London Group on Environmental Accounting
9th Meeting
Copenhagen, Denmark, 22-24 September 2004

Water accounts in the Republic of Moldova: pilot study, results and advantages" (Water Data Centre project/ Ministry of Ecology and Natural Resources of the Republic of Moldova).

Report prepared Dr. Jana Tafi with technical assistance of the "Water Data Centre" team

1. Moldova is a country with a rather high density of population, mainly orientated towards agricultural production: more than 126 persons live on 1 km2 and more than one third of GDP is produced by the agrarian sector of the economy. One of the actual problems lies in water security, which has turned into a national problem due to a deficit of water resources, accentuated by internal and external factors leading to pollution of water resources in the context of an abrupt climatic change having a negative influence on water reserves. The solution depends largely on providing society with reliable information on water resources and the level of its scarcity. At the end of the 90s , the necessity to check the availability and relevance of statistics for water resources as well as its correspondence to international and European standards, lead to implement the first pilot-study of the physical water accounts for 1994-1998.
2. On July 1998, an environment statistics project, steered by Eurostat, Ifen, (the French Environment Institute) being the principal operator has taken place in Moldova, the main action being a pilot study on water accounts. During the study, it was clear that one of the limiting factors to the physical accounts of water was the **absence of an informatics' database on water in Moldova.** The first physical water accounts were therefore continued within framework of the new project "Water Data Centre in Moldova", which started in October 2001 with technical support by the French Government. The aim of the project consisted of the **creation of a national Water Data Centre** making it possible to manage the whole data relating to water issues and implementing **physical water accounts** in Moldova. In January-June 2000 was organized the collection and according to this the filling of the first experimental tables 8.3/ 8.5 Water Supply and Use & 8.4 Matrix of flows within the economy for 1994 and 1998. For simplification, tables 8.3/8.5 of SEEA (Chapter 8) h way of work and of presentation results on these tables has decided to combine and been combined to create a single Table on Water Supply and Use, which is currently in use for assessment activities. Below are given examples of the Combined Supply and Use Tables, which describe water flows between the economy and environment and within the economy for 1994, 1998, 2000 and 2002.

Table 8.3/8.5 Water Supply & Use Table, Moldova, 1998

Million cubic metres

		Agriculture	Fisheries	Energy	Mining	Manufacturing & Construction	Distribution/ irrigation water	Distribution/ municipal water	Sewerage	Government	Household	Rest of the World	Total
from the enironment	**U1 Total abstraction**	**69,1**	**36**	**724**	**5**	**30**	**70**	**288**	**0**	**19,8**	**25**	**0**	**1268,3**
	from surface water	43	36	722	0	15	70	186	0	0	0	0	1072,1
	of which reservoirs/dams												*0*
	of which lakes												*0*
	of which rivers												*0*
	of which springs												*0*
	from groundwater (wells, …)	26,5	0	2,1	5	15	0	102		20	25		196
	from other water (sea)												0
	for own use												
	for delivery												
within the economy	**U2 Total water received**	**51,4**	**0**	**17,2**	**0**	**10**	**0,1**	**7,3**	**213**	**7**	**199**	**0**	**505,7**
	Water received by users	51	0	17	0	10	0	7		7	199	0	293
	of which recycled water				*0*	*7*							*7*
	Waste water for sewerage								213				213
Total use		***120,5***	***36***	***741***	***5***	***41***	***70***	***296***	***213***	***27***	***225***	***0***	***1774***
within the economy	**S2 Total water supplied**	**0,2**	**0**	**8**	**0**	**28**	**51**	**226**	**0**	**33,3**	**159**	**0**	**505,7**
	Water supplied to users	0,2	0	8	0	7	51	226	0	1	0	0	293
	of which recycled water			*8*		*7*							
	Waste water supplied to sewerage					22			0	32	159		213
to the environment	**S3 Total residuals & returns**	**120**	**36**	**708,8**	**5**	**12**	**20**	**70**	**213**	**-5,9**	**65**	**0**	**1244,3**
	Lost water from irrigation (infiltration)	92											92
	Treated waste water												0
	Untreated waster water	11,8	28		5	12			213	2	65		338
	Cooling water (energy)			708,5									709
	Water used for hydroelectricity												0
	Water lost in transport	16,5	8	0,3	0		20	**70**					114
	Other loss of water and adjustment									-8	**0**		-8
	S4 Consumption	**0**	**0**	**25**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**24,7**
	Evaporation and Evapotranspiration	0		24,6	0								25
	Direct discharge to the sea			0									0
Total supply, residuals & consumption		***120,5***	***36***	***741***	***5***	***41***	***70***	***296***	***213***	***27***	***225***	***0***	***1774,7***

Table 8.4 Matrix of flows within the economy, Moldova, 1998

Million cubic metres

	Agriculture	Fisheries	Energy	Mining	Manufacturing & Construction	Distribution/ irrigation water	Distribution/ municipal water	Sewerage	Government	Household	Rest of the World	**S2 Total water supplied**
Agriculture		0,1				0,1						**0,2**
Fisheries												**0**
Energy			0,7				7,3					**8**
Mining												**0**
Manufacturing					7			22				**28**
Distribution/ irrigation water		50,5										**50,5**
Distribution/ municipal water			16,5		4				7	199		**226**
Sewerage												**0**
Government		0,8						32	0,5			**33,3**
Household								**159**				**159**
Rest of the World												**0**
U2 Total water received (use)	**51,4**	**0**	**17,2**	**0**	**10**	**0,1**	**7,3**	**213**	**7**	**199**	**0**	**505,7**

Table 8.3/8.5 Water Supply & Use Table; Moldova,2000

Thousand cubic metres

		Agriculture	Fisheries	Energy	Mining	Manufacturing & Construction	Distribution/ irrigation water	Distribution/ municipal water	Sewerage	Government&Services	Households	Rest of the World	Total
from the enironment	**U1 Total abstraction**	**31120**	**8125**	**557960**	**5388**	**19731**	**63915**	**199800**	**0**	**4621**	**30000**	**0**	**920660**
	from surface water	5620	8125	555660	18	11241	63895	107510	0	1	0	0	752070
	of which reservoirs/dams	*4300*	*155*	*539841*	*0*	*1090*	*9159*	*0*		*1*	*0*		*554546*
	of which lakes	*0*	*500*	*0*	*0*	*0*	*0*	*0*		*0*	*0*		*500*
	of which rivers	*1320*	*7470*	*15819*	*18*	*10151*	*54736*	*107510*		*0*	*0*		*197024*
	of which springs	*0*	*0*	*0*	*0*	*0*	*0*	*0*		*0*	*0*		*0*
	from groundwater (wells, …)	25500	0	2300	5370	8490	20	92290		4620	30000		168590
	from other water (sea)	0	0	0	0	0	0	0		0	0		0
	for own use												*0*
	for delivery												*0*
within the economy	**U2 Total water received**	**46044,7**	**0**	**6569,5**	**16**	**12422**	**0**	**3006,6**	**143316**	**15427**	**131680**	**0**	**358481,4**
	Water received by users	46045	0	6550	16	11790	0	3007		15427	131680	0	214513
	of which recycled water				*0*	*0*							*0*
	Waste water for sewerage	0	0	20	0	632	0		143316	0	0		143968
Total use		***77165***	***8125***	***564530***	***5404***	***32153***	***63915***	***202807***	***143316***	***20048***	***161680***	***0***	***1279141,4***
within the economy	**S2 Total water supplied**	**20881**	**0**	**2183,3**	**45**	**16022**	**45462**	**145143**	**631**	**16808**	**111306**	**0**	**358481,4**
	Water supplied to users	20143	0	159,3	0	3254	45462	145143	631	373	0	0	215165
	of which recycled water			*159,3*		*3254*							
	Waste water supplied to sewerage	738	0	2024	45	12768	0	0	0	16435	111306		143316
to the environment	**S3 Total residuals & returns**	**30463**	**6069**	**557016,2**	**5359**	**16131**	**18393**	**57564**	**142685**	**3230**	**50374**	**0**	**887283,24**
	Lost water from irrigation (infiltration)	15433											15433
	Treated waste water	1830	0	3070	60	3830	0		160441	1000	0		170231
	Untreated waste water	8800	6069		5140	4030	23890		840	1010	26000		75779
	Cooling water (energy)			532865									532865
	Water used for hydroelectricity												0
	Water lost in transport	2300	0	120	0	1300	12920	**51380**		360	0		68380
	Other loss of water and adjustment	2100	0	20961	159	**6971**	-18417	6184	-18596	860	**24374**		24595
	S4 Consumption	**25821**	**2056**	**5330**	**0**	**0**	**60**	**100**	**0**	**10**	**0**	**0**	**33376,76**
	Evaporation and Evapotranspiration	25821	2056	5330	0	0	60	100		10	0		33377
	Direct discharge to the sea	0	0	0	0	0	0	0		0	0		0
Total supply, residuals & consumpt		***77165***	***8125***	***564530***	***5404***	***32153***	***63915***	***202807***	***143316***	***20048***	***161680***	***0***	***1279141,4***

Table 8.4 Matrix of flows within the economy, Moldova,2000

Thousand cubic metres

	Agriculture	Fisheries	Energy	Mining	Manufacturing & Construction	Distribution/ irrigation water	Distribution/ municipal water	Sewerage	Government&Services	Households	Rest of the World	**S2 Total water supplied**
Agriculture					4		6	738	99	20034		**20881**
Fisheries												
Energy	3				137			2024	20			**2183,3**
Mining								45				**45**
Manufacturing	1		251				3001	12768	2			**16022**
Distribution/ irrigation water	45462											**45462**
Distribution/ municipal water	559		6319	16	11637				15306	111306		**145143**
Sewerage					631							**631**
Government&Services	20				13			16435		340		**16808**
Household								111306				**111306**
Rest of the World												
U2 Total water received (use)	**46044,7**		**6569,5**	**16**	**12422**		**3006,6**	**143316**	**15427**	**131680**		**358481,4**

Table 8.3/8.5 Water Supply & Use Table, Moldova, 2002

thousandcubic metres

		Agriculture	Fisheries	Energy	Mining	Manufacturing & Construction	Distribution/ irrigation water	Distribution/ municipal water	Sewerage	Government&Services	Households	Rest of the World	Total
from the environment	**U1 Total abstraction**	**17840**	**4020**	**555810**	**5510**	**15900**	**58710**	**181150**		**381**	**20000**		**859321**
	from surface water	3493	4017	553357	13	10540	58706	102780		51			732957
	of which reservors/dams												
	of which lakes	*1680*	*1078*	*539840*	*9*	*1238*	*8266*			*50*			*552161*
	of which rivers	*1813*	*2939*	*13517*	*4*	*9302*	*50440*	*102780*		*1*			*180796*
	of which sprngs												
	from groundwater (wells, …)	14347	3	2453	5497	5360	4	78370		330	20000		126364
	from other water (sea)												
	for own use												
	for delivery												
within the economy	**U2 Total water received**	**41667**		**7686**	**2**	**23166**	**85**	**2693**	**105391**	**19099**	**98412**		**298201**
	Water received by users	38629		7680	2	21947	85	2693		16026	98412		185474
	of which recycled water												
	Waste water for sewerage	3038		6		1219			105391	3073			112727
Total use		***59507***	***4020***	***563496***	***5512***	***39066***	***58795***	***183843***	***105391***	***19480***	***118412***		***1157522***
within the economy	**S2 Total water supplied**	**12163**		**774**		**9967**	**37956**	**135294**	**1301**	**11334**	**89412**		**298201**
	Water supplied to users	12080		130		2989	37955	135294	1301	61	3000		192810
	of which recycled water			*130*		*2989*							
	Waste water supplied to sewerage	83		644		6978	1			11273	86412		105391
to the environment	**S3 Total residuals & returns**	**25407**	**3464**	**557095**	**5512**	**19099**	**20829**	**48549**	**104090**	**8146**	**29000**		**821191,4**
	Lost water from irrigation (infiltration)	11901											11901
	Treated waste water	785		3072		3176			127038	868	4000		138939
	Untreated waste water	21	3464		5383	2280	17600		764	233	25000		54745
	Cooling water (energy)			532876									532876
	Water used for hydroelectricity												
	Water lost in transport			140			3236	**55280**					58656
	Other loss of water and adjustment	12700		21007	129	**13643**	-7	-6731	-23712	7045			24074
	S4 Consumption	**21937**	**556**	**5627**		**10000**	**10**						**38129,6**
	Evaporation and Evapotranspiration	21937	556	5627		10000	10						38130
	Direct discharge to the sea												
Total supply, residuals & consumpt		***59507***	***4020***	***563496***	***5512***	***39066***	***58795***	***183843***	***105391***	***19480***	***118412***		***1157522***

Table 8.4 Matrix of flows within the economy, Moldova, 2002

thousand cubic metres

	Agriculture	Fisheries	Energy	Mining	Manufacturing & Construction	Distribution/ irrigation water	Distribution/ municipal water	Sewerage	Government&Services	Households	Rest of the World	**S2 Total water supplied**
Agriculture					18		5	83	57	12000		**12163**
Fisheries												
Energy					115	2		644	13			**774**
Mining												
Manufacturing	59		253				2656	6978	21			**9967**
Distribution/ irrigation water	37874				54			1	27			**37956**
Distribution/ municipal water	730		7428	2	21741	83			18898	86412		**135294**
Sewerage	2		5		1211				83			**1301**
Government&Services	2				27		32	11273				**11334**
Household	3000							86412				**89412**
Rest of the World												
U2 Total water received (use)	**41667**		**7686**	**2**	**23166**	**85**	**2693**	**105391**	**19099**	**98412**		**298201**

3. During the project, a set of intermediate interlinked sub-tables of water supply and use by sectors of economy has been constructed and implemented. It was very helpful in filling Main tables 8.3, 8.4, 8.5, taking into consideration national statistics capacity and experience. It makes the best use of the questionnaire of the national statistical survey about " Water Consumption" run by the public company "Apele Moldova" (National Water Agency).

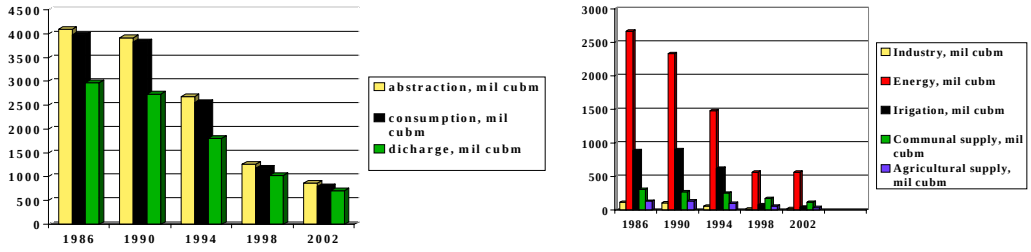
Sector Form

ISIC/ NACE Code	Total Sectors	Agriculture	Fisheries	Energy	Mining	Manufacturing & Construction	Distribution / irrigation water	Distribution / municipal water	Sewerage	Government	Household	Rest of the World
Water supplied to users	0	0	0	0	0	0	0	0	0	0	0	0
Large and medium enterprises	0											
of which recycled water	0											
Small enterprises	0											
Water received by users	0	0	0	0	0	0	0	0	0	0	0	0
Large and medium enterprises	0											
of which recycled water	0											
Small enterprises	0											
Waste water supplied to sewerage	0	0	0	0	0	0	0	0	0	0	0	0
Large and medium enterprises	0											
Small enterprises	0											
Waste water received for sewerage	0	0	0	0	0	0	0	0	0	0	0	0
Large and medium enterprises	0											
Small enterprises	0											

Water bodies	Total Inland Water + Sea	EA.1311	EA.1312	EA.1313		EA.132	EA.12 & EA.2 (except 2.4)	Total Inland Water	Sea
		Reservoirs/ Dams	Lakes	Rivers		Ground water	Land/Soil		
				Springs	Water streams				
Abstraction	0	0	0	0	0	0	0	0	0
Large and medium enterprises	0							0	
Small enterprises	0							0	
Waste water discharge	0	0	0	0	0	0	0	0	0
Large and medium enterprises	0	0	0	0	0	0	0	0	0
Small enterprises	0	0	0	0	0	0	0	0	0
Waste water discharge after treatment	0	0	0	0	0	0	0	0	0
Large and medium enterprises	0							0	
Small enterprises	0							0	
Waste water discharge insufficient treated	0	0	0	0	0	0	0	0	0
Large and medium enterprises	0							0	
Small enterprises	0							0	
Total Waste water discharge after treatment	0	0	0	0	0	0	0	0	0
Large and medium enterprises	0	0	0	0	0	0	0	0	0
Small enterprises	0	0	0	0	0	0	0	0	0
Clean water discharge without treatment.	0	0	0	0	0	0	0	0	0
Large and medium enterprises	0							0	
Small enterprises	0							0	
Waste water discharge without treatment.	0	0	0	0	0	0	0	0	0
Large and medium enterprises	0							0	
Small enterprises	0							0	
Total Waste water discharge without treatment	0	0	0	0	0	0	0	0	0
Large and medium enterprises	0	0	0	0	0	0	0	0	
Small enterprises	0	0	0	0	0	0	0	0	
Water lost in transport	0	0	0	0	0	0	0	0	0
Large and medium enterprises	0							0	
Small enterprises	0							0	
Other loss of water	0	0	0	0	0	0	0	0	0
Large and medium enterprises	0							0	
Small enterprises	0							0	
Consumption/ evaporation	0	0	0	0	0	0	0	0	0
Large and medium enterprises	0							0	
Small enterprises	0							0	
Consumption/ return to sea	0	0	0	0	0	0	0	0	0
Large and medium enterprises	0							0	
Small enterprises	0							0	

The survey on water is an annual postal report from economic agents; it is mandatory, organized and conducted since 1983 for all water suppliers and users. This survey gives data in m3 on withdrawals, supply, consumption, losses during use and supply, sewage drain as well as the volume of discharge of polluting substances in tons. In ten years, the number of economic agents increased from 5 000 to 193 000 units. Therefore, the National Water Agency has met difficulties in maintaining traditional statistical survey related to water consumption.

Graphs. Water indicators, Moldova, 1996-2002



Source: Apele Moldovei

Apele Moldovei has recognized the existence of a problem concerning the quality of the survey on water consumption and reviewed its general approach: shifting from exhaustive collection of data to selective methods of surveillance, to use more calculation methodologies, as well water accounts, which would permit estimate water abstraction, supply and consumption in different sectors of the national economy.

In 2000, the first water supply and use tables as well water asset account detected unreliable patterns concerning abstraction water with water use by households.

It has decided to organize and carry out special ecological survey within a sample frame of households (House Budget Survey) to estimate water abstraction, consumption and pollution by the households. Due the results of the Survey only one third of population has connected to water supplied system and 30% to sanitation, others are drinking self-withdrawn water. Households' volume of water self-abstracted constituted 30-mil mc self-discharged 26 mil cm sewerages. In totally they consumed 162-mil mc water supplied or self pumped in urban and rural areas.

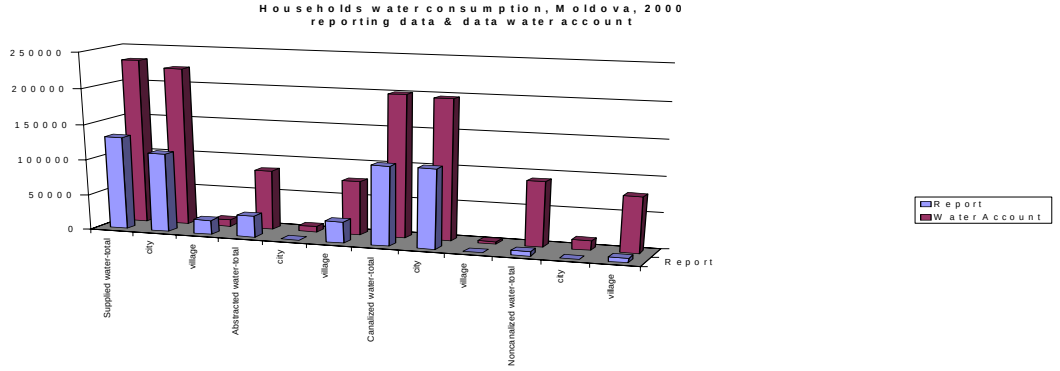
It was therefore possible to built new sets of intermediate interlinked sub-accounts of water supply and use detailing households, for defining possible ways to correct calculations.

ISIC/ NACE Code	Total Sectors	Agriculture	Fisheries	Energy	Mining	Manufacturing & Construction	Distribution/ irrigation water	Distribution/ municipal water	Sewerage	Government	Household	Services
Water supplied to users	0	0	0	0	0	0	0	0	0	0	0	0
Cities	*0*											
of which recycled water	0											
Villages	*0*											
Water received by users	131680	20034	0	0	0	0	0	111306	0	340	0	0
Cities	*111646*							*111306*		*340*		
of which recycled water	0											
Villages	*20034*	*20034*										
Waste water supplied to sewerage	111306	0	0	0	0	0	0	0	111306	0	0	0
Cities	*111306*								*111306*			
Villages	*0*											
Waste water received for sewerage	0	0	0	0	0	0	0	0	0	0	0	0
Cities	*0*											
Villages	*0*											

Water bodies	Total Inland Water + Sea	EA.1311	EA.1312	EA.1313		EA.132	EA.12 & EA.2 (except 2.4)	Total Inland Water	Sea
		Reservoirs/ Dams	Lakes	Rivers		Ground water	Land/Soil		
				Springs	Water streams				
Abstraction	30000	0	0	0	0	30000	0	30000	0
Cities	*0*							*0*	
Villages	*30000*					*30000*		*30000*	
Waste water discharge	26000	0	0	0	0	0	26000	26000	0
Cities	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
Villages	*26000*	*0*	*0*	*0*	*0*	*0*	*26000*	*26000*	*0*
Waste water discharge after treatment	0	0	0	0	0	0	0	0	0
Cities	*0*							*0*	
Villages	*0*							*0*	
Waste water discharge insufficient treated	0	0	0	0	0	0	0	0	0
Cities	*0*							*0*	
Villages	*0*							*0*	
Total Waste water discharge after treatment	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Cities	*0*	0	0	0	0	0	0	0	0
Villages	*0*	0	0	0	0	0	0	0	0
Clean water discharge without treatment.	0	0	0	0	0	0	0	0	0
Cities	*0*							*0*	
Villages	*0*							*0*	
Waste water discharge without treatment.	26000	0	0	0	0	0	26000	26000	0
Cities	*0*							*0*	
Villages	*26000*						*26000*	*26000*	
Total Waste water discharge without treatment	**26000**	**0**	**0**	**0**	**0**	**0**	**26000**	**26000**	**0**
Cities	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	
Villages	*26000*	*0*	*0*	*0*	*0*	*0*	*26000*	*26000*	
Water lost in transport	0	0	0	0	0	0	0	0	0
Cities	*0*							*0*	
Villages	*0*							*0*	
Other loss of water	4000	0	0	0	0	0	4000	4000	0
Cities	*0*							*0*	
Villages	*4000*						*4000*	*4000*	
Consumption/ evaporation	0	0	0	0	0	0	0	0	0
Cities	*0*							*0*	
Villages	*0*							*0*	
Consumption/ return to sea	0	0	0	0	0	0	0	0	0
Cities	*0*							*0*	
Villages	*0*							*0*	

These actions made progress possible to update and to overcome data gaps. Data are more complete for 2000 and 2002 (main table 8.3/8.5) as well for detail of water flows between economic sectors (table 8.4).

4. There is another important point coming during the water account studies that demonstrated weak areas of statistics on water resources, derived water indicators, which qualitative side evokes doubts regarding data reliability. This peculiarity requests revision of data surveys and monitoring, data collection process and parallel changes of national methodologies to assess water indicators according to European standards.



5. Therefore, the role of **water accounts** is obvious, as one of the main means of study of environmental problems linked to the state and assessment of natural water resources. It contributed to defining governmental policies in the sphere of natural resources and determined directions for reforming and development of government bodies responsible for water protection. Mainly it has become particularly critical after Moldova has signed the International Conventions, having now to fulfill its obligation, providing transparent harmonized information system, informing in particular about international and transboundaries water resources.

Implementing physical water accounts demanded an inter institutional information network – a "Water Data Center", which is acting and settled under the authority of the Ministry of Ecology and Natural Resources. Main partners and data holders are the Central services of the Ministry, the State Ecological Inspectorate, the Service of Hydro-meteorology, the geological institute "AGeoM", the public agency "Apele Moldovei" and the National Centre of Scientific-Practical Preventive Medicine of the Ministry of Health. The **Water Data Centre** is used for the current activities of the participating organisations involved in water management in Moldova: elaboration, implementation and follow up of the National Strategies, Governmental National Action Programmes on water issue, especially into the context of the national sustainable development. As well, the WDC is used for reporting on water data to the international organizations, compatible with the European standards.

Jana Tafi

Reference:

1. *Inland water accounts of the Republic of Moldova, July 2000, EUROSTAT, TACIS Project Environment Statistics*
2. *Statistical Survey „Water Consumption", Association „Apele Moldovei", 1994,1998, 2000,2002,*
3. *Ecological survey " Environmental pollution by households", 1999, DSS*
4. *Ecological survey „Impact of household to water resource", 2001, DSS*
5. *Creation of a national database on water . Firts results and perspectives of the project Water Data Centre in Moldova, Scientific Journal of Information and Ecological Culture Mediului Ambiant, nr.4(9) August 2003, Ministry of Ecology, Construction and Territorial Development of Moldova, 2003*