14-7	Ship	4,873	528	5,401	0	1,287	3,677	4,964	0	4,964	10,365	10,365	
14-6	Probishtip	1,233	362	1,595	0	723	630	1,353	0	1,353	2,948	2,948	
14-5	Kochani	3,407	1,283	4,689	703	603	0	603	0	603	4,589	5,292	
14-4	Vinica	1,315	530	1,845	0	108	0	108	0	108	108	1,953	
14-3	Delcevo	1,508	858	2,366	0	296	1	297	0	297	2,663	2,663	
14-1	Berevo	1,249	556	1,805	0	352	9	361	0	361	361	2,166	
15-1	Demir Hisar	249	514	763	0	51	0	51	0	51	814	814	
15-2	Krushevo	708	353	1,061	0	153	0	153	0	153	1,214	1,214	
15-4	Bitola	8,901	1,717	10,618	0	1,940	14,223	1,940	14,223	16,163	1,940	26,781	
15-3	Prilep	7,802	1,449	9,251	0	1,236	132	1,368	0	1,368	10,619	10,619	
11-5	Kavadarci	3,847	535	4,382	0	1,099	2,278	1,104	2,273	3,377	5,486	7,759	
11-6	Negotino	2,089	630	2,719	0	664	1,748	811	1,601	2,412	3,530	5,131	
11-8	Valandovo	667	455	1,122	0	123	0	123	0	123	1,245	1,245	
11-9	Gevgelija	2,138	1,168	3,306	0	748	164	913	0	913	4,219	4,219	
17-2	Ohrid	5,019	1,145	6,164	0	1,780	0	1,780	0	1,780	1,780	7,944	
17-3	Struga	2,894	2,758	5,652	0	713	0	713	0	713	6,365	6,365	
17-4	Debar	1,645	837	2,483	0	319	0	319	0	319	2,802	2,802	
17-1	Resen	1,088	488	1,575	0	396	0	396	0	396	1,971	1,971	
16-1	Radovish	2,030	903	2,933	0	165	1	166	0	166	3,099	3,099	
16-2	Strumica	5,429	3,345	8,775	0	1,059	54	1,113	0	1,113	8,775	9,888	
	Total	167,361	45,899	213,260	161,364	38,377	87,512	74,956	50,933	125,889	236,320	339,149	

Table J.6 Demand Projection of Municipal and Industrial Water (2015)

(unit : 10³ m³/year)

No. of Node	Municipality	(1) Municipal Water Demand (M)				(2) Industrial Water Demand (I)				(3)=(1)+(2) (Total of M & I)				
		Area		Source of Water		Total (1)	Classification		Source of Water		Total (2)	Ground-water	Surface water	Total
		Urban	Rural	Ground-water	Surface water		Potable	Raw Process	Ground-water	Surface water				
11-3	Skopje	76,571	7,809	84,381	0	84,381	16,211	38,541	54,753	0	54,753	139,134	0	139,134
11-1	Gostivar	6,707	5,024	11,731	0	11,731	2,516	1,681	2,742	1,455	4,197	14,473	1,455	15,928
11-2	Tetovo	9,251	9,144	18,395	0	18,395	3,179	14,452	3,272	14,360	17,632	21,667	14,360	36,027
12-1	Kichevo	3,617	1,994	5,611	0	5,611	649	4,265	4,912	0	4,912	10,523	0	10,523
12-2	Makedonski Brod	239	676	915	0	915	48	66	114	0	114	1,029	0	1,029
13-3	Kumanovo	9,684	3,971	13,655	0	13,655	1,448	1,004	2,452	0	2,452	2,452	13,655	16,107
13-2	Kratovo	704	257	962	0	962	839	0	839	0	839	839	962	1,801
13-1	Kriva Palanka	1,339	814	2,153	0	2,153	449	74	523	0	523	2,676	0	2,676
11-4	Veles	5,631	1,297	6,928	0	6,928	1,257	17,198	1,433	17,021	18,454	1,433	23,949	25,382
14-8	Sveti Nikole	1,548	515	2,063	0	2,063	179	366	545	0	545	545	2,063	2,608
14-7	Ship	5,164	650	5,813	0	5,813	1,403	5,189	6,592	0	6,592	12,405	0	12,405
14-6	Probitip	1,262	431	1,694	0	1,694	788	889	1,678	0	1,678	3,372	0	3,372
14-5	Kochani	3,561	1,560	5,121	768	5,121	658	0	658	0	658	5,011	768	5,779
14-4	Vinica	1,382	648	2,031	0	2,031	117	0	117	0	117	117	2,031	2,148
14-3	Delcevo	1,582	1,049	2,630	0	2,630	322	2	324	0	324	2,954	0	2,954
14-1	Berevo	1,262	654	1,916	0	1,916	383	13	396	0	396	396	1,916	2,312
15-1	Demir Hisar	226	542	768	0	768	55	0	55	0	55	823	0	823
15-2	Krushevo	705	409	1,114	0	1,114	167	0	167	0	167	1,281	0	1,281
15-4	Bitola	9,078	2,034	11,112	0	11,112	2,114	14,223	2,114	14,223	16,337	2,114	25,335	27,449
15-3	Prilep	7,935	1,712	9,647	0	9,647	1,348	186	1,534	0	1,534	11,181	0	11,181
11-5	Kavadarci	4,055	654	4,709	0	4,709	1,198	2,280	1,205	2,273	3,478	5,914	2,273	8,187
11-6	Negotino	2,180	778	2,958	0	2,958	724	1,809	932	1,601	2,533	3,890	1,601	5,491
11-8	Valandovo	704	560	1,264	0	1,264	134	0	134	0	134	1,398	0	1,398
11-9	Gevgeliija	2,259	1,438	3,697	0	3,697	816	232	1,048	0	1,048	4,745	0	4,745
17-2	Ohrid	5,286	1,402	6,688	0	6,688	1,941	0	1,941	0	1,941	1,941	6,688	8,629
17-3	Struga	3,058	3,405	6,463	0	6,463	777	0	778	0	778	7,241	0	7,241
17-4	Debar	1,763	1,045	2,808	0	2,808	347	0	347	0	347	3,155	0	3,155
17-1	Resen	1,081	564	1,646	0	1,646	431	0	431	0	431	2,077	0	2,077
16-1	Radovish	2,135	1,105	3,240	0	3,240	180	2	182	0	182	3,422	0	3,422
16-2	Strumica	5,698	4,111	9,809	0	9,809	1,155	73	1,229	0	1,229	1,229	9,809	11,038
	Total	175,668	56,252	175,990	55,930	231,920	41,834	102,546	93,447	50,933	144,380	269,437	106,863	376,300

Table J.7 Demand Projection of Municipal and Industrial Water (2025)

(unit: 10³ m³/year)

No. of Node	Municipality	(1) Municipal Water Demand (M)				(2) Industrial Water Demand (I)				(3)=(1)+(2) (Total of M & I)				
		Area		Source of Water		Total (1)	Potable	Raw Process	Source of Water		Total (2)	Ground-water	Surface water	Total
		Urban	Rural	Ground-water	Surface water				Ground-water	Surface water				
I1-3	Skopje	80,433	9,535	89,968	0	89,968	17,524	59,855	77,379	0	77,379	167,347	167,347	
I1-1	Gostivar	7,099	6,070	13,169	0	13,169	2,719	1,807	3,071	1,455	4,526	16,240	17,695	
I1-2	Tetovo	9,787	11,061	20,847	0	20,847	3,437	14,503	3,580	14,360	17,940	24,427	38,787	
I2-1	Kichevo	3,780	2,375	6,156	0	6,156	702	6,623	7,325	0	7,325	13,481	13,481	
I2-2	Makedonski Brod	232	760	992	0	992	52	103	155	0	155	1,147	1,147	
I3-3	Kumanovo	10,097	4,716	14,813	0	14,813	1,566	1,558	3,124	0	3,124	3,124	17,937	
I3-2	Kratovo	680	283	963	0	963	906	0	907	0	907	907	1,870	
I3-1	Kriva Palanka	1,292	896	2,187	0	2,187	486	114	600	0	600	2,787	2,787	
I1-4	Veles	5,784	1,516	7,300	0	7,300	1,358	17,296	1,633	17,021	18,654	1,633	25,954	
I4-8	Sveti Nikole	1,548	586	2,133	0	2,133	193	569	762	0	762	2,133	2,895	
I4-7	Shtip	5,429	777	6,206	0	6,206	1,516	8,058	9,575	0	9,575	15,781	15,781	
I4-6	Probishtip	1,290	502	1,791	0	1,791	852	1,381	2,233	0	2,233	4,024	4,024	
I4-5	Kochani	3,701	1,847	4,716	832	5,548	711	0	711	0	711	5,427	6,259	
I4-4	Vitica	1,443	771	2,214	0	2,214	127	0	127	0	127	2,214	2,341	
I4-3	Delcevo	1,648	1,247	2,895	0	2,895	348	3	351	0	351	3,246	3,246	
I4-1	Berevo	1,275	752	2,027	0	2,027	414	20	434	0	434	434	2,461	
I5-1	Demir Hisar	205	562	767	0	767	60	0	60	0	60	827	827	
I5-2	Krushevo	703	465	1,168	0	1,168	180	0	180	0	180	1,348	1,348	
I5-4	Bitola	9,244	2,355	11,600	0	11,600	2,286	14,223	2,286	14,223	16,509	2,286	28,109	
I5-3	Prilep	8,061	1,978	10,039	0	10,039	1,457	289	1,746	0	1,746	11,785	11,785	
I1-5	Kavadarci	4,244	779	5,023	0	5,023	1,295	2,284	1,306	2,273	3,579	6,329	8,602	
I1-6	Negotino	2,261	934	3,195	0	3,195	782	1,924	1,105	1,601	2,706	4,300	5,901	
I1-8	Valandovo	737	669	1,407	0	1,407	145	0	145	0	145	1,552	1,552	
I1-9	Gevgelija	2,368	1,720	4,088	0	4,088	882	360	1,241	0	1,241	5,329	5,329	
I7-2	Ohrid	5,530	1,668	7,199	0	7,199	2,098	0	2,098	0	2,098	7,199	9,297	
I7-3	Struga	3,204	4,083	7,287	0	7,287	840	0	840	0	840	8,127	8,127	
I7-4	Debar	1,869	1,263	3,133	0	3,133	376	0	376	0	376	3,509	3,509	
I7-1	Resen	1,076	640	1,717	0	1,717	466	0	466	0	466	2,183	2,183	
I6-1	Radovish	2,230	1,316	3,546	0	3,546	194	3	197	0	197	3,743	3,743	
I6-2	Strumica	5,938	4,909	10,847	0	10,847	1,248	115	1,363	0	1,363	10,847	12,210	
	Total	183,189	67,033	190,294	59,928	250,222	45,221	131,088	125,376	50,933	176,309	315,670	426,531	

Table J.8 Irrigation Area Projection (1/9)

2005

Cropping Pattern No.	Irrigation System No.	Irrigation System	Irrigation Service Area (ha)	No.	Climatic Region	No.	Crop	Cropping Code No.	1st Crop		2nd Crop (Summer)		
									New Area (ha)	New Ratio	New Area (ha)	New Ratio	
1.	5.	Lakavica	161	1.	Tetova - Gostivar	1.	Wheat	11	18,264	0.74	0		
	6.	Metza	230			2.	Maize	21	0	7,003	0.28		
	1.	Shkoca	142			3.	Rice	31	0	0			
	2.	Zdunje I & II	2,200			4.	Tobacco	41	0	0			
	3.	Gostivarsko pole	4,311			5.	Sunflower	51	0	0			
	4.	Banjica	531			6.	Cabbage	61	0	0			
	7.	Vrapciska reka	280			7.	Tomatoes	71	0	957	0.04		
	8.	Balin dol	116			8.	Peppers	81	0	1,103	0.04		
	9.	Stenje	500			9.	Other Vegetables	91	0	11,847	0.48		
	10.	Mazdracha	1,180			10.	Apples	101	0	0	0.00		
	11.	Radivoce-Bistrica	8,187			11.	Plums	111	0	0	0.00		
	12.	Miletino-Chelepek	856			12.	S. Cherries	121	0	0			
	13.	Rechica	114			13.	Other Orchards	131	3,692	0.15	3,692	0.15	
	14.	Ratac	1,040			14.	Grapes	141	0	0			
15.	Djeptiste	160	Total				21,956	0.89	24,602	1.00			
16.	Neprosheno	114											
17.	Stari	2,500											
124.	Debarsko pole	1,580											
New1	Raven-Rechica-Terace	0											
	Total		24,602										
2.	21.	Rigor-Dolenci	590	1.	Marrivo - Lazaropole	1.	Wheat	12	30,012	0.66	0		
	22.	Zasec-Grestinica	150			2.	Maize	22	0	11,990	0.26		
	23.	Kichevsko pole	1,450			3.	Rice	32	0	0			
	60.	Obednichka	30			4.	Tobacco	42	0	12,777	0.28		
	61.	Demir hisar	10			5.	Sunflower	52	0	0			
	62.	Buchin	120			6.	Cabbage	62	0	0			
	63.	Debrezhtic	251			7.	Tomatoes	72	0	1,911	0.04		
	64.	Crna upper reach	250			8.	Peppers	82	0	2,203	0.05		
	65.	Brailovo	140			9.	Other Vegetables	92	0	7,888	0.17		
	66.	Desovo	280			10.	Apples	102	7,000	0.15	7,000	0.15	
	67.	Krushevo	220			11.	Plums	112	1,710	0.04	1,710	0.04	
	68.	Borino (Lazhani)	666			12.	S. Cherries	122	0	0			
	69.	Prilep	6,200			13.	Other Orchards	132	0	0	0.00		
	70.	Srezhevo	20,200			14.	Grapes	142	0	0			
	71.	Slomnica upper reach	50			Total				38,722	0.85	45,479	1.00
	72.	Dihovo	270										
	73.	Bistrica	40										
	74.	Velushka river	75										
	75.	Graeshnica	20										
	102.	Ljubojno	84										
	103.	Krani	153										
104.	Asamati	2,811											
105.	Pretor	41											
106.	Kurbinovo	78											
107.	Sirhan	2,788											
108.	Ljubanishta	142											
109.	Trebanishta	50											
110.	Leskoc	100											
111.	Veigoshie	60											
112.	Ovostarnik	250											
113.	Indraglavje	700											
114.	Slatino	700											
115.	Beckishka-Velmej	1,400											
116.	Sateska	1,250											
117.	Botun	50											
118.	Shum-Vishai	305											
119.	Lozhani	550											
120.	Stari	745											
121.	Strushko pole	1,600											
122.	Banjiste	150											
123.	Gradinar	60											
New2	Buchin	0											
	Total		45,479										

Table J.8 Irrigation Area Projection (2/9)

2005

Cropping Pattern No.	Irrigation System No.	Irrigation System	Irrigation Service Area (ha)	No.	Climatic Region	No.	Crop	Cropping Code No.	1st Crop		2nd Crop (Summer)							
									New Area (ha)	New Ratio	New Area (ha)	New Ratio						
3a.	18.	Radusha	71	1.	Mavrovo - Lazaropole	1.	Wheat	13	39,565	0.49	0	0.28						
	19.	Rashche	325										2.	Maize	23	0	22,454	
	20.	Saraj	14										3.	Rice	33	0	0	
	24.	Shibevo	56										4.	Tobacco	43	0	4,784	
	25.	Glumovo	14										5.	Sunflower	53	0	9,358	
	26.	Vuchidol-Orman	85										6.	Cabbage	63	0	0	
	27.	Novo selo	68										7.	Tomatoes	73	0	3,578	
	28.	Bardovci-Zlokukjani	140										8.	Peppers	83	0	4,126	
	29.	Radishani	27										9.	Other Vegetables	93	0	6,023	
	30.	Drachevo-Bainci	110										10.	Apples	103	0	0	
	31.	Kamnuk	1,300										11.	Plums	113	0	0	
	32.	Petrovec	100										12.	S. Cherries	123	1,695	1,695	
	33.	Shamak	30										13.	Other Orchards	133	4,443	4,443	
	43.	Mladost (Otoevica)	1,200										14.	Grapes	143	23,479	23,479	
	44.	Topolka	400															
	45.	Vitanci	98															
	46.	Babuna	100															
	47.	Kochilari	80															
	48.	Zgropulci	24															
	49.	Vinichani	150															
	80.	Boshavica	1,935															
	81.	Peplishko pole	1,600															
	82.	Demir kapija	300															
	34.	Dragomanci	136															
	36.	Studerma bara-Vakuf	400															
	37.	Dvezanec-Jachince-Kle	250															
	38.	Klechovce	500															
	39.	Shupli kamen-Zubovce	122															
	40.	Rechica	60															
	41.	Ivor Jovica	44															
	42.	Lipkovo	10,820															
	56.	Osejnica	415															
	57.	Blace	915															
	58.	Betshtnica-Zletovo	200															
	125.	Mavrovo	5,581															
	59.	Mavrovica	250															
	76.	Dabesicka reka	300															
	77.	Tikvish	20,290															
	78.	Vozanci	28															
	79.	Trsenik-Gradsko	960															
	126.	Oraevica	67															
	127.	Podarash	250															
	128.	Turija	10,050															
	131.	Novo selo	200															
	129.	Vodocha	4,000															
	130.	Podbelasica	1,550															
	New3	Vakuf	0															
	New4	Skopitp pole	2,325															
	New5	Lakavica	6,000															
	New6	Podarash	6,000															
		Total	79,940															
3b.	55.	Bregalnica	32,100	1.	Mavrovo - Lazaropole	1.	Wheat	13	13,239	0.49	0	0.13						
													2.	Maize	23	0	4,047	
													3.	Rice	33	0	5,000	
													4.	Tobacco	43	0	1,725	
													5.	Sunflower	53	0	3,374	
													6.	Cabbage	63	0	0	
													7.	Tomatoes	73	0	1,290	
													8.	Peppers	83	0	1,487	
													9.	Other Vegetables	93	0	3,550	
													10.	Apples	103	0	0	
													11.	Plums	113	0	0	
													12.	S. Cherries	123	1,528	1,528	
													13.	Other Orchards	133	4,979	4,979	
													14.	Grapes	143	5,120	5,120	
	Total	24,866	0.91	32,100	1.00													

Table J.8 Irrigation Area Projection (3/9)

2005

Cropping Pattern No.	Irrigation System No.	Irrigation System	Irrigation Service Area (ha)	No.	Climatic Region	No.	Crop	Cropping Code No.	1st Crop		2nd Crop (Summer)		
									New Area (ha)	New Ratio	New Area (ha)	New Ratio	
4.	35.	Slavishko pole	250	1.	Mavrovo - Lazaropole	1.	Wheat	14	500	0.12	0		
	50.	Crn dot (Pclichevo)	80			2.	Maize	24	0	0	230	0.05	
	51.	Maleshevsko pole	3,014			3.	Rice	34	0	0	0		
	52.	Sandanski (Delchevo)	250			4.	Tobacco	44	0	0	0		
	53.	Jugorutun (Delchevo)	164			5.	Sunflower	54	0	0	0		
	54.	Milkovo (Delchevo)	540	2.	Bitola - Prilep	6.	Cabbage	64	0	0	0		
	Total					4,298	7.	Tomatoes	74	0	88	0.02	
							8.	Peppers	84	0	0		
							9.	Other Vegetables	94	0	182	0.04	
							10.	Apples	104	0	0		
							11.	Plums	114	2,656	0.62	2,656	0.62
							12.	S. Cherries	124	1,142	0.27	1,142	0.27
							13.	Other Orchards	134	0	0		
							14.	Grapes	144	0	0		
				Total			4,298	1.00	4,298	1.00			
5.	83.	Gradec	264	1.	Mavrovo - Lazaropole	1.	Wheat	15	3,347	0.21	0		
	84.	Udovo-Valandovo	3,624			2.	Maize	25	0	0	3,956	0.24	
	86.	Miravci	100			3.	Rice	35	0	0	0		
	85.	Petrushka river	100			4.	Tobacco	45	0	0	0		
	87.	Grcishte I and II	423			5.	Sunflower	55	0	0	0		
	88.	Smokvica I and II	110	2.	Bitola - Prilep	6.	Cabbage	65	2,002	0.12	0		
	89.	Prdoci	200			7.	Tomatoes	75	0	0	1,513	0.09	
	90.	Kovanska, Serminenska	200			8.	Peppers	85	0	0	872	0.05	
	91.	Vinojug	150			9.	Other Vegetables	95	0	0	3,123	0.19	
	92.	Gjavoro	1,340			10.	Apples	105	0	0	0		
	93.	Faljurci	800			11.	Plums	115	0	0	0		
	94.	Konska rika	571			12.	S. Cherries	125	0	0	0		
	95.	Sehovo	200			13.	Other Orchards	135	0	0	0		
	96.	Granica	120			14.	Grapes	145	6,764	0.42	6,764	0.42	
97.	Pod anot	120	Total			12,113	0.75	16,228	1.00				
98.	Avlakot	40											
99.	Keramadnica	80											
100.	Selemi	350											
New7	Konsko	7,426											
Total			16,228										
					1.	Mavrovo - Lazaropole	1.	Wheat	10	104,927		0	
							2.	Maize	20	0	49,680		
							3.	Rice	30	0	5,800		
							4.	Tobacco	40	0	19,286		
							5.	Sunflower	50	0	12,732		
							6.	Cabbage	60	2,002	0		
							7.	Tomatoes	70	0	9,337		
							8.	Peppers	80	0	9,791		
							9.	Other Vegetables	90	0	32,613		
							10.	Apples	100	7,800	7,800		
							11.	Plums	110	4,366	4,366		
							12.	S. Cherries	120	4,365	4,365		
							13.	Other Orchards	130	13,114	13,114		
							14.	Grapes	140	35,363	35,363		
					Total			171,137		202,447			
Grand Total			202,647										

Table J.8 Irrigation Area Projection (5/9)

2015

Cropping Pattern No.	Irrigation System No.	Irrigation System	Irrigation Service Area (ha)	No.	Climatic Region	No.	Crop	Cropping Code No.	1st Crop		2nd Crop (Summer)	
									New Area (ha)	New Ratio	New Area (ha)	New Ratio
3a.	18.	Radusha	71	1. Mavrovo - Lazaropole 2. Bitola - Prilep 3. Shitip - Skopje 4. Berovo - Kriva P. 5. Gevgelija	1.	Wheat	13	47,479	0.40	0		
	19.	Rashche	325		2.	Maize	23	0		32,441	0.27	
	20.	Saraj	14		3.	Rice	33	0		0		
	24.	Shitvevo	56		4.	Tobacco	43	0		9,412	0.08	
	25.	Glunovo	14		5.	Sunflower	53	0		12,611	0.11	
	26.	Vuchidol-Orman	85		6.	Cabbage	63	0		0		
	27.	Novo selo	68		7.	Tomatoes	73	0		5,225	0.04	
	28.	Bardovci-Zlokukjani	140		8.	Peppers	83	0		6,191	0.05	
	29.	Radishani	27		9.	Other Vegetables	93	0		10,066	0.09	
	30.	Drachevo-Batinci	110		10.	Apples	103	0		0		
	31.	Kamnik	1,300		11.	Plums	113	0		0		
	32.	Petrovec	100		12.	S. Cherries	123	2,757	0.02	2,757	0.02	
	33.	Shamak	30		13.	Other Orchards	133	9,506	0.08	9,506	0.08	
	43.	Mladost (Otoevica)	1,200		14.	Grapes	143	29,906	0.25	29,906	0.25	
	44.	Topolka	400			Total		89,648	0.76	118,115	1.00	
	45.	Vitanci	92									
	46.	Babuna	100									
	47.	Kochilani	80									
	48.	Zgropulci	24									
	49.	Vinichani	150									
	80.	Boshavica	1,935									
	81.	Pepelishko pole	1,600									
	82.	Demir kapija	300									
	34.	Dragomanci	136									
	36.	Studerna bara-Vakuf	400									
	37.	Davezenec-Jachince-Kle	250									
	38.	Klechevce	500									
	39.	Shupli kamen-Zubovec	122									
	40.	Recluca	60									
	41.	Izvor Jovica	44									
	42.	Lipkovo	10,820									
	56.	Osojnica	415									
	57.	Blatec	915									
	58.	Belashnica-Zletovo	200									
	125.	Mantovo	5,581									
	59.	Mavrovica	250									
	76.	Dabnichka reka	300									
	77.	Tikvesh	20,290									
	78.	Vozari	28									
	79.	Trestenik-Gradsko	960									
	126.	Oraovica	67									
	127.	Podaresh	250									
	128.	Turija	10,050									
	131.	Novo selo	200									
	129.	Vodocha	4,000									
	130.	Podbelasica	1,550									
	New3	Vakfu	22,000									
New4	Skopski pole	18,500										
New5	Lakavica	6,000										
New6	Podaresh	6,000										
	Total	118,115										
3b.	55.	Bregalnica	32,100	1. Mavrovo - Lazaropole 2. Bitola - Prilep 3. Shitip - Skopje 4. Berovo - Kriva P. 5. Gevgelija	1.	Wheat	13	10,753	0.39	0		
					2.	Maize	23	0		3,435	0.11	
					3.	Rice	33	0		6,000	0.19	
					4.	Tobacco	43	0		1,821	0.06	
					5.	Sunflower	53	0		2,904	0.09	
					6.	Cabbage	63	0		0		
					7.	Tomatoes	73	0		1,131	0.04	
					8.	Peppers	83	0		1,340	0.04	
					9.	Other Vegetables	93	0		4,056	0.13	
					10.	Apples	103	0		0		
					11.	Plums	113	0		0		
					12.	S. Cherries	123	1,492	0.05	1,492	0.05	
					13.	Other Orchards	133	5,922	0.22	5,922	0.18	
					14.	Grapes	143	3,999	0.15	3,999	0.12	
						Total		22,166	0.81	32,100	1.00	

Table J.8 Irrigation Area Projection (6/9)

2015

Cropping Pattern No.	Irrigation System No.	Irrigation System	Irrigation Service Area (ha)	No.	Climatic Region	No.	Crop	Cropping Code No.	1st Crop		2nd Crop (Summer)	
									New Area (ha)	New Ratio	New Area (ha)	New Ratio
4.	35.	Slavishko pole	250	1.	Mavrovo - Lazaropole	1.	Wheat	14	440	0.10	0	
	50.	Crn dol (Pebchevo)	80			2.	Maize	24	0	0	179	0.04
	51.	Maleshevsko pole	3,014			3.	Rice	34	0	0	0	
	52.	Sandanski (Delchevo)	250			4.	Tobacco	44	0	0	0	
	53.	Jugoutun (Delchevo)	164			5.	Sunflower	54	0	0	0	
	54.	Milkovo (Delchevo)	510		6.	Cabbage	64	0	0	0		
		Total	4,298		7.	Tomatoes	74	0	0	71	0.02	
					8.	Peppers	84	0	0	0		
					9.	Other Vegetables	94	0	0	190	0.04	
					10.	Apples	104	0	0	0		
					11.	Plums	114	2,927	0.68	2,927	0.68	
					12.	S. Cherries	124	931	0.22	931	0.22	
					13.	Other Orchards	134	0	0	0		
					14.	Grapes	144	0	0	0		
				Total			4,298	1.00	4,298	1.00		
5.	83.	Gradec	264	1.	Mavrovo - Lazaropole	1.	Wheat	15	2,718	0.17	0	
	84.	Udovo-Valandovo	3,624			2.	Maize	25	0	0	4,062	0.25
	86.	Miravci	100			3.	Rice	35	0	0	0	
	85.	Petrushka river	100			4.	Tobacco	45	0	0	0	
	87.	Grchishte I and II	423			5.	Sunflower	55	0	0	0	
	88.	Snokvica I and II	110		6.	Cabbage	65	2,002	0.12	0		
	89.	Prdeci	200		7.	Tomatoes	75	0	0	1,507	0.09	
	90.	Kovanska, Sermeninska	200		8.	Peppers	85	0	0	893	0.06	
	91.	Vinojug	150		9.	Other Vegetables	95	0	0	4,301	0.27	
	92.	Gjurovo	1,340		10.	Apples	105	0	0	0		
	93.	Paljari	800		11.	Plums	115	0	0	0		
	94.	Koska reka	571		12.	S. Cherries	125	0	0	0		
	95.	Schovo	200		13.	Other Orchards	135	0	0	0		
	96.	Granica	120		14.	Grapes	145	5,465	0.34	5,465	0.34	
	97.	Pod anot	120		Total			10,185	0.63	16,228	1.00	
	98.	Avlakot	40									
	99.	Keramadnica	80									
	100.	Seemli	350									
	New-7	Kosko	2,436									
		Total	16,228									
				1.	Mavrovo - Lazaropole	1.	Wheat	10	100,599		0	
						2.	Maize	20	0	0	54,014	
						3.	Rice	30	0	0	6,000	
						4.	Tobacco	40	0	0	24,405	
						5.	Sunflower	50	0	0	15,515	
						6.	Cabbage	60	2,002		0	
						7.	Tomatoes	70	0	0	10,377	
						8.	Peppers	80	0	0	11,318	
						9.	Other Vegetables	90	0	0	42,387	
						10.	Apples	100	8,000		8,000	
						11.	Plums	110	4,874		4,874	
						12.	S. Cherries	120	5,180		5,180	
						13.	Other Orchards	130	19,382		19,382	
						14.	Grapes	140	39,370		39,370	
				Total			178,407		240,822			
				Grand Total			240,822					

Table J.8 Irrigation Area Projection (7/9)

2025

Cropping Pattern No.	Irrigation System No.	Irrigation System	Irrigation Service Area (ha)	No.	Climatic Region	No.	Crop	Cropping Code No.	1st Crop		2nd Crop (Summer)		
									New Area (ha)	New Ratio	New Area (ha)	New Ratio	
1.	5.	Lakavica	161	1.	Tetovo - Gostivar	1.	Wheat	11	16,649	0.48	0	0.19	
	6.	Melca	230			2.	Maize	21			0		6,545
	1.	Sikozza	142			3.	Rice	31			0		0
	2.	Zdunje I & II	2,200			4.	Tobacco	41			0		0
	3.	Gostivarsko pole	4,311			5.	Sunflower	51			0		0
	4.	Banjica	531			6.	Cabbage	61			0		0
	7.	Vrapcistika teka	280			7.	Tomatoes	71			0		1,081
	8.	Batu dot	116			8.	Peppers	81			0		1,162
	9.	Sienshe	500			9.	Other Vegetables	91			0		18,859
	10.	Mazdracha	1,180			10.	Apples	101			0		0
	11.	Radovoc-Bistrica	8,187			11.	Plums	111			0		0
	12.	Milefino-Chelepek	856			12.	S. Cherries	121			0		0
	13.	Rechica	114			13.	Other Orchards	131			6,755		6,755
	14.	Ratae	1,040			14.	Grapes	141			0		0
15.	Djeptiste	160		Total		23,404	0.68	34,602	1.00				
16.	Neproshteno	114											
17.	Stari	2,500											
124.	Debarsko pole	1,980											
New1	Raven-Rechica-Terace	10,600											
	Total	34,602											
2.	21.	Bigor-Dolenci	590	1.	Mavrovo - Lazzaropole	1.	Wheat	12	30,998	0.43	0	0.22	
	22.	Zaac-Greshnica	450			2.	Maize	22			0		15,722
	23.	Kichevsko pole	1,450			3.	Rice	32			0		0
	60.	Obednichki	30			4.	Tobacco	42			0		20,860
	61.	Demir hisar	10			5.	Sunflower	52			0		0
	62.	Buchin	120			6.	Cabbage	62			0		0
	63.	Debeshte	251			7.	Tomatoes	72			0		2,891
	64.	Crna upper reach	250			8.	Peppers	82			0		3,642
	65.	Brailovo	240			9.	Other Vegetables	92			0		16,919
	66.	Desovo	280			10.	Apples	102			9,000		9,000
	67.	Krushevo	220			11.	Plums	112			3,445		3,445
	68.	Borino (Lazhani)	666			12.	S. Cherries	122			0		0
	69.	Prilep	6,200			13.	Other Orchards	132			0		0
	70.	Strazhevo	20,200			14.	Grapes	142			0		0
71.	Shemnica upper reach	50		Total		43,443	0.60	72,479	1.00				
72.	Dihovo	270											
73.	Bistrica	40											
74.	Velushka river	75											
75.	Graeshnica	20											
102.	Ljebojno	84											
103.	Krani	153											
104.	Asamati	2,811											
105.	Pretor	41											
106.	Kurbinovo	78											
107.	Sirhan	2,788											
108.	Ljabanishta	142											
109.	Trebanishta	50											
110.	Leskec	100											
111.	Velgoshte	60											
112.	Ovoshtharuk	250											
113.	Indeglayje	700											
114.	Statino	700											
115.	Belchishta-Velmej	1,400											
116.	Sateska	1,250											
117.	Bozur	50											
118.	Shum-Vishni	305											
119.	Lozhani	550											
120.	Stari	745											
121.	Strushtko pole	1,600											
122.	Banjiste	150											
123.	Gradinar	60											
New2	Buchin	27,000											
	Total	72,479											

Table J.8 Irrigation Area Projection (8/9)

2025

Cropping Pattern No.	Irrigation System No.	Irrigation System	Irrigation Service Area (ha)	No.	Climatic Region	No.	Crop	Cropping Code No.	1st Crop		2nd Crop (Summer)									
									New Area (ha)	New Ratio	New Area (ha)	New Ratio								
3a.	18.	Raduha	71	1.	Mavrovo - Lazaropole	1.	Wheat	13	38,529	0.32	0	29,102	0.24							
	19.	Rashebe	325			2.	Maize	23			0			0						
	20.	Saraj	14			3.	Rice	33			0			0						
	24.	Shishevo	56			4.	Tobacco	43			0			6,136	0.05					
	25.	Glumovo	14			5.	Sunflower	53			0			15,374	0.13					
	26.	Vuchidel-Orman	85			6.	Cabbage	63			0			0	0					
	27.	Novo selo	68			7.	Tomatoes	73			0			4,912	0.04					
	28.	Bardovi-Zlokukjani	140			8.	Peppers	83			0			6,227	0.05					
	29.	Radishani	27			9.	Other Vegetables	93			0			9,773	0.08					
	30.	Drachevo-Batinci	110			10.	Apples	103			0			0	0					
	31.	Kamnik	1,300			11.	Plums	113			0			0	0					
	32.	Petrovec	100			12.	S. Cherries	123			3,259			0.03	3,259	0.03				
	33.	Shamak	30			13.	Other Orchards	133			12,109			0.10	12,109	0.10				
	43.	Mladost (Orovica)	1,200			14.	Grapes	143			33,193			0.28	33,193	0.28				
	44.	Topolba	400			Total		87,090			0.73			120,115		1.00				
	45.	Vitanci	98																	
	46.	Babuna	100																	
	47.	Kochilari	80																	
	48.	Zgropulci	24																	
	49.	Vinichani	150																	
	80.	Boshavica	1,925																	
	81.	Peplishko pole	1,600																	
	82.	Dcmir kapija	300																	
	34.	Dragonanci	136																	
	36.	Stoderna bara-Vakuf	400																	
	37.	Davezence-Jachinoc-Kle	250																	
	38.	Klechovoc	500																	
	39.	Shupli kamen-Zubovoc	122																	
	40.	Rushica	60																	
	41.	Izvor Jovica	44																	
	42.	Lipkovo	10,820																	
	56.	Osojica	415																	
	57.	Blatoc	915																	
	58.	Belashnica-Zletovo	200																	
	125.	Mantovo	5,581																	
	59.	Mavrovica	250																	
	76.	Dabnichka reka	300																	
	77.	Tilyesh	20,290																	
	78.	Vozarci	28																	
	79.	Trosnik-Gradsko	960																	
	126.	Oranica	67																	
	127.	Podarsh	250																	
	128.	Turija	10,050																	
	131.	Novo selo	200																	
	129.	Vodocha	4,000																	
	130.	Podbelasica	1,550																	
	New3	Vakfu	24,000																	
	New4	Skopsko pole	18,500																	
	New5	Lakarica	6,000																	
	New6	Podarsh	6,000																	
	Total					120,115														
	3b.	55.	Bregalnica			32,100	1.	Mavrovo - Lazaropole			1.			Wheat	13	3,580	0.31	0	2,835	0.09
2.				Maize	23				0	7,000	0.22									
3.				Rice	33				0	1,415	0.04									
4.				Tobacco	43				0	3,128	0.10									
5.				Sunflower	53				0	0	0									
6.				Cabbage	63				0	980	0.03									
7.				Tomatoes	73				0	1,235	0.04									
8.				Peppers	83				0	3,599	0.11									
9.				Other Vegetables	93				0	0	0									
10.				Apples	103				0	0	0									
11.				Plums	113				0	0	0									
12.				S. Cherries	123				1,616	0.06	1,616	0.05								
13.				Other Orchards	133				6,352	0.23	6,352	0.20								
14.				Grapes	143				3,940	0.14	3,940	0.12								
Total				20,488					0.75		32,100		1.00							

Table J.8 Irrigation Area Projection (9/9)

2025

Cropping Pattern No.	Irrigation System No.	Irrigation System	Irrigation Service Area (ha)	No.	Climatic Region	No.	Crop	Cropping Code No.	1st Crop		2nd Crop (Summer)	
									New Area (ha)	New Ratio	New Area (ha)	New Ratio
4.	35.	Slavishko pole	250	1.	Mavrovo - Lazaropole	1.	Wheat	14	412	0.10	0	
	50.	Crni dol (Pelechevo)	80	2.	Bitola - Prilep	2.	Maize	24	0		161	0.04
	51.	Maleshevska pole	3,014	3.	Shitip - Skopje	3.	Rice	31	0		0	
	52.	Sandanski (Delchevo)	250	4.	Berovo - Kriva P.	4.	Tobacco	41	0		0	
	53.	Jugotun (Delchevo)	164	5.	Gevgelija	5.	Sunflower	54	0		0	
	54.	Milkovo (Delchevo)	510			6.	Cabbage	64	0		0	
						7.	Tomatoes	74	0		67	0.02
						8.	Peppers	84	0		0	
						9.	Other Vegetables	94	0		184	0.04
						10.	Apples	104	0		0	
						11.	Plums	114	2,784	0.65	2,784	0.65
						12.	S. Cherries	124	1,102	0.26	1,102	0.26
						13.	Other Orchards	134	0		0	
						14.	Grapes	144	0		0	
				4,298			Total		4,298	1.00	4,298	1.00
5.	83.	Gradec	264	1.	Mavrovo - Lazaropole	1.	Wheat	15	2,169	0.13	0	
	84.	Udovo-Valandovo	3,624	2.	Bitola - Prilep	2.	Maize	25	0		3,701	0.23
	86.	Miravci	100	3.	Shitip - Skopje	3.	Rice	35	0		0	
	85.	Petrushka river	100	4.	Berovo - Kriva P.	4.	Tobacco	45	0		0	
	87.	Grochiste I and II	423	5.	Gevgelija	5.	Sunflower	55	0		0	
	88.	Smokvica I and II	110			6.	Cabbage	65	1,000	0.06	0	
	89.	Prejci	200			7.	Tomatoes	75	0		1,432	0.09
	90.	Kovanska, Sermeninska	200			8.	Peppers	85	0		902	0.06
	91.	Vinogig	150			9.	Other Vegetables	95	0		4,192	0.26
	92.	Gjavoto	1,340			10.	Apples	105	0		0	
	93.	Paljunci	800			11.	Plums	115	0		0	
	94.	Koniska reka	571			12.	S. Cherries	125	0		0	
	95.	Schovo	200			13.	Other Orchards	135	0		0	
	96.	Granica	120			14.	Grapes	145	6,001	0.37	6,001	0.37
	97.	Pod anot	120			Total		9,170	0.57	16,228	1.00	
98.	Avlakjot	40										
99.	Keramadnica	80										
100.	Selemil	150										
New7	Kosko	7,436										
			16,228									
					1.	Mavrovo - Lazaropole	1.	Wheat	10	97,337	0	0
					2.	Bitola - Prilep	2.	Maize	20	0	58,066	
					3.	Shitip - Skopje	3.	Rice	30	0	7,000	
					4.	Berovo - Kriva P.	4.	Tobacco	40	0	28,411	
					5.	Gevgelija	5.	Sunflower	50	0	18,502	
					6.		6.	Cabbage	60	1,000	0	
					7.		7.	Tomatoes	70	0	11,393	
					8.		8.	Peppers	80	0	13,368	
					9.		9.	Other Vegetables	90	0	53,526	
					10.		10.	Apples	100	9,000	9,000	
					11.		11.	Plums	110	6,229	6,229	
					12.		12.	S. Cherries	120	5,977	5,977	
					13.		13.	Other Orchards	130	25,216	25,216	
					14.		14.	Grapes	140	43,134	43,134	
					Total		Total	187,893		279,822		
			279,822									

Table J.9 Gross Unit Irrigation Demand (1/8)

I. Climatic Region 1
(using data in Tetovo Meteo. Station)
36 years average from 1961 to 1996

No.	Year	No.	Crop	Cropping Code No.	Cropping Area (ha)	Area Ratio	Unit Demand		Demand		
							Net Volume (m3/year/ha)	Gross Volume (m3/year/ha)	Gross Volume (1,000 m3/year)		
1.	1996	1.	Wheat	11	20,857	0.90	1,058	1,824	38,171		
		2.	Maize	21	8,111	0.35	2,290	3,948	32,128		
		3.	Tomato	71	1,159	0.05	1,652	2,849	3,312		
		4.	Pepper	81	1,105	0.05	1,450	2,500	2,771		
		5.	Other Vegetables	91	10,428	0.45	2,177	3,753	39,261		
		6.	Other Orchards	131	2,317	0.10	2,969	5,119	11,898		
		7.				0.00	0	0	0		
							23,120	1.90			
					Total	23,174	1.00	3,182	5,486	127,542	
										Irr. Efficiency	0.58
2.	2005	1.	Wheat	11	18,264	0.74	1,058	1,679	30,844		
		2.	Maize	21	7,003	0.28	2,290	3,635	25,597		
		3.	Tomato	71	957	0.04	1,652	2,623	2,524		
		4.	Pepper	81	1,103	0.04	1,450	2,302	2,553		
		5.	Other Vegetables	91	11,847	0.48	2,177	3,455	41,160		
		6.	Other Orchards	131	3,692	0.15	2,969	4,713	17,495		
		7.				0.00	0	0	0		
							24,602	1.74			
					Total	24,602	1.00	3,060	4,858	120,173	
										Irr. Efficiency	0.63
3.	2015	1.	Wheat	11	14,834	0.60	1,058	1,628	24,270		
		2.	Maize	21	4,939	0.20	2,290	3,523	17,489		
		3.	Tomato	71	803	0.03	1,652	2,542	2,052		
		4.	Pepper	81	951	0.04	1,450	2,231	2,132		
		5.	Other Vegetables	91	13,955	0.57	2,177	3,349	46,970		
		6.	Other Orchards	131	3,954	0.16	2,969	4,568	18,152		
		7.				0.00	0	0	0		
							24,602	1.60			
					Total	24,602	1.00	2,920	4,492	111,064	
										Irr. Efficiency	0.65
4.	2025	1.	Wheat	11	16,649	0.48	1,058	1,628	27,204		
		2.	Maize	21	6,545	0.19	2,290	3,523	23,146		
		3.	Tomato	71	1,081	0.03	1,652	2,542	2,758		
		4.	Pepper	81	1,362	0.04	1,450	2,231	3,050		
		5.	Other Vegetables	91	18,859	0.55	2,177	3,349	63,393		
		6.	Other Orchards	131	6,755	0.20	2,969	4,568	30,971		
		7.				0.00	0	0	0		
							34,602	1.48			
					Total	34,602	1.00	2,817	4,334	150,521	
										Irr. Efficiency	0.65

Table J.9 Gross Unit Irrigation Demand (2/8)

II. Climatic Region 2
(using data in Bitola Meteo. Station)
36 years average from 1961 to 1996

No.	Year	No.	Crop	Cropping Code No.	Cropping Area (ha)	Area Ratio	Unit Demand		Demand
							Net Volume (m ³ /year/ha)	Gross Volume (m ³ /year/ha)	Gross Volume (1,000 m ³ /year)
1.	1996	1.	Wheat	12	33,783	0.80	1,673	2,885	97,764
		2.	Maize	22	12,669	0.30	3,245	5,594	71,104
		3.	Tobacco	42	10,557	0.25	1,968	3,393	35,933
		4.	Tomato	72	2,111	0.05	2,408	4,151	8,792
		5.	Pepper	82	2,111	0.05	2,172	3,745	7,931
		6.	Other Vegetables	92	6,334	0.15	3,111	5,364	34,082
		7.	Apple	102	6,334	0.15	4,736	8,166	51,888
		8.	Plum	112	2,111	0.05	4,180	7,206	15,262
							42,227	1.75	
				Total	42,229	1.00	4,419	7,618	322,755
						Irr. Efficiency	0.58		
2.	2005	1.	Wheat	12	30,012	0.66	1,673	2,656	80,145
		2.	Maize	22	11,990	0.26	3,245	5,150	62,096
		3.	Tobacco	42	12,777	0.28	1,968	3,123	40,131
		4.	Tomato	72	1,911	0.04	2,408	3,822	7,344
		5.	Pepper	72	2,203	0.05	2,172	3,448	7,637
		6.	Other Vegetables	92	7,888	0.17	3,111	4,938	39,166
		7.	Apple	102	7,000	0.15	4,736	7,518	52,916
		8.	Plum	112	1,710	0.04	4,180	6,634	11,408
						Total	45,479	1.61	4,144
					45,479	1.00			
						Irr. Efficiency	0.63		
3.	2015	1.	Wheat	12	24,375	0.54	1,673	2,574	63,059
		2.	Maize	22	8,958	0.20	3,245	4,992	44,945
		3.	Tobacco	42	13,172	0.29	1,968	3,027	40,079
		4.	Tomato	72	1,640	0.04	2,408	3,704	6,106
		5.	Pepper	82	1,943	0.04	2,172	3,341	6,526
		6.	Other Vegetables	92	9,819	0.22	3,111	4,786	47,232
		7.	Apple	102	8,000	0.18	4,736	7,286	58,588
		8.	Plum	112	1,947	0.04	4,180	6,430	12,584
						Total	45,479	1.49	3,969
					45,479	1.00			
						Irr. Efficiency	0.65		
4.	2025	1.	Wheat	12	30,998	0.43	1,673	2,574	80,089
		2.	Maize	22	15,722	0.22	3,245	4,992	78,780
		3.	Tobacco	42	20,860	0.29	1,968	3,027	63,390
		4.	Tomato	72	2,891	0.04	2,408	3,704	10,750
		5.	Pepper	82	3,642	0.05	2,172	3,341	12,216
		6.	Other Vegetables	92	16,919	0.23	3,111	4,786	81,279
		7.	Apple	102	9,000	0.12	4,736	7,286	65,825
		8.	Plum	112	3,445	0.05	4,180	6,430	22,236
						Total	72,479	1.38	3,704
					72,479	1.00			
						Irr. Efficiency	0.65		

Table J.9 Gross Unit Irrigation Demand (3/8)

IIIa. Climatic Region 3, Systems excluding Bregalnica System
(using data in Shtip Meteo. Station)
36 years average from 1961 to 1996

No.	Year	No.	Crop	Cropping Code No.	Cropping Area (ha)	Area Ratio	Unit Demand		Demand	
							Net Volume (m ³ /year/ha)	Gross Volume (m ³ /year/ha)	Gross Volume (1,000 m ³ /year)	
1.	1996	1.	Wheat	13	37,651	0.60	2,141	3,691	139,404	
		2.	Maize	23	18,824	0.30	3,730	6,431	121,448	
		3.	Rice	33	0	0.00	12,842	22,141	0	
		4.	Tobacco	43	3,138	0.05	2,358	4,066	12,801	
		5.	Sunflower	53	6,275	0.10	3,318	5,720	36,008	
		6.	Tomato	73	3,138	0.05	2,851	4,916	15,477	
		7.	Pepper	83	3,138	0.05	2,579	4,447	13,999	
		8.	Other Vegetables	93	3,138	0.05	3,613	6,229	19,611	
		9.	S. Cherrry	123	1,255	0.02	5,576	9,614	12,104	
		10.	Other Orchards	133	1,883	0.03	4,928	8,496	16,049	
		11.	Grape	143	21,962	0.35	4,092	7,055	155,444	
			Total		62,751	1.60	4,997	8,615	542,345	
									Irr. Efficiency	0.58
2.	2005	1.	Wheat	13	39,565	0.49	2,141	3,398	135,178	
		2.	Maize	23	22,454	0.28	3,730	5,921	133,682	
		3.	Rice	33	0	0.00	12,842	20,384	0	
		4.	Tobacco	43	4,784	0.06	2,358	3,743	18,008	
		5.	Sunflower	53	9,358	0.12	3,318	5,266	49,552	
		6.	Tomato	73	3,578	0.04	2,851	4,526	16,284	
		7.	Pepper	83	4,126	0.05	2,579	4,094	16,985	
		8.	Other Vegetables	93	6,023	0.08	3,613	5,735	34,734	
		9.	S. Cherry	123	1,695	0.02	5,576	8,851	15,086	
		10.	Other Orchards	133	4,443	0.06	4,928	7,821	34,944	
		11.	Grape	143	23,479	0.29	4,092	6,495	153,348	
			Total		79,940	1.44	4,764	7,561	607,802	
									Irr. Efficiency	0.63

Table J.9 Gross Unit Irrigation Demand (4/8)

IIIa. Climatic Region 3, Systems excluding Bregalnica System
(using data in Shtip Meteo. Station)
36 years average from 1961 to 1996

No.	Year	No.	Crop	Cropping Code No.	Cropping Area (ha)	Area Ratio	Unit Demand		Demand
							Net Volume (m ³ /year/ha)	Gross Volume (m ³ /year/ha)	Gross Volume (1,000 m ³ /year)
3.	2015	1.	Wheat	13	47,479	0.40	2,141	3,293	157,153
		2.	Maize	23	32,441	0.27	3,730	5,738	187,110
		3.	Rice	33	0	0.00	12,842	19,757	0
		4.	Tobacco	43	9,412	0.08	2,358	3,628	34,323
		5.	Sunflower	53	12,611	0.11	3,318	5,104	64,693
		6.	Tomato	73	5,225	0.04	2,851	4,387	23,038
		7.	Pepper	83	6,191	0.05	2,579	3,968	24,691
		8.	Other Vegetables	93	10,066	0.09	3,613	5,559	56,237
		9.	S. Cherry	123	2,757	0.02	5,576	8,579	23,772
		10.	Other Orchards	133	9,506	0.08	4,928	7,581	72,430
		11.	Grape	143	29,906	0.25	4,092	6,295	189,227
				Total	118,115	1.00	4,559	7,014	832,673
						Irr. Efficiency			0.65
4.	2025	1.	Wheat	13	38,529	0.32	2,141	3,293	127,363
		2.	Maize	23	29,102	0.24	3,730	5,738	167,633
		3.	Rice	33	0	0.00	12,842	19,757	0
		4.	Tobacco	43	6,136	0.05	2,358	3,628	22,347
		5.	Sunflower	53	15,374	0.13	3,318	5,104	78,764
		6.	Tomato	73	4,942	0.04	2,851	4,387	21,761
		7.	Pepper	83	6,227	0.05	2,579	3,968	24,802
		8.	Other Vegetables	93	9,773	0.08	3,613	5,559	54,529
		9.	S. Cherry	123	3,259	0.03	5,576	8,579	28,064
		10.	Other Orchards	133	12,109	0.10	4,928	7,581	92,143
		11.	Grape	143	33,193	0.28	4,092	6,295	209,751
				Total	120,115	1.00	4,459	6,860	827,159
						Irr. Efficiency			0.65

Table J.9 Gross Unit Irrigation Demand (6/8)

IIIb. Climatic Region 3, Bregalnica System
(using data in Shtip Meteo. Station)
36 years average from 1961 to 1996

No.	Year	No.	Crop	Cropping Code No.	Cropping Area (ha)	Area Ratio	Unit Demand		Demand	
							Net Volume (m ³ /year/ha)	Gross Volume (m ³ /year/ha)	Gross Volume (1,000 m ³ /year)	
3.	2015	1.	Wheat	13	10,753	0.33	2,141	3,293	35,592	
		2.	Maize	23	3,435	0.11	3,730	5,738	19,812	
		3.	Rice	33	6,000	0.19	12,842	19,757	119,145	
		4.	Tobacco	43	1,821	0.06	2,358	3,628	6,641	
		5.	Sunflower	53	2,904	0.09	3,318	5,104	14,897	
		6.	Tomato	73	1,131	0.04	2,851	4,387	4,987	
		7.	Pepper	83	1,340	0.04	2,579	3,968	5,344	
		8.	Other Vegetables	93	4,056	0.13	3,613	5,559	22,660	
		9.	S. Cherry	123	1,492	0.05	5,576	8,579	12,865	
		10.	Other Orchards	133	5,922	0.18	4,928	7,581	45,122	
		11.	Grape	143	3,999	0.12	4,092	6,295	25,303	
					Total	32,100	1.33	6,293	9,682	312,368
								Irr. Efficiency		0.65
4.	2025	1.	Wheat	13	8,580	0.27	2,141	3,293	28,362	
		2.	Maize	23	2,835	0.09	3,730	5,738	16,330	
		3.	Rice	33	7,000	0.22	12,842	19,757	138,822	
		4.	Tobacco	43	1,415	0.04	2,358	3,628	5,153	
		5.	Sunflower	53	3,128	0.10	3,318	5,104	16,025	
		6.	Tomato	73	980	0.03	2,851	4,387	4,315	
		7.	Pepper	83	1,235	0.04	2,579	3,968	4,919	
		8.	Other Vegetables	93	3,599	0.11	3,613	5,559	20,081	
		9.	S. Cherry	123	1,616	0.05	5,576	8,579	13,916	
		10.	Other Orchards	133	6,352	0.20	4,928	7,581	48,336	
		11.	Grape	143	3,940	0.12	4,092	6,295	24,897	
					Total	32,100	1.23	6,479	9,967	321,157
								Irr. Efficiency		0.65

Table J.10 Livestock Water Demand Projection (1/4)

Unit Water Requirement:			1994	1996	Ratio
Cattle	95	lit/day/head	281,336 heads	283,000 heads	1.006
Horse	60	lit/day/head	61,797	62,000	1.003
Pig	25	lit/day/head	171,571	185,000	1.078
Sheep	11	lit/day/head	2,466,099	2,476,000	1.004
Poultry	1	lit/day/head	4,685,021	4,668,000	0.996
			7,665,824	7,674,000	1.001

1996

No.	Code No.	No.	Municipality (old) concerned		Kind of Livestock										Total Water Demand m3/s	
			No.	Name	Cattle		Horse		Pig		Sheep		Poultry			
					heads	m3/s	heads	m3/s	heads	m3/s	heads	m3/s	heads	m3/s	heads	m3/s
Basin-1: Vardar River Basin																
1.	B1-1	1	02	Gostival	24,600	0.027	4,300	0.003	900	0.000	114,300	0.015	155,900	0.002		0.047
		2	03	Tetovo	47,800	0.053	7,800	0.005	11,900	0.003	136,000	0.017	433,700	0.005		0.084
2.	B1-2	3	01	Skopje	22,100	0.024	5,800	0.004	15,200	0.004	152,400	0.019	414,800	0.005		0.057
3.	B1-3	4	09	Veles	7,000	0.008	1,300	0.001	2,100	0.001	151,100	0.019	156,000	0.002		0.030
4.	B1-4	5	22	Negotino	1,500	0.002	700	0.000	3,000	0.001	24,500	0.003	69,500	0.001		0.007
5.	B1-5	6	23	Valandovo	2,700	0.003	500	0.000	2,600	0.001	11,900	0.002	47,600	0.001		0.006
		7	24	Gevgelija	5,200	0.006	1,500	0.001	3,300	0.001	40,200	0.005	90,800	0.001		0.014
Basin-2: Treska River Basin																
6.	B2-1	8	04	Kichevo	15,800	0.017	2,000	0.001	2,000	0.001	70,000	0.009	141,200	0.002		0.030
7.	B2-2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8.	B2-3	9	05	Brod	5,100	0.006	600	0.000	1,700	0.000	23,900	0.003	46,400	0.001		0.010
Basin-3: Pčinja River Basin																
9.	B3-1	10	06	Kumanovo	15,900	0.017	3,100	0.002	21,900	0.006	184,500	0.023	371,600	0.004		0.054
10.	B3-2	11	08	Kriva Palanka	9,600	0.011	1,500	0.001	8,600	0.002	53,700	0.007	109,500	0.001		0.022
		12	07	Kratovo	3,300	0.004	500	0.000	3,900	0.001	39,300	0.005	53,900	0.001		0.011
11.	B3-3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12.	B3-4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Basin-4: Pčinja River Basin																
13.	B4-1	13	16	Berovo	5,700	0.006	2,000	0.001	5,400	0.002	130,700	0.017	61,600	0.001		0.027
		14	15	Delchevo	8,000	0.009	700	0.000	11,100	0.003	76,900	0.010	109,000	0.001		0.024
14.	B4-2	15	14	Vinica	2,000	0.002	300	0.000	4,200	0.001	48,800	0.006	74,200	0.001		0.011
		16	13	Kochani	6,500	0.007	1,500	0.001	15,200	0.004	62,900	0.008	190,900	0.002		0.023
15.	B4-3	17	11	Shtip	2,900	0.003	400	0.000	3,100	0.001	82,200	0.010	83,500	0.001		0.016
		18	12	Probištip	2,400	0.003	200	0.000	4,500	0.001	47,300	0.006	71,500	0.001		0.011
16.	B4-4	19	10	Sveti Nikole	1,900	0.002	500	0.000	4,200	0.001	82,000	0.010	92,500	0.001		0.015
Basin-5: Crna River Basin																
17.	B5-1	20	17	Demir Hisar	4,200	0.005	1,400	0.001	2,800	0.001	29,600	0.004	81,800	0.001		0.011
		21	18	Krusevo	4,100	0.005	1,200	0.001	800	0.000	36,000	0.005	29,500	0.000		0.010
		22	20	Prilep	16,100	0.018	3,800	0.003	7,000	0.002	258,300	0.033	278,900	0.003		0.058
18.	B5-2	23	19	Bitola	16,600	0.018	1,900	0.001	8,100	0.002	221,600	0.028	377,600	0.004		0.054
19.	B5-3	24	21	Kavadarci	1,000	0.001	1,100	0.001	3,100	0.001	40,000	0.005	72,600	0.001		0.009
Basin-6: Strumica River Basin																
20.	B6-1	25	29	Radovish	4,400	0.005	3,000	0.002	5,300	0.002	75,800	0.010	161,000	0.002		0.020
21.	B6-2	26	30	Strumica	14,600	0.016	11,300	0.008	16,700	0.003	107,600	0.014	379,300	0.004		0.045
22.	B6-3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
23.	B6-4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Basin-7: Crn Drim River Basin																
24.	B7-1	27	27	Debar	2,900	0.003	1,100	0.001	0	0.000	53,100	0.007	18,200	0.000		0.011
25.	B7-2	28	28	Resen	6,500	0.007	100	0.000	1,800	0.001	20,300	0.003	101,100	0.001		0.011
		29	25	Ohrid	7,400	0.008	700	0.000	9,000	0.003	51,400	0.007	168,300	0.002		0.020
26.	B7-3	30	26	Struga	15,100	0.017	1,300	0.001	5,500	0.002	49,500	0.006	225,300	0.003		0.028
					282,900	0.311	62,100	0.043	184,900	0.051	2,475,800	0.315	4,667,700	0.054		0.775

Table J.10 Livestock Water Demand Projection (2/4)

Unit Water Requirement:			1994		2005		Ratio
			heads	m3/s	heads	m3/s	
Cattle	95	lit/day/head	281,336		289,000		1.027
Horse	60	lit/day/head	61,797		65,000		1.052
Pig	25	lit/day/head	171,571		247,000		1.440
Sheep	11	lit/day/head	2,466,099		2,523,000		1.023
Poultry	1	lit/day/head	4,685,021		4,594,000		0.981
			7,665,824		7,718,000		1.007

2005

No.	Code No.	No.	Municipality (old) concerned		Kind of Livestock								Total Water Demand m3/s		
			No.	Name	Cattle heads	Cattle m3/s	Horse heads	Horse m3/s	Pig heads	Pig m3/s	Sheep heads	Sheep m3/s		Poultry heads	Poultry m3/s
Basin-1: Vardar River Basin															
1.	B1-1	1	02	Gostival	25,100	0.028	4,500	0.003	1,200	0.000	116,400	0.015	153,400	0.002	0.048
		2	03	Tetovo	48,800	0.054	8,200	0.006	15,900	0.005	138,600	0.018	426,900	0.005	0.087
2.	B1-2	3	01	Skopje	22,600	0.025	6,000	0.004	20,200	0.006	155,300	0.020	408,200	0.005	0.059
3.	B1-3	4	09	Veles	7,100	0.008	1,400	0.001	2,800	0.001	153,900	0.020	153,600	0.002	0.031
4.	B1-4	5	22	Negotino	1,500	0.002	700	0.000	4,000	0.001	25,000	0.003	68,400	0.001	0.007
5.	B1-5	6	23	Valandovo	2,700	0.003	500	0.000	3,500	0.001	12,100	0.002	46,800	0.001	0.006
		7	24	Gevgelija	5,300	0.006	1,500	0.001	4,500	0.001	41,000	0.005	89,300	0.001	0.014
Basin-2: Treska River Basin															
6.	B2-1	8	04	Kichevo	16,200	0.018	2,000	0.001	2,700	0.001	71,300	0.009	139,000	0.002	0.031
7.	B2-2	-	-	-	-	-	-	-	-	-	-	-	-	-	
8.	B2-3	9	05	Brod	5,200	0.006	600	0.000	2,200	0.001	24,400	0.003	45,600	0.001	0.010
Basin-3: Pchinja River Basin															
9.	B3-1	10	06	Kumanovo	16,300	0.018	3,200	0.002	29,300	0.008	188,000	0.024	365,700	0.004	0.057
10.	B3-2	11	08	Kriva Palanka	9,800	0.011	1,600	0.001	11,500	0.003	54,700	0.007	107,700	0.001	0.023
		12	07	Kratovo	3,400	0.004	500	0.000	5,200	0.002	40,000	0.005	53,100	0.001	0.011
11.	B3-3	-	-	-	-	-	-	-	-	-	-	-	-	-	
12.	B3-4	-	-	-	-	-	-	-	-	-	-	-	-	-	
Basin-4: Pchinja River Basin															
13.	B4-1	13	16	Berovo	5,800	0.006	2,100	0.001	7,200	0.002	133,200	0.017	60,600	0.001	0.028
		14	15	Delchevo	8,200	0.009	700	0.000	14,900	0.004	78,400	0.010	107,300	0.001	0.025
14.	B4-2	15	14	Vinica	2,100	0.002	300	0.000	5,600	0.002	49,700	0.006	73,100	0.001	0.011
		16	13	Kochani	6,600	0.007	1,500	0.001	20,200	0.006	64,100	0.008	187,900	0.002	0.024
15.	B4-3	17	11	Ship	3,000	0.003	400	0.000	4,100	0.001	83,800	0.011	82,200	0.001	0.016
		18	12	Probishtip	2,500	0.003	200	0.000	6,000	0.002	48,200	0.006	70,400	0.001	0.012
16.	B4-4	19	10	Sveti Nikole	2,000	0.002	500	0.000	5,600	0.002	83,500	0.011	91,000	0.001	0.016
Basin-5: Crna River Basin															
17.	B5-1	20	17	Demir Hisar	4,300	0.005	1,500	0.001	3,800	0.001	30,200	0.004	80,500	0.001	0.012
		21	18	Krusevo	4,200	0.005	1,300	0.001	1,000	0.000	36,700	0.005	29,000	0.000	0.011
		22	20	Prilep	16,500	0.018	4,000	0.003	9,400	0.003	263,200	0.034	274,500	0.003	0.060
18.	B5-2	23	19	Bitola	16,900	0.019	2,000	0.001	10,800	0.003	225,900	0.029	371,600	0.004	0.056
19.	B5-3	24	21	Kavadarci	1,000	0.001	1,200	0.001	4,200	0.001	40,800	0.005	71,400	0.001	0.009
Basin-6: Strumica River Basin															
20.	B6-1	25	29	Radovish	4,500	0.005	3,200	0.002	7,000	0.002	77,300	0.010	158,400	0.002	0.021
21.	B6-2	26	30	Strumica	14,900	0.016	11,800	0.008	22,200	0.003	109,700	0.014	373,300	0.004	0.046
22.	B6-3	-	-	-	-	-	-	-	-	-	-	-	-	-	
23.	B6-4	-	-	-	-	-	-	-	-	-	-	-	-	-	
Basin-7: Crn Drim River Basin															
24.	B7-1	27	27	Debar	2,900	0.003	1,100	0.001	0	0.000	54,100	0.007	18,000	0.000	0.011
25.	B7-2	28	28	Resen	6,700	0.007	100	0.000	2,400	0.001	20,700	0.003	99,500	0.001	0.012
		29	25	Ohrid	7,500	0.008	800	0.001	12,100	0.004	52,400	0.007	165,600	0.002	0.021
26.	B7-3	30	26	Struga	15,400	0.017	1,300	0.001	7,400	0.002	50,400	0.006	221,700	0.003	0.029
					289,000	0.318	64,700	0.045	246,900	0.068	2,523,000	0.321	4,593,700	0.053	0.805

Table J.10 Livestock Water Demand Projection (3/4)

Unit Water Requirement:			1994	2015	Ratio
Cattle	95 lit/day/head		281,336 heads	296,000 heads	1.052
Horse	60 lit/day/head		61,797	68,000	1.100
Pig	25 lit/day/head		171,571	316,000	1.842
Sheep	11 lit/day/head		2,466,099	2,574,000	1.044
Poultry	1 lit/day/head		4,685,021	4,511,000	0.963
			7,665,824	7,765,000	1.013

2015				Kind of Livestock										Total	
No.	Code No.	No.	Municipality (old) concerned	Cattle		Horse		Pig		Sheep		Poultry		Water Demand m3/s	
				heads	m3/s	heads	m3/s	heads	m3/s	heads	m3/s	heads	m3/s		
Basin-1: Vardar River Basin															
1.	B1-1	1	02	Gostival	25,700	0.028	4,700	0.003	1,600	0.000	118,800	0.015	150,700	0.002	0.049
		2	03	Tetovo	50,000	0.055	8,600	0.006	20,300	0.006	141,400	0.018	419,200	0.005	0.090
2.	B1-2	3	01	Skopje	23,100	0.025	6,300	0.004	25,900	0.007	158,500	0.020	400,800	0.005	0.062
3.	B1-3	4	09	Veles	7,300	0.008	1,500	0.001	3,600	0.001	157,100	0.020	150,800	0.002	0.032
4.	B1-4	5	22	Negotino	1,600	0.002	800	0.001	5,200	0.002	25,500	0.003	67,200	0.001	0.008
5.	B1-5	6	23	Valandovo	2,800	0.003	500	0.000	4,500	0.001	12,400	0.002	46,000	0.001	0.007
		7	24	Gevgelija	5,400	0.006	1,600	0.001	5,700	0.002	41,800	0.005	87,700	0.001	0.015
Basin-2: Treska River Basin															
6.	B2-1	8	04	Kichevo	16,500	0.018	2,100	0.001	3,500	0.001	72,800	0.009	136,500	0.002	0.031
7.	B2-2	-	-	-	-	-	-	-	-	-	-	-	-	-	
8.	B2-3	9	05	Brod	5,400	0.006	600	0.000	2,900	0.001	24,900	0.003	44,800	0.001	0.011
Basin-3: Pchinja River Basin															
9.	B3-1	10	06	Kumanovo	16,700	0.018	3,400	0.002	37,400	0.011	191,800	0.024	359,100	0.004	0.060
10.	B3-2	11	08	Kriva Palanka	10,100	0.011	1,600	0.001	14,600	0.004	55,800	0.007	105,800	0.001	0.025
		12	07	Kratovo	3,400	0.004	500	0.000	6,600	0.002	40,800	0.005	52,100	0.001	0.012
11.	B3-3	-	-	-	-	-	-	-	-	-	-	-	-	-	
12.	B3-4	-	-	-	-	-	-	-	-	-	-	-	-	-	
Basin-4: Pchinja River Basin															
13.	B4-1	13	16	Berovo	6,000	0.007	2,200	0.002	9,200	0.003	135,900	0.017	59,500	0.001	0.029
		14	15	Delchevo	8,400	0.009	800	0.001	19,000	0.005	80,000	0.010	105,400	0.001	0.027
14.	B4-2	15	14	Vinicha	2,100	0.002	400	0.000	7,200	0.002	50,800	0.006	71,700	0.001	0.012
		16	13	Kochani	6,800	0.007	1,600	0.001	25,900	0.007	65,400	0.008	184,500	0.002	0.027
15.	B4-3	17	11	Ship	3,100	0.003	500	0.000	5,200	0.002	85,500	0.011	80,700	0.001	0.017
		18	12	Probishtip	2,500	0.003	200	0.000	7,700	0.002	49,200	0.006	69,100	0.001	0.012
16.	B4-4	19	10	Sveti Nikole	2,000	0.002	500	0.000	7,200	0.002	85,200	0.011	89,400	0.001	0.017
Basin-5: Crna River Basin															
17.	B5-1	20	17	Demir Hisar	4,400	0.005	1,600	0.001	4,900	0.001	30,800	0.004	79,100	0.001	0.012
		21	18	Krusevo	4,300	0.005	1,400	0.001	1,300	0.000	37,400	0.005	28,500	0.000	0.011
		22	20	Prilep	16,900	0.019	4,200	0.003	12,000	0.003	268,500	0.034	269,600	0.003	0.062
18.	B5-2	23	19	Bitola	17,300	0.019	2,100	0.001	13,800	0.004	230,400	0.029	364,900	0.004	0.058
19.	B5-3	24	21	Kavadarci	1,000	0.001	1,200	0.001	5,300	0.002	41,600	0.005	70,100	0.001	0.010
Basin-6: Strumica River Basin															
20.	B6-1	25	29	Radovish	4,600	0.005	3,300	0.002	9,000	0.003	78,900	0.010	155,600	0.002	0.022
21.	B6-2	26	30	Strumica	15,200	0.017	12,400	0.009	28,500	0.003	111,900	0.014	366,500	0.004	0.047
22.	B6-3	-	-	-	-	-	-	-	-	-	-	-	-	-	
23.	B6-4	-	-	-	-	-	-	-	-	-	-	-	-	-	
Basin-7: Crn Drim River Basin															
24.	B7-1	27	27	Debar	3,000	0.003	1,200	0.001	0	0.000	55,200	0.007	17,600	0.000	0.011
25.	B7-2	28	28	Resen	6,800	0.007	100	0.000	3,100	0.001	21,100	0.003	97,700	0.001	0.012
		29	25	Ghid	7,700	0.008	800	0.001	15,500	0.004	53,400	0.007	162,600	0.002	0.022
26.	B7-3	30	26	Struga	15,800	0.017	1,400	0.001	9,400	0.003	51,400	0.007	217,700	0.003	0.030
					295,900	0.325	68,100	0.047	316,000	0.086	2,574,200	0.328	4,510,900	0.052	0.839

Table J.10 Livestock Water Demand Projection (4/4)

Unit Water Requirement:			1994	2025	Ratio
Cattle	95	lit/day/head	281,336 heads	304,000 heads	1.081
Horse	60	lit/day/head	61,797	72,000	1.165
Pig	25	lit/day/head	171,571	384,000	2.238
Sheep	11	lit/day/head	2,466,099	2,626,000	1.065
Poultry	1	lit/day/head	4,685,021	4,429,000	0.945
			7,665,824	7,815,000	1.019

2025

No.	Code No.	No.	Municipality (old) concerned		Kind of Livestock										Total Water Demand m ³ /s
			No.	Name	Cattle		Horse		Pig		Sheep		Poultry		
					heads	m ³ /s	heads	m ³ /s	heads	m ³ /s	heads	m ³ /s	heads	m ³ /s	
Basin-1: Vardar River Basin															
1.	B1-1	1	02	Gostival	26,400	0.029	5,000	0.003	1,900	0.001	121,200	0.015	147,900	0.002	0.050
		2	03	Tetovo	51,300	0.056	9,100	0.006	24,700	0.007	144,300	0.018	411,500	0.005	0.093
2.	B1-2	3	01	Skopje	23,700	0.026	6,700	0.005	31,500	0.009	161,700	0.021	393,500	0.005	0.065
3.	B1-3	4	09	Veles	7,500	0.008	1,600	0.001	4,400	0.001	160,200	0.020	148,100	0.002	0.033
4.	B1-4	5	22	Negotino	1,600	0.002	800	0.001	6,300	0.002	26,000	0.003	66,000	0.001	0.008
5.	B1-5	6	23	Valandovo	2,900	0.003	600	0.000	5,400	0.002	12,600	0.002	45,200	0.001	0.007
		7	24	Gevgelija	5,600	0.006	1,700	0.001	6,900	0.002	42,700	0.005	86,100	0.001	0.016
Basin-2: Treska River Basin															
6.	B2-1	8	04	Kichevo	17,000	0.019	2,300	0.002	4,200	0.001	74,200	0.009	134,000	0.002	0.033
7.	B2-2	-	-	-	-	-	-	-	-	-	-	-	-	-	
8.	B2-3	9	05	Brod	5,500	0.006	600	0.000	3,500	0.001	25,400	0.003	44,000	0.001	0.011
Basin-3: Pcinja River Basin															
9.	B3-1	10	06	Kumanovo	17,100	0.019	3,600	0.003	45,500	0.013	195,600	0.025	352,600	0.004	0.063
10.	B3-2	11	08	Kriva Palanka	10,400	0.011	1,700	0.001	17,800	0.005	56,900	0.007	103,900	0.001	0.026
		12	07	Kratovo	3,500	0.004	600	0.000	8,100	0.002	41,600	0.005	51,200	0.001	0.012
11.	B3-3	-	-	-	-	-	-	-	-	-	-	-	-	-	
12.	B3-4	-	-	-	-	-	-	-	-	-	-	-	-	-	
Basin-4: Pcinja River Basin															
13.	B4-1	13	16	Berovo	6,100	0.007	2,400	0.002	11,200	0.003	138,600	0.018	58,500	0.001	0.030
		14	15	Delchevo	8,600	0.009	800	0.001	23,100	0.007	81,600	0.010	103,500	0.001	0.028
14.	B4-2	15	14	Vinica	2,200	0.002	400	0.000	8,700	0.003	51,800	0.007	70,400	0.001	0.013
		16	13	Kochani	7,000	0.008	1,700	0.001	31,500	0.009	66,700	0.008	181,100	0.002	0.029
15.	B4-3	17	11	Shtip	3,100	0.003	500	0.000	6,400	0.002	87,200	0.011	79,200	0.001	0.018
		18	12	Probishtip	2,600	0.003	200	0.000	9,400	0.003	50,200	0.006	67,900	0.001	0.013
16.	B4-4	19	10	Sveti Nikole	2,100	0.002	600	0.000	8,700	0.003	87,000	0.011	87,700	0.001	0.017
Basin-5: Crna River Basin															
17.	B5-1	20	17	Demir Hisar	4,500	0.005	1,700	0.001	5,900	0.002	31,400	0.004	77,600	0.001	0.013
		21	18	Krusevo	4,400	0.005	1,400	0.001	1,600	0.000	38,200	0.005	28,000	0.000	0.011
		22	20	Prilep	17,300	0.019	4,500	0.003	14,600	0.004	273,900	0.035	264,700	0.003	0.064
18.	B5-2	23	19	Bitola	17,800	0.020	2,300	0.002	16,800	0.005	235,100	0.030	358,300	0.004	0.060
19.	B5-3	24	21	Kavadarci	1,100	0.001	1,300	0.001	6,500	0.002	42,400	0.005	68,900	0.001	0.010
Basin-6: Strumica River Basin															
20.	B6-1	25	29	Radovish	4,700	0.005	3,500	0.002	11,000	0.003	80,400	0.010	152,700	0.002	0.023
21.	B6-2	26	30	Strumica	15,600	0.017	13,100	0.009	34,600	0.003	114,100	0.015	359,900	0.004	0.048
22.	B6-3	-	-	-	-	-	-	-	-	-	-	-	-	-	
23.	B6-4	-	-	-	-	-	-	-	-	-	-	-	-	-	
Basin-7: Crna Drim River Basin															
24.	B7-1	27	27	Debar	3,100	0.003	1,200	0.001	0	0.000	56,300	0.007	17,300	0.000	0.012
25.	B7-2	28	28	Resen	7,000	0.008	100	0.000	3,700	0.001	21,600	0.003	95,900	0.001	0.013
		29	25	Ohrid	7,900	0.009	800	0.001	18,800	0.005	54,500	0.007	159,700	0.002	0.023
26.	B7-3	30	26	Struga	16,200	0.018	1,500	0.001	11,500	0.003	52,500	0.007	213,700	0.002	0.031
					303,800	0.334	72,300	0.050	384,200	0.104	2,625,900	0.334	4,429,000	0.051	0.874

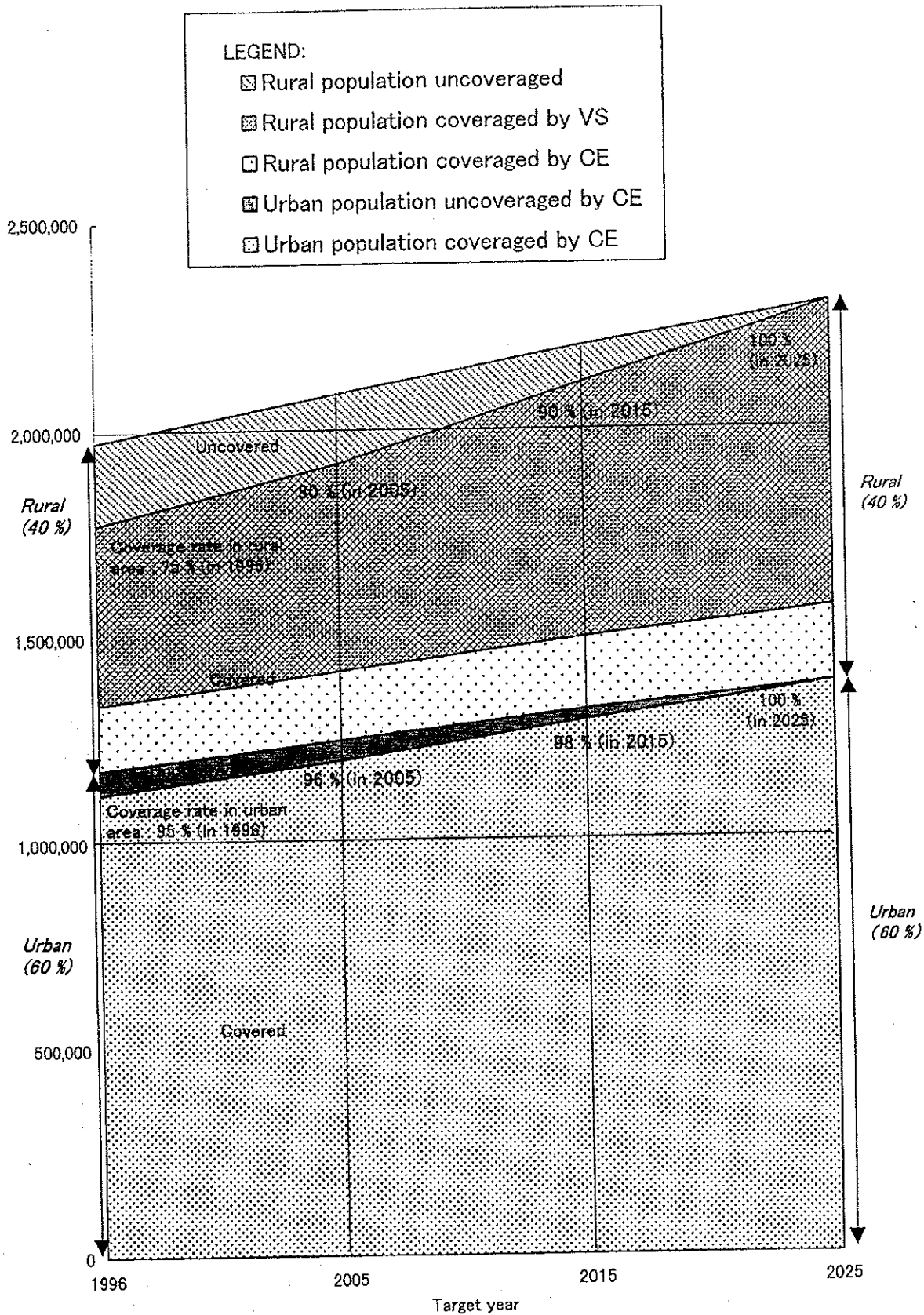


Figure J.1. Development Directions of Municipal Water Supply

THE STUDY ON THE INTEGRATED WATER RESOURCES DEVELOPMENT AND MANAGEMENT MASTER PLAN IN THE FORMER YUGOSLAV REPUBLIC OF MACEDONIA
 JAPAN INTERNATIONAL COOPERATION AGENCY

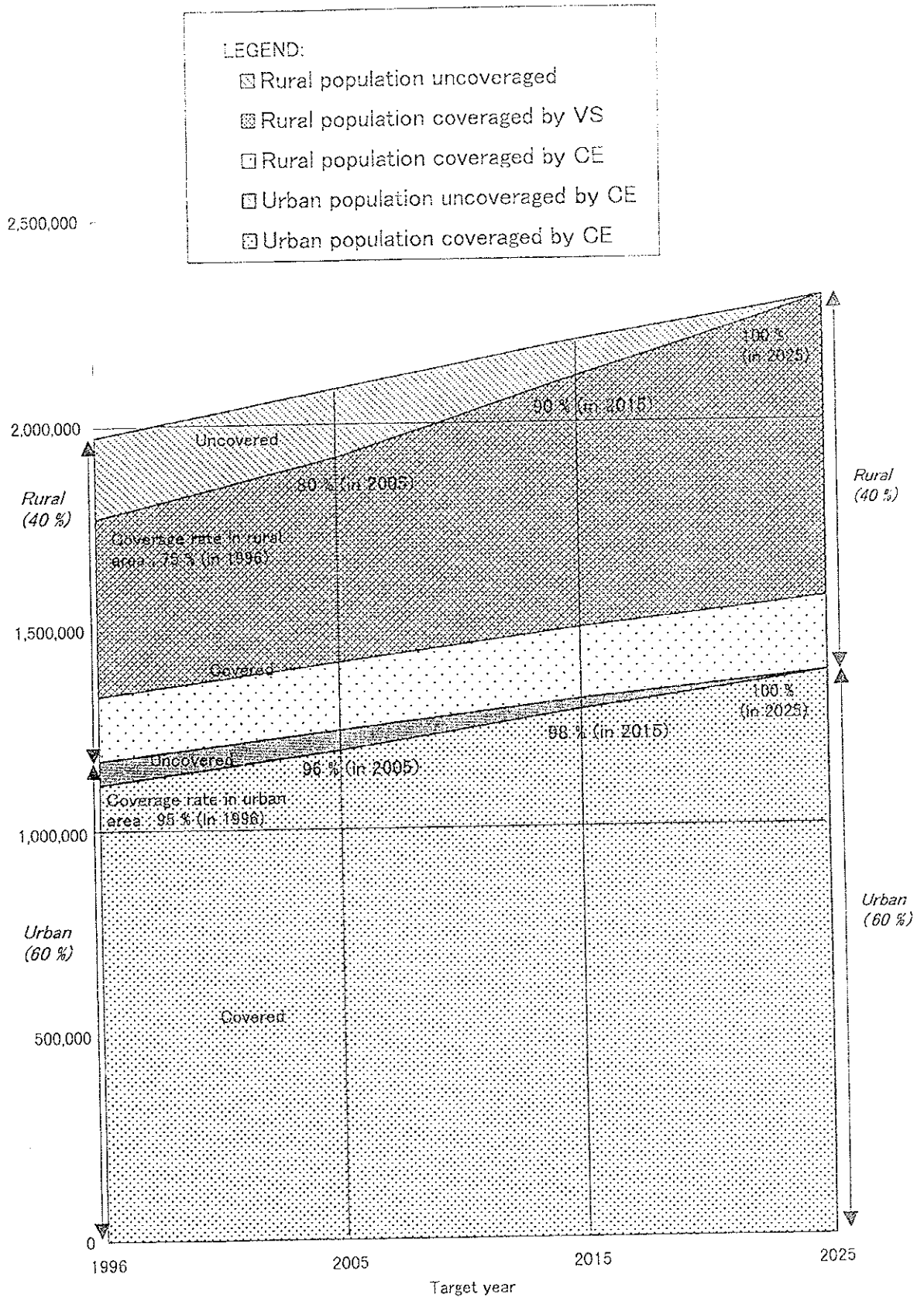


Figure J.1 Development Directions of Municipal Water Supply

THE STUDY ON THE INTEGRATED WATER RESOURCES DEVELOPMENT AND MANAGEMENT MASTER PLAN IN THE FORMER YUGOSLAV REPUBLIC OF MACEDONIA
 JAPAN INTERNATIONAL COOPERATION AGENCY

Cultivation Area (1000 ha)

Crop	1994	2020
Wheat	122	100
Maize	43	55
Tobacco	15	26
Tomatoes	7	10
Peppers	8	12
Apples	8	9
Plums	4	6
Sour Cherit	3	6
Vine-yards	31	40
Total	240	264

Cropping Area Projected in the Study

Crop	(Unit: 1,000ha)			
	1996	2005	2015	2025
1) Wheat	120	113	104	97
2) Maize	46	50	54	58
3) Tobacco	15	19	24	28
4) Tomato	9	9	10	11
5) Pepper	8	10	11	13
6) Apple	8	8	9	9
7) Plum	4	5	5	6
8) Sour cherry	3	4	5	6
9) Grape	32	35	39	43
Total	245	253	261	271

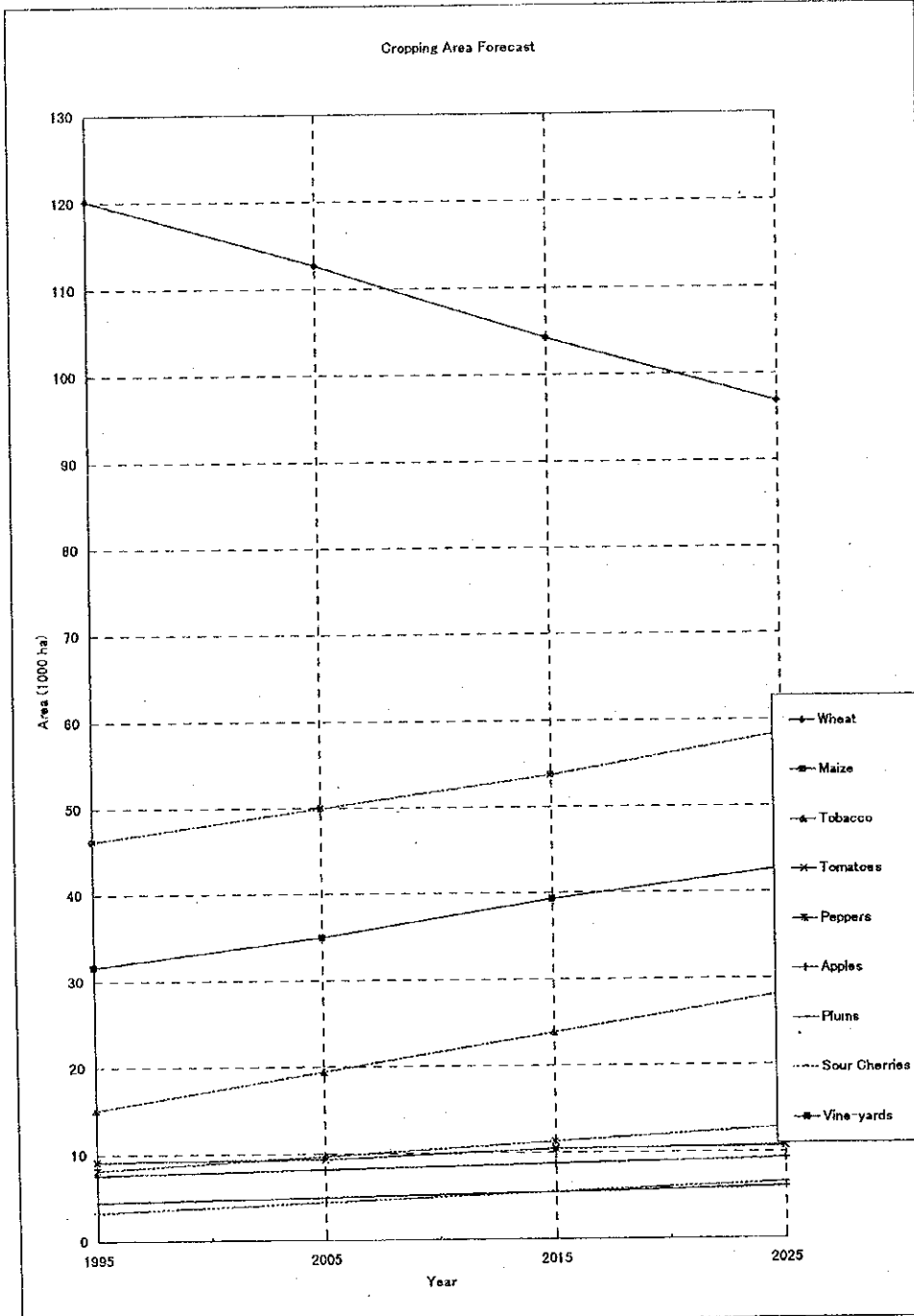


Figure J.2 Cropping Area Projection

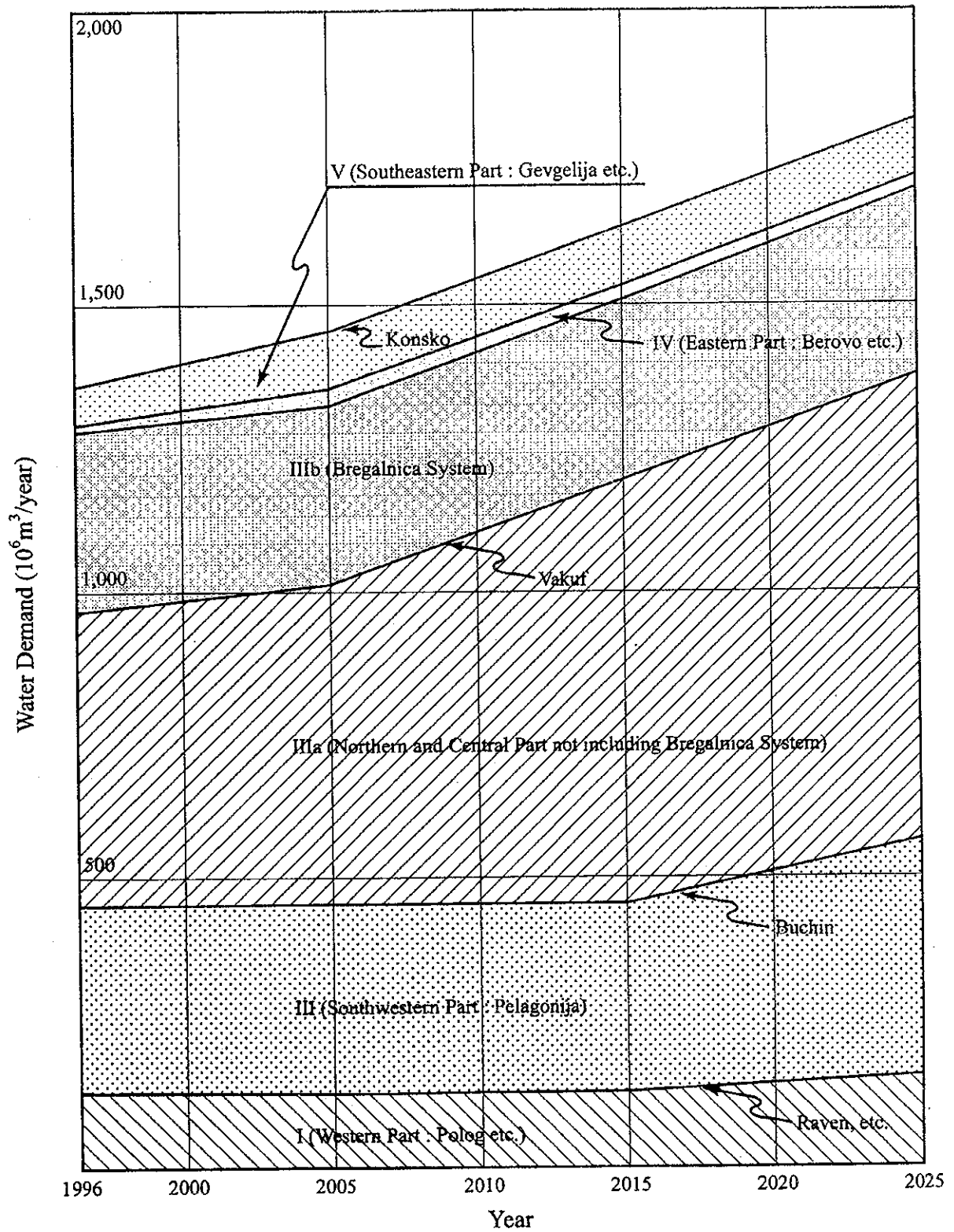


Figure J.3 Development Curve of Agricultural Water

THE STUDY ON THE INTEGRATED WATER RESOURCES
DEVELOPMENT AND MANAGEMENT MASTER PLAN IN
THE FORMER YUGOSLAV REPUBLIC OF MACEDONIA

JAPAN INTERNATIONAL COOPERATION AGENCY

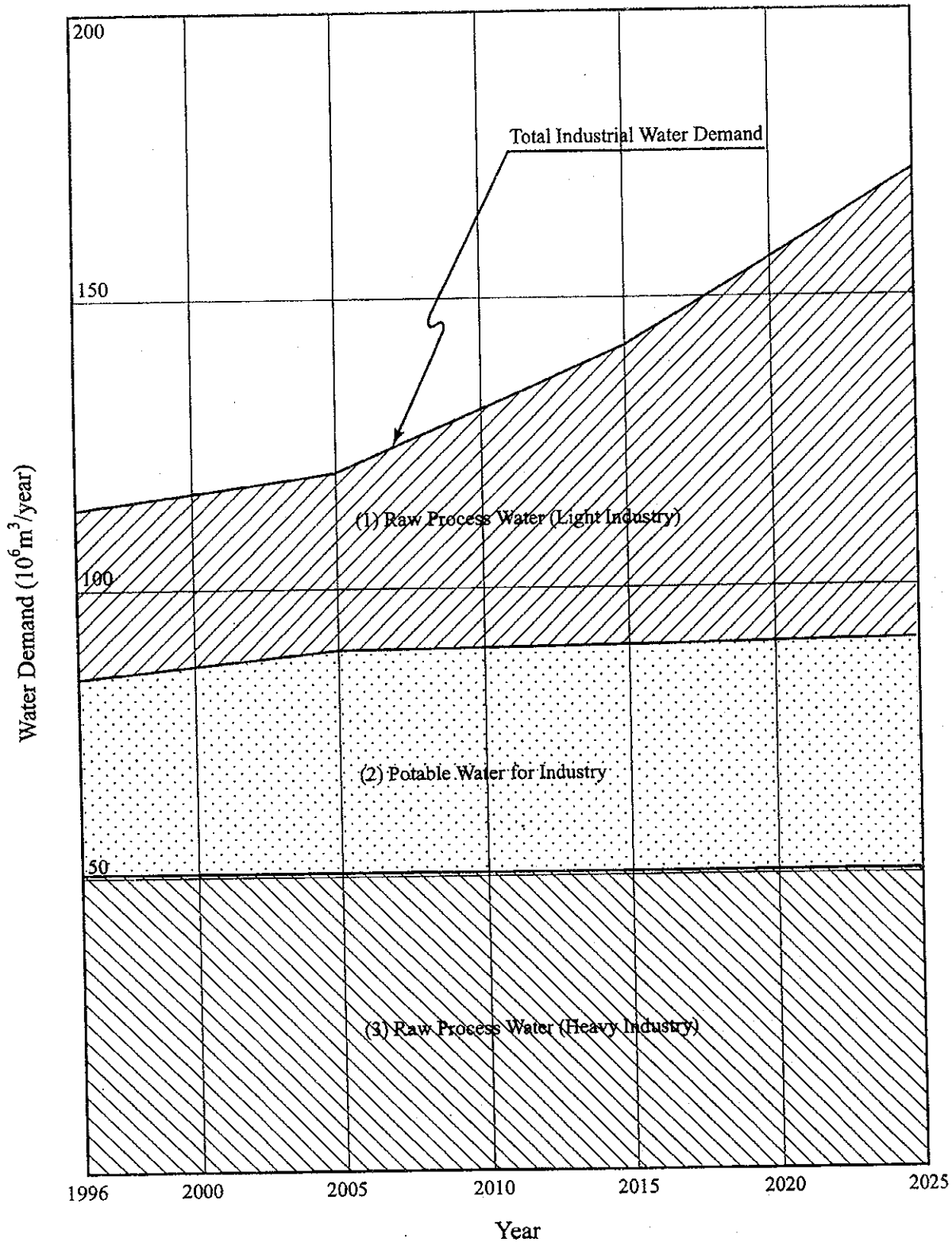


Figure J.4 Development Curve of Industrial Water

THE STUDY ON THE INTEGRATED WATER RESOURCES
DEVELOPMENT AND MANAGEMENT MASTER PLAN IN
THE FORMER YUGOSLAV REPUBLIC OF MACEDONIA

JAPAN INTERNATIONAL COOPERATION AGENCY