



# WATER QUALITY ACCOUNTING: WQA CASE STUDY T.N MOLDOVA LG/11/B/3



## 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....

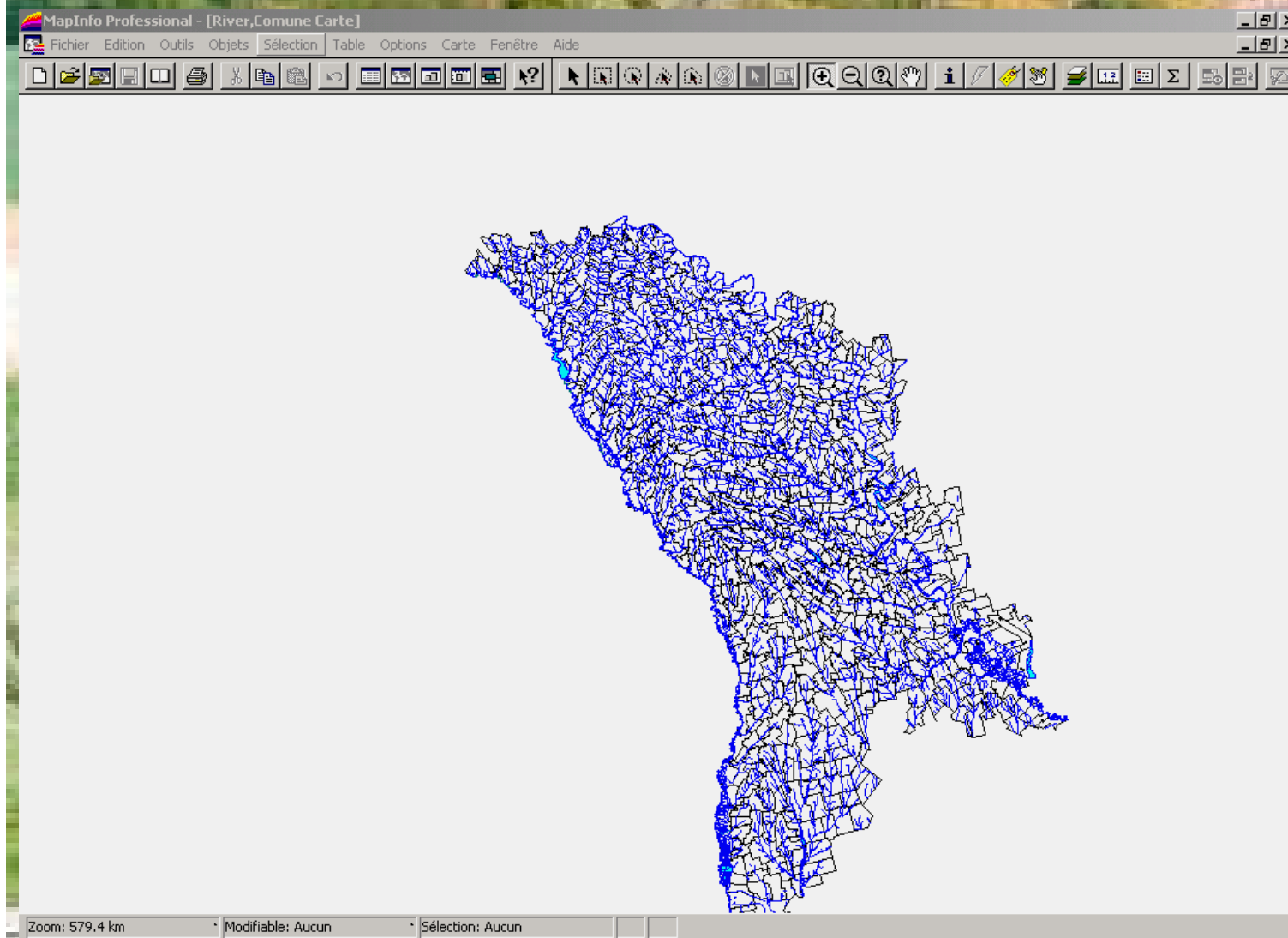
## Results obtained from the WQA study

- 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



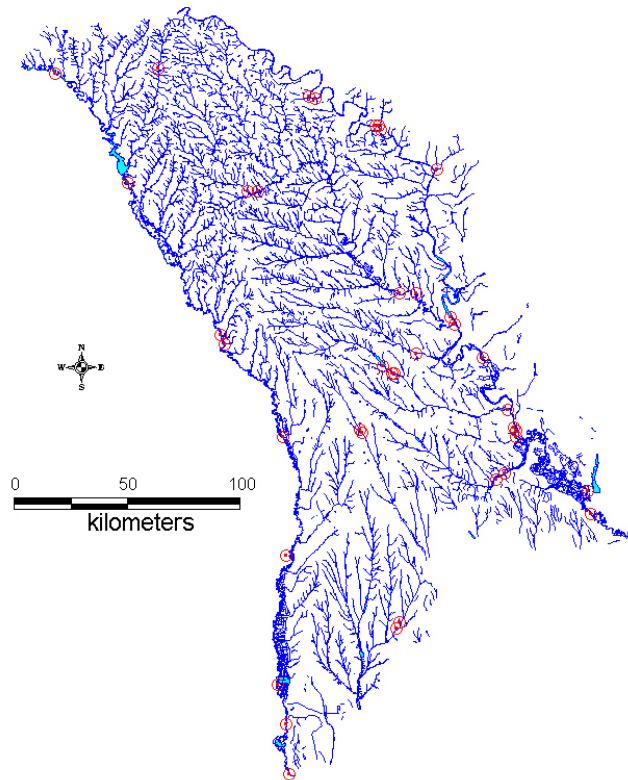
Jana TAFI and WDC team

# 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.SEPELIC		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

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# 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

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# Data treatment: monitoring to publication

The screenshot displays the Nopolu System2 V5.0 software interface, which is used for water quality data management. The main window is titled "Water quality data Republicii Moldova" and includes a map of Moldova and a description: "Database containing water quality data from Ministry of Ecology, Apele MOLDOVA & Ministry of Health".

The interface is divided into several sections:

- Water quality data Republicii Moldova:** Includes a map and a description of the database.
- Water quality data center APELE MOLDOVA:** A large blue banner with the text "WATER DATA CENTER APELE MOLDOVA".
- Data management:** A section titled "NOPOLU System 2 Environmental Water Basin Management System" with a "DATA MANAGEMENT" header. It includes a "Choose database" button and a "menu" button.
- Water quality station details:** A form for "Water quality station" with fields for "Code / name" (0906802 - r.Botna - t.Causeni), "Watershed" (BAD00), "City" (2701000), "Organism" (Hydrometeo), "Place" (0,2 km vn aval), "River" (Botna), and "Period" (from 01/01/1999 to 31/12/2001).
- Multi-parameters yearbook:** A table showing water quality data for various parameters over time. The table has columns for "Date/time", "Num", "Name", "Code", "Value", "Unit", and "Comment".

The "Multi-parameters yearbook" table shows data for the year 1999, with columns for "jan", "febr", "mars", "avril", "mai", "iun", "iul", "aug", "sept", "oct", "nov", and "dec". The table lists various parameters such as "NO3", "NH4+", "pH", "MES", "RSD", "COD", "BOD", "DCC", "HCO3-", "SiO3-", "NO2-", "NO3-", "SiO3-", "CO2", "Durete", "P total", "Mg", "Ca", "Na", "Pb", and "Zn".

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	<Tous>	Azote oxydé
1041	N.O	Micro-Orig. reviv. à 37° C
1053	M.Orig. 37°	Denbr. bact. direct tot.
1056	Denbr. Bac	Enterovirus
1050	Enteroviru	Oeufs d'helminthe

**Multi-parameters temporal analysis**  
Station: r.Prut\_town Cahul QIUAL  
Period from the 01/01/1999 to the 31/12/2001

Graph showing NO2 (mg/l) over time from 01/01/1999 to 31/12/2001.

**Water quality station**  
Code / name: 0906802 - r.Botna - l.Causheni  
Type: 2701000  
City: 2701000  
Place: 0,2 km vn aval  
River: Botna  
Watershed: BAD00  
Section: 0.1  
PK: 0.1  
Number of: 1947

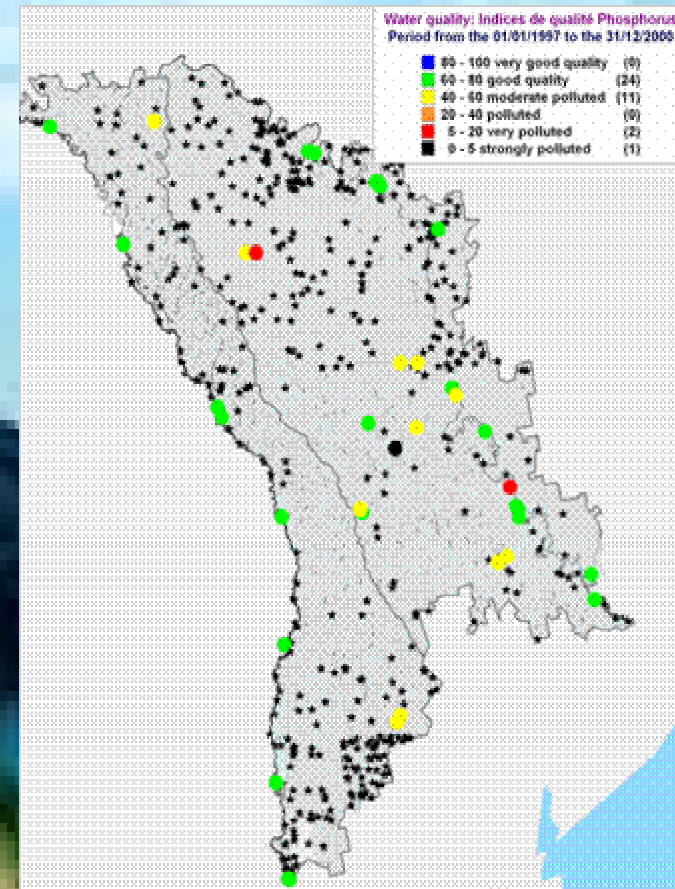
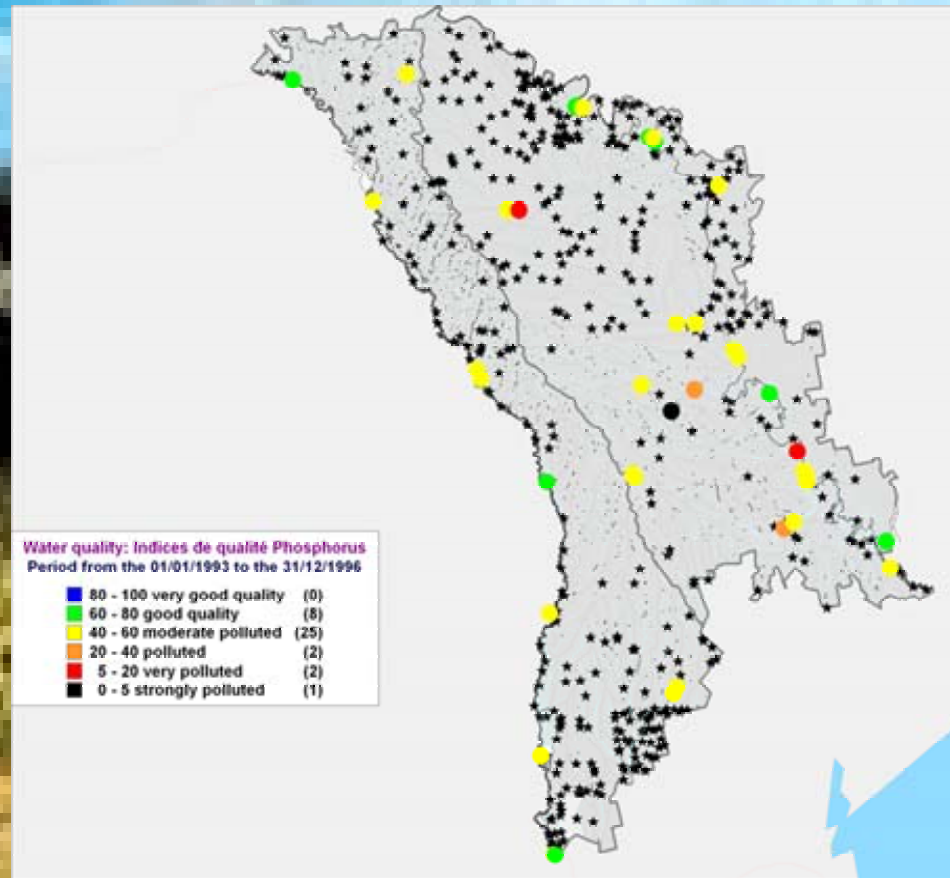
Period: Period from the 01/01/1999 to the 31/12/2001

Nature of parameter: (All)

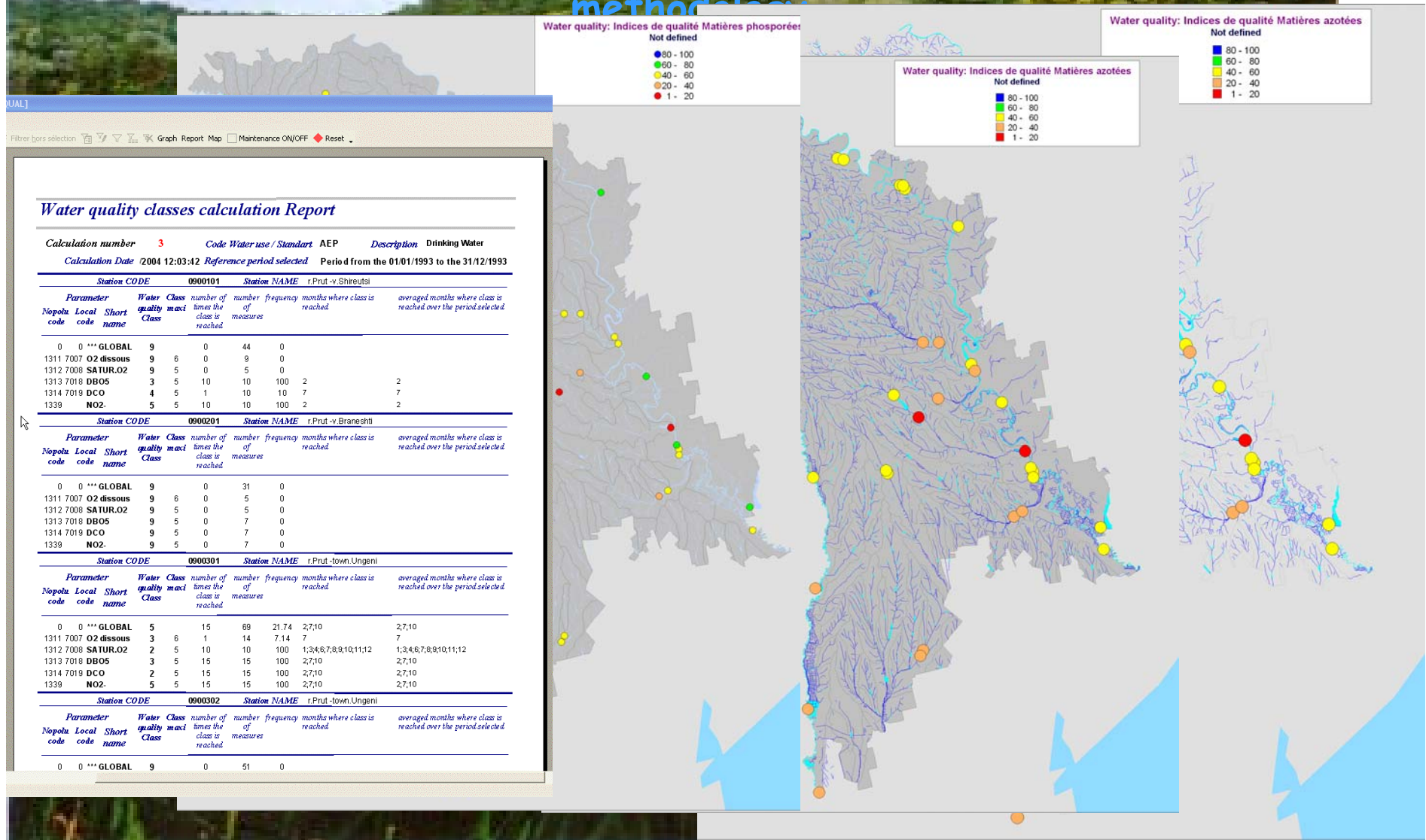
Date/time	Num	Name	Code	Value	Unit	Comment
23/02/1999	1038	Azote oxydé	N.O	12.100	mg/l	1
23/02/1999	1301	Température de l'Eau	Temp. eau	6.000	°C	1
23/02/1999	1302	Potentiel en Hydrogène (pH)	pH	8.030	Unité pH	1
23/02/1999	1305	Matières en suspension	MES	418.000	mg/l	1
23/02/1999	1307	Résidu sec à 105°C	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)	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



# 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

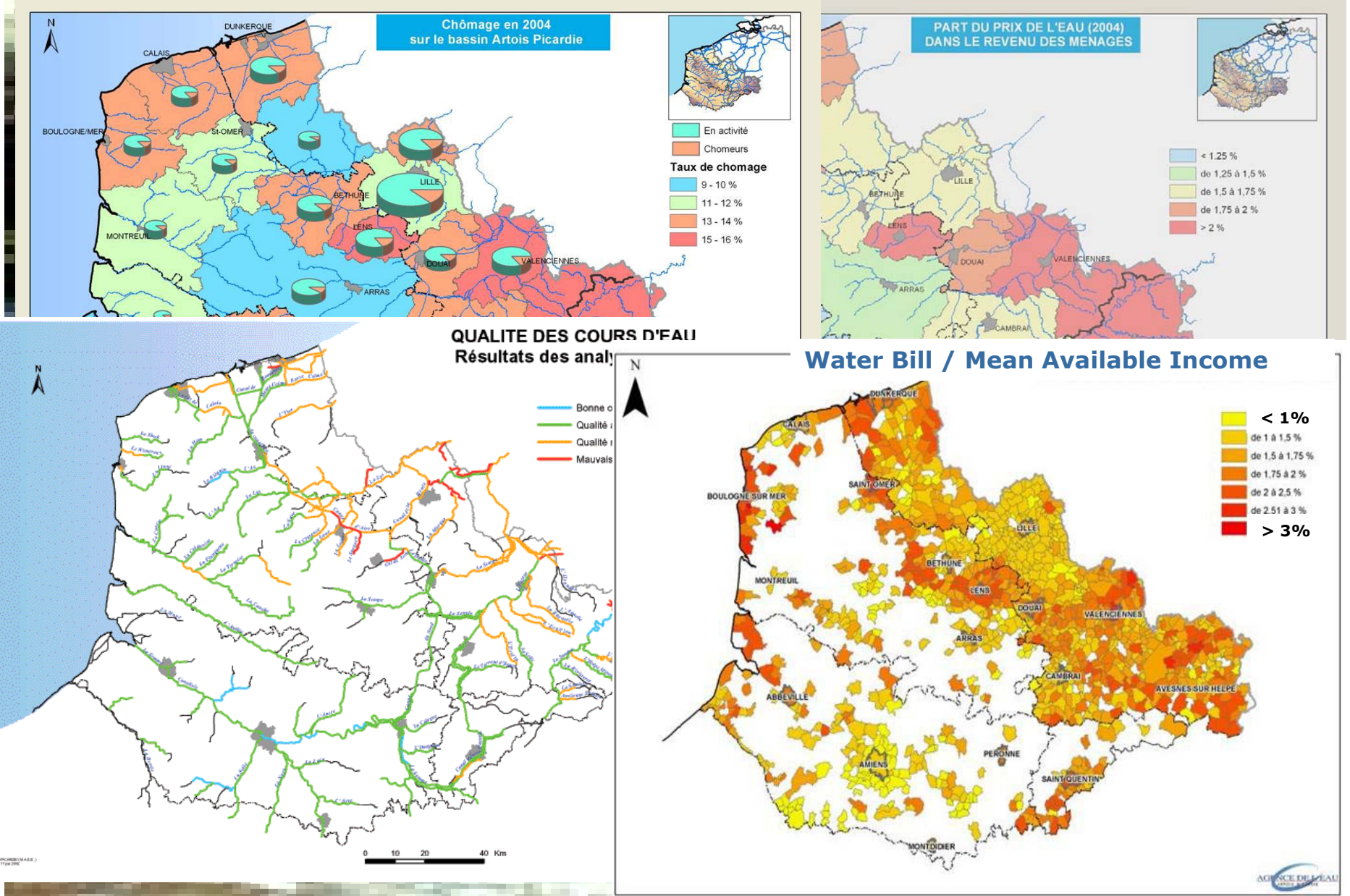
## Difficulties

- 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

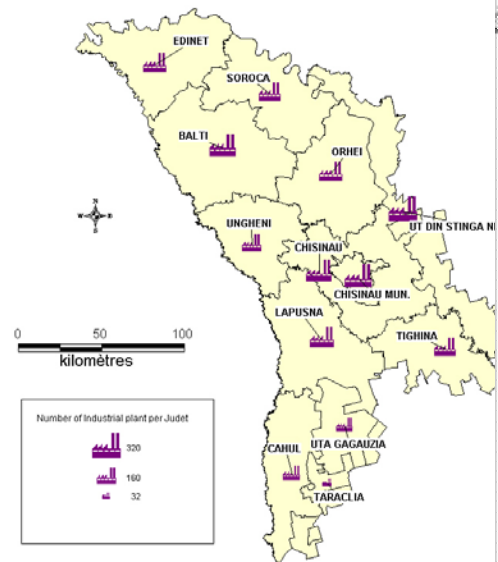
# → quality water in river



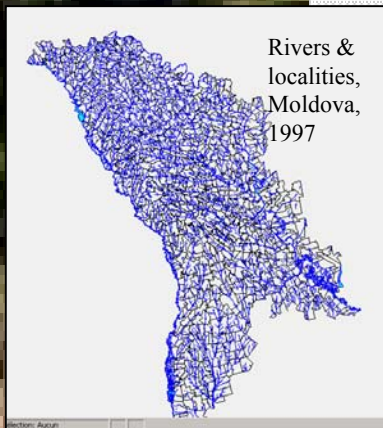


**WATER DATA CENTRE IN MOLDOVA**

**"Industrial" plants**

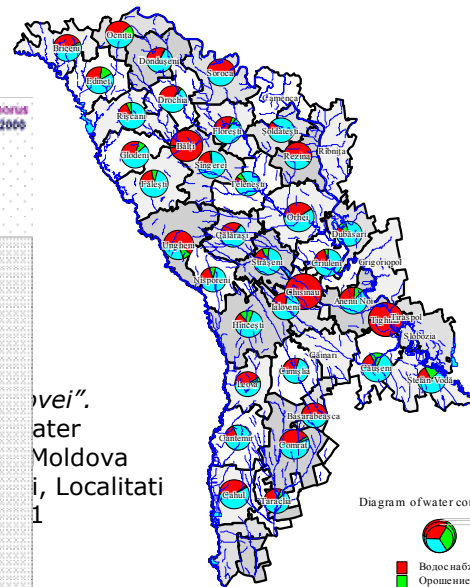


Supported by: IFEN and BETURE-CEREC

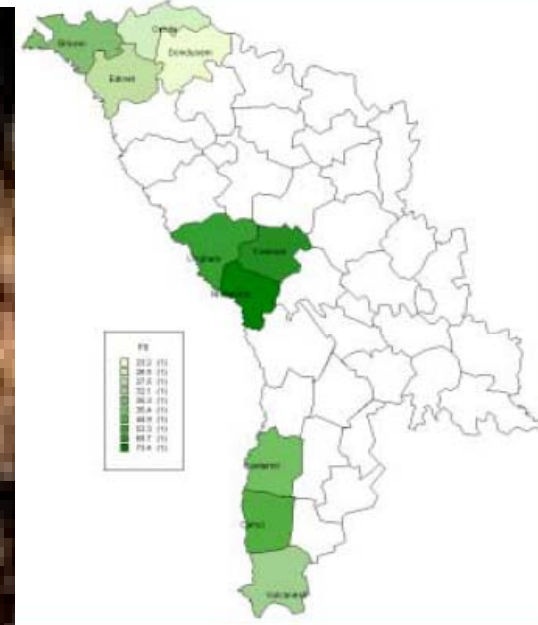


Rivers & localities, Moldova, 1997

**Water consumption, Moldova**



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**