



# Living Water Exchange: Promoting Nutrient Reduction Best Practices in the CEE

*Connecting the Dots*

October 29, 2009



REGIONAL ENVIRONMENTAL CENTER



# Connecting the Dots



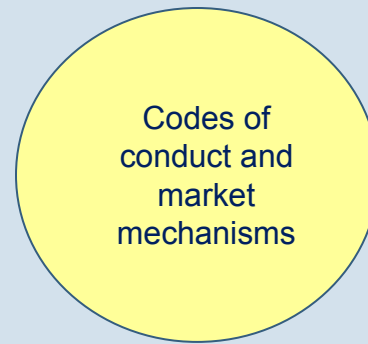
1) Sustainability



2) Replication



3) Cost Effectiveness

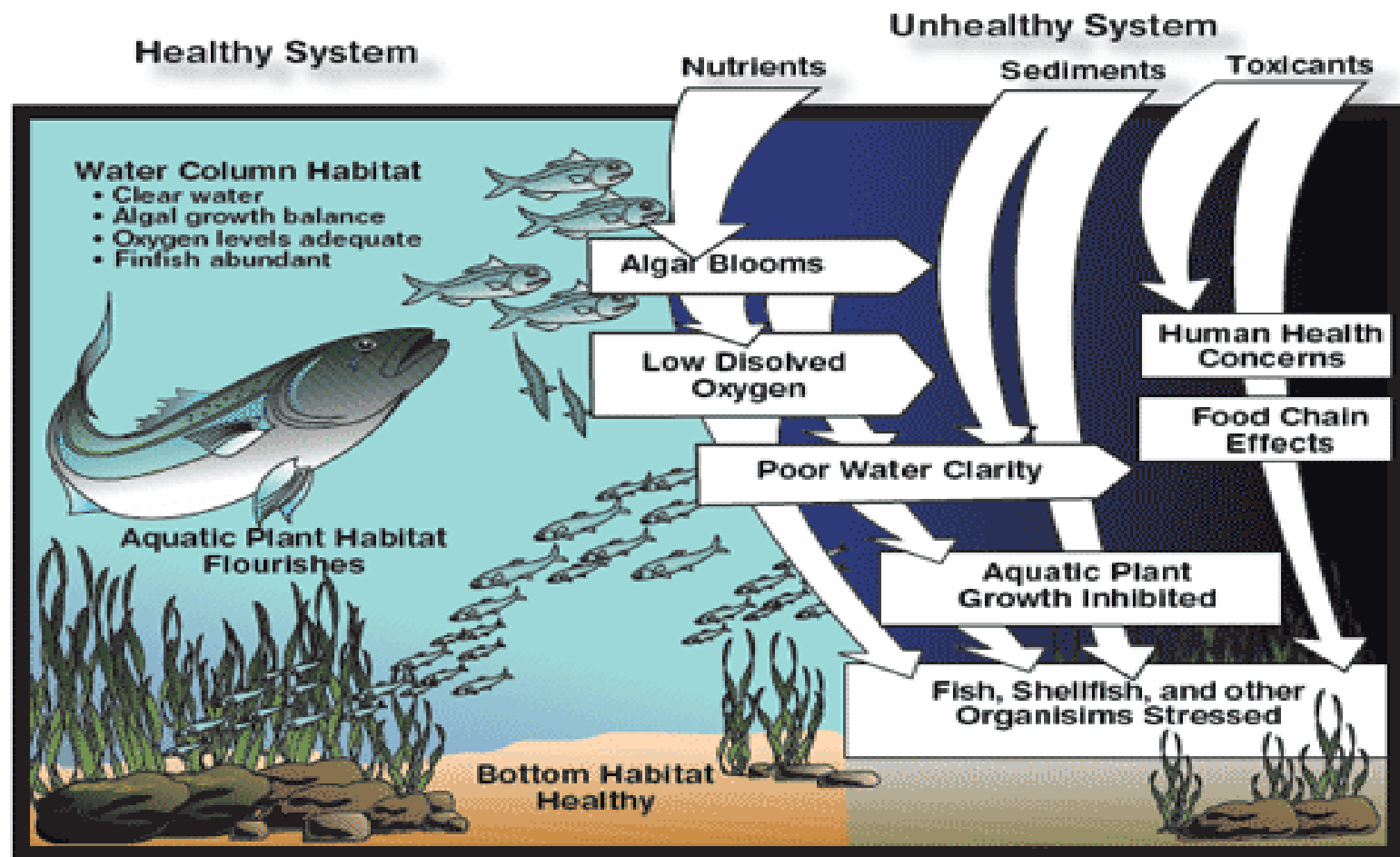




# Discussion Topics by the Panel

- Challenges - Miodrag Milovanovic, Jaroslav Cemi Institute
- Serbian Success - Alexander Bogunovic, DREPR
- Cost Effectiveness of BMPs - Mark Peters, Senior Economist, NRCS
- Solutions - Peter Whalley, Project Manager, GEF/UNDP Tisza MSP

# Nutrient Pollution





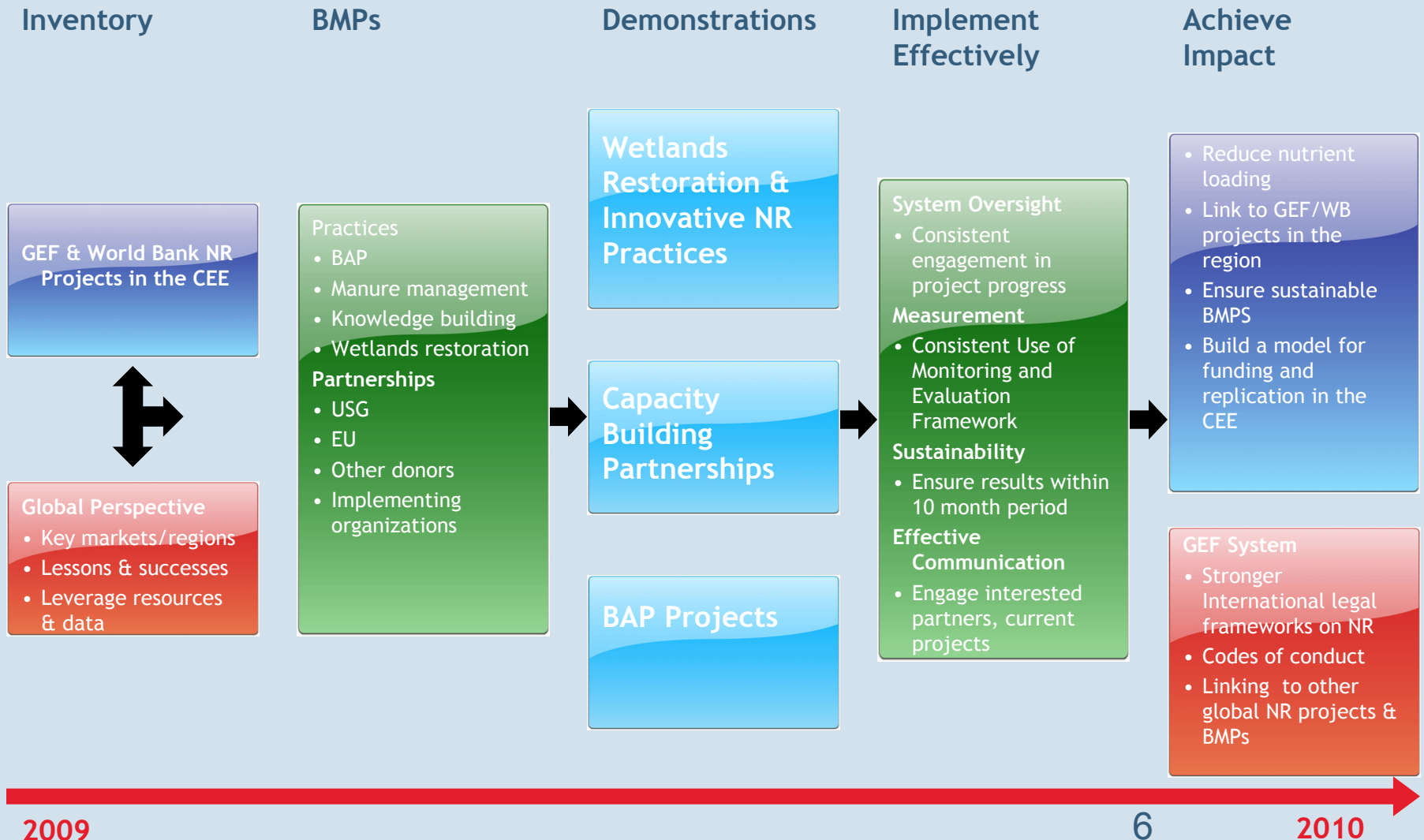


# Why Is This Important: The CEE/EECCA Body of Work

- 15 years of GEF, WB, other investments
- Agriculture issues (which the experience of the Danube has shown) contribute majority share of N
- Improved best management practices (BMPs) proven to reduce N & P (by limiting application of fertilizer & better handling of manure, etc.)
- Challenge: There is a need to collect, analyze and replicate BMPs in a systematic way.



# A Framework for Action



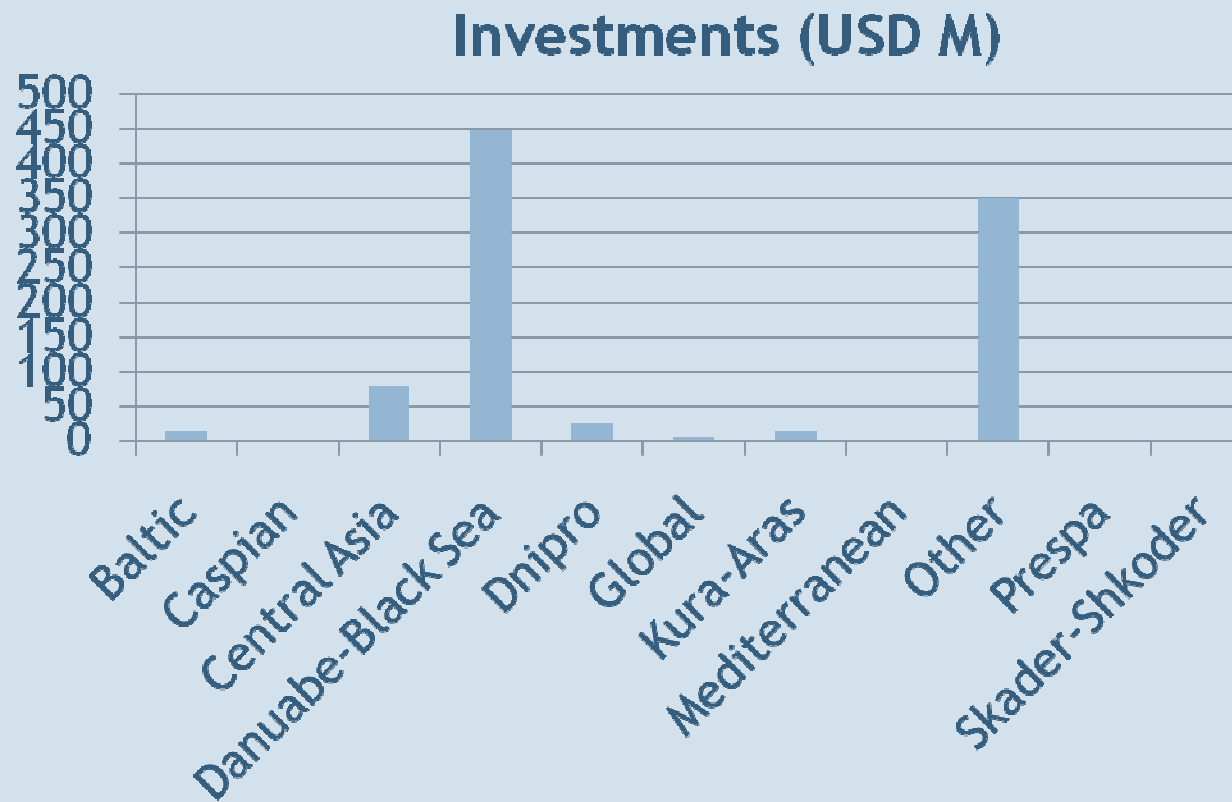


# Geographic Scope



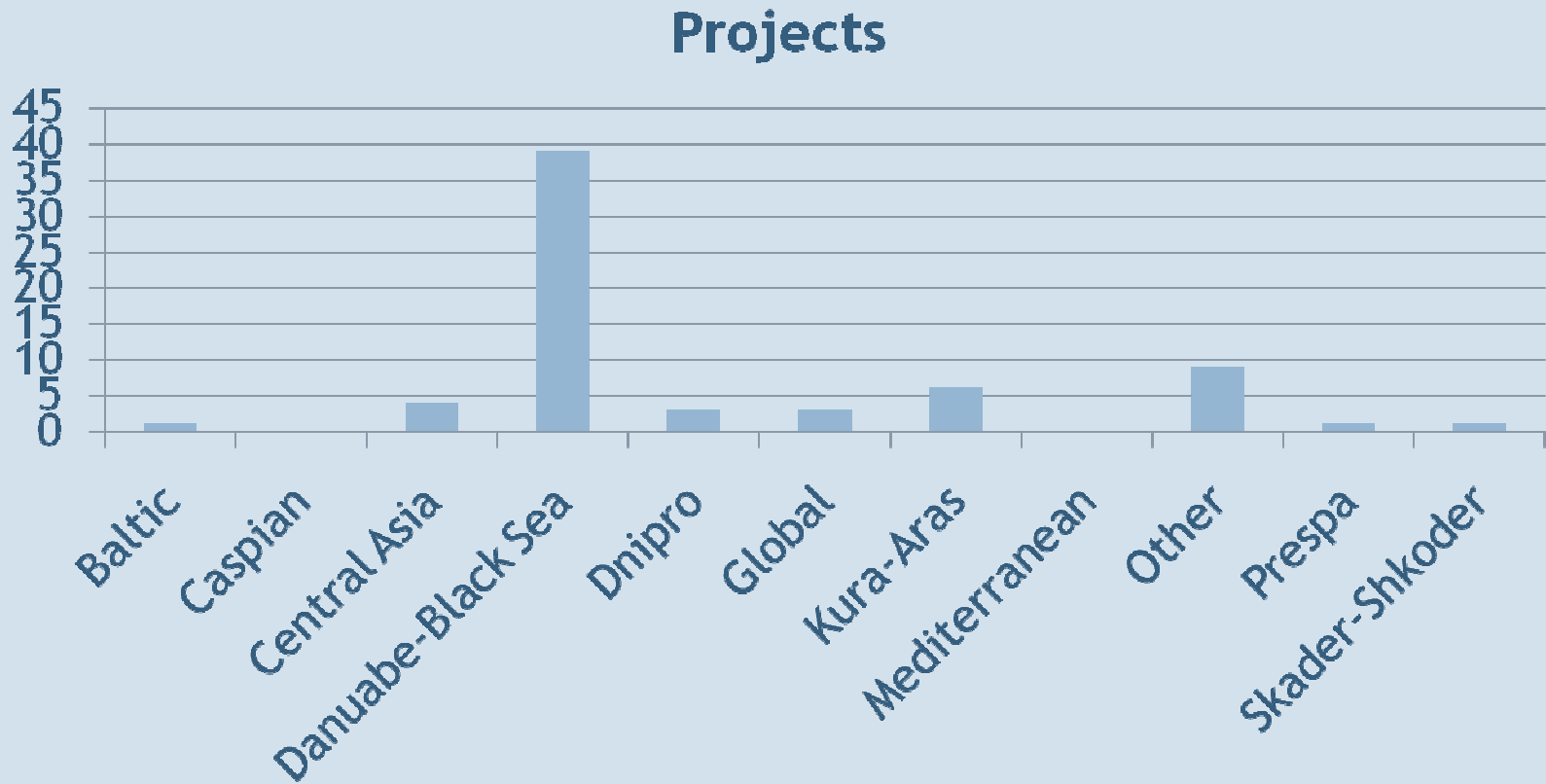


# Scope of Investment





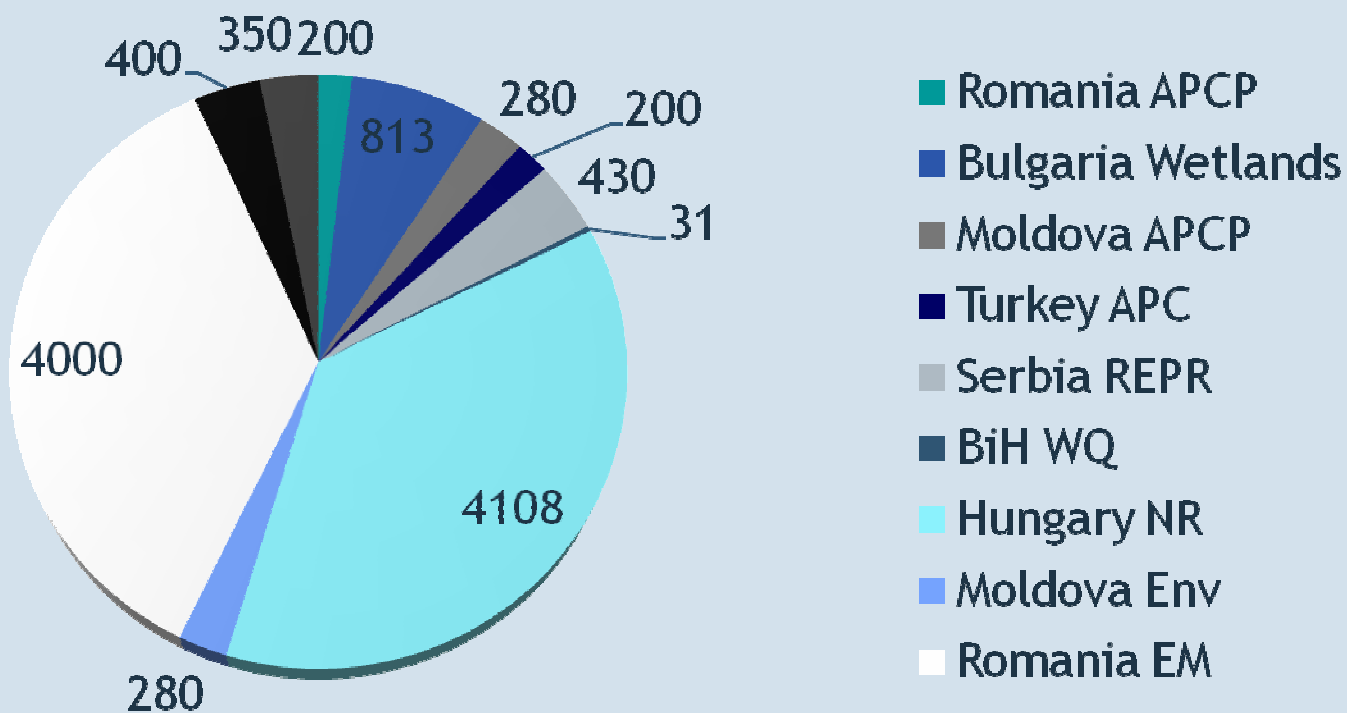
# Initial Inventory of Projects





# Impact: Investment Fund for Nutrient Reduction

**N Reduced Annually (Tons)**

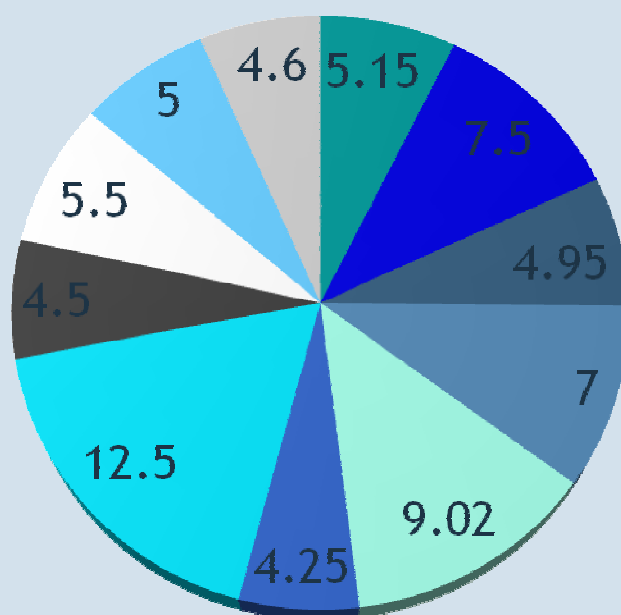






# Connecting the Dots: Investment Fund for Nutrient Reduction

**GEF Investment (USD)**



- Romania APCP
- Bulgaria Wetlands
- Moldova APCP
- Turkey APC
- Serbia REPR
- BiH WQ
- Hungary NR
- Moldova Env
- Romania EM



# What's In It for You?

- Help meet sustainability & replication requirements
- Demonstrating select best practices
- Leveraging partnerships to increase impact
- Transferring knowledge about your projects and practices directly to policy makers





# Conclusion: What Can You Do?

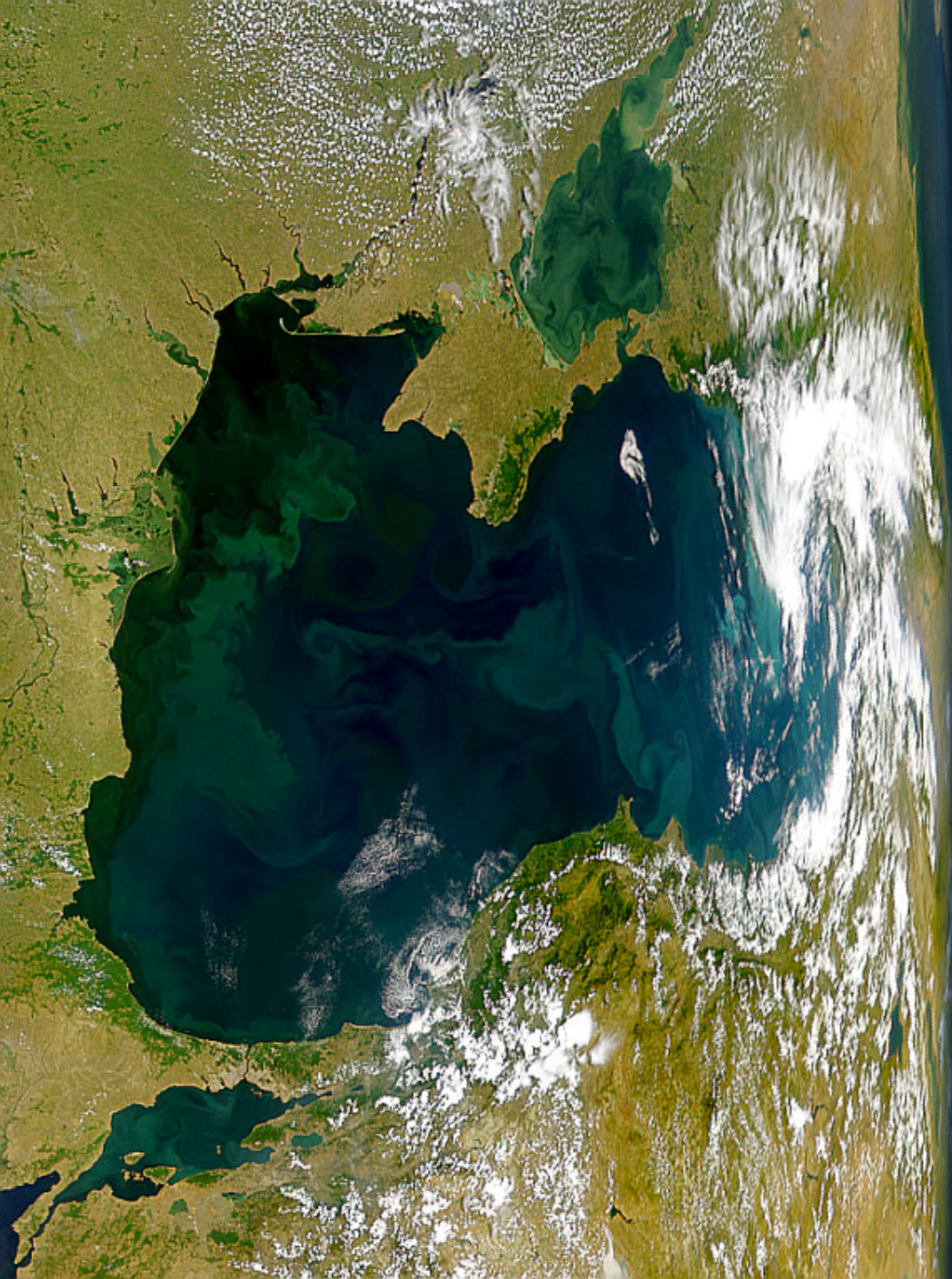
- We need your help:
  - Practices
  - Their definition
  - Why they worked or did not
  - Any lessons learned
  - Impacts (N, P reduction)



# Voluntary Agribusiness Codes of Conduct

## Agribusiness PIF:

- Promote public-private partnerships
- Engage the agribusiness supply chain
- Develop integrated management guidelines, best practices, tools, technologies and strategies for the supply chain nutrient contributions



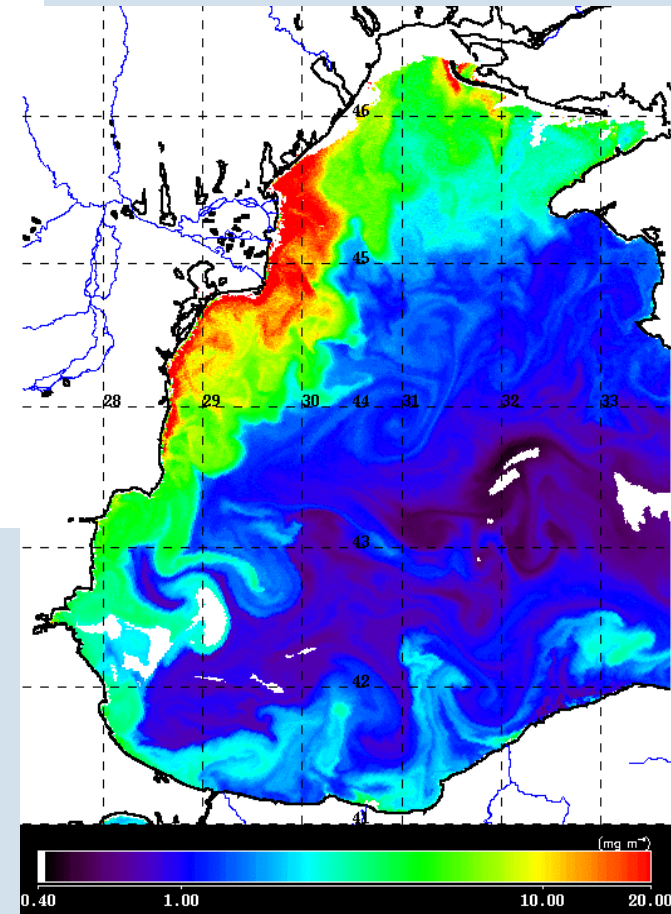
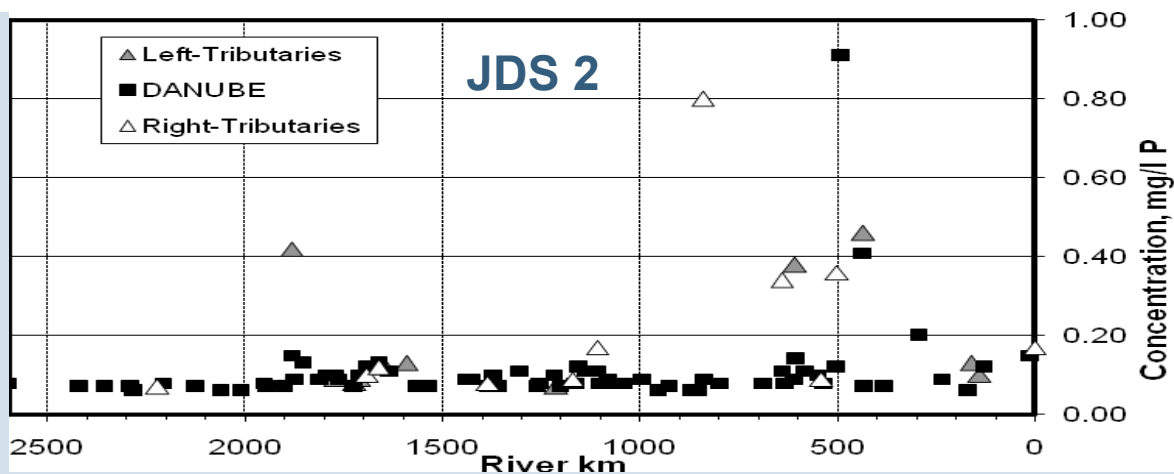
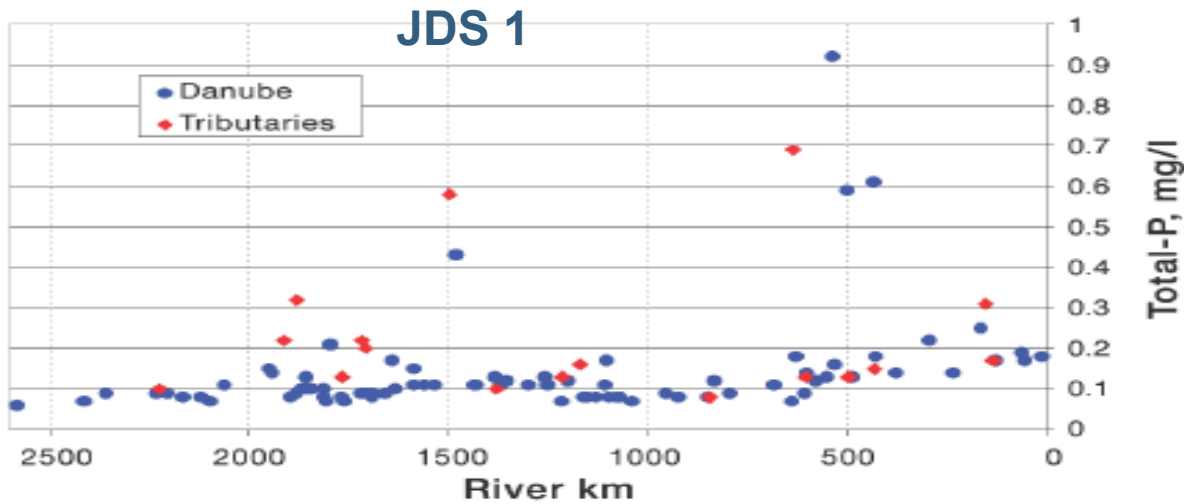
# Eutrophication of the Black Sea

## **Credit**

Provided by the SeaWiFS Project,  
NASA/Goddard Space Flight Center,  
and ORBIMAGE



# Variation in total phosphorous concentrations for the Danube River



daNUBs, 2005



# Political Commitments

## **The Danube nutrient loads: important factor responsible for the deterioration of the Black Sea ecosystem**

### **■ MoU of ICPBS and ICPDR, 2001**

The long-term goal in the wider Black Sea Basin is to implement measures to reduce the nutrients loads and hazardous substances discharged to such levels necessary to permit Black Sea ecosystems to recover to conditions similar to those observed in the 1960s.

### **■ Danube Declaration (Ministerial Meeting, 2004)**

This agreement called for reductions of the total amount of nutrients entering the Danube and its tributaries to levels consistent with the achievement of good ecological status in the Danube River and to contribute to the restoration of an environmentally sustainable nutrient balance in the Black Sea.





# Danube River Basin Analysis Report

## The Danube River Basin District

icpdr iksd

International  
Commission  
for the Protection  
of the Danube River

Internationale  
Kommission  
zum Schutz  
der Donau

River basin characteristics, impact of human activities and economic analysis required under Article 5, Annex II and Annex III, and inventory of protected areas required under Article 6, Annex IV of the EU Water Framework Directive (2000/60/EC)

### Part A – Basin-wide overview

Short: "Danube Basin Analysis (WFD Roof Report 2004)"



The complete report consists of Part A: Basin-wide overview, and Part B: Detailed analysis of the Danube river basin countries  
18 March 2005, Reporting deadline: 22 March 2005

## WFD Article V Roof Report

Approved at the Ministerial Meeting  
– Vienna, 13 December 2004



# Four Significant Water Management Issues



Organic  
Pollution



Nutrient  
Pollution



Hazardous  
Substances Pollution

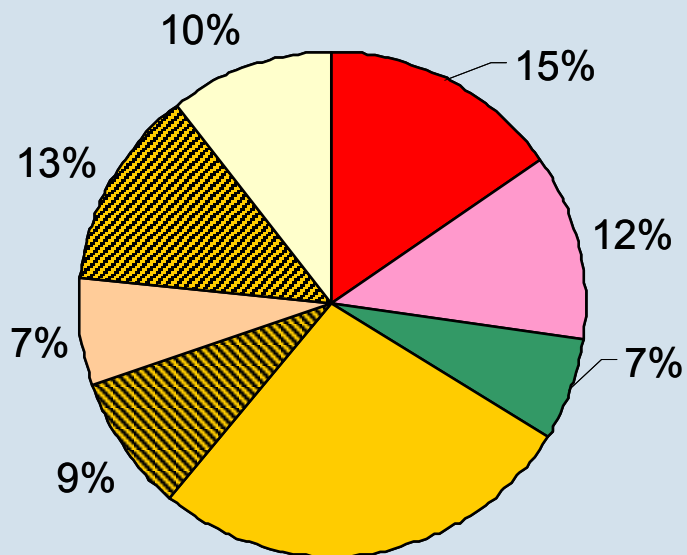


Hydromorphological  
Alterations



# Sources

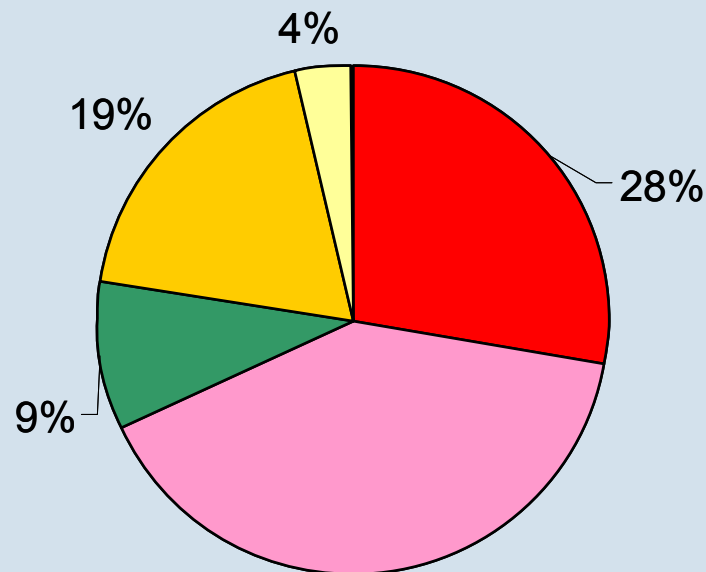
## Nitrogen



**758 kt of N/year**

- WWTP
- Urban systems
- Manure & fertilizer
- NOx agricultural areas
- NH<sub>4</sub> agricultural areas
- NH<sub>4</sub> other area
- Background
- NOx other area

## Phosphorus



**68 kt of P/year**

- WWTP
- Urban systems
- Agricultural land-use
- Background
- Other sources

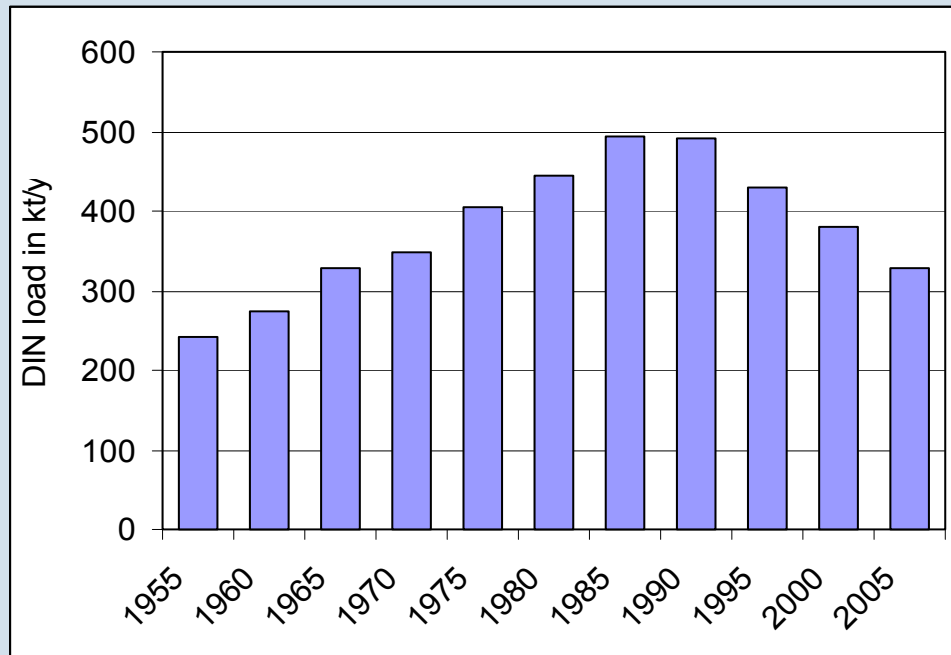
**The most dominant pathways from diffuse pollution into the surface water:**  
**For N: groundwater**  
**For P: erosion**



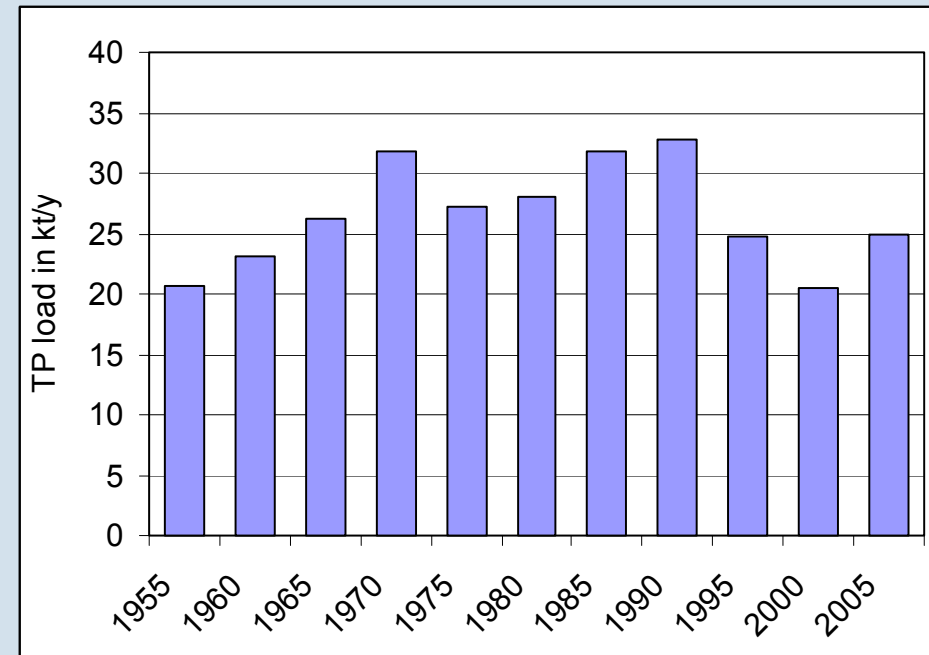


# Long-term Discharges of N & P into the Black Sea

## Nitrogen



## Phosphorus





# Basin wide Vision on Nutrient Pollution

The ICPDR's basin wide vision for nutrient pollution is

**“The balanced management of nutrient emissions via point and diffuse sources in the entire DRB, that neither the waters of the DRB nor the Black Sea are threatened or impacted by eutrophication”**



# Management Objectives (1)

- **EU Member States, Accession Countries and Non EU MS:**
- Reduce the total amount of nutrients entering the Danube and its tributaries to levels consistent with the achievement of the good ecological/chemical status by 2015.
- Reduce discharged nutrient loads in the BS Basin to such levels, which permit the BS ecosystems to recover to conditions similar to those observed in the 1960s.
- Reduce phosphates in detergents
- Implement BAPs
- Create baseline scenarios of nutrient input by 2015
- Define basin wide, sub-basin and/or national quantitative reduction targets (i.e., for point and diffuse sources) for MS and non EU countries.



## Management Objectives (2)

In addition, for EU Member States:

- Implement the UWWTD taking into account the character of the receiving coastal waters as a sensitive area.
- Implement the Nitrates Directive taking vulnerable zones into account in case natural freshwater lakes, other freshwater bodies, estuaries, coastal waters and marine waters of the DRB are found to be eutrophic or in the near future may become eutrophic.

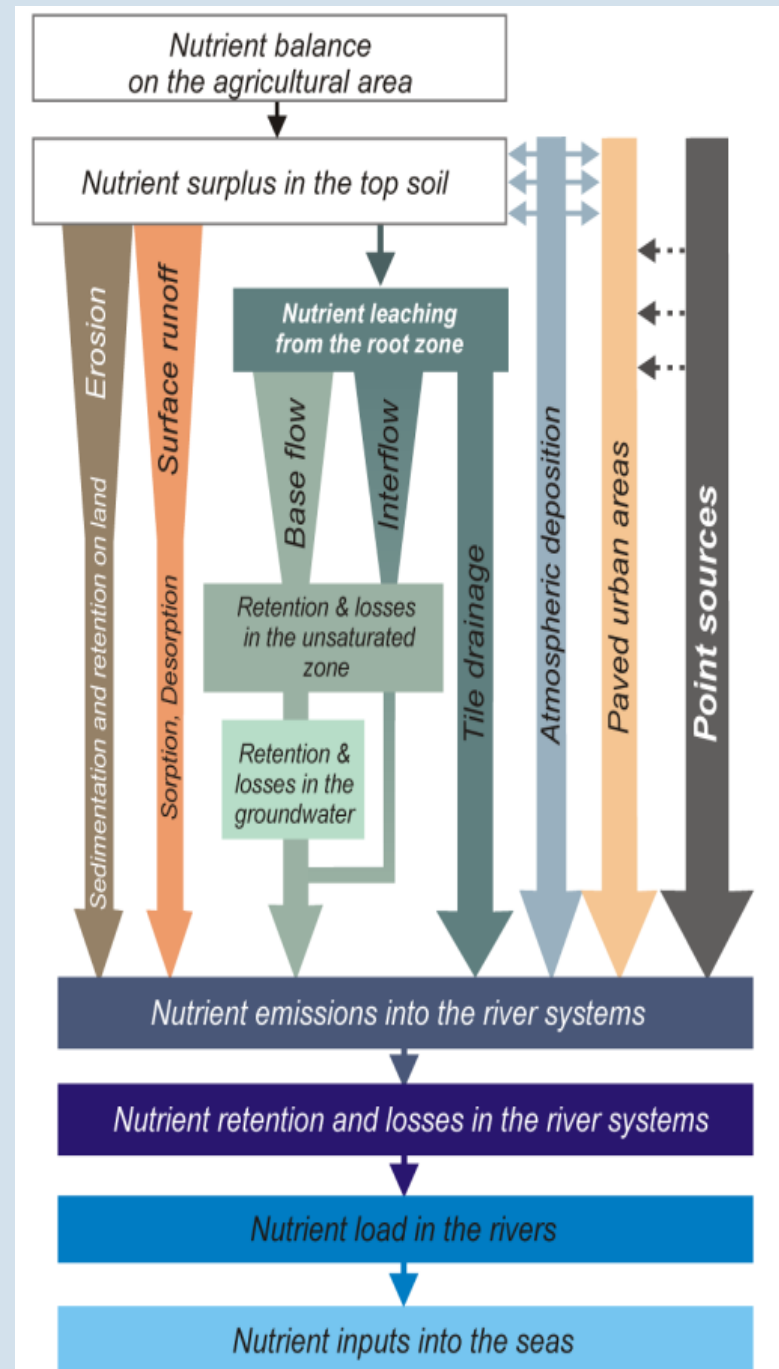
# MONERIS decision support and management tool

Concept for **integration of data** required by the EU directives for MONERIS calculations

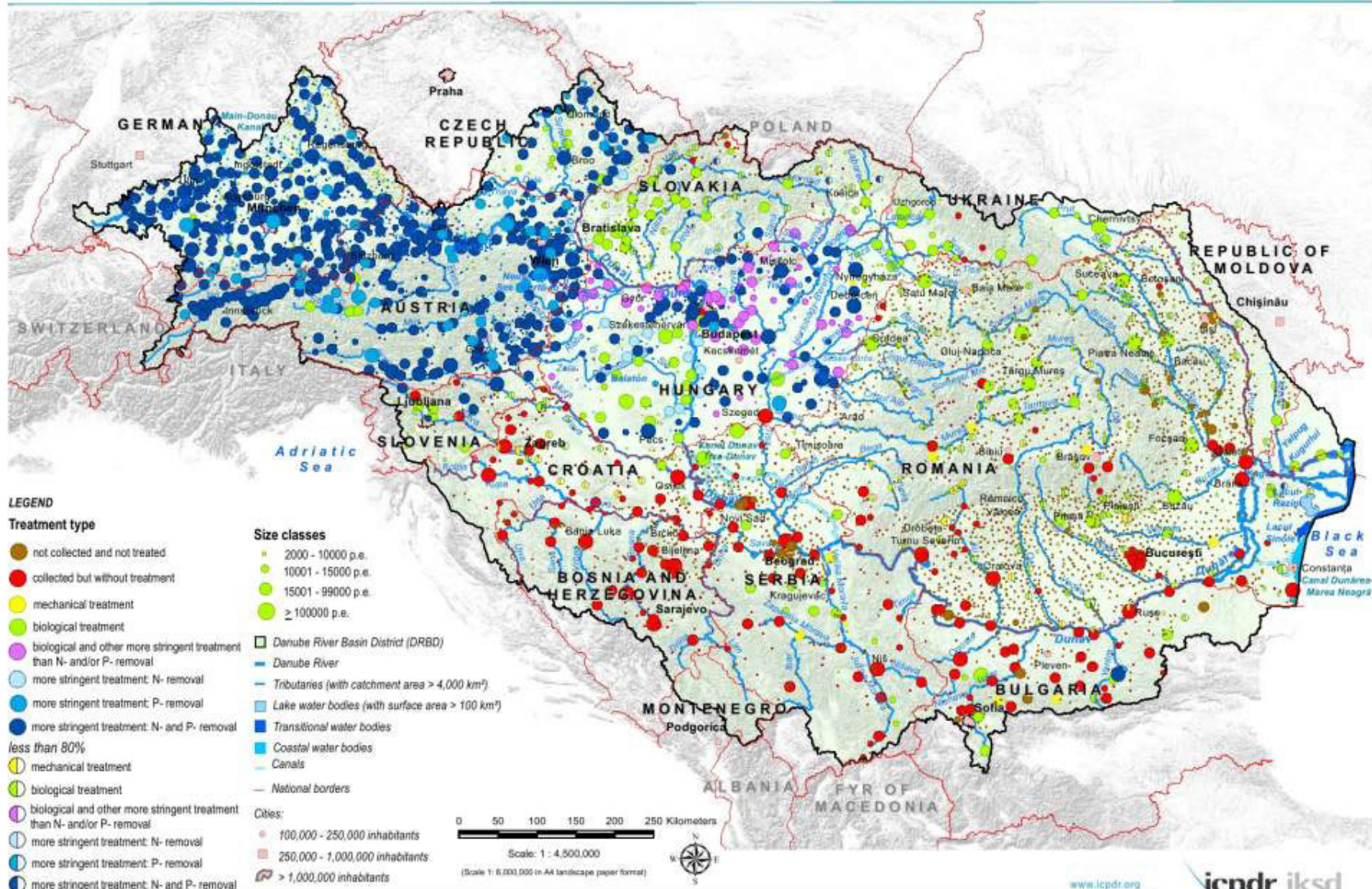
**Basin wide overview** of point and diffuse pollution sources

**Calculation of scenarios** for possible changes of nutrients loads within the Danube river systems and into the Black Sea

**Evaluation of Program of Measures**

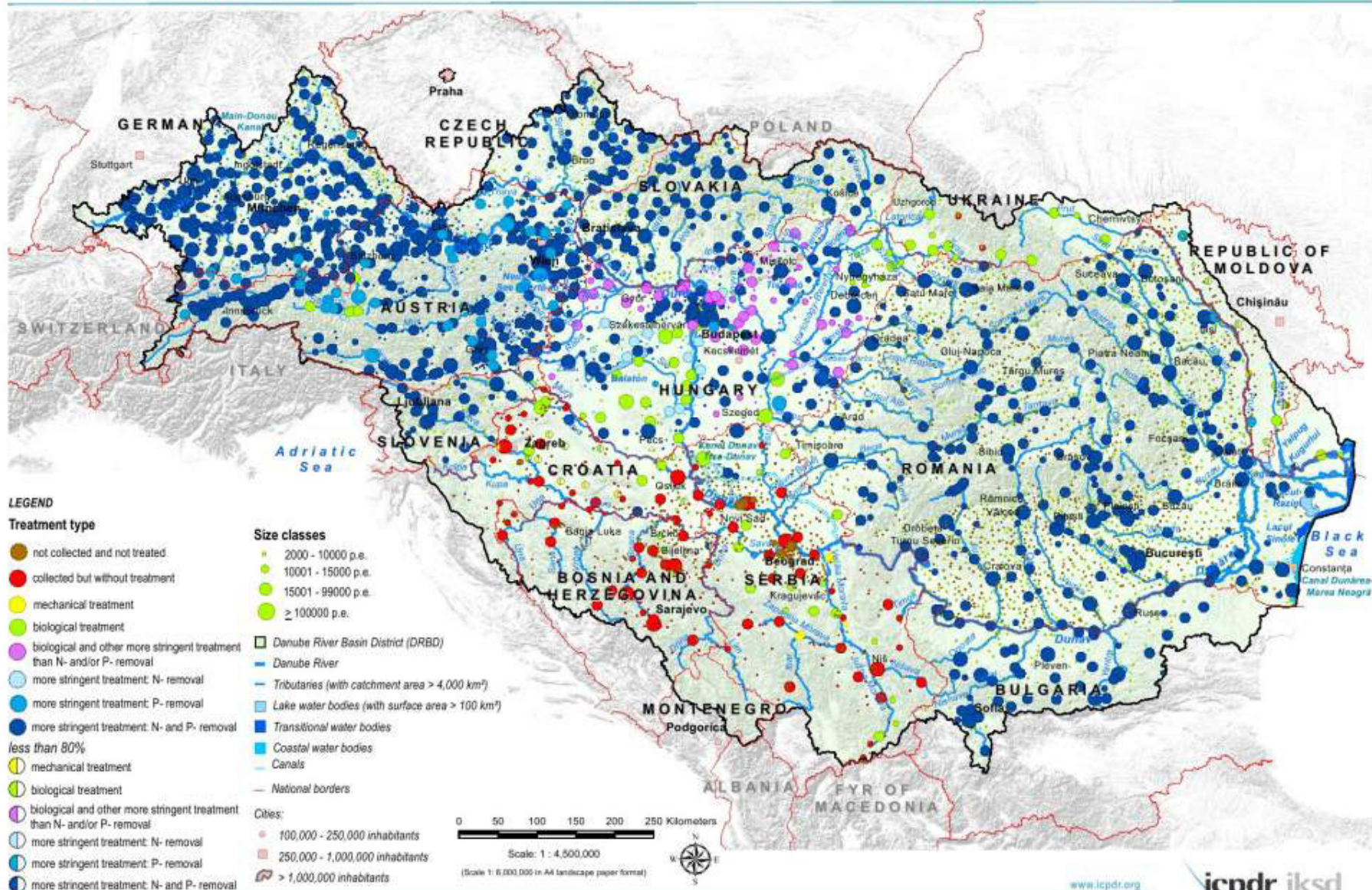






This ICPR product is based on national information provided by the Contracting Parties to the ICPR (AT, BA, BG, CZ, DE, HR, HU, MD, RO, RS, SI, SK, UA) and CH, except for the following: EuroGlobeMap v2.1 from EuroGeographics was used for national borders of AT, CZ, DE, HR, HU, MD, RO, SI, SK and UA; ESRV datasets was used for AL, ME, MK; Shuttle Radar Topography Mission (SRTM) from USGS Seamless Data Distribution System was used as topographic base; data from the European Commission (Joint Research Centre) was used for the outer border of the DRBD of AL, IT, ME and PL.





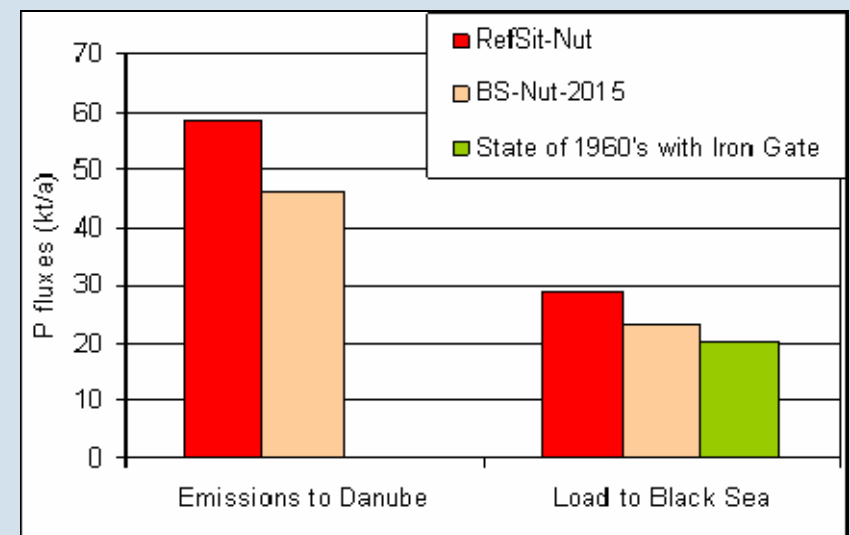
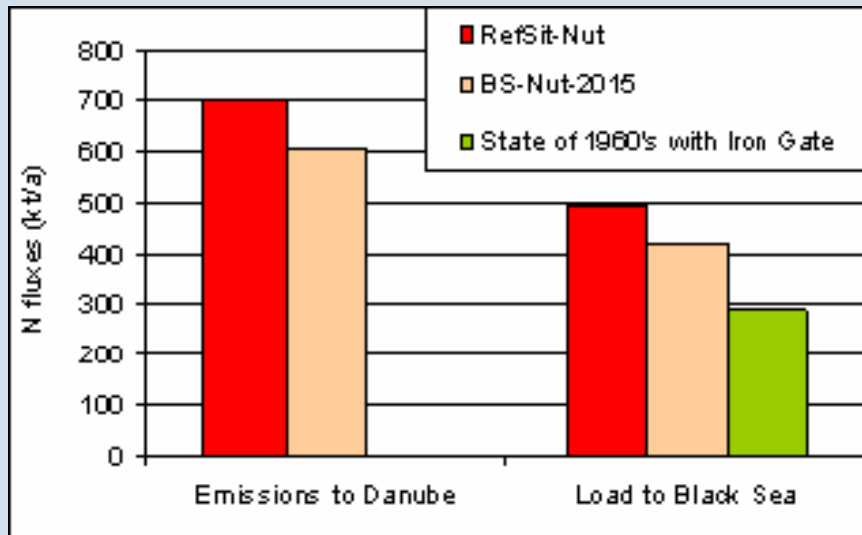
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## Nitrogen

## Phosphorus

### Reference Situation and Baseline Scenario 2015







# Anticipated Effects of Measures 2015

**N emissions** to surface waters in 2015: 12% lower.

**Load to the Black Sea:** Below present state but still far above (40%) that of the 1960's.

⇒ **EU WFD objectives will not be achieved by 2015**

**P emissions** to surface waters in 2015: 25 % lower

**Load to the Black Sea:** Below present state but still above (15%) that of the 1960's.

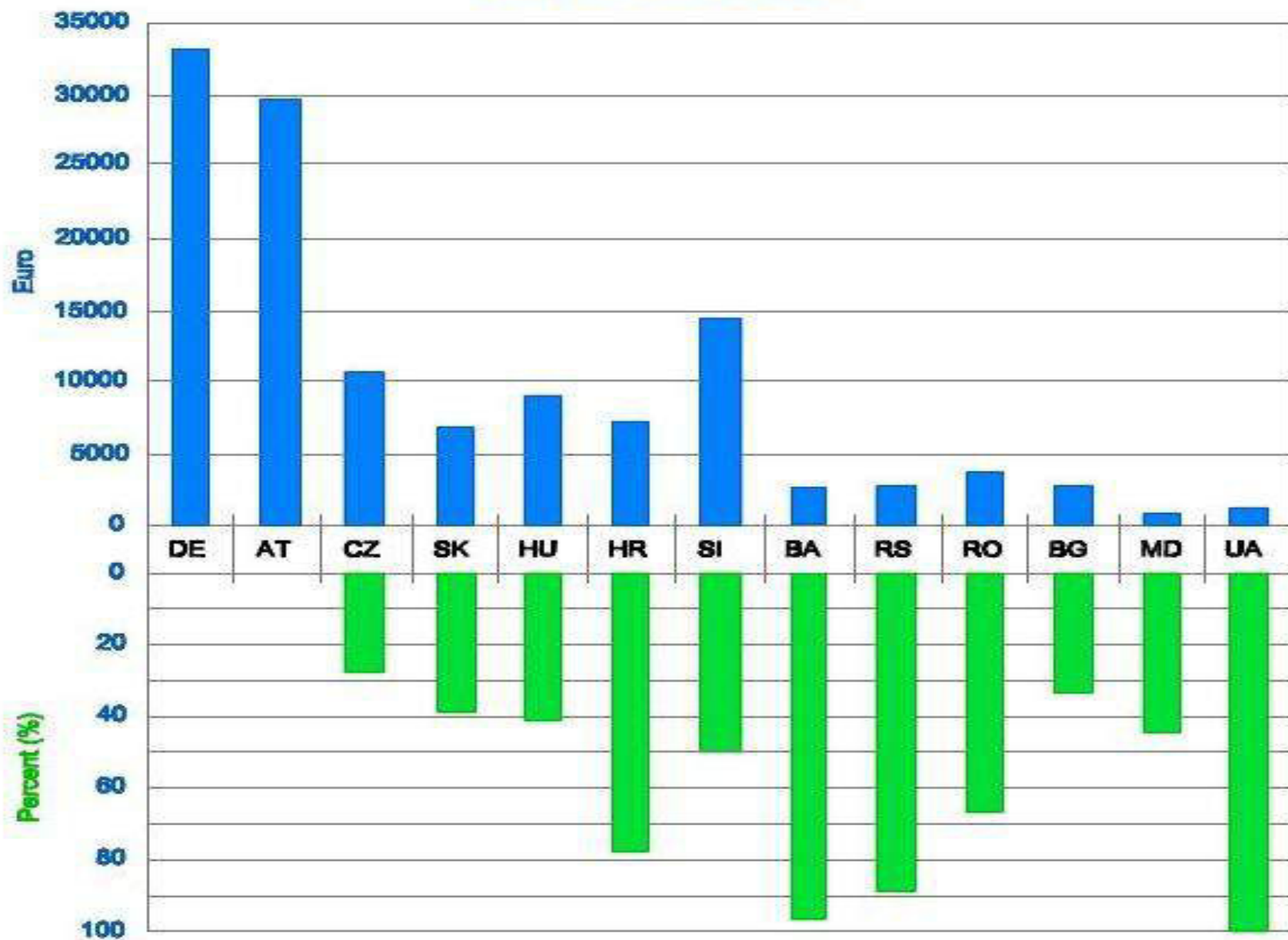
⇒ **EU WFD objectives will not be achieved by 2015**



# Conclusions & Next Steps

- ⇒ The assessment and quantification of various policy scenarios and measures that might be taken to achieve different water quality states for DRB countries up to 2015 can support national planning process in the DRB countries.
- ⇒ Success will depend on thorough implementation of actions and commitments of the countries and on effective and coordinated contribution of the international community (financial support).
- ⇒ Importance of the next phases of implementation (2021, 2027)

## GDB per capita in DRB



Development goal: 90% service level

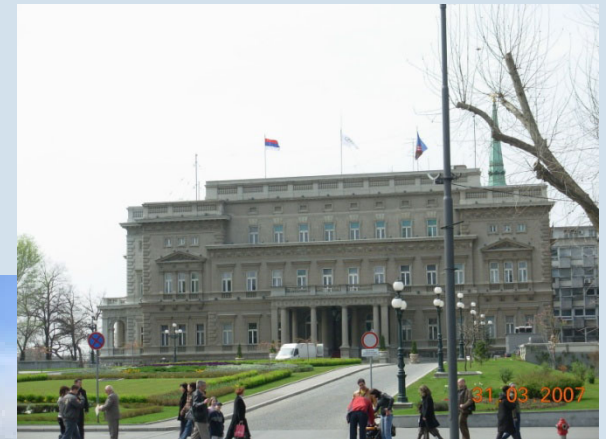
**MINISTRY OF AGRICULTURE, FORESTRY AND WATER MANAGEMENT  
REPUBLIC OF SERBIA**

# DREPR PROJECT

Danube River Enterprise Pollution Reduction Project- DREPR



October, 2009



## Project Development Objective

The project aims to reduce agricultural nutrient pollution in the Danube River .

The global environment objective of the project is to reduce nutrient flows into water bodies connected to the Danube River from selected households and enterprises.

### GEF

### SIDA

**Approval date:** 05/12/2005    03/07/2006

**Signing:**                      06/22/2005    03/07/2006

**Effectiveness:** 12/15/2005    03/07/2006

**Closing Date:** 03/31/2010    03/31/2010

**Grant Amount:** \$9 ml GEF    \$3.7 ml SIDA

***TOTAL AMOUNT: \$ 12.7 ML.***



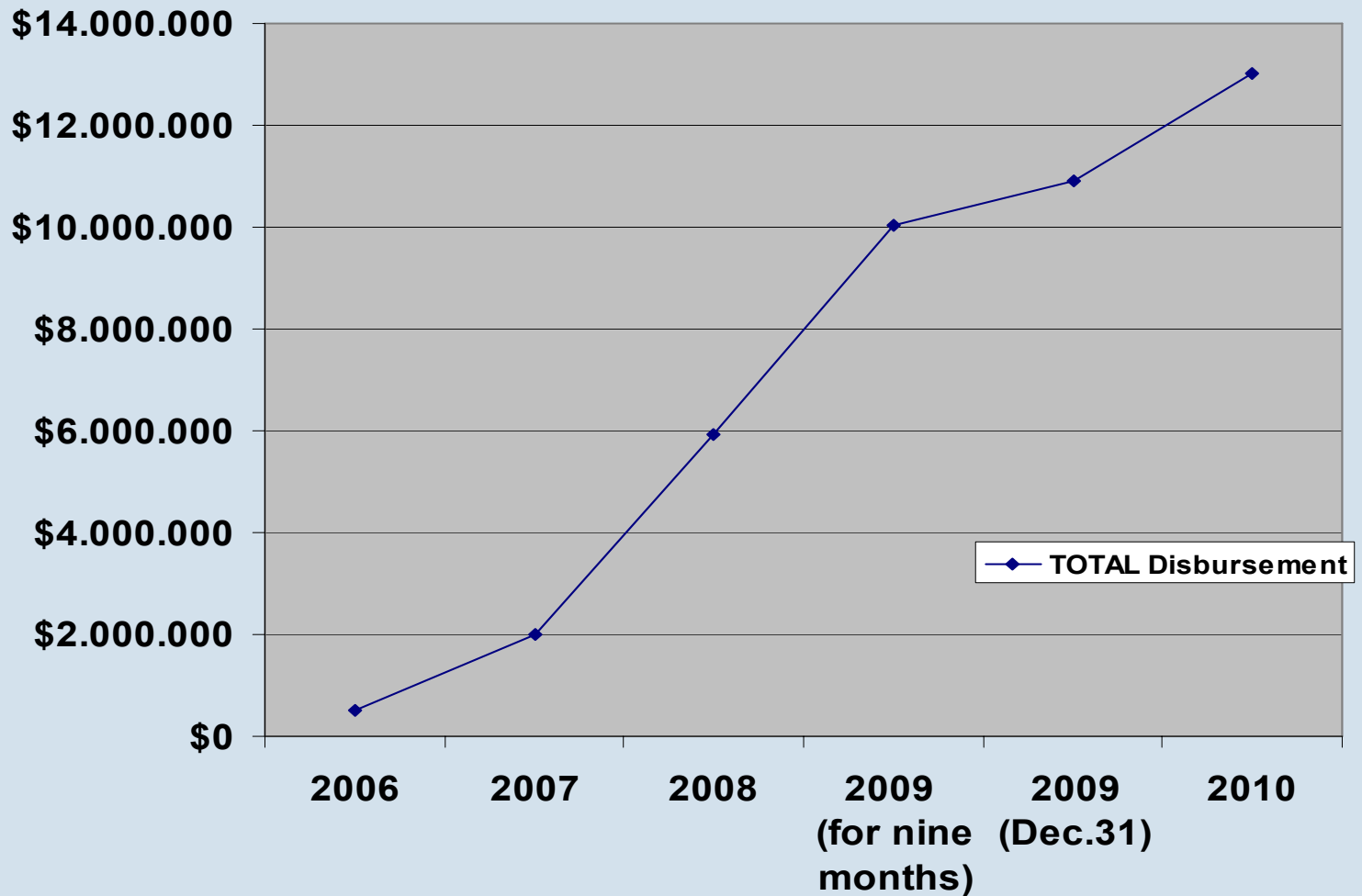
## Main Project Activities

- **Component 1.** Regulatory Reform and Capacity Building
- **Component 2.** Investment in Nutrient Reduction
- **Component 3.** Water and Soil Quality Monitoring, Public Awareness Raising and Replication Strategy
- **Component 4.** Project Management, Implementation and Monitoring

## Key Results

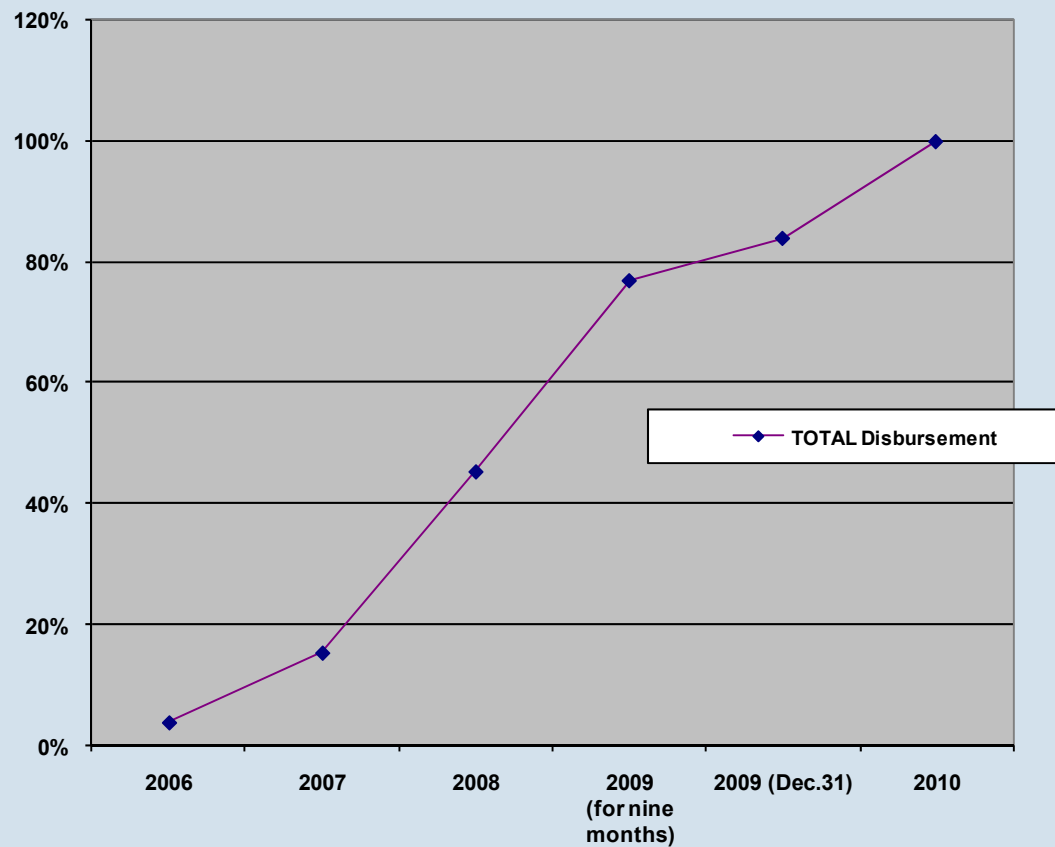
- ✓ **The Code of Good Agricultural Practice.**
- ✓ **86 nutrient management plans prepared.**
- ✓ **New procedures and activities developed and introduced**
- ✓ **64 farms- received the grant support**
- ✓ **3 Slaughterhouses received the grant support**
- ✓ **7 Agriculture Schools received the grant support**
- ✓ **Established Training and Information Centre (TIC)**
- ✓ **570 participants trained in TIC about EU legislation on ND and WFD, CGAP, proper manure and slaughterhouse animal waste management**
- ✓ **Provided equipment for laboratories and software for the Soil Science Institute (SSI), Hydrometeorological Institute (HMI) and 4 local laboratories**
- ✓ **Installation of 53 piesometers finished**
- ✓ **Public awareness raised aprox. 21% in general public, 38% among stakeholders (2006-2008)**

## Financial Data (Disbursement)





## Financial Data (Disbursement)



## Works and Equipment on Farms – in Pictures



# Works and Equipment on Farms - in Data

For the Project grant participated (and received or in receiving process) are more than 200 farms in Serbia with:

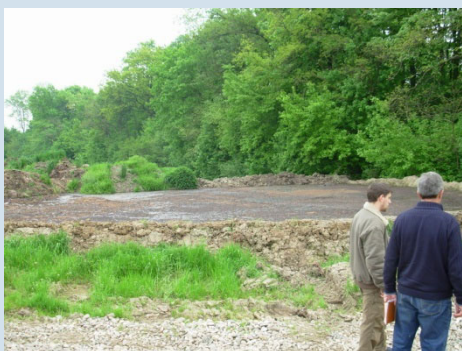
- ✓ More than 30.000 ha of arable land in the farm property,
- ✓ Aproxx. 24500 Livestock units (pigs and cows) on farms,
- ✓ Annual solid manure production is 65000 m<sup>3</sup>,
- ✓ Annual slurry production is 204000 m<sup>3</sup>,
- ✓ Total financial value of nutrients is about 700.000,00 EUR,
- ✓ Total sum of farmers investment: 3 mil dollars
- ✓ Total sum of project funds (2006-2009): 6,5 mil dollars





# Works and Equipment on Farms - in Data

BEFORE



AFTER



# Works and Equipment on Slaughterhouses - in Data

4 big slaughterhouses were included in project activities with:

- ✓ Slaughtering more than 70 units (pigs or bulls) per day
- ✓ Total sum of investment apro. 0,5 mil dollars





## Works and Equipment on Slaughterhouses





# Equipment for Rendering Plants

\* 3 rendering plants were provided with the following equipment:



# Environmental Protection and Monitoring

## Water & Soil monitoring:

Monitoring of water quality at 9 demonstration farms and the IAH.

Monitoring program, is undertaken by the laboratory of the HMI and the Soil Science Institute in Belgrade,

Aim is to test the effect of agricultural practices introduced under the project in order to reduce the leaching of nitrogen and phosphorus to local surface and groundwater.

The impact of these practices on soil quality will be monitored with the aim of providing demonstration studies to farmers and policy makers of Serbia.

## Table of water monitoring progress (October 2009):

Demonstration farms / SH	Installation of piesometers	Base line measurement	Analyses	1st regular samples	2nd regular samples	3rd regular samples
IAH	finished	finished	finished	finished	finished	November 2009
Ivan Milutinovic	finished	finished	finished	finished	finished	November 2009
VI Agra	finished	finished	finished	finished	finished	November 2009
Sava Kovacevic	finished	finished	finished	finished	finished	November 2009
Lucar FK	finished	finished	finished	finished	finished	November 2009
Vlada Drljaca	finished	finished	finished	finished	finished	November 2009
Katalin Muzlai	finished	finished	finished	finished	finished	November 2009
Miklos Balas	finished	finished	finished	finished	finished	November 2009
Momir Jovanovic	finished	finished	finished	finished	finished	November 2009
Nisprodukt (SH)	finished	finished	finished	finished	finished	November 2009

# Education, Promotion, Replication

## MORE THAN FINANCIAL AND ENVIRONMENTAL ISSUE

- ✓ Dissemination of education and “know-how” in Serbia
- ✓ Demo Farms and Institutes as a nucleus of future knowledge, CGAP, ND, NMP
- ✓ Agriculture High Schools as plant for future experts and practitioners in high qualities standards in agriculture and environmental protection in country
- ✓ Replication Strategy for other projects in MAFWM Plans
- ✓ Public awareness on key environmental issues
- ✓ Introduction of EU standards in Serbian agriculture practice and Development of Commercial Practice



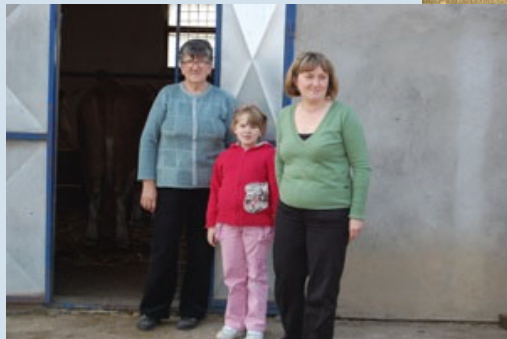
## Key Issues

(including main implementation obstacles that resulted in low disbursement)

- Low interest of SH and processing industry
- Readinesss of farmers to invest in environmentnt protection
- Undeveloped local market for large and specific manure management equipment - repetition of tenders
- Govrenment changing -changes of auhorized persons for special account
- Local permitting procedures in regard to manure and waste water treatment facilities were not foreseen in the preparation phase of the project
- Large portions of funds committed but could only be disbursed upon delivery of equipment or upon completion of construction works and obtaining operating permit
- Construction season- limited period for realization of field project activities
- Decreased PA Budget – limited results in achiving desired results

# Activities in 2010 (March Closing Date)

- On going completion of construction for SHs - December 2009
- Delivery of the equipment for rendering plants -December 2009
- Continuing sampling and analyses water from piesometers on demo farms and SH
- Completion of construcion and delivery of the equipment for 7 agricultural shools
- Piezometers Data Monitoring
- Preparation of the Nitrate Directive
- Preparation of Project Replication Strategy
- Preparation of Regional Conferen (June 2010)
- Final survey of Project Effectivnes – February 2010





## Key Recommendations

- **Simplify permitting procedure and provide incentives to industry to invest in WWT facilities**
- **More flexible approach in introduction of necessary changes in OM and pre defined procedures**
- **Adjust procedures with situation on the field**
- **Project preparation- conduct small scale pilot project**
- **Procedures and activities predicted in the Project preparation phase could be changed due to the time difference and legal and social environment changes**





## Key Recommendations

- **Explore simple co-financing options referring the budget contribution**
- **Secure that Project always has one authorized person for special accounts- project manager/ coordinator**
- **Training of Ministries coordinators on:**
  - **WB rules and procedures- how, who, help, assistance...**
  - **PCM**
  - **M&E and Reporting procedures**





## DREPR PIU TEAM:

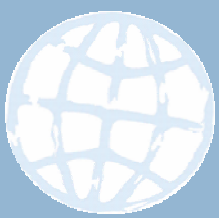
Aleksandar Bogunovic, MAFWM Project Coordinator  
Nenad Brkic, PhD, Lead Agricultural Engineer, Project Leader  
Mirjana Bowen, Procurement Specialist  
Gordana Simovic, Financial Specialist  
Danijela Ilic, Agricultural Engineer  
Darko Tadic, PhD, Communication Specialist  
Predrag Djordjevic, Environmental Specialist  
Marina Racic, Office Assistant

[www.drepr.org](http://www.drepr.org)

**Thank you !**

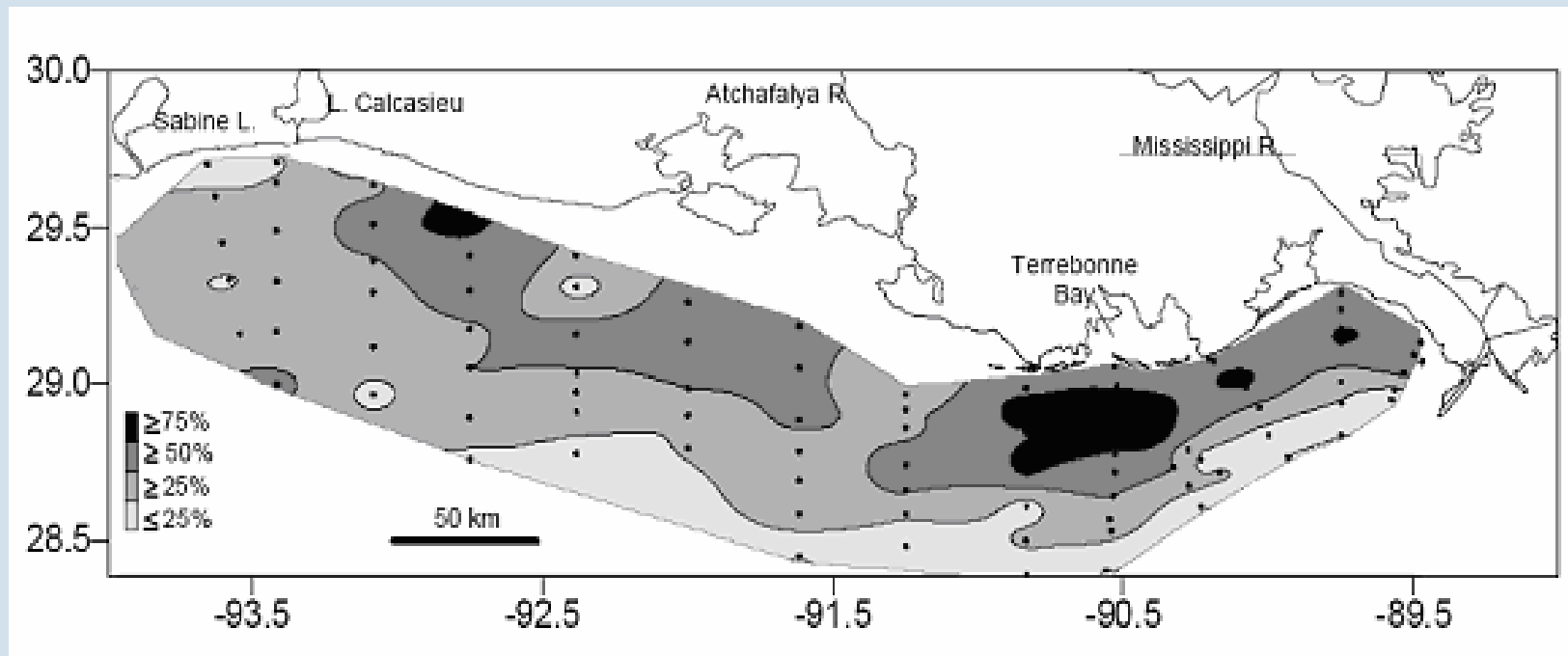


# Cost-effective BMPs for reducing nutrient runoff from agriculture in the Mississippi and Atchafalaya River Basin



# Issue: Extent of Hypoxic Zone in Northern Gulf of Mexico

Frequency of hypoxia in the northern Gulf of Mexico, 1985-2005



Source: US EPA, Science Advisory Board Report, 2007.



# Causes

- Stratification
- Nutrient loads



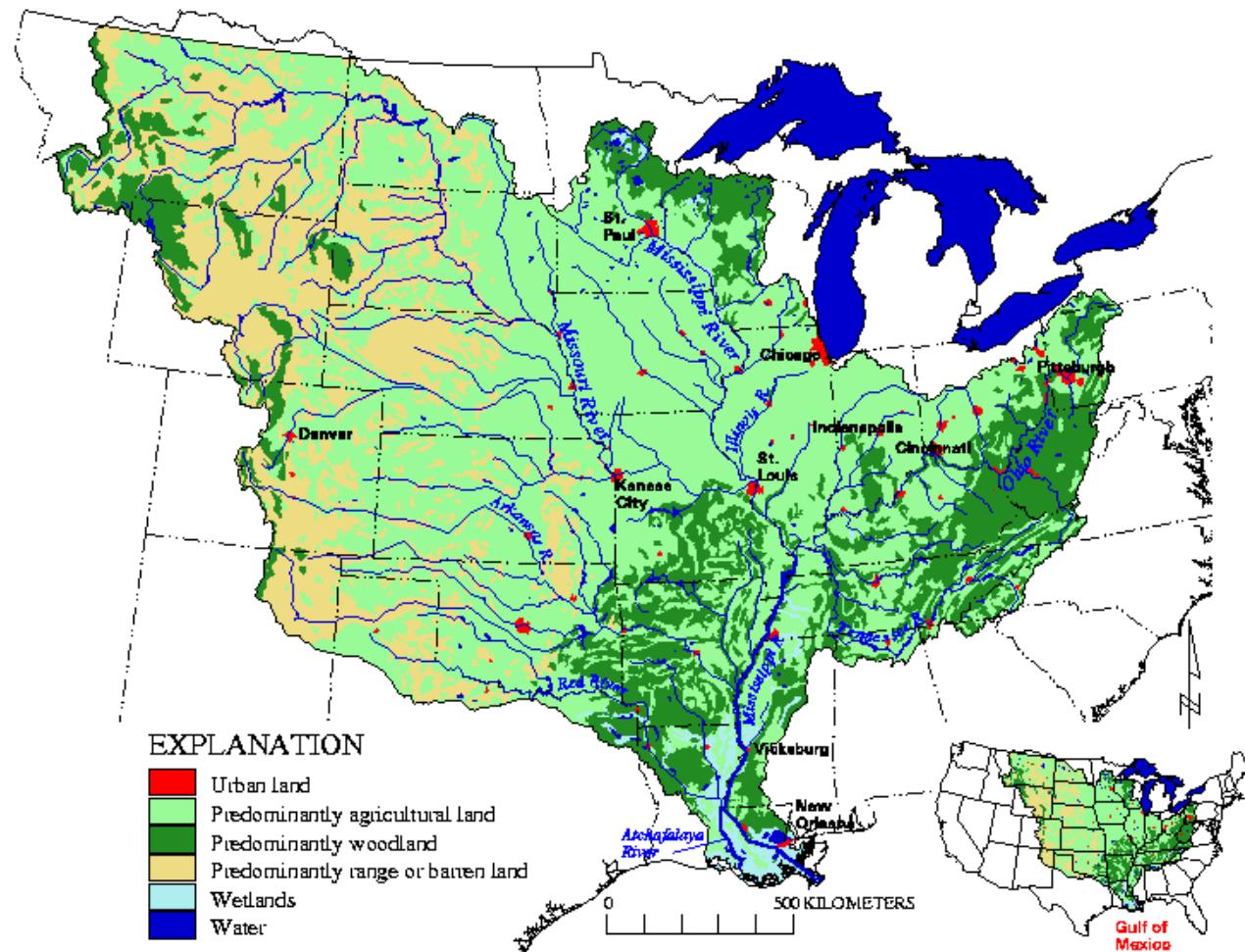
# Goal

- Reduce Nutrient Loads 45%
  - Nitrogen
  - Phosphorous





# Mississippi River Basin



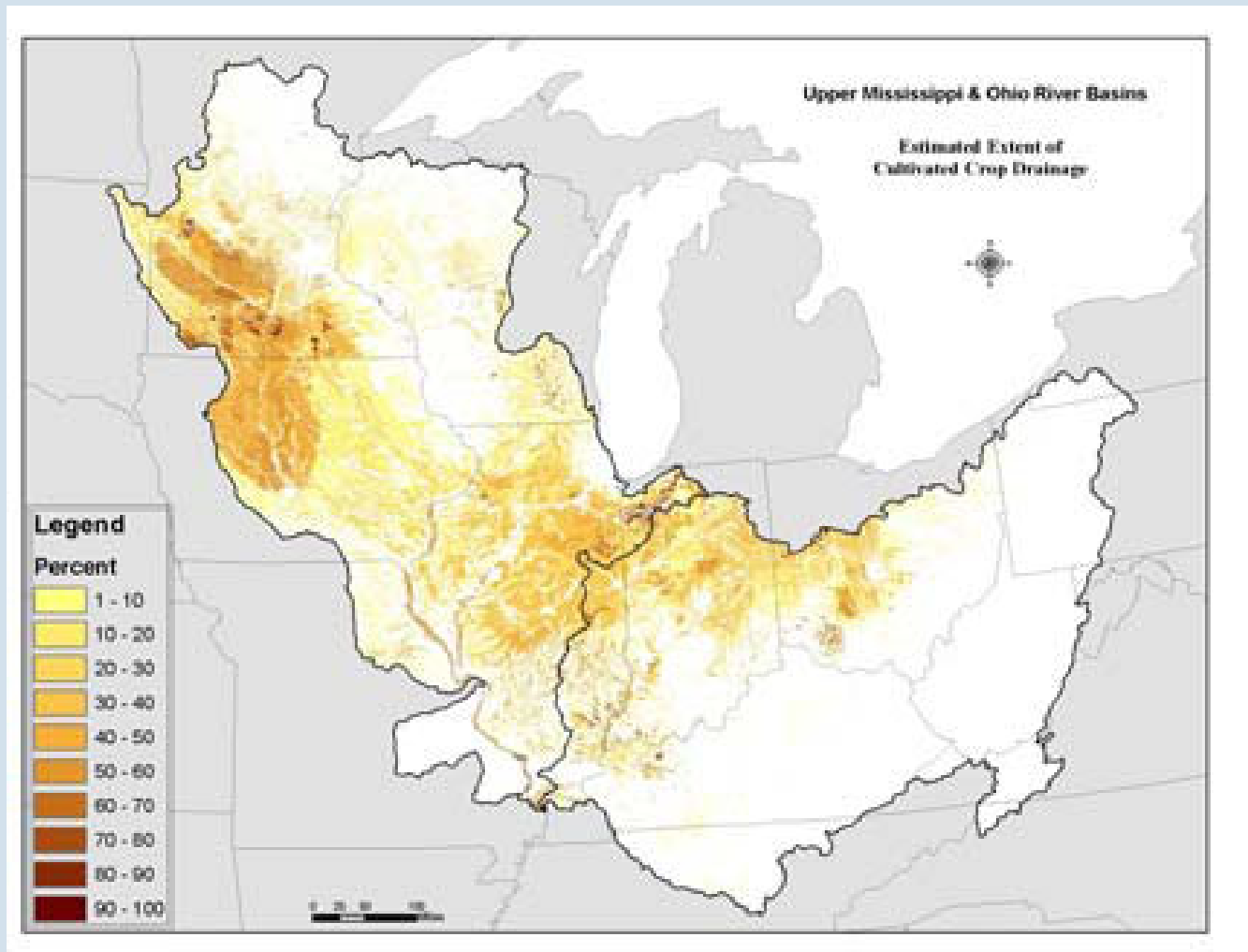


# Crop Acreage in MARB

Crop	Mississippi Basin	US	Share
	million hectares		
Corn	26.2	32.9	80%
Sorgum	3.6	4.4	82%
Barley	1.5	2.9	52%
Oats	1.6	1.9	84%
Wheat	26.6	30.6	87%
Rice	0.6	1.2	50%
Soybeans	20.4	25.2	81%
Cotton	3.5	5.7	61%
Silage	1.7	2.7	63%
Hay	15.7	25.3	62%
Total	101.4	132.8	76%



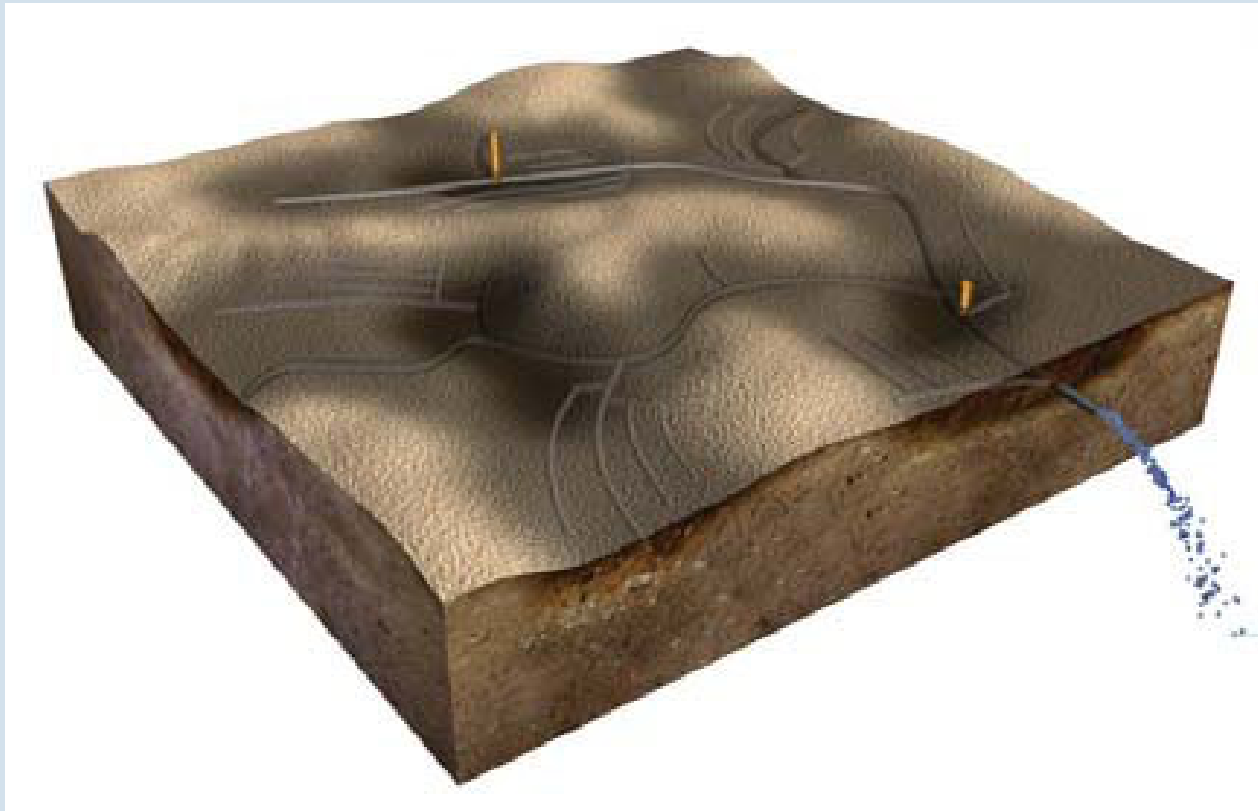
# Tile Drained Area



Source: Crumpton, W. G., G. A. Stenback, B. A. Miller, and M. J. Helmers



# Tile Drained Landscape



Source: Crumpton, W. G., G. A. Stenback, B. A. Miller, and M. J. Helmers

Slide 58



• Agriculture	58% N, 58% P
• Municipal point sources	22% N, 34% P
• Atmospheric Deposition	16% N, n/a
• Natural land	4% N, 8% P



# Best Management Practices

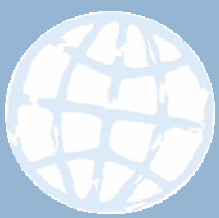
- Prevention
  - Reduced fertilizer (nutrient management)
  - Tillage practices
  - Cropping systems
- Treatment
  - Riparian buffers
  - Wetlands
  - Tile drainage management



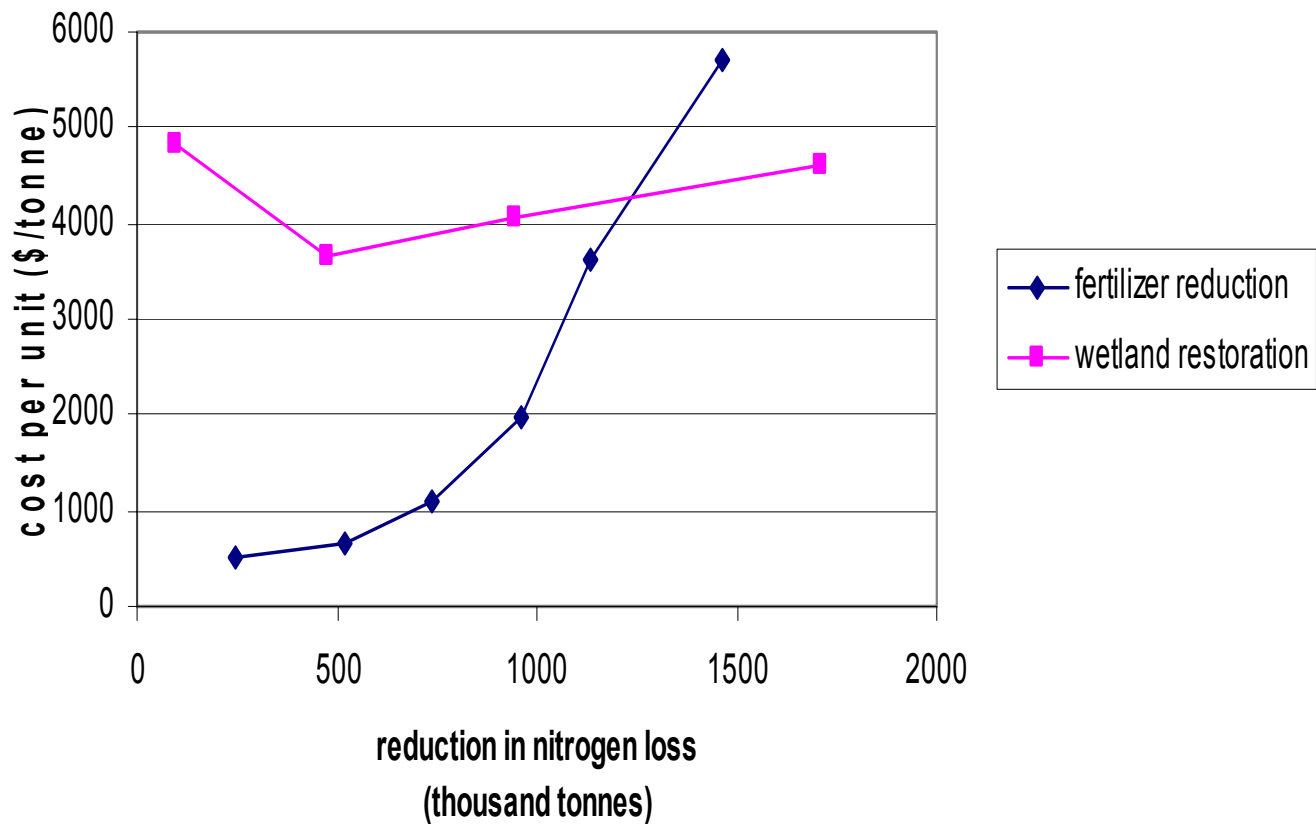


# Annual Economic Impacts

Scenario	N-loss reduction ( <sup>1</sup> 000 tonnes)	Welfare cost (million \$)	Erosion benefits (million \$)	Wetland benefits (million \$)	Net welfare costs (million \$)
<u>fertilizer reduction</u>					
10%	244	-109	-12		-121
20%	517	-348	7		-341
30%	738	-844	39		-805
40%	962	-1,961	45		-1,916
50%	1,136	-4,165	43		-4,122
60%	1,463	-8,437	98		-8,399
<u>wetland restoration</u>					
0.4 million hectares	97	-1,022	4	550	-468
2.0 million hectares	473	-4,494	16	2,751	-1,727
4.0 million hectares	944	-9,366	29	5,502	-3,855
7.3 million hectares	1,712	-17,865	51	9,904	-7,910

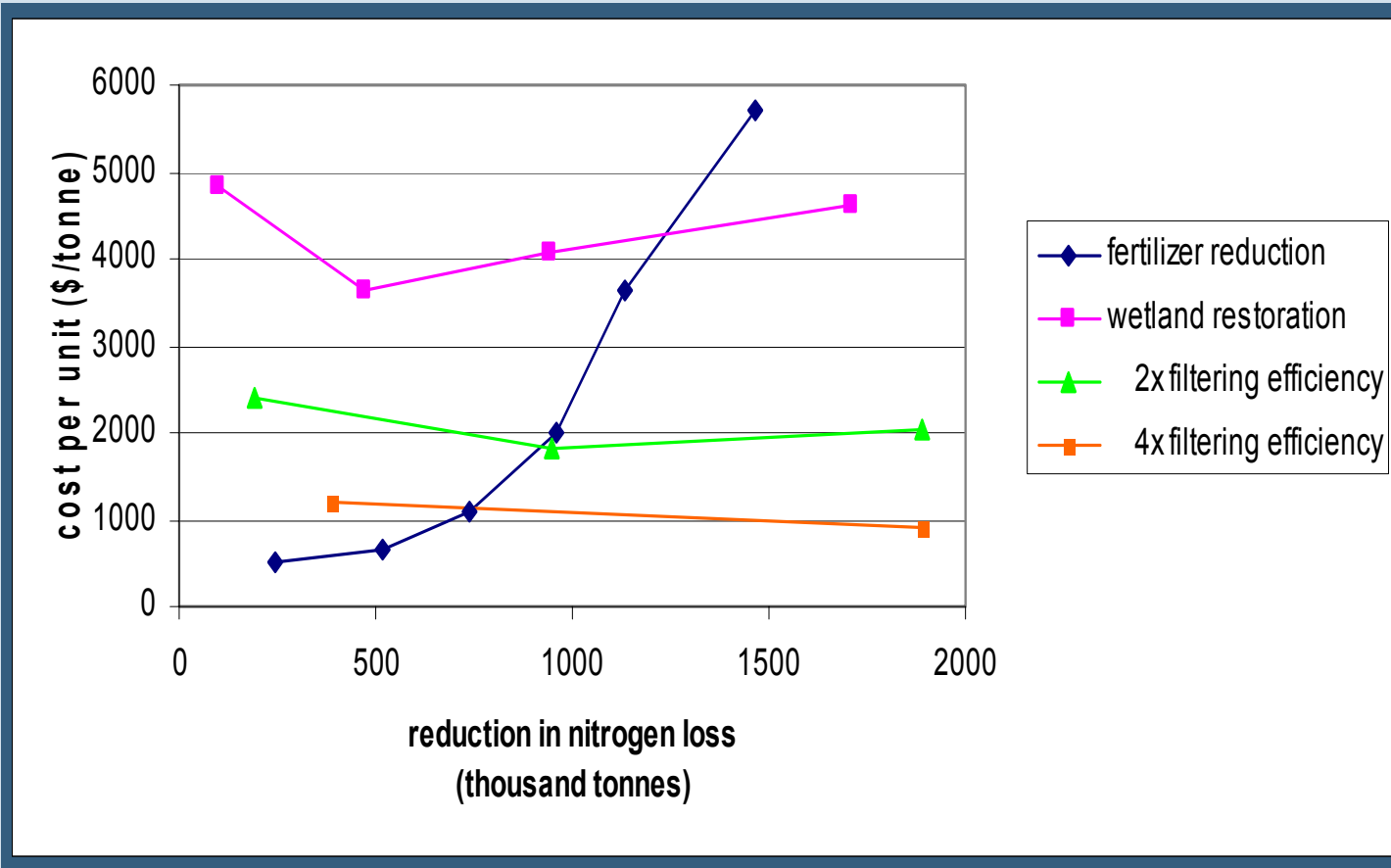


# Comparison of Nitrogen Reduction Strategies





# Effects of Increased Wetland Filtering Capacity





# Nutrient Reduction Approaches

- WWTW
- Agriculture - BAPs
- Reduction of P in detergents
- Wetlands / floodplains
- Awareness raising / training



# BAPs

- 15 BAPs developed and tested on 8 Family Farms in Serbia
  - 14 t/yr N reduced
  - 2 t/yr P reduced
  - 200kg/yr pesticide reduced
- Dissemination
  - 87 workshops with > 2500 participants
  - 91 media / promotional events in 7 countries - inc. 37 tv/radio
- IF applied throughout Danube:
  - Reduction of > 500,000 t/yr N
  - Reduction of > 90,000 t/yr P





# Laundry Detergents

- P limiting NW Black Sea
- 66% P-free in EU-25
- UWWTD benefits will be diminished without ban
- Public pressure
- Danube-wide ban advocated
- EC support of Danube ban as 'justified and proportionate' - EC Decision





# Wetlands & Floodplains

- Multiple Benefits
- MONERIS scenarios for Tisza River
- Data from nutrient removal
- Lessons







# Tisza Basin

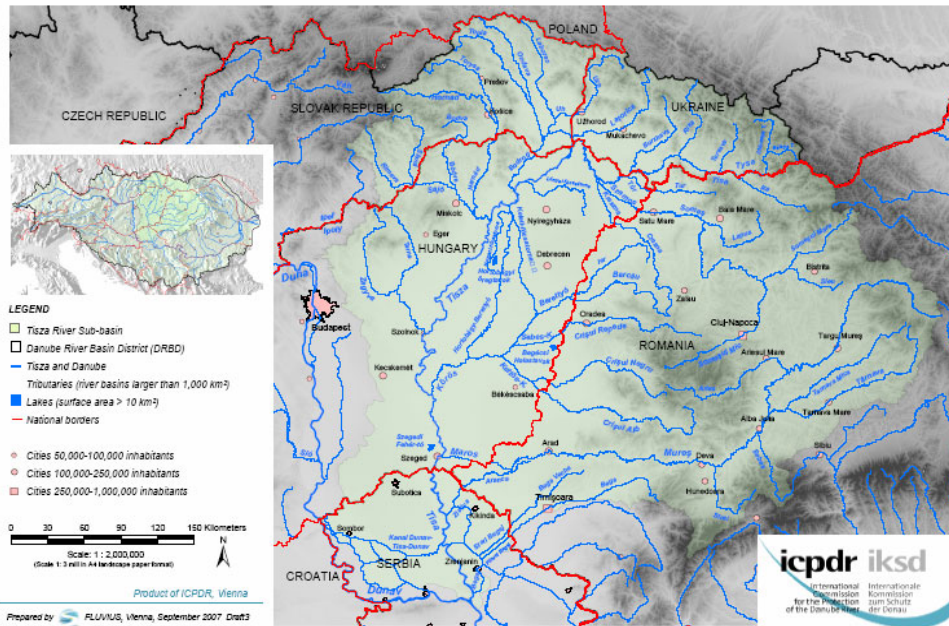




# Tisza River Basin

Tisza River Sub-basin: Overview

MAP 1



- ✓ Size: 157,186 km<sup>2</sup>
- ✓ Length: 966 km
- ✓ Largest sub-basin of the Danube River Basin
- ✓ Longest tributary of the Danube River

Ukraine, Romania, Slovakia, Hungary,  
Serbia



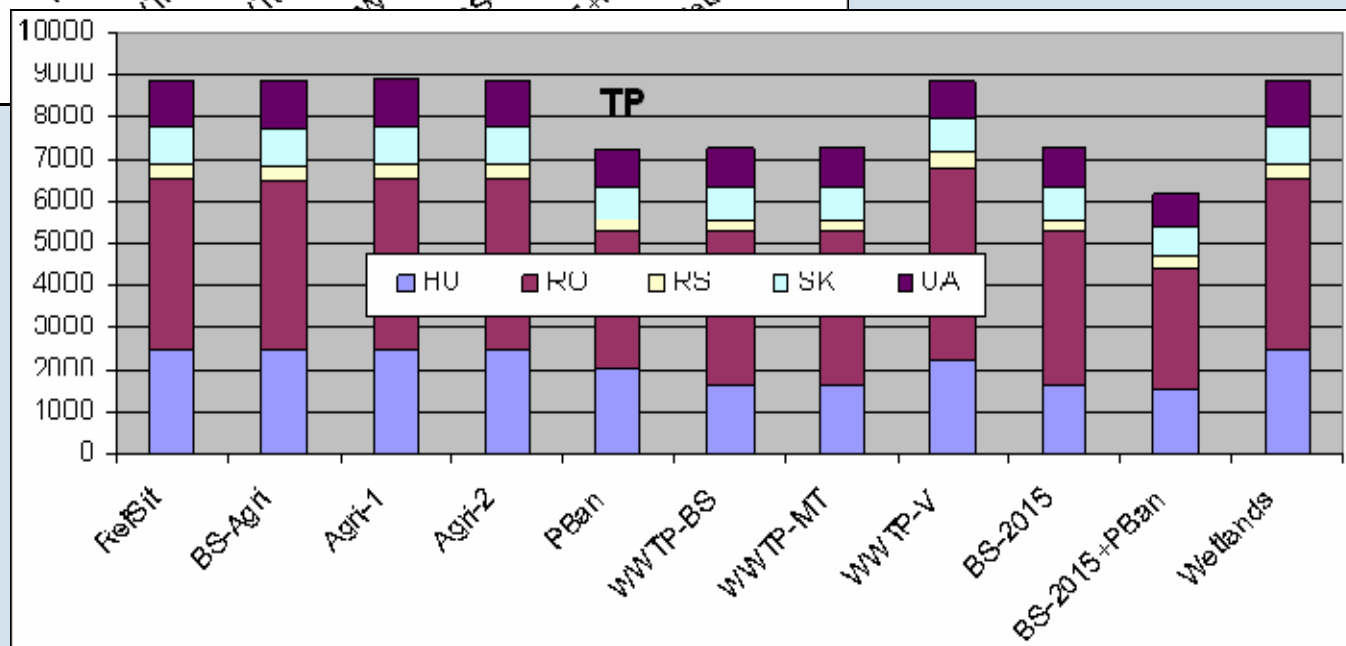
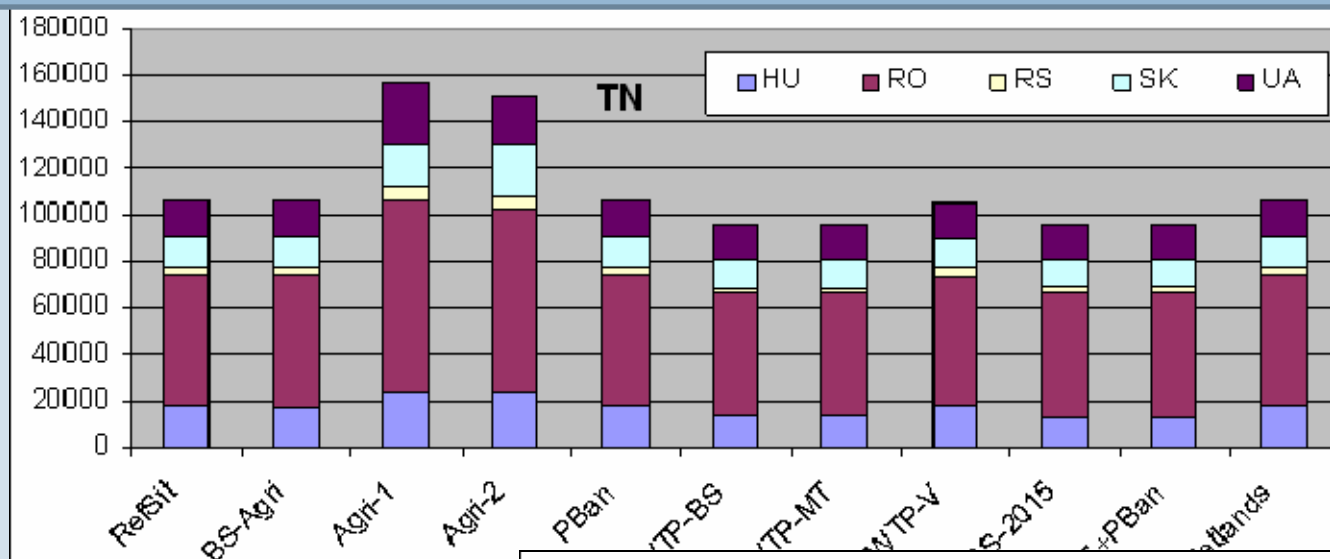
# Tisza River Basin Analysis 2007

Summary Report - A call for action





# Considering Reconstruction of Wetlands in the Tisza basin





## Case Study: Moldova APCP

- Challenges: Inappropriate storage of livestock manure, plowing that favors erosion and other poor agricultural practices
- BMPs: Effective use of fertilizer, crop rotation, improved grazing practices
- Outcomes: Direct impact in 2008 includes reduced N 102.5 T and P 79 T





# Burden Sharing

- How to achieve the Danube River Basin-wide goal of reducing nutrient emission in the long-term?
- Policy measures/activities to be implemented unilaterally (country by country);  
or
- All riparian countries agree on the principle for sharing the burden of meeting the political goal (i.e. joint/concerted action).
- Second approach could achieve the goal with the lowest overall costs



# An Empirical Example: Achieving 50% NR in the Baltic Sea

Results of a study by Gren et al. (1997): *Cost-effective Nutrient Reductions to the Baltic Sea.*

	Costs (mill EUR)	Reduction in %	Costs (mill EUR)	Reduction in %
Sweden	171	42	213	50
Germany	58	15	4,816	50
Poland	358	59	124	50
Estonia	47	54	34	50
Latvia	147	66	29	50
TOTAL (all Baltic Sea countries)	1,328	50	5,711	50



Questions?????



# Contact Information

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