LIVING WATER EXCHANGE

Promoting Nutrient Reduction Best Practices in Central and Eastern Europe

Final Project Report, Findings and Recommendations

March 31, 2011

UNDP GEF IW LEARN Global Environment & Technology Foundation REGIONAL ENVIRONMENTAL CENTER

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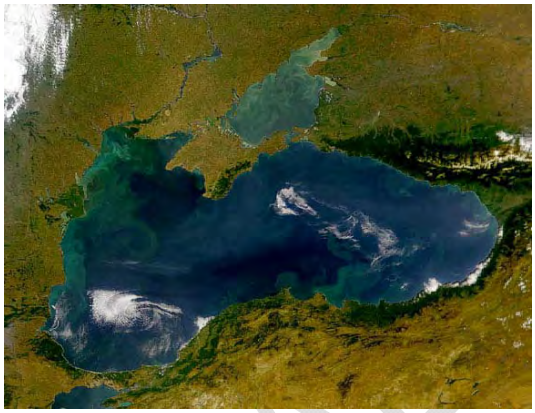
Abbreviations/Acronyms

BAP	Best Agricultural Practice
BMP	Best Management Practices
CE	Cost Effectiveness
CEE	Central and Eastern Europe
CGAP	Codes of Good Agriculture Practice
DIN	Dissolved Inorganic Nitrogen
DREPR	Danube River Enterprise Pollution Reduction Project
DRP	Danube Regional Project
GEF	Global Environment Facility
GETF	Global Environment & Technology Foundation
GPNM	Global Partnership for Nutrient Management
ICPDR	International Commission for Protection of the Danube
IW	International Waters
IW:LEARN	International Waters Learning Exchange Network
MCC	Millennium Challenge Corporation
MSP	Medium Size Project
N	Nitrogen
NMP	Nutrient Management Plan
P	Phosphorus
PIR	Project Implementation Review
REC	Regional Environmental Center
THMs	Trihalomethanes
TMDL	Total Maximum Daily Load
UNDP	United Nations Development Programme



http://www.picsearch.com

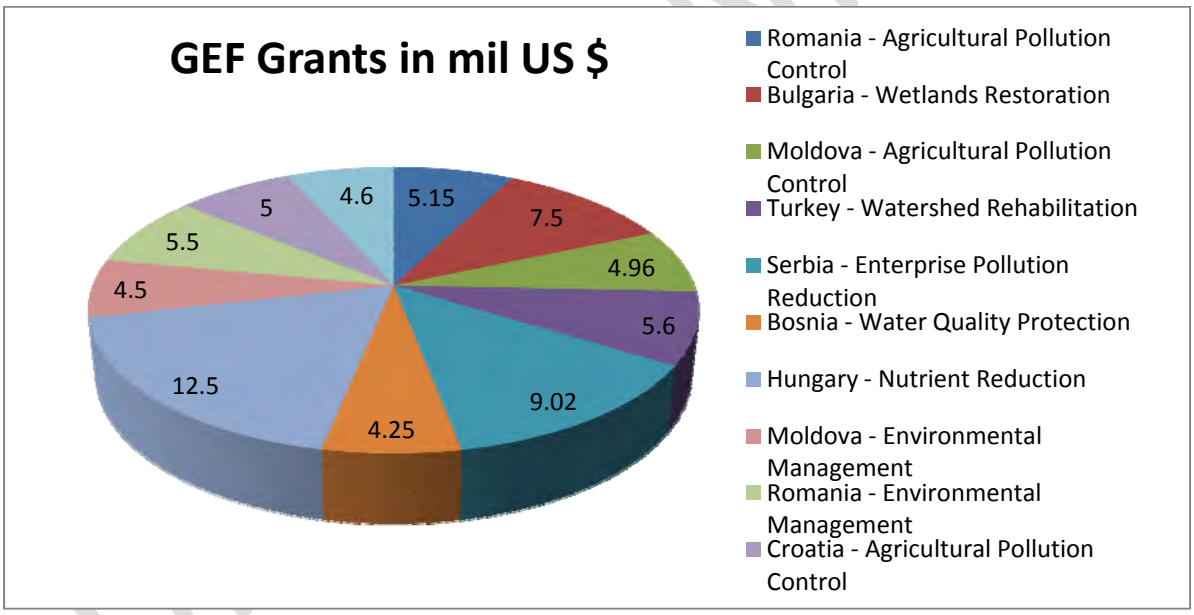
Section I – Executive Summary

Background

Since the mid-1960s, the area of summer-autumn hypoxia zones in the Black Sea increased more than 1,000 times.[1] The Global Environment Facility (GEF) International Waters (IW) Focal Area [2] was one of many organizations that made significant investments to address the challenges posed by this nutrient pollution in Central and Eastern Europe (CEE) and Central Asia. These efforts created a wealth of experiences and practices, focusing on the Danube River-Black Sea basin. However, it is unclear whether those investments were systematically linked, build on one another in a meaningful way or focused on individual interventions rather than a systems approach to improvement. Therefore the GEF and United Nations Development Programme (UNDP) in partnership with the Global Environment & Technology Foundation (GETF)[3], the Regional Environmental Center (REC)[4] and the International Waters Learning Exchange Network (IW:LEARN) initiated a GEF Medium Size Project (MSP) to inventory, assess and accelerate replication of nutrient reduction best practices across the region.

Figure 1 shows these projects and investment numbers.

Figure 1 – Core Projects[5]



[1] http://www.europe.culturebase.net/contribution.php?media=307.
[2] The GEF is a global partnership among 182countries, international institutions, non-governmental organisations (NGOs) and the private sector investing in transboundary water issues.
[3] The Global Environment & Technology Foundation (GETF), established in 1988, is a Virginia-based 501(c) (3) not-for-profit organization dedicated to building the infrastructure for sustainable development.
[4] The REC was established in 1990 by the United States, the European Commission and Hungary to assist in solving environmental problems.
[5] GEF, "GEF Nutrient Reduction Partnership Tackles the Black Sea "Dead Zone" and Danube Basin Pollution," 2009.

The official title of this MSP is Promoting Replication of Good Practices for Nutrient Reduction and Joint Collaboration in Central and Eastern Europe (hereafter referred to the Living Water Exchange: A GEF/UNDP project to promote nutrient reduction best practices in CEE).

Purpose of the Final Report

This document serves as the final report for the Living Water Exchange and will provide guidance to the Project Steering Committee, terminal evaluator and the GEF stakeholder community on possible pathways to prioritize and replicate nutrient reduction practices and experiences from previous GEF investments in Central and Eastern Europe. The report will help demonstrate that the Living Water Exchange added solid value and leadership to the GEF's discussions on reducing nutrient loading throughout the region and around the world.

The purpose of the report is as follows:

1. Summarizing findings from the inventory of projects and nutrient reduction practices – What have we learned from engaging the GEF stakeholder community and other key organizations in Central and Eastern Europe and globally? What value has the GEF received for its investments? Is there sufficient awareness of hypoxia and other challenges related to nutrient over-enrichment in our water resources? The Living Water Exchange identified 38 nutrient relevant projects with more than 138 nutrient reduction practices. Twenty-eight of the projects were related to agriculture and/or wetlands restoration issues and contained practices which are evaluated in section IV of the report and outlined in Appendix 1.
2. Offering perspective on priority practices and steps for scaling-up and replicating them throughout the region – In which practices should governments, businesses and farmers be investing funds for replication? This report recommends eight practices to replicate for further reductions of nitrogen (N) and phosphorous (P), possible approaches for replication in the region and a discussion of practice cost-effectiveness.
3. Recommending key actions to build capacity at the country-level and on the farm for more effective implementation and scaling-up of demonstration practices – What is the capacity of countries, policy makers and practitioners/farmers in Central and Eastern Europe and Central Asia to change behavior, and what are the approaches and low cost interventions that help communities and small holder farmers do so? The Living Water Exchange funded four demonstration projects to pilot low cost nutrient reduction interventions and engaged key stakeholders in the region in peer-to-peer exchanges to help share experiences and build cooperation and capacity for implementing such practices.
4. Helping demonstrate that the Living Water Exchange provides a model learning process for other GEF projects – Are there lessons from the project that the GEF can replicate to build capacity on this and other issues of importance? The outreach process to the GEF community, the peer-to-peer exchange and the low cost interventions focus are among the practices developed by this project that might be instructive to the GEF's future efforts.

Report Limitations

This final report does not however provide an exhaustive examination of all the issues, approaches and/or organizations related to nutrient pollution and its solutions in the region or worldwide. It is instead a "snap shot" in time regarding the development of nutrient reduction strategies and practices from the GEF investments in the region and suggests potential pathways to replicate such practices throughout Central and Eastern Europe and Central Asia.

Summary Findings

The Living Water Exchange's findings are summarized in the following two key categories:

1) Inventory of projects and practices:

- Systems of practices, rather than individual practices are needed to meet water quality goals.
- The scale of production and practices for the majority of small holder farmers in the region is such that collaboration among farmers to share equipment and experiences could be helpful in focusing on higher value crops and implementing ecological practices. The Federation of Agricultural Associations from Armenia has such a cooperative based model that could also assist in reaching farmers in the region, meeting a critical outreach need for organizations such as the ICPDR and offering a possible approach to bring small farmers to scale to meet economic and environmental goals.
- Consulting directly with farmers or "trusted" farmer organizations is important to ensuring buy-in and adoption of ecological/good/ best agricultural practices. Local expertise is needed to train farmers on the practices and systems. A train-the-trainer approach, perhaps in partnership with the local extension service might be one method to transfer knowledge and technologies from GEF projects to key farmer organizations. The U.S.-based national cooperative extension service is also building eXtension web-based communities of practice to facilitate collaboration and learning.
- Operations and maintenance of practices is for-the most-part not incorporated into project development, which limits the long-term stress reduction potential of practices.
- Measurement of outcomes was almost universally identified as a critical issue to verify stress reduction and improved water quality, and presents a particular challenge as it typically falls to the governments after the projects are complete.
- Harmonization with the European Union Water Framework Directive (WFD) and Nitrates Directive is driving change in the region in particular among accession countries and has resulted in the development of "Codes of Good Agricultural Practices" and implementation of legal frameworks and various nutrient management approaches (many of which are discussed in the country profiles in Section VI and Appendix 2). The GEF investments provided important support to the countries as these "Codes" were developed.
- Low cost interventions, such as wetlands restoration or nutrient management implementation are among best value investments and offer solid opportunities for significant impact as part of an overall nutrient reduction system. The GEF/World Bank Romania Agricultural Pollution Control Project concluded that nutrient management (intensive and precise management of nutrient sources is essential) was the most cost effective practice to implement. This analysis agrees with similar conclusions from the Chesapeake Bay Basin.

2) Value of the GEF investments

- Potential stress reduction from the Living Water Exchange inventoried projects in the region is approximately 13,020 tons per year N and 4,510 tons per year P based on MONERIS[6] load estimates. These numbers reflect reductions due to agricultural and wetland impacts but not waste water treatment plants.

[6] The MONERIS model, developed by ICPDR calculates the emissions of N and P to the surface water, by different pathways as well as the instream retention in the surface water network Through MONERIS the nutrient loads within the Danube river network has been calculated for today and a scenario has been developed for 2015.

While overall figures for GEF projects are not large, they should be seen as catalyzing change by demonstrating what can be achieved. It is expected that further replication through other financial resources would increase reductions further. At the same time the results also highlight the need to monitor projects, collect data and implement appropriate operations and maintenance.

- The GEF leveraged its more than $122 million in investment with approximately $400 million in co-finance.
- Measurable improvements have been observed in the ecosystem, including increases in the number of benthic species[7] and virtual elimination of the hypoxic zone in the Northern Black Sea from 1993 to 2001. While these early reductions are primarily due to the economic downturn in the region, the ongoing challenges of hypoxia in the Black Sea and how they have been solved can serve as a shining example of how initiatives to restore the agricultural economy in the region can be coupled with changes in culture/human behavior and actions, such as nutrient management can improve water quality over the long-term.
- The GEF catalyzed cooperation in the region and built on efforts of the International Commission for the Protection of the Danube River to jointly address the pressures of nutrient pollution. One of the key findings of the Danube Regional Project was the benefit of close cooperation between the ICPDR and GEF projects in the region.
- Peer-to-peer exchanges held at Living Water Exchange demonstration sites among policy makers and practitioners/farmers are a good model to build capacity to further replicate practices. So much so that the Minister of the Environment for Albania is hosting a ministerial-level meeting during first quarter of 2011 to discuss how to foster cooperation to address nutrient pollution in the region.
- The new GEF full size project entitled "Global Foundations for Reducing Nutrient Enrichment and Oxygen Depletion from Land Based Pollution in Support of the Global Nitrogen Cycle" or the Global Partnership for Nutrient Management is developing a policy tool box which will utilize the Living Water Exchange practice inventory, analysis and database as the foundation for its development and ensure that key practices are replicated and implemented to meet performance expectations and outcomes in key nutrient "hot spot" regions worldwide.

[7] GEF, 2007.

The Final Report

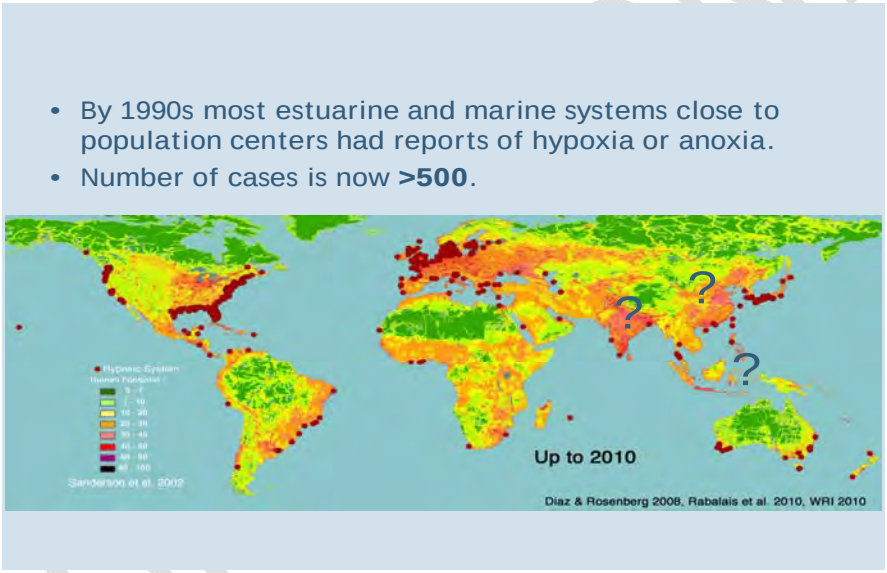
Section II – Introduction and Context

Hypoxic "dead zones" of low oxygen have increased globally almost nine times since 1969.[8] There is widespread scientific agreement that changes in the global N cycle and increased nutrient loading, primarily caused by non-point source pollution (i.e., agricultural activities and storm water runoff) are directly linked to these "dead zones" and other significant impacts on our water resources, including:[9]

- Significantly increased levels of nuisance algae and aquatic vegetation
- Reduced penetration of light
- Increased turbidity – impairment of sight feeding fish, aesthetics, water safety, limits growth of submerged aquatic vegetation, and impairment of fisheries and habitat degradation
- Low levels of dissolved oxygen and high levels of ammonia; resulting from organic decomposition
- Increased drinking water treatment costs - formation of disinfection by-products (e.g., THMs (trihalomethanes)) in drinking water, taste and odor effects of algae
- Imbalance of aquatic species and reduced biodiversity
- Shifts in the structure of the food chain
- Toxic algae including cyanobacteria (blue green algae)

Figure 2 shows the nutrient "hot spots" in coastal zones in 2010:

Figure 2 – Coastal Hypoxic



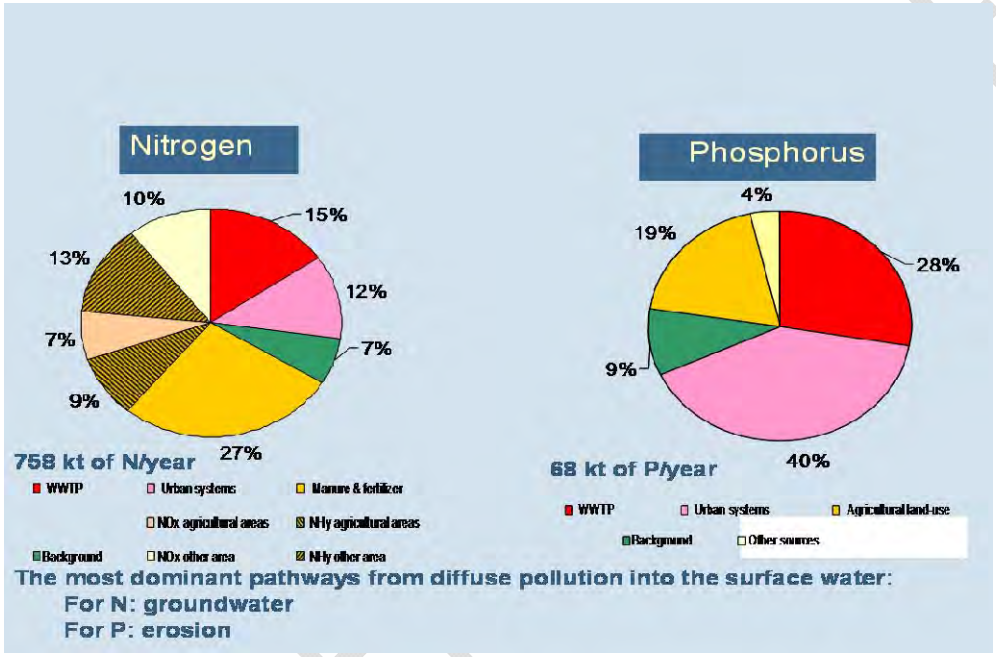
It is worth noting that there are approximately 500 million small farms globally of one to two hectares.[10] While the average size of farms in Central and Eastern Europe appear to be slightly larger (3 to 6 hectares), GEF projects have continued interest in catalyzing the sustainable management of these small farms, which is critical to reducing nutrient loading in the coastal zone worldwide.[11]

[8] Diaz, 2010.
[9] Living Water Exchange, 2010.
[10] http://www.unep.org/billiontreecampaign/FactsFigures/QandA/index.asp.

Nutrient Impacts on the Danube-Black Sea Basin

N and P levels from agriculture, municipal and industrial sources seriously degraded the Black Sea ecosystem, disrupted fisheries, reduced biodiversity, posed threats to humans and resulted in billions of dollars of losses to the economies of the six Black Sea littoral countries. Nutrient and toxic pollution from the 17 countries comprising the Danube River Basin, which flows into the Black Sea, created many of these water quality issues in the region. The specific sources of recent nutrient loading are shown in Figure 3 below. The chart also states that annual loading of N and P into the Danube-Black Sea basin is approximatelty758 kilotons and 68 kilotons respectively.

Figure 3 – Sample Sources of Nutrients in the Danube-Black Sea[12]



GEF Actions to Address Nutrient Over-Enrichment

The GEF International Waters Focal Area invested approximately $100 million in several regional partnerships and eleven single country projects to address nutrient pollution.[13]

As a result, the Black Sea coastal states have continued to make profound progress in developing and enforcing legislative and regulatory tools in accordance with the main principles of the Black Sea Strategic Action Plan. The North West Shelf of the Black Sea is showing remarkable signs of recovery. Measurable improvements have been observed in the ecosystem, including increases in the number of benthic species[14] and virtual elimination of the hypoxic zone from 1993 to 2001.[15] Much of this initial reduction can be attributed to the decrease in livestock units by as much as two-thirds primarily due to the economic downturn in the region.

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[11] Subsistence level farms in Central and Eastern are typically not able to afford enough nutrients to have high nutrient losses (see MONERIS Map of DRB, in which Western Europe has high loads and CEE has low loads). As these small landholders form partnerships that may be more economically sustainable above a subsistence level, losses will increase. The interventions and BMPs are designed to minimize or prevent increases in nutrient losses while we increase the rural economies and quality of life of CEE.

[12] ICPDR, 2005.

[13] GEF, "GEF Nutrient Reduction Partnership Tackles the Black Sea "Dead Zone" and Danube Basin Pollution," 2009.

[14] GEF, 2007.

[15] GEF, "GEF Nutrient Reduction Partnership Tackles the Black Sea "Dead Zone" and Danube Basin Pollution," 2009.

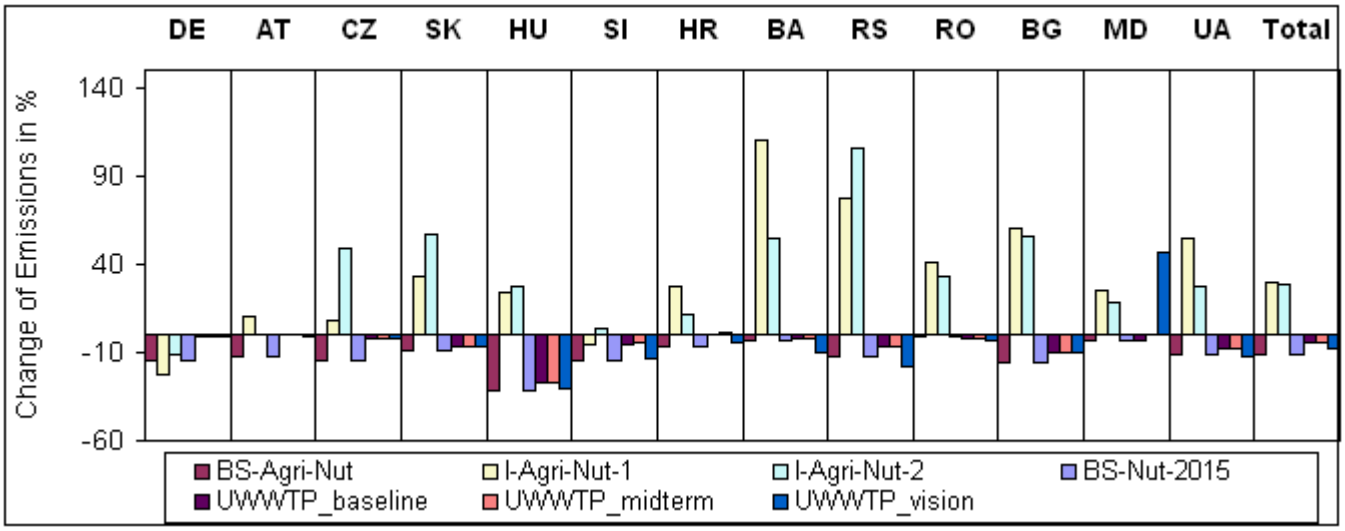
The Black Sea countries also implemented pilot demonstrations for nutrient reduction in the agriculture, municipal wastewater and industrial sectors and managed to allocate national financial resources although still scarce and insufficient.[16] These investments (European Union, GEF and nationally funded) resulted in reductions of fifty percent in P loads and twenty percent in N loads respectively.[17] Despite such regulatory and legal enforcement of point sources across the region, nutrient pollution from diffuse sources including agriculture remains a substantial challenge.

Results from calculated scenarios and pollution reduction effects 2015:

Nitrogen and P emission in the DRB

Figure 4 and Figure 5 present the changes relative to the reference situation for different scenarios. Figure 4 illustrates the results for N. It can be clearly seen that the expected development will lead to a decrease of inputs. However, the intensified agricultural scenarios (I-Agri-Nut-1 and I-Agri-Nut-2) show that a potentially significant increase in N pollution would occur for several countries.

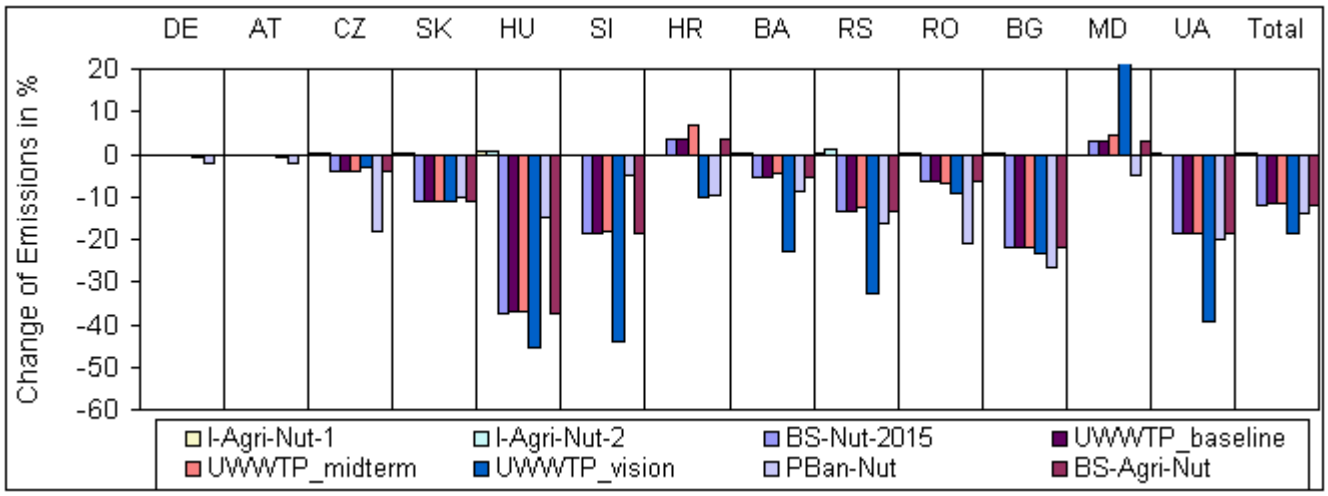
Figure 4[18] – Relative changes in N emissions compared to the Reference Situation 2005 for the different scenarios for UWWT and agricultural development



The Baseline Scenario-Nutrients (BS-Nut-2015) consists of the Baseline scenario for UWWT 2015 (Baseline Scenario UWWTP-2015) and the Baseline Scenario for Agriculture (BS-Nut-2015). (The national RBM Plans provide additional information on N emissions.)

[16] State of the Black Sea, 2009.
[17] GEF presentation, January 2011.
[18] ICPDR, 2011.

Figure 5[19] – Relative changes in P emissions compared to the Reference Situation 2005 for the different scenarios for UWWT, agricultural development scenarios and the scenario of a basin wide ban of P containing laundry detergents and dishwashers (PBan-Nut)



(The national RBM Plans provide additional information on P emissions.)

Figure 4 illustrates the P load changes relative to the Reference Situation-Nutrients. The parameter changes for the intensified agriculture scenarios do not influence the results for P, as additional input is temporally stored in the soil, leading only to changes on a longer time scale.

The significance of P reduction in detergents (laundry and dishwashers detergents) was also calculated and the results are presented in Figure 5. This figure also illustrates the values for urban wastewater treatment development in the DRB (based on the EU MS basic measures and the commitments of non EU MS in achieving wastewater treatment plants until 2015). The results for the calculated Phosphate Ban Scenario-Nutrients show that that the P emission would be significantly reduced. This relatively cheap measure has a reduction potential similar to the investments in urban waste water treatment. This leads to a very favorable cost-effectiveness solution.

Section III – The Living Water Exchange

The following is the premise under which the Living Water Exchange was funded by the GEF:

"After 15 years of continuing support, the GEF is presently phasing out its involvement in N-P reduction in the Central-Eastern European region. As countries in Central and Eastern Europe accede or approach accession into the EU, with associated agricultural production goals and policy parameters and the threat of intensive agricultural policies under the EU Common Agricultural Policy and the economic expansion of western farmers and agribusiness towards the poorer countries towards the South and East, it is increasingly important that sound and comprehensive nutrient reduction and sustainable agricultural policies, strategies and practices are identified and adopted. In addition, there is an acute need for replication of best nutrient reduction practices in the rapidly growing regions of East Asia and South Asia."[20]

[19] ICPDR, 2011.

[20] MSP project document "Promoting Replication of Good Practices for Nutrient Reduction and Joint Collaboration in Central and Eastern Europe."

"There is a wealth of GEF and non-GEF-funded nutrient reduction experience and successful nutrient reduction demonstration projects in the Central-Eastern European region. There is a need to strengthen nutrient reduction projects in and out of the region by identifying categories of nutrient reduction practice, developing generally acceptable criteria for good nutrient reduction practices, and by identifying, capturing, and disseminating good practices and lessons learned in nutrient reduction. The identification and capture of existing nutrient project information would also act as a supplemental activity to successful GEF projects such as the Danube/Back Sea Partnership in terms of an inventory and catalogue of best practices and lessons learned, and could act as an example for other partnerships."[21]

Objectives

Therefore, the Living Water Exchange was established to achieve the following key objectives:

- Limit – The project will limit the resurgence of agricultural and non-agricultural diffuse nutrient releases. This project will showcase the "best of the best practices" that will address these issues in specified beneficiary countries in CEE;
- Capture – The project will identify, capture, analyze and summarize best practices, lessons learned and technologies to reduce the impacts of nutrient loading in the region;
- Demonstrate – The project will demonstrate successful replication strategies by facilitating pilot projects (for example agricultural improvements, wetlands restoration, other low-cost solutions to nutrient reduction, etc.) and transferring knowledge to policy makers and practitioners in the region; and,
- Replicate – The project will disseminate and promote nutrient reduction best practices and other share information on successful replication strategies in the region, among key decision-makers, practitioners, industries, other stakeholders and the general public.

Beneficiary Countries

The following are the beneficiary countries of the project as shown in Figure 6 below:

[21] Ibid.

Figure 6 – A Map of Central and Eastern Europe and Central Asia[22]

- Albania
- Azerbaijan
- Bosnia & Herzegovina
- Croatia
- Georgia
- Iran
- Kazakhstan
- Moldova
- Montenegro
- Russian Federation
- Serbia
- Slovakia
- Turkey
- Turkmenistan
- Ukraine

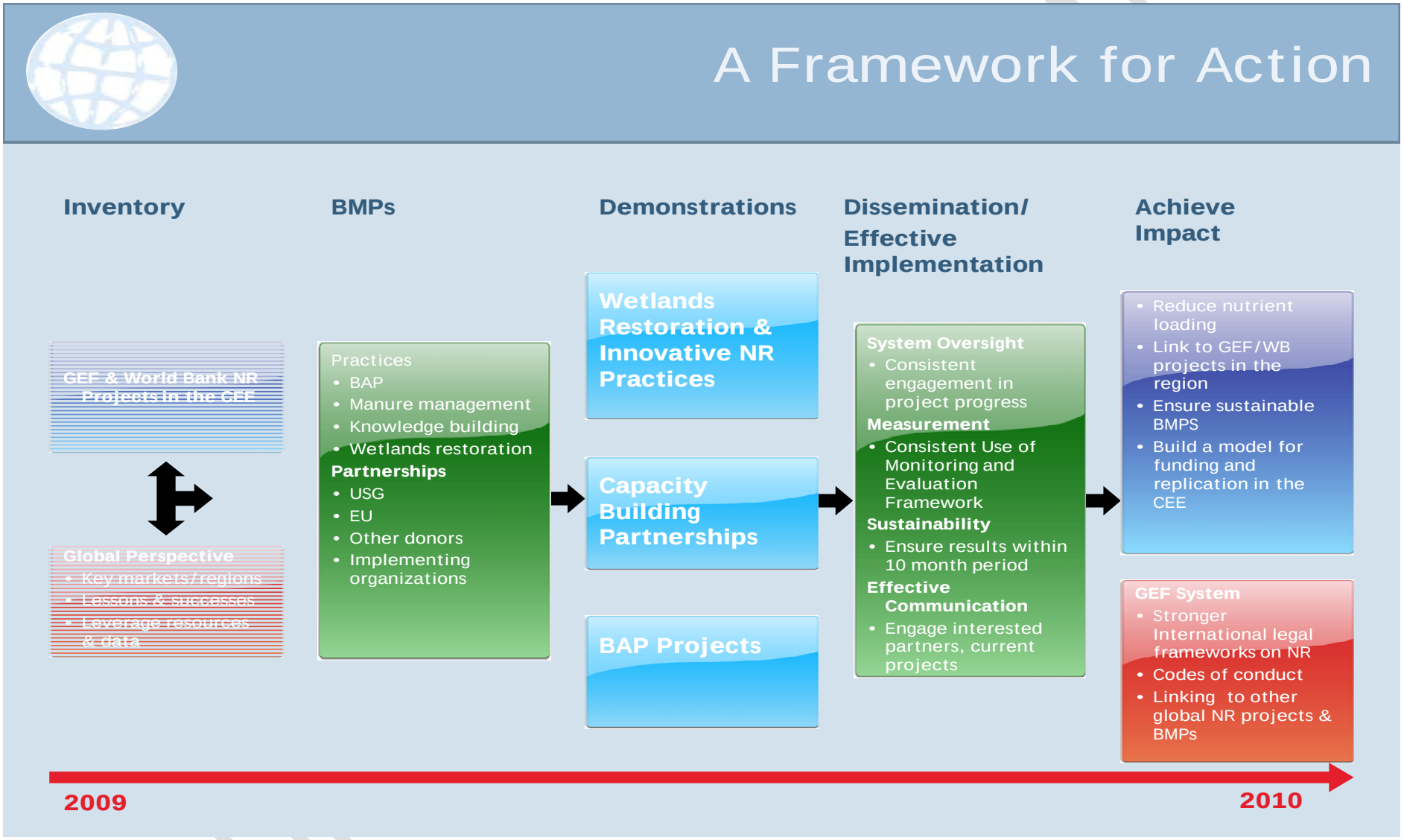
While the Living Water Exchange only funded demonstrations and looked to build capacity in beneficiary countries, the projects engaged stakeholders across the region (including Bulgaria, Estonia, Hungary, Poland, Romania, etc.) to inventory projects and practices and disseminate information.

Methodology Framework

The following figure outlines the project methodology framework used to execute the Living Water Exchange. Many of the steps were implemented concurrently by the project team:

[22]http://www.google.com/imgres?imgurl=http://indistinctunion.files.wordpress.com/2008/08/eastern_european.gif&imgrefurl=http://indistinctunion.wordpress.com/2008/08/10/background-russo-georgian-war/&h=515&w=738&sz=46&tbnid=NdCrPUFB24kFJM:&tbnh=98&tbnw=141&prev=/images%3Fq%3Dmap%2Bof%2Bcentral%2Band%2Beastern%2Beurope&zoom=1&q=map+of+central+and+eastern+europe&hl=en&usg=__eCtA_GLnT6nZf2BWIkz5KrzntCA=&sa=X&ei=-WvlTJadEMX6lwfd1cSeDA&ved=0CCQQ9QEwBQ.

Figure 7 – The Living Water Exchange Process



The details of each step in the process are as follows:

1. Step 1: Inventoried GEF and World Bank projects
    a. Identified 38 priority nutrient relevant projects from input from GEF leadership, the majority of which are recent, ongoing or other key nutrient reduction projects, including the core GEF-World Bank Investment Fund for Nutrient Reduction project, the GEF/UNDP Danube Regional Project and the GEF/UNDP Black Sea Strategic Partnership

2. Step 2: Identified Best Management Practices (BMP) for nutrient reduction
    a. Developed categories of nutrient pressures and measures to identify general challenges and solutions in the region (See Appendix 3)
    b. Developed a questionnaire to send to project managers and other country representatives to gather nutrient reduction best practices and other critical project information (See Appendix 4)
    c. Engaged GEF project managers and other country representatives to provide the information in the questionnaire
    d. Researched other key project information through various web sites and project reports and engaging key stakeholders, including the Director General Environment for the European Commission
    e. Drafted two pagers summarizing practices for specific projects (See Appendix 5 for the completed two page summaries)
    f. Developed a database of projects and practices working with IW:LEARN
    g. Evaluated the practices to prioritize them for scaling-up and replication as described in Section IV of this report

3. Step 3: Implemented Demonstrations Projects
    a. Issued a "Call for Concepts" to support pilot demonstrations to deploy nutrient reduction practices in the region (See Appendix 6 for the "Call")
    b. Received 24 responses of which nine were selected to submit final proposals. These were evaluated based on the nutrient reduction practice and impact to reduce stress, engagement with stakeholders and cost
    c. Funded four demonstrations to pilot key practices and test low cost interventions (http://nutrient-bestpractices.iwlearn.org/demostration-projects):
        1. Tirana, Albania: Constructed Wetland for Nutrient Reductions in the Waters of Tirana River
        2. Cahul, Moldova: The Decrease of Water Pollution Sources in Prut river basin through the Promotion and Implementation of the Best Agricultural Practices
        3. Kruševac, Serbia: Help the "Celije" Lake on the Rasina River nearby Krusevac with Experiences of Natural Processes

4. Zakarpattya Oblast, Ukraine: Best Practices of Fertilizers Reduction from Agricultural Lands in Upper Tisza Basin

d. Held peer-to-peer exchanges among policy makers , farmers and other stakeholders at the four demonstration sites to build capacity at the country-level and on the farm to implement nutrient reduction practices
e. Evaluated the demonstrations for effectiveness and sustainability of practices (See reports are attached in Appendix 7)

4. Step 4: Disseminated Information to Build Awareness and Ensure Effective Implementation
   a. Disseminated practices and experiences at key conferences, workshops and other events, including the GEF International Waters Conference in Cairns, Australia and the Regional World Bank Conference in Belgrade, Republic of Serbia
   b. Drafted articles based on regional successes, the demonstrations and peer-to-peer exchanges to continue to build awareness among policy makers, farmers and other stakeholders in the region (See Appendix 8 for sample articles)
   c. Held individual meetings with key U.S. government, not-for-profit and agribusiness organizations to build awareness and support for state-of-the-art best practices as appropriate for small holder farmers in the developing world (See Appendix 9 for a list of key organizations)

Outcomes versus Indicators: Knowledge Project/Learning Portfolio Lessons Learned

Accordingly, the key question is "how well did the Living Water Exchange do" based on the expectations and indicators established by the GEF and UNDP in the project documents. See Appendix 10 for a table of key impact against indicators.

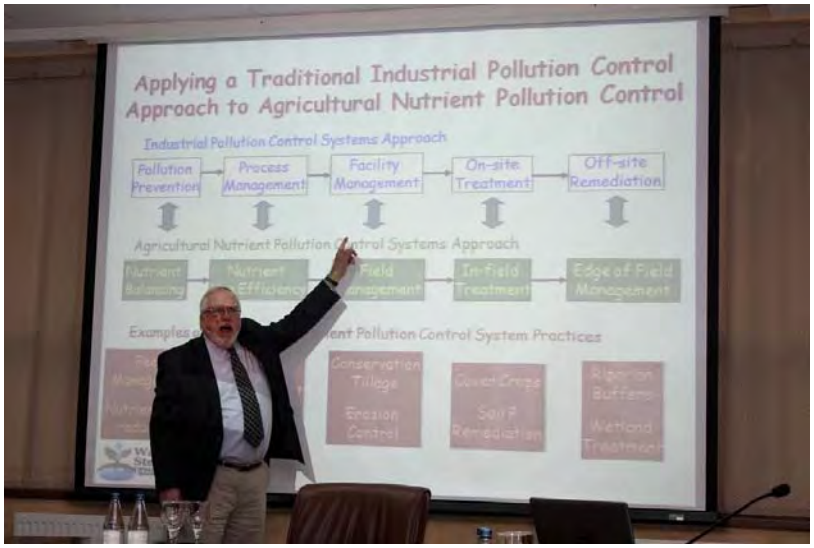
First, the Living Water Exchange was a key element of the GEF IW Learning Portfolio of projects, the purpose of which is to collect and share experiences – what works and what does not –from across all IW projects. In addition to nutrient reduction, other learning projects focus on issues such as legal frameworks, science, wastewater training, etc. The Living Water Exchange engaged the GEF IW portfolio in Central and Eastern Europe and Central Asia, which is comprised of a wide range of stakeholders in developing a host of effective nutrient reduction strategies and practices for core and non-core projects. This outreach is instructive and might guide IW projects in collecting and sharing information in the future. The following are initial observations and findings from this process:

- Outreach to GEF project managers is challenging and requires continuous follow-up; face-to-face meetings and relationship building is a key element of ensuring responses and collaboration.
- Mechanisms to bring GEF project managers together outside of the IWC context are restricted by funding availability in project budgets and IW:LEARN but are needed to build awareness of best practices and lessons learned in a timely fashion. For instance, in the early stages of development communication among project managers might be helpful and compelled especially to help meet the requirements of the EU Nitrates Directive and developing common "Codes of Good Agricultural Practice."
- Demonstrations provide a strong opportunity to showcase what works and what does not, particularly understanding the value of low cost interventions – how to stretch GEF dollars; peer-to-peer exchanges that have the right stakeholders (experts, policy makers, etc.) involved are a solid format to share experiences and see nutrient reduction interventions first hand. Mechanisms for one-on-one follow-up with farmers are also important.

- GEF project managers appear to respond positively in the peer-to-peer environment and face-to-face meetings. Email surveys are not as effective.
- Web-based databases are a key method to ensure project outcomes, data and information are readily available; Standardized processes and timelines for database delivery and linkages among various projects should be developed to avoid duplication and ensure timely delivery. (Living Water Exchange website traffic is contained in Appendix 11.)
- The International Commission for the Protection of the Danube River (ICPDR) and peer-to-peer exchanges provides a successful model for outreach and Ministerial-level coordination.

Second, the following raises key issues that provide a strong sense of what was accomplished against key tasks and whether there are next steps to ensure further impact:

- Inventory – It quite clear that the 38 nutrient relevant projects collected in the inventory include all the core projects in the GEF portfolio in the region; however, it is not certain whether the inventory captured all the key national and/or local nutrient reduction projects. Further work should be done to explore which of such projects are important to include. Perhaps the upcoming IWC can catalyze further interaction with GEF project managers and country representatives.
- Practice identification – The project two pagers and practice database offer a comprehensive "look" at what the 138 practices are.
- Practice analysis – The practice analysis and evaluation discussed below prioritizes eight practices or systems of these practices as the interventions that should be replicated and outlines how the each practice can be applied in the region. The analysis underscores that an adaptive systems approach uses the right system of practices to minimize nutrient loss for a given set of conditions and production systems.
- Practice replication pathways – There are several key issues identified in Section VII that offer stakeholders possible pathways to replicate the practices.
- Demonstrations – The project documents called for two demonstrations to build capacity and replication for key best practices. Based on the proposals received and budget available, the Living Water Exchange was able to fund four projects, described below in Section V. These projects were all successful in showing that for minimal investment, a culture to promote stress reduction and capacity building is possible. Nevertheless, issues such as land ownership and project security presented challenges that must be addressed through policies and enforcement at the government level to ensure more consistent outcomes. The ten month timeframe for the demonstrations also limited the ability to see true stress reduction.



- Peer-to-peer exchanges – Peer-to-peer exchanges among policy makers, practitioners and donors at the demonstrations, while to varying degrees, all provided solid examples of how sharing information, experiences and practices can

lay the foundation for cooperation, capacity building and replication. More detailed findings from these events are contained in Section V.

- Dissemination – The project document calls for dissemination through various means including the Fifth GEF International Waters Conference, the World Bank Regional Conference, various meetings, articles, the project website, WaterWiki , REBOC COP and other means as required. In addition to engaging GEF project managers and the GEF Science and Technical Advisory Panel, meetings and discussions included organizations such as the ICPDR, European Environment Agency, the Director General, Environment -European Commission, the U.S. Environmental Protection Agency Hypoxia team, the Gulf of Mexico/Mississippi River Basin Nutrient Task Force, the Farm Pilot Project Coordination Office, the GEF/UNIDO Large Marine Ecosystem Project Watershed Conference, the Natural Resources Conservation Service, the National Institute of Food and Agriculture and the Office of Ecosystem Markets of the U.S. Department of Agriculture, the Colonial Soil and Water Conservation District, the Conservation Technology and Information Center, the Iowa Soybean Association and the Virginia Agri-business Council, Cargill and Smithfield Foods. By all accounts, the project's presence at the events and engaging key stakeholders has exceeded expectations and requirements. For more information, see Appendix 9.

Outreach to Agri-business: Smithfield Foods with international operations in Poland and Romania:

- Own significant sow and finishing farms, on average with 1,000 to 2,000 animals
- Engage large numbers of small family contract farmers (more than 630 in Poland alone)
- Implement required standard procedures and fertilizer management plans to address nutrient issues
- Implement country specific codes of good agriculture practice
- Good practices include:
  1. Setbacks to keep operations and nutrient flow away from waters and provide buffers in case of an issue
  2. Time applications so the ground is not frozen and that crops will actually be grown on the land to ensure nutrient uptake by crops
  3. Follow requirements for the maximum amount of N to apply

One practice that may be of interest –Typical spread of manure involves significant transportation consideration to minimize driving time and costs. Smithfield is selling manure to local farmers at lower than a market rate but accounting for transportation costs. This makes it financially feasible to drive longer distances and maximize the spread of the nutrients over a wider geographic area.

Third, there are key actions that outcomes of the project suggest for the GEF, including answering the following questions:

- *How we should share and replicate these projects and practices within IW projects? How can we build these practices and learning into new projects? Should there be components specifically for working on these issues?"*
  The Living Water Exchange recommends that GEF require all new projects, transboundary diagnostic analyses and strategic action programmes to consider and review nutrient reduction practices and other actions to address coastal hypoxia and land based sources of nutrient loading as part of project design and implementation. Specific nutrient management outcomes and indicators should be included in the required project log frame. In addition, as demonstrated in the Danube Regional Project and highlighted by Living Water Exchange demonstration, small grants focusing on low cost interventions are very effective at the community-level. The Living Water Exchange suggests that the GEF establish a small grants program, providing funding of no greater than $50,000 USD per grant to local NGOs in the region to implement low cost interventions. Proposals should include replication of one of the eight priority practices, or systems of practices, a plan for further replication, capacity building to farmers, policy makers and/or communities in nutrient reduction best practice approaches, strong local co-finance components and must be linked to a larger strategic initiative or project.
- *How can we share with the new learning project/global community of practice for LMEs?*
  The Living Water Exchange is initiating a nutrient management community of practice of nutrient management experts, scientists, agri-business and farmers within IW:LEARN that can link and push information to other community of practice users. This community of practice will also serve as the foundation for similar efforts under the new GEF/UNEP project "Global foundations for reducing nutrient enrichment and oxygen depletion from land based pollution, in support of Global Nutrient Cycle." The Living Water Exchange suggests that the GEF link media and issue specific communities of practice such as nutrient management with broader transboundary water body/water source communities of practice like LMEs. This connection could be accomplished as simply as including URL links on the LME CoP site or more actively by pushing specific information from the LWE database or participating in training session.
- *How can we work with IW: LEARN to actively share practices, lessons, information and data and promote and replicate throughout the IW portfolio?*
  Under the new IW:LEARN, there are several key training opportunities scheduled including the International Waters Conference in the fall 2011, the IW Science conference in 2012 and other workshops as part of the ground and surface water communities of practices. IW:LEARN has already agreed to help coordinate and integrate nutrient management content into these sessions.
- *How the GEF replicate this kind of project in different regions, especially given the map presented that illustrated the growing hypoxia problem?*
  A similar effort is slated as a pilot project proposed by the new GEF/UNEP project "Global foundations for reducing nutrient enrichment and oxygen depletion from land based pollution, in support of Global Nutrient Cycle" in Southeast Asia. This pilot will utilize much of the LWE methodology; practices will be inventoried and GEF PMs, policy makers, scientists and farmers will be trained in a peer-to-peer environment in the region. This effort will provide the opportunity to test initial replication of the LWE process and offer an possible road map for use in other nutrient "hot spot" regions. Based on the outcomes, successes and learning from the LWE and the new pilot, the GEF should consider funding additional regional phases at that time.

<u>Project Implementation Review</u>

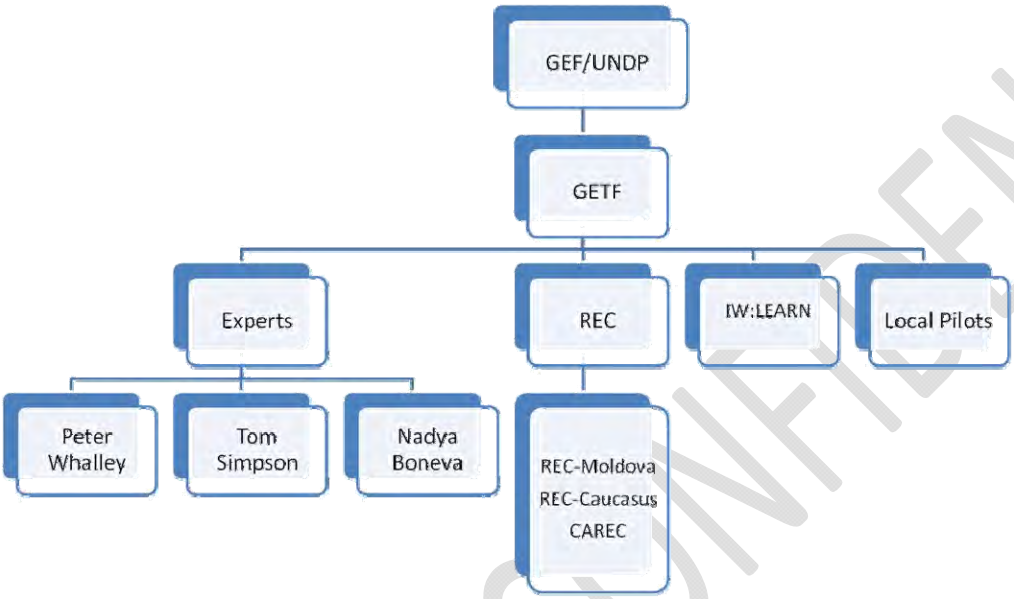
The GEF and UNDP require completion of a project implementation review (PIR) document to help track and monitor project progress. This document serves as a self-assessment and was completed on July 31, 2010. The Living Water

Exchange team gave a "satisfactory" rating to the project. As stated in the PIR, "the project s is well advancing in its implementation with no major delays and was able to deliver several significant outputs in accordance with the work plan and budget." Please see Appendix 11 for a summary of specific findings of the PIR.

Project Team

The project team consisted of key domain and regional experts as shown in Figure 8 below.

Figure 8 – Project Team Organizational Chart



Section IV – Replication Potential and Practice Evaluation

The Living Water Exchange evaluated the inventoried practices to provide guidance and help prioritize practices that have demonstrated the most potential for positive impacts on water quality, are replicable and scalable and can be systematically linked or applied in a systematic fashion (See Appendix 1 for the complete document).

As mentioned, this summary synthesizes results from the agriculturally focused projects in our inventory as well as other projects dealing with the use of wetlands to treat wastewater. All projects that dealt only with wastewater treatment technologies or urban runoff were not part of this synthesis. After removing non-agricultural or wetland projects and projects without adequate information for evaluation, this synthesis reviewed 28 of the 38 total projects.

<u>Best Agricultural Practice Definition</u>

First the report corroborates the Living Water Exchange's definition of a best agricultural practice (BAP) and notes it is consistent with the definition from the Danube Regional Project (DRP), which is as follows:

> "…the highest level of pollution control practice that any farmer can reasonably be expected to adopt when working within their own national, regional and/or local context in the Danube River Basin."

Appropriately defining "what a best practice is" provides a pathway to determining whether it was successfully implemented, estimate its efficiency, appropriately adapt the practice to partially meet or exceed the definition, understand cost effectiveness and/or offer opportunities for continued nutrient reduction.

Codes of Good Agriculture Practice

Codes of Good Agriculture Practice (CGAP) are one of the five steps-to-implementation of the EU-Nitrates Directive. Specifically, we reviewed the Serbian Code of Good Agriculture Practice developed by the GEF-World Bank Danube River Enterprise Pollution Reduction (DREPR) Project and believe it sets a foundation to move towards improved handling of animal manures and organic fertilizers. The ICPDR Issue Paper (November 2007) considers development and implementation of CGAPs as a basic measure in agricultural pollution control that is essential to reduce nutrient pressures and impacts on water.

Nevertheless, it is worth noting that there should be a "re-look" at what CGAP should include relative to water quality in light of the projects, the 8 BMPs discussed below and a systems approach. There is also a need for ongoing assessment of performance and impacts, by the farmer as well as some level of assessment likely by spot checks on whole farm checks to see if CGAPs are being implemented and followed over time.

DREPR has developed a CGAP that includes all of the key elements proposed by the Nitrate Directive and in the ICPDR Issue Paper that provides a country appropriate framework around which a more detailed BAP implementation program to limit nutrient losses to water could be built. The Serbian CGAP could be used as a model by countries that have not yet developed such a policy.

The DREPR CGAP includes:

a. Measures limiting fertilizer application to match crop needs
b. Measures limiting the conditions for fertilizer application such as proximity to water courses and frozen/snow covered ground
c. Requirements for minimum manure storage capacity
d. Keeping ground covered with crop rotations, cover crops, catch crops especially during fall and winter

UNDP/GEF DRP BAPs

In addition, the 12 BAPs discussed by the DRP are a solid starting place to begin assessing nutrient reduction practices in the region:

General

1. For all farms above 5 ha and/or 5 animal units, calculate resource economy every year for N and P (develop nutrient balances annually)

Crop production systems

2. Every farm with at least 5 ha of arable crops should ensure soil sampling at least each 5 years.

3. Crop rotation and fertilizing plans should be prepared for all farms above 5 ha every year. Fertilizing plans shall be based on the expected yield level, the needs of the crops, and include both livestock manure and mineral fertilizer.

Livestock production systems

4. Livestock should be fed with rations that are correctly balanced

5. Cleaning of stables with water should be avoided or reduced to a minimum.

6. Watering of the livestock should happen in a way that hinders spill of water.

Livestock density

7. Livestock density maximum corresponding to an N content from the manure of 170 kg N per ha. Manure should be sold to other farms or distributed to fields of other farms in case of a higher livestock density.

Livestock manure management

8. There should be on-farm storage capacity for at least 6 months production of livestock manure.

9. It must be hindered that rain water can dilute the livestock manure.

10. Spreading of manure in the period from 15 October till 1 March should not take place, and in any case not on to frozen land or land with a slope of more than 7°.

11. Proper technology should be used for spreading of livestock manure. Liquid manure and slurry should be spread with band laying system or be injected into the soil.

12. Livestock manure should be incorporated into the soil within 6 hours.

The 12 BAPs are important and in combination with the BAP synthesis from the Chesapeake Bay and results from the 28 projects reviewed formed the basis for the 8 BAPs recommended in this report for replication, some of which combine more than one of these DRP practices. They are also consistent with practices recommended by the Director General Environment for the European Commission (See http://nutrient-bestpractices.iwlearn.org/nutrient-reduction-practices/eu-database-of-practices/view for the EC database of nutrient reduction measures).

Nutrient Reduction Estimates

The N and P reduction estimates from the DRP should the BAPs be implemented in the seven lower Danube countries to include decreases of 557,000 tonnes of N and 90,000 tonnes of P under current conditions of livestock and fertilizer use. See Appendix 1 for a table of N and P reduction estimates.

Figure 9 – Reported Reductions of N

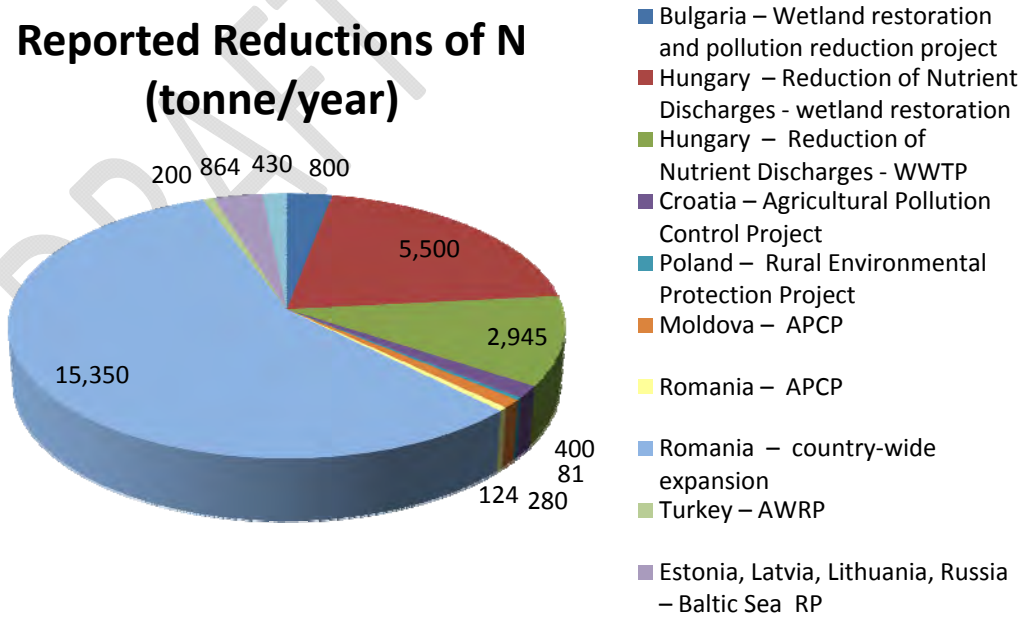
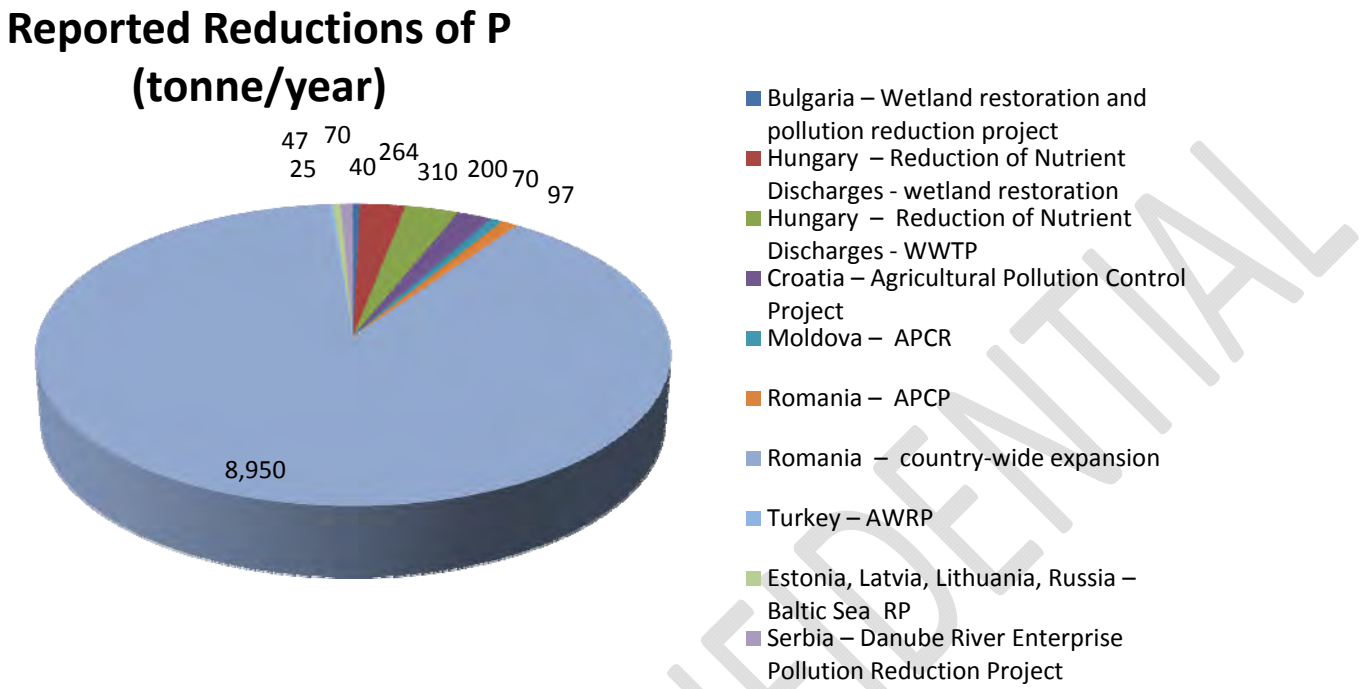


Figure 10 – Reported Reductions of P

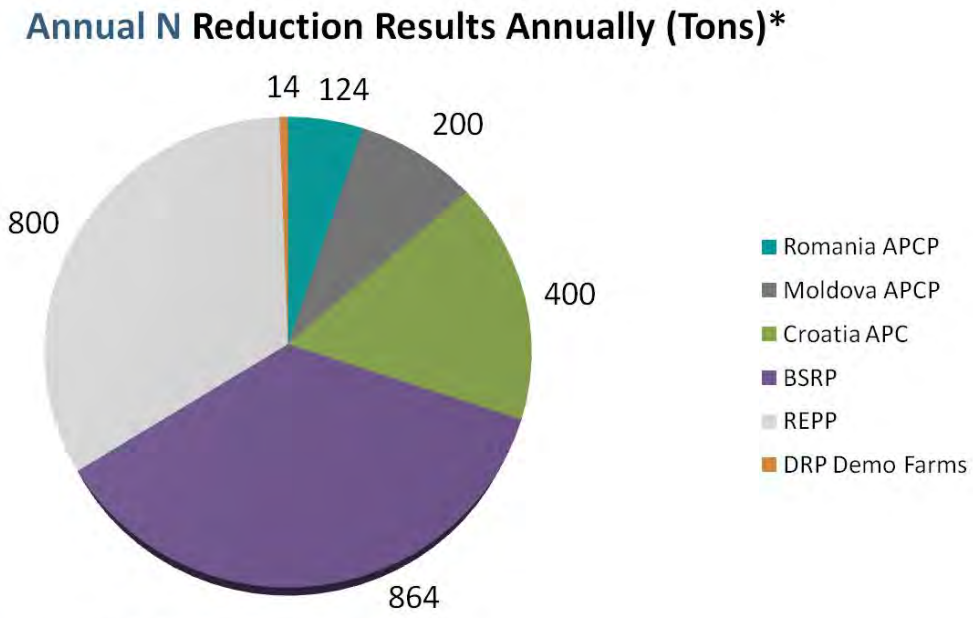


The total reductions from the data displayed in Figures 9-10 and gathered in Appendix 1 were approximately 13,020 t/yr N and 4,510 t/yr P. These numbers include the Danube Regional Project, which includes 758,000 t/yr N and 68,000 t/yr P and reflect reductions due to agricultural and wetland impacts but not waste water treatment plants. (Note: that for the Romania Integrated Nutrient Pollution Control Project it could not be established how much of the reported reductions were due to agriculture versus human waste.)

The estimated total Danube-Black Sea load estimates from MONERIS are reported to be 758 kt N and 68 kt P annually with agriculture providing 43 percent and 19 percent of the N and P, respectively. Therefore, the estimated total N and P loads in the DRB due to agriculture appear to be 326 kt/yr and 13 kt/yr, respectively. This equates to 4 percent N and 35 percent P of the total DRB load attributed to agriculture. The apparent large reduction in P is based on project estimates that were provided. This decrease is compared to the 19 percent of DRB P is attributed to agriculture. In other basins with similar land uses, the percent contribution for P is higher than these projections in the DRB.

One of the key challenges in this region and across the GEF portfolio has been collecting actual results. There have ad hoc nutrient reductions reports as in Figure 11 below.

Figure 11 – Ad Hoc Nutrient Reductions



*For those projects with available data. Many projects still ongoing.

Of particular note, the largest reductions collected were for the Rural Environmental Pollution Project in Poland, which were 800 tonnes of N annually. In addition, the eight DRP demonstration farms showed reductions of 14 tonnes of N per year and 2 tonnes of P per year.

Priority Practice Synthesis

The inventoried projects and practices are placed into the practices into key categories from crop rotation and nutrient management to Codes of Good Agricultural Practices. The DRP and Agricultural Pollution Control Projects in Croatia, Romania and Moldova and the Rural Environmental Protection Project in Poland seem to have the broadest range of implemented practices.

These inventoried practices show an emphasis on both crop production systems and livestock manure management while livestock production systems (feed ration, general management and stocking density) received less attention. Land use changes were intermediate in implementation usage. There were several projects that resulted in the establishment of Codes of Good Agricultural Practices and as cited above are used as one of the requirement for the EU Nitrates Directive.

This trend is not surprising since initial actions to improve nutrient use efficiency should concentrate on cropping and animal manure utilization. In the first case, matching nutrients applied (in fertilizers or manures) with the specific crop is essential and it is the basis for nutrient management plans.

The following is the underlying rationale for including many of the practice categories:

- **Maximum Economic Yield vs. Ecological Optimum Yields Based on Diminishing Returns –**This approach was initiated on some of the eight pilot farms in the DRP and being demonstrated in the Croatia APCP in attaining

fertilizer response curves. Additionally, one of the tenets of GCAPs is matching crop needs with input. It is a practice that through demonstration can be replicated in all countries and should be considered high priority.

- **Nutrient Management Planning –** A nutrient management plan (NMP) should include the following information: analysis from a recent soil test (at least every three years), crops to be grown, realistic yield expectations for each crop, and a manure analysis if appropriate (as described below on manure utilization).[23] The plan then determines nutrient application rates, timing and method of application for each crop. The NMP should also show crop rotations (for the following three years), cover crops to be grown and the maintenance of pastures and be a key element of whole farm planning.
- **Manure Utilization as a Critical Component of Nutrient Management –** Matching manure application to crop nutrient need, including only applying the ecologic optimum rate, as discussed above, should also be a primary action to improve nutrient use efficiency and reduce the need to purchase fertilizer N, where that is a consideration. In fact, fertilizer and manure management should be considered together to assure both that manures are used to the maximum capacity and supplemental fertilizers are used to fulfill gaps in requirements. This would be a cost effective approach to using both nutrient sources. There was little mention of manure analysis as part of any of the projects or as a focus of nutrient management.
- **Intensive Greenhouse Production Systems –** Another indication of the pressures to intensify and produce high volumes of high value crops has been the proliferation of cabbage, tomato and pepper greenhouses in Siltse and Zarichya villages in the Western Ukraine. Approximately 6,000 ha of closed plastic hoop houses have been built in these two adjacent villages. Farmers are able to grow two-three crops of cabbage and tomatoes and peppers in the summer in the greenhouses. The crops are of sufficient value that inorganic fertilizers are used in production. There is also a need to manage irrigation water and nutrients carefully in these operations. Furthermore, the hoop houses create 6,000 ha of impervious surfaces in an area already prone to flooding, which may intensify such flooding especially if growth of the industry continues in such a concentrated fashion. The increased runoff from rain falling on the houses typically moves more nutrients and sediments into the river (in addition to return flow from irrigation inside the hoop house).
- **Buffer Width versus Available Land –**Practices such as buffers and tree plantings, when newly installed, usually involve removal of land area from agricultural production. This is always a farmer concern but when the majority of land holdings are small, 5 ha or less, this becomes a much larger issue. Research indicates that buffers need to be at least 10 m wide to effectively remove N. While this may not be practical in the region, it should be done where possible and buffers implemented here should be a minimum of 5 m wide. The efficiency of the buffer decreases substantially when less than 10 m wide.
- **Wetland Restoration and Construction –** Seven country projects in our inventory specifically included wetland projects which were usually restoration of prior existing wetlands. There are four primary situations in which wetlands, when properly designed and operated, can be very efficient at nutrient and suspended solids removal. The first two situations are for treatment of flows from small to medium towns and for treatment of non-toxic industrial discharges. Such a system will not provide pathogen removal or disinfection at needed levels. The other application of constructed or restored wetlands would be to treat storm water runoff or drainage flow from agricultural or urban catchments. Proper sizing and design of the wetland systems to handle anticipated

[23] Please note the need for efficient manure use to be integrated with efficient fertilizer use in the nutrient management plan.

flows and allow adequate time for treatment is critical and often is not given enough attention in the planning and design stage.

- **BAP Efficiency: Proper Implementation, Operation and Maintenance –**Estimating the actual impact of the practices in Dr. Simpson's analysis is challenging since there is little documentation of implementation or comparison of what was implemented to a standard accepted definition of the BAP. The effectiveness of practices is closely related to their implementation and operation and maintenance where needed. Efficiencies for practices are developed based on fairly prescriptive definitions that match up with the practice as applied in research, demonstrations or monitoring used to determine the efficiency.

Table 1 below is a list of eight BAPs highlighted in the reviewed projects that have a high potential impact for reducing N and P from agriculture and should be prioritized for replication.

Table 1 – Summary of cost/benefits of 8 primary BAPS

BAP	Benefit Notes	Cost Comments	Linkages
Riparian Buffer Grass or Trees	For either grass or tree buffers width is the most important criteria. 10 m width should be considered minimal. If land is limited smaller width buffers are better than nothing	-Requires land out of crop production. -Cost of establishing grass buffer low but maintenance moderate while forest buffer establishment may be high but maintenance may be low. - over long term, buffers are very cost effective practices	Use in combination with Grazing Management/Stream Fencing
Nutrient Management	Nutrient management is a fundamental practice for the control of nutrient pollution. It should be considered basic and essential.	Nutrient management is very cost effective BAP when properly implemented to minimize nutrient use and maximize use efficiency	Use in combination with Manure Management
Manure Management	Manure management is a fundamental practice for the control of nutrient pollution, especially P. Manure and/or compost utilization as a crop nutrient provides a positive return to the producer. Capture and use of methane from anaerobic digestion can also provide a positive return to the producer.	Manure storage and/or compost pads are costly; implementation usually requires financial assistance	Use in combination with Nutrient Management

BAP	Benefit Notes	Cost Comments	Linkages
Ecological/Organic Production Systems Ecological/organic production systems are not really BAPs. They are ecosystem systems approaches that rely on organic inputs. Requirements and consumer expectations may result in many water quality BAPs being implemented.	The primary water quality benefits will be accrued through rigorous implementation of nutrient and manure management, erosion control, buffers, etc that should be part of ecological agriculture systems. Premium prices paid for ecologically grown products makes implementation more feasible for the farmer while still enhancing income.	Marketing produce with an "ecological" label would require a level of practice verification which could add a cost but the farmer should receive a premium for the product	Needs to be established as part of an integrated systems approach
Wetland Restoration /Creation	A properly designed and managed restored wetland can be very cost effective at nutrient and sediment removal. Constructed wetlands can provide similar reductions but may offer more management challenges and ate usually more costly for comparable levels of reduction.	Implementation cost can be high; maintenance costs for constructed wetlands can be substantial. Over long-term, can be very cost effective BAP, if done properly	For agricultural lands, should be linked to field-based BAPs so that per ha nutrient load to wetland is low so wetland can treat larger area
Erosion Control & Conservation Tillage (Residue Management)	Reduces tillage trips; results in Soil carbon sequestration; reduces fuel and labor costs	May require new tillage Equipment/technologies are often expensive Structural improvements to water courses can be costly and require maintenance	Link with the use of cover crops to Maximize the time that fields have plant cover; minimize bare soil time – avoid fall plowing

BAP	Benefit Notes	Cost Comments	Linkages
Grazing Management (Stream Fencing / Animal Exclusion)	Maximizes livestock production from available pasture, reduces need to store manure and import/grow feed Exclusion of domestic waterfowl from streams can provide major water quality benefits where their numbers are high (in many villages in the region). The idea of ponds and/or corralled areas to keep fowl out of free flowing streams may take time for acceptance by local farmers but may be more important than keeping livestock out of streams in many areas of Eastern Europe and Central Asia, at least at current livestock densities.	The cost of prescribed grazing can be offset by better performance & production by the animal. Stream fencing provides important benefits but can be costly, particularly in this region. Stream protection, without fencing (remote watering, shade, hardened crossings, etc.) can achieve about two thirds of the benefits of fencing at a much lost cost	Link with Nutrient Management to assure maximum biomass production and proper crediting of manure deposited on pastures
Cover Crops	Cover crops are an excellent practice to assist in utilizing residual soil N and reducing pollution potential. Additionally, cover crops reduce soil erosion, improve soil quality, creates wildlife habitat, conserves soil moisture and helps to suppress weeds.	There is a moderate cost for seeds and planting and requires either tillage or killing by herbicide or cutting of the growth in spring before summer crop is planted	Links with Erosion Control, Nutrient Management (especially if legumes used as cover crop)

Section V – Demonstrations

The Living Water Exchange was charged with establishing four demonstration projects that could highlight the following:

- "On-the-ground" nutrient reduction best practices that have a real impact on reducing stress and improving water quality
- Low cost interventions at the community level that can show a solid opportunity for replication and scalability
- The importance of engaging the community and farmers to building awareness regarding nutrient management, practices and potential for ecological approaches to help yield as well as improve the environment
- Building capacity at the government and farm levels – through peer-to-peer exchanges – to replicate such practices and promote cooperation
- Linking to other GEF investments in the region to learn from and replicate their experiences

The overall findings from demonstration management and implementation that can help with practice replication include:

- The short timeframe made more significant results challenging.
- Technical support will assist projects in more effective monitoring and measuring of outcomes.
- Local organizations serving a champion, as with the Mayoralty of Slobozia Mare in Moldova can help bring instant credibility with local farmers and other stakeholders regarding the implementation of best agricultural practices
- Land ownership is a critical consideration to ensuring the outcomes, security and sustainability of projects.
- The strength and importance of good local community (official and non-official) contacts and support improves opportunity for success as in Zakatpattya oblast.
- Local farmers are often reluctant to participate in conservation projects and take land out of production.
- More developed organic agriculture markets are needed to ensure that the economics work for farmers to change production methods.
- Partnerships among farmers to share equipment can help implement conservation practices and help bring production to scale.
- The best value for donor investments includes a combination of on-the-ground practices as in Krusevac and stakeholder engagement as in Slobozia Mare and Zakatpattya oblast to maximize opportunities for replication.
- Co-finance for demonstrations was critical to ensuring local commitment and smooth and complete project implementation. These amounts were above and beyond the co-finance outlined in the original project document, in particular the Dutch Embassy to Serbia provided $34,434 for boats, vehicles and other staff resources – items that the GEF could not fund. This funding leveraged the GEF investment at almost two to one and exemplifies the impact of co-financing especially in such low cost interventions.

Table 2 illustrates the project objectives and outcomes.

Table 2 – Demonstration Outcomes

Project Title	Location	Funding	Co-finance	Objectives	Outcomes
Constructed Wetland for Nutrient Reductions in the Waters of Tirana River	Tirana, Albania	*$38,569*	$21,516	• Reducing nutrient loading into the Tirana River by a constructed wetland which will retain/remove the excessive nutrients of Tirana River • Creating a buffer zone around the wetlands, by planting three rows of vegetation and digging shallow canals along the bank planted with aquatic vegetation, thus creating mini-wetlands that will slow or stop the sediments and runoff from entering directly into the constructed wetland • Implementing an awareness raising campaign with the help of Kamez Municipality to inform the inhabitants around the river and the farmers about the practices they should use to stop fertilizers from entering streams flowing into the river	• An initial and final environmental report regarding water quality on the Tirana River (http://iep-al.org/docs/TIRANA-Raport.doc) to provide a baseline and outcome for constructed wetland impact • Initial clean up of plastic and organic waste at the site • The constructed wetland including a sedimentation basin to hold suspended solids, a second basin consisting of shallow layer of surface water, flowing over mineral (sandy) or organic (peat) soils and vegetation (marsh plants) to remove nutrients and a larger third basin comprised of trees and larger vegetation for polishing effluent and creating wildlife habitat (frogs have started to reside in this area) • A buffer zone of three rows of vegetation and digging shallow canals along the bank planted with aquatic vegetation, thus creating some mini-wetlands that will stop the sediments and runoff to enter directly the constructed wetland • Two meetings with the community (40-50 participants) that live on the northern and southern banks of the river respectively – in the meetings there were presentations and information, and benefits arising from the project, discussions with the participants in order to disseminate and get the support of the public for the constructed wetland and the nutrient reduction importance for the environment and the society • Leaflets on the importance of constructed wetlands and nutrient reduction for distribution at the meetings

Project Title	Location	Funding	Co-finance	Objectives	Outcomes
The Decrease of Water Pollution Sources in Prut river basin through the Promotion and Implementation of the Best Agricultural Practices	Cahul, Moldova	*$55,200*	$5,000	• To increase the awareness, knowledge and interest of the population from localities along the Prut River (Cahul District), including Slobozia Mare, regarding water organic/nutrient pollution in rural areas, impact of this pollution on quality of life at local, regional and global level • To build capacity of decreasing diffuse sources of water organic/nutrient pollution in community Slobozia Mare through facilitating the access to specific information regarding implementation of best agricultural practices, as well as through building a platform for manure composting	• Informational leaflets, posters and brochures to build awareness of composting and best agricultural practices • Three meetings with the local population from Slobozia Mare, organized with the help of project partner - Mayoralty Slobozia Mare, which assured the attendance of local population, local Council members as well as attendance of pupils from "lyceum, v. Slobozia Mare." During the meetings the project, its importance, objectives, ongoing activities and anticipated results were discussed. These meetings were oriented to increase the awareness of people regarding the collection of manure and depositing to the platform. They were also informed about how and when the manure will be collected. • Four best agricultural practice training session in Cahul town for local farmers, representatives of Agricultural Department from Cahul District Council, representatives of mayoralty Slobozia Mare, ECC Cahul volunteers and others based on curricula developed by the REC Moldova – Key themes discussed included the following: 1) types of agricultural systems, biodiversity ensuring ecosystem protection; 2) agriculture and water, soil, air, biodiversity, pesticides; 3) pollutant agriculture; 4) techniques for appropriate fertilizers applications; 5) ecological solutions for pollution reduction; and , 5) manure composting and the correct use of the compost as fertilizer • Five ecological lessons with local schools using curricula developed and demonstrated by the first session • The construction works of the manure platform for depositing and composting near the garbage dump of the village Slobozia Mare (with a surface of 200 m^2 and volume of 300 m^3) • The collection of the manure as organized by the vice-mayor of Mayoralty Slobozia Mare • TV report including dissemination of the information regarding the project, best practices implemented in the framework of this project, its results, beneficiaries, financing authority, etc,. • The experimental garden, a surface of 200 m^2 and is located on the territory of kindergarten of Slobozia Mare

Project Title	Location	Funding	Co-finance	Objectives	Outcomes
Help the "Celije" Lake on the Rasina River nearby Krusevac with Experiences of Natural Processes	Kruševac, Serbia	*$19,342*	$34,434	• To reduce negative impact of eutrophication and erosion in Ćelije Lake (pilot demonstration-biological filter) • To reduce pollution by wastewater in the whole basin area (assistance in restoration of wastewater treatment plants in Brzece, Brus and Blace, establishing organic agricultural practices) • To promote eco-farming and alternative rural development • To introduce and promote nutrient reduction best practices in the project area • To ensure public consultation in adoption of development plans of the Lake Celije • To enable self-sustainability and potential return of displaced local population in area of Lake Celije	• An afforestation plan including the creation of protection zone around th Lake Celije which was agreed to by JP „Srbijavode", Krusevac – a water management firm • Water quality and quantity indicator surveys of Rasina River and Blatasnic River as well as for Rasina Delta, which were performed and obtained from Institute for Publ Health in Krusevac. Chemical analysis of erosion sediment and sludge in a of Rasina Delta was conducted as well. • Creation of a 'biological' filter at the river in-flow to the lake by channeling the flow through reed beds to retain nutrients and sediments; • Planting trees in the catchment of the Rasina River (10,000 3-year old fir saplings) and around Lake Celije (200 birch trees)to act as a buffer zone; • Educational and awareness raising; and, • Media, promotional and lobbying activities to stimulate public interest and involvement.

Project Title	Location	Funding	Co-finance	Objectives	Outcomes
Best Practices of Fertilizers Reduction from Agricultural Lands in Upper Tisza Basin	Zakarpattya Oblast, Ukraine	*$34,000*	$4,000	• To demonstrate cost-effective measures to reduce nutrients loads by means of proper agricultural practices, using Irshavka River as an example.	• Analysis of the soils which shows high contents of lead (due to soils origin), low N and very disperse P. At present Zakarpattya Oblast State Project-Technological Center of Protection of Soils Fertility and Quality of Production are preparing chapters to the Local Strategy based on the obtained results, and mapped nutrient pollution in the soils • The first public hearing on April 14, 2010 during the workshop on best agricultural practices where a number of actions to improve the present state of environment and to promote good harvests in the same time were presented. • Planted the following trees as a buffer zone along the Irshavka river (a total length of 6 km) – after a long discussion with farmers, evaluating of capacities of the trees to stop pollutants and actual available trees: o 300 black current bushes o 300 plum trees • A workshop on April 15, 2010 that focused on a presentation of EU legal requirements for organic farming, findings of soil analysis on the pilot area with further recommendations (Center of Soils Fertility), recommendations regarding water quality protection in Irshavka river (Zakarpattya water management board), vermiculture – or worm-based composting – and its advantages (ZOOUEL), control of nitrates in products (Irshava sanitary-epidemiological service) etc. The workshop united many different stakeholders in the pilot area. • Planted the following: o 50 trees of arrowwood (*Viburnum*) (20 trees purchased by the project and 30 trees were obtained from the budget of village councils) – The arrowwood is a symbol of Ukraine, these trees will be planted near the village councils buildings o 40 trees of plum planted in the eve of Victory Day in Ukraine (celebration of the victory in Second World war) and trees were symbolically planted by veterans (old generation and young generation) creating a riparian buffer

Project Title	Location	Funding	Co-finance	Objectives	Outcomes
Best Practices of Fertilizers Reduction from Agricultural Lands in Upper Tisza Basin (continued from above)					• A public campaign "Find the most clean vegetable" on 08/05/2010 including: o Children competition of drawings "My village" – Children were invited to make drawings regarding their village environment and its future. In total 3 schools took part in the competition. The best work received prizes from the project. The selected works will be used for development public awareness materials of the project. • Presented project achievements at UNDP GEF workshop **"Integrating land and water management to reduce impacts of floods and droughts on water status in the Tisza River Basin District"** (Szolnok, Hungary 26-27th of April, 2010) http://www.ecologic-events.eu/tisza/index.htm. The event was attended by ICPDR Secretariat (Mr. Phil Weller and team) and Tisza MSP project (Mr. Peter Whalley and team). The presented experience on negotiations with farmers regarding creation of riparian zones was very positively assessed and included into the recommendations of the workshop. • Two articles are published in the regional newspaper "Nove zhyttya" • A report on trend analysis of nutrient pollution • A local strategy of nutrient reduction based on the best available practices and international experience • A TV documentary on the content of the project activities

Quantitative Impact

It was challenging to measure the nutrient reduction impacts over the short timeframe of the demonstration. Data collection was consistently named as difficult by project across the portfolio in the region.

For more detailed descriptions of each demonstration, its outcomes and recommendations going forward, please visit Appendix 7.

Peer-to-Peer Exchanges

The key approach to building capacity for the demonstrations to ensure project sustainability and replication was through peer-to-peer exchanges. The following are the key experiences from these events:

- Forty attendees seem to be the optimum level of participation to ensure robust discussions and solid stakeholder representation.
- A good cross section of stakeholders among the policy, agriculture and donor communities is needed to ensure that all views are appropriately represented and to drive change, cooperation and capacity at both the county and farm levels.
- The maximum opportunity to foster cooperation among countries requires careful consideration of geographies and political interests as in Moldova and Albania. For instance, government participants from Armenia, Azerbaijan and Georgia committed to exploring a regional transboundary project focusing on an integrated approach to nutrient reduction and will develop a table of common interest as a first step. The GEF/UNDP Kura-Aras River Basin Project may offer a vehicle to implement such an initiative. As mentioned previously, the Minister of Environment for Albania called for a follow-up ministerial meeting to discuss capacity building and nutrient pollution solutions to be held on January 26, 2011.

- The two day format with facilitated breakout sessions and then site visit worked more effectively than the one day session that attempted to include both discussion and site visit in Serbia.
- Participants in several of the peer-to-peer exchanges underscored how important publicity was to raise public awareness and public education regarding the need for pollution control, especially nutrient reduction.
- Other needs identified were training sessions in the region on specific practices and funding to assist small landowners implement nutrient reduction practices.

The following are additional sample outcomes from the project regarding sustainability and knowledge transfer:

- There was interest by the Millennium Challenge Corporation (MCC) to facilitate connections with technical proposal winners to replicate practices throughout Moldova, and help with social mobilization on Central Irrigation Systems tasks under the MCC Compact that could offer a path to demonstration sustainability.

- The GEF Small Grants representative who attended the Albania session voiced possible support for funding constructed wetlands projects in the region.
- The GEF project manager from Lake Skadar-Shkoder Integrated Ecosystem Management Project in Albania/Montenegro, who participated in the Serbian exchange discussed interest in more information on constructed wetlands.
- The GEF project manager from the UNEP Mediterranean Large Marine Ecosystem Project expressed interest in further discussions on best practice and demonstration replication.
- There was good discussion among participants at the Serbian exchange, especially regarding possible transfer of N injection technology from the Anatolia River Basin Rehabilitation Project in Turkey.

Please see Appendix 13 for more information regarding the peer-to-peer exchanges from the session notes.

Section VI – Country Capacity

Countries in the region are in various stages of readiness and capacity to implement nutrient reduction strategies, much of which depend on how each country is pursuing or not pursing accession to the EU. EU member states have obligations towards the whole EU with respect to certain directives that are required of members such as the WFD and the Nitrate Directive. If a country is not an EU member state, they may implement projects that meet the EU standards for harmonizing to EU requirements in the future. Additional obstacles to the success of these projects include cooperation amongst government agencies, incentivizing the protection of water resources and monitoring implementation of the projects discussed. The success of any multi-lateral projects strongly depends on the countries working together and with all other partners. See Appendix 2 for detailed country profiles.

Below is a brief explanation of the main conventions, programs, and directives that impact multiple countries:

- **EU Water Framework Directive:** EU Member States: Bulgaria, Romania, Slovakia and Slovenia. Candidate countries: Turkey and Croatia. European Union directive which commits European Union member states to achieve good qualitative and quantitative status of all water bodies by 2015. The Directive requires the production of a number of key documents over six year planning cycles. Most important among these is the River Basin Management Plans, to be published in 2009, 2015 and 2021.
- **EU Nitrate Directive:** EU Member States: Slovakia and Slovenia. Candidate countries: Turkey and Croatia. Aiming to protect waters against pollution caused or induced by nitrates from agricultural sources through a number of steps to be fulfilled by Member States: water monitoring (with regard to nitrate concentration and trophic status); identification of waters that are polluted or at risk for pollution; designation of vulnerable zones (areas that drain into identified waters); the establishment of codes of good agricultural practices and action programmes (a set of measures to prevent and reduce nitrate pollution) and the review at least every 4 years of the designation of vulnerable zones and action programmes.
- **Black Sea Strategic Action Plan:** Bulgaria, Georgia, Romania, the Russian Federation, Turkey, Ukraine. The Black Sea ecosystem continues to be threatened by inputs of certain pollutants**,** notably nutrients. The action plan called for harmonizing water quality objectives for the Black Sea countries and then implementation and monitoring of appropriate policies to achieve each objective to “see a visible change” in water quality.
- **Caspian Environmental Programme:** Azerbaijan, I.R. Iran, Kazakhstan, Russia and Turkmenistan. A regional umbrella programme developed for and by the five Caspian Littoral States aiming to halt the deterioration of environmental conditions of the Caspian Sea and to promote sustainable development in the area.

- **Adriatic Sea Partnership:** Albania, Bosnia and Herzegovina, Croatia, Italy, Montenegro and Slovenia. The Adriatic countries have begun to make commitments for protection and management of the Adriatic Sea region .These include: the Contingency Plan for the Adriatic; the Ballast Waters Management Plan; the Integrated Coastal Zone Management; and action under the EU Marine Strategy and the EC Water Framework Directive.

The GEF nutrient reduction projects in the region supported the underlying policies in the region in particular in the development of Codes of Good Agricultural Practices to meet requirements of the EU Nitrates Directive.

The following table shows the annual nutrient loads for the beneficiary countries under the Living Water Exchange, and provides a sense of how the countries compare with one another and where future resources might be invested. The data seems to indicate that Slovakia and Serbia currently use the most fertilizer per 1,000 hectares.

Table 3 – Annual Nutrient Loads

	Use of Fertilizers per 1,000 hectares of Agricultural Land Area: Nitrogen (tonnes)[24] [25]	Emission COD (t/ha)[26]	Emission BOD_5 (t/ha)[24]	Emission N_{tot} (t/ha)[27] [28]	Emission P_{tot} (t/ha)[29]	Dissolved Oxygen Concentration (ml/l) [23]
Albania	22.59	--	58,737	2,261	456	6.6
Azerbaijan	3.54	--	14,011	--	--	8.27
Bosnia & Herzegovina	15.69	216,314	118,109	18,051	4,028	6.15
Croatia	42.34	357,240	168,022	26,927	6,919	8.95
Georgia	7.33	--	--	--	--	--
Iran	18.40	--	148,602	--	--	10.57
Kazakhstan	0.28	--	--	--	--	8.27
Moldova	12.13	56,155	28,360	4,759	954	--
Montenegro	37.02[30]	--	--	--	--	--
Russian Federation	4.80	--	1,251,940	864 (This is tonnes only , not t/ha)[31]	47 (This is tonnes only, not t/ha) [30]	9.69
Serbia	46.25	428,874	235,657	39,433	7,178	--
Slovakia	58.65	182,789	85,382	28,271	4,280	10.03
Turkey	40.66	--	169,742	1,125,899	56 [28]	--
Turkmenistan	--	--	--	--	--	6.74
Ukraine	17.70	21,745	11,614	5,189	1,730	--

[24] UN Statistics Division. Land and Agriculture. 2007. http://unstats.un.org/unsd/environment/Time%20series.htm#InlandWaterResources

[25] COD and BOD_5 emissions from agglomerations ≥2,000 PE for each Danube country and the entire DRBD emitted through all pathways (reference year 2005/2006). ICPDR.

[26] Organic Pollution from Urban Wastewater.

[27] Nutrient Point Source Pollution.

[28] N_{tot} and P_{tot} emissions from agglomerations ≥2,000 PE for each Danube country and the entire DRBD emitted through all pathways (reference year 2005/2006). ICPDR.

[29] Nutrient Point Source Pollution.

[30] Conservative estimates from mini catchments. Assumed amounts not applied. LWE Fact Sheet – Anatolia Watershed Rehabilitation Project. http://documents.rec.org/publications/LWEAnantolia.pdf.

[31] Baltic Sea RP (Estonia, Latvia, Lithuania, Russia). As load reductions in agriculture. LWE Fact Sheet.

Section VII – Findings – Potential Pathways for Replication

The following are key findings that the discussions with stakeholders and experts appear to indicate are potential pathways for replicating the priority practices identified above and that the Living Water Exchange peer-to-peer exchanges confirm. By pathways we mean those strategies and drivers that facilitate the acceleration of practice replication:

- Continue to implement policies at the country and local levels that incentivize changes in behavior – Harmonization with the EU Nitrates Directive is driving countries to develop "Codes of Good Agricultural Practice," many of which have been catalyzed and supported by GEF projects, in particular the Romania Agricultural Pollution Control Project and the Danube River Enterprise Pollution Reduction Project in Serbia. The "Codes" offer a road map for policy makers and farmers to implement the priority practices, focusing on whole farm nutrient management planning which maps specific nutrient inputs to needs on the field. The U.S. also provides a counter example of how the lack of appropriate policy frameworks has resulted in little coordinated action by the stakeholder community. Only now as the policies of "Total Maximum Daily Loads"[32] are implemented (and the economics of conservation tillage becomes clearer and well known) is the environment changing and action occurring.
- Promote cooperation among countries –ICPDR leadership – supported by the GEF projects in the region – has brought Ministries in the region together to develop a joint programme of measures. The recent ICPDR Consultation Meeting on Financing Danube River Basin Management Plan - Joint Programme of Measures in May 2010 is an example of coordination at the Ministerial level regarding wastewater infrastructure development, land-use and agriculture measures that is driving transboundary actions. Government participants from Armenia, Azerbaijan and Georgia during the peer-to-peer exchange in Chisinau, Moldova committed to exploring a regional transboundary project focusing on an integrated approach to nutrient reduction and will develop a table of common interest as a first step. The Minister of Environment for Albania asked the Living Water Exchange to facilitate a regional Ministerial meeting to discuss how to foster cooperation to address nutrient pollution in the region. Such examples are important and incremental steps that can lead to broader cooperation to develop replication strategies to address nutrient pollution that impacts across the entire region.
- Developing partnerships among farmers – Because the scale of production in the region remains focused on small holder farmers especially, partnerships among farmers is critical to leverage available and limited resources to offer access to expertise and technologies that will assist in implementing practices and systems of practices. Building the economic case for such collaboration and the notion that private landownership will be sustained are the first step in making farmers comfortable and ensure replication of agricultural best practices.
- Develop nutrient trading or burden sharing schemes to fund practice replication – The European Commission's database practices calls for nutrient trading schemes and/or N-taxation as options for funding the implementation of practices and incentivizing behavior changes. There has been analysis about implementing trading schemes in the Baltic. (See Appendix 12 for a table of potential costs in the Baltic) While this kind of approach is quite controversial among Danube basin countries, it remains a potential tool for funding nutrient reduction best practice replication in the region. Other innovative approaches to providing incentives to farmers to adopt best agricultural practices must also be developed, including modifying the current subsidy models in the EU.

[32] Under section 303(d) of the Clean Water Act, states, territories, and authorized tribes are required to develop lists of impaired waters. These are waters that are too polluted or otherwise degraded to meet the water quality standards set by states, territories, or authorized tribes. The law requires that these jurisdictions establish priority rankings for waters on the lists and develop TMDLs for these waters. A Total Maximum Daily Load, or TMDL, is a calculation of the maximum amount of a pollutant that a waterbody can receive and still safely meet water quality standards.

Section VIII – Conclusion

The Living Water Exchange increased the discussion regarding nutrient stresses and the practices needed to address them in Central and Eastern Europe and worldwide. The inventory, database and analysis of these practices will be lasting and sustainable products for the project and the GEF that will serve as key building blocks for the proposed Policy Toolbox of global policies, practices and financial instruments in the upcoming GEF/UNEP Global Partnership for Nutrient Management (GPNM) project. The database and the associated GPNM Toolbox will have reach far beyond the GEF IW portfolio to coastal communities in key nutrient "hot spots." The Ministerial-level meeting to take place in Albania during the first quarter of 2011 is a major achievement – further improving the outcomes from the peer-to-peer exchanges – in fostering cooperation among countries to build capacity and approaches to address nutrient pollution going forward in the region.

While more work needs to be done in identifying projects and practices at the national and local levels, the Living Water Exchange is helping to establish the GEF as the primary global champion in attacking the growing challenges of coastal hypoxia.

###

Appendix 1 – Best Practice Review and Recommendations to Assess Priorities for Replication In Central and Eastern Europe and Central Asia

Best Practice Review and Recommendations to Assess Priorities for Replication In Central and Eastern Europe and Central Asia

Prepared for GETF by:
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November 2010

Introduction

The overall goals of the projects being reviewed by the Living Water Exchange is to reduce stress from nutrients and build capacity at the country and farm level to replicate nutrient reduction best practices to improve water quality in Central and Eastern Europe and Central Asia. While the projects under review are dominated by the GEF Strategic Partnership for the Danube and Black Sea Projects, this document is a review of best agricultural practices, projects and programs and targets projects and practices geared to improve water quality from agricultural sector actions to reduce nutrient pollution. The summary was performed at the request of the Global Environment & Technology Foundation (GETF) to allow evaluation of projects and prioritize practices that have demonstrated the most potential for positive impacts on water quality, are replicable and scalable and can be systematically linked or applied in a systematic fashion. This approach would be a way to emphasize "farming systems" as part of "eco-systems" than reductions that could be achieved by individual practices.

This document also identifies and summarizes categories of pressures and measures of nutrient reduction practices that have been observed by projects and other broader assessments. The Living Water Exchange is in the process of providing overall guidance for better understanding the nature of nutrient pollution sources and measures to limit the resurgence of agricultural and non-agricultural diffuse nutrient releases across Central and Eastern Europe and Central Asia. The pressures in the agricultural land sector are primarily diffuse sources while agricultural industry sources tend to be point source pressures. There are gray areas, such as manure storage platforms (a practice implemented in a range of projects), which can become point sources. For the most part, the draft categories for measures agree with the discussion that follows with one possible exception. We would rank nutrient/manure management at the top agricultural land practice that can most influence nutrient pollution. This may have been assumed to be part of the Codes for Good Agricultural Practice, and if so we feel that nutrient /manure management should be singled out. It is also of importance that the GEF/World Bank Romania Agricultural Pollution Control Project concluded that nutrient management was the most cost effective practice to implement. This analysis agrees with similar conclusions from the Chesapeake Bay Basin.

Synthesis, Evaluation and Recommendations For Projects

The Living Water Exchange collected data and information, as available, on the 38 nutrient relevant projects funded by the GEF or through GEF regional projects in Central and Eastern Europe, Southeast Europe, and Central Asia. Thirty of the projects were in the Danube River Basin. This summary concentrates on synthesizing results from agriculturally focused projects as well as other projects dealing with the use of wetlands to treat wastewater. All projects that dealt only with wastewater treatment technologies or urban runoff were not part of this synthesis. In addition, there were a few projects for which results or reports were not available so they could not be included in the synthesis. After removing non-agricultural or wetland projects and projects without adequate information for evaluation, this synthesis reviewed 28 of the 38 total projects.

The level of detail, results and impact estimates in the 28 projects varied widely which made it challenging to develop a good estimate of the total N and P reductions resulting from the projects relative to practice implementation. The differing information also made assessing nutrient reductions needed to meet the requirements of the EU Water Framework Directive or Nitrate Directive or an equivalent level of water quality improvement by non-EU or non-EU accession countries a complex and difficult process. Implementation and reduction estimates are provided wherever they were included in project reports. Estimates of overall programmatic and project impacts in the Danube Basin were made based on information provided in the publication entitled "GEF Nutrient Reduction Partnership Tackles the Black Sea 'Dead Zone' and Danube Basin Pollution" as discussed later. Overall reductions were adjusted by country/project to account for what part of the total estimated reduction resulted from agricultural practices. Estimates of potential reduction from complete implementation of 12 practices on all farms of 5 hectares or more that are discussed later were obtained from the report "Reduction of Pollution Releases through Agricultural Policy Change and Demonstrations by Pilot Projects", 2007.

We present expanded information on eight BAPs that could be widely implemented and provide major nutrient reduction benefits, particularly when implemented systematically. BAP information includes practice definition, efficiency, examples of use within funded projects and options for implementation in Eastern Europe and Central Asian. The report also identifies and discusses management and productions issues in the region that may need to be addressed as part of a broad nutrient reduction strategy and also proposes adaptive, systematic approaches and evaluation methods that should be considered in future project and program activities as well as in the on the ground work to reduce or maintain low level of nutrient loss from agriculture while restoring an economically viable agricultural base that will enhance quality of life for the citizens of the region.

We provide a relative ranking of measures evaluated in the 28 projects and the two reports above and provide estimated efficiencies of practices based on long-term efforts in the Chesapeake Bay restoration program and a project conducted there by Simpson and Weammert from 2006-2009 that evaluated the global literature and practice base for practice definitions, performance data and efficiencies for all practices used in the Chesapeake Bay Basin. All practices being discussed for Central and Southeast Europe and Central Asia were evaluated during this project.

The information from each project report, the two summary reports cited above, the recent Chesapeake Bay practice synthesis report, and the "Issue Paper on Nutrient Pollution in the Danube River Basin" produced by the International Commission for the Protection of the Danube River in 2007, were all used to develop the definitions, efficiencies and systematic approach discussed in this report. The state of the science about BAP performance, current or potential

implementation levels, nutrient reductions, are all limited. In addition, the detail and certainty of information varied widely between projects. Thus, due to both science and project knowledge gaps, there are numerous places in the report where we feel it is important to express a level of uncertainty. In addition, the challenges in compiling BAPs and project information learned both during the three year Chesapeake Bay synthesis and this short term review of projects prompted us to write a section on recommendations for future activities to facilitate evaluation of actual project performance, implementation and allow better estimation of expected water quality impacts.

Recommendations

Overall we believe that great strides have been achieved by the projects reviewed in this document. Many of the planned and implemented activities have helped to lay the foundation for a strong framework in reducing nutrient pollution in the DRB and other parts of Central and Eastern Europe and Central Asia. While the programs reviewed laid the foundation for water quality improvements, development of a better documented and more accountable systems approach to BAPs in an adaptive management framework is essential to achieving the dual goals of a viable farm economy and clean water. Specifically, we would recommend the following:

- *Move towards a systematic pollution control approach adapted from the industrial model for BAP linkages*
  Adaptation of the conventional industrial pollution model has the advantage that each BAP only has to do moderate reductions to obtain very high reduction levels and if one BAP in the sequence fails in a given event, the others may provide a backstop for that BAP so that adequate treatment occurs.

- *Move towards implementation of an adaptive management strategy*
  An adaptive management approach allows forward progress in implementation, management and policy, while acknowledging uncertainty and limits in knowledge.

- *Focus on a whole farm, nutrient management approach*
  Matching agricultural needs with nutrient inputs (from organic/non-organic fertilizer or manure) is a primary tenant of Codes of Good Agricultural Practice (as exemplified in both the GEF/World Bank Romania Agricultural Pollution Control Project and the Danube River Enterprise Pollution Reduction Project).

- *Development of a tool box for nutrient reduction*
  The range of BAPs implemented in the projects reviewed could form the foundation of a "tool box' of practices for nutrient reduction that could be employed to address the excessive nutrient loss to waters from agricultural production that is occurring globally.

- *Organize "ecological-based" private farmer-owned* enterprises
  Due to the small average size of farms in the region, access to export and commodity markets, farmer income and increased implementation of BAPs may be gained by forming private partnerships/enterprises to both produce and market ecologically grown products. While we acknowledge that farmers (in the U.S. and Central and Eastern Europe) often have reservations about such an approach, it may be a key strategy to reach scale. Organizations such as the Federation of Agricultural Associations ULE from Armenia have working models that might be replicated.

- *Place more emphasis on BAP implementation, operation and management related to some prescribed definition*

In order to maximize the nutrient reducing effectiveness of implemented BAPs there is a need to better define practices and use those definitions in implementation.

- *Require documentation of practice operation and maintenance when appropriate*
  The best example of this required documentation is what occurs after manure storage platforms are constructed. For composting, there is a need to quantify inputs, conditions during the compost practice, and a record of material distribution and use.

- *Improve planning and accountability of projects*
  Some projects did not have clearly defined actions that would be taken to implement their projects and perhaps as a result, could not articulate outcomes and impacts in their project reports. Accountability for actual behavior change that occurred as a result of the project is usually unavailable. It is recommended that future projects be selected based on merit and need as in the past but that they then be provided assistance in developing a scope of work, project activity monitoring, documenting the extent and impacts (ecologic, economic and social) of implementation of project practices. Assistance will also be needed in estimating overall project impact, opportunities for expansion locally and opportunities to scale up the project at a regional/transboundary scale.

Background on Best Agricultural Practice Definitions

Best Agricultural Practice (BAP)

The Living Water Exchange project team developed a basic definition of what a BAP is and is not:

> "The best, most appropriate practices can be defined as any management systems, processes and technologies that have a positive and/or beneficial impact on the environment, and a quantifiable reduction in nutrients. These practices are not based on static standards but continuous improvements. A best, most appropriate practice can be changes in management actions to reduce nutrient emissions, for example:
>
> - Minimizing nutrient loading in local water resources coming from agglomerations, agriculture and industry
> - Implementing procedures to reduce waste and/or loss of fertilizer from agricultural land (this could cover soil analysis, application of fertilizer at the appropriate time and in the appropriate amount, use of buffer strips etc.)
> - Improving the storage and application of manure (e.g. manure platforms, equipment for application of manure)
> - Enhancing awareness and training for farmers
> - More proactive actions by farm extension (advisory) services and assistance to farmers
> - Developing farm nutrient budgets
> - Accomplishing the reduction or elimination of nutrient loading in a "practical", cost-effective manner"

The UNDP/GEF Danube Regional Project (DRP) recommended the following definition for BAPs as a conceptual framework for all countries within the Danube River Basin:

> "…the highest level of pollution control practice that any farmer can reasonably be expected to adopt when working within their own national, regional and/or local context in the Danube River Basin."

The Living Water Exchange definition is consistent with and expands upon the DRP definition and conceptual framework for BAPs.

Previous work to identify appropriate BAPs for the region:
The UNDP/GEF DRP final report (January 2007) on Reduction of Pollution Releases Through Agricultural Policy Change and Demonstrations by Pilot Projects identifies 15 Best Agricultural Practices based on their work in the 7 lower Danube countries. Twelve of the fifteen practices are related to nutrient reduction. The report suggests the practices will result in a major reduction in nutrient losses, as discussed below, and at the same time improve the economy of the farmers.

The 12 nutrient related BAPs were grouped and defined as:

General

1. For all farms above 5 ha and/or 5 animal units, calculate resource economy every year for N and P (develop nutrient balances annually)

Crop production systems

2. Every farm with at least 5 ha of arable crops should ensure soil sampling at least each 5 years.
3. Crop rotation and fertilizing plans should be prepared for all farms above 5 ha every year. Fertilizing plans shall be based on the expected yield level, the needs of the crops, and include both livestock manure and mineral fertilizer.

Livestock production systems

4. Livestock should be fed with rations that are correctly balanced
5. Cleaning of stables with water should be avoided or reduced to a minimum.
6. Watering of the livestock should happen in a way that hinders spill of water.

Livestock density

7. Livestock density maximum corresponding to an N content from the manure of 170 kg N per ha. Manure should be sold to other farms or distributed to fields of other farms in case of a higher livestock density.

Livestock manure management

8. There should be on-farm storage capacity for at least 6 months production of livestock manure.
9. It must be hindered that rain water can dilute the livestock manure.
10. Spreading of manure in the period from 15 October till 1 March should not take place, and in any case not on to frozen land or land with a slope of more than 7°.
11. Proper technology should be used for spreading of livestock manure. Liquid manure and slurry should be spread with band laying system or be injected into the soil.
12. Livestock manure should be incorporated into the soil within 6 hours.

The report focused primarily on animal production and manure management, which are clearly critical elements for controlling nutrient pollution. The first BAP dealt with farm level nutrient balances, which are largely influenced by input

of feedstock and manure generation but consider other factors. The second and third BAPs did focus on matching nutrient use to crop need and soil testing, which are also very important. The remaining nine BAPs are all related to some aspect of animal/manure management. The 12 BAPs identified are important and in combination with the BAP synthesis from the Chesapeake Bay and results from the 28 projects reviewed formed the basis for the 8 BAPs recommended in this report, some of which combine more than one of the 12 identified above.

The report cited above contains a great deal of information on BAPs that could be applied but perhaps does not offer adaptation of those BAPs so they can be broadly implemented in the region. The report only considers farms of 5 ha or larger and 7 pilot farms were from 11-200 ha, when the majority of individually owned farms in the region are less than 5 ha. We concur with the report that farms greater than 5 ha, and probably more than 25 ha are needed to be economically viable units, capable of producing at levels that can enter export or commodity markets. However, land redistribution programs, following the communist era allocated parcels of 5 ha or less to most landowners, which can really only be managed at a subsistence level and provides little revenue for purchased equipment or production inputs or money or land for BAP implementation. While not a BAP, we think that organizing collaboration among farmers wherein farmers maintain ownership of their land but work through the cooperative to scale up production to a level that allows entrance into export or commodity markets may be key to providing both the revenue and land base to allow equipment and input purchase and BAP implementation. This approach was corroborated by discussions during the Living Water Exchange peer-to-peer exchange process, especially in Chisinau, Republic of Moldova. It is essential that ecological agriculture and water quality protection be a requirement or market expectation of these private cooperatives. Evaluating/piloting the organization of ecologically-based private cooperatives would be one good focus for future activities.

Many of the BAPs in the DRP report have helped make Denmark a leader in water quality protection and ecological agriculture but may not be appropriate for application in Central and Southeast Europe and Central Asia. Farm level nutrient balances, six months of manure storage (on-farm), no manure application from 15 October to 1 March and incorporation of manure within 6 hours of application are all examples of BAPs that should be ambitions for the region in the long term but less complex, less sophisticated and less costly adaptations of such BAPs need to be applied to the region for the foreseeable future. The inability to get promised government support and the lack of engagement by the Serbian extension service on the pilot farms illustrates the need for basic BAPs, training programs and implementation assistance if water quality improvements are to be made.

The report does provide estimates of the reduction in N and P losses that would occur if all practices were implemented on farms of 5 ha or larger. An explanation of the process to develop the estimate is provided but the quantitative basis is unclear. The report projects that implementation of the 12 BAPs would reduce N losses by 60% and P losses by 56% in the 7 lower Danube countries for current and “normalized” agriculture scenarios (Figure 1) . The scenarios applied all the BAPs to current crop and animal conditions and to expanded and a much higher load associated with “normalized” agricultural operations. “Normalized” operations are defined as large operations that use large scale intensive crop and animal production typical of Western Europe and North America. Nutrient loads are about double the current estimates in the normalized scenario. It is assumed the BAPs are fully implemented and achieve proposed reductions. It should be noted that nutrient loads in North America and Western Europe are high and water quality is impacted by agricultural production. Based on reductions achieved in other parts of the world with intensive (“normalized”) agriculture, the reduction estimates appear very high and clearly assume a very high level of implementation, operation and maintenance of the BAPs. It also begs the societal and policy question of whether a return to intensive crop and

livestock production is the appropriate and sustainable goal for countries of the region. Could higher value ecological agriculture, in combination with biomass production and ecologically optimum conventional crop and livestock production provide adequate revenue to support a good quality of life while not returning to huge levels of nutrient pollution? This will be discussed later in the report.

Figure 1 – Estimated reductions in N and P loads from implementation of 12 BAPs in seven lower Danube countries (From: "Reduction of Pollution Releases through Agricultural Policy Change and Demonstrations by Pilot Projects, 2007")

Nitrogen and phosphorus loss to the environment, tonnes per year in the lower Danube countries	No - without implementation of BAP's		Yes – with implementation of BAP's	
Now – with present livestock number, productivity and use of fertiliser	Now/No - Baseline scenario		Now/Yes	
	Nitrogen	Phosphorus	Nitrogen	Phosphorus
	1,002,692	150,555	445,641	60,222
Normal – with normal number of livestock, productivity and use of fertiliser	Normal/No		Normal/Yes	
	Nitrogen	Phosphorus	Nitrogen	Phosphorus
	2,014,753	272,287	695,446	109,905

557,000 tonnes N and 90,000 tonnes P

1.1 mill tonnes N and 150,000 tonnes P

Figure 7.1: Estimated leaching to the environment of plant nutrients N and P pr. year from the agriculture in the 7 lower Danube countries in 4 defined scenarios.

Code of Good Agriculture Practice

Codes of good agriculture practice (CGAP) are one of the five steps-to-implementation of the EU-Nitrates Directive. Specifically, we reviewed the Serbian Code of Good Agriculture Practice developed by the GEF-World Bank Danube River Enterprise Pollution Reduction (DREPR) Project and believe it sets a foundation to move towards improved handling of animal manures and organic fertilizers. The ICPDR Issue Paper (November 2007) considers development and implementation of CGAPs as a basic measure in agricultural pollution control that is essential to reduce nutrient pressures and impacts on water.

DREPR has developed a CGAP that includes all of the key elements proposed by the Nitrate Directive and in the ICPDR Issue Paper that provides a country appropriate framework around which a more detailed BAP implementation program to limit nutrient losses to water could be built. The Serbian CGAP could be used as a model by countries that have not yet developed such a policy.

The DREPR CGAP includes:

a. Measures limiting fertilizer application to match crop needs
b. Measures limiting the conditions for fertilizer application such as proximity to water courses and frozen/snow covered ground
c. Requirements for minimum manure storage capacity
d. Keeping ground covered with crop rotations, cover crops, catch crops especially during

Scope, BAPs and Impacts of Central and Southeast Europe and Central Asia Agricultural or Wetlands Projects Evaluated

As discussed earlier 28 of the 38 projects were related to agriculture or wetlands and project reports or other information available for evaluation. Table 1 lists those projects and identifies the BAPs associated with each.

Table 1 – Country/project listing showing BAPs reported in the literature for each project

Legend of Best Agricultural Practices:

CR = conservation crop rotation,
NM = nutrient management,
EA = ecological agriculture/organic farming with water quality protection verification
GR = grazing systems,
CT = conservation tillage,
ST = soil testing,
IRR = irrigation efficiency,
SR = manure storage,
MG = manure management,
CO =composting
BGD = biogas digester,
FR = balanced feed ration,
MGT = animal breeding, diversity,
DN = livestock density @ 170 kg/ha,
BU = buffers
TP = tree planting
WL = wetland restoration,
EC = erosion control,
CG = Code of Good Agricultural Practices adopted,
ND = worked toward the EU Nitrates Directive

Country / Project #	**Crop Production Systems**	**Livestock Manure Management**	**Livestock Production Systems**	**Land Use Changes**	**Other**
	CR NM EA GR CT ST IRR	SR MG CO BGD	FR MGT DN	BU TP WL EC	CG ND
DRP Reports (consolidated)					
Strengthening the Implementation Capacities for Nutrient Reduction and Transboundary Cooperation in the DRP (Tranche 2)/ #2042 and Developing the DRB Pollution Reduction Program/#342 Reduction of Pollution Releases Through Agricultural Policy Change and Demonstrations by Pilot Project – Final Report/no project number Component 4.3 Nutrient Removal by Wetlands/no project number	NOTE: Overall DRP note from questionnaire (R): a range of BAPs were established/implemented on 8 demonstration farms. This information was repetitive to that in the DRP Final Report cited below. It should be noted that the estimated nutrient reductions were 14t/yr N and 2t/yr P. This estimate was compared to the basin load of 700 kt/yr N and 50 kt/yr P.				

Country / Project #	Crop Production Systems	Livestock Manure Management	Livestock Production Systems	Land Use Changes	Other
Component 1.2 – Agriculture – Final Report/no project number Romania, Croatia, Slovak Republic – Field and Policy Action for Integrated Land Use in the Danube Regional Project, Component 1.4/no project number 11 Countries -DRB – Boosting capacities for nutrient reduction & trans--boundary co-operation DRP	CR NM EA GR CT ST IRR SR MG FR MGT DN BU CG WL MG CG CR EA GR BU TP WL EC CR NM ST SR MG FR NGT DN				

Country / Project #	Crop Production Systems	Livestock Manure Management	Livestock Production Systems	Land Use Changes	Other
Additional Projects Reviewed					
Romania -Integrated Nutrient pollution control project for nutrient reduction in the DR and Black Sea/#2970	CR NM ST	SR MG CO BGD		BU	CG ND
Moldova – Biodiversity conservation of the lower Dniester river /#1600				BU WL	
Albania, FYR Macedonia, Greece – Integrated mgt in the Prespa Lakes basin/#1537	CR NM EA ST				CG
Georgia – ARET/#633	CR NM	MG BGD	FR MGT		
Bulgaria – Wetland restoration and pollution reduction project/#1123	EA			WL	

Country / Project #	Crop Production Systems	Livestock Manure Management	Livestock Production Systems	Land Use Changes	Other
Hungary - Reduction of Nutrient Discharges/#1351				WL	
Croatia – Agricultural Pollution Control Project/#1348	CR NM EA ST	SR MG			CG
Bulgaria – Sustainable Land Management Project/ no project number	EA	SR MG CO			
Poland - Rural Environmental Protection Project /#531	CR NM EA	SR MG		BU TP WL	
Moldova – APCR/#1355	CR NM EA GR ST	SR MG		TP	
Romania – APCP/#1159	CR NM EA GR ST	SR MG		BU TP	
Turkey – AWRP/#1074	NM	SR MG CO BG			

Country / Project #	Crop Production Systems	Livestock Manure Management	Livestock Production Systems	Land Use Changes	Other
Estonia, Latvia, Lithuania, Russia - Baltic Sea RP/#922	EA	MG			
Serbia - Danube River Enterprise Pollution Reduction Project /#2141	EA	SR MG			CG ND
Russia & Estonia Development and Implementation of the Lake Peipsi/Chudskoe Basin Management Program/#1444	NM EA	SR MG		BU	
Romania, Ukraine, Serbia, Hungary, Slovak Rep - Tisza River Basin Establishment of a basin management framework/#2617				WL EC	

Bulgaria, Romania, and Moldova - Best Agricultural Practice on my farm/no project number	EA	SR MG		TP	CG
Moldova - Reduction of nutrient pollution in DB through the promotion & use of GAPs /no project number	EA			TP	
Bulgaria/Romania - Cross-sectional cooperation for good water quality management on lower Danube farms /no project number		MG			CG
Serbia – Underground water and farmers/#85	EA			WL	

Romania - Cooperation to reduce nutrient pollution from agricultural sources in Ilfov County/no project number					CG
Romania - Preventing and reducing nutrient pollution from Agro-zoo technical sources in the Olt River basin/no project number		SR MG CO			

Projects not listed in Table 1 were excluded for a number of reasons based on analysis of available literature on the specific project. They are grouped as follows:

Six projects lacked any agricultural BAPs:

Bulgaria, Georgia, Romania, Russia, Turkey, and Ukraine – Control of eutrophication, hazardous substances and related measures for rehabilitating the Black Sea Ecosystem – Phase 1

Global – Enhancing the use of science in international waters projects to improve project results

Global – The role of coastal oceans in the disturbed and undisturbed nutrient and carbon cycles

Moldova – Pilot water supply and sanitation project

Moldova – Environmental infrastructure project

Moldova - Reactivation of the secondary (biological) water purifying stage in the wastewater treatment plant of Ungheni District (DRP small grant)

Two projects lacked any agricultural BAPs but included wetland restoration in relation to waste water treatment plants. Wetlands in this capacity will be discussed below (see Recommended BAPs #5 Wetland Restoration and Creation).

Bosnia and Herzegovina – Water quality protection project

Hungary – Szodrakos Creek Program – Phase 2

One project, no BAPs could be identified in the information available:

Romania - Cleans Waters without nutrients through natural fertilizers

One project, still in the planning stage, lacked any reference to BAPs:

Mongolia, Russia – Joint actions to reduce PTS and nutrient pollution in Lake Baikal through integrated basin management

Two DRP projects, on the GEF spreadsheet, for which information could not be identified:

DRP Component 4.3 Nutrient removal by wetlands – theory and demos - Danube/Black Sea

DRP 1.2 (Agriculture) - Danube/Black Sea

The following table shows the reported nutrient reductions from a number of GEF supported projects over the last decade.

Table 2 – Estimates of nutrient reductions based on project reports and other data sources

Country / Project	Reported Reductions	Comments	Data Source
DRP Strengthening the implementation capacities for nutrient reduction and transboundary cooperation in the DRB (Tranche 2)	DR-BS 758 kt/yr N 43% (326 kt/yr) do to agriculture 68 kt/yr P 19% (13 kt/yr) due to agriculture	Overall DRP note from questionnaire (R): a range of BAPs were established/implemented on 8 demonstration farms. This information was repetitive to that in the DRP Final Report cited below. It should be noted that the estimated nutrient reductions were 14t/yr N and 2t/yr P.	Strengthening the implementation capacities for nutrient reduction and transboundary cooperation in the DRB - 2006
DRP – Reduction of Pollution Releases Through Agricultural Policy Change and Demonstrations by Pilot Project – Final Report		Could not identify a overall reduction from all pilot programs	Final Report
Romania -Integrated Nutrient pollution control project for nutrient reduction in the DR and Black Sea	4340 t/yr N & 3695 t/yr P	Also called the Romania Environmental Management Project Note: Could not separate out agricultural versus human N and P reductions	GEF 4-page document on Partnership
Bulgaria – Wetland restoration and pollution reduction project	800 t/yr N & 40 t/yr P	Expected maximum reductions from 2,340 ha of restored wetlands Estimates represent 5% of Bulgaria's contribution to the Danube	LWE Fact Sheet
Hungary - Reduction of Nutrient Discharges	5,500 t/yr N & 264 t/yr 2,945 t/yr N & 310 t/yr P	Expected reductions from 25,000 ha wetland restoration Expected reductions from WWTP	LWE Fact Sheet

Country / Project	Reported Reductions	Comments	Data Source
Croatia – Agricultural Pollution Control Project	400 t/yr N & 200 t/yr P		GEF 4-page document on Partnership
Poland - Rural Environmental Protection Project	81 t/yr N	For 2004 from all project regions Reductions are in amounts applied by manures/slurries and nutrient mgt CE (cost effectiveness) Range $18-24/kg N	LWE Fact Sheet
Moldova - APCR	280 t/yr N & 70 t/yr P	Reported the lowest CE ratios for nutrient reduction – For communal manure management CE $3.79/kg N & $3.36/kg P	GEF 4-page document on Partnership WB Final Report January 2010
Romania - APCP	124 t/yr N & 97 t/yr P With expansion country-wide expected reductions: 15,350 t/yr N & 8,950 t/yr P 84 t/yr N & 81 t/yr P	2006 figures for 69,011 ha Reported as “avoided leakage” 1.8 kg N/ha & 1.4 kg P/ha Also calculated CE (cost effectiveness) for 1 kg N or P Nutrient management $10/kg Strip/cover crops $12-15/kg Manure mgt. $30-40/kg Nutrient discharges in waters decreased by ~15% for N and ~27% for P in 2006 – target was 10% Based on actual measured reduction values	Project Report 12/2007 LWE Fact Sheet Questionnaire responses GEF 4-page document on Partnership

Country / Project	Reported Reductions	Comments	Data Source
Turkey - AWRP	200 t/yr N & 25 t/yr P	Conservative estimate From mini-catchments Assumed amounts not applied	LWE Fact Sheet
Estonia, Latvia, Lithuania, Russia - Baltic Sea RP	864 t/yr N & 47 t/yr P	As load reductions in agriculture	LWE Fact Sheet
Serbia - Danube River Enterprise Pollution Reduction Project	430 t/yr N & 70 t/yr P		GEF 4-page document on Partnership

The total reductions from the data gathered in Table 2 were approximately 13,020 t/yr N and 4,510 t/yr P. These numbers reflect reductions due to agricultural and wetland impacts but not waste water treatment plants. (Note: that for the Romania Integrated Nutrient Pollution Control Project it could not be established how much of the reported reductions were due to agriculture versus human waste.)

The estimated total Danube-Black Sea loads are reported to be 758 kt N and 68 kt P annually with agriculture providing 43percent and 19 percent of the N and P, respectively. Therefore the estimated total N and P loads in the DRB due to agriculture appear to be 326 kt/yr and 13 kt/yr, respectively. This equates to 4 percent N and 35 percent P of the total DRB load attributed to agriculture. The apparent large reduction in P is based on project estimates that were provided. In other basins with similar land uses, the percent contribution for P is higher than projected in the DRB.

It should be pointed out that the reduction amounts reported appear to be equivalent to reductions in amounts applied not necessarily amounts that enter surface or groundwater. If this is the case then the reduction percentages would be lower.

Analysis of Pressures and Measures

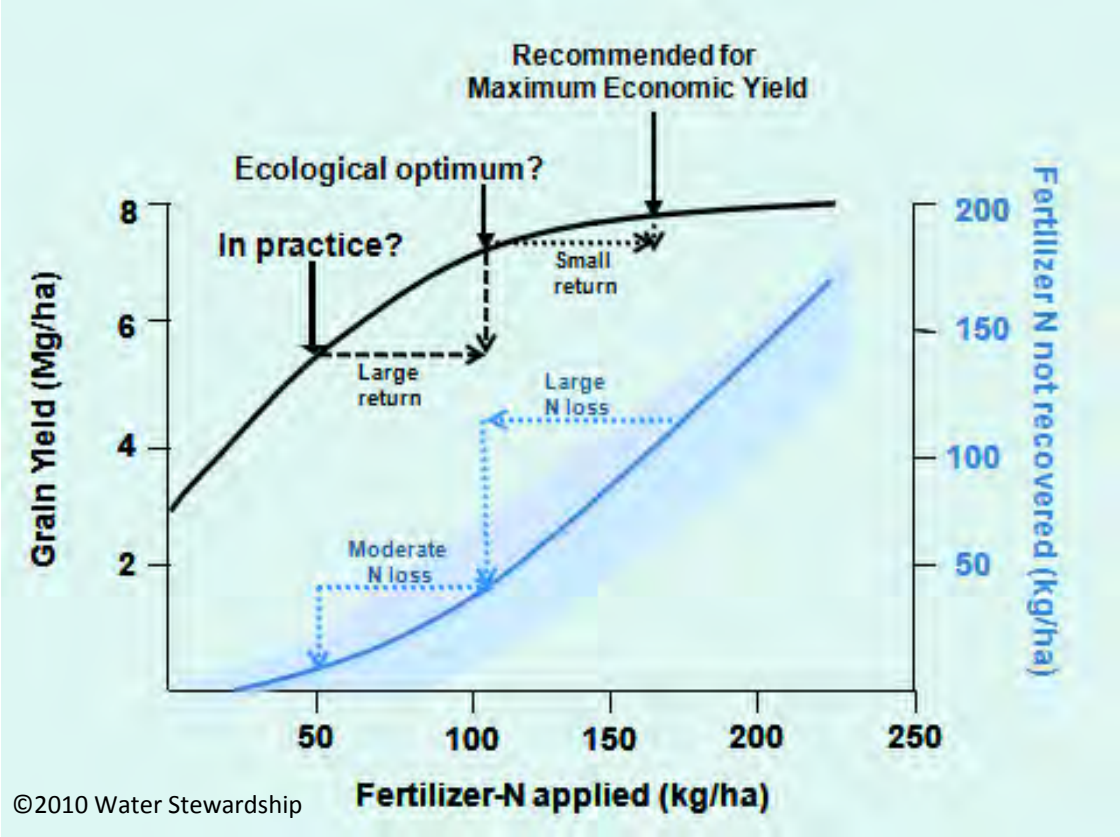
Practices recorded in Table 1 show an emphasis on both crop production systems and livestock manure management while livestock production systems (feed ration, general management and stocking density) received less attention. Land use changes were intermediate in implementation usage. There were several projects that resulted in the establishment of Codes of Good Agricultural Practices and as cited above are used as one of the requirement for the EU Nitrates Directive.

This trend is not surprising since initial actions to improve nutrient use efficiency should concentrate on cropping and animal manure utilization. In the first case, matching nutrients applied (in fertilizers or manures) with the specific crop is essential and it is the basis for nutrient management plans.

Maximum Economic Yield vs. Ecological Optimum Yields Based on Diminishing Returns

This approach was initiated on some of the eight pilot farms in the DRP and being demonstrated in the Croatia APCP in attaining fertilizer response curves. Additionally, one of the tenets of CGAPs is matching crop needs with input. It is a practice that through demonstration can be replicated in all countries and should be considered high priority. It bears reiteration that if one is in the position to initiate crop response curves, it is the time to discuss maximum (a pressure) versus ecological optimum yields, as illustrated in Figure 2 below.

Figure 2 – Grain yield response curve for corn (maize) (in black) with N loss (or unaccounted for N) at different application rates showing differences in yield change versus N loss at different N rates



Based on a graph originally developed by the US National Research Council in 1993

In high yield agriculture, a "diminishing returns" yield response curve is often used to estimate maximum economic yield. It is the point at which the yield increase from an additional unit of N has the same value as the cost of the unit of N (no return on input). However, as yields approach the maximum economic yield, the return per additional unit of N decreases, so the economic efficiency of adding additional units of N declines. In Western Europe and North America, many farmers have applied N above the maximum recommended as an "insurance policy" against yield loss should they have an extraordinary year. This practice is not economically beneficial because it means that you are paying for excess fertilizer in most years without any economic return. It also has serious environmental consequences. The rate of N loss is a mirror image of the amount of N applied and losses increase exponentially as maximum yield is approached. In some countries, incentive programs have been developed to get farmers to reduce N application or conduct trials at lower N rates to bring them back at least to maximum economic yield rates. Some programs have paid farmers to apply 15 to 25 percent below recommended rates. In the US, American Farmland Trust (AFT) has had a program for several years that pays incentives to farmers to apply less N. They offered a yield warranty to cover any lost income if yields were reduced. The Iowa Soybean Association (ISA) has developed, and expanded nationally, the "On-Farm Network" Program that uses field strips to let farmers evaluate the impact of lower N rates on yields. The ISA program has found that most US Corn Belt farmers can reduce N rates 15-25% without yield impact. The AFT program worked through crop consultants and focused on high management farmers that had already refined N use so there were some yield impacts but it still ended up being a very cost effective BAP.

Water Stewardship worked with AFT in 2010 to adapt their program to farms with very high soil P levels in the Shenandoah Valley of Virginia where manure has been applied for many years. These results showed no yield impact from stopping all P application on soils testing very high or excessive in the nutrient. These results for both N and P are consistent with the ecological optimum approach discussed above.

In Eastern and Southeast Europe and Central Asia, a large amount of corn is grown. Since the communist era, most of it is grown with far less N additions than recommended for maximum economic yield due to cost of N inputs. There exists the opportunity to create a new target yield for corn growers in this region, the "Ecologically Optimum Yield" shown in Figure 2. This is the yield at which the slope of the yield response curve declines rapidly so the additional yield from each added unit of N also decreases rapidly. Because of the relationship between N price and corn yield, some profit may be made by applying N at rates out onto the "flatter" part of the response curve but the return per unit of input is much less than in the steep part of the curve. Regional farmers are, for the most part, fertilizing with N on the steep part of the curve (applying sub-optimum rates) and are likely to be challenged to purchase enough N to get to the flat part of the response curve. It may be both economically and ecologically desirable for these farmers to only try to increase nutrient use to what is termed the "Ecologically Optimum Yield" above. At this point, the yield return to the farmer for each additional unit of N begins to decline so the farmer is getting less economic return for purchasing the additional N. We have termed it the Ecological Optimum because it is the point at which the rate of N loss with each added unit begins to increase and does so in an exponential fashion. It has proven challenging to get intensive farmers who have been applying at or above the rates needed for maximum economic yield to reduce applications below that point. However, it may be advantageous for a limited resource farmer to only apply N at the ecologically optimum rate to get the greatest return on N costs while minimizing the opportunity for N loss to the environment.

Nutrient Management Planning

A nutrient management plan (NMP) should include the following information: analysis from a recent soil test (at least every three years), crops to be grown, realistic yield expectations for each crop, and a manure analysis if appropriate. The plan then determines nutrient application rates, timing and method of application for each crop. When manures are used they are considered first before fertilizers to meet crop needs. The NMP should also show crop rotations (for the following three years), cover crops to be grown and the maintenance of pastures. The NMP considers the entire farm. Owing to the small size of most farm holdings the idea of developing a community-scale NMP has merit. It would allow a broader use of manures, equipment, diversity of crops and from a water quality perspective implementation of BAPs on a larger scale.

Manure Utilization as a Critical Component of Nutrient Management

Matching manure application to crop nutrient need, including only applying the ecologic optimum rate, as discussed above, should also be a primary action to improve nutrient use efficiency and reduce the need to purchase fertilizer N, where that is a consideration. In fact, fertilizer and manure management should be considered together to assure both that manures are used to the maximum capacity and supplemental fertilizers are used to fulfill gaps in requirements. This would be a cost effective approach to using both nutrient sources. There was little mention of manure analysis as part of any of the projects or as a focus of nutrient management. Where manure is used in crop production, analysis of it is as important as soil testing, both to assure adequate but not too much N and to avoid overloading soils with P.

An example that highlights the need to match crop nutrient needs from both fertilizers and manures is the influx of poultry operations as noted in the Croatia APCP report. Poultry litter utilization, due to the imbalance in N and P contents, can quickly lead to high P soil levels. It is better to devise ways to either transport the litter or identify alternate uses now that try to deal with reducing high soil P levels in the future. Excessive soil test P levels are common, throughout the world, in intensive animal production areas, especially poultry. Water Stewardship published a report evaluating excess soil P levels in the Chesapeake Bay Basin that documents the impact of intensive livestock and poultry production on soil P levels over time (report available at http://corporatewaterstewardship.org/). It is strongly recommended that Central and Eastern Europe and Central Asia countries avoid getting into the situation of having landscapes in animal production regions dominated by soils with excessive P levels.

Intensive Greenhouse Production Systems

Another indication of the pressures to intensify and produce high volumes of high value crops has been the proliferation of cabbage, tomato and pepper greenhouses in Siltse and Zarichya villages in the Western Ukraine. Approximately 6,000 ha of closed plastic hoop houses have been built in these two adjacent villages. Farmers are able to grow two-three crops of cabbage and tomatoes and peppers in the summer in the greenhouses. The crops are of sufficient value that inorganic fertilizers are used in production. The crops are irrigated, usually by furrow irrigation, with water from a nearby stream and the effluent water is discharged back into the stream at the same point as the intake. This practice is having two detrimental effects. First, the effluent from the irrigation is high in nutrients and is discharged directly to the stream. Secondly, these villages are naturally prone to flooding and the presence of 6,000 ha of greenhouses, acting as impervious surfaces are increasing runoff, erosion, stream scouring and add to flooding. These results, and the Croatian response curve work, illustrate the pressures for intensive, high nutrient load agriculture that will only be offset if the framework, infrastructure and markets can be developed for water protective ecological agriculture products.

Buffer Width versus Available Land

Practices such as buffers and tree plantings, when newly installed, usually involve removal of land area from agricultural production. This issue is always a farmer concern but when the majority of land holdings are small, 5 ha or less, this becomes a much larger issue. Research indicates that buffers need to be at least 10 m wide to effectively remove N. While this may not be practical in the region, it should be done where possible and buffers implemented here should be a minimum of 5 m wide. The efficiency of the buffer decreases substantially when it is less than 10 m wide. This reduction in cropping land can be offset to some extent by using the buffers for fruit production (plum tress) or other tree species (for fuel) and/or harvesting the buffer grass as hay. Where appropriate grass and/or trees buffers should be linked to animal grazing (see Table 3 below) to assure the long-term stability of the buffers and that they provide maximum nutrient removal. Development of private farmer partnerships could increase the size of farm operating units and allow more widespread implementation of buffers.

Wetland Restoration and Construction

Seven country projects in Table 1 specifically included wetland projects which were usually restoration of prior existing wetlands. There are four primary situations in which wetlands, when properly designed and operated, can be very efficient at nutrient and suspended solids removal. The first two situations are for treatment of flows from small to medium towns and for treatment of non-toxic industrial discharges. These usually have reasonably consistent flow rates so a wetland treatment system designed and operated to handle the flow and total nutrient and suspended solids loads could be efficient and cost effective. However, such a system will not provide pathogen removal or disinfection at needed levels.

The other application of constructed or restored wetlands would be to treat storm water runoff or drainage flow from agricultural or urban catchments. There are numerous examples of such wetlands that could provide guidance on their design and efficiency. When properly designed, constructed, operated and maintained, they can be very effective; however, they must be designed and managed differently. Unlike wastewater discharges which are relatively uniform in flow, runoff and drainage varies from nil to extremely high flows during the course of a year. As a result, some open water retention basin is usually required to allow capture of runoff from a "design storm" (usually 1-5 year return frequency) and the subsequent distribution of that water over time through the associated wetland. The other difference is that runoff treatment wetlands can go through prolonged periods where no water will enter the system. It is critical to design the wetland treatment system so that it maintains it wetland function through such dry periods or can rapidly recover when water enters it following rainfall events. Constructed wetlands have been used successfully in many locations for diffuse pollutant control. Constructed or restored wetlands may have their greatest application as the final component of a multi-step treatment system that reduces nutrient and suspended solids in runoff from diffuse sources.

BAP Efficiency: Proper Implementation, Operation and Maintenance

Estimating the actual impact of the practices in Table 1 is challenging since there is little documentation of implementation or comparison of what was implemented to a standard accepted definition of the BAP. The effectiveness of practices is closely related to their implementation and operation and maintenance where needed. Efficiencies for practices are developed based on fairly prescriptive definitions that match up with the practice as applied in research, demonstrations or monitoring used to determine the efficiency. For instance, a number of projects report implementation of buffers but no mention is made of the buffer width and in many cases the composition and management of the buffer. Both the width and composition/management can significantly impact buffer efficiency (as discussed below).

We recommend that future projects be planned with more emphasis on BAP implementation and management related to some prescribed definition to which efficiency can be attributed. It is equally important to document operation and maintenance to verify that a practice is reducing nutrient loss as is being credited. Clear plans for record keeping, documentation of implementation and monitoring of the planned actions and impacts need to be included in the scope of work for future projects. It should also be made clear that the final report must contain documentation of action, implementation and impacts in a more quantitative manner than was typical of the projects reviewed. We do not want to overlook the importance of other drivers and principles like better practice definition, documentation and verification which can help avoid issues that have arisen in North America regarding actual practice impacts and claimed levels of implementation.

Support documents, such as Codes of Good Agricultural Practices, help to set the foundation from which BAPs can be implemented and eventually improved upon. The EU Water Framework and Nitrates Directive (and potential future emphasis on P) will also guide the use of monitoring and evaluation which will likewise assist in enhanced BAP implementation. Within the Nitrates and Water Framework Directives regulations, the policy tool is designed to help achieve "good status" by 2015 in water bodies at risk from eutrophication. At recent Living Water Exchange project meetings, there was some discussion of a possible P Directive. Such a directive could help focus needed attention on P management, and indirectly, erosion.

Recommended BAPs

The following is a list of eight BAPs highlighted in the reviewed projects that have a high potential impact for reducing N and P from agriculture. For each, we describe the optimal efficiency and provide options which may not provide optimum efficiency but may be better adapted to conditions in the DRB and Central Asia. The information that follows is adapted from work done by Simpson and Weammert in 2009, to develop best management practice definitions and effectiveness estimates for N, P and sediment in the Chesapeake Bay Watershed.

At the end of the discussion below on the eight BAPs we summarize the cost/benefits of the practices.

1. **Riparian Buffers** – These can be either forest or grass. They should receive no fertilizer or manure addition, livestock should be excluded (including geese) and runoff should be controlled so it enters the buffer as sheet rather than channelized flow. The first 10m of width it critical for N removal. Buffers generally have a low to moderate P removal efficiency.

   Definition: Riparian Forest Buffers: An area of trees at least 35 feet (approximately 10 m) wide on one side of a stream, usually accompanied by trees, shrubs and other vegetation adjacent to a body of water. The riparian area is managed to maintain the integrity of stream channels and shorelines, to reduce the impacts of upland sources of pollution by trapping, filtering, and converting sediments, nutrients, and other chemicals.
   Riparian Grass Buffers: an area of grasses that is at least 35 feet (approximately 10 m) wide on one side of a stream. The riparian area is managed to maintain the integrity of stream channels and shorelines, to reduce the impacts of upland sources of pollution by trapping, filtering, and converting sediments, nutrients, and other chemicals.

   Project Examples: The UNDP/GEF Danube Regional Project – Strengthening the Implementation Capacities for Nutrient Reduction and Transboundary Cooperation in the Danube River Basin – is an example of the use of grass and tree buffers. In the Lower Elan Valley, to help restore the floodplain, a number of tree species were planted to control soil erosion and protection from agricultural practices. Elsewhere, additional afforestation was implemented. In The Olsavica Valley, grasslands were restored to act as a buffer between agricultural land and the stream. The Living Water Exchange Project in the Western Ukraine established a 5 m wide plum tree buffer along the Irshavka River. Planting trees is a good practice to retard soil erosion and should be encouraged. When trees and/or grasses as used to interest water from agricultural lands it is imperative that information be provide on the width of the planting. Effectiveness of buffers for nutrient removal is greatly dependent on width.

   Efficiencies: A land use conversion from cropland or hay/pasture to forest or unfertilized (native) grass is applied for each ha converted to a buffer. In addition, efficiencies are applied to the upland acres that the buffers treat. For each ha of buffer, four upland ha are treated with the total N efficiency and two upland ha are treated with the total P efficiency.

   Riparian Forest Buffer – when implemented as defined it should result in about a 46 percent reduction in N and a 36 percent reduction in P entering the waterway in addition to the land use conversion for the buffer itself.

Riparian Grass Buffer - when implemented as defined it should result in about a 32 percent reduction in N and a 36 percent reduction in P entering the waterway, in addition to the land use conversion for the buffer itself.

Options for Implementation in Eastern Europe and Central Asia

Care should be taken to better describe the type and width of buffers implemented in projects. Emphasis should be placed on not adding fertilizer or manures to buffers and excluding animals. Grass or forest buffers are ideal candidates for community-based action in the design, implementation and use.

Options include:

a. Flash grazing – allow cows and other cattle to graze the buffer in spring and fall but move frequently (daily) to maintain grass cover. This would reduce efficiencies 25 percent from those above. It could be organized as a community activity. As possible, efforts should be made to minimize animals getting into the stream (graze on cool days, tethered livestock, "herdsman" to direct animal grazing, etc.).
b. Hay harvesting – once a year harvest the hay from the buffer, would not impact efficiencies, could be organized as a community activity; recommend that harvest be delayed until after nesting birds fledge to maintain the wildlife and biodiversity benefits of the buffer.
c. Mini-Buffer – 5 m width – when land is limited, this would result in a 50% reduction of efficiencies. Mini-buffers could be cut for hay manually or with walk behind mowers, with timing as described above; flash grazing not recommended.

2. **Nutrient Management**

Definition: Managing the amount, source, placement, form and timing of the application of plant nutrients and soil amendments. Soil test analysis and manure analysis are essential components of a nutrient management plan.

Project Examples: The Danube River Enterprise Pollution Reduction Project (DREPR) in Serbia is a good example of the inclusion of nutrient management. By the implementation of a Code of Good Agricultural Practices including nutrient management, the project prepared 86 farm nutrient management plans. This was accomplished through the support of three Local Advisory Units. Projects like the Moldova Agricultural Pollution Control Project help to institutionalize soil testing along with crop nutrient management as part of their overall nutrient management approach.

Efficiencies: Efficiency is a function of the level of nutrient management employed. The upper end of our current range of efficiency (16 percent) is a reduction estimate for good nutrient management using standard nutrient use and production approaches. Efficiencies could be higher in situations where there is no recent history of soil fertility planning, soil or manure testing or guidelines for agronomic use of nutrient sources. Further efforts should be made to define region or country specific nutrient management criteria for different crops and then efficiencies different from what has been developed for intensive agriculture could be developed.

Options for Implementation in Eastern Europe and Central Asia

Ability to perform both soil tests and manure analyses noted in a number of projects coupled with the establishment of Codes of Good Agricultural Practices are essential steps in achieving nutrient management. Options include:

a. Match nutrient use to the yield potential based on other aspects of management such as weed control, plant population, pest management, and other factors. As an example, do not feed the weeds, if weeds or other management factors are going to limit yields.
b. Assuming the management required in "a" above is met, and then match nutrient additions with yield potential based on soil, rainfall and temperature regime. From the yield response curve discussed above fertilizer applications should be calculated to achieve the "ecological optimum" yield. In so doing the potential for N pollution is greatly lowered and one achieves better N use efficiency. Many farmers in Eastern Europe and Central Asia are probably below recommended or ecological rates due to economic constraints. As nutrient application rates increase, yield goals should be based on the ecological optimum which will greatly reduce N loss and the return on additional fertilizer diminishes above that point.
c. In addition to the amount of nutrient to apply, the timing and method of application need to match the crop needs.

3. **Manure Management**

Definition: This deals primarily with the proper collection, storage and handling of manures and the management of animal confinement area runoff, where animals are confined for significant periods. This includes the ability to evenly apply the manure at the appropriate agronomic rate, as determined in the nutrient management plan. Managing the amount, source, placement, form and timing of the application of manures is usually done in combination with fertilizer planning as part of the nutrient management plan.

Project Example: The Turkey Anatolia Watershed Rehabilitation Project has constructed about 335 farm-based manure storage platforms with a goal of establishing manure management systems for 10 percent of the households within each of the 28 micro-catchments in the project area. The platforms in addition to helping store manure are also being used for composting. Both manure and compost use are gaining interest due to high fertilizer prices. Implementation of these manure management strategies is being complimented by increased water quality monitoring.

Efficiencies:

In intensive confined animal agriculture, it is assumed that only 15 percent of swine and poultry manure (since they are usually confined) and 20 percent of beef, dairy, sheep, goat, and horse manure have the potential to be lost during storage and handling. This is assumed for all manure loads, with or without an Animal Waste Management System (AWMS). If an AWMS is in place, the N and P load from manure that can be lost during storage and handling is reduced by an efficiency of 75% for N and P. These assumptions and efficiencies will likely only apply to large scale or "industrial" animal operations in Eastern Europe and Central Asia.

Options for Implementation in Eastern Europe and Central Asia

Many projects included the installation of storage platforms which can also be used for improved storage or for composting. The utilization of stored or composted manure should follow nutrient management guidelines for rates, incorporation and amounts.

In some areas of Eastern Europe and Central Asia, manure has been dumped adjacent to streams so that it washed away over winter. This is obviously an environmentally detrimental practice but it is also wasting what may be the only affordable nutrient source for many small scale farmers. Farm or community scale manure storage and management is critical both to environmental and economic improvement in the region.

Options include:

a. Composting is a management option and could be performed following acceptable composting practices to assure optimum nutrient utilization.
b. Consider manure storage/composting as a community-scale operation since amounts of manures may not justify single producer use. Proper management and monitoring of placement and removal of materials at a community compost site is very important. If cost prohibits having an individual act as site monitor, farmers should be asked to sign an agreement to record all materials emptied onto the pad and compost removed from the pad. The pad should also only receive manure or other pre-determined easily compostable material. The ability to maintain proper moisture content and turn the composting material once every week or two is also critical to creating good compost.
c. Manure storage in tanks, lagoons, or bins helps to stabilize the material including the N content.
d. Farm or community scale anaerobic digesters to stabilize manure and generate methane for heat or energy should also be considered

4. **Ecological/Organic Production Systems**

Definition: Ecological/organic production systems are not really BAPs but rather a systems approach that relies on organic inputs. Ecological agriculture requirements and expectations can drive implementation of many BAPs. Documented Nutrient Management and Manure Management should be standard requirements for ecological agriculture and many other practices such as buffers, should be expectations. It should also be noted that growing crops ecologically (organically) can actually make long term nutrient management and erosion control more challenging than in conventional production systems.

Project Example: The Russia & Estonia Development and Implementation of the Lake Peipsi/Chudskoe Basin Management Program is one of several GEF-funded projects that included “eco-farming” practices as one suite of measures to control pollution from crop production. The project supported BATs including vegetative buffer strips, new drainage systems, and following additional good agricultural practices.

Efficiencies:

The same efficiencies that apply to nutrient and manure management would apply here.

Options for Implementation in Eastern Europe and Central Asian

Ecological, organic or sustainable agricultural practices do not necessarily equate to reduced nutrient pollution. The procedures and approaches used to implement these types of systems will determine the ultimate benefit

to reducing nutrient pollution. This is why nutrient and manure management must be an important part of ecological agriculture. Options include:

a. Ecological agriculture could provide a platform for farmers or private farmer partnerships to produce products for export markets at premium prices. This could both require that they implement and document water quality protection efforts and provide sufficient revenue, compared to current systems, to allow this to occur. Thus, although not actually a BAP, ecological agriculture could promote implementation of many other BAPs.
b. Given the small size typical of farms in the region, it is likely that groups of farmers with adjacent or nearby land will need to form private partnerships to get to a scale where they can afford the equipment and harvesting and storage cost and generate enough product to enter export markets.

5. **Wetland Restoration/Creation**

Definition: Wetland Restoration*:* Returning natural/historic functions to a *former* wetland results in a gain in wetland acres. Nutrients and suspended particles are removed via settling. N is further removed primarily via plant and microbial uptake and nitrification-denitrification reactions, while P is further removed by soil sorption.

Wetland Creation*:* Developing a wetland that did not previously exists on an upland or deepwater site results in a gain in wetland acres. Nutrients and suspended particles are removed via settling. N is also removed primarily via plant and microbial uptake and nitrification-denitrification reactions, while P is further removed by soil sorption.

It is important to distinguish wetland restoration from wetland creation. Agricultural wetland restoration activities re-establish the natural hydraulic condition in a field that existed prior to the installation of subsurface or surface drainage. In contrast, "wetland creation" establishes a wetland in a place where none previously existed. Created wetlands may use artificial or highly engineered hydrology. Often created wetlands have regulated water inputs, with water being pumped or fed in at steady controlled rates. In contrast, restored wetlands generally have natural or unregulated water inputs, with water entering through surface or subsurface flows at variable uncontrolled rates.

Project Examples: The GEF-World Bank Bulgarian project on Wetlands Restoration and Nutrient Reduction is a good example of a cost effective use of restored wetlands. In fact the project succeeded in restoring 30 percent more wetlands than originally planned. Over time, a better quantification of nutrient reductions will be gained but the project presently is a model with a high replication value.

Also, the GEF-World Bank Hungary - Reduction of Nutrient Discharges project has shown the value of restored wetlands in the Danube-Drava National Park with an estimated 5,500 t/yr N reduction and a 264 t/yr P reduction. As importantly, this restored area will provide knowledge and technical data on the mechanisms of nutrient reduction in the future.

Efficiencies: Total N and total P removal depends on wetland size compared to catchment area and/or flow. Understanding temporal flow conditions is absolutely necessary to provide estimated effectiveness. The graph below (Figure 3) depicts the effectiveness of N and P removal from wetlands as the ratio of land in wetland to

watershed size increases. There is a nearly linear increase in removal efficiencies as the percentage of the watershed area occupied by wetlands increases.

For all treatment wetlands, but particularly constructed wetlands, efficiency is a function of retention time, with generally 3-7 days retention required for optimal efficiency. Figure 4 below shows the removal of dissolved reactive P as a function of retention time. N removal would be similar and suspended solids are removed more quickly (about 50% as much detention time).

Figure 3 – Reduction efficiency based on wetland as percent of small catchments

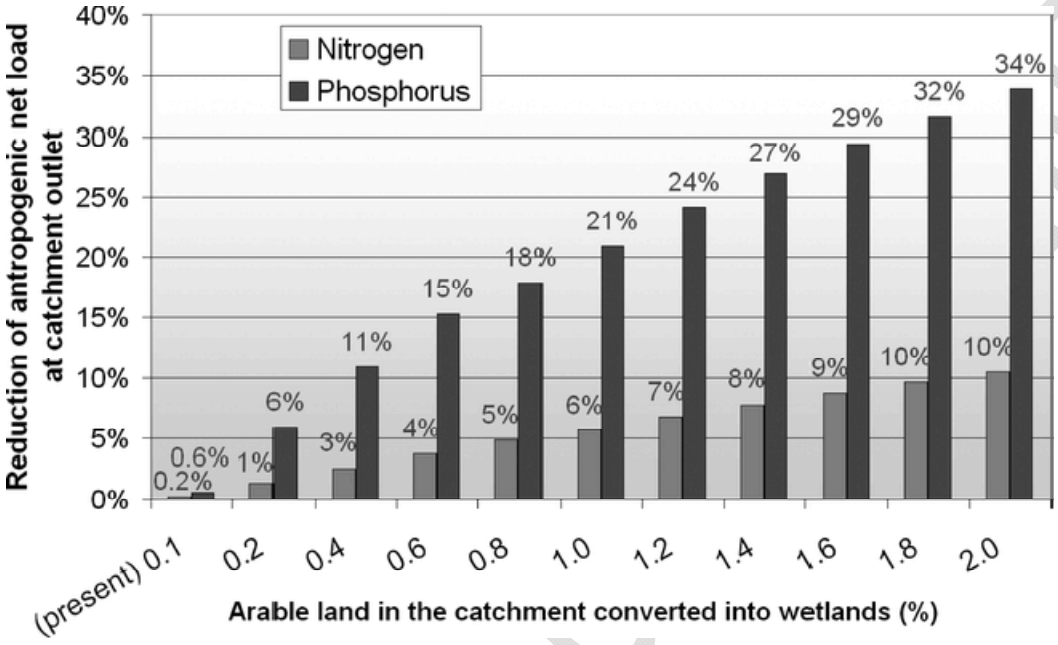
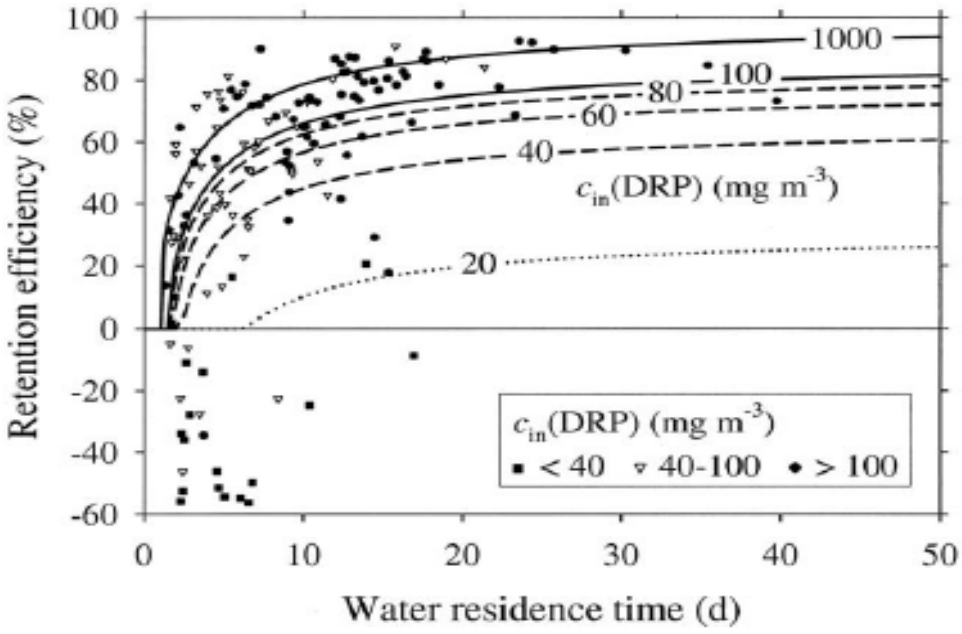


Figure 4 – Removal rates of dissolved reactive P (DRP) as a function of water residence time in a constructed (or restore) wetland



Options for Implementation in Eastern Europe and Central Asia

Wetlands were used in several projects to treat agricultural runoff and raw wastewater. Based on one site visit and information available from other projects, it does not appear the size of wetland was designed to allow adequate water residence time in the wetland to provide treatment. The wetlands also did not appear adequately designed to direct flow of water through the wetland to achieve maximum treatment.

For agricultural wetlands, there was not enough information to determine if there was adequate storage capacity to account for storage of water from a "design storm" or if design and management allowed wetland hydrology, biology and vegetation to remain viable during dry periods so the wetland would function properly when runoff events did occur.

For wastewater treatment, wetlands are usually only cost effective for relatively small villages and towns. It is highly desirable that the wastewater be disinfected before entering the wetland.
Options include:

a. Wetlands provide limited pathogen removal or disinfection capacity and do not replace primary wastewater treatment followed by disinfection when used for nutrients removal.
b. Consideration needs to be given to the amount and composition of the water entering the wetland and the retention time of the water within the wetland.
c. Biomass production by the wetland can be harvested.

6. **Erosion Control & Conservation Tillage (Residue Management)**

Definition: Conservation Tillage: involves the planting, growing and harvesting of crops with minimal disturbance to the soil surface through the use of minimum tillage, mulch tillage, ridge tillage, or no-till.

Conservation tillage systems have traditionally required two standard components:

(a) a minimum of 30 percent of the soil surface covered by crop residue and/or organic residues immediately following the planting operation
(b) a non-inversion tillage method (abandoning moldboard plowing).

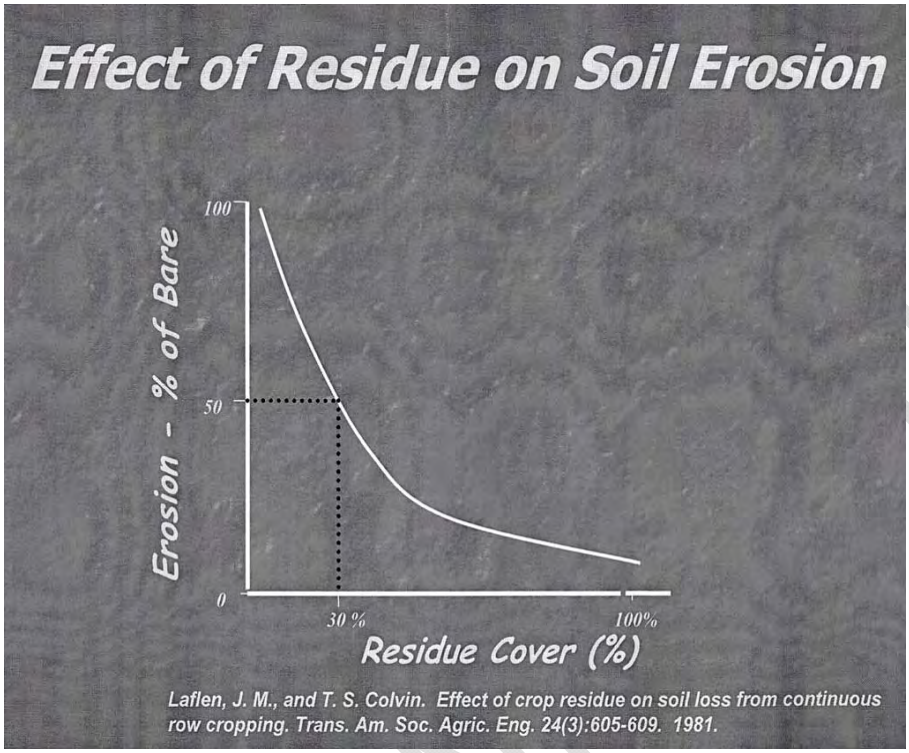
Project Examples: The GEF-funded project on the Tisza River Basin in Romania, Ukraine, Serbia, Hungary, and the Slovak Republic included a number of erosion control practices such as establishment of an ecological corridor, and restoration of grasses and trees on river banks.

Efficiencies:
Typical efficiencies for conservation tillage are about 8% for N and 22% for P and sediment. In addition conservation tillage can: (a) reduce erosion and transport of nutrient enriched sediment and particulates, (b) improve water infiltration and nutrient (P) adsorption to the soil matrix, (c) improve stabilization of soil surface to impede wind and water erosion detachment and transport of nutrient enriched sediment and particulates, (d) reduce the volume of runoff water reaching surface waters, and (e) Increase temporary nutrient sequestration in soil organic matter. As noted in the figure below, erosion is reduced with increased soil cover.

Options for Implementation in Eastern Europe and Central Asia
Fall tillage and moldboard plowing are very common in the region. This leaves bare soil exposed for loss to erosion during the winter, carrying much P and some N with it. Maintenance of crop residue or a winter cover crop could greatly reduce erosion and thus sediment and P losses in project countries (see Figure 5). The harvest of corn stalks/residue for bedding and/or fuel may be viewed as necessary at a subsistence level but it has substantial negative soil and water quality impacts. Reducing the removal of crop residue and/or instituting the use of winter cover crops, as discussed below, could greatly reduce erosion and sedimentation in the region. Options include:

a. Avoid conventional tillage (plowing) operations
b. Leave crop residue on field
c. Grow winter cover crops (see definition and discussion below)

Figure 5 – Relationship between percent residue cover and erosion



7. **Grazing Management**

Definition: Prescribed grazing utilizes pasture management and grazing techniques to improve the quality and quantity of the forages grown on pastures and to reduce the impact of animal travel lanes or other degraded areas of the pastures. Prescribed grazing should be applied on a continuing basis throughout the occupation period; the grazing plan should be reviewed or re-evaluated annually to determine if adjustments or modifications are needed; in-season evaluations of the current feed and forage supply are needed; the grazing infrastructure should be maintained in good working order.

In addition to grazing management two other BAPs are important considerations:

Alternate Watering Facilities – located remotely from stream they allow livestock exclusion from streams thereby helping to protect the stream corridor.

Stream Access Control with Fencing – can allow access for stream crossing, area between fence and stream can be planted to trees or grass, width should ideally be at least 3m, reduced with will reduce efficiency

Project Example: The Olsavica Valley reclamation site of the UNDP/GEF Danube Regional Project – Strengthening the Implementation Capacities for Nutrient Reduction and Transboundary Cooperation in the Danube River Basin – incorporated the use of stream fencing. Grazing animals were destroying a number of spring-wetlands and fencing was installed to protect these wetlands. There was no indication, however, if alternative sources of water for the cattle were provided.

Efficiencies

Prescribed grazing - an efficiency of 11% for total N and 24% for total P and sediment is applied to each hectare of improved pasture that demonstrates a predominance of surface versus subsurface storm water flow.

Alternate Watering Facilities – an efficiency of 5% for total N and 8% for total P applied to each pasture hectare

Stream Access Control with Fencing – Off stream watering with fencing: This BAP is meant to exclude livestock from streams. It incorporates both alternative watering and installation of fencing that excludes narrow strips of land along streams from pastures and livestock with management of the alternative watering area so it does not become a source of sediment or P. Effectiveness estimates: 25% N, 30% P and 40% sediment.
(Note: Stream Access Control with Fencing is actually a stand-alone best management practice but is included under grazing management for the purposes of this report)

Options for Implementation in Eastern Europe and Central Asia

Analysis of the GEF projects showed only limited evaluation of grazing management. This is probably due to the limited area per farm available for grazing. Grazing management and stream protection from livestock and fowl are very important to local and downstream water quality where animals have access to streams and should be emphasized as part of the overall conservation management system where applicable. Options include:

a. Although most producers may be land-limited grazing management could be implemented on a community scale.
b. Stream fencing: While fully fencing cattle out of streams may not be widely feasible in the region, remote watering, shade and hardened stream crossing could provide major reductions in sediment, P and, to a lesser extent, N loss.
c. In some countries, large numbers of domestic geese are produced “free range” with open access to streams. This can create very high nutrient and sediment loads. Where possible, off-stream ponds, fences or other measures should be used to keep domestic geese out of streams.

8. **Cover Crops**

Definition: Cereal cover crops reduce erosion and the leaching of N to groundwater by maintaining a vegetative cover on cropland and holding nutrients within the root zone. This practice involves the planting and growing of cereal crops with minimal disturbance of the surface soil. In order to qualify as a cover crop, nutrients must not be applied (e.g., manure, commercial fertilizer, compost). If possible, the cereal can be harvested early for hay or silage and the subsequent crop can be planted directly into the residue, thus providing erosion control through “no-till”. If the cereal is not harvested as hay, it can be killed/suppressed early in spring by mowing or with herbicides, and the summer crop can be planted into the residue. If the residue is left, it will provide nutrients to help the summer crop grow. If ecologically optimum nutrient application rates are made, they should be adjusted for the nutrient provided by the residue.

In addition to cereal cover crops, legumes may be used as cover crops. In addition to providing a vegetative ground cover they can provide up to 100 kg/ha of N for the following crop.

Project Example: The Croatia Agricultural Pollution Control project has incorporated demonstrations of cover crop technologies. The goals are to show reduced nutrient loss, protection from soil erosion and compaction, and maintenance of soil organic matter. The plan includes demonstrating cover crops on up to 200 ha annually in each participating county.

Efficiencies:
Effectiveness varies based on planting date, species, and planting method. In order to qualify as early planted, the cover crop must be planted earlier than 14 days prior to the average date of the first killing frost in the fall, while standard planted cover crops must be planted 0-14 days prior to the average date of the first killing frost in the fall. Late planted cover crops must be planted between the average date of the first killing frost in the fall and 3 weeks following that and they must be incorporated with a no-till drill system.

Options for Implementation in Eastern Europe and Central Asia

a. Much of the arable land in Eastern Europe and Central Asia is plowed in the fall in preparation for spring planting. This practice causes high levels of soil and P loss. The practice may be done for a combination of weed control or earlier soil warming in the spring but its detrimental impacts to soil and water likely far outweigh the perceived advantages. Creating a culture of growing early planted fall cereal grain cover crops (e.g. rye or barley) to "trap" residual N from the summer crop could provide substantial soil and water quality benefits with minimal adjustments to the next summer's production system.
b. In cases where corn (maize) or other crops are left in the field until cold weather, cover crops may not be applicable or could be interseeded at planting, but this would require substantial demonstration and evaluation before proposing widespread adoption.
c. Leguminous cover crops (e.g. clover, vetch) could be planted where summer crops are harvested early enough to allow reasonable fall growth. Although not as effective at "trapping" residual N from the summer crop, microbes associated with these winter legumes can fix about 100 kg/ha for the next summer's crop and reduce erosion, sedimentation and P loss while not increasing N loss.

Table 3 – Summary of cost/benefits of 8 primary BAPS

BAP	Benefit Notes	Cost Comments	Linkages
Riparian Buffers Grass or Trees	For either grass or tree buffers width is the most important criteria. 10 m with should be considered minimal. If land is limited smaller width buffers are better than nothing	-Requires land out of production. -Cost of establishing grass buffer low but maintenance moderate while forest buffer establishment may be high but maintenance may be low. - over long term, buffers are very cost effective practices	Use in combination with Grazing Management/Stream Fencing
Nutrient Management	Nutrient management is a fundamental practice for the control of nutrient pollution. It should be considered basic and essential.	Nutrient management is very cost effective BAP when properly implemented to minimize nutrient use and maximize use efficiency	Use in combination with Manure Management
Manure Management	Manure management is a fundamental practice for the control of nutrient pollution. Manure and/or compost utilization as a crop nutrient provides a positive return to the producer. Capture and use of methane from anaerobic digestion can also provide a positive return to the producer.	Manure storage and/or compost pads are costly; implementation usually requires financial assistance	Use in combination with Nutrient Management
Ecological/Organic Production Systems Ecological/organic	The primary water quality benefits will be accrued through rigorous implementation of nutrient and manure management, erosion control, buffers, etc that should be	Marketing produce with an "ecological" label would require a level of practice	Needs to be established as part of an integrated systems approach

BAP	Benefit Notes	Cost Comments	Linkages
production systems are not really BAPs. They are ecosystem systems approaches that rely on organic inputs. Requirements and consumer expectations may result in many water quality BAPs being implemented.	part of ecological agriculture systems. Premium prices paid for ecologically grown products makes implementation more feasible for the farmer while still enhancing income.	verification which could add a cost but the farmer should receive a premium for the product	
Wetland Restoration / Creation	A properly designed and managed restored wetland can be very cost effective at nutrient and sediment removal. Constructed wetlands can provide similar reductions but may offer more management challenges and ate usually more costly for comparable levels of reduction.	Implementation cost can be high; maintenance costs for constructed wetlands can be substantial. Over long-term, can be very cost effective BAP, if done properly	For agricultural lands, should be linked to field-based BAPs so that per ha nutrient load to wetland is low so wetland can treat larger area
Erosion Control & Conservation Tillage (Residue Management)	Reduces tillage trips; results in soil carbon sequestration; reduces fuel and labor costs	May require new tillage equipment Structural improvements to water courses can be costly and require maintenance	Link with the use of cover crops to maximize the time that fields have plant cover; minimize bare soil time – avoid fall plowing

BAP	Benefit Notes	Cost Comments	Linkages
Grazing Management (Stream Fencing / Animal Exclusion)	Maximizes livestock production from available pasture, reduces need to store manure and import/grow feed Exclusion of domestic waterfowl from streams can provide major water quality benefits where their numbers are high (in many villages in the region). The idea of ponds and/or corralled areas to keep fowl out of free flowing streams may take time for acceptance by local farmers but may be more important than keeping livestock out of streams in many areas of Eastern Europe and Central Asia, at least at current livestock densities.	The cost of prescribed grazing can be offset by better performance & production by the animal. Stream fencing provides important benefits but can be costly, particularly in this region. Stream protection, without fencing (remote watering, shade, hardened crossings, etc.) can achieve about two thirds of the benefits of fencing at a much lost cost	Link with Nutrient Management to assure maximum biomass production and proper crediting of manure deposited on pastures
Cover Crops	Cover crops are an excellent practice to assist in utilizing residual soil N and reducing pollution potential. Additionally, cover crops reduce soil erosion, improve soil quality, creates wildlife habitat, conserves soil moisture and helps to suppress weeds.	There is a moderate cost for seeds and planting and requires either tillage or killing by herbicide or cutting of the growth in spring before summer crop is planted	Links with Erosion Control, Nutrient Management (especially if legumes used as cover crop)

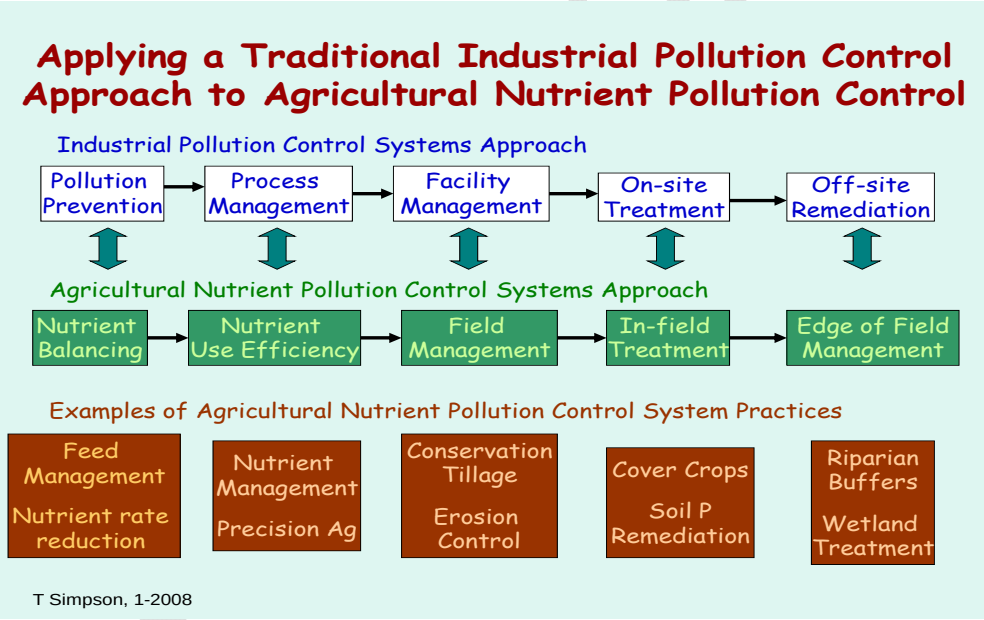
In summary from Table 3, to be sustainable, agricultural best management practices must have limited economic impact and, if possible, maintain or increase profitability. They must fit within current production systems or allow transition to equally viable, less polluting systems and have acceptable implementation costs. Furthermore, they must be acceptable to the farmer and any practice must be properly implemented, operated and maintained.

Systematic Approach to BAP Implementation and Adaptive Management

Rarely will a single practice achieve a nutrient reduction goal. Usually attainment requires a sequence of practices to achieve needed reduction and to back each other up if one does not work well during a specific event. This will rely on a systems approach to implementation. It can be achieved by developing a whole-farm/catchment water quality protection program that identifies practices and matches them to key "intervention" points. Implementation should occur over time based on impact, cost and farmer interest. Operation and maintenance of implemented practices should be considered a critical element in the overall plan.

Figure 6 illustrates the adaptation of the conventional industrial pollution control model to agriculture with each of the five steps serving as potential intervention points for a systematic approach to nutrient reduction. The advantages of this approach are that each practice only has to do moderate reductions to obtain very high reduction levels and if one practice in the sequence fails in a given event, the others may provide a backstop for that practice so that adequate treatment occurs.

Figure 6 – Applying an industrial pollution control process model to identify intervention points in a systems approach to agricultural nutrient pollution control.



In the near future, an adaptive management approach should be adopted for water quality improvement efforts in Central and Eastern Europe and Central Asia. An adaptive management approach allows forward progress in implementation, management and policy, while acknowledging uncertainty and limits in knowledge (Figure 7). The adaptive management approach to practice development incorporates the best available science along with best current professional judgment into definition and effectiveness estimate recommendations. With adaptive management

it is necessary to include a schedule that allows for revisions as advances knowledge and experience becomes available. It is recommended that continued monitoring of practices, with revision of definitions and effectiveness estimates be scheduled at set intervals (e.g. every three to five years) to incorporate new data and knowledge.

Figure 7 – An adaptive management approach for use in implementing BAP systems and controlling nutrient pollution control

Use an adaptive management approach in projects and *teach farmers to "think adaptively"*

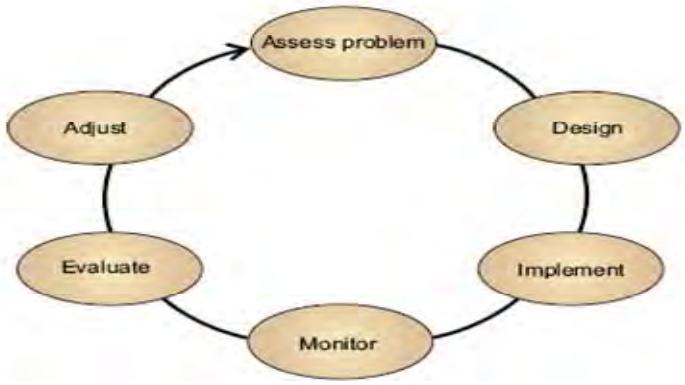


Figure 1.1. Diagram of the adaptive management process.

Source: U.S. DOI Adaptive Management Manual

Appendix 2 – Country Nutrient Reduction Profiles

ALBANIA	
What are key nutrient problems/challenges (agriculture, detergents, wastewater, etc)?	**Wastewater** • Wastewater flowing into the Tirana river is one of the key nutrient challenges. • The major source of pollution to superficial ground waters are urban water discharge, untreated waters generated from different industrial and commercial activity, as well as deposits of solid urban waste. • Superficial waters near urban areas are contaminated by organic matter and nutrients primarily from untreated urban waters. • Upper stream of the rivers with distant location form urban and industrial sources of pollution provide same characteristics as natural water, but their quality is affected by downstream. • Organic pollutants are present in rivers from percolate oil fields and areas near refinery plants. • Water pollution level from industrial discharge has reduced and there is improvement in its quality as compared to 15 years ago. Reason: the close down of industrial activities, as well as the restricted use of chemicals in agricultural sector. **Agriculture** • Agricultural pollution also plays a role in the eutrophication of water bodies in coastal areas.
What are the current legal/regulatory drivers/frameworks for nutrient pollution control/reduction?	**Institutional Framework - Competent Authorities:** • Ministry of Environment, Forestry and Water Administration • Institute of Energy, Water and Environment (IEWE) • Institute of Public Health (IPH) • Environmental and Forest Agency (EFA) **Legal Framework** • Law nr 8093, date 21.03.1996 "For Water Sources" • Law nr.9115, date 24.7.2003 "For environmental treatment of polluted waters" • Law nr. 8905, date 6.06.2002, "For Protection of marine environment from pollution and damage" • Law nr 9103, date 10.07.2003 "For protection of international lakes". • Law nr. 8690 date 26.10.2000 "For accession of Republic of Albania in the Convention for Protection of Marine Environment and of Mediterranean Coastal Region". Barcelona Convention and its 6 protocols. • Decision of Ministers' Council nr. 177 date 31.3.2005 "For permitted liquid discharges and blundering criteria of water hosting environments" **Memorandum of Understanding between the Macedonian and Albanian governments** was signed • A binational Lake Ohrid Management Board was established. Both governments agreed to undertake appropriate legal, institutional, investment and technical measures to protect Lake Ohrid. Harmonizing Albanian and Macedonian laws and regulations may be the Lake Ohrid Conservation Project's greatest challenge, particularly on fisheries and wastewater treatment issues.

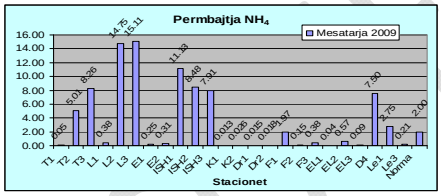
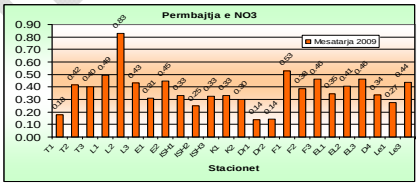
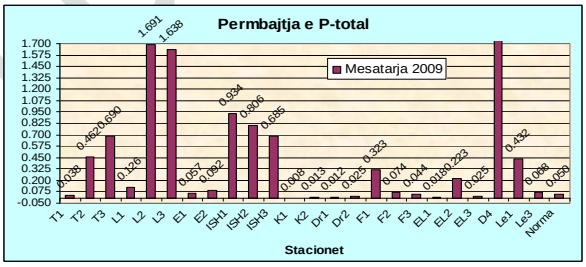
Is there baseline data of current nutrient loads? What are they? What are the sources?	**Systematic Water quality monitoring includes:** • Surface water quality monitoring. Network of 30 river stations, collecting physico-chemical parameters (such as alkalinity pH, temperature, ammonia, nitrites, nitrates, by the IEWE phosphate, total P, chemical need for oxygen, dissolved oxygen, biological need for oxygen) • Coastal water quality monitoring. Network of 72 monitoring points recording microbiological indicators, the Fecal Coliformes (FC) and Enterococun Intestinal (IE) is performed by the IPH. • Monitoring on the impact of liquid urban discharge to ground water quality (rivers and seaside). 35 monitoring points distributed in the 8 most important cities, by EFA, according to the Chemical and Microbiotic pollution Indicators **Water Monitoring -nutrients** • Urban and residential leaking are the most important N pollutant sources. They are as well more problematic than agriculture, where average use of N and the density of livestock is lower than the rates determined in the Nitrates Directive. • Main source of water pollution with P is the urban water discharge as a result of P containing detergents used by the population    • Total-N = 915 ton/year (1) • Total-P = 184 ton/year (1)

	Table 3-1. Volume of solid industrial waste accumulated by 2000 **Mining** — **Estimated Waste Volumes** coal mining — 3×10^6 m^3 iron nickel extraction — 4.2×10^6 m^3 copper extraction — 12×10^6 m^3 chromium extraction — 18.8×10^6 m^3 **Enrichment** copper tails — 11.8×10^6 m^3 chromium tails — 2.5×10^6 m^3 After UNECE (2002a). (3)
What are the current nutrient reduction projects/approaches/practices/ interventions and how much is being invested? • What are the barriers to implementation? • What have been the outcomes/quantitative results? • What are the gaps? • What might be a strategy to address these gaps? • How can we reach farmers?	**1. Integrated Water and Ecosystems Management Project** **2. Strategic Partnership for the Mediterranean Large Marine Ecosystem--Regional Component:** Implementation of agreed actions for the protection of the environmental resources of the Mediterranean Sea and its coastal areas, which could include nutrient reduction activities **3. Promoting Replication of Good Practices for Nutrient Reduction and Joint Collaboration in Central and Eastern Europe** **4. Prespa Lake Integrated Ecosystem Management.** Reducing Environmental Impacts of Agriculture – controlled use of fertilizers - Minimization of the quantities of nutrients transported by runoff to surface water bodies and groundwater **5. Constructed Wetland for nutrient reduction in the waters of the Tirana River** • Barriers to implementation: o Being an informal area, the Municipality of Tirana is not offering any garbage collection system to the area. o People near the Tirana River have seized the riverbanks illegally and sell the land informally to newcomers, thus any future development of the riverbank as a buffer zone seems to scare the residents of neighbouring communities. o Achieving consistent international laws is further complicated by the fact that many different ministries have responsibilities for different aspects of environmental protection. o Decreased levels of fertilizers decrease the economic turnaround and even if there was a ban on fertilizers, farmers could still purchase the fertilizers on the black market. • Outcomes: Biodiversity has been increased in the banks of the Tirana River —the creation of the wetland has already attracted frogs and some aquatic birds even one month after its construction **6. The Adriatic Sea Partnership** (4) • Albania, Bosnia and Herzegovina, Croatia, Italy, Slovenia, Montenegro • Lead organization: REC • Multi-year Project (from 2006 to 2009), multi-million dollar umbrella partnership for cooperation on the Adriatic Sea • A major goal of the ASP is to establish an operative international body on the basis of political commitment by littoral countries, to act as a common platform for regional cooperation on action to protect the Adriatic Sea and promote its

	sustainable use. **7. Lake Ohrid Conservation Project (1996)** (2) • Lake Ohrid, one of the oldest lakes in Europe, straddles Albania and FYR Macedonia • Financed by the Global Environment Facility (GEF) and executed by the World Bank • Goal of conserving and protecting its unique biodiversity and watershed through a joint management arrangement. • A Lake Ohrid Management Board was set up and a bi-national monitoring task force has produced a State of the Environment Report. • The project has facilitated cooperation between local authorities on both sides of the lake and has helped mobilize substantial investment assistance, including for the funding for sewage treatment, solid waste management, and water supply system improvements. **8. Albania Fisheries Project** (2) • World Bank-financed, will benefit Lake Ohrid

1. http://www.bvsde.paho.org/bvsacd/cd56/eutrophica/cap5.pdf
2. Water In South Eastern Europe Unique Opportunities And Challenges http://www.waternunc.com/gb/WB30_2003.htm
3. Risks and Vulnerabilities from Mining Activities. http://www.envsec.org/see/pub/REPORT%20Draft%20Issue%2001-11-04.pdf
4. Situation in South Eastern Europe. http://waterwiki.net/index.php/Situation_in_South-Eastern_Europe

AZERBAIJAN	
What are key nutrient problems/challenges (agriculture, detergents, wastewater, etc)?	**Oil and Gas** • Oil and Gas abstraction and transportation greatly effects water quality of the Caspian Sea and rivers running through Azerbaijan. **Industry** • High nitrate concentrations in the Kura and Aras Rivers flowing through Azerbaijan • **Industry is the main pollutant.** **Excessive Use of Fertilizers on Cotton, Grapes, and Vegetables** • **Issue:** Excessive use of fertilizers, pesticides and herbicides in agriculture; lack of adequate storage areas for toxins; aircraft spraying of pesticides not carried out to safe standards including height, wind velocity, and proximity to residential zones; people not warned nor protected during sprayings. (5) • **Concern:** Pollution of air, soil, water and food. Toxic residues remain in clothing, fruit, wine and vegetables; toxins may enter the food chain; residues seep down into water table and contaminate drinking water supplies; cancers and possible genetic damage. (5)
What are the current legal/regulatory drivers/frameworks for nutrient pollution control/reduction?	**1. The Convention on the Protection and Use of Transboundary Watercourses and International Lakes (2)** • The Convention is intended to strengthen national measures for the protection and ecologically sound management of transboundary surface waters and groundwaters. The Convention obliges Parties to prevent, control and reduce water pollution from point and non-point sources. It also includes provisions for monitoring, research and development, consultations, warning and alarm systems, mutual assistance, institutional arrangements, and the exchange and protection of information, as well as public access to information. **2. Framework Convention for the Protection and Sustainable Management of the Caspian Environment and its Resources** **3. The Law of Azerbaijan Republic on Water Supply and Sewage (4)** • Purpose of the present Law consists in regulation

	of relations in the area of maintenance of the population, enterprises, establishments and organizations by qualitative water meeting the requirements of state standards in necessary quantity, discharge sewage. • The legislation on water supply and discharge of sewage consists of the present law, the Water code of the Azerbaijan Republic and other normative-legal acts.
Is there baseline data of current nutrient loads? What are they? What are the sources?	• Fertilizer consumption: 141.75 hundred grams/hectare • Organic water pollutants (BOD) emissions > tonnes per day: 15.53653 tonnes/day • Organic water pollutants (BOD) emissions > tonnes per day per worker: 0.0016 tonnes per day per worker • Dissolved oxygen concentration: 8.27 mls/litre • P concentration: 0.3291278 tonnes • Severe water stress: 95.4 • Suspended solids: 6.61 mls/litre • Water pollution, chemical industry > % of total BOD emissions: 15.93 % • Water pollution, food industry > % of total BOD emissions: 39.21 % • Water pollution, metal industry > % of total BOD emissions: 20.19 % (3)
What are the current nutrient reduction projects/approaches/practices/ interventions and how much is being invested? • What are the barriers to implementation? • What have been the outcomes/quantitative results? • What are the gaps? • What might be a strategy to address these gaps? • How can we reach farmers?	1. Towards a Convention and Action Programme for the Protection of the Caspian Sea Environment, Phase II • The statutory, administrative and procedural capabilities for multi-national regional environmental administration and management in the Caspian are not uniformly strong. (gap) 2. Caspian Environment Program

- http://europeandcis.undp.org/environment/azerbaijan/
- http://www.caspianenvironment.org/newsite/Convention-FrameworkConventionText.htm
- http://www.nationmaster.com/red/country/aj-azerbaijan/env-environment&all=1
- http://www.cawater-info.net/library/eng/az_wat_sup.pdf
- Major Environmental Issues in Azerbaijan. http://azer.com/aiweb/categories/magazine/23_folder/23_articles/23_overview.html

BOSNIA AND HERZEGOVINA	
What are key nutrient problems/challenges (agriculture, detergents, wastewater, etc)?	**Wastewater – Settlements** (2**)** • Today, none of Bosnia and Herzegovina's settlements with over 10,000 ES has a treatment facility for wastewaters. **Agriculture** (2) • Mineral fertilizers are used in agriculture that pollute the waterways. • The specific P point discharges reflect, not only the state of the P elimination in waste water treatment plants, but also the existing use of P in detergents, and discharges from direct industrial sources. • The other diffuse N emissions mainly due to atmospheric deposition of NOx are the one of the dominant source for Bosnia & Herzegovina.
What are the current legal/regulatory drivers/frameworks for nutrient pollution control/reduction?	**Institutional Framework - Competent Authorities:** • Ministry of Foreign Trade and Economic Relations • Public enterprise "Vodno područje slivova rijeke Save" • Public enterprise "Vodno područje slivova Jadranskog mora" • Federal Ministry of Agriculture, Forestry and Water Management • Republika Srpska, Ministry of Agriculture, Forestry and Water Management • Republika Srpska, Directorate for Water **Legal Framework** • The Water Law (5) • Rule Book on Limit Concentration Values for Pollutants in the Urban Waste Waters Discharged to the Surface Waters, Official gazette F BiH – 50/2007.
Is there baseline data of current nutrient loads? What are they? What are the sources?	• The use of mineral fertilizers in agriculture is significantly below 011150.027552 tonnes/hectare per year N. • The N surplus per inhabitant is below 0.01 tonnes/(inh.·a). • The medium level P emission between 0.000001 and 0.000002 tonnes/(Inh.·d) was found for the Bosnia & Herzegovina. The specific P point discharges reflect, not only the state of the P elimination in waste water treatment plants, but also the existing use of P in detergents, and discharges from direct industrial sources. • 1990 is the year of the most recent survey, and the percentage of total river length in each of the four classes is: I=3%, II=68%, III=15.9% and IV=13.0%. (3) • Water Statistics of Bosnia and Herzegovina: (4) o Dissolved Oxygen Content: 6.15 mls/litre o Freshwater Pollution: 0.16 tons/cubic km o P Concentration: 0.1974766 tonnes o Water pollution, wood industry > % of total BOD emissions: 5.79 % o Water pollution, paper and pulp industry > % of total BOD emissions: 13.11 % o Water pollution, food industry > % of total BOD emissions: 33.35% o Salinisation: 1,248.06 o Suspended Solids: 8.01 mls/litre • Proportion of lake stations in categories of total P (TP) (mg/l) o 50%: 0.02 – 0.05 o 50%: 0.05 – 0.1 • Proportion of river stations in categories of NO_3 (mg/l)

	○ 70%: 0 - 0.8 ○ 30%: 0.8 – 2 • Proportion of lake stations in categories of NO_3 (mg/l) ○ 100%: 0 – 0.4
What are the current nutrient reduction projects/approaches/practices / interventions and how much is being invested? • What are the barriers to implementation? • What have been the outcomes/quantitative results? • What are the gaps? • What might be a strategy to address these gaps? • How can we reach farmers?	**1. Bosnia and Herzegovina Water Quality Protection Program (1)** • The project addresses the environmental degradation of the Neretva and Bosna Rivers, coordinates regional priorities, and develops a Wastewater Improvement Plan for Bosnia and Herzegovina (BiH). It helps improve wastewater management and promote cooperation among relevant institutions in Croatia, Serbia and Montenegro. The project also builds a network of public and private institutions needed for effective wastewater treatment and prepares the groundwork for innovative low-cost wastewater treatment methods. • The project further strengthens the Joint BiH/Croatian Working group coordinated with Serbia and Montenegro to launch the Wastewater Improvement Plan. • Total Project Costs Estimated at $US20.3 million, of which: (World Bank - Water Quality Protection Project PPT) ○ $US8.9 million GEF, $US5.2 million other donors, $US6.2 million the Gvt of BiH

1. http://go.worldbank.org/960KY3W8N0
2. http://www.ICPDR.org/ICPDR-pages/bosnia_herzegovina.htm
3. State of the Environment of Bosnia and Herzegovina http://enrin.grida.no/htmls/bosnia/soe/water/back.htm
4. Nation Master Environment Stats. http://www.nationmaster.com/country/bk-bosnia-and-herzegovina/env-environment
5. Official Gazette, No. 42/07

CROATIA	
What are key nutrient problems/challenges (agriculture, detergents, wastewater, etc)?	**Agriculture** (5) • The N emissions caused by agricultural activities represents the major source. **Industrial and Domestic Waste** (2) • The specific P emissions are above 0.0000025 tonnes/(Inh.·d) is registered for Croatia. The picture for P is similar to the one for N, but the differences between the countries are much larger, due to specific P point discharges which reflect, not only the state of the P elimination in waste water treatment plants, but also the existing use of P in detergents, and discharges from direct industrial sources. • Coastal water systems have been damaged by industrial and domestic waste. • The use of mineral fertilizers in agriculture is low to moderate, between 0.0275522 and 0.0551044 tonnes/ hectare N. • Environmental management is becoming more decentralized, thereby empowering city and municipal administrations to determine environmental policy.
What are the current legal/regulatory drivers/frameworks for nutrient pollution control/reduction?	**Institutional Framework - Competent Authorities:** • Ministry of Agriculture, Fisheries and Rural Development • Ministry of Regional Development, Forestry and Water Management • Croatian Waters • Ministry of the Sea, Transport and Infrastructure • Ministry of Environmental Protection, Physical Planning and Construction • Ministry of Health and Social Welfare • Meteorological and Hydrological Service **Legal Framework (4)** • The Water Law • The Law on Water Management financing, • The Law on Physical Planning and Construction (NN 76/2007) • The Law on protection of the nature (NN 162/03) • The Law on Environmental Protection (NN 82/94, NN 128/99) • The Law on waste (NN 178/04) • The State plane for Water Protection (NN 8/99) • The Water Management Strategy (NN 91/08) • Regulation on Water Classification (NN 77/98) • Regulation on Water Hazardous Substances (NN 78/98) • Regulation on Limit Values concerning water hazardous and dangerous substances in waste waters (NN 94/08) • Regulation on drinking water quality (NN 182/04) • Regulation on protection of agricultural land against pollution bt hazardous and dangerous substance (NN 15/92) • Regulation on good agricultural Practice concerning use of fertilizers (NN 56/08) Croatia proposes the necessary measures for nutrient reduction that include the introduction of P-free detergents, the improvement of national policies and legislation regarding the utilization of fertilizers and livestock waste, and the approximation of national legislation to relevant EU legislation, respectively EU-standards. Expected outcomes N – tons/year – 1,509

	P –tons/year – 239
Is there baseline data of current nutrient loads? What are they? What are the sources?	• The agricultural area per inhabitant is about 0.6 ha/inh. or more. • High N surplus (about 0.000020 tonnes/(inh.·a) • A unique Water Information System has been developer at the state level, with several relevant layers • 45% of rivers have **0-.8 NO_3(mg/l)** 50% of rivers have **.8-2 NO_3(mg/l)** 5% of rivers have **2-3.6 NO_3(mg/l)** 35% of lakes have **0-.4 NO_3(mg/l)** 65% of lakes have **.4-1 NO_3 (mg/l)** • 40% of rivers have **0-.02 OP (mg/l)** 20% of rivers have **.02-.05 OP (mg/l)** 20% of rivers have **.05-.1 OP (mg/l)** 10% of rivers have **.1-.2 OP (mg/l)** 10% of rivers have **.2-.4 OP (mg/l)** 55% of lakes have **0-.02 TP (mg/l)** 30% of lakes have **.02-.05 TP (mg/l)** 15% of lakes have **>.4 TP (mg/l)** • Water Statistics of Croatia: (3) o Organic water pollutant (BOD) emissions > tonnes per day: 42.87111 tonnes/day o Organic water pollutant (BOD) emissions > tonnes per day per worker: 0.00017 tonnes per day per worker o Dissolved Oxygen Concentration: 8.95 mls/litre o Freshwater pollution: 0.32 tons/cubic km o P concentration: 0.2742731 tonnes o Suspended Solids: 6.12 mls/litre o Water pollution, chemical industry > % of total BOD emissions: 7.45 % o Water pollution, food industry > % of total BOD emissions: 48.37 % o Water pollution, pulp and paper industry > % of total BOD emissions: 15.95 % o Wetland of international important > area: 79,999.989 hectare

What are the current nutrient reduction projects/approaches/practices/ interventions and how much is being invested? • What are the barriers to implementation? • What have been the outcomes/quantitative results? • What are the gaps? • What might be a strategy to address these gaps? • How can we reach farmers?	1. **Strengthening the implementation of nutrient reduction measures and trans-boundary cooperation in the Danube river basin** (8) 2. **Croatia Agriculture Pollution Control Project** (6) 3. **The Adriatic Sea Partnership** (7) • Albania, Bosnia and Herzegovina, Croatia, Italy, Slovenia, Montenegro • Lead organization: REC • Multi-year Project (from 2006 to 2009), multi-million dollar umbrella partnership for cooperation on the Adriatic Sea • A major goal of the ASP is to establish an operative international body on the basis of political commitment by littoral countries, to act as a common platform for regional cooperation on action to protect the Adriatic Sea and promote its sustainable use.

1. Situation in South Eastern Europe. http://waterwiki.net/index.php/Situation_in_South-Eastern_Europe
2. Environment - Croatia - policy http://www.nationsencyclopedia.com/Europe/Croatia-ENVIRONMENT.html#ixzz14i2lNjdk
3. http://www.nationmaster.com/red/country/hr-croatia/env-environment&all=1
4. Official Gazette, NN 107/95, NN 150/05
5. http://www.ICPDR.org/ICPDR-pages/croatia.htm
6. Croatia Agriculture Pollution Control Project Website. http://web.worldbank.org/external/projects/main?Projectid=P100639&theSitePK=40941&piPK=73230&pagePK=64283627&menuPK=228424
7. Adriatic Sea Partnership. http://asp.rec.org/
8. "International Waters Programs: Delivering Results." http://www.undp.org/gef/documents/publications/IW_deliveringresults.pdf

GEORGIA	
What are key nutrient problems/challenges (agriculture, detergents, wastewater, etc)?	**Agriculture** (1) • The Mtkvari River and the Black Sea are both heavily polluted. • Pesticides from agricultural areas have significantly contaminated the soil. • Soil pollution from toxic chemicals
What are the current legal/regulatory drivers/frameworks for nutrient pollution control/reduction?	**The Law of Georgia on Environmental Protection** •
Is there baseline data of current nutrient loads? What are they? What are the sources?	• Freshwater withdrawal > Agriculture: 59% • Freshwater withdrawal > Domestic: 20% • Freshwater withdrawal > Industrial: 21% • Wetlands of international importance > area: 34 thousand hectares (2)
What are the current nutrient reduction projects/approaches/practices/ interventions and how much is being invested? • What are the barriers to implementation? • What have been the outcomes/quantitative results? • What are the gaps? • What might be a strategy to address these gaps? • How can we reach farmers?	• Discharges of nutrients reduced drastically and a slow recovery of parts of the ecosystem has been observed in the past 5 years. This recovery is ongoing, but not yet sustainable, and could become reversed, when industrial agricultural activities emerge in the river basins. • Due to the political situation 1/3 of the shoreline belonging to Abkhasia is not controlled by the government of Georgia. • It is nearly landlocked and the exchange of its water with the Mediterranean Sea is very limited. Permanent natural anoxia exists within 90% of its volume (547 000 km3), making the Black Sea the largest anoxic water body in the world. The Black Sea surface area (432 000 km2) is five times smaller than its basin (more than 2,000,000 km^2) covering parts of Europe and Asia. • In 1997, project funded by the World Bank supported irrigation systems and reclamation rehabilitation. (4) (

1. Environment - Georgia - area http://www.nationsencyclopedia.com/Europe/Georgia-ENVIRONMENT.html#ixzz14i4265gw
2. http://www.nationmaster.com/red/country/gg-georgia/env-environment&all=1
3. http://www.envsec.org/projects.php
4. http://www.gwpcacena.net/en/pdf/georgia.pdf

KAZAKHSTAN	
What are key nutrient problems/challenges (agriculture, detergents, wastewater, etc)?	**Industrial Waste** • One of the major environmental concerns for human security derives from large amounts of industrial wastes and inappropriate waste management. "By 1998, accumulated hazardous industrial wastes amounted to almost 3 billion tonnes" • Industry is located mainly in the east of Kazakhstan, where many of its rich natural resources can be found. • Improper waste disposal and the large quantity of hazardous wastes pose a substantial risk of contaminating surface and groundwater by heavy metals
What are the current legal/regulatory drivers/frameworks for nutrient pollution control/reduction?	**Committee for Environmental Regulation and Control (CERC) of Kazakhstan** (5)
Is there baseline data of current nutrient loads? What are they? What are the sources?	• Dissolved oxygen concentration: 8.27 mls/litre • P concentration: 0.2578167 tonnes • Suspended Solids: 7.22 mls/litre (2)
What are the current nutrient reduction projects/approaches/practices/ interventions and how much is being invested? • What are the barriers to implementation? • What have been the outcomes/quantitative results? • What are the gaps? • What might be a strategy to address these gaps? • How can we reach farmers?	**1. Syr Darya Control and Northern Aral Sea Project** (4) • 13-km Kokaral dike was built to preserve the NAS • 8 hydro structures on Syr Darya river were reconstructed • Water flow capacity of the river doubled from 300-400 cubic meters per second to 700-800 • Water levels in the NAS increased (to 42 m above Baltic Sea level) • 800 sq. km of once dried seabed are under water again • Salinity levels in the NAS have halved to less than 10 gr/ltr due the inflow of freshwater • Fishing industry is revived, unemployment reduced. The fish catch in the NAS increased from about 52 tons in 2004 to about 2,000 tons in 2007 • The climate is improving, benefiting air, soil and water qualities, biodiversity and flora/fauna Nura River Clean-Up Project has achieved the following: • Three Sedimentation ponds of the wastewater treatment plant (WWTP) remediated - containment of 510 000 m^2 of polluted area was executed near the Ash dump, areas to North and West of the WWTP and other areas **2. Ust-Kamenogorsk Environmental Remediation Project** (4)

	3. **Nura River Cleanup Project** (4) 4. **Strengthening the Implementation Capacities for Nutrient Reduction and Transboundary Cooperation in the Danube River Basin (6)** 5. **Elimination of POPs Wastes** (7) • The overall Global Environment Objective of the proposed project is to support the development of environmentally sound management of POPs in Kazakhstan consistent with the country's obligations under the Stockholm Convention. • The project will support priority implementation activities identified in the country's National Implementation Plan (NIP) to achieve impacts in the reduction of POPs releases, which aim to reduce the stress on human health and the environment caused by POPs (PCB-containing materials, obsolete pesticides), and to rehabilitate territories in accordance with obligations under the Stockholm Convention.

1. http://www.envsec.org/pub/envsec_undp_ca_study.pdf
2. Environment Stats. http://www.nationmaster.com/red/country/kz-kazakhstan/env-environment&all=1
3. Environment and Security. http://www.envsec.org/centasia/pub/caspian2eng_scr.pdf
4. http://go.worldbank.org/9UH84B3B70
5. Securing Resources for Environmental Regulation and Enforcement in Kazakhstan. http://www.oecd.org/document/22/0,3343,en_2649_34339_26401686_1_1_1_1,00.html
6. Strengthening the Implementation Capacities for Nutrient Reduction and Transboundary Cooperation in the Danube River Basin (Tranche 2). http://europeandcis.undp.org/environment/kazakhstan/show/3D21D496-F203-1EE9-BAE5EE84DD28FC7F
7. Kazakhstan - Elimination of POPs Wastes. GEF Project ID 3982. http://gefonline.org/projectDetailsSQL.cfm?projID=3982

IRAN	
What are key nutrient problems/challenges (agriculture, detergents, wastewater, etc)?	**Oil and Gas** • Oil and Gas abstraction and transportation greatly effects water quality of the Caspian Sea and rivers running through Azerbaijan **Wastewater** • Household waste and refuse dumped into the water of the Caspian sea • Raw sewage flowing into the sea from nearby large city of Anzali **Agriculture** • Pesticides running into the sea from nearby farms
What are the current legal/regulatory drivers/frameworks for nutrient pollution control/reduction?	**The Convention on the Protection and Use of Transboundary Watercourses and International Lakes (2)** • The Convention is intended to strengthen national measures for the protection and ecologically sound management of transboundary surface waters and groundwaters. The Convention obliges Parties to prevent, control and reduce water pollution from point and non-point sources. It also includes provisions for monitoring, research and development, consultations, warning and alarm systems, mutual assistance, institutional arrangements, and the exchange and protection of information, as well as public access to information. **Framework Convention for the Protection and Sustainable Management of the Caspian Environment and its Resources** o The Framework Convention is to include pollution prevention, reduction and control; protection, preservation and restoration of the marine environment; procedures to fulfill the obligations contained in a Framework Convention; and formation of the Organization for the Protection of the Sustainable Management of the Caspian Environment and its Resources. **Iran's Department of Environment (4)** • Established under the Environment

	Protection and Enhancement Act of 1974; • **Challenge:** Iran has not yet developed a policy of sustainable development because short term economic goals have taken precedence
Is there baseline data of current nutrient loads? What are they? What are the sources?	• Organic water pollutant (BOD) emissions > tonnes per day: 164.760 tonnes/day • Organic water pollutant (BOD) emissions > tonnes per day per worker: 0.00015 tonnes per day per worker • Dissolved oxygen concentration: 10.57 mls/litre • P concentration: 0.1919912 tonnes • Severe water stress: 87.5 • Suspended solids: 5.92 mls/litre • Water pollution, chemical industry > % of total BOD emissions: 10.66 % • Water pollution, food industry > % of total BOD emissions: 46.67 % • Water pollution, metal industry > % of total BOD emissions: 15.55 %
What are the current nutrient reduction projects/approaches/practices/ interventions and how much is being invested? • What are the barriers to implementation? • What have been the outcomes/quantitative results? • What are the gaps? • What might be a strategy to address these gaps? • How can we reach farmers?	• GAP: The political situation in Iran makes working here more difficult. • GAP: Lack of baseline data from diffuse pollution sources **1. Caspian Environment Program (3)** • Increasing oil and gas production/exploration in the region poses new threat to ecosystem and human health/tourism incomes is threatened by unsafe drinking water, untreated sewage, unsanitary beaches and bathing waters. CEP is a regional initiative to address these problems. In its current phase CEP activities focused on assisting littoral countries implement the Caspian Strategic Action Programme. GEF support has targeted priority areas such as biodiversity protection – including mitigation of invasive species impact – as well as pollution monitoring and control. • **Challenge:** The Environmental Impact Assessment Process, or its equivalent, is a legal requirement in the majority of the Caspian countries. However, the manner in which it is applied, particularly the scoping process and provisions for follow up, is not systematic between states.

- http://www.nationmaster.com/red/country/ir-iran/env-environment&all=1
- UNECE Water Convention. http://www.unece.org/env/water/text/text.htm
- Caspian Environment Programme. http://www.caspianenvironment.org/envissues.htm
- Iran Environmental Issues. http://www.iran-e-sabz.org/news/iranenv.html
  Environment – Iran. http://www.nationsencyclopedia.com/Asia-and-Oceania/Iran-ENVIRONMENT.html#ixzz15NSznze4

MOLDOVA	
What are key nutrient problems/challenges (agriculture, detergents, wastewater, etc)?	**Agriculture** • Agricultural pollution and poor manure management are the main nutrient problems in Moldova.
What are the current legal/regulatory drivers/frameworks for nutrient pollution control/reduction?	**Black Sea Strategic Action Plan.** • The action plan calls for a "State of the Black Sea" assessment to be made every 5 years to keep a close watch on pollution levels. (1) **Danube Declaration 2004 and 2010** • "To reduce 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" • By 2015 N will be approxmately. 12% lower and P approx. 25% lower than 2000-2005 levels. • Levels are still above that of the MoU (see below) and all parties recognize that more action needs to be taken. **Nitrates Directive** **MoU between ICPBS and ICPDR** • "The long-term goal is to take measures to reduce the loads of nutrients discharged to such levels necessary to permit Black Sea ecosystems to recover to conditions similar to those observed in the 1960s." **Possible ban of phosphate containing laundry detergents** • Danube Declaration 2010- start initiating limit to .2%-.5%P/weight in laundry detergents by 2012 and work towards market launch of polyphosphate-free dishwasher detergent by 2015. **Objectives taken by the Moldovan Government that contribute to achieving the objectives of the EECCA Environment strategy include:** • Regulations on control of transboundary movement of hazardous waste streamlined • Permitting for waste management improved • List of products subject to mandatory certification approved (2004) • Regulation on pesticides and fertilizers approved • Permitting for ODS improved Nr of surface water quality parameters monitored increased from 46 to 49 • 2003-2010 Water Resources National Policy Concept developed • A 2005 law on agriculture production and environmental performance • Rules on environmental management

	Water and Health Protocol ratified (4) • Reform of environmental quality standards started
Is there baseline data of current nutrient loads? What are they? What are the sources?	**2007** **Point source**: 1,600 tons of N and 100 tons of P. **Diffuse:** 17,500 tons of N and 1,600 tons of P • Danube Facts and Figures-Moldova (2)
What are the current nutrient reduction projects/approaches/practices/ interventions and how much is being invested? • What are the barriers to implementation? • What have been the outcomes/quantitative results? • What are the gaps? • What might be a strategy to address these gaps? • How can we reach farmers?	**1. GEF-led Partnership for Nutrient Reduction in the Black Sea Danube Basin established in 2000 to implement the Danube Convention.** **2. Republic of Moldova Agricultural Pollution Control Project (3)** • This project is promoting environmentally friendly agricultural practices, strengthening national policy, regulatory and institutional capacity, public awareness-raising activities, and establishing a project management unit under RISP. • **GAP**: Lack of adequate environmental protection policies • **Result:** Total estimated annual nutrient reductions due to the Project are about 102.5 tons of N and 78.9 tons of P in 2008. • Soil erosion reduced by between 35 and 64 percent Increase in income of small farmers by up to $167/ha

1. http://www.undp.org/gef/new/blacksea.htm
2. Danube Facts and Figures-Moldova. http://www.icpdr.org/icpdr-pages/moldova.htm
3. Agricultural Pollution Control Project Website. http://web.worldbank.org/external/projects/main?Projectid=P075995&theSitePK=40941&piPK=73230&pagePK=64283627&menuPK=228424
4. http://www.oecd.org/dataoecd/34/38/39284099.pdf

MONTENEGRO	
What are key nutrient problems/challenges (agriculture, detergents, wastewater, etc)?	**Municipal - Sanitary Wastewater** (1) • The N emissions from urban settlements are the dominant sources to the total emission; • From point sources – settlements and industry. Untreated sanitary waters are discharged directly into rivers in every municipality, except Mojkovac. • The picture for P is similar to the one for N, but the differences between the countries are much larger, due to the fact that the specific P point discharges reflect, not only the state of the P elimination in waste water treatment plants, but also the existing use of P in detergents, and discharges from direct industrial sources • Coastal waters are polluted from sewage outlets, especially in resort areas such as Koror. **Industrial Wastewater** (4) • Municipal landfills are located at the river banks without proper safety measures • Industrial wastes are dumped into rivers, which flow into the Adriatic Sea.
What are the current legal/regulatory drivers/frameworks for nutrient pollution control/reduction?	**Institutional Framework - Competent Authorities:** • Ministry of Agriculture and Rural Development • Directorate for Water • Ministry of Truism and Environmental Protection • Hydrometeorological Institute • Agency for Environmental Protection • Public Health Instituted **Legal Framework** • **The Convention on Cooperation for the Protection and Sustainable Use of the Danube River** (1), October 2008 • **The Water Act** (7) • **Regulations on quality and sanitary-technical conditions** for the – For the discharge of waste water in the recipient and to the public sewage system, method and procedure of testing the quality of waste water, the minimum number of tests and determined the content of reports on the quality of waste water (8). Implementation is characterized with pour enforcement of legal provisions and lack of data • **The Law on Organic Agriculture** – Adopted by the Parliament of the Republic of Montenegro at the Sixth sitting of the First regular session in 2004 on July 15, 2004 – Producers of products of organic agriculture shall be provided with special support from the Government, i.e., the relevant Ministry, through support to agriculture development measures
Is there baseline data of current nutrient loads? What are they? What are the sources?	• **There is no unique Data Base** • The specific P emissions are above 2.5 g/(Inh.·d) is registered for Montenegro. • The water quality of rivers, lakes, sea and groundwater is considered satisfactory. • The quality of groundwater in natural conditions is classified as class I for the majority of the year (with the exception of coastal aquifers influenced by the sea).

	• In line with the Master plan for hydrological observation network - HYDRAS (prepared in cooperation with the Norwegian Directorate for Water and Energy / NVE): o 20 automatic stations have been installed and became operational until now; o Additional 31 should be put in place until 2012; o All main rivers are covered with, at least 2 stations 
What are the current nutrient reduction projects/approaches/practices / interventions and how much is being invested? • What are the barriers to implementation? • What have been the outcomes/quantitative results? • What are the gaps? • What might be a strategy to address these gaps? • How can we reach farmers?	**1. Capacity Building For Environmental Policy Institutions For Integration Of Global Environment Commitments In The Investment And Development Decisions/Projects (2)** • GEF Grant: $500,000 • To analyze, identify and pilot advanced tools and practices for environmental information management and compliance monitoring, and to develop capacity of institutions for global environmental management by institutionalizing identified tools and practices. **2. Enabling Activities for the Development of a National Plan for Implementation of the Stockholm Convention on POPs - "add-on"** (2) • This add-on results from the break-up of Serbia & Montenegro and the need to increase the originally allocated budget to allow for distinct national processes. • POPs enabling activities to: o Develop a comprehensive country-driven National Implementation Plan (NIP) for reduction and elimination of POPs in compliance with the provisions of the Stockholm Convention; o Prepare the ground for implementation of the Convention in Montenegro; o Achieve a high level of awareness of the POPs issue and sustained ownership of the NIP among all stakeholders; o Assist Montenegro in meeting its reporting and other obligations under the Convention o Strengthen the national capacity of Montenegro to manage POPs and chemicals

1. ICPDR. http://www.icpdr.org/icpdr-pages/montenegro.htm
2. http://www.gefonline.org/Country/CountryDetails.cfm
3. http://www.icpdr.org/icpdr-pages/serbia.htm
4. http://www.nationsencyclopedia.com/Europe/Serbia-and-Montenegro-ENVIRONMENT.html#ixzz156SHZr2K
5. www.meteo.co.me
6. http://www.minpolj.gov.me/ministarstvo
7. Official gazette of Republic of Montenegro, No 27/07
8. Official gazette of Republic of Montenegro, No 45/08, 9/10

RUSSIAN FEDERATION	
What are key nutrient problems/challenges (agriculture, detergents, wastewater, etc)?	**Agricultural and Industrial Waste** (2) • Lake Baikal is the largest fresh water reservoir in the world, but has been heavily polluted through agricultural and industrial development. • In 1992 the Russian Federation's Committee on Fishing reported 994 cases in which bodies of water were "completely contaminated" by agricultural runoff. Runoff from fields results in fish kills and groundwater contamination. Among the largest river systems in European Russia, the Volga and Dnepr rivers suffer from acute eutrophication--depletion of dissolved oxygen by over-nutrition of aquatic plant life--which distorts natural life cycles. Large-scale fish kills have occurred in the Kama, Kuban', North Dvina, Oka, and Ural rivers. • Russian agriculture, like industry subject to centralized control and quota fulfillment in the Soviet era, continues to cause severe water pollution by overuse and improper handling and storage of toxic chemical fertilizers, herbicides, and pesticides. During the Soviet era, dioxin, a carcinogen, was used routinely as an agricultural insecticide, and it heavily tainted rural wells. • Pollution in the Gulf of Finland, the easternmost extension of the Baltic Sea, includes untreated sewage from St. Petersburg, where heavy metals and other chemical substances are not properly removed prior to dumping. In late 1995, St. Petersburg city officials signed an agreement with a French water purification company to process the city's drinking water; the Finns hope that such a move also will improve the overall quality of the city's effluent water.
What are the current legal/regulatory drivers/frameworks for nutrient pollution control/reduction?	**CIS Agreement on rational management and protection of transboundary waterbodies**. (5) • Armenia; Azerbaijan; Belarus; Georgia; Kazakhstan; Kyrgyzstan; Moldova, Republic of; Russian Federation; Tajikistan; Turkmenistan; Ukraine; Uzbekistan. • The Parties have agreed to cooperate as follows o (a) to prevent freshwater pollution; o (b) to exchange information and water monitoring data; o (c) to carry out water purification arrangements for sewage and polluted water; o (d) to carry out arrangements for the mitigation of the consequences of natural disasters and emergency situations in waterbodies; o (e) to establish the basic principles of management and distribution of water

	resources **Water Code of the Russian Federation** (4) • Article 44. Use of water bodies for wastewater and/or drainage water discharge purposes o 1. Water bodies shall be used for wastewater and (or) drainage water discharge purposes in compliance with the requirements of this Code and environmental laws. o 2. It is prohibited to discharge wastewater and (or) drainage water into water bodies: - ▪ 1) which contain medicinal resources; ▪ 2) which are specially protected water bodies.
Is there baseline data of current nutrient loads? What are they? What are the sources?	• In Krasnodar Krai, the significant source of nutrient loads to the Black Sea and the Sea of Azov is agriculture. The N load in runoff waters from fields and manure storages has been estimated at about 20,000 tons per year. This can be compared with the N load from industry: 136 t/a. The River Kuban, the main river in Krasnodar Krai discharges to the Sea of Azov that empties into the Black Sea via the Kerch Strait. The annual discharge volumes vary from 18.3 to 8.6 km3, the mean being 11.1 km3 a year. The River Don is the largest river discharging into the Sea of Azov, and the discharge volumes are about three times higher than those of the Kuban. (world bank) • Fertilizer consumption: 0.00008627 hundred tonnes/hectare • Organic water pollutant (BOD) emissions > tonnes per day per worker: 0.00018 tonnes per day per worker • Organic water pollutant (BOD emissions >tonnes per day: 1,388.061 tonnes/day • Dissolved oxygen content: 9.69 mls/litre • Freshwater pollution: 0.43 tons/cubic km • P concentration: 0.0767964 tonnes • Suspended solids: 3.23 mls/litre • Water pollution, chemical industry > % of total BOD emissions: 3.24 % • Water pollution, food industry > % of total BOD emissions: 51.94 % • Water pollution, metal industry > % of total BOD emissions: 20.33 % (3)
What are the current nutrient reduction projects/approaches/practices/ interventions	**1. Krasnodar Black Sea Agricultural Nutrient Reduction Project (5)**

and how much is being invested? • What are the barriers to implementation? • What have been the outcomes/quantitative results? • What are the gaps? • What might be a strategy to address these gaps? • How can we reach farmers?	1. Main objective is to reduce nutrient (N and P) pollution from agricultural sources in Krasnodar Krai to the BlackSea. In support of this objective, the project would assist the Government of the Russian Federation to: (i) promote the adoption of environmentally-friendly practices in crop and livestock production, including organic farming; (ii) strengthen national policy, regulatory and institutional capacity for agricultural nutrient pollution control; and (iii) promote a broad public awareness campaign to disseminate the benefits of the proposed project activities and develop a replication strategy. 2. The Project will assist the Krasnodar Krai administration to: (i) promote the adoption of mitigating measures by farmers and agro-industry for reducing nutrient loads (N and P) entering local water bodies; (ii) strengthen national policy, regulatory enforcement and institutional capacity for agricultural nutrient pollution control; and (iii) promote a public awareness campaign and replication strategy so that project activities could be replicated in similar areas within Russia and other Black Sea riparian countries. 3. Project Global Environmental Objectives: The global environmental objective of the project is to reduce the discharge of nutrients into surface and groundwater in watersheds draining into the Sea of Azov and Black Sea. 4. An ancillary benefit is increased carbon sequestration from tree planting and ecologically sustainable land use practices and decreased methane emissions from farming and livestock practices, both of which have significant implications for climate change mitigation and biodiversity conservation. 5. This component will introduce mitigation practices for reducing nutrient loads from agriculture to the Black Sea. The project will support investments in (i) improved manure management practices, including manure handling, storage and use; (ii) promotion of environmentally-friendly agricultural practices, including nutrient management, crop rotation, conservation tillage, buffer strips and wetland management; (iii) measures to reduce pollution from small-scale agro-industries; (iv)

	riparian zone management; and (v) water and soil quality monitoring. 6. **Barriers:** Municipal waste water treatment plants often are in a poor state because of lack of maintenance and investment. This causes the discharge into rivers or directly into the sea of insufficiently treated sewage. 7. After 1990, due to the collapse of the agricultural sector in the downstream countries, discharges of nutrients reduced drastically and a slow recovery of parts of the ecosystem has been observed in the past 5 years. This recovery is ongoing, but not yet sustainable, and could become reversed, when industrial agricultural activities emerge in the river basins. 8. Available retention ponds and manure storage facilities cover only 27% of the need in the Krai. The situation is exacerbated during the rainy season, when frequent storm runoffs destroy imperfect storage structures intended to prevent cattle-breeding wastes from spreading over vast territories.

1. http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2005/05/23/000104615_20050525083657/Rendered/PDF/PID010Concept0Stage.pdf
2. Environment - Russia - problem, area, power http://www.nationsencyclopedia.com/Europe/Russia-ENVIRONMENT.html#ixzz14i3JFMCg
3. http://www.nationmaster.com/red/country/rs-russia/env-environment&all=1
4. Water Code of the Russian Federation. http://www.cabri-volga.org/DOC/PolicyRoundtable/WaterCodeOfRF-UnofficialEnglishTranslation.pdf
5. Danube/Black Sea Basin Strategic Partnership on Nutrient Reduction, Phase I. http://www.worldbank.org/blacksea

SERBIA	
What are key nutrient problems/challenges (agriculture, detergents, wastewater, etc)?	**Municipal - Sanitary Wastewater** (2) • The N emissions from urban settlements are the dominant sources to the total emission; • The list of significant point sources covers 46 communities and 14 industries. **Agriculture** • The agricultural area per inhabitant is about 0.6 ha/inh. or more. • The picture for P is similar to the one for N, but the differences between the countries are much larger, due to the fact that the specific P point discharges reflect, not only the state of the P elimination in waste water treatment plants, but also the existing use of P in detergents, and discharges from direct industrial sources. **Agriculture** (1) • Agroprocessing and large scale livestock breeding farms are major sources of pollution. • Large pig farms - 10,000 pigs per year, are significant polluters of nutrients due to their inadequate storage practice of manure and limited and improper recycling of manure as fertilizers. Highly concentrated liquid waste is disposed in lagoons, from where it penetrates the groundwater, especially in the low lying Vojvodina where the groundwater table is high. The liquid part of manure from the lagoons is directed into drainage canals which channel it to the Danube or its tributaries without treatment. **Slaughterhouses** (1) • Slaughterhouses typically collect animal waste (blood, the gut content, solids including hoof and bristle, ears, and red water) to storage tanks from where it is taken away by tankers for disposal into the municipal waste water system or municipal landfill lagoons. • Waste is high in organic material and N content, and may contain pathogens, including salmonella and shigella bacteria, parasite eggs, and amoebic eggs. **Wastewater - Industry** (2) • Industry is a significant source of hydraulic wastewater volume, while the nutrient load is significantly higher from municipal sources – due to the fact that municipal wastewaters are mainly discharged untreated and that current industrial output is low.
What are the current legal/regulatory drivers/frameworks for nutrient pollution control/reduction?	**Institutional Framework - Competent Authorities:** • Ministry of Agriculture, Forestry and Water Management • Directorate for Water • Ministry of Environment and Spatial Planning • Ministry of Health • Hydrometeorological Institute, Governmental institution responsible for water quantity and quality monitoring • Agency for Environmental Protection • Public Health Institutes, Governmental institutions responsible for drinking water quality control (raw and potable waters) **Legal Framework** • The Convention on Cooperation for the Protection and Sustainable Use of the

	Danube River (2), 30 Jan 2003 • The Water Act (7) • The Law on Environmental Protection (6) • The Law on Environmental Impact Assessment (6) • The Law on Strategic Environmental Impact Assessment (6) • The Law on Integrated Pollution Prevention and Control (6) **Nitrates Directive** • Cultivated agricultural land has decreased (-1.5%) • Forestation has increased (0.5%) • Urban area has increased (1%)
Is there baseline data of current nutrient loads? What are they? What are the sources?	• **There is no unique Data Base, data are spread between different institutions** • The use of mineral fertilizers in agriculture is significantly below 0.0275522 tonnes/ hectare /year N • The N surplus per inhabitant is below 0.010 tonnes/(inh.·a) • The specific P emission is above .0000025 tonnes/ (Inh.·d). • The major municipal pollution sources stem from the cities of Beograd, Novi Sad and Niš, with emission levels >150,000 PE. These discharge untreated wastewater and are sources of significant organic and nutrient pollution. (2) • Data on agricultural sources are not available. (2) • According to available data, municipal sources account for 4.36 million population equivalent (PE), with an annual total of c. 457 million m^3 of wastewater. (2) • The organic load amounts to 232000 tonne/year COD and 91000 tonne/year BOD, while total N load is 9100 tonne N/year and total P load 3600 tonne P/year. (2) • Total hydraulic volume of industrial wastewaters is 134 million m^3/year. Total organic load is 25,200 tonne/year COD and 12,800 tonne BOD /year with a total N load of 687 tonne N/year and total P load of 23 tonne P/year. (2) • Chemical fertilizers are the preferred method for most farmers and are widely used. Their use decreased from 0.2147345 tonnes/hectare in 1991 to 0.0484326 tonnes/hectare in 1999 but 2002 saw an increase to c. 0.0662242 tonnes/hectare (2) • Copper-based pesticides are the most common. • Only 14 of the 25 *EU List of Priority Pesticides* are legal in Serbia and Montenegro. Aldrin and DDT are prohibited. (2) • Water Statistics of Serbia (4) o Organic water pollutant (BOD) emissions > tonnes per day per worker: 0.00016 tonnes per day per worker o Organic water pollutant (BOD) emissions > tonnes per day: 98.69602 tonnes/day o Water pollution, chemical industry > % of total BOD emissions: 8.19%
What are the current nutrient reduction projects/approaches/practices / interventions and how much is being invested? • What are the barriers to implementation? • What have been the outcomes/quantitative results? • What are the gaps?	**1. Serbia Danube River Enterprise Pollution Reduction (1)** • The project approved in 2004 aims at reducing and effectively managing hazardous waste, as well as promoting environmentally friendly practices among polluting enterprises in the Danube Basin of the Republic of Serbia. The project concentrates on nutrient pollution from livestock farms, notably pig and cattle farms, as well as nutrient discharging industries. Improving the quality of river and groundwater resources will reduce the costs of treating river water for the drinking water supply of cities and reduce the risk of health problems caused by elevated concentrations of nitrates in groundwater, which is the main drinking water source in rural areas. • The total cost of the project is US$18.85 million, out of which the GEF financed US$9.02 million.

• What might be a strategy to address these gaps? • How can we reach farmers?	**2. Preparation of a Draft Strategy and Action Plan for Adoption and Implementation of the Nitrate Directive for Serbia and Proposal for Transposing into Local Legislation**

1. http://go.worldbank.org/IQIENXW8F0
2. http://www.ICPDR.org/ICPDR-pages/serbia.htm
3. http://www.gefonline.org/Country/CountryDetails.cfm
4. Nation Master Environment Stats. http://www.nationmaster.com/country/serbiaandmontenegro/env-environment
5. http://www.inweb.gr/workshops/Workshop_Thessaloniki_June_08/presentation_pdf/Serbia_2.pdf
6. Official gazette of Republic of Serbia, No 135/2004
7. Official gazette of Republic of Serbia, No 30/10, 7.5.2010

Nation Master Environment Stats. http://www.nationmaster.com/country/serbiaandmontenegro/env-environment

8. http://www.inweb.gr/workshops/Workshop_Thessaloniki_June_08/presentation_pdf/Serbia_2.pdf

SLOVAKIA	
What are key nutrient problems/challenges (agriculture, detergents, wastewater, etc)?	**Agriculture** (1) • Diffuse sources of pollution from herbicides and pesticides in agriculture. **Industry** (1) • Pollution caused by hazardous substances comes primarily from industrial and communal wastewater. • Rivers in the Slovak Republic receive insufficiently treated wastewater from agglomerations, industry and agriculture. **Settlement Wastewater** (1) • Smaller waters are often influenced by diffuse pollution from households in settlements which are not connected to public sewage systems.
What are the current legal/regulatory drivers/frameworks for nutrient pollution control/reduction?	**Regulation of the MoH SR No. 354/2006 Coll. on drinking water demands and drinking water quality** (5) • Acceptable concentration figures (maximum acceptable concentration) were defined Levels in 2005 exceeded the following indicators: Fe total (122 times), Mn (134 times), and Al (42 times) out of the all 334 assessments. **SR Government Ordinance 296/2005 Coll.** (5) • Introduces requirements on the quality and quantitative goals for surface water, as well as the limit indicator values for wastewater and special water contamination. **Nitrate Directive**
Is there baseline data of current nutrient loads? What are they? What are the sources?	• In 2005, only 57.1% of the population was connected to sewage systems. (1) • Of the 96 groundwater bodies identified in the Slovak part of the Danube River Basin District, 7 are considered 'at risk' of failing to reach 'good chemical status' due to point source pollution and 16 due to diffuse pollution. (1) • There are 217 significant point pollution sources in the Danube River Basin District. Of these, 129 are effluents from agglomerations, 82 are industrial effluents and 6 effluents are from agriculture. • The total amount of discharged organic pollution into surface waters of the Danube River Basin District from significant identified sources is around 17ktons of BOD and around 54ktons of COD in 2002. • Around 7,000 tonnes per year of N and 1,000 tonnes per year of P are emitted into the surface water from significant point sources of pollution. • Diffuse sources of pollution (from land use - urban area, agricultural land and forests and land use intensity - application of mineral and organic fertilizers) are around 39,000 tonnes of N per year and around 3,000 tonnes of P per year • The main pathway of N in Slovakia is groundwater and the main source of P is erosion.

- Approximately 0.0006950017173 ton/acrehectare of herbicides and pesticides are used (average of 1993-2002).
- Water Statistics of Slovakia (4)
  - Organic water pollutant (BOD) emissions > tonne per day: 43.30425 tonne/day
  - Organic water pollutant (BOD) emissions > tonne per day per worker: 0.00016 tonne per day per worker
  - Dissolved Oxygen Content: 10.03 mls/litre
  - Freshwater Pollution: 0.76 tons/cubic km
  - P Concentration: 0.1206801 tonnes
  - Suspended Solids: 3.75 mls/litre
  - Water pollution, food industry > % of total BOD emissions: 43.69 %
- Proportion river stations in categories of NO3 (mg/l)
  - 5%:0 -0.8
  - 65%: 0.8 - 2
  - 30%: 2.0 – 3.6
- Load of the balanced contamination sources discharged into surface watercourses in the period of years 1996-2006 (5)

Discharged waste water	Volume (thous.$m^3.y^{-1}$)	IS ($t.y^{-1}$)	BOD_5 ($t.y^{-1}$)	COD_{Cr} ($t.y^{-1}$)
1996	1 139 980	41 107	27 370	75 843
2003	950 686	21 193	17 372	56 829
2004	919 869	21 389	13 702	45 162
2005	881 946	12 670	10 661	37 312
2006	733 594	11 200	9 026	31 563

What are the current nutrient reduction projects/approaches/practices / interventions and how much is being invested?

- What are the barriers to implementation?
- What have been the outcomes/quantitative results?
- What are the gaps?
- What might be a strategy to address these gaps?
- How can we reach farmers?

1. **Initial Assistance to the Slovak Republic to meet its obligations under the Stockholm Convention on Persistent Organic Pollutants POPs (2)**
   - GEF Grant: $475,000
2. **Global Programme to Demonstrate the Viability and Removal of Barriers that Impede Adoption and Successful Implementation of Available, Non-Combustion Technologies for Destroying Persistent Organic Pollutants (POPs) (2)**
   - GEF Grant: $10,004,040
   - PPG/PDF Grant: $ 700,000
   - Danube River Basin and provided technological assistance for 17 enterprises (industrial pollutants) in Bulgaria, Croatia, Hungary, Romania and Slovakia.
   - Slovak implementation:
     - The Slovakian strategy for reducing industrial pollutant discharge into the Danube is described: (6)
       - Application of appropriate technologies;
         - The activities proposed are modernization of industrial processes, promotion of environmental management systems and establishment of an information center for new environmental technologies
       - Proper treatment of industrial wastewater

	• The activities proposed are introduction of chemical and biological treatment technologies and technologies for nutrient removal, increased capacity and efficiency of wastewater treatment plants and establishment of monitoring and warning systems in the frame of water management of enterprises. ▪ Adequate implementation of legislative and financial mechanisms. • The activities proposed are improved legislation, improved financial mechanisms and increased availability of funds. 4. **Integrating multiple benefits of wetlands and floodplains into improved transboundary management for the Tisza River Basin** (7) • Adoption of policies and legislation (zoning, land use, etc.) within the countries of the Tisza River Basin that promote the optimal use of wetlands / floodplains and other habitat for flood mitigation, nutrient retention, biodiversity enhancement and social amenity value consistent with the EU WFD and IWRM • Demonstrations of effective floodplain management strategies including the adaptation to increased flood events as a consequence of fluctuating flow regime for, nutrient retention, habitat restoration, and flood management implemented at local level. • **Activities:** o Wetland and Floodplain reconnection: Restoration of the original floodplains affected by capital-intensive drainage systems, with focus on water retention measures.

- http://www.icpdr.org/icpdr-pages/slovakia.htm
- http://www.gefonline.org/Country/CountryDetails.cfm
- http://www.unido.org/index.php?id=939
- Nation Master Environment Stats. http://www.nationmaster.com/country/slovakia/env-environment
- State of the Environment Report - Slovak Republic 2006 http://www.enviro.gov.sk/servlets/page/868?c_id=5328&lang_id=2
- Transfer of Environmentally Sound Technology. http://www.iwlearn.net/iw-projects/Msp_112799491541/project_doc/test-project-document-65p-304k.pdf
- UNDP/GEF Tisza MSP. http://www.icpdr.org/undp-gef-tisza

TURKEY	
What are key nutrient problems/challenges (agriculture, detergents, wastewater, etc)?	**Agriculture** • Drivers of nutrient enrichment ((1) o Point and diffuse sources from agriculture/farming, industry and settlements o Lack of fertilizer storage facilities o Unsustainable/inefficient farming practices o Intensive livestock production o Intensive fertilizer utilization and detergents o Lack of proper effluent treatments of discharges from livestock and agricultural farms • Excessive input use has also led to high levels of nutrient loads in ground water and rivers draining into the Black Sea, causing eutrophication. (4) • The *Black Sea Region Transboundary Diagnostic Analysis* (1996) identified Turkey's rivers which empty into the Black Seas as a key sources o f P (P) and N pollution. (4) o It estimated that Turkey's annual discharge of N contributed about 20 percent, and its discharge of phosphates 12 percent, of total N and P respectively produced in the non-Danube Black Sea Basin. • The main sources o f river pollution from agriculture non-point sources are: (i) poor agricultural practices, including inappropriate and over-application o f fertilizers and pesticides, (ii) soil erosion, (iii) poor drainage and, (iv) inappropriate handling o f animal manure waste. (4) **Detergents** • Cultural practices of cleaning sidewalks increase amount of run-off from detergents **Industry** • Drivers of nutrient enrichment (1 o Untreated or improperly treated industrial effluents due to outdated or absence of treatment technology? o Insufficient treatment plants and their poor management o Lack of control for waste water treatment plants • Causes of nutrient enrichment o Deposition from atmospheric emissions originated from land-based sources • Three of the largest rivers emptying into the Black Sea originate in Central Anatolia. While one of them (Sakarya) embraces industrial as well as agricultural areas, the main source of pollution in the other two (Yesilirmak and Kizilirmak) is agriculture. (4)

	Deforestation (4) • Increasing timber, fuel and fodder demands, together with overgrazing of rangeland, farming of steep slopes, and the lack of effective soil conservation practices on agricultural land have resulted in wide spread degradation of land and water resources. • Only 6.6% of the land in Turkey does not suffer from erosion; 7.2% slightly; 20.1% moderately; 36.4% severely; 22.3% very severely eroded. • Reduced vegetative cover has led to marked reductions in soil moisture content thus subjecting agricultural lands to significantly higher vulnerability to drought. • Land degradation has also led to unstable and increasingly torrential river flows with increased incidence o f flooding and growing sedimentation problems. • Landslides have also become a growing problem.
What are the current legal/regulatory drivers/frameworks for nutrient pollution control/reduction?	**The Convention on the Protection of the Black Sea against Pollution (5)** • 1992 **The Black Sea Environment Programme (5)** • 1993 **1996 Black Sea Strategic Action Plan (5)** • Land-based sources of pollution, the introduction of alien species and inadequate resources management are some of the main issues highlighted in the Strategic Action Plan (SAP). The SAP is a step in the process towards attaining sustainable development in the Black Sea region. • In June 2002, the SAP was revised by all member states, which reconfirmed their commitment to the original document. • Envisioned the establishment of a Black Sea Environmental Fund, financed by fees and levies on activities which use the Black Sea environment, more international financial support is needed. **Regulations requiring ships carrying hazardous materials to report to the Turkish environmental protection ministry –After 1994** • However, Turkey's power to regulate commercial shipping through the Straits is limited by the 1936 Treaty of Montreux that delineates the Straits as an international waterway. **Nitrates Directive** **Nitrates Twinning Project** o Funded by the European Union, twinning projects are aiming to transfer of Member States' experience to the candidate country for the

	purpose of strengthening the required institutional and administrative capacities for the full implementation of the EU legislation in the candidate country. • Ground and surface water monitoring is ongoing. Chemical fertilizer pollution is not widespread, but is more in certain areas. (14) • The overarching water policy and law document of the EU, namely the WFD as well as the proposed flood directive pose challenges in the harmonization process for the candidate country Turkey. (13) o **Challenges**: 1. EU defines "future uses" of water as "risks," Turkey does not regard building of new infrastructures (dams and irrigation systems) for water resources development as "risks." 2. Contrary to the EU water policies Turkey still follows the *hydraulic mission*, which is mainly about water quantity and supply augmentation. 3. In Turkey building of new infrastructure is regarded to have positive effects on socio-economic development. •
Is there baseline data of current nutrient loads? What are they? What are the sources?	• Estimated nutrient loads were considerably different in various months due to the temporally irregular fertilizer application and meteorological conditions. (7) • Annual-mean river-borne nutrient loads (in kilotonnes y^{-1}) into the Black Sea from Turkey during 2003-2005 (1) o Dissolved inorganic N (DIN): 24.87 o Phosphate (P-PO4): 6.13 • The second major pathway of DIN load is the atmospheric deposition that said to contribute at a level of 28-45%. Direct discharges from large waste water treatment plants counts around 8% of the P-PO4 loads where the contribution of Istanbul Strait makes 21%. (8) • Organic water pollutant (BOD) emissions > kgtonnes per day: 172,.185 kgtonnes/day • Organic water pollutant (BOD emissions > kgtonnes per day per worker: 0.16 kg00016 tonnes per day per worker • Dissolved oxygen concentration: 7.77 mls/litre • Freshwater pollution: 1.1 tons/cubic km • P concentration: 0.35 mls/litre • Suspended solids: 2.3 mls/litre (13)

What are the current nutrient reduction projects/approaches/practices/ interventions and how much is being invested? • What are the barriers to implementation? • What have been the outcomes/quantitative results? • What are the gaps? • What might be a strategy to address these gaps? • How can we reach farmers?	**1. Turkey Anatolia Watershed Rehabilitation** (Under WB-GEF Strategic Partnership for Nutrient Reduction in the Danube River and Black Sea**) (2)** • The project aims at reducing, over the long-term, the discharge of nutrients (N and P) and other agricultural pollutants into the surface and ground waters of Turkey and the Black Sea through integrated land and water management and ecologically sustainable use of natural resources. • The total cost of the project is US$45 million, out of which the GEF financed US$7 million, with an additional loan of US$20 million from the World Bank. • In many areas of the country, particularly in low lands and fertile plains, extension workers and farmers heavily emphasize the use of external inputs like pesticides, inorganic fertilizers and animal feed. (2) o Farmers are not sufficiently familiar with these technologies and their risks. • **Barrier:** Organizing multiple government institutions to focus on service delivery in poor communities • **Barrier:** Poor understanding of impacts of Climate Change on hydrology • **Barrier:** Relevant Government bodies are ill equipped to legislate and implement the necessary controls to prevent the over-use of chemicals. (2) o Existing regulatory restrictions are weak and there are indications that excessive application of agricultural chemicals has led to considerable contamination o f soil and ground water, including the contamination of drinking water in rural communities. • GEF Grant: $7,000,000 (11) **2. Antalya Water Supply and Sanitation Project (3)** • Objectives: a) Meet at least cost the demand for water supply, sewerage and stormwater drainage; b) Develop new institutional arrangements for management of municipal water supply, sewerage and stormwater drainage, and to introduce private sector participation in the operation of the services; c) Implement appropriate cost recovery policies; d) Postpone the need to develop costly new water resources by improving the efficiency of utilization of existing sources and of water usage by reducing the volume of non-revenue water which is presently too high; e) Improve and sustain environmental conditions and reduce health hazards that threaten the

	local population and the tourism industry. • The project represents the first phase, to be implemented from 1995 through 2002, of a program designed to continue to the year 2020. **3. Enabling activities to facilitate early action on the implementation of the Stockholm Convention on Persistent Organic Pollutants (POPs) in the Republic of Turkey (10)** • UNIDO assists countries in the formulation of the National Implementation Plans to eliminate POPs and reduce the hazardous effect of the most toxic chemicals to the environment in line with the Stockholm Convention. UNIDO POPs projects are funded from GEF resources. Four countries benefit from UNIDO assistance: Azerbaijan, Croatia, Hungary and Turkey. UNIDO plans to initiate the POPs programmes in Armenia, Romania, Russian Federation and Tajikistan. • GEF Grant: $ 469,700 (11) • Introducing integrating manure management systems which return compost to crops/pastures (2)

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TURKMENISTAN	
What are key nutrient problems/challenges (agriculture, detergents, wastewater, etc)?	**Agrochemical Use (2)** • Cotton uses far more pesticides and defoliants than other crops, and application of these chemicals often is mishandled by farmers. • Overuse of fertilizers and pesticides for agricultural crops have led indirectly to health impacts upon the population. **Domestic and Industrial Wastewater (1)** • Domestic and industrial wastewater is discharged to the deserts, affecting groundwater locally. Agricultural drainage water, which is discharged to rivers without control, has increased the levels of minerals, phenols, pesticides and other chemicals in water bodies. • Rivers have reached dangerously high concentrations of salts and chemicals, especially in lower reaches. Drinking water quality is therefore a major problem in many regions of Turkmenistan (Ministry for Natural Resource Use and the Environment 1998). The local population in the Dashkhovuz province south of the Aral Sea has suffered from hepatitis and intestinal diseases due to polluted drinking water and the region has been declared by a presidential decree as an ecological disaster zone (1) • The pollution of the Amu Darya penetrates adjacent land, where the river's water is used for agricultural irrigation, reducing the quantity and quality of food production. The combination of these issues poses considerable risks to the health and well-being of the population, which is necessarily concentrated around the available water sources.
What are the current legal/regulatory drivers/frameworks for nutrient pollution control/reduction?	**Ministry of Natural Resources Use and Environmental Protection (2)** • July 1992 • Departments responsible for environmental protection, protection of flora and fauna, forestry, hydrometeorology, and administrative planning. **Established an Environmental Fund (2)** • Laws On Nature Conservation (1991) that became the basic document regulating socioeconomic and environmental legal norms. Later, the following documents for natural resources and environment protection were adopted: "On State

	Protected Areas" (1992), "On Mineral Resources" (1992), "On Flora Protection and Management" (1993), "On Fauna Protection and Management" (1997) (3)
Is there baseline data of current nutrient loads? What are they? What are the sources?	• Experts have estimated that only 15 to 40 percent of the chemicals can be absorbed by cotton plants, while the remainder washes into the soil and subsequently into the groundwater. • In Turkmenistan the campaign to reduce agrochemical usage reduced fertilizer use 30 percent between 1988 and 1989. In the early 1990s, use of some pesticides and defoliants declined drastically because of the country's shortage of hard currency. (2) • Water Statistics for Turkmenistan (5) o Dissolved Oxygen Content: 6.74 mls/litre o P Concentration: 0.2633022 tonnes o Salinisation: 2,438.25 o Suspended Solids: 7.86 mls/litre
What are the current nutrient reduction projects/approaches/practices/ interventions and how much is being invested? 1. What are the barriers to implementation? 2. What have been the outcomes/quantitative results? 3. What are the gaps? 4. What might be a strategy to address these gaps? 5. How can we reach farmers?	1. **Conservation and Sustainable Use of Globally Significant Biological Diversity in Khazar Nature Reserve on the Caspian Sea Coast** (4) GEF Grant: $1,428,600

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4. http://europeandcis.undp.org/environment/turkmenistan/show/3D2A39C5-F203-1EE9-B0BB281F89F8A43B Nation Master Environment Stats. http://www.nationmaster.com/red/country/tx-turkmenistan/env-environment&all=1

UKRAINE	
What are key nutrient problems/challenges (agriculture, detergents, wastewater, etc)?	**Urban and Industrial Wastewater** • Rivers as receiving waters for effluents • Big enterprises do not often follow restrictions on waste products discharge into the rivers and the sea, out-of-date sewage disposal plants, collecting systems. (4) • Ukraine releases polluted water, heavy metal, organic compounds, and oil-related pollutants into the Black Sea. The water supply in some areas of the country contains toxic industrial chemicals up to 10 times the concentration considered to be within safety limits. (4)
What are the current legal/regulatory drivers/frameworks for nutrient pollution control/reduction?	**The Danube Biosphere Nature Reserve of the National Academy of Sciences of Ukraine (1)** • A total area of approximately 46,000 ha, protected areas include islands with attached areas of water and wetlands. **1996 Black Sea Strategic Action Plan (3)** • Land-based sources of pollution, the introduction of alien species and inadequate resources management are some of the main issues highlighted in the Strategic Action Plan (SAP). The SAP is a step in the process towards attaining sustainable development in the Black Sea region. • An Advisory Group on Pollution Monitoring and Assessment, coordinated by the Activity Centre in Odesa, Ukraine was established (9) o Focusing upon the establishment of a regionally coordinated network of National Status and Trends monitoring programmes and the subsequent development of Environmental Quality Objectives. o Specifically, the Group shall provide the following services: 1. Quality Assurance/Quality Control services for environmental chemical analysis 2. Coordination of pilot monitoring activities 3. Coordination of regional training exercises in monitoring 4. Coordination of regional multi-disciplinary expert consultations to develop common environmental objectives and standards for different water uses in the Black Sea. • In June 2002, the SAP was revised by all member states, which reconfirmed their commitment to the original document. • Envisioned the establishment of a Black Sea Environmental Fund, financed by fees and levies on

	activities which use the Black Sea environment, more international financial support is needed. **Law on Environmental Protection (6)** • This law determines legal, economic and social framework for the environmental protection in the interest of present and future generation. • EU Related Directives & Guidelines: (10) o On Protection of Waters from Pollution by Nitrates from Agricultural Sources (91/676/EEC) o On Pollution Caused by Certain Dangerous Substances, Discharged into Water Bodies (76/464/EEC) **Law on Ecological Expertise (6)** • The relationships in the area of ecological expertise are regulated by this Law, Law on the environmental protection and other legal acts of Ukraine. The objective of the legislation on the ecological expertise is to regulate public relationships in the area of ecological expertise for the provision of ecological safety, environmental protection, rational use and reproduction of natural resources, protection of ecological rights and interests of citizens and the state. **Water Code of Ukraine (6)** • Water Code is complex with activities of organizational, legal, economic and educational influence will help to form water-ecological law and order. It will also provide a provision of ecological safety of the Ukrainian population as well as more effective use of water and protection from pollution, choking up and exhaustion. **Law on the Exceptional (marine) Economic Zone of Ukraine (6)** • The Ordinance of Cabinet of Ministers of Ukraine #557, July 12 2005, on the approval of the order of licenses issue for the water fund lands works • The Ordinance of Cabinet of Ministers of Ukraine #1490, August 13 1999, on the approval of the order conditions of use of the Ukrainian exceptional (marine) economic zone fish and other live resources • The Ordinance of Cabinet of Ministers of Ukraine #269 1996 on the approval of Rules on the internal marine water and territorial sea protection from the pollution and choking up. • Decree of the Ministry of the Environmental Protection of Ukraine #47, February 10 2004 "With regard to the approval of Regulation on interdepartmental commission on Azov and Black sea ecological issues"

	National Program for the Protection and Rehabilitation of the Environment of the Azov and Black Seas (6) **The Convention on the Protection of the Black Sea Against Pollution** • Ukraine adopted in 1994 • Harmonization of Ukrainian water protection and economic water use legislation with the corresponding EC legislation requires undertaking the following steps: (10) 1. Development of the draft Amendments to the Water Code of Ukraine aimed at increasing the number of direct action norms in the Code an taking into account a series of advanced regulatory provisions of the EC legislation; 2. Development of the specific Laws and Regulations of Ukraine; 3. Development of basin-wide approaches to water-related issues management; 4. Development of the system of water-related issues monitoring.
Is there baseline data of current nutrient loads? What are they? What are the sources?	• The annual runoff of the Tisza in Ukraine is 7.83 billion m3. (1) • Annual-mean river-borne nutrient loads (in kilotonnes y^{-1}) into the Black Sea from Ukraine during 2003-2005 (2) o Dissolved inorganic N (DIN): 29.85 o Phosphate (P-PO4): 2.30 • Along the western coastal waters of Ukraine, DIN concentration increased from 1 μM in the 1960s to 9 μM in the 1980s and stabilized thereafter around 7.5 μM (2) • Permanent natural anoxia exists within 90% of its volume (547 000 km3), making the Black Sea the largest anoxic water body in the world. (4) • The sharp increase of input of nutrients after 1960, has caused severe eutrophication, notably of the north western shelf of the Black Sea to which about 50 % of total input of nutrients to the Black Sea was discharged by the Danube. The effects of eutrophication became practically disastrous in the period 1970-1990, causing temporarily anoxia on significant parts of the shallow shelf itself as the secondary effect of algae blooms. (4)
What are the current nutrient reduction projects/approaches/practices/ interventions and how much is being invested? 5. What are the barriers to implementation? 6. What have been the outcomes/quantitative	**Environmental Collaboration for the Black Sea (Georgia, Moldova, Russia, & Ukraine) (5)** • Prevention and reduction of pollution to the Black Sea (from river discharges or direct discharges)

results? 7. What are the gaps? 8. What might be a strategy to address these gaps? 9. How can we reach farmers?	• Sustainable management of natural resources and protection of biodiversity of the Black Sea basin. • Project Partners: o Ministry of Environment Protection and Natural Resources in Georgia; o Ministry of Environment and Natural Resources in Moldova; o Ministry of Environmental Protection in Ukraine; o Permanent Secretariat of the Black Sea Commission. • Project period: 2.5 years (starting from March 29, 2007) • The Project is financed by the European Commission under the EuropeAid Programme, the budget for the three countries makes up 2,2 million Euro. **EA to Facilitate Early Action on the Implementation of the Stockholm Convention on Persistent Organic Pollutants (POPs) in Ukraine** (7) • GEF Grant: $499,050 **National Capacity Needs Self-Assessment for Global Environmental Management (NCSA)** (7) • GEF Grant: $200,000 • **Activities:** o Developing thematic profiles related to each of the three Conventions; o Drafting the Assessment Reports; o Assessing and analyzing cross-cutting issues; o Preparing an action plan; o Preparing a strategic environment document. **Integrating multiple benefits of wetlands and floodplains into improved transboundary management for the Tisza River Basin** (11) • Adoption of policies and legislation (zoning, land use, etc.) within the countries of the Tisza River Basin that promote the optimal use of wetlands / floodplains and other habitat for flood mitigation, nutrient retention, biodiversity enhancement and social amenity value consistent with the EU WFD and IWRM • Demonstrations of effective floodplain management strategies including the adaptation to increased flood events as a consequence of fluctuating flow regime for, nutrient retention, habitat restoration, and flood management implemented at local level. • **Outcomes:** project outputs of actual hectares of wetlands reconnected/restored/conserved will encourage the replication of these GEF-funded pilots as new approaches on the use of wetlands with their multiple environmental benefits,

	including impacting nutrient loads, throughout the region and with potential for global dissemination. • **Activities:** o Implementing the EU Water Framework Directive; o Developing flood and drought management strategies; o The development of a river basin management plan

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Appendix 3 – Categories of Nutrient Reduction Practice

This draft paper on Categories of nutrients reduction practice provides an overall guidance for better understanding of the nature of nutrient pollution sources and measures for the achievement of the good status of all waters.

The ***key nutrient drivers*** in targeted countries are:

- Households
- Agriculture
- Industry
- Land use practices
- Aquaculture plants
- Deforestation
- Climate conditions

Identifying **Categories of nutrient reduction practice**, following aspects were considered:

a) ***pressures*** caused by N and P discharges and losses from different *point and diffuses pollution sources* into inland surface waters; ground waters and maritime areas, and

b) ***corresponding measures*** developed to enable the achievements of good ecological status in all affected waters.

Combining pressures and measures a variety of potential categories relevant for targeted countries are identified, as follows:

A) NUTRIENT REDUCTION PRACTICE CATEGORIES BY PRESSURES

1. Point Sources

1.1. ***Sewage treatment works and sewerage.*** Nutrient reduction practice on discharges within urban areas – agglomerations[33] from sewage treatment works and drainage:

a) Discharges by combined sewer systems;
b) Discharges by separate sewer systems;
c) Discharges by sewer systems that are not connected to a waste water treatment plant;
d) Households within the agglomeration which are not connected to a public sewer system, but expected to be connected in the near future
e) Discharges of storm waters overflows from combined sewer

1.2. ***Industry.*** Nutrient reduction practice on discharges from different industrial plants not connected to public wastewater treatment plants. Industrial sectors to be considered, discharging significant quantities of N and/or P directly to surface waters, are:

a) Fertiliser industry;
b) Food and drink related industry, incl. dairy industry, soft drinks, wine production and brewing industry; milk and milk products processing, meat and fish processing, alcoholic beverages

[33] The N and P losses from unpaved urban areas are considered in as diffuse ones.

manufacture and bottling, manufacture of fruit and vegetable products, manufacture of gelatine, production of yeast;

c) Organic chemical and biochemical industry, incl. pharmaceutics, detergents industry, manufacture of glue, production of industrial alcohol, manufacture or removal of ink;
d) Waste processing industry, including manure processing industry, composting;
e) Pulp and paper industry;
f) Cokeries and refineries; and
g) Other sectors, such as non-ferrous metal industries that are considered to be of catchment related or national importance.

1.3. Industrial agriculture production, i.e. those farms that would fall under Integrated Pollution Prevention and Control Directive (IPPC[34])

1.4. ***Aquaculture Plants.*** Nutrient reduction practice on discharges/losses from aquaculture plants that use artificial feed and where the discharge pipes are not connected to a public sewerage system:

a) Fish farming
b) Molluscs farming
c) Farming of species of algae

2. Diffuse Sources

2.1. Households not connected to public sewerage[35]***.*** Nutrient reduction practice on discharges/losses from households not connected to public sewerage systems, including both scattered dwellings and households within urban areas that are not connected and will not be connected in the near future 5-10 years.

2.2. Diffuse Anthropogenic Sources and Natural Background Losses. Nutrient reduction practice on losses into primary surface water recipients from:

a) *Agricultural land* (area under cultivation, specific crops, livestock densities):
   - arable land: nutrients from fertilisers and manure, sediment loss
   - grassland: nutrients from manure
   - over grazing leading to soil erosion
   - application of agricultural waste to land
   - sewage sludge recycling to land drainage
b) *Industry* **(**significant industrial plants not provided with proper waste management facilities)
c) *Artificial drainage flow* (through drainage pipes/tile drainage);
d) *Surface runoff* and *direct atmospheric deposition* on inland surface waters and seas
e) *Riverine load* of N and P, including water flow normalisation procedures (bank and riverbed erosion)
f) *Wetlands and retention* of N and P in river catchments
g) *Leaching* (net mineralisation, percolating waters i.e. interflow, tile drain flow, spring water and groundwater); and
h) Uncultivated areas

[34] The Integrated Pollution Prevention And Control Directive.
[35] The diffuse anthropogenic N and P losses from households encompass the P and N losses from sanitary wastewater.

B) NUTRIENT REDUCTION PRACTICE CATEGORIES BY MEASURES

1. Urban wastewater development including:
   1.1. connecting settlements to public sewers and appropriate treatment plants;
   1.2. upgrading the wastewater treatment plants with respect to N and P removal;
2. Development and improvement of permitting and licensing policy including requirements for new and existing installations; and development of Best Available Techniques (BAT[36]);
3. Access to information and public participation in the permitting procedures
4. Development and introduction of the BAT on the agro-industrial units (e.g. Use of fertilizers and other chemicals low in nutrient and/ or P content; Creation of farm ponds to water cattle and keep them from polluting natural water supplies);
5. Development of action programmes, taking into account vulnerable zones and appropriate Best Agricultural Practice (BAP[37]) (e.g. Relocation of feed lots or other farm sources of nutrient runoff; Improve manure handling;);
6. Implementation of the Best Environmental Practice (BEP[38]) for farmers linked to the Common Agricultural Policy (CAP[39]) (e.g. Use of various farming practices that control or slow runoff and erosion such as contour farming, choice of crops planted, crop rotation, grass strips, windbreaks and shelterbelts to stop wind erosion; Reduce grazing pressure on fields to increase health of vegetation, etc);
7. Prevent and control soil erosion (e.g. Erosion control structures);
8. Prior regulation, such as a prohibition on the entry of pollutants into water, prior authorisation or registration based on general binding rules where such a requirement is not otherwise provided for under Community legislation.
9. Prohibition of direct discharges of pollutants into groundwater
10. Legislative instruments (e.g. Instruments and policy measures to support WFD[40], Ensuring integration between River Basin Management Plans and Land Use Planning)
11. Administrative instruments (e.g. The Rural Development Regulation, Ensuring integration between River Basin Management Plans and Land Use Planning)
12. Economic or fiscal instruments to reduce pollution (e.g. Compensation payments for changing land use management; Legislation or laws adapted to give protection to waterway like zoning. or penalties for polluting, etc.)
13. Voluntary programmes with cooperative agreements (e.g. Creation of River Councils or Committees or Associations to address all the problems for the entire length of stream and similar approaches for lakes, etc)
14. Emission controls and limit values (e.g.)
15. Codes of good practice (e.g. Develop codes of good Agricultural practices;)
16. Creation and restoration of wetlands areas
17. Technical and construction projects and similar activities. (e.g. Implementing P and possible N removal on WWTP, without legal obligations; Reduction of volumes of wastewater directly discharges from combined

[36] The Best Available Techniques.
[37] The Best Agricultural Practice.
[38] The Best Environmental Practice.
[39] The Common Agricultural Policy.
[40] EU Water Framework Directive.

sewerage systems to the rivers; Green belts along waterways created by plantings of grass, shrubs, or trees and then protected; Fencing the waterway from cattle or other animals that could get into the waterway; Terracing of hilly agricultural lands to keep run off or erosion from occurring; Rock dams in streams to speed flow thus giving a cleansing effect as well as interest to the stream and a fish holding capacity; Removal of solid waste dams, especially illegal dams; Protection of natural springs that serve as source of clean water to waterway; Manage flood plain areas;);

18. Rehabilitation projects (e.g. on land management and use to restore previous flow patterns, to establish buffer strips, to re-create and restore wetland areas; Litter clean up projects),
19. Educational, training and advisory services projects both in urban and rural areas (e.g. Build expertise to address nutrient reduction)
20. Research, Development and Demonstration projects
21. Awareness raising projects (e.g. Adapt a stream programs for NGOs; Public education to build public understanding and interest in protecting the waterway)
22. other relevant measures
23. Sustainable Land Management projects that enhancing and enabling environment and capacity for arresting land degradation and establishing sustainable land management practice.
24. Cross –border projects addressing water management issues

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Appendix 4 – Country/Project Manager Outreach Questionnaire

The following are proposed questions for country representatives and/or project managers to provide in depth information regarding select national, regional/trans-boundary and/or local nutrient reduction projects in the Central and Eastern Europe (CEE) and Eastern Europe Caucuses and Central Asia (EECCA) regions. The key outcomes from this questionnaire include: 1) a better understanding regarding how and why best, most appropriate practices have been implemented and associated challenges; 2) strategies for replication; and, 3) likely candidate countries and practices for demonstration. For more information, please email chuck@getf.org.

Methodology

1. Water Resource Type
    - What kind of waterway is involved or impacted? Stream? River? Lake? Marsh? etc.
    - What is the source of water, size and length of the water body, watershed?

2. Pollution/Nutrient Challenge
    - What are the main sources of nutrient pollution?
    - What are the main impacts of excess nutrients on water quality?
    - Are there other impacts on the water (human health, biodiversity, other)?
    - Have baseline conditions been established with regards to nutrient concentrations/loads at the start of the project and is there a target set for nutrient reduction (e.g. a desired state in the past {*as in the Danube /Black Sea}*)?
    - How has the impact of excess nutrients been established?

3. Project Description
    - What is the projected cost of the practice, process and/or technology installed?
    - Category of farms for which practice/ technology is best suited (size, species, etc.)

4. Benefits /Best Practices
    - What are the best practices and how would you define them?
    - What are general benefits of the project and who were specific beneficiaries? (Can you give some examples of the qualitative and quantitative benefits and impacts from the project)

Nutrient Reduction / Environmental Impacts and Benefits:

- How has the project intervention resulted in nutrient reductions?
- Has the intervention been successful, is there evidence of success and what is the rationale for the specific approach implemented?
- What percentage of the N and/or P will be reduced by the project? What are the existing (measured or estimated) N/P concentration / loads from the farm?
- What additional environmental benefits, if any, will be realized from this project?
- Who will benefit from these changes?
- If the project had the impact on the local population or community how many people are influenced from the project results?

5. Monitoring Plans
    - Who and how will the project be maintained and monitored?

6. Local Input
    - What local stakeholders supported or opposed the project and what was the reaction, if any? What were their reasons to support or to oppose? Has the project met local needs? What are the needs yet to be addressed?

7. Project Metrics
    - What are the project milestones and metrics?
    - How were they measured?

Technology/Best Management Practice Transfer:

- If successful, what type and size of farm will these technologies and/or best management practices apply to?
- Do the technologies and/or best management practices have local or regional applications?
- Describe briefly the existing project that will be leveraged and how?
- What are possible follow-up actions? If there were any follow up actions, what did they consist of?

8. Lessons Learned
    - What could have been done better? What are the challenges in the project implementation? Were there any changes in the original procedure, process and/or action? Why? Any specific recommendations/suggestions?

Appendix 5 – Living Water Exchange Factsheets on Nutrient Reduction Good Practices

SERBIA

Danube River Enterprise Pollution Reduction Project (DREPR)

Project Summary and Scope

The objective of this project is to reduce nutrient loads discharged into the Danube River and its tributaries from livestock farms (i.e., pig and cattle farms) as well as slaughterhouses.

- **Component 1. Regulatory Reform and Capacity Building** — The project supports policy and legal reforms that target the reduction of enterprise nutrient pollution, and supports SAM in its goal to gradually harmonise environmental laws and regulations with those in the EU *aquis*. The project also builds technical capacity of the Ministry of Environment and Spatial Planning, Serbian Environmental Protection Agency (MESP and SEPA); the Ministry of Agriculture, Forestry and Water Management (MAFWM) and other institutions with legal mandates to enforce water-quality standards
- **Component 2. Investment in Nutrient Reduction** — Investment support is provided for agricultural sector (i.e. pig and cattle farms, slaughterhouses, and the meat processing industry) that are significant sources of nutrient pollution. The project supports:
  - improved manure management on livestock farms;
  - slaughterhouse animal waste management;
  - the Training and Information Center (TIC) to update the knowledge and skills of agricultural advisors, trainers, staff of MAFWM and MESP, local authorities and enterprise managers; and
  - local advisory units (LAUs) to raise awareness among farmers and slaughterhouses on proper nutrient, manure and slaughterhouse animal waste management and assist enterprises participating in the project.
- **Component 3. Water and Soil Quality Monitoring, Public Awareness Raising and Replication Strategy** — The project assesses the impact of the project investments on water and soil quality in the Serbian part of the Danube Basin and carries out public information campaigns at the national and local levels to raise awareness on nutrient manure management and water pollution, and their impact on public health, ecosystems and the economy, including piloting a "Public Environmental Information Sharing Scheme." The pilots use public pressure to change behaviour of significant polluters to improve environmental performance and compliance with environmental regulations.

INVESTMENT

Global Environment Fund grant	USD 9.02 million
Country co-financing	USD 13.12 million
Total	**USD 22.14 million**

PROJECT DURATION

2005 to 2010

NUTRIENT CHALLENGES

Nutrient pollution of surface and ground waters with nitrogen and potasium coming from farms and agro-processing industries, especially large-scale livestock farms where liquid manure is transferred from lagoons into drainage canals connected to the Danube River or its tributaries, without any additional treatment. The main impacts, caused by nitrogen losses, mineral fertilisers and organic nitrogen (in manure) recycled to water and soils, lead to ground waters enrichment, eutrophication of surface waters and in synergy with phosphorus, are contributing to "acid rain" damages on terrestrial flora and soils.

EARLY NUTRIENT BMP "WINS"

- BAP information materials, capacity building among farmers and monitoring programme in place on demonstration farms to show a decrease of nitrogen and phosphorous pollution and improvement of ground and surface water status

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INVESTMENT

Danube Regional Project
USD 36,376

PROJECT DURATION

2005 to 2006

NUTRIENT CHALLENGES

- Poor agricultural practices related to the application and storage of both mineral and organic fertilizers.
- Storage and use of pesticides, especially in private agricultural households.
- Over nutrient enrichment of surface and ground waters in rural and agricultural regions (eutrophication).
- Loss of biodiversity, decrease of water quality, a negative impact on human health

EARLY NUTRIENT BMP "WINS"

- Preparing farmers and agriculture experts to implement GAP
- Observation of EU requirements and standards
- Advising on application of GAPs and EU Water Framework Directive
- Providing information about DRP and regional agro-environmental issues
- Encouraging use of environmentally-friendly methods of production
- Encouraging networking and exchange of good practices with farmers/stakeholders from neighboring countries
- Encouraging organisation to meet the environmental challenges in the Danube Basin and the requirements of EU accession.

BULGARIA, ROMANIA AND MOLDOVA
Best Agricultural Practice on my Farm

Project Summary and Scope

The project aimed to increase the cooperation between local public authorities (LPA), farmers, local population, environmental and agriculture field NGOs etc. to promote the use of the best agriculture practices to reduce and prevent nutrient and toxic pollution from agriculture sector, including: Changing to the use of organic fertilizers, manure management, crop rotation, and rational use of water.

It was implemented in partnership with Agriculture and Food Department of the Falesti County Council, Ecologic Control Section, mayoralties of Pruteni, Horesti and Taxobeni villages, the Centre for Ecologic Investigations "Selecția" from Balti, "Prut 2000" NGO from Pruteni and "Euroconcept" NGO from Botoşani town.

The implementation of the project started with an information campaign, distribution of materials and the launching of the contest of local farmers selection that will be involved in the training programme on promoting and testing the BAP on their own lands. After the selection, collaboration contracts were signed between the NGOs and the farmers. There were 4 training workshops with the participation of scientists in the field.

Best Agricultural Practices

The projects have contributed to the reduction and minimisation of nutrient loads in the Danube River Basin by informing and training selected farmers in non-polluting agricultural practices and the reduction and correct application of pesticides. Farmers, youth, students, citizens and agricultural land owners were involved in rehabilitation of the agricultural environment. These activities have served as an example for other communities.

As result of the project:

- **25 farmers** stopped using or have diminished use of fertilizers and other toxic substances in agricultural growth;
- **12 unauthorized dumping sites** in the region close to aquatic sources that flow into the

LIVINGWATER EXCHANGE

Danube basin were liquidated;

- **8 unauthorized dumping sites** on the Prut riverbank were liquidated;
- **The remaining of three chemical storehouses n** based on a feasibility study to rehabilitate, construct and maintain the wetlands area to reduce nutrient loading; and
- **2,000 trees were** were planted.

Other Key Successes

- Better environmental awareness among rural population due to greater responsibility of LPA and citizens for environmental protection, improvement of environmental and water quality through liquidation of unauthorised dumping sites
- An increased level of awareness and responsibility of farmers, civil society and authorities on use and storage of pesticides
- Increased level of competency and practical abilities to promote and apply the best agricultural practices for farmers, partners of the project
- Transboundary experience and knowledge sharing in the practical application of environmentally oriented agricultural practices.

Key BMP Indicators

- At the end of the project the lab analysis showed an improvement of water quality in Camenca and Sovatul Mare rivers, with about 20% better than at the beginning of the project.
- 12 unauthorized dumping sites from the region, situated close to aquatic sources that flow into the Danube basin were liquidated.
- Awareness was improved for than 15,000 people from those 12 communities situated on the left Prut riverbank and indirectly over 30,000 citizens by informative booklets and bulletins.

Further information

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About the Living Water Exchange

The Living Water Exchange, a GEF/UNDP project promoting nutrient reduction best practices in Central and Eastern Europe, will share information and accelerate the replication of the most appropriate nutrient reduction practices developed from GEF and other investments in the region.

For more information, please visit **http://nutrient-bestpractices.iwlearn.org/** or email Chuck Chaitovitz **chuck@getf.org**

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Benefits/Best Practices

- Construction of manure storage facilities, improved slaughterhouse operations and waste water and animal waste management processes
- Implementation of a Code of Good Agricultural Practices; adoption of the law and sanctions against polluters; the draft Strategy and Action Plan for implementation of the EU Nitrate Directive, including a project replication strategy; introduction of environmental standards and methodologies required by EU directives and Serbian laws
- Introducing manure handling equipment, including proper nutrient manure management through three LAUs.
- Training and education to help farmers establish sustainable agricultural production compiling knowledge of Serbian technologies that meet both farmers' needs and EU requirements

Other Key Successes

- Improvement of environmental conditions throughout Serbia
- Improved access to EU export markets for Serbian meat and meat products
- Assistance in harmonisation with EU acquis communautaire and EU integration
- Honouring international Danube Basin and Black Sea protection conventions
- Improvement of knowledge and skills of the local agro-processing sector

Key Agricultural BMP Indicators

- 86 Nutrient management plans prepared.
- New procedures and activities developed and introduced, compiling knowledge on Serbian technologies meeting both farmers' needs and EU requirements.
- 64 farms received the grant support for manure storage and proper handling equipment.
- The TIC being a knowledge resource base for stakeholders; 570 participants trained on relevant EU legislation
- Number of farmers and slaughterhouses being assisted by the three LAUs.
- Construction works and equipment ongoing on 4 slaughterhouses and/or meat-processing industries, seven agricultural schools and three rendering plants.

Further information

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DANUBE RIVER BASIN

Boosting capacities for nutrient reduction and transboundary co-operation

Project Summary and Scope

Since the 1960s, nitrogen and phosphorus levels from agriculture, municipal and industrial sources have seriously degraded the Black Sea ecosystem, disrupted fisheries, reduced biodiversity, posed threats to humans and resulted in billions of dollars of losses to the economies of the six Black Sea littoral countries. Nutrient and toxic pollution from the 17 countries comprising the Danube River Basin, which flows into the Black Sea, created many of these threats to transboundary water quality in the region.

Therefore, the Danube Regional Project (DRP) was established as a component of the Global Environment Facility's strategic partnership on nutrient reduction in the Danube/Black Sea Basin. The overall objective was to reduce nutrient loading into the Danube River and its tributaries and to improve water quality in the Danube and the Black Sea. The project is designed to complement the activities of the International Commission for the Protection of the Danube River and undertook approximately 180 basin activities in addition to 130 national and regional small grant projects.

Best Agricultural Practices

- **General**
  - All farms larger than 5 hectares and/or 5 animal units should calculate their resource economy every year by April 1 of the preceding year and covering at least the resource economy for nitrogen and phosphorous;
- **Crop production systems**
  - Every farm with at least 5 hectares of arable crops should ensure soil sampling at least every 5 years.
  - Crop rotation and fertilising plans should be prepared every year for all farms larger than 5 hectares, with the finishing date no later than March 31 (or August 1 for winter crops). Fertilising plans should be based on the expected yield level and the needs of the crops, and include both livestock manure and mineral fertiliser.

INVESTMENT

Global Environment Fund	USD 17.24 million
Country co-financing	USD 19 million
Total	**USD 35 million**

PROJECT DURATION

December 2001 to September 2007

NUTRIENT CHALLENGES

- Nutrient enrichment of the Black Sea North West Shelf from emissions in the Danube River Basin

EARLY NUTRIENT BMP "WINS"

- Agreed definition of 'Best Agricultural Practice'
- Reduced nitrogen by 14 tonnes/year and phosphorous by 2 tonnes/year on eight demonstration farms
- Enhanced a nutrient pathway estimation model
- Made recommendations on phosphorous-free laundry detergents
- Published guidance document for nutrient reduction in wetlands
- Restored wetlands and carried out land-use change pilots.
- More than 100 small grant projects launched aimed at reducing nutrients at community level.

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- **Livestock production systems**
  - Livestock should be fed with rations that are correctly balanced with energy, protein and minerals in relation to productivity.
  - Cleaning of stables with water should be avoided or reduced to a minimum.
  - Watering of the livestock should happen in a way that hinders spill of water.
- **Livestock density**
  - Livestock numbers should be limited to ensure that nitrogen content in the manure is no more than 170 kg/ha. Manure should be sold to other farms or distributed to fields of other farms in case of a higher livestock density.
- **Livestock manure management**
  - There should be storage capacity for at least six months production of livestock manure at the farm. Production systems with use of bedding material need storage capacity for both liquid and solid manure. Production systems with deep bedding can store the manure on the field for up to six months if the manure has a dry matter content of minimum 30%.
  - Farmers should limit the extent that rain water dilutes livestock manure.
  - Spreading of manure from October 15th to March 1st should not take place, particularly not on frozen land or land with a slope of more than 7 degrees.
  - Proper technology should be used for spreading livestock manure. Liquid manure and slurry should be spread with a band-laying system or be injected into the soil.
  - Livestock manure should be incorporated into the soil within six hours.

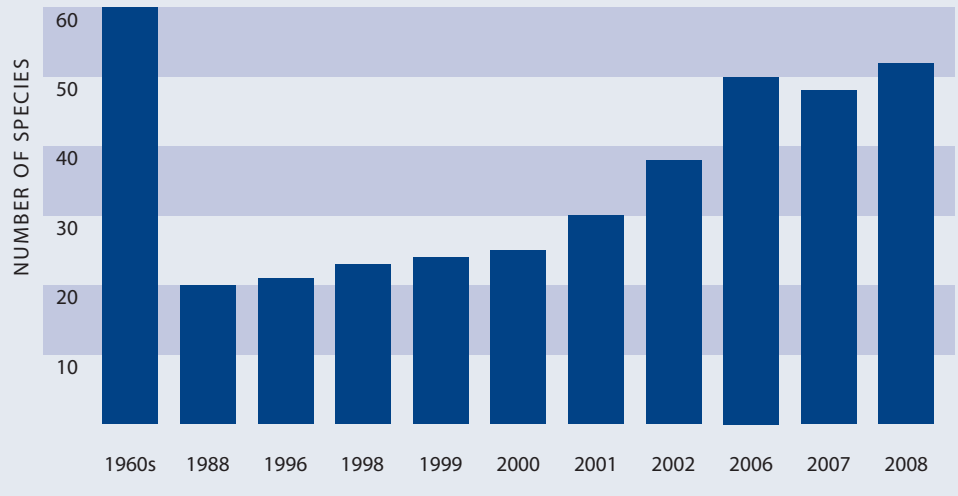
Key BMP Indicators

The Danube basin has a long history of water quality monitoring which has been supplemented by the use of MONERIS. Decreases in nutrients in the mid 1990s are mostly attributed to regional economic decline but the DRP has assisted countries in introducing new approaches (e.g. BAPs, BAT, etc.) that are intended to reduce impacts as economic conditions increase.

Further information

Details are available on the ICPDR web site: **www.icpdr.org**

Zoobenthos – Constanta, Romania (number of species)



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HUNGARY
Reduction of Nutrient Discharges

Project Summary and Scope

The key development and global environmental objectives of the project will be achieved through: (i) the development of tertiary treatment (nutrient removal) at the North Budapest Wastewater Treatment Plant (NBWWTP); (ii) the rehabilitation of wetlands in the Gemenc and Beda-Karapancsa areas of the Danube-Drava National Park (DDNP); and (iii) the establishment of a comprehensive monitoring and evaluation system for water quality and environmental health that allows measurement of nutrient reduction and contributes to the development of an impact evaluation methodology. The project will also finance dissemination activities to foster replication in Hungary and in other parts of the Danube River basin.

Component 1: Development of tertiary treatment at the NBWWTP.
The project supports the upgrading of the NBWWTP to the tertiary level of treatment for nitrogen and phosphorous removal. The evaluation of an appropriate technology will be based on technical and financial efficiency in, among other factors, attaining nitrogen and phosphorous reduction.

Component 2: Wetland restoration in the Danube-Drava National Park.
Under this component, investment support has been provided for the rehabilitation of about 10,000 hectares of wetlands in order to develop their nutrient trapping capacity. The wetlands are in Gemenc and Beda-Karapancsa, located within the DDNP on the Danube. The rehabilitation process has been implemented in stages, starting with the establishment of a one-year pilot in each of the two areas. A comprehensive baseline study was carried out at the beginning of the project to assess the environmental quality of the areas and to help determine the precise location of the two pilots.

Component 3: Dissemination and replication.
Comprehensive impact evaluation and results analysis studies of the two interventions (tertiary treatment and wetlands restoration), including a cost-benefit analysis, will be carried out at the end of the project. The results of the studies will serve as a basis for the dissemination, replication and knowledge-sharing activities. This component will also finance workshops, public communication campaigns and the promotion of cost-effective solutions for nutrient reduction in other areas of Hungary and in other riparian countries.

INVESTMENT

WB-GEF Strategic Partnership for Nutrient Reduction in the Danube River and Black Sea **USD 31.97 million**

PROJECT DURATION

2006–2011

NUTRIENT CHALLENGES

- Eutrophication caused by the enrichment of water by nutrients, especially compounds of nitrogen and/or phosphorus
- Nutrient discharges into the Danube River originating from untreated communal wastewaters from Budapest
- Biological processes of nutrient trapping in floodplains and wetlands

EARLY NUTRIENT BMP "WINS"

- Demonstration role in developing technically and financially sound solutions for wastewater treatment of domestic discharges and to restore high-priority wetlands to work as nutrient traps, allowing for the best use of scarce resources
- Institutional strengthening and building the capacity of local staff

LIVINGWATER EXCHANGE

Best Practices

- **Municipal wastewater treatment and aeration** — Reduction of nutrient discharges (nitrogen and phosphorous) from Budapest into the Danube River, and consequently into the Black Sea through the implementation and operation of aeration tanks.
- **Wetlands restoration** — Enhancement of the nutrient trapping capacity of the Gemenc and Beda-Karapancsa wetlands situated in the lower Hungarian reaches of the Danube River. It is critical to demonstrate this approach in Hungary and the region as a replicable model for the treatment of non-point sources of nutrient pollution using wetlands and floodplains.
- **Leveraging investments** — Generation of the necessary commitment to complementary investments for nutrient reduction in order to achieve the ultimate objective of controlling eutrophication in the Black Sea.

Other Key Successes

- Progress towards compliance with EU directives, in particular the wetland management aspects of the Water Framework Directive.
- Increased capacity of existing central, regional and local institutions to protect and manage wetlands, floodplains and aquatic ecosystems.
- Improvement in environmental conditions.
- Improved water quality and decreased risk of pollution at 700 potable water wells producing 1.2 million cubic meters of drinking water daily.
- Support to the GEF Danube and Black Sea regional projects, to dissemination activities of international conventions for the protection of the Danube basin and Black Sea, and to the GEF-funded IW Learn initiative (International Waters Learning Exchange and Resource Network).
- Protection of the ecosystems of two internationally important Ramsar sites that are nesting places for a number of migratory birds and other species of global importance.

Key BMP Indicators

- Annual reduction of nutrient discharges from the NBWWTP (kg/year of nitrogen and phosphorous).
- Average operating costs of the nutrient reduction process in the NBWWTP (USD/kg of nutrients reduced).
- Number of hectares of wetlands rehabilitated in the DDNP.
- Annual amount of nutrients retained by the DDNP wetlands (kg/year of nitrogen and phosphorous).
- Average operating costs of wetland management procedures in the DDNP, in terms of its nutrient reduction capacity (USD/kg of nutrients reduced).

Further Information

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Website: **http://www.ktm.hu**

About the Living Water Exchange

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PHOTO: ICPDR/VICTOR MELLO

HUNGARY
Sződrákos Creek Program – Phase 2

Project Summary and Scope

The Tavirózsa Association, an NGO, implemented a wetlands rehabilitation demonstration project to reduce the nutrient pollution of lakes from a poorly managed sewage system.

The project focused on the 132 square kilometre catchment of Sződrákos Creek northeast of the Budapest agglomeration. The creek runs north through Veresegyház and three lakes, including Malom Lake, which was given national protection status in 1985. The water eventually drains into the Danube River above Budapest. Veresegyház, a bedroom community of 15,600 lying 30 minutes from Budapest, is one of the fastest growing towns in Hungary, attracting some 500 new residents per year to a new suburb 30 minutes from Budapest. It also draws plenty of visitors with attractions such as fishing lakes and wetlands, a beach, a nature trail, an all-year thermal bath and a bear sanctuary.

The main ecological concern in the catchment area was the introduction of foreign grass carp to the lakes, which destroyed natural aquatic and marsh vegetation that used to help absorb nutrient pollution. Because many anglers like to fish in clear open spaces, fishing associations continued to stock the lake with reed-eating carp even though the introduction of exogenous fish species is prohibited by law. Other nutrient inputs come from leaching household cesspits and discharge from the local sewage treatment plant. Water quality monitoring by authorities has also been poor. In 1996, a new sewage treatment plant was built near the lakes to serve Veresegyház and neighbouring villages. Plant capacity was over-used, however, and the concentrations of nutrients discharged from the treatment plant were above permitted levels and leached into the lake system. Bacteria levels increased sharply including toxic cyanobacteria and coliform bacteria, causing allergic reactions, fever and vomiting among local residents.

In 2006, with the help of the DRP Small Grants Programme, Tavirózsa purchased equipment to test water in the three lakes. Monitoring found that heavy rainshowers in April and May caused significant nutrient pollution in the lakes because of the city's poorly functioning combined sewage system. In one instance, rain volumes pushed up the solid steel cover of a sewer allowing sewage to seep into the lake. The NGO measured algae and cyanobacteria chlorophyll and found counts to be double acceptable limits. They notified the Hungarian health authority ANTSZ but there were doubts that water quality tests were being carried out according to law.

INVESTMENT

Danube Small Grants Program of the UNDP-GEF Danube Regional Project **USD 4,675**

PROJECT DURATION

2006 - 2007

NUTRIENT CHALLENGES

- Nutrient inputs from leaching household cesspits and discharge from local sewage treatment plant
- Introduction of foreign grass carp fish species to lakes which destroyed natural vegetation that used to help absorb nutrient pollution.
- Demonstration of wetlands rehabilitation used to reduce the nutrient pollution

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Project funds were used to purchase water testing equipment to determing pollution levels, which found very high organic and nutrient counts. Following a baseline environmental assessment in the spring of 2006, a small fenced-off pilot site was created at the southern part of Pamut Lake. The grass carp was removed and natural wetland vegetation (rooted and floating native aquatic plant species) with high nutrient removal capacities was collected from the surrounding area and replanted in the pilot site. Water quality monitoring was implemented at the start and end of the project to see if nutrient pollution was reduced. The next step was to test the demonstration site water to prove that quality improved. (See table below.) Based on that evidence, the NGO hopes to secure a larger project using the same strategy to restore all three lakes. Discussions took place with the mayor to improve sewage treatment discharge. One of three local fishing associations at Pamut Lake agreed to work with the NGO, which in turn undertook to change the anglers' ideas about grass carp and local water ecology.

Reduction of nutrient concentrations of Pamut during project

	Time of measurements	Phosphate-P (mg/l)	Nitrate (mg/l)	Nitrite(mg/l)	Ammonium (mg/l)
Before rehabilitation	15.08.2006	0,8	13,0	0,20	0,10
After rehabilition	29.10. 2006	0,9	24,0	0,12	0,04
	09.02.2007	0,0	11,0	n.a.	n.a.
	18.08.2009	0,1	8,0	0,13	0,08
Change from 2006 to 2009	---	- 87,5 %	- 38,5 %	- 35%	- 20%

The results of reduction of nutrients concentrations in the pilot rehabilitation area of Pamut Lake between 2006-2009 during and after the project:

Best Practices

- The natural self-cleaning capacity of wetland areas was improved with the help of small funds.
- Water quality monitoring is essential to prove nutrient pollution was lowered.
- Removing alien species will allow for endemic species of fish and wetland plants to thrive.
- Wetland species were returned to site through replanting efforts.

Additional Benefits

- Funds helped the NGO to execute the pilot site, the results of which will facilitate a larger grant to accomplish similar work on all three lakes.
- New testing equipment will be used to monitor long-term water quality.
- Natural, social and economic values; protected species and human impacts were also assessed.

Other Key Successes

- The mayor may agree to improve sewage plant discharge.
- Water quality will improve in future which would help large local bathing area.

Key BMP Indicators

- Replanted aquatic plant species showing improvements of water quality and valuable local fish species

For Further Information

Project Contact: **Sandor Tatar, Tavirózsa Association**
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Website: **www.tavirozsa-egyesulet.hu**

About the Living Water Exchange

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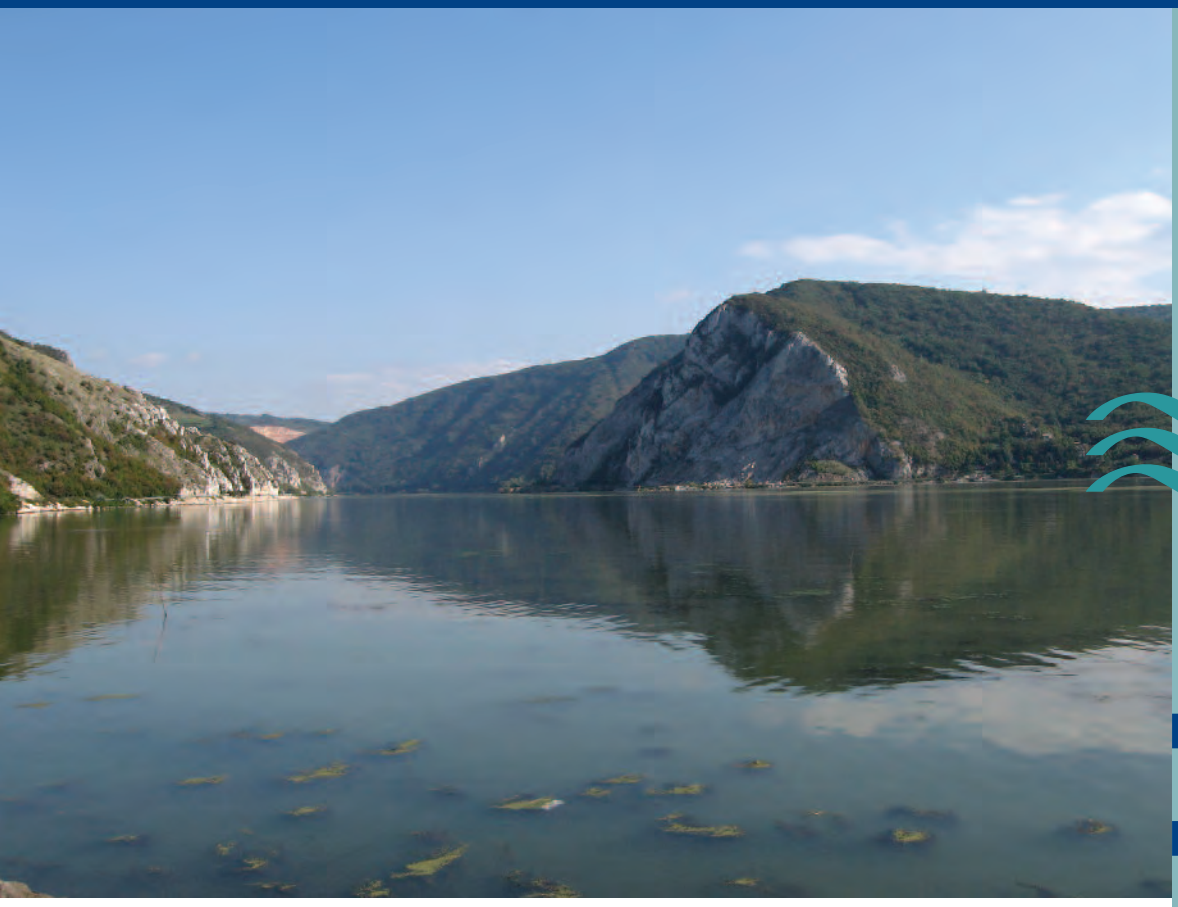

MOLDOVA
Agricultural Pollution Control Project

Project Summary and Scope

The overall objective of the Agricultural Pollution Control Project in Moldova was to reduce nutrient (nitrogen and phosphorous) pollution from agricultural sources in the river Danube and the Black Sea. The project assisted the Government of Moldova to: (i) promote the adoption of environment-friendly practices in crop and livestock production and in rural agro-industries that contribute to nutrient pollution, including wetland and integrated watershed management; (ii) strengthen national policy, regulatory and institutional capacity for agricultural nutrient pollution control; and (iii) promote a broad public awareness campaign and replication strategy. The project is a component of a USD 30 million rural investment and services project funded by the International Development Association and mainstreams environmental concerns into agricultural practices. The proposed project also assists the Government of Moldova to harmonise its legislative framework with relevant EU directives and to honour its international commitments to reduce nutrient loads in the river Danube and the Black Sea.

Component 1: Promoting environmentally friendly agricultural practices.
Activities under this component included crop rotation, conservation tillage, efficient manure management practices, the promotion of organic farming, nutrient management, the creation of buffer strips along rivers, and soil and water quality monitoring. Farmers were offered training in these techniques.

Component 2: Strengthening national policy, regulatory and institutional capacities.
This component focuses on strengthening the capacities of the Government of Moldova to achieve conformity with EU requirements in agricultural pollution control.

Component 3: Public awareness-raising activities and replication strategy.
A broad local and nationwide campaign was undertaken to disseminate information about the benefits of proposed project activities and to achieve replicability. At the local level, the main target group were the direct stakeholders (local and county officials, farmers, community groups and NGOs). The aim was to familiarise the population with the concepts and to help bring about the behavioural changes necessary to the success of the project (the prevention of soil erosion, the use of manure management practices, and respecting the Code of Good Agricultural Practices etc.).

Component 4: The establishment of a project management unit under the Rural Investment and Services Project.

INVESTMENT
Total USD 10.74 million

PROJECT DURATION
2004–2009

NUTRIENT CHALLENGES
- Inappropriate storage and use of livestock manure, inappropriate agricultural practices (e.g. ploughing across the contour lines, which encourages soil erosion), and the direct discharge of untreated wastewater from agro-processors into water bodies
- The eutrophication of water reservoirs
- Contaminated drinking-water wells

EARLY NUTRIENT BMP "WINS"
- The high rate of adoption of the demonstrated practices by farmers and agro-processors is evidence of the project's success. Water quality improved as a result of the reduction in nutrient discharges

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Best Practices

- **Nutrient management** — Crop rotation, crop nutrient management with soil testing, the use of organic fertiliser and livestock grazing practices.
- **Manure management and storage** — Centralised and household manure storage and management practices.
- **Production efficiency measures** — Improved production efficiency through cost-effective inputs and better farm management, including selected seed usage.
- **Sanitation and hygiene** — Improved health and sanitation as a result of better drinking-water quality and better general hygiene in the villages.

Additional Benefits

Nationally, the country will benefit through:

- Improved quality of surface waters and groundwater in the watershed pilot area and consequently in the river Prut.
- Improved agricultural productivity through better agricultural practices.
- Progress towards compliance with EU directives.
- Increased capacity building of local institutions such as the State Ecological Inspectorate and the Ministry of Public Health.
- Sustainable rural growth and development through environmentally sound agricultural practices.

Internationally, benefits will accrue through:

- Continual reduction in the discharge of nutrients and sediments into the river Danube and the Black Sea and accompanying improvements in the quality of local and Black Sea water.
- Improving habitats for migratory waterfowl and a variety of endangered species.
- Carbon sequestration in grasslands, arable land and forests.

Key BMP Indicators

- Improved water quality as a result of reduced nutrient discharges.
- Reduced nutrient loads by 102.5 tons of nitrogen and 78.9 tons of phosphorus in 2008.
- Measurements taken in the demonstration areas showed that soil erosion can be reduced by as much as 35 to 64 percent, depending on the environment-friendly practice applied. Environment-friendly practices were adopted on about 3,000 hectares in the project area.
- An increase in the income of small farmers of up to USD 167/ha due to the adoption of manure management practices. The same practices applied on medium-sized farms contributes to a reduction in nutrient discharges into water bodies of up to 40 kg N/ha/year and 36 kg P/ha/year.

Further Information

http://www.capmu.md/?a=1&id=60

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LIVING WATER EXCHANGE

POLAND
Rural Environmental Protection Project

Project Summary and Scope

The Baltic Sea Strategic Action Plan estimates that 30 to 40 percent of the nitrogen and 10 percent of the phosphorous entering the sea come from agriculture, and the eutrophic conditions they cause is the top priority transboundary water challenge. The Rural Environmental Protection Project for Poland aimed to significantly increase the prevalence of environmentally responsible practices among eligible farms to reduce nutrient discharges.

The project had two main components:

- farm environmental improvements facilitated by specially trained agri-environmental advisors who will work with eligible farmers to develop farm-management plans to reduce non-point source pollution, including options for cropping, tilling, manure spreading, fertiliser application practices, and constructed wetlands, as well as investments such as manure storage facilities, buffer strips, etc; and
- public awareness programmes, project monitoring and management and a replication strategy.

Best Practices

The project utilised a wide range of BAPs (manure handling, tillage, etc.) and worked with small farmers to identify the following practices:

- Improvement of extension services in Poland to advise farmers and help propagate the successes of the project beyond local pilot demonstrations. However, it was recognised that more effort had to be directed towards the Ministry to raise interest in the benefits and importance of the extension/advisory services.
- Privately managed advisory firms are more effective than state organisations.
- Convincing farmers about the necessity of certain technological solutions by displaying a demonstration farm on the local scale.
- Encouraging farmers to gather in groups to lower costs through joint tender procedures.
- Gathering farmers into groups of producers and equipment users is financially advantageous.

INVESTMENT

Global Environment Fund	USD 3 million
World Bank loan	USD 2 million
Country co-financing	USD 3.5 million
European Union co-financing	USD 2 million
Nordic Environment Finance Corp	USD 1 million
Total	**USD 14.4 million**

PROJECT DURATION

1999 to 2004

NUTRIENT CHALLENGES

- Excess nutrients from agriculture causing eutrophic conditions in the Baltic Sea

EARLY NUTRIENT BMP "WINS"

- Provision of agri-environment advisors
- Promotion of good pracices in cropping, tilling, manure handling and fertiliser application
- The use of constructed wetlands

Key BMP Indicators

- Manure tanks and manure pads were useful in showing farmers how much of their manure had previously been wasted (a valuable source of nutrients) resulting in pollution. Training and the use of agricultural advisory services, planting of buffer strips (500,000 trees/shrubs planted), publicity material for farmers, 25 monitoring sites to quantify benefits (in the longer term of 5-10 years)
- 28,000 family farms involved, 952 manure tanks constructed, and 655 manure pads built. Nutrient management plans were introduced on 893 farms covering 23,295 hectares with an estimated nutrient reduction of 800 tonnes/year
- Seventy-three percent of farmers participating saw the benefits and cost savings from the reduced use of mineral fertilisers

Nitrogen loss reductions (kg N/farm/year)

Farm Type	Loss reduction due to proper manure storage	Loss reduction due to better timing of slurry spreading	Total
on mineral soil			
cattle, manure	86.1	0.0	86.1
cattle slurry	0.0	94.8	94.8
cattle, manure + slurry	38.5	39.1	77.6
pigs, manure	49.5	0.0	49.5
pigs, slurry	0.0	60.1	60.1
pigs, manure + slurry	32.8	37.6	70.4
cattle + pigs, manure	61.0	0.0	61.0
cattle + pigs, slurry	0.0	68.2	68.2
cattle + pigs, manure + slurry	36.6	49.0	85.6
on organic soil			
cattle	544.0		544.0
pigs	257.0		257.0
cattle and pigs	363.0		363.0

Nitrogen loss reductions by region during the project period (kg N)

Year	2002	2003	2004	.....	2011
Lomza/Ostroleka	14,462	28,837	28,837		28,837
Torun	12,826	25,738	25,738		25,738
Elblag	9,038	18,249	18,249		18,249
Bug River Catchment	0	0	9,038		9,038
Total	36,326	72,824	81,862		81,862

Replication approach

The project developed a replication strategy for encouraging the lessons learned more widely within the region.

For more information

Visit the following webpage:
http://web.worldbank.org/external/projects/main?pagePK=64283627&piPK=73230&theSitePK=40941&menuPK=228424&Projectid=P050660

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LIVING WATER EXCHANGE

INVESTMENT

GEF USD 4.13 million

UNDP co-financing (Intervention 2) USD 220,000

PROJECT DURATION

2005–2010

Intervention 2: 2005–2006

NUTRIENT CHALLENGES

- Agriculture, particularly apple production, which is the primary source of income for the local population
- The exposure of the lake and tributaries to continuous input of nutrients from untreated wastewater from settlements that do not have access to a wastewater collection and treatment system (around 40 percent of the total population of Prespa, and almost all industrial installations)
- Land-use and cropping patterns in Prespa, which largely contribute to the nutrient load in the lake, mainly because of erosion processes and sediment transportation

EARLY NUTRIENT BMP "WINS"

- The controlled use of fertilisers based on improved knowledge of nutrient status in the soil

PRESPA LAKE

Integrated Ecosystem Management. Intervention 2: Reducing Environmental Impacts of Agriculture

Project Summary and Scope

Recent analyses of the status of Prespa Lake show dramatic ecological changes, caused by the synergetic influence of natural and anthropogenic factors. One of the factors affecting the lake's water quality and ecosystem is the rapid drop in water level over the past 15 to 20 years (mainly as a result of unfavourable hydrological conditions but also due to water abstraction for irrigation purposes). The reduced quantities of fresh water have resulted in the increased concentration of various pollutants, including nutrients, which has an impact on the status of the ecosystem. At the same time, an increasing area of land is being cultivated (mainly apple production), leading to a rise in the quantities of nutrients across the basin. The river corridors that provide fertile soil and access to water for irrigation are particularly important for apple farming. Based on analyses carried out by various institutions, in addition to natural hydrological factors, the changes taking place in the Prespa Lake ecosystem can largely be attributed to the excessive use of agrochemicals (fertilisers and pesticides), sedimentation and erosion.

The project supported the farmers' association to monitor and control agrochemical use by analysing the presence of nutrients (nitrogen, phosphorus and potassium) and a wide range of microelements (micronutrients) in the soil. An agrochemical laboratory established by the project and currently run by the farmers' association provides soil analysis services for local farmers. Based on the tested samples, trained personnel from the association provide recommendations on the most appropriate selection of fertilisers and fertilisation dynamics that will result in minimum economic losses and the minimum environmental damage. The project focused on collaboration with local apple farmers to lower production costs and enhance productivity while reducing negative impacts on the lake's ecosystem from the unsustainable use of pesticides, fertilisers and irrigation water. It also promoted transboundary cooperation in agriculture between the former Yugoslav Republic of Macedonia and Albania in the Prespa region through the sharing of knowledge and best practices.

Best Practices

- **Controlled use of fertilisers based on an improved knowledge of the nutrient status of the soil** — This approach provided of a solid basis to introduce good agricultural production principles using agrochemical laboratory testing and disease monitoring, managed by farmers' associations. The project reduced pesticide applications and excessive levels of nutrients (nitrogen, phosphorus, and potassium) in the soil by establishing a scientific monitoring and community-based information sharing system.
- **Sustainable irrigation practices** — These practices focused on demonstrating wise use of groundwater and surface water resources through piloting alternative apple orchard management.
- **Consideration of actual crop needs** — Optimal fertilisation was determined based on several factors, such as apple variety, expected yield etc.
- **Maximisation of use of nutrients by plants** — Minimisation of the quanitites of nutrients transported by runoff to surface water bodies and groundwater.

Additional Benefits

- Reduction of the environmental impacts of agriculture.
- Possibility for reducing production costs as a result of reduced fertiliser and pesticide use, and the improved marketability of products.

Other Key Successes

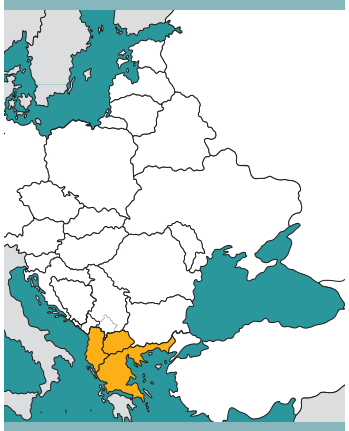
- Collaboration with local apple farmers to reduce negative environmental impacts (pesticides, water- and soil-use patterns etc.) while enhancing their productivity in a sustainable manner.
- The potential application of the technology on any farm, regardless of size and crop type.
- Reduction of the negative environmental impacts of agriculture.

Key BMP Indicators

- The number of farmers using the services (records maintained by farmers' associations).
- Sustainable functioning of the laboratory.
- Number of farmers applying environmentally sound agricultural practices.
- Number of farmers attending the training programme on good agricultural production principles and number of farmers complying with those principles (certificates issued by the Faculty of Agricultural Sciences and Food).

Further Information

Project Contact: **Anita Kodzoman,** Programme Officer for Energy and Environment at UNDP, the former Yugoslav Republic of Macedonia, 8-ma Udarna Brigada, 2, PO Box 305, 1000 Skopje
Tel.: (389-23) 249-560, E-mail: **anita.kodzoman@undp.org,** Website: **http://prespa.iwlearn.org**



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LIVINGWATER EXCHANGE

INVESTMENT

Government contribution USD 5.65 million, including USD 1 million from the World Bank-funded Agricultural Support Services Project

GEF USD 5.15 million

Total USD 10.8 million

PROJECT DURATION

2001–2007

NUTRIENT CHALLENGES

- Inappropriate storage and use of livestock manure
- The large percentage of cropped area without nutrient management systems

EARLY NUTRIENT BMP "WINS

- The most successful practices in terms of adoption rates were manure management, crop rotations using leguminous plants, soil testing, nutrient management plans and the planting of forest windbreaks. These environment-friendly practices apply to arable and livestock farms of all sizes

ROMANIA
Agricultural Pollution Control Project

Project Summary and Scope

The Agricultural Pollution Control Project is aimed at "increasing significantly the use of environment-friendly agricultural and household practices in rural areas in order to ultimately reduce the discharge of nutrients and other agricultural pollutants into the Danube River and Black Sea through integrated land and water management."

In order to facilitate the design of an integrated intervention covering the entire nation, a pilot project was designed and is currently under way in Calarasi county. The location was selected based on urgent pollution challenges associated with inappropriate manure storage in the area.

Component 1: Activities in Calarasi county:

- Manure management.
- The promotion of environment-friendly agricultural practices.
- The integrated management of Boianu-Sticleanu polder.
- The ecological restoration of Calarasi-Raul polder.
- Soil and water quality monitoring.

Component 2: Strengthening national policy and regulatory capacity.
This component includes support to the Ministry of Environment and Water Management and the Ministry of Agriculture, Forests and Rural Development for: (i) supporting the implementation of the Nitrates Directive and the harmonisation of legislation with EU requirements; (ii) developing a code of good agricultural practices; and (iii) strengthening the capacity of the National Authority for Ecological Agriculture in its efforts to promote scientific organic farming and land-use management.

Component 3: Public awareness activities and replication strategy.
The project supports increasing public awareness: (i) in Calarasi county, to familiarise the population with the concepts and to help bring about the behavioural changes necessary to the success of the project in the seven selected villages, and replication throughout the county; (ii) at national level, to disseminate information on the benefits of the project activities and to promote replication at national level; and (iii) at regional level, in the Black Sea riparian countries to promote the pilot project as a possible model for replication.

LIVINGWATER EXCHANGE

Component 4: Project management and implementation.
The Ministry of Environment and Water Management has established a project management unit located in the Directorate for Agriculture and Rural Development to handle financial matters such as procurement, disbursements, the maintenance of project accounts and financial monitoring; the monitoring and evaluation of all project activities; as well as the coordination of implementation by the various local and national agencies, including the field agencies of the Ministry of Agriculture, Forests and Rural Development and the Ministry of Environment and Water Management.

Best Practices

- **Manure management** — Provision of incentives to communes and individual households for the installation of improved manure storage facilities and equipment for manure collection and application in seven communes.
- **Promotion of environment-friendly agricultural practices** — Nutrient management, shrub rows, narrow vegetation barriers, conservation tillage, tree planting and riparian buffer strips; as well as the demonstration of integrated crop and nutrient management.
- **Integrated management** of Boianu-Sticleanu polder and the ecological restoration of part of Calarasi-Raul polder.

Additional Benefits

Nationally, the country will benefit through:

- Improved surface water and groundwater quality in the watershed pilot area and consequently in the river Prut.
- Improved agricultural productivity as a result of better agricultural practices.
- Progress towards compliance with EU directives.
- Increased capacity building of local institutions, such as the State Ecological Inspectorate and the Ministry of Public Health.
- Sustainable rural growth and development through environmentally sound agricultural practices.

Internationally, benefits will accrue through:

- Continual reduction in the discharge of nutrients and sediments into the river Danube and the Black Sea and accompanying improvements in local and Black Sea water quality.
- Improving habitats for migratory waterfowl and a variety of endangered species.
- Carbon sequestration in grasslands, arable land and forests.

Key BMP Indicators

The success of the project can be illustrated through four key performance indicators:

Indicator 1: The percentage of households with livestock in the project area adopting improved manure-handling facilities.

Indicator 2: The percentage of arable land under nutrient management systems, including crop rotation, crop nutrient management with soil testing, and the use of organic manure.

Indicator 3: The percentage of arable land on which environment-friendly practices are used.

Indicator 4: Trends in water quality at designated sites.

Further Information

http://www.apcp.ro/

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LIVING WATER EXCHANGE

RUSSIA AND ESTONIA

Development and Implementation of the Lake Peipsi/Chudskoe Basin Management Programme

Project Summary and Scope

The overall objective of the project was to develop and start implementation of the Lake Peipsi/Chudskoe Basin Management Programme. This effort included practical recommendations for nutrient load reduction and prevention and the sustainable conservation of habitats and ecosystems in the cross-border region. The project ensured strengthening capacity of all stakeholders groups as well as active involvement for management programme preparation. The project substituted for uncoordinated, small-scale projects that would have been otherwise implemented separately on the Estonian and Russian sides without sufficient coordination, education or public information and without consulting local stakeholders and the wider public.

Lake Peipsi/Chudskoe-Pskovskoe (referred to here as Lake Peipsi) is the fourth largest and biggest transboundary lake in Europe. Lake Peipsi's drainage basin covers 45,000 km^2, approximately 12 times larger than the lake surface itself. The basin is shared by Russia (59 percent), Estonia (33 percent) and Latvia (8 percent).

The most serious environmental challenge of Lake Peipsi/Chudskoe is eutrophication, primarily caused by increased levels of phosphorus. Blue-green algal blooms have also reappeared in the lake in recent years causing summer fish-kills. The priority is to reduce phosphorus concentrations in lake. Connection to wastewater treatment plants (WWTP) and/or improved phosphorus removal at existing WWTPs would offer an immediate decrease, especially for point sources close to the lake (e.g. Pskov city), and address hygienic problems locally.

A transboundary diagnostic analysis was conducted in 2004, outlining challenges that need to be addressed. A Management Programme was developed between Russia and Estonia. The programme completed in 2006, proposed to address nutrient pollution by working to improve wastewater treatment facilities by the lake and create "buffer" zones where industrial activities cannot be conducted by the shore.

INVESTMENT

Global Environment Fund	USD 1 million
EU-TACIS	USD 1.82 million
MANTRA 1	USD 440,000
Danish EPA	USD 665,000
EU-LIFE	USD 175,000
NGOs	USD 30,000
Total	**USD 4.775 million**

PROJECT DURATION

January 2003 to January 2006

NUTRIENT CHALLENGES

- Eutrophication is the most serious environmental problem of Lake Peipsi/Chudskoe. Blue-green algal blooms have reappeared in the lake in recent years, causing summer fish-kills.

EARLY NUTRIENT BMP "WINS"

- Nutrient load reduction and prevention in cross border context through waste water treatment, phosphorus removal, animal husbandry and crop production improvements

The measures to reduce nutrient loading to Lake Peipsi, include:

- short-term measures related to the reduction of emissions from municipal wastewater discharges through the construction, upgrade and maintenance of wastewater treatment and sewerage facilities and the creation of "buffer" zones where industrial activities cannot be conducted by the shore.; and
- long-term measures are targeted at the development of eco-farming in the region to reduce nutrient loads from animal husbandry and crop production.

Best Practices

Measures to control pollution from animal husbandry included:

- manure storage and silos are better isolated to avoid leakage;
- approximation of manure storages with EU legislation and other water protection requirements should be achieved;
- application of manure to frozen fields is prohibited;
- environmental restrictions for concentration of animal husbandry and regulation via financial support schemes were put in place; and
- in dairies, phosphorus-free detergents, sludge separation and other BATs are promoted.

Measures to control pollution from crop production

The programme strategy focuses on the prevention of nutrient pollution by encouraging best agricultural practices and management of on-farm nutrient losses, including:

- prohibiting application of mineral fertilisers to snow cover and frozen soil;
- prohibiting the use of herbicides and arboricides for ditch maintenance of drainage systems;
- Controlling the application, transport and storage of mineral fertilisers and pesticides;
- promoting reductions in fertiliser and pesticide application;
- supporting BATs in agriculture and eco-farming.
- establishing buffer vegetation strips between water bodies (streams and ditches) and agricultural areas.
- devising strategies for and carrying out assessments of designing new drainage systems or restoring old drainage systems (drainage flow regulation, artificial wetlands, etc.) in order to maintain the apparent high nutrient retention capacity in the drainage basin

Additional Benefits

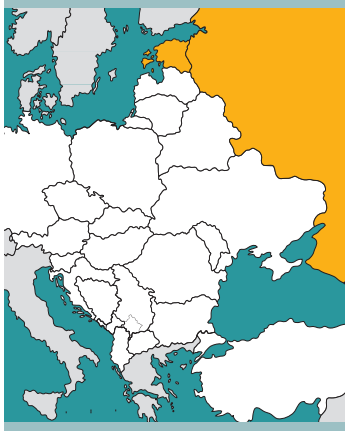
- Several international and national projects and programmes have been launched to preserve the biodiversity of the lake and its protected areas.
- Promotion of regional ecotourism is also considered as a way to improve the regional economy while contributing to current reclamation efforts in the lake.

Other Key Successes

- A sound scientific base for the long-term water management is in place.
- Joint monitoring activities have been supported and carried out.
- Joint data processing and databases have been established.
- Information exchange and networking is fully operational.
- Public/local stakeholders have been actively engaged into the programme implementation.

For More Information

Project Contact: **Natalia Alexeeva, former UNDP/GEF Project Manager, currently Water Programme Coordinator for Centra Asia, UNDP**



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LIVING WATER EXCHANGE

INVESTMENT

Work Bank IBRD loan	USD 20 million
Global Environment Facility grant	USD 7 million
Turkish co-financing	USD 8.65 million
Local communities co-financing	USD 9.46 million
Total	**USD 45.11 million**

PROJECT DURATION

2004–2012

NUTRIENT CHALLENGES

- Poor agricultural practices, including inappropriate and excessive application of fertilisers and pesticides
- Soil erosion
- Poor drainage
- Inappropriate handling of animal manure waste

EARLY NUTRIENT BMP "WINS"

- Manure management and centralised manure storage

TURKEY
Anatolia Watershed Rehabilitation Project

Project Summary and Scope

The purpose of this project is to implement sustainable natural resource management practices in order to raise incomes in communities impacted by resource degradation in 28 micro-catchments in the Anatolia and Black Sea regions of Turkey. Each micro-catchment covers between 5,000 and 15,000 hectares, with a total area under development of approximately 202,000 hectares. The project, which was launched in 2004, focuses on poverty reduction by making the rural economy more resilient to crises that affect the most vulnerable. The project's strategic objectives are directly linked to Turkey's National Environmental Action Plan, which calls for improved and more environmentally friendly agricultural practices to reduce soil erosion and the pollution of groundwater and surface water. Turkey contributes approximately 20 percent of the nitrogen and 12 percent of the phosphorus produced in the non-Danube Black Sea basin. Only 6.6 percent of land in Turkey is free of some level of erosion.

Best Practices

Best practices implemented to date for small family farms and livestock operations include:

- **Household manure platforms and centralised composting** — The construction of small manure platforms and the development of institutional and management systems for collection/delivery to central composting facilities.
- **The introduction of new technologies for the storage and collection of manure** — In areas with limited physical access to sites where manure is stored, standard-design containers (normally used for garbage collection) have been introduced. These are collected by purpose-built vehicles, which haul the manure to central storage and composting facilities.
- **Manure compost injection.** A locally manufactured system has been designed to handle poultry waste and is coupled with global positioning system modeling to pilot the effectiveness of injecting the compost and its impact on yield and nutrient reduction.

- **Digesters** — Two small-scale pilot biogas digesters have been completed in Corum (the village of Arifegazili) to convert animal waste to energy. Nutrients will still have to be transported off site.

Other Key Successes

- The project provides a platform for collaboration between multiple ministries and interest groups to address issues related to rural poverty.
- The introduction of manure management systems has had a profound impact on health, sanitation and hygiene in the local communities.
- Economic development/income-generating opportunities for livestock farmers from the selling of composted manure (partly due to significant increases in commercial fertiliser prices).

Key BMP Indicators

- Adoption of environmentally friendly practices by 30 percent of farmers in the project areas.
- Adoption of improved manure handling and storage facilities by 55 to 60 percent of farmers in the pilot areas.
- Development and adoption of packages of investments and practices for nutrient discharge reduction by 65 percent of farmers in the pilot areas.
- Facilitation of the alignment of national regulations with the EU Nitrates Directive.

Further Information

Project information documents are available at **http://web.worldbank.org**

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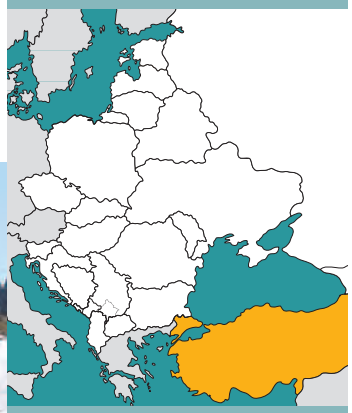

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LIVING WATER EXCHANGE

Appendix 6 – Project Scope and Pilot Eligibility

APPENDIX A: PROJECT SCOPE AND PILOT ELIGIBILITY

The scope of the nutrient reduction best practices pilot demonstration grants is to facilitate the replication of the most appropriate practices or system of practices needed to reduce nutrient loading and meet minimum water quality standards in nutrient hotspots in CEE.

Scoring guidelines

This evaluation grid is divided into **subsections**. Subsections 1 and 2 have a total of 50 points and must be given a score between 1 and 5 in accordance with the following guidelines

Score	Meaning
1	Very poor
2	Poor
3	Adequate
4	Good
5	Excellent & complete

Subsection 3 has a total of 50 points and must be given a score between 1 and 10 in accordance with the following guidelines:

Score	Meaning
1	Very poor
2	
3	Poor
4	
5	Adequate
6	
7	Good
8	Very good
9	
10	Excellent & complete

These scores are added to provide the total score for the section concerned. The totals for each section are then added together to give the total score for the proposal.

Each section contains a box for comments. These comments should address the issues covered by that section. Comments must be made on each **section**. If an evaluator gives a score of 1 (Very poor), 2 (Poor) or 5 (Very good) to a subsection, the reasons for giving such a score must be explained in the comments box. Extra space may be used for comments if required.

1. Issues	**Score**
1.1 Existing nutrient reduction project underway or in advanced stage of planning, which could be supplemented by UNDP/GEF project (focusing on agricultural or wetlands restoration best practices)	/ 5
1.2 Availability of national or international resources (cash or in-kind) to co-finance UNDP/GEF budget	/ 5
1.3 Local and national community involvement, interest and support (from a wide range of stakeholders)	/5
1.4 Approach can be replicated elsewhere in the region and more widely	/5
1.5 Sustainability post-project	/5
Total score for issues:	**/ 25**
Comments for issues:	
2. Challenges	**Score**
2.1 Relevance to priority concerns in the CEE and EECCA regions: a) Nutrient and other pollution from farm practices, local small constructed wetlands b) Loss of floodplains c) Other issues such as pollution from P detergents, untreated wastewater etc.	/5
2.2 Lack of planning approval challenges	/ 5
2.3 Socioeconomic costs (cost-effectiveness of the project and potential impact on the local society and economy)	

	/ 5
2.4 Sufficient project management capacity	/5
2.5 Project duration of 10 months	/5
Total score for challenges:	**/25**
Comments for challenges:	

3. Benefits	**Score**
3.1 Quantifiable reduced nutrient loading	/ 10
3.2 Quantifiable improved water quality benefits	/ 10
3.3 Transboundary involvement & benefits	/ 10
3.4 Local benefits of implementing projects (e.g. tourism, minimising damage from floods etc.)	/ 10
3.5 High benefits for agricultural lands	/10
Total score for benefits:	**/50**
Comments for benefits:	

Innovative ideas for other practices and tools that could prove useful in addressing the reduction of nutrient pollution are encouraged and will be awarded 5 bonus points.

Appendix 7 – Demonstration Evaluations

Living Water Exchange Project – Albania
Site visit and project review report

Constructed Wetland for Nutrient Reductions in the Waters of the Tirana River in Albania

November, 2010

Overview: This project was centered on the development and evaluation of a constructed wetland system along the banks of the Tirana River within the municipality of Tirana, the capital of Albania. The project was led by the Institute for Environmental Policy NGO but also involved scientist from Tirana University. Samples from what appear to be two combined sewer outfall pipes (combination of sewage and urban runoff) and the Tirana River were take in February 2010 and analyzed for various pollutants and biological parameters. In the spring of 2010, a constructed wetland consisting of three adjacent 5m by 25m basins were built. The basins were designed so that influent from the pipes could enter the first basin and then would overflow into the second basin which would again overflow into the third basin. The wastewater was discharged from the third basin into the Tirana River. In concept, particulate matter would settle in the first basin, treatment would occur in the second basin and "polishing" or further treatment would occur in the third basin, prior to discharge. The basins were planted to various wetland plants. Cattails were observed to be the dominant species in the wetland basins during a 15 September 2010 site visit. The three basins and the river were sampled again for pollutants and biological parameters in July 2010 after the cattails were reasonable well established.

The location of the site was selected and provided by the Municipality of Tirana in an area known as "Bregu Lumit". The site was located in a filled area of floodplain on which unpermitted houses had and are being built, and the river bank, including the wetland area was used for illicit disposal of garbage and solid waste (Photo 1). Volunteers from environmental NGOs removed the solid waste from the site prior to constructing the wetland. This just moved the illicit dumping immediately upstream of the wetland as will be discussed later. After the site was constructed, two new unpermitted houses were built on filled land adjacent to the wetland (one was still under construction in September 2010 (Photo 2)). The unpermitted houses built on the filled floodplain appear to have shallow wells for their domestic water supply, which will also be discussed later.

The principal activities with this project involved the construction of the wetland, two water sampling and analysis events to estimate water quality impacts in the first year and some outreach. The primary outreach efforts appear to have been to officials from the city of Tirana.

Photo 1: Conditions along Tirana River at constructed wetland site


Photo 2: New houses adjacent to constructed wetland on filled floodplain

Overall Comments on Project

The project team is to be commended for what they were able to accomplish in the short time provided by project funding. Getting agreement from Tirana Municipality on a site, removing all the solid waste and constructing the concrete walls for the basin in time to successfully establish the cattails required a tremendous amount of effort by the local environmental community. It was clear during the site visit that Edvin Pacara, with the Institute for Environmental Policy, had provided the energy and leadership to get the project implemented in such a short time frame.

Performance of constructed or restored wetlands:

General: Constructed and restored wetlands have proven to be very effective at nitrogen, phosphorus and sediment removal when properly constructed and managed. Such wetlands have been used to remove nutrients from wastewater, agricultural runoff and stormwater runoff in numerous studies and applications around the world. Their potential is far greater than the limited use seen to date but they must be appropriate for the situation in which they are placed to be effective. They are generally used either to treat small wastewater flows or intermittent runoff flow from agricultural or developed lands. The most important factors in their performance are the residence time of the water in the wetland and contact of the water with vegetation and wetland substrate so that ample opportunity exists for treatment. As stated in their second report from July 2010, it may take several years for a constructed wetland to reach its full potential. Since these plants had less than six months to grow, only limited impacts could have been expected under the best of circumstances. Despite the limitations discussed below, water exiting the wetland was notably clearer than what entered (Photos 3 and 4).

Photo 3. Wastewater near influent pipe

Photo 4. Discharged water from wetland

Observations and Recommendations on the Tirana River Constructed Wetland Project

Observation: *Size and function of the constructed wetland:* The wetland appears far too small for both the hydraulic and pollutant loads that entered it from the two pipes. As shown in Figure 1, residence time of the water is critical for nutrient removal from a constructed wetland. Figure 1 shows results for phosphorus removal but results would be similar for nitrogen. It is apparent from Figure 1 that a water residence time of 3-7 days is needed to get optimal levels of removal (where the slope of the removal curve “flattens out”).

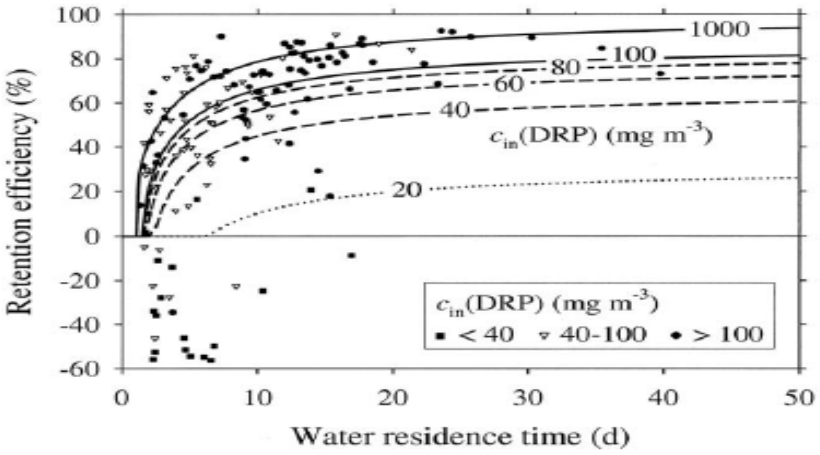

Figure 1: Removal of dissolved reactive phosphorus (DRP) in a wetland as a function residence time

There was no measurement of flow into the wetland but several people with hydrologic experience, including the author, estimated it to be in the range of 0.2 to 1 cubic meter per second (cms) based on observation at both the influent and effluent points. If one assumes a half meter of water in the 375m^2 wetland (which would be deep for a vegetated wetland), the residence time of the water is between about 3 and 15 minutes. While this may be adequate for some settling and limited nutrient removal by biomass, the residence time is so short that only limited treatment could ever be expected from such a small wetland receiving such a proportionally large volume of water. If the flow is 0.5 cms, it would take an area about 300 times the size of this wetland, about 10,000 m^2 or one hectare, to provide near optimal treatment, *if designed the same as this wetland*. While this wetland had three cells or ponds and there appears to be shallow submerged baffles in the basins, the system was severely undersigned for the flow received.

Recommendation 1: Wetland design for efficient treatment: Wetlands can be designed to increase efficiency and residence time so that flows of this magnitude could probably be treated to remove nutrients and sediments with about 2500 to 5000 m^2. The increased efficiency could be obtained by creating a circuitous (highly meandering) flow path through the wetland area using baffles, islands, rocks, vegetative barriers, etc to maximize retention time within the cell and also maximize interaction of the water with vegetation and wetland substrate (soil and organic material base).

Recommendation 2: Wetland modification and management: Even if the wetland was designed for optimum residence time and interaction with vegetation and substrate, the current wetland is too small for the flow entering it. Either the flow needs to be reduced to less 10% of current flow (preferably less than 5% or the wetland needs to be expanded in size to 2500 to 5000 m^2 (which is unlikely given the location and ongoing construction occurring). If the wetland is going to be maintained at its current size after the project, at a minimum, the pipe with the largest flow should be diverted from the wetland. While it is recognized this will directly discharge that wastewater to the Tirana River, it is necessary to give the wetland any reasonable opportunity to reduce nutrients or suspended solids (inorganic and organic particles). All wastewater should be redirected from the wetland for a short period to allow redesign of the wetland base to

assure more circuitous flow and better interaction with vegetation and substrate. This can be done by improving the baffle system and/or creating "rock pile" diversions or flow directors. The above water line vegetative biomass should be harvested at least once per year. Those working on the wetland or harvesting biomass should take adequate precautions to protect themselves from exposure to the untreated sewage in the wetland.

Observation: *Monitoring of the wetland:* The short time period for the project limited the opportunity for monitoring influent and effluent water quality, however, only two sampling dates were reported; pre-construction and post-vegetation establishment. The first set of samples was from the pipes and the river in February and the second set was from each of the three basins and the river in July. While understandable due to project time constraints, the results are inadequate to draw any meaningful conclusions about function of the wetland. Some parameters appear to go down while others, such as PO^4 (phosphate) appear to increase. Recommendation: Assuming continued evaluation of the wetland (and flow or size modification), sampling needs to occur at a monthly to quarterly frequency and the parameters of greatest interest and importance should be focused upon. Total nitrogen was not determined in the two samples and it is likely that large amounts of dissolved and particulate organic nitrogen may be entering (and leaving?) the wetland. Also, there was much work done on the biotic community in the wetland and river. While important, and of academic interest, the focus of water monitoring at this time should be on key pollutants and the wetland's effectiveness at reducing them. These would include total phosphorus, PO^4, total nitrogen, ammonium, nitrite, nitrate, suspended solids and fecal and total coliform.

The other key monitoring element that was missing was flow into and/or out of the wetland. As discussed above, no flow data was available and tour group members made rough estimates of flow based on their experience. Flow from the two pipes should have been measured before designing the wetland and should be measured at least monthly, if not possible to have continuous flow measurement. A weir can be constructed on each pipe and flow can be calculated based on the height of flow through the weir. The weir should be designed to allow flow estimation at both low (summer) and high (winter) flow levels. A continuous flow monitoring device would be preferred but may not be economically feasible and would also have a high probability of damage by vandalism.

Observation: *Treatment of municipal wastewater in a constructed wetland*: Flow to the wetland was from two pipes that appeared to represent household wastewater and sewage and perhaps stormwater runoff, although the amount of flow stormwater is unclear. Based on the project report and site visit, it is assumed most flow is from municipal wastewater. Allowing stormwater flow into this system would overwhelm and probably damage the wetland. There was no evidence of this but the source of flow does need to be determined.

Constructed wetlands are used very effectively to reduce nutrients and suspended solids from municipal wastewater *but usually only after at least primary treatment and disinfection*. The wetland has limited chemical or biologic ability to kill pathogens in wastewater. The vegetation and substrate will filter some pathogens and provide modest reductions before discharge but will not make the water safe for human contact.

Recommendation: It is not feasible to do primary treatment and disinfection on just the flow to this site. It is acknowledged that the removal of even modest amounts of pathogens is some improvement from previous conditions, however, constructed wetlands cannot make the waters of the Tirana River safe for human contact. As discussed below, it is questionable if constructed wetlands are appropriate for treating wastewater for nutrients and suspended solids from cities the size of Tirana, and they will clearly not accomplish needed disinfection.

In their July report, the project team acknowledges that such wetlands cannot treat the flow for Tirana and that some form of centralized sewage treatment is needed. While that may not be possible at this time, it is the only means, of which I am aware, to make the waters of the Tirana River and downstream estuaries, safe for human contact. Based on further reading, towns above Tirana will also need treatment to kill pathogens. It is critical that both the municipal and national governments understand that c*onstructed wetlands are not intended to provide disinfection*.

Observation: *Appropriate flows for wetland treatment:* Constructed or restored wetlands require sufficient land area if they are to be effective that they are typically only used to remove nutrients and suspended solids for flows from smaller towns and cities with flows of less than 4,000 cubic meters per day. It is difficult to directly relate this to a population size since it is a function of industrial discharges and other sources but it is unlikely that constructed or restored wetlands would be the most economically feasible option for cities with more than 50,000 people. Regardless of population base; collection, primary treatment and disinfection are assumed to occur before running the wastewater through the wetland for nutrient and suspended solid removal.

Recommendation: As the project team acknowledges in their July report, constructed wetlands are not likely to be a viable option for nutrient or suspended solids removal for a city the size of Tirana due to the large land area required. Smaller wetlands could help remove nutrient and solids but would need primary treatment and disinfection before discharge to the wetlands. Building many small treatment plants is usually not cost effective. The project wetland can continue to function as a demonstration and research site (with some of the adjustments noted above) but it should be made clear that wetlands are not likely to be the solution for wastewater treatment for nutrient, suspended solids or pathogens for the municipality of Tirana. The information collected at the demonstration site could assist smaller communities in Albania and throughout the region who wish to implement constructed wetlands (however, as noted below, general conditions at the site may not make it a desirable location for a long term demonstration).

General recommendations on appropriate application for constructed and restored wetlands to remove nutrients or suspended solids.

There are four primary situations in which wetlands, when properly designed and operated, can be very efficient at nutrient and suspended solids removal. The first two situations are for treatment of flows from small to medium towns and for treatment of non-toxic industrial discharges. These usually have reasonably consistent flow rates so a wetland treatment system similar to the one used in this project and designed and operated to handle the flow and total nutrient and suspended solids loads could be efficient and cost effective. Again, it will not provide pathogen removal or disinfection at needed levels.

The other application of constructed or restored wetlands that was not the focus of this project would be to treat storm water runoff or drainage flow from agricultural or urban catchments. There are numerous examples of such wetlands that could provide guidance on their design and efficiency. When properly designed, constructed, operated and maintained, they can be very effective, however, they must be designed and managed differently. Unlike wastewater discharges which are relatively uniform in flow, runoff and drainage varies from nil to extremely high flows during the course of a year. As a result, some open water retention basin is usually require to allow capture of runoff from a "design storm" (usually 1-5 year return frequency) and the subsequent distribution of that water over time through the associated wetland. The other difference is that runoff treatment wetlands can go through prolonged periods where no water will enter the system. It is critical to design the wetland treatment system so that it maintains it wetland function through such dry periods or can rapidly recover when water enters it following rainfall events. Constructed wetlands have been used successfully in many locations for diffuse pollutant control. Constructed or restored wetlands may have their greatest application as the final component of a multi-step treatment system that reduces nutrient and suspended solids in runoff from diffuse sources.

Closing observations on the Tirana River riparian corridor

The area of the Tirana River observed during the site visit has so many issues of concern that it was hard for the tour group to even focus on the wetland and the potential benefits of constructed wetlands. Most of the natural floodplain and wetlands along the river had been, or were being, filled with spoil material, apparently as a convenient dumping ground for excavated material. (Photo 5). Fill material was even being pushed into the river to change its water course (Photo 6). The riverbed and bank had become a dumping ground for household and construction solid waste (Photo 7). The fill, with solid waste included, was flattened and unpermitted houses had been, and were being, built on the filled floodplain area (Photo 8). Shallow wells had been bored through the fill to provide water, likely highly polluted with pathogens and chemicals, for the unpermitted houses (Photo 9). This had been ongoing long enough that a community had developed within the floodplain and further filling was occurring which was leading to expansion of the illicit community on the floodplain.

Photo 5: Fill and solid waste along Tirana River

Photo 6: Fill changing flow path of Tirana River

Photo 7: Solid waste disposal along banks of Tirana River

Photo 8: New unpermitted house being constructed on fill in Tirana River floodplain

Photo 9: Shallow well in floodplain fill

Closing comments on the condition of the Tirana River in the City of Tirana

The Tirana River was milky colored, filled with debris and had high pathogen and nutrient levels according to sample results. It was clearly not safe for human contact and it seems unlikely it could support fish or other healthy aquatic communities. In addition, filling of the floodplain and wetlands will cause more severe flooding downstream.

Collection and treatment of sewage appears to be a paramount need in Tirana, however, it is clear that riparian zone management, solid waste management and the discontinuation of filling and building on the floodplain and wetlands are equally essential to the protection of public health and improvement of quality of life and civil society.

The small wetland demonstration site will not restore the Tirana River but continuing to take municipal, national and international officials to see it should awaken all of those visiting to the horrific conditions along the Tirana River as it flows through the capital city bearing its name on the way to the Adriatic Sea.

The Living Water Exchange: A UNDP/GEF Project Promoting Nutrient Reduction Best Practices in Central and Eastern Europe

Review of Demonstration Project:

'Cleaning-up Lake Celije from Nutrients and Sediments'

Krusevac and Brus Municipality,

Republic of Serbia

Project Overview

Lake Celije on the Rasina River (a tributary of the Zapadna Morava River within the Danube River Basin) was created by construction of a dam intended to alleviate flooding and reduce sediment transport downstream. Subsequently the lake was utilised as a drinking water supply source for the city of Krusevac and the Resina municipality.

The Rasina River is subjected to a number of pollution pressures resulting in elevated nutrient loads in the lake. The sources of these nutrients are the municipality of Brus (population 16,000 with no wastewater treatment facilities), industrial activities, plus additional inputs via untreated discharges from a population of at least 24,000 living in the region. The use of agro-chemicals is totally unregulated and untreated waste from cattle breeding adds to the nutrient loads. In addition, inappropriate land use has resulted in the loss of trees has increased problems associated with sedimentation.

The key activities undertaken by the project to reduce the impacts of these pressures on the lake water quality included:

- Creation of a 'biological' filter at the river in-flow to the lake by channelling the flow through reed beds to retain nutrients and sediments;
- Planting trees in the catchment of the Rasina River (10,000 3-year old fir saplings) and around Lake Celije (200 birch trees)to act as a buffer zone;
- Educational and awareness raising;
- Media, promotional and lobbying activities to stimulate public interest and involvement.

The project offers a good example of how a low cost intervention can have solid impact in reducing nutrient loading.

Figure 1: Lake Celije and the reed beds

The Project Team

The project (53,776 USD with a grant of 19,342 USD from the Living Water Exchange) was led by the Ecological Centre of Krusevac and had a range of NGO, academic and interested stakeholder groups (e.g. diving club, fishermen clubs, etc.) involved. The project duration was approximately 1 year with completion in October 2010.

Achievement of the project

Initial progress was slow due to heavy rains resulting in high waters that delayed the start of the construction of a 50 m channel to bring connecting the River Rasina to the reedbeds. The poor conditions also delayed the planned planting of additional trees close to the lake. The project also faced problems due to the illegal occupation of the planned buffer area by local farmers for cultivation (it is understood that this 'illegal' occupation has lasted 10s of years).

Figure 2: Digging a channel to connect reedbeds with River Rasina

The digging of a canal was needed to ensure water levels were about 2m depth.

Figure 3: Location of canal and associate reedbed adjacent to Lake Celije

10,000 three year old fir trees were planted in the Kopanoik mountains by volunteers and the project team over 14 days to help long-term reduction in soil erosion. The total area for afforestation for the project (upland and lake buffers) was 10.8 ha (with 6 ha in the upland regions)

Figure 4: Tree planting in the Kapaonik Mountains

The following table summarise the indicators and their values agree for this project

Indicator	**Baseline** **-value at the start of the project**	**Target** **(value to be achieved after 1 year)**
Area under aquatic plants (increase)	4ha	5,7ha
Area under eutrophication in delta (decrease)	4ha	2,8 ha
Amounts of nutrients (sodium, phosphorous) and organic matter (decrease) (At basin Zlatari)	Total N=0,539 Total P=0,0336 Organic matter ($KMnO_4$)=15,94 [mg/lit]	Total N=0,420 Total P=0,0170 Organic matter ($KMnO_4$) =11,50 [mg/lit]

Dissemination / Awareness raising

The project has successfully engaged many volunteers to assist with the tree planting and the construction of the biological filter, thereby raising awareness amongst the local population on these approaches. In addition the project has conducted a wide number of workshops, training sessions, public lectures and participated in TV and radio presentations to increase the awareness of the problems of nutrients and the potential solutions demonstrated by this project.

Sustainability

The project team was successful at securing significant co-financing from bilateral support from the Dutch Embassy (boas, vehicles, staff resources, etc.) and this will also assist with the on-going requirement to supervise and continue to monitor the results of this successful project.

The approach demonstrated at Lake Celije could be further replicated in Serbia and would assist with meeting national obligations under the Danube River Protection Convention to reduce nutrient emissions within the Danube Basin.

The project team consider that simple and low cost maintenance of the area could be undertaken by the local population. During the peer-to-peer exchange visits discussion at the site focused on how this will be achieved, with the following points being made:

- The current approach is for the reeds to retain nutrients (phosphorus containing sediments to be trapped by the reeds and nitrogen to be taken up by the reeds). However if the reeds are left in-situ to decay at the end of the growing season there is a risk that the nitrogen will be released back to the environment.
- Harvesting of the reeds and removal from the vicinity would be a means to reduce further the nitrogen being released.
- The reeds have potential for both building material (e.g. roofing) and more widely as a source of renewable fuel. Further investigations should be conducted in to the opportunities for local use of the reeds – especially as a fuel source. There are experiences from other GEF projects (e.g. Bulgaria – Worldbank wetlands project) where reeds have been harvested and converted to briquette fuel source.
- Maintenance of the channels will need to performed at regular intervals to prevent sediment blockages.
- Monitoring should continue to establish the nutrient removal capacity of this site.
- Farmers are currently using the flood plain adjacent as productive land. Whilst it was stated that these were ‘illegal’ occupants of the land, the local authority should assist the farmers introduce more environmentally friendly methods if they choose to continue to use the land for crop production.

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Living Water Exchange Project – Moldova
Site visit and project review report

The Decrease of Water Pollution Sources in Prut River Basin through the Promotion and Implementation of the Best Agricultural Practices

October, 2010

Overview: This project focused on demonstration and outreach activities regarding composting and the use of composted manure as a nutrient source for "ecological agricultural production" (apparently viewed as equivalent to EU organic production standards). The centerpiece of the project was construction of a 100m^2 composting pad with a capacity of 300 m^3 of manure to be composted (Photo 1). Famers from the town of Slobozia Mare delivered compost to the facility during late 2009 and the winter of 2010 that was composted for use as a nutrient source and soil conditioner during the spring of 2010. In addition, compost was provided for a 200m^2 vegetable garden at the village kindergarten.

Outreach activities consisted of meetings to raise awareness about ecological issues, the importance of the lower Prut River wetland complex and the impact of excessive nutrient loads (eutrophication) to the Prut River, Danube and Black Sea. There were five village meetings and five educational sessions in schools and colleges. The Village Council organized a train the trainer session on ecological issues for local geography teachers, with an emphasis on nutrient pollution and the need for reductions in nutrients entering local waterways. Joint meetings were held with three or four nearby communities to inform them of the work bring conducted in Slobozia Mare. Leaflets, brochures and posters were obtained from, or jointly produced with, the Ministry of Agriculture. Meetings were held with local farmers where they identified topics in the information packets of interest to them which became the focus of further efforts.

Overall Comments on Project

The project leaders are to be commended for what they were able to accomplish in the short time provided by project funding. Getting the compost pad built and generating material for use on farms and gardens in less than six months required a focused effort. The compost pad appears adequate and meets the sizing requirement proposed. The quality of the product generated is unclear as no "finished" product was available during the site visit and there was not mention of any analysis of the product. Observations at the compost site led to questions about the adequacy of composting and quality of finished product for use in crop production.

Despite the observations, concerns and recommendations that follow, composting facilities, as part of an ecological agriculture program, could play an important role both directly and indirectly in reducing agricultural impacts on water quality. The direct effect is that manure is stored on an impervious surface and runoff/leachate is controlled rather than manure being stockpiled improperly or adjacent to streams where nutrient losses would be high. In addition, the nutrients in the compost are more stable and less volatile than in manure (although considerable atmospheric ammonia loss may occur during composting). The indirect benefit of

a centralized composting facility is that it provides an opportunity to educate the farmers on the proper application methods, rates and timing and crop and field management to optimize nutrient use from the compost and minimize loss. Additionally, farmers using the compost to produce crops for ecological agriculture markets can be shown how to implement other Best Agricultural Practices (BAPs) to reduce nutrient and sediment loss to water as expected under ecological agriculture principles.

Observations and Recommendations (These observations are limited to what was learned from presentations, conversations and a brief visit to the compost facility (9 September, 2010) when there was little manure or compost on the pad.

- **Composting process:**

  Location of composting facilities:

  - Observation: Given the limited time and choices, the compost pad was constructed on the town dump site. While this could potentially facilitate turning of the compost when equipment is brought in to cover the solid waste, the convenience of the compost pad and dump being co-located resulted in substantial amounts of trash and other solid waste being mixed with manure on the compost pad. This probably resulted from household trash being put on top of manure as it left the farm and not being separated prior to unloading onto the pad. Signs were painted on compost pad walls (Photo 2) but substantial amounts of solid waste were evident in the manure/compost piles (Photo 3).
  - Recommendation: While co-location of this demonstration site at the dump may have been unavoidable, adequate separation of future composting facility from dumps or other sources of non-manure contaminants is critical to generating good quality compost. Perhaps locating compost facilities near, but not within, dumps and other locations that would allow sharing of equipment to turn the compost would be beneficial but the compost facility should be segregated (about 100-300m from other facility). Monitoring, as discussed next can also minimize contamination of the manure or compost with foreign materials. The compost site should also be located as convenient as possible for the farmers that will bring manure to or take compost from the site. There was insufficient information to determine the convenience of this location and the short time to conduct the project may have overridden this consideration.

  Management and monitoring of composting pads:

  - Observation: There did not appear to be any means of limiting access to the compost facility (or dump). There was also no evidence that the compost site only accepted manure (was “open”) during certain times or that there was anyone onsite to monitor the quality and presence of non-manure materials (such as solid waste) that were in materials being deposited on the pad.
  - Recommendation: It may be impractical to have someone present to “monitor” what is being brought to the compost pad but there should be easy to understand signage that briefly tells farmers their responsibilities when depositing manure on the pad. It is possible to limit access to the pad to certain hours, require/request all farmers using the pad to sign an agreement to only

bring manure and to have a "log" or recording sheet (protected from weather). Each person who brings manure to the pad would be asked to record their best estimate of the amount and type of manure, time of delivery and sign-off that the material they deposited only contained manure and bedding. Knowing who brought what quantity of manure to the site should also help with equitable distribution of compost once it becomes viewed as a valuable nutrient source While not as effective as a site monitor, this type of "honor system" has been shown to reduce misuse of facilities like this, to become "self policing' among facility users and to provide much better information on how much and what type of material was deposited. Limiting hours "open" to daylight hours reduces placement of inappropriate material on the pad and creates the opportunity for whoever is responsible for the site to do occasional spot checks of the material being deposited.

Materials accepted for composting and maintaining proper moisture content:

- Observation: The materials observed on the composting pad were extremely heterogeneous (Photo 4) with respect to the mix of manure and bedding, manure type (animal type) and moisture content. There were also some materials that appeared to be crop residue with little or no manure and, as stated above, solid waste was intermixed with the manure. It is not possible to determine if this was typical of the material throughout the project period as there was only a small amount of material on the pad.
- Recommendation: It may not be possible to avoid the heterogeneity of manure and bedding placed on the pad due to the diversity of animal production locally. However, as discussed below, this heterogeneity makes proper turning and mixing of materials imperative to make an acceptable quality compost product. As discussed above, solid waste should not be allowed to be mixed with the manure. Limited amounts of crop residue (corn stalk, cobs, straw, etc) could be mixed with the manure but must be thoroughly mixed and may reduce the available nitrogen content of the compost.

  The overall dryness of the material on the site and the large variability in moisture content are critical to both safe and successful composting. Where high moisture materials have an unmixed contact zone with dry materials, extreme heat can be generated due to microbial activity and spontaneous combustion of the dry material can occur. This appeared to be the case in one corner of the pad where smoke was coming from a pile of material and there were ashes indicating that burning or smoldering had been occurring for some time (Photos 5-6). This is both a safety hazard and decreases the quality of the compost, and may stop the composting process altogether. While variation in moisture of deposited manure may be inevitable, mixing, as discussed below, will create a material of uniform moisture content. If turning does not occur at regular intervals, dry and wet materials should be segregated until they can be properly mixed.

  Maintaining the appropriate and uniform moisture content of the material is one of the most critical elements for creating high quality compost. Moisture content should be about 50% by weight during composting with the

material allowed to dry once composting is complete and sustained temperatures of less than 40^{o} C indicate a stable material. The "rule of thumb" to estimate 50% moisture is the point at which you can almost get a drop of water out of the material when it is squeezed by gloved hand. At this moisture content, the microbes will decompose the raw materials best and higher quality compost will be made. It did not appear that water had been added to the materials on the pad and most were very dry with little composting occurring. In one corner, wet material appeared to have caused spontaneous combustion, as discussed above. It was not apparent if a water source was available at the site, but, for future work, the availability of water to maintain 50% moisture in the material is critical (along with proper mixing).

Mixing and turning manure/compost:

- Observation: It did not appear the material on the compost pad was being turned. There was some suggestion, but no documentation, that previously the manure/compost was turned when the adjacent trash was buried. It also appeared there was a continuous input of manure to the pad.
- Recommendation: Turning compost is essential to producing a quality homogenous material that can be used as a nutrient source and soil conditioner in crop production. Turning and maintaining proper moisture content are essential to achieving temperatures of 60-70^{o} C needed to generate quality compost and kill off pathogens and weed seeds Turning should occur at least every two weeks and more frequently is desirable. The more frequently the compost is turned after it has "reheated" (usually one to two days), the faster finished compost will be generated. While frequent turning may not be possible, turning and mixing at regular intervals, along with maintaining proper moisture, are two of the most critical elements in making quality compost.

  It is also important that the pad be managed so that new manure is not added to partially composted material. This will not allow composting to reach completion and will result in a low quality material. Composting can be staged so that material is accumulated on one end of the pad and is moved toward the other end as it is turned, allowing for new material to be deposited and composting of it began at the front of the pad. With experience, operators will learn how to manage the pad so that the material will be homogenous, high quality compost by the time it reaches the other end of the pad. However, it should be noted that a 4-6 week stockpiling period is recommended following composting before use to assure a stable finished product.

Monitoring and record keeping:

- Observation: There was no discussion of monitoring inputs or composting conditions at the site or of any analysis of the compost product.
- Recommendation: As discussed above, maintaining manure inputs (and compost removal) are important and may be adequately addressed by a log sheet where farmers record basic information about material deposited. The amount of compost removed from the pad and where and how it was used should also be recorded to demonstrate the value this effort is having for the community. The

temperature of the compost should be measured frequently (daily to weekly) to assure it is in the optimal range (60-70^{o} C) or to determine when it has finished composting (temperature of 40^{o} C for several days after mixing). This can be done using a one meter long metal thermometer inserted into the composting materials at representative location near the center of the pile. Such thermometers are not expensive and are critical to managing the composting process. Moisture should be estimated using the "squeeze test" described above and water added to maintain appropriate moisture. Water additions should be recorded. controlling inputs, turning and maintaining moisture will do much to assure proper composting. However, measuring and recording temperatures at several locations inside the compost windrow/pile can assure good composting; one meter long stem thermometer; temperature of 60-70^{o} C, reheating after turning; look for stable temperature below 40^{o} C for several days as sign of finished compost. Composite samples of the finished product should be sent to a laboratory for basic analyses for crop nutrients, organic carbon and other basic components. This analysis is essential to know the proper compost application rate for the crop to which it is being applied and will likely be a requirement to qualify as "organic" or "ecologically produced". Proper rates are essential for optimal yields with minimal impacts on water quality.

- **Evaluation of compost use:**

The purpose of the composting project was two-fold: to improve manure storage and management to reduce water quality impacts and to provide a quality organic nutrient source and soil conditioner. Most of the discussion has been on the composting process which is critical to generating a usable product. However, the economic value of the composting activity and the opportunity to make ecological agriculture and water quality protection a part of the crop production ethic, occurs with the use of the material in crop production.

The development of the compost garden at the kindergarten school was an excellent opportunity to demonstrate compost use (Photos 7-8). It provided a highly visible location and engaged both the school children, and presumably, and provided food for the school to use. However, the demonstration could have been managed in a way that provided more information for farmers on the value of compost. There was a control area where no compost was applied but, based on response to a question, there was no comparison of growth, yield or quality of produce from the composted and control area other than informal observation that it may have looked a little better. Demonstrations such as this can be extremely valuable in getting farmers and the local community excited about participating in the compost production and use efforts by showing the real value of the material. It is strongly recommended that records be kept of compost application, crops grown, visual crop response to compost (emergence, growth rate, color/"greenness"), yields of different vegetables or other crops, crop quality and any difference in weeds, insects or other pests. Most of this could be done by parents and teachers at the kindergarten or by students at primary or secondary schools. If not located at schools, it is critical for someone to collect "performance" information on compost use at all field demonstration sites. Information from all

demonstrations should be used in publications and at farmer meetings to show benefits and to develop recommendations on application rates and management using compost.

- **Training sessions on compost use in crop production:**
  Meetings were held with local farmers where they identified what information in brochures provided was of interest to them and this was used to focus discussion. This is a good approach to gain farmer support and engagement by focusing on what is of interest to them. It was unclear how many meetings were held and what topics were of interest to the farmers. It is also important that farmers be provided information on proper application rates, need for even spreading and crop and soil management using compost. Meetings, publications, field days and training sessions on use of compost in crop production are needed if widespread adoption by farmers is to occur. Since some farmers apparently expressed interest in composting their own manures, training sessions on small scale composting may also be warranted.

Strategic Issues Beyond the Scope of the Project:

- **Amount of manure available for composting and scale of composting:**
  There was no indication of the potential amount of manure (or animal numbers) that could become available for composting compared to the demand for compost as a nutrient source and soil conditioner for ecological agriculture. Assuming that 300 m^3 of finished compost could be made twice per year for a total of 600 m^3, this could provide nutrients for perhaps 100-200 ha/yr (assuming application rates of 3-6 mt/ha, which may be low). There are about 6,000 ha of agricultural land in Slobozia Mare so it would take 30-60 times as much compost as could be currently generated by the demonstrations pad, if only two cycles per year are made. This raise two strategic questions about expansion of compost based ecological agriculture in Slobozia Mare. The first is what is the availability of manure or other appropriate compostable materials in the town area? There needs to be an inventory of animal numbers or manure generation and availability of other appropriate compostable materials (vegetable peelings/waste, low carbon to nitrogen crop/organic residues, etc) to determine how much it will be possible to scale up ecological production in this one town. The second issue is that there needs to be 30-60 times the composting ability of the demonstration platform. While the platform was a demonstration, it would be challenging, but not impossible to expand it to generate 30-60 times as much compost. This could occur in two ways. The composting process could be better managed allowing 4-6 “batches of compost to be finished per year thus increasing the efficiency of use of composting pads two to three times the two batch per year rate. The second approach, used in combination with improved composting efficiency would be to locate up to ten pads of comparable or bigger size at key locations throughout the village, near groups of farms. Thus, each farmer would have a pad near them which would make it easier to access and use. If increased composting efficiency and decentralized pads near the farmers were used, it could be possible to convert most, if not all of the production in Slobozia Mare to ecological agriculture. This could increase the value of products and open up export markets if other constraints discussed below could be overcome. This approach could also be used to gain implementation of other practices that protect

water as part of the compost use program and develop crop production systems with less impact on local and downstream waters.

- **Getting beyond subsistence scale production: A role for farmer owned Cooperatives?** In Chisinau, it was stated that 253 Moldovan farms were engaged in ecological agriculture on a total of about 30,000 ha, for an average size of 118 ha/farm. The Mayor of Slobozia Mare said there were about 6,000 ha of agricultural land and 2,000 farm households in her town for an average farm size of about three ha, which is consistent with other information we heard. Clearly, ecological agriculture in Moldova is dominated by large scale farms. It is very hard for farms of 3 ha to be more than subsistence farms with perhaps limited sales of produce, milk or animals to others in the town. This small size makes exporting products from such operations essentially impossible and also limits/prohibits the purchase of equipment or machinery to produce high quality crops that could be exported. While this would appear to be an economic issue, it has the environmental impact of making it challenging to unfeasible for farmers to properly implement and maintain Best Agricultural Practices on these small areas or to generate revenues from the marketplace to implement environmental improvements. The development of farmer owned Cooperatives could allow "joint ventures" by groups of adjacent farms to work together to create larger farming units that could afford equipment and other inputs needed to scale-up for export markets. The farmers would still own their land but would make group decisions about production based on markets, prices and their mutual interests. Profits would be shared based on land area in the cooperative and the amount of labor and farm work provided by the cooperative member. It is suggested that cooperatives of 60-120 ha (20-40 farmers) be tried initially. The optimal size for both management and marketing will evolve with time. This model was discussed at the meeting and is being successfully implemented by some other countries in the region. This may be the only way currently available for such small farms to compete with larger operations in export markets for high value ecological agriculture products and should make it much easier to meet EU marketing and water directives/requirements.

Closing Observations

Much was accomplished in the limited time available but there was little documentation, data or record keeping that could have greatly enhanced what was learned from the project. This should be an important consideration in planning future projects. Scaling-up compost generation is important to allow ecological agriculture to move forward. More importantly, agricultural production must be scaled-up above a subsistence level so that profits can be generated from selling ecological agricultural products to export markets. Finally, composting is a Best Agricultural Practice for improving manure management but it can also provide a platform for promotion and implementation of a wide range of additional on-farm practices and management actions that will reduce agricultural nutrient pollution of local and downstream waters.

Photo 1. Demonstration composting pad in Slobozia Mare, Moldova

Photo 2: Sign stating that “manure only” is to be deposited on pad

Photo 3: Solid waste mixed with manure on pad

Photo 4: heterogeneity of manure and bedding materials requires frequent mixing

Photo 5: Burned area in compost pad apparently due to spontaneous combustion

Photo 6: Smoke from smoldering fire apparently due to spontaneous combustion from manures of different moisture contents on compost pad.

Photo 7: Kindergarten where demonstration compost garden was located.

Photo 8: Demonstration garden at Kindergarten in Autumn

Best Practices for Fertilizer Reduction from Agricultural Lands in Upper Tisza Basin, Ukraine

Project Review
Nov, 2010

Overview: This project was centered around the villages of Siltse and Zarichya in the Irsshava region of the Zakatpattya oblast of the western Ukraine. The stated objective of the project was to demonstrate cost-effective measures to reduce nutrients loads by means of proper agricultural practices using Irshavka River as an example. The project logo/slogan was "To Produce for People Without Damage to Nature".

The project was led locally by Mr. Vasyl Manivchuk with overall coordination provided at the national level by Ms. Olena Simonova. They collaborated with researchers, municipal and oblast officials, farmer groups and others to develop a large coordinated effort.

Cooperating Organizations include:

- Zakarpattya Oblast State Project-Technological Center of Protection of Soils Fertility and Quality of Production
- Association of farmers of Irshava rayon
- Village councils in Zarichya and Siltse, Irshavsky rayon, Zakarpatska Oblast
- Zakarpattya Water Management Board, Irshavsky Interrayon Department and Laboratory
- Irshava Rayon State Administration

It was clear that this was a well organized effort where each project partner understood their role and wanted cooperation with all to assure success. Based on information in their proposal, it is evident that most organizations and individuals involved in this project had worked together successfully on other projects in the past. That appears to have laid the groundwork needed to start the project quickly and conduct proposed sampling, analysis and landscape based activities in the short time period available for the project. While this review identifies questions about certain aspects of project implementation and suggests opportunities to refocus and enhance future activities, the planning, coordination and partnerships demonstrated by the project team are to be commended and should serve as a model for others. Ms. Simonova and Mr. Manivchuk did a tremendous job of coordinating and leading the project team.

The villages of Siltse and Zarichya were selected for the project because they are at the center of a developing closed hoophouse cabbage and vegetable production industry. Photo1, from the cover of their proposal, illustrates the density of the hoophouses in the villages.

Photo 1: Hoophouses for cabbage and vegetable production in Irshavsky Region

The closed end hoophouses allow the production of 2-3 crops of cabbage per year and one crop of tomatoes and peppers during the summer. The early cabbage market provides very high prices domestically compared to maturity of field grown cabbage. Farmers were quick to identify the early cabbage crop as the largest profit center for the hoophouses. However, the ability to produce three cabbage crops and one summer vegetable crop provides much more produce for market than one field grown crop at any price. Economically, this is particularly important since land redistribution left most farmers with small parcels, typically less than five hectare (ha). They estimate that about 80% of the working population of the villages are involved in the growing of early vegetables (cabbage) and that two thirds of the land area of the communities are devoted to their production (and assumed to be covered by hoophouses).

The head of the village council for Zarichya estimated that there are now some 6,000 ha covered by these hoophouses and new ones are being constructed each year. There was no indication that they were close to meeting domestic demand for the high return early cabbage so there remains a strong economic signal to expand the hoophouse industry.

While providing economic improvement, the early cabbage hoophouse industry is creating substantial impact as stated in the proposal: "*Unfortunately, trying to receive the highest possible harvests, farmers use modern fertilizers without scientific support and ecological control, which leads to high man-caused load for ground and surface waters. It is especially dangerous that they use most of all the land in the vicinity to Irshavka in riparian zone. As a result Irshavka river is heavily polluted by the nutrients. The data of surveillance monitoring showed that water quality by nutrients (nitrogen ammonium, total nitrogen, phosphates, total*

phosphorous) downstream of Siltse and Zarichya exceeds background concentrations in several times and exceed in 2 times fishery Maximum Acceptable Concentrations (MACs) for nutrients". Samples collected during the project period had total phosphorus levels of Class 3 waters and total nitrogen levels of Class 3 to 4. This was based on a water quality classification scale of 1 to 4, where 1 is "excellent" quality and 4 is "bad" quality. Clearly the waters carry excessive nutrients downstream to the Tisza and Danube rivers in addition to causing local water quality impairments. Pesticide use in hoophouse production is also becoming a concern that builds on top of concern about remaining soil contamination from chlorinated hydrocarbon pesticide use (e.g. DDT) during the communist era.

The project proposed to work with the hoophouse farmers to reduce their impacts while also working with field crop production, manure use, riparian zone issues and household waste management. The caption from Photo 2 in the proposal identified the hoophouse farms as the focus of the project.

Picture 2. Farmers green houses – target items of the project

Photo 2: Hoophouse photo with caption from proposal

The final report for the project was only available in hard copy in Ukrainian so it could not be used for this review. However, a fairly detailed 24 page summary, in English, was provided. The summary, while quite well done and very informative, appeared to have been written for field production and contained almost no information regarding hoophouse production. It also discussed riparian zone and household issues but did not have information or recommendations regarding hoophouse production. The final report, in Ukranian, was scanned

to see if there was indication of discussion of hoophouse production and management and none was evident based on tables, figures and pictures. As a result, I will initially comment upon what was discussed in the summary as it related to water quality. Subsequently, I will discuss observations and conversations regarding environmental issues associated with the expanding hoophouse industry in this region.

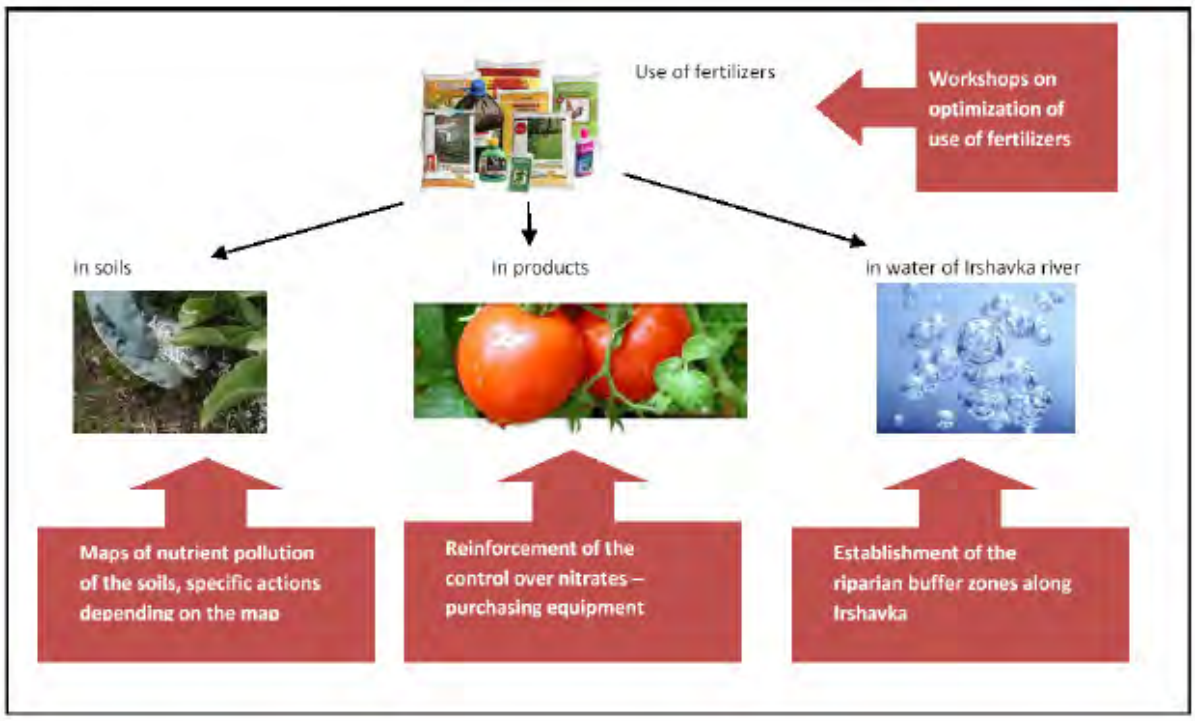
Protecting the riparian zone

In this area, it has been typical to grow crops, graze and do other agricultural and non-agricultural activities right up to the edge of the river. This project convinced local officials and landowners of the importance of protecting the riparian zone both to restore the river to a more natural state and to establish a zone to remove nutrient and sediment and discourage dumping of manures and solid wastes along the river bank. A riparian buffer, about 5m wide was established on both sides of the river by planting plum trees at its outer border along a six kilometre section of the river, making it the longest such buffer in the Ukraine (Photo 3). It is hoped that the plums will provide fruit that the landowner and townspeople can use so they will not view the buffer as unused land. It must be noted that, based on research, buffers need to be at least 10m wide to begin reaching optimal nitrogen removal rates and are frequently not highly effective at phosphorus removal. Thus, it would be inappropriate to assume removal rates in the literature associated with wider buffers. *However, gaining landowner and community support for the establishment of this buffer represents a tremendous accomplishment in a place where land is scarce and buffers have never been used.*

Photo 3. Plum trees as outer edge of 5m buffer along Irshavka River

Review of data and accomplishment Summary Report

In the Introduction, the summary report presents the graphic below to illustrate the major focal points of the work. The three items along the bottom of the graphic were included in the report and observed during the visit and are discussed below. I do not have notes or recall hearing discussion of workshops on optimizing use of fertilizers. The apparent lack of outreach to farmers/producers and the emphasis on field production rather than hoophouse production will be discussed later in this report.



Analysis of soil conditions in Zarichya and Siltse area

The majority of the report focuses on an analysis of soil conditions in the villages, with maps showing soil characteristics, nutrient levels and contaminants. The maps appear to be based on samples taken from aggregated field sub-units of the area. Analysis was done by soil scientists at the local institute using standard procedures. The results provide interesting insights into local soil conditions.

<u>Soil acidity and humus content</u>

The soils in the area are mostly slightly to moderately acid but within the range suitable for crop production. The report recommends the use of lime to maintain these conditions. Soils had low to moderate humus levels which is typical of soils of the region or this climate and native vegetation in general.

Nitrogen

Background levels of soluble nitrogen (probably nitrates) were very low in all the soils (<100ppm). This is also typical of soils in a humid climate assuming they were sampled in winter to spring before fertilizer or manure was applied. Soluble nitrogen/nitrate is highly mobile in soils and typically leaches below the root zone to the ground water over fall and winter. It then travels through the groundwater to surface waters/streams where it typically accounts for the majority of nitrates in the stream. The report provides information or recommendations in highlighted boxes called either "Good to know" or "Advice". In most cases, this would be valuable information for farmers and others to read and follow (appears to also be in Ukranian report). However, for nitrogen, the recommendations appear high for single crop outdoor production which appears to be the focus here. They recommend 100-220 kg/ha nitrogen for vegetables which may be within acceptable levels depending on the vegetable and how the fertilizer is applied. The upper end of that range would require very high management and yields and would likely result in substantial nitrogen loss without substantial economic return. Of more concern is the recommendation that 30-60 t/ha of manure be applied as a nitrogen source. The composition of the manure is not discussed in the report but, unless there is more bedding than actual manure in the material, this is likely to result in plant available nitrogen application rates of 250 to 500 kg/ha and twice that much total nitrogen, most of which will mineralize (become available) in subsequent years. Because manure composition is not discussed, it is not possible to be certain the recommended rates are too high but they raise a question that can only be answered through understanding the composition of "manure" and/or analysis of manure products in the area.

Phosphorus

The content of phosphorus (and potassium) in the soils varies widely in the area. It is interesting that there are substantial areas of "increased", high and very high soluble phosphates in the area. The high variability suggests this is likely a post-Soviet management related issue rather than a carryover from past uniform management under a collective farm. When results similar to these are observed elsewhere, it is usually found that the soils with "increased" (?), high and very high soluble phosphate have been receiving substantial manure applications for several to many years. The ratio of nitrogen to phosphorus in manure is lower than what plants need so when manure is applied to meet nitrogen needs, phosphorus is over applied. As a result, soluble soil phosphorus increases as do losses of dissolved phosphorus in runoff. While the ratio of nitrogen to phosphorus varies with different animal species, and is less problematic with cattle/cows than with pigs and poultry, application of manure from all species at nitrogen rates to meet crop needs will result in eventual overloading of the soil with phosphorus, and increased phosphorus loss to water.

Soil contamination with heavy metals

Heavy metals are not a nutrient/water quality issue but are a concern with the safety of production of crops for human consumption, particularly root crops or metal accumulators. The soils were analyzed for manganese, zinc, copper, cadmium, and lead. Only lead levels were found to be high and the data is not clear on lead. Table 1 on page 11 of the summary report indicates that lead levels are only 40% of the Maximum Admissible Concentrations, which suggests they are elevated from background but not at a level of concern. However, picture 8 on page 13 shows that most of the sampling units had very high lead levels. It is also interesting to

note that the sampling units in picture 8 tended to have either very high or background (very low) lead levels. The most likely source of the lead is from lead arsenate pesticides used during the Soviet era (which raises the question of arsenic levels). Project members suggested the lead may be coming from alluvium washed from high lead natural deposits in nearby mountains. While this may be the source, the occurrence of four "background" level sampling units suggest the source is related to human activity and agricultural management. It is likely that the four background areas either were not part of a collective farm or were being used for something that did not involve the use of lead containing pesticides (e.g. hay or pasture).

Regardless of the source, if the results in picture 8 indicate field conditions, it represents a serious human health concern, particularly for children. It would question the appropriateness of the production of root crops and make the washing and cleaning of all produce before consumption very important. Most plants do not accumulate lead in their tissue so most lead consumption results from ingestion of high lead soil particles on the food that is eaten. This is a particular issue with root crops but other crops that grow near the soil, such as cabbage, can also contain enough soil particles, when consumed to cause lead toxicity concerns. Lead accumulates in humans and has been found to cause growth, learning and health problems in children with a long exposure to high lead materials, including ingestion of lead contaminated soil. In addition to food consumption, children playing ingest about a kilogram of soil before adolescence so just the widespread presence of high lead soils where children play or work is a cause for concern.

Soil contamination with chlorinated organic pesticides

The average soil content of chlorinated organic pesticides was 217% and 270% of maximum Admissible Concentrations in Siltse and Zarichya villages, respectively. Picture 10 on page 15 shows that most fields had very high levels of chlorinated organic pesticides, most likely DDT or its degradation products. While not a nutrient/water quality issue, the high levels of DDT in soils in the area and the known stockpiles of the material discussed during the meeting (200t) are a concern to some extent for human health but are a much greater concern as a bio-accumulator in wildlife. DDT concentrations increase as we rise up the wildlife food chain with predator species at the top of the food chain suffering the greatest effects from DDT accumulation. In raptors and some fish eating birds, DDT and its derivatives cause softening of the egg shell so that reproduction is reduced or eliminated. DDT is widely acknowledged as having been responsible for the decline of raptor populations world-wide when it was widely used. While DDT is persistent in the soil, it will decompose over time. Recovery of many raptors has occurred since it was banned in many countries several decades ago. While it is known that DDT was widely used during the Soviet era, there is also some concern that its use may continue in some cases because of the large known (and suspected unknown) quantities of it in this area. It is somewhat surprising that levels have not dropped below these extremely high values if it has not been applied for 20 years. Efforts should be made to properly dispose of the stockpiles and to stop any current use that is occurring through outreach, education and "amnesty" collection programs.

Reducing soil contamination for human health and quality of products for markets

Soil contamination by lead and DDT should not stop development of a viable agricultural industry in the area but must be addressed if products are to gain acceptance in export markets. It is also vitally important to the health of the children (and adults) of the area and to the recovery of wildlife species and birds in this area affected by the high DDT levels in their food chain.

Lead levels will decrease very slowly with time and there is little that can be done to accelerate that decline. What can be done is to focus commercial and export production on crops where the above ground part is marketed and to make sure that thorough washing of all directly consumed products occurs to minimize soil remaining on product. An educational effort should be conducted among the general population to inform them of the importance of washing all produce they grow or purchase and washing their and their children's hands before meals. While limited in its practicality ("kids will be kids"), efforts should also be made to reduce direct ingestion of soil by young children.

DDT does decompose with time. The healthier the soil environment and the more vigorous the microbial activity, the more rapidly, it can be decomposed (although it is still a long process). Properly fertilized and well managed soils and crops will create conditions that favour decomposition of DDT. However, it is critical that any current use of the material be stopped as soon as possible so that recovery can begin.

Water Quality in Irshavka River

Water samples were collected and analyzed from three locations along the river from December 2009 through July 2010. The short time frame of the project limited the ability to show trends in water quality but did show how heavily polluted the river is. It would be beneficial to implement long term monitoring of the river so trends could be established and, hopefully, the effect of continued pollution control efforts can be seen in improving river water quality.

Organic pollution

The report states that the level of organic pollution is high and constantly growing. The two primary sources of organic pollution to the river are the stockpiles of organic materials, primarily manures, along the river banks. The dumping of solid waste into the river is also a concern. The other primary source of organic waste (and nutrients) into the river is the direct discharge of household wastewater/sewage into the river. The report suggests that farmers begin to manage their manure and account for its value as a fertilizer rather than having it washed away by the river over winter. They also recommend that each house create its own "cesspool" (septic rank-drainfield(?)) until such time as centralized sewer can be installed in the communities.

Nutrient pollution

During the current project, nitrogen and phosphorus were both in class 2, or "good" levels, in the river. However, earlier monitoring has shown that spring to autumn nutrient content is usually higher and is typically class 3, with some stations have class 4, "bad" nitrogen levels. The nutrient loads increase between Siltse and Zarichya and appear to be worsening over time. The project scientist attributed this primarily to the rapid expansion of the hoophouse vegetable production.

Heavy metals in the river

The river had class 1 - very good/excellent heavy metal levels except for lead which was class 2 – good. This is not unexpected and illustrates that the metals are primarily a soil contamination problem and metals on riverine sediments are likely tightly bound and unavailable.

Actions to prevent pollution of groundwater and soil
The report contains an excellent closing section (that also appears to included in the Ukranian version) titled "Instead of Conclusions: Lets reduce together water pollution in the Irshavka River" that provides basic advice and suggestions for local officials, citizens and farmers. Most encourage better home management of waste and sewage, expansion of buffers, misuse of the river to wash cars, clothes, equipment, etc and vegetable production without pollution of the river. The final offer of advice is to reconsider the situation regarding pollution of the river and think what they can do.

Observations and Recommendations:

Project Accomplishments
Observation: The project accomplished a great deal in the 10 month time period. It is clear that a well organized team exists to advance environmental restoration in this region.
Recommendations: The project team needs to continue the work begun in this project. There is also a need for a more strategic look at how they take the scientific results they have found and use them to change behaviour and to scale-up conservation implementation in the region.

Soil Pollution
Observation: Lead and DDT levels in the soils appear to be at unacceptable levels and pose a threat to the local population, particularly children and to wildlife. Additionally, production on soils as contaminated as these may be hard to get approved for export and even harder to get certified as ecologically produced should they wish to pursue that.
Recommendation: Remove and properly dispose of all DDT and stop all current use. Manage soils to optimize degradation of DDT over time. Assure careful/thorough washing of all produce and perhaps have samples analyzed for lead content to develop a database that proves the "finished" product is not contaminated with lead.

Field based agricultural production:
Observation: Vegetables are being intensively produced relative to nutrient inputs in fields as well as hoophouses. Manure is being used but may not be appropriately credited as a nutrient source in both vegetable and field crop production.
Recommendation: Implement soil and manure testing and nutrient management planning for field crop and field vegetable production.

Erosion Control
Observation: There was no discussion of erosion control for field crop production in the report. During the visit, many fields were being plowed and it was sufficiently late that they would have to be left bare over winter. This is a practice that is almost certain to create high levels of soil erosion. In addition, tillage is heavily used in the spring and the redistribution of land frequently forces farmers to plow their small area up and down the slope which also contributes to erosion.
Recommendation: While more study may be needed to determine if fall plowing can be avoided, work should be undertaken to develop production systems that do not involve fall plowing unless it is early and a winter (cover) crop is planted. Reduced tillage and leaving crop residue on the surface should be encouraged. The potential for no-till systems should be assessed. This region has some very productive soils if well managed but the observed management is likely to

lead to erosion levels that will reduce the production potential of the soils and contribute substantially to sediment and nutrient pollution.

Observation: There was little discussion of outreach activities to farmers as part of the project. A video was developed but it did not appear focused on farm production water quality issues (it was in Ukrainian).
Recommendation: Much good information and recommendations were developed during the project. It is recommended that farmer meetings and outreach activities be undertaken to raise farmer awareness of the issues and opportunities to implement practices to reduce water quality impacts. If nutrient, water and crop management recommendations are available or developed for hoophouse vegetable production as discussed below, outreach and education to these producers are critical.

Hoophouse production of cabbage and summer vegetable: A looming ecological crisis?
Observation: As is evident in Photos 1 and 2, hoophouse production has expanded exponentially in the project area during the last decade. The project proposal indicated that a major focus of the project would be on crop and nutrient management in these hoophouse production systems. While the project accomplished much in the time available, most of the information in the report and activities appear to have focused on field production and riparian zone management. While these remain important, the rapid expansion of the hoophouses critically needs attention now. The hoophouses are providing much needed economic growth to the region but represent a very intensive form of production that raises several ecological issues:

- The hoophouses use high rates of inorganic(and some organic) fertilizers and pesticides.
- Crops grown in the houses are irrigated usually with water from rivers or streams, most commonly by either "furrow" or intensive spray irrigation and runoff from the irrigation is discharged back into the river
- The combination of high nutrient loads and heavy irrigation with return flow discharge to the river makes it almost certain that high levels of nutrient discharge to the river is occurring. It is likely that pesticide loss is occurring as well.
- The hoophouses are effectively acting as expansive areas of impervious surface, just like a road or new building, but on a much grander scale. All precipitation runs off the hoophouses and enters channelized flow paths which find their way to local stream and rivers. One official suggested there were 6,000 ha of hoophouses in the two villages and another said about two thirds of the villages were now in hoop houses. While it is unknown if these two figures are consistent, either of them represents a huge increase in impermeable surface with both water quality and quantity impacts. Research has indicated that once a watershed has more than 10-20% impervious surfaces, stream hydrology is dramatically modified with higher energy water eroding landscapes and scouring streambeds. Both of these result in major increases in nutrient and sediments loads to the stream. In addition to water quality concerns, the volume of runoff water greatly increases. For each hectare of hoop houses, about 1,000 additional cubic meters will occur for each 100mm of precipitation. The project area is already prone to flooding from the surrounding mountains. The extensive hoophouses will increase the flooding locally and also have downstream effects.

Recommendations:

The economic importance of the hoophouses cannot be overlooked but they are changing the local landscape and have substantial water quality implications. They represent a return to intensive highly polluting agriculture, not movement toward a more ecologically and economically sustainable agriculture. They also lend themselves to integration and control by multi-national corporations as has occurred in many places in the livestock and poultry industry. Recommendations to address these issues include:

- Local officials, farmers and the local citizenry need to determine of continued expansion of this industry is in the best interest of them, their communities and their environment.
- Nutrient management plans need to be developed and rigorously implemented for the intensive hoophouse production
- Irrigation needs to be managed to minimize or eliminate discharge of irrigation waters. The use of drip or trickle irrigation needs to be considered to minimize water demand and eliminate discharge of irrigation water.
- Runoff retention basins and other storm water management practices need to be installed to manage the large increase in runoff resulting from the concentration of hoophouses in these two villages and elsewhere. A first step would be to inventory the number of hoophouses and their density in this region and calculate the impact on runoff and flood waters at a village and regional scale.
- Downstream water quality and quantity impacts of the hoophouses need to be estimated and preventative measures implemented

Closing comments on project

This project accomplished much in a short time frame. The discussion above regarding hoophouses needs to become a focus of future efforts but should not diminish the teamwork, degree of effort and accomplishments of this project. While there are numerous opportunities to enhance project work and impact documentation as well as the need to address the soil contamination identified by the project, the project team is to be complimented on what they have accomplished. It is hoped that they view this as the inspiration and “springboard” for further work to develop viable ecological agriculture in the western Ukraine that enhances quality of life and quality of water resources and the environment.

Appendix 8 – "Feeding the Water" article

Feeding the water

Peer-to-peer exchange in western Ukraine focuses on agricultural nutrient pollution in Tisza River Basin

By Nathan Johnson

WORKING THE LAND: A farmer tends to his fields in Zakarpattya Oblast, Ukraine. *All photos by Nathan Johnson unless otherwise indicated.*

Improper and over-use of chemical fertilisers results in a wide range of environmental problems, such as soil pollution, high nitrate concentrations in food products, and high nutrient loads into neighbouring and connected water systems. One of the key challenges in agriculture is to achieve maximum soil fertility with a minimum of environmental damage, and to make sure that good agricultural practices are in place, which are carried out consistently and over the long-term.

PEER TO PEER: The day-one plenary session in Uzhgorod, Ukraine concludes with a group photo. *Photo: Living Water Exchange*

The Living Water Exchange is a GEF/UNDP project established to promote nutrient reduction practices in the EECCA region (Eastern and Central Europe and Central Asia), implemented by the Global Environmental Technology Foundation in partnership with the Regional

Environmental Center (REC), REC Moldova, REC Caucasus and CAREC between November 2009 and December 2010. A number of demonstration projects and peer-to-peer exchanges were carried out in September and October 2010 to help facilitate this goal. The results of one such project, titled 'Best Practices of Fertilizers Reduction from Agricultural Lands in the Upper Tisza Basin, Ukraine', were discussed during a lively, informative peer-to-peer exchange October 25-28 in Uzhgorod, Ukraine. Approximately 35 participants - hailing from Ukraine, Moldova, Kazakhstan, Russia, Turkmenistan and elsewhere - also had the opportunity to make site visits in west Zarkarpattya Oblast to see what the project team has accomplished thus far.

Wholesale change

MAPPING THE PROBLEM: Pollution takes on a cumulative effect in riparian regions.

Agricultural reform carried out in Ukraine from 1999-2001 resulted in monumental changes, the most significant of which was the breaking up of 140 collective farms into an estimated 140,000 much smaller, independently operated farms. This signalled a shift away from some of the more impractical and environmentally unsound practices carried out under the Soviet Union's 'command economy', but has also led to widely inconsistent farming practices, due partly to differences in resources and access to equipment, and also because of the difficulty of disseminating information and knowledge required for best practices on a reliably consistent and widespread level.

Peter Whalley from the Living Water Exchange, in his opening remarks during the first day's plenary session, stated that there are now, globally, some 500 million farmers working on two hectares or less of land, and stressed the importance of hearing stories of local practices, of "how things are applied in your region."

ON TO THE DANUBE: The Tisza River, shown here at marking the Ukraine-Hungary border, joins the Danube in Serbia.

In order to help illustrate the problems at hand from a regional point of view, Whalley explained the impact of nutrient pollution on the Black Sea. Nutrient influx from major rivers, including the Danube and Dniestr (which are themselves fed from many other rivers, including the Tisza), has resulted in severe eutrophication in parts of the Black Sea, most notably at and near the river mouths. Eutrophication depletes the water of oxygen and severely depletes plant and animal life in affected areas. The gravity of the problem in recent years is made clear by the documented rise in episodes of coastal hypoxia (reduced dissolved oxygen content in a body of water) at points along the Black Sea shoreline. There were 60 reported cases of hypoxia worldwide in 1969; the

number climbed to 275 in 1989, and rose to above 500 during the 1990s. And these are likely gross underestimates, Whalley suggests. The overall effect is to undermine the resilience of these marine and coastal ecosystems, affecting in turn their ability to support coastal livelihoods such as fishing and tourism.

To illustrate the problem of coastal hypoxia on a global scale, Whalley showed comparative graphics from the 1960s and the 1990s, clearly demonstrating that the areas affected are growing in number and intensity. (Areas where the problem is most acute are Japan, Northern Europe, and the United States' Atlantic, Pacific and Gulf coasts.) Such examples can help us to understand the transboundary nature of many types of pollution, and this is made abundantly clear in the case of river pollution.

VISION OF THE FUTURE: A pilot project poster titled "Growth for People without Harm to Nature" adorns the wall of a village council building in Siltse, Ukraine. Assessments conducted by the International Commission for the Protection of the Danube have established that 410 kilotonnes of inorganic nitrogen is deposited each year into the Danube River. Obviously, pollution takes on a cumulative effect in riparian systems, thus rivers are most severely polluted at points furthest downstream. Concerning the Danube in particular, Europe's political and economic history has resulted in a situation in which richer, more developed countries are located furthest upstream; and where pollution in general is concerned, Whalley's assertion that "rich countries are some of the worst offenders" certainly holds true for the Danube River Basin.

SHARING BEST PRACTICES: Eduard Osiyskiy, Head of Department of Complex Use of Water Resources, Zakarpattya Water Management Board (right), shows Peter Whalley a line of plum trees planted along the Irshava River.
In an attempt to prevent destructive modes of economic development, the GEF has invested roughly USD 100 million in the Danube-Black Sea region. On one hand, effective policy has to be implemented in 'upstream' countries to limit the amount of damage eventually caused elsewhere. (The panel spent some time here discussing phosphate pollution from washing detergents, and various approaches to addressing this problem.) On the other hand, countries further downstream are presently ill equipped to effectively monitor water pollution, and are not suitably trained and informed about ways to reduce their own contribution to the problem.

According to Whalley, some of the main challenges in tackling nitrate pollution from agricultural practices in Zakarpattya Oblast - and in this case, Irshava Rayon - include: lack of baseline data,

difficulty in balancing economic development and pollution reduction efforts, local actors not understanding the costs involved, and a general tendency of resistance to innovation.
Mariya Skobley, addressing conference delegates on behalf of the Zakarpattya Ecological Inspection, talked about some of the local challenges in effectively monitoring water pollution, emphasising that most of the problems are financial. Skobley said that of the Oblast's 20 water treatment facilities, six are nearly useless. Furthermore, there is just one laboratory facility in Zakarpattya that is accredited for organic analysis.

The city of Uzhgorod's current water-treatment capacity is roughly 60 percent of what it should be, said Skobley. The general approach for the time being is not to upgrade the quality of treatment currently taking place, but to increase the percentage of water treated. Meanwhile, there is a development initiative in place in Zakarpattya Oblast, one purpose of which is to ban new construction of polluting facilities without treatment capacity, according to Skobley.

Linked activities

Diana Heilmann from the ICDPR spoke about her organisation's cooperative wide-scale efforts with UNDP/GEF to address water management issues in the Tisza River Basin. A memorandum of understanding toward an integrated approach between the five Tisza countries was signed in 2004, and by the end of 2007, the ICPDR Tisza Group had produced a detailed analysis report, which resulted in the very recent development of the Tisza River Basin Management Plan.

Heilmann listed several serious water-related problems affecting the Tisza River Basin - in addition to nutrient pollution - such as organic pollution, hazardous substances pollution, hydro-morphological alterations, and pressures due to extreme water-quality fluctuations brought on by floods, drought, climate change and other phenomena.

Regarding nutrient pollution, Heilmann explained that the ICPDR's goal is to achieve balanced management of nutrient emission via point- and diffuse sources over the total area of the Tisza River Basin, so that the waters in the basin itself, along with those of the Danube River Basin and the Black Sea (through contact with the Tisza) are free from threats and impacts of eutrophication.

TAKING ROOT: Some 750 plum trees have been planted along a 6km stretch of the Irshava.

In order to move towards this goal, a number of measures and objectives are in place (with 2015 as the target year) that apply to EU member states and non-member states alike, such as: reducing the total amount of nutrients entering the Tisza and its tributaries to levels consistent with the achievement of 'good' ecological/chemical status; reducing discharged nutrient loads in the Black Sea Basin to levels permitting Black Sea ecosystems to recover to conditions observed in the 1960s; reducing phosphates in detergents; implementing management objectives described for organic pollution, with additional

focus on reducing nutrient point-source emissions; implementing best environmental practices in agriculture to reduce non-point source nutrient pollution; and, defining basin-wide, sub-basin and/or national quantitative reduction targets.

There are, in addition, additional requirements that EU member states must fulfil towards achieving management plan objectives. Perfect results will likely prove elusive, Heilmann concluded: "Total nitrogen reduction goals for the Tisza Basin will probably not be met, as various scenarios point to a strong potential for an increase of total nitrogen emissions."

On the other hand, a phosphate ban for detergent products could go far towards achieving phosphorous reduction goals, Heilmann added. "This is a relatively cost-effective and easy-to-implement measure, and could be one of the first solutions realised," she said. "Of course, it will be necessary to implement other measures, and especially to improve wastewater treatment capacity."

A 'systems' approach

"Good soil is critical to good growth, but good practice involves limiting soil nutrient loss from getting good growth," argues Tom Simpson, executive director of US-based Water Stewardship, Inc. In tackling the problem of agricultural nutrient pollution, Simpson advocates a 'systems-based' approach, which is essentially the opposite of an 'all eggs in one basket' approach. In focusing attention on several areas of concern, a systems-based approach can be successful in one or several areas, even if other areas yield disappointing results.

UNDER COVER: Hothouses, used mostly to grow cabbages, tomatoes and peppers, are common sights in Zakarpattya's many rural villages.

Simpson demonstrated one example of such an approach, broken down in to four steps: 1) develop a water-quality protection programme for the entire catchment system in question; 2) make sure that the plan identifies best-management practices (BMPs) and matches them with key information points; 3) ensure that the plan is time-based and cost-effective; and, 4) operate and maintain the programme over the long-term. Also important, Simpson added, is to have specific goals and targets in mind, rather than vague injunctions to 'improve'.

A plan can also be viewed in a cyclical way, Simpson explained: assess the problem, design a plan to solve the problem(s), implement the plan, monitor progress along the way, evaluate results, and make adjustments as needed. Too little attention is paid to some or many of these steps, Simpson said, and there is too often a tendency to make 'adjustments' to plans or programmes without having carried out sufficient levels of evaluation, monitoring, or even implementation.

LOCAL INPUT: Officials from the project area convene at the event's day-two plenary in Siltse.

Finally, the Water Stewardship director provided one graphic example of how the drive for maximum crop yield can create unnecessarily high levels of nutrient pollution. One line plotted on a graph showed how the application of fertilisers increases crop yield significantly, but only up to a point, after which the line rises slightly before flattening; another line shows nitrate loss depending on fertiliser application. There is point just beyond maximum crop yield at which nitrate loss spikes sharply. Simpson then traced three successive vertical lines indicating an 'ecological optimum', the 'recommended' level of fertiliser application (as practiced typically in the United States), and actual 'practice'. In other words the graph clearly demonstrates that the slight increase in crop yield obtained at the 'practice' level comes at significant environmental cost in terms of much greater nutrient loss. Thus, over the long term, farmers should be applying fertilisers at the 'ecological optimum', and not at what are typically recommended or even higher levels.
The day-one plenary session continued with more presentations, and concluded with a spirited Q&A session, with participants sharing local experiences and discussing at length some of the key issues. Much of the following discussion concerned methods of irrigation and the phosphorous-related hazards resulting from overuse of manure fertilisers.

Getting out of doors

Participants boarded a chartered bus on day two of the event for an opportunity to visit project pilot sites in the villages of Siltse and Batar. With local elections looming, the Siltse community cultural centre was closed for voter registration, so a welcome lunch, hosted by Irshava regional administrative authorities, and discussion took place in a hall above a nearby cafe. General tasks and project goals were presented by Vasyl Manivchuk, and other speakers addressed such topics as: nutrient reduction in soils, fertility mapping and advice for farmers, the importance of establishing riparian zones, and obtaining and using nitrate-measuring devices.

BIO-PRODUCTION: This juice factory in Zakarpattya uses organic farm products.

What followed was a description of the Ukraine pilot project's main achievements. First, a riparian protective zone was established along the Irshava River by means of planting 750 plumb trees, making it the longest such 'alley' in Zakarpattya Oblast, at some 6 kilometres in length. Second, nitrate measuring devices were obtained for village councils, and a sanitary-epidemiological service was placed in charge quality control of agricultural products, having been trained in the proper use of measuring devices. Third, organic fertilisers were introduced in Zakarpattya through a vermiculture programme. Fourth, a 'Strategy of Nutrient Reduction' was developed for the villages of Siltse and Zarichya, which includes chemical analysis of water in rivers and soils, relevant maps detailing soil pollution and soil fertility, and specific recommendations on fertiliser to be used in certain conditions. Finally, a high-profile public-awareness campaign was carried out, which included a drawing competition for children, a 'find the fruit grown with fewest fertilisers' competition, joint tree-planting activities, and more.

After the project presentation, the group then got to see for itself a section of the riparian zone created under the pilot project. Plum trees had been planted near the river bank, and team member showed where flood barriers had been constructed at other points. The project campaign's public awareness-raising poster was also on display on the wall of the cultural centre.

PURELY DELICIOUS: Pan-Eco's bio apple juice and bio jam selection were big hits with event participants. The following leg of the journey passed through several rural villages, many of which featured a profusion of hothouses growing both tomatoes and peppers. After an opportunity to stretch the legs where the Tisza flows beneath a bridge at the Ukraine/Hungary border, event participants then visited an organic mangalica pig farm (the farmer sells his products almost exclusively to restaurants). The next destination was a bio jam- and juice-processing plant. After touring the plant and viewing a film about the pilot project, a lavish dinner of delicious local products was served, with local musicians and dancers on hand to provide a radiant sparkle of country hospitality and generosity.

Deserving of special thanks is Pilot Project Manager Olena Marushevska for her indefatigable energy in helping to organise, translate and assist with all facets of this important and memorable learning and social experience.

Appendix 9 – List of Organizations Contacted

International Commission for the Protection of the Danube River

European Environment Agency

the Director General, Environment -European Commission

the U.S. Environmental Protection Agency Hypoxia team, the Gulf of Mexico/Mississippi River Basin Nutrient Task Force

the Farm Pilot Project Coordination Office

the Natural Resources Conservation Service, USDA

the National Institute of Food and Agriculture, USDA

the Office of Ecosystem Markets, USDA

the Colonial Soil and Water Conservation District

the Conservation Technology and Information Center

the Iowa Soybean Association

the Virginia Agri-business Council

Cargill

Smithfield Foods

Bulgarian Platform for International Development

Fora Foundation

Centre for Inclusive Education

The Management Center

People in Need

FoRS -Czech Forum for Development Cooperation

Hungarian Volunteer Sending Foundation HVSF

Latvian Adult Education Association

NGO DIA+LOGS

Global Initiative on Psychiatry

Lithuanian Kolping Society

CAMYouths

Centre for Citizenship Education

Zagranica Group

PATRIR

FDSC

Fundatia Pro WOMEN

Pontis Foundation

African Centre of Slovenia

Ekvilib Institute

HORIZONT3000

Light for the World

Polish Humanitarian Action

Ekumenicka Akademie Praha

European Perspectives

Terre des hommes Foundations “Lausanne” in Hungary

Lithuanian Kolping Society / LITDEA

KOPIN

CSDF

Centre for Inclusive Education

Bulgarian Platform for International Development

The Management Centre of the Mediterranean

Prague Global Policy Institute – Glopolis

Společnost pro Fair Trade (SFT)

Eesti People to People

Estonian Roundtable for Development Cooperation (AKÜ)

Anthropolis Association

Foundation for Development of Democratic Rights (DemNet Hungary)

LAPAS

LITDEA

One World Association

Institute of Global Responsibility

World Vision Romania Foundation

Slovak NGDO Platform

HUMANITAS / Sloga

Ministry of Agriculture, Forestry and Water Management, Serbia

Ministry of Environment and Spatial Planning Republic, Serbia

General Directorate of Afforestation and Erosion Control, Turkey

Embassy of Sweden for Serbia and for Montenegro, Development Programme Section (SIDA)

Regional Rural Development Standing Working Group (SWG) in SEE, Macedonia

Republic Hydrometeorological Service of the Republic of Serbia

Centre for Agriculture, Food and Rural Affairs, Croatia

World Bank, Romania

Institute for Animal Husbandry, Serbia

Shadownet, Serbia

Drago Project

Agency for Environmental Protection, Serbia

Budapest University of Technology and Economics, Hungary

Ministry of Agriculture, fisheries and Rural Development, Croatia

UNEP/MAP GEF Strategic Partnership for the Mediterranean Sea Large Marine Ecosystem (MedPartnership), Greece

USAID Agribusiness Project, Serbia Institute of Field and Vegetable Crops, Serbia

Public Water Management Company “Srbijavode”, Serbia

Local Agenda 21 for Kostolac – Municipality, Serbia

Federal Ministry for Agriculture and Forestry, Austria

South-Transdanubian Environmental Protection and Water Management Directorate, Hungary

World Bank, Serbia

General Directorate of Afforestation and Erosion Control, Turkey

Euroconsult Mott MacDonald, Serbia

Agency for Watershed of Adriatic Sea, Bosnia and Herzegovina

European Bank for Reconstruction and Development (EBRD), United Kingdom

Environmental Institute - Sava RBM Plan Project, Croatia

Embassy of the Kingdom of the Netherlands

University of Novi Sad Faculty of Sciences, Department of Chemistry, Biochemistry and Environmental Protection, Serbia

Soil Science Institute, Serbia

Provincial Secretariat of Environmental Protection and Sustainable Development, Serbia

Institute of Public Health “Dr. Milan Jovanovic Batut”, Serbia

Ministry of Waters, Forests and Environmental Protection, Romania

Center for Ecology and Sustainable Development (CEKOR), Serbia

Public Water Management Company “Srbijavode”, Serbia

Sava River Watershed Agency, Bosnia and Herzegovina

"Vode Vojvodine"

Embassy of Romania in Belgrade

Serbian Government

Institute for water management “Jaroslav Cerni”

Directorate for Development of Vrbas, Serbia

German Embassy Belgrade

Ministry of Spatial Planning and Environment, Montenegro

Local Development Initative, Bosnia and Herzegovina

SAFEGE

Tisza Group

UCEF

Wildlfe Habitat Council

Japan Water Forum

Chesapeake Bay Foundation

Environmental Footprint

Regional Environmental Center (REC)

Tennessee Valley Authority (TVA)

Environmental Network

Ding Darling Wildlife Refuge

Echo

Resources for the Future

University of Minnesota College of Natural Resources

6 Mile Cypress Park

Appendix 10 – Indicators

Output	Process Indicator	Outcome/Impact
1 a) Project information identified and captured	Comprehensive search and capture of CEE GEF and non-GEF NR projects	38 nutrient relevant projects captured
1 b) Analysis of project information	Thorough analysis of project documents, original surveys and in-depth interviews with a variety of practitioners and stakeholders	Completed 23 interviews[41]; held one-on-one meetings and discussions with other select GEF project managers in the region and key global agribusiness organizations
1 c) In-depth interviews and other experiences	Effectively structured interviews and surveys	Interviews and ongoing outreach to GEF project managers complete
1 d) Good nutrient reduction practices criteria and categories developed	Comprehensive review of key nutrient reduction project attributes, published guidelines on good practices, published and original needs assessments Development of set of clear and concise criteria for nutrient reduction practice Definition of at least 20 nutrient reduction best practices categories	Criteria and 20 categories developed
2 a) Selection of good nutrient reduction practices and lessons learned	Review of project and experiences by a review team of experts, using criteria developed for each subject area, as well as a transparent and uniform selection process	138 practices identified and analyzed
2 b) Selection of at least two countries for the site of the replication pilot projects	Identification of country specific institutional capacity, needs and potential for replication of successful GEF nutrient reduction projects	Selection of four demonstration with low cost intervention strategies

[41] Other projects did not provide information, largely due to the nascent or ongoing nature of the project and the lack of available information with relevance to nutrient related issues.

Output	Process Indicator	Outcome/Impact
2 c) Implementation of at least two replication pilot projects focused on agriculture practices and wetlands	1. Peer-to-peer knowledge transfer among peers from demonstration countries and targeted countries 2. Planning with targeted country officials to implement the replication projects 3. Identification and engagement of business community, trade associations, individual facilities, and opinion-leader businesses focused within specific industry sectors relevant to nutrient reduction, as well as selected other relevant key stakeholders	Four demonstration with low cost intervention strategies (i.e., manure management, constructed wetland, best agricultural practices, etc.) completed Peer-to-peer exchanges held at the four sites resulting in commitments to further cooperation, capacity building, project sustainability and practice transfer Follow-up ministerial meeting to discuss capacity building and nutrient pollution solutions to be held on January 26, 2011
3 a) Nutrient reduction good practices, lessons learned, and successful replication strategies, including policy reforms and mainstreaming activities, summarized and disseminated via IW:LEARN, RBEC-COP, Water Wiki and Russian-English printed materials	1. Capture of input from IW practitioners and stakeholders in surveys and interviews 2. Development of website and all materials in English and Russian	Web site completed (http://nutrient-bestpractices.iwlearn.org/) containing a database of practices from GEF projects in the region, links and other information, including a practice database from the European Commission Director General Environment and other select organizations, See Appendix 9 for a list of organizations
3 b) Ongoing interactive dialogue among practitioners and decision makers	1. Active discussions regarding nutrient reduction issues and practices in RBEC-COP and on Water Wiki 2. Project participation in a World Bank Regional Nutrient Reduction	Presentation on October 6, 2010 at the GEF/WB Danube River Enterprise Pollution Reduction project regional conference in Belgrade, Republic of Serbia Linked to GEF/World Bank Investment Fund presentations Promoting practice transfer

Output	Process Indicator	Outcome/Impact
	Conference	among projects (i.e., N injection from the GEF/WB Anatolia Watershed Rehabilitation project
3 c) Project information disseminated at IWC5	Dissemination of nutrient reduction good practices, lessons learned, and successful NR strategies at IWC5	IWC plenary and work shop held to discuss information needs and interest in cooperation and replication with other GEF project managers from Central and Eastern Europe

Appendix 11 – The PIR Summary

The PIR notes that:

- "The project is well advancing in its implementation with no major delays and was able to deliver several significant outputs in accordance with the work plan and budget."
- "Some risks have emerged during project implementation: 1) Modifying inventory analysis to a broader range of projects in the region; 2) Non-responsive nature of some GEF project managers; and, 3) Slow implementation of the database of projects and practices by IWLEARN. Mitigating the these risks focuses on more specific and aggressive outreach to project managers, country representatives and others in the region to better understand analysis and impact each project and practice. This could also be strengthening the project by including more projects in the inventory. IWLEARN has changed project managers again at the project level so it continues to be challenging to implement and complete the database. These risks likely are not critical and can be addressed prior to projection termination."
- "Project team members attended key stakeholder meetings in the region including: 1)A workshop and presentation at the International Waters Conference in October 2009; 2) The ICPDR Consultation Meeting on Financing Danube River Basin Management Plan - Joint Programme of Measures in May 2010; 3) one pager fact sheets distributed to the ICPDR and IWC; 4) Implementing an awareness raising campaign with the help of Kamez Municipality, Albania to inform the inhabitants around the river and the farmers about the practices they should use to stop fertilizers from entering streams flowing into the river; 5) Held stakeholder workshops on the value of constructed wetlands and best agricultural practices; 6) Held three meetings with the local population from Slobozia Mare, Moldova organized with the help of project partner Mayoralty Slobozia Mare, which assured the attendance of local population, local Council members as well as attendance of pupils from "lyceum, v. Slobozia Mare;" 7) Held four best agricultural practice training session in Cahul town for local farmers, representatives of Agricultural Department from Cahul District Council, representatives of mayoralty Slobozia Mare, ECC Cahul volunteers and others based on curricula developed by the REC Moldova. Key themes discussed included the following: a) types of agricultural systems, biodiversity ensuring ecosystem protection; b) agriculture and water, soil, air, biodiversity, pesticides; c) pollutant agriculture; d) techniques for appropriate fertilizers applications; e) ecological solutions for pollution reduction; and f) manure composting and the correct use of the compost as fertilizer; 8) Held five ecological lessons with local schools using curricula developed and demonstrated by the first session; 9) Building a manure platform to compost manure from local livestock operations for use on area farms; 10) Presented project achievements of the Ukrainian demonstration at UNDP GEF workshop "Integrating land and water management to reduce impacts of floods and droughts on water status in the Tisza River Basin District" (Szolnok, Hungary 26-27th of April, 2010); 11) Published two articles in the regional Ukrainian newspaper "Nove zhyttya;" 12) Developed numerous leaflets and brochures associated with the demonstrations to be handed out at work shops; and 13) Provided a presentation to the GEF Science and Technical Advisory Panel meeting on addressing hypoxia in June 2010."

- Between April 2010 and July 2010, the nutrient web site had 12251 hits. The most popular pages were:
  1. /nutrient-reduction-practices/nutrient-reduction-challenges
  2. /nutrient-reduction-practices/demonstration-projects
  3. /nutrient-reduction-practices/eu-database-of-practices
  4. /nutrient-reduction-practices/project-overview

Appendix 12 – Baltic Nutrient Trading Example

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

Appendix 13 – Notes and Outcomes from Living Water Exchange Peer-to-Peer Exchange meetings

LIVING WATER EXCHANGE

Meeting Minutes and Outcomes

Living Water Exchange Peer-to-Peer Exchange

Chisinau, Moldova

September 7-10, 2010

Objectives

The goals of the exchange include:

- Showcasing on-the-ground, innovative nutrient reduction best practices from our demonstrations, which build on and link to previous GEF investments;
- Developing and adopting successful replication strategies in key countries in the region;
- Bringing together in a direct exchange of information among key policymakers, practitioners and potential sources of nutrient reduction funding that will help to build capacity and facilitate replication of nutrient reduction practices; and,
- Creating a new value proposition for agriculture across Central and Eastern Europe and Central Asia.

Attendees:

Please see attend list attached.

Initial Commitments:

The following are the initial commitments from stakeholders:

- There was interest by the Millennium Challenge Corporation (MCC) to facilitate connections with technical proposal winners to replicate practices throughout Moldova, and help with social mobilization on Central Irrigation Systems tasks under the MCC Compact that could offer a path to demonstration sustainability.
- The Ganja Agribusiness Association (from Azerbaijan) will provide further information on manure handling and platforms and in turn is interested in the ecological lessons from the Moldova demonstration.
- Government participants from Armenia, Azerbaijan and Georgia committed to exploring a regional transboundary project focusing on an integrated approach to nutrient reduction and will develop a table of common interest as a first step. Chuck Chaitovitz will reach out to the GEF Secretariat and USAID to discuss interest.

UNDP GEF IW LEARN REGIONAL ENVIRONMENTAL CENTER

- The Federation of Agricultural Associations from Armenia has a cooperative based model that could assist in reaching farmers in the region, meeting a critical outreach need for organizations such as the ICPDR and offering a possible approach to bring small farmers to scale to meet economic and environmental goals. They also met with the farmer association from Moldova subsequent to our session to promote further cooperation.

Meeting Minutes

10.00-10.20 Opening by Chuck Chaitovitz, Project Manager, and by the representative of the host country's Ministry of Water, Environment/Agriculture

Chuck Chaitovitz, Principal, Global Environment & Technology Foundation – I am with the Global Environment & Technology Foundation – a small NGO dedicated to building the infrastructure for sustainable development. GETF is managing a $60 million partnership between the Coca-Cola Company and USAID to bring clean drinking water to more than 2 million people across Africa by 2015.

I am so pleased and humbled to be here in Chisinau with you to share experiences and build capacity to scale-up and replicate nutrient reduction best practices in Moldova and throughout the region.

We will go around the room; please introduce your selves and provide your expectations and interest in the session today.

Lurie Senic, Ministry of Agriculture of Moldova – We must address nutrient reduction in the most polluted areas. The ministry sometimes thinks it may be greatest polluter. These projects are important to nutrient reduction.

When we look deeper into details, we are so proud of what Moldova is doing regarding reduction of various pollutants over the last four years.

Ecological farming is a great alternative to traditional methods that are danger of adding to pollution issues. We are drafting legal documents and by now there is approximately 32,000 hectares in compliance with environmentally certified requirements for organic farming. There is fruitful cooperation between agricultural specialists and the government. We have made 7 million to 10 million MDL improvements in the agricultural area, including harmonization of legislation for agriculture and application of various fertilizers and chemicals.

Dr. Tom Simpson, Executive Director, Water Stewardship, Inc. – I am an agronomist and soil scientist by training but have been involved in water quality improvement from urban and farm sources, largely in the Chesapeake Bay region.

Nutrient pollution from all sources is one of major challenges across the globe as our water supply becomes tighter, and the need clean water grows.

Bob Herbst, Co-Founder, GETF – Water is the most important of resources – both issues of quality and quantity. I was the youngest commissioner of the Department of Natural Resources in Minnesota where I managed 14,231 lakes. I was Assistant Secretary for Parks at the U.S. Department of Interior where we managed 700 million acres in water resources and land. I was Chairman of Great Lakes Fisheries Commission responsible for restoration of the Great Lakes, and the Washington Representative for the Tennessee Valley Authority. I was U.S. representative to the Regional Environmental Center for Central and Eastern Europe. Finally, I have a 2,000 acre ranch in Nebraska where we have tree buffers, clean fences keeping cattle from the streams. So we are implementing these straight forward practices. I am glad to be here.

Viorel Gherciu, Country Coordinator, European Commission, FAO Food Security Programme – Our organization is promoting good agricultural practices. We have experiences from our producers in using non polluting approaches. We developed a UNEP report for agricultural organizations in Moldova. We are promoting citizens action in biodiversity and conservation, and organic agriculture in the schools.

I am also worked with NGOs in Moldova where our main goal is environmental education. We did projects in this issue.

Sergiu Budesteanu, Environmental and Social Assessment, Millennium Challenge Account Moldova – One of the important elements is transition to organic agriculture. We are working on river basin management and irrigation systems issues and are interested what practices already applied in Moldova.

Radio MD – We focus on environmental issues, and are looking forward to the meeting.

Sergiu Scobioala NGO "Eco – Tur"– International and joining mostly related

Lozinschi Stefan, NGO "Eco – terra"

Vitalie Cimpoies, Executive Director, Public Association of Cutezatorul – For quite a number of years we have been working in nutrient reduction. We have certain experiences in the Danube Regional Project. We are working cooperatively with Romania on protection in Danube and Prut rivers.

Dr. Victor Cotruta, Regional Environmental Center, Moldova – We are a partner in the Living Water Exchange We implement a lot of projects in this field.

Gulnar Surmanidze, NGO – Black Sea EcoAcademy Georgia

Khatuna Chikviladze, Ministry of Environment, Republic of Georgia – We are working on an environmental protection strategy, including water quality and quantity issues.

There are two key points of interest:

1. Access to chemists who understand science and policy

2. BMPs may offer some understanding of how you solved different projects and addressed nutrient reduction is essential

Dr. Edgar Pirumyan, Deputy Head, Water Resources Management Agency, Ministry of Nature Protection, Republic of Armenia – I am head of Water Resources Agency involved in implementation of river basin management. We are standardizing policy on water resources to harmonize with the EU Water Framework Directive. We are also dealing with policy on monitoring based on the WFD. We are drafting legal documents and acts in this area.

I am interested in sharing experiences in water management area and control of nutrients.

Tigran Hakhnaazaryan, Project Coordinator, Federation of Agricultural Associations – We are working with farmer organizations focused on sustainable farming. We are very interested in addressing farming practices.

I am also representing REC Caucuses, which is working with all countries to collaborate on environmental issues.

I wanted to inform you of an International Agricultural Research project, which has 12 indicators including social and economic aspects.

We must address at the farm level and work to identify ways of resolving problems.

Rashad Mammadov, Environmental National Monitoring Department, Ministry of Ecology and Natural Resources Azerbaijan – I am working with analysis of surface waters. We are working with special equipment to address pollution issues in all areas.

Vugar Babayev, The Ganja Agribusiness Association, Azerbaijan – We represent the agri-business sector in Azerbaijan. I am happy to see friends and partners here today. I am looking forward to new knowledge for new opportunities for cooperation.

Artur Nebunu, Director, Eco Counseling Center Cahul – I would like to greet all our guests here today. I am manager of the demonstration pilot in Cahul. I am director of Environment in Center.

Carastan Valentina, Mayor of Slobozia Mare village – This is an important project. We are very keen of BMPs sharing, especially in rural areas.

Stirbet Silvia, Mayor of Valeni –We are neighbors on the bank of the Prut River.

Maria, Mayor's office Slobozia Mare village – I look forward to seeing you in our village tomorrow.

Sergiu Mariceanu, Deputy Mayor – I focus on environment problems.

Nicoli, farmer, Slobozia Mare village

10.15- 10.45 Introduction - Goals of the workshop, outline of session, project objectives and project results to frame the day (by Chuck Chaitovitz, Project Manager)

See power point presentation on Living Water Exchange overview

Questions/answers

Vugar Babayev – Will you be sharing the contacts and presentations from today?

Chuck – Yes.

10.45-11.10 Nutrient Reduction challenges in the Region/Country – by a Ministerial representative

Lurie Senic, Ministry of Agriculture – We are developing an underlying legal framework.

It is prohibited to apply mineral fertilizer and chemicals since these chemicals for protection of the plants and soil are consistent with the compliance with goals of the EU Water Framework Directive

The policy itself has two precise goals: 1) qualitative; and 2) quantitative measures.

We have a 2005 law on agriculture production and environmental performance drafted and approved; we have rules on environmental management approved.

In 2008 the EU introduced amendments, which are not just regulatory.

We must ask "Is a practice that is very successful?"

The registration and process for accounting for farmers is difficult.

We have the book of history of the fields, which are resultant from Soviet Union era requirements. It has the signatures of people involved.

We must have facilitates in helping to raise the harvest at the end of the day. The EU is improving registration and procedures to obtain data on the fields and agriculture at the country-level. It is important to farmers to have all outcomes of the fields and history of actions. The Ministry of Agriculture must register individual farmers in order to obtain better results in area of agriculture.

We have only five specialists working to his or her duties to implement environmental regulatory rules.

Yields are growing and 35,000 hectares are certified. Subsidies of ecological production:

1. 1.6% of share of ecological

LIVING WATER EXCHANGE

Meeting Minutes and Outcomes

Living Water Exchange Peer-to-Peer Exchange

Chisinau, Moldova

September 7-10, 2010

Objectives

The goals of the exchange include:

- Showcasing on-the-ground, innovative nutrient reduction best practices from our demonstrations, which build on and link to previous GEF investments;
- Developing and adopting successful replication strategies in key countries in the region;
- Bringing together in a direct exchange of information among key policymakers, practitioners and potential sources of nutrient reduction funding that will help to build capacity and facilitate replication of nutrient reduction practices; and,
- Creating a new value proposition for agriculture across Central and Eastern Europe and Central Asia.

Attendees:

Please see attend list attached.

Initial Commitments:

The following are the initial commitments from stakeholders:

- There was interest by the Millennium Challenge Corporation (MCC) to facilitate connections with technical proposal winners to replicate practices throughout Moldova, and help with social mobilization on Central Irrigation Systems tasks under the MCC Compact that could offer a path to demonstration sustainability.
- The Ganja Agribusiness Association (from Azerbaijan) will provide further information on manure handling and platforms and in turn is interested in the ecological lessons from the Moldova demonstration.
- Government participants from Armenia, Azerbaijan and Georgia committed to exploring a regional transboundary project focusing on an integrated approach to nutrient reduction and will develop a table of common interest as a first step. Chuck Chaitovitz will reach out to the GEF Secretariat and USAID to discuss interest.

- The Federation of Agricultural Associations from Armenia has a cooperative based model that could assist in reaching farmers in the region, meeting a critical outreach need for organizations such as the ICPDR and offering a possible approach to bring small farmers to scale to meet economic and environmental goals. They also met with the farmer association from Moldova subsequent to our session to promote further cooperation.

Meeting Minutes

10.00-10.20 Opening by Chuck Chaitovitz, Project Manager, and by the representative of the host country's Ministry of Water, Environment/Agriculture

Chuck Chaitovitz, Principal, Global Environment & Technology Foundation – I am with the Global Environment & Technology Foundation – a small NGO dedicated to building the infrastructure for sustainable development. GETF is managing a $60 million partnership between the Coca-Cola Company and USAID to bring clean drinking water to more than 2 million people across Africa by 2015.

I am so pleased and humbled to be here in Chisinau with you to share experiences and build capacity to scale-up and replicate nutrient reduction best practices in Moldova and throughout the region.

We will go around the room; please introduce your selves and provide your expectations and interest in the session today.

Lurie Senic, Ministry of Agriculture of Moldova – We must address nutrient reduction in the most polluted areas. The ministry sometimes thinks it may be greatest polluter. These projects are important to nutrient reduction.

When we look deeper into details, we are so proud of what Moldova is doing regarding reduction of various pollutants over the last four years.

Ecological farming is a great alternative to traditional methods that are danger of adding to pollution issues. We are drafting legal documents and by now there is approximately 32,000 hectares in compliance with environmentally certified requirements for organic farming. There is fruitful cooperation between agricultural specialists and the government. We have made 7 million to 10 million MDL improvements in the agricultural area, including harmonization of legislation for agriculture and application of various fertilizers and chemicals.

Dr. Tom Simpson, Executive Director, Water Stewardship, Inc. – I am an agronomist and soil scientist by training but have been involved in water quality improvement from urban and farm sources, largely in the Chesapeake Bay region.

Nutrient pollution from all sources is one of major challenges across the globe as our water supply becomes tighter, and the need clean water grows.

Bob Herbst, Co-Founder, GETF – Water is the most important of resources – both issues of quality and quantity. I was the youngest commissioner of the Department of Natural Resources in Minnesota where I managed 14,231 lakes. I was Assistant Secretary for Parks at the U.S. Department of Interior where we managed 700 million acres in water resources and land. I was Chairman of Great Lakes Fisheries Commission responsible for restoration of the Great Lakes, and the Washington Representative for the Tennessee Valley Authority. I was U.S. representative to the Regional Environmental Center for Central and Eastern Europe. Finally, I have a 2,000 acre ranch in Nebraska where we have tree buffers, clean fences keeping cattle from the streams. So we are implementing these straight forward practices. I am glad to be here.

Viorel Gherciu, Country Coordinator, European Commission, FAO Food Security Programme – Our organization is promoting good agricultural practices. We have experiences from our producers in using non polluting approaches. We developed a UNEP report for agricultural organizations in Moldova. We are promoting citizens action in biodiversity and conservation, and organic agriculture in the schools.

I am also worked with NGOs in Moldova where our main goal is environmental education. We did projects in this issue.

Sergiu Budesteanu, Environmental and Social Assessment, Millennium Challenge Account Moldova – One of the important elements is transition to organic agriculture. We are working on river basin management and irrigation systems issues and are interested what practices already applied in Moldova.

Radio MD – We focus on environmental issues, and are looking forward to the meeting.

Sergiu Scobioala NGO "Eco – Tur"– International and joining mostly related

Lozinschi Stefan, NGO "Eco – terra"

Vitalie Cimpoies, Executive Director, Public Association of Cutezatorul – For quite a number of years we have been working in nutrient reduction. We have certain experiences in the Danube Regional Project. We are working cooperatively with Romania on protection in Danube and Prut rivers.

Dr. Victor Cotruta, Regional Environmental Center, Moldova – We are a partner in the Living Water Exchange We implement a lot of projects in this field.

Gulnar Surmanidze, NGO – Black Sea EcoAcademy Georgia

Khatuna Chikviladze, Ministry of Environment, Republic of Georgia – We are working on an environmental protection strategy, including water quality and quantity issues.

There are two key points of interest:

1. Access to chemists who understand science and policy

- We are in close proximity to the 19,000 hectare RAMSAR site. The project is between Cahul town, which is capital of southern Moldova. This is the entrance of the Prut River into Danube basin.
- There is great biodiversity. The area is very diversified with a humid climate and many different birds, fish and reptiles.
- One of the largest natural lakes in the region is Manta Lake –24 square kilometers.
- There is also a Roman wall, which of a unique geographic outcrop, including mollusk shells.
- Socio-economic data includes employment of 98% agriculture.
- There are 6,000 inhabitants in the village of Slobozia Mare.

The project activities are comprised of the following:

- An awareness campaign, 5 meetings with villages
- 5 ecological in schools and colleges, with 177 people
- Village council organized to teachers of geography to train the trainer on the ecological lessons
- Discussions focused on reducing pollutants and in particular nutrient reduction
- Joint meetings from three or four communities
- Produced leaflets, brochures, posters, jointly from rural Ministry of Agriculture
- Farmers underlined topics of interest and we focused on these issues.

We gained experiences from GEF APCP for composting and constructing platforms for manure and other agriculture and household wastes. We understood major problems and how important awareness was.

Questions/answers

What were the problems?

Artur – The different uses of manure application was an issue. Everything new is old. When constructing the platform, we involved specialists in platforms from Romania to help meet EU requirements. We worked to subdivide the village and worked with villagers to provide manure and wastes to this platform so it could be treated. Many villages developed platforms for their individual households.

How many?

Artur – We built a garden scale test for fertilizers to see the differences in production and how we could make use of wastes.

What did you find?

Artur – One-third of the garden was not treated and two-thirds was treated with compost.

Was production better?

Artur – You could tell that the treated side was more robust.

What about runoff?

Artur – We made a small video which shows outcomes.

What impacts on stress reduction on the Prut? Have you reduced wastes and discharge?

Artur – Data showed that awareness is increased and villagers have different attitudes. We collected solid waste and organic waste separately. Our approach is getting wiser.

There is no data on discharges.

Bob – 1) What were some questions local pop asked?

Artur – The people in the village were mainly interested in environmental and aesthetic issues. The village wants to become clean so health issues are important.

Excessive nutrients, eutrophic issues and health and economic aspects were also of interest.

The Mayor is in charge so a key area of interest is how can we make this economic?

2) Farmers had a survey- what were their interests?

The farmers were interested in where and how they could sell organic products. The FAO discussed these ecologic benefits.

3) What were some questions that they wanted more info on?

Artur –The schools asked procedures of composting.

Tom – What application rate of compost? How did you decide how much?

Artur – An agronomist was a manager and he was giving instructions.

Victor – We are producing organic agriculture in Moldova. There is a leaflet for different kinds of crops, technology and amounts of compost to be applied and each area of the country.

TIgran – I suggest establishing an agricultural cooperative. The main problem of all member farmers would be their production issues. You could develop a consolidation center and refrigeration center.

Artur – The market presents key issues. 30 Kilometers is the Ukraine and close to Romania. The geography is good between all countries; It is good for promoting and selling products. There is an issue of certification. The environmental requirements are significant. It is difficult to produce agricultural products at specified level and people are not able to invest.

Tigran – Clean production is possible. The cooperative could offer technical assistance. The farmer organization is in charge of meeting the standards. In Armenia farmers do not get subsidies.

Artur – In Moldova, it is not that easy. The rules and standards are strict. The farmer and products need all certifications as ecologically clean.

Vitalie – The role of this project is important. 50% of production is used by families. The legal frameworks are being developed. Some companies are helping with certification, and there are some positive steps. In our organization we did not believe it would work out well. Now one of the original pilots of a Greek project to implement organic farming some of the products is certified. This shows how change can happen in one village. These are specific examples, and we must replicate it. We worked with villages to clean uncontrolled waste sites. There were 4 specialized devises in cars, and one joint waste disposal facility.

Organic fertilizers and others can limit pollution into waters.

Bob – What is the model of farming in Moldova? It is a family farm?

Artur –We are a small country and agricultural country.

Vitalie – I agree that associations/cooperative may make sense. There is a strategy at the governmental level

Tigran – Is there a law on cooperatives?

Vitalie – Yes, there is a law.

Bob – I want to let you know how things are changing in the US. Our farms are bigger, many farmers find that equipment is not economic so have to grow farmland or producing crops. So cooperatives and corporate farming is growing, and family farmers are decreasing.

Farmland is being purchased by hunters for conservation.

Vitalie – What about genetic modified products?

Bob – There is concern about genetic modified products in particularly in cows and chickens.

Tom – There are up and down sides to genetic products. Some products that have been discovered such as a new invasive weed, herbicide resistant canola. There are consistent yields and increase nutrient use efficiencies.

Farmers have little choice to accept them readily. Seeds for non GMO became hard to get. Seed/chemical companies only produce GMO seeds.

Khatuna – What systems do you use to regulate when farmers produce more manure than they need? What do they do with excess?

Artur – We have a guide has technical norms?

Victor – We built two platforms. Two farmers are buying manure for the platforms and selling it later. There was big project by the World Bank funded at 6 million USD. One of the big mistakes was they started to build platforms without consulting with farmers, without investigation. It was not used properly. We must in parallel to inform farmers. Why is it? We must get feedback first.

Artur – In addition to what Victor has mentioned, we can see that villages close to project, mayor in Manta they applied for a project and construction in their village from the Environmental Center and the Central government.

14.30-15.30 Breakout sessions – Key outputs include:

- Nutrient Reduction problems
- How they were solved
- Share experiences on good practices
- Identify future opportunities for replication and Nutrient Reduction strategies

Pilot demonstration project managers from the other 3 project countries participate and present their pilot results in the breakout groups to inspire discussion.

Chuck – I would very much like to hear from you on:

- What are key nutrient problems/challenges (agriculture, detergents, wastewater, etc)?
- What are the current legal/regulatory drivers/frameworks for nutrient pollution control/reduction?
- Is there baseline data of current nutrient loads? What are they? What are the sources?
- What are the current nutrient reduction projects/approaches/practices/ interventions and how much is being invested?
    - What are the barriers to implementation?
    - What have been the outcomes/quantitative results?
    - What are the gaps?
    - What might be a strategy to address these gaps?

How can we replicate and scale-up best practices in the region?

Tigran – We must explore and solve common problems. As the growing season looms, what outputs, machinery and technical assistance would be most helpful?

There are several ways to we work with farmers in the cooperative model on potential projects:

1) Service fees less the market price of the product
2) Social interactions of users and owners
3) Technical assistance to help address specific issues to solve problems
4) Financial opportunities to pool resources and make money

We have a GEF/UNDP project on biofarming, where we are examining endemic species. We create small farms where they can be produced.

We have created an association of biofarming that focuses on the crops, provides seeds for next year, develops a marketing system and eco-products.

Associations do not have resources; strong policies are needed to develop markets for manure.

Khatuna – We need more information on wetlands restoration and nutrient management.

Tom – We have on-the-ground demonstrations that show how to implement them. The key is to better understand the cost per pound of nutrient removal.

Vugar – After agriculture reform in 1996, agriculture in Azerbaijan was privatized. 800,000 families became small land owners with 1 to 2 hectares.

A great deal of land has been lost to erosion, channels and roads. We must create a pilot association/union to demonstrate to farmers.

There is a need for large investments in irrigation infrastructure.

Farmers' unions/associations developed a hazelnut producers association. They understood advantages of working/producing together.

People are no so happy to bring funds together because of the Soviet experience. A strategy is needed regarding an approach from government.

Under a World Bank project, there is a water users association so farmers do not have to pay for water. We have the water source not the infrastructure.

Who is the owner of the operations and maintenance of the system?

We need research for irrigation infrastructure. May be others have skills in agriculture approaches.

We need voluntary associations based on trust based relationships.

We need a kind of public relations campaign to educate farmers on irrigation and agriculture in general. Research and soil analysis is also needed.

How can we develop marketing side of projects? Farmers are looking for profits.

Waste analysis in cities is also needed along with experts and professionals in this sector.

Extension might be a solution.

Khatuna – We had a competition called "own agronomist" to transfer knowledge. This was financed by USAID? How can we implement to replicate?

Tom – I agree. One way is to create a local expert, not a permanent staff. Two weeks to a month to become reasonably competent, and have train-the-trainer opportunities one week per year for an update. The expert could rotate among countries that have similar production systems. Ecological training would also be helpful in addition to agronomic and water quality training.

There is a need for economies of scale for the 1 to 2 hectares to see advantages of 50 hectares. There should be focus on high value crops and the development of marketing plans.

Khatuna – A Kibbutz in Israel could be an example of cooperative approaches.

Tom – Ecological labeling could also be helpful.

Chuck – What do you think Edgar?

Edgar – 50% of government term contracts with associations stipulate supply of water. How is the cost of one cubic meter of water? The cost ends up being just transportation. 2003 to 2013 water is free for farmers. Cost from surface water sources is zero dram. Ground water is nominal perhaps 1 dram. 365 dram equals 1 USD.

What is the nutrient reduction policy?

There is a national policy on water use. All water resources should meet EU directives. Anthropogenic should be next to zero.

We had a loan agreement with the EBRD and the French to reconstruct treatment.

Tom – Has it been successful?

Edgar – We identified what needed to be done in the short medium and long term. There are 29 programs, one of which is to implement a national water code harmonized with the EU directives. We also have a strategy of monitoring. We worked out priorities and the water is excellent or good for drinking. If satisfactory, it should be very good treatment.

What groups comply with these standards?

Khatuna – In Georgia we have a good enforcement mechanism. The overloading of the soil is the responsibility of the Ministry of Agriculture. Water pollution and health impacts are also important. We should integrate a solution.

The Ministry of Environment has inspectors that look at wastewater loads.

Nutrients have agricultural and climate change implications.

There are projects to do biofarming. If you have a nutrient surplus, use the nutrients for energy production.

The Ministry of Agriculture has jurisdiction over fertilizers. There is a GEF/FAO project focusing on pesticides.

May be there is a project idea that could include how to prevent soil erosion.

Existing information is collected to determine what were the issues and problems. There could be pilots to address existing problems to fill the gaps.

Chuck – How does this compare to Moldova Victor?

Victor – The implementation of practices is big problem.

There are some trade issues with Russia related to wine, fruits and vegetables. The Ministries are paying more attention to best management practices. Organic farming could be one step to help with nutrient reduction.

NGOs, civil society must work with the Ministry of Agriculture to implement practices. The Ministry only has 260 employees.

Farmers have a tough time selling:

- To find a market
- To promote organic farming and pollution reduction

The database we are developing will be helpful to show the "stuff" that is done right. Now the real issue is bringing it to scale for farms of 5 hectares to 50 hectares. We need to answer "what, how, what was done?"

Perhaps there can be a series of seminars to inform about good practices – something small and medium scale.

Tigran – I agree that we need to build awareness:

- There should be data on increase and decrease of nutrients appropriately
- We should try to get local environmental action planning to include nutrient reduction.
    - We must determine what the steps are and who the stakeholders are. In Armenia this is already being done.

Victor – Yes in each district they should develop a plan. But implementation is difficult.

Tigran – There should be mentor activities and a determination of who is in charge.

Khatuna – In Poland there is not a lot of space, and there is a problem with nutrients for small and medium scale farms.

Artur – Your neighbor will drive change. He will stimulate and encourage improvements. This is a small country.

There are clearly benefits to demonstrate how to be environmentally friendly. I heard from a Romanian entrepreneur who has interest in environmentally clean products. I will be in touch with him.

Chuck – What about funding for projects?

Bob – There are significant results and impacts in the region and opportunities to fund projects:

1. The U.S. Agency for International Development has interest in water resources and nutrient reduction
2. Large agricultural corporations such as Cargill from Minnesota is promoting cooperation in grain related sectors
3. Farm equipment companies
4. Auto companies such as Toyota and Ford have a "green" focus and interest in the region

Associations and unions are a good way to promote cooperation, not only to promote products but also to ensure purchase and a viable market.

Artur – Huge companies often do not have interest in a small country like Moldova.

Bob – I understand. It has to be the right companies.

Tom – Large global food system companies that before the recession had a big interest in corporate social responsibility actions, such as Unilever, Sysco, Nestle, the Coca-Cola Company, etc.

Chuck – I agree. We will work to target appropriate sources. Thank you again for traveling long distances and for your good contributions.

Day 3 – Visit to the pilot site and/or to other relevant sites

Mayor of Slobozia Mare – We are very proud of our village. There are approximately 6,000 people, 2 schools, a hospital, a veterinary clinic, a stadium for soccer, places of culture, enterprises and civil society organizations.

The Village is comprised of approximately 11,000 hectares including 6,000 hectares for agriculture. There are 2,000 farming households. There are an estimated 18 flocks of sheep.

Cleanliness of the village is a significant issue. This project was very important is addressing these kinds of problems by:

- Building awareness of the importance of ecological practices and manure collection
- Utilizing a village publication to describe the project and its benefits

There is quite a lot of work to be done on water supply issues funded initially by the Mormon Church. The water comes from a well and we are building the piping infrastructure to connect households.

Sanitation is the most serious issue facing the village.

Tom – Are you turning the manure and how?

Chuck – How many farmers have adopted the practices?

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List of Participants

Workshop "Living Water Exchange"

Chisinau, Moldova, 8 September 2010

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LIVING WATER EXCHANGE

Peer to Peer Exchange Meeting

Minutes

September 13-15, 2010, Tirana, Albania

The goals of the exchange include:

- Showcasing on-the-ground, innovative nutrient reduction best practices from our demonstrations, which build on and link to previous GEF investments;
- Developing and adopting successful replication strategies in key countries in the region;
- Bringing together in a direct exchange of information among key policymakers, practitioners and potential sources of nutrient reduction funding that will help to build capacity and facilitate replication of nutrient reduction practices; and,
- Creating a new value proposition for agriculture across Central and Eastern Europe and Central Asia.

The agenda was comprised of presentations, field visits, feedback and discussions from participants focusing on building capacity for best practice replication.

Location: Hotel Tirana International for the seminar and visit to the pilot demonstration project site near Tirana.

SEPTEMBER 14, 2010

1. Opening session

On behalf of the Living Water Exchange Project, opening introduction was given by Mr. Bob Herbst (BH),

– ***Fatmir Mediu, Minister of Environment and Water*** welcomed this project, emphasizing needs for extending knowledge on sustainable use and management of water resources. Another issue that requires an urgent action is related to waste and wastewater management. The new law on Water Management (WM) has been adopted, but implement and enforcement requires more time and efforts. He considers this and similar Pilot Projects as a good opportunity to achieve those goals. Considering the WM issues, the following are the most important for Albania: 1) water pollution, particularly along the coasts during the summer season; 2) lack of WWTPs; 3) contamination caused by improper maintenance of a breeding fields; 4) illegal deposition of construction materials along the river beds. What is also an imperative when we talk about water quality is improving water inspection service and recycling and WWT facilities, with the main concern on coastal areas. About 50% of population is not connected to a sewerage system, and WWTPs are

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needed to control wastewater discharges. Currently several project are active, supported by the World Bank and Japan Government, such as the Prespa Lake Basin project or another project on the Skadar lake, under implementation with Greece and FYR of Macedonian;

- ***BH*** asked participants for short introduction

2. Presentation: The challenges of nutrients (N, P) reduction in Albania

- ***Mrs. Figali Hila (FG), Ministry of Environment, Forestry and Water Administration,*** *stressed currently a low level of nitrates, but high level of phosphorus, lack of WWTP and no treated waters. Concerning future challenges she pointed out needs for:*

  - Improvements in the sewerage network and treatment of polluted waters
  - Strengthening of monitoring system
  - Development of management plans for water basins
  - Strengthening of institutional capacities and cooperation.
  - Sustained use of natural water resource

Questions/Discussions:

- Montenegro representative was asking for more information about present Ground Water (GW) monitoring and scale of the pollution

Answer: In general there is no pollution, but the EU threshold values are not introduced yet. Pressure is more caused by point them diffuse sources of pollution.

3. Presentation: What are good practices of Nutrient Reduction?

- ***Dr. Tom Simpson (TS) Executive Director, Water Stewardship, Inc. Annapolis, in his presentation*** addressed the different types of Nutrient Reduction practices including agriculture, wetlands, wastewater development and pollution reduction in general and relevant to the country.

Questions/Discussions:

- ***EG*** added needs to reduce costs for waste water treatments and then to reuse it for irrigation. Sludge could to be used tor bio-generation and to place it to their soil. Duras WWTP. There are no large areas for the wetlands, but there are small communities. They might not reduce P, just N
- ***BH*** asked participants ***to*** comment challenges in their countries***:***

- ***Kosovo:*** Project proposal was prepared last year for the WWT in Skandera city; it's under construction and is expected to become operational soon. For that reason it will be necessary to set management issues. Other project ideas have been developed for the 7 biggest urban areas, as Prizren, Mitrovica, Djakovo, etc. but there is further need to identify donors and prepare feasibility studies. In addition there is an activity planed to be completed during the next year on grouping together small settlements, build WWP and upgrading the collection systems. It turned out that those projects are also financially very demanding. Drinking water supply is an important issue in terms of drinking water quality improvement and upgrade installation. Concerning financial resources a regional approach would be more acceptably.

  As for the potential for using wetlands, a feasibility study is under preparation stage in order to show possible solutions. Wetlands are not excluded. They are one of the doable options, but Government wants to know about efficiency of other solutions. So far there are no constructed wetlands in use.

- ***MNE - Radosav Rašović (RR):*** Two basins, the river Lim and its tributaries belong to the Danube Basin, while other rivers flow to the Adriatic Sea. He gave an general overview about the situation in the country, stressing that concerning surface waters, majority of rivers are in II quality class (the threshold values are defined based on the old - ambient criteria system), but there is an evidence of quantity deficit. Current projects are focused on rural areas, as the World Bank project in the northern part, on preservation of natural resources as the GEF fund (5 mil US$); or to alleviate impacts caused by big pollutions along the river Moraca like the WWTP for PodgoricA. There are also some regional projects and for other urban areas too. So far there are no constructed wetlands, although he believes there should be locations where wetlands could be introduced.

- ***FYRM - Lile Simonovska (LS):*** Their institute is not in charge for environmental issues. There are no constructed wetlands. There is a current project on the Prespa Lake, then a conservation project for the Ohrid Lake. Some activities are targeted for Prilep and Strezevo cities. She stressed that more awareness raising activities should be organized for farmers to improve their knowledge and daily practice. For example, they constantly irrigate their fields with surface waters contaminated by untreated wastewaters and sludge. There was recently one project with the purpose to educate farmers by establishing a Water Association.

  TS asked whether agriculture is a significant source of Nitrogen pollution.

  Answer: Generally, farmers do not over-use fertilizers, particularly not in mountain regions, but yes in some arable areas. At the same time there are no WWTs, while slaughterhouses, meat industry and dog ponds (where animal waste is treated) are discharging waste waters without any treatment.

4. Demonstration project outcomes and results – presented by Edvin Pacara, Project Manager of ponds pilot demonstration project "Constructed Wetland for Nutrient Reductions in the Waters of Tirana River"

- ***Edvin Pacara (EP) – About Tirana River as an environmental and water issue***

Questions/Discussions:

- ***Enkelejda Gjinali (EG), Advisor to Prime Minister for Water Issues***, informed audience about current plans on 4 WWTPs for approximately 2.6 Million PE, stressing that Albanian Government is working on that issue already with Germany and the European Commission. At the same time Department for Environmental Engineering at the Civil Faculty has focused on water matters and developing and designing plans from scientific point of view. She also emphasized the UNDP support regarding children in schools and another project with Germany on constructed wetlands.
- ***Representative from Albania:*** Asked for ***s***ome clarifications regarding water quality data and range of the Tirana River pollution before and after constructing this pond in order to materialize its efficiency in numbers, to know if it works or not. He was interested to hear/see some concrete data.

  Answer: All the tables and data regarding water quality measurements will be presented tomorrow during the site visit.

BH: Brief introduction of the project objectives and project results, PP and costs.

5. Breakout sessions – Key outputs include:

- Nutrient Reduction problems
- How they were solved
- Share experiences on good practices
- Identify future opportunities for replication and Nutrient Reduction strategies

- ***BH*** presented in brief Pilot Projects in other 3 project countries and their pilot results to inspire discussion in the breakout groups (BGs).

  Two breakout groups have been formed:

  - ***BG 1:*** FYRM, Kosovo, Montenegro
  - ***BG 2:*** Albania

  mainly due to the total number of representatives.

6. Presentation of breakout session results (5 minutes each group)

BG 1: FYRM, Kosovo, Montenegro

<table>
<tr><th colspan="2">Question</th><th colspan="5">Answers</th></tr>
<tr><td>1</td><td>What are key nutrient problems/challenges (agriculture, detergents, wastewaters, etc)?</td><td colspan="3">Problems
a) Untreated wastewater (industrial, sanitary)
b) Agriculture (fertilizers, pesticides, manure)
c) Erosion, acid rain and floods</td><td colspan="2">Challenges
a) Financing, policy, legislation and awareness</td></tr>
<tr><td rowspan="4">2</td><td rowspan="4">What are the current legal/regulatory drivers/frameworks for nutrient pollution control/reduction?</td><td>FYRM</td><td>Kosovo</td><td>MNE</td><td></td></tr>
<tr><td>+</td><td>+</td><td>+</td><td>WWTD</td></tr>
<tr><td>+</td><td>+</td><td>+</td><td>WFD</td></tr>
<tr><td>+</td><td>+</td><td>-</td><td>Nitrate D</td></tr>
<tr><td>3</td><td>Is there baseline data of current nutrient loads?
What are they?
What are the sources?</td><td colspan="5">There are DBs, but not linked and accessible, so data are spread between different governmental institutions, water departments and public services</td></tr>
<tr><td>4</td><td>What are the current nutrient reduction projects/approaches/ practices/interventions and how much is being invested</td><td colspan="5">– Projects: WWTPs in 3 municipalities in FYRM and Good agricultural practice / certificates
– Lack of: transparency and information from authorities; funding from municipalities and external; relevant reports
– Gaps: Monitoring of Water Quality Indicators, Accessibility of historical Water quality Data;
– Start with better coordination and cooperation between authorities and shakeholders involvement</td></tr>
</table>

LIVING WATER EXCHANGE

BG 2: Albania

Question		Answers	
1	What are key nutrient problems/challenges (agriculture, detergents, wastewaters, etc)?	*Problems* a) Untreated wastewater (urban and industrial) b) Agriculture wasted are not studied	*Challenges* a) Agriculture
2	What are the current legal/regulatory drivers/frameworks for nutrient pollution control/reduction?	– 5. Laws on administration and Water Quality – EU funded project "Implementation of the National Plan for the Approximation of the Environmental Legislation (INPAEL) in Albania" – Implementation of the EU WFD and Nitrate Directive	
3	Is there baseline data of current nutrient loads? What are they? What are the sources?	There is an Inventory of Nutrients loads (2005) under the StEMA Project - Strengthening of the Environmental Monitoring System in *Albania* (*StEMA*) Lakes, Rivers, coastal area	
4	What are the current nutrient reduction projects/approaches/ practices/interventions and how much is being invested	a) There are currently 14 WWTPs projects – 3 completed in Kavaja, Vlora and Pogradeci – 11 under construction or in a phase of planning, approval and financing. – *App. 3 wetlands are planed for coastal area* b) Current Infrastructure project: Collection system for sanitary and atmospheric waters. There are still pending issues regarding funds and property matters c) Quality of Bathing and Surface waters are improved, but there is a need for better drinking water storage facilities d) Information and data about quality of waters used in agriculture are missing; monitoring system is still not completed e) Needs: – Legal framework on EU water related directives approximation; – Instruments to strengthen legislation implementation; – Strengthening institutional capacities – Strengthening monitoring system	

UNDP GEF IW LEARN REGIONAL ENVIRONMENTAL CENTER

7. Panel discussion about possible project needs and funding opportunities with participation of ministry officials, practitioners, funding institutions, UNDP/GEF

- ***Arian Gace (AG),*** GEF/SGP: stressed needs to protect biodiversity, take care of sustainable water use and treatment of international water, pointing out lack of willingness for stronger involvement and support. Small GEF grants may give money only to NGOs.
- ***BH****:* encourage participants to elaborate together on possibilities, mentioning that with mutual efforts concerning needs and ideas from one side and support from GEF in identifying available funding source we may b ring further benefit for the region and beyond. He pointed out possibilities to be explored as:
  - New positions in the Agency for international waters
  - WB as one of potential source;
  - Small Bob's foundation together with REC, help MO REC to establish themselves and to educate children to educate
  - REC small GP, depending of donors
  - Foundations in the US, there are foundlings available,
  - Corporations in WM and in related Issues, e.g. Coca Cola, Toyota; farm machinery manufacturing
  - Approaching individuals, Bob may help (different families are interested to help in some parts of the World) in different topics.
  - Different Governments to be used as grants to solve some problems. Bob formed coalition to lobby in congress). Find somebody within the leadership to push for your ideas.
  - Fresh water in the World – conflict between regions/countries on fresh water, to establish a conflict resolution center
- ***Argiana Micu, UNDP,*** informed present participants about possible needs and actions regarding EU obligations and Directives. The Drinking water and sludge directive has to insure reduction and control of that pollution. Implementation of the Nitrate Directive and its requirements concerning pollution from agricultural sources is one of the most complex on that list. It requires a lot of money, so several countries asked for transition period. Definition and mapping of vulnerable areas, sensitive zones, measures to be introduced, monitoring and action plans for implementation are just some or future activities. To mention steps as: (i) identifying all the agricultural sources; (ii) mapping-vulnerable areas; (iii) introduction of necessary measures including small interventions; etc. At Governmental level it's:(a) monitoring system for surface and ground water (b) introduction of the PRTR register and periodic reports, (iv) fresh water and coastal areas under eutrophication, integrated water management, code for Good Practice in agriculture, trainings, etc.

Questions/Discussions:

- ***EP:*** Possible funds could be sought from the EC, different cross-boarder and IPA programs
- ***Magdolna Toth Nagy (MTN)****:* Initiative from the high policy level, on country or regional

needs, more strategic efforts at country levels.

– ***AM**: T*rasboundary cooperation between AL, FYRM and GR, like the one on the Prespa Lake

8. Closure - Conclusions on current situation, needs and possible ways forward

– ***TS***: Water is important resource and water quality is an issue. Water supply may become a problem, with regional consequences and creases. Demand for water is increasing so people should work together, with no national boundaries to look for possibilities for transboundary solutions. The Adriatic group should continue working together and eutrofication should not be a problem for recreation and swimming. EU accession is a good opportunity to deal with and understand Nitrate Directive, agricultural impacts on water quality and to think what agriculture would look like at the Adriatic areas within the next 10 yeas. We should work on healthy agriculture development but in parallel with environmental development. Water scarcity and climate change in another issue to be considered, internally within the each country and externally as a region. This is a big challenge on both stages.

SEPTEMBER 15, 2010

9. Visit to the pilot site

Questions/Discussions:

– ***BH:*** He underscored the "good job" by the pilot team and that it was within time and budget. "It's more than he expected, and appeared well governed under negative circumstances." It is also smaller than expected with more water flowing due to the contribution of two pipes. Only one should stay in the future if we want pool to operate properly. Generally, surrounding conditions are "pathetic," a disgrace for Tirana city and should be addressed as soon as possible. This is no longer a river, but an "open sewer."

  If it will be difficult to maintain the pool without the additional funding, the city should hire young people and start cleaning the spot, rehabilitate the area and see Tirana river as a resource and nice place for the future.

– ***EP***: The same opinion, and in addition to the efforts done so far it is necessary to have all officials interested. He and his NGO will try to find some funds to continue with monitoring for at least one year to show results. This example could be used all over the country and in neighbouring countries too.

– ***Kosovo:*** More cooperation with local and national representatives is needed. Another point is to spread information more among local people and beyond. He thinks this was not the best place to build the wetland and because of that it resulted as we saw today. Stakeholders should be more involved and consulted. They have similar example in Kosovo where the KFOR built one wetland planting garden but the place was not accessible and caused serious problems with mosquitoes.

– ***FYRM:*** Suggests involving all stakeholders as this is a good example to replicate. Already

mentioned aspect of irrigation by untreated wastewaters should be considered in the future too. At least one education station should be created where farmers will directly benefit via education sessions, training or exchange of experiences between regions. Only by doing they will support lagoons future. This wetland was properly planed at the beginning but people living around are not disposed toward the "pool."

- ***Albania:*** There are no such examples, and this one is artificial. The location selected is a wrong one and there are complaints from people living around the site.
- ***TS:*** This was a good exercise but with a short time and money to manage everybody's expectations. It is necessary to continue sampling (in and out) and measuring inflow, to spread water across the cells and increase retention time. It is also recommended to continue working with other faculties, as well as with the Civil faculty and to try to improve and find funding. This is "a wake up call" for Tirana Government, not to turn its back to the existing problem of solid waste collection and direct discharges of the solid sewerage as this is a real health risk. There is also no feeling of a global ownership to the river.
- ***Kosovo:*** Supports the project; our presence is evidence of it. The initial planning phase should have been more effective and, as being a pioneer project; a bigger contribution of all stakeholders is needed.

  They congratulate their colleagues on this initiative, particularly in involving neighbouring countries. These are disciplines with no proper respect in urban area with so many positive things. One is to underlying current state of the river as the collector of solid waste. According to monitoring result there is a very high levels of pollution, so this is a modality which should be used in other areas to reduce pollution. People living along rivers believe that population coming from rural areas is "tolerable" without any treatment as rivers self-purification capacity will handle everything. This kind of project should be replicated in other cities, countries.
- ***TS:*** It is worthwhile to continue with wetlands and to outreach Governments and local people to start doing something and we should use this existing system as direct discharges, solid sewerage and filling inundation are the most important things, our wetland is addressing just one piece of the problem;
- ***BH:*** We will go back to the GEF and ask for additional pilot projects to reduce nutrient pollution. What are the additional projects you would like to see in your country? Should we organize more seminars like this, caring out pilot projects and to come back and discuss it? Do you need some additional projects on how to do it, should we set more training sessions?
- ***Kosovo:*** It would be good to continue with this kind of "small thing" with great love. This form is OK and should be kept in other countries, to learn and to have more seminars. It is also necessary to have trainings about potential need, new methods, implementation methodologies and exchange of information.
- ***MTN:*** Suggested to use existing knowledge and experiences through the EU and implement it.

Discussion Draft Meeting Minutes for the Peer to Peer Exchange

October 7, 2010

Krusevac, Republic of Serbia

Objectives

The goals of the exchange include:

- Showcasing on-the-ground, innovative nutrient reduction best practices from our demonstrations, which build on and link to previous GEF investments;
- Developing and adopting successful replication strategies in key countries in the region;
- Bringing together in a direct exchange of information among key policymakers, practitioners and potential sources of nutrient reduction funding that will help to build capacity and facilitate replication of nutrient reduction practices; and,
- Creating a new value proposition for agriculture across Central and Eastern Europe and Central Asia.

Attendees:

Please see attend list attached.

Initial Findings:

The following are the initial findings from the demonstration visit and discussion:

1. There seemed to be solid agreement that the demonstration project highlighted that significant environmental benefit is possible for the right low cost intervention.
2. Some concerns were expressed regarding how the "green comb" filter would be harvested to ensure the removal of the nutrients.
3. Monitoring and data collection (including multiple measurement parameters) to better understand project impact and outcomes must be appropriately considered during project development, implementation and subsequent to project completion. Regular water quality monitoring is ongoing at Lake Celije and may offer some insights into results of the demonstration.
4. Land rights issues appear to present challenges related to pollution control, in particular questionable farming and building sites around Lake Celije.
5. There are opportunities to transfer practices from other GEF projects to Serbia and elsewhere in the region including the "nitrogen injection" from the Anatolia Watershed Project in Turkey. The demonstration approach and the Tirana constructed wetland could be utilized as the Lake Skadar-Shkoder Integrated Ecosystem Management Project develops its own constructed wetland focused on wastewater treatment.

Meeting Minutes

The agenda will be comprised of presentations, field visits, feedback and discussions from participants focusing on building capacity for best practice replication.

11.30 -13.00 Demonstration project outcomes and results – presented by the Mr. Poprasic, Project Manager of pilot demonstration project "Help the "Celije" Lake on the Rasina River nearby Kruševac with Experiences of Natural Processes" on outcomes and visit to the demonstration site Questions/answers

13.00-14.30 Lunch

14.30-17.30 Discussion of scaling-up and replication – Key outputs include:

- Nutrient Reduction problems
- How they were solved
- Share experiences on good practices
- Identify future opportunities for replication and Nutrient Reduction strategies

~~Chuck Chaitovitz, Principal, Global Environment & Technology Foundation~~ – I am with the Global Environment & Technology Foundation – a small NGO dedicated to building the infrastructure for sustainable development. GETF is managing a $60 million partnership between the Coca-Cola Company and USAID to bring clean drinking water to more than 2 million people across Africa by 2015.

I am so pleased and humbled to be here in Kruševac with you to share experiences and build capacity to scale-up and replicate nutrient reduction best practices in Serbia and throughout the region.

As I have had heard many questions about the other demonstration projects, here is a brief summary of each:

- Tirana, Albania: Constructed Wetland for Nutrient Reductions in the Waters of Tirana River – This project calls for the development of a constructed wetland primarily to address urban runoff issues. The project includes a sedimentation basin to hold suspended solids, a second basin consisting of shallow layer of surface water, flowing over mineral (sandy) or organic (peat) soils and vegetation (marsh plants) to remove nutrients and a larger third basin comprised of trees and larger vegetation for polishing effluent and creating wildlife habitat (frogs have started to reside in this area. A buffer zone of three rows of vegetation and shallow canals along the bank planted with aquatic vegetation was also developed, thus creating some mini-wetlands that will stop the sediments and runoff to enter directly the constructed wetland.

- Cahul, Moldova: The Decrease of Water Pollution Sources in Prut river basin through the Promotion and Implementation of the Best Agricultural Practices – This project calls for construction of a manure platform for depositing and composting near the garbage dump of the village Slobozia Mare (with a surface of 200 m^2 and volume of 300 m^3). Training sessions to build awareness of the proper use of the platform and to promote development of household platforms, ecological farming and best agricultural practices were held with farmers, other village residents and school children. The four best agricultural practice training sessions in Cahul town for local farmers, representatives of Agricultural Department from Cahul District Council, representatives of mayoralty Slobozia Mare, ECC Cahul volunteers and others based on curricula developed by the REC Moldova focused on the following key themes: 1) types of agricultural systems, biodiversity ensuring ecosystem protection; 2) agriculture and water, soil, air, biodiversity, pesticides; 3) pollutant agriculture; 4) techniques for appropriate fertilizers applications; 5) ecological solutions for pollution reduction; and , 5) manure composting and the correct use of the compost as fertilizer.

- Zakarpattya Oblast, Ukraine: Best Practices of Fertilizers Reduction from Agricultural Lands in Upper Tisza Basin – This project calls for planting the following trees as a buffer zone along the Irshavka river (a total length of 6 km) – after a long discussion with farmers, evaluating of capacities of the trees to stop pollutants and actual available trees:

    1. 300 black current bushes
    2. 300 plum trees

    The project also focused on building awareness of EU legal requirements for organic farming, best agricultural practices, the findings of soil analysis on the pilot area with further recommendations (Center of Soils Fertility), recommendations regarding water quality protection in Irshavka river (Zakarpattya water management board), vermiculture – or worm-based composting – and its advantages (ZOOUEL), control of nitrates in products (Irshava sanitary-epidemiological service) etc. A nutrient management strategy was developed to promote an integrated approach in the demonstration area.

Now I would like to go around the room to hear your interests, the needs and challenges you face and perhaps the legislative frameworks in place regarding nutrient loading into our water resources in the region.

~~Ivica Trumbic~~ – I am project manager of the GEF Mediterranean Large Marine Ecosystem project and work for the UNEP/MAP GEF Mediterranean Partnership.

We are focusing on regional actions to implement the strategic action program which includes an approach to address land based sources of pollution.

There s also interest in biodiversity in the region.

The following are the key elements of the project:

1. Implementation recently Mediterranean protocol on integrated coastal zone management
2. The management of an investment fund led by the World Bank and UNEP
3. The management and execution of a list of demonstration projects including three which are advanced and two are on the Adriatic in BiH and Croatia

The total project value is approximately $100 million including co-financing sizable in cash. We are just in the 2nd year of implementation.

One of our major challenges is to develop and implement an effective replication strategy is difficulty. I am hopeful to learn much here. How to replicate practices? We need an overall portfolio assessment. If there are any good practice that can be utilized, the projects and practices in regional actions from the 30 demonstrations might be replicated.

For the investment fund:

1. Evaluation of replicable practices is also important.
2. High priority replicable practices – we need regional replication criteria, potential for stress reduction, and the likelihood that replication takes place in the time frame of the project
3. Design and implementation of replication activities – awareness/capacity

~~Marinko Antunovic~~ – I work for the Water agency in BiH. Our geographic area of focus includes the Adriatic Sea And the Certina River, which forms a huge reservoir threat for eutrophication.

We focus on waste water treatment and industrial wastewater treatment and work on monitoring in terms of N and P. There are more than 40 monitoring points in our watershed. This offers a real opportunity to understand threats and individual parameters including chlorophyll, nitrates, dissolved oxygen, transparency in addition to total nitrogen and total phosphorus. The mouth of river has some problems with eutrophication.

~~Zeljko Krstanovic~~ – I am with an NGO in BiH and we look at environmental impact of all types especially in terms of rural development, energy efficiency and water pollution.

The biggest problem is with wastewater that impacts the ground water.

We have good pieces of legislation. But the main problem appears to be formal control between lots of cultivated land and agricultural pollution.

We had a Danube Regional Project small grant workshops to raise public awareness of these issues.

There is pressure for subsidies for producers of agriculture projects.

~~Bratislav Poprasic~~ – There are some unified characteristics here when it comes to nitrogen pollution, especially from sewage.

There is also a zeolyte mine that was used for remedy of Chernobyl. It has the capability to absorb a significant portion of these issues including contamination in the canal and ash deposit from power plants.

~~Viktor Subotic~~ – I am the GEF project manager for the Lake Skadar-Shkoder Integrated Ecosystem Management Project in Albania/Montenegro. The total GEF investment is $5 million to address capacity building and sustainable management at the governmental level. It is managed by the states and includes a well balanced approach for both countries.

The sustainable development strategy is promoted at the level of ministry of environment. Strategic documents have been adopted, including agreements on the reduction of organic pollution.

We are preparing a harmonized monitoring plan.

There has been accidental pollution by nutrients from urban wastewater in Albania mostly.

There is no intensive agriculture in that part of the country. There are some heavy metals from Albania.

We are developing a database to build capacity for the ministries. There are currently no large investments in pollution, but we may be consulting with key industries.

We are building a constructed wetland so perhaps if the Tirana demo you mentioned is for wastewater treatment, the wetland project might be useful.

In Montenegro there are more organic farms and cattle raising is growing.

~~Marinko~~ – For constructed wetlands, there are many ongoing projects in BiH for about 500 PE. There is a possibility to support that project, but money is the main idea. The primary design is completed.

Colleague in Slovenia an ex

~~Mahmut Temiz –~~ What is the relationship between the government and your project? You are the NGO

~~Natasa Dereg~~, project coordinator/assistant – It is a partnership between the local government and NGO. Of course we need official permits. We are engaged with professors from universities and key experts to get credibility. This is not easy.

~~Chris Severin~~ – Was it the government coming to you with a problem?

~~Mr. Poprasic~~ – The project was started by the Kruševac Environmental Center. We started with Celije Lake with Institute of Environment for Serbia. We had a spatial plan.

~~Viktor –~~ Are there zones for sustainable development called for by the spatial plan?

One is where the wetland pilot. A location study is needed.

Biological parameters should be monitored for a long time.

~~Jovana Raseta~~ – Water in Serbia is a public, managed enterprise. There are alternative methods of water treatment. I am interested to see what results of this project when bio treatment is implemented on all five canals of the Lake.

Are there plans for integrated basin management plan? I would like to see the final results and reduction of nutrients.

~~Olivera Antic~~ – I am an engineer of technology at the Ministry of Water Supply in Serbia focusing on water use issues and protection of waters.

I have been directly involved in DREPR concerned underground water. There was approximately $200,000 USD invested in the tank. 4,500 hectares is large compared to most farms.

The Government is working toward nitrates directive and depends on certain assessments.
There are sensitive zones in Voivodina. We will know more about the estimates after the project is completed.

The EU master plan of waste water of western river basin so all polluters will be covered, and 25% of this basin is included.

There is Swedish and Serbia cooperation on the river basin to assess diffuse pollution.

~~Violeta Jankovic~~ – I am engineer with BiH Water agency for the Sava River. In the Ministry of Agriculture, Forestry and Water Supply we look at micro-biological parameters. We report on all analysis and do it 12 times per year.
The N and P results from 2009 include the biggest concentrations in the Bosnia River.

There is some organic pollution, but not much from farms. Most is from cattle farms, butcheries I(some 300) and other point sources.

Most are from diffuse pollution rather than point sources. Solid waste is a big problem.

There are 3 wastewater treatment plants. Only one WWT needs to be reconstructed

GEF/World Bank and the Austria agency for pipelines have a project for the protection of waters. We are focusing on non conventional technologies.

There is an assessment of 500 people to 2000 people with climatic factors, land etc.

We developed artificial wetlands in the project where we included bacteria beds. There are high standards and requirements from EU and BiH for water quality. We are trained on water treatment.

We have also identified sensitive zones and promoted best agricultural practices. There are six different guidelines for food industry.

~~Sabaheta Hafilovic~~ – I am with the Agency of Sava River, which focuses on the use and protection of the rivers. We drafted water legislation and guidelines. We really have no pollution from the agriculture sector. Urban waste water is our biggest problem.

We have ten facilities, which are non tertiary.

As mentioned, there is a GEF/World Bank investment for biological monitoring with a list of polluters.

~~Nezafeta Lejdic~~ – I am with the Sava Basin involved with laboratory. We test four times per year with chemicals and two times per year with biological parameters. There is too little testing. This has to be planned
We need increased sampling.

~~Mahmut~~ – I am managing the GEF/World Bank project in Turkey, the Anatolia Watershed Rehabilitation Project. I would like my colleague Bahar to discuss our project and some points of value.

~~Bahar~~ – I am with the Director General for Environmental Management, focusing on marine and coastal management and erosion issues.

We have a significant monitoring component in our micro catchments. We perform water monitoring every three months. There is surface water monitoring at 37 monitoring sites, along underground 33 wells for samples.

These are "hot spots."

We need more urban waste water treatment planning. We party to the Barcelona and Bucharest convention which calls for land based pollution action plans.

We are monitoring coastal areas and have identified vulnerable areas in line with eutriphication.

We are working toward compliances with the WFD and in accordance developing river management plans, which focus on limiting P.

~~Mahmut~~ – We took some good examples. Upper and lower of micro catchments are different. It is difficult to communicate. We also see problems may belong to different agencies – either combine agencies or water shed areas.

If you need good project management and project implementation you do this.

In Anatolia we are reducing pollution coming from livestock.

People do not agree to central collection and storage of manure so you must get buy in. They want their own storage facilities.

~~Berry growers~~ – Goals is production for gaining profit and preservation of environment. We must have a balance between production and environment.

We must show good practices to farmers and how they can earn profit and preserve the environmental.

Farmers are resistant.

But they depend on natural resources.

~~Mahmut~~ – As a producer how do join to reduce N pollution?

~~Grower~~ – We focus on reducing fertilizer amount and application of modern technology and application manure, by reducing manure we can do this.

But we reduce yield at the same time. So will buyer pay higher price because we produce less?

Mr. Poprasic – Zeolyte might be a good option to create markets for the area.

The National park is 30 km away from Celije Lake. Krusevac is cooperating with our NGO KEC.

We replanted 5 hectares of new forest and focus on place vulnerable to erosion, so sediments do not reach the lake.

The production of zeolyte could be an option. We want to provide minerals for all projects.

~~Peter Whalley~~ – What happens to zeolyte when it is applied?

~~Answer –~~ It has huge absorption power especially for chemicals.

~~Chris~~ – Can you dispose of it?

~~Answer~~ – No projects are currently on line to disposal of it.

~~Marinko~~ – This is good project. It is working because the reeds grew high demonstrating N uptake.

The parameters for monitoring should include: 1) Bio chemical parameters; 2) chlorophyll; 3) P; 4) transparency; 5) TN; and; 6) TP.

What is the level of nutrients? What types of planktons are present because people are swimming? Microbiological parameters must be measured; fecal cola form is very dangerous.

Dissolved oxygen; and level of stratification also should be measured.

~~Poprasic –~~ This kind of measurement goes beyond scope of the project. These are good questions to ask.

This is a study for protection of the Lake.

~~Olivera~~ – We have protected zones.

~~Chris~~ – We are seeing replicated constructed wetlands around the world. There are many applications up to 10,000 PE.

There is a land issue.

How would you feel to donate this land – directed toward farmers?

Do we need to buy the land?

I would like to hear from the local farmers.

How do we deal with the land issue?

~~XXX (?)~~ –Land in our country is not that expensive. Many bigger polluters may emerge.

~~Mr. Poprasic~~ – There are Illegal land owners.

~~Chris~~ – The system we have seen today is small. It is a low tech solution. Constructed wetlands can be developed a little higher tech target specific nutrient groups.

~~Magdi Toth Nagy~~ – Would you have an interest in replication?

~~Mahmut~~ – We do not have these systems.

~~Olivera~~ – In Serbia, application of manure is not quantified and but the manner of application. There is extensive agriculture, not intensive.

There is a new law on waters in Serbia enacted on May 2011. Regulations and by laws will follow.
WFD is in line/aligned to regulatory quality.

This is excellent as one project and how we can use canals to address waste water flows into lakes. It is an important to start.

~~Viktor –~~ This pilot in Lake Skadar-Shkoder is first in Montenegro. I am not an expert in the laws in waste water management.

From 2000 we were not planning for waste water treatment.

Several municipalities have more inhabits where strong natural resources conservation is the focus. There is no industrial pollution.

There is a Slovenian company that has experts in eco-remediation and wetland construction. We are communicating with them to initiate our activities.

~~Mr. Poprasic~~ – This is treatment of river water not waste water.

Panel discussion about possible project needs and funding opportunities with participation of ministry officials, practitioners, funding institutions, UNDP/GEF

~~Mark Hughes~~ – I am with the European Bank for Regional Development. Constructed wetlands are not of interest by themselves because there is not a clear income opportunity.

We offer a blend of grants with loan – but in all cases there needs to be an income generation opportunity.

One option might be to take the reeds to create income.

~~Chris~~ – There could also be some fee structure associated with the water discharge.

Plastic bottle issue could also provide income, and industrial , household waste or recycling

I also wanted to let you know the GEF is developing an Adriatic investment fund.

This project was a great example of a little money having large impact.

~~Olivera~~ – I wanted to comment on fee. In previous and new laws, fees for use and discharge were included. The state will reinvest in construction and reconstruction of facility and water protection – sewage systems mostly. The Ministry of Agriculture is managing this. 1% will go to the final fund.

~~Chuck~~ – Thank you for coming today. I encourage cooperation among the countries to build capacity to replicate nutrient reduction best practices.

###

	Questions/comments to the panel by participants
	Conclusions on current situation, needs and possible ways forward
17.30	Closure

Living Water Exchange Peer-to-Peer Meeting, Kruševac, Serbia			
Attendee List			
First	**Last**	**Organization**	**Email**
Olivera	Antic	Ministry of Agriculture, Forestry and Water Management - Directorate for Water	olivera.antic@minpolj.gov.rs
Marinko	Antunovic	Agencija za vodno podrucje Jadranskog mora / Agency for Watershed of adriatic sea Mostar	mantunovic@jadran.ba
Chuck	Chaitovitz	GETF	chuck@getf.org
Natasa	Dereg	Center for Ecology and Sustainable Development	djnatasa@yahoo.com
Durdevic	Gradimir	Udruzene Jastrebaki Biser	marmladen@ptt.rs
Sabaheta	Hafizovic	Agencija za vodno podrucje rijeke save, Sarajevo	Hafizovic@voda.ba
Mish	Hamid	GEF/IWLEARN	mish@iwlearn.org
Mark	Hughes	European Bank for Reconstruction and Development	hugesm@ebrd.com
Jovanka	Ignjatovic	Regional Environmental Center	JIgnjatovic@rec.org
Violeta	Jankovic	Agencija za vodno podrucje rijeke save, Sarajevo	jvioleta@teol.net
Željko	Krstanović	LIR	Željkok@lir.ba
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Jacimovio	Slobodan	PSS Krusevac	brka@poly.stomica.com
Viktor	Subotic	Lake Skadar-Shkoder Integrated Ecosystem Management Project (LSIEMP)	viktor.subotic@gov.me
Mohmut	Temiz	Ministry of Environment and Forestry, Turkey	temizm@yahoo.com
Ivana	Tomasevic	Regional Environmental Center	itomasevic@rec.rs
Magda	Toth Nagy	Regional Environmental Center	tmagdi@rec.org
Ivica	Trumbic	UNEP/MAP - GEF Med Partnership	Ivica.Trumbic@unepmap.gr
Peter	Whalley	UNDP/GEF Tisza MSP	pdwhalley@btinternet.com
Nikolie	Zivimir	PSS Krusevac	zika@poly.stomica.com

MINUTES OF MEETING

the Peer to Peer Exchange

October 25-28, 2010, Uzhgorod, Ukraine

October, 26 Peer to peer seminar

List of participants:

#	*Name*	*Position*
1.	Rakhimova Asem	Directorate Sustainable Development Department of Environmental Policy and Sustainable Development, Ministry of Environmental Protection, Kazakhstan
2.	Toktasynova Tota Kylyshbekovna	Ministry of Environmental Protection, Kazakhstan
3.	Klimov Evgeniy	Foundation for Integration of Ecological Culture, Kazakhstan
4.	Krugelchuk Vladimir	Republican Public Union of Farmers of Kazakhstan
5.	Mukayeva Akmaral	CAREC, Kazakhstan
6.	Ivanova Svetlana	International Plant Nutrition Institute, Moscow, Russian Federation
7.	Danilova Irina	Non-commercial organization Ynanch-Vepa, Turkmenistan
8.	Heilmann Diana	International Commission for the Protection of the Danube River, Austria
9.	Whalley Peter	Project Team, United Kingdom
10.	Simpson Tom	GETF, Project Consultant
11.	Contruta Victor	Regional Environmental Centre for Moldova
12.	Nebunu Artur	ECC Cahul, Moldova

#	Name	Position
13.	Johnson Nathan	REC, Green Horizon Magazine, Project team, Hungary
14.	Marushevska Olena	Pilot project manager, Kyiv, Ukraine
15.	Lobko Vasyl	Zakarpattya Oblast Branch of All-Ukrainian Ecological League, Uzhgorod
16.	Manivchuk Vasyl	Projct director, Uzhogorod, Ukraine
17.	Osiysky Eduard	Zakarpattya water management
18.	Skobley Maria	State ecological inspection in Zakarpatska Oblast
19.	Tsapulich Ostap	State Department of Environment in Zakarpattya Oblast
20.	Terelya Victor	Department of agricultural development of Zakarpattya Stat Administration
21.	Chonka Ivan	Teacher of environmental sciences of Uzhgorod National University
22.	Martigay Lubov	Professor in the field of vegetable growing, Uzhgorod National University
23.	Kravchuk Oxana	Vegetable growing department, Uzhgorod National University
24.	Matviets Andriy	Zakarpattya Institute of hydrotechnics and melioration
25.	Matviets Oxana	Zakarpattya Institute of hydrotechnics and melioration
26.	Fandalyuk Alla	State Soil Fertility Research Institute, Zakarpattya
27.	Pasichnyk Oleg	State Soil Fertility Research Institute, Zakarpattya
28.	Kurtynets Mykhaylo	Head of the club of Organic Farming, Zakarpattya
29.	Gyryavets Miron	Head of farm “Geryavyts”
30.	Dubovy Bogdan	Газета «Новини Закарпаття» м. Ужгород

The aim of the exchanges is: capacity building, possible replication of best practices and identifying further funding opportunities for interested countries /stakeholders.

Location: Uzhgorod, Ukraine for the seminar and visit to the pilot demonstration project site near Uzhgorod

LIVING WATER EXCHANGE

Picture 1. Some of the participants of the peer to peer exchange in Uzhgorod

Minutes of meeting:

1. *Welcome speech by Head of Department of Agricultural development, Zakarpattya Oblast Administration Mr. Terelya*

In his speech he highly assessed the pilot project implemented and said that there is an urgent need to good agricultural practices in Zakarpattya. He stressed, that large old collective farms, established during the soviet time, do not exist anymore. 140 large farms are split at present at 140,000 of small farming plots of the total size 0,24 ha. Such large number of agricultural plots makes it impossible to assess the way of agricultural production. Therefore such projects are timely and highly required.

2. *Introduction - Goals of the workshop, outline of session, project objectives and project results to frame the day (by Peter Whalley)*

Mr. Whalley on behalf of Mr. Chaikovitz, presented the main goals of the project and described the arhived results so far.

3. *UNDP/GEF Support to ICPDR for the development of an integrated River basin Management Plan in the Tisza River basin and the Significant Water Management Issues related to nutrient pollution (by Diana Heilmann, ICPDR Project Staff)*

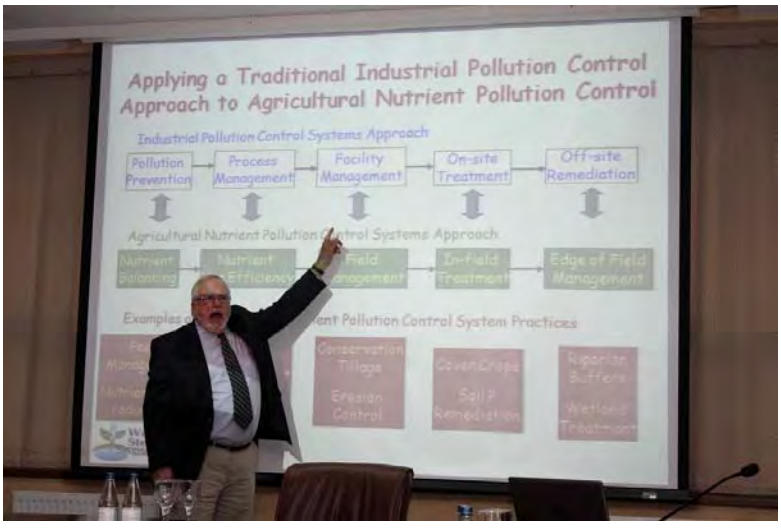
Mrs. Heilmann described the current work towards development of Integrated Tisza River Basin Management Plan and described the main issues defined there and approaches to be followed.

4. *Nutrient Reduction challenges in the Country – by Mariya Skobley, Zakarpattya Ecological Inspection.*

Mrs. Skobley described the current system of monitoring and existing data on nutrients pollution in Zakarpattya. She stresses the problem of old pesticides storages, especially in the times of flooding. Skobley said that of the Oblast's 20 water treatment facilities, six are nearly useless. There were many questions to her regarding the frequency of monitoring and distribution of monitoring obligations between different organizations in Zakarpattya.

5. What are good practices of Nutrient Reduction? – by Dr. Tom Simpson, President and Executive Director, Water Stewardship, USA

In his presentation he addressed the different types of Nutrient Reduction practices including agriculture, wetlands, wastewater development and pollution reduction in general and relevant to the USA. The participants asked many questions about the costs of programme of nutrient reduction and stimuli for the farmers to reduce use of chemicals.



REGIONAL ENVIRONMENTAL CENTER

6. *Experience of the implementation of the pilot project on nutrients reduction in Moldova – by Dr.Artur Nebunu, ECC*

Mr. Artur Nebunu presented the demo project held in Moldova. Its main goal was to support use of manure in agriculture. Participants were very surprised that problem of dumping of manure exists because in Zakarpattya, the problem is opposite – lack of manure and its high costs. However, the whole project was very positively accepted by the public. There are many questions regarding the stimuli for good agricultural practices, ways of institutional enforcement by government (how to persuade the government to follow recommendations of the project), as well as sustainable production of the grape. The experience of Moldova is very valuable for Ukraine, because our countries have similar former background.

7. *Breakout sessions – Key outputs include:*
    - Nutrient Reduction problems (including the experience of the Tisza MSP project)

The main problems noted by participants is

- lack of economic stimuli for sustainable agriculture, no market of clean production and the same pricing used for organic / non organic production.
- Need of special legislative act in support of organic agriculture
- Need for national monitoring of quality of products – eco labeling
- In case of Zakarpattya, lack of knowledge how to get organic fertilizers in absence of manure (how to get it out of wooded residues etc.)
- Controversy between organic agriculture, which is more expensive in operation and high level of poverty – no demand for good quality, but more expensive products.

    - Share experiences on good practices

The participants described different methods of obtaining of organic fertilizers, use of vermiculture, use of drop irrigation in different countries.

    - Identify future opportunities for replication and Nutrient Reduction strategies

In future it was proposed to make more focus on development of ecolabeling and establishment of market for agricultural products. It was stressed that it is important NOT to follow the previous experience of the EU countries, when the richer is the country, the more chemicals it uses. The need of replication of such experience as establishment of riparian protective zones in whole Zakarpattya.

Some pictures of the participants

October 27 – Visit to the pilot site and/or to other relevant sites

1. *Presentation of the pilot activities in Ukraine (Siltse and Zarichya villages)*

- General tasks and goals of the project (V. Manivchuk)
- Activities towards nutrients reduction in soils: soil fertility mapping and advices for the farmers (Yu.Penzenyk, A. Fandalyuk)
- Activities towards nutrients reduction in surface water: importance of establishment of riparian zone (O.Osiysky / O.Skral)
- Activities towards nutrients reduction in products: obtaining and use nitrate measuring devices (Siltse and Zarichya, Sanitary-epidemiological service)

All participants received the Strategy of Nutrients Reduction prepared by the project, where all the project results are accumulated.

2. *Site visits to the riparian zone, poster, and one green house*

The participants were surprised by the level of land use in villages (there is something growing in each piece of the land) and closeness of the agricultural fields to the water. In some places, the green houses are literally hanging in the air above the river.

3. *Excursion to bio jam processing factory and mangolica organic farm (Batar)*

The participants were introduced to unique in Ukraine mangolica (wild pig) organic farm. The pigs live in nature and 9 months provide food by themselves (no chemicals are used to stipulate their growth). Comparing to normal pigs they grow twice slower (during 2 years comparing to 8 months of normal pig), but their meet is very tasty and clean. The participants asked many questions regarding the market for this much more expensive meet and market for his organic juices and jams (which are also 4 times higher than the same products grown not organically). He informed that he worked mainly for export (children food in Hungary) and sells meet to expensive restaurants – yet no stable market for organic products in Ukraine.

Mangolica pig.

Conclusions:

The peer-to-peer exchange went very successfully; the participants got introduced to Zakarpattian reality in the field of agriculture production, discussed problems and possible solutions. The group was very diverse (9 countries presented there), which allowed to have really global picture of nutrient related problems.

The proposed topics for the further exchange of the best agricultural practices, namely in field of producing of organic fertilizers from residues, methods of irrigation, and the most crucial ecolabelling and legal and institutional support to organic producer (tax decrease policy, laws etc.).

The organizers would like to thank speakers for valuable contributions and to GEFT for financing this useful event!

НЗ №№ 121—122 (3690—3691)
29 жовтня 2010 року

ЩОБ МАТИ «ЖИВУ ВОДУ»,

НЕОБХІДНО ПОДБАТИ ПРО ПЕРЕДОВІ ПРАКТИКИ ОРГАНІЧНОГО СІЛЬГОСПВИРОБНИЦТВА

Міжнародна конференція щодо впровадження у Східній Європі та Центральній Азії передових практик органічного сільськогосподарського виробництва з метою зменшення забруднення поверхневих вод сполуками азоту і фосфору впродовж двох днів проходила на Закарпатті. Вона була організована Міжнародною комісією із захисту р. Дунай (МКЗРД).

У вівторок у конференц-залі готельного комплексу «Золота гора», що поблизу Ужгорода, відбулося пленарне засідання, на якому йшла мова про можливості впровадження передових практик на теренах країн СНД за підтримки Проекту розвитку ООН (ПРООН) і глобального екологічного фонду (ГЕФ).

Заступник начальника головного управління агропромислового розвитку ОДА Віктор Тереля, відкриваючи засідання, звернув увагу на актуальність проблеми для нашого краю. Адже з 1999-го по 2001 рік, коли проходила активна фаза реформування агропромислового комплексу, за його словами, в АПК Закарпаття кількість користувачів землі з 160 зросла аж до 140 тисяч. Отож від міжнародної конференції керівництво області хоче отримати насамперед чіткі пропозиції, як навчити цих людей газдувати так, щоби не забруднювати воду, ґрунти і навколишнє середовище. Вирішити проблему можна лише у тісній співпраці зі спеціалістами країн-сусідів, залучивши для цього кошти ЄС і ГЕФ.

Основне ж питання, яке розглядалось — презентаційні доповіді представника проекту обміну «Жива вода» Пітера Веллі (Великобританія) та представника МКЗРД Діани Хельман про підтримку ПРООН і ГЕФ, надану Міжнародній комісії із захисту р. Дунай для розробки Інтегрованого плану управління басейном р. Тиси як найбільшої притоки Дунаю і запобігання гіпоксії, тобто нестачі кисню у водних об'єктах через їх забруднення поживними речовинами, президента й виконавчого директора «Water Stewardship» доктора Тома Сімпсона (США) про різні типи практик зниження вмісту нутрієнтів, включаючи сільське господарство, водноболотні угіддя, очистку стічних вод, директора «ЕСС Кагул» Артура Небуну про результати впровадження демонстраційного проекту по зменшенню забруднення поживними речовинами в Молдові та інші.

Богдан ДУБОВИЙ.

Article about the peer to peer exchange in local press

LIVINGWATER EXCHANGE

PROJECT REPORT

PROMOTING REPLICATION OF GOOD PRACTICES IN NUTRIENT REDUCTION AND JOINT COLLABORATION OF CENTRAL AND EASTERN EUROPE PROJECT

Contract № LC-09-040

Akmaral Mukayeva

The Regional Environmental Centre
for Central Asia (CAREC)
December 27, 2010

UNDP GEF IW LEARN REGIONAL ENVIRONMENTAL CENTER carec

CONTENT

Introduction

The report is prepared under the «Promoting Replication of Good Practices in Nutrient Reduction and Joint Collaboration of Central and Eastern Europe project» financed by UNDP/GEF through the Global environment and technology foundation (GEFT).

Project Objective is to accelerate the replication of successful nutrient reduction projects by identifying best nutrient reduction practices, to demonstrate successful replication strategies, and to disseminate and promote best practices and replication strategies to practitioners and decision makers.

The countries that implement the project are Albania, Azerbaijan, Bosnia and Herzegovina, Croatia, Georgia, I.R. Iran, Kazakhstan, Moldova, Montenegro, Poland, Russian Federation, Serbia, Slovakia, Turkey, Turkmenistan, and Ukraine.

The principal project executor is the Regional Environmental Centre for Central and Eastern Europe (REC CEE).

The project executor in the Central Asia is the Regional Environmental Centre for Central Asia (CAREC) according to contract No. LC-09-040 with CAREC.

Project duration: December 1, 2008 - December 31, 2010

Other partners to the project are: REC for Caucasus, REC Moldova, and REC Russia

Urgency of the project for the Central Asia

This project can well be considered the first initiative in Central Asia countries to attend to issues of nutrient soil and water pollution. There has been some research on nutrient pollution of superficial water and soil. Thus, according to these researches, for example, the nutrient load in the Kazakh rivers Irtysh, Syr-Darya, Nura, Ili, Shu, Talas, Tobol, Ural is reported to vary from the level "extremely high" to "moderately polluted". The quality of water in the river Kokpekty, an inflow of the river Nura, corresponds to level 4, or "polluted" waters. The nutrient load is characterized by an excessive content of Ammonium Salt, i.e. up to 2.1 MPC (maximum permissible concentration), and Nitrite Nitrogen up to 6.95 MPC.

Regretfully, these studies tend to be discrete, with no analysis of long term trends in pollution of waterways and watersheds, and no assessment of nutrient pollution by phases of hydrological regime, whereas the issue demands steadfast attention of national agencies, researchers, experts and practitioners.

Project performance in Central Asia

The project has had the following goals:

- to accelerate the replication of successful nutrient reduction projects by identifying best nutrient reduction practices
- to demonstrate successful replication strategies
- to disseminate and promote best practices and replication strategies to practitioners and decision makers

Achievement of these goals has been carried out through execution of the following components:

Component 1 - Identification, capture, analysis and summarization of nutrient reduction best practices and lessons learnt

Component 2 - Demonstration of successful nutrient reduction replication strategies

Component 3 - Dissemination and promotion of nutrient reduction best practices, lessons learnt and successful nutrient reduction replication strategies

Component 1

Identification, capture, analysis and summarization of nutrient reduction best practices and lessons learnt

Activity on the component went from May 2009 till September 2009.

Firstly, an official inquiry was sent to the Ministries of Environment Protection, Ministries of Agriculture, and the Ministries of Water Resource Management of the five Central Asia countries to identify nutrient reduction projects that had already been implemented or were being implemented in these countries. The inquiry letter was annexed with brief information on the project goals and challenges. We received official responses from all the ministries which clearly states that no nutrient reduction projects were implemented in the territory of the Central Asian region (Annex 1-5).

Secondly, questionnaires were distributed among managers of eight relevant projects (Annex 6). The questionnaire has been translated into Russian for a deeper understanding of it by the project managers. We received the filled out questionnaires from 3 project managers:

- Eugeniy Lukinih, manager of "Ust Kamenogorsk-Environmental Remediation" project
- Eugeniy Lukinih, manager of "Nura River Clean-Up" project
- Alexander Nikolaenko, manager of «Kazakhstan National integrated water resources management and water efficiency plan (phase 2)» project.

The questionnaires revealed that the first two projects aimed at reduction of toxic industrial waste, and the third project was directed at developing the system of national integrated water resources management and creating eight basin councils which might mean that nutrient pollution was not considered by any of the above stated projects (Annex 7-9). The three questionnaires were translated into English and handed over to UNDP/GEF and REC CEE in August 2009.

Telephone polling on the other projects showed that these projects had no relation to nutrient pollution either.

Besides, we searched the Internet (WaterWiki, CARNet, Cawater-info.net) for relevant projects in Central Asia and analyzed them.

Component 2

Demonstration of successful nutrient reduction replication strategies

To exchange experience and share best practices in nutrient load reduction UNDP/GEF has organized an exchange programme which consisted of four events in the countries implementing the pilot projects: Albania, Serbia, Moldova and Ukraine.

Participants from Central Asia, i.e. Kazakhstan and Turkmenistan, were invited to the seminar of October 25-29, 2010 in Uzhgorod, Ukraine.

The seminar was held with the purpose of exchanging advanced nutrient reduction strategies and demonstrating the pilot project «Advanced strategies in reducing fertilizers runoff from agricultural plots into the Tisa watershed» which was selected and supported by UNDP/GEF as a demo-project in Ukraine.

Invitations were sent to the Ministry of Environment Protection, Agriculture and Water resources of Kazakhstan and Turkmenistan and to representatives of agricultural non-governmental organizations and expert practitioners.

The following nominees were chosen to take part in the seminar:

1. Tota Toktasynova, expert, Committee on environmental regulation and control, Ministry of Environment Protection KZ

2. Assel Rakhimova, expert, Department of Environmental Policy and Sustainable Development, Ministry of Environment Protection KZ
3. Vladimir Krugelchuk, farmer, Union of Farmers of Kazakhstan
4. Guljamal Nurmuhamedova, NGO "Ynanch-vepa", Turkmenistan
5. Akmaral Mukayeva, project manager, CAREC

Two representatives from Turkmenistan, who had been delegated by the Ministry of Nature Protection, sent a post-deadline refusal to take part which made it impossible for other nominees to arrive due to absence of the entrance visa to Ukraine.

This seminar raised awareness of Central Asian specialists about nutrient pollution, gave idea of best strategies to fight this problem, and demonstrated the outcomes of the pilot project «Advanced strategies in reducing fertilizers runoff from agricultural plots into the Tisa watershed».

Component 3

Dissemination and promotion of nutrient reduction best practices, lessons learnt and successful nutrient reduction replication strategies

1. Exhibition under the VI Ministerial Conference on Environment and Development (MCED6) of Asia and the Pacific region, September 27 - October 2, 2010 (Astana, Kazakhstan)

The exhibition was held under the framework of MCED6 to disseminate information on the project, problems of nutrient pollution and ways to tackle them in Central Asia.

The exhibition was the CAREC contribution to the project. The event included publishing and distribution of:

- leaflets on best nutrient load reduction practices developed by REC CEE (1,100 copies)
- brochures on goals and challenges of the project in the Russian and English languages (100 copies)
- posters (5 copies)

2. Seminar «Promotion of advanced nutrient load reduction practices in Kazakhstan»

The awareness raising seminar held on December 20, 2010 in Astana aimed at promotion of advanced nutrient load reduction practices in Kazakhstan.

Representatives of the Ministry of Environment Protection, Hydrometeorological Service of Kazakhstan, Ministry of Agriculture, Committee on Water resources, international and non-governmental organizations, farmers and agricultural experts were invited to participate in the seminar. Eventually fifteen specialists took part in it (Annex 10).

Goals and challenges of the project «Promoting Replication of Good Practices for Nutrient Reduction and Joint Collaboration in Central and Eastern Europe» were presented at the seminar.

The agenda of the seminar included a lecture of the Ministry of Environment Protection on the current situation in nutrient pollution in Kazakhstan, a report of a task worker on soil resources in Kazakhstan: their state, assessment and productivity enhancement, and also an address of the Union of Farmers of Kazakhstan on organic farming and ways to approach the problems of nutrient pollution (Annex 11).

The discussion revealed most urgent nutrient pollution problems and requirements in Kazakhstan. Inter alia, the participants of the seminar named the following problems:

- No comprehensive picture of nutrient pollution of the territory in Kazakhstan due to inadequate system of monitoring
- Lack of accurate and complex research, and nutrient pollution assessment of superficial water resources and soils
- Insufficient awareness and capacity of experts, farmers, ecologists on environmentally friendly management practices and techniques to reduce nutrient load
- Low public awareness of how nutrient load increase affects them and the environment
- Underdeveloped infrastructure

Such steps were defined by the participants to improve the current situation:

- Base comprehensive nutrient load assessment in Kazakhstan, including pollution mapping and division of the territory into zones
- Capacity building of farmers, agricultural experts and ecologists in applying environmentally friendly management practices
- Implementation of pilot projects for demonstration and promotion of best practices and new environmentally friendly land management practices in Kazakhstan
- Development of a nutrient management strategy and plans for pilot territories
- Awareness raising campaign for the stakeholders on the issues of nutrient pollution

Following decisions were taken by the participants during the workshop:

- Participants (official bodies, farmers, experts) have recognized the relevance of the topic for Kazakhstan and the need for its further elaboration
- Participants expressed their readiness to take part in similar projects in Kazakhstan
- Participants recognized the need for a comprehensive assessment of the baseline situation of nutrient pollution in Kazakhstan
- It was decided to entrust the CAREC review priorities and strategies of international and donor organizations to promote similar projects in Kazakhstan
- It was decided to recognize the coordinating role of CAREC in advancing this initiative in Kazakhstan

The participants of the seminar received leaflets on best nutrient load reduction practices which had been translated into Russian. Besides, the participants were given a list of relevant Internet sites (www.nutrient-bestpractices.iwlearn.org, www.getf.org, www.rec.org, www.iwlearn.net, www.carecnet.org) where they can find detailed information on the project and best practices.

The seminar has facilitated understanding the importance and urgency of the nutrient reduction initiative in Kazakhstan.

3. Data distribution via electronic and printed media

To distribute the information further in the Central Asia countries, the published leaflets on best nutrient load reduction practices have been handed over to CAREC Offices in Tajikistan, Kyrgyzstan, and Uzbekistan.
Besides, the information on the project, its outcomes and best practices, e-publications in the Russian and English languages have been put up at CAREC Internet site (www.carecnet.org) openly available and free for the public.

Letter from Committee on water resources of the Republic of Kazakhstan

КАЗАКСТАН РЕСПУБЛИКАСЫ
АУЫЛ ШАРУАШЫЛЫҒЫ
МИНИСТРЛІГІ
СУ РЕСУРСТАРЫ
КОМИТЕТІ

РЕСПУБЛИКА КАЗАХСТАН
МИНИСТЕРСТВО
СЕЛЬСКОГО ХОЗЯЙСТВА
КОМИТЕТ
ПО ВОДНЫМ РЕСУРСАМ

Вх №06-3-150
08.05.09

Региональный
Экологический Центр
Центральной Азии

На №С-03-150 от 6 мая 2009 года

Комитет по водным ресурсам Министерства сельского хозяйства Республики Казахстан (далее-Комитет), рассмотрев указанное письмо, сообщает, что проекты, затрагивающие вопросы снижения уровня биогенного загрязнения на территории Республики Казахстан Комитетом не реализовывались.

Заместитель Председателя А.Кеншимов

Ганиева Д.
74-76-80

0002444

Letter from Ministry of nature protection of Turkmenistan

TÜRKMENISTANYŇ
TEBIGATY GORAMAK
MINISTRLIGI

744000, Aşgabat ş., Kemine köç., 102
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MINISTRY
OF NATURE PROTECTION
OF TURKMENISTAN

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Phone: 35-43-17; fax: 39-31-84

«21» 05 2009 ý. № 1194/04

Исполнительному директору РЭЦЦА
Т.М. Макееву

на Ваш исх. №С/03-150 от 06.05.2009

Уважаемый Талайбек Мукашевич!

В ответ на Ваш запрос Министерство охраны природы Туркменистана информирует РЭЦЦА о том, что в рамках Министерства не реализовывались проекты по снижению уровня биогенного загрязнения. Вместе с тем Национальный институт пустынь, растительного и животного мира, государственные заповедники и др. организации Министерства охраны природы могут принять участие в реализации регионального проекта «Содействие распространению передового опыта по снижению биогенного загрязнения» при общей координации мероприятий по проекту в стране представительством РЭЦЦА в Туркменистане.

С уважением,

Министр **М.К. Акмурадов**

МИНИСТЕРСТВО ОХРАНЫ
ОКРУЖАЮЩЕЙ СРЕДЫ
РЕСПУБЛИКИ КАЗАХСТАН

02-02-23/6760
01.06.2009

Исполнительному директору
Регионального экологического
центра Центральной Азии
Макееву Т.М.

050043, г.Алматы, Орбита-1, 10

Уважаемый Талайбек Мукашевич!

Министерство охраны окружающей среды Республики Казахстан на Ваше письмо от 6 мая 2009 года № С/03-150, направляет информацию согласно приложения.

Приложение на 2 листах.

Вице-министр **Э. Садвакасова**

Исп. Кенжеев Арман
тел. 8 (7172) 740 876
факс. 740 880
E-mail: a_kenzeyf@mail.ru

Annex 4

Letter from Ministry of agriculture, water resources of Kyrgyz Republic

КЫРГЫЗ
РЕСПУБЛИКАСЫНЫН
АЙЫЛ, СУУ ЧАРБА ЖАНА
КАЙРА ИШТЕТҮҮ ӨНӨР ЖАЙ
МИНИСТРЛИГИ

МИНИСТЕРСТВО СЕЛЬСКОГО,
ВОДНОГО ХОЗЯЙСТВА И
ПЕРЕРАБАТЫВАЮЩЕЙ
ПРОМЫШЛЕННОСТИ
КЫРГЫЗСКОЙ РЕСПУБЛИКИ

720040, Бишкек ш., Киев көчөсү, 96 А
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"3" июня 2009 г. № 01-4/1726

На №

Региональный экологический центр
Центральной Азии

На исх. № С/03-150
от 6 мая 2009 года.

О практике снижения уровня
биогенного загрязнения

Министерство сельского, водного хозяйства и перерабатывающей промышленности Кыргызской Республики информирует о том, что сложности в сельском хозяйстве и энергетическом секторе Кыргызстана подталкивают к неординарным решениям имеющихся проблем. Истощение пахотных земель, снижение урожайности, а также увеличивающиеся энерготарифы являются основными причинами низкого уровня жизни сельского населения. Одно из видимых и предполагаемых решений – использование биогазовых технологий в сельском хозяйстве.

Учитывая важность проблемы, Министерством сельского водного хозяйства и перерабатывающей промышленности республики совместно с Японским агентством международного сотрудничества ЛСА реализуется проект технического сотрудничества «Содействия распространению биогазовых технологий (БГТ) в Кыргызской Республике». Реализующее ведомство - Министерство сельского, водного хозяйства и перерабатывающей промышленности Кыргызской Республики.

Сроки реализации проекта: 19 декабря 2007 – 18 декабря 2010 (3года).

Целевые регионы: Чуйская и Иссык-Кульская область.

Целью Проекта является создание системы распространения опыта усовершенствованных биогазовых технологий в Кыргызской Республике, а основными задачами разработка надлежащих моделей биогазовых установок (БГУ), подготовка технических специалистов по БГУ, привлечение административных ресурсов и кредитно-финансовой системы к внедрению опыта биогазовых технологий, распространение информации о БГТ в сельской местности.

На сегодняшний день, в результате изучения опыта по распространению биогазовых технологий в республике,определения проблем внедрения биогазовых технологий и проблем местных фермеров на основе анализа реализованных ранее аналогичных проектов в селе Алмалуу Иссык-Атинского района (п/п №1) в г. Токмок (п/п №2) и в с. Кароол-Добо Кеминского района (п/п №3), проектом

построены и начали действовать биогазовые установки. В первых двух пилотных хозяйствах - объемом 25 куб.м, в третьем- 10 куб.м.

На следующем этапе до сентября 2009 года проектом планируется строительство нескольких биогазовых установок в Иссык-Кульской области.

Применение биогазовых установок позволит решить проблему утилизации бытового мусора и отходов животноводства, уменьшится потребление электроэнергии. Использование отходов от биогазовых установок - метанового эффлюента на сельскохозяйственных культурах, позволит повысить их урожайность и плодородие почвы, решатся социальные вопросы – улучшится уровень жизни сельского населения, снизится уровень его бедности.

Контактные данные менеджера проекта ЛСА «Содействия распространению биогазовых технологий в Кыргызской Республике» - 720000, г. Бишкек, ул. Боконбаева, 241, здание Госдепартамента химизации, защиты и карантина растений, 3 этаж, рабочий телефон 45-55-13.

Заместитель министра **Д.Кенжебаев**

List of projects in Central Asia

№	Title	Countries	Donor	Contact information	Project manager
1.	Water Governance in Central Asia	Europe& CIS, Central Asia	EC	country: Kazakhstan city: Almaty tel:+8 (727) 291-76-76 fax:+8 (727) 2910749 Delphin.Marie@ec.europa.eu	Delphin Marie
2.	Regional Environment Programme	Europe& CIS, Central Asia	EC	country: Kazakhstan city: Almaty tel:+8 (727) 291-76-76 fax:+8 (727) 2910749 Delphin.Marie@ec.europa.eu	Delphin Marie
3.	Promoting IWRM and fostering transboundary dialogue in Central Asia	Europe& CIS, Central Asia	UNDP	country: Slovakia city: Bratislava +421-2 59 337 250 juerg.staudenmann@undp.org skype:juerg_staudenmann	Juerg Staudenmann
4.	Kazakhstan National integrated water resources management and water efficiency plan (phase 2)	Kazakhstan	EC	country: Kazakhstan city: Almaty tel:8 (727) 2785110 (ext) 109 mob. 87772361430 Anikolaenko@carec.kz	Nikolayenko A.
5.	Ust Kamenogorsk-Environmental Remediation Project	Kazakhstan, Europe& CIS, Central Asia	WB	country: Kazakhstan city: Astana Ust-Kamenogorsk Tel:8 (7172) 742737	Lim Vichaslav
6.	Nura River Clean-Up Project	Kazakhstan	WB	country: Kazakhstan city: Astana Tel: 8 (7172) 742284	Lukinih Eugeniy
7.	Restoring Depleted Fisheries and Consolidation of a Permanent Regional Environmental Governance Framework in the Caspian Sea	Kazakhstan, Europe& CIS, Central Asia, Turkmenistan, Russia, Azerbaijan, Iran	GEF	country: Slovakia city: Bratislava +421-2 59 337 267 vladimir.mamaev@undp.org	Vladimir Mamaev
8.	Drainage, Irrigation & Wetlands Improvement Project - Phase 1	Uzbekistan, Central Asia	WB	country: Uzbekistan city: Tashkent (+99871) 244-84-30	Iusupov Bakhtior

Country/Project Manager Outreach Questionnaire

The following are proposed questions for country representatives and/or project managers to provide in depth information regarding select national, regional/trans-boundary and/or local nutrient reduction projects in the Central and Eastern Europe (CEE) and Eastern Europe Caucuses and Central Asia (EECCA) regions. The key outcomes from this questionnaire include: 1) a better understanding regarding how and why best, most appropriate practices have been implemented and associated challenges; 2) strategies for replication; and, 3) likely candidate countries and practices for demonstration. For more information, please email chuck@getf.org.

Project: Development of National Plan for Integrated Water Management (IWM) and Water Supply in Kazakhstan
Manager: Alexander Nikolaenko

Methodology

1. Water Resource Type

· What kind of waterway is involved or impacted? Stream? River? Lake? Marsh? etc.
  + River
  + Lake
  + Marshy territories
  + Sea

2. Pollution/Nutrient Challenge

• What are the main sources of nutrient pollution?
Communal, household, agricultural

• What are the main impacts of excess nutrients on water quality?
Pollution with phenols, organic substances, weediness, silting, oxygen reduction

• Are there other impacts on the water (human health, biodiversity, other)?
Enteric diseases, epidemiological effects, diseases of domestic animals

• Have baseline conditions been established with regards to nutrient concentrations/loads at the start of the project and is there a target set for nutrient reduction (e.g. a desired state in the past {*as in the Danube /Black Sea}*)?
State norms (PMC, sanitary and epidemiological norms)

• How has the impact of excess nutrients been established?
Through expert, annual monitoring by Sanitary and Epidemiological Bodies of the Republic of Kazakhstan

3. Project Description

• What is the projected cost of the practice, process and/or technology installed?
Methodologies and know-how were not being introduced during the project implementation

• Category of farms for which practice/ technology is best suited (size, species, etc.)

4. Benefits /Best Practices

• What are general benefits of the project and who were specific beneficiaries? (Can you give some examples of the qualitative and quantitative benefits and impacts from the project)

A State Policy in the field of Integrated Water Management (IWM) developed. The Republic of Kazakhstan is the beneficiary.

5. Nutrient Reduction / Environmental Impacts and Benefits:

• How has the project intervention resulted in nutrient reductions?

Water conservation zones established, condition of the Ili-Balkhash basin improved

• Has the intervention been successful, is there evidence of success and what is the rationale for the specific approach implemented?

All Project Objectives have been achieved, IWM Plan has been developed, the state budget provided financing

• What percentage of the nitrogen and/or phosphorous will be reduced by the project? What are the existing (measured or estimated) nitrogen/phosphorous concentration / loads from the farm?

• What additional environmental benefits, if any, will be realized from this project?

• Who will benefit from these changes?

If the project had the impact on the local population or community how many people are influenced from the project results?

6. Monitoring Plans

• Who and how will the project be maintained and monitored?

Water Committee, Projects Management Committee, annual independent audit

7. Local Input

• What local stakeholders supported or opposed the project and what was the reaction, if any? What were their reasons to support or to oppose? Has the project met local needs? What are the needs yet to be addressed?

Supporters: Environment Ministry of the Republic of Kazakhstan, Water Committee of the Republic of Kazakhstan, Parliament of the Republic of Kazakhstan

Opponents: Ministry of Finance of the Republic of Kazakhstan

8. Project Metrics

• What are the project milestones and metrics?

Plan development, a State Programme for drinking water adopted

• How were they measured?

9**.** Technology/Best Management Practice Transfer:

• If successful, what type and size of farm will these technologies and/or best management practices apply to?

- Do the technologies and/or best management practices have local or regional applications?
  - Local
  - National
  - Regional

Describe briefly the existing project that will be leveraged and how?

The Project is the first activity, directly aimed to achieve Millennium Development Goals for water supply and sanitation, as well as to develop the National Integrated Water Management and Water Supply Plan.

Basin Councils established in eight river basins of Kazakhstan to ensure involvement of water consumers in water-management decision-making. Also, the Project is aimed to enhance cooperation and establish partnerships at regional and state levels.

• What are possible follow-up actions? If there were any follow up actions, what did they consist of?

10. Lessons Learnt

• What could have been done better?

• What are the challenges in the project implementation?

Complicated coordination activities at Ministerial level

- Were there any changes in the original procedure, process and/or action? Why? Any specific recommendations/suggestions?

Country/Project Manager Outreach Questionnaire

The following are proposed questions for country representatives and/or project managers to provide in depth information regarding select national, regional/trans-boundary and/or local nutrient reduction projects in the Central and Eastern Europe (CEE) and Eastern Europe Caucuses and Central Asia (EECCA) regions. The key outcomes from this questionnaire include: 1) a better understanding regarding how and why best, most appropriate practices have been implemented and associated challenges; 2) strategies for replication; and, 3) likely candidate countries and practices for demonstration. For more information, please email chuck@getf.org.

**Refining of Nura-river Project covers the issues of mercury pollution but does not consider biogenic pollution.*

Methodology

1. Water Resource Type

What kind of waterway is involved or impacted? Stream? River? Lake? Marsh? etc.

- River *Nura-river, Karagandinskaya and Akmolinskaya oblasts, Kazakhstan*
- Lake
- Marshy territories
- Sea

• What is the source of water, size and length of the water body, watershed?

- Width
- Length *Total length of the river is 978 km.*
- Depth
- Water intake *Water intake area is 58,1 thousand km.^{2}.*

2. Pollution/Nutrient Challenge

• What are the main sources of nutrient pollution? *The sources of mercury pollution include buildings and facilities of former Karbid plant, gold dump of Karaganda Hydro Power Plant, main sewage, mercury-polluted sediments in the river bed and bottom.*

• What are the main impacts of excess nutrients on water quality?

Formation of water-soluble and particularly toxic methylmercury.

• Are there other impacts on the water (human health, biodiversity, other)? *Mercury or its fumes may cause serious poisoning, affect nervous system, liver, kidneys, digestive tract, if inhaled – airways (most often mercury gets into an organism through inhaling scentless fumes). Fish, mollusks and water plants may also accumulate mercury and poison people through the food system.*

• Have baseline conditions been established with regards to nutrient concentrations/loads at the start of the project and is there a target set for nutrient reduction (e.g. a desired state in the past {*as in the Danube /Black Sea}*)?

Yes, Feasibility Report, design specifications and estimates developed.
Yes, to the normative index.

• How has the impact of excess nutrients been established? *A number of studies, starting from 1986-1988. Environmental geo-chemical evaluation of mercury pollution of Nura-river. Published by Yanin in 1997; 1997-1999. INCO-Copernicus studies: development of options to restrict damage and environmental rehabilitation of mercury-polluted areas in Northern and Central Kazakhstan; 2000-2001. Study of sustainability of dam at Intumak water reservoir; assessment of its current condition and that of the soil dam as well as partially constructed hydrotechnical facilities. Rehabilitation options developed and compared; 2001-2002. Feasibility Study: Project for environmental rehabilitation and management of Nura-Ishim rivers basins; the present report includes Ramboll studies on the territory of the plant and Zhaur swamp; 2004 "Nura-river Monitoring", performed by Kazgidromet Karaganda Center for Hydrometeorology, which studies hydrological, chemical and biological data in terms of pollution of river water, subsoil waters, bed sediment, flora, fauna and air; 2004-2005. Projecting Nura-river refining activities; 2004-2005. Mathematical modeling, performed by PROFKONSULT Ltd, The edited Final Report published on 21 July 2005; 2004-2005. Collection of samples at Intumak water reservoir, performed by GEOS Freiberg, The Final Report published on 18 October 2005; 2005. Development of Guidelines for operation of Intumak water reservoir. The Final*

Report published in November 2005; 2005-2006. The Project for rehabilitation and technical re-equipment of Intumak water reservoir. The Final Report published in April 2007.

3. Project Description

• What is the projected cost of the practice, process and/or technology installed?

The total Project value amounts to 86 million US dollars.

• Category of farms for which practice/ technology is best suited (size, species, etc.)

4. Benefits /Best Practices

• What are general benefits of the project and who were specific beneficiaries? (Can you give some examples of the qualitative and quantitative benefits and impacts from the project)

Well-being and health of local communities being improved, safe source of water consumption for water consumers, environmental situation improved, river flow regulated and water supply ensured to Kurgaldzhinskiy natural reserve. The Project provided jobs to the local communities. Mercury level nearby Karbid plant decreased from 144.000 nanogramm per 1 m3 to 5.000 nanongramm upon deconstruction of buildings and facilities.

5. Nutrient Reduction / Environmental Impacts and Benefits:

• How has the project intervention resulted in nutrient reductions? *A module, safe testing range established to dispose mercury-polluted structure units and wastes, mercury-polluted sediment from the river bed and bottom. Mercury sediment will be cleaned out from the river bed and bottom, buildings and facilities of the former Karbid plant will be deconstructed. All these on the whole shall make positive affect on the environment.*

• Has the intervention been successful, is there evidence of success and what is the rationale for the specific approach implemented?

The Project is under implementation.

• What percentage of the nitrogen and/or phosphorous will be reduced by the project? What are the existing (measured or estimated) nitrogen/phosphorous concentration / loads from the farm?

• What additional environmental benefits, if any, will be realized from this project?

In the present Project framework, JICA helped implement the Project on Environmental Mercury Monitoring in Nura-river. The following have been successfully accomplished: planned equipment installed; all planned Japanese experts took part in the Project; Kazakhstan specialists trained to handle mercury; Kazakhstan specialists trained in Japan at Minomato Institute; Japanese experts made suggestions to improve the river monitoring system and methodological instructions on lab testing of samples.

In 2007, as per invitation of Ministry of Healthcare of the Republic of Kazakhstan and Water Committee of the Ministry of Agriculture of the Republic of Kazakhstan, the Project site was visited by experts of the World Health Organization, scientists and medics from Austria and Germany. They were invited to perform an expert evaluation of the situation with mercury pollution and provide consultations in the Project framework. They also brought all necessary equipment to perform their studies.

Since 2007, Kazgidromet has been constantly monitoring the river basin through budget financing.

• Who will benefit from these changes?

Regional communities.

• If the project had the impact on the local population or community how many people are influenced from the project results?

The city of Temirtau, inhabited by 150.000 people, and downstream villages of Chkalovo, Kalinino, Samarkand, Gagarinskoe, Andronnikovo.

6 Monitoring Plans

· Who and how will the project be maintained and monitored?

Water Committee of the Ministry of Agriculture of the Republic of Kazakhstan and competent bodies.

7. Local Input

• What local stakeholders supported or opposed the project and what was the reaction, if any? What were their reasons to support or to oppose? Has the project met local needs? What are the needs yet to be addressed?

This is the first and unique project, being implemented in Kazakhstan, in this context, there were many disputes as to know-how, testing range location.

8. Project Metrics

• What are the project milestones and metrics?

To bring pollution to relevant norms.

• How were they measured?

Through monitoring.

9. Technology/Best Management Practice Transfer:

• If successful, what type and size of farm will these technologies and/or best management practices apply to?

• Do the technologies and/or best management practices have local or regional applications?

- Local
- National √
- Regional √

• Describe briefly the existing project that will be leveraged and how?

In August 1950, in the city of Temirtau, a chemical rubber producing plant was launched. Its acetaldehyde workshop applied sulfuric acid and sulfate mercury salines as a catalyst to hydrate acetylene with acetaldehyde, the main ingredient for production of chemical rubber. Refining facilities were not meant to remove mercury which brought to its significant discharge to Nura-river downstream Samarkand reservoir. Upon the process completion, most mercury would come out either as silt, produced as a result of regeneration of contact acid, or in a residual form from distillation block, where acetaldehyde would separate from non-reacting acetylene. In addition, mercury would discharge into atmosphere as gas from ventilation systems out of hydration process as well as out of cooling of re-circulating water and dry silt distillation.

The first stage of sewage refining was launched in 1950 with a capacity of 3.000 m3 per day, and the second stage – in 1954 with a capacity of 5.500 m3 per day. Biological filtration layers would be formed at these stages. Then sewage would go to refining reservoirs, where it would be chlorinated and silted with the help of biofilters. Water would be discharged into the main collector through the underground collector and further on to Nura-river. Tank silt that would be accumulated in refining reservoirs would settle on the silt site. Till 1969 silt would be discharged into degradation named Zhaurskoe swamp that has not been drained. Mercury-containing silt would also be deposited in old gold dumps of Karaganda State District Power Station-1, situated on Nura-river banks.

Upon completion of production, discharge of waste ceased, but results of studies of the river bed and bottom demonstrate that large amounts of mercury still remain in the environment. Buildings and facilities of former Karbid plant are the main source of repeated mercury pollution and possible cause of an emergency.

Objective of the Refining of Nura-river Project is to refine the river bed and bottom from mercury as well as to deconstruct buildings and facilities of former Karbid plant, to dispose pathological waste, structural units and materials in a safe module testing range, to rehabilitate Intumak water reservoir.

• What are possible follow-up actions? If there were any follow up actions, what did they consist of?

10. Lessons Learnt

• What could have been done better?

The Project is under implementation

• What are the challenges in the project implementation?

Technical issues which are quite resolvable

• Were there any changes in the original procedure, process and/or action? Why? Any specific recommendations/suggestions?

Yes, the scale and spread of pollution were specified in detail.

Country/Project Manager Outreach Questionnaire

The following are proposed questions for country representatives and/or project managers to provide in depth information regarding select national, regional/trans-boundary and/or local nutrient reduction projects in the Central and Eastern Europe (CEE) and Eastern Europe Caucuses and Central Asia (EECCA) regions. The key outcomes from this questionnaire include: 1) a better understanding regarding how and why best, most appropriate practices have been implemented and associated challenges; 2) strategies for replication; and, 3) likely candidate countries and practices for demonstration. For more information, please email chuck@getf.org.

Rehabilitation of environment of the city of Ust-Kamenogorsk

Methodology

1. Water Resource Type

What kind of waterway is involved or impacted? Stream? River? Lake? Marsh? etc.

– *Rivers of Irtysh and Ulba*

• What is the source of water, size and length of the water body, watershed?

Ulba-river parameters:

- Up to 200 m. wide
- 90 km. long
- Up to 3 m. deep
- Водосборы около 2000 км2

Irtysh-river parameters:

- 350 km. wide;
- Flows throughout China (525 km.), Kazakhstan (1.835 km.) and Russia (2.010 km.)
- 6 m. deep
- 106.000 km. of water intake.

2. Pollution/Nutrient Challenge

· What are the main sources of nutrient pollution?

Leaks from water-carrying communications and waste facilities of enterprises

• What are the main impacts of excess nutrients on water quality?

Aggravated habitat of aquatic organisms and quality of water resources, supplied to underground waters, consumed for economic and household needs

• Are there other impacts on the water (human health, biodiversity, other)?

Reduced species of zoobenthos and ichthyofauna, aggravated human health in case of consumption of low quality water

• Have baseline conditions been established with regards to nutrient concentrations/loads at the start of the project and is there a target set for nutrient reduction (e.g. a desired state in the past {*as in the Danube /Black Sea}*)?

PMC norms for pollutants, bringing drinking water to the normative content of 3B

• How has the impact of excess nutrients been established?

Based on information, provided by Fishery Research and Development Center and Sanitary & Epidemiological Bodies

3. Project Description

· What is the projected cost of the practice, process and/or technology installed?

Project overall value *amounts to 40.09 million US dollars, including the following:*
- 24.29 million US dollars as the World Bank loan;

- 15.80 million US dollars as co-financing from the Republican budget;
- 3.5 million Euro as a grant of the European Community for an additional Project component – monitoring of underground water quality and institutional capacity-building.

• Category of farms for which practice/ technology is best suited (size, species, etc.)
Populated areas with a large number of industrial establishments

4. Benefits /Best Practices

• What are general benefits of the project and who were specific beneficiaries? (Can you give some examples of the qualitative and quantitative benefits and impacts from the project)

In line with Project Feasibility Study, the following outcomes shall be achieved upon Project implementation:

- *Improved quality of surface water to be supplied as drinking water to the population of the following cities: Ust-Kamenogorsk, Semipalatinsk, Kurchatov, Aksu and Pavlodar, inhabited by more than 1 million people and located downstream Irtysh-river;*
- *Irtysh basin preserved from pollution by toxic wastes;*
- *Enhanced activities of environmental bodies in the field of water quality preservation and water management;*
- *Reduced expenses of the communities for healthcare (as soon as the quality of drinking water improves, the number of diseases, related to bad water supply, shall decrease)*
- *Reduced expenses of the communities for water refining through purchase of various cleaning devices or direct purchase of bottled quality drinking water to consume, the cost of which is much higher than drinking water, supplied through the city water supply system;*
- *Improved drinking water supply shall reduce migration of population from the region, which is a significant economical factor.*

In case the Project has not been implemented, the following might be expected:

- *Further pollution advancement towards transboundary Irtysh-river;*
- *Drinking water inlets polluted and closed-down;*
- *Aggravated environmental situation on Project territories;*
- *Increased social and economic issues of local communities.*

The Project shall re-cultivate industrial waste and rehabilitate sources of underground water in the city of Ust-Kamenogorsk, which shall establish a background for quality drinking water supply to the population of strategically important centers of the Republic: Ust-Kamenogorsk, Semipalatinsk, Kurchatov, Aksu and Pavlodar, inhabited by over 1 million people.
Feasibility Study identifies the Project area as the overall area of industrial waste to be re-cultivated which makes 855.00 m ^{2}.

*The Project consists of **three** main components:*

- *Urgent water-refining activities, aimed to prevent pollution from further penetration into the water-bearing bed;*
- *Relevant steps to be taken to catch, process and monitor infected underground water on the Project territory;*
- *The Programme of ground water quality monitoring, institutional capacity-building, identification and elimination of leaks.*

Objects of the Main Project Components

#	Component
1	Recultivation of a sludge dump of Ust-Kamenogorsk condenser-producing plant
2	Recultivation of cone-shaped dump #6 of Ust-Kamenogorsk Lead & Zinc Processing Plant
3	Recultivation of cone-shaped dump #6 of Ulba Metallurgic Plant
4	Recultivation of cone-shaped dump #6 of Ust-Kamenogorsk Thermal Power Plant
5	Recultivation of cone-shaped dump #1 of Titan & Magnesium Processing Plant
6	Recultivation of gold dump #2a and 2b of Ust-Kamenogorsk Thermal Power Plant

7	*Recultivation of dump of an experimental Lead & Zinc Processing Plant*
8	*Facilities for pumping and re-filtration of underground water*
9	*Water-processing facilities*
10	*Supervision wells (monitoring)*

1. Transfer or minimization of sources of underground water pollution. *Transfer or minimization of the sources of pollution covers the following: examination and repair of leaks and spills at industrial plants; minimization of leaks from dumps and waste facilities. The Project team shall examine and repair leaks at Ulba Metallurgic Plant and Kazzinc. Leaks from dumps and waste facilities shall be minimized through covering them with clay loam.*

2. Processing and refining of polluted water. *Polluted underground water shall be re-cultivated through pumping and processing, as well as infiltration, using mobilizing reagents. The system of rehabilitating wells shall have the following parameters: overall capacity - 830-1.000 m^3/h; debit of 1 well - 12 l/sec (43.2 m^3/h); number – 23 wells. The system of infiltration wells shall have the following parameters: infiltration capacity – 1.000 m^3/h; debit of well - 6 l/sec; number - 46 wells. The complex shall also include the following: conduits 18.1 km. long and 400-700 mm. in diameter in total; a refining station with a capacity of up to 300 l/sec; a pump station with a capacity of up to 300 l/sec; reservoirs with a capacity of 250 m^3 - 2 units; satellite facilities, warehouses, garages and workshops.*

3. Minimization of toxicity level of waste, produced by industrial sources. *SRC method shall be applied to re-cultivate dumps. SRC is based upon the principle, reading that one accumulating layer of a sufficient width shall be filled with water during rain and shall release water during dry seasons through evaporation. SRC shall be applied to Ulba Metallurgic Plant 6; cone-shaped mine waste # 6 of Kazzinc and a sludge dump of a condenser-producing plant.*

4. Infrastructure activities. *To operate the facility for water intake, supply and discharge, the Project shall establish an operating unit, consisting of 8 persons, including those engaged in water intake and infiltration wells – 3 persons; collectors – 2 persons; pump station of water discharge station – 2 persons; water supply and discharge system management – 1 person.*

5. Nutrient Reduction / Environmental Impacts and Benefits:

• How has the project intervention resulted in nutrient reductions?

The Project is at its initial stage at the moment.

• Has the intervention been successful, is there evidence of success and what is the rationale for the specific approach implemented?

The Project is at its initial stage at the moment.

• What percentage of the nitrogen and/or phosphorous will be reduced by the project? What are the existing (measured or estimated) nitrogen/phosphorous concentration / loads from the farm?

The Project is at its initial stage at the moment.

• What additional environmental benefits, if any, will be realized from this project?

The Project is at its initial stage at the moment.

• Who will benefit from these changes?

The Project is at its initial stage at the moment.

• Have local communities been affected by the Project outcomes? If yes, please specify the number of people.

The Project is at its initial stage at the moment.

6**.** Monitoring Plans

• Who and how will the project be maintained and monitored?

State bodies as per their competence.

7**.** Local Input

• What local stakeholders supported or opposed the project and what was the reaction, if any? What were their reasons to support or to oppose? Has the project met local needs? What are the needs yet to be addressed?

As a result of public hearings and kick-off workshop, on the whole, the Project is supported by non-governmental organizations, municipal authorities and communities.

8. Project Metrics

• What are the project milestones and metrics?
Conformity to water quality standards

• How were they measured?
Through monitoring of water condition

9**.** Technology/Best Management Practice Transfer:
• If successful, what type and size of farm will these technologies and/or best management practices apply to?

Industrial establishments

• Do the technologies and/or best management practices have local or regional applications?
  – *At all levels*

• Describe briefly the existing project that will be leveraged and how?

On 10 December 2007, Presidential Decree # 487 "On signing of Loan Agreements (Project for Environment Rehabilitation in the city of Ust-Kamenogorsk) between the Republic of Kazakhstan and International Bank for Reconstruction and Development" was signed to refine and protect underground waters of Ust-Kamenogorsk. According to this normative paper, the Project for Environment Rehabilitation of the city of Ust-Kamenogorsk came into force and, thusly, it was launched.

The Project ***Objective*** *is to prevent pollution of underground waters by industrial waste, spread to the most vulnerable locations of underground waters, including residential parts of the city, potable water-intake facilities, as well as directly to transboundary Irtysh-river. The Project is planning to carry out activities, aimed at isolation of polluted industrial dumps and wastes, prevention of further migration of waste plumes to underground waters, as well as enhancement of the system of underground waters monitoring.*

The Project shall be launched through various field explorations and projecting of underground waters refining activities. Water Committee of the Ministry of Agriculture of the Republic of Kazakhstan shall be the ***Executive Body****.*

The Project is expected to have been implemented by March 2013.

The Project is to cease further pollution of underground waters by historical industrial pollutants and prevent transfer of polluted underground waters to residential areas and, eventually, to Irtysh-river.

• What are possible follow-up actions? If there were any follow up actions, what did they consist of?

The Project is at its initial stage at the moment.

10. Lessons Learnt

• What could have been done better?

The Project is at its initial stage at the moment.

What are the challenges in the project implementation?

The Project is at its initial stage at the moment.

• Were there any changes in the original procedure, process and/or action? Why? Any specific recommendations/suggestions?.

The Project is at its initial stage at the moment.

Annex 10

LIST OF PARTICIPANTS
OF THE WORKSHOP PROMOTING REPLICATION OF GOOD PRACTICES FOR NUTRIENT REDUCTION AND JOINT COLLABORATION IN KAZAKHSTAN
December 20, 2010
Astana

№	Name	Organization	Contacts
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Annex 11

AGENDA OF WORKSHOP
Promoting Replication of Good Practices for Nutrient Reduction and Joint Collaboration in Kazakhstan
December 20, 2010
Astana

10:00-10:10	Opening of the workshop	Toktassynova T, Ministry of environmental protection of Kazakhstan
10:10-10:15	Introduction of participants	
10:15-10:30	Presentation: Promoting Replication of Good Practices for Nutrient Reduction and Joint Collaboration in Central and Eastern Europe Questions/answers	Ms. Mukayeva A. CAREC
10:30-10:50	Presentation: Nutrient Reduction challenges and needs of Kazakhstan Questions/answers	Ms. Toktassynova T. Ministry of environmental protection of Kazakhstan
10:50-11:05	Presentation: Soil resources of Kazakhstan: condition, evaluation and increasing of fertility Questions/answers	Mr. Bobrovnik V. Scientific adviser on landscaping and improvement of Astana city
11:05-11:20	Presentation: Organic farming as way of improving nutrient reduction in Kazakhstan Questions/answers	Mr. Krugelchuk V. Farmer association of Kazakhstan
11:20-11:40	*Coffee-break*	
11:40-11:50	Presentation: Future steps and ideas for replication of nutrient reduction initiatives in Kazakhstan	Ms. Mukayeva A. CAREC
11:50-12:20	Discussion: How nutrient reduction challenges meet the priorities and strategies of donors and international organizations?	
12:20-12:50	Discussion: Opportunities of Nutrient reduction best practices replication and implementation in Kazakhstan	
13:00-14:00	*Lunch*	