Hungarian Central Statistical Office

Final Report

Statistics on water resources, water use and waste water treatment

Water Statistics of Hungarian Regions and River Basin District Subunits

– *Eurostat grant project 2010* –

Agreement number: 50303.2010.001–2010.561

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Contents

1 Introduction and project information

In Europe, the introduction of the European Water Framework Directive (WFD) has given an increasingly demand for water statistical information at regional (NUTS2) and at river basin district subunits (RBDSUs) level.

The relevant water *statistical* indicators at regional (NUTS2) or at RBDSUs level can play a significant role in achieving a better management of water resources and uses.
In order to fulfill these requirements, Eurostat introduced the new Regional Environmental Questionnaire on Inland Waters 2012 (REQ-IW 2012).

The main objectives of this project were to increase the level of availability and quality of the water statistical data reported to REQ-Water 2012. Hungary has participated in this REQ-project also in 2010.

Generally Hungary is able to provide the most information required for tables of the Eurostat/OECD Joint Questionnaire on Inland Water *at national level*, but the statistical distribution of water information at regional (NUTS2) and at RBDSUs level is quite difficult task.

1.1 Main objectives of the project

After elaboration of this methodological grant project Hungary probably will be able to provide more relevant, qualified data and indicators to meet the European regional (NUTS2) environmental data requirements.

- Improved, revised and more complete data sets for Inland Water part of REQ 2012 for Hungary.
- Developed water related regional (NUTS2) *indicators*, based on REQ-Water 2012.
- Improved long-term collaboration between different relevant institutions.

1.2 Project participants and duration

The project participant will be the Hungarian Central Statistical Office (HCSO) only. The Hungarian Act on Statistics provides the opportunity of access to other administrative and statistical data sources of ministries and other institutions for statistical purposes.

Concerning water statistical data the responsibilities are shared between the Hungarian Central Statistical Office (HCSO) and the Ministry of Rural Development (MoRD). MoRD has a responsibility of environmental protection and water affairs also in the new governmental structure from 2010. Former name of our partner was: Ministry of Environment and Water (MoEW). There is also special agreement on statistical cooperation between the two institutions (HCSO and MoEW, from 2008) for exchange of information on water.

The start of the action was in January 2011, and duration of the action was 23 months.

1.3 Analyzed and applied methodologies

The work to be developed for setting up new improved water statistical data sets at regional (NUTS2) and at RBDSUs levels from only existing information, has been based on the following methodological and relevant other sources:

- Manual for Water Data Collection 2.21, Eurostat;
- EU Water Framework Directive (2000/60/EC);
- Hungarian Water Basin Management Plan (2009-2010)

- International Recommendation for Water Statistics, UNSD;
- Joint Eurostat/OECD Questionnaire 2012;
- Council Directive 91/271/EEC;
- IPPC Directive;
- Hungarian first NAMEA Water tables (emissions) 2008
- First water account tables on water assets and water use (2009)
- First Hungarian Water Emissions Register for Statistical Purposes (2010)
- Methodological information from the Eurostat Workshop on REQ-Water in 2012.

1.4 Applied data sources, reference years

During the implementation of this project the reference years were the years 2007-2011, according to the data availability.

Using only the available datasets we have tried to integrate the all water related information according to the data requirement of REQ-Water 2012 and proposals of the Water Statistics Manual 2.21.

The First Water Management Plan of Hungary (2009-2010) compiled by MoEW also was involved. This plan contains lot of relevant datasets; GIS maps with coordinates and lot of methodological issues e.g. diffuse emissions (N & P) at RBDSUs level.

For instance, water use by various economic sectors can be related to the economic interests involved. It is this integration of water and *economy at river basin* level, which makes the Hungarian REQ-IW based on the First Water Management Plan of Hungary an important information tool to support policy and decision making in the field of integrated water management as advocated by the WFD.

1.5 Actions carried out

The following main actions carried out to achieve the main goals of the project:

- Establishment of the working group, project preparation work,
- Determination of the common data request of the REQ-Water 2012 and estimation/checking methods,
- Mapping and analyzing the possible method/data sources; crosschecking,
- Checking and validating existing data sources, with GIS also,
- Integration of public water supply and waste water treatment statistical data of HCSO at regional (NUTS2) and at RBDSUs level into the OLAP-based dissemination database of HCSO,
- Elaboration of some regional water related indicators,
- Compiling and submission of Interim and Final Report.

2 Hungarian water resources and regions

2.1 Hungary in Danube River Basin District

Water is the most important natural resource that both in terms of quality and availability is a major concern in Hungary. In Hungary the climatic conditions make the water resources very sensitive to droughts. In addition to the temporal and spatial limitations of water availability, water management faces quality problems as well.

Hungary is situated mostly on plain land in the Carpathian basin and in the international Danube River basin District. The significant parts of the catchments area lies outside the borders of the country; therefore the carried water amount and quality of our rivers, the usability of the renewable water resources, depend mainly on the water management system of upstream countries.

The concept of intensive river management takes environment and nature development into consideration, and has regard for sustainable development. The conditions in upstream countries determine the water quantity and quality of our large water streams.

Fig. 1. Danube River Basin District[1]

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[1] Source: ICPDR

2.2 Regional queries according to Hungarian RBDSUs and NUTS2 regions

In relation to policy-making of water management the water statistical data reported to REQ-Water 2012, according to the 7 Hungarian regions (NUTS2) and to the 4 river basin district sub-units (RBDSUs) could be used mainly for the following aims:

- to support priority setting, by determining main factors that cause pressure on the water related environment;
- to supply policy-makers with information on the state of water related environment;
- to control the impacts of policy responses of water management.

In this report the data have been reported with the administrative status of 1 January of the given year.

Settlements situated in more RBDSUs have been classified according to the RBDSUs which is excised the biggest area from the settlement.

In order to avoid the usual mystery of IT or/and the subordination to IT (e.g. Oracle etc.), the working *production* database is based on user-friendly MS-Access 2003. For the better analysis of the existing data sets we have started to integrate them into the MS Access 2003 + ArcView GIS database.

For connection of statistical data with the geo-referenced data we apply the ESRI ArcView 3.2 software. The all programs, datasets and databases could be available on a better notebook.

Fig. 2. The regional (NUTS2) query of data

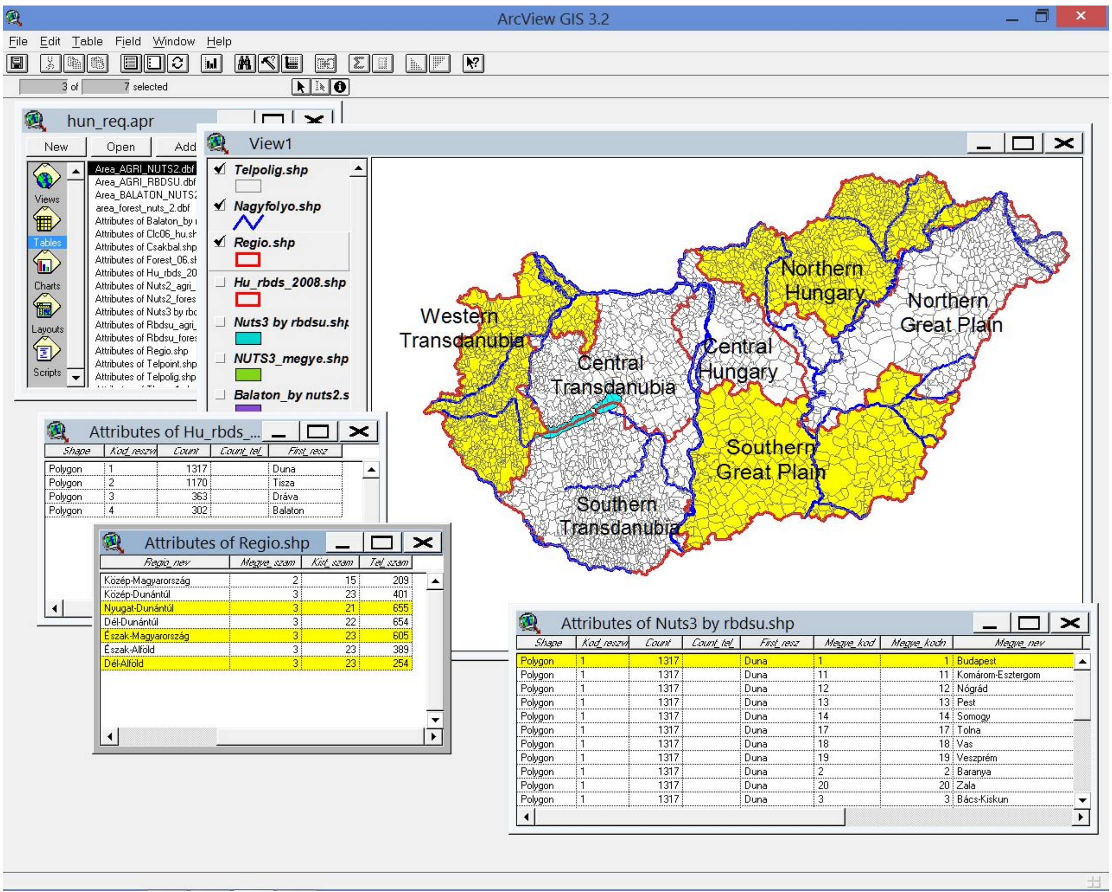


Fig. 3. Data queries at RBDSUs level (1)

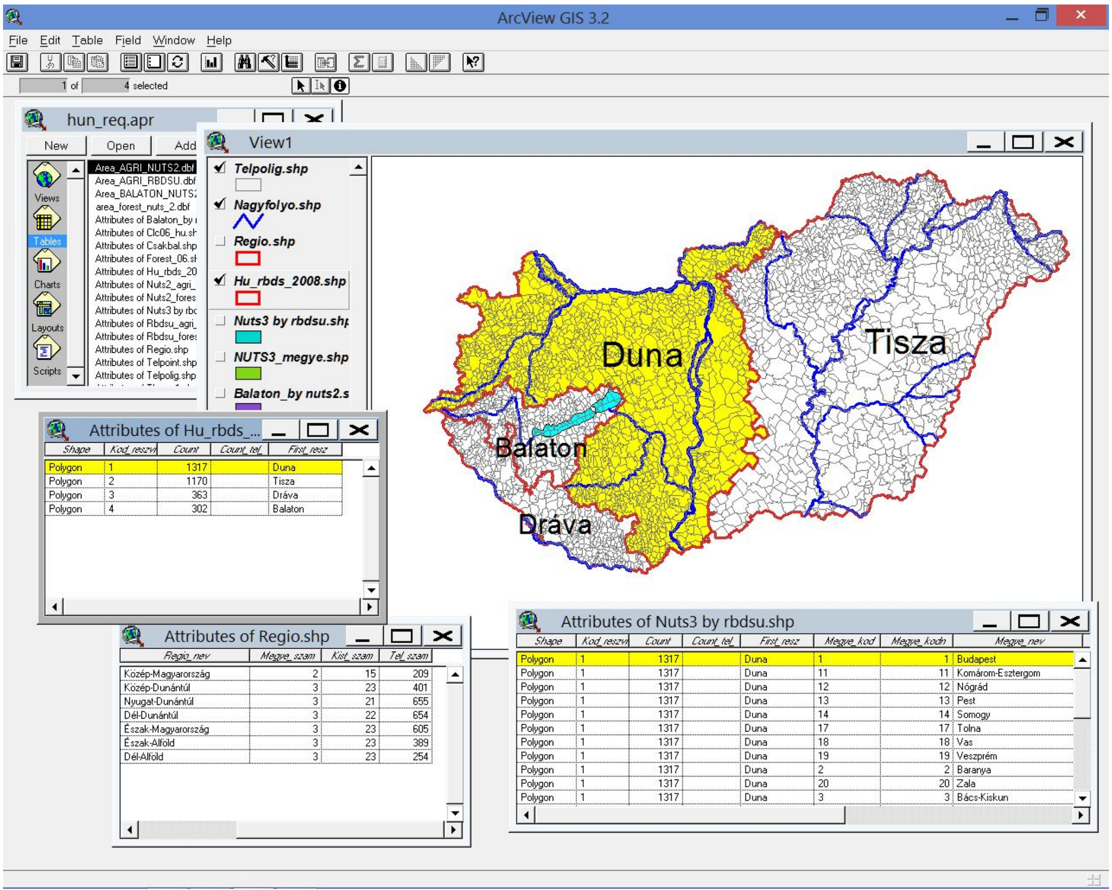
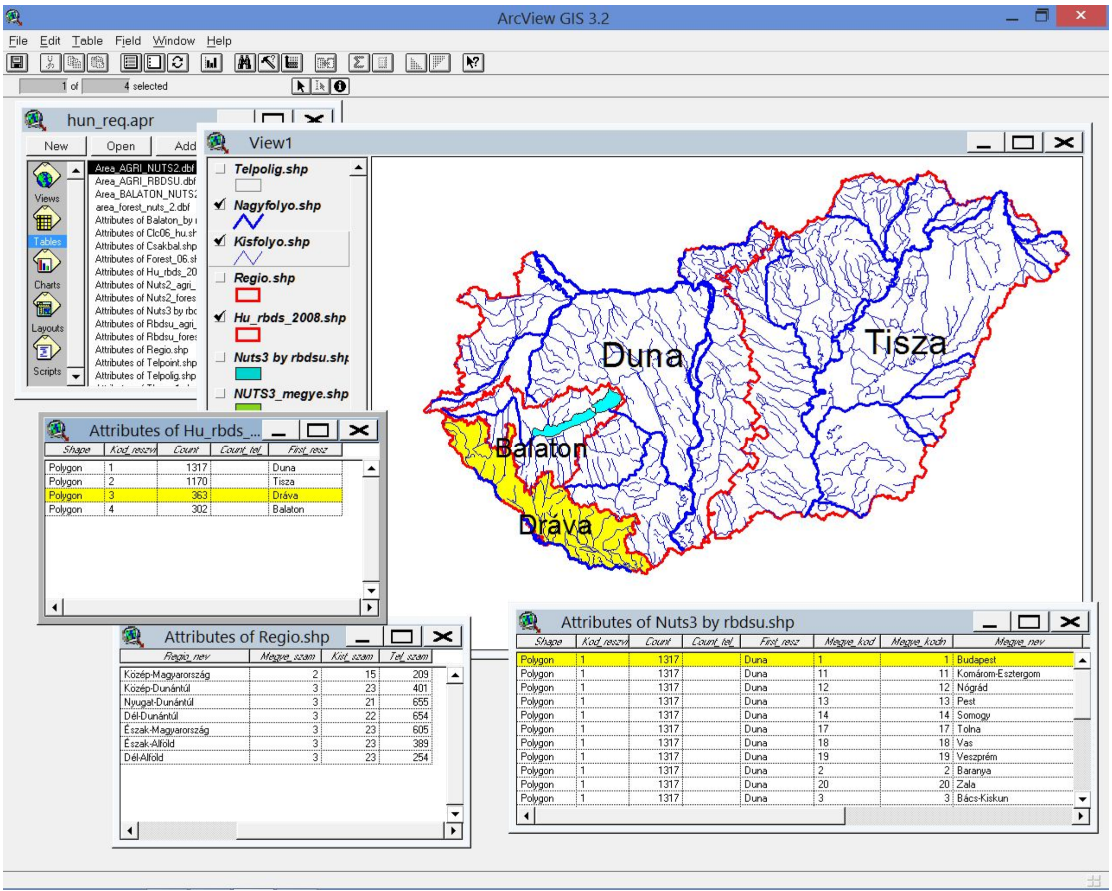


Fig. 4. Data queries at RBDSUs level (2)



3 Compilation of regional water statistics data according to the REQ-IW 2012

3.1. Freshwater resources by RBDSUs and by NUTS2 regions (Table 1)

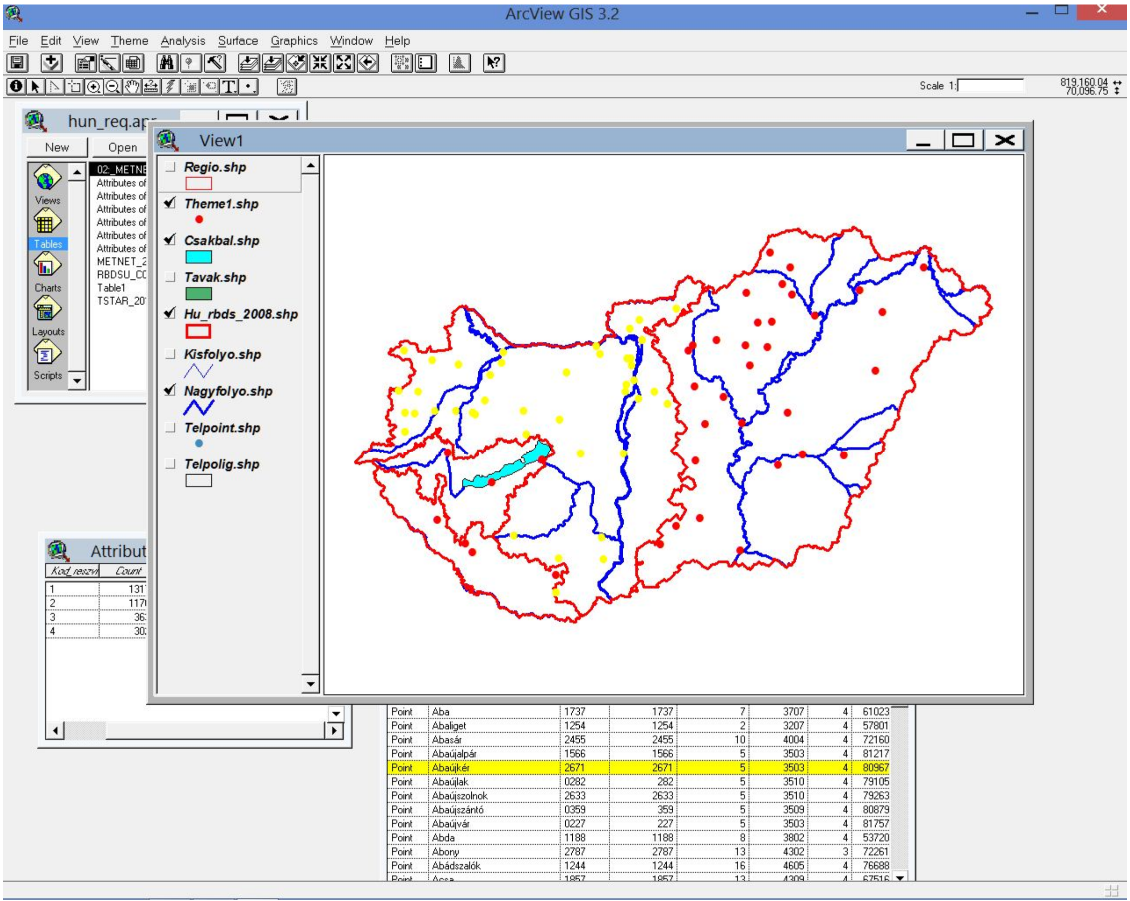
Fig. 5. Data request of Table 1

Denomination	Unit
- Precipitation (1)	10^6 m^3
- Actual evapotranspiration (2)	10^6 m^3
Internal Flow (1-2)	10^6 m^3
- Actual external inflow (3)	10^6 m^3
Total renewable freshwater resources (1-2+3)	10^6 m^3
- Total actual outflow	10^6 m^3
- Recharge into the Aquifer	10^6 m^3
- Groundwater available for annual abstraction	10^6 m^3

3.1.1. Precipitation (P)

The data sources are the databases of Association of Hungarian Amateur Meteorologists'[2], (annual average of precipitation and temperature) because we don't have access for the official measured data of Hungarian Meteorological Service (HMS). The settlements with more precipitation measurement stations are taken into account as one 'virtual' measurement station with average values of measured precipitation and temperature in the same settlement.

Fig. 6. Distribution of 'virtual' precipitation (and temperature) measurement stations for 2010



2 www.metnet.hu

In 2008-2011 the volume of the precipitation in Hungary was calculated from the data of 83–96 precipitation measurement stations. (HMS has more than 600 precipitation measurement stations (mostly automatic) in Hungary.)
The territorial averages of precipitation (mm) by RBDSUs and by NUTS2 regions were estimated from simple arithmetic average of relevant measured precipitation values.
The differences from the country data provided for the JQ Inland Water 2012 were distributed among the regions proportionately according to the areas of regions.

3.1.2. Actual evapotranspiration (AET)

3.1.2.1. Determination of actual annual evapotranspiration at regional (NUTS2) and at RBDSUs level for Hungary total generally

For determination of actual annual evapotranspiration at regional (NUTS2) and at RBDSUs level we applied the Turc formula, due to the inadequate territorial distribution of the measurement stations of evapotranspiration. Generally the transpiration surplus of the free water surfaces is not taken into consideration except transpiration of Lake Balaton.

The applied Turc formula[3] is: $AET=ß*P*(0,9+P^2/K^2)^{-0,5}$,

where:

AET= annual actual evapotranspiration (mm);
P= average annual precipitation (mm);
T= average annual temperature (^{o}C);
$K=300+25*T+c*T^3$
c= 0,05 (empirical coefficient);
ß= coefficient depends on land cover,
in Hungary for agricultural area: 1,13; for forests: 1,62

For determination of the agricultural and forest areas (for all represented years) we applied the CORINE 2006 land cover categories and data[4]. The delimitation of different land cover categories was elaborated with ArcView 3.2. Geoprocessing Wizard application.

3.1.2.1. Determination of annual transpiration of Lake Balaton

The Lake Balaton situated in the west part of the Hungary. According its surface the lake is the largest lake in the Central Europe. Surface: 600 km^2; length: 78km; average width: 7,8km; volume: about 2 billion m^3.
For determination of transpiration of Balaton we applied the annual water budget calculations of Balaton Water Authority of Central Transdanubian Water Directorate.

The applied transpiration formula is: $P=a*(E-ev)*(0,59+0,013*v)*n$

where:

P= average daily transpiration of the water surface (mm);
a= seasonal correction coefficient (-);
(E-ev)= saturation deficit (mbar)
v=average wind speed (m/s)
n= number of day of month

[3] Source: Budapest University of Technology and Economics
[4] http://sia.eionet.europa.eu/clc2006

Fig. 7. Forest areas according to CORINE 2006

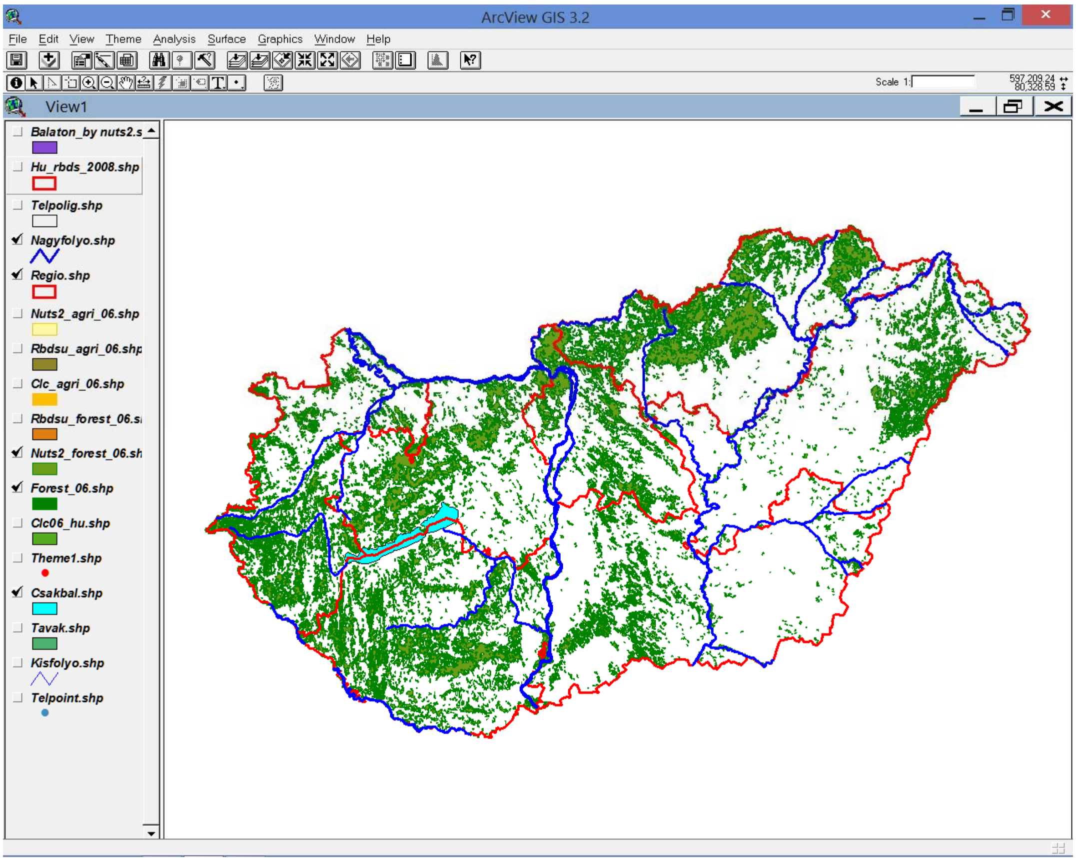
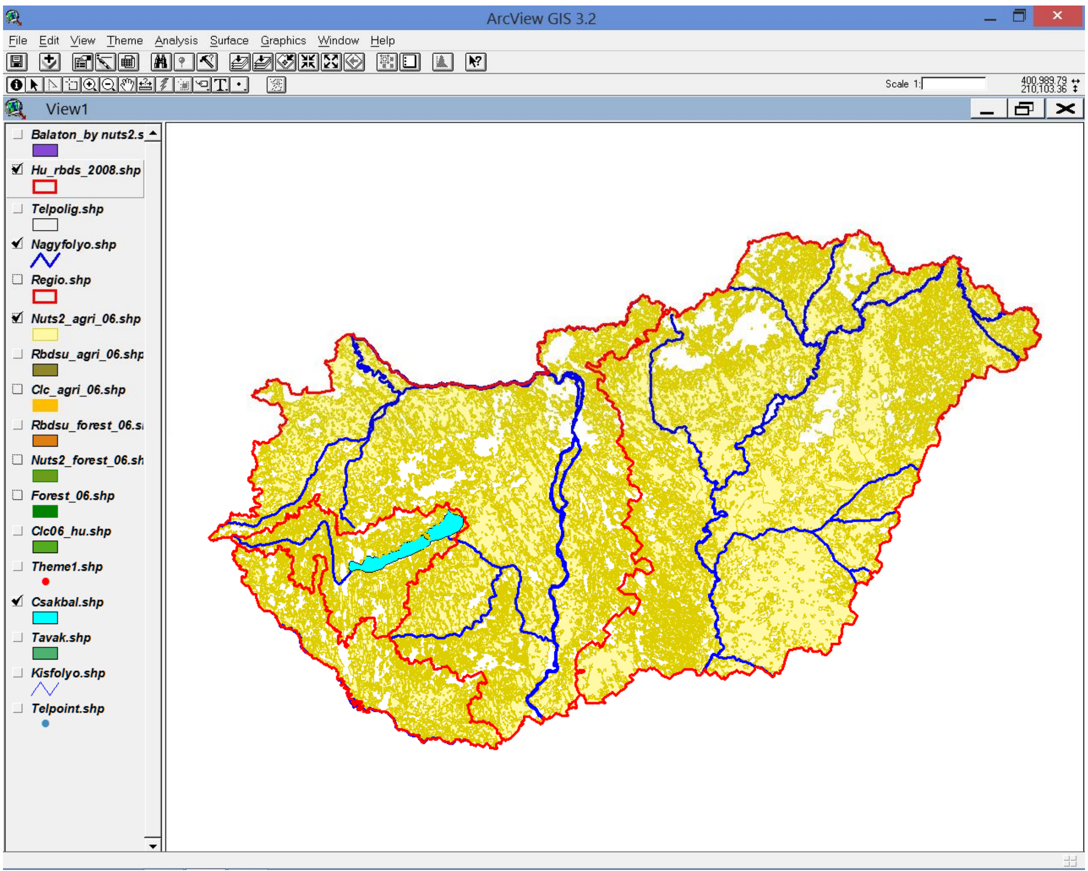


Fig. 8. Agricultural areas according to CORINE 2006



3.1.3. Actual external inflow (AIF) and total actual outflow (AOF)

Unfortunately, we don't have access also to the Hungarian Hydrological Database[5], so we applied for determination of external inflow and outflow at RBDSUs level the national external inflow and outflow data of JQ on Inland Water 2012[6].
For distribution of the annual national inflow and outflow data we applied the long term annual average inflow and outflow data by main rivers, according to the Fig.9. For the year 2011 the actual external inflow and total actual outflow values were calculated from the LTAA values of actual external inflow and total actual outflow, due to data availability according to the JQ on Inland Water 2012 (v1.0).

***Fig. 9. Long term annual average inflow and outflow, m^3/s*[7]**

By estimation of inflow and outflow for border river we took into account half of the total volume of runoff. E.g. between two country (River Dráva: Hungary - Croatia) or two NUTS2 region (Danube: Southern Transdanubia - Southern Great Plain).

For determination of external inflow and outflow at NUTS2 level we applied the LTAA (1991-2000) runoff data of Hydrological Yearbook of Hungary 2006. This yearbook series is available from 1886(!) only to 2006, due to reorganization of Hungarian Hydrological Service, and due to lack of financial sources.

[5] National Water Authority
[6] Source of data: National Water Authority
[7] Source: Ministry of Rural Development

3.1.4. Estimation of the recharge into the aquifer and groundwater available for annual abstraction

For determination of the estimated values of the recharge into the aquifer and groundwater available for annual abstraction, we applied the simple proportional sharing of the LTAA total values of JQ on Inland Water 2012 according to the areas of NUTS2 regions or RBDSUs. The estimated data for Freshwater resources by RBDSUs and by NUTS2 regions see in the following Tables 1 and 2.

Table 1.R. Freshwater resources by RBDSUs

Denomination	Unit	2011	2010	2009	2008
1. Duna RBDSU HUAEP180					
- Precipitation (1)	10^6 m³	14 140,4	33 495,1	21 494,6	22 039,6
- Actual evapotranspiration (2)	10^6 m³	14 976,1	24 046,1	19 560,9	19 859,0
Internal Flow (1-2)	10^6 m³	-835,7	9 449,0	1 933,7	2 180,6
- Actual external inflow (3)	10^6 m³	68 851,4	86 403,7	77 380,5	65 720,6
Total renewable freshwater resources (1-2+3)	10^6 m³	68 015,7	95 852,7	79 314,2	67 901,2
- Total actual outflow	10^6 m³	70 792,1	87 457,5	82 142,5	66 081,0
- Recharge into the Aquifer	10^6 m³	1 238,3	1 238,3	1 238,3	1 238,3
- Groundwater available for annual abstraction	10^6 m³	893,4	893,4	893,4	893,4
2. Tisza RBDSU HUAEP182					
- Precipitation (1)	10^6 m³	19 840,6	45 756,6	27 502,5	26 295,6
- Actual evapotranspiration (2)	10^6 m³	20 278,7	31 926,3	25 125,3	24 537,8
Internal Flow (1-2)	10^6 m³	-438,1	13 830,3	2 377,1	1 757,9
- Actual external inflow (3)	10^6 m³	24 938,4	36 092,2	22 187,0	25 932,2
Total renewable freshwater resources (1-2+3)	10^6 m³	24 500,3	49 922,5	24 564,2	27 690,0
- Total actual outflow	10^6 m³	27 278,6	44 465,8	21 034,5	27 089,4
- Recharge into the Aquifer	10^6 m³	1 661,6	1 661,6	1 661,6	1 661,6
- Groundwater available for annual abstraction	10^6 m³	1 198,9	1 198,9	1 198,9	1 198,9
3. Dráva RBDSU HUAEP179					
- Precipitation (1)	10^6 m³	3 164,7	7 461,1	4 655,9	4 063,5
- Actual evapotranspiration (2)	10^6 m³	3 293,8	4 774,7	4 064,7	3 860,9
Internal Flow (1-2)	10^6 m³	-129,1	2 686,4	591,2	202,6
- Actual external inflow (3)	10^6 m³	7 660,7	8 301,7	9 785,6	6 947,4
Total renewable freshwater resources (1-2+3)	10^6 m³	7 531,6	10 988,1	10 376,8	7 150,0
- Total actual outflow	10^6 m³	8 793,2	10 863,2	10 203,0	8 208,0
- Recharge into the Aquifer	10^6 m³	220,7	220,7	220,7	220,7
- Groundwater available for annual abstraction	10^6 m³	159,3	159,3	159,3	159,3
4. Balaton RBDSU HUAEP178					
- Precipitation (1)	10^6 m³	2 007,3	5 822,2	4 658,0	4 052,3
- Actual evapotranspiration (2)	10^6 m³	2 650,4	4 352,9	3 980,1	3 750,3
Internal Flow (1-2)	10^6 m³	-643,1	1 469,2	678,0	301,9
- Actual external inflow (3)	10^6 m³	0,0	0,0	0,0	0,0
Total renewable freshwater resources (1-2+3)	10^6 m³	-643,1	1 469,2	678,0	301,9
- Total actual outflow	10^6 m³	214,0	500,2	84,5	22,7
- Recharge into the Aquifer	10^6 m³	206,1	206,1	206,1	206,1
- Groundwater available for annual abstraction	10^6 m³	148,7	148,7	148,7	148,7
Hungary Total RBD HU1000					
- Precipitation (1)	10^6 m³	39 153,0	92 535,0	58 311,0	56 451,0
- Actual evapotranspiration (2)	10^6 m³	41 199,0	65 100,0	52 731,0	52 008,0
Internal Flow (1-2)	10^6 m³	-2 046,0	27 435,0	5 580,0	4 443,0
- Actual external inflow (3)	10^6 m³	101 236,6	130 297,4	109 268,6	98 577,4
Total renewable freshwater resources (1-2+3)	10^6 m³	99 190,6	157 732,4	114 848,6	103 020,4
- Total actual outflow	10^6 m³	106 863,9	142 786,5	113 380,0	101 378,4
- Recharge into the Aquifer	10^6 m³	3 326,7	3 326,7	3 326,7	3 326,7
- Groundwater available for annual abstraction	10^6 m³	2 400,3	2 400,3	2 400,3	2 400,3

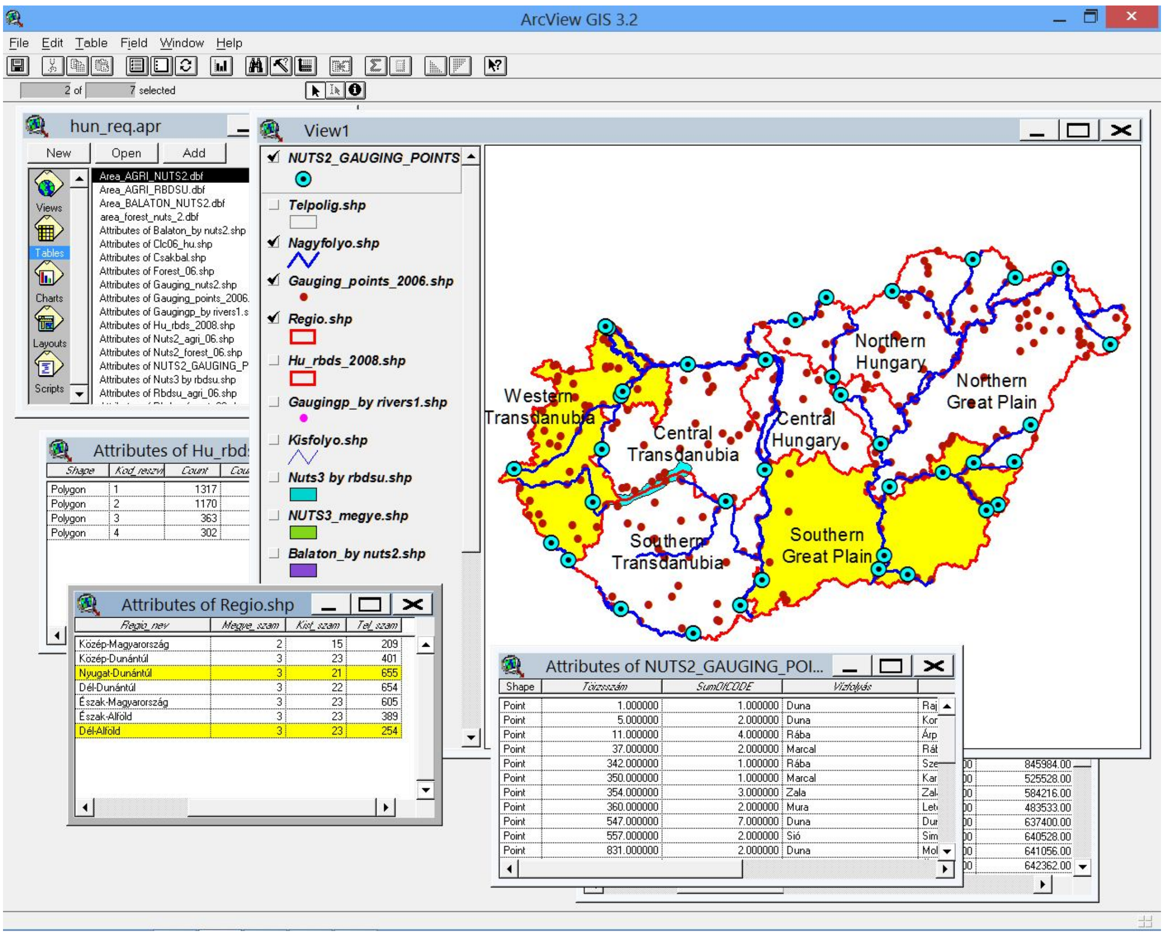
Table 1.N. Freshwater resources by NUTS2 regions

Denomination	Unit	2011	2010	2009	2008
1. Central Hungary HU10					
- Precipitation (1)	10^6 m³	2 668,8	6 742,2	4 087,4	4 276,9
- Actual evapotranspiration (2)	10^6 m³	2 883,8	4 797,4	3 800,2	3 922,5
Internal Flow (1-2)	10^6 m³	-214,9	1 944,8	287,2	354,4
- Actual external inflow (3)	10^6 m³	72 308,9	72 308,9	72 308,9	72 308,9
Total renewable freshwater resources (1-2+3)	10^6 m³	72 094,0	74 253,7	72 596,1	72 663,3
- Total actual outflow	10^6 m³	72 406,7	72 406,7	72 406,7	72 406,7
- Recharge into the Aquifer	10^6 m³	247,3	247,3	247,3	247,3
- Groundwater available for annual abstraction	10^6 m³	178,5	178,5	178,5	178,5
2. Central Transdanubia HU21					
- Precipitation (1)	10^6 m³	4 117,0	11 042,5	7 006,5	6 465,4
- Actual evapotranspiration (2)	10^6 m³	4 662,6	7 775,0	6 413,9	6 195,3
Internal Flow (1-2)	10^6 m³	-545,6	3 267,5	592,6	270,1
- Actual external inflow (3)	10^6 m³	34 122,7	34 122,7	34 122,7	34 122,7
Total renewable freshwater resources (1-2+3)	10^6 m³	33 577,1	37 390,2	34 715,3	34 392,8
- Total actual outflow	10^6 m³	36 480,8	36 480,8	36 480,8	36 480,8
- Recharge into the Aquifer	10^6 m³	397,5	397,5	397,5	397,5
- Groundwater available for annual abstraction	10^6 m³	286,8	286,8	286,8	286,8
3. Western Transdanubia HU22					
- Precipitation (1)	10^6 m³	5 519,2	10 191,8	7 999,9	8 070,8
- Actual evapotranspiration (2)	10^6 m³	5 692,4	7 850,3	6 986,5	6 941,3
Internal Flow (1-2)	10^6 m³	-173,1	2 341,5	1 013,5	1 129,5
- Actual external inflow (3)	10^6 m³	25 418,0	25 418,0	25 418,0	25 418,0
Total renewable freshwater resources (1-2+3)	10^6 m³	25 244,9	27 759,5	26 431,5	26 547,5
- Total actual outflow	10^6 m³	36 990,2	36 990,2	36 990,2	36 990,2
- Recharge into the Aquifer	10^6 m³	405,1	405,1	405,1	405,1
- Groundwater available for annual abstraction	10^6 m³	292,3	292,3	292,3	292,3
4. Southern Transdanubia HU23					
- Precipitation (1)	10^6 m³	5 333,8	15 668,6	9 548,2	8 883,3
- Actual evapotranspiration (2)	10^6 m³	6 086,9	10 569,8	8 733,1	8 526,5
Internal Flow (1-2)	10^6 m³	-753,1	5 098,8	815,1	356,7
- Actual external inflow (3)	10^6 m³	89 190,9	89 190,9	89 190,9	89 190,9
Total renewable freshwater resources (1-2+3)	10^6 m³	88 437,8	94 289,7	90 006,0	89 547,7
- Total actual outflow	10^6 m³	90 839,4	90 839,4	90 839,4	90 839,4
- Recharge into the Aquifer	10^6 m³	506,7	506,7	506,7	506,7
- Groundwater available for annual abstraction	10^6 m³	365,6	365,6	365,6	365,6
5. Northern Hungary HU31					
- Precipitation (1)	10^6 m³	5 752,6	14 145,7	8 531,1	8 287,0
- Actual evapotranspiration (2)	10^6 m³	6 145,0	9 597,0	7 723,8	7 582,1
Internal Flow (1-2)	10^6 m³	11 660,6	11 660,6	11 660,6	11 660,6
- Actual external inflow (3)	10^6 m³	0,0	0,0	0,0	0,0
Total renewable freshwater resources (1-2+3)	10^6 m³	11 660,6	11 660,6	11 660,6	11 660,6
- Total actual outflow	10^6 m³	16 635,2	16 635,2	16 635,2	16 635,2
- Recharge into the Aquifer	10^6 m³	480,3	480,3	480,3	480,3
- Groundwater available for annual abstraction	10^6 m³	346,5	346,5	346,5	346,5
6. Northern Great Plain HU32					
- Precipitation (1)	10^6 m³	8 691,0	17 216,8	11 074,2	10 355,6
- Actual evapotranspiration (2)	10^6 m³	8 345,7	11 925,7	9 623,5	9 307,3
Internal Flow (1-2)	10^6 m³	345,4	5 291,1	1 450,7	1 048,4
- Actual external inflow (3)	10^6 m³	24 436,3	24 436,3	24 436,3	24 436,3
Total renewable freshwater resources (1-2+3)	10^6 m³	24 781,7	29 727,4	25 887,0	25 484,7
- Total actual outflow	10^6 m³	41 135,6	41 135,6	41 135,6	41 135,6
- Recharge into the Aquifer	10^6 m³	634,0	634,0	634,0	634,0
- Groundwater available for annual abstraction	10^6 m³	457,4	457,4	457,4	457,4

Table 1.N. Freshwater resources by NUTS2 regions (continued)

Denomination	Unit	2011	2010	2009	2008
7. Southern Great Plain HU33					
- Precipitation (1)	10^6 m³	7 070,4	17 527,4	10 063,6	10 112,1
- Actual evapotranspiration (2)	10^6 m³	7 382,7	12 584,8	9 450,0	9 533,0
Internal Flow (1-2)	10^6 m³	-312,2	4 942,5	613,6	579,1
- Actual external inflow (3)	10^6 m³	65 711,6	65 711,6	65 711,6	65 711,6
Total renewable freshwater resources (1-2+3)	10^6 m³	65 399,4	70 654,1	66 325,2	66 290,7
- Total actual outflow	10^6 m³	67 774,0	67 774,0	67 774,0	67 774,0
- Recharge into the Aquifer	10^6 m³	655,8	655,8	655,8	655,8
- Groundwater available for annual abstraction	10^6 m³	473,2	473,2	473,2	473,2
Hungary Total HU					
- Precipitation (1)	10^6 m³	39 153,0	92 535,0	58 311,0	56 451,0
- Actual evapotranspiration (2)	10^6 m³	41 199,0	65 100,0	52 731,0	52 008,0
Internal Flow (1-2)	10^6 m³	-2 046,0	27 435,0	5 580,0	4 443,0
- Actual external inflow (3)	10^6 m³	101 236,6	130 297,4	109 268,6	98 577,4
Total renewable freshwater resources (1-2+3)	10^6 m³	99 190,6	157 732,4	114 848,6	103 020,4
- Total actual outflow	10^6 m³	106 863,9	142 786,5	113 380,0	101 378,4
- Recharge into the Aquifer	10^6 m³	3 326,7	3 326,7	3 326,7	3 326,7
- Groundwater available for annual abstraction	10^6 m³	2 400,3	2 400,3	2 400,3	2 400,3

Fig. 10. Gauging points for determination of long term annual average inflow and outflow by NUTS2 regions[8]



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[8] Source: Hydrological Yearbook of Hungary, 2006, Notes: Long term annual average: 1991-2000. Selected gauging points with runoff values are signed with turquoise colour.

3.2. Water abstraction by RBDSUs and by NUTS2 regions (Table 2)

Fig. 11. Data request of Table 2

Denomination	NACE Rev2	Unit
- Fresh surface water		10^6 m^3
of which: - Public water supply	36.00	10^6 m^3
- Irrigation in agriculture	01-02.40	10^6 m^3
- Production of electricity (cooling)	35.11	10^6 m^3
- Fresh groundwater		10^6 m^3
of which: - Public water supply	36.00	10^6 m^3
- Non freshwater sources (marine and brackish water)		10^6 m^3
- Desalinated water (gross production)		10^6 m^3
- Reused water		10^6 m^3
- Losses during transport - Total		10^6 m^3
Evaporation losses		10^6 m^3
Leakage		10^6 m^3

3.2.1. Water abstraction of public water supply (surface and groundwater)

The most relevant questionnaire of HCSO on public water supply and waste water treatment is the 'Questionnaire on Public Water- and Sewerage Supply of the Settlements' (Reference No. 1062). (Timeliness: T-1 year.)

This annual questionnaire is sent out to the operators of public water works and sewer systems and operators of public waste water treatment plants. Data are collected by settlements, so the aggregations at NUTS2 and at RBDSU level are easily available.
According to the OECD/Eurostat methodology volume of abstracted *bank filtered* water is counted to the surface water abstraction.
In Hungary the water abstraction of public water supply from ground water is very relevant also.

3.2.2. Irrigation in agriculture

These data are collected yearly by Hungarian Research Institute of Agricultural Economics (AKII), from the irrigation water user with water low permissions[9].

The yearly publication of AKII on irrigation contained data of irrigated areas, and the volume of irrigated water according to source of water (ground, surface and bank filtered) and by NUTS2 and NUTS3 (counties) categories also.
For determination of the volume of the irrigated water by RBDSUs we used the NUTS3 data proportionally, according to the areas of counties within the area of proper RBDSUs. The partitioning of different 19 NUTS3 areas, according to 4 RBDSUs categories was elaborated also with ArcView 3.2. Geoprocessing Wizard application.

The other important informational source of agricultural water uses could be the system of water resources fee statistics (see later). These statistics contain the water abstractions more than $500 m^3$/year.

Unfortunately from the year 2006 we have not reliable information on agricultural water abstraction from this administrative database, because there were given an exemption from the water resource fee for the agricultural water user like 'subvention'.

[9] www.akii.hu

This situation of exemption concerns and persists only for the agricultural water abstractions as ‘support’ for agriculture from 2006, but the obligation of data supply remained compulsory. Unfortunately the fee-free situation has a significant negative effect on data supply on agricultural water abstraction. The obligations of payment of fee and of data supply remained for all other industries in this system.

3.2.3. Production of electricity (cooling)

The data source of this topic is again the water resources fee statistics of the National Water Directorate. The basis of water resources fee has been the effectively abstracted water quantity according to the act on Water Management (LVII. 1995). Previously (from 1968!) the basis was the water quantity bound by water low *permission*.
The loading of each water base can be calculate, resp. planned on the basis of existing contingents in the permissions (allowed during the year, continuously or in defined period water quantity for production).

The register can be joined to regional (NUTS2) or national water balances, and the NACE2 statistics can be produced by HCSO-codes of water users (abstraction and use).

Difficulties:

- the water resources fee register is obligatory only, if the water use more than 500m^3/year;
- the water resources fee act contains many *exceptions*, so many active water users aren't included;
- the aim of water uses (NACE codes) aren't known exactly, or corrected generally in water resources fee register.

The HCSO has access to these yearly datasets, *but only in aggregated form*. These aggregations contain the classification of NACE2, and the aggregated data are provided by settlements. The compilations of required datasets *for cooling* are available at RBDSUs and NUTS2 levels, because these enterprises (NACE D) abstract huge volume of water per year. Unfortunately we can’t be able to provide or to estimate the national total water abstractions without detailed, individual data sets (for coefficients, and for grossing-up etc.).

3.2.4. Non freshwater sources, Desalinated water, Reused water

In Hungary the following water resources are not relevant for water abstraction or use:

- non freshwater sources (marine and brackish water)
- desalinated water
- reused water.

3.2.5. Losses during transport, Evaporation losses, Leakage

For this topics we can provide information only for the leakage in *public water supply*, due to lack of any statistical information or estimation methods on ‘Losses during transport’, and ‘Evaporation losses’, or on leakages in other sectors.

The leakage information origins from the above mentioned questionnaire of HCSO dealing with public water supply (Ref. No. 1062).

Table 2.R. Water abstraction by RBDSUs

Denomination	NACE Rev2	Unit	2011	2010	2009	2008
1. Duna RBDSU HUAEP180						
- Fresh surface water		10^6 m³	..	..	..	..
of which: - Public water supply	36.00	10^6 m³	222,2	222,0	230,7	245,6
- Irrigation in agriculture	01-02.40	10^6 m³	7,7	3,4	..	..
- Production of electricity (cooling)	35.11	10^6 m³	3 462,9	3 505,5	3 437,3	..
- Fresh groundwater		10^6 m³	..	..	..	..
of which: - Public water supply	36.00	10^6 m³	140,0	137,9	131,0	124,8
- Irrigation in agriculture	01-02.40	10^6 m³	0,8	0,6	..	..
Leakage (only public water supply)		10^6 m³	63,5	64,5	71,2	67,0
2. Tisza RBDSU HUAEP182						
- Fresh surface water		10^6 m³	..	..	..	..
of which: - Public water supply	36.00	10^6 m³	21,0	13,7	21,0	21,1
- Irrigation in agriculture	01-02.40	10^6 m³	70,1	78,3	..	..
- Production of electricity (cooling)	35.11	10^6 m³	331,5	400,3	449,7	..
- Fresh groundwater		10^6 m³	..	..	..	..
of which: - Public water supply	36.00	10^6 m³	175,4	181,7	202,0	202,7
- Irrigation in agriculture	01-02.40	10^6 m³	1,8	2,6	..	..
Leakage (only public water supply)		10^6 m³	45,2	50,3	48,1	45,9
3. Dráva RBDSU HUAEP179						
- Fresh surface water		10^6 m³	..	..	..	..
of which: - Public water supply	36.00	10^6 m³	3,8	3,9	3,9	3,8
- Irrigation in agriculture	01-02.40	10^6 m³	0,4	0,4	..	..
- Production of electricity (cooling)	35.11	10^6 m³	0,0	0,0	0,0	..
- Fresh groundwater		10^6 m³	..	..	..	..
of which: - Public water supply	36.00	10^6 m³	17,8	17,9	22,1	20,0
- Irrigation in agriculture	01-02.40	10^6 m³	0,0	0,1	..	..
Leakage (only public water supply)		10^6 m³	4,9	5,3	5,8	4,8
4. Balaton RBDSU HUAEP178						
- Fresh surface water		10^6 m³	..	..	..	..
of which: - Public water supply	36.00	10^6 m³	7,7	8,1	8,6	9,4
- Irrigation in agriculture	01-02.40	10^6 m³	0,2	0,3	..	..
- Production of electricity (cooling)	35.11	10^6 m³	0,0	0,0	0,0	..
- Fresh groundwater		10^6 m³	..	..	..	..
of which: - Public water supply	36.00	10^6 m³	12,2	12,5	13,1	13,3
- Irrigation in agriculture	01-02.40	10^6 m³	0,0	0,1	..	..
Leakage (only public water supply)		10^6 m³	2,4	2,5	3,0	2,9
Hungary Total RBD HU1000						
- Fresh surface water		10^6 m³	..	..	..	..
of which: - Public water supply	36.00	10^6 m³	254,6	247,6	264,3	279,8
- Irrigation in agriculture	01-02.40	10^6 m³	78,3	82,5	..	..
- Production of electricity (cooling)	35.11	10^6 m³	3 794,4	3 905,8	3 887,0	..
- Fresh groundwater		10^6 m³	..	..	..	..
of which: - Public water supply	36.00	10^6 m³	345,5	350,0	368,2	360,9
- Irrigation in agriculture	01-02.40	10^6 m³	2,5	3,4	..	..
Leakage (only public water supply)		10^6 m³	116,0	122,6	128,2	120,7

Table 2.N. Water abstraction by NUTS2 regions

Denomination	NACE Rev2	Unit	2011	2010	2009	2008
1. Central Hungary HU10						
- Fresh surface water		10^6 m³	..	..	..	..
of which: - Public water supply	36.00	10^6 m³	191,7	192,4	201,8	208,7
- Irrigation in agriculture	01-02.40	10^6 m³	0,9	0,3	..	..
- Production of electricity (cooling)	35.11	10^6 m³	399,9	479,1	432,5	..
- Fresh groundwater		10^6 m³	..	..	..	..
of which: - Public water supply	36.00	10^6 m³	29,3	28,8	29,1	28,6
- Irrigation in agriculture	01-02.40	10^6 m³	0,0	0,0	..	..
Leakage (only public water supply)		10^6 m³	39,7	42,5	47,2	45,3
2. Central Transdanubia HU21						
- Fresh surface water		10^6 m³	..	..	..	..
of which: - Public water supply	36.00	10^6 m³	13,0	11,9	12,5	13,0
- Irrigation in agriculture	01-02.40	10^6 m³	1,7	0,4	..	..
- Production of electricity (cooling)	35.11	10^6 m³	86,9	93,5	92,7	..
- Fresh groundwater		10^6 m³	..	..	..	..
of which: - Public water supply	36.00	10^6 m³	60,0	58,6	48,8	49,9
- Irrigation in agriculture	01-02.40	10^6 m³	0,2	0,2	..	..
Leakage (only public water supply)		10^6 m³	10,2	8,1	9,7	8,6
3. Western Transdanubia HU22						
- Fresh surface water		10^6 m³	..	..	..	..
of which: - Public water supply	36.00	10^6 m³	13,5	13,7	13,8	21,2
- Irrigation in agriculture	01-02.40	10^6 m³	1,4	1,2	..	..
- Production of electricity (cooling)	35.11	10^6 m³	86,9	0,0	0,0	..
- Fresh groundwater		10^6 m³	..	..	..	..
of which: - Public water supply	36.00	10^6 m³	41,3	41,7	43,1	37,0
- Irrigation in agriculture	01-02.40	10^6 m³	0,1	0,3	..	..
Leakage (only public water supply)		10^6 m³	9,6	10,5	11,3	10,1
4. Southern Transdanubia HU23						
- Fresh surface water		10^6 m³	..	..	..	..
of which: - Public water supply	36.00	10^6 m³	8,1	8,7	7,7	8,5
- Irrigation in agriculture	01-02.40	10^6 m³	1,8	0,7	..	..
- Production of electricity (cooling)	35.11	10^6 m³	2 892,6	2 932,9	2 912,1	..
- Fresh groundwater		10^6 m³	..	..	..	..
of which: - Public water supply	36.00	10^6 m³	41,8	41,2	46,5	44,3
- Irrigation in agriculture	01-02.40	10^6 m³	0,1	0,1	..	..
Leakage (only public water supply)		10^6 m³	10,3	10,0	10,6	9,8
5. Northern Hungary HU31						
- Fresh surface water		10^6 m³	..	..	..	..
of which: - Public water supply	36.00	10^6 m³	11,3	8,9	10,2	10,8
- Irrigation in agriculture	01-02.40	10^6 m³	0,7	0,1	..	..
- Production of electricity (cooling)	35.11	10^6 m³	331,5	400,3	449,7	..
- Fresh groundwater		10^6 m³	..	..	..	..
of which: - Public water supply	36.00	10^6 m³	49,5	53,9	53,2	54,1
- Irrigation in agriculture	01-02.40	10^6 m³	0,5	0,4	..	..
Leakage (only public water supply)		10^6 m³	15,9	16,8	16,0	15,9
6. Northern Great Plain HU32						
- Fresh surface water		10^6 m³	..	..	..	..
of which: - Public water supply	36.00	10^6 m³	11,8	6,7	12,7	12,0
- Irrigation in agriculture	01-02.40	10^6 m³	43,5	57,4	..	..
- Production of electricity (cooling)	35.11	10^6 m³	0,0	0,0	0,0	..
- Fresh groundwater		10^6 m³	..	..	..	..
of which: - Public water supply	36.00	10^6 m³	69,9	67,3	74,1	74,2
- Irrigation in agriculture	01-02.40	10^6 m³	0,3	0,1	..	..
Leakage (only public water supply)		10^6 m³	15,3	14,5	16,0	14,5

Table 2.N. Water abstraction by NUTS2 regions (continued)

Denomination	NACE Rev2	Unit	2011	2010	2009	2008
7. Southern Great Plain HU33						
- Fresh surface water		10^6 m³	..	..	..	..
of which: - Public water supply	36.00	10^6 m³	5,2	5,2	5,7	5,6
- Irrigation in agriculture	01-02.40	10^6 m³	28,4	22,5	..	..
- Production of electricity (cooling)	35.11	10^6 m³	–	–	–	..
- Fresh groundwater		10^6 m³	..	..	..	..
of which: - Public water supply	36.00	10^6 m³	53,7	58,5	73,4	72,9
- Irrigation in agriculture	01-02.40	10^6 m³	1,4	2,4	..	..
Leakage (only public water supply)		10^6 m³	15,1	20,3	17,4	16,4
Hungary Total HU						
- Fresh surface water		10^6 m³	..	..	..	..
of which: - Public water supply	36.00	10^6 m³	254,6	247,6	264,3	279,8
- Irrigation in agriculture	01-02.40	10^6 m³	78,3	82,5	..	..
- Production of electricity (cooling)	35.11	10^6 m³	3 797,8	3 905,8	3 887,0	..
- Fresh groundwater		10^6 m³	..	..	..	..
of which: - Public water supply	36.00	10^6 m³	345,5	350,0	368,2	360,9
- Irrigation in agriculture	01-02.40	10^6 m³	2,5	3,4	..	..
Leakage (only public water supply)		10^6 m³	116,0	122,6	128,2	120,7

3.3. Water use by RBDSUs and by NUTS2 regions (Table 3)

Fig. 12. Data request of Table 3

Denomination	NACE Rev2	Unit
Population connected to public water supply		%
Water use from all supply categories - TOTAL (public / self / other)		10^6 m³
used by: 1. Agriculture, forestry, fishing	A	10^6 m³
of which : for irrigation	01-02.40	10^6 m³
2. All industrial activities	B, C, D, E, F	10^6 m³
2.1 Mining and quarrying	B	10^6 m³
2.2 Total manufacturing industry :	C	10^6 m³
- Manufacture of food processing industry	10	10^6 m³
- Manufacture of basic metals	24	10^6 m³
- Manufacture of transport equipment	29, 30	10^6 m³
- Manufacture of textiles, wearing apparel and leather	13, 14, 15	10^6 m³
- Manufacture of paper and paper products	17	10^6 m³
- Manufacture of refined petroleum, chemicals and pharmaceuticals	19, 20, 21	10^6 m³
- Other manufacturing industry n.e.c.		10^6 m³
2.3 Production and distribution of electricity	35.11, 35.13	10^6 m³
of which : for cooling purposes		10^6 m³
2.4 Construction	F	10^6 m³
3. Services	G-S	10^6 m³
4. Private households		10^6 m³

3.3.1. Population connected to public water supply

The data sources of this indicator are the annual questionnaire of HCSO on public water supply and waste water treatment is the 'Questionnaire on Public Water- and Sewerage Supply of the Settlements', and the indicator of the yearly updated stock of dwellings, according to the Hungarian settlements.

We estimated the ratio of population connected to the public water supply directly, from the ratio of dwellings connected to the public water conduit network.
In Hungary the population which has no direct connection to the public water conduit network is supplied by public taps. According to this information in all Hungarian regions the ratio of population connected to public water supply is100%.

Data on *public water supply* are collected by settlements, so the aggregations at NUTS2 and RBDSU level are easily available.

3.3.2. Water use from all supply categories

For estimation of water use, we applied only the available water abstraction data (see 3.2.) for the direct supply, due to lack of any other appropriate information.
For agricultural water use we have only information on irrigation from the datasets of AKII.

Table 3.R. Water use by RBDSUs, without water use from public water supply, $10^6 m^3$, 2011

NACE2	NACE2 Denomination	Water Use
1. Duna RBDSU HUAEP180		
A	AGRICULTURE, FORESTRY AND FISHING	7 693,40
B	MINING AND QUARRYING	2,0
C	MANUFACTURING	34,4
D	ELECTRICITY, GAS, STEAM AND AIR CONDITIONING SUPPLY	2 404,0
F	CONSTRUCTION	228,9
G	WHOLESALE AND RETAIL TRADE; REPAIR OF MOTOR VEHICLES AND MOTORCYCLES	1,2
H	TRANSPORTATION AND STORAGE	0,5
I	ACCOMMODATION AND FOOD SERVICE ACTIVITIES	0,8
K	FINANCIAL AND INSURANCE ACTIVITIES	0,0
M	PROFESSIONAL, SCIENTIFIC AND TECHNICAL ACTIVITIES	2,4
O	PUBLIC ADMINISTRATION AND DEFENCE; COMPULSORY SOCIAL SECURITY	3,5
P	EDUCATION	0,3
Q	HUMAN HEALTH AND SOCIAL WORK ACTIVITIES	52,3
R	ARTS, ENTERTAINMENT AND RECREATION	7,6
S	OTHER SERVICE ACTIVITIES	15,2
T	ACTIVITIES OF HOUSEHOLDS AS EMPLOYERS; U0NDIFFERENTIATED GOODS- AND SERVICES-PRODUCING ACTIVITIES OF HOUSEHOLDS FOR OWN USE	0,0
2. Tisza RBDSU HUAEP182		
A	AGRICULTURE, FORESTRY AND FISHING	70 139,40
B	MINING AND QUARRYING	1,9
C	MANUFACTURING	37,2
D	ELECTRICITY, GAS, STEAM AND AIR CONDITIONING SUPPLY	13 952,1
F	CONSTRUCTION	1,0
G	WHOLESALE AND RETAIL TRADE; REPAIR OF MOTOR VEHICLES AND MOTORCYCLES	2,0
H	TRANSPORTATION AND STORAGE	0,6
I	ACCOMMODATION AND FOOD SERVICE ACTIVITIES	1,2
K	FINANCIAL AND INSURANCE ACTIVITIES	0,0
M	PROFESSIONAL, SCIENTIFIC AND TECHNICAL ACTIVITIES	3,2
O	PUBLIC ADMINISTRATION AND DEFENCE; COMPULSORY SOCIAL SECURITY	6,8
P	EDUCATION	0,8
Q	HUMAN HEALTH AND SOCIAL WORK ACTIVITIES	3,3

2. Tisza RBDSU HUAEP182 (continued)		
R	ARTS, ENTERTAINMENT AND RECREATION	11,6
S	OTHER SERVICE ACTIVITIES	1,9
T	ACTIVITIES OF HOUSEHOLDS AS EMPLOYERS; U0NDIFFERENTIATED GOODS- AND SERVICES-PRODUCING ACTIVITIES OF HOUSEHOLDS FOR OWN USE	0,0
3. Dráva RBDSU HUAEP179		
A	AGRICULTURE, FORESTRY AND FISHING	350,4
B	MINING AND QUARRYING	0,1
C	MANUFACTURING	2,0
D	ELECTRICITY, GAS, STEAM AND AIR CONDITIONING SUPPLY	0,0
F	CONSTRUCTION	0,0
G	WHOLESALE AND RETAIL TRADE; REPAIR OF MOTOR VEHICLES AND MOTORCYCLES	0,1
H	TRANSPORTATION AND STORAGE	0,0
I	ACCOMMODATION AND FOOD SERVICE ACTIVITIES	0,0
K	FINANCIAL AND INSURANCE ACTIVITIES	0,0
M	PROFESSIONAL, SCIENTIFIC AND TECHNICAL ACTIVITIES	0,1
O	PUBLIC ADMINISTRATION AND DEFENCE; COMPULSORY SOCIAL SECURITY	0,5
P	EDUCATION	0,0
Q	HUMAN HEALTH AND SOCIAL WORK ACTIVITIES	0,6
R	ARTS, ENTERTAINMENT AND RECREATION	3,8
S	OTHER SERVICE ACTIVITIES	0,2
T	ACTIVITIES OF HOUSEHOLDS AS EMPLOYERS; U0NDIFFERENTIATED GOODS- AND SERVICES-PRODUCING ACTIVITIES OF HOUSEHOLDS FOR OWN USE	0,0
4. Balaton RBDSU HUAEP178		
A	AGRICULTURE, FORESTRY AND FISHING	151,4
B	MINING AND QUARRYING	0,1
C	MANUFACTURING	1,1
D	ELECTRICITY, GAS, STEAM AND AIR CONDITIONING SUPPLY	0,0
F	CONSTRUCTION	0,0
G	WHOLESALE AND RETAIL TRADE; REPAIR OF MOTOR VEHICLES AND MOTORCYCLES	0,0
H	TRANSPORTATION AND STORAGE	0,0
I	ACCOMMODATION AND FOOD SERVICE ACTIVITIES	0,7
K	FINANCIAL AND INSURANCE ACTIVITIES	0,0
M	PROFESSIONAL, SCIENTIFIC AND TECHNICAL ACTIVITIES	0,2
O	PUBLIC ADMINISTRATION AND DEFENCE; COMPULSORY SOCIAL SECURITY	1,1
P	EDUCATION	0,1
Q	HUMAN HEALTH AND SOCIAL WORK ACTIVITIES	0,5
R	ARTS, ENTERTAINMENT AND RECREATION	1,5
S	OTHER SERVICE ACTIVITIES	0,0
T	ACTIVITIES OF HOUSEHOLDS AS EMPLOYERS; U0NDIFFERENTIATED GOODS- AND SERVICES-PRODUCING ACTIVITIES OF HOUSEHOLDS FOR OWN USE	0,0
Hungary Total RBD HU1000		
A	AGRICULTURE, FORESTRY AND FISHING	78 334,6
B	MINING AND QUARRYING	4,1
C	MANUFACTURING	74,7
D	ELECTRICITY, GAS, STEAM AND AIR CONDITIONING SUPPLY	16 356,1
F	CONSTRUCTION	229,9
G	WHOLESALE AND RETAIL TRADE; REPAIR OF MOTOR VEHICLES AND MOTORCYCLES	3,3
H	TRANSPORTATION AND STORAGE	1,2
I	ACCOMMODATION AND FOOD SERVICE ACTIVITIES	2,7
K	FINANCIAL AND INSURANCE ACTIVITIES	0,0
M	PROFESSIONAL, SCIENTIFIC AND TECHNICAL ACTIVITIES	5,9
O	PUBLIC ADMINISTRATION AND DEFENCE; COMPULSORY SOCIAL SECURITY	11,9
P	EDUCATION	1,1
Q	HUMAN HEALTH AND SOCIAL WORK ACTIVITIES	56,6
R	ARTS, ENTERTAINMENT AND RECREATION	24,5
S	OTHER SERVICE ACTIVITIES	17,3
T	ACTIVITIES OF HOUSEHOLDS AS EMPLOYERS; U0NDIFFERENTIATED GOODS- AND SERVICES-PRODUCING ACTIVITIES OF HOUSEHOLDS FOR OWN USE	0,1

3.4. Population connected to wastewater treatment by RBDSUs and by NUTS2 regions (Table 4)

Fig. 13. Data request of Table 4

Denomination	Unit
Resident population	1000's
% of resident population connected to : urban wastewater collecting system	% of tot. pop.
of which: connected to wastewater treatment (urban, other) with Primary treatment only	% of tot. pop.
with Secondary treatment	% of tot. pop.
with Tertiary treatment	% of tot. pop.
of which: not connected to wastewater treatment	% of tot. pop.
Independent wastewater treatment	% of tot. pop.

The estimation of population connected to wastewater treatment by RBDSUs and by NUTS2 regions method is the following:

$$P_{CPrimary} = [D_{connected}/D_{total}]*[ST_{primary}/ST_{total}]*[1-(S_{not\ treated}/S_{collected})]*100$$
$$P_{CSecondary} = [D_{connected}/D_{total}]*[ST_{secondary}/ST_{total}]*[1-(S_{not\ treated}/S_{collected})]*100$$
$$P_{CTertiary} = [D_{connected}/D_{total}]*[ST_{tertiary}/ST_{total}]*[1-(S_{not\ treated}/S_{collected})]*100$$
$$P_{Cnot\ treated} = [D_{connected}/D_{total}]*[S_{not\ treated}/S_{collected}]*100$$

The calculation of the population connected to the independent waste water collecting system is based on the following equation, because theoretically there is not a dwelling without public or independent waste water collecting and treatment solution.

$$P_{CIndep.\ collection\ \&\ treatment} = 100-[P_{CPrimary} + P_{CSecondary} + P_{CTertiary} + P_{Cnot\ treated}]$$

Where:

$P_{CPrimary}$ = Percentage of population connected to the primary treatment
$P_{CSeondary}$ = Percentage of population connected to the secondary treatment
$P_{CTertiary}$ = Percentage of population connected to the tertiary treatment
$P_{Cnot\ treated}$ = Percentage of population connected to the waste water collecting system without treatment
$D_{connected}$ = Number of dwellings connected to the sewerage
D_{total} = Total number of dwellings
$ST_{primary}$ = Treated urban waste water by primary treatment
$ST_{secondary}$ = Treated urban waste water by secondary treatment
$ST_{tertiary}$ = Treated urban waste water by tertiary treatment
ST_{total} = Total amount of the treated urban waste water with waste water delivered directly to the plant.
$S_{not\ treated}$ = Not treated sewage collected by urban waste water collecting system
$S_{collected}$ = Sewage collected by urban waste water collecting system
$P_{CIndep.\ collection\ \&\ treatment.}$ = Percentage of population connected to the independent waste water collecting and treatment system

These estimated data and the data on resident population are based on the yearly updated census data. The yearly resident populations are calculated according to the mid-year status of the resident populations.

Table 4.R. Population connected to wastewater treatment by RBDSUs

Denomination	Unit	2011	2010	2009	2008
1. Duna RBDSU HUAEP180					
Resident population	1000's	5 223,2	5 216,1	5 203,5	5 184,9
% of resident population connected to: urban wastewater collecting system	% of tot. pop.	82,8	82,4	81,9	81,2
of which: connected to wastewater treatment (urban, other) with Primary treatment only	% of tot. pop.	2,2	4,0	28,8	29,9
with Secondary treatment	% of tot. pop.	41,8	44,2	27,3	27,1
with Tertiary treatment	% of tot. pop.	38,1	33,4	20,5	19,1
of which: not connected to wastewater treatment	% of tot. pop.	0,7	0,7	5,4	5,1
Independent wastewater treatment	% of tot. pop.	17,2	17,6	18,1	18,8
2. Tisza RBDSU HUAEP182					
Resident population	1000's	3 924,3	3 954,9	3 986,0	4 016,2
% of resident population connected to: urban wastewater collecting system	% of tot. pop.	59,6	58,8	58,7	57,4
of which: connected to wastewater treatment (urban, other) with Primary treatment only	% of tot. pop.	0,4	0,4	0,5	0,5
with Secondary treatment	% of tot. pop.	28,5	30,2	29,6	28,7
with Tertiary treatment	% of tot. pop.	30,6	27,8	28,2	27,3
of which: not connected to wastewater treatment	% of tot. pop.	0,1	0,5	0,4	1,0
Independent wastewater treatment	% of tot. pop.	40,4	41,2	41,3	42,6
3. Dráva RBDSU HUAEP179					
Resident population	1000's	445,1	448,4	451,1	453,7
% of resident population connected to: urban wastewater collecting system	% of tot. pop.	71,1	70,9	71,0	70,6
of which: connected to wastewater treatment (urban, other) with Primary treatment only	% of tot. pop.	0,1	0,0	0,0	0,0
with Secondary treatment	% of tot. pop.	4,8	5,0	27,2	18,9
with Tertiary treatment	% of tot. pop.	66,2	65,8	43,8	51,7
of which: not connected to wastewater treatment	% of tot. pop.	0,0	0,0	0,0	0,0
Independent wastewater treatment	% of tot. pop.	28,9	29,1	29,0	29,4
4. Balaton RBDSU HUAEP178					
Resident population	1000's	379,2	380,6	381,9	383,4
% of resident population connected to: urban wastewater collecting system	% of tot. pop.	72,9	72,3	72,9	70,5
of which: connected to wastewater treatment (urban, other) with Primary treatment only	% of tot. pop.	0,0	0,0	0,0	0,0
with Secondary treatment	% of tot. pop.	5,9	25,2	20,3	20,6
with Tertiary treatment	% of tot. pop.	67,0	47,1	52,6	49,9
of which: not connected to wastewater treatment	% of tot. pop.	0,0	0,0	0,0	0,0
Independent wastewater treatment	% of tot. pop.	27,1	27,7	27,1	29,5
Hungary Total RBD HU1000					
Resident population	1000's	9 971,7	10 000,0	10 022,6	10 038,2
% of resident population connected to: urban wastewater collecting system	% of tot. pop.	72,8	72,3	72,0	71,0
of which: connected to wastewater treatment (urban, other) with Primary treatment only	% of tot. pop.	1,4	2,3	16,7	17,7
with Secondary treatment	% of tot. pop.	33,9	36,4	27,4	26,7
with Tertiary treatment	% of tot. pop.	37,2	33,1	24,7	23,3
of which: not connected to wastewater treatment	% of tot. pop.	0,4	0,6	3,3	3,3
Independent wastewater treatment	% of tot. pop.	27,2	27,7	28,0	29,0

Table 4.N. Population connected to wastewater treatment by NUTS2 regions

Denomination	Unit	2011	2010	2009	2008
1. Central Hungary HU10					
Resident population	1000's	2 978,2	2 961,3	2 938,5	2 911,4
% of resident population connected to: urban wastewater collecting system	% of tot. pop.	87,3	87,0	86,4	86,1
of which: connected to wastewater treatment (urban, other) with Primary treatment only	% of tot. pop.	3,7	6,3	42,2	43,3
with Secondary treatment	% of tot. pop.	45,1	48,4	22,5	22,1
with Tertiary treatment	% of tot. pop.	37,6	31,4	14,0	13,4
of which: not connected to wastewater treatment	% of tot. pop.	0,9	0,9	7,8	7,2
Independent wastewater treatment	% of tot. pop.	12,7	13,0	13,6	13,9
2. Central Transdanubia HU21					
Resident population	1000's	1 092,2	1 096,4	1 100,9	1 104,0
% of resident population connected to: urban wastewater collecting system	% of tot. pop.	77,5	77,3	76,9	75,7
of which: connected to wastewater treatment (urban, other) with Primary treatment only	% of tot. pop.	0,5	0,4	0,4	0,5
with Secondary treatment	% of tot. pop.	33,7	39,1	41,0	45,4
with Tertiary treatment	% of tot. pop.	42,7	37,4	35,5	29,8
of which: not connected to wastewater treatment	% of tot. pop.	0,7	0,3	0,0	0,1
Independent wastewater treatment	% of tot. pop.	22,5	22,7	23,1	24,3
3. Western Transdanubia HU22					
Resident population	1000's	994,1	995,5	997,3	998,1
% of resident population connected to: urban wastewater collecting system	% of tot. pop.	77,7	76,8	76,7	75,0
of which: connected to wastewater treatment (urban, other) with Primary treatment only	% of tot. pop.	0,0	0,0	0,0	0,0
with Secondary treatment	% of tot. pop.	25,4	21,1	34,1	30,0
with Tertiary treatment	% of tot. pop.	52,2	55,6	42,4	44,8
of which: not connected to wastewater treatment	% of tot. pop.	0,1	0,1	0,2	0,2
Independent wastewater treatment	% of tot. pop.	22,3	23,2	23,3	25,0
4. Southern Transdanubia HU23					
Resident population	1000's	937,2	944,3	950,5	956,5
% of resident population connected to: urban wastewater collecting system	% of tot. pop.	66,3	65,8	66,6	65,7
of which: connected to wastewater treatment (urban, other) with Primary treatment only	% of tot. pop.	0,0	0,0	0,0	0,1
with Secondary treatment	% of tot. pop.	26,3	32,4	30,7	31,9
with Tertiary treatment	% of tot. pop.	39,8	32,6	35,4	33,4
of which: not connected to wastewater treatment	% of tot. pop.	0,2	0,7	0,4	0,3
Independent wastewater treatment	% of tot. pop.	33,7	34,2	33,4	34,3

Table 4.N. Population connected to wastewater treatment by NUTS2 regions (continued)

Denomination	Unit	2011	2010	2009	2008
5. Northern Hungary HU31					
Resident population	1000's	1 188,6	1 201,9	1 216,2	1 230,0
% of resident population connected to: urban wastewater collecting system	% of tot. pop.	65,1	64,7	65,2	63,8
of which: connected to wastewater treatment (urban, other) with Primary treatment only	% of tot. pop.	0,0	0,0	0,0	0,0
with Secondary treatment	% of tot. pop.	36,0	40,7	36,0	35,1
with Tertiary treatment	% of tot. pop.	29,1	24,0	29,2	28,7
of which: not connected to wastewater treatment	% of tot. pop.	0,0	0,0	0,0	0,0
Independent wastewater treatment	% of tot. pop.	34,9	35,3	34,8	36,2
6. Northern Great Plain HU32					
Resident population	1000's	1 477,5	1 487,2	1 497,5	1 508,2
% of resident population connected to: urban wastewater collecting system	% of tot. pop.	62,8	61,3	60,5	59,5
of which: connected to wastewater treatment (urban, other) with Primary treatment only	% of tot. pop.	0,3	0,3	0,4	0,4
with Secondary treatment	% of tot. pop.	12,3	13,9	14,9	13,8
with Tertiary treatment	% of tot. pop.	50,1	47,0	45,2	45,3
of which: not connected to wastewater treatment	% of tot. pop.	0,1	0,1	0,0	0,0
Independent wastewater treatment	% of tot. pop.	37,2	38,7	39,5	40,5
7. Southern Great Plain HU33					
Resident population	1000's	1 303,9	1 313,3	1 321,9	1 330,0
% of resident population connected to: urban wastewater collecting system	% of tot. pop.	54,7	54,6	54,4	52,7
of which: connected to wastewater treatment (urban, other) with Primary treatment only	% of tot. pop.	0,0	0,0	0,0	0,0
with Secondary treatment	% of tot. pop.	37,7	36,9	38,0	35,9
with Tertiary treatment	% of tot. pop.	16,6	16,6	15,4	14,5
of which: not connected to wastewater treatment	% of tot. pop.	0,3	1,2	1,0	2,3
Independent wastewater treatment	% of tot. pop.	45,3	45,4	45,6	47,3
Hungary Total HU					
Resident population	1000's	9 971,7	10 000,0	10 022,6	10 038,2
% of resident population connected to: urban wastewater collecting system	% of tot. pop.	72,8	72,3	72,0	71,0
of which: connected to wastewater treatment (urban, other) with Primary treatment only	% of tot. pop.	1,4	2,3	16,7	17,7
with Secondary treatment	% of tot. pop.	33,9	36,4	27,4	26,7
with Tertiary treatment	% of tot. pop.	37,2	33,1	24,7	23,3
of which: not connected to wastewater treatment	% of tot. pop.	0,4	0,6	3,3	3,3
Independent wastewater treatment	% of tot. pop.	27,2	27,7	28,0	29,0

3.5. Treatment capacity of wastewater treatment plant by RBDSUs and by NUTS2 regions (Table 5)

The main objective of the Urban Waste Water Treatment Directive is to protect the inland waters from the harmful affects of waste water discharges. According to this directive the MoRD compiles regularly reports on the actual situation of the collection, treatment and discharge of urban and other waste water and the treatment capacity of urban and other waste water treatment plants.

Fig. 14. Data request of Table 5

Denomination	Unit
Primary treatment Plants	number
design capacity BOD_5	1000 kg O_2/d
incoming load BOD_5	1000 kg O_2/d
effluent BOD_5	1000 kg O_2/d
Secondary treatment Plants	number
design capacity BOD_5	1000 kg O_2/d
incoming load BOD_5	1000 kg O_2/d
effluent BOD_5	1000 kg O_2/d
Tertiary treatment Plants	number
design capacity BOD_5	1000 kg O_2/d
incoming load BOD_5	1000 kg O_2/d
effluent BOD_5	1000 kg O_2/d

Unfortunately, we don't have access also to the Waste Water Treatment Database of MoRD directly, so we apply here the received aggregated data sets for determination of treatment capacity of wastewater treatment plant by RBDSUs and by NUTS2 regions for Table 5 of REQ-IW 2012, without any detailed information.

For the determination of other treatment of waste water we supposed that the MoRD applied the definition of the JQ-IW 2012:
'Treatment of wastewater in any non-public treatment plant, e.g. industrial wastewater treatment plants or treatment facilities of hotels, army camps etc. that do not fall under Independent Treatment. Excluded from "other wastewater treatment" is the treatment in septic tanks'.

Table 5.R. Treatment capacity of urban and other wastewater treatment plant by RBDSUs

Denomination	Unit	2010	2009	2008
1. Duna RBDSU HUAEP180				
Primary treatment plants	number	6,0	6,0	6,0
design capacity BOD_5	1000 kg O_2/d	0,8	0,8	0,8
incoming load BOD_5	1000 kg O_2/d	0,4	0,4	0,5
effluent BOD_5	1000 kg O_2/d	0,2	0,2	0,2
Secondary treatment plants	number	119,0	118,0	116,0
design capacity BOD_5	1000 kg O_2/d	71,4	69,4	68,9
incoming load BOD_5	1000 kg O_2/d	52,2	50,1	47,1
effluent BOD_5	1000 kg O_2/d	3,3	4,8	4,9
Tertiary treatment plants	number	178,0	179,0	174,0
design capacity BOD_5	1000 kg O_2/d	384,1	387,8	296,0
incoming load BOD_5	1000 kg O_2/d	294,8	235,0	253,1
effluent BOD_5	1000 kg O_2/d	7,7	8,9	7,2

Table 5.R. Treatment capacity of urban and other wastewater treatment plant by RBDSUs (continued)

Denomination	Unit	2010	2009	2008
2. Tisza RBDSU HUAEP182				
Primary treatment plants	number	7,0	7,0	5,0
design capacity BOD_5	1000 kg O_2/d	0,6	0,6	0,6
incoming load BOD_5	1000 kg O_2/d	0,4	0,6	0,6
effluent BOD_5	1000 kg O_2/d	0,5	0,5	0,6
Secondary treatment plants	number	128,0	131,0	132,0
design capacity BOD_5	1000 kg O_2/d	150,4	151,3	153,3
incoming load BOD_5	1000 kg O_2/d	77,6	100,3	89,4
effluent BOD_5	1000 kg O_2/d	5,2	4,8	5,1
Tertiary treatment plants	number	154,0	150,0	142,0
design capacity BOD_5	1000 kg O_2/d	138,8	140,7	121,6
incoming load BOD_5	1000 kg O_2/d	98,7	111,2	110,9
effluent BOD_5	1000 kg O_2/d	3,3	2,9	6,1
3. Dráva RBDSU HUAEP179				
Primary treatment plants	number	1,0	1,0	1,0
design capacity BOD_5	1000 kg O_2/d	0,0	0,0	0,0
incoming load BOD_5	1000 kg O_2/d	0,0	0,0	0,0
effluent BOD_5	1000 kg O_2/d	0,0	0,0	0,0
Secondary treatment plants	number	32,0	32,0	29,0
design capacity BOD_5	1000 kg O_2/d	15,5	15,5	13,2
incoming load BOD_5	1000 kg O_2/d	8,9	10,0	10,1
effluent BOD_5	1000 kg O_2/d	0,5	0,5	0,6
Tertiary treatment plants	number	6,0	6,0	9,0
design capacity BOD_5	1000 kg O_2/d	27,0	27,0	32,1
incoming load BOD_5	1000 kg O_2/d	15,1	13,0	18,4
effluent BOD_5	1000 kg O_2/d	0,3	0,2	1,1
4. Balaton RBDSU HUAEP178				
Primary treatment plants	number	0,0	0,0	0,0
design capacity BOD_5	1000 kg O_2/d	0,0	0,0	0,0
incoming load BOD_5	1000 kg O_2/d	0,0	0,0	0,0
effluent BOD_5	1000 kg O_2/d	0,0	0,0	0,0
Secondary treatment plants	number	2,0	2,0	2,0
design capacity BOD_5	1000 kg O_2/d	2,1	2,1	2,1
incoming load BOD_5	1000 kg O_2/d	0,9	0,7	0,4
effluent BOD_5	1000 kg O_2/d	0,0	0,0	0,0
Tertiary treatment plants	number	30,0	30,0	29,0
design capacity BOD_5	1000 kg O_2/d	25,6	25,6	25,5
incoming load BOD_5	1000 kg O_2/d	17,1	16,8	18,8
effluent BOD_5	1000 kg O_2/d	0,4	0,4	0,5
Hungary Total RBD HU1000				
Primary treatment plants	number	14,0	14,0	12,0
design capacity BOD_5	1000 kg O_2/d	1,4	1,4	1,4
incoming load BOD_5	1000 kg O_2/d	0,8	1,0	1,2
effluent BOD_5	1000 kg O_2/d	0,7	0,7	0,8
Secondary treatment plants	number	281,0	283,0	279,0
design capacity BOD_5	1000 kg O_2/d	239,4	238,3	237,6
incoming load BOD_5	1000 kg O_2/d	139,6	161,0	147,0
effluent BOD_5	1000 kg O_2/d	9,0	10,1	10,7
Tertiary treatment plants	number	368,0	365,0	354,0
design capacity BOD_5	1000 kg O_2/d	575,5	581,1	475,1
incoming load BOD_5	1000 kg O_2/d	425,7	376,0	401,1
effluent BOD_5	1000 kg O_2/d	11,7	12,5	14,9

Table 5.N. Treatment capacity of urban and other wastewater treatment plant by NUTS2 regions

Denomination	Unit	2010	2009	2008
1. Central Hungary HU10				
Primary treatment plants	number	1,0	1,0	1,0
design capacity BOD_5	1000 kg O_2/d	0,3	0,3	0,3
incoming load BOD_5	1000 kg O_2/d	0,2	0,2	0,2
effluent BOD_5	1000 kg O_2/d	0,1	0,1	0,1
Secondary treatment plants	number	27,0	24,0	24,0
design capacity BOD_5	1000 kg O_2/d	28,1	25,0	24,8
incoming load BOD_5	1000 kg O_2/d	22,2	21,0	19,2
effluent BOD_5	1000 kg O_2/d	2,6	4,2	4,5
Tertiary treatment plants	number	40,0	43,0	42,0
design capacity BOD_5	1000 kg O_2/d	201,3	210,2	111,6
incoming load BOD_5	1000 kg O_2/d	173,2	127,6	143,0
effluent BOD_5	1000 kg O_2/d	4,8	6,6[10]	4,5
2. Central Transdanubia HU21				
Primary treatment plants	number	3	3	2
design capacity BOD_5	1000 kg O_2/d	0,4	0,4	0,4
incoming load BOD_5	1000 kg O_2/d	0,2	0,3	0,3
effluent BOD_5	1000 kg O_2/d	0,1	0,1	0,1
Secondary treatment plants	number	26	27	27
design capacity BOD_5	1000 kg O_2/d	18,2	18,2	18,2
incoming load BOD_5	1000 kg O_2/d	11,6	11,0	10,5
effluent BOD_5	1000 kg O_2/d	0,5	0,4	0,4
Tertiary treatment plants	number	80	80	79
design capacity BOD_5	1000 kg O_2/d	81,8	81,2	81,0
incoming load BOD_5	1000 kg O_2/d	59,4	56,0	57,0
effluent BOD_5	1000 kg O_2/d	1,2	1,2	1,2
3. Western Transdanubia HU22				
Primary treatment plants	number	0	0	0
design capacity BOD_5	1000 kg O_2/d	0,0	0,0	0,0
incoming load BOD_5	1000 kg O_2/d	0,0	0,0	0,0
effluent BOD_5	1000 kg O_2/d	0,0	0,0	0,0
Secondary treatment plants	number	48	49	47
design capacity BOD_5	1000 kg O_2/d	21,7	22,9	22,3
incoming load BOD_5	1000 kg O_2/d	13,4	15,9	15,8
effluent BOD_5	1000 kg O_2/d	0,6	0,7	0,9
Tertiary treatment plants	number	53	51	49
design capacity BOD_5	1000 kg O_2/d	79,8	78,5	78,8
incoming load BOD_5	1000 kg O_2/d	51,2	45,4	49,9
effluent BOD_5	1000 kg O_2/d	1,2	1,1	1,8
4. Southern Transdanubia HU23				
Primary treatment plants	number	1	1	1
design capacity BOD_5	1000 kg O_2/d	0,0	0,0	0,0
incoming load BOD_5	1000 kg O_2/d	0,0	0,0	0,0
effluent BOD_5	1000 kg O_2/d	0,0	0,0	0,0
Secondary treatment plants	number	37	37	34
design capacity BOD_5	1000 kg O_2/d	23,7	23,6	21,5
incoming load BOD_5	1000 kg O_2/d	14,6	12,0	10,8
effluent BOD_5	1000 kg O_2/d	0,9	1,0	0,7
Tertiary treatment plants	number	24	24	27
design capacity BOD_5	1000 kg O_2/d	59,9	59,7	70,9
incoming load BOD_5	1000 kg O_2/d	36,2	33,2	37,1
effluent BOD_5	1000 kg O_2/d	0,9	0,6	1,5

[10] The cause of the significant growing: Budapest Central Wastewater Treatment Plant began trial operation in 2009.

Table 5.N. Treatment capacity of urban and other wastewater treatment plant by NUTS2 regions (continued)

Denomination	Unit	2010	2009	2008
5. Northern Hungary HU31				
Primary treatment plants	number	4	4	3
design capacity BOD_5	1000 kg O_2/d	0,2	0,2	0,1
incoming load BOD_5	1000 kg O_2/d	0,1	0,1	0,1
effluent BOD_5	1000 kg O_2/d	0,0	0,0	0,0
Secondary treatment plants	number	55	56	58
design capacity BOD_5	1000 kg O_2/d	39,7	39,7	41,1
incoming load BOD_5	1000 kg O_2/d	23,9	24,7	26,4
effluent BOD_5	1000 kg O_2/d	1,3	1,0	1,1
Tertiary treatment plants	number	78	77	70
design capacity BOD_5	1000 kg O_2/d	39,0	39,1	36,4
incoming load BOD_5	1000 kg O_2/d	19,3	21,0	20,5
effluent BOD_5	1000 kg O_2/d	1,0	0,8	3,4
6. Northern Great Plain HU32				
Primary treatment plants	number	4	4	4
design capacity BOD_5	1000 kg O_2/d	0,5	0,5	0,5
incoming load BOD_5	1000 kg O_2/d	0,3	0,4	0,6
effluent BOD_5	1000 kg O_2/d	0,4	0,4	0,6
Secondary treatment plants	number	53	55	54
design capacity BOD_5	1000 kg O_2/d	22,1	23,0	23,3
incoming load BOD_5	1000 kg O_2/d	11,9	10,2	11,7
effluent BOD_5	1000 kg O_2/d	0,8	0,7	0,9
Tertiary treatment plants	number	49	47	45
design capacity BOD_5	1000 kg O_2/d	74,1	73,0	57,7
incoming load BOD_5	1000 kg O_2/d	62,6	69,8	68,5
effluent BOD_5	1000 kg O_2/d	1,7	1,3	1,5
7. Southern Great Plain HU33				
Primary treatment plants	number	1	1	1
design capacity BOD_5	1000 kg O_2/d	0,0	0,0	0,0
incoming load BOD_5	1000 kg O_2/d	0,0	0,0	0,0
effluent BOD_5	1000 kg O_2/d	0,0	0,0	0,0
Secondary treatment plants	number	35	35	35
design capacity BOD_5	1000 kg O_2/d	85,9	85,8	86,4
incoming load BOD_5	1000 kg O_2/d	41,9	66,3	52,5
effluent BOD_5	1000 kg O_2/d	2,3	2,2	2,2
Tertiary treatment plants	number	44	43	42
design capacity BOD_5	1000 kg O_2/d	39,5	39,3	38,6
incoming load BOD_5	1000 kg O_2/d	23,7	22,9	25,1
effluent BOD_5	1000 kg O_2/d	0,9	0,9	0,9
Hungary Total HU				
Primary treatment plants	number	14	14	12
design capacity BOD_5	1000 kg O_2/d	1,4	1,4	1,4
incoming load BOD_5	1000 kg O_2/d	0,8	1,0	1,2
effluent BOD_5	1000 kg O_2/d	0,7	0,6	0,8
Secondary treatment plants	number	281	283	279
design capacity BOD_5	1000 kg O_2/d	239,4	238,3	237,6
incoming load BOD_5	1000 kg O_2/d	139,6	161,0	147,0
effluent BOD_5	1000 kg O_2/d	9,0	10,1	10,7
Tertiary treatment plants	number	368	365	354
design capacity BOD_5	1000 kg O_2/d	575,5	581,0	475,1
incoming load BOD_5	1000 kg O_2/d	425,7	376,0	401,1
effluent BOD_5	1000 kg O_2/d	11,7	12,5	14,9

3.6. Generation and discharge of wastewater by RBDSUs and by NUTS2 regions (Table 6)

We have information only on volume of treated public waste water treatment from the data collection of HCSO (1062) at settlement level, so we can provide data of treated volume at NUTS2 or NUTS3.

Table 6.N. Public waste water treatment by NUTS2 and NUTS3 regions, 2011, (1000m³)

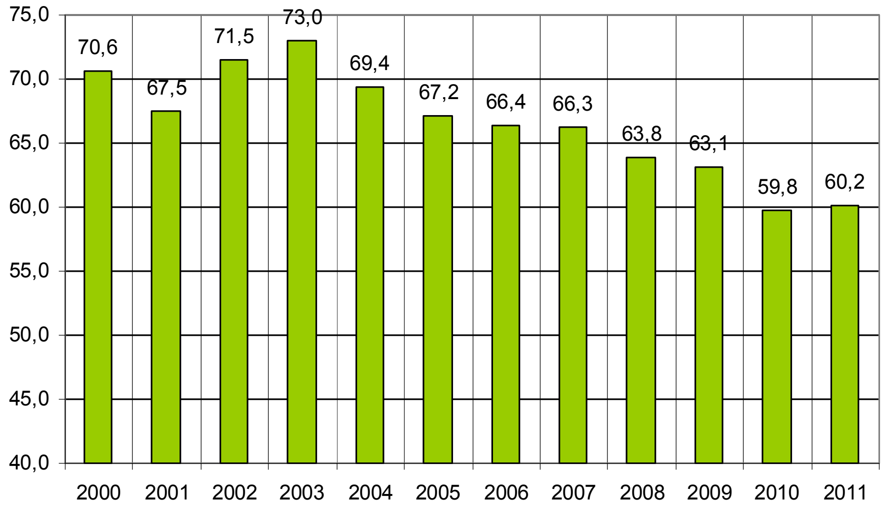
County, capital, region	Waste water piped after purification	Waste water transported directly to the treatment plant	Altogether	Of which: only mechanically treated	Of which: also biologically treated	Of which: treated also with advanced treatment technology	Waste water piped without treatment
Budapest	151 428	143	151 571	7 304	82 344	61 924	1 931
Pest	41 530	191	41 721	953	18 506	22 261	64
Central Hungary	**192 958**	**334**	**193 292**	**8 257**	**100 850**	**84 185**	**1 995**
Fejér	19 924	65	19 989	–	14 218	5 771	–
Komárom-Esztergom	13 498	56	13 555	299	5 030	8 226	420
Veszprém	13 931	13	13 944	–	1 559	12 385	–
Central Transdanubia	**47 353**	**134**	**47 487**	**299**	**20 807**	**26 382**	**420**
Győr-Moson-Sopron	23 354	25	23 379		14 212	9 167	43
Vas	12 585	12	12 597	1	1 479	10 535	–
Zala	13 628	12	13 640		343	13 297	–
Western Transdanubia	**49 567**	**49**	**49 616**	**1**	**16 033**	**32 999**	**43**
Baranya	13 985	62	14 047	15	3 482	10 551	97
Somogy	10 659	20	10 679	–	4 900	5 780	–
Tolna	6 026	83	6 109		3 893	2 216	–
Southern Transdanubia	**30 670**	**165**	**30 835**	**15**	**12 274**	**18 546**	**97**
Borsod-Abaúj-Zemplén	24 565	96	24 661	17	20 394	4 250	–
Heves	10 422	22	10 443		912	9 532	
Nógrád	5 089	10	5 099	–	917	4 182	–
Northern Hungary	**40 075**	**127**	**40 202**	**17**	**22 223**	**17 963**	**–**
Hajdú-Bihar	24 305	280	24 584	25	3 563	20 996	–
Jász-Nagykun-Szolnok	15 514	88	15 602	–	3 679	11 923	56
Szabolcs-Szatmár-Bereg	17 627	270	17 897	287	4 140	13 470	–
Northern Great Plain	**57 445**	**638**	**58 083**	**312**	**11 382**	**46 389**	**56**
Bács-Kiskun	17 544	160	17 704	12	11 547	6 144	25
Békés	14 947	134	15 081	–	5 997	9 085	–
Csongrád	21 711	52	21 763	20	20 316	1 427	251
Southern Great Plain	**54 202**	**346**	**54 548**	**32**	**37 860**	**16 656**	**276**
Total	**472 271**	**1 793**	**474 064**	**8 932**	**221 429**	**243 119**	**2 887**

4 Compilation of regional water related indicators by RBDSUs and by NUTS2 regions[11]

4.1. Water abstraction by public water supply

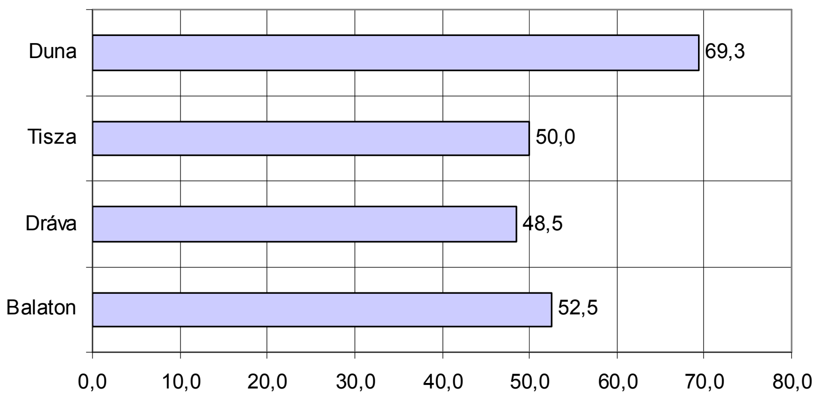
This indicator shows the annual gross water abstraction by public water supply from fresh surface and ground water resources for different economic and human uses: public water supply, industry, agriculture, energy, urban amenities, tourism, etc.
In Hungary, from 2000 to 2011, the volume of water abstraction per capita by public water supply constantly decreased (15%) due to the very high water prices, and also due to the very high prices of waste water collection and treatment.

Fig. 15. Water abstraction by public water supply, (m^3/capita/year)



The main reasons for the different values of water abstraction per capita by regions of public water supply could be the following: different water abstraction technologies, the different public water facilities of dwellings, different climatic circumstances and the different types of ownership of public water facilities (state/private), significant role of the water supply from own wells etc.

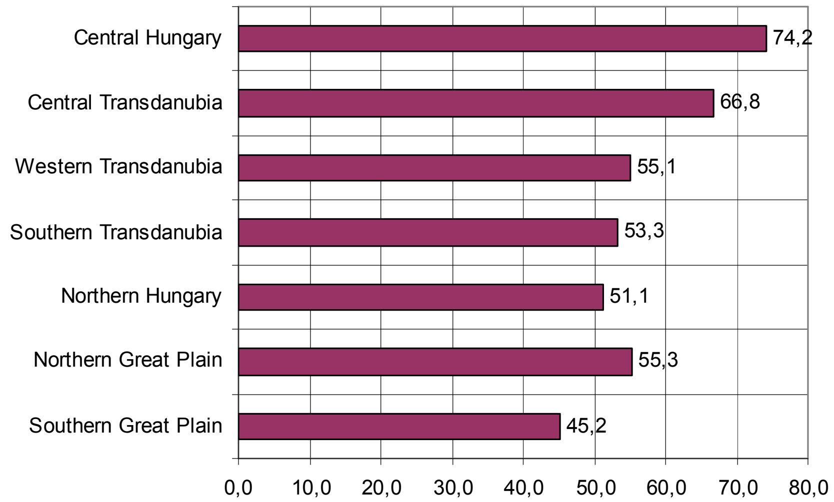
Fig. 16. Water abstraction by public water supply, by RBDSUs, 2011 (m^3/capita)



[11] Source of data: HCSO

Regional data on water abstraction of public water supply at RBDSU level suggests that the greatest value per capita was observed in Duna RBDSU. The lowest value was measured in Dráva RBDSU (70% of Duna RBDSU).

Fig. 17. Water abstraction by public water supply, by NUTS2 regions, 2011 (m^3/capita)

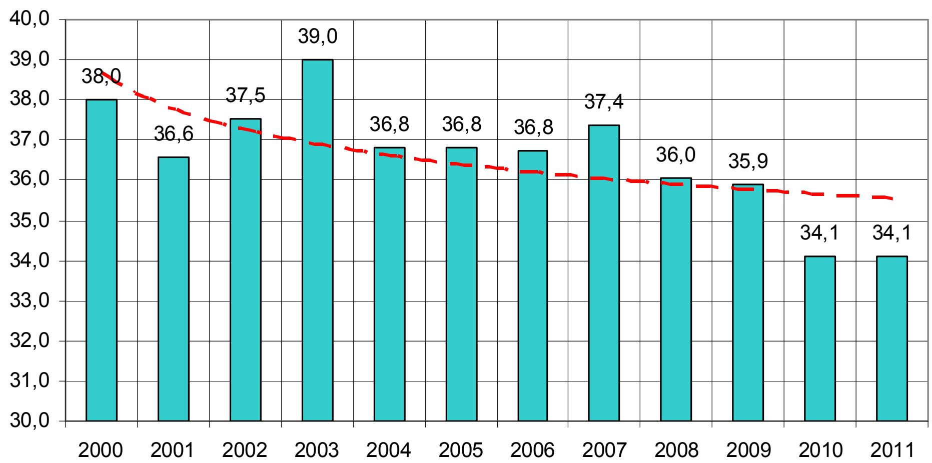


Regional data on water abstraction of public water supply at NUTS2 level suggests that the greatest value per capita was observed in Central Hungary. The lowest value was measured in Southern Great Plain (61% of Central Hungary). The main reasons for the different values are: the different water abstraction technologies, the different population densities, the different facilities of dwellings and except Budapest and big cities the free water abstractions from own bored wells is very significant also.

4.2. Water use of population from public water supply

This indicator shows the annual water use of households. The water use of households contains the volume of drinking water supplied by public water utilities to the households and to the public taps.

Fig. 18. Water use of population from public water supply, (m^3/capita/year)



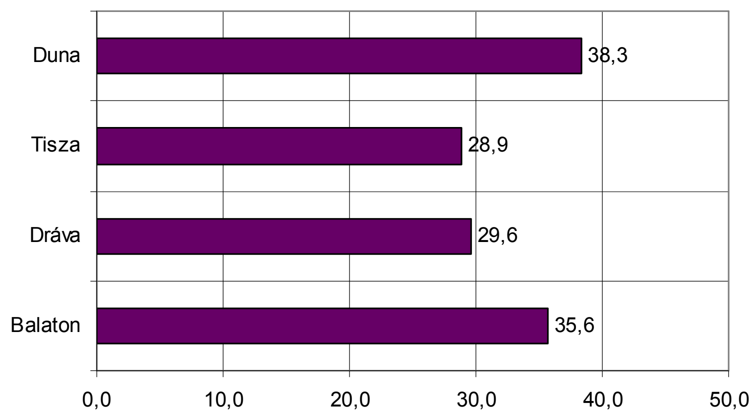
An environmentally conscious society economizes on water usage to preserve own water resources for the healthy and sustainable development of the society.

According to the National Sustainable Development Strategy of Hungary, the goal is to create a quantitative balance in the artificial water circulation and to spread the techniques of an economical and pollution-free water use.

In Hungary between 2000 and 2011 the volume of yearly water use per capita from public water supply constantly decreased (>10%), principally due to very high public water and waste water treatment prices, and due to the spread of self supply from own bored wells.
The volume of yearly water use per capita from public water supply is in close correlation with the climatic conditions also. See the annual extreme values of water uses and the extreme drought in 2000, 2003 and 2007

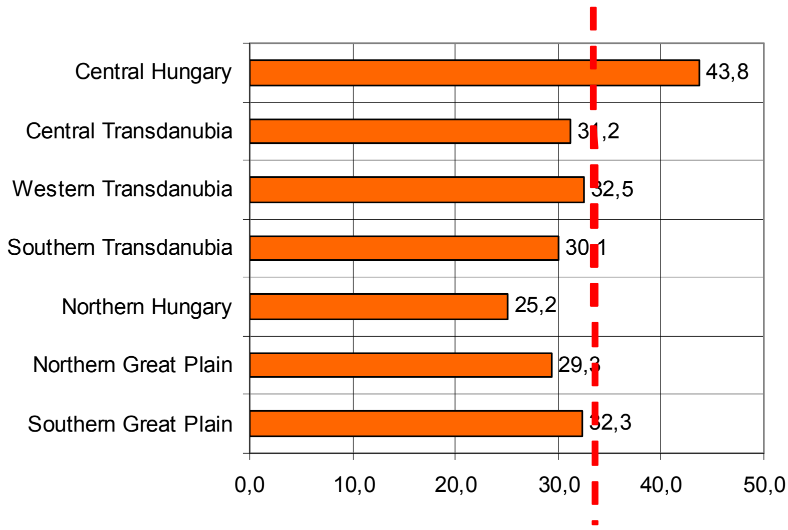
This indicator makes it possible to assess the annual average drinking water use of households by regions. To compare different regions (RBDSUs and NUTS2) the data of annual water use are correlated to the mid-year population.

Fig. 19. Water use of population from public water supply, by RBDSUs, 2011 (m^3/capita)



It can be stated that the annual drinking water use per capita is the highest in Duna RBDSU (38,3m^3) and it is the lowest in Tisza (28,9m^3), and, in general the regional water uses per capita are lower than the national average (34,1m^3), excluding Duna RBDSU due to the effect of Budapest and Balaton RBDSU, due to the impact of tourism in 2011.

Fig. 20. Water use of population from public water supply, by NUTS2 regions, 2011 (m^3/capita)



The main reasons for the different values of yearly water use per capita from public water supply by regions could be the following: different water abstraction technologies, the different public water facilities of dwellings, different climatic circumstances, the different types of ownership of public water facilities (state/private), high water prices, significant role of water supply from own bored wells etc.

Due to different water prices and infrastructural conditions there are significant regional differences in the drinking water use per capita.
It can be stated that the annual drinking water use per capita is the highest in Central Hungary (43,8m^3) and it is the lowest in Northern Hungary (25,2m^3), and, in general the regional water uses per capita are lower than the national average (34,1m^3), excluding Central Hungary (incl. Budapest) in 2011.

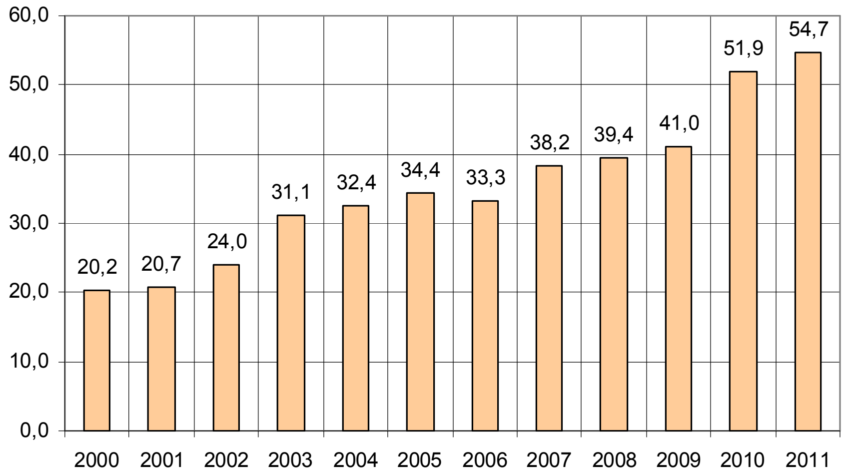
4.3. Municipal waste water treatment index

The municipal waste water treatment index allows for the measurement of the development of urban waste water treatment, based on the effectiveness of treatment.
We applied for the description of the effectiveness of waste water treatment plants the coefficients developed by Eurostat *in inverse form*: 0.00 for non-treated waste water[12], 0.14 for primary (mechanical) treatment only, 0.51 for additional secondary (biological) treatment, and 1.00 for additional tertiary (advanced) treatment. The *new* index of municipal waste water treatment is 0% if there is no treatment and 100% if all municipal waste water is treated by tertiary treatment.
The main reason of these changes is the better interpretation of development of urban waste water treatment (with positive trends).

For the description of the effectiveness of waste water treatment plants the *original* coefficients developed by Eurostat[13] were the following: 1.00 for non-treated waste water, 0.86 for primary (mechanical) treatment only, 0.49 for additional secondary (biological) treatment, and 0.00 for additional tertiary (advanced) treatment. The original index of municipal waste water treatment is 100% if there is no treatment and 0% if all municipal waste water is treated by tertiary treatment.

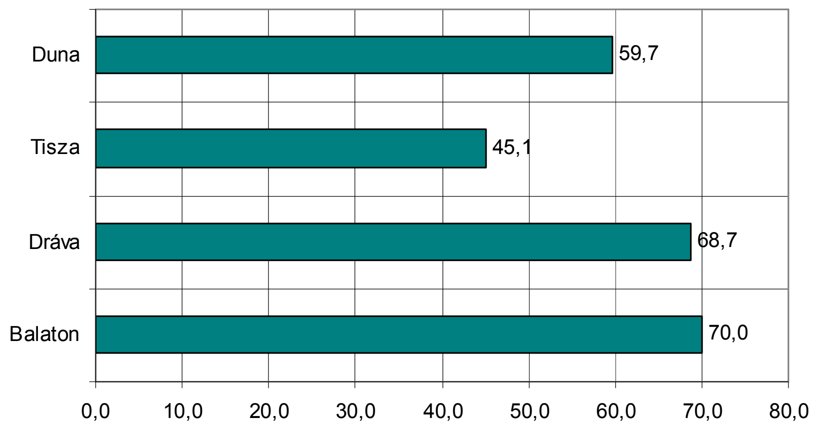
In Hungary the value of the index of the municipal waste water treatment increased by 34,5 percentage points from 2000 to 2011 due to huge investments into waste water collection systems and municipal waste water treatment plants.

Fig. 21. Municipal waste water treatment index (%)



[12] Including independent treatment due to lack of information.
[13] Towards environmental pressure indicators for EU, Eurostat, 1999

Fig. 22. Municipal waste water treatment index by RBDSUs, 2011 (%)

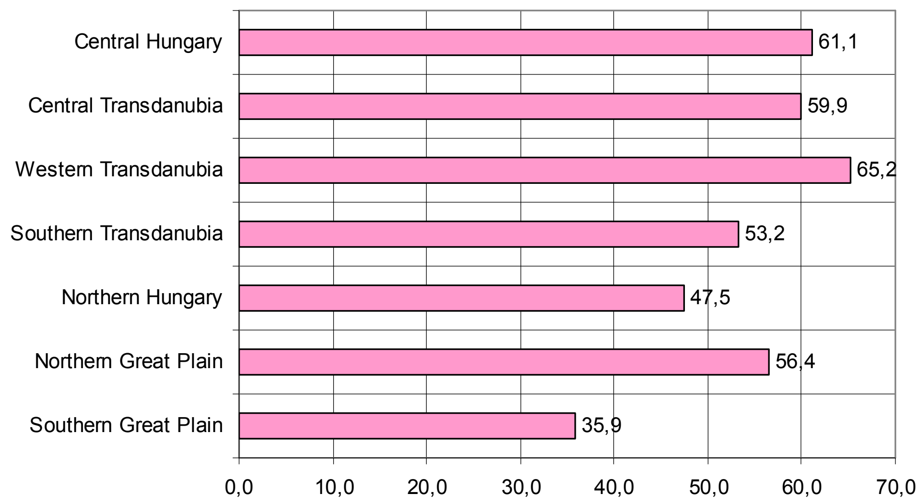


According to the analyses of index of municipal waste water treatment in 2011 by NUTS2 regions it can be stated that the highest indices are measured for Western Transdanubia (65.2%), Central Transdanubia (59.9) and in Central Hungary (61.1%) due to huge investments into waste water collection and treatment in Budapest.

The values of this index are the lowest in Northern Hungary (47.5%) and Southern Great Plain (35.9%).

The main reasons of regional differences are: the estimated proportion of population connected to municipal waste water treatment plants with at least biological (secondary) treatment technologies is significant in Western Transdanubia, in Central Transdanubia and in Central Hungary (77,6%, 76,4% and 82,7%), and the volume of waste water treated by advanced (tertiary) treatment technologies is relatively low in Southern Great Plain.

Fig. 23. Municipal waste water treatment index by NUTS2 regions, 2011 (%)



5 Applied integrated database structure

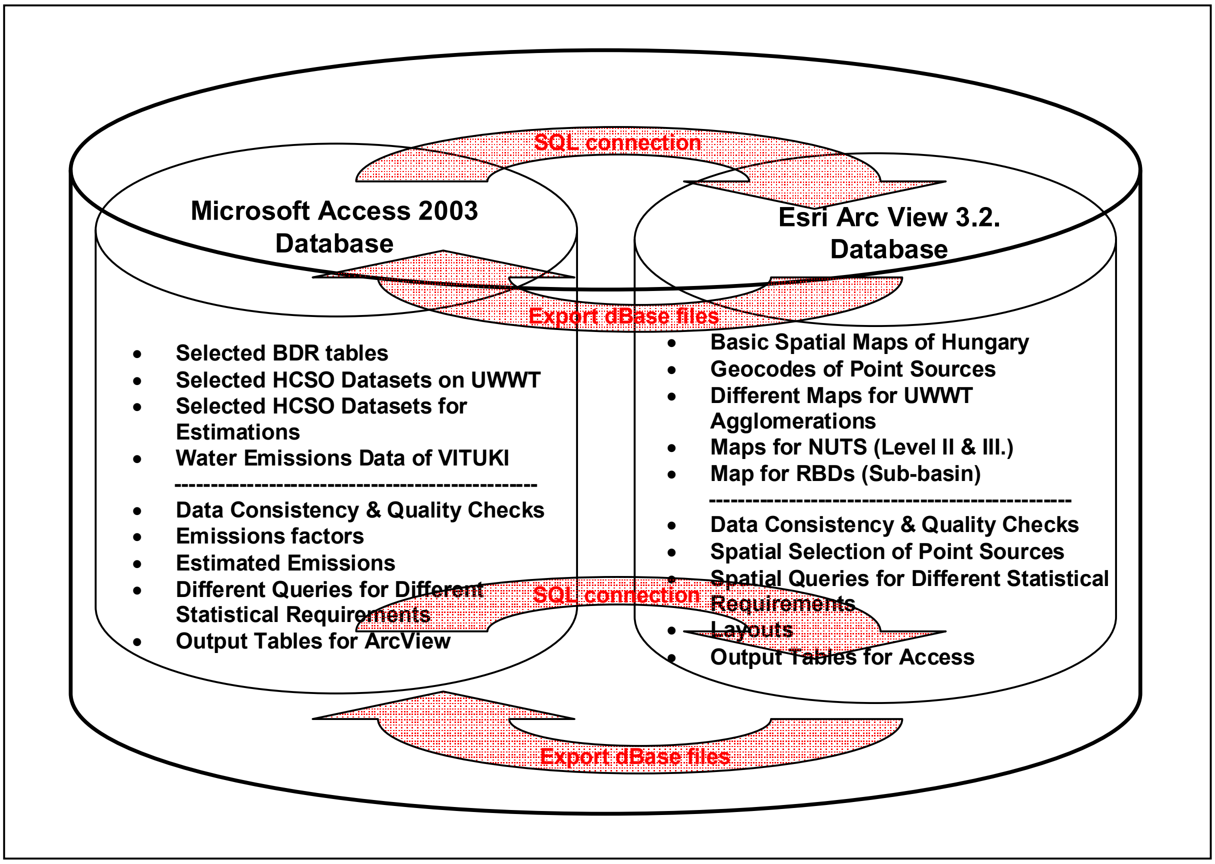
In order to avoid mystery and usual niggling attitude of IT or/and the continual subordination to IT (e.g. Oracle, ArcGIS), the working database is an integrated database based on Microsoft Access 2003 and ArcView 3.2.

Thanks to the selected user-friendly integrated database the system could work on a better notebook too, without any server.

With the integration of Microsoft Access 2003 and ArcView 3.2, we can use Access to store and manage the basic statistical and environmental self-checking data, and use ArcView to display and analyze the subset of data according to various interests.

Therefore we can take the advantage of the data management features of the Access, and the spatial data display and analysis features of ArcView.

Fig. 24. The statistical content and the structure of applied database

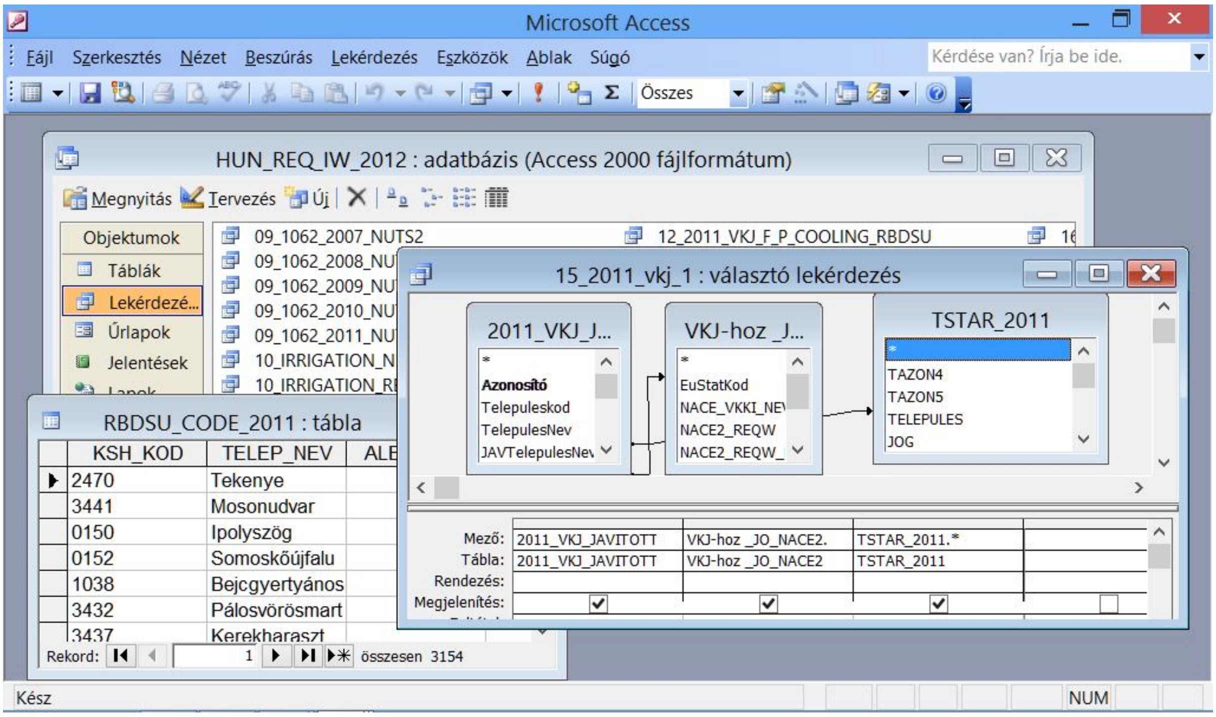


5.1 The Microsoft Access 2003 part of the database

In this project, we decided to use Microsoft Access 2003 as relational database base management system (RDBMS) for statistical data for the following reasons:

- It is readily available as part of the Microsoft Office 2003, which is provided on most desktop PCs or notebooks/netbooks.
- Most people can quickly learn how to use it, with uses of the online help or the menus. It is very easy to use with many built in wizards. No specific training is required.
- It is much cheaper than many other databases such as Oracle.
- It can be easily connected to other software such as MS Word or Excel. It can directly generate reports as Word documents.
- It provides macros to automate database operations.

Fig. 25. MS Access database behind the grant project



5.2 The ESRI ArcView 3.2 part of the database

The ESRI ArcView part of the database contains and visualizes the spatial information of grant project.
E.g. selecting features of ArcView on a view enables to find specific geographic features according to the various interests.

In the view window features highlight (yellow) when they are selected and remain highlighted until a different selection is made, or until they are deselected.

By the link between Access and ArcView, we could use Access to store and manage the statistical and environmental data, and we could use ArcView to display and analyze the subset data of interest by different queries.

6 Integration of available data into dissemination database of HCSO

In parallel with this grant project and due to the data availability we have integrated firstly the data sets of HCSO on public water supply and waste water treatment statistical data of HCSO at regional (NUTS2) and RBDSUs level into the OLAP-based dissemination database of HCSO.

This bilingual dissemination database allows the detailed analysis of the public water supply and public (urban) waste water treatment statistical data from settlements to the country level.

This dissemination database is available free on internet (www.ksh.hu).

In the following we will present some screenshots, to show the capabilities of this dissemination database, especially taking in account to the different regional distributions.

Fig. 26. Content of dissemination database of HCSO on public water supply (PWS) by RBDSUs and by NUTS2

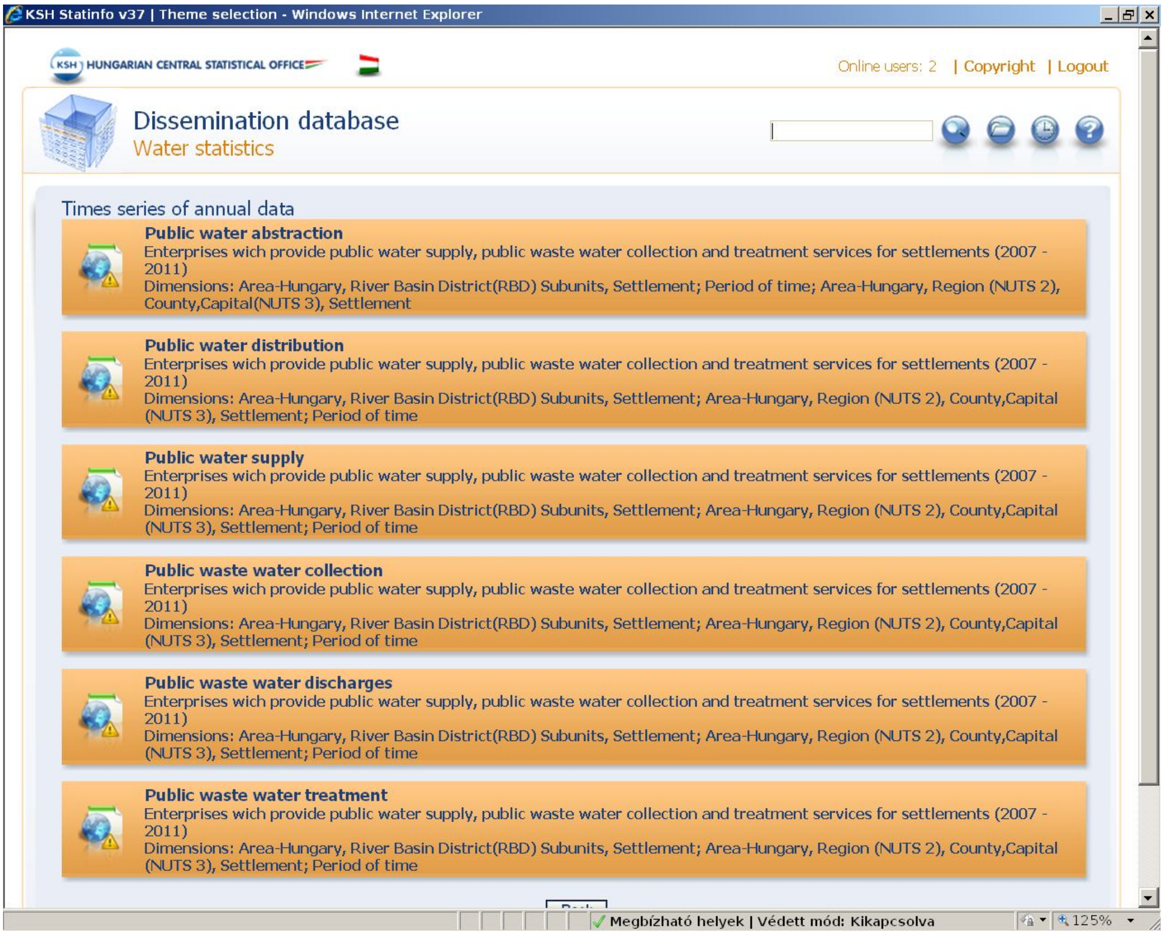
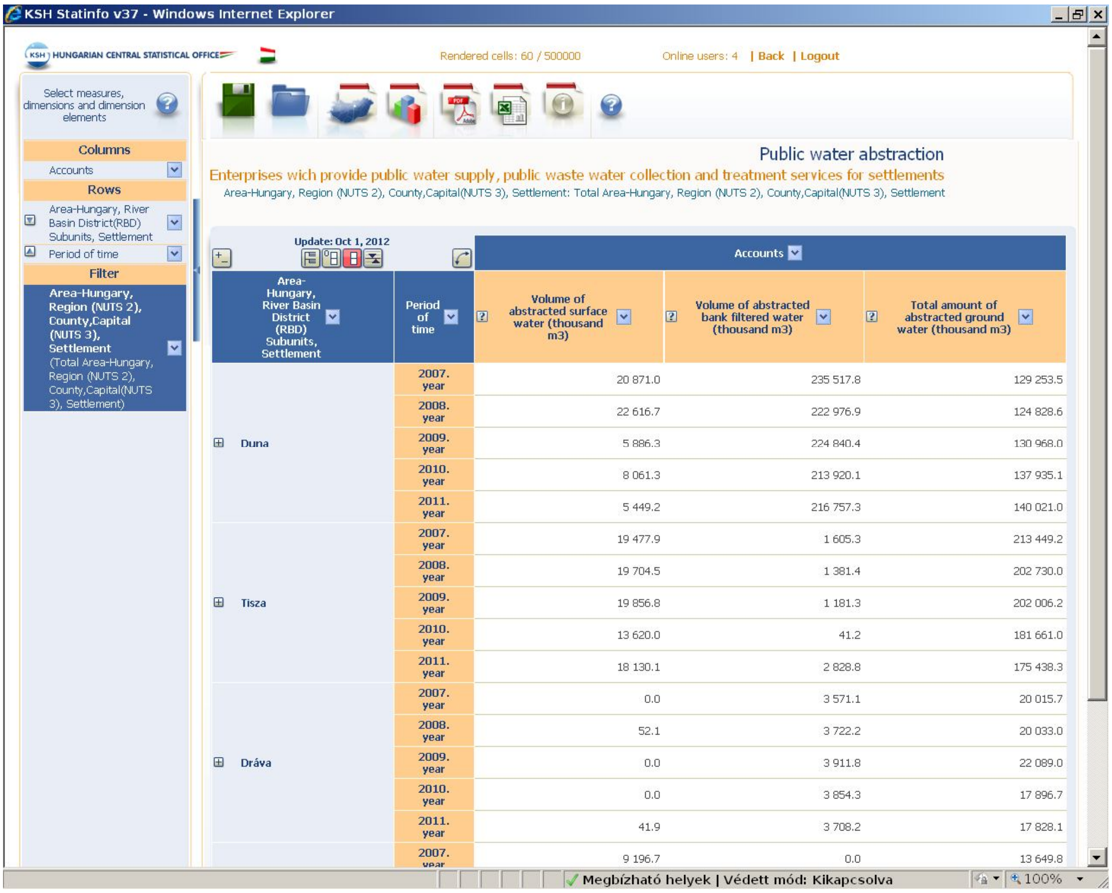
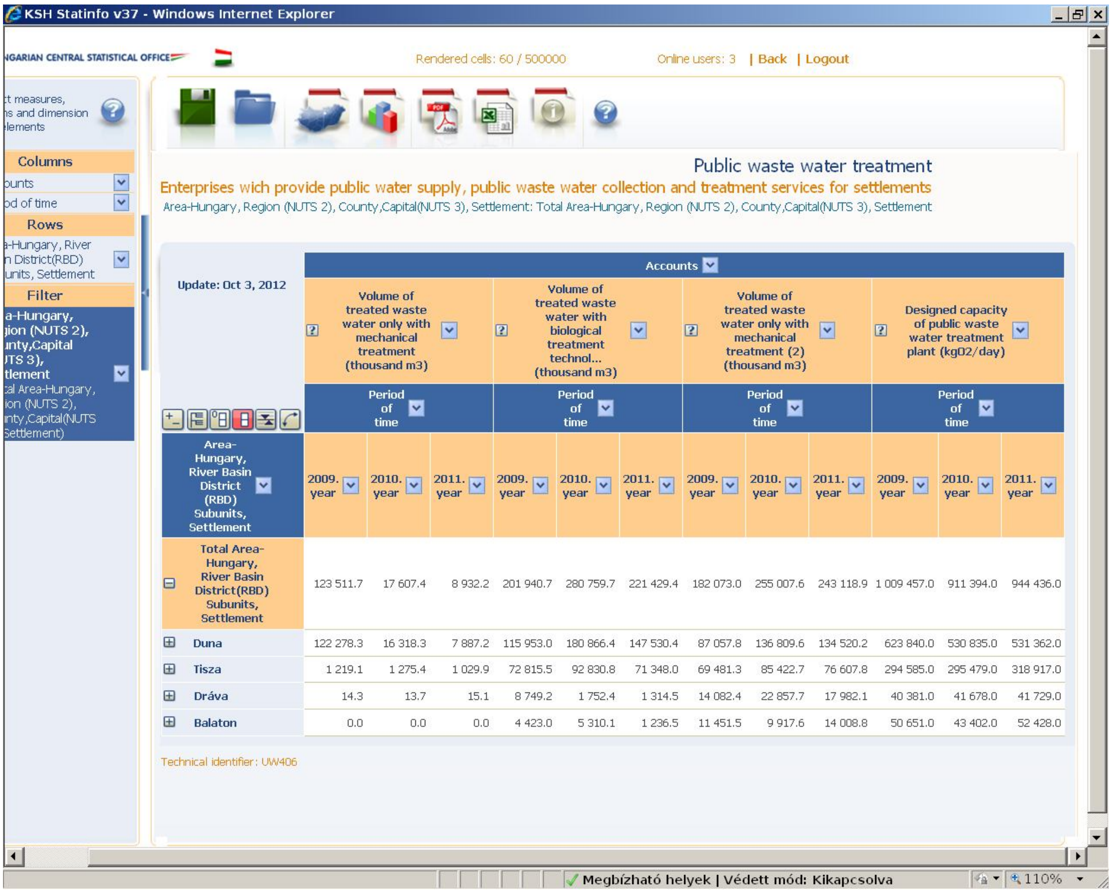


Fig. 27. Dissemination database of HCSO on PWS, query by RBDSUs



Area-Hungary, River Basin District (RBD) Subunits, Settlement	Period of time	Volume of abstracted surface water (thousand m3)	Volume of abstracted bank filtered water (thousand m3)	Total amount of abstracted ground water (thousand m3)
Duna	2007. year	20 871.0	235 517.8	129 253.5
	2008. year	22 616.7	222 976.9	124 828.6
	2009. year	5 886.3	224 840.4	130 968.0
	2010. year	8 061.3	213 920.1	137 935.1
	2011. year	5 449.2	216 757.3	140 021.0
Tisza	2007. year	19 477.9	1 605.3	213 449.2
	2008. year	19 704.5	1 381.4	202 730.0
	2009. year	19 856.8	1 181.3	202 006.2
	2010. year	13 620.0	41.2	181 661.0
	2011. year	18 130.1	2 828.8	175 438.3
Dráva	2007. year	0.0	3 571.1	20 015.7
	2008. year	52.1	3 722.2	20 033.0
	2009. year	0.0	3 911.8	22 089.0
	2010. year	0.0	3 854.3	17 896.7
	2011. year	41.9	3 708.2	17 828.1
	2007. year	9 196.7	0.0	13 649.8

Fig. 28. Dissemination database of HCSO on PWS, query by RBDSUs (2)



Area-Hungary, River Basin District (RBD) Subunits, Settlement	Volume of treated waste water only with mechanical treatment (thousand m3)			Volume of treated waste water with biological treatment technol... (thousand m3)			Volume of treated waste water only with mechanical treatment (2) (thousand m3)			Designed capacity of public waste water treatment plant (kg02/day)		
	2009. year	2010. year	2011. year	2009. year	2010. year	2011. year	2009. year	2010. year	2011. year	2009. year	2010. year	2011. year
Total Area-Hungary, River Basin District(RBD) Subunits, Settlement	123 511.7	17 607.4	8 932.2	201 940.7	280 759.7	221 429.4	182 073.0	255 007.6	243 118.9	1 009 457.0	911 394.0	944 436.0
Duna	122 278.3	16 318.3	7 887.2	115 953.0	180 866.4	147 530.4	87 057.8	136 809.6	134 520.2	623 840.0	530 835.0	531 362.0
Tisza	1 219.1	1 275.4	1 029.9	72 815.5	92 830.8	71 348.0	69 481.3	85 422.7	76 607.8	294 585.0	295 479.0	318 917.0
Dráva	14.3	13.7	15.1	8 749.2	1 752.4	1 314.5	14 082.4	22 857.7	17 982.1	40 381.0	41 678.0	41 729.0
Balaton	0.0	0.0	0.0	4 423.0	5 310.1	1 236.5	11 451.5	9 917.6	14 008.8	50 651.0	43 402.0	52 428.0

Fig. 29. Dissemination database of HCSO on public waste water treatment by NUTS2

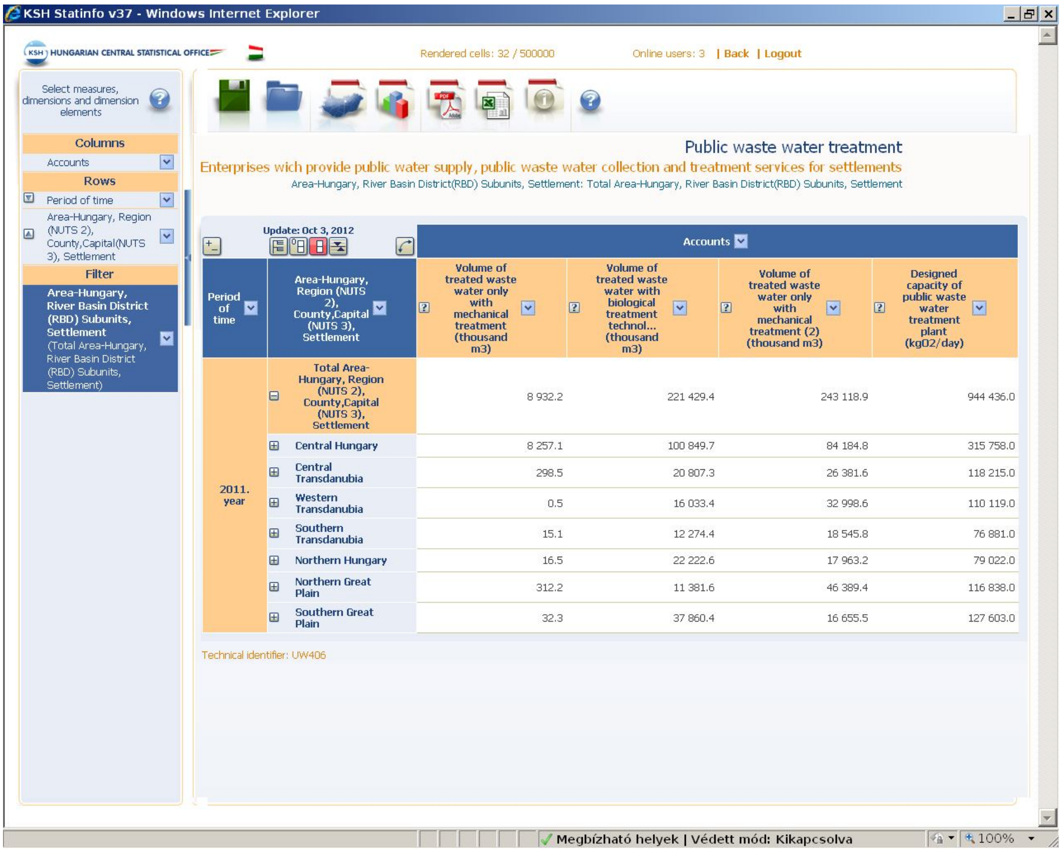


Fig. 30. Dissemination database of HCSO on public waste water treatment by RBDSUs with integrated metainformation

7 Conclusions and further steps

In summary, we could lie down, that this grant project on regional water statistics in Hungary with GIS applications were a very useful and practical training to enhance the data consistency and to provide regional water statistical data and indicators according to the statistical data requirements.

By linking water and substance flows to economic flows and doing this systematically for a number of years, insight could be gained into the relationship between our physical water systems and the economy at regional level too.

To sum up the main results, we achieved the following:

- Collaboration with relevant institutions.
- Revision of the current practice, of the available data sources and methods used in the production of regional water statistics data.
- Improvement of availability of regional water statistical data according to the statistical data requirements of Eurostat.

But the examination of regional water statistical data revealed lots of additional problems and future tasks also. In order to solve these tasks we have to make further efforts, and researches. For the completion of sustainable, complex data-sets on regional water statistical data, which are appropriate for statistical use the following activities are needed:

- further work out and improve the methodology for statistical estimations;
- additional completion and documentation of the existing estimation methods;
- examinations of the connections of the water statistical data and the other data sets of HCSO (e.g. data of agricultural and business statistics etc.)
- examinations and elaboration of the connections of HCSO to other relevant institutions, *in order to direct access of water related databases*;
- elaboration and use of the applied country specific nomenclatures and classifications;
- further developments and functional testing of applied IT application, (queries, macros & scripts, GIS);
- further checking and validating the estimated data on regional water statistical data.

Additional data collection on water would be needed in most of the branches of industry, in order to increase the coverage of the data. (E.g. developments of water use statistics and estimation of water emissions, embedded water in products, inflow-outflow waters from/into RoW, etc.)

After these further innovations we will able to provide more relevant and more up-to-date statistical data and indicators from regional water statistical data for the REQ-Water of Eurostat.

8 References & sources

1) Eurostat, September 2008, Data Collection Manual for the OECD/Eurostat Joint Questionnaire on Inland Waters Tables 1–7 Concepts, definitions, current practices, evaluations and recommendations Version 2.21

2) Eurostat, 2012, Inland Water parts of the Eurostat Regional Questionnaire on Environment, 2012

3) OECD/Eurostat Joint Questionnaire on Inland Waters Tables 1–7: Hungary 2012

4) UNSD, 2009 International Recommendations for Water Statistics