ROMANIA

MINISTRY OF ENVIRONMENT
AND WATER MANAGEMENT

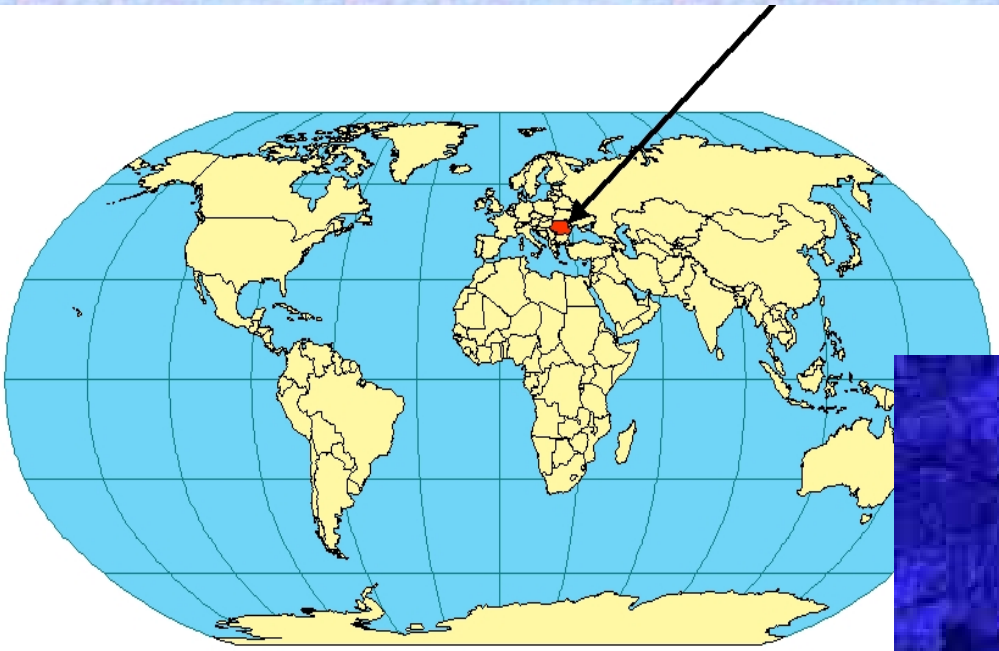
FLOOD MANAGEMENT IN ROMANIA

PRESENT AND FUTURE

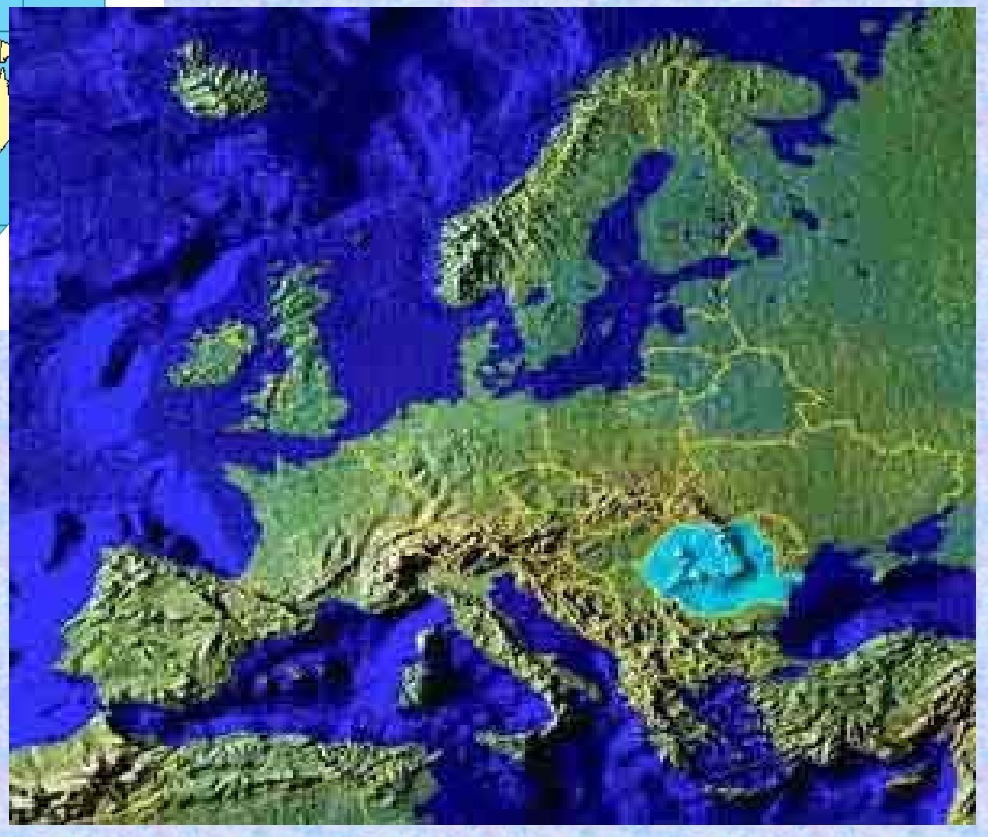
Lucia Ana VARGA – Secretary of State

Anemarie CIURA – Deputy Director

ROMANIA IN EUROPE AND IN THE WORLD



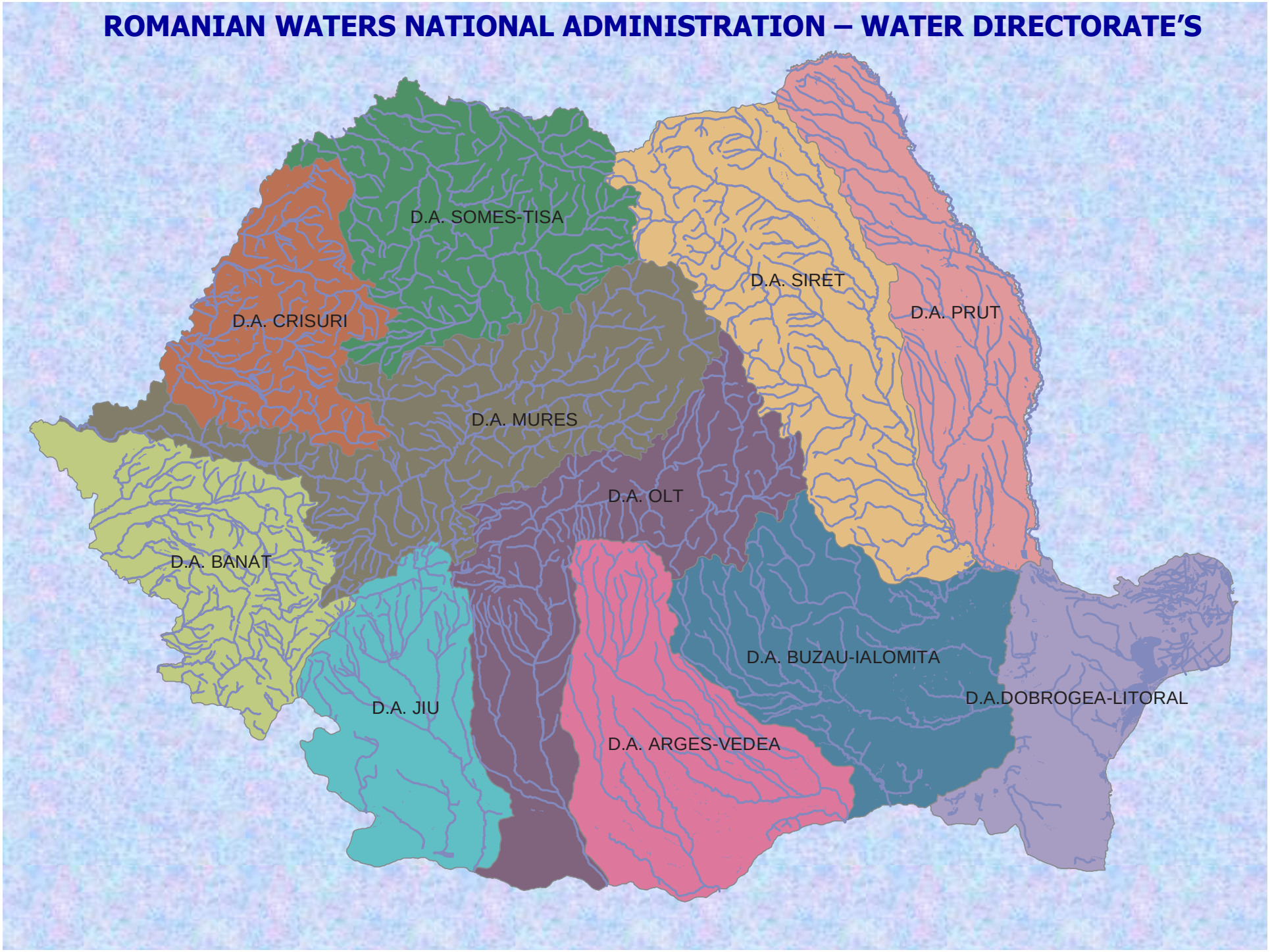
Area: 237 500 km²
Population 21 640 000 inh



97.8 % of the Romanian surface are included in the Danube River Basin

30% of the Danube River Basin is in Romania

ROMANIAN WATERS NATIONAL ADMINISTRATION – WATER DIRECTORATE'S



WATER MANAGEMENT EVOLUTION

XVIII-th Centuries - The necessity of flood defence measures had the results :

- hydrometric stations (first at Orsova in 1838)
- Structural measures: dikes and non permanent reservoirs have been built
- First mapping of flood defence structures

- 1924-1974 QUANTITATIVE WATER MANAGEMENT

- have been built the reservoirs with complex role, including the flood mitigation-
- 1924 First Water Law – elements of hydrologic measurement, situation and river embankment
- 1925 – River basin organisation
- 1953 – First Government Decision for rational water use and for water quality protection

- 1974-2000 QUALITY AND QUANTITATIVE WATER MANAGEMENT

- Development of the hydraulic structures
- 1976- first national program for arrangement of the river basins in Romania
- Preparation of the framework of hydraulic structures plans, for sustainable development and integrated of the water resources
- 1991 – Romanian Waters National Authority, with 11 river basin branches
- 1996 – New water law

- STARTED OF THE YEAR 2000-WATER MANAGEMENT FOR SUSTAINABLE DEVELOPMENT BASED ON EUROPEAN LAWS

WATER MANAGEMENT IN ROMANIA

***PRINCIPLES*:**

- water is a finite and vulnerable resource
- water management organized in each river basin
- integrate management for quality and quantity
- river basin solidarity
- polluter pays
- water create a economic value

***POLITICS*:**

- administration: conservation; rational using of water resources
- rehability and development of Water Management National System
- financial: implement the new economic mechanism
- institutional : implement the new structure of Romanian Waters National Administration
- implement of European Union Directives
- participation: Basin Committee

THE ACTUAL ORGANISATION OF THE WATER SECTOR IN ROMANIA

First level : Ministry for Environment and Water Management – the central authority in water sector;

Second level : National Administration "Apele Romane" – the implementing authority of water management policy;

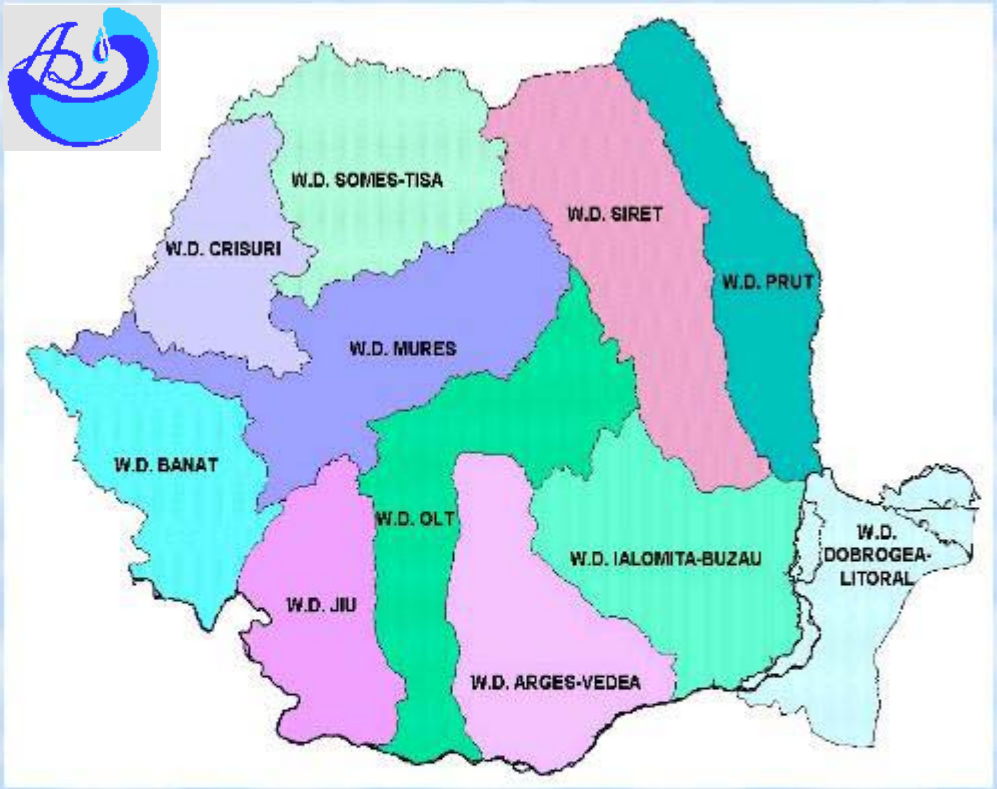
Third level : Local Authorities

MINISTRY FOR ENVIRONMENT AND WATER MANAGEMENT

WATER DEPARTMENTRESPONSABILITIES

- Elaborates the strategy and coordinates the development of the quantitative and qualitative water management
- Establishes at the national level, the strategy on meteorological, hydrological and hydro-geological activities and the system of information, forecast and warning of the dangerous meteorological phenomena
- Ensures the organization and control of the warning systems in case of accidental pollution in the inner waters courses and Danube or the accidents of the hydro-technical constructions
- Organizes and controls the general status of the waters courses, the evidence of the rights for the quantitative and qualitative usage of the waters and the national fund of water management data
- Is responsible for the implementation of the Directives related to water, including the Water Framework Directive 60/2000/ECC

"ROMANIAN WATERS" NATIONAL ADMINISTRATION

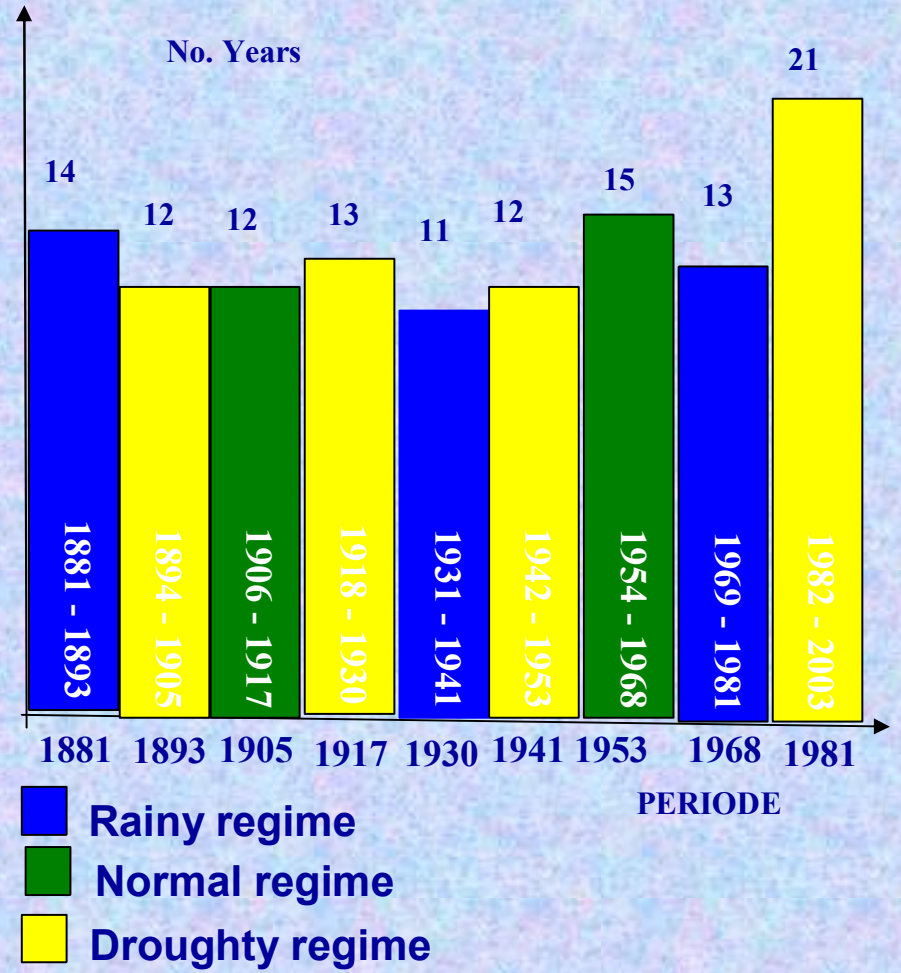


- The basic unit for river management in Romania is river basin. (since 1956).
- There are 11 river basins managed by the National Administration Romanian Waters through its units – Water Directorates.
- All the 11 Romanian River basins are directly or indirectly sub-basins of the Danube River

ACTIVITIES

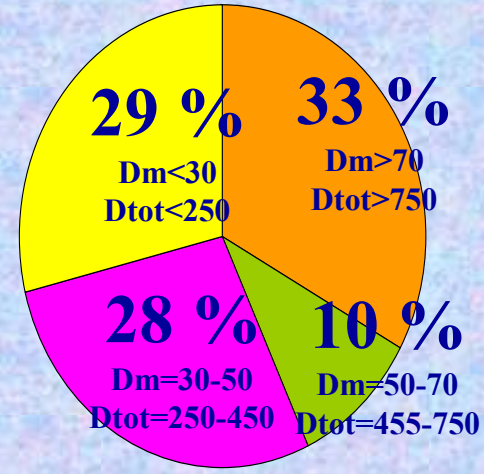
- River basin management
- Implementation of the EU Directives related to the water
- Water resources management
- Administration of national system hydraulics structures
- Water protection against pollution and over-use
- Flood control management
- Coordination of national investments in water resources field
- Turning to account of water resources
- **Application of international water agreements**

THE HIGH FLOODS CAUSES



- Very severe rains (100-200 l/sqm) which have fallen in a very short time on small areas;
- Island effect (concrete and glass) generated by urban areas, which transmit to the climate specific characteristics
- Civil indiscipline - various constructions in the river bed areas: houses, households, fences, saw-mills, waste deposits and materials deposits
- The reduction of the river bed capacity by embankments without reservoirs and wet zones realization
- Non-rational deforestation of a large fields, especially in the leakage forming zone

FLOODS VURNERABILITY IN ROMANIA
1992-2004



Dm – MEAN DAMAGES (mld. ROL);
Dtot- TOTAL DAMAGES (mld. ROLi)

COUNTY WITH HIGHEST VULNERABILITY DEGREE

COUNTY WITH HIGH VULNERABILITY DEGREE

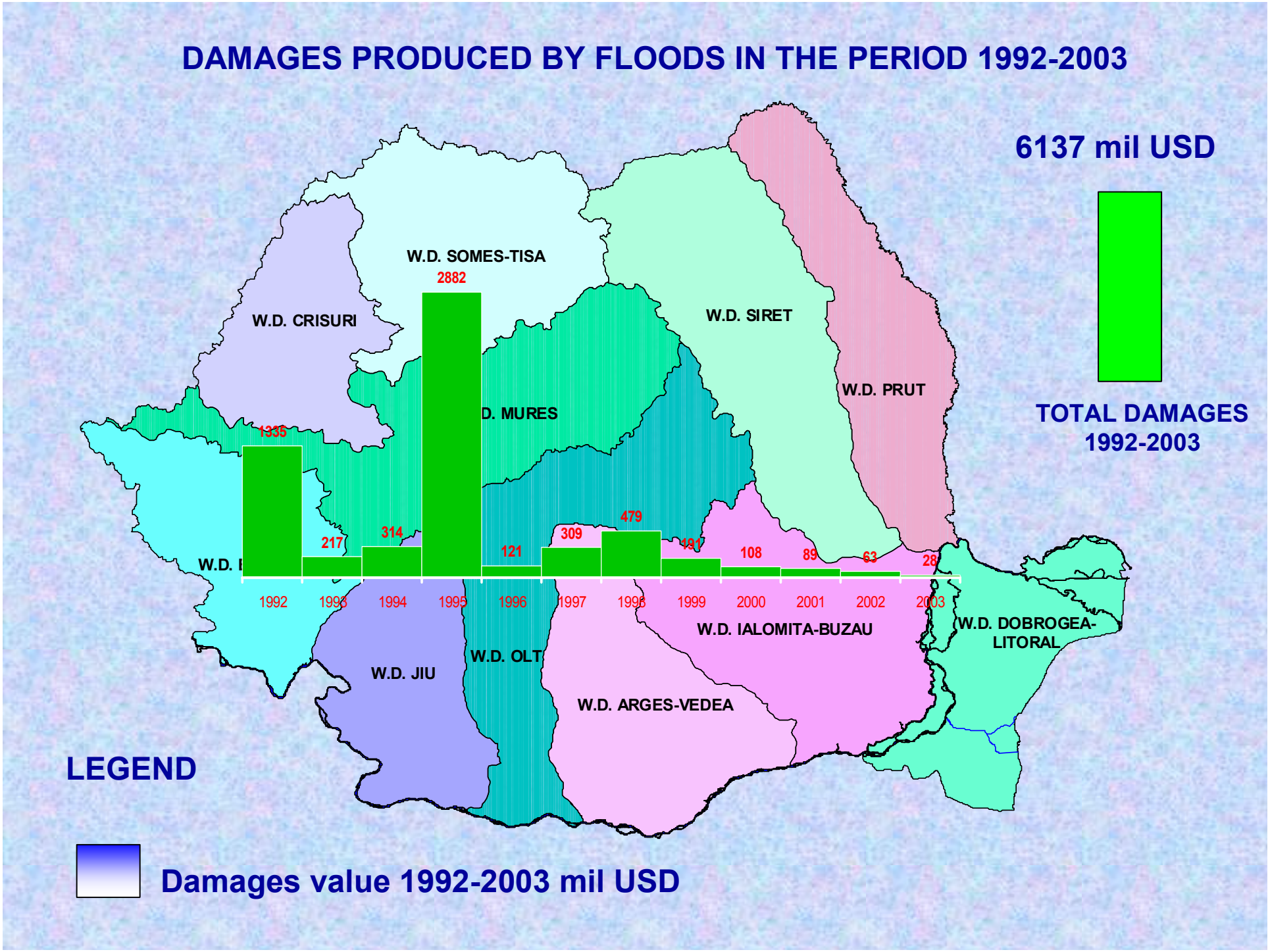
COUNTY WITH MEAN VULNERABILITY DEGREE

COUNTY WITH LOW VULNERABILITY DEGREE

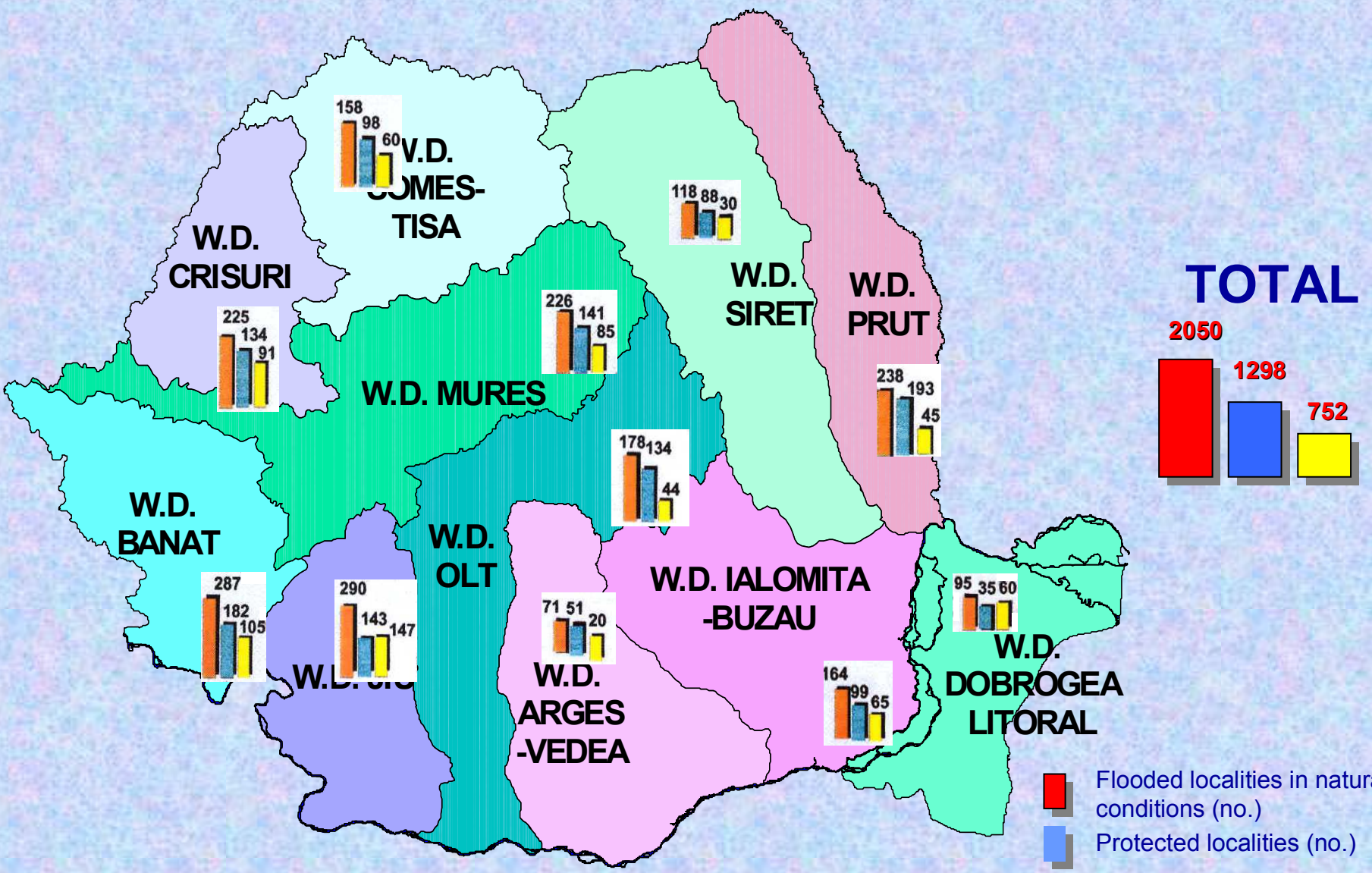
FLOOD DEFENCE INFRASTRUCTURE

- ⇨ **78905 KM WATERCOURSES**
- ⇨ **122 NATURAL LAKES**
- ⇨ **1420 WATER STORAGES WITH 14.2 BIL. CU.M. VOLUME**
- ⇨ **9365 KM DIKES FOR CITIES, VILLAGES, LANDS PROTECTION**
- ⇨ **6600 KM RIVER BAND STABILISATION WORKS**
- ⇨ **1100 KM CANALS**
- ⇨ **59 PUMPS STATIONS**

DAMAGES PRODUCED BY FLOODS IN THE PERIOD 1992-2003



Affected localities by floods

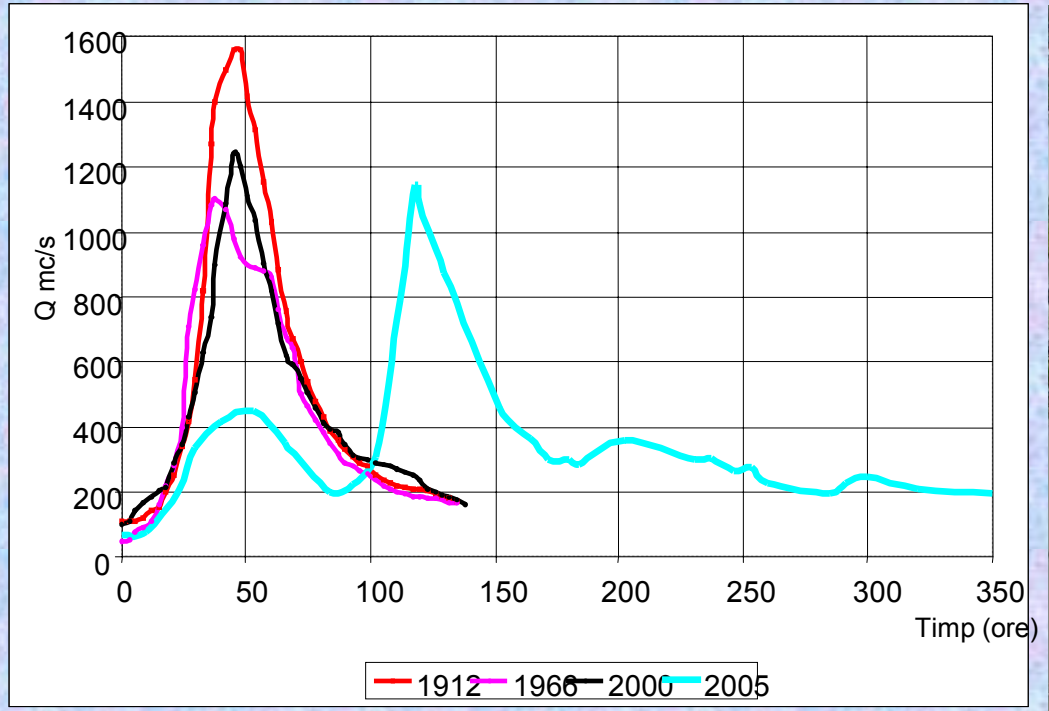


DEVELOPING WATER MANAGEMENT SYSTEM

INVESTMENTS PROGRAM for 2004: 56,5 Mil. Euro
Objectives under development : 170

- **142 – objectives for flood defense**
- **22 - objectives for water sources supply**
- **6 - objectives for environmental protection**

FLOODS IN ROMANIA IN 2005



DEATH – 4 peoples

DISTROYED
3300 km pipelines
830 houses

AFFECTED:
393 localities from 28 counties
5467 houses affected
26 schools
16 kindergarten
10 hospitals
159 187 hectars
1330 km roads

NEW CONCEPT FOR WATERCOURSES MANAGEMENT

1. MORE SPACE FOR WATER

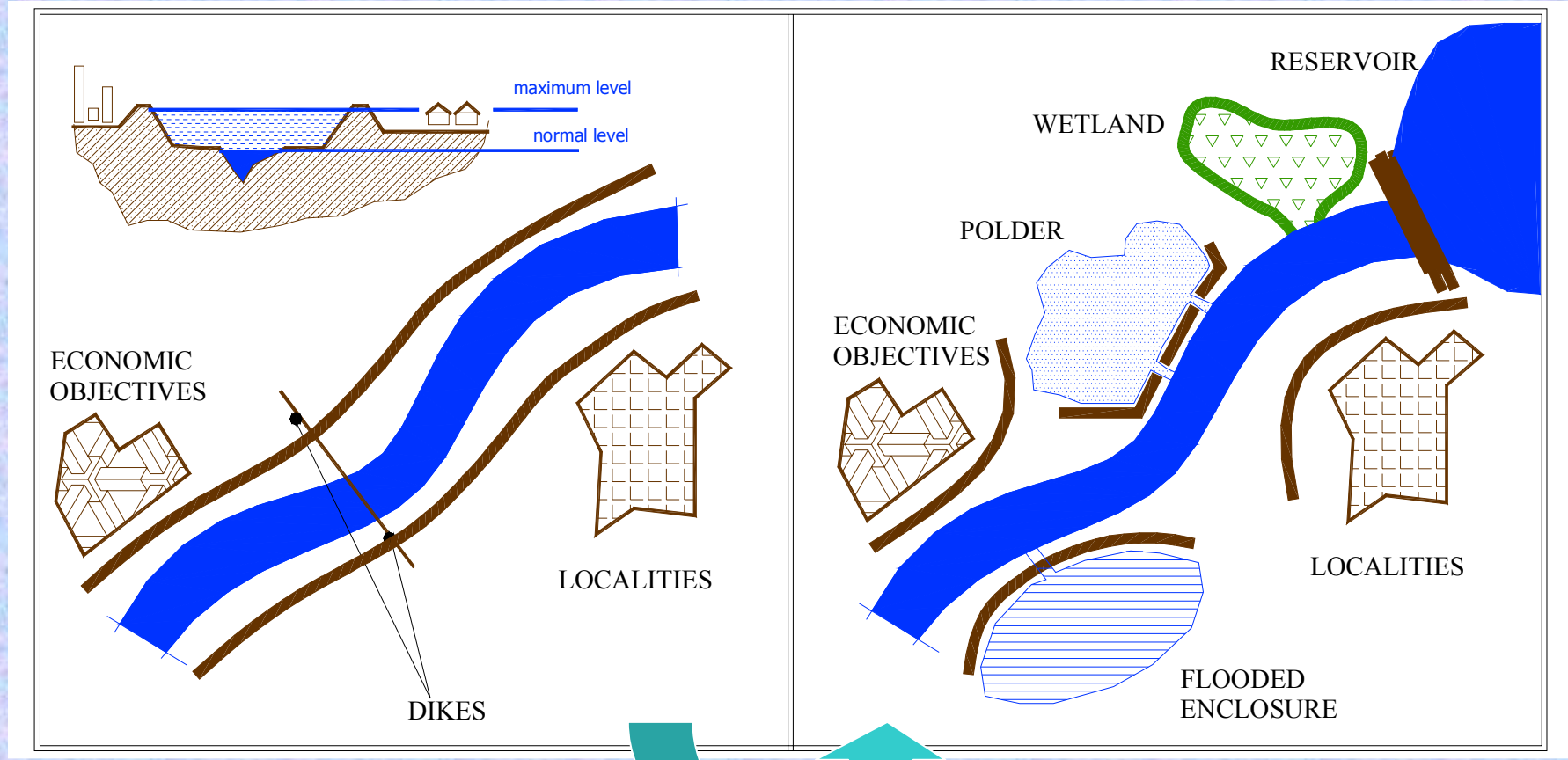
2. FLOOD MITIGATION USING:
   - -RESERVOIRS
   - -POLDERS
   - -FLOODED ENCLOSURE

3. LOCAL FLOOD DEFENCE WORKS FOR LOCALITIES AND AGRICULTURAL AREAS

4. REDUCING OF RIVER "KEEP ENCLOSURE" WORKS

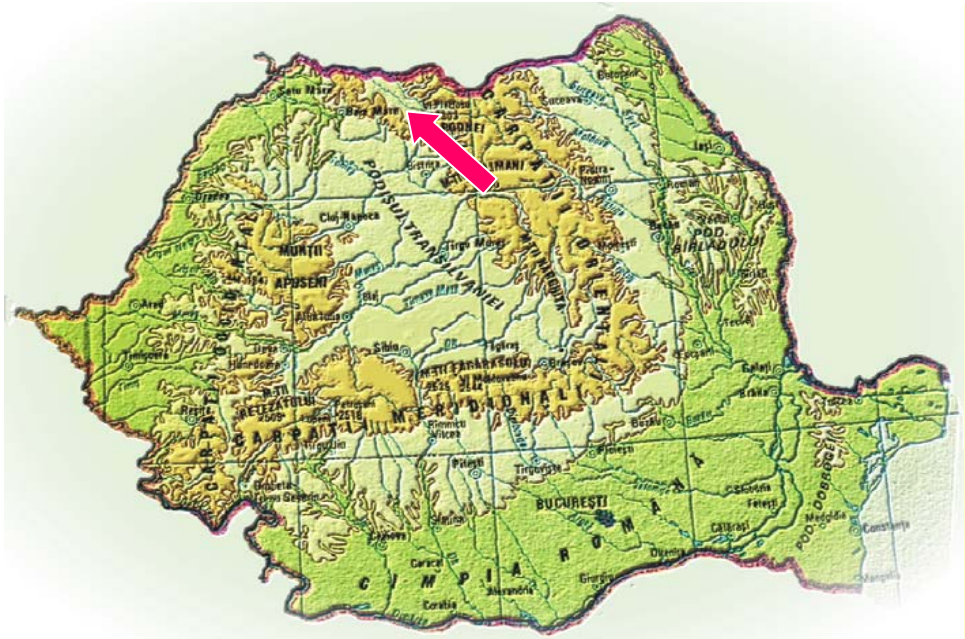
5. BIODIVERSITY PRESERVATION USING WETLANDS

NEW CONCEPT FOR WATERCOURSES MANAGEMENT

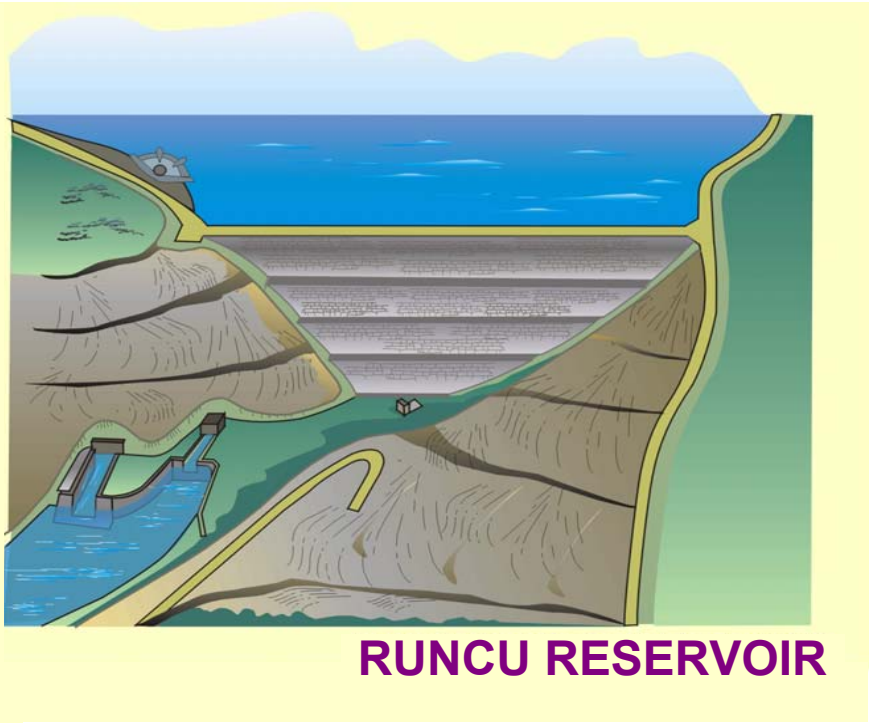


TODAY

TOMOROW



RUNCU RESERVOIR

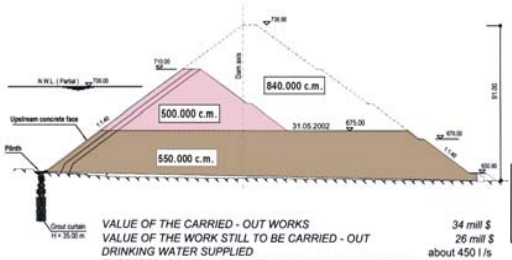


RUNCU RESERVOIR

RUNCU RESERVOIR ON THE MARA RIVER
Maramures County

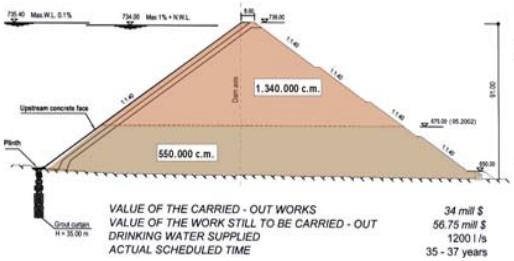
Water management scheme
General lay-out

RUNCU RESERVOIR
INTERMEDIATE ELEVATION PUT IN OPERATION



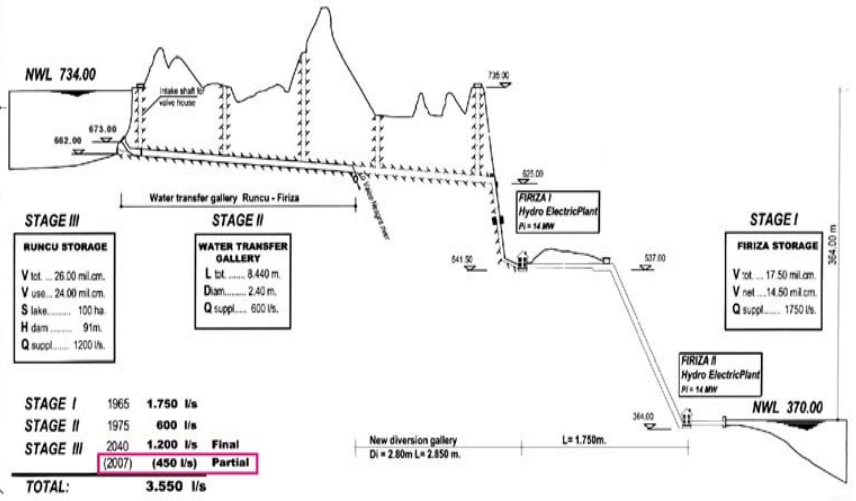
VALUE OF THE CARRIED - OUT WORKS	34 mill $
VALUE OF THE WORK STILL TO BE CARRIED - OUT	26 mill $
DRINKING WATER SUPPLIED	about 450 l /s
EXPECTED SCHEDULED TIME(with foreign investment funds)	about 5 years

RUNCU RESERVOIR
FINAL ELEVATION PUT IN OPERATION

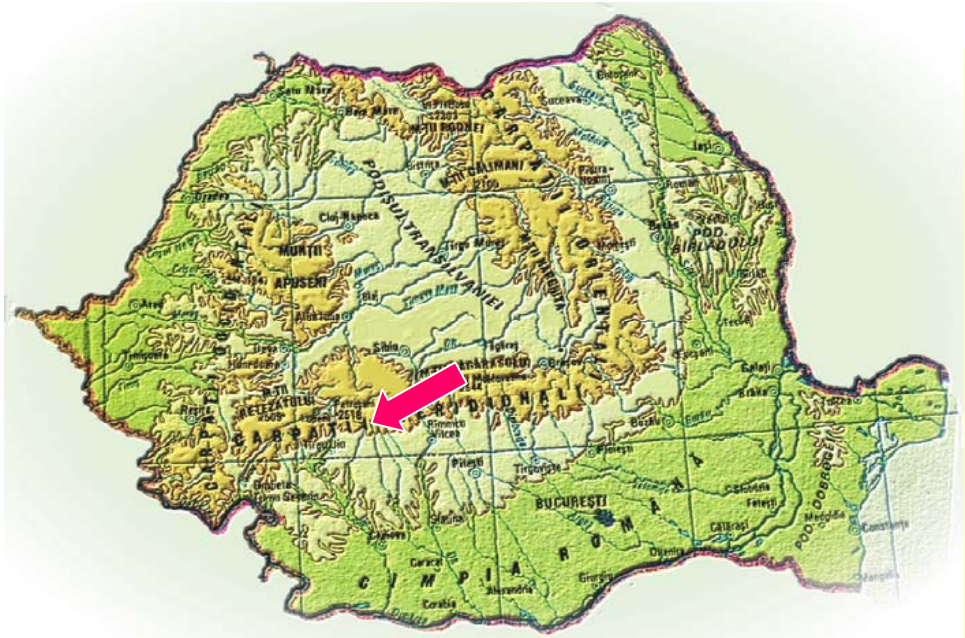


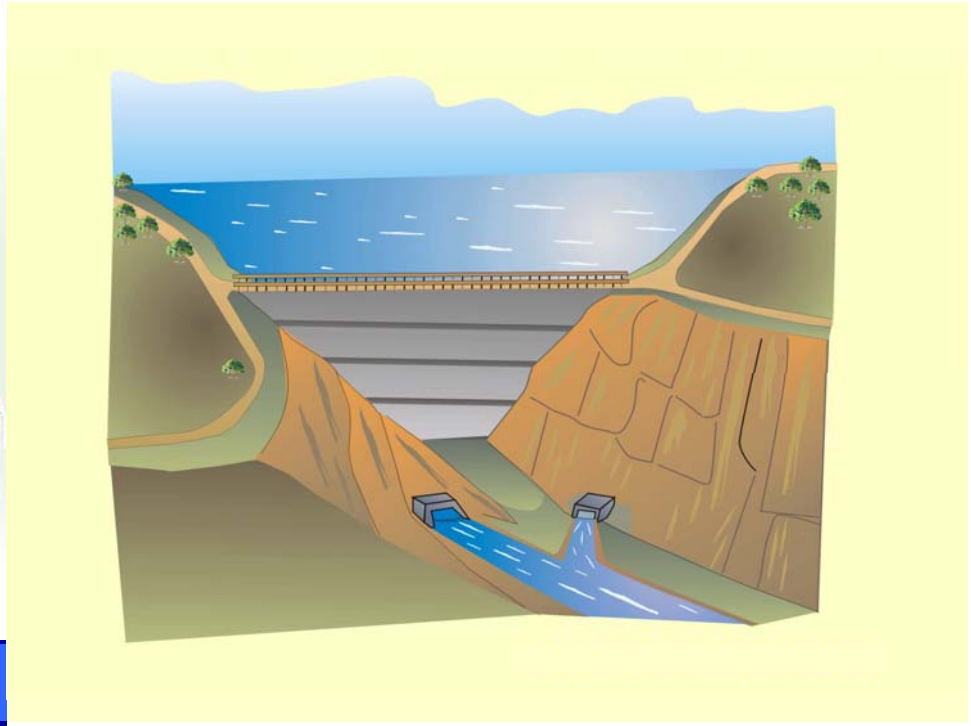
VALUE OF THE CARRIED - OUT WORKS	34 mill $
VALUE OF THE WORK STILL TO BE CARRIED - OUT	56.75 mill $
DRINKING WATER SUPPLIED	1200 l /s
ACTUAL SCHEDULED TIME	35 - 37 years

RUNCU - FIRIZA HYDROTEHNICAL SYSTEM
LONGITUDINAL PROFILE

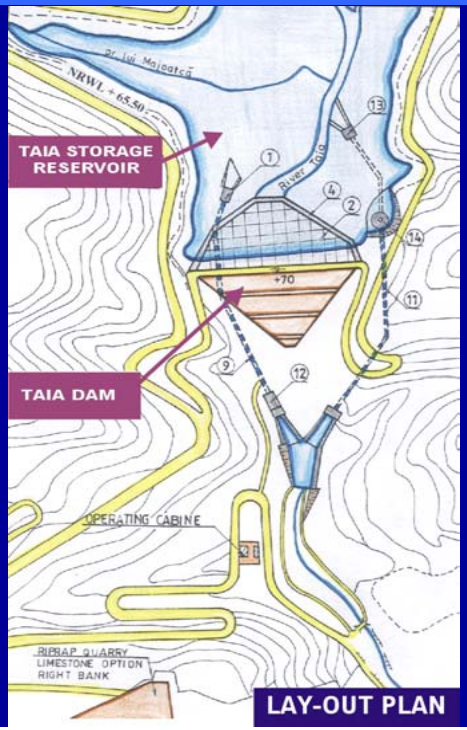


STAGE I	1965	1.750 l/s	
STAGE II	1975	600 l/s	
STAGE III	2040	1.200 l/s	Final
	(2007)	(450 l/s)	Partial
TOTAL:		3.550 l/s	

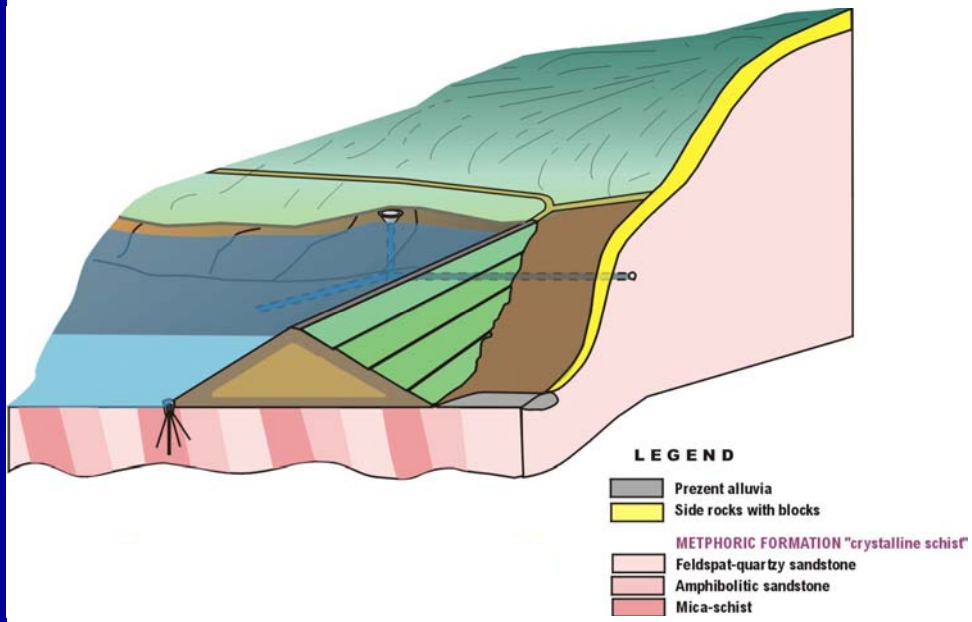


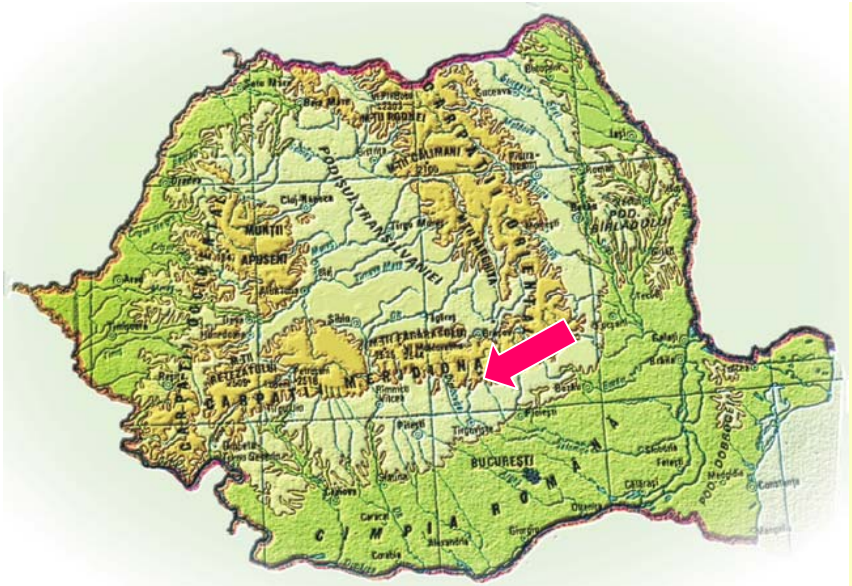


TAIA RESERVOIR

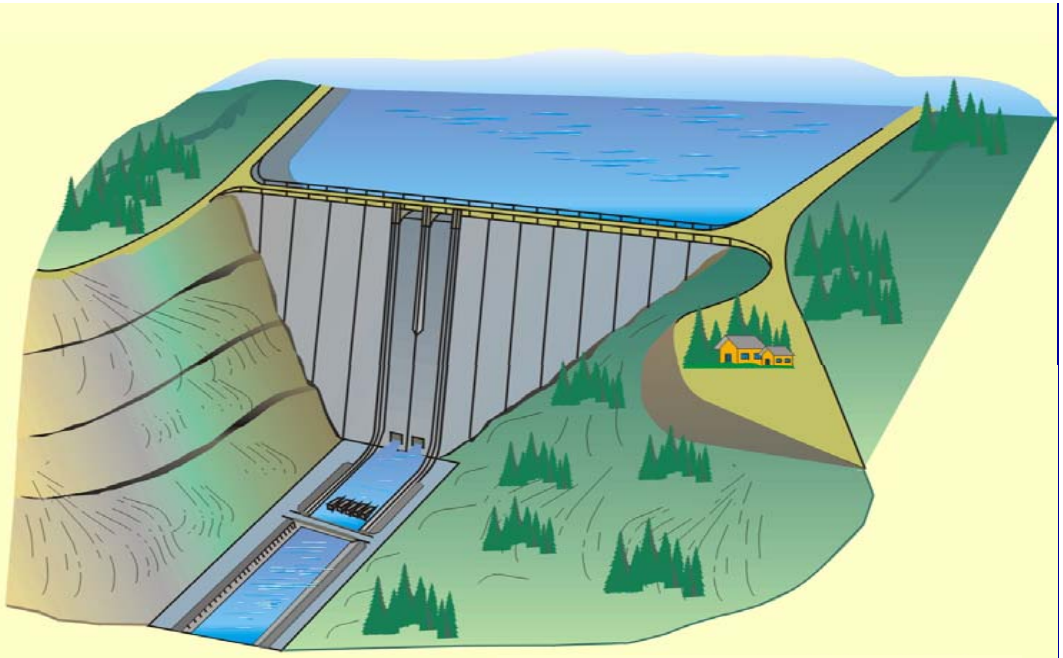


LAY-OUT PLAN

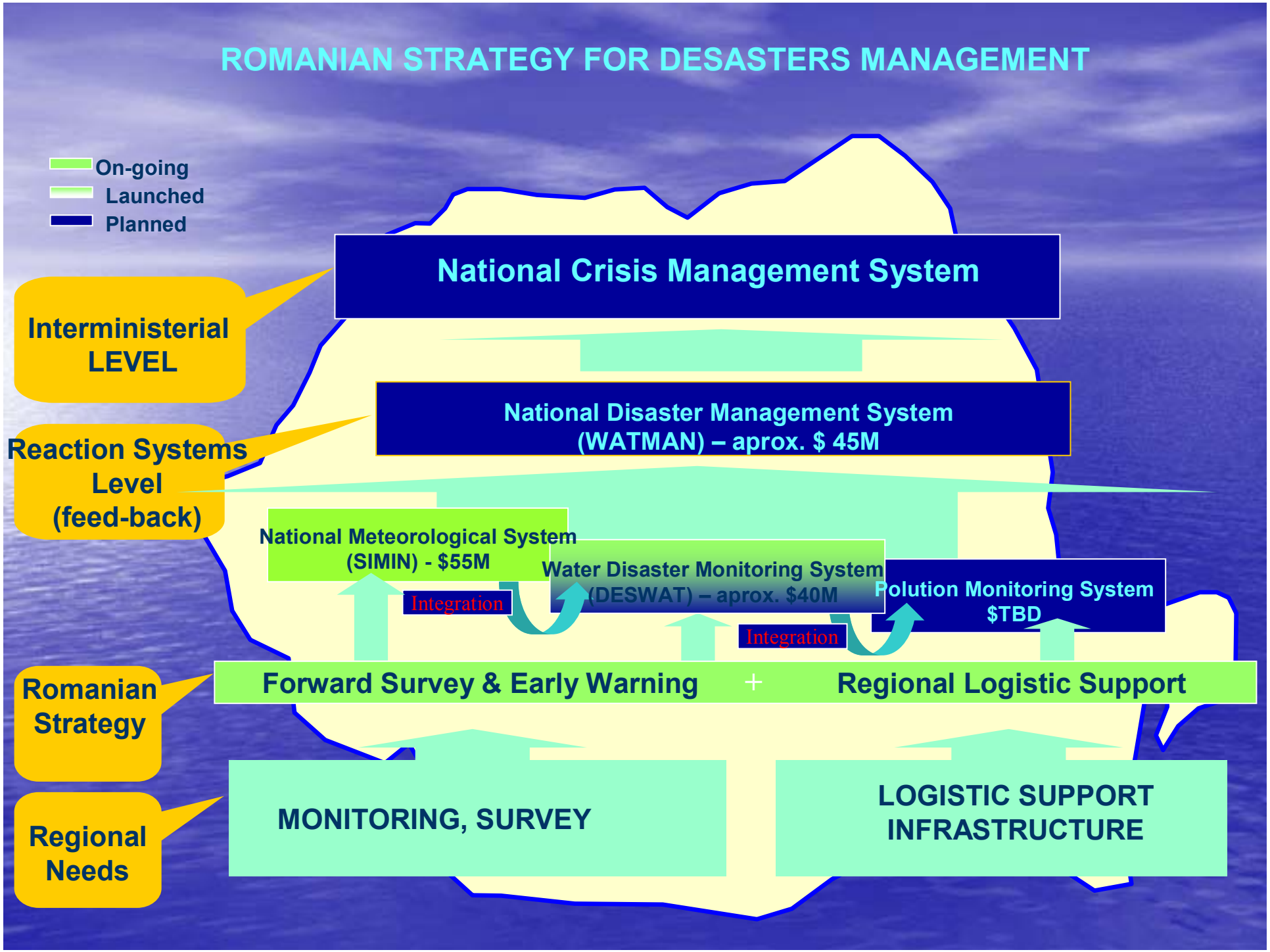




WATER SUPPLY OF THE AZUGA BREAZA ZONE



AZUGA RESERVOIR


ROMANIAN STRATEGY FOR DESASTERS MANAGEMENT
On-going
Launched
Planned
National Crisis Management System
Interministerial LEVEL
National Disaster Management System (WATMAN) – aprox. $ 45M
Reaction Systems Level (feed-back)
National Meteorological System (SIMIN) - $55M
Water Disaster Monitoring System (DESWAT) – aprox. $40M
Polution Monitoring System $TBD
Integration
Integration
Forward Survey & Early Warning + Regional Logistic Support
Romanian Strategy
MONITORING, SURVEY
LOGISTIC SUPPORT INFRASTRUCTURE
Regional Needs

NATIONAL PROJECTS

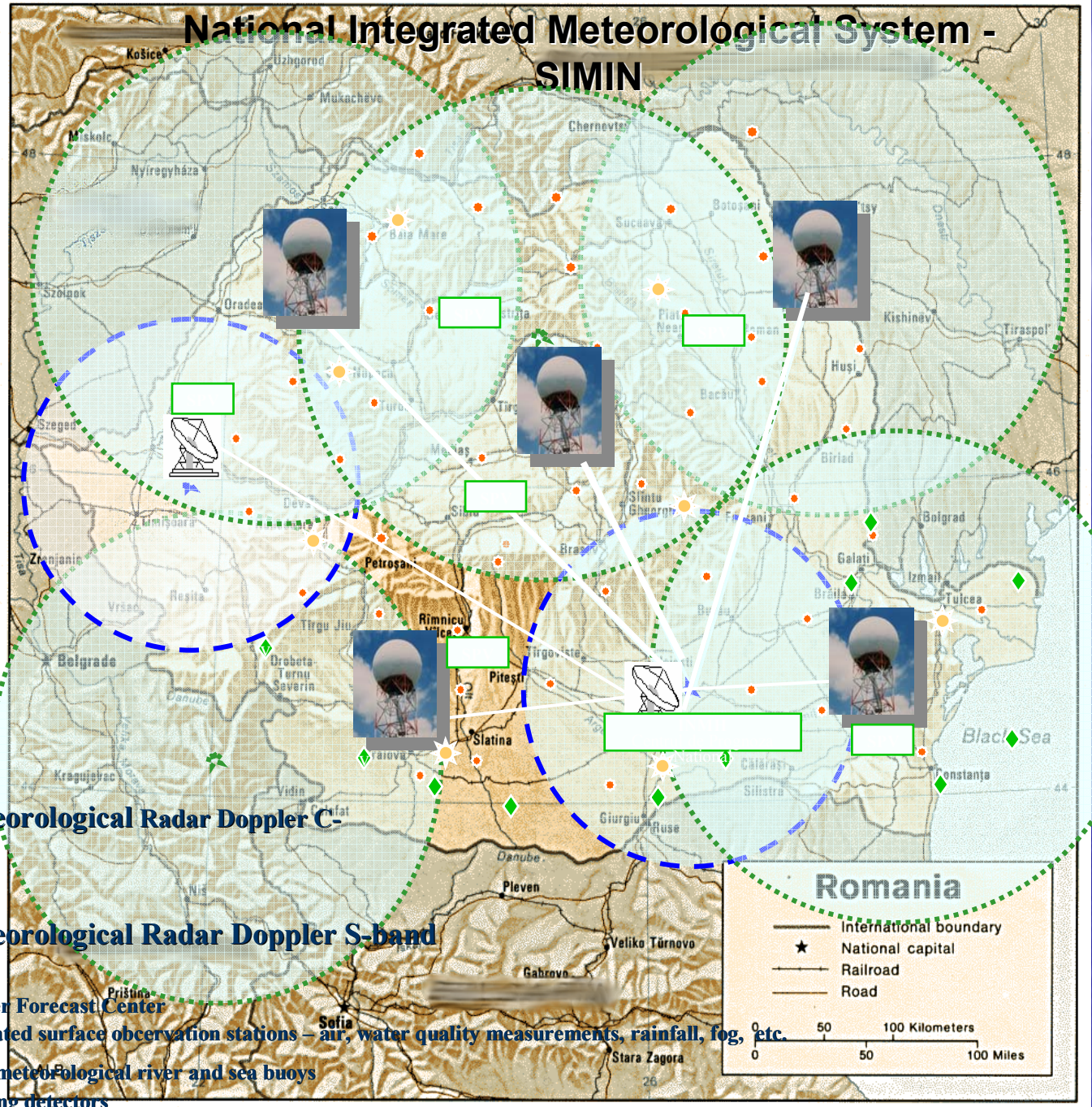
IN IMPLEMENTATION AND PERSPECTIVE

1. SIMIN PROJECT (Meteorological Integrated National System)
Stage: FINALIZED 2001÷2004

2. DESWAT PROJECT (Hydrological System for warning and forecasting)
Stage: - Feasibility Study 2002
- Implementation 2004÷2007

3. WATMAN PROJECT (Water Management Integrated System)
Stage: - Feasibility Study 2004
- Implementation 2005 ÷2008

National Integrated Meteorological System - SIMIN



Meteorological Radar Doppler C-band

Meteorological Radar Doppler S-band

Weather Forecast Center

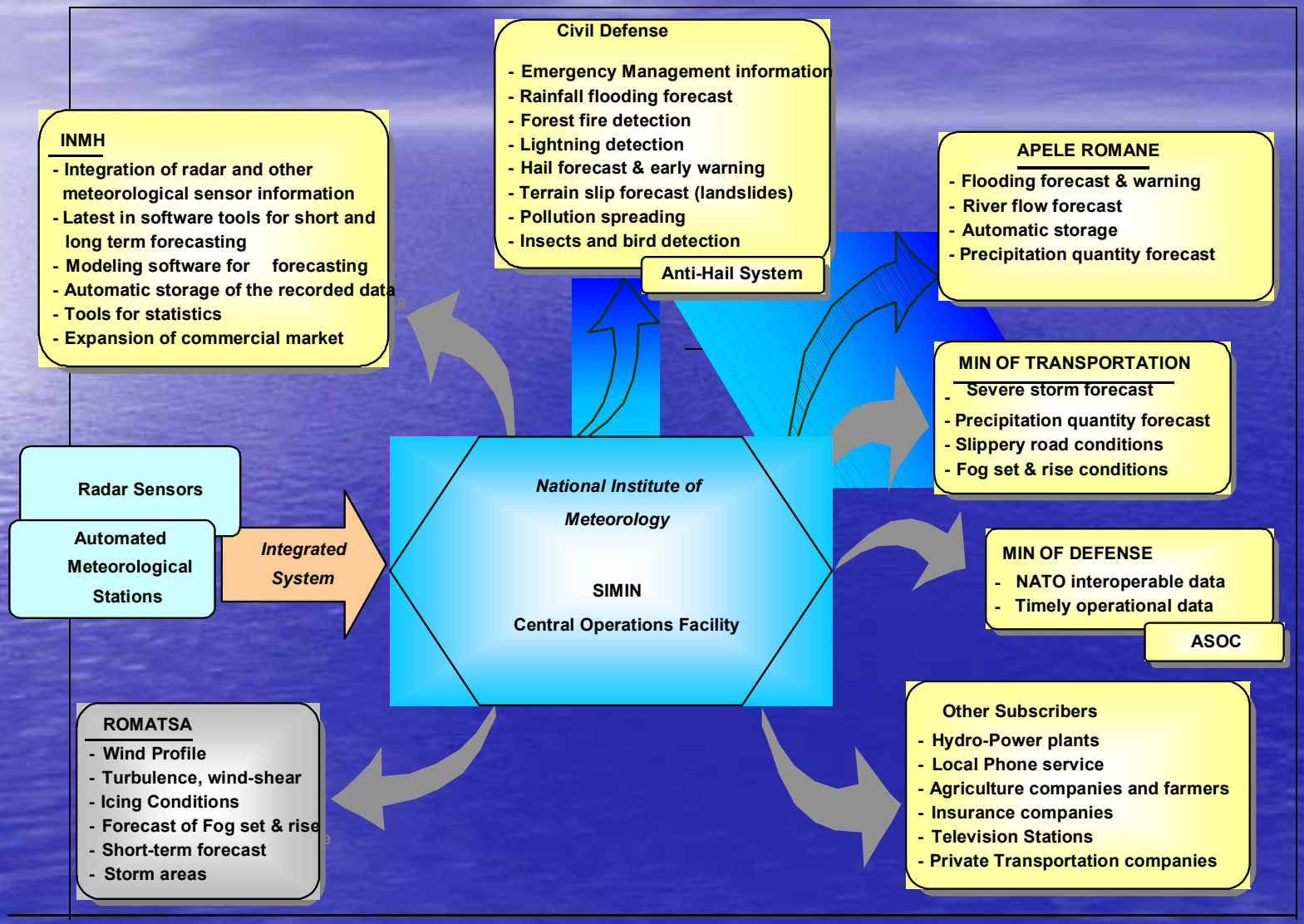
Automated surface obcervation stations – air, water quality measurements, rainfall, fog, etc.

Hydro-meteorological river and sea buoys

Lightning detectors

Base 505038 (547584) 8-82

END-USERS

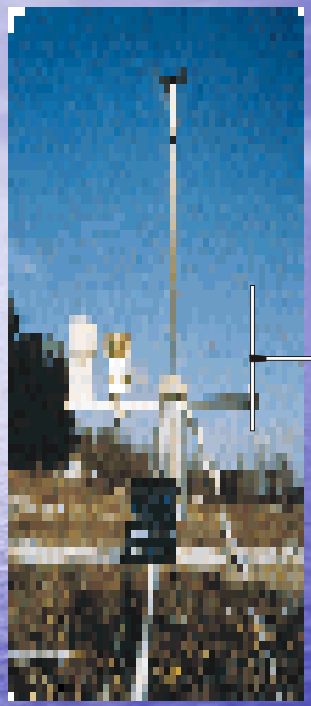

Civil Defense
- Emergency Management information
- Rainfall flooding forecast
- Forest fire detection
- Lightning detection
- Hail forecast & early warning
- Terrain slip forecast (landslides)
- Pollution spreading
- Insects and bird detection
Anti-Hail System
INMH
- Integration of radar and other meteorological sensor information
- Latest in software tools for short and long term forecasting
- Modeling software for forecasting
- Automatic storage of the recorded data
- Tools for statistics
- Expansion of commercial market
APELE ROMANE
- Flooding forecast & warning
- River flow forecast
- Automatic storage
- Precipitation quantity forecast
MIN OF TRANSPORTATION
- Severe storm forecast
- Precipitation quantity forecast
- Slippery road conditions
- Fog set & rise conditions
Radar Sensors
Automated Meteorological Stations
Integrated System
National Institute of Meteorology
SIMIN
Central Operations Facility
MIN OF DEFENSE
- NATO interoperable data
- Timely operational data
ASOC
ROMATSA
- Wind Profile
- Turbulence, wind-shear
- Icing Conditions
- Forecast of Fog set & rise
- Short-term forecast
- Storm areas
Other Subscribers
- Hydro-Power plants
- Local Phone service
- Agriculture companies and farmers
- Insurance companies
- Television Stations
- Private Transportation companies

SYSTEM CAPABILITY

PRECISELY INDICATES / ANTICIPATES TIME & PLACE:

1. FLOODING AND RAINFALL ACCUMULATION
2. DAMAGING WINDS
3. HAIL, ICING, SLIPPERY, FOG, LIGHTNING
4. AIR TURBULENCE (GUST FRONTS, SEA BREEZES/FRONTS)
5. TROPOSPHERIC WIND PROFILING
6. FORESTRY AND TECHNOLOGIC FIRES /EXPLOSIONS
7. BIRDS & INSECTS BEVIES
8. AIR POLLUTION SPREADING

AUTOMATICAL MEASURE POINTS



WEATHER AUTOMATICAL STATIONS (60)

LIGHTNING DETECTORS NETWORK (8 Sensors)

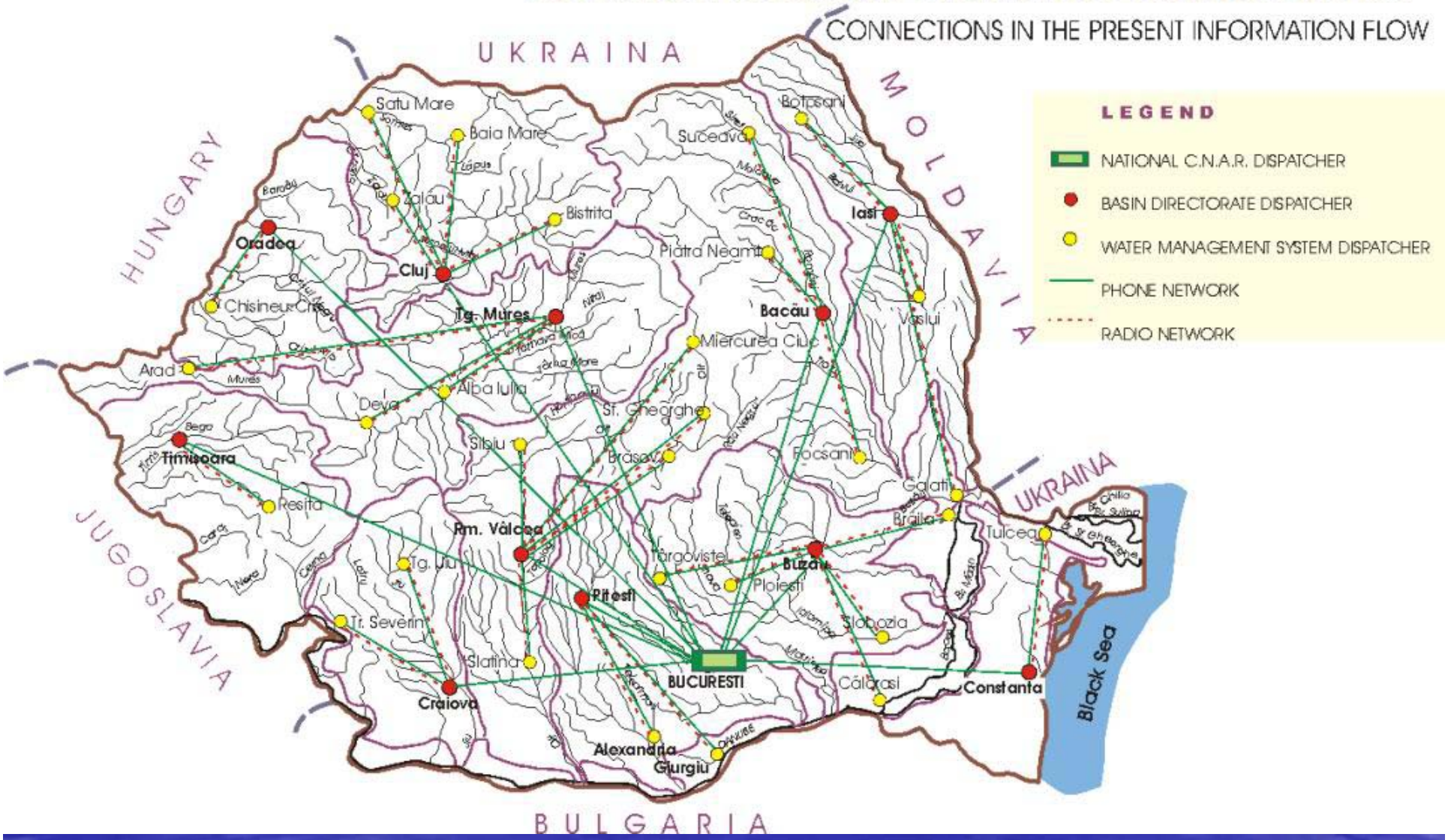
Hydro-meteorological river and sea buoys (8 River, 3 Sea)

DESWAT PROJECT OBJECTIVES

- MODERNIZATION OF HYDROLOGICAL PHENOMENA FORECAST SYSTEM.
- MODERNIZATION OF HYDROLOGICAL AND QUALITY MONITORING STATIONS
- INTEGRATION OF RECEPTION DATA FROM EXISTING SYSTEMS (STATIONS AND INTERNET) WITH NEW AUTOMATIC CONFIGURATION
- REALISATION COMMUNICATION NETWORK IN REAL TIME BETWEEN MEASURE POINTS, COLLECTING AND PROCESSING CENTERS AND USERS
- SUPPORTING DECISIONAL MAKERS WITH DATA AND INFORMATION IN REAL TIME
- FACILITING EXCHANGE OF HYDROLOGICAL DATA AT REGIONAL AND EUROPEAN LEVEL

Drawing 1

ORGANIZATION OF THE "APELE ROMÂNE" NATIONAL COMPANY ON HYDROGRAPHIC AREAS



DESWAT UPGRADE HYDROLOGICAL MONITORING STATIONS

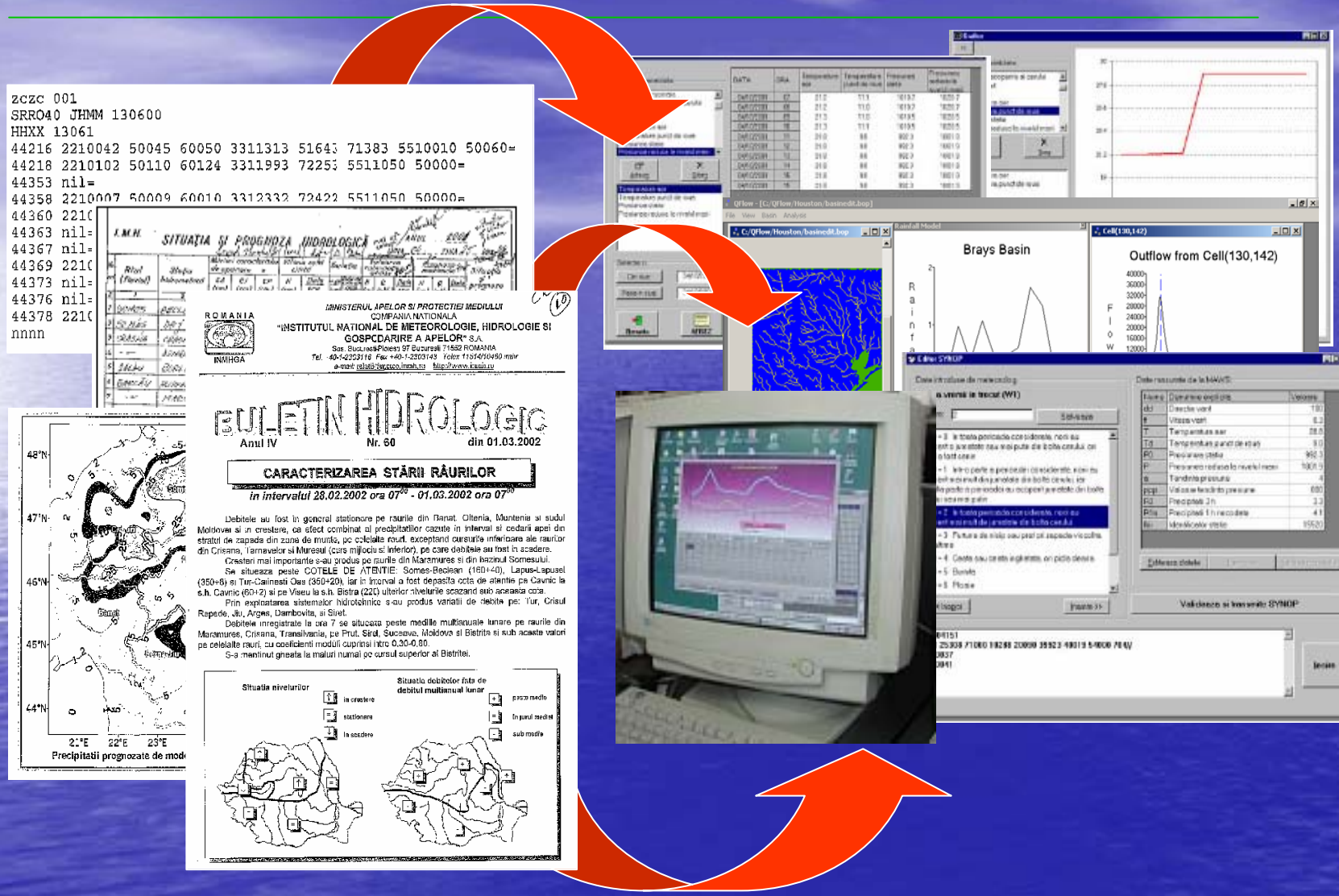
UPGRADE OR REPLACE EXISTING STRUCTURES
581 HYDROLOGICAL STATIONS
70 QAULITITY STATIONS
250 RAINGAGE STATIONS

DESWAT Upgrade Hydrometric sensors and data collection

Replace manual sensors with Automatic Hydrometric Stations

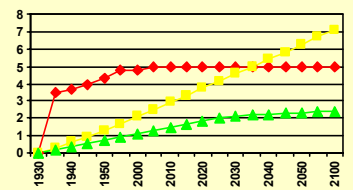
- Level sensors (float, pressure, radar, soil moisture)
- Water temperature sensors
- Precipitation sensors
- Environmental quality sensors (dissolved oxygen, conductivity, pH, redox, turbidity)
- Heavy metal ion (nitrates, phosphates, etc.)

DESWAT DEVELOPMENT HYDROLOGICAL DATA INTEGRATION SOFTWARE

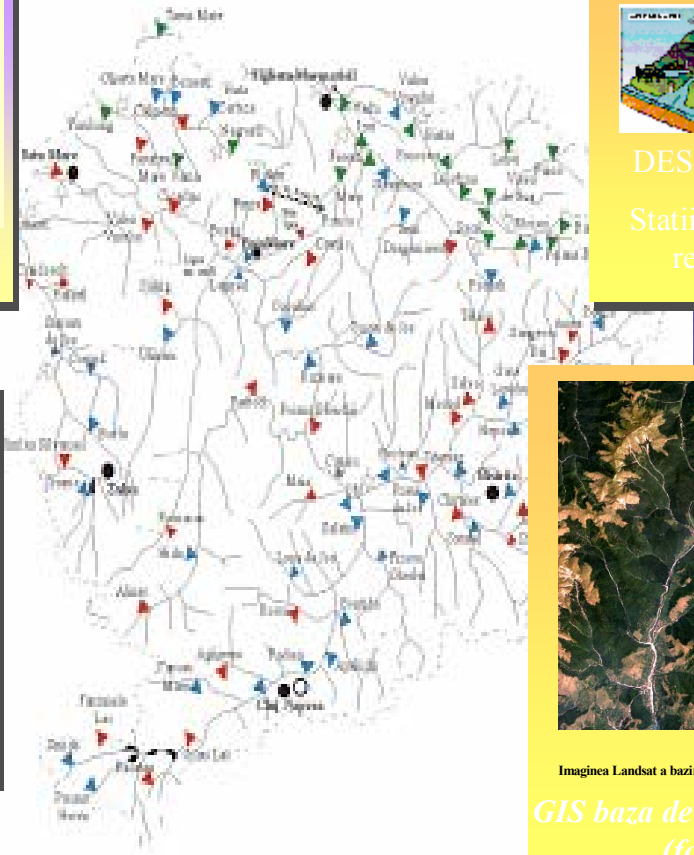


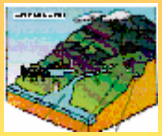
Enhance analysis and product generation capabilities. Passing from paper to digital format

IMPLEMENTATION STAGES

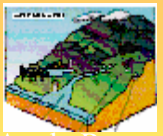


Modele Hidrologice



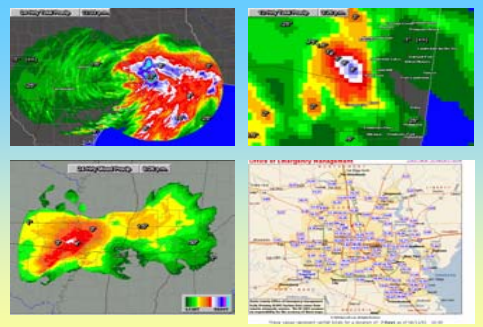


DESWAT

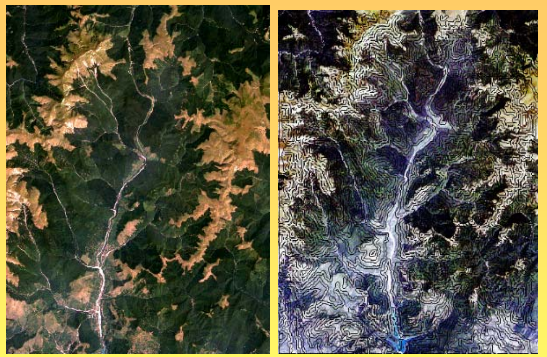


Apele Romane

Statii hidrologice automate si reteaua de comunicatii



SIMIN hydrological products

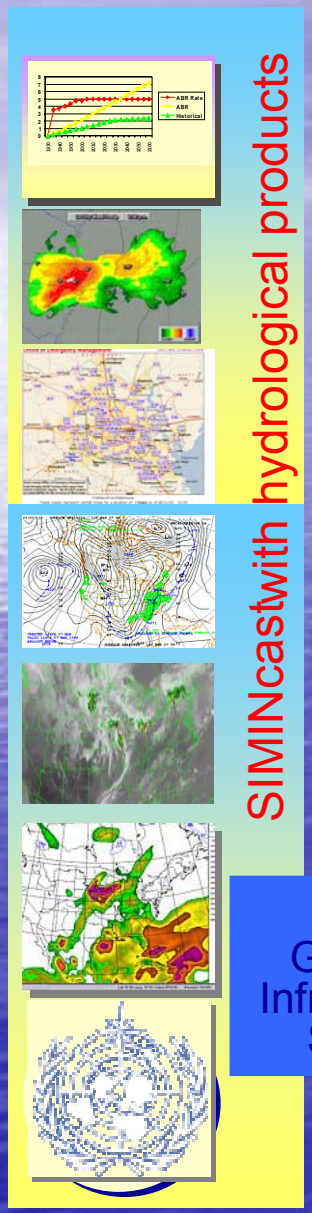


Imaginea Landsat a bazinului Dâmboviþa Harta topografică suprapusă imaginii

GIS baza de date pentru modele hidrologice (forecasting si hidraulic)

STAGE I- Pilot Project in Arges -Vedea Basin - 18 months
STAGE II - 6 BASINS- 36 MONTHS
STAGE III- 5 BASINS - 24 MONTHS

SIMIN – DESWAT Integration



APELE ROMANE
National Water Resource Management Center

VIPW server

OMNI-Hydro-Trac

SIMIN Forecaster workstation

Basin Dispatch Centers (Level 2)
Hydrological Service Centers

Apele Romane Communications Gateway

SAF-T-NET server

Data
GIS maps
Infrastructure
Sensors

COF Communications Gateway

National Hydrological Service Center

MWEP
National Management Center

WATMAN PROJECT END - USERS

- MINISTRY OF WATER AND ENVIROMENTAL PROTECTION;
- MINISTRY OF PUBLIC ADMINISTRATION
- “APELE ROMÂNE” NATIONAL ADMINISTRATION
- COUNTIES AND LOCAL ADMINISTRATION
- CIVIL PROTECTION

PROJECT PURPOSE :

1. INCREASING REACTION CAPACITY OF CENTRAL PUBLIC ADMINISTRATION IN CASE OF FLOODS , ACCIDENTAL POLLUTION, ACCIDENTS AT HYDROTECHNICAL WORKS
2. REALIZATION OF NEW MODERN INSTRUMENT FOR WATER MANAGEMENT IN TIME OF DRAUGHTS, FLOODS, ACCIDENTAL POLLUTION
3. REALIZATION OF NEW MODERN INSTRUMENT FOR DEMAGES EVALUATION DONE BY FLOODS , ACCIDENTAL POLLUTION, ACCIDENTS AT HYDROTECHNICAL WORKS
4. INTEGRATION HYDRO-METEOROLOGICAL DATA AND FORECASTS BY SIMIN AND DESWAT PROJECTS

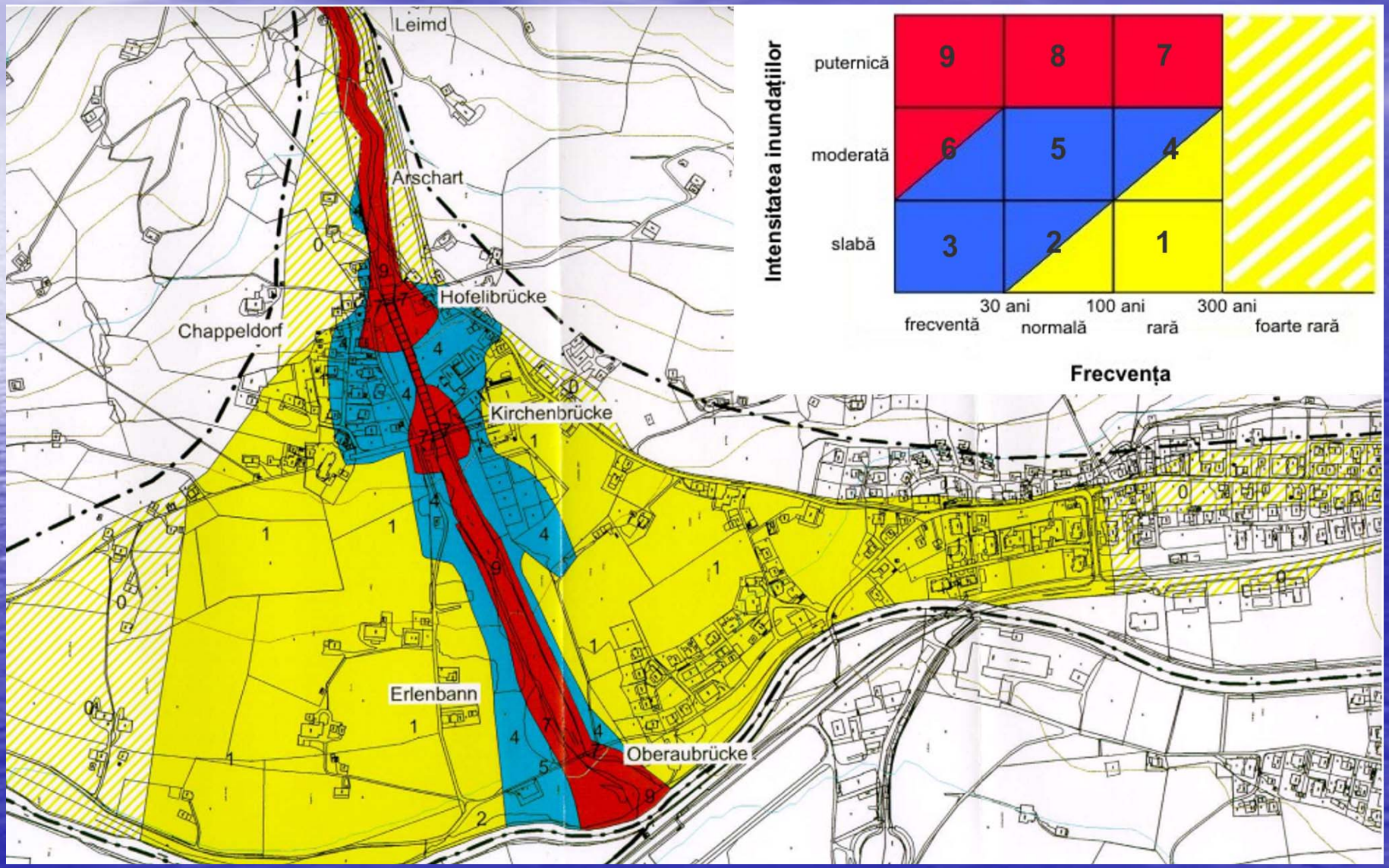
OBJECTIVES (1):

- BUILDING OF 11 BASIN CENTERS (ONE IN EACH RIVER BASIN) ENDOWED WITH SPECIAL EQUIPMENT FOR INTERVENTION IN CASE OF FLOODS AND ACCIDENTAL POLLUTION, ETC
- MODERNISATION OF ACTUAL INFORMATIONAL SYSTEM FROM WATER FIELD AND INTERCONNECTION WITH INFORMATIONAL SYSTEM OF CENTRAL AND LOCAL ADMINISTRATION
- REALIZATION OF FIXED INTERVENTION SECTIONS IN CASE OF ACCIDENTAL POLLUTION FOR MAIN RIVERS AND TRANSBOUNDARIES RIVERS
- REALIZATION OF INTERVENTION PLANS TO OPTIMIZE ACTIONS OF ALL ACTORS INVOLVED IN CASE OF FLOODS, DRAUGHTS, ACCIDENTAL POLLUTION, ETC

OBJECTIVES (2):

- ENDOWMENT WITH SOFTWARE FOR SETTING UP OF POTENTIAL AREAS TO BE AFFECTED BY FLOODS, ACCIDENTAL POLLUTIONS, ETC
- ENDOWMENT WITH SOFTWARE FOR ESTABLISHING AND ASSESSING OF DAMAGES PRODUCED BY FLOODS, ACCIDENTAL POLLUTIONS, ETC.
- ENDOWMENT WITH SOFTWARE FOR SETTING-UP OF ACTIONS PLANS IN CASE OF SPECIAL PHENOMENA

FLOOD RISK MAP



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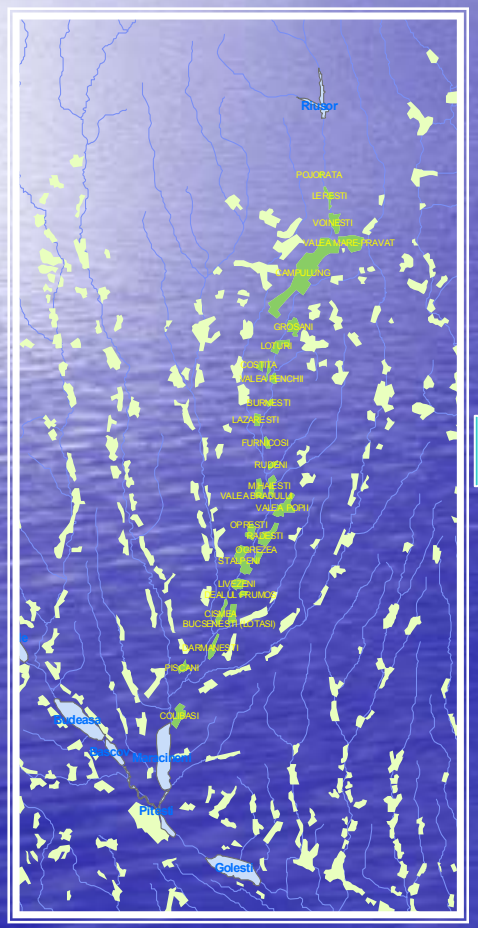
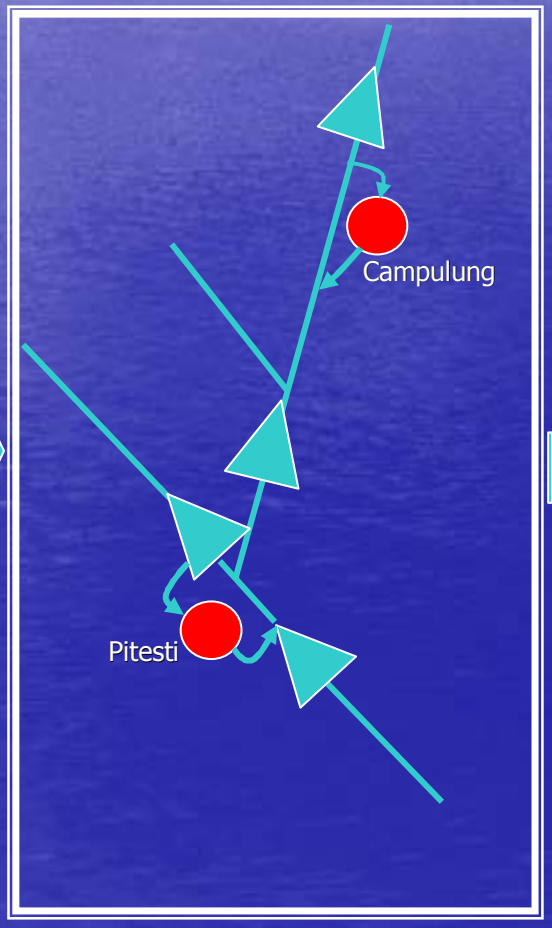
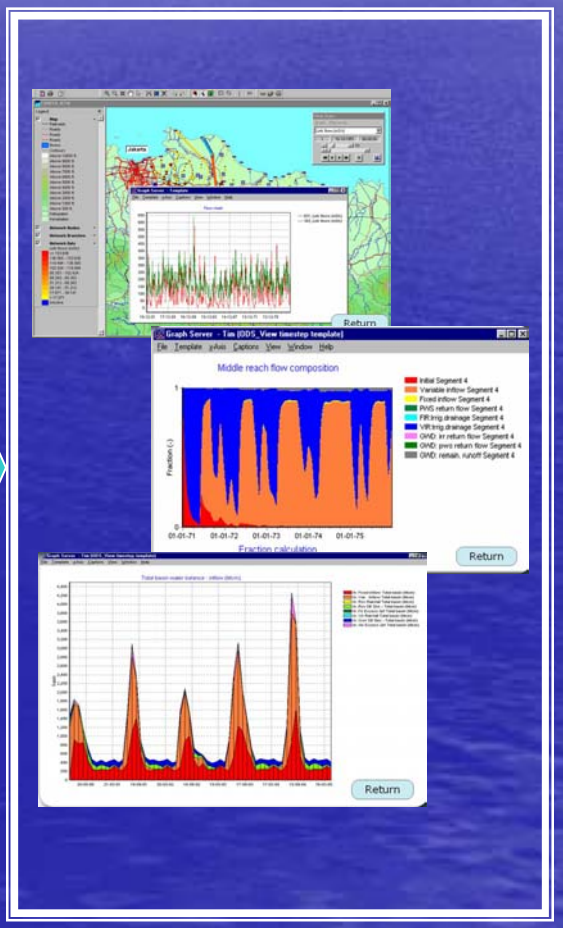
- IMPLEMENTING OF DECISIONAL SUPPORT SYSTEMS -







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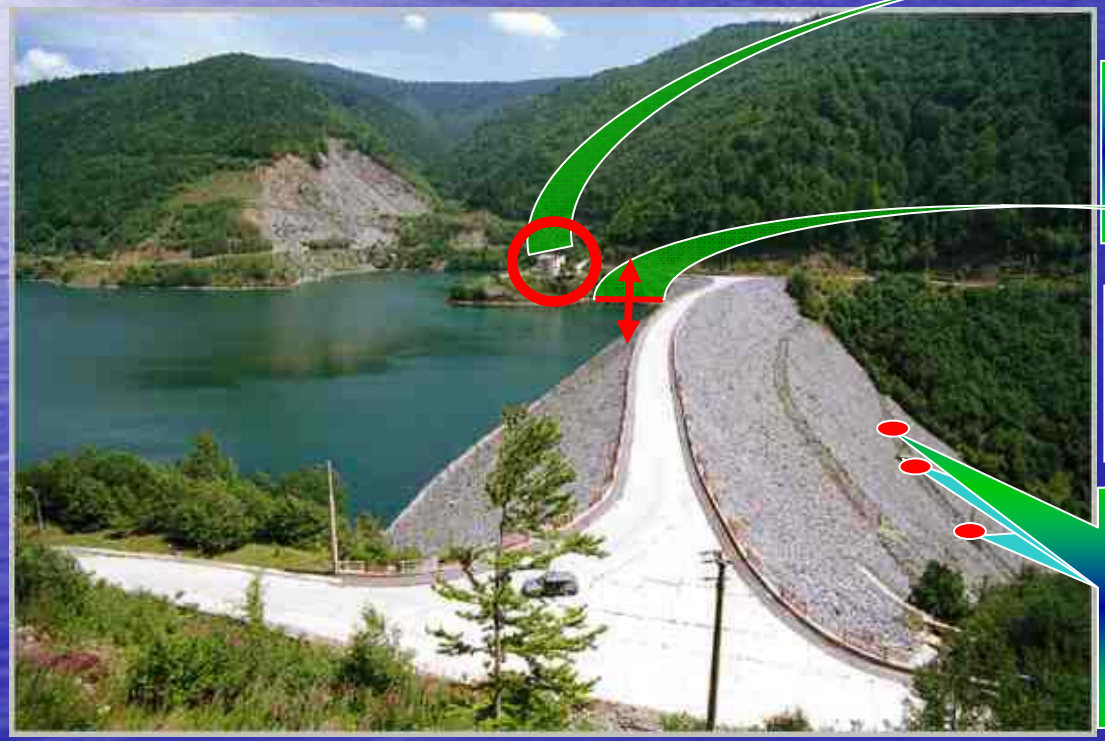
Implementation of SCADA systems for dam monitoring, comunication systems and remote sensing of hydraulic equipements



SCADA system for automatic operation of hydraulic equipement

Automatic levels monitoring

Comunication systems and database with technical parameters (internal pression, seismic parameters, 3D movements, etc)

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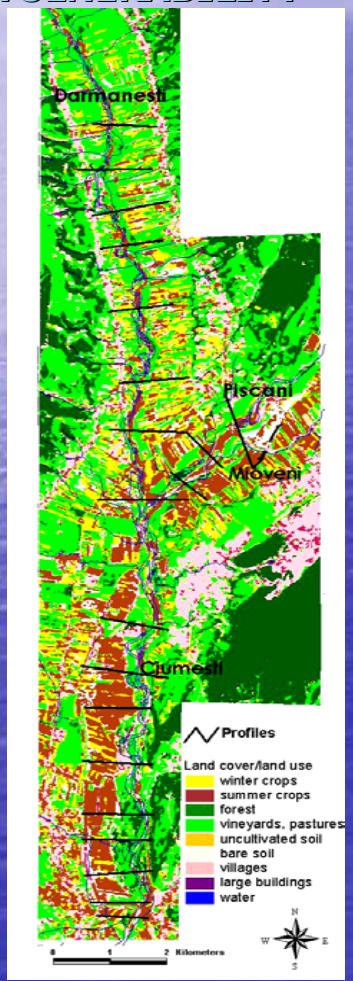
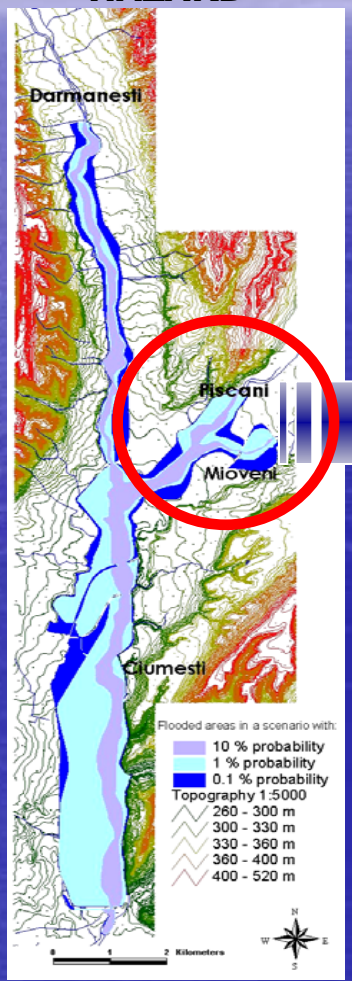
- FLOOD RISK ASSESMENT -

FLOOD RISK ASSESMENT

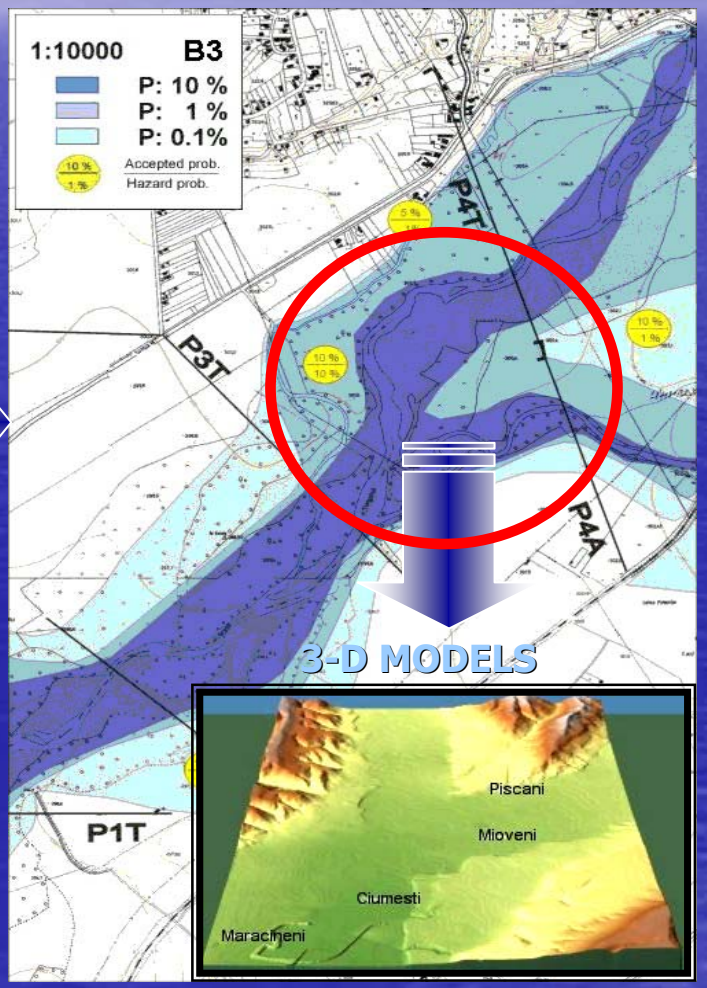
VULNERABILITY



HAZARD



FLOODED AREAS - DETAILED



3-D MODELS

WATMAN PROJECT

ACTION SHEMA AT RIVER BASIN LEVEL

C.C.D.D.

L.C.C.D.D.

BASIN
DISPATCH +
C. H. F.

I.E.R.

SIMIN

DESWAT

Existent stations

LEGEND

- Direct intervention
- Feed-back (sms, net, fax)
- Data,warning,alert

C.C.D.D.- County Committee for Disasters Defense

C.H.F -Center for Hydrological Forecas

I.E.R. -Intervention Emergency Center

SIMIN -Radar

DESWAT -Automatic stations


Living with floods
Be informed.
Be prepared