APPENDIX 3, PART I (B/P)

Frameworks of the Study

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APPENDIX 3 FRAMEWORK OF THE STUDY

3.1 Population Projection of Skopje City

Table 3.1 Population Change of Skopje City

Municipality	Town	1948	1953	1961	1971	1981	1991	1994	2002
Skopje	**all**	**35,555**	**42,995**	**96,553**	**25,514**	**442,606**	**414,990**	**475,902**	**502,665**
Gazi Baba	**all**	**6,974**	**9,291**	**12,690**	**5,833**	**64,042**	**61,161**	**67,664**	**72,222**
	Bulacani	1,004	1,074	966	943	1,033	1,063	1,080	1,104
	Idrizovo	434	875	1,166	1,562	2,292	1,751	1,789	1,589
	Indzikovo	217	314	1,067	×	×	×	×	3,343
	Jurumleri	542	637	1,057	1,246	2,061	3,256	3,326	2,983
	Kolonija Idrizovo	×	×	×	×	×	×	×	451
	Madzari	996	1,589	3,246	×	×	×	×	12,874
	Naselba Goce Delcev	×	×	×	×	×	×	×	1,405
	Rastak	573	578	468	376	463	435	408	367
	Singelic	882	1,095	1,399	×	×	×	×	23,915
	Skopje - Gazi Baba	×	×	×	×	56,064	52,728	58,458	15,182
	Smiljkovci	×	×	×	×	×	×	×	345
	Stajkovci	327	359	500	×	×	×	×	3,532
	Stracinci	466	500	541	526	650	332	1,038	1,185
	Trubarevo	410	1,047	1,078	×	×	×	×	2,669
	Cresevo	1,123	1,223	1,202	1,180	1,479	1,596	1,565	1,278
Gorce Petrov	**all**	**5,378**	**7,177**	**10,969**	**2,302**	**2,056**	**538**	**1,507**	**41,490**
	Volkovo in	409	524	715	×	×	×	×	6,750
	Gracani out	383	392	414	442	358	×	21	×
	Kuckovo out	1,336	1,394	1,220	927	608	302	249	138
	Nikistane out	606	652	618	704	793	×	1,010	1,114
	Novo Selo	317	355	919	×	×	×	×	8,349
	Orizari	373	469	456	×	×	×	×	15,637
	Orman out	210	215	205	229	297	236	227	461
	Skopje - Gorce Petrov	1,744	3,176	6,422	×	×	×	×	9,041
Karpos	**all**	**2,389**	**2,769**	**5,048**	**0**	**100,826**	**97,161**	**102,409**	**59,810**
	Bardovci	614	689	1,079	×	×	×	×	1,472
	Vlae	243	278	492	×	×	×	×	6,809
	Gorno Nerezi	1,041	1,044	229	×	×	×	×	314
	Dolno Nerezi	303	533	2,889	×	×	×	×	12,418
	Zlokucani	188	225	359	×	×	×	×	1,635
	Skopje - Karpos	×	×	×	×	100,826	97,161	102,409	37,162
Kisela Voda	**all**	**5,252**	**5,962**	**48,137**	**724**	**88,846**	**120,388**	**118,079**	**125,379**
	Gorno Lisice	1,849	1,847	2,608	×	×	×	×	18,223
	Dolno Lisice	253	526	630	×	×	×	×	2,440
	Naselba Dracevo	×	×	×	×	×	×	×	10,605
	Selo Dracevo	2,747	3,094	3,482	×	×	×	×	8,641
	Skopje - Kisela Voda	×	×	40,473	×	87,792	119,158	116,877	84,625
	Usje	403	495	944	724	1,054	1,230	1,202	845
Centar	**all**	×	×	×	×	**93,614**	**67,968**	**85,021**	**82,604**
	centar	×	×	×	×	93,614	67,968	85,021	82,604
Cair	**all**	**2,819**	**3,522**	**4,055**	**3,185**	**74,358**	**66,507**	**77,676**	**68,395**
	Butel	×	373	903	×	×	×	×	14,005
	Vizbegovo	84	85	150	×	×	×	×	2,817
	Ljubanci	1,364	1,494	1,312	968	942	902	863	928
	Ljuboten	1,183	1,271	1,254	1,452	1,613	169	2,035	2,343
	Radisani	188	299	436	765	1,956	6,688	7,579	9,123
	Skopje Cair	×	×	×	×	69,847	58,748	67,199	39,179
Suto Orizari	**all**	**157**	**185**	**365**	**0**	**0**	**0**	**0**	**17,357**
	Gorno Orizari	157	185	365	×	×	×	×	454
	Dolno Orizari	×	×	×	×	×	×	×	1,550
	Skopje - Suto Orizari	×	×	×	×	×	×	×	15,353
Kondovo	**all**	**4,235**	**4,849**	**5,334**	**5,988**	**7,872**	**235**	**9,840**	**11,155**
	Gorno Svilare	271	284	313	358	505		600	712
	Dvorce	154	142	297	252	213		225	249
	Dolno Svilare	783	885	909	1,123	1,435	3	1,725	2,010
	Kondovo	331	368	451	797	1,857	137	2,890	3,384
	Radusa	929	1,580	1,212	1,565	1,781	5	1,824	1,892
	Rasce	1,474	1,590	1,450	1,581	1,814		2,363	2,697
	Rudnik Radusa	293		702	312	267	90	213	211

Municipality	Town	1948	1953	1961	1971	1981	1991	1994	2002
Saraj	**all**	**8,351**	**9,240**	**9,955**	**7,482**	**10,992**	**1,032**	**13,706**	**24,253**
	Arnaklija	358	348	385	517	699	4	935	1,077
	Bojane	1,128	1,207	1,195	1,306	1,579		1,910	2,230
	Bukovic	611	654	668	871	1,256	28	1,622	1,723
	Glumovo	506	574	700					1,683
	Grcec	607	658	569	30	1,315	39	1,805	1
	Kopanica	877	926	941	1,042	1,192		1,478	1,714
	Krusopek	847	929	893	952	1,277	6	1,642	1,902
	Laskarci	585	624	709	762	990	5	1,083	1,190
	Ljubin	153	143	247	374	1,230	947	1,617	2,044
	Matka	423	513	433					468
	Panicari	206	225	240	282	292		271	261
	Raovic	341	377	328	319	244		284	213
	Saraj	327	565	1,015					5,232
	Semeniste	399	410	404	492	408	3	479	559
	Cajlane	443	469	552	535	510		580	580
	Sisevo	540	618	676					3,376

Source: State Statistical Office

Table 3.2 Population of Skopje City

Municipality	From MLSG		Projection by ST(pop.)
	Area(km^2)	Population	
	(2005)		(2006)
Aerodrom	21.85	72,009	
Butel	54.79	36,154	
Gazi Baba	110.86	72,617	74,854
Gorce Petrov	66.93	41,634	41,084
Karpos	35.21	59,666	60,089
Kisela Voda	34.24	57,236	
Centar	7.52	45,412	
Cair	3.52	64,773	Remains
Suto Orizari	7.48	22,017	(309187)
Saraj	229.06	35,408	36,973
Total	571.46	506,926	522,187

Note 1: Official number announced by Ministry of Local Government is based on 2002 Census (502,665) plus population in two development areas of 4261.
2: Population projection by Statistic Office is based on the 0.074% annual increase.
3: MLSG: Ministry of Local Self Government
ST: Statistic Office

Table 3.3 Population in Sewer Districts

Municipality	Village	Census	Projection by Statistic Office			Remarks
		2002	2006	2020	2030	
Central Sewer District						
Aerodrom		69,569	71,697	80,200	86,900	
	Gorno Lisice	18,223				
	Aerodrom	51,346				
Butel		25,945	26,785	29,900	32,400	
	Butel	14,005				
	Vizbegovo	2,817				
	Radisani	9,123				
Gazi Baba		58,846	60,752	67,900	73,500	
	Indzikovo	3,343				
	Madzari	12,874				
	Singelic	23,915				
	Skopje - Gazi Baba	15,182				
	Stajkovci	3,532				
Gorce Petrov		33,027	34,097	38,100	41,300	
	Orizari	15,637				
	Skopje - Gorce Petrov	9,041				
	Novo Selo	8,349				
Karpos		59,352	59,775	66,800	72,300	
Kisela Voda		43,315	44,718	58,000	62,800	
	K.Voda	37,990	*39,221*	*50,480*	*54,640*	Note (1)
	Sopiste	5,325	*5,497*	*7,520*	*8,160*	Note (1) Outside of Skopje
	Soncev Grad	0	0	6,000	6,000	Outside of Skopje
Centar		45,412	46,883	52,400	56,700	
Cair		64,773	66,871	74,800	81,000	
Suto Orizari		22,017	22,730	25,400	27,500	
Sub-total		422,256	434,307	499,500	540,400	
Saraj Sewer District		35,408	38,628	52,500	62,820	Note (2)
North Gorce Petrov Sewer District		8,405	9,800	13,200	16,100	Note (3)
Dracevo Sewer District		34,551	35,670	39,900	43,200	Including outside of Skopje
合　計		500,620	518,405	605,100	662,520	

Note:
(1) Figures in *Italic*: Breakdown by the study team
(2) Source: Saraj Municipality
(3) Source: Gorce Petrov Municipality
Source: Vodovod except Saraj Sewer District and North Gorce Petrov Sewer District

Table 3.4 Population in Dracevo Sewer District

Municipality		Town	Census	Projection		
			2002	2006	2020	2030
Inside of Skopje City	Kisela Voda	Naselba Dracevo	10,605	*10,948*	*12,250*	*13,260*
		Selo Dracevo	8,641	*8,921*	*9,970*	*10,800*
	Aerodrom	Dolno Lisice	2,440	*2,519*	*2,830*	*3,050*
		Sub-total	21,686	22,388	25,050	27,110
Outside of Skopje City		Studenicani	5,786	*5,974*	*6,680*	*7,240*
		Morani	1,715	*1,771*	*1.980*	*2,140*
		Batinci	5,364	*5,537*	*6,190*	*6,710*
		Sub-total	12,865	13,282	14,850	16,090
Total			34,551	35,670	39,900	43,200

Note: Figures in *Italic*: Breakdown by the study team
Source: Vodovod

Table 3.5 Population Projection（Basic Plan Area）

Master Plan			General Urban Plan of Skopje			
Munici-parity	(1998)	(2020)	Munici-parity	(1994)	(2010)	(2020)
Gazi Baba	58,000	68,000	Gazi Baba	42,895	49276	53581
Gorce Petrov	26,000	30,000	Gorce Petrov	29,495	30795	31627
Karpos	58,000	68,000	Karpos	54,927	56148	56927
Kisela Voda	110,000	129,000	Kisela Voda	107,505	113143	116645
Centar	85,000	99,000	Centar	85,021	93012	98499
Cair	50,000	59,000	Cair	54,514	64581	70812
Suto Orizari	14,000	16,000	Suto Orizari	13,044	17849	21473
Sub-total	401,000	469,000	Saraj	7596	8241	9333
Future urban area			Total	394,997	433,045	458,897
Saraj etc.	50,400	76,200				
Total	451,400	545,200				

Note 1: Increase rate/year from census 1981 – 1994: 0.56%
2: Increase rate/year applied for Master Plan existing urban area: 0.8%, future development area: 2.0%
3: Increase rate/year applied for GUP 1994 – 2010: 0.58%, 2010-2020: 0.58%

3.2 Per Capita Domestic Sewage Generation

Table 3.6 Population and Its Ratio Served by Water Supply

No	Municiparity	Population	Population served	Service ratio
1	Aerodrom	72,009	72,009	100%
2	Butel	36,154	32,883	91%
3	Gazi Baba	72,617	61,966	85%
4	Gorce Petrov	41,634	40,382	97%
5	Karpos	59,666	59,352	99%
6	Kisela Voda	57,236	57,236	100%
7	Saraj	35,408	30,731	87%
8	Centar	45,412	45,412	100%
9	Cair	64,773	64,773	100%
10	Suto Orizari	22,017	21,563	98%
Total of Skopje		506,926	486,307	96%
11	Sopiste	5,656	2,282	40%
12	Studenicani	17,246	12,865	75%
Total of Outside		22,902	15,147	66%
Grand Total		529,828	501,454	95%

Source: Vodovod

Table 3.7 Unit Pollution Loading of Domestic Sewage

(g/person-day)

	Data No.	Item	BOD	SS	Data Source
Thailand	1	Excreta	11.4	8.7	
		Gray Water	41.9	16.6	
		Total	53.4	25.3	
Indonesia	1	Excreta	10.5		
		Gray Water	30.4～14.2		
		Total	40.9～24.7		
	2	Excreta	11.2		
		Gray Water	32.7～15.6		
		Total	43.9～26.8		
India	1	Total	30～45		Duncan Mara
	2	Total	35		D.A. Okun and G. Ponghis
Japan	1	Excreta	18	20	Japan Sewerage Works Association
		Gray Water	40	25	
		Total	58	45	
Zambia	1	Total	36		Duncan Mara
Kenya	1	Total			Duncan Mara
Uganda	1	Total	63	43	D.A. Okun and G. Ponghis
Brazil	1	Total		75	D.A. Okun and G. Ponghis
	2	Total	44		WHO
Developing Countries	1	Total	45		WHO
Rural Towns in France	1	Total	23～34		Duncan Mara
United Kingdom	1	Total	50～59		Duncan Mara
	2	Total	59	62	D.A. Okun and G. Ponghis
United States of America	1	Total	45～78		Duncan Mara
	2	Excreta	16.7	27.0	Design Manual − Onsite Wastewater Treatment and Disposal System
		Gray Water	28.5	17.2	
		Total	45.2	42.2	

Source: JICA Report

3.3 Estimation of Industrial Wastewater Generation and Quality at Present

Estimation of industrial wastewater generation is very difficult because there is no actual data on generation either in factories/enterprises or in supervising office. The Study team estimated it by using various methods.

Sewerage M/P estimated industrial pollution load to be approximately 40,000 m^3/d in 1998 and expected it to increase to 53,000 m^3/d in 2020.

Vodovod's water supply data indicates that industrial production index increased by 13.5 % in 2006 compared to that in 2002. However, water supply for these enterprises has been decreasing every year. The water supplied to these enterprises was 34,279 m^3/d in 2002 which decreased to 26,293 m^3/d in 2006.

To collect the information on actual conditions, the surveys of industries and sewage outlets along with the Industrial Survey were conducted in this Project. The Study team estimated industrial wastewater generation on the basis of the results of these surveys.

3.3.1 Industrial Survey

The Study Team carried out industrial survey in December 2007. For this purpose, fifty (50) factories/industries were selected as the target installations (the locations of selected installations are shown in Figure 3.1).

The target installations were selected referring to the followings.

- Enterprises selected under the Study on Sewerage Development Plan in Skopje in 1999 (Sewerage M/P)
- Cadastre of polluters prepared by MEPP (Ministry of Environment and Physical Planning) after the similar survey in 2003
- Enterprises listed under IPPC system by MEPP
- Other installations

Among these references, the enterprises that consume relatively large amount of water were also considered while selection of target enterprises for this survey. Forty two (42) installations are listed as category A and thirteen (13) installations as Category B under IPPC system in Skopje city. Of these; twenty (20) installations of category A and thirteen (13) installations of category B are included as selected target installations for this survey. Types of installations and their scale for category A and category B are listed in Appendix Part I, 3.5 and NACE (Nomenclature des Activities Economiques) code is shown in Appendix Part I, 3.6.

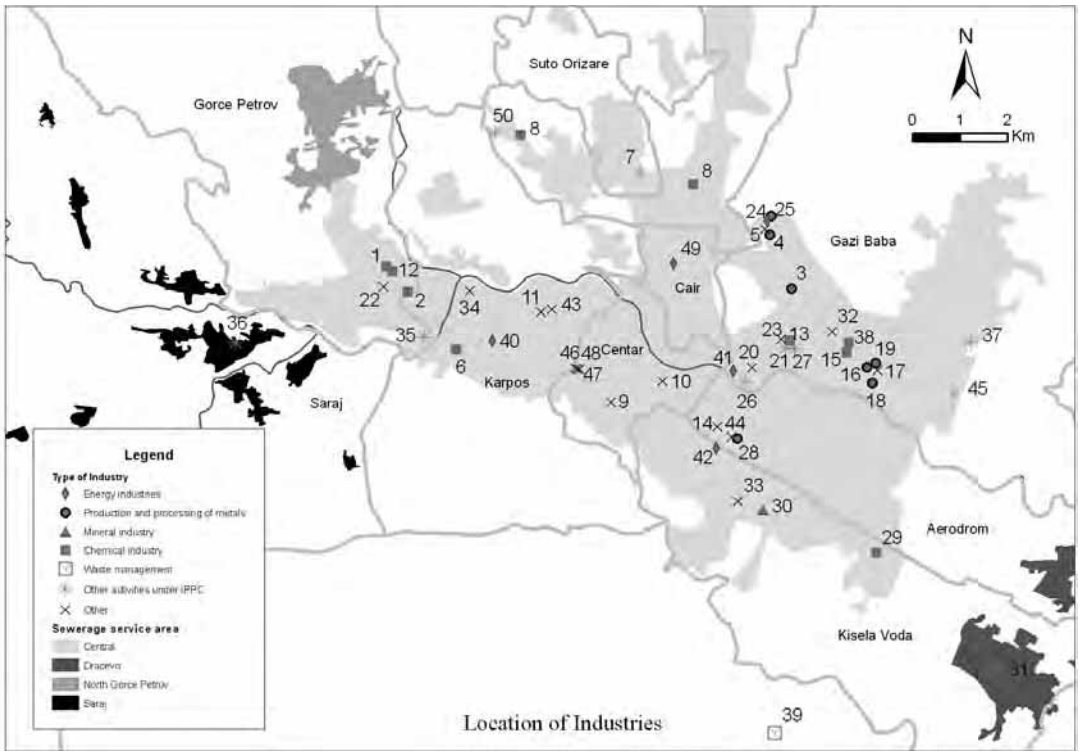

Figure 3.1 Locations of 50 Installations Surveyed

The results of survey are presented and discussed below. Large installations such as steel processing and chemical companies need large amount of water for their processes and therefore depend on their own sources rather than depending on water supply by Vodovod.

(1) Water consumption by source

Total water consumption is 17,878,505 m^3/y. Sources of water for these installations are categorized as water supply from Vodovod (WSS in Figure Figure 3.2), own wells and others (Rasche spring). Of the surveyed installations, 16% are using water from Vodovod supply, 19% use water of their own well, and 65 % are using water of other categories such as Rasche spring (Figure 3.2).

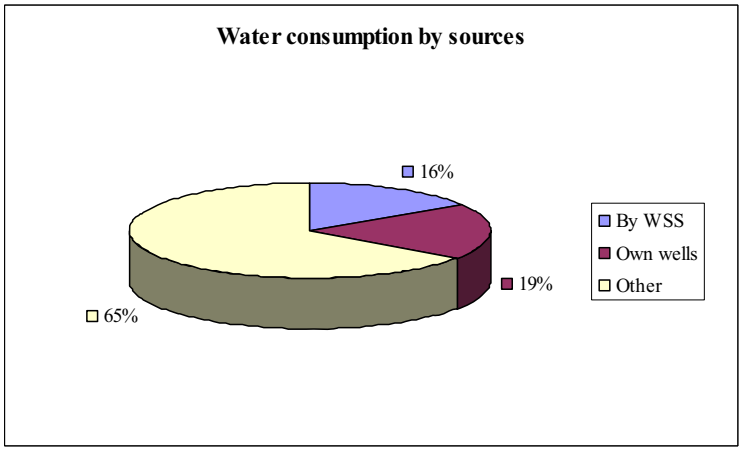

Figure 3.2 Water Consumption by Source

Of the total surveyed installations, about 88% (44 industries) depend on water supply from Vodovod. Komuna AD (paper producing industry) and Drisla (Waste disposal landfill), which are out of Vodovod' water service area, and also MIDA (car washing) use water from their own wells.

Arcelormittal, Makstil, Energetika – ELEM, and Skopski Leguri, the former steel manufacturing complex, are supplied water for their uses directly from Rasche spring. Skopski Leguri is also supplied water by Vodovod.

(2) Water consumption by purpose

The purposes for which these industries use water include production (55%), cooling (30%), sanitary (13%), cleaning (2%) and other (less than 1%) (Figure 3.3).

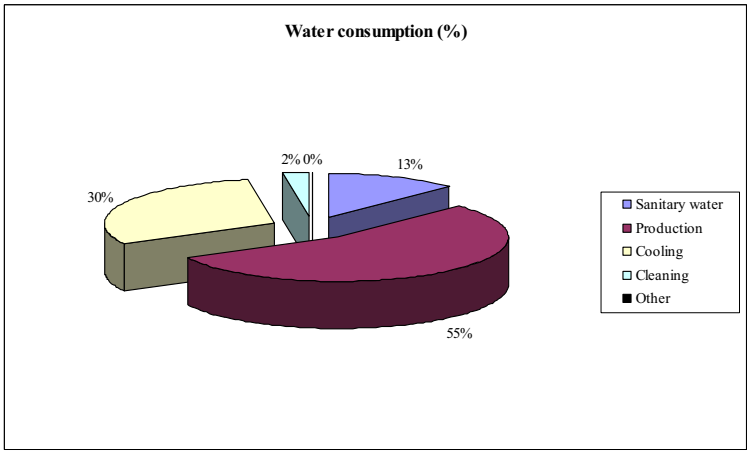

Figure 3.3 Water Consumption by Purpose

(3) Water consumption by type of industry

Table 3.8 Water Consumption by Type of Industry

Type of Industry	Water Consumption (m^3/year)	Rate of Water Consumption (%)
Energy Industries	665,491	4
Production and Processing of Metals	11,654,602	66
Mineral Industry	395,000	2
Chemical Industry	2,552,601	14
Waste Management	9,025	0
Other Activities under IPPC (Food, Paper Industry)	1,466,817	8
Other (Services)	1,134,969	6
Total	17,878,505	100

Metals Production and processing industries are the maximum water consuming industries in Skopje. Out of the total water used by surveyed 50 installations, more than 66% is used by only seven metal producing and processing plants (Figure 3.4). It is because 11,351,653 m^3/y (64% of total consumption of 50 surveyed installations) is consumed by former steel manufacturing complex including Arcelormittal, Makstil, and Skopski Leguri.

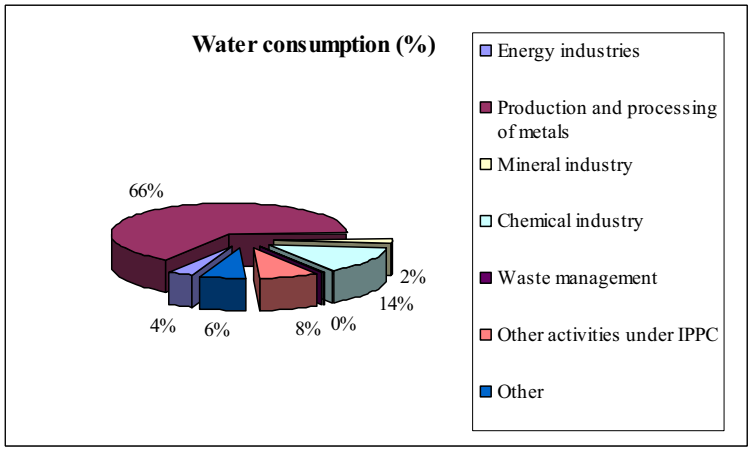

Figure 3.4 Water Consumption by Type of Industry

(4) Wastewater generation and ratio of wastewater generation

Wastewater generation from surveyed installations based on their types is presented in Table 3.9, for details "Industrial Survey Report" may be referred.

Table 3.9 Wastewater Generation by Type of Industry and Ratio of Wastewater Generation

Type of Industry	Wastewater Generation (m^3/y)	Ratio of Wastewater Generation (%)
Energy Industries	100,841	1
Production and Processing of Metals	5,856,897	59
Mineral Industry	368,000	4
Chemical Industry	1,295,777	13
Waste Management	34,254	13
Other Activities under IPPC (Food, Paper Industry)	1,280,821	10
Other (Services)	1,037,429	0
Total	9,974,019	100

Total wastewater generation from surveyed industries is 9,974,019 m^3/y. Of this, the wastewater from production and processing of metals contributes 59 % (Figure 3.5). This is due to the reason that 56 % of total wastewater generation from 50 surveyed installations is contributed by former steel manufacturing complex including Arcelormittal, Makstil, and Skopski Leguri.

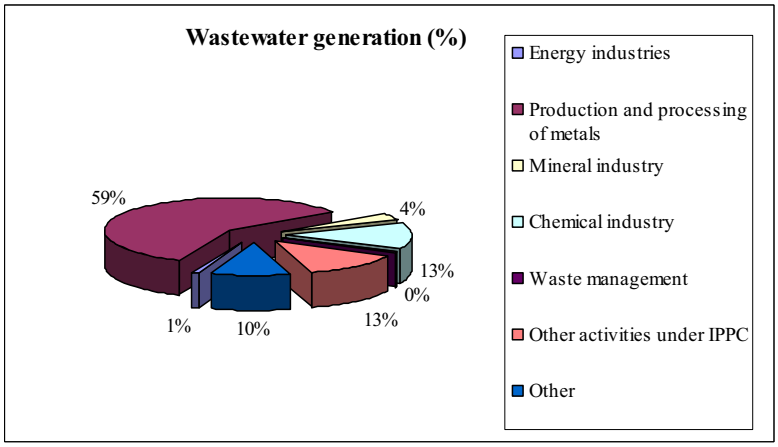

Figure 3.5 Wastewater Generation Ratio by Type of Industry

(5) Wastewater generation ratio by purpose

Percentage of wastewater generated from different purposes of water use is illustrated in Figure 3.6. As can be observed in Figure 3.6, wastewater generation from production units is the highest (59 %), that from sanitary uses (20 %) comes the next and that from cooling purposes contributes 18 %.

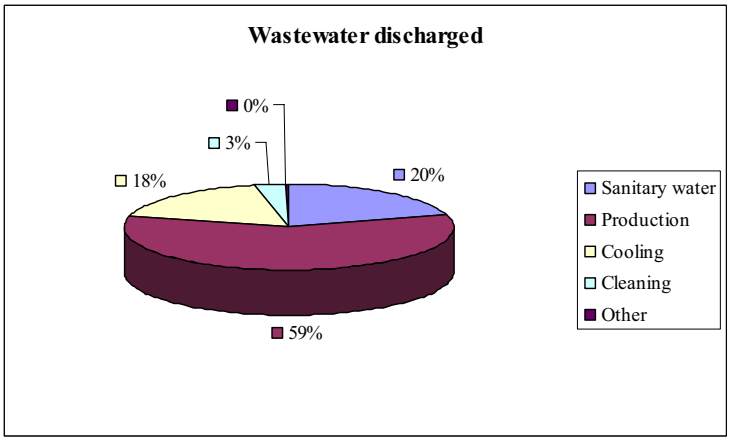

Figure 3.6 Wastewater Generation by Purpose

(6) The ratio of wastewater generation to water consumption by type of industry

Figure 3.7 shows the ratio of wastewater generation to water consumption by type of industries using values from Table 3.8 and Table 3.9.

Table 3.10 Wastewater Generation Ratio (Wastewater Generation/Water Consumption %)

Type of Industry	Water Consumption (m^3/year)	Wastewater Generation (m^3/year)	Wastewater Generation Ratio (%)
Energy Industries	665,491	100,841	15
Production and Processing of Metals	11,654,602	5,856,897	50
Mineral Industry	395,000	368,000	93
Chemical Industry	2,552,601	1,295,777	51
Waste Management	9,025	34,254	380[Note1]
Other Activities under IPPC (Food, Paper Industry)	1,466,817	1,280,821	87
Other (Services)	1,134,969	1,037,429	91
Total	17,878,505	9,974,019	

Note1 : Waste disposal site, including leachate

Table 3.10 indicates that among surveyed installations, wastewater generation ratios of energy industries, metal production and processing industries, and chemical industry are relatively lower and those of mineral industry, food industry, paper processing industry and services industries are high.

The average wastewater generation ratio to water consumption is 65 %, excluding the case of waste disposal site.

(7) Wastewater generation and load by Industrial Survey

The data of water quality of industrial effluents is necessary to estimate the current pollution load from industrial sector. However, continuous monitoring record of such data for these industries based on their own sampling and analysis, or even in MEPP central laboratory is not available sufficiently until now. Even if some data are available in MEPP information center, these include information on only some of the general parameters such as pH, COD, SS, NO_3-N, NO_2-N, PO_4, BOD, etc., and heavy metals such as Fe, Mn, Cr, etc. Also, even for these parameters, the levels of recorded values of BOD seem to be too low, if compared to similar cases in Japan. In addition, the reliability of analysis results of other parameters seems to be suspicious.

The Study Team estimated industrial wastewater quality of each surveyed installations by referring to the followings.

1) IPPS method (The Industrial Pollution Projection System): This method is normally used by the WB to estimate the levels of BOD, SS and toxic pollution intensity based on the type of industry under ISIC (International Standard of Industrial Classification), amount of generated wastewater, and the number of employees.（Refer to Appendix Part I, 3.7 for estimation of pollutants load by this method）
2) Existing analysis results (Refer to "Industrial Survey Report"）
3) Editorial Committee of Pollution Prevention Techniques and Laws; Table 1.7 to 1.11, Revision 5th of Pollution Prevention Techniques and Laws, Water Quality, for a series of lectures for qualifying pollution controller, 1995（Refer to Appendix Part I, 3.8）
4) List of raw materials, chemicals, etc. in the industrial survey
5) Analysis experiences in Japan. BOD level in metal processing industry is ignored in 3); however, anti-erosion, surfactant, etc. are measured as BOD.

On the basis of the result, 1) was evaluated to be inappropriate because calculated BOD level is too low even in case of food industries. As a principle, in case when there are some analysis results, after the comparison of the maximum level and 3), a figure is estimated. In case when there is no data, a figure is estimated with comprehensive considerations of 3) to 5). Detailed estimation process is explained in Appendix Part I, 3.9.

However, it is important to mention here that classification of industry by NACE being used in Macedonia is not always the same as the classification by ISIC or that of 3). Also, all raw materials and chemicals are not completely declared and all information of products is not completely included in this Survey.

Table 3.11 includes the summary of current pollution load of fifty (50) surveyed installations in terms of BOD and SS estimated by the quantity of generated wastewater and using estimations of quality as mentioned above. Table 3.11 shows the ratio of pollution loads by type of industries.

Table 3.11 Current Pollution Load Estimation of 50 Surveyed Industries

Type of Industry	Wastewater Generation (m^3/d) *	BOD Load (kg/d)	SS Load (kg/d)
Energy Industries	380	31	94
Production and Processing of Metals	16,199	735	3,936
Mineral Industry	1,008	30	202
Chemical Industry	4,044	1,006	614
Waste Management	94	5.6	11
Other Activities under IPPC (Food, Paper Industry)	3,751	1,821	1,679
Other (Services)	2,988	407	910
Total	28,464	4,039	7,447

* Annual wastewater generation/ operation days of each installation. Calculation of daily and hourly peaks of wastewater generation of each installation needs detailed data processing by water consumption using records of many years of each installation. However, it is impossible to do it due to lack of time and data of each installations. Therefore, the Study Team only calculated daily and hourly wastewater generation of each installation from the Industrial Survey. (Refer to Appendix Part I, 3.12) Regarding the seasonal fluctuation, only five (5) installations answered that they hope to discharge their wastewater into sewer in the future. As a result, it was ignored because their ratio to total amount of wastewater generation from fifty (50) is only 0.2 %, although there will be hourly, daily and seasonal fluctuations. Grasping and supervision of the operations of each installation is the key in IPPC system; the data will be gathered gradually from 2008 with financial resources.

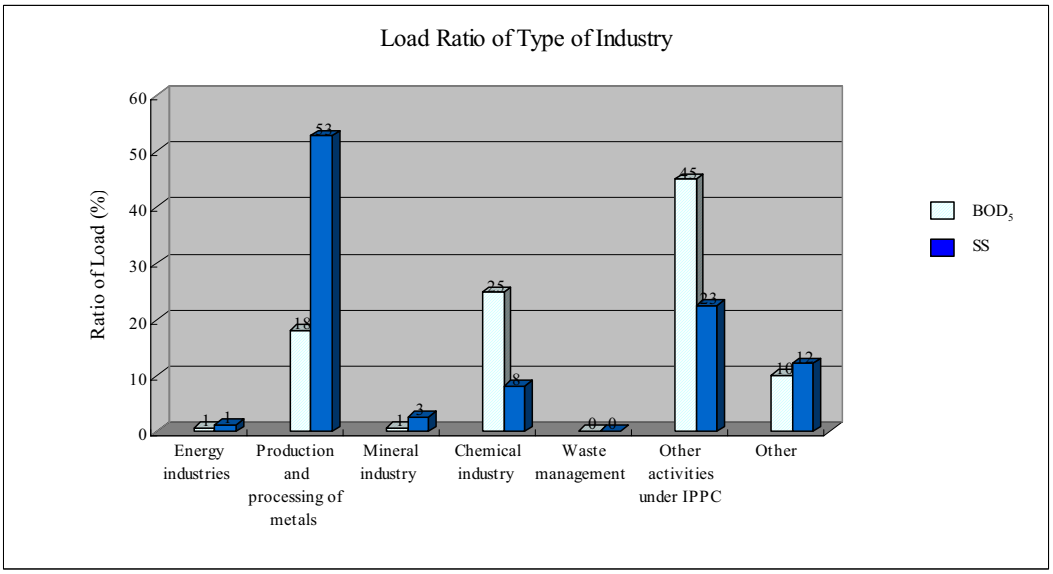

Figure 3.7 Load Ratio by Type of Industry

In Figure 3.7 it is observed that BOD load ratio is high in food industry and paper processing industry among other activities under IPPC (45 %), and chemical industry (25 %). On the other hand, SS load ratio is high in production and processing industries of metals (53 %), and in other activities under IPPC (23 %).

3.3.2 Wastewater Outlet Survey

The Study team firstly confirmed the locations and wastewater discharge quantities of approximately fifty (50) outlets through visual survey **(**Refer to Appendix Part I, 2.9). After that, the outlets with large amount of wastewater discharge and fairly bad water quality were selected based on the information of Vodovod's water quality laboratory that has been analyzing water quality of major outlets every month. Among the selected outlets, one is the private outlet of Arcelomittal Steel, Makstil, Skopski Leguri and Energetika Elem. Also, a major main sewer on the left bank of the Vardar River, including industrial wastewater from beer and food installations is selected.

The amount of industrial wastewater discharge from Arcelomittal Steel, Makstil, Skopski Leguri and Energetika Elem was calculated to be approximately 0.9 m^3/sec (approximately 80,000 m^3/d) on the basis of two times survey including 24 hours' continuous measurement, although self-declaration was 15,625 m_3/d of wastewater discharge. According to Vodovod, this amount is almost the same as the direct water supply from Rasche spring. Rasche spring is the common water supply source of Vodovod but direct supply is out of Vodovod's scope.

3.3.3 Estimation of Current Industrial Wastewater Generation (Correction of the Result of the Industrial Survey)

Total wastewater generation from the 50 installations surveyed was 28,464 m^3/d. Taking into consideration that the values of industrial wastewater generation gathered from the Industrial Survey is expected to cover 65 % of the wastewater generation of the entire installations within the City. Accordingly, wastewater generation excluding the one from the four steel related companies was estimated 24,300 m^3/d.

Although the detail estimation process is shown in Appendix Part I, 3.12, the outline of the calculation is as following.

(1) Total industrial wastewater generation from the Industrial Survey: 28,464 m^3/d
(2) Assuming the amount above is equivalent to 65 % of the total industrial wastewater generation: total generation is 43,791 m^3/d
(3) Industrial wastewater generation by self-declaration of the six enterprises: 19,494 m^3/d
(4) Industrial wastewater generation excluding those of the above two enterprises: 24,296 m^3/d

3.3.4 Estimation of Current Average Industrial Wastewater Quality for the Estimation of Pollution Load to Sewer in Future

The Study Team estimated that the current average industrial wastewater quality is 209 mg/l of BOD and 355 mg/l of SS, excluding the six specified industries Arcelormittal、MakStill、Skopski Leguri、Energetika Elem、OhisAD、Pivara）that have plan to discharge their wastewater directly to Vardar River after treating by their own treatment plants in future.
Although the detail estimation process is shown in Appendix Part I, 3.11, the outline of the calculation is listed as follows.

(1) Industrial wastewater generation excluding those of the six enterprises that have plan to discharge their wastewater directly to Vardar River after treating by their own treatment plants in future: 8,970 m^3/d
(2) Current BOD level excluding that of the six enterprises that have plan to discharge their wastewater directly to Vardar River after treating by their own treatment plants: 1,874 kg/d
(3) Current SS level excluding that of the six enterprises that have plan to discharge their wastewater directly to Vardar River after treating by their own treatment plants: 3,185 kg/d
(4) From the above, current BOD and SS levels are calculated as 209 mg/l and 355 mg/l, respectively.

3.4 Estimation of Industrial Wastewater Generation and Quality in Future

3.4.1 Industrial Growth Rate

In order to estimate the future industrial wastewater generation, it is required to consider industrial growth rate. However, official long-term estimation of industrial growth rate is not available.

In the four year plan (Program of the Government 2006-2010) by the prime minister's office, high value of annual growth rate of 6 - 8 % is presented.

National Development Plan (2007-2009), three year's investment plan, by Ministry of Finance does not mention the current value of growth rate. Although, values of growth rate in past have been described in the Report. It could be said that Macedonian economy is growing positively since 1996 after the initial transition-induced recession. The growth rate has been rather poor between 1996 and 2003. The growth has been increasing since 2004 and about 4% annual growth rate was experienced in 2005.

According to the industrial growth rate (Refer to Figure 3.8), in last few years, the minimum growth was experienced in 2002 and it increased by 13 % (annual average of 3.25 %) from the year 2002 to 2006.

Source: Statistical Review: Industry and Energy, Industry 2001-2006, Republic of Macedonia State Statistics Office, June 2007

Figure 3.8 Industrial Growth Rate by Year

Considering these points, the Study Team assumed the annual industrial growth rate of 3.5 % until year 2020 and the same rate of increase was considered for increase of industrial wastewater generation.

3.4.2 Future Industrial Wastewater Generation to Sewer

In addition, reduction of water consumption and improvement in water quality by the activities of CP (Cleaner Production) was assumed as 15 % and 20 %, respectively until year 2020. Consequently, wastewater generation, the levels of BOD and SS were calculated to be approximately 24,300 m^3/d, 167 and 284 mg/l, respectively. Accordingly, the industrial wastewater loads to sewer in year 2020 were computed to be approximately 5,399 and 9,175 kg/d.

Although the detail estimation process is shown in Appendix Part I, 3.12, the outline of the calculation is listed as the followings.

(1) Industrial wastewater generation excluding those of the six enterprises that have plan to discharge their wastewater to sewer in future: 24,296 m^3/d
(2) Increase in ratio of industrial wastewater generation from 2007 to 2020: 156 % of the current generation（Assuming 3.5 % of annual increase）
(3) Estimated industrial wastewater generation in 2020: 37,999 m^3/d
(4) Expected decrease in industrial wastewater generation by CP: 15%
(5) Accordingly, estimated industrial wastewater generation in 2020: 32,299 m^3/d
(6) Current levels of BOD and SS of the enterprises that have plan to discharge their wastewater to sewer in future: BOD 209 mg/l, SS 355 mg/l
(7) Expected improvement in industrial wastewater quality by CP: 20 %
(8) Accordingly, BOD 167 mg/l, SS 284 mg/l in 2020
(9) Consequently, BOD and SS load is calculated as 5,399 kg/d, 9,175 kg/d, respectively.

3.4.3 Receiving Industrial Wastewater to Sewer and Self-treatment

Surveyed fifty (50) installations were classified into two categories. In one of these categories, the effluent from installations can be accepted in public sewerage system with pre-treatment if required and for other category, the enterprises would be required to have its own treatment plant and treated effluent could be discharged directly to Vardar River. Six (6) enterprises were considered to be under later category that can discharge treated industrial effluent directly to Vardar River.

- Enterprises that have their own treatment plants at present or have a plan to construct one in future and want to discharge directly into Vardar River: Ohis AD (No.29 in the Industrial Survey-Refer to Appendix 2.9) that has self treatment plant at present. However, considering the actual data (CODMn: 220 mg/l), estimated BOD of 100 mg/l and 80 mg/l of SS, rehabilitation will be necessary. Another one is Pivara. (No. 27 in the Industrial Survey in

Appendix 2.9) which has a plan to construct its own treatment plant to discharge effluent directly to Vardar River.

- Installations that discharge large amount of industrial wastewater with little organic matter content in the effluent: Arcelormittal, Makstil, Skopski Leguri、Energetika Elem (steel production related enterprises) want to discharge their industrial wastewater to public sewerage system and are willing to pay for sewerage services. However, industrial wastewater generated from these four (4) factories contributes 55 % of total discharge of fifty (50) surveyed installations. According to the actual wastewater discharge survey, those two factories discharge approximately 88, 000 m^3/d. This amount is equivalent to more than 80 % of the total municipal wastewater generation. Estimated BOD is relatively low, 45 mg/l, and their industrial wastewater should be considered as inorganic one with low concentration of organic matters. Even if they construct pre-treatment facilities, it will not be appropriate to allow the effluents from these factories to flow into public sewerage system because this will result into extremely low level of BOD in inflow to the municipal WWTP (wastewater treatment plant) causing deterioration of WWTP treatment performance and increased flow will certainly increase the capacity and cost of WWTP.

Although more accurate data is necessary to arrive at any final conclusion, considering both quality and quantity of wastewater from surveyed installations, which is very limited but only available data now, the Study Team concluded that it would be possible for municipal WWTP to accept industrial wastewater from surveyed installations, except the six (6) specified factories, with necessary pre-treatment[1].

3.4.4 Estimation of Discharge Load to Vardar River with and without Sewage and Industrial Wastewater Treatment

Table 3.13 shows the result of load estimation based on the assumptions listed in Table 3.12. The detail on calculation and result is included in Appendix Part I, 3.11 to 3.13 “Load estimation to sewage treatment plant and environment”.

Table 3.12 Assumptions in Load Estimation to the River

Present load	Discharge amount by steel related industries (Arcelormittal Steel, Makstil, Skopski Leguri、Energetika Elem)	0.935m^3/s
Load in year 2020	Increase of the four steel related industries	No increase because the current operation is almost 100 %.
	Decrease of wastewater generation of the four steel related industries by CP, etc,	5% compared to the present time
	Water quality improvement of the four steel related industries by CP, etc.	10 % compared to the present time
	Wastewater generation from other industries	3.5 % annually
	Decrease of generated wastewater from other industries by CP, etc,	15% compared to the present time
	Water quality improvement of other industries by CP, etc.	20 % compared to the present time
Load in Year 2030	Increase of the four steel related industries	No increase because the current operation is almost 100 %.
	Decrease of wastewater generation of the four steel related industries by CP, etc,	10 % compared to the present time
	Water quality improvement of the four steel related industries by CP, etc.	15 % compared to the present time
	Wastewater generation of other industries	3.5 % annually
	Decrease of wastewater generation of other industries by CP, etc,	35% compared to the present time
	Water quality improvement of other industries by CP, etc.	35 % compared to the present time

[1] PE can regulate the discharge criteria to sewer; however; the criteria of the toxic parameters which can not be removed by sewage treatment plant which mainly can treat organic matters in terms of BOD, like heavy metals, should be the same as the discharge criteria from sewage treatment plant.

Table 3.13 Estimated Load by Industrial Wastewater to Vardar River (kg/d)

		Without Treatment		With Treatment**	
		BOD	SS	BOD	SS
Present	The two steel related industries	3,660	20,066		
	Privala and Ohis AD	1,457	381		
	Others	5,077	8,627		
	Total of present load	10,194	29,074	0	0
In 2020	The two steel related industries	3,130	17,157	1,919	2,686
	Privala and Ohis AD	1,550	405	129	180
	Others*	5,399	9,175	807	1,130
	Total load in 2020	10,078	26,736	2,855	3,997
In 2030	The two steel related industries	2,800	15,351	1,818	2,545
	Privala and Ohis AD	1,358	355	139	194
	Others*	4,732	8,041	871	1,219
	Total load in 2030	8,890	23,747	2,827	3,958

* Installations acceptable to sewer
** Tentative discharge criteria. BOD 25 mg/l, SS 35 mg/l (EU Guidline)

Although the detail estimation process is indicated in Appendix Part I, 3.11 to 3.13, the outline of the calculation is listed as follows.

(1) The calculation process of the installations (sewer discharge), excluding the four steel installations and Privevala and Ohis AD is in accordance with the one in 3.4.2.
(2) Regarding the industrial wastewater generation from the two steel related installations of which industrial wastewater will be discharged directly to Vardar River after their own treatment, actually measured figure of 0.935 m^3/sec (80,784 m^3/d) is used.
(3) The estimated current water quality of BOD and SS of 45 mg/l and 248 mg/l of the four steel related installations are used to compute the future water quality in accordance with the process in 3.4.2.
(4) As for the computation of the future industrial wastewater and quality of Privala and Ohis AD, the current average industrial wastewater generation in Industrial Survey and wastewater quality estimation is used. Average industrial wastewater of the two installations is 3,869 m^3/d and estimated average water quality of BOD and SS are 379 mg/l and 98 mg/l, respectively.
(5) The current and future loads are computed in accordance with the process in 3.4.2

CP (Cleaner Production)

CP is the key factor of IPPC and BAT system. Its adoption will be spread to enterprises with the progress of IPPC implementation. The spread of the system is the matter of Macedonian side. The Study Team proposes the establishment of financial resources. EU has been focusing on spread of the concepts of IPPC and BAT. There are some studies on CP in cement industry, etc. without detailed specifications of the facilities and there is no case of implementation of it with financial assistance. The implementation will require selection of a model installation, input of experts with fair time to invest in the current installations within the enterprise, and financial assistance. The Study Team considered such implementation impossible within this study period and only shall concentrate on introduction of examples of simple CP through seminar and workshop and assistance of preparation of examples of operation and maintenance of existing wastewater treatment plants, if the situation allows. MEPP has such ideas as financial assistance for imported wastewater treatment plants with tax reduction; however, it is not materialized because this is the matter of the Government's decision. However, environmental issue is the key point for Macedonia to join EU and Article 174 Purpose of Funds states that the Government shall provide financial assistance to CP. Hence, the Study Team expects that implementation of CP will be proceeded, if the financial assistance system is once established.

The reasons why the decrease rate of wastewater generation and water quality are different in Table 3.12 from the type of industry and the year are based on the following assumptions.

(1) The steel related enterprises have been promoting water recirculation. This is reason that the decrease rate is set smaller than those of other enterprises.
(2) Sewerage M/P states that 30 to 40 % of the pollution load reduction will be possible from the EU's experiences by CP, etc., however, the Study Team considered it will be impossible in 2020 with the consideration that the new Law on water will be put in to practice in 2010.
(3) As for other industries, the Study Team assumed the decease rates of wastewater generation and water quality of the other industries to be 15 % and 20 %, respectively, after estimation of wastewater generation in 2020 with the annual increase of wastewater generation of 3.5 %.
(4) Food industry has not implemented water recirculation until now; however, the Study Team expects that the assumed figures will be realized as the total through the implementation of IPPC and BAT system in the target year.

3.5 Type of Industry to Classify A and B under IPPC

Based on Article 95 paragraph (1) and article 135 paragraph (5) of the Law on environment (Official Gazette of Republic of Macedonia no.53/05), the Government of the Republic of Macedonia adopted the following

DECREE
For determining the activities of the installations requiring an integrated environmental permit, i.e. adjustment permit with an adjustment plan and time schedule for submission of application for adjustment permit with an adjustment plans

Article 1

(1)This Decree sets out/determines the activities of the new installations or the substantial changes of the existing installations, which can be carried out only when an integrated environmental permit, i.e. adjustment permit with an adjustment plan is issued by the competent authority, and sets out the time schedule for submission of application for issuing an adjustment permit with an adjustment plan.
(2) This Decree does not cover the activities of installations or parts of installations used for research, development and testing of new products and processes

Article 2

The activities either involving a new installation or substantial changes to an existing installation which requires an A an integrated environmental permit is set out in Annex I of this Decree, which is part of this Decree.

Article 3

The activities either for a new installation or substantial changes to an existing installation which require a B integrated environmental permit are determined in Annex II of this Decree, which is part of this Decree.

Article 4

The threshold values given in Annex 1 and 2 of this Decree refer to production capacities and to capacities which are part of the production capacities. If one operator carries out several activities falling under a same industrial sector in the same installation or in the same site, the capacities of such activities are added together.

Article 5

(1) Existing installations that carry out activities for which an A integrated environmental permit, i.e. B integrated environmental permit for installation in a protected area is issued, as well as existing installations for which a B integrated environmental permit is required, submit an application for adjustment permit with an adjustment plan to the competent authority, in a time period of 6 months determined for each industrial sector, as follows:

1. Installations set out/determined in:

Annex 1 item 2;
Annex 1 item 6.3;
Annex 2 item 2, and
Annex 2 item 6.3, of this Decree,

the application for issuing an adjustment permit with an adjustment plan from paragraph (1) of this article have to submit in the time period from 01.01.2006 until 01.07.2006.

2. Installations set out/determined in:

Annex 1 item 1;
Annex 1 item 6.6 (a);
Annex 2 item 1, and
Annex 2 item 6.6 (a), of this Decree,

the application for issuing an adjustment permit with an adjustment plan from paragraph (1) of this article have to submit in the time period from 01.07.2006 until 31.12.2006.

3. Installations set out/determined in:

Annex 1 item 3;
Annex 2 item 3, of this Decree,

the application for issuing an adjustment permit with an adjustment plan from paragraph (1) of this article have to submit in the time period from 01.01.2007 until 01.07.2007.

4. Installations set out/determined in:

Annex 1 item 4;
Annex 2 item 4, of this Decree,

the application for issuing an adjustment permit with an adjustment plan from paragraph (1) of this article have to submit in the time period from 01.07.2007 until 31.12.2007.

5. Installations set out/determined in:

Annex 1 item 6.1;
Annex 1 item 6.2;
Annex 1 item 6.4;
Annex 1 item 6.5;

Annex 1 item 6.6 (b) and (c);
Annex 1 item 6.7;
Annex 1 item 6.8;
Annex 2 item 6.1;
Annex 2 item 6.2;
Annex 2 item 6.4;
Annex 2 item 6.5;
Annex 2 item 6.6 (b) and (c);
Annex 2 item 6.7 of this Decree,

the application for issuing an adjustment permit with an adjustment plan from paragraph (1) of this article have to submit in the time period from 01.01.2008 until 01.07.2008.

6. Installations set out/determined in:

Annex 1 item 5;
Annex 2 item 5, of this Decree,

the application for issuing an adjustment permit with an adjustment plan from paragraph (1) of this article have to submit in the time period from 01.07.2008 until 31.12.2008.

Article 6

This Decree enters into force the day after its publication in the "Official Gazette of Republic of Macedonia".

	President of the Government of the Republic of Macedonia **Vlado Buckovski, PhD**

ANNEX I
Activities of Installations that Require A Integrated Environmental Permit

1. Energy industries

1.1. Combustion installations with a rated thermal input exceeding 50 MW
1.2. Mineral oil and gas refineries
1.3. Coal gasification and liquefaction plants

2. Production and processing of metals

2.1. Metal ore (including sulphide ore) roasting or sintering installations
2.2. Installations for the production of pig iron or steel (primary or secondary fusion) including continuous casting, with a capacity exceeding 2,5 tonnes per hour
2.3. Installations for the processing of ferrous metals:
(a) hot-rolling mills with a capacity exceeding 20 tonnes of crude steel per hour
(b) smitheries with hammers the energy of which exceeds 50 kilo joule per hammer, where the calorific power used exceeds 20 MW
(c) application of protective fused metal coats with an input exceeding 2 tonnes of crude steel per hour
2.4. Ferrous metal foundries with a production capacity exceeding 20 tonnes per day
2.5. Installations
(a) for the production of non-ferrous crude metals from ore, concentrates or secondary raw materials by metallurgical, chemical or electrolytic processes
(b) for the smelting, including the alloyage, of non-ferrous metals, including recovered products, (refining, foundry casting, etc.) with a melting capacity exceeding 4 tonnes per day for lead and cadmium or 20 tonnes per day for all other metals
2.6. Installations for surface treatment of metals and plastic materials using an electrolytic or chemical process where the volume of the treatment vats exceeds 30 m^3

3. Mineral industry

3.1. Installations for the production of cement clinker in rotary kilns with a production capacity exceeding 500 tonnes per day or lime in rotary kilns with a production capacity exceeding 50 tonnes per day or in other furnaces with a production capacity exceeding 50 tonnes per day
3.2. Installations for the manufacture of glass including glass fibre with a melting capacity exceeding 20 tonnes per day
3.3. Installations for melting mineral substances including the production of mineral fibres with a melting capacity exceeding 20 tonnes per day
3.4. Installations for the manufacture of ceramic products by firing, in particular roofing tiles, bricks, refractory bricks, tiles, stoneware or porcelain, with a production capacity exceeding 75 tonnes per day, and/or with a kiln capacity exceeding 4 m^3 and with a setting density per kiln exceeding 300 kg/m^3
3.5. Stationary asphalt bases.
3.6 Installations for the production of asbestos and the manufacture of asbestos-based products

4. Chemical industry

Production within the meaning of the categories of activities contained in this section means the production on an industrial scale by chemical processing of substances or groups of substances listed in Sections 4.1 to 4.6

4.1. Chemical installations for the production of basic organic chemicals, such as:
(a) simple hydrocarbons (linear or cyclic, saturated or unsaturated, aliphatic or aromatic)
(b) oxygen-containing hydrocarbons such as alcohols, aldehydes, ketones, carboxylic acids, esters, acetates, ethers, peroxides, epoxy resins
(c) sulphurous hydrocarbons
(d) nitrogenous hydrocarbons such as amines, amides, nitrous compounds, nitro compounds or

nitrate compounds, nitrites, cyanates, isocyanates
(e) phosphorus-containing hydrocarbons
(f) halogenic hydrocarbons
(g) organometallic compounds
(h) basic plastic materials (polymers synthetic fibres and cellulose-based fibres)
(i) synthetic rubbers
(j) dyes and pigments
(k) surface-active agents and surfactants

4.2. Chemical installations for the production of basic inorganic chemicals, such as:
(a) gases, such as ammonia, chlorine or hydrogen chloride, fluorine or hydrogen fluoride, carbon oxides, sulphur compounds, nitrogen oxides, hydrogen, sulphur dioxide, carbonyl chloride
(b) acids, such as chromic acid, hydrofluoric acid, phosphoric acid, nitric acid, hydrochloric acid, sulphuric acid, oleum, sulphurous acids
(c) bases, such as ammonium hydroxide, potassium hydroxide, sodium hydroxide
(d) salts, such as ammonium chloride, potassium chlorate, potassium carbonate, sodium carbonate, perborate, silver nitrate
(e) non-metals, metal oxides or other inorganic compounds such as calcium carbide, silicon, silicon carbide

4.3. Chemical installations for the production of phosphorous-, nitrogen- or potassium-based fertilizers (simple or compound fertilizers)
4.4. Chemical installations for the production of basic plant health products and of biocides
4.5. Installations using a chemical or biological process for the production of basic pharmaceutical products
4.6. Chemical installations for the production of explosives

5. Waste management

5.1. Installations for the disposal, incineration, burning or processing of hazardous waste
5.2. Installations for the disposal of hazardous waste with a capacity exceeding 500 kilograms per day
5.3. Installations for the incineration of municipal waste or other non-hazardous waste.
5.4. Installations for the disposal of communal or other non-hazardous waste, except quarry waste.
5.5 Installations for removing animal waste
5.6 Installations for mines waste management

6. Other activities

6.1. Installations for the production of:
(a) pulp from timber or other fibrous materials
(b) paper and board

6.2. Installations for the pre-treatment (operations such as washing, bleaching, mercerization) or dyeing of fibres or textiles where the treatment capacity exceeds 1 tonnes per day
6.3. Installations for the tanning of hides and skins where the treatment capacity exceeds 12 tonnes of finished products per day
6.4. (a) Slaughterhouses
(b) Treatment and processing intended for the production of food products from
- animal raw materials (other than milk) with a finished product production capacity greater than 5 tonnes per day
- vegetable raw materials with a finished product production capacity greater than 50 tonnes per day (average value on a quarterly basis)
- vegetable oil with production capacity equal or greater than 50 tonnes per day
- Beer production with production capacity equal or greater than 50 tonnes per day

(c) Treatment and processing of milk, the quantity of milk received being greater than 50 tonnes per day (average value on an annual basis)

6.5. Installations for the disposal or recycling of animal carcases and animal waste
6.6. Installations for the intensive rearing of poultry or pigs with more than:

(a) 40 000 places for poultry
(b) 2 000 places for production pigs (over 30 kg), or
(c) 750 places for sows

6.7. Installations for the surface treatment of substances, objects or products using organic solvents, in particular for dressing, printing, coating, degreasing, waterproofing, sizing, painting, cleaning or impregnating, with a consumption capacity of more than 150 kg per hour or more than 200 tonnes per year

6.8. Installations for the production of carbon (hard-burnt coal) or electrographite by means of incineration or graphitization

ANNEX II

Activities of installations requiring B integrated environmental permit

1. Energy industries

1 installations with a rated thermal input exceeding 5 MW and less then 50 MW

2. Production and processing of metals

2.1. Installations for the processing of ferrous metals:
(a) application of protective fused metal coats, regardless of the input of crude steel per hour

2.2. Ferrous metal foundries

2.3. Installations for the smelting, including the alloyage, of non-ferrous metals, including recovered products, (refining, foundry casting, etc.) with a melting capacity of less than 4 tonnes per day for lead and cadmium, or less than 20 tonnes per day for all other metals

2.4. Installations for surface treatment of metals and plastic materials using an electrolytic or chemical process where the volume of the treatment vats exceeds less than 30 m^3

3. Mineral industry

3.1. Installations for the production of cement clinker in rotary kilns with a production capacity not exceeding 500 tonnes per day or lime in rotary kilns or in other furnaces with a production capacity less than 50 tonnes per day.

3.2. Quaries

3.3. Stationary ready mixed concrete plants with aggregate capacity of cement silos bigger than 50m3.

3.4. Installations for the production of glass including glass fibre with a melting capacity less than 20 tonnes per day

3.5. Installations for melting mineral substances including the production of mineral fibres with a melting capacity less than 20 tonnes per day

3.6. Installations for the manufacture of ceramic products by firing, in particular roofing tiles, bricks, refractory bricks, tiles, stoneware or porcelain, with a production capacity less than 75 tonnes per day.

3.7. Vapour glazing earthenware or clay with salts.

4. Chemical industry

4.1. Cutting polyurethane foams or polyurethane elastomers with heated wires.

5. Other activities

5.1. Installations for the pre-treatment (operations such as washing, bleaching, mercerization) or dyeing of fibres or textiles where the treatment capacity is less than 10 tonnes per day

5.2. Installations for the tanning of hides and skins where the treatment capacity is less than 12 tonnes of finished products per day

5.3. (a) Slaughterhouses with a carcase production less than 50 tonnes per day
(b) Treatment and processing intended for the production of food products from:
- animal raw materials (other than milk) with a finished product production capacity less than 5 tonnes per day
- vegetable raw materials with a finished product production capacity between 1 and 50 tonnes per day (average value on a quarterly basis)

(c) Treatment and processing of milk, the quantity of milk received between 20 and 200 tonnes per day (average value on an annual basis)

5.4. Installations for the disposal or recycling of animal carcases and animal waste.

5.5. Installations for the intensive rearing of poultry or pigs with a capacity between:

(a) 5000 and 40 000 places for poultry

(b) 100 and 2 000 places for production pigs (over 30 kg), or

(c) 50 and 750 places for sows

5.6. Installations for the surface treatment of substances, objects or products using organic solvents, in particular for dressing, printing, coating, degreasing, waterproofing, sizing, painting, cleaning or impregnating, with a consumption capacity between 10 and 150 kg per hour

3.6 NACE Codes

Section A : Agriculture, hunting and forestry

- 01 : Agriculture, hunting and related service activities
  - 01.1 : Growing of crops; market gardening; horticulture
  - 01.11 : Growing of cereals and other crops n.e.c.
  - 01.12 : Growing of vegetables, horticultural specialities and nursery products
  - 01.13 : Growing of fruit, nuts, beverage and spice crops
  - 01.2 : Farming of animals
  - 01.21 : Farming of cattle, dairy farming
  - 01.22 : Farming of sheep, goats, horses, asses, mules and hinnies
  - 01.23 : Farming of swine
  - 01.24 : Farming of poultry
  - 01.25 : Other farming of animals
  - 01.3 : Growing of crops combined with farming of animals (mixed farming)
  - 01.30 : Growing of crops combined with farming of animals (mixed farming)
  - 01.4 : Agricultural and animal husbandry service activities, except veterinary activities
  - 01.41 : Agricultural service activities
  - 01.42 : Animal husbandry service activities, except veterinary activities
  - 01.5 : Hunting, trapping and game propagation, including related service activities
  - 01.50 : Hunting, trapping and game propagation, including related service activities
- 02 : Forestry, logging and related service activities
  - 02.0 : Forestry, logging and related service activities
  - 02.01 : Forestry and logging
  - 02.02 : Forestry and logging related service activities

Section B : Fishing

- 05 : Fishing, operation of fish hatcheries and fish farms; service activities incidental to fishing
  - 05.0 : Fishing, operation of fish hatcheries and fish farms; service activities incidental to fishing
  - 05.01 : Fishing
  - 05.02 : Operation of fish hatcheries and fish farms

Section C : Mining and quarrying SubSection CA : Mining and quarrying of energy producing materials

- 10 : Mining of coal and lignite; extraction of peat
  - 10.1 : Mining and agglomeration of hard coal
  - 10.10 : Mining and agglomeration of hard coal
  - 10.2 : Mining and agglomeration of lignite
  - 10.20 : Mining and agglomeration of lignite
  - 10.3 : Extraction and agglomeration of peat
  - 10.30 : Extraction and agglomeration of peat
- 11 : Extraction of crude petroleum and natural gas; service activities incidental to oil and gas extraction, excluding surveying
  - 11.1 : Extraction of crude petroleum and natural gas
  - 11.10 : Extraction of crude petroleum and natural gas
  - 11.2 : Service activities incidental to oil and gas extraction, excluding surveying
  - 11.20 : Service activities incidental to oil and gas extraction, excluding surveying
- 12 : Mining of uranium and thorium ores
  - 12.0 : Mining of uranium and thorium ores
  - 12.00 : Mining of uranium and thorium ores

SubSection CB : Mining and quarrying, except of energy producing materials

- 13 : Mining of metal ores
  - 13.1 : Mining of iron ores
  - 13.10 : Mining of iron ores
  - 13.2 : Mining of non-ferrous metal ores, except uranium and thorium ores
  - 13.20 : Mining of non-ferrous metal ores, except uranium and thorium ores
- 14 : Other mining and quarrying
  - 14.1 : Quarrying of stone
  - 14.11 : Quarrying of stone for construction
  - 14.12 : Quarrying of limestone, gypsum and chalk
  - 14.13 : Quarrying of slate

- 14.2 : Quarrying of sand and clay
- 14.21 : Operation of gravel and sand pits
- 14.22 : Mining of clays and kaolin
- 14.3 : Mining of chemical and fertilizer minerals
- 14.30 : Mining of chemical and fertilizer minerals
- 14.4 : Production of salt
- 14.40 : Production of salt
- 14.5 : Other mining and quarrying n.e.c.
- 14.50 : Other mining and quarrying n.e.c.

Section D : Manufacturing SubSection DA : Manufacture of food products, beverages and tobacco

- 15 : Manufacture of food products and beverages
  - 15.1 : Production, processing and preserving of meat and meat products
  - 15.11 : Production and preserving of meat
  - 15.12 : Production and preserving of poultrymeat
  - 15.13 : Production of meat and poultrymeat products
  - 15.2 : Processing and preserving of fish and fish products
  - 15.20 : Processing and preserving of fish and fish products
  - 15.3 : Processing and preserving of fruit and vegetables
  - 15.31 : Processing and preserving of potatoes
  - 15.32 : Manufacture of fruit and vegetable juice
  - 15.33 : Processing and preserving of fruit and vegetables n.e.c.
  - 15.4 : Manufacture of vegetable and animal oils and fats
  - 15.41 : Manufacture of crude oils and fats
  - 15.42 : Manufacture of refined oils and fats
  - 15.43 : Manufacture of margarine and similar edible fats
  - 15.5 : Manufacture of dairy products
  - 15.51 : Operation of dairies and cheese making
  - 15.52 : Manufacture of ice cream
  - 15.6 : Manufacture of grain mill products, starches and starch products
  - 15.61 : Manufacture of grain mill products
  - 15.62 : Manufacture of starches and starch products
  - 15.7 : Manufacture of prepared animal feeds
  - 15.71 : Manufacture of prepared feeds for farm animals
  - 15.72 : Manufacture of prepared pet foods
  - 15.8 : Manufacture of other food products
  - 15.81 : Manufacture of bread; manufacture of fresh pastry goods and cakes
  - 15.82 : Manufacture of rusks and biscuits; manufacture of preserved pastry goods and cakes
  - 15.83 : Manufacture of sugar
  - 15.84 : Manufacture of cocoa; chocolate and sugar confectionery
  - 15.85 : Manufacture of macaroni, noodles, couscous and similar farinaceous products
  - 15.86 : Processing of tea and coffee
  - 15.87 : Manufacture of condiments and seasonings
  - 15.88 : Manufacture of homogenized food preparations and dietetic food
  - 15.89 : Manufacture of other food products n.e.c.
  - 15.9 : Manufacture of beverages
  - 15.91 : Manufacture of distilled potable alcoholic beverages
  - 15.92 : Production of ethyl alcohol from fermented materials
  - 15.93 : Manufacture of wines
  - 15.94 : Manufacture of cider and other fruit wines
  - 15.95 : Manufacture of other non-distilled fermented beverages
  - 15.96 : Manufacture of beer
  - 15.97 : Manufacture of malt
  - 15.98 : Production of mineral waters and soft drinks
- 16 : Manufacture of tobacco products
  - 16.0 : Manufacture of tobacco products
  - 16.00 : Manufacture of tobacco products

SubSection DB : Manufacture of textiles and textile products

- 17 : Manufacture of textiles

- 17.1 : Preparation and spinning of textile fibres
- 17.11 : Preparation and spinning of cotton-type fibres
- 17.12 : Preparation and spinning of woollen-type fibres
- 17.13 : Preparation and spinning of worsted-type fibres
- 17.14 : Preparation and spinning of flax-type fibres
- 17.15 : Throwing and preparation of silk, including from noils, and throwing and texturing of synthetic or artificial filament yarns
- 17.16 : Manufacture of sewing threads
- 17.17 : Preparation and spinning of other textile fibres
- 17.2 : Textile weaving
- 17.21 : Cotton-type weaving
- 17.22 : Woollen-type weaving
- 17.23 : Worsted-type weaving
- 17.24 : Silk-type weaving
- 17.25 : Other textile weaving
- 17.3 : Finishing of textiles
- 17.30 : Finishing of textiles
- 17.4 : Manufacture of made-up textile articles, except apparel
- 17.40 : Manufacture of made-up textile articles, except apparel
- 17.5 : Manufacture of other textiles
- 17.51 : Manufacture of carpets and rugs
- 17.52 : Manufacture of cordage, rope, twine and netting
- 17.53 : Manufacture of non-wovens and articles made from non-wovens, except apparel
- 17.54 : Manufacture of other textiles n.e.c.
- 17.6 : Manufacture of knitted and crocheted fabrics
- 17.60 : Manufacture of knitted and crocheted fabrics
- 17.7 : Manufacture of knitted and crocheted articles
- 17.71 : Manufacture of knitted and crocheted hosiery
- 17.72 : Manufacture of knitted and crocheted pullovers, cardigans and similar articles

- 18 : Manufacture of wearing apparel; dressing and dyeing of fur
  - 18.1 : Manufacture of leather clothes
  - 18.10 : Manufacture of leather clothes
  - 18.2 : Manufacture of other wearing apparel and accessories
  - 18.21 : Manufacture of workwear
  - 18.22 : Manufacture of other outerwear
  - 18.23 : Manufacture of underwear
  - 18.24 : Manufacture of other wearing apparel and accessories n.e.c.
  - 18.3 : Dressing and dyeing of fur; manufacture of articles of fur
  - 18.30 : Dressing and dyeing of fur; manufacture of articles of fur

SubSection DC : Manufacture of leather and leather products

- 19 : Tanning and dressing of leather; manufacture of luggage, handbags, saddlery, harness and footwear
  - 19.1 : Tanning and dressing of leather
  - 19.10 : Tanning and dressing of leather
  - 19.2 : Manufacture of luggage, handbags and the like, saddlery and harness
  - 19.20 : Manufacture of luggage, handbags and the like, saddlery and harness
  - 19.3 : Manufacture of footwear
  - 19.30 : Manufacture of footwear

SubSection DD : Manufacture of wood and wood products

- 20 : Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials
  - 20.1 : Sawmilling and planing of wood; impregnation of wood
  - 20.10 : Sawmilling and planing of wood; impregnation of wood
  - 20.2 : Manufacture of veneer sheets; manufacture of plywood, laminboard, particle board, fibre board and other panels and boards
  - 20.20 : Manufacture of veneer sheets; manufacture of plywood, laminboard, particle board, fibre board and other panels and boards
  - 20.3 : Manufacture of builders' carpentry and joinery
  - 20.30 : Manufacture of builders' carpentry and joinery

- 20.4 : Manufacture of wooden containers
- 20.40 : Manufacture of wooden containers
- 20.5 : Manufacture of other products of wood; manufacture of articles of cork, straw and plaiting materials
- 20.51 : Manufacture of other products of wood
- 20.52 : Manufacture of articles of cork, straw and plaiting materials

SubSection DE : Manufacture of pulp, paper and paper products; publishing and printing

- 21 : Manufacture of pulp, paper and paper products
  - 21.1 : Manufacture of pulp, paper and paperboard
  - 21.11 : Manufacture of pulp
  - 21.12 : Manufacture of paper and paperboard
  - 21.2 : Manufacture of articles of paper and paperboard
  - 21.21 : Manufacture of corrugated paper and paperboard and of containers of paper and paperboard
  - 21.22 : Manufacture of household and sanitary goods and of toilet requisites
  - 21.23 : Manufacture of paper stationery
  - 21.24 : Manufacture of wallpaper
  - 21.25 : Manufacture of other articles of paper and paperboard n.e.c.
- 22 : Publishing, printing and reproduction of recorded media
  - 22.1 : Publishing
  - 22.11 : Publishing of books
  - 22.12 : Publishing of newspapers
  - 22.13 : Publishing of journals and periodicals
  - 22.14 : Publishing of sound recordings
  - 22.15 : Other publishing
  - 22.2 : Printing and service activities related to printing
  - 22.21 : Printing of newspapers
  - 22.22 : Printing n.e.c.
  - 22.23 : Bookbinding and finishing
  - 22.24 : Composition and plate-making
  - 22.25 : Other activities related to printing
  - 22.3 : Reproduction of recorded media
  - 22.31 : Reproduction of sound recording
  - 22.32 : Reproduction of video recording
  - 22.33 : Reproduction of computer media

SubSection DF : Manufacture of coke, refined petroleum products and nuclear fuel

- 23 : Manufacture of coke, refined petroleum products and nuclear fuel
  - 23.1 : Manufacture of coke oven products
  - 23.10 : Manufacture of coke oven products
  - 23.2 : Manufacture of refined petroleum products
  - 23.20 : Manufacture of refined petroleum products
  - 23.3 : Processing of nuclear fuel
  - 23.30 : Processing of nuclear fuel

SubSection DG : Manufacture of chemicals, chemical products and man-made fibres

- 24 : Manufacture of chemicals and chemical products
  - 24.1 : Manufacture of basic chemicals
  - 24.11 : Manufacture of industrial gases
  - 24.12 : Manufacture of dyes and pigments
  - 24.13 : Manufacture of other inorganic basic chemicals
  - 24.14 : Manufacture of other organic basic chemicals
  - 24.15 : Manufacture of fertilizers and nitrogen compounds
  - 24.16 : Manufacture of plastics in primary forms
  - 24.17 : Manufacture of synthetic rubber in primary forms
  - 24.2 : Manufacture of pesticides and other agro-chemical products
  - 24.20 : Manufacture of pesticides and other agro-chemical products
  - 24.3 : Manufacture of paints, varnishes and similar coatings, printing ink and mastics
  - 24.30 : Manufacture of paints, varnishes and similar coatings, printing ink and mastics
  - 24.4 : Manufacture of pharmaceuticals, medicinal chemicals and botanical products

- 24.41 : Manufacture of basic pharmaceutical products
- 24.42 : Manufacture of pharmaceutical preparations
- 24.5 : Manufacture of soap and detergents, cleaning and polishing preparations, perfumes and toilet preparations
- 24.51 : Manufacture of soap and detergents, cleaning and polishing preparations
- 24.52 : Manufacture of perfumes and toilet preparations
- 24.6 : Manufacture of other chemical products
- 24.61 : Manufacture of explosives
- 24.62 : Manufacture of glues and gelatines
- 24.63 : Manufacture of essential oils
- 24.64 : Manufacture of photographic chemical material
- 24.65 : Manufacture of prepared unrecorded media
- 24.66 : Manufacture of other chemical products n.e.c.
- 24.7 : Manufacture of man-made fibres
- 24.70 : Manufacture of man-made fibres

SubSection DH : Manufacture of rubber and plastic products

- 25 : Manufacture of rubber and plastic products
  - 25.1 : Manufacture of rubber products
  - 25.11 : Manufacture of rubber tyres and tubes
  - 25.12 : Retreading and rebuilding of rubber tyres
  - 25.13 : Manufacture of other rubber products
  - 25.2 : Manufacture of plastic products
  - 25.21 : Manufacture of plastic plates, sheets, tubes and profiles
  - 25.22 : Manufacture of plastic packing goods
  - 25.23 : Manufacture of builders' ware of plastic
  - 25.24 : Manufacture of other plastic products

SubSection DI : Manufacture of other non-metallic mineral products

- 26 : Manufacture of other non-metallic mineral products
  - 26.1 : Manufacture of glass and glass products
  - 26.11 : Manufacture of flat glass
  - 26.12 : Shaping and processing of flat glass
  - 26.13 : Manufacture of hollow glass
  - 26.14 : Manufacture of glass fibres
  - 26.15 : Manufacture and processing of other glass, including technical glassware
  - 26.2 : Manufacture of non-refractory ceramic goods other than for construction purposes; manufacture of refractory ceramic products
  - 26.21 : Manufacture of ceramic household and ornamental articles
  - 26.22 : Manufacture of ceramic sanitary fixtures
  - 26.23 : Manufacture of ceramic insulators and insulating fittings
  - 26.24 : Manufacture of other technical ceramic products
  - 26.25 : Manufacture of other ceramic products
  - 26.26 : Manufacture of refractory ceramic products
  - 26.3 : Manufacture of ceramic tiles and flags
  - 26.30 : Manufacture of ceramic tiles and flags
  - 26.4 : Manufacture of bricks, tiles and construction products, in baked clay
  - 26.40 : Manufacture of bricks, tiles and construction products, in baked clay
  - 26.5 : Manufacture of cement, lime and plaster
  - 26.51 : Manufacture of cement
  - 26.52 : Manufacture of lime
  - 26.53 : Manufacture of plaster
  - 26.6 : Manufacture of articles of concrete, plaster and cement
  - 26.61 : Manufacture of concrete products for construction purposes
  - 26.62 : Manufacture of plaster products for construction purposes
  - 26.63 : Manufacture of ready-mixed concrete
  - 26.64 : Manufacture of mortars
  - 26.65 : Manufacture of fibre cement
  - 26.66 : Manufacture of other articles of concrete, plaster and cement
  - 26.7 : Cutting, shaping and finishing of stone

- 26.70 : Cutting, shaping and finishing of stone
- 26.8 : Manufacture of other non-metallic mineral products
- 26.81 : Production of abrasive products
- 26.82 : Manufacture of other non-metallic mineral products n.e.c.

SubSection DJ : Manufacture of basic metals and fabricated metal products

- 27 : Manufacture of basic metals
  - 27.1 : Manufacture of basic iron and steel and of ferro-alloys (ECSC)
  - 27.10 : Manufacture of basic iron and steel and of ferro-alloys (ECSC)20)
  - 27.2 : Manufacture of tubes
  - 27.21 : Manufacture of cast iron tubes
  - 27.22 : Manufacture of steel tubes
  - 27.3 : Other first processing of iron and steel and production of non-ECSC20) ferro-alloys
  - 27.31 : Cold drawing
  - 27.32 : Cold rolling of narrow strip
  - 27.33 : Cold forming or folding
  - 27.34 : Wire drawing
  - 27.35 : Other first processing of iron and steel n.e.c.; production of non-ECSC20) ferro-alloys
  - 27.4 : Manufacture of basic precious and non-ferrous metals
  - 27.41 : Precious metals production
  - 27.42 : Aluminium production
  - 27.43 : Lead, zinc and tin production
  - 27.44 : Copper production
  - 27.45 : Other non-ferrous metal production
  - 27.5 : Casting of metals
  - 27.51 : Casting of iron
  - 27.52 : Casting of steel
  - 27.53 : Casting of light metals
  - 27.54 : Casting of other non-ferrous metals
- 28 : Manufacture of fabricated metal products, except machinery and equipment
  - 28.1 : Manufacture of structural metal products
  - 28.11 : Manufacture of metal structures and parts of structures
  - 28.12 : Manufacture of builders' carpentry and joinery of metal
  - 28.2 : Manufacture of tanks, reservoirs and containers of metal; manufacture of central heating radiators and boilers
  - 28.21 : Manufacture of tanks, reservoirs and containers of metal
  - 28.22 : Manufacture of central heating radiators and boilers
  - 28.3 : Manufacture of steam generators, except central heating hot water boilers
  - 28.30 : Manufacture of steam generators, except central heating hot water boilers
  - 28.4 : Forging, pressing, stamping and roll forming of metal; powder metallurgy
  - 28.40 : Forging, pressing, stamping and roll forming of metal; powder metallurgy
  - 28.5 : Treatment and coating of metals; general mechanical engineering
  - 28.51 : Treatment and coating of metals
  - 28.52 : General mechanical engineering
  - 28.6 : Manufacture of cutlery, tools and general hardware
  - 28.61 : Manufacture of cutlery
  - 28.62 : Manufacture of tools
  - 28.63 : Manufacture of locks and hinges
  - 28.7 : Manufacture of other fabricated metal products
  - 28.71 : Manufacture of steel drums and similar containers
  - 28.72 : Manufacture of light metal packaging
  - 28.73 : Manufacture of wire products
  - 28.74 : Manufacture of fasteners, screw machine products, chain and springs
  - 28.75 : Manufacture of other fabricated metal products n.e.c.

SubSection DK : Manufacture of machinery and equipment n.e.c.

- 29 : Manufacture of machinery and equipment n.e.c.
  - 29.1 : Manufacture of machinery for the production and use of mechanical power, except aircraft, vehicle and cycle engines
  - 29.11 : Manufacture of engines and turbines, except aircraft, vehicle and cycle engines

- 29.12 : Manufacture of pumps and compressors
- 29.13 : Manufacture of taps and valves
- 29.14 : Manufacture of bearings, gears, gearing and driving elements
- 29.2 : Manufacture of other general purpose machinery
- 29.21 : Manufacture of furnaces and furnace burners
- 29.22 : Manufacture of lifting and handling equipment
- 29.23 : Manufacture of non-domestic cooling and ventilation equipment
- 29.24 : Manufacture of other general purpose machinery n.e.c.
- 29.3 : Manufacture of agricultural and forestry machinery
- 29.31 : Manufacture of agricultural tractors
- 29.32 : Manufacture of other agricultural and forestry machinery
- 29.4 : Manufacture of machine-tools
- 29.40 : Manufacture of machine-tools
- 29.5 : Manufacture of other special purpose machinery
- 29.51 : Manufacture of machinery for metallurgy
- 29.52 : Manufacture of machinery for mining, quarrying and construction
- 29.53 : Manufacture of machinery for food, beverage and tobacco processing
- 29.54 : Manufacture of machinery for textile, apparel and leather production
- 29.55 : Manufacture of machinery for paper and paperboard production
- 29.56 : Manufacture of other special purpose machinery n.e.c.
- 29.6 : Manufacture of weapons and ammunition
- 29.60 : Manufacture of weapons and ammunition
- 29.7 : Manufacture of domestic appliances n.e.c.
- 29.71 : Manufacture of electric domestic appliances
- 29.72 : Manufacture of non-electric domestic appliances

SubSection DL : Manufacture of electrical and optical equipment

- 30 : Manufacture of office machinery and computers
  - 30.0 : Manufacture of office machinery and computers
  - 30.01 : Manufacture of office machinery
  - 30.02 : Manufacture of computers and other information processing equipment
- 31 : Manufacture of electrical machinery and apparatus n.e.c.
  - 31.1 : Manufacture of electric motors, generators and transformers
  - 31.10 : Manufacture of electric motors, generators and transformers
  - 31.2 : Manufacture of electricity distribution and control apparatus
  - 31.20 : Manufacture of electricity distribution and control apparatus
  - 31.3 : Manufacture of insulated wire and cable
  - 31.30 : Manufacture of insulated wire and cable
  - 31.4 : Manufacture of accumulators, primary cells and primary batteries
  - 31.40 : Manufacture of accumulators, primary cells and primary batteries
  - 31.5 : Manufacture of lighting equipment and electric lamps
  - 31.50 : Manufacture of lighting equipment and electric lamps
  - 31.6 : Manufacture of electrical equipment n.e.c.
  - 31.61 : Manufacture of electrical equipment for engines and vehicles n.e.c.
  - 31.62 : Manufacture of other electrical equipment n.e.c.
- 32 : Manufacture of radio, television and communication equipment and apparatus
  - 32.1 : Manufacture of electronic valves and tubes and other electronic components
  - 32.10 : Manufacture of electronic valves and tubes and other electronic components
  - 32.2 : Manufacture of television and radio transmitters and apparatus for line telephony and line telegraphy
  - 32.20 : Manufacture of television and radio transmitters and apparatus for line telephony and line telegraphy
  - 32.3 : Manufacture of television and radio receivers, sound or video recording or reproducing apparatus and associated goods
  - 32.30 : Manufacture of television and radio receivers, sound or video recording or reproducing apparatus and associated goods
- 33 : Manufacture of medical, precision and optical instruments, watches and clocks
  - 33.1 : Manufacture of medical and surgical equipment and orthopaedic appliances
  - 33.10 : Manufacture of medical and surgical equipment and orthopaedic appliances

- 33.2 : Manufacture of instruments and appliances for measuring, checking, testing, navigating and other purposes, except industrial process control equipment
- 33.20 : Manufacture of instruments and appliances for measuring, checking, testing, navigating and other purposes, except industrial process control equipment
- 33.3 : Manufacture of industrial process control equipment
- 33.30 : Manufacture of industrial process control equipment
- 33.4 : Manufacture of optical instruments and photographic equipment
- 33.40 : Manufacture of optical instruments and photographic equipment
- 33.5 : Manufacture of watches and clocks
- 33.50 : Manufacture of watches and clocks

SubSection DM : Manufacture of transport equipment

- 34 : Manufacture of motor vehicles, trailers and semi-trailers
  - 34.1 : Manufacture of motor vehicles
  - 34.10 : Manufacture of motor vehicles
  - 34.2 : Manufacture of bodies (coachwork) for motor vehicles; manufacture of trailers and semi-trailers
  - 34.20 : Manufacture of bodies (coachwork) for motor vehicles; manufacture of trailers and semi-trailers
  - 34.3 : Manufacture of parts and accessories for motor vehicles and their engines
  - 34.30 : Manufacture of parts and accessories for motor vehicles and their engines
- 35 : Manufacture of other transport equipment
  - 35.1 : Building and repairing of ships and boats
  - 35.11 : Building and repairing of ships
  - 35.12 : Building and repairing of pleasure and sporting boats
  - 35.2 : Manufacture of railway and tramway locomotives and rolling stock
  - 35.20 : Manufacture of railway and tramway locomotives and rolling stock
  - 35.3 : Manufacture of aircraft and spacecraft
  - 35.30 : Manufacture of aircraft and spacecraft
  - 35.4 : Manufacture of motorcycles and bicycles
  - 35.41 : Manufacture of motorcycles
  - 35.42 : Manufacture of bicycles
  - 35.43 : Manufacture of invalid carriages
  - 35.5 : Manufacture of other transport equipment n.e.c.
  - 35.50 : Manufacture of other transport equipment n.e.c.

SubSection DN : Manufacturing n.e.c.

- 36 : Manufacture of furniture; manufacturing n.e.c.
  - 36.1 : Manufacture of furniture
  - 36.11 : Manufacture of chairs and seats
  - 36.12 : Manufacture of other office and shop furniture
  - 36.13 : Manufacture of other kitchen furniture
  - 36.14 : Manufacture of other furniture
  - 36.15 : Manufacture of mattresses
  - 36.2 : Manufacture of jewellery and related articles
  - 36.21 : Striking of coins and medals
  - 36.22 : Manufacture of jewellery and related articles n.e.c.
  - 36.3 : Manufacture of musical instruments
  - 36.30 : Manufacture of musical instruments
  - 36.4 : Manufacture of sports goods
  - 36.40 : Manufacture of sports goods
  - 36.5 : Manufacture of games and toys
  - 36.50 : Manufacture of games and toys
  - 36.6 : Miscellaneous manufacturing n.e.c.
  - 36.61 : Manufacture of imitation jewellery
  - 36.62 : Manufacture of brooms and brushes
  - 36.63 : Other manufacturing n.e.c.
- 37 : Recycling
  - 37.1 : Recycling of metal waste and scrap
  - 37.10 : Recycling of metal waste and scrap

- 37.2 : Recycling of non-metal waste and scrap
- 37.20 : Recycling of non-metal waste and scrap

Section E : Electricity, gas and water supply

- 40 : Electricity, gas, steam and hot water supply
  - 40.1 : Production and distribution of electricity
  - 40.10 : Production and distribution of electricity
  - 40.2 : Manufacture of gas; distribution of gaseous fuels through mains
  - 40.20 : Manufacture of gas; distribution of gaseous fuels through mains
  - 40.3 : Steam and hot water supply
  - 40.30 : Steam and hot water supply
- 41 : Collection, purification and distribution of water
  - 41.0 : Collection, purification and distribution of water
  - 41.00 : Collection, purification and distribution of water

Section F : Construction

- 45 : Construction
  - 45.1 : Site preparation
  - 45.11 : Demolition and wrecking of buildings; earth moving
  - 45.12 : Test drilling and boring
  - 45.2 : Building of complete constructions or parts thereof; civil engineering
  - 45.21 : General construction of buildings and civil engineering works
  - 45.22 : Erection of roof covering and frames
  - 45.23 : Construction of highways, roads, airfields and sport facilities
  - 45.24 : Construction of water projects
  - 45.25 : Other construction work involving special trades
  - 45.3 : Building installation
  - 45.31 : Installation of electrical wiring and fittings
  - 45.32 : Insulation work activities
  - 45.33 : Plumbing
  - 45.34 : Other building installation
  - 45.4 : Building completion
  - 45.41 : Plastering
  - 45.42 : Joinery installation
  - 45.43 : Floor and wall covering
  - 45.44 : Painting and glazing
  - 45.45 : Other building completion
  - 45.5 : Renting of construction or demolition equipment with operator
  - 45.50 : Renting of construction or demolition equipment with operator

Section G : Wholesale and retail trade; repair of motor vehicles, motorcycles and personal and household goods

- 50 : Sale, maintenance and repair of motor vehicles and motorcycles; retail sale of automotive fuel
  - 50.1 : Sale of motor vehicles
  - 50.10 : Sale of motor vehicles
  - 50.2 : Maintenance and repair of motor vehicles
  - 50.20 : Maintenance and repair of motor vehicles
  - 50.3 : Sale of motor vehicle parts and accessories
  - 50.30 : Sale of motor vehicle parts and accessories
  - 50.4 : Sale, maintenance and repair of motorcycles and related parts and accessories
  - 50.40 : Sale, maintenance and repair of motorcycles and related parts and accessories
  - 50.5 : Retail sale of automotive fuel
  - 50.50 : Retail sale of automotive fuel
- 51 : Wholesale trade and commission trade, except of motor vehicles and motorcycles
  - 51.1 : Wholesale on a fee or contract basis
  - 51.11 : Agents involved in the sale of agricultural raw materials, live animals, textile raw materials and semi-finished goods
  - 51.12 : Agents involved in the sale of fuels, ores, metals and industrial chemicals
  - 51.13 : Agents involved in the sale of timber and building materials
  - 51.14 : Agents involved in the sale of machinery, industrial equipment, ships and aircraft
  - 51.15 : Agents involved in the sale of furniture, household goods, hardware and ironmongery
  - 51.16 : Agents involved in the sale of textiles, clothing, footwear and leather goods

- 51.17 : Agents involved in the sale of food, beverages and tobacco
- 51.18 : Agents specializing in the sale of particular products or ranges of products n.e.c.
- 51.19 : Agents involved in the sale of a variety of goods
- 51.2 : Wholesale of agricultural raw materials and live animals (These groups include only wholesale on own account)
- 51.21 : Wholesale of grain, seeds and animal feeds
- 51.22 : Wholesale of flowers and plants
- 51.23 : Wholesale of live animals
- 51.24 : Wholesale of hides, skins and leather
- 51.25 : Wholesale of unmanufactured tobacco
- 51.3 : Wholesale of food, beverages and tobacco
- 51.31 : Wholesale of fruit and vegetables
- 51.32 : Wholesale of meat and meat products
- 51.33 : Wholesale of dairy produce, eggs and edible oils and fats
- 51.34 : Wholesale of alcoholic and other beverages
- 51.35 : Wholesale of tobacco products
- 51.36 : Wholesale of sugar and chocolate and sugar confectionery
- 51.37 : Wholesale of coffee, tea, cocoa and spices
- 51.38 : Wholesale of other food, including fish, crustaceans and molluscs
- 51.39 : Non-specialized wholesale of food, beverages and tobacco
- 51.4 : Wholesale of household goods
- 51.41 : Wholesale of textiles
- 51.42 : Wholesale of clothing and footwear
- 51.43 : Wholesale of electrical household appliances and radio and television goods
- 51.44 : Wholesale of china and glassware, wallpaper and cleaning materials
- 51.45 : Wholesale of perfume and cosmetics
- 51.46 : Wholesale of pharmaceutical goods
- 51.47 : Wholesale of other household goods
- 51.5 : Wholesale of non-agricultural intermediate products, waste and scrap
- 51.51 : Wholesale of solid, liquid and gaseous fuels and related products
- 51.52 : Wholesale of metals and metal ores
- 51.53 : Wholesale of wood, construction materials and sanitary equipment
- 51.54 : Wholesale of hardware, plumbing and heating equipment and supplies
- 51.55 : Wholesale of chemical products
- 51.56 : Wholesale of other intermediate products
- 51.57 : Wholesale of waste and scrap
- 51.6 : Wholesale of machinery, equipment and supplies
- 51.61 : Wholesale of machine-tools
- 51.62 : Wholesale of construction machinery
- 51.63 : Wholesale of machinery for the textile industry and of sewing and knitting machines
- 51.64 : Wholesale of office machinery and equipment
- 51.65 : Wholesale of other machinery for use in industry, trade and navigation
- 51.66 : Wholesale of agricultural machinery and accessories and implements, including tractors
- 51.7 : Other wholesale
- 51.70 : Other wholesale

- 52 : Retail trade, except of motor vehicles and motorcycles; repair of personal and household goods
  - 52.1 : Retail sale in non-specialized stores
  - 52.11 : Retail sale in non-specialized stores with food, beverages or tobacco predominating
  - 52.12 : Other retail sale in non-specialized stores
  - 52.2 : Retail sale of food, beverages and tobacco in specialized stores
  - 52.21 : Retail sale of fruit and vegetables
  - 52.22 : Retail sale of meat and meat products
  - 52.23 : Retail sale of fish, crustaceans and molluscs
  - 52.24 : Retail sale of bread, cakes, flour confectionery and sugar confectionery
  - 52.25 : Retail sale of alcoholic and other beverages
  - 52.26 : Retail sale of tobacco products
  - 52.27 : Other retail sale of food, beverages and tobacco in specialized stores
  - 52.3 : Retail sale of pharmaceutical and medical goods, cosmetic and toilet articles

- 52.31 : Dispensing chemists
- 52.32 : Retail sale of medical and orthopaedic goods
- 52.33 : Retail sale of cosmetic and toilet articles
- 52.4 : Other retail sale of new goods in specialized stores
- 52.41 : Retail sale of textiles
- 52.42 : Retail sale of clothing
- 52.43 : Retail sale of footwear and leather goods
- 52.44 : Retail sale of furniture, lighting equipment and household articles n.e.c.
- 52.45 : Retail sale of electrical household appliances and radio and television goods
- 52.46 : Retail sale of hardware, paints and glass
- 52.47 : Retail sale of books, newspapers and stationery
- 52.48 : Other retail sale in specialized stores
- 52.5 : Retail sale of second-hand goods in stores
- 52.50 : Retail sale of second-hand goods in stores
- 52.6 : Retail sale not in stores
- 52.61 : Retail sale via mail order houses
- 52.62 : Retail sale via stalls and markets
- 52.63 : Other non-store retail sale
- 52.7 : Repair of personal and household goods
- 52.71 : Repair of boots, shoes and other articles of leather
- 52.72 : Repair of electrical household goods
- 52.73 : Repair of watches, clocks and jewellery
- 52.74 : Repair n.e.c.

ection H : Hotels and restaurants

- 55 : Hotels and restaurants
  - 55.1 : Hotels
  - 55.11 : Hotels and motels, with restaurant
  - 55.12 : Hotels and motels, without restaurant
  - 55.2 : Camping sites and other provision of short-stay accommodation
  - 55.21 : Youth hostels and mountain refuges
  - 55.22 : Camping sites, including caravan sites
  - 55.23 : Other provision of lodgings n.e.c.
  - 55.3 : Restaurants
  - 55.30 : Restaurants
  - 55.4 : Bars
  - 55.40 : Bars
  - 55.5 : Canteens and catering
  - 55.51 : Canteens
  - 55.52 : Catering

ection I : Transport, storage and communication

- 60 : Land transport; transport via pipelines
  - 60.1 : Transport via railways
  - 60.10 : Transport via railways
  - 60.2 : Other land transport
  - 60.21 : Other scheduled passenger land transport
  - 60.22 : Taxi operation
  - 60.23 : Other land passenger transport
  - 60.24 : Freight transport by road
  - 60.3 : Transport via pipelines
  - 60.30 : Transport via pipelines
- 61 : Water transport
  - 61.1 : Sea and coastal water transport
  - 61.10 : Sea and coastal water transport
  - 61.2 : Inland water transport
  - 61.20 : Inland water transport
- 62 : Air transport
  - 62.1 : Scheduled air transport
  - 62.10 : Scheduled air transport

- 62.2 : Non-scheduled air transport
- 62.20 : Non-scheduled air transport
- 62.3 : Space transport
- 62.30 : Space transport

- 63 : Supporting and auxiliary transport activities; activities of travel agencies
  - 63.1 : Cargo handling and storage
  - 63.11 : Cargo handling
  - 63.12 : Storage and warehousing
  - 63.2 : Other supporting transport activities
  - 63.21 : Other supporting land transport activities
  - 63.22 : Other supporting water transport activities
  - 63.23 : Other supporting air transport activities
  - 63.3 : Activities of travel agencies and tour operators; tourist assistance activities n.e.c.
  - 63.30 : Activities of travel agencies and tour operators; tourist assistance activities n.e.c.
  - 63.4 : Activities of other transport agencies
  - 63.40 : Activities of other transport agencies
- 64 : Post and telecommunications
  - 64.1 : Post and courier activities
  - 64.11 : National post activities
  - 64.12 : Courier activities other than national post activities
  - 64.2 : Telecommunications
  - 64.20 : Telecommunications

Section J : Financial intermediation

- 65 : Financial intermediation, except insurance and pension funding
  - 65.1 : Monetary intermediation
  - 65.11 : Central banking
  - 65.12 : Other monetary intermediation
  - 65.2 : Other financial intermediation
  - 65.21 : Financial leasing
  - 65.22 : Other credit granting
  - 65.23 : Other financial intermediation n.e.c.
- 66 : Insurance and pension funding, except compulsory social security
  - 66.0 : Insurance and pension funding, except compulsory social security
  - 66.01 : Life insurance
  - 66.02 : Pension funding
  - 66.03 : Non-life insurance
- 67 : Activities auxiliary to financial intermediation
  - 67.1 : Activities auxiliary to financial intermediation, except insurance and pension funding
  - 67.11 : Administration of financial markets
  - 67.12 : Security broking and fund management
  - 67.13 : Activities auxiliary to financial intermediation n.e.c.
  - 67.2 : Activities auxiliary to insurance and pension funding
  - 67.20 : Activities auxiliary to insurance and pension funding

Section K : Real estate, renting and business activities

- 70 : Real estate activities
  - 70.1 : Real estate activities with own property
  - 70.11 : Development and selling of real estate
  - 70.12 : Buying and selling of own real estate
  - 70.2 : Letting of own property
  - 70.20 : Letting of own property
  - 70.3 : Real estate activities on a fee or contract basis
  - 70.31 : Real estate agencies
  - 70.32 : Management of real estate on a fee or contract basis
- 71 : Renting of machinery and equipment without operator and of personal and household goods
  - 71.1 : Renting of automobiles
  - 71.10 : Renting of automobiles
  - 71.2 : Renting of other transport equipment
  - 71.21 : Renting of other land transport equipment

- 71.22 : Renting of water transport equipment
- 71.23 : Renting of air transport equipment
- 71.3 : Renting of other machinery and equipment
- 71.31 : Renting of agricultural machinery and equipment
- 71.32 : Renting of construction and civil engineering machinery and equipment
- 71.33 : Renting of office machinery and equipment, including computers
- 71.34 : Renting of other machinery and equipment n.e.c.
- 71.4 : Renting of personal and household goods n.e.c.
- 71.40 : Renting of personal and household goods n.e.c.

- 72 : Computer and related activities
  - 72.1 : Hardware consultancy
  - 72.10 : Hardware consultancy
  - 72.2 : Software consultancy and supply
  - 72.20 : Software consultancy and supply
  - 72.3 : Data processing
  - 72.30 : Data processing
  - 72.4 : Database activities
  - 72.40 : Database activities
  - 72.5 : Maintenance and repair of office, accounting and computing machinery
  - 72.50 : Maintenance and repair of office, accounting and computing machinery
  - 72.6 : Other computer related activities
  - 72.60 : Other computer related activities
- 73 : Research and development
  - 73.1 : Research and experimental development on natural sciences and engineering
  - 73.10 : Research and experimental development on natural sciences and engineering
  - 73.2 : Research and experimental development on social sciences and humanities
  - 73.20 : Research and experimental development on social sciences and humanities
- 74 : Other business activities
  - 74.1 : Legal, accounting, book-keeping and auditing activities; tax consultancy; market research and public opinion polling; business and management consultancy; holdings
  - 74.11 : Legal activities
  - 74.12 : Accounting, book-keeping and auditing activities; tax consultancy
  - 74.13 : Market research and public opinion polling
  - 74.14 : Business and management consultancy activities
  - 74.15 : Management activities of holding companies
  - 74.2 : Architectural and engineering activities and related technical consultancy
  - 74.20 : Architectural and engineering activities and related technical consultancy
  - 74.3 : Technical testing and analysis
  - 74.30 : Technical testing and analysis
  - 74.4 : Advertising
  - 74.40 : Advertising
  - 74.5 : Labour recruitment and provision of personnel
  - 74.50 : Labour recruitment and provision of personnel
  - 74.6 : Investigation and security activities
  - 74.60 : Investigation and security activities
  - 74.7 : Industrial cleaning
  - 74.70 : Industrial cleaning
  - 74.8 : Miscellaneous business activities n.e.c.
  - 74.81 : Photographic activities
  - 74.82 : Packaging activities
  - 74.83 : Secretarial and translation activities
  - 74.84 : Other business activities n.e.c.

Section L : Public administration and defence; compulsory social security

- 75 : Public administration and defence; compulsory social security
  - 75.1 : Administration of the State and the economic and social policy of the community
  - 75.11 : General (overall) public service activities
  - 75.12 : Regulation of the activities of agencies that provide health care, education, cultural services and other social services, excluding social security

- 75.13 : Regulation of and contribution to more efficient operation of business
- 75.14 : Supporting service activities for the government as a whole
- 75.2 : Provision of services to the community as a whole
- 75.21 : Foreign affairs
- 75.22 : Defence activities
- 75.23 : Justice and judicial activities
- 75.24 : Public security, law and order activities
- 75.25 : Fire service activities
- 75.3 : Compulsory social security activities
- 75.30 : Compulsory social security activities

Section M : Education

- 80 : Education
  - 80.1 : Primary education
  - 80.10 : Primary education
  - 80.2 : Secondary education
  - 80.21 : General secondary education
  - 80.22 : Technical and vocational secondary education
  - 80.3 : Higher education
  - 80.30 : Higher education
  - 80.4 : Adult and other education
  - 80.41 : Driving school activities
  - 80.42 : Adult and other education n.e.c.

Section N : Health and social work

- 85 : Health and social work
  - 85.1 : Human health activities
  - 85.11 : Hospital activities
  - 85.12 : Medical practice activities
  - 85.13 : Dental practice activities
  - 85.14 : Other human health activities
  - 85.2 : Veterinary activities
  - 85.20 : Veterinary activities
  - 85.3 : Social work activities
  - 85.31 : Social work activities with accommodation
  - 85.32 : Social work activities without accommodation

Section O : Other community, social and personal service activities

- 90 : Sewage and refuse disposal, sanitation and similar activities
  - 90.0 : Sewage and refuse disposal, sanitation and similar activities
  - 90.00 : Sewage and refuse disposal, sanitation and similar activities
- 91 : Activities of membership organizations n.e.c.
  - 91.1 : Activities of business, employers' and professional organizations
  - 91.11 : Activities of business and employers' organizations
  - 91.12 : Activities of professional organizations
  - 91.2 : Activities of trade unions
  - 91.20 : Activities of trade unions
  - 91.3 : Activities of other membership organizations
  - 91.31 : Activities of religious organizations
  - 91.32 : Activities of political organizations
  - 91.33 : Activities of other membership organizations n.e.c.
- 92 : Recreational, cultural and sporting activities
  - 92.1 : Motion picture and video activities
  - 92.11 : Motion picture and video production
  - 92.12 : Motion picture and video distribution
  - 92.13 : Motion picture projection
  - 92.2 : Radio and television activities
  - 92.20 : Radio and television activities
  - 92.3 : Other entertainment activities
  - 92.31 : Artistic and literary creation and interpretation
  - 92.32 : Operation of arts facilities

- 92.33 : Fair and amusement park activities
- 92.34 : Other entertainment activities n.e.c.
- 92.4 : News agency activities
- 92.40 : News agency activities
- 92.5 : Library, archives, museums and other cultural activities
- 92.51 : Library and archives activities
- 92.52 : Museums activities and preservation of historical sites and buildings
- 92.53 : Botanical and zoological gardens and nature reserves activities
- 92.6 : Sporting activities
- 92.61 : Operation of sports arenas and stadiums
- 92.62 : Other sporting activities
- 92.7 : Other recreational activities
- 92.71 : Gambling and betting activities
- 92.72 : Other recreational activities n.e.c.

- 93 : Other service activities
  - 93.0 : Other service activities
  - 93.01 : Washing and dry-cleaning of textile and fur products
  - 93.02 : Hairdressing and other beauty treatment
  - 93.03 : Funeral and related activities
  - 93.04 : Physical well-being activities
  - 93.05 : Other service activities n.e.c.

Section P : Private households with employed persons

- 95 : Private households with employed persons
  - 95.0 : Private households with employed persons
  - 95.00 : Private households with employed persons

Section Q : Extra-territorial organizations and bodies

- 99 : Extra-territorial organizations and bodies
  - 99.0 : Extra-territorial organizations and bodies
  - 99.00 : Extra-territorial organizations and bodies

3.7 Pollution Estimation by IPPS method

Table 3.14 Pollution Estimation by IPPS Method

ISIC Code	ISIC Description	Used metal		BOD_5		TSS	
		pound/year per 1,000 employees	ton/year per 1,000 employees	pound/year per 1,000 employees	ton/year per 1,000 employees	pound/year per 1,000 employees	ton/year per 1,000 employees
3111	Meat Products	1,621	0.74	7,182.2	3.26	8,906.8	4.04
3112	Dairy products	7,187	3.26	2,556,411.0	1,159.86	368,217.1	167.06
3113	Preserved fruits, vegetables	3,284	1.49	54,357.6	24.66	85,749.4	38.91
3114	Fish products	0	0.00	84,938.7	38.54	144,803.4	65.70
3115	Oils and Fats	28,611	12.98	95,975.3	43.54	108,436.3	49.20
3116	Grain mill products	0	0.00	3.2	0.00	40.7	0.02
3117	Bakery products	0	0.00	13.8	0.01	15.5	0.01
3118	Sugar Factory &Refineries	437	0.20	602,434.9	273.33	863,751.5	391.89
3119	Confectionery Products	0	0.00	3,543.7	1.61	1,701.6	0.77
3121	Food Products N.E.C.	766	0.35	604.1	0.27	238.9	0.11
3122	Prepared animal foods	611	0.28	409.4	0.19	596.4	0.27
3131	Distilled sprits	18,997	8.62	2,115,815.1	959.96	3,802,819.9	1,725.37
3132	Wine industries	0	0.00	5,917.1	2.68	3,247.9	1.47
3133	Malt liquors and malt	2,668	1.21	12,387.7	5.62	28,632.1	12.99
3140	Tobacco Manufactures	860	0.39	714.2	0.32	872.2	0.40
3211	Spinning, weaving, finishing textiles	16,757	7.60	9,198.9	4.17	14,285.3	6.48
3212	Made-up textiles except apparel	268	0.12	0.0	0.00	0.0	0.00
3213	Knitting mills	866	0.39	122.7	0.06	247.1	0.11
3214	Carpets and rugs	8,574	3.89	2,153.8	0.98	3,622.4	1.64
3215	Cordage, rope &twine	0	0.00		0.00		0.00
3219	Textiles, N.E.C	78	0.04	0.0	0.00	527.1	0.24
3220	Wearing apparel	0	0.00	0.0	0.00	0.0	0.00
3231	Tanneries and leather finishing	34,593	15.70	95,498.5	43.33	180,341.8	81.82
3232	Fur dressing and dyeing	1,480	0.67	15,732.8	7.14	48,087.6	21.82
3233	Leather products	0	0.00	0.0	0.00	72.8	0.03
3240	Footwear	3	0.00	5,832.4	2.65	5,718.9	2.59
3311	Sawmills, planting& other wood mills	121	0.05	11,115.1	5.04	52,412.3	23.78
3312	Wooden &cane containers; small cane ware	0	0.00	257.8	0.12	461.8	0.21
3319	Wood &cork products	8	0.00		0.00		0.00
3320	Furniture &fixtures, nonmetal	69	0.03	0.2	0.00	1.7	0.00
3411	Pulp, paper, &paperboard	290,395	131.75	3,302,137.6	1,498.21	11,215,316.3	5,088.48
3412	Paper &paperboard containers &boxes	901	0.41	11,389.4	5.17	19,555.4	8.87
3419	Pulp, paper, &paperboard articles	1,059	0.48	41,969.9	19.04	41,398.8	18.78
3420	Printing &publishing	2	0.00	382.2	0.17	209.2	0.09
3511	Industrial chemicals except fertilizer	941,970	427.38	1,255,448.8	569.61	1,940,529.1	880.43

ISIC Code	ISIC Description	Used metal		BOD_5		TSS	
		pound/year per 1,000 employees	ton/year per 1,000 employees	pound/year per 1,000 employees	ton/year per 1,000 employees	pound/year per 1,000 employees	ton/year per 1,000 employees
3512	Fertilizer &pesticides	38,790	17.60	15,697.9	7.12	3,054,594.1	1,385.89
3513	Synthetic resins, plastics materials, &manmade fibers	109,799	49.82	55,872.2	25.35	180,549.5	81.92
3521	Paints, varnishes, &lacquers	990	0.45	60.1	0.03	252.5	0.11
3522	Drugs and medicines	13,021	5.91	14,183.2	6.44	3,555,879.2	1,613.33
3523	Soap, cleaning preps., perfumes, &toilet papers	1,584	0.72	33,360.2	15.14	47,118.9	21.38
3529	Chemical products, N.E.C.	12,370	5.61	2,635.6	1.20	3,803.7	1.73
3530	Petroleum refiners	72,606	32.94	250,712.4	113.75	1,258,255.8	570.88
3540	MISC. Petroleum &coal products	3,480	1.58	6,558.0	2.98	8,049.9	3.65
3551	Tires and tubes	455	0.21	3.4	0.00	1,506.5	0.68
3559	Rubber products, N.E.C.	35	0.02	57.0	0.03	267,163.7	121.21
3560	Plastics products, N.E.C	489	0.22	54,766.8	24.85	1,183.5	0.54
3610	Pottery, China, &earth ware	63	0.03	2,900.9	1.32	719.4	0.33
3620	Glass and glass products	2,066	0.94	176.7	0.08	1,250.5	0.57
3691	Structural clay products	160	0.07	47.1	0.02	840.3	0.38
3692	Cement, lime and plaster	8,817	4.00	241.0	0.11	528,465.8	239.77
3699	Nonmetallic mineral products, N.E.C.	253	0.11	2,860.3	1.30	4,196.1	1.90
3710	Iron and steel	55,775	25.31	2,105.4	0.96	31,018,255.6	14,073.24
3720	Non-ferrous metals	22,527	10.22	575,085.3	260.92	8,312,905.1	3,771.63
3811	Cutlery, hand tools, &general hardware	225	0.10	0.0	0.00	42.0	0.02
3812	Furniture &fixtures of metal	120	0.05	0.0	0.00	72.0	0.03
3813	Structural metal products	7,203	3.27	123.6	0.06	169.8	0.08
3819	Fabricated metal products	4,661	2.11	3,043.9	1.38	87,616.2	39.75
3821	Engines and turbines	1,073	0.49	266.7	0.12		0.00
3822	Agricultural machinery equipment	1,361	0.62	0.0	0.00	728.5	0.33
3823	Metal & wood working machinery	322	0.15	15.7	0.01	13,809.7	6.27
3824	Special industrial machinery & equipment	337	0.15	835.5	0.38	683.2	0.31
3825	Office computing, & accounting machinery	14	0.01	0.3	0.00	103.3	0.05
3829	Machinery & equipment, N.E.C	1,519	0.69	166.0	0.08	3,909.5	1.77
3831	Electrical industrial machinery	198	0.09	93.1	0.04	516.4	0.23
3832	Radio, TV, & communication equipment	716	0.32	4,477.8	2.03	6,196.2	2.81
3833	Electrical appliances & house wares	5	0.00		0.00		0.00
3839	Electrical apparatus and supplies, N.E.C	1,135	0.51	39.3	0.02	241.1	0.11
3841	Shipbuilding and repairing	22	0.01	12.0	0.01	38.0	0.02
3842	Railroad equipment	27	0.01	0.0	0.00	422.4	0.19
3843	Motor vehicles	543	0.25	57.3	0.03	288.1	0.13

ISIC Code	ISIC Description	Used metal		BOD_5		TSS	
		pound/year per 1,000 employees	ton/year per 1,000 employees	pound/year per 1,000 employees	ton/year per 1,000 employees	pound/year per 1,000 employees	ton/year per 1,000 employees
3844	Motorcycles and bicycles	14,501	6.58	646.0	0.29	3,836.4	1.74
3845	Aircraft	173	0.08	132.6	0.06	1,153.2	0.52
3851	Professional & scientific equipment	107	0.05	68.3	0.03	75.9	0.03
3852	Photographic and optical goods	6	0.00	49.9	0.02	30.3	0.01
3853	Watches and clocks	0	0.00	0.0	0.00	0.0	0.00
3901	Jewelry and related articles	1,589	0.72	0.0	0.00	2,875,077.4	1,304.45
3902	Musical instruments	0	0.00		0.00		0.00
3903	Sporting and athletic goods	27	0.01	0.0	0.00	2,279,277.3	1,034.13
3909	Manufacturing industries, N.E.C	326	0.15	6.8	0.00	41.5	0.02

3.8 Examples of Industrial Wastewater Quality in Japan

Table 3.15 High Concentration Organic Wastewater

1. High concentration organic wastewater

Industry classification	Type of Industry	Products	Sources of Wastewater	Quantity (m^3/day) & Quality of Wastewater	Treatment (General)	Remarks
Food Processing	Meat products	Sausage, ham, bacon, including canned or bottled products	Raw material treatment Boiling process Cooling water	pH around 7 BOD_5 300 – 600 SS 100 – 300 T-N 50 – 80 T-P 10 – 15 Quantity 50 – 100	Activated sludge	Ratio of N and P in biological treatment
	Fishery products	Canned or bottled seafood, sausage and ham, other fishery products	Raw material treatment Boiling process Cooling water	pH 7 – 8.5 BOD_5 200 – 2,000 SS 150 – 1,000 T-N 100 – 200 T-P 30 – 80 Quantity 200 – 400 - 5,000	Activated sludge	Soluble protein, ratio of N and P, order
	Agar products	Agar for eating and industry	Raw material treatment Melting process Sun drying process	pH 1 – 14 BOD_5 300 – 600 SS 250 – 600	Activated sludge	Soluble organic matter, pH
	Canned and preserved vegetable and fruits products	Canned and preserved vegetable and fruits, vegetable pickles, jam, marmalade, jelly, peanuts butter, frozen vegetables and fruits	Raw material treatment (de-salt, drying) Disinfection process Cooling water	pH 1 -12 BOD_5 200 – 600 – 2,500 SS 120 –200 – 1,000 T-N 100 T-P 30 Cl (picling) 2,500 – 8,000 Quantity 50 – 300 – 600	Activated sludge	pH, Cl^o in picking process
	Bakery, confectionery products	Kinds of bread, cakes, biscuit, cracker, dried confectionery, candy, chocolate, sweets, wafer	Mixer cleaning process Equipment and machinery cleaning process	pH 6 -8 BOD_5 200 – 600 – 1,300 SS 100 –150 – 900 T-N 20 - 40 T-P 10 – 20 Quantity 20 – 50 –200	Floatation Activated sludge	Oil separator and ratio of N and P

Industry classification	Type of Industry	Products	Sources of Wastewater	Quantity (m^3/day) & Quality of Wastewater	Treatment (General)	Remarks
Food Processing	Bear product	Bear	Malt cleaning facility Equipment and machinery cleaning process Bottle cleaning process Cooling water	pH 8 -11 BOD_5 500 – 2,000 SS 250 –1,000 T-N 30 - 50 T-P 5 – 15 Quantity 5,000– 10,000	Activated sludge	Cleaning wastewater: 0.9 m^3/m^3-barley 9 – 13 m^3/m^3-bear after brewing pH
	Sprits, mixed liquor products	Whiskey, brandy, mixed liquor, sweet sake, fruit wine, medical wine	Distilled residue Cleaning process	pH 6 -8 BOD_5 600 – 92,000 SS 600 –2,000 T-N 20 T-P 10 Quantity 500– 1,500	Activated sludg	Concentrated wastewater 5–7 m^3-wastewater/m^3-grain
	Baking powder, Yeasts production	Yeasts synthetic compounds	Syrup fermentation wastewater Cleaning wastewater Other wastewater	pH 6 -9 BOD_5 300 – 1,200- 7,000 SS 100 –300 -1,500 T-N 300 - 600 T-P 20 - 50 Quantity 600– 80,000	Activated sludge	Ratio of N and P in biological treatment
	Edible Oil and fat production not classified into others	Cooking oil, salad oil, margarine, refined edible oil and fat	Raw material cleaning facility De-acid facility Cooling water	pH 1 -7 BOD_5 150 – 1,100 SS 100 – 300 Quantity 50 –20	Floatation Activated sludge	Emulsified oil separation
	Starch production	Starch, sweet potato starch, potato starch, corn starch	Raw material treatment process Chopping process	pH 6 -8 BOD_5 500 –3,000 SS 3,000 T-N 100 - 200 T-P 30 - 40 Quantity 100– 200-1,000	Sedimentation Lagoon	pH change due to decomposition Wastewater: 8 -10 m^3/ton-raw material
	D-glucose, malt syrup production	D-glucose, glucose sweet syrup, maltos	Raw material treatment process Soaking process	pH 6 -8 BOD_5 1,500 –2,000 SS 1,000 – 2,250 T-N 40 - 50 T-P 30 - 40 Quantity 50– 100	Activated sludge	

Industry classification	Type of Industry	Products	Sources of Wastewater	Quantity (m^3/day) & Quality of Wastewater	Treatment (General)	Remarks
Food Processing	Noodle production	Noodles, macaroni	Raw material treatment process Boiling process	pH 6 -8 BOD_5 250 –600 SS 200 – 500 Quantity 50– 200	Coagulation-sedimentation Activated sludge	
	Crudely made bean jam production	Raw bean jam	Raw material treatment process Sedimentation process Compression process	pH 6 -8 BOD_5 500 –4,000 SS 250 – 500 T-N 60 T-P 15 Quantity 30– 300	Activated sludge	N and P change Wastewater: 30 – 35 m^3/ton-bean
	Frozen food processing	Frozen food such as deep fried fish and meat, croquette, cutlet, stick, hamburger steak, meat dumpling, meat ball	Raw material treatment process Boiling process Cleaning process	pH 6 -8 BOD_5 200 –1,000- 4,000 SS 100 – 500- 1,000 Oil and fat 30 – 200 T-N 30 T-P 6 Quantity 100– 1,000	Oil separation Activated sludge	
Chemical industry	Animal and vegetable oil and fat production	Animal and vegetable oil and fat	Extraction process Cleaning process De-acid process	pH 4 -9 BOD_5 100 –2,000 SS 400 – 600- 1,000 T-N 20 - 30 T-P 40 - 80 Quantity 100– 500 -2,000	Flotation Activated sludge	Emulsified oil separation Odor
	Medical supplies production	Blood serum, vaccine, medical grass, synthetic medical supplies, vitamin, hormone, alkaloid, penicillin, antibiotic, organic and inorganic medical medicines, regents	Reaction facility Synthetic facility Distillation facility	pH 2 -11 BOD_5 40 –2,500 SS 200 – 600 T-N 80 -100 T-P 10 - 20 Quantity 1,000 – 3,000	Neutralization Activated sludge	pH, color, odor

Industry classification	Type of Industry	Products	Sources of Wastewater	Quantity (m^3/day) & Quality of Wastewater	Treatment (General)	Remarks
Chemical industry	Gelatin, glue production	Glue, soybean glue, mix casein glue	Extraction process Reaction process	pH 1 -9 BOD_5 1,000 –5,000 SS 500 – 700 T-N 30 T-P 5 Quantity 20 – 50 - 150	Activated sludge	Odor
Pulp, paper, paper processing	Pulp production	Kraft pulp	Decomposition process with steam Cleaning process Bleaching process	pH 7 -9 BOD_5 300 –700 SS 40 – 80 T-N 110 T-P 2	Coagulation-sedimentation Activated sludge	Strong odor Pulp recover : around 50 % Wastewater: 150 – 300 m^3/ton-pulp
	Pulp production	SP pulp	Decomposition process with steam Cleaning process Bleaching process	pH 3.5 -4.5 BOD_5 300 –500 SS 50 – 300 T-N 100 T-P 3	Coagulation-sedimentation Activated sludge	Pulp recover : around 50 % Wastewater: 150 – 500 m^3/ton-pulp
	Pulp production	SCP pulp	Decomposition process with steam Cleaning process Bleaching process	pH 3 - 7 BOD_5 500 –2,000 SS 200 – 600 T-N 70 T-P 2	Coagulation-sedimentation Activated sludge	Pulp recover : around 75 % Wastewater: 100 – 150 m^3/ton-pulp

Table 3.16 Low Concentration Organic Wastewater

2. Low concentration organic wastewater

Industry classification	Type of Industry	Products	Sources of Wastewater	Quantity (m^3/day) & Quality of Wastewater	Treatment (General)	Remarks
Food Processing	Dairy products	Butter, cheese, casein, powdered yogurt, condensed milk, milk, ice cream, other diary products	Bottle cleaning process Equipment and machinery cleaning process Cooling water	pH 6.5 – 11 BOD_5 50 –350 SS 70 – 150 T-N 30 - 40 T-P 5 - 8 Quantity 1,000 –6,000	Activated sludge	pH, N and P, residual chlorine

Industry classification	Type of Industry	Products	Sources of Wastewater	Quantity (m^3/day) & Quality of Wastewater	Treatment (General)	Remarks
Food Processing	Seasoning product	Fermented soybean paste, edible amino acid, glutamine soda, sauce, tomato ketchup, vegetable sauce, mayonnaise, edible vinegar, spices, curry powder, red pepper, Japanese horseradish, pepper	Raw material treatment process Bottle cleaning process Cleaning process	pH 6 – 8 BOD_5 40 –300- 2,000 SS 200 – 300 T-N 100 - 150 T-P 15 - 60 Quantity 50 – 200	Activated sludge	Oil
	Grain polishing, flour milling	Grain, rice and barley polishing; flour mill; powdered buckwheat, corn, bean, soybean, starch, feed; fertilizer of seafood, bone, fish, soybean waste	Raw material treatment process Dust collection facility wastewater De-odor wastewater	pH 6 – 8 BOD_5 20 –400 SS 400 – 600 Quantity 50 – 200- 400	Sedimentation Flotation Activated sludge	Odor
	Sugar production	Sugar, cube sugar, granulated sugar, molasses	Filtration facility Cooling water	pH 6 – 8 BOD_5 80 –500 SS 70 – 100 T-N 20 - 30 T-P 3 - 8 Quantity 300 –1,500	Sedimentation	Flow-out of activated carbon in cleaning filter cloth
	Refined sake	Refined sake	Bottle cleaning process Equipment and machinery cleaning process	pH 8 – 11 BOD_5 500 –2,000 SS 250 – 1,000 T-N 15 - 25 T-P 3 - 10 Quantity 7,000	Activated sludge	
	Soft drinks production	Soft drinks, favorite drinks, cider, lemonade, carbonated drinks, juice, syrup, honey (except fruit wines)	Bottle cleaning process	pH 9 – 12 BOD_5 250 –350 SS 100 – 150 Quantity 300 – 1,000 – 3,000	Activated sludge	Ratio of N and P
	Bean curd production	Bean curd, fried bean curd, frozen bean curd	Raw material treatment process Boiling process Soaking process	pH 5.1 –7.3 BOD_5 200 –1,400 SS 80 – 460 n-hexane 6 -80 T-N 10 - 50 T-P 1.3 -7.4 Quantity 2 –600	Oil separation Activated sludge	Wastewater: 50 – 160 m^3/ton-soybean

Industry classification	Type of Industry	Products	Sources of Wastewater	Quantity (m^3/day) & Quality of Wastewater	Treatment (General)	Remarks
Food Processing	Lunch production	Rice lunch, sushi lunch, sandwich, boiled noodle, rice ball	Kitchen facility (Raw material cleaning; dishes and container cleaning facility)	pH 6 –10 BOD_5 40 –1,700 SS 20 – 500 n-hexane 10 – 1,200 T-N 4.5 - 44 T-P 1 -13 Quantity 4 –450	Activated sludge	Including similar facilities to lunch caterer, group and school lunch facilities
Tobacco Production	Tobacco production	Cigarette, cigar, pipe tobacco	Wet de-odor facility Cleaning process	pH 7 BOD_5 50 –250 SS 40 – 300 T-N 5 - 3 T-P 2 -3 Quantity 500 –1,000	Activated sludge	Addition of N and P
Textile Industry except textile products	Silk industry	Raw silk	Silk production facility	pH 6 -8 BOD_5 150 –300 SS 50 – 100 T-N 20 - 30 T-P 3 -8 Quantity 80 –200	Activated sludge	
	Spinning industry	Cotton, chemical fiber, wool, silk	Dyeing facility Bleaching facility Glue facility	pH 3.5 -9 BOD_5 150 –200 - 400 SS 60 – 800 T-N 20 - 140 T-P 10 -30 Quantity 100 –300- 1,000	Activated sludge	
	Knitting industry	Socks, gloves	Dyeing facility	pH 6 -9 BOD_5 40 –100 SS 50 – 80 T-N 10 T-P 5 Quantity 500 –100- 400	Coagulation-Sedimentation Activated sludge	Wastewater: 0.03 – 0.06 m^3/m^2-cotton cloth

Industry classification	Type of Industry	Products	Sources of Wastewater	Quantity (m^3/day) & Quality of Wastewater	Treatment (General)	Remarks
Textile Industry except textile products	Dyeing and finishing industry	Bleaching, dyeing and finishing thread, cloth, kitted fiber	Refining facility Dyeing facility Bleaching facility	pH 3 -11 BOD_5 10 –350 SS 20 – 250 T-N 25 T-P 10 Quantity 30 –200	Coagulation-Sedimentation Activated sludge	
	Textile sanitary production	Absorbent cotton, gauze, bandage, fibrous sanitary products	Bleaching facility Cleaning facility	pH 6.5 -10 BOD_5 200 –500 SS 150 – 200 Quantity 100 –150	Coagulation-Sedimentation Activated sludge	
Lumber, wooden production	Lumber, wooden production	Sawed lumber, tip, particle board, plywood	Wet parker Adhesive machine cleaning facil	pH 4.5 -6.4 BOD_5 20 – 240 SS 40 – 300 T-N 0.5- 2.0 T-P 1 -7 Quantity 3,000 –130,000	Coagulation-Sedimentation Floatation	
Pulp, paper, paper processing	Paper production	Kinds of paper, cardboard	Papermaking facility	pH 8 - 9 BOD_5 150 – 200 SS 250 – 600 Quantity 500 –2,000	Coagulation-Sedimentation Floatation	
	Pulp production	Grand pulp, thermo mechanical pulp	Tip soaking facility Grinder facility Cleaning facility	pH 6.5 – 7.5 BOD_5 100 – 150 SS 200 – 300 Quantity 500 –2,000	Coagulation-	Pulp recovery rate: around 90% Wastewater: average 65m^3/ton-pulp
Chemical Industry	Organic industrial	Coal tar product; dyeing and medical intermittent product, synthetic dyeing material, organic paint, fermentation industry, ethylene derivative, acetylene derivative, synthetic resin, methanol and its derivative, organic industrial products not classified into plasticity products	Reaction facility Cleaning facility	pH 1 -13 BOD_5 100 – 1,000 SS 20 – 150 T-N 10- 200 T-P 10 -20 Quantity 50 – 200 - 500	Neutralization Activated sludge Coagulation-sedimentation	pH, odor, color

Industry classification	Type of Industry	Products	Sources of Wastewater	Quantity (m^3/day) & Quality of Wastewater	Treatment (General)	Remarks
Chemical Industry	Oil and fat processing, paint production including surfactan	Oil and fat acid, hardened oil, glycerin, soap, surfactant, paint, printing ink, cleaning agent, brushing agent	Raw oil cleaning facility Cooling water	pH 2 -11 BOD_5 200 – 2,400 SS 200 – 250 T-N 15- 25 T-P 40 -80 Quantity 50 – 200 – 1,000	Floatation Activated sludge	
Oil and coal products	Waste oil recycle	Refining waste oil, recycled oil, mud oil recycle	Cleaning facility Distill facility	pH 2 -8 BOD_5 20 – 200 SS 300 – 500 Quantity 10 – 30 – 50	Floatation	pH, oil
	Oil refinery	Oil products, gasoline, paraffin	Cleaning wastewater (including emulsion, acid and alkali wastewater)	pH 1 -13 BOD_5 20 – 200 SS 20 – 100 T-N 20- 30 T-P 5	Floatation Activated sludge Coagulation- sedime	50,000 m^3-wastewater/ 15,900,000 barrel 1m^3-white water/m^3-product
Rubber industry	Tire, tube	Tire, tube, rubber hose, rubber plate, industrial rubber products	Direct vulcanization process	pH 6 -9 COD_{Mn} 50 – 70 SS 30 n-hexane 10 T-N 1 T-P 0.5 Quantity 2,000– 9,000 – 100,000	Coagulation-sedimentation Oil separation	Zn Possible biological treatmen
	Medical, sanitary rubber production	Medical, sanitary rubber products, fiber rubber, rubber glove	Latex mold cleaning process			
Wholesale market	Local whole sale market	Fresh, frozen, salt dried fishery products, Marine products processing	Cleaning wastewater	pH 6 -7 BOD_5 100 – 300 SS 90 - 300 T-N 10 - 25 T-P 8 - 10 Quantity 10– 500	Activated sludge	

Industry classification	Type of Industry	Products	Sources of Wastewater	Quantity (m^3/day) & Quality of Wastewater	Treatment (General)	Remarks
Wholesale	Empty bottle wholesale	Bottle cleaning, reuse and wholesale for wine, whisky, brandy, milk, edible vinegar	Automatic bottle cleaning	pH 8 -12 BOD_5 30 – 500 n-hexane 0 -30 SS 10 - 200 T-N 2 - 8 T-P 1 - 4 Quantity 20– 500 – 3,000	Activated sludge	
Vehicle repair shop	Automobile repair shop	Automobile repair	Car washing facility	pH 7 -9.5 BOD_5 20 – 120 SS 10 - 700 n-hexane 10 - 100 T-N 2 - 5 T-P 0.5 Quantity 10– 300	Grid chamber Oil separation Coagulation - sedimentation	
Cleaning industry	Home laundry	Y-shirt	Cleaning facility	pH 8.7 -11.5 BOD_5 90 – 410 SS 140 (ave.) n-hexane 95 (ave) T-N 10 - 30 T-P 15 - 40	Coagulation – sedimentation Floatation Biological treatment	Use rotary bio-disk due to heavy foaming Chloride solvent is used in dry cleaning
	Linen supply	Sheet, pillow cover	Cleaning facility	pH 9.0 -10.6 BOD_5 87 – 647 SS 160 (ave.) n-hexane 110 (ave) T-N 10 - 30 T-P 15 - 40	Coagulation – sedimentation Floatation Biological treatment	Use rotary bio-disk due to heavy foaming
	Baby laundry	Diaper	Cleaning facility	pH 8.5 -9.4 BOD_5 200 – 1,450 SS 150 (ave.) n-hexane 150 (ave) T-N 10 - 40 T-P 15 - 30	Coagulation – sedimentation Floatation Biological treatment	Use rotary bio-disk due to heavy foaming

Industry classification	Type of Industry	Products	Sources of Wastewater	Quantity (m^3/day) & Quality of Wastewater	Treatment (General)	Remarks
Restaurant	Restaurant	Restaurant serving staple food such as bread, rice, cooked cuisine	Kitchen facility	pH 6 - 8 BOD_5 30 – 3,400 SS 20 – 2,200 n-hexane 13 – 2,200 T-N 3 - 42 T-P 1 - 12 Quantity 1– 160	Oil separator Activated sludge	Western and Chinese restaurant wastewater includes high BOD and oil
	Restaurant	Sushi, noodle, drinking (coffee, tea, milk, alcohol)	Kitchen facility	pH 6 - 8 BOD_5 210 – 1,200 SS 40 – 90 n-hexane 10 – 250 T-N 3 - 40 T-P 1 - 13 Quantity 1– 25	Activated sludge	High BOD_5 and oil in wastewater from coffee shop serving light meal Big difference in quality depends on serving alcohol
	Restaurant	Cuisine, staple, alcohol	Kitchen facility	pH 6 - 8 BOD_5 50 – 2,600 SS 30 – 700 n-hexane 5 – 780 T-N 4 - 39 T-P 1 - 13 Quantity 1– 60	Activated sludge	Big difference in scale Big daily and hourly fluctuation
Hospital	General hospital	Medical service such as out and in-patient, medication, operation	Kitchen facility Laundry facility Bathing facility Examination room Picture development facility	pH 6.9 – 7.4 BOD_5 80 – 280 SS 20 – 50 Phenol 0.02 – 48 T-N 4 - 7 T-P 0.5 - 1 Quantity 50– 1,000	Coagulation-sedimentation Activated sludge	Big difference in scale and examination courses
Livestock industry	Pig raising	Living pig	Raising facility	pH 7 – 8 BOD_5 2,200 – 4,500 SS 2,700 – 8,500 T-N 1,300 – 1,750 T-P 120 - 300 Quantity 3 – 410	Activated sludge Methane fermentatio	Big difference in scale, feeding, raising and facility management

Table 3.17 Organic Wastewater with Toxic Substances

Industry classification	Type of Industry	Products	Sources of Wastewater	Quantity (m^3/day) & Quality of Wastewater	Treatment (General)	Remarks
Leather processing	Leather industry	Leather, tanned leather, chrome leather, Fish skin, leather dyeing	Raw material treatment process Tanning facility Lime soaking facility Dyeing facility	pH 7 – 12 BOD_5 80 – 2,500 SS 50 – 3,000 T-N 250 – 350 T-P 10 - 20 Quantity 3 0– 100 - 600	Coagulation-sedimentation Activated sludge Oxidation ditch	Chrome, sulfide
Steel industry	Blast furnace Pig iron	Pig iron by blast furnace	Coke furnace	(Gas liquid) pH 9 – 9.5 BOD_5 3,000 – 4,000 SS 50 T-N 800 – 1,000 T-P 20 – 50 Phenol 1,000 – 5,000 Thio-cyanide acid 200 – 800 Cyanide 40 Sulfide 200 – 400 Free ammonia 3,000 – 7,000 (Gas cleaning wastewater) pH 9 – 9.5 BOD_5 150 – 800 Phenol 50 – 500 Thio-cyanide acid 200 – 800 Cyanide 0- 300 Sulfide 200 – 400 Free ammonia 500 – 2,000	Chemical treatment Activated sludge Ammonia stripping	Same as gas production, coke production industry Liquid: 10 % of carbonized coal Wastewater: 1.5 - 5m^3/ton-carbonized coal

Industry classification	Type of Industry	Products	Sources of Wastewater	Quantity (m^3/day) & Quality of Wastewater	Treatment (General)	Remarks
Chemical Industry	Insecticide production	Insecticide, disinfectant, mosquito killer, pesticide	Reaction facility Cleaning facility	pH 4 – 9 BOD_5 20 – 100 SS 50 – 70 Quantity 50 – 200 - 300		Need design of each treatment with each product
Publishing business	Newspaper, publishing, print, bookbinder	Newspaper, magazine, books, advertisement	Cleaning facility of automatic film development Cleaning facility of print development with automatic sensitive plate	(Development and fixing solution) pH 4-4.5; 9.5- 10.5 BOD_5 3,000 – 20,000 SS 100 – 200 T-N 100 – 200 T-P 10 - 20 Quantity 400 – 120,000	Neutralization Coagulation - sedimentation	CN, Cd, Cr, Mn, Cu, Zn included

Table 3.18 Inorganic Wastewater

Industry classification	Type of Industry	Products	Sources of Wastewater	Quantity (m^3/day) & Quality of Wastewater	Treatment (General)	Remarks
Chemical Industry	Chemical fertilizer production	Ammonia fertilizer, lime nitrogen, phosphate fertilizer, combined fertilizer	Reaction facility Gas cleaning facility	pH 1 – 4 BOD_5 800 – 1,200 SS 50 – 350 T-N 250 – 350 T-P 220 - 280 Quantity 100 – 1,000	Neutralization-sedimentation	
	Inorganic industrial products	Soda industrial product, Calcium-carbide, man-made carbon, Phosphate acid, inorganic paint, salt, other inorganic industrial products	Grinder facility Cleaning facility Cooling facility	pH 1 – 9 BOD_5 20 SS 1,000 – 2,000 T-N 60 – 100 T-P 2 – 5 - 50 Quantity 500 – 2,000	Neutralization-sedimentation	pH, color
Ceramic industry, soil and stone production	Glass production	Plate glass, glass fiber, glass ware, glass processed goods	Grinding facility Cleaning facility Cooling facility	pH 7 – 9 BOD_5 20 -70 SS 150 – 300 Quantity 50 – 100- 5,000	Coagulation-sedimentation	Abrading, oil

Industry classification	Type of Industry	Products	Sources of Wastewater	Quantity (m^3/day) & Quality of Wastewater	Treatment (General)	Remarks
Ceramic industry, soil and stone production	Concrete product	Concrete tube, cement tile, cement plate, slate, concrete electricity poll, concrete tank, block	Molding facility Curing facility	pH 9 – 14 SS 150 – 500 Quantity 100- 300	Neutralization-sedimentation	
Steel industry	Not by blast furnace	Electric furnace steel, charcoal furnace steel, small-sized blast furnace steel, recycled furnace steel, raw iron, sponge steel, granule steel, steel bar, pure iron, ferroalloy, base metal, titan slug	Cooling facility Dust collecting facility	pH 4 – 8 BOD_5 50 - 100 SS 500 – 3,000 T-N 5 – 15 T-P 10 – 20 Quantity 200 – 1,000	Neutralization-sedimentation	
	Steel industry, rolling mill	Steel and rolling mill products, special steel, steel pipe	Rolling mill facility Acid cleaning facility Dust collecting facility	pH 3 – 8 SS 500 – 1,000 Quantity 100 – 1,500	Neutralization-Coagulation-sedimentation	Acid washing wastewater: 1 – 4m^3/ton-steel 200 – 400 mg/L oil in cool rolling wastewater Wastewater in rolling mill: 7 -12 m^3/ton-steel
	Steel materials production with steel manufacturing, except plating	Heated and cooled rolling plate, expanded steel	Acid cleaning facility Cooling facility	pH 3 – 4 SS 70 – 200 Quantity 100 – 400	Neutralization-Coagulation-sedimentation	Hundreds of scale and 10 – 20 mg/L oil in heated rolling wastewater
	Plating steel materials production	Tin plate, zinc steel plate, lead steel plate, zinc plating steel pipe, plating steel wire, tinning steel pipe	Acid cleaning facility Cooling water	pH 2 – 6 SS 30 – 150 Quantity 50 – 150	Neutralization-Coagulation-sedimentation	Wastewater: 30 -40 m^3/ton-steel plate
	Steel industry by blast furnace	Steel rolling products, regular steel, steel pipe	Blast furnace (steel manufacturing	(Furnace dust wastewater) pH 7 – 8 SS 500 – 3,000 Temperature 40 – 50 ℃ Quantity 10 – 15 m^3 per ton-steel	Coagulation-sedimentation Sedimentation	Rolling wastewater and acid cleaning wastewater: same as the rolling wastewater above

Industry classification	Type of Industry	Products	Sources of Wastewater	Quantity (m^3/day) & Quality of Wastewater	Treatment (General)	Remarks
Steel Industry	Steel industry by blast furnace	Steel rolling products, regular steel, steel pipe	Revolving furnace (steel manufacturing)	(Revolving furnace gas cleaning wastewater) pH 3 – 6 SS 2,000 – 6,000 Temperature 40 – 60 ℃ Quantity 1 – 3 m^3 per ton-ingot	Coagulation-sedimentation Sedimentation	Wastewater consumption:100 – 150 m^3/crude steel Among it fresh water: 50 – 80 m^3/crude steel, among it 70 – 90 % is reused.
Metal processing	Metal surface processing	Electrolysis polishing, Alumite, Polishing, metal corrosion protection	Chemical film facility Acid or alkali cleaning wastewat	pH 2 – 10 SS 70 – 150 Quantity 20 – 60	Neutralization-sedimentation	Fluctuation of wastewater

Table 3.19 Inorganic Wastewater with Toxic Substances

Industry classification	Type of Industry	Products	Sources of Wastewater	Quantity (m^3/day) & Quality of Wastewater	Treatment (General)	Remarks
Nonferrous metals processing	Nonferrous metals first metallurgy, refiner	Cupper metallurgy, Cupper production, electricity cupper metallurgy; metallurgy of lead, zinc, aluminum, gold, titan, nickel, silver, antimony, mercury, magnesium, tungsten, germanium	Gas cleaning facility	pH 6 – 8 SS 500 – 3,000 Quantity 1,000 – 3,000	Coagulation-sedimentation Chemical treatment	Heavy metals
	Nonferrous metal rolling, expanded pipe, alloy compounds	Expanded cupper, pipe, rolling and expanded lead, aluminum, precious metals	Acid cleaning facility	pH 2 – 7 SS 70 – 200 Quantity 200– 600– 10,000	Neutralization-sedimentation	Heavy metals
Metal products processing	Electricity plating industry	Electricity plating	Electricity plating facility Acid, alkali cleaning facility	pH 1 – 2 CN 20 – 200 Cr 40 -150 Cu, Cd, Zn included Quantity 10 – 30 - 100	Chemical treatment	Fluctuation of wastewater Heavy metals
Chemical industry	Inorganic industrial products	Soda industrial product	Mercury electrode Electrolysis facility	Hg including	Ion-exchange Chemical treatment	

Industry classification	Type of Industry	Products	Sources of Wastewater	Quantity (m^3/day) & Quality of Wastewater	Treatment (General)	Remarks
Ceramic industry, soil an stone products manufacturing	Glass production	Optical glass, special glass(with heavy metals like Cd)	Grinder, Cleaning facility	Heavy metal like Cd	Coagulation-sedimentation Filtration	

3.9 Estimation of Industrial Wastewater Quality

Table 3.20 Estimation of Industrial Wastewater Quality

No.	Company/Factory Name	Industrial Category - IPPC	Classification A or B	Industry code	Number of employees	Products	Water consumption (m^3/year)	Wastewater generation (m^3/year)	Estimation by IPPS (The Industrial Pollution Projection System) Method								Example in Japan			Analysis Result					Estimated water quality (g/m^3)	
									Estimate ISIC Code	Unit Load (ton/year/1,000			Load (ton/year)			g/m^3			g/m^3						
										Used metal	BOD_5	SS	Used metal	BOD_5	SS	Used metal	BOD_5	SS	Estimated Type of Industry	BOD_5	SS	BOD_5	COD(Mn)	SS	Remarks	BOD_5	SS
1	Ading AD	4.1,4.2	A	24.66	100	powder cement products,water solution additives, epoxide systems, mineral oils, construction facilities	18,600	6,000	3529	5.61	1.2	1.73	0.6	0.1	0.2	94	20	29	Organic industrial production	100-1,000	20-150	150	1,930	264		200	300
2	TGS Tehnicki gasovi	4.2 a	A	24.11	76	acetylen	18,500	16,000	3529	5.61	1.2	1.73	0.4	0.1	0.1	27	5.7	8.2	In-organic indutrial products	20	1,000-2,000	-	-	-	-	30	1,000
3	ARCELORMITTAL STEEL	2.3	A	27.10	970	hot rolling mill,cold rolling mill	2,375,600	2,085,600	3710	25.31	0.96	14,074	24.6	0.9	13,651.8	12	0.4	6,546	Steel industry, Rolling mill		500-1,000	ignore	190	315	Fe: 177	60	500
4	Makstil	2.2 & 2.3	A	27.10	960	sheet metal	4,492,853	1,523,449	3710	25.31	0.96	14,074	24.3	0.9	13,511.0	16	0.6	8,869	Plating steel materials production		30-150	5.6	15(CODcr)	12	Fe: 1.9	60	150
5	Re Ushugi	/	/	40.3, 41.10	207	services, water supply	50,370	50,370	3851	0.05	0.03	0.03	0.0	0.0	0.0	0.21	0.12	0.12	(Steam and hot water supply, collection, purfication and				8.8	94		60	150
6	Replek Farm	4.5	B	24.41	330	pharmaceutical products	2,580	2,064	3511	427	570	880	140.9	188.1	290.4	68,270	91,134	140,698	Organic industrial production	100-1,000	20-150	413	628	67		500	75
7	Zito Luks - Suto Orizari	6.4	B	15.81	394	bread, pastries made of flour and reebound dought	57,024	48,840	3121	0.35	0.27	0.11	0.1	0.1	0.0	2.8	2.2	0.9	Bakery, confectionery products	200-600-2,500	120-600-2500	-	-	-	-	600	600
8	Fitofarm	4.5	A	24.41	31	cosmetic products,solutions,medicine creams and greases,syrups	5,531	5,531	3523	0.72	15.14	21	0.0	0.5	0.7	4.0	85	120	Organic industrial production	100-1,000	20-150	-	-	-	-	250	200
9	Klinicki centar	/	/	85.11	4200	services, hospital	527,588	475,000	3512	17.6	7.12	1,386	73.9	29.9	5,821.2	156	63	12,255	Genral hospital	80-280	20-50	-	-	-	-	170	350
10	Gradska bolnica	/	/	85.11	340	services, hospital	39,630	36,000	3512	17.6	7.12	1,386	6.0	2.4	471.2	166	67	13,090	Genral hospital	80-280	20-50	-	-	-	-	80	150
11	Voena bolnica	/	/	85.11	604	services, hospital	240,000	220,000	3512	17.6	7.12	1,386	10.6	4.3	837.1	48	20	3,805	Genral hospital	80-280	20-50	-	-	-	-	80	350
12	Alkaloid AD-Laflora	4.1,4.2,4.5	A	24.51	194	chemicals,cosmetics products, pharmaceuticals,chemedialysis solution	310,000	210,000	3523	0.72	15.14	21	0.1	2.9	4.1	0.7	14	20	Organic industrial production	100-1,000	20-150		1,430	315	Fe;31	700	350
13	Alkaloid AD-pharmaceutical	4.5	A	24.41	758	analgin,paracetamol,kofein,pentoksifelin	138,900	137,900	3511	427	570	880	323.7	432.1	667.0	2,347	3,133	4,837	Organic industrial production	100-1,000	20-150		343			250	75
14	Alkaloid AD-Herbs	/	/	15.86	50	tea,spices,pan,pharmaceuticals,herbs	70,000	68,000	3121	0.35	0.27	0.11	0.0	0.0	0.0	0.3	0.2	0.1	Seasoning product	40-300-2,000	200-300		182			150	250
15	ALKALOID PREMAZI DOOEL	4.1	A	24.3	63	materials, dispersions,coatings,synthetic materials	40,820	23,681	3521	0.45	0.03	0.11	0.0	0.0	0.0	1.2	0.1	0.3	Organic industrial production	100-1,000	20-150		420			200	100
16	Kanar-92	2.6	A	28.11	50	welded metal structures	5,000	4,000	3813	3.27	0.06	0.08	0.2	0.0	0.0	41	0.8	1.0	Plating steel materials production		30-150	-	-	-	-	30	70
17	MZT energetika	/	/	40.3, 41.10	43	Production and distribution of compressed air, gases and water	800	800	3851	0.05	0.03	0.03	0.0	0.0	0.0	2.7	1.6	1.6	(Steam and hot water supply, collection, purfication and							30	60
18	MZT Hepos	2.3	A	28.11	493	machines and parts	174,149	132,248	3813	3.27	0.06	0.08	1.6	0.0	0.0	12	0.2	0.3	Plating steel materials production		30-150	30	50	55		30	60
19	MZT Learnica	2.4	A	27.52	367	foundries of nodular foundry,foundries of grey foundry	92,400	48,600	3710	25.31	0.96	14073	9.3	0.4	5,164.8	191	7.2	106,271	Plating steel materials production		30-150			188		70	190
20	Sanos Bus	/	/	34.1	59	buses	12,950	11,656	3842	0.25	0.03	0.13	0.0	0.0	0.0	1.3	0.2	0.7	Automobile repair shop	20-120	10-700	-	-	-	-	40	70
21	Evropa A.D.	6.4	B	15.84	431	confectionary products	102,000	90,000	3119	1.61	0.77	0.13	0.7	0.3	0.1	7.7	3.7	0.6	Bakery, confectionery products	200-600-2,500	120-600-2500	17	115	56		300	600
22	JSP - Gjorce Petrov	/	/	60.21	1294	services, public transporatation	39,201	37,240	3851	0.05	0.03	0.03	0.1	0.0	0.0	1.7	1.0	1.0	Automobile repair shop	20-120	10-700	-	-	-	n-hexane	80	200
23	JSP - Avtokomonda	/	/	60.21	1294	services, public transporatation	90,996	87,834	3851	0.05	0.03	0.03	0.1	0.0	0.0	0.7	0.4	0.4	Automobile repair shop	20-120	10-700				n-hexane	80	200

No.	Company/Factory Name	Industrial Category - IPPC	Classification A or B	Industry code	Number of employes	Products	Water consumption (m^3/year)	Wastewater generation (m^3/year)	Estimation by IPPS (The Industrial Pollution Projection System) Method								Example in Japan			Analysis Result				Estimated water quality (g/m^3)	
									Estimate ISIC Code	Unit Load (ton/year/1,000			Load (ton/year)			g/m^3			g/m^3					
										Used metal	BOD_5	SS	Used metal	BOD_5	SS	Used metal	BOD_5	SS	Estimated Type of Industry	BOD_5	SS	BOD_5	COD(Mn)	SS	Remarks	BOD_5	SS
24	Energetika - ELEM	1.1	A	40.3	138	technological steam,hot water,DM water	255,211	62,611	3851	0.05	0.03	0.03	0.0	0.0	0.0	0.1	0.1	0.1	(Steam and hot water supply, collection, purification			-	-	-	-	20	50
25	Skopski Leguri	2.5	A	27.1	696	Si-Mn, Planning Fe-Mn	4,483,200	2,031,600	3720	10.22	261	3772	7.1	181.7	2,625.3	3.5	89	1,292	Plating steel materials production	30-150						20	70
26	Komuna	6.1	A	21.21	75	paper,confection,bags	496,392	473,620	3412	0.41	5.17	8.87	0.0	0.4	0.7	0.1	0.8	1.4	Paper production	150-200	250-600		220	498		150	500
27	Pivara	6.4	A	15.96	394	beer,bah,vinigar	660,000	520,827	3133	1.21	5.62	12.99	0.5	2.2	5.1	0.9	4.3	9.8	Beer product	500-2,000	250-1,000	808	296	130		850	130
28	Rade Koncar-Kontaktori i relei	2.4	B	31.2	270	contactors	31,400	31,400	3831	0.09	0.04	0.23	0.0	0.0	0.1	0.8	0.3	2.0	Electricity plating	70-150				59		50	70
29	Obis AD	4	A	24.1	1500	detergents,acrylic fibre,mat fibre, roving, yarn,PVA emulsions and processing (not production),PVC moulding into duct, compounds, mixes and foils,cosmetics	2,014,430	891,361	3513	49.82	25.35	81.92	74.7	38.0	122.9	84	43	138	Organic industrial production	100-1,000	20-150		220			100	80
30	Cementarnica Usje	3.1	A	26.51	514	cement	395,000	368,000	3692	4	0.11	240	2.1	0.1	123.4	5.6	0.2	335	Concrete product		150-500	30	128 (CODc	100		30	200
31	Mlekarnica Masko	6.4	B	15.51	9	yogurt,milk,cheese	72,720	72,720	3112	3.26	1160	167	0.0	10.4	1.5	0.4	144	21	Dairy products	50-350	70-150	11	37 (CODcr	2,200		350	2,200
32	Skovin	/	/	15.98	66	vine production	18,000	18,000	3132	0	2.68	1.47	0.0	0.2	0.1	-	10	5.4	Sprits, mixed liquor	600-92,000	600-2,000	-	-	-	-	600	600
33	M&A beveridzis	/	/	15.98	130	soft drinks	10,200	4,200	3132	0	2.68	1.47	0.0	0.3	0.2	-	83	46	Soft drinks production	250-350	100-150	132 (D	25	8		350	150
34	Beton AD Skopje	/	/	26.61	1316	concrete	8,024	5,400	3691	0.07	0.02	0.38	0.1	0.0	0.5	17	4.9	93	Concrete product		150-500					20	200
35	Globus	6.4	B	15.11	51	delicatess products	14,000	13,110	3111	0.74	3.26	4.04	0.0	0.2	0.2	2.9	13	16	Meat products	300-600	100-300	2.5	620	570		600	600
36	Klanica "vilan"	6.4	B	15.11	6	loading/unloading of meat	1,320	1,254	3111	0.74	3.26	4.04	0.0	0.0	0.0	3.5	16	19	Meat products	300-600	100-300	-	-	-	-	300	100
37	"Rimes"	6.4	B	15.11	45	sausages,smoked pig meat,pareni products	7,836	7,150	3111	0.74	3.26	4.04	0.0	0.1	0.2	4.7	21	25	Meat products	300-600	100-300	73	26 (CODcr	217		300	100
38	Lek Skopje	4.5	B	24.41	33	medicaments	3,240	3,240	3529	5.61	1.2	1.73	0.2	0.0	0.1	57	12	18	Empty bottel wholesale	30-500	10-200	-	-	-	-	350	100
39	Drisla	5.3	A	90.00	102	landfill	9,025	34,254	3529	5.61	1.2	1.73	0.6	0.1	0.2	17	3.6	5.2				15				60	120
40	AD Toplifikacija - Zapad	1.1	A	40.30	220	heat energy	155,700	5,100	3529	5.61	1.2	1.73	1.2	0.3	0.4	242	52	75				560	235	2,600	Fe: 1,400,	600	2,600
41	AD Toplifikacija - Istok	1.1	A	40.30	70	heat energy	239,950	30,350	3529	5.61	1.2	1.73	0.4	0.1	0.1	13	2.8	4.0				-	-	-	-	60	70
42	AD Toplifikacija - 11 Oktomvri	1.1	B	40.30	?	heat energy	9,520	1,520	3529	5.61	1.2	1.73	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!				-	-	-	-	60	70
43	MIDA	/	/	/	120	services, car wash	22,200	18,000	3843	0.25	0.03	0.13	0.0	0.0	0.0	1.7	0.2	0.9	Automobile repair shop	20-120	10-700	-	-	-	-	60	350
44	Rade Koncar TEP	/	/	31.10	21	cupboard,transformators	305	230	3831	0.09	0.04	0.23	0.0	0.0	0.0	8.2	3.7	21	Plating steel materials production		30-150	-	-	-	-	60	100
45	"Promes"	6.4	B	15.11	150	meat products (dry)	44,400	42,180	3111	0.74	3.26	4.04	0.1	0.5	0.6	2.6	12	14	Meat products	300-600	100-300		48	114		300	150
46	Carwash TONI	/	/	/	3	services, car wash	1,095	1,095	3843	0.25	0.03	4.04	0.0	0.0	0.0	0.7	0.1	11	Home laundry	90-410	10-700	-	-	-		120	150
47	Carwash Brane	/	/	/	3	services, car wash	730	730	3843	0.25	0.03	4.04	0.0	0.0	0.0	1.0	0.1	17	Home laundry	90-410	10-700	-	-	-		120	150
48	Carwash Medzik Kisel	/	/	/	4	services, car wash	2,880	2,880	3843	0.25	0.03	4.04	0.0	0.0	0.0	0.3	0.0	5.6	Home laundry	90-410	10-700	-	-	-		120	150
49	AD Toplifikacija - Sever	1.1	B	40.30	7	heat energy	5,110	1,260	3529	5.61	1.2	4.04	0.0	0.0	0.0	31	7	22				-	-	-		60	70
50	Swiss-lion	/	B	15.81	114	softy biscuette,salt proggramme	11,125	11,120	3119	0	1.61	0.77	0.0	0.2	0.1	-	17	7.9	Bakery, confrictionery products	200-600-1,300	100-150-900	1500	1500	550		1,500	600
	Total				**19,365**		**17,878,505**	**9,974,019**																			

3.10 Pollution Load by Type of Industry

Table 3.21 Pollution Load by Type of Industry

No.	Company/Factory Name	Industrial Category - IPPC	Classification A or B	Industry code	Number of employees	Products	Wastewater generation		Estimated water quality (mg/L)		Estimated load (kg/day)		Operation days/year	Operation hours/day	Wastewater/hour	Discharge in Future	Estimated Pre-traetment[1]
							m^3/year	m^3/day	BOD_5	SS	BOD_5	SS					
1	**Energy industries**																
24	Energetika - ELEM	1.1	A	40.3	138	technological steam,hot water,DM water	62,611	172	20	50	3.4	8.6	365	24	7.1	Sewer	Oil
49	AD Toplifikacija - Sever	1.1	B	40.30	7	heat energy	1,260	6.9	60	70	0.4	0.5	183	15	0.5	Sewer	Oil
40	AD Toplifikacija - Zapad	1.1	A	40.30	220	heat energy	5,100	27.9	600	2,600	16.7	72.5	183	15	1.9	Sewer	Fe,Mn, Oil
41	AD Toplifikacija - Istok	1.1	A	40.30	70	heat energy	30,350	166	60	70	10.0	11.6	183	15	11	Sewer	Oil
42	AD Toplifikacija - 11 Oktomvri	1.1	B	40.30	?	heat energy	1,520	8.3	60	70	0.5	0.6	183	15	0.6	Sewer	Oil
	Total energy industries						**100,841**	**380**			**31**	**94**			**21**		
2	**Production and processing of metals**																
31	ARCELORMITTAL STEEL	2.3	A	27.10	970	hot rolling mill,cold rolling mill	2,085,600	5,714	60	500	342.8	2,857.0	365	24	238	Vardar River	Heavy metals, Oil, BOD_5
4	Makstil	2.2 & 2.3	A	27.10	960	sheet metal	1,523,449	4,174	60	150	250.4	626.1	365	24	174	Vardar River	Heavy metals, Oil, BOD_5
16	Kanar 92	2.6	A	28.11	50	welded metal structures	4,000	14.3	30	70	0.4	1.0	280	16	0.9	Sewer	Heavy metal, Oil
18	MZT Hepos	2.3	A	28.11	493	machines and parts	132,248	479	30	60	14.4	28.7	276	16	30	Sewer	Oil
25	Skopski Leguri	2.5	A	27.1	696	Si-Mn, Planning Fe-Mn	2,031,600	5,566	20	70	111.3	389.6	365	24	232	Sewer	Heavy metals, Oil
19	MZT Learnica	2.4	A	27.52	367	foundries of nodular foundry,foundries of grey foundry	48,600	133	70	190	9.3	25.3	365	24	5.5	Sewer	Oil
28	Rade Koncar-Kontaktori i relei	2.4	B	31.2	270	contactors	31,400	119	50	70	5.9	8.3	264	16	7.4	Sewer	CN, heavy metals, phenol, oil
	Total production and processing of metals						**5,856,897**	**16,199**			**735**	**3,936**			**688**		
3	**Mineral industry**																
30	Cementarnica Usje	3.1	A	26.51	514	cement	368,000	1,008	30	200	30.2	202	365	24	42	Sewer	
	Total mineral industry						**368,000**	**1,008**			**30**	**202**			**42**		
4	**Chemical industry**																
1	Ading AD	4.1,4.2	A	24.66	100	powder cement products, water solution additives, epoxide systems, mineral oils, construction facilities	6,000	23	200	300	4.6	7	260	8	2.9	Sewer	Oil
2	TGS Tehnicki gasovi	4.2 a	A	24.11	76	acetylene	16,000	62	30	1,000	1.8	62	260	8	7.7	Sewer	SS
6	Replek Farm	4.5	B	24.41	330	pharmaceutical products	2,064	9.4	500	75	4.7	1	220	16	0.6	Sewer	
8	Fitofarm	4.5	A	24.41	31	cosmetic products,solutions,medicine creams and greases,syrups	5,531	21	250	200	5.3	4	261	15	1.4	Sewer	
12	Alkaloid AD-Lafoma	4.1,4.2,4.5	A	24.51	194	chemicals,cosmetics products, pharmaceuticals,chemodialysis solution	210,000	840	700	350	588.0	294	250	24	35	Sewer	Fe
13	Alkaloid AD-pharmaceutical	4.5	A	24.41	758	analgin,paracetamol,kofein,pentoksifelin	137,900	552	250	75	137.9	41	250	16	34	Sewer	Fe
15	ALKALOID PREMAZI DOOEL	4.1	A	24.3	63	materials, dispersions,coatings,synthetic materials	23,681	95	200	100	18.9	9	250	8	12	Sewer	Phenol
29	Ohis AD	4	A	24.1	1500	detergents,acrylic fibre,mat fibre, roving, yarn,PVA emulsions and processing (not production),PVC moulding into duct, compounds, pipes and foils,cosmetics	891,361	2,442	100	80	244.2	195	365	24	102	Vardar River	
38	Lek Skopje	4.5	B	24.41	33	medicaments	3,240									Sewer	
	Total chemical industry						**1,295,777**	**4,044**			**1,006**	**614**			**196**		
5	**Waste management**																
39	Drisla	5.3	A	90.00	102	landfill	34,254	94	60	120	5.6	11	365	24	3.9	Sewer	Heavy metals
	Total waste management						**34,254**	**94**			**5.6**	**11**			**3.9**		

No.	Company/Factory Name	Industrial Category - IPPC	Classification A or B	Industry code	Number of employees	Products	Wastewater generation		Estimated water quality (mg/L)		Estimated load (kg/day)		Operation days/year	Operation hours/day	Wastewater/hour	Discharge in Future	Estimated Pre-traetment[1]
							m^3/year	m^3/day	BOD_5	SS	BOD_5	SS					
6	**Other activities under IPPC**																
7	Zito Luks - Suto Orizari	6.4	B	15.81	394	bread, pastries made of flour and icebound dought	48,840	134	600	600	80	80	365	24	5.6	Sewer	Oil
37	"Rimes"	6.4	B	15.11	45	sausages,smoked pig meat,pareni products	7,150	27	300	100	8	3	261	16	1.7	Sewer	Oil
26	Komuna	6.1	A	21.21	75	paper,confection,bags	473,620	1,377	150	500	207	688	344	24	57	Sewer	
27	Pivara	6.4	A	15.96	394	beer,bah,vinigar	520,827	1,427	850	130	1,213	186	365	24	59	Vardar River	
21	Evropa A.D.	6.4	B	15.84	431	confectionary products	90,000	346	300	600	104	208	260	8	43	Sewer	Oil
31	Mlekarnica Masko	6.4	B	15.51	9	yogurt,milk,cheese	72,720	199	350	2,200	70	438	365	24	8.3	Sewer	SS
35	Globus	6.4	B	15.11	51	delicatess products	13,110	46	600	600	27	27	288	8	5.7	Sewer	
36	Klanica "Vilan"	6.4	B	15.11	6	loading/unloading of meat	1,254	4.5	300	100	1	0	280	8	0.6	Sewer	
45	"Promes"	6.4	B	15.11	150	meat products (dry)	42,180	146	300	150	44	22	288	24	6.1	Sewer	Oil
50	Swiss-lion	6.4	B	15.81	114	softy biscuette,salt proggramme	11,120	44	1,500	600	67	27	250	24	1.9	Sewer	Oil
	Total other activities under IPPC						**1,280,821**	**3,751**			**1,821**	**1,679**			**190**		
7	**Other**																
5	Rz Uslugi	/	/	40.3, 41.10	207	services, water supply	50,370	138	60	150	8	21	365	24	5.8	Sewer	Oil
9	Klinicki centar	/	/	85.11	4200	services, hospital	475,000	1,301	170	350	221	455	365	24	54	Sewer	Toxic substances
10	Gradska bolnica	/	/	85.11	340	services, hospital	36,000	99	80	150	8	15	365	24	4.1	Sewer	Toxic substances
11	Voena bolnica	/	/	85.11	604	services, hospital	220,000	603	80	350	48	211	365	24	25	Sewer	Toxic substances
14	Alkaloid AD-Herbs	/	/	15.86	50	tea,spices,parapharmaceuticals,herbs	68,000	272	150	250	41	68	250	8	34	Sewer	
17	MZT energetika	/	/	40.3, 41.10	43	Production and distribution of compressed air, gases and water	800	2.2	30	60	0	0	365	24	0.1	Sewer	
22	JSP - Gjorce Petrov	/	/	60.21	1294	services, public transporatation	37,240	102	80	200	8	20	365	24	4.3	Sewer	Oil
23	JSP - Avtokomonda	/	/	60.21	1294	services, public transporatation	87,834	241	80	200	19	48	365	24	10	Sewer	Oil
46	Carwash TONI	/	/	/	3	services, carwash	1,095	3.0	120	150	0	0	365	8	0.4	Sewer	Oil
47	Carwash Brane	/	/	/	3	services, carwash	730	2.0	120	150	0	0	365	8	0.3	Sewer	Oil
48	Carwash Medzik Kisel	/	/	/	4	services, carwash	2,880	7.9	120	150	1	1	365	8	1.0	Sewer	Oil
20	Sanos Bus	/	/	34.1	59	buses	11,650	47	40	70	2	3	250	8	5.8	Sewer	Oil
32	Skovin	/	/	15.98	66	vine production	18,000	69	600	600	41	41	261	16	4.3	Sewer	
33	M&A beveridzis	/	/	15.98	130	soft drinks	4,200	13	350	150	5	2	313	24	0.6	Sewer	
43	MIDA	/	/	/	120	services, carwash	18,000	53	60	350	3	19	340	8	6.6	Sewer	Oil
44	Rade Koncar TEP	/	/	31.10	21	cupboard,transformators	230	0.9	60	100	0	0	260	8	0.1	Sewer	
34	Beton AD Skopje	/	/	26.61	1316	concrete	5,400	22	20	200	0	4	250	8	2.7	Sewer	
	Total Other						**1,037,429**	**2,975**			**407**	**910**			**159**		
	Grand Total						**9,974,019**	**28,464**			**4,039**	**7,447**			**1,301**		

3.11 Estimation of Pollution Load to Sewer and Environment-1: Future Load by All Enterprises to Environment

Table 3.22 Estimation of Pollution Load to Sewer and Environment: Current Situation

(1) Whole 50 Factories

No.	Company/Factory Name	Wastewater Generation		Estimated Water Quality (mg/l)		Remarks, Pre-treatment	Estimated Load (kg/day)		Treatment Plant	Preferable Discharge Sewer	Operation (days/year)	Operation (hrs/day)	Wastewater (m^3/hour)
		(m^3/year)	(m^3/day)	BOD	SS		BOD	SS					
1	Ading AD	6,000	23	200	300		4.6	6.9	No	Sewer	260	8	3
2	TGS Tehnicki gasovi	16,000	62	30	1,000	TSS	1.8	61.5	No	Sewer	260	8	8
3	**ARCELORMITTAL STEEL**	**2,085,600**	**5,714**	**60**	**500**	**Fe, oil, heavy metals**	**342.8**	**2,857.0**	**Yes**	**Direct**	**365**	**24**	**238**
4	**Makstil**	**1,523,449**	**4,174**	**60**	**150**	**Oil, heavy metal**	**250.4**	**626.1**	**No**	**Direct**	**365**	**24**	**174**
5	Rz Uslugi	50,370	138	60	150	oil	8.3	20.7	No	Sewer	365	24	6
6	Replek Farm	2,064	9	500	75		4.7	0.7	No	Sewer	220	16	1
7	Zito Luks - Suto Orizari	48,840	134	600	600	n-hexane	80.3	80.3	No	Sewer	365	24	6
8	Fitofarm	5,531	21	250	200		5.3	4.2	No	Sewer	261	15	1
9	Klinicki centar	475,000	1,301	170	350	Check Toxic substances	221.2	455.5	No	Sewer	365	24	54
10	Gradska bolnica	36,000	99	80	150	Check Toxic substances	7.9	14.8	No	Sewer	365	24	4
11	Voena bolnica	220,000	603	80	350	Check Toxic substances	48.2	211.0	No	Sewer	365	24	25
12	Alkaloid AD-Lafoma	210,000	840	700	350	Fe	588.0	294.0	Yes	Sewer	250	24	35
13	Alkaloid AD-pharmaceutical	137,900	552	250	75	Fe	137.9	41.4	No	Sewer	250	16	34
14	Alkaloid AD-Herbs	68,000	272	150	250		40.8	68.0	No	Sewer	250	8	34
15	ALKALOID PREMAZI DOOEL	23,681	95	200	100	Phenol	18.9	9.5	No	Sewer	250	8	12
16	Kanar 92	4,000	14	30	70	(Fe, n-hexane)	0.4	1.0	No	Sewer	280	16	1
17	MZT energetika	800	2	30	60	(n-hexane)	0.1	0.1	No	Sewer	365	24	0
18	MZT Hepos	132,248	479	30	60		14.4	28.7	Yes	Sewer	276	16	30
19	MZT Leamica	48,600	133	70	190	Heavy metal, n-hexane	9.3	25.3	No	Sewer	365	24	6
20	Sanos Bus	11,650	47	40	70	(n-hexane)	1.9	3.3	No	Sewer	250	8	6
21	Evropa A.D.	90,000	346	300	600	n-hexane	103.8	207.7	No	Sewer	260	8	43
22	JSP - Gjorce Petrov	37,240	102	80	200	n-hexane	8.2	20.4	No	Sewer	365	24	4
23	JSP - Avtokomonda	87,834	241	80	200	n-hexane	19.3	48.1	No	Sewer	365	24	10
24	**Energetika - ELEM**	**62,611**	**172**	**20**	**50**	**n-hexane**	**3.4**	**8.6**	**No**	**Direct**	**365**	**24**	**7**
25	**Skopski Leguri**	**2,031,600**	**5,566**	**20**	**70**	**Heavy metal, n-hexane**	**111.3**	**389.6**	**No**	**Direct**	**365**	**24**	**232**
26	Komuna	473,620	1,377	150	500		206.5	688.4	No	Sewer	344	24	57
27	**Pivara**	**520,827**	**1,427**	**850**	**130**		**1,212.9**	**185.5**	**No**	**Direct**	**365**	**24**	**59**
28	Rade Koncar-Kontaktori i relei	31,400	119	50	70	CN, heavy metals, phenol, n-hexane, anti-corrosion agent	5.9	8.3	Yes	Sewer	264	16	7
29	**Ohis AD**	**891,361**	**2,442**	**100**	**80**		**244.2**	**195.4**	**Yes**	**Direct**	**365**	**24**	**102**
30	Cementarnica Usje	368,000	1,008	30	200	n-hexane	30.2	201.6	No	Sewer	365	24	42
31	Mlekarnica Masko	72,720	199	350	2,200	n-hexane, SS	69.7	438.3	No	Sewer	365	24	8
32	Skovin	18,000	69	600	600		41.4	41.4	No	Sewer	261	16	4
33	M&A beveridzis	4,200	13	350	150		4.7	2.0	No	Sewer	313	24	1
34	Beton AD Skopje	5,400	22	20	200	(n-hexane, SS)	0.4	4.3	-	Sewer	250	8	3
35	Globus	13,110	46	600	600		27.3	27.3	No	Sewer	288	8	6
36	Klanica "Vilan"	1,254	4	300	100		1.3	0.4	No	Sewer	280	8	1
37	"Rimes"	7,150	27	300	100	(n-hexane)	8.2	2.7	Yes-oil	Sewer	261	16	2
38	Lek Skopje	3,240	12	350	100		4.3	1.2	No	Sewer	261	8	2
39	Drisla	34,254	94	60	120	T-P. T-N	5.6	11.3	No	Sewer	365	24	4
40	AD Toplifikacija - Zapad	5,100	28	600	2,600	Fe,Mn, n-hexane	16.7	72.5	No	Sewer	183	15	2
41	AD Toplifikacija - Istok	30,350	166	60	70	n-hexane	10.0	11.6	No	Sewer	183	15	11
42	AD Toplifikacija - 11 Oktomvri	1,520	8	60	70	n-hexane, Cr	0.5	0.6	-	Sewer	183	15	1
43	MIDA	18,000	53	60	350	n-hexane, heavy metal	3.2	18.5	No	Sewer	340	8	7
44	Rade Koncar TEP	230	1	60	100		0.1	0.1	Yes-other	Sewer	260	8	0
45	"Promes"	42,180	146	300	150	n-hexane	43.9	22.0	Yes-oil	Sewer	288	24	6
46	Carwash TONI	1,095	3	120	150	(n-hexane)	0.4	0.5	No	Sewer	365	8	0
47	Carwash Brane	730	2	120	150	(n-hexane)	0.2	0.3	No	Sewer	365	8	0
48	Carwash Medzik Kisel	2,880	8	120	150	(n-hexane)	0.9	1.2	No	Sewer	365	8	1
49	AD Toplifikacija - Sever	1,260	7	60	70	(n-hexane)	0.4	0.5	No	Sewer	183	15	0
50	Swiss-lion	11,120	44	1,500	600	(n-hexane, BOD)	66.7	26.7	No	Sewer	250	24	2
	Sub Total (65%)		**28,464**				**4,039**	**7,447**			**15,124**	**859**	**1,301**
	Others (35%)		**15,327**										**701**
	Total		**43,791**										**2,002**
						Average BOD (mg/l)	**142**	**--**					
						Average SS (mg/l)	**--**	**262**					

(2) Large Six Factories

No.	Company/Factory Name	Wastewater Generation		Estimated Water Quality (mg/l)		Remarks, Pre-treatment	Estimated Load (kg/day)		Treatment Plant	Preferable Discharge Sewer	Operation (days/year)	Operation (hrs/day)	Wastewater (m^3/hour)
		m^3/year	m^3/day	BOD	SS		BOD	SS					
3	ARCELORMITTAL STEEL	2,085,600	5,714	60	500	Fe, oil, heavy metals	343	2,857	Yes	Direct	365	24	238
4	Makstil	1,523,449	4,174	60	150	Oil, heavy metal	250	626	No	Direct	365	24	174
24	Energetika - ELEM	62,611	172	20	50	n-hexane	3	9	No	Direct	365	24	7
25	Skopski Leguri	2,031,600	5,566	20	70	Heavy metal, n-hexane	111	390	No	Direct	365	24	232
27	Pivara	520,827	1,427	850	130		1,213	186	No	Direct	365	24	59
29	Ohis AD	891,361	2,442	100	80		244	195	Yes	Direct	365	24	102
	Large Six Factories Total		**19,494**				**2,165**	**4,262**					

(3) Other 44 Factories

No.	Company/Factory Name	Wastewater Generation		Estimated Water Quality (mg/l)		Remarks, Pre-treatment	Estimated Load (kg/day)		Treatment Plant	Preferable Discharge Sewer	Operation (days/year)	Operation (hrs/day)	Wastewater (m^3/hour)
		m^3/year	m^3/day	BOD	SS		BOD	SS					
1	Ading AD	6,000	23	200	300		4.6	6.9	No	Sewer	260	8	3
2	TGS Tehnicki gasovi	16,000	62	30	1,000	TSS	1.8	61.5	No	Sewer	260	8	8
5	Rz Uslugi	50,370	138	60	150	oil	8.3	20.7	No	Sewer	365	24	6
6	Replek Farm	2,064	9	500	75		4.7	0.7	No	Sewer	220	16	1
7	Zito Luks - Suto Orizari	48,840	134	600	600	n-hexane	80.3	80.3	No	Sewer	365	24	6
8	Fitofarm	5,531	21	250	200		5.3	4.2	No	Sewer	261	15	1
9	Klinicki centar	475,000	1,301	170	350	Check Toxic substances	221.2	455.5	No	Sewer	365	24	54
10	Gradska bolnica	36,000	99	80	150	Check Toxic substances	7.9	14.8	No	Sewer	365	24	4
11	Voena bolnica	220,000	603	80	350	Check Toxic substances	48.2	211.0	No	Sewer	365	24	25
12	Alkaloid AD-Lafoma	210,000	840	700	350	Fe	588.0	294.0	Yes	Sewer	250	24	35
13	Alkaloid AD-pharmaceutical	137,900	552	250	75	Fe	137.9	41.4	No	Sewer	250	16	34
14	Alkaloid AD-Herbs	68,000	272	150	250		40.8	68.0	NO	Sewer	250	8	34
15	ALKALOID PREMAZI DOOEL	23,681	95	200	100	Phenol	18.9	9.5	No	Sewer	250	8	12
16	Kanar 92	4,000	14	30	70	(Fe, n-hexane)	0.4	1.0	NO	Sewer	280	16	1
17	MZT energetika	800	2	30	60	(n-hexane)	0.1	0.1	No	Sewer	365	24	0
18	MZT Hepos	132,248	479	30	60		14.4	28.7	Yes	Sewer	276	16	30
19	MZT Leamica	48,600	133	70	190	Heavy metal, n-hexane	9.3	25.3	No	Sewer	365	24	6
20	Sanos Bus	11,650	47	40	70	(n-hexane)	1.9	3.3	No	Sewer	250	8	6
21	Evropa A.D.	90,000	346	300	600	n-hexane	103.8	207.7	No	Sewer	260	8	43
22	JSP - Gjorce Petrov	37,240	102	80	200	n-hexane	8.2	20.4	No	Sewer	365	24	4
23	JSP - Avtokomonda	87,834	241	80	200	n-hexane	19.3	48.1	No	Sewer	365	24	10
26	Komuna	473,620	1,377	150	500		206.5	688.4	No	Sewer	344	24	57
28	Rade Koncar-Kontaktori i relei	31,400	119	50	70	CN, heavy metals, phenol, n-hexane, anti-corrosion agent	5.9	8.3	Yes	Sewer	264	16	7
30	Cementarnica Usje	368,000	1,008	30	200	n-hexane	30.2	201.6	No	Sewer	365	24	42
31	Mlekarnica Masko	72,720	199	350	2,200	n-hexane, SS	69.7	438.3	No	Sewer	365	24	8
32	Skovin	18,000	69	600	600		41.4	41.4	No	Sewer	261	16	4
33	M&A beveridzis	4,200	13	350	150		4.7	2.0	No	Sewer	313	24	1
34	Beton AD Skopje	5,400	22	20	200	(n-hexane, SS)	0.4	4.3	-	Sewer	250	8	3
35	Globus	13,110	46	600	600		27.3	27.3	No	Sewer	288	8	6
36	Klanica "Vilan"	1,254	4	300	100		1.3	0.4	No	Sewer	280	8	1
37	"Rimes"	7,150	27	300	100	(n-hexane)	8.2	2.7	Yes-oil	Sewer	261	16	2
38	Lek Skopje	3,240	12	350	100		4.3	1.2	No	Sewer	261	8	2
39	Drisla	34,254	94	60	120	T-P. T-N	5.6	11.3	No	Sewer	365	24	4
40	AD Toplifikacija - Zapad	5,100	28	600	2,600	Fe,Mn, n-hexane	16.7	72.5	No	Sewer	183	15	2
41	AD Toplifikacija - Istok	30,350	166	60	70	n-hexane	10.0	11.6	No	Sewer	183	15	11
42	AD Toplifikacija - 11 Oktomvri	1,520	8	60	70	n-hexane, Cr	0.5	0.6	-	Sewer	183	15	1
43	MIDA	18,000	53	60	350	n-hexane, heavy metal	3.2	18.5	No	Sewer	340	8	7
44	Rade Koncar TEP	230	1	60	100		0.1	0.1	Yes-other	Sewer	260	8	0
45	"Promes"	42,180	146	300	150	n-hexane	43.9	22.0	Yes-oil	Sewer	288	24	6
46	Carwash TONI	1,095	3	120	150	(n-hexane)	0.4	0.5	No	Sewer	365	8	0
47	Carwash Brane	730	2	120	150	(n-hexane)	0.2	0.3	No	Sewer	365	8	0
48	Carwash Medzik Kisel	2,880	8	120	150	(n-hexane)	0.9	1.2	No	Sewer	365	8	1
49	AD Toplifikacija - Sever	1,260	7	60	70	(n-hexane)	0.4	0.5	No	Sewer	183	15	0
50	Swiss-lion	11,120	44	1,500	600	(n-hexane, BOD)	66.7	26.7	No	Sewer	250	24	2
	Sub Total		**8,970**				**1,874**	**3,185**			**12,934**	**715**	**489**
						Average BOD (mg/l)	**209**	**--**					
						Average SS (mg/l)	**--**	**355**					

The industrial wastewater generation amount by 3, 4, 24, 25, 27 and 29	19,494 m^3/day
BOD load by 3,4, 24, 25,27 and 29	2,165 kg/day
Total BOD load	4,039 kg/day
BOD load by other installations to sewer in the future	1,874 kg/day
Wastewater generation within the survey, except 3, 4, 24, 25, 27 and 29 (to sewer)	8,970 m^3/day
BOD concentraion to sewer in the future	209 g/m^3
SS load by 3, 4, 24, 25, 27 and 29	4,262 kg/day
Total SS load	7,447 kg/day
SS load by other installations to sewer in the future	3,185 kg/day
SS concentraion to sewer in the future	355 g/m^3
The industrial wastewater generation amount by 3, 4, 24 and 25	15,625 m^3/day
The total BOD load by 3,4, 24 and 25	708 kg/day
Average BOD of 3,4, 24 and 25	45 g/m^3
The industrial wastewater generation amount by 3, 4, 24 and 25	15,625 m^3/day
The total SS load by 3,4, 24 and 25	3,881 kg/day
Average SS of 3,4, 24 and 25	248 g/m^3
The industrial wastewater generation amount by 27 and 29	3,869 m^3/day
The total BOD load by 27 and 29	1,457 kg/day
Average BOD of 27 and 29	377 g/m^3
The industrial wastewater generation amount by 27 and 29	3,869 m^3/day
The total SS load by 27 and 29	381 kg/day
Average SS of 27 and 29	98 g/m^3
Average operation days per year of the 50 enterprises	302 days/year
Average operation hours per day of the 50 enterprises	17 hours/day

3.12 Estimation of Pollution Load to Sewer and Environment-2: Future Load to Sewer

The following calculations are to estimate the total load without treatment to sewer line
The current calculations are to estimate the total load without Treatment plant

1 Current Wastewater Qualtity		
Estimated Wastewater generation by interview survey	43,791	m^3/day
future (Arcelormittal Steel, Maskstill, Skopski Leguri and Energetika Elem, Pivara and Ohis AD)	19,494	m^3/day
Wastewater generation except six factories above	24,296	m^3/day
2 Current Wastewater Quality		
BOD load within the interview survey	4,039	kg/day
BOD load of the 6 factories above within interview the survey	2,165	kg/day
BOD load except 6 factories above within the interview survey	1,874	kg/day
Wastewater generation except 6 factories above within the interview survey	8,970	m^3/day
BOD concentration except 6 factories above within the interview survey	**209**	g/m^3
SS load within the interview survey	7,447	kg/day
SS load of the 6 factories above within interview the survey	4,262	kg/day
SS load except 6 factories above within the interview survey	3,185	kg/day
Wastewater generation except 6 factories above within the interview survey	8,970	m^3/day
SS concentration except 6 factories above within the interview survey	**355**	g/m^3
Assuming BOD and SS concentration is the same as above, except 6 factories above		
BOD load except 6 companies	5,077	kg/day
BOD load by Pivera and Ohis AD	1,457	kg/day
Industrail wastewater generation by Arcelormittal Steel, Maskstill, Skopski Leguri and Energeti	0.935	m^3/sec
(Use actual measurement)	80,784	m^3/day
Average BOD_5 concentration of the 4 steel realted companies	45	**g/m^3**
BOD load by 4 steel compnaies	3,660	kg/day
Total current BOD load	**10,194**	**kg/day**
SS load except 6 companies	8,627	kg/day
SS load by Pivera and Ohis AD	381	kg/day
Industrail wastewater generation by Arcelormittal Steel, Maskstill, Skopski Leguri and Energeti	0.935	m^3/sec
(Use actual measuremant)	80,784	m^3/day
Average SS concentration of the 4 steel realted companies	248	**g/m^3**
SS by 4 steel compnaies	20,066	kg/day
Total current SS load	**29,074**	**kg/day**

3 Estimation of future in Year 2020 in sewer

Excluding the Privala and Ohis AD that have their own treatment plants and ARCELORMITTAL STEEL, Makstill, Skopski Leguri and Energetika Elem that should have their own treatment plants, (by using current condition)

Current total wastewater generation, excluding 6 factories	24,296 m^3/day
Average BOD concentration, excluding 6 factories	**209 g/m^3**
Average SS concentration, excluding 6 factories	**355 g/m^3**
Assuming the annual genrationgrowth	3.5 %
until Year 2020 total growth from year 2007	156 %
Assuming wastewater generation increase in proportion to this rate	
Wastewater generation in Year 2020	37,999 m^3/day
Assuming water saving by introduction of cleaner production	15 %
Wastewater generation by cleaner production	**32,299** m^3/day
Assuming reduction of pollutants by introduction of cleaner production	20 %
BOD by introduction of cleaner production	**167** g/m^3
SS by introduction of cleaner production	**284** g/m^3
Pollution load to sewer in Year 2020	
BOD	5,399 kg/day
SS	9,175 kg/day
Effluent After treatment by Sewage Treatment Plant	
Effluent BOD	25 g/m^3
	807 kg/day
Effluent SS	35 g/m^3
	1,130 kg/day

4 Estimation of future in Year 2030 to sewer

Excluding the Privala and Ohis AD that have their own treatment plants and ARCELORMITTAL STEEL, Makstill, Skopski Leguri and Energetika Elem that should have their own treatment plants, (by using current condition)

Current total wastewater generation, excluding 6 factories	24,296 m^3/day
Average BOD concentration, excluding 6 factories	**209 g/m^3**
Average SS concentration, excluding 6 factories	**355 g/m^3**
Assuming the annual generaton growth	3.5 %
until Year 2030 total growth from year 2007	221 %
Assuming wastewater generation increase in proportion to this rate	
Wastewater generation in Year 2020	53,601 m^3/day
Assuming water saving by introduction of cleaner production	35 %
Wastewater generation by cleaner production	**34,840** m^3/day

Assuming reduction of pollutants by introduction of cleaner production	35 %
BOD by introduction of cleaner production	**136** g/m^3
SS by introduction of cleaner production	**231** g/m^3
Pollution load to sewer in Year 2020	
BOD	4,732 kg/day
SS	8,041 kg/day
Effluent After treatment by Sewage Treatment Plant	
Effluent BOD	25 g/m^3
	871 kg/day
Effluent SS	35 g/m^3
	1,219 kg/day

3.13 Estimation of Pollution Load to Sewer and Environment-3: Future Load to Sewer by the 4 Factories to Environment

5 In 2020 industrial wastewater estimation

5.a ARCELORMITTAL STEEL, Makstill, Skopski Leguri and Energetika Elem

Current Actual industrial wastewater generation of 4 steel related factories	80,784 m^3/day
Current Average BOD_5 concentration, from 4 steel related factories	**45 g/m^3**
Current SS concentration, from 4 steel related factories	248 **g/m^3**
Assuming the annual generation growth	0 %
until Year 2020 total growth from year 2007	100 %
Assuming wastewater generation increase in proportion to this rate	
Wastewater generation in Year 2020	80,784 m^3/day
Assuming water saving by introduction of cleaner production	5 %
Wastewater generation by cleaner production	76,745 m^3/day
Assuming reduction of pollutants by introduction of cleaner production	10 %
BOD_5 by introduction of cleaner production	41 **g/m^3**
SS by introduction of cleaner production	224 **g/m^3**
Polution load in 2020	
BOD load	3,130 kg/day
SS by introduction of cleaner production	17,157 kg/day

After treatment by Own Treatment Plant

effluent BOD	25 g/m^3
	1,919 kg/day
effluent SS	35 g/m^3
	2,686 kg/day

5.b Privala and Ohis AD

Current total wastewater generation of 2 factories	3,869 m^3/day
Current average BOD concentration, from 2factories	377 **g/m^3**
Current average SS concentration, from 2 steel related factories	98 **g/m^3**
Assuming the annual generaion growth	3.5 %
until Year 2020 total growth from year 2007	156 %

Assuming wastewater generation increase in proportion to this rate		
Wastewater generation in Year 2020	6,051	m^3/day
Assuming water saving by introduction of cleaner production	15	%
Wastewater generation by cleaner production	5,143	m^3/day
Assuming reduction of pollutants by introduction of cleaner production	20	%
BOD_5 by introduction of cleaner production	**301**	g/m^3
	1,550	kg/day
SS by introduction of cleaner production	**79**	g/m^3
	405	kg/day
After treatment by Own Treatment Plant		
effluent BOD	25	g/m^3
	129	kg/day
effluent SS	35	g/m^3
	180	kg/day
5.c Total load by 6 factories		
BOD	**4,679**	**kg/day**
SS	**17,562**	**kg/day**
After treatment		
BOD	2,047	**kg/day**
SS	2,866	**kg/day**

6 In 2030 industrial wastewater estimation

6.a ARCELORMITTAL STEEL, Makstill, Skopski Leguri and Energetika Elem

Current Actual industrial wastewater generation of 4 steel related factories	80,784	m^3/day
Current Average BOD concentration, from 4 steel related factories	**45**	**g/m^3**
Current SS concentration, from 4 steel related factories	248	**g/m^3**
Assuming the annual generation growth	0	%
until Year 2030 total growth from year 2007	100	%
Assuming wastewater generation increase in proportion to this rate		
Wastewater generation in Year 2030	80,784	m^3/day
Assuming water saving by introduction of cleaner production	10	%
Wastewater generation by cleaner production	72,706	m^3/day
Assuming reduction of pollutants by introduction of cleaner production	15	%
BOD by introduction of cleaner production	39	**g/m^3**
SS by introduction of cleaner production	211	**g/m^3**

Polution load in 2030		
BOD load	2,800	kg/day
SS by introduction of cleaner production	15,351	kg/day
After treatment by Own Treatment Plant		
effluent BOD	25	g/m^3
	1,818	kg/day
effluent SS	35	g/m^3
	2,545	kg/day
6.b Privala and Ohis AD		
Current total wastewater generation of 2 factories	3,869	m^3/day
Current average BOD concentration, from 2factories	377	**g/m^3**
Current average SS concentration, from 2 steel related factories	98	**g/m^3**
Assuming the annual generaion growth	3.5	%
until Year 2030 total growth from year 2007	221	%
Assuming wastewater generation increase in proportion to this rate		
Wastewater generation in Year 2020	8,535	m^3/day
Assuming water saving by introduction of cleaner production	35	%
Wastewater generation by cleaner production	5,548	m^3/day
Assuming reduction of pollutants by introduction of cleaner production	35	%
BOD by introduction of cleaner production	**245**	g/m^3
	1,358	kg/day
SS by introduction of cleaner production	**64**	g/m^3
	355	kg/day
After treatment by Own Treatment Plant		
effluent BOD	25	g/m^3
	139	kg/day
effluent SS	35	g/m^3
	194	kg/day
6.c Total load by 6 factories		
BOD	**4,158**	**kg/day**
SS	**15,706**	**kg/day**
After treatment by Own Treatment Plant		
effluent BOD	1,956	kg/day
effluent SS	2,739	kg/day

3.14 Estimation of Pollution Load to Sewer and Environment-4: Future Load by all Enterprises to Environment

Load to the river

		Wastewater generation (m^3/day)	Load (kg/day)			
			Without Treatment		With Treatment	
			BOD_5	SS	BOD_5	SS
Current	ARCELORMITTAL STEEL, Makstill, Skopski Leguri and Energetika Elem	80,784	3,660	20,066	-	-
	Privala and Ohis AD	3,869	1,457	381	-	-
	Others	24,296	5,077	8,627	-	-
	Municipal wastewater					
	Total current Case-2	**108,949**	**10,194**	**29,074**	**-**	**-**
in 2020	ARCELORMITTAL STEEL, Makstill, Skopski Leguri and Energetika Elem	76,745	3,130	17,157	1,919	2,686
	Privala and Ohis AD	5,143	1,550	405	129	180
	Others (Load to Sewer)	32,299	5,399	9,175	807	1,130
	Municipal wastewater					
	Total in 2020 Case-2	**114,187**	**10,078**	**26,736**	**2,855**	**3,997**
in 2030	ARCELORMITTAL STEEL, Makstill, Skopski Leguri and Energetika Elem	72,706	2,800	15,351	1,818	2,545
	Privala and Ohis AD	5,548	1,358	355	139	194
	Others (Load to Sewer)	34,840	4,732	8,041	871	1,219
	Municipal wastewater					
	Total in 2030 Case-2	**113,094**	**8,890**	**23,747**	**2,827**	**3,958**

3.15 Current Situation of BREF Note Preparation

Table 3.23 Current Situation of BREF Note Preparation

= BREF formally adopted; = BREF finalised; = Final Draft BREF; = Working Draft BREF; = work started.

TWG & Members list (click on TWG name to see the list of members)	Documents available (see key below table)	Documents available for the revisions (see key below table)	Revisions (see key below table)	Background material	Additional Information
Pulp and Paper manufacture	BREF (12.01)		MR (01.07)	List	Yes
Iron and Steel production	BREF (12.01)		MR (09.06)	List	Yes
Cement and Lime production	BREF (12.01)	D1 (09.07)	MR (09.05)	List	Yes
Cooling Systems	BREF (12.01)			List	Yes
Chlor-Alkali manufacture	BREF (12.01)		2008	List	Yes
Ferrous Metal processing	BREF (12.01)		2007	List	Yes
Non-Ferrous Metal processes	BREF (12.01)		2007	List	Yes
Glass manufacture	BREF (12.01)		MR (05.07)	List	Yes
Tanning of hides and skins	BREF (02.03)		MR (10.07)	List	Yes
Textile processing	BREF (07.03)			List	Yes
Monitoring systems	BREF (07.03)			List	Yes
Refineries	BREF (02.03)		2008	List	Yes
Large Volume Organic Chemicals	BREF (02.03)		2008	List	Yes
Smitheries and Foundries	BREF (05.05)			List	
Intensive Livestock Farming	BREF (07.03)		2008	List	Yes
TWG & Members list (click on TWG name to see the list of members)	**Documents available (see key below table)**	**Documents available for the revisions (see key below table)**	**Revisions (see key below table)**	**Background material**	**Additional Information**

Emissions from storage of bulk or dangerous materials	BREF (07.06)			List	
Common waste water and waste gas treatment and management systems in the chemical sector	BREF (02.03)		2007	List	Yes
Economic and cross media issues under IPPC	BREF (07.06)			List	
Large Combustion Plant	BREF (07.06)			List	
Large Volume Inorganic Chemicals - Ammonia, Acids & Fertilisers	BREF (08.07)			List	
Large Volume Inorganic Chemicals - Solid & Others	BREF (08.07)			List	Yes
Slaughterhouses and Animal By-products	BREF (05.05)			List	
Food, Drink and Milk processes	BREF (08.06)			List	Yes
Ceramics	BREF (08.07)			List	
Management of Tailings and Waste-Rock in Mining Activities	MR BREF (07.04)			List	
Surface treatment of metals	BREF (08.06)			List	
Surface treatments using solvents	BREF (08.07)			List	Yes
Waste Incineration	BREF (08.06)			List	
TWG & Members list (click on TWG name to see the list of members)	**Documents available (see key below table)**	**Documents available for the revisions (see key below table)**	**Revisions (see key below table)**	**Background material**	**Additional Information**
Waste Treatments [Previously Waste Recovery/Disposal	BREF (08.06)			List	Yes

activities]					
Speciality inorganic chemicals	BREF (08.07)			List	Yes
Organic fine chemicals	BREF (08.06)			List	
Polymers	BREF (08.07)			List	
Energy Efficiency	MR D2 (07.07)			List	

Key to "Documents available":

BREF (mm.yy)	indicates that a document has been formally adopted by the Commission and can be downloaded by following the link which leads to the list of mirrors available and selecting the site nearer to you.
BREF (mm.yy)	indicates that a document has been finalised after submission to DG Environment and the final version dated as shown can be downloaded by following the link which leads to the list of mirrors available and selecting the site nearer to you.
FD (mm.yy)	indicates that a **Final Draft** document dated as shown has been put up for discussion with DG Environment and the Information Exchange Forum and the draft can be downloaded by following the link.
D1/2/3 (mm.yy)	indicates that a 1st / 2nd / 3rd working **Draft** reference document dated as shown has been put to consultation in the TWG and the draft can be downloaded by following the link.
MR (mm.yy)	indicates work has started, theTWG has met for the first time on date shown and a **Meeting Report** of that first meeting can be downloaded by following the link where shown.
yyyy	indicates work is planned to commence in the year shown and has not yet started.

Source: European Integrated Pollution Prevention and Control Bureau by Internet

= BREF formally adopted; = BREF finalised; = Final Draft BREF; = Working Draft BREF; = work started.

TWG & Members list	Documents available	Documents available for the revisions	Revisions	Background material	Additional Information
Pulp and Paper manufacture	BREF (12.01)		MR (01.07)	List	Yes
Iron and Steel production	BREF (12.01)		MR (09.06)	List	Yes
Cement and Lime production	BREF (12.01)	D1 (09.07)	MR (09.05)	List	Yes
Cooling Systems	BREF (12.01)			List	Yes
Chlor-Alkali manufacture	BREF (12.01)		2008	List	Yes
Ferrous Metal processing	BREF (12.01)		2007	List	Yes
Non-Ferrous Metal processes	BREF (12.01)		2007	List	Yes
Glass manufacture	BREF (12.01)		MR (05.07)	List	Yes
Tanning of hides and skins	BREF (02.03)		MR (10.07)	List	Yes
Textile processing	BREF (07.03)			List	Yes
Monitoring systems	BREF (07.03)			List	Yes
Refineries	BREF (02.03)		2008	List	Yes
Large Volume Organic Chemicals	BREF (02.03)		2008	List	Yes
Smitheries and Foundries	BREF (05.05)			List	
Intensive Livestock Farming	BREF (07.03)		2008	List	Yes
Emissions from storage of bulk or dangerous materials	BREF (07.06)			List	
Common waste water and waste gas treatment and management systems in the chemical sector	BREF (02.03)		2007	List	Yes
Economic and cross	BREF (07.06)			List	

media issues under IPPC					
Large Combustion Plant	BREF (07.06)			List	
TWG & Members list	Documents available	Documents available for the revisions	Revisions	Background material	Additional Information
Large Volume Inorganic Chemicals - Ammonia, Acids & Fertilisers	BREF (08.07)			List	
Large Volume Inorganic Chemicals - Solid & Others	BREF (08.07)			List	Yes
Slaughterhouses and Animal By-products	BREF (05.05)			List	
Food, Drink and Milk processes	BREF (08.06)			List	Yes
Ceramics	BREF (08.07)			List	
Management of Tailings and Waste-Rock in Mining Activities	MR BREF (07.04)			List	
Surface treatment of metals	BREF (08.06)			List	
Surface treatments using solvents	BREF (08.07)			List	Yes
Waste Incineration	BREF (08.06)			List	
Waste Treatments [Previously Waste Recovery/Disposal activities]	BREF (08.06)			List	Yes
Speciality inorganic chemicals	BREF (08.07)			List	Yes
Organic fine chemicals	BREF (08.06)			List	
Polymers	BREF (08.07)			List	
Energy Efficiency	MR D2 (07.07)			List	

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MR (mm.yy)	indicates work has started, theTWG has met for the first time on date shown and a **Meeting Report** of that first meeting can be downloaded by following the link where shown.
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Source: European Integrated Pollution Prevention and Control Bureau by Internet

3.16 Uniformed Discharge Criteria to Sewer System in Japan

Table 3.24 Uniformed Discharge Criteria to Sewer System in Japan

		Parameter		Unit	Special Enterprise	
					More than 50m^3/day	Less than 50 m^3/day
Criteria by local ordinance	General parameters	Temperature		℃	45	45
		pH			5 to 9	5 to 12
		Biological oxygen demand (BOD_5)		mg/l	600	1,200
		Suspended solid (SS)		mg/l	600	1,200
		n-hexane extract	Mineral oil	mg/l	5	5
			Animal and vegetable oil	mg/l	30	150
		Iodine(I_2) consumption		mg/l	220	220
Criteria by governmental law	Uniformed environmental parameter	Phenol		mg/l	5	5
		Cupper (Cu)		mg/l	3	3
		Zinc (Zn)		mg/l	5	5
		Iron (Fe)		mg/l	10 (soluble)	10 (soluble)
		Manganese (Mn)		mg/l	10 (soluble)	10 (soluble)
		Total chromium (Cr)		mg/l	2	2
	Toxic substances	Cadmium (Cd)		mg/l	0.1	0.1
		Cyanide (CN)		mg/l	1	1
		Organic phosphorus		mg/l	1	1
		Lead (Pb)		mg/l	0.1	0.1
		Hexavelent chromium (Cr^{6+})		mg/l	0.5	0.5
		Arsenic (As)		mg/l	0.1	0.1
		Total mercury (T-Hg)		mg/l	0.005	0.005
		Alkyl-Hg		mg/l	ND	ND
		Poly Biphenyl Chloride (PCB)		mg/l	0.003	0.003
		Tri-chloroethylene		mg/l	0.3	0.3
		Tetrachloroethylene		mg/l	0.1	0.1
		Di-chloromethane		mg/l	0.2	0.2
		Butyl chloride carbon (CCl_4)		mg/l	0.02	0.02
		1.2-dichloroethane		mg/l	0.04	0.04
		1.1-dichloroethylene		mg/l	0.2	0.2
		cis-1.2-dichloroethylene		mg/l	0.4	0.4
		1.1.1-trichroroethane		mg/l	3	3
		1.1.2-trichroroethane		mg/l	0.06	0.06
		1.3-dichloropropene		mg/l	0.02	0.02
		Thriuram		mg/l	0.06	0.06
		Simazine		mg/l	0.03	0.03
		Thiobencarb		mg/l	0.2	0.2
		Benzene		mg/l	0.1	0.1
		Selenium (Se)		mg/l	0.1	0.1
		Boric acid (B)		mg/l	10 (230)	10 (230)
		Fluorine (F)		mg/l	8 (15)	8 (15)
		NH_4-N, $N0_2$-N and NO_3-N		mg/l	380	380
		Dioxin		pg-TEQ/l	10	10

(Note)

1, Columns in yellow is the criteria of direct punishment in case of violation

2,Colums in white is the criteria for the obligation of installation of facility to sewer.

3,Discharge volume is the one divided by operation days per year,

4, Criteria for dioxin depends on the enterprise or location.

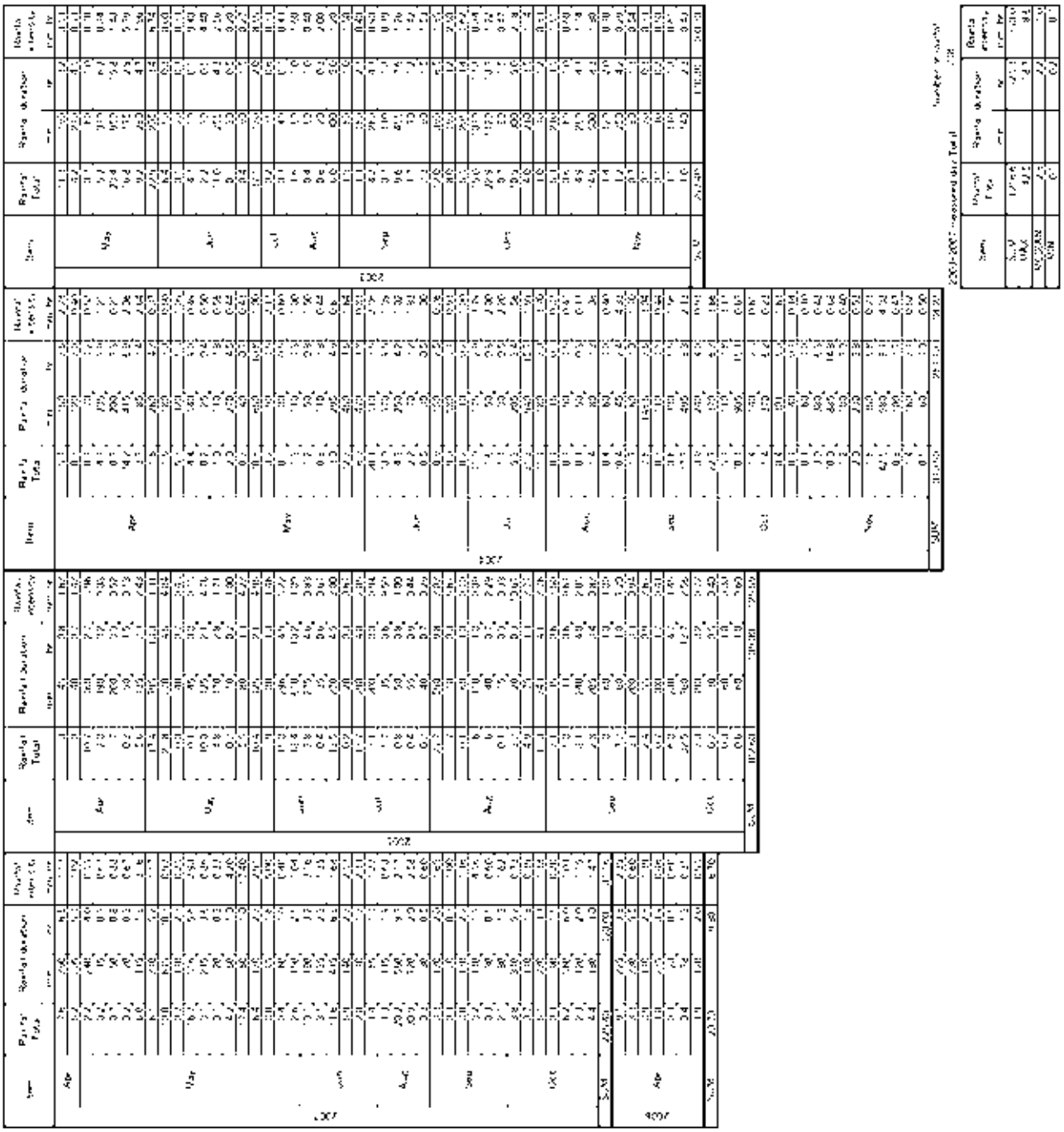
5, Criteria in parentheses for boronic acid, fluorine is used in case municipal wastewater discharges its effluent to the sea.

6, Criteria of boronic acid, NH_4-N, NO_2-N and NO_3-N have the transition criteria depending on type of industry.

7. The criteria of each parameter is possible to change more stricter or add parameters by local government.

3.17 Rainfall Data from 2003 to 2007

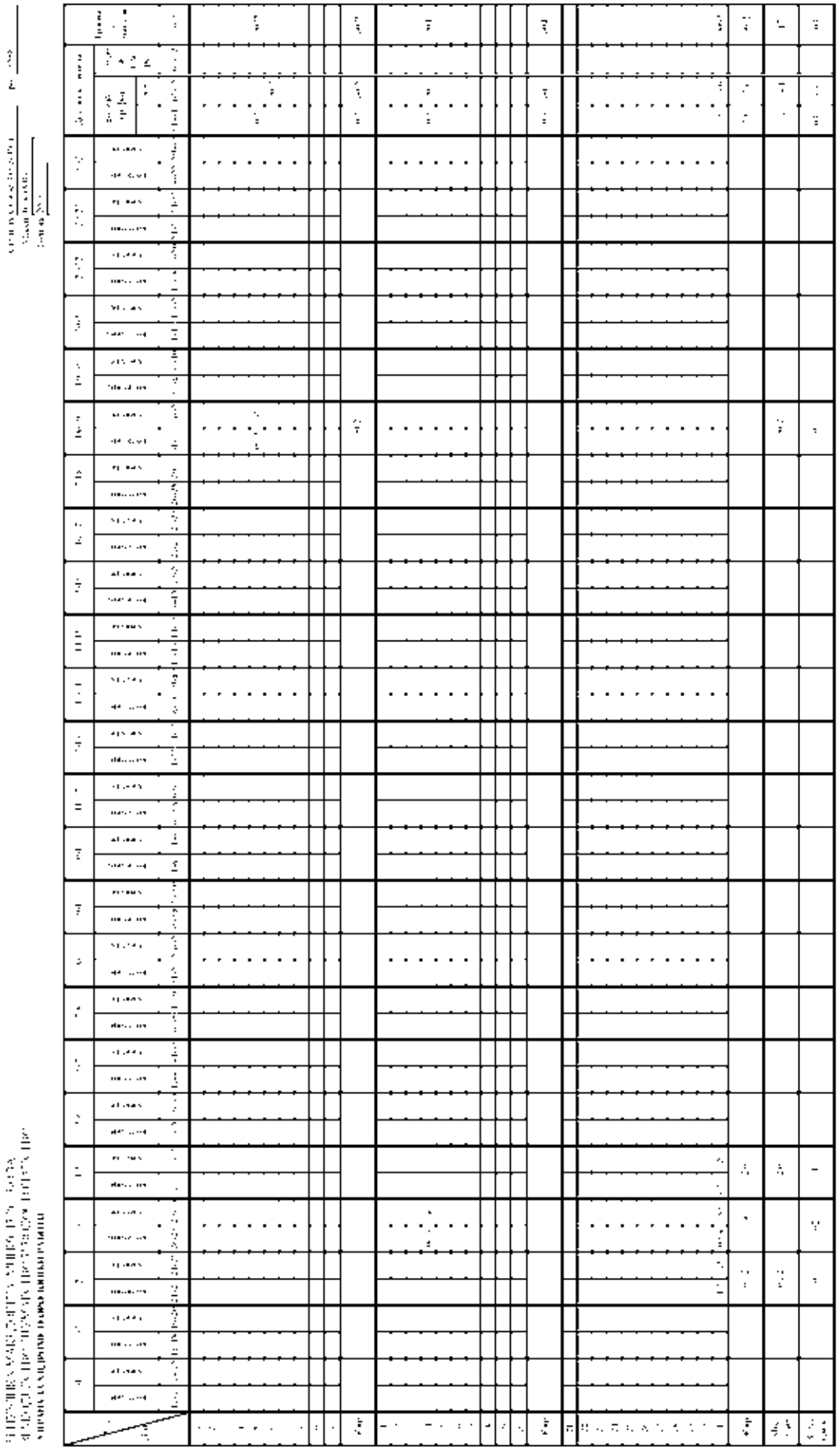
Table 3.25 Rainfall Data from 2003 to 2007



Survey on Amount of Rainfall in Skopje 03.2003

Survey on Amount of Rainfall in Skopje 06.2003

Survey on Amount of Rainfall in Skopje 07.2003



Survey on Amount of Rainfall in Skopje 08.2003

Survey on Amount of Rainfall in Skopje 09.2003

Survey on Amount of Rainfall in Skopje 10.2003

Survey on Amount of Rainfall in Skopje 11.2003

Survey on Amount of Rainfall in Skopje 04.2004

Survey on Amount of Rainfall in Skopje 05.2004

Survey on Amount of Rainfall in Skopje 06.2004

Survey on Amount of Rainfall in Skopje 07.2004

Survey on Amount of Rainfall in Skopje 08.2004

Survey on Amount of Rainfall in Skopje 09.2004

Survey on Amount of Rainfall in Skopje 10.2004

Survey on Amount of Rainfall in Skopje 11.2004

Survey on Amount of Rainfall in Skopje 04.2005

Survey on Amount of Rainfall in Skopje 05.2005

Survey on Amount of Rainfall in Skopje 06.2005

Survey on Amount of Rainfall in Skopje 07.2005

Survey on Amount of Rainfall in Skopje 08.2005

Survey on Amount of Rainfall in Skopje 09.2005

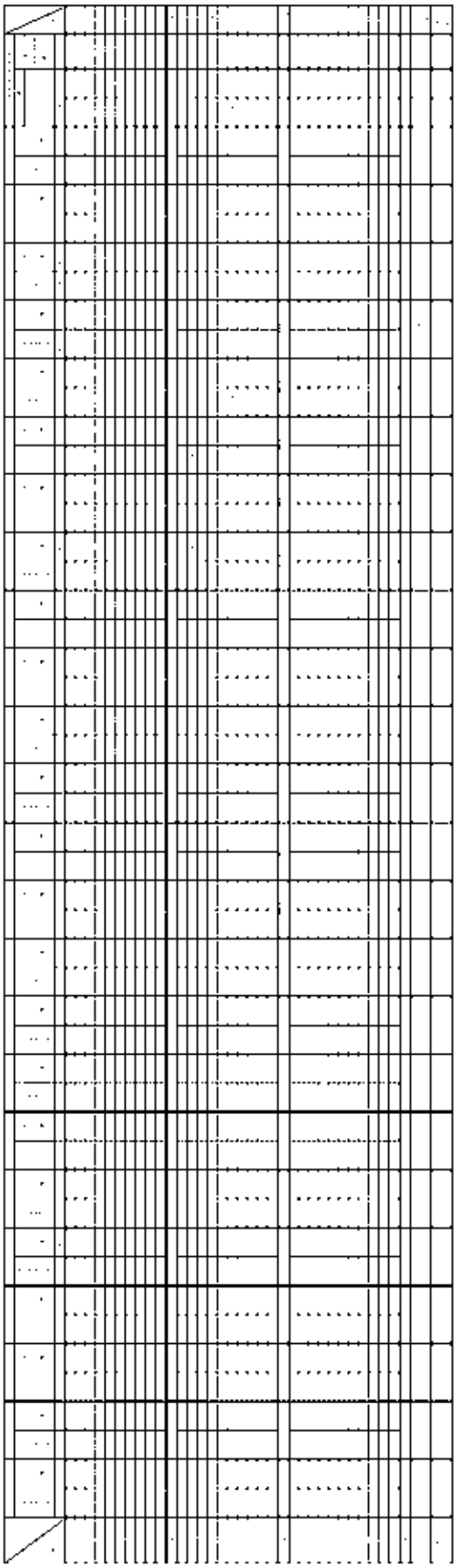
Survey on Amount of Rainfall in Skopje 10.2005

Survey on Amount of Rainfall in Skopje 04.2006

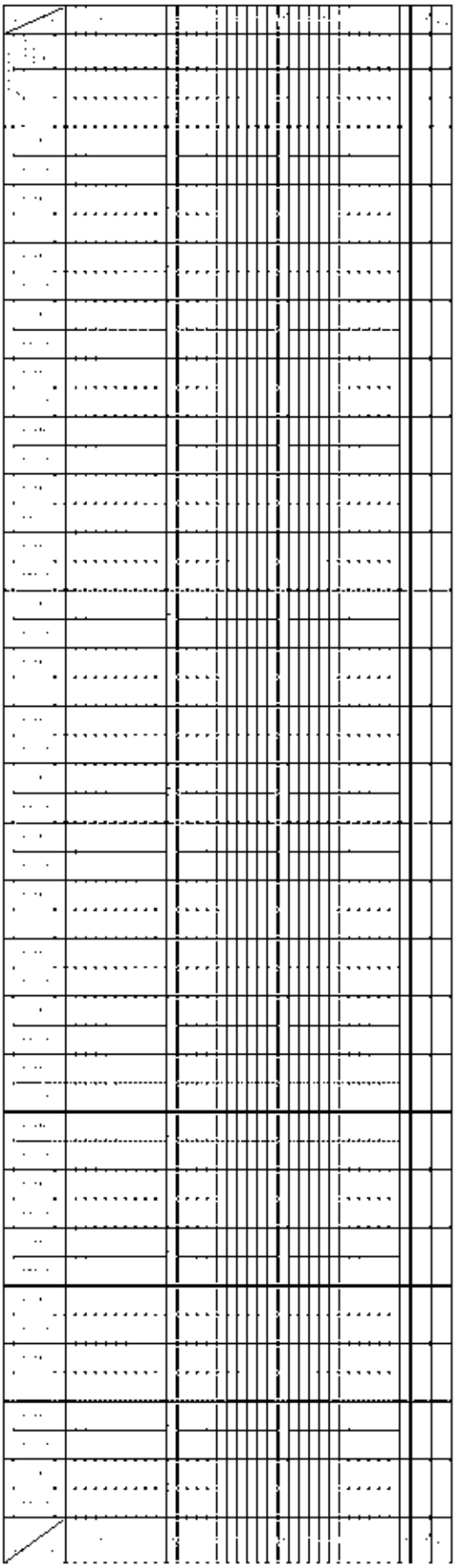
Survey on Amount of Rainfall in Skopje 04.2007

Survey on Amount of Rainfall in Skopje 05.2007

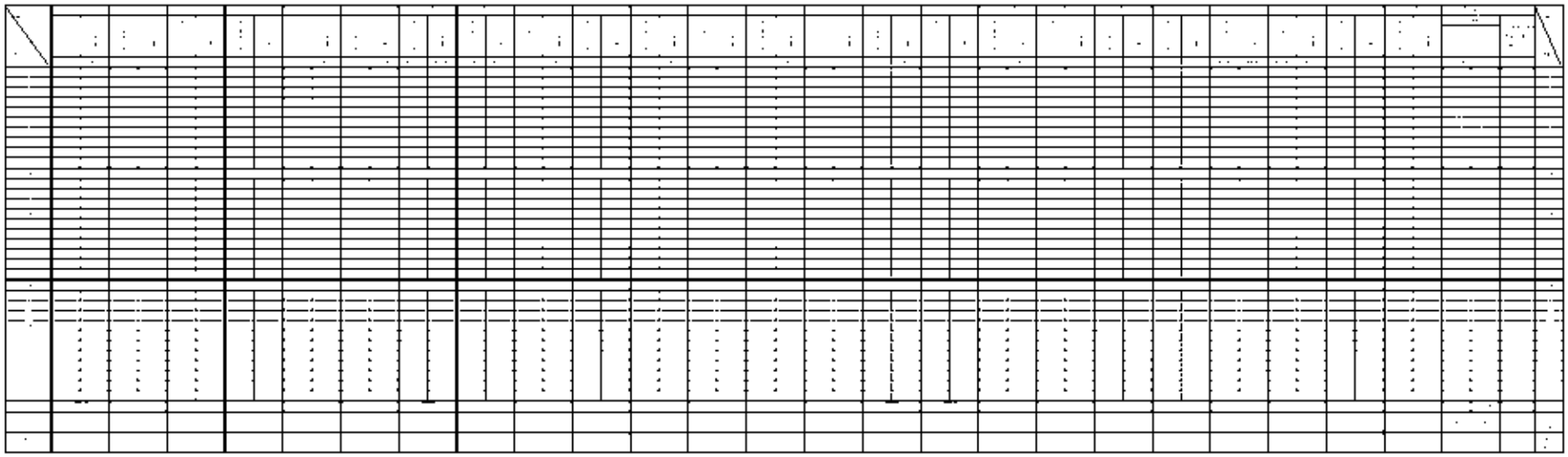
Survey on Amount of Rainfall in Skopje 06.2007



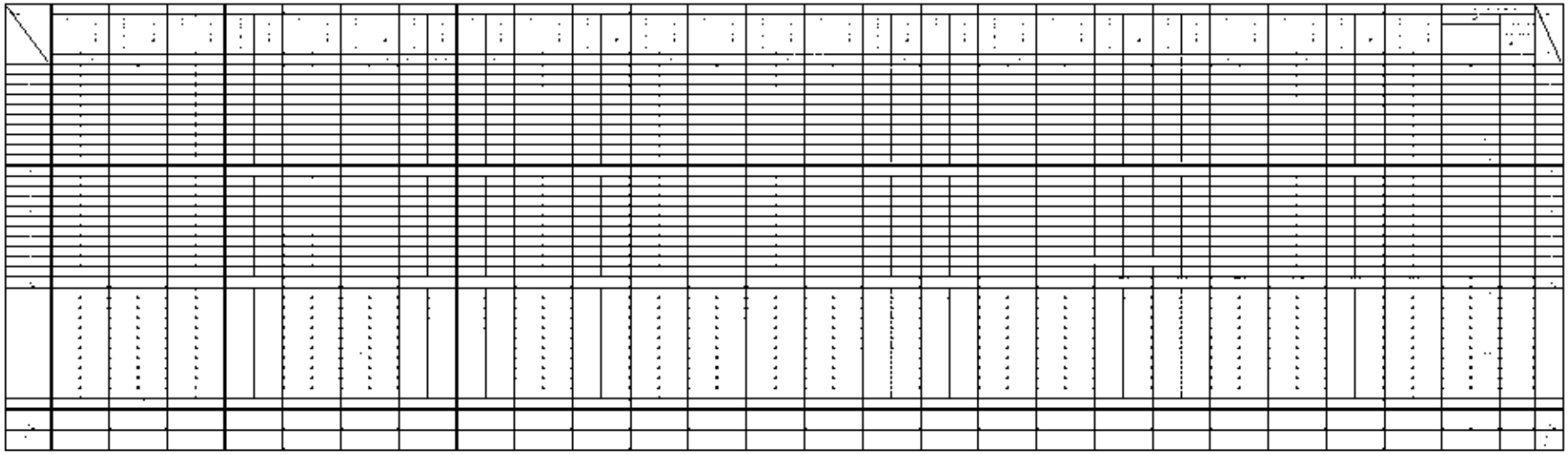
Survey on Amount of Rainfall in Skopje 08.2007



Survey on Amount of Rainfall in Skopje 09.2007



Survey on Amount of Rainfall in Skopje 10.2007



3.18 Current situation of Industrial Wastewater Management

Table 3.26 Situation of Industrial Wastewater Management

No.	Company/Factory Name	Treatment plant	Discharge hope	Willing to pay	Pollution controller	Own laboratory	ISO9000 or 14000	Recirculation of water	Measurement		Sampling No.
									Water supply	Wastewater	
1	Ading AD	No	Sewer	No	Yes only monitoring	Other	Yes	No	Meter	No	2
2	TGS Tehnicki gasovi	-	Sewer	Yes	-	-	Yes	No	Meter	No	0
3	ARCELORMITTAL STEEL	Sedimentation, Neutralization, oil separator	Sewer	Yes	Yes	Other	Yes	Yes	Meter	No	4
4	Makstil	Sedimentation, Filtration, Oil separator,	Sewer	Yes	Yes	Other	Yes	Yes	Meter	No	4
5	Rz Uslugi	No (Pond)	Sewer	Yes	-	Other	No	Yes	Meter	No	1
6	Replek Farm	No	Sewer	No	No	Yes	No	No	Meter	No	4
7	Zito Luks - Suto Orizari	No	Sewer	Yes	No	-	Yes	No	Meter	No	0
8	Fitofarm	No	Sewer	Yes	No	-	No	No	Meter	No	0
9	Klinicki centar	No	Sewer	Yes	No	-	No	No	Meter	No	0
10	Gradska bolnica	No	Sewer	Yes	No	-	No	No	Meter	No	0
11	Voena bolnica	No	Sewer	Yes	-	-	No	No	Meter	No	0
12	Alkaloid AD Laboma	Yes	Sewer	No	No	Yes	Yes	No	Meter	No	7
13	Alkaloid AD-pharmaceutical	No	Sewer	No	No	Yes	No	No	Meter	No	7
14	Alkaloid AD-Herbs	-	Sewer	No	No	Yes	Yes	Yes	Meter	No	9
15	ALKALOID PREMAZI DOOEL	-	Sewer	No	No	Yes	No	No	Meter	No	7
16	Kanar 92	No	-	-	Yes	-	-	No	Meter	No	0
17	MZT energetika	No	Sewer	Yes	Yes	-	No	Yes	Meter	No	0
18	MZT Hepos	Sedimentation, Filtration, Oil separator,	Sewer	-	Yes	Yes	Yes	Yes	Meter	No	5
19	MZT Learnica	No	Sewer	Yes	Yes	-	Yes	Yes	Meter	No	1
20	Sanos Bus	-	-	-	-	-	-	Yes	Bill	No	0
21	Evropa A.D.	No	Sewer	-	-	Other	-	No	Meter	No	1
22	JSP - Gjorce Petrov	No	Sewer	Yes	No	Other	No	No	Meter	No	5
23	JSP - Avtokomonda	No	Sewer	Yes	No	Other	No	No	Meter	No	2
24	Energetika - ELEM	No (only pool for neutralization)	Sewer	Yes	Yes	Yes	Yes	Yes	Meter	No	0
25	Skopski Leguri	No (Sedimentation only for recirculation)	Sewer	-	Yes	Yes	No	Yes	Meter	No	0

No.	Company/Factory Name	Treatment plant	Discharge hope	Willing to pay	Pollution controller	Own laboratory	ISO9000 or 14000	Recirculation of water	Measurement		Sampling No.
									Water supply	Wastewater	
26	Komuna	No	Sewer	No	No	Other	No	Yes	Meter	No	3
27	Pivara	No	Water body	No	No	Yes	No	No	Meter	No	
28	Rade Koncar-Kontaktori i relei	Sedimentation, Filtration, Oxidation-decomposition, Neutralization, Reduction-sedimentation with metal coagulant (Fe, Al)	Sewer	No	Yes	Yes	Yes	No	Meter	No	1
29	Ohis AD	Biological treatment, coagulation-sedimentation, Neutralization,	Vardar River	No	Yes	Yes	Yes	No	Meter	No	3
30	Cementarnica Usje	No	Sewer	Yes	No	Other	Yes	Yes	Meter	No	2
31	Mlekarnica Masko	No	Sewer	Yes	No	Other	Yes	No	Meter	No	1
32	Skovin	No	Sewer	Yes	-	-	Yes	No	Meter	No	0
33	M&A beveridzis	No	Sewer	Yes	No	Other	No	No	Meter	No	0
34	Beton AD Skopje	-	-	-	-	-	-	No	-	-	1
35	Globus	No	Sewer	Yes	-	Other	HASSP	No	Meter	No	2
36	Klanica "Vilan"	No	Sewer	-	-	-	No	No	Meter	No	0
37	"Rimes"	Yes	Sewer	Yes	No	Other	No	No	Meter	No	1
38	Lek Skopje	No	Sewer	Yes	No	-	Yes	No	Meter	No	0
39	Drisla	No	Sewer	Yes	No	Other	No	No	Reservoir level	Weir	1
40	AD Toplifikacija - Zapad	No	-	-	No	Yes	Yes	No	Meter	No	1
41	AD Toplifikacija - Istok	No	Sewer	Yes	No	Yes	Yes	No	Meter	-	1
42	AD Toplifikacija - 11 Oktomvri	-	Sewer	Yes	-	-	Yes	No	Meter	No	0
43	MIDA	No	Sewer	No	No	-	Yes	No	Meter	No	0
44	Rade Koncar TEP	Sedimentation	Sewer	No	No	-	Yes	No	Meter	No	0
45	"Promes"	Oil separator	Sewer	-	-	Other	HASSP	No	Meter	No	1
46	Carwash TONI	No	Sewer	Yes	No	-	No	No	No	No	0
47	Carwash Brane	No	Sewer	Yes	No	-	No	No	Water works	No	0
48	Carwash Medzik Kisel	No	Sewer	Yes	No	-	No	No	Lump-sum	No	0
49	AD Toplifikacija - Sever	No	Sewer	No	No	Yes	No	No	Meter	No	1
50	Swiss-lion	No	Sewer	Yes	No	Other	ISO 22000	No	Meter	No	2