5.2.5 Socioeconomic Frame

The Socioeconomic Frame was prepared following the results of current conditions analysis on the water resources and socio-economy described in NDS 1997. Careful discussions were made between the Macedonia side and the Study Team in order to set up the most appropriate Socioeconomic Frame, because it was regarded as the basic data for the succeeding activities of the Master Plan formulation. Finally, the Socioeconomic Frame, including the development targets which were produced through downward revision of the development targets given by NDS 1997, which was agreed by the Macedonian side. The Socioeconomic Frame is summarized below:

Socioeconomic Frame in the Study

	Actual data	Estimation based on the previous census data				
	1994	1995	1996	2005	2015	2025
Population (person)	1,945,932 persons	1,960,000 persons	1,974,000 persons	2,090,000 persons	2,203,000 persons	2,304,000 persons
GDP growth rate	--	--	1.5%	3.0%	4.5%	5.5%
GDP per capita	--	--	US$1,580	US$1,790	US$2,500	US$4,000

Average annual growth rate :	During the period 1998 - 2025
Per capita GDP (value term)	3 – 4 %
Agricultural sector (value term)	5 – 6 %
Industrial sector (value term)	4 – 5 %

5.2.6 Development Directions

(1) Industrial Sector Development

After several years of decrease, industrial production increased by a real rate of 1.6% in 1997 compared to the previous year. The industrial sector is predicted to keep its 20% share of the GDP. NDS 1997 has the following objectives to secure stable development of the industrial sector:

(a) to revitalize and restructure the existing production structure;

(b) to update the technology and technique to facilitate the production with higher level of processing, expansion of exports and an increase in profitability;

(c) to increase exports through a more intensive dynamics of production in order to facilitate the meeting of import demands and improve the country's international liquidity;

(d) to increase a significant inflow of foreign capital, mainly in the shape of direct investments and joint ventures; concessions, etc.

(e) to promote human resources development for the industrial development through strengthening education and training system from basic techniques to state-of-the-art technologies.

(2) Agricultural Sector Development

In Macedonia, the agricultural sector has been marked by a constant moderate increase and a virtually unvarying 14 to 16% share of GNP over the long term, although there is some fluctuation in the short-range term mainly influenced by droughts. Although there has been no significant increase due to the recession in the industry and the other economic sectors, the share of the agriculture has recently risen to above 20%.

The objectives for agricultural development are described in NDS 1997 as follows:

(a) to utilize the natural resources potentials to the optimal extent;

(b) to meet the domestic demand for agricultural products and produce made from them;

(c) to increase the export of agricultural products and produce made from them;

(d) to provide agricultural producers with a more favorable and more stable economic and social status; and

(e) to adopt the developmental trends of developed countries.

The average annual growth rate of the agriculture sector during the period 1997-2025 was predicted to be 5-6%. In order to realize these objectives and the growth rate, the following outputs need to be promoted:

(a) to increase the production efficiency of early grown vegetables including tomatoes, cucumbers, paprikas, etc. to increase their export

(b) to increase the production efficiency of fruits including apples, grapes, peaches, etc. to increase the export of agricultural products and produce made from them (wine, juice, sauce, etc.)

(c) to increase the yield of industrial crops including sunflowers and sugar beets to meet the needs from the domestic industry and to decrease the import of products (sugar and cooking oil)

(d) to increase the bread wheat production for domestic demand and to reduce the import

(e) to improve the yield of livestock (cattle, sheep, etc.) and its products (milk, cheese, etc.) qualitatively and quantitatively to decrease the import and to meet the domestic demand

(3) Regional Development

NDS 1997 pointed out the urgent need of restraint and well-balanced

development of Skopje as a concentrated metropolitan region as well as the decrease of the disparity between urban and rural areas. The promotion of medium-sized towns and/or cities is one of the most efficient methods to alleviate the excessive socioeconomic concentration in the capital. At the same time, a certain number of rural centers should be developed through support for infrastructure construction and stimulation of the development of agriculture and small businesses.

5.3 Water Demand Projection

5.3.1 Municipal Water

(1) Breakdown of Municipal Water Requirement and Consumption Records

Water consumption records of municipal water supplies by the water supply companies (Communal Enterprises : CEs) were obtained from the Statistical Office for the period from 1990 to 1996 for each municipality for six breakdowns except rural water consumption as follows;.

Breakdown of Municipal Water Requirement and Consumption Records

Breakdown	Period of Water Consumption Records
1) Domestic households	1960 - 1996
2) Communal facilities (parks, hospitals, schools, etc.)	1960 - 1996
3) Commercial establishments (shops, offices, hotels, etc.)	1960 - 1996
4) Potable water to industry	1960 - 1996
5) Water supplied to others (unspecified)	1960 - 1996
6) Network system loss (network leakage and treatment plant usage)	1960 - 1996
7) Rural water consumption	Not available

(2) Estimated Population Served by Communal Enterprises (CEs)

CEs supply predominantly urban areas and a small proportion of rural areas. There is no national data available giving the population served by all the CEs across Macedonia. However, the following were obtained:

(a) Certain information on supply coverage from CEs in the major cities

(b) Data on urban and rural populations for each municipality by the Statistical Office

(c) Data on supply coverage in rural areas from the Republic Institute for Health Protection (RIHP)

The population distribution across Macedonia is approximately 60 % urban and 40% rural, ranging from 81.5% urban within the Skopje municipality to 100% rural in Makedonski Brod and Demir Hisar as described above. In Skopje urban area, 426,000 citizens out of an urban population of 449,000 were

supplied by Vodovos Skopje (CEs) in 1995, which represents coverage of 95% of the urban area. Skopje is easily the most representative urban center and the UNICEF data gives the public water coverage of 99% of the urban area population. Therefore, it is reasonable to adopt the 95% coverage for all urban areas in Macedonia. Likewise in rural areas, RIHP's statistic shows that 20% of the rural population in 1991 were supplied by CEs.

(3) Per capita Water Consumption and System Loss

Per capita water consumption from 1990 to 1996 was estimated from water supply records and population data as follows. Population census data for 1961, 1971, 1981, 1991 and 1994 were used to determine population trend to fill in data for years of 1995 and 1996.

(The unit of per capita water consumption is liter per capita per day, abbreviated as "lpcd").

Per capita Consumption on National Level from 1990 to 1996

(Unit: lpcd)

Year	(1) Domestic Household Use	(2) Communal Use	(3) Commercial Use	(4) Others (Loss, etc.)	(5) Gross of Municipal Water
1990	137	17	24	79	257
1991	131	21	19	76	247
1992	140	24	19	111	294
1993	151	16	22	97	286
1994	155	16	17	97	285
1995	148	18	19	87	272
1996	149	24	19	70	262

The per capita consumption estimates shown in above table compare well with those experienced elsewhere in Europe.

Though no records were available, per capita rural water consumption was assumed 250 lpcd.

The mean system loss for 1996 across all municipalities was assessed at 35%, which was midway between the range of 20% to 50% quoted by many water supply companies.

(4) Demand Projection of Municipal Water

The demand of municipal water was projected based on population (60 % urban and 40% rural) 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

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 : persons

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.)

(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
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	10,564	12,521	12,521	12,521
Subtotal (2 to5)	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

(10^3m^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

(10^3m^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

Municipal water consumption records in 1996 are shown in Table 5.4. Table 5.5 shows consumption record of municipal water including industrial water at the current condition.

Demand projections of municipal water for each municipality (the former division) are tabulated in Tables 5.6 to 5.8 together with those of industrial water. Figure 5.1 shows development directions of municipal water supply.

5.3.2 Agricultural Water

Agricultural water consists of irrigation water and livestock water. The consumption of agricultural water, however, has not been recorded in Macedonia like that of the municipal water, and consequently has to be assessed by analyzing the existing irrigation systems, climate conditions, cropping pattern, as well as results of the water utilization survey of agricultural water.

The fishery water requirement is not considered, because the fishery method in Macedonia involves the continuous flow of water taken from a river into a fish pond and then back to the original river.

(1) Current Requirement of Irrigation Water

(a) Survey of existing irrigation systems

To more accurately grasp the present condition of existing irrigation systems, a questionnaire survey was conducted for all 131 systems in Macedonia. Questionnaires were distributed to 27 water management organizations (WMOs) that cover 103 irrigation systems (the questionnaire was not distributed to all the system in reality). The questionnaires were answered from 12 WMOs, from which 50 irrigation systems were clarified about their present conditions such as (i) location

of intake, (ii) irrigation service area, (iii) cropping pattern and area, (iv) major features of irrigation, (v) drainage and road facilities, (vi) maintenance and repair conditions, and so on.

For the remaining 81 irrigation systems, the report titled "Analysis of Conditions and Problems in Utilization of Irrigation Systems in Macedonia", 1993, Ministry of Agriculture, Forestry and Water Economy, was mainly referred to for grasping the conditions.

In parallel with the above, actual conditions of various systems' facilities were examined through five separate field investigations.

A net registered service area of 168,112 ha is irrigated under the existing 131 systems, as broken down below for each river basin, and tabulated in Table 5.9 with a location map shown in Figure 5.2.

Existing Irrigation (Irri.) System

River basin	No. of Systems	Designed Irri. Area (ha)	Existing Irri. Area(ha)	Incomplete Area(ha)
- Vardar River Upper Reach	42	40,034	38,676	1,358
- Vardar River Middle Reach	17	39,980	34,099	5,881
- Vardar River Lower Reach	42	63,247	61,352	1,895
- Crn Drim River	23	16,047	12,437	3,610
- Strumica River	7	21,698	21,548	150
Total	131	181,006	168,112	12,894

According to the Statistical Yearbook 1997, however, the actual irrigated area in 1996 was only 51,677 ha, corresponding to 31% of 168,112ha. This is regarded as just a reference.

The Sretenovo system of 120 ha irrigated by Lake Dojran was excluded from the water balance calculation, and hence 130 systems are adopted in this Study.

(b) Basic conditions for estimate

For estimate of the current irrigation water requirement, the following conditions were applied:

C1: Irrigation water requirement is calculated on 10-day basis in accordance with the Penman-Monteith method with reference to the report "Expert Consultation on Revision of FAO Methodologoies for Crop Water Requirements", May 1990. The crop water requirement is actually calculated with use of a computer program introduced by FAO Irrigation Drainage Paper 33 CROPWAT Computer Program for Irrigation Planning and Management 1992.

C2: Effective rainfall is, in principle, calculated in accordance with the USDA Soil Conservation Service method introduced by FAO

Irrigation Drainage Paper 33 CROPWAT Computer Program for Irrigation Planning and Management 1992. In the method, the effective rainfall is calculated, not 10-day but monthly basis with use of monthly rainfall. Consequently monthly effective rainfall calculated by the original equation was distributed into three 10-day effective rainfalls with use of such ratio as obtained through the following equation, which is modified from the original method for estimation of 10-day effective rainfall (ER_{10}) with use of 10-day rainfall (RA_{10}).

$ER_{10}=3 \times RA_{10} \times (125 - 0.2 \times 3 \times RA_{10})/125/3$ for $RA_{10}<=250mm/3$ (1)
$ER_{10}=(125 +0.1 \times 3 \times RA_{10})/3$ for $RA_{10}>250mm/3$ (2)

C3: For the efficient estimate work, all 130 irrigation systems are classified into the following five regions, according to the climate conditions such as temperature and rainfall, in particular.

Climatic Region

No. of Climatic Region	District in Macedonia	Meteorological Station of Adopted Data (No. of Sta.)
I	Western part	Tetovo (ST001)
II	Southwestern part	Bitola (ST025)
III	Northern and central part	Shtip (ST040)
IV	Eastern part	Berovo (ST050)
V	Southeastern part	Gevgelija (ST279)

(See Figure 5.2)

It is considered that the water requirement estimated on the basis of the above classification would fulfill the accuracy practically required for the water balance calculation.

C4: As for the cropping pattern, since there is paddy rice cultivation in the Bregalnica irrigation system in climatic region III, six patterns are formulated as follows, adding paddy rice cultivation to region III as one pattern.

Cropping Pattern

No. of Cropping Pattern	Climatic Region Applied for the Pattern
1	I
2	II
3a	III (excluding Bregalnica system)
3b	III (for Bregalnica system only)
4	IV
5	V

(See Figure 5.3)

In preparation of the cropping pattern, crop kind and cropping area of each crop were carefully examined and determined with reference to the Statistical Yearbook 1997 so as to obtain reasonable results on not only the total cultivation area in Macedonia but also the regional cultivation area of each crop.

C5: The current irrigation efficiency of the workable system is estimated to be 0.58, calculated from the following, with reference to Table 37 in FAO Irrigation and Drainage Paper 24 revised in 1977 Crop Water Requirements.

- Conveyance efficiency : 0.8
- Field canal efficiency : 0.9
- Field application efficiency : 0.8

(c) Current Irrigation Water Requirement

The current irrigation water requirement is calculated for each intake node in the basin model for the water balance calculation, which amounts to 41 nodes in total, on a 10-day basis for the 36 years period from 1961 to 1996 with the following process:

P1: Gross unit irrigation water requirements (lit/s/ha) for the six cropping patterns are estimated taking the effective rainfall and irrigation efficiency into the calculation. The gross unit irrigation requirements for the period of 36 years from 1961 to 1996 are tabulated in Table 5.10 (1/6) to (6/6).

P2: Intake discharge at the 41 intake nodes are estimated taking the gross unit water requirement (lit/s/ha) and the total irrigation service area (ha) commanded under the concerned intake point into the calculation. The intake discharges at the 41 intake nodes calculated on the basis of the average gross unit water requirement of 36 years are tabulated in Table 5.10 (1/6) to (6/6).

Total demand for irrigation water is thus calculated for the 36 years and averaged as follows for each river basin and tabulated in Table 5.11(1/2) to (2/2).

Summary of Irrigation Water Demand

Basin	No. of Irrigation Intake Node	Total Service Area (ha)	Water Demand (10^3 m^3/year)
1. Vardar (mainstream)	13	38,513	252,186
2. Tresca	1	2,080	16,406
3. Pchinja	4	12,162	103,661
4. Bregalnica	8	37,628	378,264
5. Crna	5	49,205	402,723
6. Strumica	4	15,967	137,336
7. Crn Drim	6	12,437	94,872
Total	41	167,992	1,385,448

Through the above process, the gross irrigation water requirement per crop for the respective crops and regions were obtained. Those in the climatic Region III are presented below, for example, in order of large requirement obtained in this Study.

Unit Irrigation Water Requirement per Crop in Region III (m^3/ha/cropping)

Kind of Crop	JICA Study (Climate Region III)	Prevailing Standard in Macedonia
1) Paddy rice	22,100	22,500
2) Orchards	8,500	6,250
3) Vineyard	7,100	4,375
4) Maize	6,400	6,250
5) Vegetable	6,200	7,875
6) Wheat	3,700	2,875

Note: Prevailing standard values are obtained from Proceeding of Papers Meeting "Faculty with Farmers" 96 Volume 4 issued by the University

(2) Current Requirement of Livestock Water

(a) Basic conditions for estimate of livestock water

For estimate of the current livestock water requirement, the following conditions were applied:

C1: Unit water requirement per head of livestock was determined referring to the criteria provided by the Faculty of Agriculture of the University.

C2: Number of livestock in each municipality (the former division) as of 1994 was estimated referring to The Book X Agricultural Holdings in the 1994 Census of Population, Households, Dwellings and Agricultural Holdings in the Republic of Macedonia and Statistical Yearbook 1997.

(b) Livestock water requirement

The livestock water requirement in 1994 was calculated for each municipality with use of the unit water requirement and number of livestock. The requirement at the national level is tabulated below.

Livestock Water Requirement

Kind of Livestock	(1) Unit Water Requirement (lit/day/head)	(2) Number (heads)	(3) = (1) x (2) Water Requirement (m^3/sec)
1) Cattle	95	281,336	0.309
2) Horse	60	61,797	0.043
3) Pig	25	171,571	0.048
4) Sheep	11	2,466,099	0.314
5) Poultry	1	4,685,021	0.054
Total			0.768

The requirement of the livestock water requirement is calculated at 0.768 m^3/sec (66,355 m^3/day or 24.2 million m^3/year, which is 1.8 % of the requirement of irrigation water of 1,368 million m^3/year). The requirement in each river basin is tabulated in Table 5.12.

(3) Demand Projection of Irrigation Water

(a) Cropping area projection

The cropping area was first projected at 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 is projected 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 Figure 5.3(1/3) to (3/3).

(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 : 10^6m^3/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

(4) Demand Projection of Livestock Water

(a) Livestock number projection

Livestock number was projected at 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 at the national level was projected as follows;

Livestock Water Demand Projection

(Unit : m^3/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 ($24.6 \times 10^6 m^3$)	0.81 ($25.5 \times 10^6 m^3$)	0.84 ($26.5 \times 10^6 m^3$)	0.87 ($27.4 \times 10^6 m^3$)

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

(5) 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 : $10^6 m^3$/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 5.4 shows a development curve of agricultural water.

5.3.3 Industrial Water

The current industrial water requirements were assessed by analysis of historical water consumption records, assessment of water utilization in selected industries, and from a water utilization survey of industrial consumers.

(1) Analysis of Historical Consumption Records

Historical water consumption records for water supplied to industry and water used for production, sub-divided by type of activity for the period from 1990 to 1996, were obtained from the Statistical Office.

It should be noted that numerous inconsistencies were found with these data, but as several years of data are available for each type of industrial activity, it was possible to identify the types of activity with particular years having suspect data. Such inconsistencies were generally not difficult to identify, being often an order of magnitude different to the data from other years. In these cases the suspect data were re-estimated by observing the trend over the other years for the particular type of activity. This screening process produced a much more consistent data set and a clear picture emerged as to the change in industrial water use over the past decade.

Historical data were obtained for over thirty industrial activities for the period from 1990 to 1996.

(2) Water Supplied to Mining and Industry

The total water supplied to mining and industry for all Macedonia was assessed by adding the water supplies of raw process water from groundwater and surface.

The results, regarded as requirement of industrial water, showed a pronounced downward trend in industrial water consumption that reflects the reduction in industrial activity witnessed over the past decade following the break-up of the former Yugoslav. This downward trend is particular to Eastern Europe following the break-up of the Soviet Union.

The industrial water requirement from the historical data is tabulated for the period from 1990 to 1996.

Industrial Water Requirement for the Period 1990 - 1996.

(Unit: 10^3m^3)

Year	Potable Water (1)	Industrial Water Supplied from (2) Surface	(3) Groundwater	Total (4) = (1) + (2) +(3)
1990	43,101	81,944	45,097	170,142
1991	40,890	75,678	41,648	158,216
1992	38,027	74,772	41,150	153,949
1993	38,244	68,605	37,756	144,605
1994	38,678	59,518	32,755	130,951
1995	39,047	54,090	29,768	122,905
1996	34,920	50,933	28,030	113,883

(3) Demand Projection of Industrial Water

Above data for the period 1990 to 1996 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.

(a) 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.

(b) 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(10^3m^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

(c) 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

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

(d) 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.

(e) Demand projection of industrial water

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

Industrial Water Demand Projection

(Unit : 10^3m^3/year)

Breakdown	1996	2005	2015	2025
1) Potable water	34,920	38,377	41,834	45,221
	(1.000)	(1.099)	(1.198)	(1.295)
2) Raw process water from groundwater	28,030	36,579	51,613	80,155
	(1.000)	(1.305)	(1.411)	(1.553)
3) Raw process water from surface water	50,933	50,933	50,933	50,933
	(1.000)	(1.000)	(1.000)	(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 5.6 to 5.8 together with those of municipal water. Figure 5.5 shows a development curve of industrial water.

5.3.4 Biological Minimum

The biological minimum and/or ecological need was determined, from the ecological standpoint, as being 10% of the average flow, according to the Water Economy Basis of Macedonia as mentioned in the National Development Strategy 1997.

According to the hydrological study, average flows in major rivers for the 36 years from 1961 to 1996 are as follows, together with 10 % of them as the

ecological need.

Biological Minimum from Ecological Standpoint

Basin/Gauging Station (Catchment Area)	(1) Average Flow (m^3/s)	(2)= (1) x 10% (m^3/s)	Annual Amount of (2) (10^6m^3)
1. Vardar/Gevgelija ($22,301km^2$)	136.0	13.6	429
2. Treska/Sveta Bogorodica ($1,880km^2$)	23.3	2.3	73
3. Pchinja/Katlanovska Banja ($2,794km^2$)	11.9	1.2	38
4. Bregalnica/Shtip ($2,897 km^2$)	11.3	1.1	35
5. Crna/Rasimbegov Most ($4,526 km^2$)	22.4	2.2	70
6. Strumica/Novo Selo ($1,401 km^2$)	3.8	0.4	12
7. Crn Drim/Lozani (-)	23.4	2.3	73
Total			730

Following NDS 1997, river flow of around 730 x 10^6m^3/year will be required for the biological minimum from the ecological standpoint.

5.3.5 Total Water Demand Projection

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

Total Water Demand Projection

(10^6m^3/year)

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 5.1 Total 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
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	105,053	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 Probistip	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 Kochani	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 5.2 Urban 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
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 Probistip	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 5.3 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
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
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
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
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
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	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
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
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
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
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
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
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
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
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
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
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
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	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
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
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
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
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
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
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
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
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
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
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
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
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
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**

Table 5.4 Municipal Water Consumption in Macedonia for Year 1996

Municipality		Source	by Water Supply Company ($10^6 m^3$)							by Rural Supply	(9)	(10)	(11)	(12)	(12)
			(1) Domestic household	(2) Communal	(3) Commerce	(4) Industry (potable)	(5) Others	(6) System Loss	(7) Total excl.(4)	(8) Domestic,etc. ($10^6 m^3$)	Total excl.(4) ($10^6 m^3$)	Total (1) to (8) ($10^6 m^3$)	Urban Population	Rural Population	Total Population
1	Skopje	Spring, well	24.8	4.0	3.1	13.5	10.4	23.3	65.5	5.2	144.6	158.1	454,480	103,242	557,722
2	Gostivar	Spring	2.9	0.5	0.4	2.1	0.0	2.1	5.8	3.4	13.8	15.9	41,768	68,418	110,186
3	Tetovo	Spring	4.0	0.6	0.5	2.7	0.0	2.9	8.0	6.2	18.8	21.5	51,300	124,140	175,440
4	Kichevo	Spring	1.6	0.3	0.2	0.5	0.0	1.2	3.3	1.4	7.0	7.5	25,460	28,196	53,656
5	Makedonski Brod	Spring	0.1	0.0	0.0	0.0	0.0	0.1	0.2	0.6	0.5	0.5	0	10,974	10,974
6	Kumanovo	Reservoir	4.4	0.7	0.6	1.2	0.0	3.1	8.8	2.8	18.8	20.0	72,717	56,634	129,351
7	Kratovo	River intake	0.4	0.1	0.0	0.7	0.0	0.3	0.8	0.2	2.2	2.9	6,419	4,375	10,794
8	Kriva Palanka	Spring	0.7	0.1	0.1	0.4	0.0	0.5	1.4	0.7	3.3	3.7	11,060	13,831	24,891
9	Veles	Well, river intake, reservoir	2.7	0.4	0.3	1.0	0.0	1.9	5.3	1.0	11.6	12.6	47,107	19,270	66,377
10	Sveti Nikole	Reservoir	0.8	0.1	0.1	0.1	0.0	0.6	1.6	0.4	3.2	3.3	13,276	8,142	21,418
11	Shtip	Well	2.3	0.4	0.3	1.2	0.0	1.6	4.6	0.5	10.4	11.6	42,329	9,113	51,442
12	Probishtip	Well	0.6	0.1	0.1	0.7	0.0	0.4	1.2	0.3	3.1	3.8	10,253	6,482	16,735
13	Kochani	Well, reservoir	1.6	0.3	0.2	0.5	0.0	1.2	3.3	1.1	7.0	7.5	26,653	22,417	49,070
14	Vinica	Well, river intake	0.6	0.1	0.1	0.1	0.0	0.4	1.2	0.5	2.6	2.7	10,097	9,207	19,304
15	Delchevo	Well, river intake	0.7	0.1	0.1	0.3	0.0	0.5	1.4	0.7	3.2	3.5	10,685	14,916	25,601
16	Berevo	Reservoir	0.6	0.1	0.1	0.3	0.0	0.4	1.2	0.5	2.8	3.1	9,804	10,065	19,869
17	Demir Hisar	Well	0.1	0.0	0.0	0.0	0.0	0.1	0.2	0.5	0.5	0.5	0	10,304	10,304
18	Krushevo	Spring	0.4	0.1	0.0	0.1	0.0	0.3	0.7	0.3	1.5	1.6	5,498	6,488	11,986
19	Bitola	River intake, reservoir	4.4	0.7	0.6	1.8	0.0	3.1	8.7	1.5	19.3	21.1	77,764	30,858	108,622
20	Prilep	Well, spring	3.8	0.6	0.5	1.2	0.0	2.7	7.7	1.3	16.5	17.7	68,364	26,118	94,482
21	Kavadarci	Spring, river intake	1.8	0.3	0.2	1.0	0.0	1.3	3.6	0.5	8.3	9.3	33,193	9,281	42,474
22	Negotino	Spring, river intake	0.8	0.1	0.1	0.6	0.0	0.6	1.6	0.5	3.7	4.3	12,713	10,807	23,520
23	Valandovo	Well, spring	0.3	0.1	0.0	0.1	0.0	0.2	0.6	0.4	1.4	1.5	4,420	7,847	12,267
24	Gevgelija	Well	1.0	0.2	0.1	0.7	0.0	0.7	2.0	1.0	4.7	5.4	15,192	20,132	35,324
25	Ohrid	Spring, Lake	2.4	0.4	0.3	1.6	0.0	1.7	4.8	1.0	11.1	12.7	41,675	19,869	61,544
26	Struga	Spring	1.4	0.2	0.2	0.6	0.0	1.0	2.7	2.4	6.0	6.6	16,286	47,366	63,652
27	Debar	Spring	0.8	0.1	0.1	0.3	0.0	0.5	1.5	0.7	3.4	3.7	11,727	14,203	25,930
28	Resen	Well, spring	0.5	0.1	0.1	0.4	0.0	0.4	1.1	0.5	2.6	3.0	8,667	8,979	17,646
29	Radovis	Well	1.0	0.2	0.1	0.2	0.0	0.7	1.9	0.8	4.1	4.3	15,263	15,657	30,920
30	Strumica	Reservoir	2.4	0.4	0.3	1.0	0.2	1.8	5.2	2.9	11.3	12.3	34,545	57,780	92,325
	Total		70.0	11.2	8.9	34.9	10.6	55.4	156.1	39.9	196.0	230.9	1,178,715	795,111	1,973,826

Table 5.5 Current Demand of Municipal and Industrial Water (1996)

(unit : $10^3 m^3$/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)			
		Urban	Rural	Ground-water	Surface water		Potable	Raw Process	Ground-water	Surface water		Ground-water	Surface water	Total
I1-3	Skopje	65,457	5,181	70,638	0	70,638	13,532	20,931	34,463	0	34,463	105,101	0	105,101
I1-1	Gostivar	5,828	3,434	9,262	0	9,262	2,100	1,578	2,223	1,455	3,678	11,485	1,455	12,940
I1-2	Tetovo	8,034	6,230	14,265	0	14,265	2,654	14,410	2,704	14,360	17,064	16,969	14,360	31,329
I2-1	Kichevo	3,258	1,415	4,673	0	4,673	542	2,316	2,858	0	2,858	7,531	0	7,531
I2-2	Makedonski Brod	240	551	790	0	790	40	36	76	0	76	866	0	866
I3-3	Kumanovo	8,782	2,842	0	11,624	11,624	1,209	545	1,754	0	1,754	1,754	11,624	13,378
I3-2	Kratovo	762	220	0	981	981	700	0	700	0	700	700	981	1,681
I3-1	Kriva Palanka	1,450	694	2,144	0	2,144	375	40	415	0	415	2,559	0	2,559
I1-4	Veles	5,309	967	0	6,276	6,276	1,049	17,117	1,145	17,021	18,166	1,145	23,297	24,442
I4-8	Sveti Nikole	1,555	409	0	1,964	1,964	149	199	348	0	348	348	1,964	2,312
I4-7	Shtip	4,591	457	5,048	0	5,048	1,171	2,818	3,989	0	3,989	9,037	0	9,037
I4-6	Probishtip	1,205	325	1,531	0	1,531	658	483	1,141	0	1,141	2,672	0	2,672
I4-5	Kochani	3,255	1,125	3,723	657	4,380	549	0	549	0	549	4,272	657	4,929
I4-4	Vinica	1,249	462	0	1,711	1,711	98	0	98	0	98	98	1,711	1,809
I4-3	Delcevo	1,434	749	2,183	0	2,183	269	1	270	0	270	2,453	0	2,453
I4-1	Berevo	1,237	505	0	1,742	1,742	320	7	327	0	327	327	1,742	2,069
I5-1	Demir Hisar	225	517	742	0	742	46	0	46	0	46	788	0	788
I5-2	Krushevo	712	326	1,038	0	1,038	139	0	139	0	139	1,177	0	1,177
I5-4	Bitola	8,743	1,549	0	10,291	10,291	1,765	14,223	1,765	14,223	15,988	1,765	24,514	26,279
I5-3	Prilep	7,685	1,311	8,996	0	8,996	1,125	101	1,226	0	1,226	10,222	0	10,222
I1-5	Kavadarci	3,647	466	4,112	0	4,112	1,000	2,277	1,004	2,273	3,277	5,116	2,273	7,389
I1-6	Negotino	1,555	542	2,097	0	2,097	604	1,714	717	1,601	2,318	2,814	1,601	4,415
I1-8	Valandovo	630	394	1,024	0	1,024	112	0	112	0	112	1,136	0	1,136
I1-9	Gevgelija	2,016	1,010	3,026	0	3,026	681	126	807	0	807	3,833	0	3,833
I7-2	Ohrid	4,758	997	0	5,755	5,755	1,620	0	1,620	0	1,620	1,620	5,755	7,375
I7-3	Struga	2,724	2,377	5,102	0	5,102	649	0	649	0	649	5,751	0	5,751
I7-4	Debar	1,527	713	2,240	0	2,240	290	0	290	0	290	2,530	0	2,530
I7-1	Resen	1,095	451	1,546	0	1,546	360	0	360	0	360	1,906	0	1,906
I6-1	Radovish	1,926	786	2,711	0	2,711	150	1	151	0	151	2,862	0	2,862
I6-2	Strumica	5,154	2,900	0	8,054	8,054	964	40	1,004	0	1,004	1,004	8,054	9,058
	Total	156,043	39,905	146,892	49,056	195,948	34,920	78,963	62,950	50,933	113,883	209,842	99,989	309,831

Table 5.6 Demand Projection of Municipal and Industrial Water (2005)

(unit : $10^3 m^3$/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)			
		Urban	Rural	Ground-water	Surface water		Potable	Raw Process	Ground-water	Surface water		Ground-water	Surface water	Total
I1-3	Skopje	72,296	6,179	78,475	0	78,475	14,872	27,315	42,187	0	42,187	120,662	0	120,662
I1-1	Gostivar	6,270	4,029	10,299	0	10,299	2,308	1,616	2,468	1,455	3,923	12,767	1,455	14,222
I1-2	Tetovo	8,651	7,323	15,974	0	15,974	2,917	14,425	2,982	14,360	17,342	18,956	14,360	33,316
I2-1	Kichevo	3,437	1,627	5,064	0	5,064	596	3,022	3,618	0	3,618	8,682	0	8,682
I2-2	Makedonski Brod	247	590	837	0	837	44	47	91	0	91	928	0	928
I3-3	Kumanovo	9,229	3,254	0	12,483	12,483	1,329	711	2,040	0	2,040	2,040	12,483	14,523
I3-2	Kratovo	732	230	0	962	962	769	0	769	0	769	769	962	1,731
I3-1	Kriva Palanka	1,393	727	2,120	0	2,120	412	52	464	0	464	2,584	0	2,584
I1-4	Veles	5,464	1,084	0	6,548	6,548	1,153	17,146	1,278	17,021	18,299	1,278	23,569	24,847
I4-8	Sveti Nikole	1,550	444	0	1,994	1,994	164	260	423	0	423	423	1,994	2,417
I4-7	Shtip	4,873	528	5,401	0	5,401	1,287	3,677	4,964	0	4,964	10,365	0	10,365
I4-6	Probishtip	1,233	362	1,595	0	1,595	723	630	1,353	0	1,353	2,948	0	2,948
I4-5	Kochani	3,407	1,283	3,986	703	4,689	603	0	603	0	603	4,589	703	5,292
I4-4	Vinica	1,315	530	0	1,845	1,845	108	0	108	0	108	108	1,845	1,953
I4-3	Delcevo	1,508	858	2,366	0	2,366	296	1	297	0	297	2,663	0	2,663
I4-1	Berevo	1,249	556	0	1,805	1,805	352	9	361	0	361	361	1,805	2,166
I5-1	Demir Hisar	249	514	763	0	763	51	0	51	0	51	814	0	814
I5-2	Krushevo	708	353	1,061	0	1,061	153	0	153	0	153	1,214	0	1,214
I5-4	Bitola	8,901	1,717	0	10,618	10,618	1,940	14,223	1,940	14,223	16,163	1,940	24,841	26,781
I5-3	Prilep	7,802	1,449	9,251	0	9,251	1,236	132	1,368	0	1,368	10,619	0	10,619
I1-5	Kavadarci	3,847	535	4,382	0	4,382	1,099	2,278	1,104	2,273	3,377	5,486	2,273	7,759
I1-6	Negotino	2,089	630	2,719	0	2,719	664	1,748	811	1,601	2,412	3,530	1,601	5,131
I1-8	Valandovo	667	455	1,122	0	1,122	123	0	123	0	123	1,245	0	1,245
I1-9	Gevgelija	2,138	1,168	3,306	0	3,306	748	164	913	0	913	4,219	0	4,219
I7-2	Ohrid	5,019	1,145	0	6,164	6,164	1,780	0	1,780	0	1,780	1,780	6,164	7,944
I7-3	Struga	2,894	2,758	5,652	0	5,652	713	0	713	0	713	6,365	0	6,365
I7-4	Debar	1,645	837	2,483	0	2,483	319	0	319	0	319	2,802	0	2,802
I7-1	Resen	1,088	488	1,575	0	1,575	396	0	396	0	396	1,971	0	1,971
I6-1	Radovish	2,030	903	2,933	0	2,933	165	1	166	0	166	3,099	0	3,099
I6-2	Strumica	5,429	3,345	0	8,775	8,775	1,059	54	1,113	0	1,113	1,113	8,775	9,888
	Total	167,361	45,899	161,364	51,896	213,260	38,377	87,512	74,956	50,933	125,889	236,320	102,829	339,149

Table 5.7 Demand Projection of Municipal and Industrial Water (2015)

(unit : 10^3m^3/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)			
		Urban	Rural	Ground-water	Surface water		Potable	Raw Process	Ground-water	Surface water		Ground-water	Surface water	Total
I1-3	Skopje	76,571	7,809	84,381	0	84,381	16,211	38,541	54,753	0	54,753	139,134	0	139,134
I1-1	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
I1-2	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
I2-1	Kichevo	3,617	1,994	5,611	0	5,611	649	4,265	4,912	0	4,912	10,523	0	10,523
I2-2	Makedonski Brod	239	676	915	0	915	48	66	114	0	114	1,029	0	1,029
I3-3	Kumanovo	9,684	3,971	0	13,655	13,655	1,448	1,004	2,452	0	2,452	2,452	13,655	16,107
I3-2	Kratovo	704	257	0	962	962	839	0	839	0	839	839	962	1,801
I3-1	Kriva Palanka	1,339	814	2,153	0	2,153	449	74	523	0	523	2,676	0	2,676
I1-4	Veles	5,631	1,297	0	6,928	6,928	1,257	17,198	1,433	17,021	18,454	1,433	23,949	25,382
I4-8	Sveti Nikole	1,548	515	0	2,063	2,063	179	366	545	0	545	545	2,063	2,608
I4-7	Shtip	5,164	650	5,813	0	5,813	1,403	5,189	6,592	0	6,592	12,405	0	12,405
I4-6	Probishtip	1,262	431	1,694	0	1,694	788	889	1,678	0	1,678	3,372	0	3,372
I4-5	Kochani	3,561	1,560	4,353	768	5,121	658	0	658	0	658	5,011	768	5,779
I4-4	Vinica	1,382	648	0	2,031	2,031	117	0	117	0	117	117	2,031	2,148
I4-3	Delcevo	1,582	1,049	2,630	0	2,630	322	2	324	0	324	2,954	0	2,954
I4-1	Berevo	1,262	654	0	1,916	1,916	383	13	396	0	396	396	1,916	2,312
I5-1	Demir Hisar	226	542	768	0	768	55	0	55	0	55	823	0	823
I5-2	Krushevo	705	409	1,114	0	1,114	167	0	167	0	167	1,281	0	1,281
I5-4	Bitola	9,078	2,034	0	11,112	11,112	2,114	14,223	2,114	14,223	16,337	2,114	25,335	27,449
I5-3	Prilep	7,935	1,712	9,647	0	9,647	1,348	186	1,534	0	1,534	11,181	0	11,181
I1-5	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
I1-6	Negotino	2,180	778	2,958	0	2,958	724	1,809	932	1,601	2,533	3,890	1,601	5,491
I1-8	Valandovo	704	560	1,264	0	1,264	134	0	134	0	134	1,398	0	1,398
I1-9	Gevgelija	2,259	1,438	3,697	0	3,697	816	232	1,048	0	1,048	4,745	0	4,745
I7-2	Ohrid	5,286	1,402	0	6,688	6,688	1,941	0	1,941	0	1,941	1,941	6,688	8,629
I7-3	Struga	3,058	3,405	6,463	0	6,463	777	0	778	0	778	7,241	0	7,241
I7-4	Debar	1,763	1,045	2,808	0	2,808	347	0	347	0	347	3,155	0	3,155
I7-1	Resen	1,081	564	1,646	0	1,646	431	0	431	0	431	2,077	0	2,077
I6-1	Radovish	2,135	1,105	3,240	0	3,240	180	2	182	0	182	3,422	0	3,422
I6-2	Strumica	5,698	4,111	0	9,809	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 5.8 Demand Projection of Municipal and Industrial Water (2025)

(unit : $10^3 m^3$/year)

No. of Node	Municipality	(1) Municipal Water Demand (M)				Total (1)	(2) Industrial Water Demand (I)				Total (2)	(3)=(1)+(2) (Total of M & I)		
		Area		Source of Water			Classification		Source of Water					
		Urban	Rural	Ground-water	Surface water		Potable	Raw Process	Ground-water	Surface water		Ground-water	Surface water	Total
I1-3	Skopje	80,433	9,535	89,968	0	89,968	17,524	59,855	77,379	0	77,379	167,347	0	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	1,455	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	14,360	38,787
I2-1	Kichevo	3,780	2,375	6,156	0	6,156	702	6,623	7,325	0	7,325	13,481	0	13,481
I2-2	Makedonski Brod	232	760	992	0	992	52	103	155	0	155	1,147	0	1,147
I3-3	Kumanovo	10,097	4,716	0	14,813	14,813	1,566	1,558	3,124	0	3,124	3,124	14,813	17,937
I3-2	Kratovo	680	283	0	963	963	906	0	907	0	907	907	963	1,870
I3-1	Kriva Palanka	1,292	896	2,187	0	2,187	486	114	600	0	600	2,787	0	2,787
I1-4	Veles	5,784	1,516	0	7,300	7,300	1,358	17,296	1,633	17,021	18,654	1,633	24,321	25,954
I4-8	Sveti Nikole	1,548	586	0	2,133	2,133	193	569	762	0	762	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	0	15,781
I4-6	Probishtip	1,290	502	1,791	0	1,791	852	1,381	2,233	0	2,233	4,024	0	4,024
I4-5	Kochani	3,701	1,847	4,716	832	5,548	711	0	711	0	711	5,427	832	6,259
I4-4	Vinica	1,443	771	0	2,214	2,214	127	0	127	0	127	127	2,214	2,341
I4-3	Delcevo	1,648	1,247	2,895	0	2,895	348	3	351	0	351	3,246	0	3,246
I4-1	Berevo	1,275	752	0	2,027	2,027	414	20	434	0	434	434	2,027	2,461
I5-1	Demir Hisar	205	562	767	0	767	60	0	60	0	60	827	0	827
I5-2	Krushevo	703	465	1,168	0	1,168	180	0	180	0	180	1,348	0	1,348
I5-4	Bitola	9,244	2,355	0	11,600	11,600	2,286	14,223	2,286	14,223	16,509	2,286	25,823	28,109
I5-3	Prilep	8,061	1,978	10,039	0	10,039	1,457	289	1,746	0	1,746	11,785	0	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	2,273	8,602
I1-6	Negotino	2,261	934	3,195	0	3,195	782	1,924	1,105	1,601	2,706	4,300	1,601	5,901
I1-8	Valandovo	737	669	1,407	0	1,407	145	0	145	0	145	1,552	0	1,552
I1-9	Gevgelija	2,368	1,720	4,088	0	4,088	882	360	1,241	0	1,241	5,329	0	5,329
I7-2	Ohrid	5,530	1,668	0	7,199	7,199	2,098	0	2,098	0	2,098	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	0	8,127
I7-4	Debar	1,869	1,263	3,133	0	3,133	376	0	376	0	376	3,509	0	3,509
I7-1	Resen	1,076	640	1,717	0	1,717	466	0	466	0	466	2,183	0	2,183
I6-1	Radovish	2,230	1,316	3,546	0	3,546	194	3	197	0	197	3,743	0	3,743
I6-2	Strumica	5,938	4,909	0	10,847	10,847	1,248	115	1,363	0	1,363	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	110,861	426,531

Table 5.9 Existing Irrigation Systems (1/2)

No.	Code No.	Irrigation System	Designed Irri. Area (ha)	Existing Irri. Area (ha)	Incompleted Area (ha)	River of Water Source 0	1	2	3
I.	**Vardar River Basin, Upper Reaches**								
1.	I-1	Shkoza	142	142	0	Vardar			
2.	I-2	Zdunje I & II	2,200	2,200	0	Vardar			
3.	I-3	Gostivarsko pole	4,311	3,914	397	Vardar			
4.	I-4	Banjica	531	400	131	Vardar			
5.	I.4a-1	Lakavica	161	161	0		Lakavichka		
6.	I.4a.1a-1	Melca	230	230	0			Melca	
7.	I.4b-1	Vrapcishka reka	280	280	0		Vrapchishka		
8.	I.4b.1a-1	Balin dol	116	116	0			Tributary	
9.	I-5	Stenche	500	500	0	Vardar			
10.	I.5a-1	Mazdracha	1,180	1,180	0		Mazdracha		
11.	I-6	Radiovce-Bistrica	8,187	8,187	0	Vardar			
12.	I-7	Miletino-Chelopek	856	856	0	Vardar (belongs to 11. Radiovce-Bistrica)			
13.	I.7a.0a-1	Rechica	114	114	0		(Tetovska)	Tributary	
14.	I.7b-1	Ratae	1,040	1,040	0		Tributary (belongs to 11. Radiovce-Bistrica)		
15.	I.7c-1	Djepishte	160	160	0		Tributary (belongs to 11. Radiovce-Bistrica)		
16.	I.7d-1	Neproshteno	114	114	0		Leshachka (belongs to 11. Radiovce-Bistrica)		
17.	I.7e-1	Stari	2,500	2,500	0		Tributaries		
18.	I-8	Radusha	71	71	0	Vardar			
19.	I-9	Rashche	325	325	0	Vardar			
20.	I-10	Saraj	14	14	0	Vardar			
21.	I.10a.0a-1	Bigor-Dolenci	590	590	0		(Treska)	Zajashka	
22.	I.10a.0b-1	Zaec-Greshnica	450	450	0			Tributary	
23.	I.10a-1	Kichevosko pole	1,450	1,040	410		Treska		
24.	I.10a-2	Shishevo	56	56	0		Treska		
25.	I.10a-3	Glumovo	14	14	0		Treska		
26.	I.10b-1	Vuchidol-Orman	85	85	0		Lepenec		
27.	I.10b-2	Novo selo	68	68	0		Lepenec		
28.	I.10b-3	Bardovci-Zlokukjani	140	140	0		Lepenec		
29.	I.10c-1	Radishani	27	27	0		Cicerska		
30.	I.10d-1	Drachevo-Batinci	110	110	0		Markova		
31.	I.10e-1	Kamnik	1,300	1,300	0		Tributaries		
32.	I.10f-1	Petrovec	100	100	0		Tributary		
33.	I.10g-1	Shamak	30	30	0		Tributary		
34.	I.10i-1	Dragomanci	136	136	0		Pchinja		
35.	I.10i.1a-1	Slavishko pole	250	250	0			Kriva	
36.	I.10i.1a-2	Studena bara-Vakuf	400	290	110			Kriva	
37.	I.10i.1a-3	Davezence-Jachince-Klechovc	250	175	75			Kriva	
38.	I.10i-2	Klechovce	500	265	235		Pchinja		
39.	I.10i-3	Shupli kamen-Zubovce	122	122	0		Pchinja		
40.	I.10i.3a.0a-	Rechica	60	60	0		(Kumanovska)	Rechica (well)	
41.	I.10i.3a.0a-	Izvor Jovica	44	44	0			Lojanska	
42.	I.10i.3a.0b-	Lipkovo	10,820	10,820	0			Lipkovska	
		Sub-total	40,034	38,676	1,358				
II.	**Vardar River Basin, Middle Reaches**								
43.	II.0a-1	Mladost (Otovica)	1,200	1,200	0	(Vardar)	Otovica		
44.	II.0b-1	Topolka	400	400	0		Topolka		
45.	II.0c-1	Vitanci	98	98	0		Babuna		
46.	II.0c-2	Babuna	100	100	0		Babuna		
47.	II-1	Kochilari	80	80	0	Vardar			
48.	II-2	Zgropulci	24	24	0	Vardar			
49.	II-3	Vinichani	150	150	0	Vardar			
50.	II.3a.0a-1	Crn dol (Pehchevo)	80	80	0		(Bregalnica)	Crn Dol	
51.	II.3a.0b-1	Maleshevsko pole	3,014	917	2,097			Tributary	
52.	II.3a-1	Sandanski (Delchevo)	250	250	0		Bregalnica		
53.	II.3a.1a-1	Jugotutun (Delcevo)	164	164	0			Tributaries	
54.	II.3a-2	Milkovo (Delchevo)	540	495	45		Bregalnica		
55.	II.3a-3	Bregalnica	32,100	28,890	3,210		Bregalnica		
56.	II.3a.3a-1	Osojnica	415	415	0			Osojnica	
57.	II.3a.3a.1a-	Blatec	915	500	415				Blateshka
58.	II.3a.3b-1	Belashnica-Zletovo	200	200	0			Zletovska	
59.	II.3a.4c-1	Mavrovica	250	136	114			Orlica	
		Sub-total	39,980	34,099	5,881				

Table 5.9 Existing Irrigation Systems (2/2)

No.	Code No.	Irrigation System	Designed Irri. Area (ha)	Existing Irri. Area (ha)	Incompleted Area (ha)	River of Water Source 0	1	2	3
III.	**Vardar River Basin, Lower Reaches**								
60.	III.0a.0a-1	Obednichki	30	30	0	(Vardar)	(Crna)	Tributary	
61.	III.0a.0b-1	Demir hisar	10	10	0			Tributary	
62.	III.0a-1	Buchin	120	120	0		Crna		
63.	III.0a.1a.0a-1	Debreshte	251	251				(Blato)	Tributary
64.	III.0a.1a-1	Crna upper reach	250	250	0			Blato	
65.	III.0a.1a.1a-1	Brailovo	240	240	0				Suvodolichka
66.	III.0a.1a.1a-2	Desovo	280	280	0				Suvodolichka
67.	III.0a.1a.1b-1	Krushevo	220	220	0				Selishva
68.	III.0a.1a.1c-1	Borino (Lazhani)	666	666	0				Tributary
69.	III.0a.1a.1d-1	Prilep	6,200	6,200	0				Stara
70.	III.0a.1b-1	Strezhevo	20,200	20,200	0			Shemnica	
71.	III.0a.1b-2	Shemnica upper reach	50	50	0			Sazdaica	
72.	III.0a.1c-1	Dihovo	270	140	130			Dihovska	
73.	III.0a.1d-1	Bistrica	40	40	0			Zlokuchanska	
74.	III.0a.1d.1a-1	Velushka river	75	75	0				Velushka
75.	III.0a.1e-1	Graeshnica	20	20	0			Tributary	
76.	III.0a.1f-1	Dabnichka reka	300	200	100			Dronska	
77.	III.0a-2	Tikvesh	20,290	19,225	1,065		Crna		
78.	III.0a-3	Vozarci	28	28	0		Crna		
79.	III.0a-4	Trstenik-Gradsko	960	960	0		Crna		
80.	III.0b-1	Boshavica	1,935	1,935	0		Valashka		
81.	III-1	Pepelishko pole	1,600	1,000	600	Vardar			
82.	III.1a-1	Demir kapija	300	300	0		Boshava		
83.	III-2	Gradec	264	264	0	Vardar			
84.	III-3	Udovo-Valandovo	3,624	3,624	0	Vardar			
85.	III.3a.0a-1	Petrushka river	100	100	0		(Stara)	Petrushka	
86.	III.3a-1	Miravci	100	100	0		Stara		
87.	III-4	Grchishte I and II	423	423	0	Vardar			
88.	III-5	Smokvica I and II	110	110	0	Vardar			
89.	III-6	Prdejci	200	200	0	Vardar			
90.	III.6a-1	Kovanska, Sermeninska rivers	200	200	0		Kovanska		
91.	III-7	Vinojug	150	150	0	Vardar (wells)			
92.	III-8	Gjavoto	1,340	1,340	0	Vardar			
93.	III.8a-1	Paljurci	800	800	0		C. Luda Mara		
94.	III.8b-1	Konska reka	571	571	0		Konjska		
95.	III-9	Sehovo	200	200	0	Vardar			
96.	III-10	Granica	120	120	0	Vardar			
97.	III.10a-1	Pod anot	120	120	0		Konjushka (wells)		
98.	III-11	Avlakjot	40	40	0	Vardar (wells)			
99.	III-12	Keramadnica	80	80	0	Vardar			
100.	III.12a-1	Selemli	350	350	0		Tributary		
101.	III.13	Sretenovo	120	120	0	Dojran			
		Sub-total	63,247	61,352	1,895				
IV.	**Crn Drim River Basin**								
102.	IV.0a-1	Ljubojno	84	84	0	(Lake Prespa)	Brajchinska		
103.	IV.0b-1	Krani	153	153	0		Kranska		
104.	IV-1	Asamati	2,811	2,811	0	Lake Prespa			
105.	IV.1a-1	Pretor	41	41	0		Pretorska		
106.	IV.1b-1	Kurbinovo	78	78	0		Kurbinovska		
107.	IV-2	Sirhan	2,788	2,788	0	Lake Prespa			
108.	IV.2a-1	Ljubanishta	142	142	0	(Lake Ohrid)	Ljubanishta		
109.	IV.2b.0a-1	Trebenishta	50	50	0		(Tributary)	Tributary	
110.	IV.2b.0b-1	Leskoec	100	100	0			Tributary	
111.	IV-3	Velgoshte	60	60	0	Lake Ohrid			
112.	IV-4	Ovoshtarnik	250	250	0	Crn Drim			
113.	IV.4a-1	Izdeglavje	700	700	0		Sateska		
114.	IV.4a.1a-1	Slatino	700	400	300		Sateska		
115.	IV.4a.1b-1	Belchishta-Velmej	1,400	440	960			Tributary	
116.	IV.4a.1b-2	Sateska	1,250	400	850			Tributary	
117.	IV.4a-2	Batun	50	50	0		Sateska		
118.	IV.4b-1	Shum-Vishni	305	305	0		Belichka		
119.	IV-5	Lozhani	550	550	0	Crn Drim			
120.	IV-6	Stari	745	745	0	Crn Drim			
121.	IV-7	Strushko pole	1,600	1,000	600	Crn Drim			
122.	IV.7a-1	Banjiste	150	150	0		Banjishka R.		
123.	IV.7b-1	Gradinar	60	60	0		Graeshnica		
124.	IV.9-1	Debarsko pole	1,980	1,080	900		Radika		
		Sub-total	16,047	12,437	3,610				
V.	**Strumica River Basin**								
125.	V.0a.0a-1	Mantovo	5,581	5,581	0	(Vardar)	(Bregalnica)	Kriva Lakavica	
126.	V.0b-1	Oraovica	67	67	0	(Strumica)	Orahovachka		
127.	V.0c-1	Podaresh	250	250	0		Plavaja		
128.	V.0d-1	Turija	10,050	10,050	0		Nivichanska		
129.	V.0e-1	Vodocha	4,000	4,000	0		Tributary		
130.	V.0f-1	Podlbelasica	1,550	1,400	150		Tributaries		
131.	V.0g-1	Novo selo	200	200	0		Novoselska		
			21,698	21,548	150				
		Total	181,006	168,112	12,894				

Table 5.10 Gross Unit Water Requirements (1/6)

I. Cropping Pattern in Climatic Region 1 (at present) (using Data at Tetovo Meteo. Station)

(Unit: lit/s/ha)

No.	Year	Jan.			Feb.			Mar.			Apr.			May			Jun.			Jul.			Aug.			Sep.			Oct.			Nov.			Dec.		
		1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
1.	1961	0.00	0.00	0.00	0.00	0.11	0.18	0.00	0.23	0.00	0.05	0.47	0.00	0.45	0.00	0.18	0.04	0.05	0.18	0.08	0.20	0.37	0.54	0.63	0.64	0.50	0.60	0.48	0.07	0.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.	1962	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.53	0.22	0.65	0.60	0.04	0.02	0.07	0.19	0.12	0.43	0.21	0.37	0.64	0.68	0.60	0.01	0.38	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
3.	1963	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14	0.00	0.13	0.31	0.14	0.45	0.07	0.10	0.01	0.04	0.20	0.24	0.25	0.12	0.13	0.65	0.28	0.03	0.60	0.33	0.00	0.09	0.00	0.02	0.00	0.00	0.00	0.00	0.00
4.	1964	0.04	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.13	0.47	0.11	0.51	0.33	0.00	0.05	0.04	0.02	0.17	0.03	0.21	0.48	0.35	0.64	0.00	0.60	0.12	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00
5.	1965	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.05	0.00	0.00	0.20	0.11	0.45	0.44	0.05	0.03	0.18	0.20	0.27	0.43	0.52	0.29	0.39	0.58	0.60	0.48	0.38	0.27	0.16	0.00	0.00	0.00	0.00	0.00	0.00
6.	1966	0.00	0.00	0.00	0.07	0.00	0.00	0.00	0.16	0.05	0.38	0.05	0.23	0.45	0.63	0.17	0.04	0.03	0.24	0.09	0.23	0.21	0.50	0.63	0.59	0.34	0.20	0.48	0.25	0.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7.	1967	0.00	0.00	0.00	0.07	0.04	0.16	0.14	0.00	0.28	0.28	0.00	0.00	0.57	0.27	0.17	0.05	0.05	0.17	0.07	0.00	0.12	0.21	0.59	0.26	0.64	0.40	0.46	0.20	0.27	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8.	1968	0.00	0.00	0.00	0.00	0.00	0.04	0.13	0.00	0.13	0.36	0.00	0.55	0.61	0.00	0.00	0.01	0.00	0.02	0.24	0.22	0.43	0.07	0.45	0.05	0.50	0.40	0.15	0.36	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9.	1969	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.57	0.65	0.60	0.00	0.06	0.22	0.00	0.17	0.32	0.31	0.61	0.59	0.48	0.16	0.37	0.38	0.27	0.16	0.00	0.02	0.00	0.00	0.00	0.00
10.	1970	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.55	0.39	0.63	0.00	0.05	0.06	0.13	0.00	0.14	0.34	0.54	0.65	0.55	0.12	0.60	0.48	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00
11.	1971	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.14	0.55	0.43	0.47	0.20	0.00	0.07	0.24	0.07	0.02	0.09	0.19	0.47	0.63	0.46	0.00	0.37	0.13	0.01	0.16	0.00	0.00	0.00	0.00	0.00	0.00
12.	1972	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.28	0.38	0.04	0.07	0.00	0.51	0.35	0.01	0.06	0.22	0.14	0.04	0.35	0.21	0.23	0.33	0.20	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.00	0.00	0.02	0.03
13.	1973	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14	0.09	0.33	0.45	0.13	0.60	0.04	0.05	0.19	0.02	0.20	0.00	0.03	0.65	0.00	0.68	0.60	0.48	0.38	0.27	0.16	0.04	0.04	0.02	0.02	0.02	0.03
14.	1974	0.00	0.00	0.00	0.00	0.00	0.07	0.00	0.20	0.00	0.36	0.00	0.22	0.39	0.02	0.13	0.06	0.00	0.15	0.22	0.27	0.43	0.54	0.65	0.02	0.46	0.60	0.17	0.14	0.00	0.00	0.00	0.04	0.00	0.00	0.00	0.03
15.	1975	0.00	0.04	0.00	0.07	0.00	0.00	0.14	0.00	0.00	0.00	0.22	0.09	0.41	0.14	0.03	0.03	0.00	0.06	0.05	0.22	0.41	0.41	0.08	0.32	0.44	0.40	0.46	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03
16.	1976	0.00	0.04	0.00	0.00	0.00	0.18	0.00	0.14	0.00	0.14	0.23	0.25	0.14	0.23	0.03	0.00	0.05	0.02	0.03	0.23	0.04	0.35	0.33	0.55	0.34	0.48	0.42	0.31	0.00	0.00	0.04	0.04	0.02	0.02	0.02	0.03
17.	1977	0.00	0.00	0.00	0.00	0.00	0.16	0.14	0.05	0.08	0.00	0.18	0.55	0.25	0.47	0.44	0.02	0.03	0.11	0.19	0.27	0.08	0.12	0.59	0.48	0.58	0.40	0.00	0.34	0.01	0.16	0.00	0.00	0.00	0.00	0.00	0.00
18.	1978	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.27	0.00	0.47	0.08	0.06	0.07	0.15	0.24	0.11	0.43	0.54	0.33	0.63	0.00	0.07	0.10	0.32	0.25	0.00	0.04	0.04	0.02	0.02	0.02	0.03
19.	1979	0.00	0.00	0.00	0.00	0.00	0.16	0.13	0.00	0.24	0.00	0.11	0.53	0.00	0.13	0.11	0.05	0.06	0.12	0.03	0.27	0.39	0.09	0.35	0.24	0.22	0.60	0.42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20.	1980	0.00	0.00	0.00	0.00	0.00	0.18	0.00	0.00	0.00	0.24	0.39	0.41	0.23	0.00	0.00	0.03	0.04	0.24	0.19	0.27	0.43	0.54	0.43	0.64	0.48	0.58	0.37	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21.	1981	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.28	0.38	0.00	0.51	0.45	0.11	0.33	0.03	0.02	0.22	0.24	0.07	0.26	0.54	0.29	0.00	0.01	0.22	0.30	0.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22.	1982	0.00	0.00	0.05	0.07	0.05	0.00	0.00	0.00	0.07	0.20	0.05	0.37	0.55	0.18	0.03	0.02	0.06	0.24	0.06	0.16	0.35	0.35	0.47	0.46	0.60	0.16	0.46	0.00	0.06	0.14	0.04	0.00	0.00	0.00	0.00	0.00
23.	1983	0.02	0.00	0.00	0.00	0.00	0.11	0.00	0.23	0.02	0.32	0.43	0.51	0.20	0.67	0.07	0.04	0.01	0.02	0.08	0.10	0.14	0.45	0.33	0.52	0.00	0.60	0.48	0.36	0.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24.	1984	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.09	0.02	0.14	0.25	0.35	0.44	0.05	0.02	0.16	0.15	0.27	0.32	0.12	0.45	0.12	0.68	0.16	0.03	0.27	0.11	0.16	0.02	0.00	0.00	0.02	0.00	0.00
25.	1985	0.00	0.00	0.00	0.00	0.00	0.16	0.00	0.00	0.18	0.38	0.35	0.05	0.14	0.63	0.24	0.03	0.07	0.19	0.17	0.23	0.43	0.48	0.65	0.64	0.50	0.60	0.48	0.38	0.24	0.00	0.00	0.00	0.00	0.02	0.00	0.00
26.	1986	0.00	0.00	0.00	0.07	0.11	0.18	0.00	0.05	0.28	0.40	0.31	0.43	0.05	0.55	0.26	0.00	0.03	0.03	0.02	0.15	0.09	0.12	0.65	0.64	0.68	0.60	0.03	0.38	0.27	0.00	0.00	0.04	0.02	0.02	0.00	0.00
27.	1987	0.00	0.00	0.00	0.00	0.00	0.00	0.14	0.00	0.00	0.04	0.47	0.14	0.14	0.35	0.03	0.06	0.02	0.02	0.24	0.25	0.43	0.00	0.59	0.64	0.68	0.60	0.01	0.11	0.00	0.08	0.00	0.00	0.00	0.00	0.00	0.03
28.	1988	0.02	0.04	0.00	0.02	0.11	0.00	0.05	0.04	0.00	0.32	0.39	0.25	0.49	0.61	0.56	0.04	0.03	0.19	0.24	0.27	0.35	0.54	0.61	0.57	0.68	0.32	0.35	0.05	0.27	0.09	0.00	0.00	0.00	0.00	0.00	0.00
29.	1989	0.00	0.04	0.05	0.07	0.11	0.00	0.00	0.23	0.28	0.40	0.47	0.45	0.33	0.11	0.46	0.00	0.07	0.00	0.00	0.16	0.00	0.41	0.55	0.32	0.68	0.32	0.35	0.00	0.01	0.16	0.00	0.04	0.00	0.00	0.02	0.00
30.	1990	0.04	0.04	0.05	0.07	0.00	0.16	0.07	0.23	0.23	0.00	0.00	0.31	0.59	0.35	0.27	0.06	0.07	0.18	0.24	0.02	0.43	0.33	0.65	0.55	0.48	0.54	0.40	0.38	0.24	0.11	0.00	0.00	0.00	0.00	0.00	0.02
31.	1991	0.04	0.04	0.05	0.07	0.00	0.16	0.07	0.23	0.23	0.00	0.00	0.31	0.59	0.35	0.27	0.06	0.07	0.18	0.24	0.02	0.43	0.33	0.63	0.55	0.48	0.54	0.40	0.38	0.24	0.11	0.00	0.00	0.00	0.00	0.00	0.02
32.	1992	0.04	0.04	0.00	0.04	0.00	0.18	0.18	0.20	0.23	0.00	0.00	0.49	0.61	0.63	0.55	0.02	0.02	0.14	0.24	0.27	0.43	0.54	0.65	0.64	0.68	0.56	0.42	0.00	0.00	0.00	0.04	0.00	0.02	0.00	0.00	0.03
33.	1993	0.00	0.04	0.05	0.07	0.04	0.00	0.00	0.23	0.00	0.09	0.27	0.27	0.41	0.63	0.47	0.01	0.06	0.12	0.24	0.27	0.34	0.07	0.63	0.50	0.34	0.42	0.40	0.00	0.27	0.13	0.00	0.00	0.00	0.00	0.00	0.00
34.	1994	0.00	0.00	0.00	0.02	0.00	0.00	0.16	0.23	0.23	0.00	0.22	0.49	0.22	0.65	0.60	0.05	0.05	0.20	0.01	0.21	0.12	0.52	0.65	0.64	0.68	0.09	0.48	0.22	0.27	0.00	0.00	0.00	0.02	0.02	0.00	0.00
35.	1995	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.18	0.00	0.38	0.22	0.00	0.04	0.37	0.42	0.02	0.05	0.16	0.20	0.01	0.00	0.19	0.25	0.12	0.12	0.58	0.00	0.38	0.27	0.16	0.00	0.00	0.00	0.00	0.00	0.00
36.	1996	0.00	0.04	0.00	0.00	0.00	0.00	0.18	0.00	0.00	0.00	0.00	0.55	0.47	0.02	0.00	0.06	0.02	0.14	0.24	0.20	0.43	0.08	0.65	0.33	0.22	0.00	0.00	0.13	0.06	0.01	0.04	0.00	0.00	0.00	0.00	0.00
	Average	0.01	0.01	0.01	0.02	0.02	0.06	0.04	0.08	0.09	0.16	0.16	0.30	0.34	0.36	0.26	0.03	0.04	0.14	0.14	0.17	0.28	0.32	0.50	0.44	0.42	0.41	0.30	0.20	0.12	0.05	0.01	0.01	0.00	0.00	0.00	0.01

Table 5.10 Gross Unit Water Requirements (2/6)

II. Cropping Pattern in Climatic Region 2 (at present) (using Data at Bitola Meteo. Station)

(Unit: lit/s/ha)

No.	Year	Jan.			Feb.			Mar.			Apr.			May			Jun.			Jul.			Aug.			Sep.			Oct.			Nov.			Dec.		
		1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
1.	1961	0.00	0.00	0.00	0.00	0.11	0.18	0.00	0.27	0.16	0.19	0.59	0.45	0.27	0.38	0.59	0.14	0.08	0.40	0.27	0.46	0.55	0.71	0.88	0.88	0.85	0.71	0.73	0.37	0.37	0.00	0.00	0.00	0.03	0.00	0.00	0.00
2.	1962	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.02	0.26	0.69	0.59	0.84	0.75	0.12	0.06	0.37	0.35	0.42	0.56	0.77	0.71	0.88	0.93	0.83	0.31	0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.	1963	0.00	0.00	0.00	0.00	0.00	0.00	0.11	0.00	0.00	0.38	0.59	0.03	0.67	0.00	0.28	0.08	0.12	0.47	0.17	0.52	0.38	0.71	0.82	0.75	0.74	0.83	0.14	0.20	0.23	0.00	0.06	0.00	0.00	0.00	0.00	0.00
4.	1964	0.00	0.03	0.00	0.05	0.00	0.10	0.00	0.11	0.20	0.34	0.55	0.47	0.35	0.18	0.00	0.15	0.16	0.18	0.44	0.37	0.17	0.37	0.54	0.84	0.16	0.83	0.31	0.26	0.13	0.03	0.00	0.00	0.03	0.00	0.00	0.00
5.	1965	0.00	0.00	0.00	0.00	0.00	0.00	0.11	0.27	0.03	0.44	0.13	0.67	0.31	0.70	0.62	0.15	0.14	0.40	0.50	0.52	0.56	0.77	0.61	0.77	0.91	0.83	0.73	0.60	0.37	0.23	0.00	0.00	0.00	0.00	0.00	0.00
6.	1966	0.00	0.00	0.00	0.08	0.00	0.12	0.00	0.08	0.13	0.42	0.43	0.41	0.18	0.82	0.68	0.00	0.14	0.47	0.35	0.20	0.55	0.77	0.67	0.75	0.83	0.39	0.71	0.45	0.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7.	1967	0.00	0.00	0.04	0.00	0.06	0.18	0.16	0.00	0.13	0.30	0.49	0.27	0.73	0.22	0.00	0.13	0.13	0.18	0.09	0.03	0.26	0.77	0.73	0.75	0.60	0.44	0.73	0.35	0.34	0.00	0.00	0.00	0.02	0.00	0.00	0.00
8.	1968	0.00	0.00	0.00	0.00	0.00	0.06	0.13	0.08	0.23	0.49	0.29	0.69	0.77	0.18	0.17	0.05	0.00	0.31	0.50	0.52	0.56	0.60	0.78	0.35	0.62	0.75	0.52	0.55	0.34	0.09	0.00	0.00	0.00	0.00	0.00	0.00
9.	1969	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.42	0.00	0.55	0.77	0.60	0.75	0.12	0.18	0.45	0.44	0.36	0.39	0.56	0.57	0.84	0.85	0.52	0.56	0.60	0.37	0.23	0.05	0.05	0.00	0.00	0.00	0.00
10.	1970	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.13	0.34	0.27	0.67	0.18	0.72	0.20	0.12	0.18	0.08	0.00	0.33	0.56	0.68	0.88	0.86	0.76	0.83	0.73	0.16	0.05	0.00	0.00	0.00	0.00	0.00	0.03	0.00
11.	1971	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.13	0.00	0.40	0.19	0.69	0.65	0.84	0.28	0.08	0.17	0.45	0.11	0.50	0.42	0.71	0.50	0.69	0.28	0.00	0.73	0.37	0.27	0.23	0.05	0.05	0.00	0.00	0.00	0.01
12.	1972	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.33	0.40	0.00	0.00	0.31	0.62	0.69	0.14	0.13	0.47	0.48	0.00	0.19	0.75	0.61	0.00	0.66	0.67	0.33	0.00	0.00	0.00	0.06	0.00	0.00	0.02	0.03	0.00
13.	1973	0.00	0.00	0.00	0.05	0.00	0.00	0.18	0.00	0.00	0.38	0.33	0.59	0.77	0.34	0.75	0.14	0.14	0.47	0.21	0.17	0.45	0.34	0.88	0.31	0.93	0.83	0.73	0.60	0.37	0.23	0.06	0.05	0.03	0.03	0.03	0.03
14.	1974	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.26	0.40	0.14	0.41	0.24	0.68	0.31	0.13	0.04	0.37	0.50	0.52	0.55	0.77	0.88	0.44	0.87	0.83	0.48	0.24	0.30	0.00	0.00	0.03	0.00	0.00	0.00	0.00
15.	1975	0.00	0.03	0.03	0.05	0.00	0.00	0.18	0.00	0.03	0.45	0.37	0.19	0.55	0.24	0.46	0.13	0.10	0.23	0.28	0.31	0.19	0.34	0.86	0.82	0.66	0.77	0.71	0.28	0.00	0.12	0.00	0.00	0.00	0.00	0.00	0.01
16.	1976	0.00	0.03	0.00	0.00	0.00	0.18	0.16	0.11	0.22	0.32	0.11	0.53	0.41	0.54	0.04	0.00	0.15	0.05	0.00	0.50	0.06	0.34	0.67	0.56	0.81	0.75	0.71	0.26	0.00	0.06	0.06	0.05	0.03	0.03	0.03	0.03
17.	1977	0.00	0.00	0.00	0.00	0.00	0.18	0.08	0.03	0.33	0.24	0.51	0.57	0.45	0.62	0.44	0.10	0.14	0.47	0.32	0.52	0.51	0.39	0.84	0.69	0.45	0.75	0.27	0.60	0.27	0.23	0.00	0.00	0.00	0.00	0.00	0.00
18.	1978	0.00	0.00	0.00	0.00	0.02	0.12	0.03	0.06	0.00	0.00	0.41	0.33	0.43	0.46	0.35	0.13	0.18	0.47	0.50	0.50	0.55	0.77	0.59	0.88	0.35	0.05	0.41	0.60	0.34	0.00	0.06	0.05	0.00	0.00	0.00	0.00
19.	1979	0.00	0.00	0.00	0.00	0.00	0.18	0.16	0.08	0.22	0.00	0.11	0.59	0.18	0.00	0.40	0.13	0.16	0.31	0.38	0.52	0.56	0.75	0.00	0.33	0.30	0.81	0.73	0.00	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.00
20.	1980	0.00	0.00	0.00	0.00	0.00	0.18	0.05	0.00	0.06	0.13	0.43	0.57	0.33	0.19	0.31	0.10	0.15	0.47	0.48	0.50	0.56	0.77	0.61	0.88	0.89	0.83	0.46	0.49	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21.	1981	0.00	0.00	0.00	0.00	0.00	0.00	0.19	0.00	0.33	0.26	0.00	0.63	0.51	0.64	0.60	0.16	0.06	0.25	0.50	0.07	0.42	0.77	0.38	0.21	0.30	0.60	0.73	0.02	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22.	1982	0.00	0.00	0.01	0.06	0.11	0.00	0.00	0.03	0.22	0.26	0.00	0.00	0.77	0.08	0.28	0.06	0.16	0.47	0.34	0.48	0.56	0.50	0.06	0.77	0.39	0.54	0.67	0.00	0.13	0.20	0.05	0.00	0.00	0.00	0.00	0.00
23.	1983	0.02	0.00	0.00	0.00	0.00	0.06	0.00	0.26	0.32	0.18	0.55	0.63	0.55	0.78	0.00	0.08	0.00	0.20	0.00	0.01	0.53	0.75	0.44	0.88	0.14	0.58	0.44	0.60	0.34	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24.	1984	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.16	0.15	0.32	0.21	0.31	0.71	0.80	0.71	0.14	0.11	0.23	0.48	0.52	0.28	0.62	0.30	0.19	0.93	0.58	0.37	0.60	0.28	0.21	0.06	0.00	0.00	0.03	0.00	0.00
25.	1985	0.00	0.00	0.00	0.06	0.00	0.18	0.03	0.14	0.12	0.49	0.00	0.33	0.41	0.44	0.10	0.15	0.17	0.28	0.50	0.36	0.56	0.77	0.84	0.84	0.62	0.83	0.73	0.60	0.34	0.00	0.00	0.00	0.00	0.03	0.00	0.00
26.	1986	0.00	0.00	0.00	0.08	0.11	0.18	0.00	0.00	0.25	0.49	0.49	0.61	0.00	0.42	0.24	0.06	0.10	0.28	0.22	0.15	0.29	0.73	0.84	0.88	0.93	0.83	0.64	0.60	0.37	0.00	0.00	0.05	0.03	0.03	0.00	0.00
27.	1987	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.43	0.51	0.45	0.76	0.66	0.15	0.18	0.11	0.24	0.50	0.56	0.58	0.84	0.88	0.76	0.75	0.62	0.02	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.01
28.	1988	0.00	0.02	0.00	0.00	0.06	0.00	0.00	0.11	0.04	0.40	0.45	0.51	0.75	0.84	0.55	0.12	0.10	0.23	0.50	0.52	0.47	0.75	0.86	0.88	0.83	0.58	0.39	0.05	0.37	0.10	0.00	0.00	0.00	0.00	0.00	0.00
29.	1989	0.02	0.03	0.04	0.08	0.00	0.00	0.00	0.24	0.09	0.49	0.31	0.49	0.19	0.50	0.19	0.08	0.12	0.35	0.02	0.48	0.00	0.77	0.82	0.67	0.83	0.58	0.39	0.00	0.05	0.23	0.00	0.03	0.00	0.00	0.03	0.00
30.	1990	0.03	0.00	0.04	0.06	0.00	0.00	0.13	0.27	0.19	0.19	0.27	0.53	0.73	0.54	0.42	0.15	0.15	0.45	0.50	0.52	0.13	0.58	0.69	0.40	0.85	0.25	0.64	0.60	0.37	0.02	0.00	0.00	0.00	0.00	0.00	0.00
31.	1991	0.00	0.00	0.00	0.00	0.00	0.00	0.18	0.06	0.23	0.00	0.02	0.35	0.69	0.30	0.35	0.13	0.17	0.47	0.32	0.23	0.23	0.08	0.07	0.88	0.93	0.50	0.00	0.60	0.35	0.00	0.00	0.00	0.00	0.00	0.02	0.00
32.	1992	0.03	0.03	0.00	0.02	0.03	0.18	0.21	0.03	0.04	0.00	0.00	0.69	0.77	0.48	0.29	0.16	0.00	0.13	0.32	0.48	0.41	0.77	0.59	0.88	0.93	0.79	0.31	0.35	0.00	0.00	0.06	0.00	0.00	0.00	0.00	0.00
33.	1993	0.00	0.03	0.00	0.08	0.00	0.00	0.00	0.27	0.16	0.32	0.59	0.67	0.43	0.44	0.53	0.03	0.16	0.47	0.38	0.52	0.56	0.43	0.88	0.88	0.76	0.79	0.73	0.00	0.37	0.06	0.00	0.00	0.00	0.00	0.00	0.00
34.	1994	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.27	0.26	0.05	0.55	0.00	0.55	0.78	0.75	0.12	0.13	0.47	0.28	0.33	0.33	0.37	0.65	0.61	0.93	0.71	0.73	0.60	0.35	0.00	0.00	0.00	0.03	0.03	0.00	0.00
35.	1995	0.00	0.00	0.00	0.08	0.00	0.18	0.06	0.13	0.13	0.30	0.41	0.33	0.10	0.74	0.22	0.12	0.14	0.47	0.05	0.10	0.47	0.56	0.50	0.71	0.28	0.73	0.14	0.60	0.37	0.23	0.00	0.00	0.00	0.00	0.00	0.00
36.	1996	0.00	0.03	0.00	0.00	0.00	0.00	0.06	0.00	0.00	0.40	0.22	0.67	0.73	0.06	0.39	0.14	0.13	0.47	0.50	0.27	0.25	0.39	0.88	0.27	0.68	0.23	0.00	0.39	0.00	0.09	0.06	0.00	0.00	0.00	0.00	0.00
	Average	0.00	0.01	0.00	0.02	0.01	0.06	0.06	0.09	0.14	0.28	0.30	0.46	0.49	0.49	0.40	0.11	0.12	0.34	0.32	0.37	0.41	0.61	0.65	0.67	0.68	0.64	0.52	0.37	0.22	0.07	0.02	0.01	0.01	0.01	0.00	0.00

Table 5.10 Gross Unit Water Requirements (3/6)

IIIa. Cropping Pattern in Climatic Region 3 excluding Bregalnica System (at present) (using Data at Shtip Meteo. Station)

(Unit: lit/s/ha)

No.	Year	Jan.			Feb.			Mar.			Apr.			May			Jun.			Jul.			Aug.			Sep.			Oct.			Nov.			Dec.		
		1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
1.	1961	0.00	0.00	0.00	0.00	0.10	0.16	0.11	0.23	0.12	0.31	0.56	0.37	0.33	0.35	0.19	0.17	0.28	0.44	0.49	0.65	0.68	0.79	0.91	0.85	0.83	0.74	0.70	0.37	0.30	0.14	0.00	0.00	0.04	0.00	0.00	0.00
2.	1962	0.02	0.00	0.00	0.00	0.08	0.00	0.00	0.00	0.12	0.23	0.11	0.65	0.39	0.73	0.70	0.21	0.00	0.39	0.56	0.65	0.50	0.81	0.58	0.85	0.71	0.80	0.52	0.57	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.	1963	0.00	0.00	0.00	0.00	0.00	0.00	0.17	0.22	0.00	0.25	0.56	0.19	0.71	0.37	0.17	0.19	0.20	0.59	0.49	0.57	0.48	0.65	0.91	0.80	0.67	0.80	0.50	0.33	0.00	0.00	0.06	0.01	0.04	0.00	0.00	0.00
4.	1964	0.02	0.04	0.00	0.07	0.06	0.07	0.00	0.18	0.26	0.29	0.56	0.07	0.67	0.39	0.10	0.28	0.19	0.57	0.58	0.06	0.50	0.69	0.80	0.67	0.29	0.68	0.24	0.00	0.07	0.02	0.00	0.00	0.04	0.00	0.00	0.00
5.	1965	0.00	0.00	0.00	0.00	0.00	0.03	0.10	0.23	0.16	0.37	0.18	0.45	0.11	0.73	0.21	0.25	0.13	0.57	0.52	0.00	0.68	0.83	0.00	0.72	0.81	0.80	0.70	0.57	0.30	0.17	0.00	0.00	0.00	0.00	0.00	0.00
6.	1966	0.00	0.00	0.00	0.07	0.00	0.13	0.01	0.14	0.13	0.35	0.38	0.45	0.47	0.71	0.54	0.00	0.25	0.61	0.60	0.61	0.66	0.79	0.90	0.85	0.67	0.52	0.66	0.45	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7.	1967	0.00	0.00	0.04	0.07	0.10	0.10	0.18	0.01	0.24	0.38	0.30	0.22	0.57	0.41	0.32	0.18	0.22	0.30	0.13	0.00	0.38	0.73	0.60	0.85	0.75	0.40	0.66	0.45	0.30	0.06	0.01	0.00	0.00	0.00	0.00	0.00
8.	1968	0.00	0.00	0.00	0.04	0.00	0.09	0.17	0.17	0.21	0.35	0.22	0.65	0.71	0.06	0.00	0.13	0.08	0.20	0.62	0.65	0.66	0.57	0.76	0.23	0.81	0.78	0.46	0.53	0.30	0.05	0.00	0.00	0.00	0.00	0.00	0.00
9.	1969	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.03	0.35	0.07	0.57	0.71	0.75	0.74	0.12	0.29	0.55	0.54	0.61	0.59	0.55	0.74	0.76	0.79	0.74	0.70	0.57	0.30	0.17	0.06	0.05	0.00	0.00	0.00	0.00
10.	1970	0.00	0.00	0.00	0.00	0.00	0.04	0.17	0.06	0.25	0.25	0.28	0.63	0.14	0.77	0.27	0.26	0.32	0.28	0.14	0.17	0.62	0.77	0.88	0.83	0.55	0.80	0.70	0.05	0.00	0.00	0.05	0.00	0.00	0.00	0.02	0.00
11.	1971	0.00	0.01	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.33	0.36	0.65	0.24	0.75	0.23	0.00	0.31	0.61	0.22	0.49	0.23	0.61	0.86	0.65	0.73	0.00	0.70	0.57	0.15	0.17	0.06	0.05	0.00	0.00	0.01	0.01
12.	1972	0.00	0.00	0.00	0.00	0.02	0.00	0.14	0.14	0.27	0.29	0.38	0.00	0.24	0.57	0.72	0.24	0.23	0.59	0.56	0.09	0.14	0.71	0.42	0.54	0.61	0.13	0.06	0.00	0.00	0.01	0.06	0.00	0.00	0.01	0.02	0.02
13.	1973	0.00	0.01	0.00	0.05	0.00	0.04	0.16	0.00	0.00	0.17	0.34	0.24	0.57	0.63	0.74	0.28	0.32	0.61	0.11	0.65	0.38	0.71	0.91	0.05	0.89	0.80	0.70	0.57	0.30	0.17	0.06	0.05	0.04	0.02	0.02	0.02
14.	1974	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.17	0.27	0.35	0.00	0.47	0.19	0.01	0.25	0.12	0.10	0.16	0.49	0.65	0.68	0.83	0.91	0.60	0.33	0.80	0.30	0.37	0.03	0.00	0.00	0.05	0.00	0.00	0.00	0.00
15.	1975	0.00	0.04	0.03	0.07	0.00	0.15	0.18	0.02	0.13	0.38	0.54	0.47	0.22	0.31	0.54	0.28	0.05	0.00	0.04	0.51	0.57	0.25	0.82	0.82	0.83	0.56	0.70	0.35	0.00	0.00	0.06	0.00	0.00	0.02	0.00	0.02
16.	1976	0.01	0.04	0.00	0.02	0.02	0.16	0.18	0.20	0.24	0.18	0.42	0.61	0.37	0.45	0.03	0.00	0.31	0.45	0.03	0.55	0.06	0.55	0.72	0.72	0.85	0.68	0.70	0.55	0.00	0.14	0.06	0.05	0.04	0.02	0.02	0.02
17.	1977	0.02	0.00	0.00	0.00	0.00	0.16	0.18	0.04	0.27	0.22	0.46	0.65	0.55	0.61	0.30	0.16	0.13	0.42	0.42	0.65	0.36	0.30	0.86	0.71	0.89	0.80	0.58	0.49	0.19	0.17	0.06	0.00	0.00	0.00	0.00	0.01
18.	1978	0.02	0.01	0.00	0.00	0.04	0.12	0.18	0.10	0.09	0.07	0.23	0.55	0.35	0.73	0.19	0.25	0.32	0.61	0.62	0.55	0.59	0.83	0.68	0.85	0.27	0.46	0.50	0.57	0.29	0.00	0.06	0.05	0.00	0.00	0.00	0.00
19.	1979	0.02	0.00	0.00	0.00	0.05	0.16	0.18	0.17	0.14	0.00	0.32	0.51	0.45	0.17	0.66	0.28	0.19	0.30	0.32	0.61	0.46	0.79	0.20	0.42	0.49	0.78	0.70	0.41	0.19	0.08	0.00	0.00	0.00	0.02	0.00	0.00
20.	1980	0.00	0.04	0.00	0.05	0.02	0.16	0.12	0.19	0.05	0.28	0.36	0.53	0.49	0.17	0.17	0.13	0.26	0.61	0.49	0.65	0.57	0.63	0.54	0.85	0.75	0.80	0.20	0.55	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00
21.	1981	0.01	0.00	0.00	0.00	0.00	0.06	0.12	0.04	0.27	0.29	0.00	0.61	0.63	0.77	0.57	0.16	0.19	0.51	0.62	0.15	0.43	0.73	0.66	0.43	0.02	0.52	0.48	0.43	0.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22.	1982	0.00	0.02	0.04	0.07	0.07	0.00	0.17	0.00	0.25	0.37	0.06	0.00	0.63	0.27	0.46	0.28	0.24	0.61	0.30	0.53	0.64	0.67	0.90	0.76	0.89	0.72	0.70	0.37	0.25	0.17	0.06	0.00	0.02	0.00	0.00	0.00
23.	1983	0.02	0.01	0.00	0.00	0.02	0.13	0.13	0.23	0.11	0.11	0.46	0.63	0.71	0.29	0.10	0.19	0.00	0.10	0.39	0.17	0.27	0.83	0.78	0.40	0.00	0.76	0.64	0.57	0.30	0.00	0.00	0.00	0.00	0.00	0.01	0.02
24.	1984	0.00	0.00	0.00	0.00	0.00	0.12	0.02	0.11	0.10	0.11	0.22	0.59	0.59	0.65	0.70	0.19	0.30	0.51	0.45	0.65	0.60	0.71	0.17	0.69	0.89	0.66	0.15	0.55	0.21	0.17	0.06	0.00	0.00	0.02	0.02	0.00
25.	1985	0.00	0.02	0.00	0.06	0.00	0.16	0.08	0.00	0.15	0.36	0.40	0.35	0.51	0.33	0.05	0.28	0.29	0.44	0.60	0.59	0.68	0.59	0.90	0.71	0.77	0.80	0.70	0.57	0.29	0.00	0.00	0.00	0.00	0.02	0.00	0.00
26.	1986	0.00	0.00	0.00	0.07	0.10	0.16	0.02	0.20	0.23	0.38	0.34	0.31	0.25	0.57	0.36	0.18	0.30	0.47	0.07	0.20	0.62	0.79	0.56	0.85	0.89	0.80	0.52	0.57	0.30	0.00	0.00	0.05	0.02	0.02	0.00	0.00
27.	1987	0.00	0.00	0.00	0.07	0.04	0.07	0.02	0.13	0.00	0.00	0.46	0.45	0.35	0.63	0.57	0.29	0.32	0.42	0.62	0.61	0.68	0.30	0.72	0.71	0.89	0.70	0.46	0.04	0.08	0.16	0.06	0.00	0.00	0.00	0.00	0.02
28.	1988	0.00	0.02	0.03	0.06	0.10	0.00	0.05	0.14	0.16	0.24	0.52	0.45	0.55	0.49	0.57	0.22	0.13	0.51	0.62	0.65	0.38	0.83	0.72	0.85	0.87	0.76	0.64	0.31	0.30	0.16	0.00	0.00	0.00	0.00	0.00	0.00
29.	1989	0.02	0.04	0.04	0.07	0.06	0.07	0.12	0.23	0.22	0.38	0.04	0.20	0.25	0.69	0.39	0.06	0.05	0.00	0.27	0.65	0.24	0.69	0.60	0.58	0.87	0.76	0.64	0.37	0.07	0.16	0.00	0.05	0.00	0.00	0.02	0.00
30.	1990	0.02	0.04	0.03	0.07	0.06	0.13	0.14	0.23	0.27	0.25	0.04	0.47	0.53	0.69	0.52	0.29	0.26	0.53	0.62	0.48	0.66	0.45	0.91	0.67	0.89	0.78	0.70	0.39	0.30	0.01	0.00	0.02	0.02	0.00	0.00	0.00
31.	1991	0.01	0.00	0.00	0.00	0.00	0.15	0.17	0.10	0.11	0.27	0.13	0.07	0.53	0.57	0.32	0.16	0.32	0.61	0.30	0.02	0.43	0.49	0.74	0.83	0.89	0.78	0.15	0.57	0.21	0.00	0.00	0.00	0.00	0.02	0.02	0.00
32.	1992	0.02	0.04	0.04	0.07	0.10	0.16	0.18	0.20	0.09	0.00	0.00	0.47	0.73	0.24	0.50	0.23	0.20	0.49	0.62	0.59	0.57	0.83	0.91	0.71	0.87	0.76	0.36	0.53	0.15	0.13	0.06	0.00	0.04	0.00	0.00	0.00
33.	1993	0.00	0.04	0.00	0.07	0.06	0.00	0.08	0.23	0.00	0.29	0.52	0.55	0.61	0.59	0.52	0.28	0.23	0.53	0.62	0.57	0.59	0.79	0.91	0.85	0.83	0.76	0.70	0.15	0.30	0.10	0.00	0.00	0.00	0.00	0.00	0.00
34.	1994	0.00	0.00	0.04	0.00	0.00	0.09	0.17	0.23	0.24	0.14	0.54	0.16	0.43	0.81	0.74	0.20	0.27	0.37	0.54	0.46	0.15	0.75	0.90	0.72	0.89	0.60	0.68	0.53	0.30	0.00	0.02	0.00	0.04	0.02	0.00	0.00
35.	1995	0.00	0.00	0.00	0.02	0.06	0.16	0.00	0.19	0.13	0.36	0.42	0.39	0.14	0.79	0.41	0.25	0.23	0.51	0.33	0.01	0.15	0.51	0.86	0.02	0.27	0.76	0.15	0.57	0.30	0.16	0.00	0.00	0.00	0.00	0.00	0.00
36.	1996	0.00	0.04	0.00	0.00	0.00	0.00	0.16	0.07	0.08	0.07	0.44	0.65	0.45	0.51	0.10	0.28	0.29	0.61	0.62	0.32	0.23	0.77	0.90	0.23	0.67	0.10	0.20	0.53	0.17	0.15	0.06	0.00	0.00	0.00	0.02	0.00
	Average	0.01	0.01	0.01	0.03	0.03	0.08	0.11	0.13	0.15	0.25	0.31	0.42	0.45	0.52	0.39	0.20	0.22	0.45	0.43	0.45	0.48	0.67	0.73	0.66	0.69	0.66	0.52	0.43	0.18	0.08	0.03	0.01	0.01	0.01	0.01	0.00

Table 5.10 Gross Unit Water Requirements (4/6)

IIIb. Cropping Pattern in Bregarnica System in Climatic Region 3 (at present) (using Data at Shtip Meteo. Station)

(Unit: lit/s/ha)

No.	Year	Jan.			Feb.			Mar.			Apr.			May			Jun.			Jul.			Aug.			Sep.			Oct.			Nov.			Dec.		
		1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
1.	1961	0.00	0.00	0.00	0.00	0.08	0.14	0.09	0.19	0.10	0.54	0.78	0.59	0.43	0.45	0.30	0.35	0.49	0.61	0.67	0.82	0.81	0.93	1.03	0.95	0.93	0.84	0.79	0.33	0.30	0.12	0.00	0.00	0.03	0.00	0.00	0.00
2.	1962	0.02	0.00	0.00	0.00	0.07	0.00	0.00	0.00	0.10	0.44	0.31	0.87	0.49	0.83	0.81	0.40	0.14	0.56	0.74	0.82	0.64	0.95	0.69	0.95	0.81	0.90	0.61	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.	1963	0.00	0.00	0.00	0.00	0.00	0.00	0.14	0.18	0.00	0.47	0.78	0.40	0.81	0.47	0.28	0.37	0.39	0.76	0.67	0.74	0.62	0.79	1.03	0.89	0.77	0.90	0.59	0.30	0.00	0.00	0.05	0.01	0.03	0.00	0.00	0.00
4.	1964	0.02	0.03	0.00	0.06	0.05	0.06	0.00	0.15	0.22	0.52	0.78	0.27	0.77	0.49	0.19	0.49	0.38	0.74	0.76	0.23	0.64	0.83	0.91	0.77	0.39	0.78	0.33	0.00	0.07	0.02	0.00	0.00	0.03	0.00	0.00	0.00
5.	1965	0.00	0.00	0.00	0.00	0.00	0.02	0.08	0.19	0.14	0.62	0.39	0.67	0.19	0.83	0.32	0.45	0.31	0.74	0.70	0.14	0.81	0.97	0.09	0.82	0.91	0.90	0.79	0.50	0.30	0.15	0.00	0.00	0.00	0.00	0.00	0.00
6.	1966	0.00	0.00	0.00	0.06	0.00	0.11	0.01	0.12	0.11	0.58	0.60	0.67	0.57	0.81	0.64	0.11	0.46	0.78	0.78	0.78	0.80	0.93	1.01	0.95	0.77	0.62	0.75	0.40	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7.	1967	0.00	0.00	0.04	0.06	0.08	0.09	0.15	0.01	0.20	0.63	0.52	0.43	0.67	0.51	0.43	0.36	0.42	0.48	0.30	0.15	0.52	0.87	0.71	0.95	0.85	0.50	0.75	0.40	0.30	0.06	0.01	0.00	0.00	0.00	0.00	0.00
8.	1968	0.00	0.00	0.00	0.03	0.00	0.07	0.14	0.14	0.17	0.58	0.43	0.87	0.81	0.14	0.08	0.30	0.24	0.38	0.80	0.82	0.80	0.71	0.87	0.33	0.91	0.88	0.55	0.46	0.30	0.05	0.00	0.00	0.00	0.00	0.00	0.00
9.	1969	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.03	0.58	0.27	0.79	0.81	0.85	0.84	0.28	0.51	0.72	0.72	0.78	0.72	0.69	0.85	0.86	0.89	0.84	0.79	0.50	0.30	0.15	0.05	0.04	0.00	0.00	0.00	0.00
10.	1970	0.00	0.00	0.00	0.00	0.00	0.04	0.14	0.05	0.21	0.47	0.50	0.85	0.23	0.87	0.37	0.46	0.54	0.46	0.32	0.34	0.76	0.91	0.99	0.93	0.65	0.90	0.79	0.04	0.00	0.00	0.04	0.00	0.00	0.00	0.02	0.00
11.	1971	0.00	0.01	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.57	0.58	0.87	0.34	0.85	0.34	0.10	0.53	0.78	0.40	0.67	0.36	0.75	0.97	0.75	0.83	0.03	0.79	0.50	0.14	0.15	0.05	0.04	0.00	0.00	0.01	0.01
12.	1972	0.00	0.00	0.00	0.00	0.02	0.00	0.12	0.12	0.23	0.52	0.60	0.18	0.34	0.67	0.83	0.44	0.43	0.76	0.74	0.26	0.28	0.85	0.53	0.64	0.71	0.21	0.13	0.00	0.00	0.01	0.05	0.00	0.00	0.01	0.02	0.02
13.	1973	0.00	0.01	0.00	0.04	0.00	0.04	0.13	0.00	0.00	0.37	0.56	0.45	0.67	0.73	0.84	0.49	0.54	0.78	0.28	0.82	0.52	0.85	1.03	0.12	0.99	0.90	0.79	0.50	0.30	0.15	0.05	0.04	0.03	0.02	0.02	0.02
14.	1974	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14	0.23	0.58	0.19	0.69	0.28	0.09	0.35	0.28	0.27	0.33	0.67	0.82	0.81	0.97	1.03	0.69	0.43	0.90	0.39	0.33	0.03	0.00	0.00	0.04	0.00	0.00	0.00	0.00
15.	1975	0.00	0.03	0.03	0.06	0.00	0.12	0.15	0.02	0.11	0.63	0.76	0.69	0.31	0.42	0.64	0.48	0.21	0.12	0.19	0.68	0.71	0.38	0.93	0.91	0.93	0.66	0.79	0.31	0.00	0.00	0.05	0.00	0.00	0.02	0.00	0.02
16.	1976	0.01	0.03	0.00	0.02	0.02	0.14	0.15	0.17	0.20	0.39	0.64	0.83	0.47	0.55	0.12	0.12	0.53	0.63	0.18	0.72	0.20	0.69	0.83	0.82	0.95	0.78	0.79	0.48	0.00	0.12	0.05	0.04	0.03	0.02	0.02	0.02
17.	1977	0.02	0.00	0.00	0.00	0.00	0.14	0.15	0.03	0.23	0.43	0.68	0.87	0.65	0.71	0.41	0.34	0.31	0.59	0.60	0.82	0.50	0.44	0.97	0.80	0.99	0.90	0.67	0.43	0.18	0.15	0.05	0.00	0.00	0.00	0.00	0.01
18.	1978	0.02	0.01	0.00	0.00	0.03	0.10	0.15	0.08	0.07	0.27	0.44	0.77	0.45	0.83	0.30	0.45	0.54	0.78	0.80	0.72	0.72	0.97	0.79	0.95	0.37	0.56	0.59	0.50	0.29	0.00	0.05	0.04	0.00	0.00	0.00	0.00
19.	1979	0.02	0.00	0.00	0.00	0.04	0.14	0.15	0.14	0.12	0.12	0.54	0.73	0.55	0.26	0.77	0.49	0.38	0.48	0.50	0.78	0.60	0.93	0.32	0.51	0.59	0.88	0.79	0.36	0.18	0.07	0.00	0.00	0.00	0.02	0.00	0.00
20.	1980	0.00	0.03	0.00	0.04	0.02	0.14	0.10	0.16	0.05	0.50	0.58	0.75	0.59	0.26	0.28	0.30	0.47	0.78	0.67	0.82	0.71	0.77	0.65	0.95	0.85	0.90	0.29	0.48	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00
21.	1981	0.01	0.00	0.00	0.00	0.00	0.05	0.10	0.03	0.23	0.52	0.18	0.83	0.73	0.87	0.68	0.34	0.38	0.68	0.80	0.33	0.57	0.87	0.77	0.53	0.10	0.62	0.57	0.38	0.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22.	1982	0.00	0.02	0.04	0.06	0.06	0.00	0.14	0.00	0.21	0.62	0.26	0.18	0.73	0.38	0.57	0.49	0.44	0.78	0.48	0.70	0.78	0.81	1.01	0.86	0.99	0.82	0.79	0.33	0.25	0.15	0.05	0.00	0.02	0.00	0.00	0.00
23.	1983	0.02	0.01	0.00	0.00	0.02	0.11	0.11	0.19	0.09	0.31	0.68	0.85	0.81	0.40	0.19	0.37	0.02	0.27	0.56	0.34	0.41	0.97	0.89	0.49	0.07	0.86	0.73	0.50	0.30	0.00	0.00	0.00	0.00	0.00	0.01	0.02
24.	1984	0.00	0.00	0.00	0.00	0.00	0.10	0.02	0.09	0.08	0.31	0.43	0.81	0.69	0.75	0.81	0.37	0.52	0.68	0.63	0.82	0.74	0.85	0.28	0.78	0.99	0.76	0.23	0.48	0.21	0.15	0.05	0.00	0.00	0.02	0.02	0.00
25.	1985	0.00	0.02	0.00	0.05	0.00	0.14	0.07	0.00	0.13	0.60	0.62	0.57	0.61	0.44	0.15	0.48	0.50	0.61	0.78	0.76	0.81	0.73	1.01	0.80	0.87	0.90	0.79	0.50	0.29	0.00	0.00	0.00	0.00	0.02	0.00	0.00
26.	1986	0.00	0.00	0.00	0.06	0.08	0.14	0.02	0.17	0.19	0.63	0.56	0.53	0.35	0.67	0.46	0.36	0.52	0.65	0.23	0.37	0.76	0.93	0.67	0.95	0.99	0.90	0.61	0.50	0.30	0.00	0.00	0.04	0.02	0.02	0.00	0.00
27.	1987	0.00	0.00	0.00	0.06	0.03	0.06	0.02	0.11	0.00	0.18	0.68	0.67	0.45	0.73	0.68	0.50	0.54	0.59	0.80	0.78	0.81	0.44	0.83	0.80	0.99	0.80	0.55	0.03	0.08	0.14	0.05	0.00	0.00	0.00	0.00	0.02
28.	1988	0.00	0.02	0.03	0.05	0.08	0.00	0.04	0.12	0.14	0.46	0.74	0.67	0.65	0.59	0.68	0.41	0.30	0.68	0.80	0.82	0.52	0.97	0.83	0.95	0.97	0.86	0.73	0.28	0.30	0.14	0.00	0.00	0.00	0.00	0.00	0.00
29.	1989	0.02	0.03	0.04	0.06	0.05	0.06	0.10	0.19	0.18	0.63	0.23	0.41	0.35	0.79	0.50	0.21	0.21	0.07	0.45	0.82	0.38	0.83	0.71	0.68	0.97	0.86	0.73	0.33	0.07	0.14	0.00	0.04	0.00	0.00	0.02	0.00
30.	1990	0.02	0.03	0.03	0.06	0.05	0.11	0.12	0.19	0.23	0.47	0.23	0.69	0.63	0.79	0.63	0.50	0.47	0.70	0.80	0.65	0.80	0.59	1.03	0.77	0.99	0.88	0.79	0.35	0.30	0.01	0.00	0.02	0.02	0.00	0.00	0.00
31.	1991	0.01	0.00	0.00	0.00	0.00	0.12	0.14	0.08	0.09	0.49	0.34	0.27	0.63	0.67	0.43	0.33	0.54	0.78	0.48	0.18	0.57	0.63	0.85	0.93	0.99	0.88	0.23	0.50	0.21	0.00	0.00	0.00	0.00	0.02	0.02	0.00
32.	1992	0.02	0.03	0.04	0.06	0.08	0.14	0.15	0.17	0.07	0.17	0.12	0.69	0.83	0.34	0.61	0.42	0.39	0.66	0.80	0.76	0.71	0.97	1.03	0.80	0.97	0.86	0.45	0.46	0.14	0.11	0.05	0.00	0.03	0.00	0.00	0.00
33.	1993	0.00	0.03	0.00	0.06	0.05	0.00	0.07	0.19	0.00	0.52	0.74	0.77	0.71	0.69	0.63	0.48	0.43	0.70	0.80	0.74	0.72	0.93	1.03	0.95	0.93	0.86	0.79	0.14	0.30	0.08	0.00	0.00	0.00	0.00	0.00	0.00
34.	1994	0.00	0.00	0.04	0.00	0.00	0.07	0.14	0.19	0.20	0.35	0.76	0.36	0.53	0.91	0.84	0.39	0.48	0.54	0.72	0.63	0.29	0.89	1.01	0.82	0.99	0.70	0.77	0.46	0.30	0.00	0.02	0.00	0.03	0.02	0.00	0.00
35.	1995	0.00	0.00	0.00	0.02	0.05	0.14	0.00	0.16	0.11	0.60	0.64	0.61	0.23	0.89	0.52	0.45	0.43	0.68	0.51	0.16	0.29	0.65	0.97	0.09	0.37	0.86	0.23	0.50	0.30	0.14	0.00	0.00	0.00	0.00	0.00	0.00
36.	1996	0.00	0.03	0.00	0.00	0.00	0.00	0.13	0.06	0.06	0.27	0.66	0.87	0.55	0.61	0.19	0.49	0.50	0.78	0.80	0.50	0.36	0.91	1.01	0.33	0.77	0.17	0.29	0.46	0.17	0.13	0.05	0.00	0.00	0.00	0.02	0.00
	Average	0.01	0.01	0.01	0.03	0.03	0.07	0.09	0.11	0.13	0.47	0.52	0.64	0.55	0.62	0.49	0.38	0.41	0.61	0.61	0.61	0.61	0.81	0.84	0.75	0.79	0.76	0.61	0.38	0.18	0.07	0.02	0.01	0.01	0.01	0.01	0.00

Table 5.10 Gross Unit Water Requirements (5/6)

IV. Cropping Pattern in Climatic Region 4 (at present) (using Data at Berovo Meteo. Station)

(Unit: lit/s/ha)

No.	Year	Jan.			Feb.			Mar.			Apr.			May			Jun.			Jul.			Aug.			Sep.			Oct.			Nov.			Dec.		
		1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
1.	1961	0.00	0.00	0.00	0.00	0.01	0.02	0.02	0.02	0.00	0.04	0.17	0.00	0.01	0.03	0.04	0.17	0.21	0.57	0.61	0.74	0.70	0.75	0.73	0.63	0.57	0.51	0.43	0.02	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00
2.	1962	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.22	0.00	0.31	0.02	0.35	0.17	0.38	0.54	0.39	0.67	0.75	0.53	0.61	0.33	0.53	0.37	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.	1963	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.23	0.10	0.30	0.02	0.00	0.00	0.03	0.56	0.40	0.74	0.11	0.51	0.67	0.61	0.33	0.55	0.02	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.	1964	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.02	0.23	0.03	0.22	0.01	0.00	0.39	0.00	0.23	0.69	0.72	0.27	0.39	0.53	0.58	0.07	0.45	0.01	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.	1965	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.03	0.03	0.00	0.14	0.00	0.35	0.01	0.41	0.41	0.48	0.21	0.39	0.70	0.75	0.00	0.45	0.55	0.55	0.43	0.05	0.03	0.02	0.00	0.00	0.00	0.00	0.00	0.00
6.	1966	0.00	0.00	0.00	0.01	0.00	0.02	0.00	0.01	0.00	0.04	0.03	0.01	0.00	0.25	0.10	0.00	0.43	0.50	0.61	0.74	0.65	0.45	0.69	0.63	0.53	0.39	0.39	0.04	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7.	1967	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.03	0.02	0.02	0.01	0.18	0.25	0.13	0.17	0.16	0.48	0.56	0.09	0.50	0.37	0.39	0.12	0.35	0.15	0.43	0.03	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8.	1968	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.03	0.04	0.19	0.28	0.38	0.00	0.00	0.19	0.00	0.25	0.75	0.76	0.67	0.39	0.37	0.19	0.35	0.25	0.35	0.05	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9.	1969	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.02	0.01	0.12	0.26	0.21	0.48	0.19	0.59	0.52	0.48	0.70	0.63	0.57	0.41	0.56	0.23	0.49	0.41	0.05	0.03	0.02	0.00	0.00	0.00	0.00	0.00	0.00
10.	1970	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.01	0.01	0.12	0.00	0.33	0.00	0.41	0.51	0.61	0.56	0.47	0.65	0.23	0.73	0.61	0.33	0.31	0.43	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11.	1971	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.03	0.30	0.04	0.45	0.08	0.00	0.59	0.69	0.61	0.00	0.59	0.33	0.37	0.59	0.43	0.00	0.43	0.04	0.01	0.02	0.00	0.00	0.00	0.00	0.00	0.00
12.	1972	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.03	0.03	0.01	0.03	0.01	0.29	0.24	0.07	0.17	0.71	0.65	0.04	0.25	0.63	0.35	0.25	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00
13.	1973	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.03	0.20	0.02	0.44	0.46	0.51	0.63	0.00	0.13	0.39	0.51	0.73	0.01	0.63	0.55	0.43	0.05	0.03	0.02	0.01	0.00	0.00	0.00	0.00	0.00
14.	1974	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.03	0.00	0.18	0.02	0.01	0.19	0.01	0.00	0.14	0.60	0.76	0.45	0.73	0.73	0.19	0.55	0.55	0.29	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15.	1975	0.00	0.01	0.00	0.01	0.00	0.01	0.02	0.00	0.00	0.02	0.09	0.06	0.01	0.01	0.46	0.53	0.16	0.03	0.05	0.07	0.56	0.33	0.51	0.58	0.25	0.49	0.33	0.03	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00
16.	1976	0.00	0.01	0.00	0.01	0.00	0.02	0.02	0.02	0.01	0.00	0.02	0.00	0.02	0.09	0.00	0.00	0.41	0.48	0.11	0.54	0.00	0.33	0.21	0.38	0.21	0.41	0.27	0.05	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00
17.	1977	0.00	0.00	0.00	0.00	0.00	0.02	0.01	0.00	0.03	0.03	0.03	0.30	0.20	0.25	0.01	0.07	0.30	0.56	0.25	0.76	0.18	0.27	0.25	0.47	0.63	0.51	0.07	0.04	0.03	0.02	0.00	0.00	0.00	0.00	0.00	0.00
18.	1978	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.10	0.03	0.02	0.00	0.00	0.60	0.71	0.75	0.62	0.67	0.75	0.09	0.63	0.01	0.01	0.03	0.04	0.03	0.00	0.01	0.00	0.00	0.00	0.00	0.00
19.	1979	0.00	0.00	0.00	0.00	0.00	0.02	0.02	0.00	0.01	0.00	0.03	0.14	0.12	0.02	0.06	0.41	0.57	0.56	0.38	0.62	0.52	0.73	0.00	0.00	0.07	0.53	0.43	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20.	1980	0.00	0.00	0.00	0.01	0.00	0.02	0.00	0.01	0.01	0.02	0.07	0.00	0.01	0.00	0.04	0.00	0.32	0.50	0.20	0.60	0.59	0.75	0.35	0.56	0.41	0.55	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21.	1981	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.03	0.04	0.02	0.22	0.01	0.33	0.24	0.46	0.21	0.05	0.54	0.52	0.11	0.73	0.45	0.18	0.00	0.31	0.02	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22.	1982	0.00	0.00	0.01	0.00	0.01	0.00	0.02	0.00	0.03	0.04	0.00	0.00	0.18	0.09	0.00	0.48	0.14	0.71	0.50	0.62	0.39	0.00	0.65	0.39	0.59	0.05	0.41	0.02	0.02	0.02	0.01	0.00	0.00	0.00	0.00	0.00
23.	1983	0.00	0.00	0.00	0.00	0.01	0.02	0.02	0.03	0.01	0.00	0.05	0.24	0.34	0.05	0.00	0.14	0.00	0.00	0.00	0.43	0.36	0.75	0.73	0.21	0.13	0.25	0.35	0.05	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24.	1984	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.07	0.18	0.24	0.03	0.33	0.16	0.50	0.67	0.54	0.76	0.58	0.45	0.00	0.25	0.63	0.47	0.05	0.04	0.03	0.02	0.01	0.00	0.00	0.00	0.00	0.00
25.	1985	0.00	0.00	0.00	0.01	0.00	0.02	0.01	0.00	0.01	0.04	0.03	0.03	0.18	0.07	0.01	0.00	0.32	0.54	0.71	0.20	0.70	0.55	0.71	0.16	0.49	0.49	0.43	0.05	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00
26.	1986	0.00	0.00	0.00	0.01	0.01	0.02	0.00	0.02	0.03	0.04	0.01	0.20	0.01	0.01	0.12	0.35	0.35	0.71	0.29	0.68	0.68	0.53	0.09	0.63	0.63	0.55	0.21	0.04	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00
27.	1987	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.02	0.00	0.00	0.02	0.10	0.03	0.25	0.00	0.43	0.59	0.00	0.75	0.49	0.70	0.31	0.29	0.63	0.63	0.37	0.23	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
28.	1988	0.00	0.01	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.02	0.15	0.08	0.22	0.00	0.06	0.14	0.10	0.12	0.75	0.76	0.30	0.75	0.71	0.63	0.57	0.47	0.39	0.02	0.03	0.02	0.00	0.00	0.00	0.00	0.00	0.00
29.	1989	0.00	0.01	0.01	0.01	0.00	0.00	0.00	0.02	0.03	0.04	0.00	0.18	0.01	0.37	0.08	0.16	0.23	0.01	0.00	0.54	0.00	0.59	0.71	0.14	0.57	0.47	0.39	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00
30.	1990	0.01	0.01	0.00	0.01	0.00	0.01	0.01	0.03	0.02	0.01	0.00	0.02	0.28	0.39	0.15	0.41	0.17	0.61	0.73	0.52	0.58	0.31	0.73	0.47	0.57	0.47	0.41	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00
31.	1991	0.01	0.00	0.00	0.00	0.00	0.02	0.02	0.01	0.01	0.03	0.00	0.00	0.06	0.09	0.00	0.00	0.60	0.71	0.34	0.56	0.30	0.53	0.09	0.59	0.63	0.33	0.01	0.05	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
32.	1992	0.01	0.00	0.00	0.01	0.00	0.02	0.02	0.02	0.01	0.00	0.00	0.06	0.38	0.21	0.01	0.46	0.01	0.42	0.69	0.41	0.61	0.51	0.73	0.52	0.61	0.27	0.19	0.04	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00
33.	1993	0.00	0.01	0.00	0.01	0.01	0.00	0.00	0.03	0.00	0.02	0.03	0.16	0.20	0.05	0.02	0.46	0.53	0.69	0.75	0.52	0.61	0.71	0.73	0.63	0.39	0.47	0.43	0.01	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00
34.	1994	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.03	0.00	0.00	0.21	0.00	0.01	0.11	0.48	0.35	0.43	0.50	0.40	0.60	0.13	0.55	0.55	0.47	0.55	0.55	0.15	0.00	0.03	0.00	0.01	0.00	0.00	0.00	0.00	0.00
35.	1995	0.00	0.00	0.00	0.01	0.00	0.02	0.00	0.01	0.00	0.02	0.11	0.10	0.00	0.39	0.00	0.51	0.25	0.61	0.21	0.00	0.23	0.55	0.07	0.00	0.07	0.37	0.00	0.05	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00
36.	1996	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.30	0.14	0.07	0.24	0.03	0.37	0.71	0.75	0.56	0.30	0.39	0.55	0.01	0.27	0.03	0.00	0.05	0.00	0.02	0.01	0.00	0.00	0.00	0.00	0.00
	Average	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.02	0.05	0.11	0.12	0.15	0.11	0.23	0.30	0.46	0.47	0.50	0.45	0.52	0.46	0.40	0.39	0.38	0.26	0.03	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00

Table 5.10 Gross Unit Water Requirements (6/6)

V. Cropping Pattern in Climatic Region 5 (at present) (using Data at Gevegelija Meteo. Station)

(Unit: lit/s/ha)

No.	Year	Jan.			Feb.			Mar.			Apr.			May			Jun.			Jul.			Aug.			Sep.			Oct.			Nov.			Dec.		
		1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
1.	1961	0.00	0.00	0.00	0.00	0.02	0.08	0.08	0.13	0.18	0.00	0.00	0.01	0.27	0.33	0.29	0.26	0.30	0.41	0.49	0.56	0.62	0.92	0.94	0.82	0.83	0.73	0.62	0.21	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.	1962	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.11	0.18	0.23	0.61	0.67	0.62	0.24	0.28	0.37	0.57	0.64	0.69	0.89	0.90	0.77	0.73	0.63	0.52	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.	1963	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.10	0.24	0.37	0.45	0.13	0.17	0.14	0.26	0.30	0.41	0.49	0.56	0.63	0.87	0.88	0.75	0.59	0.49	0.36	0.09	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.	1964	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.00	0.00	0.20	0.31	0.35	0.09	0.13	0.13	0.13	0.17	0.20	0.42	0.48	0.53	0.87	0.88	0.79	0.35	0.26	0.16	0.27	0.06	0.03	0.00	0.00	0.00	0.00	0.00	0.00
5.	1965	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.02	0.08	0.12	0.55	0.61	0.58	0.34	0.38	0.49	0.63	0.70	0.71	0.87	0.88	0.77	0.83	0.73	0.62	0.45	0.10	0.06	0.00	0.00	0.00	0.00	0.00	0.00
6.	1966	0.00	0.00	0.00	0.05	0.00	0.14	0.00	0.16	0.08	0.29	0.37	0.37	0.13	0.67	0.54	0.12	0.36	0.59	0.38	0.62	0.78	0.41	0.52	0.79	0.31	0.07	0.62	0.35	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.00
7.	1967	0.00	0.00	0.01	0.05	0.05	0.14	0.14	0.20	0.23	0.29	0.41	0.27	0.51	0.23	0.00	0.32	0.28	0.15	0.22	0.00	0.69	0.71	0.20	0.42	0.73	0.06	0.62	0.39	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8.	1968	0.00	0.00	0.00	0.00	0.00	0.12	0.10	0.20	0.23	0.31	0.39	0.59	0.67	0.10	0.42	0.25	0.01	0.19	0.69	0.76	0.63	0.89	0.80	0.52	0.81	0.73	0.54	0.47	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9.	1969	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.26	0.21	0.39	0.25	0.41	0.69	0.03	0.44	0.51	0.63	0.68	0.13	0.77	0.76	0.82	0.14	0.69	0.58	0.47	0.11	0.06	0.00	0.04	0.00	0.00	0.00	0.00
10.	1970	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.00	0.17	0.00	0.21	0.59	0.08	0.00	0.45	0.40	0.41	0.25	0.01	0.72	0.78	0.89	0.92	0.82	0.57	0.73	0.62	0.27	0.01	0.00	0.02	0.01	0.00	0.00	0.03	0.00
11.	1971	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.07	0.00	0.24	0.25	0.53	0.45	0.65	0.00	0.21	0.44	0.59	0.38	0.70	0.56	0.73	0.88	0.82	0.81	0.32	0.62	0.45	0.00	0.06	0.02	0.02	0.00	0.00	0.00	0.00
12.	1972	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.23	0.24	0.00	0.00	0.05	0.63	0.53	0.06	0.44	0.59	0.69	0.14	0.65	0.92	0.88	0.16	0.43	0.22	0.07	0.00	0.00	0.00	0.02	0.00	0.00	0.01	0.03	0.03
13.	1973	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.00	0.26	0.21	0.41	0.57	0.61	0.69	0.20	0.32	0.51	0.30	0.64	0.78	0.71	0.94	0.19	0.83	0.73	0.62	0.47	0.11	0.06	0.02	0.04	0.04	0.03	0.03	0.03
14.	1974	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.14	0.25	0.00	0.41	0.35	0.37	0.31	0.30	0.24	0.57	0.57	0.76	0.76	0.92	0.94	0.81	0.59	0.73	0.44	0.05	0.10	0.00	0.00	0.04	0.00	0.03	0.00	0.00
15.	1975	0.00	0.03	0.00	0.04	0.00	0.03	0.03	0.13	0.00	0.24	0.45	0.59	0.47	0.21	0.69	0.28	0.11	0.00	0.42	0.54	0.62	0.65	0.92	0.82	0.77	0.59	0.60	0.33	0.00	0.00	0.02	0.00	0.00	0.03	0.00	0.03
16.	1976	0.03	0.03	0.00	0.00	0.00	0.14	0.00	0.00	0.10	0.26	0.20	0.45	0.63	0.08	0.05	0.01	0.28	0.49	0.36	0.74	0.09	0.23	0.84	0.48	0.59	0.71	0.62	0.47	0.00	0.00	0.02	0.04	0.04	0.03	0.03	0.03
17.	1977	0.03	0.00	0.00	0.00	0.00	0.14	0.14	0.00	0.22	0.26	0.45	0.41	0.02	0.20	0.42	0.19	0.02	0.07	0.63	0.76	0.62	0.04	0.84	0.62	0.81	0.69	0.54	0.47	0.07	0.06	0.00	0.00	0.00	0.00	0.00	0.03
18.	1978	0.03	0.00	0.00	0.00	0.02	0.03	0.14	0.09	0.08	0.00	0.16	0.37	0.13	0.47	0.00	0.37	0.44	0.59	0.69	0.74	0.71	0.71	0.26	0.82	0.23	0.24	0.50	0.43	0.10	0.00	0.02	0.04	0.00	0.00	0.00	0.00
19.	1979	0.03	0.00	0.00	0.00	0.01	0.14	0.13	0.00	0.21	0.00	0.20	0.55	0.67	0.10	0.27	0.40	0.44	0.39	0.69	0.76	0.56	0.92	0.48	0.10	0.39	0.73	0.62	0.39	0.08	0.00	0.02	0.00	0.00	0.03	0.00	0.00
20.	1980	0.03	0.03	0.04	0.05	0.08	0.14	0.02	0.00	0.16	0.29	0.37	0.25	0.00	0.00	0.33	0.40	0.44	0.59	0.15	0.72	0.78	0.92	0.70	0.82	0.33	0.73	0.14	0.45	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00
21.	1981	0.03	0.00	0.00	0.00	0.08	0.00	0.08	0.00	0.23	0.26	0.00	0.59	0.63	0.73	0.53	0.22	0.35	0.41	0.69	0.74	0.69	0.92	0.01	0.50	0.35	0.59	0.60	0.21	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22.	1982	0.00	0.03	0.04	0.05	0.03	0.00	0.05	0.00	0.10	0.17	0.00	0.00	0.67	0.65	0.29	0.37	0.39	0.59	0.47	0.72	0.05	0.02	0.36	0.21	0.83	0.40	0.58	0.00	0.00	0.02	0.02	0.00	0.00	0.00	0.00	0.00
23.	1983	0.03	0.00	0.00	0.02	0.04	0.10	0.00	0.20	0.12	0.00	0.47	0.49	0.67	0.35	0.00	0.02	0.00	0.04	0.14	0.70	0.76	0.87	0.88	0.70	0.27	0.65	0.48	0.47	0.11	0.00	0.00	0.04	0.00	0.00	0.00	0.00
24.	1984	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.01	0.13	0.10	0.47	0.55	0.67	0.62	0.32	0.29	0.59	0.69	0.76	0.65	0.81	0.70	0.64	0.83	0.67	0.22	0.37	0.11	0.06	0.02	0.00	0.00	0.03	0.03	0.00
25.	1985	0.00	0.00	0.00	0.05	0.00	0.14	0.00	0.00	0.03	0.31	0.25	0.47	0.39	0.45	0.07	0.40	0.44	0.55	0.69	0.76	0.78	0.81	0.94	0.79	0.79	0.69	0.62	0.47	0.11	0.00	0.00	0.00	0.00	0.03	0.02	0.02
26.	1986	0.00	0.00	0.00	0.05	0.08	0.14	0.00	0.03	0.16	0.31	0.45	0.59	0.00	0.49	0.45	0.09	0.22	0.42	0.40	0.76	0.78	0.73	0.76	0.82	0.83	0.73	0.28	0.47	0.11	0.00	0.00	0.04	0.00	0.00	0.00	0.00
27.	1987	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.03	0.00	0.00	0.15	0.53	0.43	0.61	0.36	0.40	0.39	0.00	0.69	0.76	0.78	0.79	0.76	0.81	0.81	0.73	0.52	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.03
28.	1988	0.00	0.00	0.00	0.00	0.08	0.00	0.00	0.14	0.18	0.25	0.49	0.21	0.67	0.49	0.15	0.28	0.29	0.57	0.69	0.76	0.47	0.92	0.92	0.82	0.83	0.73	0.56	0.15	0.11	0.02	0.00	0.00	0.00	0.00	0.00	0.00
29.	1989	0.03	0.03	0.04	0.05	0.04	0.12	0.04	0.19	0.05	0.31	0.03	0.31	0.37	0.73	0.24	0.04	0.06	0.39	0.34	0.52	0.36	0.92	0.80	0.82	0.83	0.73	0.62	0.00	0.00	0.06	0.00	0.02	0.00	0.00	0.03	0.00
30.	1990	0.03	0.03	0.04	0.05	0.00	0.12	0.14	0.20	0.23	0.18	0.00	0.31	0.59	0.67	0.24	0.40	0.38	0.42	0.69	0.60	0.67	0.73	0.94	0.33	0.81	0.51	0.62	0.37	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.02
31.	1991	0.03	0.00	0.03	0.00	0.00	0.00	0.03	0.00	0.08	0.18	0.20	0.00	0.59	0.15	0.38	0.18	0.44	0.59	0.09	0.02	0.58	0.92	0.42	0.82	0.75	0.73	0.00	0.47	0.06	0.00	0.00	0.00	0.00	0.03	0.03	0.00
32.	1992	0.03	0.03	0.00	0.05	0.08	0.14	0.14	0.20	0.06	0.00	0.00	0.51	0.67	0.15	0.20	0.37	0.11	0.00	0.57	0.38	0.65	0.92	0.94	0.81	0.83	0.73	0.28	0.00	0.00	0.05	0.02	0.00	0.04	0.00	0.00	0.02
33.	1993	0.00	0.03	0.01	0.05	0.05	0.00	0.00	0.20	0.06	0.15	0.47	0.59	0.00	0.65	0.27	0.08	0.26	0.55	0.69	0.76	0.78	0.87	0.94	0.82	0.73	0.73	0.58	0.06	0.11	0.00	0.00	0.00	0.00	0.03	0.02	0.00
34.	1994	0.00	0.00	0.04	0.00	0.00	0.00	0.09	0.20	0.02	0.00	0.51	0.11	0.16	0.69	0.69	0.40	0.38	0.59	0.40	0.70	0.74	0.87	0.94	0.61	0.83	0.40	0.62	0.02	0.07	0.00	0.00	0.00	0.04	0.03	0.00	0.00
35.	1995	0.00	0.00	0.00	0.05	0.01	0.14	0.00	0.08	0.00	0.30	0.47	0.37	0.13	0.73	0.14	0.31	0.39	0.59	0.00	0.50	0.74	0.59	0.72	0.66	0.25	0.63	0.03	0.47	0.11	0.06	0.00	0.00	0.00	0.00	0.00	0.00
36.	1996	0.00	0.03	0.00	0.00	0.00	0.00	0.14	0.00	0.00	0.00	0.29	0.59	0.04	0.59	0.29	0.38	0.44	0.59	0.69	0.70	0.00	0.92	0.94	0.48	0.49	0.16	0.00	0.33	0.01	0.05	0.02	0.00	0.00	0.00	0.02	0.00
	Average	0.01	0.01	0.01	0.02	0.02	0.06	0.04	0.07	0.10	0.18	0.24	0.37	0.37	0.43	0.34	0.25	0.30	0.41	0.48	0.62	0.61	0.76	0.76	0.65	0.63	0.57	0.46	0.29	0.06	0.02	0.01	0.01	0.00	0.01	0.01	0.01

Table 5.11 Water Demand at Irrigation Intake Node (1/2)

(Present Cropping Condition)

Basin No.	Code No. (by Basin)	No. (Node No.) (Diagram)	Node Name	Total Service Area (ha)	Annual Water Demand on 36 Years Average (1,000 m3/year)
1.	B1-1	A1-1	**Melca**	391	1,912
	B1-1	A1-2	**Gostivarsko pole**	6,656	32,393
	B1-1	A1-3	**Stenche**	896	4,368
	B1-1	A1-4	**Mazdracha**	1,180	5,748
	B1-1	A1-5	**Radiovce-Bistrica**	13,381	74,722
	B1-2	A1-6	**Bardovci-Zlokukjani**	390	3,356
	B1-3	A1-7	**Kamnik**	1,540	13,245
	B1-3	A1-8	**Mladost (Otovica)**	1,200	10,307
	B1-4	A1-9	**Topolka**	852	7,329
	B1-4	A1-10	**Boshavica**	1,935	16,644
	B1-4	A1-11	**Pepelishko pole**	1,300	11,196
	B1-5	A1-12	**Udovo-Valandovo**	3,988	32,194
	B1-5	A1-13	**Bogdanci I and II**	4,804	38,771
			Total	38,513	252,186
2.	B2-1	A2-1	**Kichevosko pole**	2,080	16,406
3.	B3-2	A3-1	**Slavishki pole**	250	1,226
	B3-2	A3-2	**Studerna bara-Vakuf**	852	7,329
	B3-1	A3-3	**Dragomanci**	136	1,166
	B3-3	A3-4	**Lipkovo**	10,924	93,940
			Total	12,162	103,661

Table 5.11 Water Demand at Irrigation Intake Node (2/2)

(Present Cropping Condition)

Basin No.	Code No. (by Basin)	No. (Node No.) (Diagram)	Node Name	Total Service Area (ha)	Annual Water Demand on 36 Years Average (1,000 m3/year)
4.	B4-1	A4-1	**Crn dol (Pehchevo)**	80	377
	B4-1	A4-2	**Maleshevsko pole**	917	4,453
	B4-1	A4-3	**Milkovo (Delchevo)**	909	4,411
	B4-2	A4-4	**Bregalnica**	28,890	310,304
	B4-2	A4-5	**Blatec**	915	7,867
	B4-3	A4-6	**Belashnica-Zletovo**	200	1,709
	B4-4	A4-7	**Mantovo**	5,581	47,977
	B4-4	A4-8	**Mavrovica**	136	1,166
			Total	37,628	378,264
5.	B5-1	A5-1	**Desovo**	2,067	16,305
	B5-1	A5-2	**Prilep**	6,200	48,931
	B5-2	A5-3	**Strezhevo**	20,525	161,959
	B5-3	A5-4	**Tikvesh**	19,425	167,028
	B5-3	A5-5	**Trstenik-Gradsko**	988	8,500
			Total	49,205	402,723
6.	B6-1	A6-1	**Podaresh**	317	2,727
	B6-2	A6-2	**Turija**	10,250	88,161
	B6-3	A6-3	**Vodocha**	4,000	34,410
	B6-3	A6-4	**Podlbelasichki**	1,400	12,039
			Total	15,967	137,336
7.		A7-1	**Asamati**	5,955	46,996
		A7-2	**Ljubanishte**	142	1,123
		A7-3	**Leskoec**	210	1,663
		A7-4	**Izdeglavje**	2,240	17,667
	B7-2	A7-5	**Strushko pole**	2,810	22,175
	B7-2	A7-6	**Debarsko pole**	1,080	5,248
			Total	12,437	94,872
			Grand Total	**167,992**	**1,385,448**

Table 5.12 Livestock Water Requirement

Unit Water Requirement:				1994
	Cattle	95	lit/day/head	281,336 heads
	Horse	60	lit/day/head	61,797
	Pig	25	lit/day/head	171,571
	Sheep	11	lit/day/head	2,466,099
	Poultry	1	lit/day/head	4,685,021
				7,665,824

1994

No.	Code No.	No.	Municipality (old) concerned 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	Total Water Demand m3/s
Basin-1: Vardar River Basin															
1.	B1-1	1	02	Gostival	24,439	0.027	4,249	0.003	865	0.000	113,810	0.014	156,484	0.002	0.046
		2	03	Tetovo	47,511	0.052	7,770	0.005	11,043	0.003	135,492	0.017	435,327	0.005	0.083
2.	B1-2	3	01	Skopje	21,968	0.024	5,742	0.004	14,057	0.004	151,810	0.019	416,299	0.005	0.056
3.	B1-3	4	09	Veles	6,923	0.008	1,331	0.001	1,963	0.001	150,474	0.019	156,619	0.002	0.030
4.	B1-4	5	22	Negotino	1,498	0.002	702	0.000	2,800	0.001	24,388	0.003	69,803	0.001	0.007
5.	B1-5	6	23	Valandovo	2,674	0.003	480	0.000	2,422	0.001	11,858	0.002	47,775	0.001	0.006
		7	24	Gevgelija	5,165	0.006	1,449	0.001	3,095	0.001	40,085	0.005	91,116	0.001	0.014
Basin-2: Treska River Basin															
6.	B2-1	8	04	Kichevo	15,722	0.017	1,945	0.001	1,884	0.001	69,707	0.009	141,719	0.002	0.030
7.	B2-2		-	-											
8.	B2-3	9	05	Brod	5,087	0.006	555	0.000	1,559	0.000	23,854	0.003	46,547	0.001	0.010
Basin-3: Pchinja River Basin															
9.	B3-1	10	06	Kumanovo	15,849	0.017	3,047	0.002	20,329	0.006	183,734	0.023	372,990	0.004	0.053
10.	B3-2	11	08	Kriva Palanka	9,586	0.011	1,493	0.001	7,954	0.002	53,463	0.007	109,874	0.001	0.022
		12	07	Kratovo	3,263	0.004	475	0.000	3,608	0.001	39,095	0.005	54,142	0.001	0.011
11.	B3-3		-	-											
12.	B3-4		-	-											
Basin-4: Pchinja River Basin															
13.	B4-1	13	16	Berovo	5,682	0.006	2,039	0.001	5,010	0.001	130,175	0.017	61,845	0.001	0.026
		14	15	Delchevo	7,978	0.009	684	0.000	10,338	0.003	76,603	0.010	109,439	0.001	0.023
14.	B4-2	15	14	Vinicha	1,996	0.002	333	0.000	3,899	0.001	48,626	0.006	74,507	0.001	0.011
		16	13	Kochani	6,447	0.007	1,459	0.001	14,052	0.004	62,648	0.008	191,613	0.002	0.022
15.	B4-3	17	11	Shtip	2,907	0.003	428	0.000	2,841	0.001	81,886	0.010	83,796	0.001	0.016
		18	12	Probishtip	2,422	0.003	185	0.000	4,190	0.001	47,144	0.006	71,803	0.001	0.011
16.	B4-4	19	10	Sveti Nikole	1,920	0.002	500	0.000	3,890	0.001	81,665	0.010	92,810	0.001	0.015
Basin-5: Crna River Basin															
17.	B5-1	20	17	Demir Hisar	4,158	0.005	1,421	0.001	2,637	0.001	29,513	0.004	82,107	0.001	0.011
		21	18	Krusevo	4,104	0.005	1,234	0.001	708	0.000	35,850	0.005	29,607	0.000	0.010
		22	20	Prilep	16,026	0.018	3,834	0.003	6,526	0.002	257,246	0.033	279,957	0.003	0.058
18.	B5-2	23	19	Bitola	16,455	0.018	1,931	0.001	7,498	0.002	220,761	0.028	378,968	0.004	0.054
19.	B5-3	24	21	Kavadarci	988	0.001	1,119	0.001	2,891	0.001	39,864	0.005	72,854	0.001	0.009
Basin-6: Strumica River Basin															
20.	B6-1	25	29	Radovish	4,379	0.005	3,014	0.002	4,894	0.001	75,546	0.010	161,576	0.002	0.020
21.	B6-2	26	30	Strumica	14,466	0.016	11,243	0.008	15,448	0.003	107,198	0.014	380,662	0.004	0.045
22.	B6-3		-	-											
23.	B6-4		-	-											
Basin-7: Crn Drim River Basin															
24.	B7-1	27	27	Debar	2,849	0.003	1,049	0.001	0	0.000	52,891	0.007	18,308	0.000	0.011
25.	B7-2	28	28	Resen	6,501	0.007	77	0.000	1,659	0.000	20,249	0.003	101,477	0.001	0.011
		29	25	Ohrid	7,342	0.008	727	0.001	8,389	0.002	51,195	0.007	168,891	0.002	0.019
26.	B7-3	30	26	Struga	15,031	0.017	1,282	0.001	5,122	0.001	49,269	0.006	226,106	0.003	0.028
					281,336	0.309	61,797	0.043	171,571	0.048	2,466,099	0.314	4,685,021	0.054	0.768

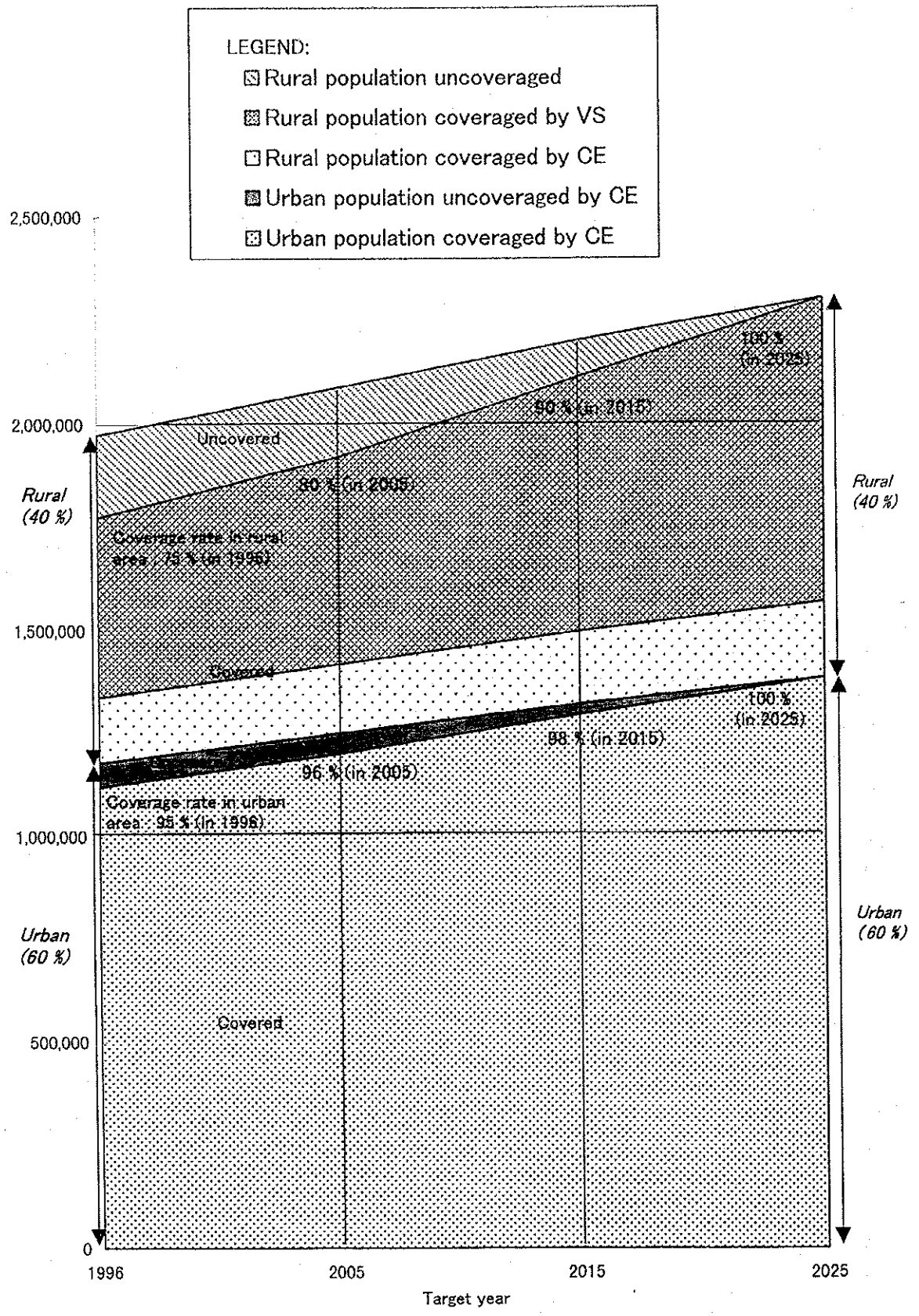

Figure 5.1 Development Directions of Municipal Water Supply

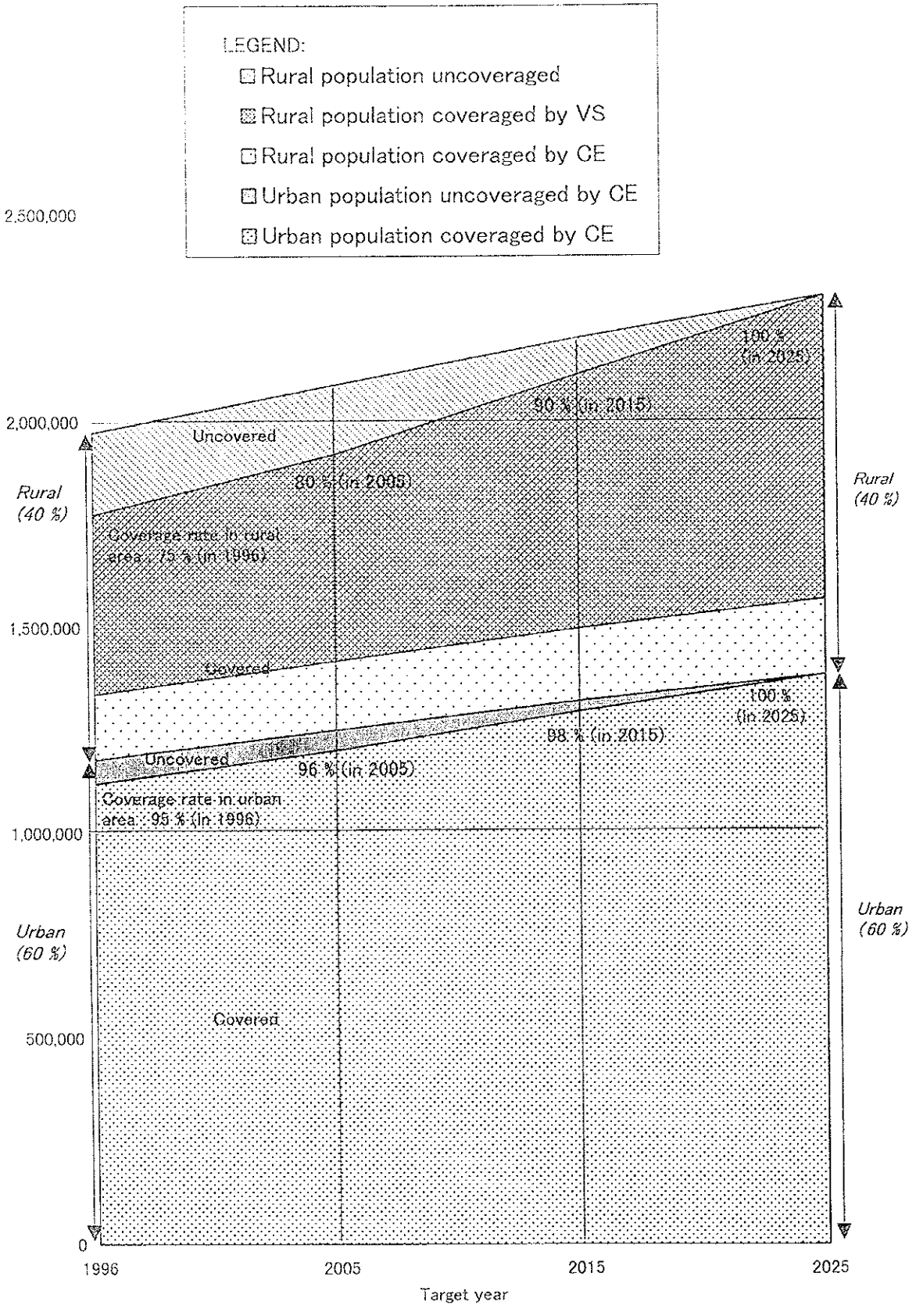

Figure 5.1 Development Directions of Municipal Water Supply

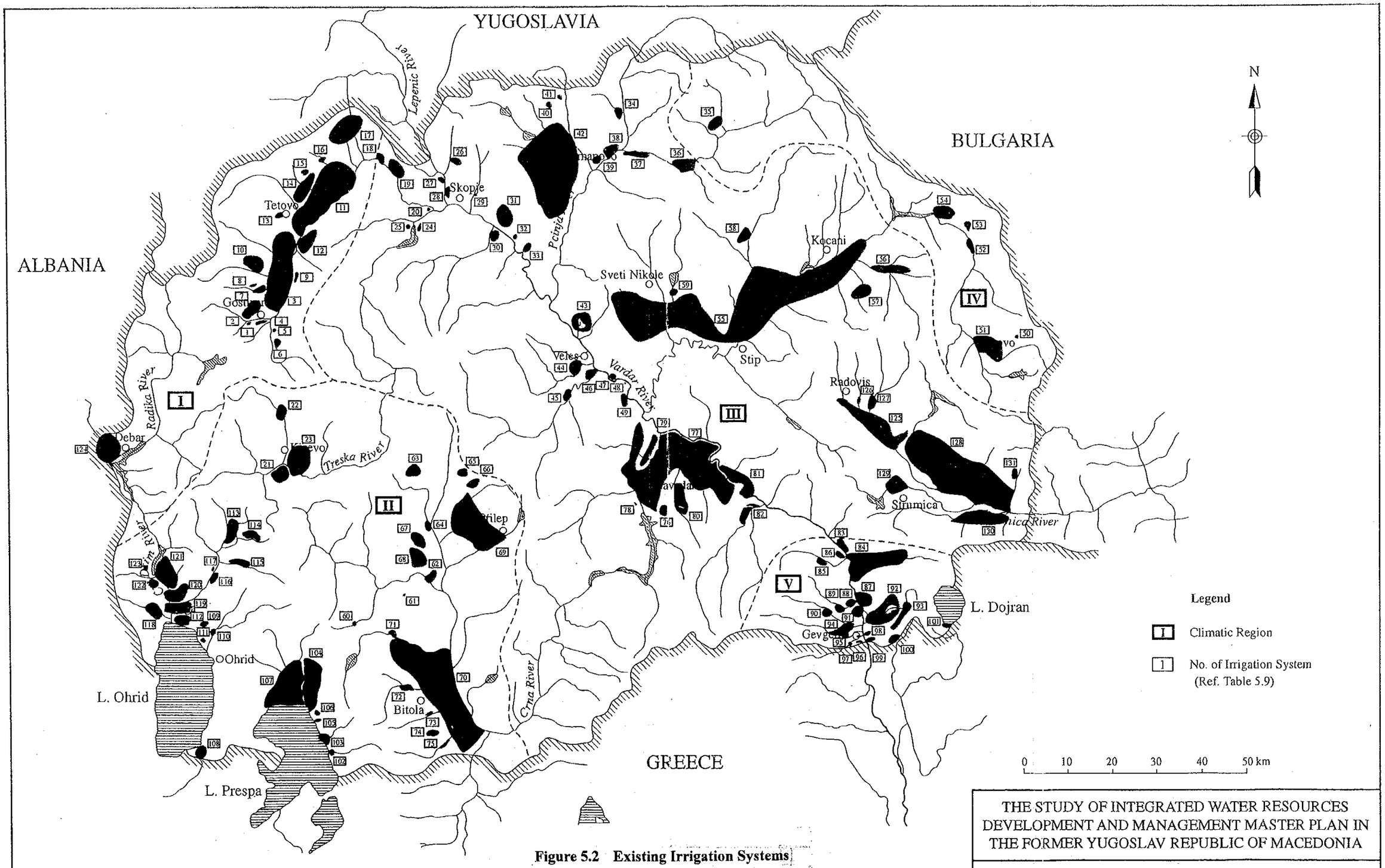

Figure 5.2 Existing Irrigation Systems

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

JAPAN INTERNATIONAL COOPERATION AGENCY

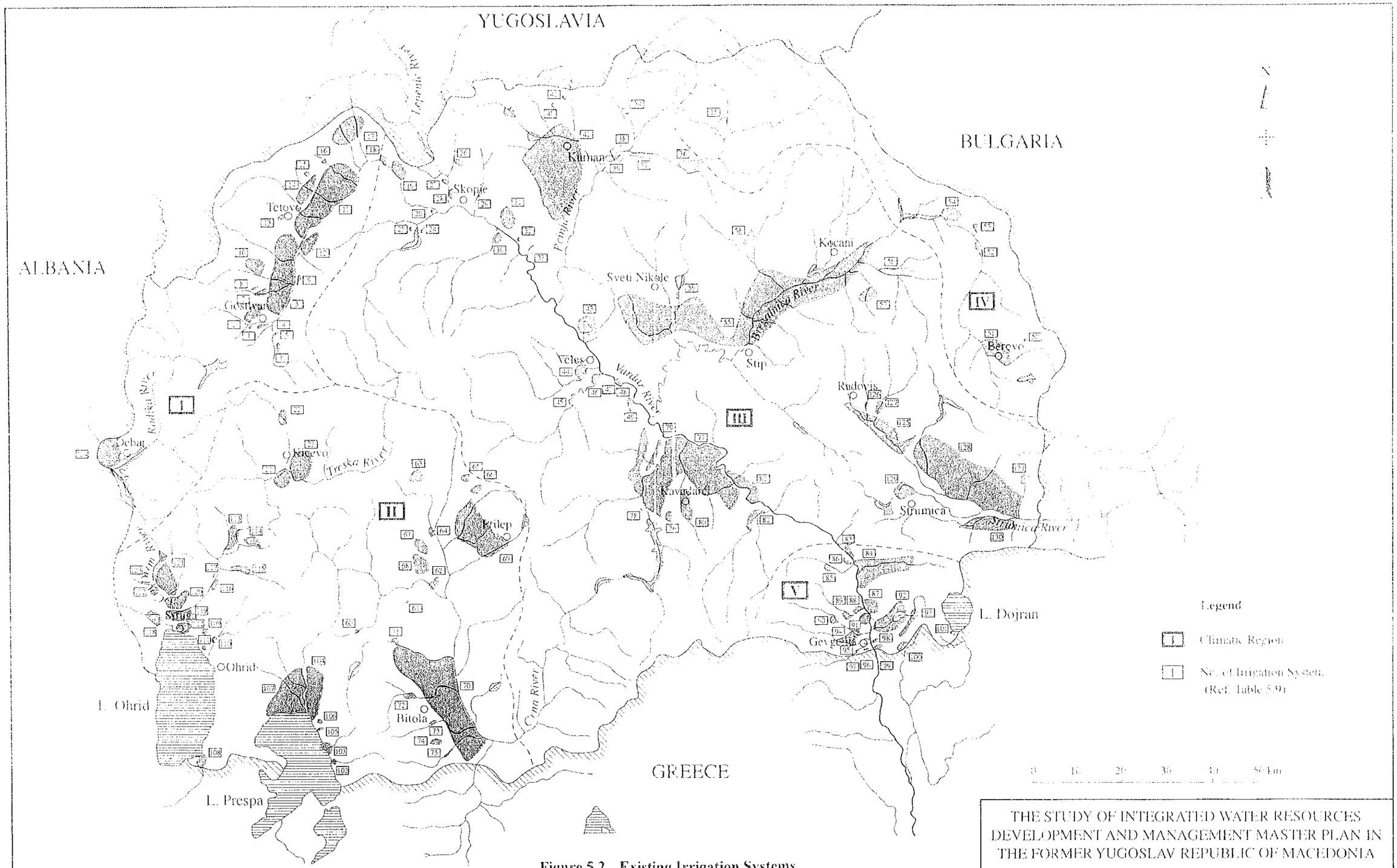

Figure 5.2 Existing Irrigation Systems

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

JAPAN INTERNATIONAL COOPERATION AGENCY

1996

Cropping Pattern No.	Code No. (Sub-Basin) (Diagram)	Node No. (Intake) (Diagram)	Irrigation System No.	Irrigation System	Irrigation Service Area (ha)	No.	Climatic Region
1.	B1-1	A1-1	5.	Lakavica	161	1.	Tetovo - Gostivar
	B1-1	A1-1	6.	Melca	230	2.	Bitola - Prilep
	B1-1	A1-2	1.	Shkoza	142	3.	Shtip - Skopje
	B1-1	A1-2	2.	Zdunje I & II	2,200	4.	Berovo - Kriva P.
	B1-1	A1-2	3.	Gostivarsko pole	3,914	5.	Gevgelija
	B1-1	A1-2	4.	Banjica	400		
	B1-1	A1-3	7.	Vrapcishka reka	280		
	B1-1	A1-3	8.	Balin dol	116		
	B1-1	A1-3	9.	Stenche	500		
	B1-1	A1-4	10.	Mazdracha	1,180		
	B1-1	A1-5(1/2)	11.	Radiovce-Bistrica	8,187		
	B1-1	A1-5(1/2)	12.	Miletino-Chelopek	856		
	B1-1	A1-5(1/2)	13.	Rechica	114		
	B1-1	A1-5(1/2)	14.	Ratae	1,040		
	B1-1	A1-5(1/2)	15.	Djepishte	160		
	B1-1	A1-5(1/2)	16.	Neproshteno	114		
	B1-1	A1-5(1/2)	17.	Stari	2,500		
	B7-3	A7-6	124.	Debarsko pole	1,080		
				Total	23,174		
2.	B2-1	A2-1	21.	Bigor-Dolenci	590	1.	Tetovo - Gostivar
	B2-1	A2-1	22.	Zace-Greshnica	450	2.	Bitola - Prilep
	B2-1	A2-1	23.	Kichevosko pole	1,040	3.	Shtip - Skopje
	B5-1	A5-1	60.	Obednichki	30	4.	Berovo - Kriva P.
	B5-1	A5-1	61.	Demir hisar	10	5.	Gevgelija
	B5-1	A5-1	62.	Buchin	120		
	B5-1	A5-1	63.	Debreshte	251		
	B5-1	A5-1	64.	Crna upper reach	250		
	B5-1	A5-1	65.	Brailovo	240		
	B5-1	A5-1	66.	Desovo	280		
	B5-1	A5-1	67.	Krushevo	220		
	B5-1	A5-1	68.	Bonino (Lazhani)	666		
	B5-1	A5-2	69.	Prilep	6,200		
	B5-2	A5-3	70.	Strezhevo	20,200		
	B5-2	A5-3	71.	Shemnica upper reach	50		
	B5-2	A5-3	72.	Dihovo	140		
	B5-2	A5-3	73.	Bistrica	40		
	B5-2	A5-3	74.	Velushka river	75		
	B5-2	A5-3	75.	Graeshnica	20		
	B7-2	A7-1	102.	Ljubojno	84		
	B7-2	A7-1	103.	Krani	153		
	B7-2	A7-1	104.	Asamati	2,811		
	B7-2	A7-1	105.	Pretor	41		
	B7-2	A7-1	106.	Kurbinovo	78		
	B7-2	A7-1	107.	Sirhan	2,788		
	B7-2	A7-2	108.	Ljubanishta	142		
	B7-2	A7-3	109.	Trebenishta	50		
	B7-2	A7-3	110.	Leskoec	100		
	B7-2	A7-3	111.	Velgoshte	60		
	B7-2	A7-4	112.	Ovoshtarnik	250		
	B7-2	A7-4	113.	Izdeglavje	700		
	B7-2	A7-4	114.	Slatino	400		
	B7-2	A7-4	115.	Belchishta-Velmej	440		
	B7-2	A7-4	116.	Sateska	400		
	B7-2	A7-4	117.	Botun	50		
	B7-3	A7-5	118.	Shum-Vishni	305		
	B7-3	A7-5	119.	Lozhani	550		
	B7-3	A7-5	120.	Stari	745		
	B7-3	A7-5	121.	Strushko pole	1,000		
	B7-3	A7-5	122.	Banjiste	150		
	B7-3	A7-5	123.	Gradinar	60		
				Total	42,229		

No.	Crop	Cropping Code No.	Cropping Area: 1st Crop Area (ha)	1st Crop Ratio	2nd Crop (summer) Area (ha)	2nd Crop (summer) Ratio
1.	Wheat	11	20,857	0.90	0	
2.	Maize	21	0		8,111	0.35
3.	Rice	31	0		0	
4.	Tobacco	41	0		0	-
5.	Sunflower	51	0		0	
6.	Cabbage	61	0		0	
7.	Tomatoes	71	0		1,159	0.05
8.	Peppers	81	0		1,159	0.05
9.	Other Vegetables	91	0		10,428	0.45
10.	Apples	101	0		0	0.00
11.	Plums	111	0		0	0.00
12.	S. Cherries	121	0		0	
13.	Other Orchards	131	2,317	0.10	2,317	0.10
14.	Grapes	141	0		0	
		Total	23,174	1.00	23,174	1.00

No.	Crop	Cropping Code No.	Cropping Area: 1st Crop Area (ha)	1st Crop Ratio	2nd Crop (summer) Area (ha)	2nd Crop (summer) Ratio
1.	Wheat	12	33,784	0.80	0	
2.	Maize	22	0		12,670	0.30
3.	Rice	32	0		0	
4.	Tobacco	42	0		10,558	0.25
5.	Sunflower	52	0		0	
6.	Cabbage	62	0		0	
7.	Tomatoes	72	0		2,111	0.05
8.	Peppers	82	0		2,111	0.05
9.	Other Vegetables	92	0		6,334	0.15
10.	Apples	102	6,334	0.15	6,334	0.15
11.	Plums	112	2,111	0.05	2,111	0.05
12.	S. Cherries	122	0		0	
13.	Other Orchards	132	0		0	0.00
14.	Grapes	142	0		0	
		Total	42,229	1.00	42,229	1.00

Cropping Period: Jan. | Feb. | Mar. | Apr. | May | Jun. | Jul. | Aug. | Sep. | Oct. | Nov. | Dec. (1 2 3)

Cropping Duration	
months	Decades
7	2
4	1
4	1
4	1
12	0
7	2
4	1
4	1
4	1
4	1
12	0
12	0

Figure 5.3 Cropping Pattern (1/3)

Cropping Pattern No.	Code No. (Sub-Basin) (Diagram)	Node No. (Intake) (Diagram)	Irrigation System No.	Irrigation System	Irrigation Service Area (ha)
3a.	B1-1	A1-5(2/2)	18.	Radusha	71
	B1-1	A1-5(2/2)	19.	Rashche	325
	B1-1	A1-5(2/2)	20.	Saraj	14
	B1-2	A1-6	24.	Shishevo	56
	B1-2	A1-6	25.	Glumovo	14
	B1-2	A1-6	26.	Vuchidol-Orman	85
	B1-2	A1-6	27.	Novo selo	68
	B1-2	A1-6	28.	Bardovci-Zlokukjani	140
	B1-2	A1-6	29.	Radishani	27
	B1-3	A1-7	30.	Drachevo-Batinci	110
	B1-3	A1-7	31.	Kamnik	1,300
	B1-3	A1-7	32.	Petrovec	100
	B1-3	A1-7	33.	Shamak	30
	B1-3	A1-8	43.	Mladost (Otovica)	1,200
	B1-4	A1-9	44.	Topolka	400
	B1-4	A1-9	45.	Vitanci	98
	B1-4	A1-9	46.	Babuna	100
	B1-4	A1-9	47.	Kochilari	80
	B1-4	A1-9	48.	Zgropulci	24
	B1-4	A1-9	49.	Vinichani	150
	B1-4	A1-10	80.	Boshavica	1,935
	B1-4	A1-11	81.	Pepelishko pole	1,000
	B1-4	A1-11	82.	Demir kapija	300
	B3-1	A3-3	34.	Dragomanci	136
	B3-2	A3-2	36.	Studerna bara-Vakuf	290
	B3-2	A3-2	37.	Davezence-Iachince-Klechovce	175
	B3-2	A3-2	38.	Klechovce	265
	B3-2	A3-2	39.	Shupli kamen-Zubovce	122
	B3-3	A3-4	40.	Rechica	60
	B3-3	A3-4	41.	Izvor Jovica	44
	B3-3	A3-4	42.	Lipkovo	10,820
	B4-2	A4-5	56.	Osojnica	415
	B4-2	A4-5	57.	Blatec	500
	B4-3	A4-6	58.	Belashnica-Zletovo	200
	B4-4	A4-7	125.	Mantovo	5,581
	B4-4	A4-8	59.	Mavrovica	136
	B5-3	A5-4	76.	Dabnichka reka	200
	B5-3	A5-4	77.	Tikvesh	19,225
	B5-3	A5-5	78.	Vozarci	28
	B5-3	A5-5	79.	Tratenik-Gradsko	960
	B6-1	A6-1	126.	Oraovica	67
	B6-1	A6-1	127.	Podaresh	250
	B6-2	A6-2	128.	Turija	10,050
	B6-2	A6-2	131.	Novo selo	200
	B6-3	A6-3	129.	Vodocha	4,000
	B6-3	A6-4	130.	Podlbelasica	1,400
				Total	62,751
3b.	B4-2	A4-4	55.	Bregalnica	28,890

No.	Climatic Region
1.	Tetovo - Gostivar
2.	Bitola - Prilep
3.	Shitip - Skopje
4.	Berovo - Kriva P.
5.	Gevgelija

No.	Crop	Cropping Code No.	1st Crop Area (ha)	1st Crop Ratio	2nd Crop (summer) Area (ha)	2nd Crop (summer) Ratio
1.	Wheat	13	37,651	0.60	0	
2.	Maize	23	0		18,824	0.30
3.	Rice	33	0		0	
4.	Tobacco	43	0		3,138	0.05
5.	Sunflower	53	0		6,275	0.10
6.	Cabbage	63	0		0	
7.	Tomatoes	73	0		3,138	0.05
8.	Peppers	83	0		3,138	0.05
9.	Other Vegetables	93	0		3,138	0.05
10.	Apples	103	0		0	
11.	Plums	113	0		0	
12.	S. Cherries	123	1,255	0.02	1,255	0.02
13.	Other Orchards	133	1,883	0.03	1,883	0.03
14.	Grapes	143	21,962	0.35	21,962	0.35
		Total	62,751	1.00	62,751	1.00
1.	Wheat	13	14,445	0.50	0	
2.	Maize	23	0		4,333	0.15
3.	Rice	33	0		4,333	0.15
4.	Tobacco	43	0		1,445	0.05
5.	Sunflower	53	0		2,888	0.10
6.	Cabbage	63	0		0	
7.	Tomatoes	73	0		1,445	0.05
8.	Peppers	83	0		1,445	0.05
9.	Other Vegetables	93	0		2,889	0.10
10.	Apples	103	0		0	
11.	Plums	113	0		0	
12.	S. Cherries	123	1,445	0.05	1,445	0.05
13.	Other Orchards	133	2,889	0.10	2,889	0.10
14.	Grapes	143	5,778	0.20	5,778	0.20
		Total	24,557	0.85	28,890	1.00

Cropping Period: Jan. | Feb. | Mar. | Apr. | May | Jun. | Jul. | Aug. | Sep. | Oct. | Nov. | Dec. (1 2 3)

Cropping Duration	
months	Decades
7	2
4	1
4	1
4	1
4	1
4	1
12	0
12	0
12	0
7	2
4	1
5	1
4	1
4	1
4	1
4	1
4	1
12	0
12	0
12	0

Figure 5.3 Cropping Pattern (2/3)

1996

Cropping Pattern No.	Code No. (Sub-Basin) (Diagram)	Node No. (Intake) (Diagram)	Irrigation System No.	Irrigation System	Irrigation Service Area (ha)
4.	B3-2	A3-1	35.	Slavishko pole	250
	B4-1	A4-1	50.	Crn dol (Pehchevo)	80
	B4-1	A4-2	51.	Maleshevsko pole	917
	B4-1	A4-3	52.	Sandanski (Delchevo)	250
	B4-1	A4-3	53.	Jugotutun (Delcevo)	164
	B4-1	A4-3	54.	Milkovo (Delchevo)	495
				Total	2,156
5.	B1-5	A1-12	83.	Gradec	264
	B1-5	A1-12	84.	Udovo-Valandovo	3,624
	B1-5	A1-12	86.	Miravci	100
	B1-5	A1-13	85.	Petrushka river	100
	B1-5	A1-13	87.	Grchishte I and II	423
	B1-5	A1-13	88.	Smokvica I and II	110
	B1-5	A1-13	89.	Prdejci	200
	B1-5	A1-13	90.	Kovanska, Sermeninska rivers	200
	B1-5	A1-13	91.	Vinojug	150
	B1-5	A1-13	92.	Gjavoto	1,340
	B1-5	A1-13	93.	Paljurci	800
	B1-5	A1-13	94.	Konska reka	571
	B1-5	A1-13	95.	Sehovo	200
	B1-5	A1-13	96.	Granica	120
	B1-5	A1-13	97.	Pod anot	120
	B1-5	A1-13	98.	Avlakjot	40
	B1-5	A1-13	99.	Keramadnica	80
	B1-5	A1-13	100.	Selemli	350
				Total	8,792
				Grand Total	167,992

No.	Climatic Region
1.	Tetovo - Gostivar
2.	Bitola - Prilep
3.	Shitip - Skopje
4.	Berovo - Kriva P.
5.	Gevgelija

No.	Crop	Cropping Code No.	Cropping Area 1st Crop Area (ha)	1st Crop Ratio	2nd Crop (summer) Area (ha)	2nd Crop (summer) Ratio
1.	Wheat	14	216	0.10	0	
2.	Maize	24	0		108	0.05
3.	Rice	34	0		0	
4.	Tobacco	44	0		0	
5.	Sunflower	54	0		0	
6.	Cabbage	64	0		0	
7.	Tomatoes	74	0		43	0.02
8.	Peppers	84	0		0	
9.	Other Vegetables	94	0		65	0.03
10.	Apples	104	0		0	
11.	Plums	114	1,509	0.70	1,509	0.70
12.	S. Cherries	124	431	0.20	431	0.20
13.	Other Orchards	134	0		0	
14.	Grapes	144	0		0	
		Total	2,156	1.00	2,156	1.00
1.	Wheat	15	2,198	0.25	0	
2.	Maize	25	0		2,198	0.25
3.	Rice	35	0		0	
4.	Tobacco	45	0		0	
5.	Sunflower	55	0		0	
6.	Cabbage	65	2,638	0.30	0	
7.	Tomatoes	75	0		879	0.10
8.	Peppers	85	0		440	0.05
9.	Other Vegetables	95	0		1,319	0.15
10.	Apples	105	0		0	
11.	Plums	115	0		0	
12.	S. Cherries	125	0		0	
13.	Other Orchards	135	0		0	
14.	Grapes	145	3,956	0.45	3,956	0.45
		Total	8,792	1.00	8,792	1.00
1.	Wheat	10	109,151		0	
2.	Maize	20	0		46,244	
3.	Rice	30	0		4,333	
4.	Tobacco	40	0		15,141	
5.	Sunflower	50	0		9,163	
6.	Cabbage	60	2,638		0	
7.	Tomatoes	70	0		8,775	
8.	Peppers	80	0		8,293	
9.	Other Vegetables	90	0		24,173	
10.	Apples	100	6,334		6,334	
11.	Plums	110	3,620		3,620	
12.	S. Cherries	120	3,131		3,131	
13.	Other Orchards	130	7,089		7,089	
14.	Grapes	140	31,696		31,696	
		Total	163,659	0.97	167,992	1.00

Cropping Period: Jan. (1 2 3) Feb. (1 2 3) Mar. (1 2 3) Apr. (1 2 3) May (1 2 3) Jun. (1 2 3) Jul. (1 2 3) Aug. (1 2 3) Sep. (1 2 3) Oct. (1 2 3) Nov. (1 2 3) Dec. (1 2 3)

Cropping Duration months	Cropping Duration Decades
7	2
4	1
4	1
4	1
12	0
12	0
7	2
4	1
6	2
4	1
4	1
4	1
12	0

Figure 5.3 Cropping Pattern (3/3)

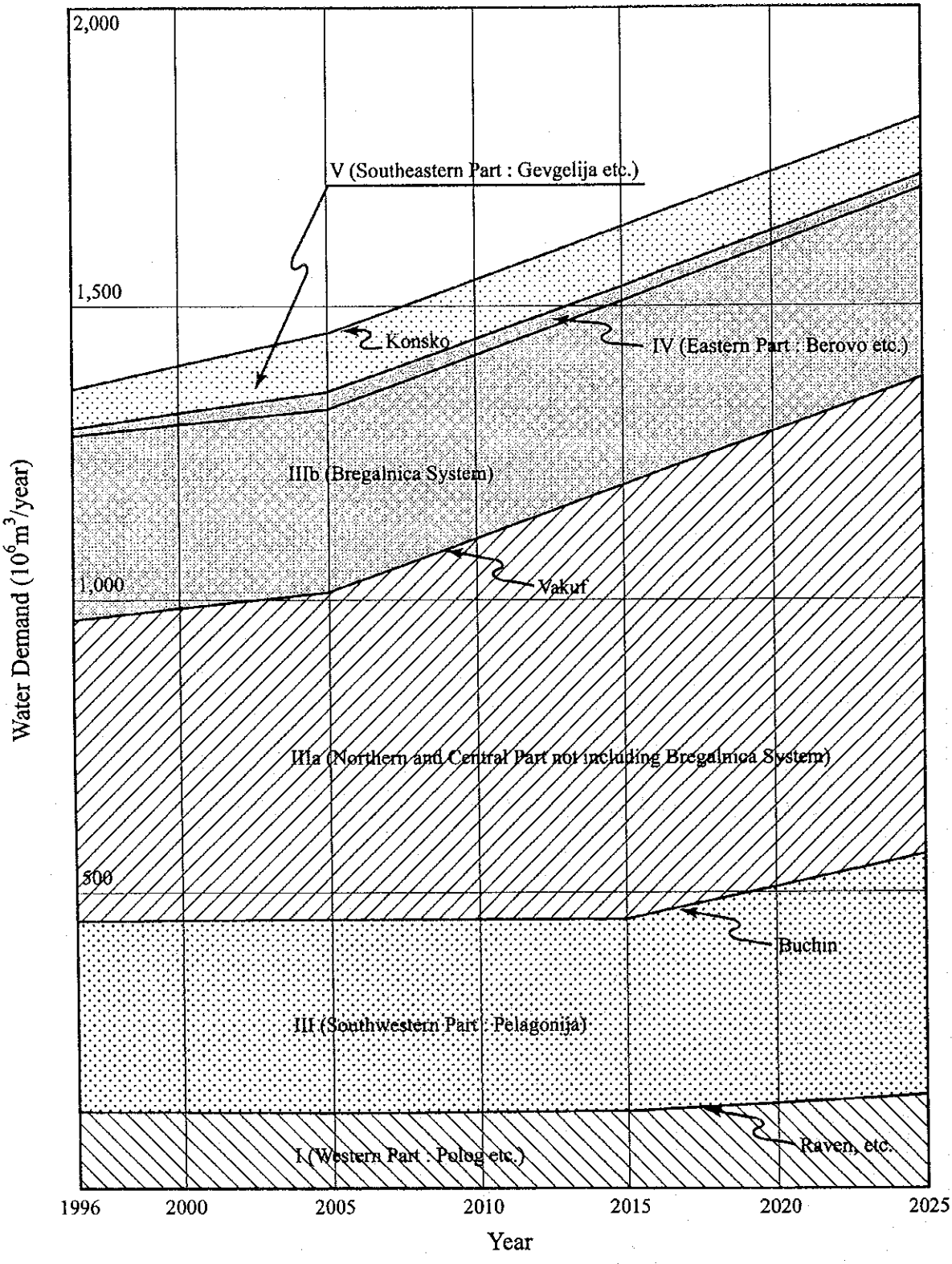

Figure 5.4 Development Curve of Agricultural Water

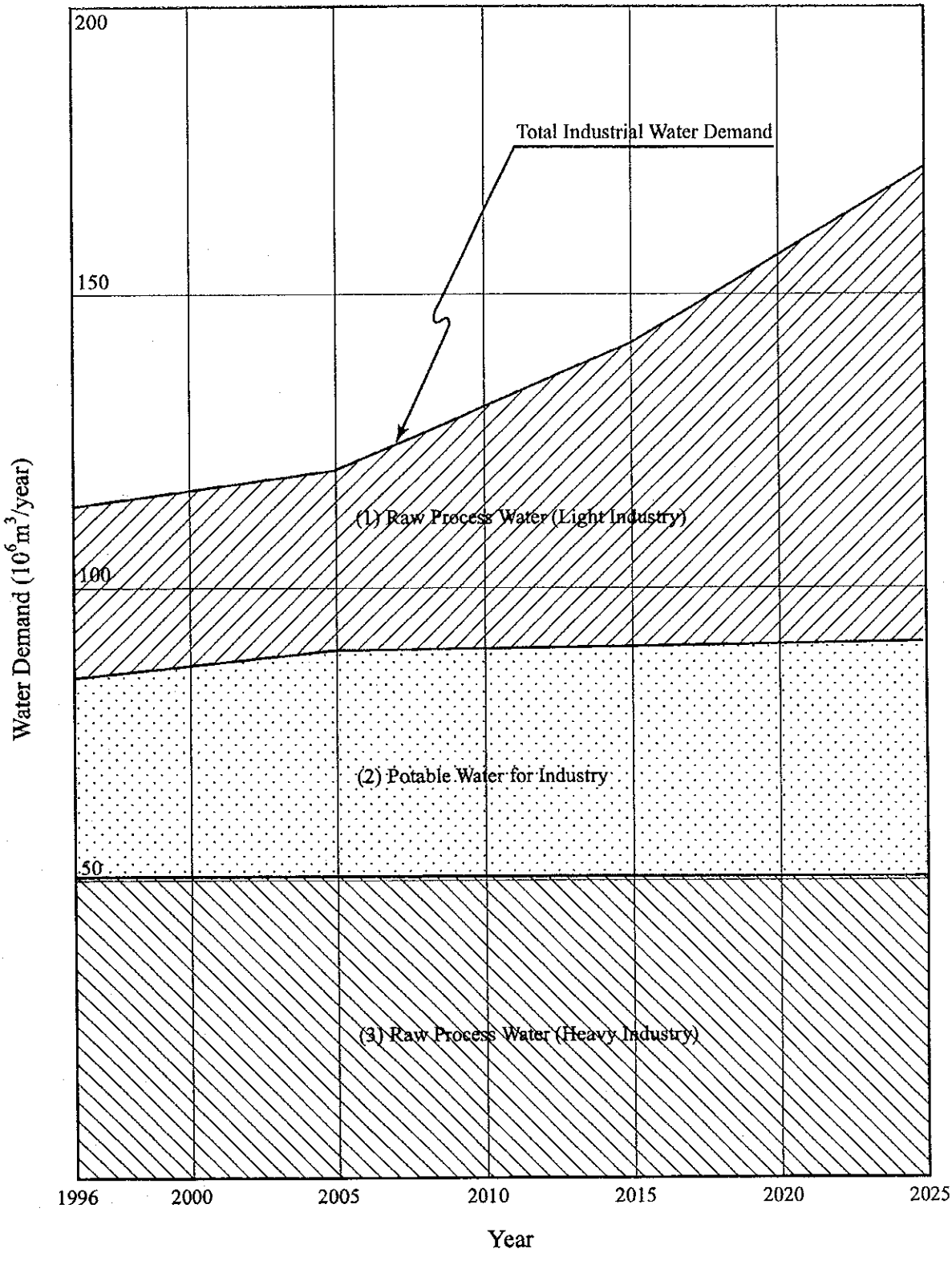

Figure 5.5 Development Curve of Industrial Water