



WATER QUALITY ACCOUNTING: WQA CASE STUDY T.N MOLDOVA



Jana TAFI and WDC team

Context & objects

- National : The Parliament and the Government of Moldova has adopted Framework of national policy in the water resources domain 2003-2010 (N 325-XV din 18.07.2003)
- European: Action Plan Moldova-EU & WFD
- International= two trans boundaries rivers Nistru (Ukraine) & Prut (Romania) = Conventions: The Protection and Use of Transboundary Watercourses and International Lakes , The Transboundary Effects of Industrial accidents, On Environmental Impact Assessment in a Transboundary Context

*Project « Consolidation Water Data Centre in Moldova »
COCOOP France & BETURE-CEREC (France) to Ministry of
Ecology and Natural Resources of the Republic of Moldova,
April 2005, 20 Th Euro*

Data holders & water quality surveillance

- Ministry of Ecology & Natural Resources
- State Agency « AGeoM »
- Hydro-Meteorological Service
- Ecological State Inspectorate
- National Center of Scientific-Practical Preventive Medicine of the Ministry of Health
- State Water Agency « Apele Moldovei »

Methodology : environmental accounting
for water, SEEA, 2000

Why water quality account?

WQA path to water price policy!!!

- water quality & cost water supply-sewerage
- cost water supply-sewerage & price water supply-sewerage users/consumers (households & business entities)
- price water supply-sewerage households & income households (vulnerability to low income households correlating to unemployment rate)
- water quality & investment in water supply - sewerage

Main sources of information

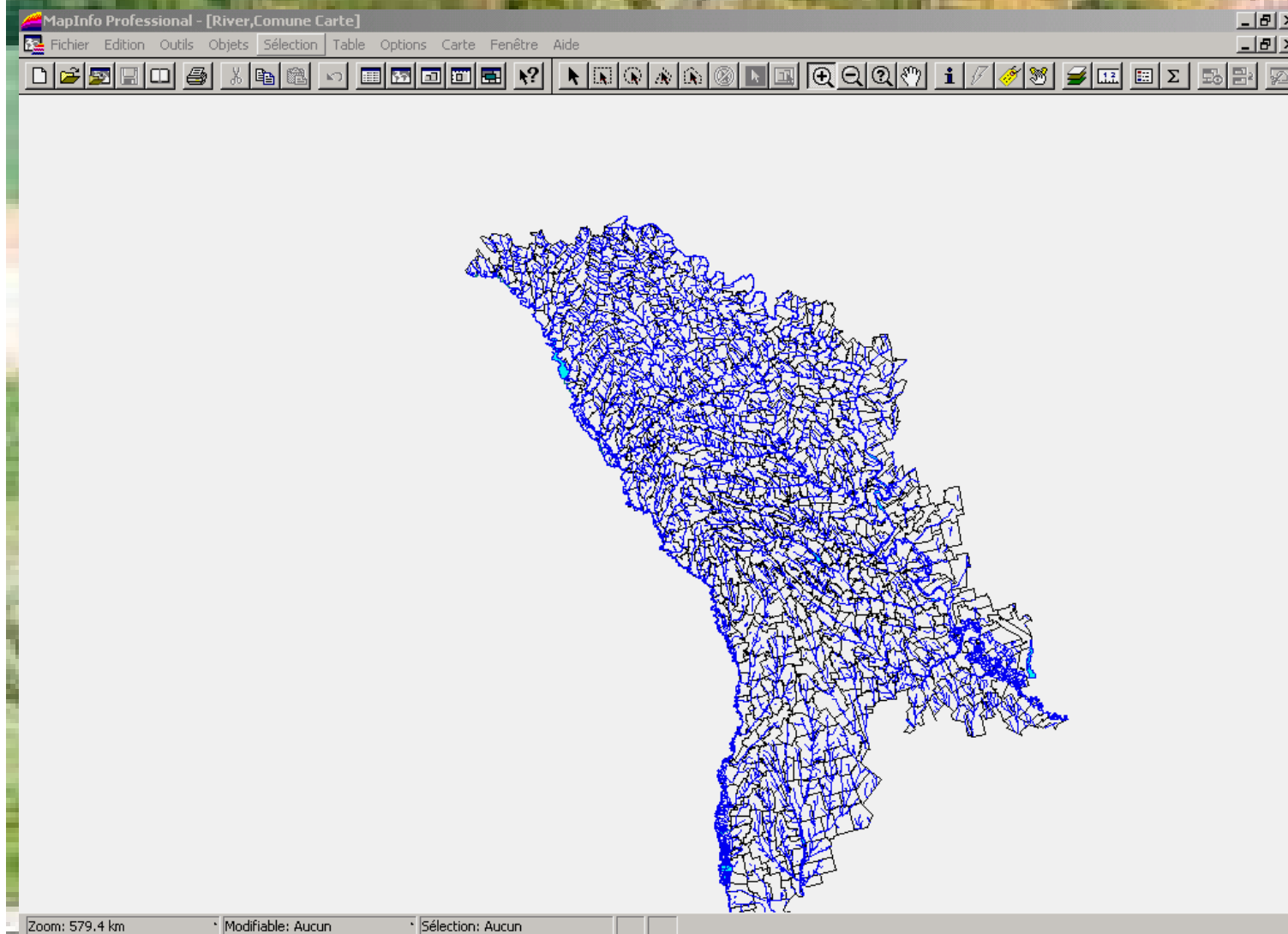
- Hydro chemical data in monitoring points
- Hydrological data in monitoring points
- Annual Survey Water Agency (companies, communal services and irrigation supply)
- Monitoring data quality surface water for drinking and recreations needs
- Inventory wells and bore holes
- GIS data :rivers, localities, regions....

Results obtained from the WQA study

- Database on water quality, ACCESS, 1993-2003 :
 1. common principal in design C_qual & V_qual
 2. common principal in codification parameters
 3. common use GIS data
- Modern way data management: compute indicator process, update, fast response to policy demand

Preliminary results quality account water resource (French SEQ-l'eau)

GIS data -main and minor water, localities 1:200 000



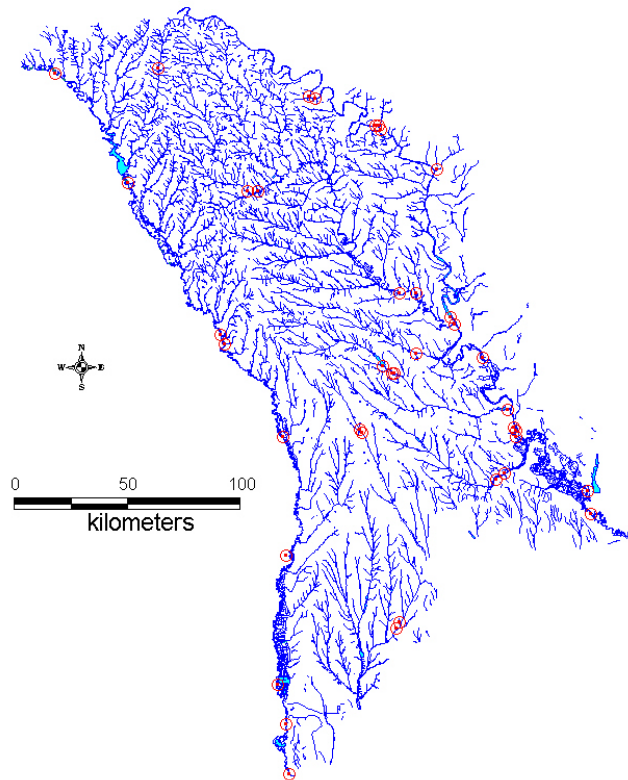
Jana TAFI and WDC team

Monitoring stations "Hydrometeo Service"

Ministry of Ecology, Constructions and Territorial Development

WATER DATA CENTRE IN MOLDOVA

QUALITY STATIONS



Supported by: IFEN and BETURE-CEREC

- Surface water in major and minor rivers and lakes
- 40 stations
- 60 parameters

State Geological Agency: inventory 1747 wells, 13455 measures

Microsoft Access

File Edit View Insert Format Records Tools Window Help

Type a question for help

1 : Database (Access 2000)

v_qualgroundwater : Table

ID	code	date	code_paramete	val
1	561	02/10/1975	7011	34.2
2	561	02/10/1975	7010	224.7
3	561	02/10/1975	7009	739.7
4	561	02/10/1975	7012	6.1
5	561	02/10/1975	7013	1.8
6	561	02/10/1975	7043	402
7	561	02/10/1975	7016	1094
8	561	02/10/1975	7017	0.45

C_groundwater : Table

ID	Code_sound	code_raion	name_raion	place	code_locality	name_locality	ZHYD	name_ZHYD	pa
1	557	6200000	R-UL OCNITA	partea de NV a	6203000	OR.OTACI	0101000000	Nistru	M-35-X
2	558	6200000	R-UL OCNITA	partea de V a o	6203000	OR.OTACI	0101000000	Nistru	M-35-X
3	559	1400000	R-UL BRICENI	0.8 km SE de l	1401000	OR.BRICENI	0201030000	Lopatinca	M-35-X
4	560	1400000	R-UL BRICENI	1.3 km SE de l	1401000	OR.BRICENI	0201030000	Lopatinca	M-35-X
5	561	3400000	R-UL DONDUS	partea de N a o	3401000	OR.DONDUSEI	0101010000	Raut	M-35-X
6	562	3400000	R-UL DONDUS	2.3 km NV de l	3600000	S.TAUL		cumpana	M-35-X
7	563	3600000	R-UL DROCHIA	1.5 km SV de l	3634000	S.SURI		cumpana	M-35-X
8	564	3600000	R-UL DROCHIA	2.2 km SE de l	3616000	S.GRIBOVA	0101010300	Cubolta	M-35-X
9	565	7800000	R-UL SOROCA	0.6 km N de la	7818000	S.EGORENI	0101000000	Nistru	M-35-X
10	565-a	7800000	R-UL SOROCA	2.7 km N de la	7818000	S.EGORENI	0101000000	Nistru	M-35-X
11	566	7800000	R-UL SOROCA	1.3 km SE de l	7833000	S.SEPELICI		afluent dreapta	M-35-X
12	567	9800000	TDS NISTRULL	1.5 km NE de l	9844000	S.HRISTOVAIA	0101000000	Camenca	M-35-X
13	568	7800000	R-UL SOROCA	1.2 km S de la	7839001	S.SLOBOZIA-C	0101000000	Nistru	M-35-X
14	569	9800000	TDS NISTRULL	partea de V a o	9802000	OR.CAMENCA	0101000000	Nistru	M-35-X
15	4320	7100000	R-UL RISCANI	2.8 km NE de l	7112000	S.BOROSENII	0201060000	Camenca	L-35-IV
16	4321	7100000	R-UL RISCANI	0.9 km NE de l	7101000	OR.RISCANI		afluent dreapta	L-35-IV
17	4322	3600000	R-UL DROCHIA	2.7 km NV de l	3632000	S.SOFIA	0101010300	Cubolta	L-35-IV
18	4323	7100000	R-UL RISCANI	1.5 km SV de l	7123000	S.PETRUSENI	0201060000	Camenca	L-35-IV
19	4324	7100000	R-UL RISCANI	1.7 km SV de l	7102004	S.PROSCUREI	0201050000	Ciugur	L-35-IV
20	4325	0301000	MUN.BALTI	partea de E a o	0301000	MUN.BALTI	0101010000	Raut	L-35-IV
21	4326	0301000	MUN.BALTI	partea de N a o	0301000	MUN.BALTI	0101010000	Raut	L-35-IV
22	4327	4300000	R-UL FALESTI	3.5 SE de la s.l	4325000	S.MARANDENI	0101010701	Ciuluc de Mijloc	L-35-IV

identification code

Jana TAFI and WDC team

Ministry of Health - monitoring surface water in 8800 measures on 60 parameters

Microsoft Access

File Edit View Insert Format Records Tools Window Help

Type a question for help

V_QUAL_Prut : Table

CODE	DATE	CODE_param	Suport	VAL	LAB	Rem	Calc	Corr
0900301	01/06/1989	7006		7.99			<input type="checkbox"/>	<input type="checkbox"/>
0900301	13/11/1989	7006		8.15			<input type="checkbox"/>	<input type="checkbox"/>
0900301	11/02/1990	7006		8			<input type="checkbox"/>	<input type="checkbox"/>
0900301	19/05/1990	7006		7.1			<input type="checkbox"/>	<input type="checkbox"/>
0900301	14/09/1990	7006		8.2			<input type="checkbox"/>	<input type="checkbox"/>
0900301	08/02/1991	7006		6.5			<input type="checkbox"/>	<input type="checkbox"/>
0900301	03/05/1991	7006		6.6			<input type="checkbox"/>	<input type="checkbox"/>
0900301	12/09/1991	7006		6.8			<input type="checkbox"/>	<input type="checkbox"/>
0900301	17/11/1991	7006		7.7			<input type="checkbox"/>	<input type="checkbox"/>
0900301	25/02/1992	7006		8.2			<input type="checkbox"/>	<input type="checkbox"/>
0900101	09/02/1988	7006		7.5			<input type="checkbox"/>	<input type="checkbox"/>
0900101	09/06/1988	7006		6.9			<input type="checkbox"/>	<input type="checkbox"/>
0900301	20/09/1988	7006		7.65			<input type="checkbox"/>	<input type="checkbox"/>
0900301	20/10/1988	7006		7.9			<input type="checkbox"/>	<input type="checkbox"/>
0900301	22/02/1994	7006		8.2			<input type="checkbox"/>	<input type="checkbox"/>
0900301	05/04/1994	7006		8.4			<input type="checkbox"/>	<input type="checkbox"/>
0900501	01/06/1989	7006		7.9			<input type="checkbox"/>	<input type="checkbox"/>
0900501	03/11/1989	7006		6.8			<input type="checkbox"/>	<input type="checkbox"/>
0900501	11/02/1990	7006		6.8			<input type="checkbox"/>	<input type="checkbox"/>
0900101	20/09/1988	7006		7.6			<input type="checkbox"/>	<input type="checkbox"/>
0900101	20/10/1988	7006		7.99			<input type="checkbox"/>	<input type="checkbox"/>
0900101	12/02/1989	7006		6.8			<input type="checkbox"/>	<input type="checkbox"/>
0900501	19/05/1990	7006		8.4			<input type="checkbox"/>	<input type="checkbox"/>
0900501	14/09/1990	7006		8			<input type="checkbox"/>	<input type="checkbox"/>
0900501	12/02/1991	7006		7.2			<input type="checkbox"/>	<input type="checkbox"/>
0900501	07/05/1991	7006		6.8			<input type="checkbox"/>	<input type="checkbox"/>
0900301	12/05/1992	7006		8.2			<input type="checkbox"/>	<input type="checkbox"/>
0900301	17/06/1992	7006		8.2			<input type="checkbox"/>	<input type="checkbox"/>
0900301	02/11/1992	7006		8			<input type="checkbox"/>	<input type="checkbox"/>
0900301	10/02/1993	7006		8.4			<input type="checkbox"/>	<input type="checkbox"/>
0900301	04/05/1993	7006		7.9			<input type="checkbox"/>	<input type="checkbox"/>
0900301	28/07/1993	7006		8.2			<input type="checkbox"/>	<input type="checkbox"/>
0900301	07/10/1993	7006		8.1			<input type="checkbox"/>	<input type="checkbox"/>

Record: 1 of 8800

code of station // codul statiei de efectuare a masurarilor

Jana TAFI and WDC team

Data treatment: monitoring to publication

The screenshot displays the Nopolu System2 V5.0 software interface, which is used for water quality data management and monitoring. The main window is titled "Water quality data Republicii Moldova" and includes a map of Moldova and a description of the database. A "WATER DATA CENTER APELE MOLDOVA" banner is overlaid on the interface. The software is divided into several panes:

- Data management:** Includes a "DATA MANAGEMENT" section with tabs for Structure, Quantity, Quality, Wasteloads, and Envi.
- Water Quality:** A central pane showing a list of water quality parameters and their values for a specific station.
- Multi-parameters yearbook:** A table showing a summary of water quality data for the year 1999.

The "Water quality" pane shows the following data for station 0906802 - r.Botna - t.Causheni:

Date/time	Num	Name	Code	Value	Unit	Comment
23/02/1999	1038	Azote oxydé	N O	12.100	mg/l	1
23/02/1999	1301	Température de l'Eau	Temp. eau	6.000	°C	1
23/02/1999	1302	Potentiel en Hydrogène (pH)	pH	8.030	Unité pH	1
23/02/1999	1305	Matières en suspension	MES	418.000	mg/l	1
23/02/1999	1307	Résidu sec à 105°C	Résidu sec	1 784.000	mg/l	1
23/02/1999	1311	Oxygène dissous	O2 dissous	10.700	mg/l	1
23/02/1999	1312	Taux de saturation en oxygène	SATUR.O2	86.000	%	1
23/02/1999	1313	Demande Biochimique en oxygène en 5 jours (D.B.O.5)	DBO5	4.590	mg/l	1
23/02/1999	1314	Demande Chimique en Oxygène (D.C.O.)	DCC	48.000	mg/l	1
23/02/1999	1327	Hydrogencarbonates	HCO3-	483.000	mg/l	1
23/02/1999	1332	Limpidité - Disque de Secchi	LimpidSecch	0.000	cm	1
23/02/1999	1335	Ammonium	NH4+	1.023	mg/l	1
23/02/1999	1337	Chlorures	Cl-	195.000	mg/l	1
23/02/1999	1338	Sulfates	SO4--	590.000	mg/l	1
23/02/1999	1339	Nitrites	NO2-	0.453	mg/l	1
23/02/1999	1340	Nitrates	NO3-	49.500	mg/l	1
23/02/1999	1342	Silicates	SiO3--	4.000	mg/l	1
23/02/1999	1345	Dureté	Dureté	12.980	°f	1
23/02/1999	1350	Phosphore total	P total	0.264	mg/l	1
23/02/1999	1372	Magnésium	Mg	95.200	mg/l	1
23/02/1999	1374	Calcium	Ca	103.000	mg/l	1

The "Multi-parameters yearbook" pane shows a summary table for the year 1999:

Statut	Janvier	Fevrier	Mars	Avril	Mai	Jun	Juillet	Août
N O			12.10			5.52		
Temp. eau		6.00				11.40		
pH		8.03				8.20		
MES		418.00				210.00		
Résidu sec		1784.00				1689.00		
O2 dissous		10.70				9.28		
SATUR.O2		86.00				89.10		
DBO5		4.59				3.96		
DCC		48.00				30.00		
HCO3-		483.00				426.00		
Limp.Secch		0.00				0.00		
NH4+		1.03				0.67		
Cl-		195.00				189.00		
SO4--		590.00				570.00		
NO2-		0.45				0.11		
NO3-		49.50				21.97		
SiO3--		4.00				2.90		
Dureté		12.98				12.98		
P total		0.26				0.18		
Mg		95.20				103.00		
Ca		103.00				90.00		
Nb								
Pb								
Zn		0.02						

Jana TAFI and WDC team

"Consolidation WDC in Moldova" project Ministry of Ecology Moldova & BETURE-CEREC, France
The 11th London Group Meeting on Environmental Accounting, Pretoria, South Africa, 26 to 30 March 2007

Data treatment: monitoring to graph

Water quality data Republicii Moldova
Database containing water quality data from Ministry of Ecology, Apele MOLDOVA & Ministry of Health

WATER DATA CENTER APELE MOLDOVA
JAAKKO PÖYRY INFRA
Beture-Cerec

DATA MANAGEMENT

Structure | Quantity | Quality | Wasteloads | Envi

WATER QUALITY

Quality stations	Analysis	Parameters
prepare TS DATA	SEQ-Eau quality classes	Quality cla
Available data summary	Import Column format file	One par
Weighted Time Averages	Quality accounts	

1038 N.O
1041 M.Org. 37°
1053 Denbr. Bac
1056 Enteroviru
1050 Helminthe

Azote oxydé
Micro-Org. reviv. à 37° C
Denbr. bact. direct tot.
Enterovirus
Oeufs d'helminthe

METEOROLOGY | Meteo stations | Meteorology

NOPOLU MODEL | NOPELU general parameters | TOOL

Water quality

Water quality station: 0906802 - r.Botna - l.Causheni | Watershed: BAD00

Type: 2701000 | Organism: Hydrometeo | number of: 1 947 | Section: 0.1

Place: 0,2 km vn aval | River: Botna

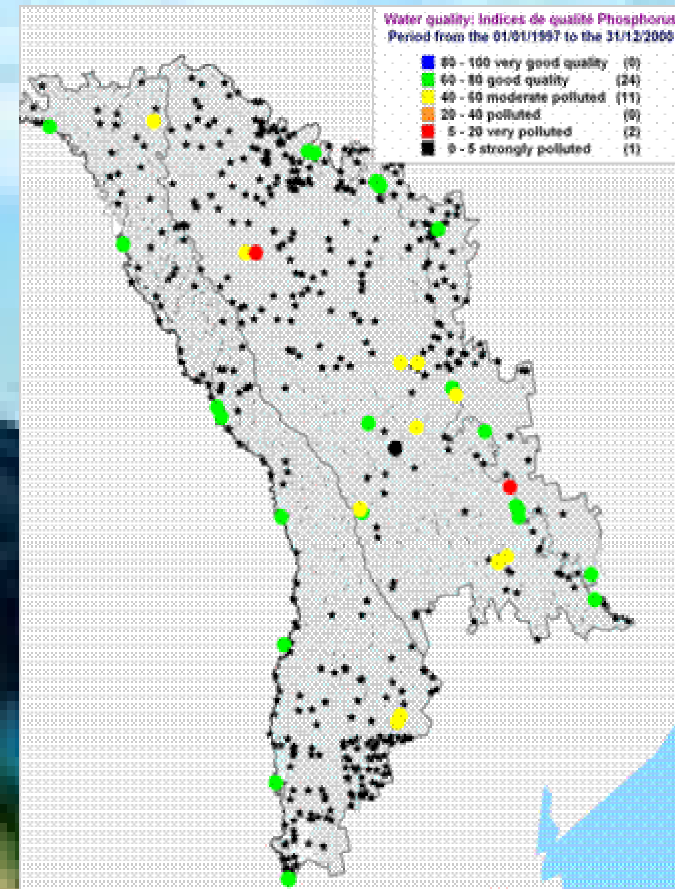
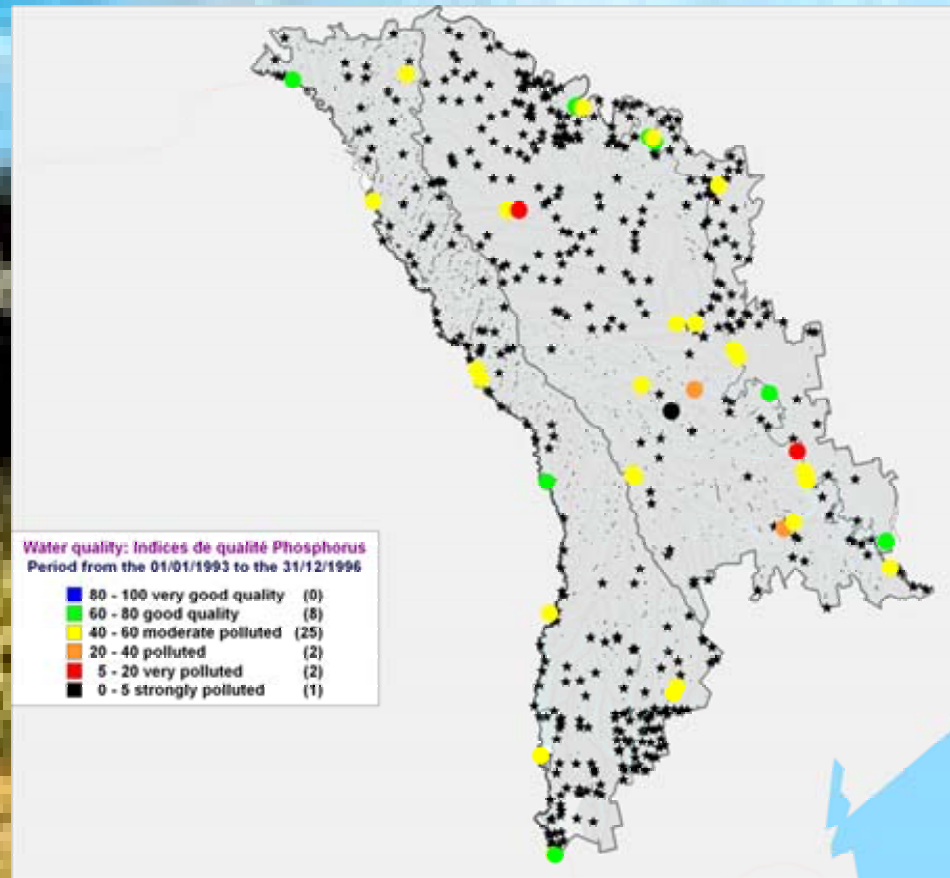
Period: Period from the 01/01/1999 to the 31/12/2001

Nature of parameter: (All)

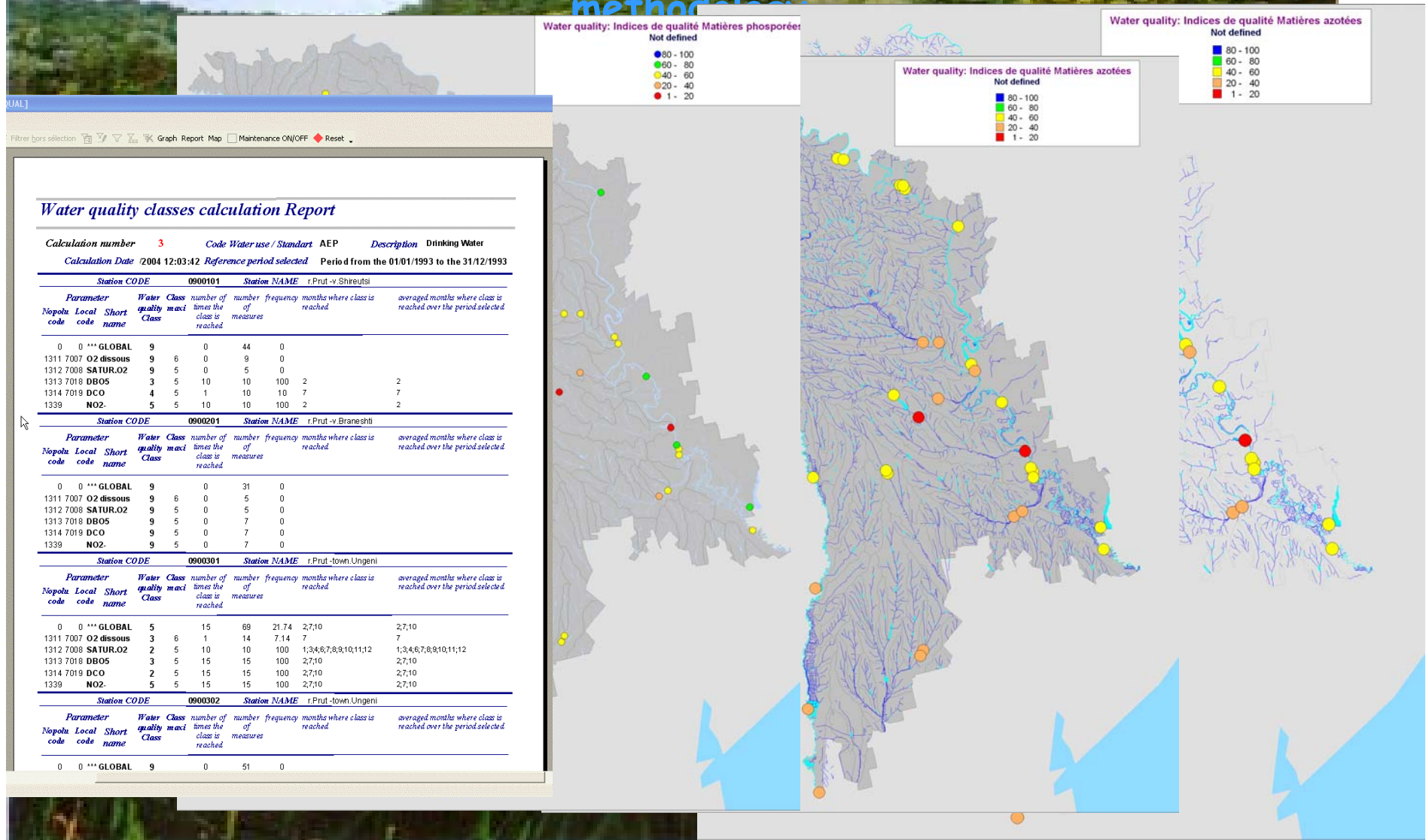
Date/time	Num	Name	Code	Value	Unit	Commen
23/02/1999	1038	Azote oxydé	N.O	12.100	mg/l	1
23/02/1999	1301	Température de l'Eau	Temp. eau	6.000	°C	1
23/02/1999	1302	Potentiel en Hydrogène (pH)	pH	8.030	Unité pH	1
23/02/1999	1305	Matières en suspension	MES	418.000	mg/l	1
23/02/1999	1307	Résidu sec à 105°C	Résidu sec	1.784.000	mg/l	1
23/02/1999	1311	Oxygène dissous	O2 dissous	10.700	mg/l	1
23/02/1999	1312	Taux de saturation en oxygène	SATUR.O2	86.000	%	1
23/02/1999	1313	Demande Biochimique en oxygène en 5 jours (D.B.O.5)	DB05	4.530	mg/l	1
23/02/1999	1314	Demande Chimique en Oxygène (D.C.O.)	DCO	48.000	mg/l	1
23/02/1999	1327	Hydrogencarbonates	HCO3-	483.000	mg/l	1
23/02/1999	1332	Limpidité - Disque de Secchi	LimpiSecch	0.000	cm	1
23/02/1999	1335	Ammonium	NH4+	1.029	mg/l	1
23/02/1999	1337	Chlorures	Cl-	195.000	mg/l	1
23/02/1999	1338	Sulfates	SO4-	590.000	mg/l	1
23/02/1999	1339	Nitrites	NO2-	0.453	mg/l	1

Form View

Water quality index, Moldova, 1993-2000



Step to water resources quality account quality data (from Ecology and Health) merged and processed with Nopolu using the French SEQ-eau methodology



Water quality accounts study

together various sources of information on water:

- awareness of lack of consistency among the different data sets and poor quality of data (the accounting framework is an important tool for checks and balances)
- common definitions and classifications;
- identification of data gaps and efforts to improve data coverage (e.g. using various techniques can give some examples;
- many more analyses can be done with the water accounts (combining different sources of information).
- better meet users' demand

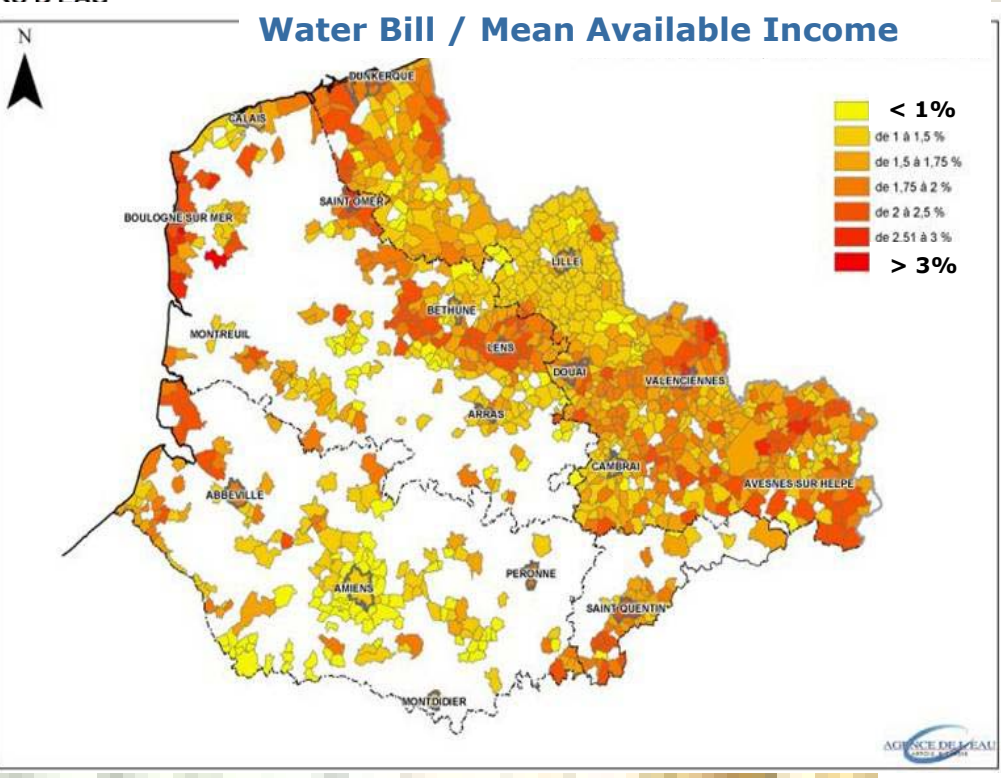
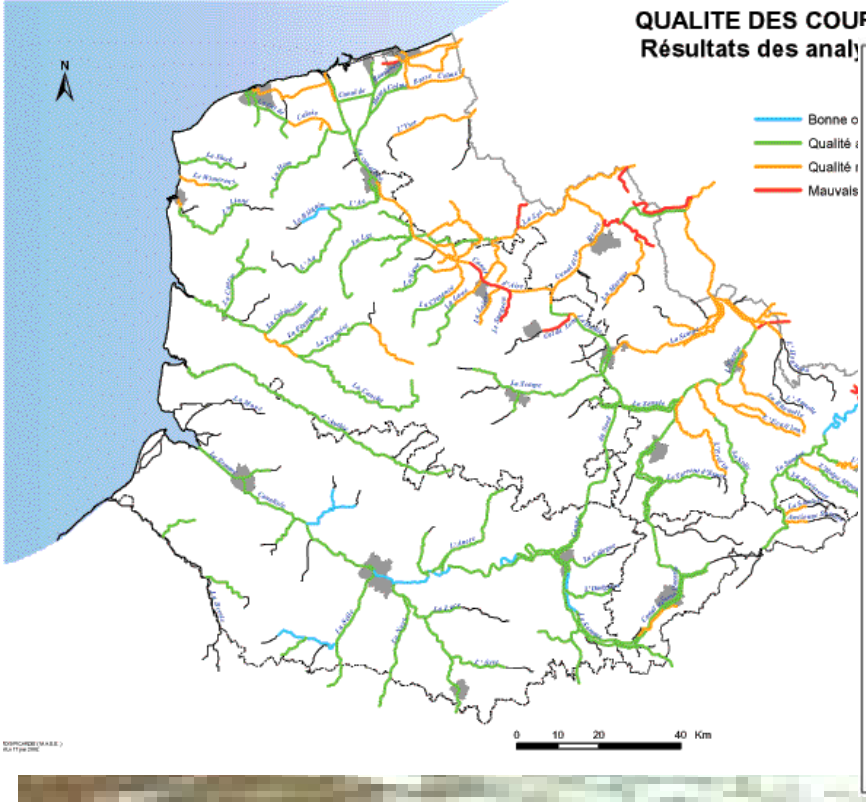
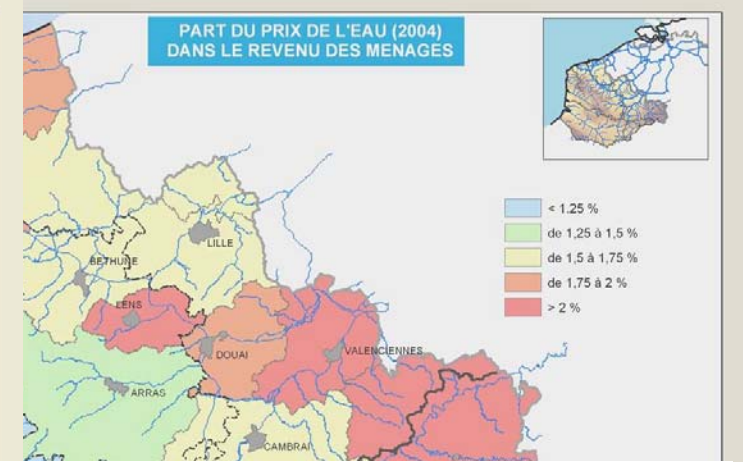
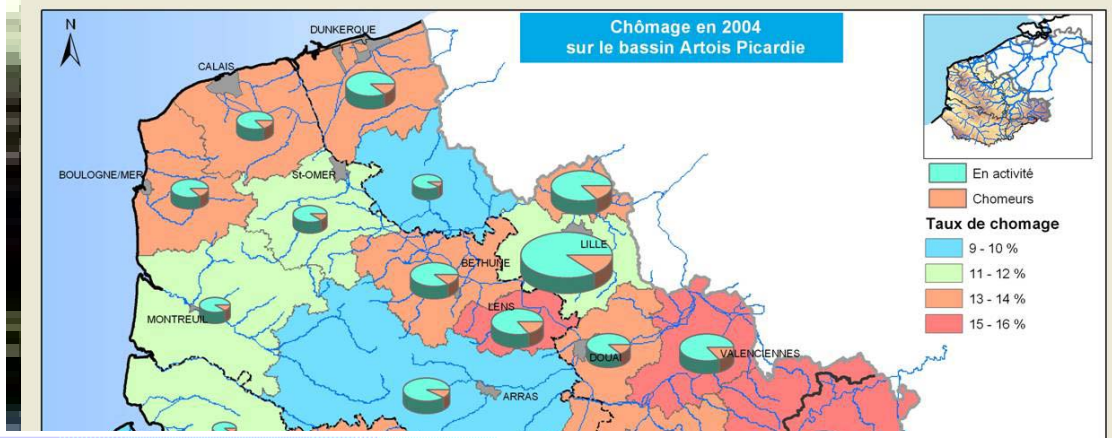
Difficulties

- Multi institutional involvement at national & international
- Recognition by policymakers
- Quality data: monitoring and spatial
- Institutional capacity

Future steps

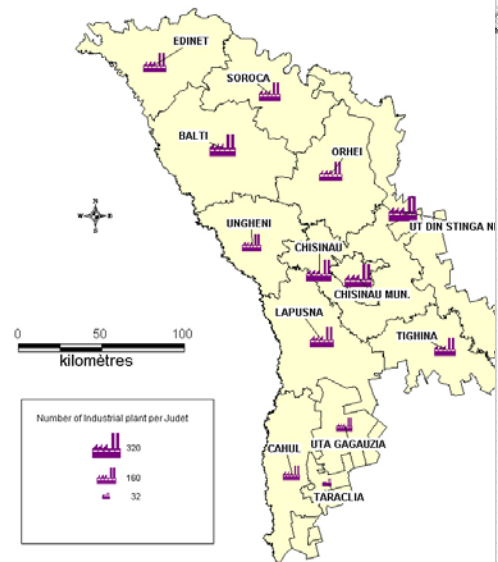
- Development of indicators based on water quality accounts
- Performing GIS layer : watersheds, catchments
- Compute water quality accounts
- Improve the database in terms of quality of the monitoring data and statistics and to implement the methodological changes needed to better define these data, to improve data gathering, processing and dissemination;
- Technical training in management data bases and data analysis
- Water price survey

→ quality water in river

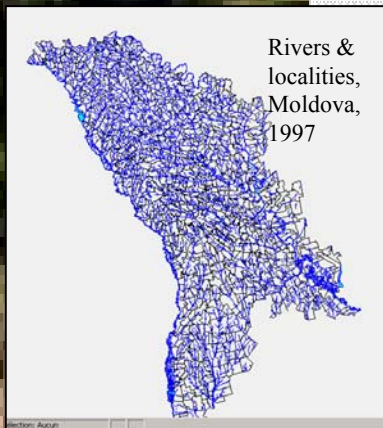


WATER DATA CENTRE IN MOLDOVA

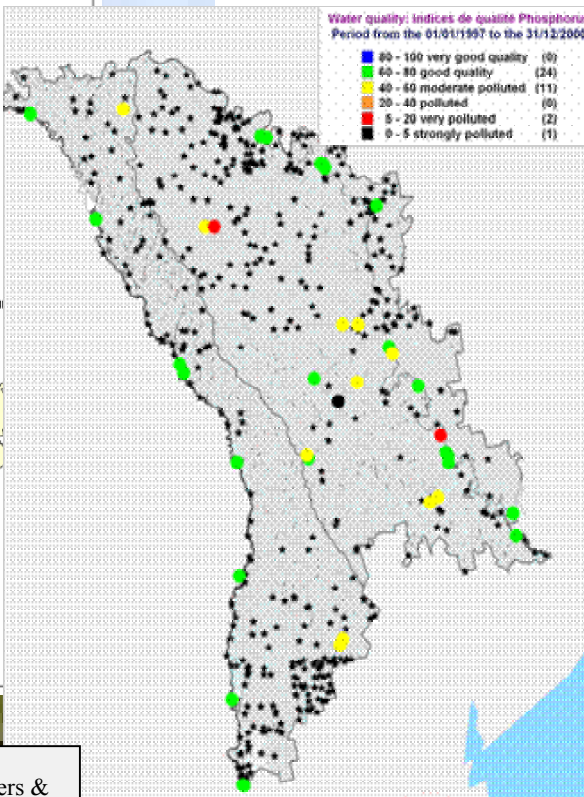
"Industrial" plants



Supported by: IFEN and BETURE-CEREC



Rivers & localities, Moldova, 1997

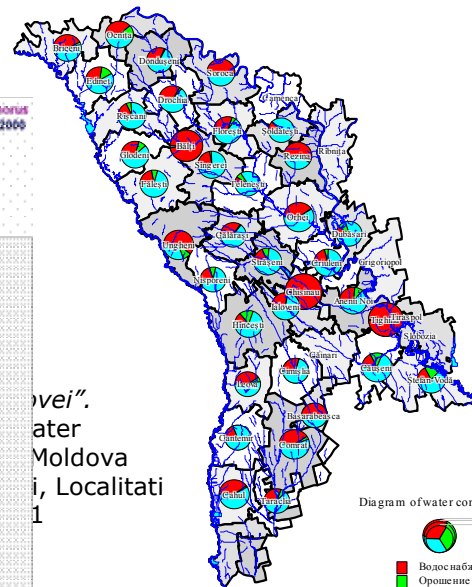


Water quality: indices de calitate Phosphorus

Period from the 01/01/1997 to the 31/12/2005

- 80 - 100 very good quality (10)
- 60 - 80 good quality (24)
- 40 - 60 moderate polluted (111)
- 20 - 40 polluted (0)
- 5 - 20 very polluted (2)
- 0 - 5 strongly polluted (1)

Water consumption, Moldova



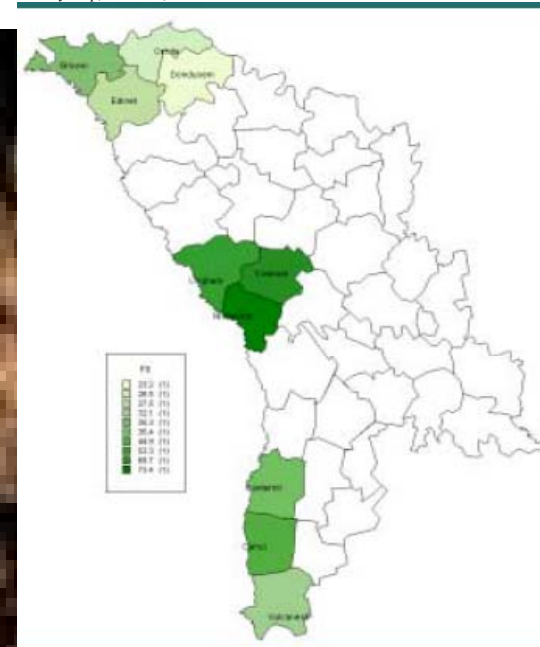
Water consumption, Localitati

Diagram of water consumption per regions



- 590 000
- 295 000
- 59 000

Poverty Map, Moldova, 2005





THANKS

janatafi@hotmail.com

wdc@mediu.moldova.md

&

*Arnaud Courtecuisse, Agence de l'Eau Artois-
Picardie*

**“OUTPUTS OF THE EU WFD ECONOMIC ANALYSIS AND ITS OUTPUTS OF THE EU WFD
ECONOMIC ANALYSIS AND ITS ROLE IN THE DECISION
PROCESS: ILLUSTRATIONS FROM THE ARTOIS-PICARDIE RIVER BASIN”
, Water price survey**