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Report No: ICR00001916

IMPLEMENTATION COMPLETION AND RESULTS REPORT
(TF-54908 TF-56212 TF-96289)

ON A

GLOBAL ENVIRONMENT FACILITY GRANT

IN THE AMOUNT OF US$ 9.02 MILLION

TO

SERBIA AND MONTENEGRO

FOR A

SERBIA DANUBE RIVER ENTERPRISE POLLUTION REDUCTION PROJECT

October 26, 2011

Sustainable Development Department
South Eastern Europe Unit
Europe and Central Asia Region

CURRENCY EQUIVALENTS

(Exchange Rate Effective 04/30/2011)

Currency Units = RSD, USD$, EURO, SEK
RSD 67.21 = USD$ 1.00
EURO 1.00 = USD$ 1.48
SEK 6.04 = USD$ 1.00

FISCAL YEAR

SAM: January 1 - December 31
World Bank: July 1 - June 30

ABBREVIATIONS AND ACRONYMS

ABD	EU Animal By-products Directive
AK	Agrokombinat
AU	Animal Unit
BNWPP	Bank-Netherlands Water Partnership Program
CAP	Common Agricultural Policy
CAS	Country Assistance Strategy
CFAA	Country Financial Accountability Assessment
CFPs	Country Financing Parameters
CIDA	Canadian International Development Agency
CoGAP	Code of Good Agricultural Practices
DEP	Directorate for Environmental Protection
DREPR	Danube River Enterprise Pollution Reduction
DWM	Directorate for Water Management
EAR	European Agency for Reconstruction
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EPA	Environmental Protection Agency
ESI	Environmental Status Indicator
EU	European Union
FMR	Financial Management Report
FRY	Federal Republic of Yugoslavia
GA	Grant Agreement
GAP	Good Agricultural Practices
GCMS	Gas chromatography-mass spectroscopy
GDP	Gross Domestic Product
GEF	Global Environment Facility
GEO	Global Environment Objective
GF	Grant Facility
GMO	Genetically Modified Organisms
GOS	Government of Serbia
HMS	Hydrometeorological Service
HPLCMS	Liquid chromatography-mass spectrometry
ICPDR	International Commission for the Protection of the Danube River
IAH	Institute for Animal Husbandry
ICPMS	Inductively coupled plasma mass spectrometry
IPARD	Instrument for Pre-Accession Rural Development
IPPC	Integrated Pollution Prevention and Control
IRI	International Republican Institute
JUAT	Accreditation Board of Serbia and Montenegro
LAU	Local Advisory Unit
LEAD	Livestock, Environment and Development Initiative
MAFWM	Ministry of Agriculture, Forestry and Water Management
MOF	Ministry of Finance
MOI	Ministry of Infrastructure
MIER	Ministry for International Economic Relations
MSEP	Ministry of Science and Environmental Protection
N	Nitrogen
ND	Nitrate Directive
NEAP	National Environmental Action Plan
NGO	Non-governmental Organization
NMP	Nutrient Management Plan
OM	Operational Manual
O&M	Operations and Maintenance
P	Phosphorus
PDO	Project Development Objective
PI	Process Indicator
PIC	Public Information Campaign
PIU	Project Implementation Unit
PPU	Project Preparation Unit
PRSP	Poverty Reduction Strategy Paper
PSC	Project Steering Committee
PSD	Phytosanitary Directorate
PSEPSD	AP Vojvodina Provincial Secretariat for Environmental Protection and Sustainable Development
PSA	AP Vojvodina Provincial Secretariat for Agriculture
PTAC	Project Technical Advisory Committee
ROS	Republic of Serbia
SAM	Serbia and Montenegro
SDP	Standard Disbursement Percentage
SGA	Subsidiary Grant Agreement
SIDA	Swedish International Development Agency
SOE	Statement of Expenditures
SRAD	Sector for Rural and Agriculture Development
SRI	Stress Reduction Indicator
SPPAP	Stakeholder Participation and Public Awareness Plan
SSI	Soil Science Institute
STAR	Serbia Transitional Agricultural Reform Project
STAP	Scientific and Technical Advisory Panel
TIC	Training and Information Center
TOR	Terms of Reference
USD	United States Dollar
VAT	Value Added Tax
VD	Veterinary Directorate
WFD	EU Water Framework Directive
WWT	Wastewater Treatment

Vice President:	Philippe H. Le Houerou

Country Director:	Jane Armitage
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Project Team Leader:	Tijen Arin
ICR Team Leader	Craig Meisner

SERBIA AND MONTENEGRO
Serbia Danube River Enterprise Pollution Reduction Project

CONTENTS

A. Basic Information			
Country:	Serbia	Project Name:	Danube River Enterprise Pollution Reduction GEF Project (Serbia)
Project ID:	P084604	L/C/TF Number(s):	TF-54908,TF-56212,TF-96289
ICR Date:	10/26/2011	ICR Type:	Core ICR
Lending Instrument:	SIL	Borrower:	SERBIA AND MONTENEGRO,REPUBLIC OF SERBIA
Original Total Commitment:	USD 9.02M	Disbursed Amount:	USD 8.50M
Revised Amount:	USD 8.50M		
Environmental Category: B		**Global Focal Area: IW**	
Implementing Agencies: Ministry of Agriculture, Forestry and Water Management			
Cofinanciers and Other External Partners: Swedish International Development Agency (SIDA) European Commission (EC) Government of Serbia Local Communities			

B. Key Dates				
Process	**Date**	**Process**	**Original Date**	**Revised / Actual Date(s)**
Concept Review:	08/26/2003	Effectiveness:	12/19/2005	12/15/2005
Appraisal:	12/06/2004	Restructuring(s):		07/22/2008 03/12/2009 11/22/2010 04/29/2011
Approval:	05/12/2005	Mid-term Review:	02/15/2008	02/05/2008
		Closing:	03/31/2010	04/30/2011

C. Ratings Summary	
C.1 Performance Rating by ICR	
Outcomes:	Satisfactory
Risk to Global Environment Outcome	Moderate
Bank Performance:	Moderately Satisfactory
Borrower Performance:	Moderately Satisfactory

C.2 Detailed Ratings of Bank and Borrower Performance			
Bank	**Ratings**	**Borrower**	**Ratings**
Quality at Entry:	Moderately Satisfactory	Government:	Satisfactory
Quality of Supervision:	Satisfactory	Implementing Agency/Agencies:	Moderately Satisfactory
Overall Bank Performance:	Moderately Satisfactory	**Overall Borrower Performance:**	Moderately Satisfactory

C.3 Quality at Entry and Implementation Performance Indicators			
Implementation Performance	**Indicators**	**QAG Assessments (if any)**	**Rating**
Potential Problem Project at any time (Yes/No):	No	Quality at Entry (QEA):	None
Problem Project at any time (Yes/No):	Yes	Quality of Supervision (QSA):	Satisfactory
GEO rating before Closing/Inactive status	Satisfactory		

D. Sector and Theme Codes

	Original	**Actual**
Sector Code (as % of total Bank financing)		
Agricultural extension and research	20	20
Agro-industry	10	10
Central government administration	30	30
General agriculture, fishing and forestry sector	40	40
Theme Code (as % of total Bank financing)		
Environmental policies and institutions	25	25
Pollution management and environmental health	50	50
Rural policies and institutions	25	25

E. Bank Staff

Positions	**At ICR**	**At Approval**
Vice President:	Philippe H. Le Houerou	Shigeo Katsu
Country Director:	Jane Armitage	Orsalia Kalantzopoulos
Sector Manager:	Benoit Paul Blarel (Acting)	Marjory-Anne Bromhead
Project Team Leader:	Tijen Arin	Tijen Arin
ICR Team Leader:	Craig M. Meisner	
ICR Primary Author:	Craig M. Meisner	

F. Results Framework Analysis

Global Environment Objectives (GEO) and Key Indicators(as approved)

The global environment objective of the Project is to reduce nutrient flows into water bodies connected to the Danube River from selected Republic of Serbia (ROS) enterprises.

Revised Global Environment Objectives (as approved by original approving authority) and Key Indicators and reasons/justifications

The GEO was not revised. GEO Indicator 3 was revised at the mid-term review to qualify that non-point reductions were "from demonstration farms and the Institute of Animal Husbandry". Measurement of point source nutrient reductions (into rivers) from slaughterhouses was dropped since wastewater connections to municipal systems made measurement to rivers irrelevant. GEO Indicator 4 on EU Nitrate Directive transposition was revised to the preparation of a strategy and action plan, while the development of the Code of Good Agricultural Practices remained unchanged. The target value for Intermediate Outcome Indicator 1 was revised from 80 to 160 to accommodate increased training demand. Indicators were tracked through Implementation Status Reports (ISRs) and details of revisions are outlined in Section 1.3.

(a) GEO Indicator(s)

Indicator	Baseline Value	Original Target Values (from approval documents)	Formally Revised Target Values	Actual Value Achieved at Completion or Target Years
Indicator 1 :	Nutrient reduction sub-projects have been prepared and sub-grants awarded to at least 60 farms and four slaughterhouses to control nutrient run-off			
Value (quantitative or Qualitative)	Farms: 0 Slaughterhouses: (0)	60 (4)		105 (3)
Date achieved	12/31/2005	03/21/2010		04/30/2011
Comments (incl. % achievement)	Farms: 100% achieved. Slaughterhouses: 75% achieved. The fourth slaughterhouse (Nisprodukt) completed works for wastewater treatment, but investments in wastewater treatment equipment stalled. Hence no grant was provided.			
Indicator 2 :	At least 65% of beneficiary farms and slaughterhouses implementing nutrient reduction plans properly two years after being awarded the sub-grant			
Value (quantitative or Qualitative)	0	65%		69%
Date achieved	12/31/2005	03/21/2010		04/30/2011
Comments (incl. % achievement)	100% achieved. In April 2009, 39 farms had completed nutrient management investments and plans. According to the end-of-project beneficiary survey, 27 of these farms found the nutrient management plans useful and were able to implement all aspects.			
Indicator 3 :	Point and non-point source nitrogen and phosphorus pollution flows into water courses connected to the Danube River from the Participating Enterprises have decreased substantially			

Value (quantitative or Qualitative)	Nitrogen (N): 0 Phosphorus (P): 0	N: 20% P: 20%		N: 44% P: 100%
Date achieved	12/31/2005	03/21/2010		04/30/2011
Comments (incl. % achievement)	100% achieved. Reductions were estimated as the % decrease in N-P flow into rivers and for non-point sources (demonstration farms) only. Point source reductions for slaughterhouses were dropped since wastewater connections did not require measurement.			
Indicator 4 :	The EU Nitrate Directive (ND) is transposed through the Law on Fertilizers and the Development of a Code of Good Agricultural Practices (CoGAP)[1]			
Value (quantitative or Qualitative)	EU ND not transposed; CoGAP non-existent	EU ND transposed through Law on Fertilizers; CoGAP Adopted by MAFWM	Preparation of EU ND strategy and action plan	EU ND strategy and action plan complete; CoGAP finalized, adopted by MAFWM and widely distributed to farmers, agricultural advisors and agricultural schools. Updated version published in March 2011
Date achieved	12/31/2005	03/21/2010	04/30/2011	04/30/2011
Comments (incl. % achievement)	Partially achieved. An EU ND strategy and action plan was developed to transpose the Directive into domestic legislation. See Section 1.3 for further details.			
Indicator 5 :	Training and information center (TIC) for environmentally friendly agriculture is established and integrated in the MAFWM agricultural advisory service system			
Value (quantitative or Qualitative)	TIC non-existent	Established and functioning		Established and functioning
Date achieved	12/31/2005	03/21/2010		04/30/2011
Comments (incl. % achievement)	100% achieved.			

(b) Intermediate Outcome Indicator(s)

Indicator	Baseline Value	Original Target Values (from approval documents)	Formally Revised Target Values	Actual Value Achieved at Completion or Target Years
Indicator 1 :	Number of agricultural advisors trained			

[1] Indicator revised to the development of an EU ND strategy and action plan for the transposition into domestic legislation. The development of the CoGAP remained unchanged.

Value (quantitative or Qualitative)	0	80	120 (2008) 160 (2010)	186
Date achieved	12/31/2005	03/21/2010	04/30/2011	04/30/2011
Comments (incl. % achievement)	100% achieved. Target was revised at mid-term review to 120, then to 160 in 2010.			
Indicator 2 :	Laboratory equipment installed and operational in Hydro-meteorological Institute			
Value (quantitative or Qualitative)	Lab equipment not installed	Installed and operational		Installed and operational
Date achieved	12/31/2005	03/21/2010		04/30/2011
Comments (incl. % achievement)	100% achieved.			
Indicator 3 :	Increase in percentage of farmers in the target areas aware of environmental issues in agriculture			
Value (quantitative or Qualitative)	Not available	40%		58%
Date achieved	12/31/2005	03/21/2010		04/30/2011
Comments (incl. % achievement)	100% achieved. Based on July 2010 survey among farmers in the target areas.			
Indicator 4 :	Replication Strategy developed			
Value (quantitative or Qualitative)	Strategy non-existent	Strategy prepared		Strategy prepared
Date achieved	12/31/2005	03/21/2010		04/30/2011
Comments (incl. % achievement)	100% achieved. An IPARD measure for farm manure management, options for post-Project awareness raising, and a pre-feasibility study for anaerobic digestion were prepared.			

G. Ratings of Project Performance in ISRs

No.	Date ISR Archived	GEO	IP	Actual Disbursements (USD millions)
1	03/14/2006	Satisfactory	Satisfactory	0.36
2	12/15/2006	Satisfactory	Satisfactory	0.50
3	01/23/2007	Satisfactory	Moderately Satisfactory	0.50
4	08/02/2007	Moderately Satisfactory	Moderately Satisfactory	0.99
5	09/17/2007	Moderately Satisfactory	Moderately Satisfactory	0.99
6	11/20/2007	Moderately Satisfactory	Moderately Satisfactory	1.33
7	03/05/2008	Moderately Satisfactory	Moderately Satisfactory	1.81

8	06/26/2008	Moderately Unsatisfactory	Moderately Unsatisfactory	2.12
9	07/11/2008	Moderately Satisfactory	Moderately Satisfactory	2.12
10	01/04/2009	Moderately Unsatisfactory	Moderately Unsatisfactory	3.85
11	06/30/2009	Moderately Satisfactory	Moderately Satisfactory	4.92
12	11/16/2009	Satisfactory	Moderately Satisfactory	6.91
13	06/20/2010	Satisfactory	Satisfactory	8.37
14	01/02/2011	Satisfactory	Satisfactory	8.58
15	05/31/2011	Satisfactory	Moderately Satisfactory	8.89

H. Restructuring (if any)

Restructuring Date(s)	Board Approved GEO Change	ISR Ratings at Restructuring		Amount Disbursed at Restructuring in USD millions	Reason for Restructuring & Key Changes Made
		GEO	IP		
07/22/2008	N	MS	MS	2.12	To support (i) the procurement of essential equipment for three selected rendering plants to facilitate the collection of slaughterhouse and meat processing plant waste; (ii) works and equipment for seven selected agricultural high schools in the project area for the training of future farmers in farm nutrient management; and (iii) an increase in the grant funding percentage for slaughterhouses and meat processing plants from 30% to 40% of investment costs.
03/12/2009		MU	MU	4.37	Extension of closing date from March 30, 2010 to December 31, 2010.
11/22/2010	N	S	S	8.58	Extension of closing date from December 31, 2010 to April 30, 2011.
04/29/2011	N	S	S	8.89	Reallocation of proceeds between project components.

I. Disbursement Profile

1. Project Context, Global Environment Objectives and Design

1.1 Context at Appraisal

Agriculture accounted for approximately 25 percent of Serbia's 2004 Gross Domestic Product (GDP), 26 percent of exports and was the largest sector of the economy. Among agricultural products, meat and milk production contributed about 34 percent to agricultural output with significant herd numbers as of 2001: 3.6 million pigs, 1.2 million cattle, 9.2 million poultry and 1.5 million sheep and goats in Serbia (incl. Kosovo).

In the late 1990s, basin-wide water quality models ranked Serbia and Montenegro (SAM) third in terms of Nitrogen (N) pollution and second with respect to Phosphorus (P) pollution among the 13 Danube riparian countries. Serbia's livestock sector was among the largest sources of water pollution in Serbia's part of the Danube/Black Sea Basin. Livestock farms, and in particular very large pig farms, were 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 was disposed in lagoons, from where it penetrated groundwater, especially in low-lying Vojvodina where the groundwater table was high. Most commonly, the liquid part of manure from lagoons was directed into drainage canals which channel it to the Danube or its tributaries without treatment.

Slaughterhouse waste also constituted a significant source of nutrient pollution, especially in Vojvodina where there were 240 slaughterhouses. Slaughterhouses typically collected animal waste in storage tanks and transported it by tanker for disposal in the municipal waste water system or municipal landfill lagoons. This waste included blood, the gut content, solids including hoof and bristle, ears, and red water (the water that results from the washing and cleaning of carcasses). In recent years, waste to be disposed of increased since the use of bone meal as livestock feed was discontinued in accordance with EU practice on animal health. Given the current poor level of wastewater treatment and lack of sanitary landfills these practices resulted in high level discharge into watercourses and leakage into groundwater.

There was a lack of information on the local health effects of pollution from improperly disposed manure and slaughterhouse waste but the content of waste suggested the effects could be significant. Slaughterhouse waste was high in organic material and nitrogen content, and may have contained pathogens, including salmonella and shigella bacteria, parasite eggs, and amoebic eggs. This waste was believed to pose a public health threat, especially to those communities living near dumpsites and scavenge on them. In addition, elevated concentrations of nitrates in groundwater, which was the main drinking water source in rural areas, could have lead to fatalities among infants (the "blue baby syndrome").

SAM signed (2002) and ratified (2004) the Convention on Cooperation for the Protection and Sustainable Use of the Danube River (Danube Convention) (1994). SAM was also a member of the International Commission for the Protection of the Danube River (ICPDR) and its predecessor, the Former Republic of Yugoslavia (FRY), was in full cooperation with ICPDR during the 1990s. FRY participated in the preparation of the Danube River Transboundary Diagnostic Analysis, prepared a National Review (NR), held a National Planning Workshop in 1998, and contributed a SAM national action plan to the Five Year Nutrient Reduction Action Plan (2000).

In December 2002, SAM also signed the Sava River Agreement with Croatia, Bosnia and Herzegovina and Slovenia which aims to institute integrated river basin management in the basin.

Rationale for Bank involvement

The rationale for Bank involvement was twofold: First, the project complemented and built on other development partner and Government efforts to strengthen environmental management and restructure the agriculture sector to be more responsive to EU requirements for enhanced exports. However, the majority of international assistance focused on technical assistance and institutional and technical capacity building, rather than investments for actual mitigation of agricultural and agro-industrial pollution.

Secondly, the Bank had a comparative advantage in carrying out agricultural and agro-industrial pollution control. The Bank was the implementing agency for the GEF-supported Investment Fund for Nutrient Reduction in the Danube and Black Sea Basin with a portfolio of 12 projects at various stages of implementation and preparation in the basin, all aiming to reduce nutrient pollution. Through these projects the Bank gained significant experience in cost-effective methods to reduce nutrient run-off, in building capacity of implementing government agencies, monitoring project success in reducing nutrient run-off, and regulatory reform. The World Bank also had substantial experience in industrial pollution control in region, involving both mitigation and remediation investments and legal framework reform, including in neighboring Bulgaria. Most projects in the region involved harmonization with the EU environment related *acquis*.

The Project would also support the goals of the GEF International Waters Focal Area. The Project would be implemented under the GEF Black Sea and Danube Strategic Partnership on Nutrient Reduction established to support the ICPDR and the Black Sea Commission in reducing nutrient pollution in the Danube River and Black Sea. The Project would help Serbia reduce its nutrient discharges into the Danube from agricultural sources in the long run as specified in FRY/SAM's Five Year Nutrient Reduction Plan submitted to the ICPDR. The Project's objectives were also consistent with the 2005 Country Assistance Strategy (CAS) for SAM which emphasized environmental sustainability as an important component of economic growth. Goal Two envisioned a larger, more dynamic private sector requiring progress on cleaning up and protecting the environment to ensure quality economic growth over the medium term.

1.2 Original Global Environment Objectives (GEO) and Key Indicators (*as approved*)

The *development objective* of the project is that EU *acquis* compliant measures for reducing agricultural nutrient pollution in the Danube River are adopted in selected Republic of Serbia (ROS) enterprises. The *global environment objective* of the project is to reduce nutrient flows into water bodies connected to the Danube River from selected ROS enterprises.

To track the progress toward achieving these objectives, the Project was to use the following key results indicators:

(i) Nutrient reduction sub-projects have been prepared and sub-grants awarded to at least 60 farms and four slaughterhouses to control nutrient run-off;
(ii) At least 65% of beneficiary farms and slaughterhouses implementing nutrient reduction plans properly two years after being awarded the sub-grant;

(iii) Point and non-point source nitrogen and phosphorus pollution flows into water courses connected to the Danube River from the Participating Enterprises have decreased substantially;
(iv) The EU Nitrate Directive is transposed through the Law on Fertilizers and the Development of a Code of Good Agricultural Practices;
(v) Training and information center for environmentally friendly agriculture is established and integrated in the MAFWM agricultural advisory service system.

Nutrient reduction defined. The annual reduction of Nitrogen (N) due to Project interventions in 60 livestock farms and four slaughterhouses was estimated to be 430 tons. The strengthening of agricultural advisory services and of the legal and policy framework and likely financial support from Government and EU sources, were anticipated to replicate project interventions considerably in the next several decades. Assuming that in 20 years 50 percent of livestock farms in Serbia adopt these practices, the reduction would amount to 8,000 tons N/year.

1.3 Revised GEO (*as approved by original approving authority*) and Key Indicators, and reasons/justification

The GEO was not revised.

Revisions to GEO key indicators in Section 1.2 above. A part of GEO indicator (iv) was changed during a restructuring in July 30, 2009 where the GEF Grant and SIDA Letter Agreements (Schedule 2, Part A on Policy and Regulatory Reform) were amended to reflect changes in the transposition of the Nitrate Directive through the draft Law on Fertilizers. Specifically, the Project component description was amended from:

> "Strengthening of the Republic of Serbia policy and regulatory framework regulating nutrient run-off and discharge from livestock farms and slaughterhouses, in accordance with the European Union Council Directive Concerning the Protection of Waters Against Pollution Caused by Nitrates From Agricultural Sources (91/676/EEC, dated December 12, 1991 (Nitrate Directive)), through the development of a Code of Good Agricultural Practice, *identification of vulnerable areas in the Republic of Serbia, transposition of the Nitrate Directive into the draft law on fertilizers, and development of an implementation plan for the Nitrate Directive*, through the provision of goods, training and services." to

> "…*and the **preparation of a strategy and action plan** for the adoption and implementation of the Nitrate Directive, including its transposition into domestic legislation*, through the provision of goods, training and services."

Discussions with Government clarified that the Nitrate Directive did not necessarily have to be transposed into the draft law on fertilizers, as originally envisaged, but could be transposed into another piece of "domestic legislation" as deemed appropriate by the Government's legal experts and MAFWM. Thus it was agreed to prepare a strategy and action plan. Although the change did not affect the development of the Code of Good Agricultural Practice (CoGAP), the amendment should have also been reflected by changing GEO indicator (iv) in this instance.

GEO indicator (iii) was clarified at the mid-term review to define non-point nutrient reductions "*from demonstration farms and the Institute of Animal Husbandry*". Point source reduction targets were dropped since (revised) slaughterhouse investments in wastewater connections to municipal systems negated the measurement of nutrient flows into river courses.

1.4 Main Beneficiaries

The primary beneficiaries identified at appraisal were:

(i) Farm and slaughterhouse enterprises receiving grants to fund part of their nutrient reduction investments;
(ii) Households in the geographical areas of Novi Sad, Vrbas, Šabac, Požarevac and surrounding municipalities from improved local environmental conditions and drinking water quality;
(iii) Government of Serbia agricultural advisors, trainers, and staff of Ministry of Agriculture, Forestry and Water Management (MAFWM), Ministry of Science and Environmental Protection, Directorate for Environmental Protection (MSEP DEP), Institute for Animal Husbandry (IAH), Local Advisory Units (LAUs) and local authorities receiving training on proper nutrient, manure and slaughterhouse waste management.

Additional beneficiaries upon restructuring in 2008:

(iv) Three state-owned rendering facilities located in Ćupria, Sombor and Belgrade receiving collection and processing equipment to improve collection, temporary storage and processing of high-risk animal waste from slaughterhouses, meat processing enterprises and livestock farms;
(v) Seven public agricultural high schools in Valjevo, Požarevac, Svilajnac, Vršac, Futog, Bačka Topola, and Zrenjanin receiving grants for equipment, works, training and teaching materials on farm nutrient management and good agricultural practices.

Information dissemination and other outreach activities also was to benefit rural communities, local NGOs and the general public in raising awareness of nutrient management issues.

1.5 Original Components (*as approved*)

Component 1: Support to Policy and Regulatory Reform (Total cost: US$0.22 m, of which GEF funding: US$0.20m and GOS funding: US$0.02m)

The objective of this component was to strengthen the policy and regulatory framework that regulates nutrient run-off and discharge from livestock farms and slaughterhouses, in line with the EU Nitrate Directive (ND). In particular, the project was to support: (i) a study to identify nitrate-vulnerable areas in Serbia; (ii) development of an implementation plan for the EU ND; (iii) transposition of the EU ND into the Law on Fertilizers; and (iv) development of a Code of Good Agricultural Practices.

Component 2: Investment in Nutrient Reduction (Total cost: US$17.87m, of which GEF funding: US$6.92m, beneficiary funding US$7.67m, SIDA funding: US$3.00m, and GOS funding: US$0.28m)

The objective of this component was to demonstrate cost-effective methods by which livestock farms and slaughterhouses could reduce nutrient run-off and discharge into the Danube River and its tributaries, and to improve agricultural advisory service capacity to extend knowledge of these technologies. The project was to support: (a) investments in manure management in livestock farms; (b) investments in slaughterhouse animal waste management; (c) the establishment of a Training and Information Center (TIC) for proper nutrient, manure and slaughterhouse waste

management and training of environmental, veterinary, agricultural and water inspectors; and (d) LAUs to raise awareness among farmers and slaughterhouses of proper nutrient/manure and animal waste management and to assist enterprises participating in the project.

Investments in nutrient management in livestock farms were to be supported through sub-grants to farms meeting pre-established eligibility and selection criteria. The investments were to mainly consist of the establishment and implementation of a farm nutrient management plan (NMP), construction of proper manure storage facilities and purchase of incremental and essential field equipment for transporting and applying liquid and solid manure in the field. Geographical focus was on Novi Sad, Vrbas, Šabac, Požarevac and surrounding municipalities, where livestock density and pollution levels were high. Grants of up to 60 percent or a maximum of Euro 120,000, of total investment cost were to be provided to cover part of the cost of such investments in approximately 60 livestock farms. Eight pig and cattle farms of differing sizes were to be selected for enhanced support as demonstration farms. These were to be used to refine practices that were most suitable to local conditions, to demonstrate them to other interested farmers, to demonstrate alternative cropping and tillage practices on set-aside plots, and to monitor water and soil quality improvements as a result of the project interventions.

Grant support of up to 30 percent, or a maximum of Euro 120,000, was to be offered to approximately eight large or very large slaughterhouses to finance acquisition of facilities and equipment for animal waste separation, treatment and land application. There was to be no geographical limitation to eligibility other than being in the Danube River Basin (DRB) and in the ROS. The total cost of investment at each site was expected to range from US$350,000 - US$500,000 depending on the size of the enterprise; however, some enterprises already possessed some of the equipment or facilities in which case the total investment cost was lower. A section was to be developed in the Operational Manual (OM) addressing nutrient, manure and slaughterhouse animal waste management and providing guidelines for the component.

The slaughterhouse enterprise selection process which was detailed in the OM included two stages: screening for eligibility and selection based on review of detailed project proposals. The eligibility and selection criteria included ownership that was at least 51 percent private, financial viability, having no current tax arrears and being in the project region.

The project was to also fund the establishment of a TIC in the IAH that would offer training to agricultural advisors, farmers, slaughterhouse managers, regulators, and environmental, veterinary, agricultural and water inspectors on proper manure and slaughterhouse animal waste management; and be a national repository of knowledge on evolving EU regulations in this field. The IAH's own manure and slaughterhouse animal waste management facilities were to be upgraded so that they can be used for demonstration purposes. A TIC was to be established as a self standing training unit in the IAH and will be managed by a half time logistical coordinator and two subject-matter course coordinators. As required, specialized subject-matter experts were to be contracted for the duration of the course to prepare the training material and provide the training. An OM detailing investments in activities by the TIC was to be prepared.

Farmers and slaughterhouses were to be offered advice on proper nutrient, manure and slaughterhouse waste management through three LAUs in the project region. Furthermore, the LAUs were to assist eligible enterprises in preparing sub-project proposals. LAUs were provided guidance in their activities through a detailed OM.

Component 3: Water and Soil Quality Monitoring, Public Awareness Raising and Replication Strategy (Total cost: US$1.26m, of which GEF funding: US$0.77m, SIDA funding: US$0.24m, GOS funding: US$0.13m, and EAR funding: US$0.11m)

The objective of this component was threefold: to assess the impact of the project interventions on water and soil quality in the Serbian Danube Basin; to increase local communities', enterprises' and policy makers' awareness of water pollution from livestock farms and slaughterhouses and of improvements made through the project; and to devise a strategy to replicate the project's interventions in other parts of the Danube River Basin in Serbia and beyond. This was to be achieved through three sub-components: (a) Capacity Building and Support for Water and Soil Quality Monitoring; (b) Stakeholder Participation and Public Awareness Raising; and (c) Replication Strategy Development. A section of the OM addressing soil and water quality monitoring and a Stakeholder Participation and Public Awareness Plan (SPPAP) was to be used in the implementation of this component.

Component 4: Project Management and Project Impact Monitoring (Total cost: US$0.64m, of which GEF funding US$0.57m, and GOS funding: US$0.07m)

This component was to support project management, including project coordination and administration, procurement, financial management and all reporting. All project outcomes and results monitoring were to be carried out under this component as well.

A Project Implementation Unit (PIU) was to be established to implement the project and to carry out day-to-day activities of the project under the overall supervision of the MAFWM. The PIU, on behalf of the responsible ministries, was to provide for project coordination and administration of staff, procurement, financial management, reporting and overall project monitoring and evaluation activities for all components.

The Project Technical Advisory Committee (PTAC) was to be established to provide overall direction and strategic oversight of the project; approve annual work programs, annual procurement plans and sub-project selections; ensure proper coordination of project activities among the ministries and agencies of Serbia involved in project implementation; and to oversee overall project monitoring, evaluation and reporting.

A section of the OM detailed the roles and responsibilities of individual government agencies and institutions, the PTAC and the PIU.

1.6 Revised Components

Also refer to Section 1.3 on the revision of indicators.

The following amendments were made to Project components:

November 9, 2007: Sub-component 2a Investments in Farm Manure Management: Despite significant interest by farmers, a large number retracted their expressions of interest or put on hold their agreements due to the costs of 50-year design life of structures required by authorities. Although a reduction in the design life to 20 years substantially reduced costs, the GEF Grant Agreement was also amended increasing grant co-funding to farms from 60% to 70% and the maximum contribution from Euro 120,000 to Euro 140,000 (in the case of demonstration farms

the increase was from 70% to 80% with a maximum grant amount from Euro 140,000 to Euro 160,000). These changes were expected to increase the pool of eligible and interested farmers and accelerate project implementation. The geographical area of support was also expanded from Novi Sad, Vrbas, Šabac, Požarevac and surrounding municipalities to all of Vojvodina and Central Serbia.

February 20, 2008: Sub-component 2b Slaughterhouse Animal Waste Management: Meat processing industries were added as beneficiary enterprises along with slaughterhouses and livestock farms since meat processing enterprises, similarly to slaughterhouses, emit significant quantities of nutrient and other pollutants to the Danube and its tributaries. Their addition to the project would not add significant management costs to the project but increase disbursement since there were several enterprises expressing interest. Their addition would also not necessitate any reallocation of grant proceeds since grants would come from the same category, namely "Nutrient Reduction Sub-grants". The GEF Grant Agreement was amended in all relevant sections and schedules to include these beneficiaries.

July 14, 2008: Sub-component 2b Slaughterhouse & Meat Processing Plants Animal Waste Management: Inclusion of three state-owned rendering facilities located in Ćupria, Sombor and Belgrade as project beneficiaries. Separation of animal waste at slaughterhouses and meat processing plants reduces the amount of materials rich in nutrients and other pollutants released into watercourses. The rendering plants would be provided with collection and processing equipment to improve collection, temporary storage and processing of high-risk animal waste from slaughterhouses, meat processing enterprises and livestock farms. This additional activity aimed to help the Project achieve the outcome of this sub-component more efficiently without any significant modification. Equipment to be acquired for the rendering plants would be financed 89% from GEF grant funds and 11% from MAFWM Veterinary Directorate budgetary funds. The Grant Agreement was amended to include these additional beneficiaries and reallocations among disbursement categories were made to reflect these changes (see table in Section 1.7 below).

July 14, 2008: Sub-component 2b Slaughterhouse & Meat Processing Plants Animal Waste Management: Percentage increase in grant support to slaughterhouses and meat processing enterprises from 30% to 40% (with unchanged grant ceiling per enterprise of Euro 120,000). The increase in grant co-financing of animal waste management investment in slaughterhouses and meat processing plants would increase the incentive to undertake such investments. Implementation experience at the time revealed low uptake by enterprises given the weak regulatory environment (very stringent standards and very weak enforcement) and uncertain capital availability forecasts. Increased percentages would help the project enlist four enterprises to demonstrate good practices. This restructuring change was approved by the Regional Vice President on July 22, 2008. The GEF Grant Agreement was amended to reflect these changes.

July 14, 2008: Sub-component 2c Establishment of a Training and Information Center: Provision of equipment, works, training and teaching materials on farm nutrient management and good agricultural practices to the public agricultural high schools of Valjevo, Požarevac, Svilajnac, Vršac, Futog, Bačka Topola, and Zrenjanin. The project would finance nutrient management plans, construction of manure storage facilities, procurement of manure spreading equipment, training of teachers, and provision of course materials. These investments would further the objective of this sub-component by significantly enlarging the target group receiving training on nutrient management and other good agricultural practices. Works, goods and consultants' services for agricultural high schools would be financed 100% from GEF grant funds. There were

no changes in project institutional arrangements. Procurement of goods, works and consultants' services for the rendering plants (see above) and agricultural high schools would be carried out by the PIU of the MAFWM. The GEF Grant Agreement was amended to include these additional beneficiaries and a new disbursement category was created along with subsequent reallocations among disbursement categories (see table in Section 1.7 below).

July 30, 2009: Component 1: Support to Policy and Regulatory Reform: Component 1 on policy and regulatory reform was revised to focus on CoGAP development the strategy and action plan for EU ND transposition into local legislation (see Section 1.3 for details). This was due to time and cost considerations in identifying nitrate vulnerable zones (NVZs) and the realization that the EU ND transposition would require extensive stakeholder consultations in formulating a strategy.

1.7 Other significant changes

July 30, 2009: GEF Grant and SIDA Letter Agreements (Schedule 2, Part A on Policy and Regulatory Reform) were amended to reflect changes in the transposition of the Nitrate Directive through the draft Law on Fertilizers. See Section 1.3 for further detail.

March 12, 2010: At the request of the Ministry of Finance (Oct. 2009, Dec. 2009 and Feb. 2010), the Bank accepted a Project Closing Date extension from March 30, 2010 to December 31, 2010 along with a reallocation of grant proceeds (see table below). In addition, the Bank received an additional contribution from the Government of Sweden of SEK 9,975,000 to a new Trust Fund (TF096289) in support of nutrient reduction sub-grants under Project Component 2.

November 29, 2010: The Ministry of Finance (Oct. 2010) requested a further extension of the Project from December 31, 2010 to April 30, 2011. The extension was necessary to allow Serbia to use approximately US$ 840,000 in uncommitted funds, which arose in part due to an exchange rate buffer retained by the implementing agency. Funds would support additional public awareness raising activities and nutrient management investments in about six farms.

April 29, 2011: A final reallocation in both Trust Funds (GEF and SIDA) was made to redirect grant proceeds that were either unallocated or available from a completed activity and directed towards categories to complete project activities and finalize payments (see tables below).

Summary of reallocation of GEF (TF-054908) grant proceeds:

Category of expenditure		**Allocation (US$)**			
Original	**Revised**	**Original**	**Revised – July 2008**	**Revised – March 2010**	**Revised – Apr 2011**
1) Goods, works, consultants' services, training and incremental operating costs	No changes	2,620,000	4,220,000	4,220,000	4,000,000
2) Nutrient Reduction Sub-grants	No changes	5,500,000	3,500,000	3,900,000	4,240,000
3) Unallocated	No changes	900,000	900,000	150,000	0
4) Grants to Agricultural High Schools	Added	0	400,000	750,000	780,000
TOTAL		9,020,000	9,020,000	9,020,000	9,020,000

Summary of reallocation of SIDA (TF-056212 & TF-096289) grant proceeds:

Category of expenditure		**Allocation (US$)**			
Original	**Revised**	**Original**	**Revised – July 2008**	**Revised – March 2010**	**Revised – Apr 2011**

1) Goods, works, consultants' services, training and incremental operating costs	No changes	8,713,893	8,713,893	8,713,893	7,107,241
2) Nutrient Reduction Sub-grants	No changes	17,692,759	20,092,759	30,067,759	32,267,759
3) Unallocated	No changes	2,993,348	593,348	593,348	0
TOTAL		29,400,000	29,400,000	39,375,000	39,375,000

2. Key Factors Affecting Implementation and Outcomes

2.1 Project Preparation, Design and Quality at Entry

Project background analysis was generally adequate. Background preparation benefitted from several completed and ongoing agricultural pollution projects in the region (e.g. Poland, Romania and the Baltic Sea Region). The main difference in this Project was that it focused on medium and large enterprises however several general lessons were incorporated into Project design:

An effective public awareness campaign should be prepared targeting farmers on the financial benefits of recycling manure as fertilizer and that a full-time Stakeholder Participation and Public Awareness Plan (SPPAP) specialist in the PIU be tasked to liaise with LAUs adjusting the campaign to current needs. A SPPAP specialist was established in the PIU and outreach was directed to farmers and other stakeholders largely for the purposes of raising awareness and stimulating investment interest. A larger media campaign, based on implementation experience, was reserved until January 2011 to showcase Project benefits (see also Annex 2 for details of the media campaign and Annex 5 for beneficiary survey results).

Project components dealing with agriculture should be implemented by the ministry or agency in charge of agriculture to ensure mainstreaming with agricultural policies, while water quality and other environmental impact monitoring responsibilities should be under the ministry or agency in charge of environmental protection. Project implementation was the responsibility of MAFWM and water quality monitoring was undertaken by the Hydrometeorological Service (HMS).

Investments must make financial sense to farmers if the farmers are to contribute their own funds and to maintain the investments. A financial feasibility study was undertaken at appraisal among farmers and slaughterhouses on the ability to pay for nutrient reduction investments and results were taken into consideration in setting the levels of support. Although other factors played a significant role in the reluctance to undertake investments (e.g. life-design of supporting structures in the case of farmers and stringent water regulations in the case of slaughterhouses) ultimately financial support levels were adjusted to attract more interest.

Capacity building among a large group of agricultural advisors on nutrient management is a precondition for the replicability of nutrient reduction methods introduced by the project. The Project established the TIC within the IAH to serve as a knowledge resource base, accreditation and training center for trainers, extension agents, staff of MAFWM and MSEP DEP, managers of farms and slaughterhouses. At project completion more than 600 individuals were trained including 186 agricultural advisors (see also Annex 2 for details).

Project preparation and component design also benefitted from several stakeholder consultations as part of the Social Assessment (Annex 17 of PAD). Public awareness of nutrient pollution as a contributor to poor water quality in the Danube was found to be quite low however respondents agreed that a linkage could be made to health outcomes. Poor water quality was ranked highest among environmental priorities, followed by sewerage, waste collection and air quality.

Informants proposed a variety of mitigation measures to offset negative impacts from Danube River pollution ranging from legal instruments to public education and treatment methodologies. Respondents also believed that the State did not give the environment sufficient priority and that greater support should be given to the legal enforcement of environmental compliance with EU standards; greater public education; provide financial incentives to industry to adopt environmentally-friendly practices; initiate broader reforms in the farm sector; and develop national plans and strategies for pollution abatement.

The rationale for Bank intervention was sound. The experience gained through other nutrient reduction projects in the region provided a sound technical justification for Bank intervention. The Bank was also a logical partner given its supporting role with the GEF Strategic Partnership on the Danube and Black Sea Basin established to support the ICPDR and the Black Sea Commission in reducing nutrient pollution in the Danube River and Black Sea (see also Section 1.1).

Project design was generally sound. Project objectives (both the PDO and GEO) were realistic and sufficiently achievable through component activities and as measured by the system of indicators. Component 1 on policy and regulatory reform was ultimately narrowed (July 30, 2009) to focus only on CoGAP development and the strategy and action plan for EU ND transposition in light of time, cost and holding extensive stakeholder consultations. The component was perhaps too ambitious given the country's short experience with environmental protection (Environmental Protection Agency established in 2003). Component 3 activities on water quality monitoring, which did not commence until after the Mid-term Review, were similarly ambitious given the time required to establish a statistically-significant time trend. The geographical focus of nutrient reduction investments was (correctly) limited to areas where livestock density and pollution levels were high however the area was later expanded to increase participation.

Ambiguities in local permitting of works also led to construction delays that could have been avoided through consultations with target municipalities on proposed structures.

The main alternative considered was to focus on smallholding farmers, as was the case in other parts of the Danube and Black Sea Basin, such as Romania, Turkey, Georgia, and Poland. This option was rejected because the FRY National Report on Danube Pollution submitted to the ICPDR clearly identified large-scale livestock farms as main polluters. Furthermore, smallholding Serbian farmers generally use manure as fertilizer and hence, unlike farmers in the above countries, do not constitute a major source of pollution. Nevertheless, smallholding farmers benefitted from Project advisory services and the establishment of the CoGAP.

The Government's commitment was demonstrated through its ratification of the Danube Convention in 2004. In addition the Government passed the Law on Environmental Protection and several new laws on Environmental Impact Assessment (EIA), Strategic Environmental Impact Assessment (SEIA) and Integrated Pollution Prevention and Control (IPPC). The Government also supported environmentally-friendly agriculture through the establishment of a rural development grant fund which provided partial grants (20 – 50% of investment value) for farm improvements, notably for fruit, vegetable, mushroom, flower and livestock production; the promotion of organic production; marketing improvements; and village community development through non-agricultural economic activities, such as agro-tourism.

The Government's commitment was also demonstrated through the establishment of the PTAC which provided direction and strategic oversight of the project; approved annual work programs,

annual procurement plans and sub-project selections; ensured proper coordination of project activities among Project-associated ministries and agencies; and oversaw overall project monitoring, evaluation and reporting. The PTAC, chaired by the Assistant Minister of MAFWM, comprised six voting members, one from each of the MAFWM VD, Phytosanitary Directorate (PSD) and the Directorate for Water Management (DWM), the MSEP, the Secretariat for Environment and Sustainable Development of the Autonomous Province of Vojvodina (PSEPSD), and one agricultural economist designated by the MAFWM, plus five non-voting members representing the private sector, non-governmental organizations and local municipal authorities from Project areas.

Most risks were adequately identified and rated; mitigation measures were adequate. Financial risks related to Government counterpart financing, rated a "moderate" risk, were not an issue at preparation, perhaps also due to the modest requirements. The "substantial" risk of co-financing from farmers and slaughterhouses was realized however this was due to the unrealistic design standard of on-site manure storage facilities (see Section 2.2 below). Revisions to the standard mitigated this financial risk, but grant limits were also raised by 10 percent to further incentivize participation. The health risks posed by the spread of animal diseases from slaughterhouse animal waste, rated a "moderate" risk, were adequately controlled by the MAFWM Veterinary Directorate.

2.2 Implementation

Despite the Project achieving, or exceeding, most GEO and intermediate indicator targets implementation severely lagged in the first two years (15 percent disbursement rate by the MTR), resulting in a downgrade of the GEO and IP to *moderately unsatisfactory* by June 2008. Continuing implementation challenges thereafter placed the Project at risk in achieving the PDO and GEO, with the most critical occurring in Component 2 activities on nutrient management investments:

1) Delays in the issuance of construction permits (due to 50-year design-life standards) by municipalities and stringent water conditions by the Water Directorate limited the completion of farm investments.[2] The slaughterhouse sub-component lagged as a result of poor regulations, enforcement and slow water permitting procedures (July 2008)[3];
2) EU Nitrate Directive strategy and action plan implementation was delayed by the preparation of an adequate Terms of Reference, short-listing and evaluation of expressions of interest (June 2009);
3) Organizational and leadership changes in government ministries, including MATFWM, in early 2011 prevented new commitments, including contract signing with selected providers, resulting in approximately US$ 588,000 of GEF and SIDA grant funding being returned to financiers. Additionally, approximately US$ 460,000 of unpaid goods and services were outstanding by Project closing on April 30, 2011.

[2] Specifically, liquid manure slurry tanks were classified by the Ministry of Infrastructure (MOI) as septic tanks requiring detailed designs with specific water conditions instead of being classified as 'auxiliary' structures. The design life of on-farm manure storage facilities was later revised to be 20 years instead of 50 resulting in a substantial cost reduction.

[3] Chief among these were stringent wastewater discharge standards (for enterprises not connected with the municipal sewer) which in some cases exceeded those in the European Union (EU).

A series of short-term agreements and targets were made between the Bank and the MAFWM to accelerate disbursements to farms and enterprises after the MTR. For example, beneficiary farms were eligible to receive equipment prior to completion of construction works. Water conditions (see footnote 2) for slaughterhouses and meat processing plants were agreed to with the Water Directorate and took a phased approach towards compliance with legal requirements on pollutant concentrations in wastewater discharged directly into watercourses.[4] Grant incentives were also raised to sustain interest by farmers and enterprises (see Section 1.6). Historically, construction and permitting issues at the farm-level were infrequent as farmers completed works themselves, without the aid of companies or conditional permits. To help farmers cope with these new requirements a strong awareness campaign and support from the LAUs were used to familiarize farmers with necessary procedures and guided through the project cycle. On the other hand, ministerial approval of contracts with selected beneficiary farms often took several months, which at times meant that the construction season was missed. The issue was highlighted in several management letters. Part of the reason was a lack of delegated approval authority at levels below the minister. During the final months of the Project, all contract approvals stopped, and as a result about $588,000 could not be spent. For this reason implementation performance was rated "moderately satisfactory".

The Project had three major restructurings, including seven amendments to the GEF Grant Agreement and four amendments to the SIDA Letter Agreement (see Sections 1.6 and 1.7 for details). The first major restructuring in 2008 focused on raising grant limits for manure management investments by slaughterhouses (grant limits were raised for farms in 2007), the inclusion of three rendering plants and seven agricultural high schools as beneficiaries. The addition of the three rendering plants was a logical extension as animal waste collection and processing capacity was insufficient to serve all of Serbia and waste was indiscriminately dumped into unsanitary, illegal dumpsites. Agricultural high schools were included to promote nutrient and manure management on a more sustainable basis by future generations. These actions were also perceived as significantly contributing to the achievement of the PDO and GEO.

Two later restructurings were undertaken – a Project extension in November 2010 and a reallocation of proceeds in April 2011. No major counterpart or co-financier funding issues arose during Project implementation.

2.3 Monitoring and Evaluation (M&E) Design, Implementation and Utilization

The five key performance indicators listed in Section 1.2 were adequate in tracking progress towards achieving the PDO and GEO. However, the disaggregated indicators tracked in the Results Framework (PAD, Annex 3) provide more detail on each of the five summary indicators. These five indicators were included in the Supplemental Letter (SL) to the GEF Grant Agreement. The second indicator in the SL did not provide a percentage target, but was set at 65 percent in the PAD (i.e. "The *great majority* of beneficiary farms and slaughterhouses implementing

[4] The phased approach required enterprises to prepare designs for complete treatment, i.e. including primary/mechanical, secondary and tertiary treatment, to meet water conditions for the particular watercourse prescribed by the Water Directorate. If the enterprise chose only to invest in primary treatment, with project support, the agreement signed with MAFWM states explicitly that the slaughterhouse will be liable to undertake further investments to achieve the water condition – although a time limit would not be specified. This was a pragmatic approach to improvements in water quality since mechanical treatment will remove up to 50% of nitrogen and phosphorus content, as well as a significant share of Biological Oxygen Demand (BOD) and solids in discharged wastewater.

nutrient reduction plans properly two years after being awarded the sub-grant"). A few modifications were also later made to GEO key indicator 4 to more accurately reflect transposition of the EU Nitrate Directive and a wording change to GEO key indicator 3 (see Section 1.3).

Design. The M&E design was well developed in the early stages of preparation and target values were appropriate and measureable. The collection of indicators was adequate in measuring progress towards the PDO and GEO. Baseline values for PAD, Annex 3 indicators were missing in some instances because either one could not be set until enterprise works had been established or the value was assumed to be zero. GEO indicators 2 and 3 from the data sheet (i.e. Nitrogen and Phosphorus reduction targets) should have been in PAD Annex 3, rather than the generic nutrient reduction indicator, given their significance in measuring GEO achievement. Support to the HMS laboratory facilities for water quality monitoring ensured that results could be linked to PDO and GEO achievement as well as establish the necessary infrastructure for long-term monitoring. However delays in demonstration farm selection meant that an insufficient number of measurements could be observed to be conclusive. Thus the Project measured "avoided nutrient losses not taken up by plants". Project data were collected through several means including specific monitoring activities (e.g. Component 3a for water and soil quality monitoring), approved nutrient management plans (Component 2a), issued training certificates (e.g. Component 2c), procurement invoices (e.g. Components 2 and 3), and beneficiary and public awareness surveys (e.g. Component 3b).

Implementation. Overall progress monitoring was the responsibility of the PIU, with soil and water quality monitoring inputs from the Soil Science Institute (SSI) and HMS, respectively. Annual progress reports were generated and reviewed by the PIU and the Bank. Slow Project implementation during the first two years hindered the establishment of baselines for several indicators relating to farm and slaughterhouse investments – including water quality monitoring. This also had spillover effects on measuring changes via the beneficiary surveys. A series of interim targets (based on existing results indicators) were formulated and monitored to accelerate implementation; and this 'small-step' approach helped the Project overcome several of the larger challenges.

Utilization. Indicators proved critical in measuring implementation progress – as shown by the actions taken during, and after, the MTR. For example, slow disbursement for farm and slaughterhouse investments prompted the PIU (and the Bank) to identify constraints (e.g. local permitting issues) and to take actions to accelerate implementation (e.g. working with municipalities on classifying structures as 'auxiliary' and with the Water Directorate on water conditions). Other indicators proved useful in adjusting implementation. For example, beneficiary surveys helped identify the inoperative truck procured for the rendering plant in Glutin – and subsequently reallocated to Cuprija. Another example was the monitoring of exchange rate fluctuations which affected contracts denominated in different currencies (see Section 3.5c).

2.4 Safeguard and Fiduciary Compliance

Financial Management. The Project's financial management arrangements were satisfactory throughout most of implementation. Financial covenants of the Grant Agreement were adequately complied with. Internal controls and accounting procedures were in place. Minor issues were raised during the 2008 MTR with respect to the appropriate use of the accounting software and internal controls ensuring quality financial information. Although FM was downgraded to moderately satisfactory, these issues were resolved by January 2009. Annual Project audits were unqualified (clean), with only two recommendations raised in the 2006 audit and which were

immediately addressed: (i) lack of sufficient documentation relating to counterpart funding; and (ii) certain internal control weaknesses (e.g. eight payment orders executed but not signed by the Project Director). Agreed counterpart financing was received in a timely fashion and did not affect Project implementation.

Procurement. Procurement activities were undertaken by an assigned procurement specialist in the PIU. However limited numbers of qualified specialists in Serbia, and high demand, lead to high turnover. The absence of a procurement specialist prompted the PIU to quickly train LAU experts in helping guide farmers and other stakeholders in equipment and construction tendering procedures – identified as the one of the main procurement challenges in the first two years. Tender delays also pushed some works to the following year owing to the limited construction season. Issues related to tendering also prompted the PIU to develop a shortlist of construction and equipment providers to maintain quality control and to allow farmers some flexibility in contracting goods and services. Government changes in 2011 prevented new commitments and signing of contracts with selected providers ultimately leading to slow disbursements and the return of grant funding (see below).

The Procurement Plan was revised several times by the time of the MTR (Feb., 2008), reflecting changes in Project activities and to fit the revised time line for implementation. Annual procurement pre-reviews were carried out and a post-review in 2007 – which found that procurement had been carried out in accordance with the agreed provisions.

Disbursement. Disbursement performance lagged significantly by the time of the MTR mostly due to delays under Component 2 (15 percent disbursed out of a targeted 50 percent). Actions taken by the PIU to accelerate disbursement were ultimately realized by November 2009, where combined GEF and SIDA disbursements reached 77 percent. However the Government's transition in 2011 prevented the signing of new commitments and contracts and US$ 588,000 was returned to GEF (US$400,000) and SIDA (US$188,000) at Project closing.

Environmental Assessment. The Environmental Assessment (EA) concluded the Project would result in a number of positive environmental impacts, including the reduction of Nitrogen, Phosphorus and other pollutant loads into water bodies, preventing the further deterioration of riverine and Black Sea ecosystems. Public health benefits would be realized through the reduction of high nitrate concentrations in groundwater used for drinking and contamination of surface waters used for bathing, fishing and other recreational purposes.

Project activities did not take place in any sensitive natural habitats and thus the Natural Habitats safeguard policy was not triggered. The safeguard policy on International Waterways was not triggered since the Project neither used nor potentially polluted international waterways.

The EA rated the Project "category B" due to construction activities under Component 2 on pig and cattle farms and in slaughterhouses. The most significant impacts identified were local dust and noise emissions during construction, odor conditions once structures were operational and in the case of slaughterhouses potential worker safety issues with inadequate handing of wastewater or sludge. An Environmental Management Plan (EMP) was devised outlining mitigation and monitoring measures along with institutional responsibilities. Measures were then incorporated into the OM together with the EMP to guide sub-project investments to comply with World Bank safeguards and ROS environmental requirements. The EMP also developed a "negative" screening list of sub-project types posing greater environmental risks which would be eliminated from further consideration under the Project. A list of recommended mitigation activities on

farms and in slaughterhouses is contained in Annex 10 of the PAD. EMPs following this structure were also prepared for each beneficiary farm. Public discussion of the EMP was held in November, 2004, at the Agency for Environmental Protection.

New activities added to the Project (i.e. Agricultural High Schools, meat processing plants and rendering plants) did not raise the environmental category of the Project or trigger new safeguard policies. The EMP developed for beneficiary agricultural schools followed the same model as those prepared for regular beneficiary farms.

Monitoring was undertaken by the PIU safeguard compliance member responsible for reviewing and approving environmental aspects of each proposal sub-project. This was complemented by the MSEP-DEP local environmental and MAFWP WD inspectors' routine inspections. It was the responsibility of each operator/owner to conform with legal requirements as specified by various environmental and legal inspection authorities (MAFWM, MSE, Directorate for Water, Directorate for Environment, Vojvodina provincial secretariats and municipal inspection services).

Upon review of the monitoring reports, compliance with OP 4.01 was rated satisfactory throughout Project implementation. A comprehensive safeguards review was completed during the MTR and found no significant issues with Project EMPs.

Social Safeguards. No social safeguards were triggered by the Project. Component 2 activities did not involve any land acquisition, eviction of tenants or restrictions of access, thus the Involuntary Resettlement safeguard policy was not triggered. The Project did not support any investments that affected objects of cultural value. During project preparation, numerous consultations were carried out with Project stakeholders, including farmers; owners and managers of slaughterhouses; officials of central and regional government organizations dealing with environment and agriculture issues; agricultural extension officers; municipal leaders; and NGOs. A Social Assessment and Stakeholder Plan study were undertaken in 2004 to better understand attitudes towards the country's environment and proposed Project interventions to address pollution of the Danube (see Annex 17 of PAD). The study involved a combination of quantitative and qualitative research methods. Several findings from the study were instrumental in shaping the public awareness component of the Project – including gender issues as tracked through the annual beneficiary surveys (see Annex 5).

2.5 Post-completion Operation/Next Phase

This section discusses the sustainability and replicability of Project interventions.

Sustainability: All Project-supported goods and works were transferred to beneficiaries during implementation. Grants for solid manure platforms, slurry tanks, and manure handling and spreading equipment were completed at 105 livestock farms; equipment and manure storage facilities in 7 agricultural high schools; transferred ownership of 5 specialized trucks, a blood tanker, and a crusher among two rendering plants[5]; and animal waste storage equipment, municipal sewer and waste water treatment (WWT) connection works at three slaughterhouse and meat processing facilities. The sustainability of these investments is quite high because of the co-financing arrangements where recipients would have an incentive to capture a return on their

[5] Originally there were three beneficiary rendering plants, but the truck at the rendering plant in Belgrade (Glutin) was later reallocated to Ćuprija.

investment. Findings from the beneficiary survey indicated that over 59 percent of large-scale farms would be planning further investments in manure storage and equipment in the next two years. Farms using manure as fertilizer also realize a cost savings and 67 percent of farmers in the beneficiary survey indicated efficiency gains. Firms facing more stringent operating standards (whether EU-driven or not) have the added incentive to maintain these investments over time and avoid costly future capital outlays.

The importance of improved manure management, and associated soil and water quality benefits, was internalized through training activities by the TIC (see Annex 2 for details). At the farm-level, over 100 NMPs were prepared in collaboration with farmers on nutrient management. The development of the CoGAP under Component 1 also contributed to the sustainability of improved nutrient management. Five thousand copies were distributed to public agricultural extension service offices, the network of ten rural development centers, the IAH TIC, agricultural schools, and farmers at field days. A special version of the Code was prepared by teachers of agricultural high schools in cooperation with the DREPR Project Team targeting students. The MAFWM also introduced a support measure in the National Program for Rural Development, using the principles and lessons learned from the Project. Thus results from the DREPR Project were incorporated into the MAFWM subsidy system, securing the continuation of support in establishing environmentally-friendly agriculture.

Training of more than 180 agricultural advisors and investments in 7 agricultural high schools will contribute to Project sustainability for many years. Capacity building and equipment support to the SSI, HMS and local laboratories significantly enhanced the capacity and monitoring functions of these institutions. For example, with parallel co-financing by the European Agency for Reconstruction the Project procured several pieces of laboratory equipment worth more than Euro 1.0 million. The HMS is now rated as one of the best labs in Europe for inorganic and organic chemistry analyses including PCBs. Continued support for groundwater monitoring is anticipated with support from the Secretariat for Environmental Protection of Vojvodina, as part of their regular environmental monitoring program funded by the Environmental Protection Fund of Serbia.

Replicability: Demonstrated investments in nutrient management and greater awareness among beneficiaries point to good replication potential. Insights and experience gained during Project implementation were formalized under *Component 3c Replication Strategy Development*. Four major activities contributed to the replicability of Project outcomes:

- The EU ND implementation strategy and action plan will contribute to Serbia's compliance with the ND in preparation for EU membership.
- A draft IPARD-like [6] measure to support proper manure management practices was completed in July 2010. This document will contribute to MAFWM's broader IPARD program when Serbia is granted EU candidate status.
- A pre-feasibility assessment for anaerobic digestion was completed to continue environmentally-friendly practices in agriculture while also addressing issues of global warming and energy security.

[6] The overall objective of the IPARD programme is to support candidate countries for EU membership in the development of agricultural policy and preparation for Common Agricultural Policy (CAP) implementation. In this case, IPARD assistance could be used to continue farm investment support for construction and equipment.

- Public awareness activities successfully promoted the benefits of nutrient management among farmers as evidenced by the continued pipeline of investment interest even until Project closing. The demonstration effects were cited as one of the main reasons for raising this interest. The public awareness section of the replication strategy was also prepared by the PIU PR Specialist in June 2010. It included lessons learned from Project implementation with technical, financial and social aspects and replication recommendations. These were disseminated through the larger communications strategy (see Annex 2 and 6).
- Next steps: The MAFWM would like to build on the achievements of DREPR by focusing on renewable energy production through bio-digestion of manure and other animal waste. The MAFWM intends to explore possibilities for a follow-on GEF supported project.

3. Assessment of Outcomes

3.1 Relevance of Objectives, Design and Implementation

The Project's objectives, design and implementation remain highly relevant to Serbia's development and environmental priorities. Priority 3 of the Country Assistance Strategy (CAS) for 2008-11 highlights the need to manage emerging environmental and disaster risks, such as those associated with agricultural pollution and are consistent with the Project's PDO and GEO. The Results Matrix, under strengthening environmental management, identifies the reduction of nitrogen and phosphorus pollution flows into the Danube and its tributaries as one of the outcomes. The CAS emphasizes the importance of reforms to ensure that EU pre-accession programs and financing can be utilized to support the transition of Serbian agriculture (e.g. IPARD). Development of the IPARD measure under Component 2 is aligned with this objective. The CAS also points to the importance of increased investment in implementing the EU environment *Acquis* and its transposition into Serbian legislation. The action plan for the adoption of the Nitrate Directive and the development of the CoGAP are steps in this direction.

The Project is also aligned with priorities under Serbia's Rural Development Program (NRDP) which defines rural and agricultural development objectives over the period 2011-2013. Axis 2 activities and support a focus on agro-ecological measures to improve the environment (including biodiversity). These actions are in response to the observed impacts agriculture has on the environment including an oversaturation of water bodies with nutrients (eutrification), which are connected to the uncontrolled flow of manure from livestock farms.

At the global level, the Project contributes to the achievement of objectives under the GEF Black Sea and Danube Basin Strategic Partnership on Nutrient Reduction established to support the ICPDR and the Black Sea Commission in reducing nutrient pollution in the Danube River and Black Sea. In addition, the Project contributes to the objectives of the GEF's International Waters Focal Area.

3.2 Achievement of Global Environmental Objectives

A review of Project outputs against key performance indicators reveals that PDO and GEO targets were exceeded. The annual decrease in the amount of nutrients not taken up by plants and potentially flowing into watercourses from Project beneficiary farms is conservatively estimated at 44% for nitrogen and 100% for phosphorus compared to the target of 20% for each nutrient. Despite the significant disbursement lag during the first two years of implementation, the Project

completed animal waste management investments in 105 livestock farms, 7 agricultural high schools, three slaughterhouses and meat processing facilities, and two rendering plants. Training, awareness raising and replication strategy activities built considerable capacity which will help Serbia transpose and implement the EU Nitrate Directive and reduce livestock-related nutrient pollution at a national scale. The TIC established in the IAH also trained over 180 agricultural advisors significantly strengthening the agricultural advisory service system. Sixty-nine percent of beneficiary farms were implementing Project-supported nutrient management plans two years after they received grants for manure storage and handling.

3.3 Efficiency

An incremental cost analysis (ICA) was conducted at appraisal. At the ICR stage, an ex-post ICA and cost-effectiveness analysis were conducted (Annex 3).

At appraisal, the Baseline Scenario included several planned and ongoing initiatives broadly categorized under i) policy, legal and institutional framework, ii) investments in waste management, and iii) water quality monitoring and public awareness raising (see Table 1, Annex 15 of PAD). The estimated cost of these activities was US$42.01 million to be financed from several sponsoring governments and development agencies.[7] The GEF-Alternative scenario offered a more direct and integrated approach to nutrient reduction through policy and regulatory support (e.g. harmonize laws and regulations with the EU ND; development of CoGAP), farm and slaughterhouse investments in nutrient reduction, strengthening agricultural advisory services through the establishment of the TIC, and a replication strategy with local awareness building. Local benefits of the Alternative included improved marketability of livestock products to the EU, cost savings of manure used as fertilizer and avoided health hazards from water pollution. Under the Alternative N reductions leaching to surface and groundwater would be approximately 280 tons N/year from 60 farms and about 150 tons N/year from 4 slaughterhouses for a total annual reduction of about 430 tons N/year. Serbia would also benefit from steps taken for harmonization with the EU *aquis*. Globally, both the Sava and Danube River Basins would benefit from nutrient reductions and the mitigation effects on biodiversity. The cost of the Alternative was US$64.15 million and the incremental cost was US$22.14 million of which the GEF would finance US$9.02 million and the remainder (US$13.12 million) from other (parallel) co-financiers. Further details are contained in Annex 3.

Ex-post analysis indicates that the GEF-Alternative was achieved at a lower incremental cost of US$20.73 million, including US$6.49 million from Government and local communities, US$5.46 million from SIDA, US$0.13 million from the EAR, US$0.01 million from the Government of Netherlands and US$8.62 million from the GEF Grant. Estimated *annual* nutrient losses for 100 beneficiary farms were approximately 172.7 tons of N and 23.1 tons of P_2O_5. Unfortunately, pre-Project manure spreading practices (i.e. amounts) were not collected and thus annual losses were conservatively calculated as 123.7 tons of N and 23.1 tons of P_2O_5. Annual N reduction for farms was lower than the appraisal estimate, but in percentage terms was higher than the target set by the GEO (i.e. a 44% reduction versus a 20% reduction target). Ex-post estimates for slaughterhouses were not computed because of the change in investment support, but interventions likely result in additional N and P reductions.

A cost-effectiveness analysis found that reducing one kg of N costs, on average, Euro 14.24/ kg N and Euro 85.32/ kg P reduced. The lack of a consistent methodology in estimating nutrient

[7] Namely the Government of Finland, SIDA, BNWPP, EAR, Government of Norway, and CIDA.

reduction cost-effectiveness makes comparisons difficult, however these results do compare favorably with similar projects in countries such as Romania and Poland.

3.4 Justification of Overall Outcome Rating

Rating: Satisfactory

The PDO and GEO remain highly relevant for local and global environmental protection and in meeting the requirements of the EU Nitrate Directive. The GEO was achieved, and surpassed in the case of nutrient reduction investments and outcomes; including a wider scope of beneficiaries (e.g. rendering plants and agricultural schools). Strengthening the regulatory and institutional structure also ensures the long-term control of nutrient pollution. Overall Project costs were lower than anticipated and results were achieved in a cost-effective manner.

3.5 Overarching Themes, Other Outcomes and Impacts

(a) Poverty Impacts, Gender Aspects, and Social Development

Gender issues were not a specific Project objective however the beneficiary surveys tracked the perceptions and awareness of female beneficiaries from 2007-2010 (see Annex 5 and Section 3.6 below for details). Any measured differences would then be followed up in the field by local advisors – to avoid any potential bias of Project interventions. Gender differences among farmers were observed among indicators of farm size (females tended to have smaller livestock holdings), land holdings (females tended to have fewer land registrations) and machinery ownership (fewer females indicated possession of tanks for liquid manure). Follow up confirmed these observations but concluded that this was not due to any potential bias – but rather it reflected the underlying structure of female farm ownership in Serbia. The attitudes and perceptions of females among the general population also differed from that of men. Women evaluated environmental protection issues somewhat more positively – emphasizing the importance of pollution problems and the detrimental influence of farms, slaughterhouses and manure on the condition of rivers. They also valued the importance of the DREPR Project to a somewhat greater degree and the feasibility of the Project's objectives.

(b) Institutional Change/Strengthening

The Project built capacity in several institutions to address agricultural pollution issues. In addition to the support given to HMS for water quality monitoring, SSI for soil monitoring and the extensive advisor training through the TIC, the Project increased MAFWM's capacity to support farm and enterprise investments in the long-term – particularly at the local level with municipalities and the WD. Development of the EU ND implementation strategy and action plan guided the streamlining of internal procedures and tendering processes resulting in increased fiduciary efficiency to better serve new investment interest. MAFWM's policy and regulatory readiness for accession was also strengthened with the EU ND implementation strategy and action plan, CoGAP development and the draft IPARD measure.

(c) Other Unintended Outcomes and Impacts (*positive or negative, if any*)

In December 2009, the Project received an additional contribution from the Government of Sweden of SEK 9,975,000 to a new Trust Fund (TF096289) in support of nutrient reduction sub-grants under Project Component 2.

Exchange rate fluctuations posed a risk to the level of Project outputs and potentially to unused grant funds as a necessity of keeping an uncommitted reserve. Project funds were denominated in USD (GEF grant) and Swedish Kronor (SIDA grant) while most contracts were denominated in Euros. This affected the USD value of both outstanding and new contracts. Consequently it was necessary to keep a cushion of several hundred thousand USD until November 2010, when a restructuring allocated funds to new contracts.

3.6 Summary of Findings of Beneficiary Survey and/or Stakeholder Workshops

Public awareness (PA) and beneficiary surveys: The Project undertook annual public awareness surveys (from 2007-2010) and a beneficiary survey (2010) as part of Component 3 activities. Survey findings were to aid in designing PA activities and the MAFWM's post-project PA strategy as a part of the Replication Strategy. Annual PA surveys monitored the awareness of agricultural pollution issues among the general public and farmers in Project regions and the beneficiary survey focused on the before- and after-Project experience encountered by farm and non-farm beneficiaries (also including a sample of non-beneficiaries). A brief summary of findings from the two surveys is presented below with details in Annex 5.

Survey findings suggest that interest in environmental issues was high among farmers and the general population, but farmers tended to attach less importance to environmental protection. There was significant recognition among farmers and the general population of poor river quality, and both perceived slaughterhouses, relative to farms, to be greater contributors to river pollution. DREPR Project awareness increased among farmers but was less noticeable among the general population. Farm beneficiaries' primary reason for Project participation was to reduce environmental pollution, but other benefits such as fertilizer cost savings were also realized. Non-farm beneficiaries also acknowledged pollution reduction benefits, but the increase in equipment capacity was recognized as the largest benefit. Overall Project satisfaction was primarily driven by the increasingly positive interactions with LAUs and the MAFWM over time. Difficulties experienced were mainly financial (i.e. investments) and cumbersome administrative procedures – which improved over time once constraints were identified and LAU assistance in navigating the administrative hurdles. A majority of beneficiaries (both farm and non-farm) indicated continued investment interest in manure management as well as in new areas such as biogas facilities. Among farmers, interest was a function of obtaining favorable financing arrangements and among public institutions a function of State budgets. Other identified sources of future funding included the EU and the World Bank.

Stakeholder workshops: Project experience was shared at several major events throughout implementation including farmer field days that played an important role in raising farmer awareness. The following were three of the more recent and significant events.

Regional Conference on Agricultural Pollution Control (APC: Belgrade, Oct. 4-6, 2010). Organized by the MAFWM in cooperation with the ICPDR, the APC conference drew nearly 100 Serbian and international participants, including HMS, IAH, SSI, the GEF, UNDP, the European Bank for Reconstruction and Development, and implementing agencies of APC-related projects in Turkey, Croatia, Montenegro, Bosnia and Herzegovina. Participants discussed DREPR and other APC projects in the region with a focus on lessons learned and monitoring.

DREPR Stakeholder Workshop (Belgrade - March 3, 2011). Project beneficiaries were brought together to share their challenges, experience and lessons learned. A summary is provided in Annex 6.

Project design, implementation challenges and lessons learned were also presented at several *GEF Biennial International Water (IW) Conferences* [3rd (2005), 4th (2007), 5th (2009)].

4. Assessment of Risk to Development Outcome

Rating: Moderate

Project outcomes are likely to be sustainable for the foreseeable future. Farmers who received co-financing have appropriate incentives to maintain their newly productive assets and as do the beneficiary institutes who rely on high quality information service provision (e.g. HMS, SSI). The momentum gained through the Project is also likely to result in new manure management interest – for several reasons. The financial uncertainty felt during the economic crisis was one reason farmers were reluctant to enter into co-financing arrangements. With stability returning to the economy, those who had expressed interest, but were on the sidelines, are likely to renew their interest with the MAFWM. The second reason one may expect an increase in continued interest is due to the demonstration effects of Project interventions. For example, farmers expressed concern that the administrative process for permitting, licensing and tendering was cumbersome and time-consuming. Through working with the MAFWM and municipalities, most of these procedures were streamlined and agreements made on the interpretation of storage tanks as auxiliary facilities; and were not privy to water conditions mandated by the WD. But the most compelling reason to expect continued support to farmers is compliance with the EU ND. Failure to do so could lead to the possibility of Directive infringement – the consequences of which are now being felt in some other EU member countries. Finally, a continued awareness and information campaign is planned as part of implementing the Replication Strategy.

The market for specialized equipment and construction of manure storage also matured as a result of Project demand for these goods and services.

Funding of operating and maintenance expenses among institutes relies on State budget support (e.g. HMS and SSI) and they are regulated through existing agreements. Their services are viewed as an important part of monitoring and evaluation extensions of the Government. Beneficiary agricultural high school graduates will continue to practice proper nutrient management on their farms, but funding for such curricula in other schools will depend on the Ministry of Education.

Completed slaughterhouse investments are expected to be sustainable as a result of having to comply with EU requirements. Future investments in other slaughterhouses will be a function of whether municipalities can support new wastewater treatment plants (WWTP); however, Serbia has already begun the construction of new municipal WWTPs in several locations.

5. Assessment of Bank and Borrower Performance

5.1 Bank

(a) Bank Performance in Ensuring Quality at Entry

Rating: Moderately satisfactory

The Bank identified an area of support that was and remains relevant to the Serbian environment, agriculture, public health, as well as the global commons (Danube River). Project activities targeted key areas considered as priorities in the CAS and NRDP, and complemented ongoing

wastewater management and (EU) regulatory reforms in the country. Project outputs and outcomes were appropriately balanced across four key areas: (i) nutrient reduction investments, (ii) institutional readiness and compliance with EU standards, (iii) monitoring and evaluation, and (iv) capacity and awareness building. Insights gained from other nutrient management Projects were incorporated into Project design and the approach to sustainability through the Replication Strategy was novel.

The Project suffered a significant disbursement lag leading to a Project downgrade to marginally unsatisfactory in 2008. The most significant determinant of this lag was due to the unfamiliarity of municipalities with manure structure design and permitting as well as water conditions set by the WD – which preparation (in conjunction with Government) could have identified. The 50-year design life of structures, and associated cost, served as a financial constraint to farmers.

(b) Quality of Supervision
(*including of fiduciary and safeguards policies*)
Rating: Satisfactory

The Bank closely supervised Project implementation through semi-annual missions, monthly video conferences, fiduciary reviews and maintained a constructive dialogue between the PIU, the MAFWM and other stakeholders. Issues raised were addressed in a timely manner and were candidly reported in official documentation. The major disbursement issue faced by the time of the MTR was handled in a very proactive manner with the Bank team identifying problematic areas such as those related to municipalities' interpretation of structure design-life, permitting issues and the re-incentivization of co-financing arrangements among farm beneficiaries. Corrective actions and a series of interim targets were set with the PIU to accomplish increasing the disbursement rate – such as the number of signed sub-grant agreements with beneficiary farms and equipment deliveries. A year and a half later the disbursement rate was 76.5 percent. The Bank team also maintained a focus on achieving the PDO and GEO through the identification of additional beneficiaries (i.e. meat processing and rendering plants and agricultural schools). The background preparation and feasibility of interventions developed for these new beneficiaries was exemplary. Compliance with fiduciary and safeguards policies was regularly reviewed and areas of weakness were addressed in a timely manner. A Quality of Supervision report in 2006 also gave the Project a satisfactory rating.

The satisfactory performance of the Bank team is not without its flaws. The low disbursement rate should have been flagged earlier and possible solutions derived. The eventual actions taken led the Project to achieve or exceed most objectives, but earlier identification of the local regulatory environment and remedial actions might have lead to smoother implementation.

(c) Justification of Rating for Overall Bank Performance
Rating: Moderately satisfactory

Bank support to the Government in preparing and implementing the Project was instrumental to achieving Project outcomes; and outcomes are regarded as environmental priorities to the country both then and now. While preparation drew on other nutrient management projects outside the country (e.g. Romania), the institutional and regulatory context was a factor leading to its slow implementation during the first two years. Despite the rough beginning, proactive supervision and guidance to the PIU and MAFWM pushed the Project to even surpass many of the original targets (e.g. 105 beneficiary farms versus 60). Overall Bank performance is rated as moderately satisfactory as the lower of the two individual ratings.

5.2 Borrower
(a) Government Performance
Rating: Satisfactory

Government commitment to the Project and its objectives was commendable as demonstrated through the actions of the PTAC in approving annual programs, sub-project selections, and ensuring coordination among Project stakeholders (see Section 2.1 for stakeholder description). The Project benefitted from good inter-agency coordination between the MAFWM, IAH, HMS, SSI, Veterinary Directorate and the Secretariat for Environment and Sustainable Development of the Autonomous Province of Vojvodina. Counterpart funding was received in a timely manner, even though commitments were quite modest (US$0.60 million). The Government (Ministry of Finance) also provided a substantial in-kind contribution through tax exemptions on goods and services (worth over US$2.4 million).

(b) Implementing Agency or Agencies Performance
Rating: Moderately satisfactory

The MAFWM, as the main implementing agency, remained committed to the Project and provided satisfactory support to the PIU on daily issues and in resolving problems. For example, near Project completion it was discovered that one of the procured trucks for the rendering plant in Belgrade (Glutin) was non-operational and the MAFWM quickly transferred the truck to the rendering plant Ćuprija. However, as written elsewhere, local permitting requirements encountered with municipalities and the WD should have been identified early on. The turbulent political environment also had an impact on implementation. Elections and government reshuffling resulted in seven different MAFWM Ministers over the life of the Project – and each change required renewed awareness of the Project. In addition, Ministerial approval of contracts should have been delegated to levels below the Minister – delays that resulted in missed construction seasons. Ultimately refunds to the GEF and SIDA were necessary.

Safeguard and fiduciary compliance was satisfactory throughout the Project. This was demonstrated at the time of the MTR through the development of EMPs for new beneficiaries.

The PIU within the MAFWM was very effective in its ability to help beneficiaries navigate the rather complex application and tendering process. The direct one-to-one engagement with beneficiaries was crucial for gaining beneficiary confidence and trust; PIU and LAUs were praised for their support as revealed in the beneficiary survey (see Annex 5). The MAFWM was also successful in attracting additional co-financing from SIDA (SEK 9,975,000) to support of further nutrient reduction sub-grants under Component 2.

(c) Justification of Rating for Overall Borrower Performance
Rating: Moderately satisfactory

Overall borrower performance is rated as moderately satisfactory taking into account the Government's commitment to achieving the PDO, GEO and the commendable field supervision by the PIU. Despite the initial two-year implementation lag, actions taken by the MAFWM and the superior performance of the PIU led to the achievement of the PDO and GEO. The rating is moderately satisfactory - the lower of the two individual ratings on Government and Implementing Agency Performance ratings as per ICR Guidelines.

6. Lessons Learned

Project experience highlighted the following important factors for successful and timely implementation:

- Project preparation should include an investigation of national as well as local /municipal level permitting requirements and standards for construction of Project-supported facilities. Such investigation would reveal that no permit requirements and/or standards suitable for Project-promoted structures exist – possibly leading to excessive requirements and costs. Early discovery of such issues can prompt early resolution avoiding implementation delays;

- Lessons from other projects proved useful in designing components – although DREPR focused on larger-scale enterprises;

- Implementation support missions should be complemented by monthly video or audio conferences between the implementing agency and Bank teams to review and resolve issues that affect implementation. In the DREPR Project, had this approach been adopted from the beginning of implementation, the issue of the excessively stringent construction standard as the root cause of delays might have been discovered and resolved earlier;

- Technical aspects of investment preparation (nutrient management plans, preliminary and final designs) for the initial batch of beneficiary enterprises should be carried out during Project preparation. If possible, the procurement process (without actual contract signing) for this first group should also be carried out before project effectiveness. This would allow an examination and rectification of any technical or procedural issues and lead to smoother implementation when the Project becomes effective;

- Project implementers and the Bank should be flexible and ready to take advantage of opportunities that present themselves during project implementation and adjust the scope to achieve the GEO/PDO. Inclusion of rendering plants and agricultural schools at mid-term is a good example;

- Nutrient reduction evaluation. While it is desirable to measure the Project's impact on groundwater pollutant concentration, the short project duration and other factors that influence groundwater quality make such monitoring unfeasible. Therefore, projects should focus on avoided nutrient losses and collect necessary farm-level data before and after project investments. Groundwater quality monitoring is a long-term activity that the project may support initially but should be part of the government's water quality monitoring plan, including budgetary commitments for recurrent costs.

7. Comments on Issues Raised by Borrower/Implementing Agencies/Partners

(a) Borrower/implementing agencies

The borrower's contribution to the ICR was shared with the World Bank on June 18, 2011 and is reproduced in Annex 7. It provides a summary of Project experience with important assessments of Government and the Bank, along with specific recommendations in the design of other projects. The MAFWM had only minor comments on the Bank's ICR and are contained in Annex 7.

(b) Cofinanciers

Comments were received from SIDA on October 13, 2011, stating that the ICR "*was very informative*" and noting that the (Project's), "*good results were well presented*". They did not have any specific comments.

(c) Other partners and stakeholders
(e.g. NGOs/private sector/civil society)

Annex 1. Project Costs and Financing

(a) Project Cost by Component (in USD Million equivalent)

Components	Appraisal Estimate (USD millions)	Actual/Latest Estimate (USD millions) *	Percentage of Appraisal
Support to Regulatory Reform and Capacity	0.22	0.50	226
Investment in Nutrient Reduction	17.69	18.16	103
Water and Soil Quality Monitoring, Public Awareness Raising and Replication Strategy	1.26	0.67	53
Project Management and Project Impact Monitoring	0.64	1.40	218
Total Baseline Cost	**19.81**	**20.73**	**105**
Physical Contingencies	1.20		
Price Contingencies	1.13		
Total Project Costs	**22.14**	**20.73**	**94**
Total Financing Required	**22.14**	**20.73**	**94**

* - Includes additional funds received from SIDA and the Government of the Netherlands.

(b) Financing

Source of Funds	Type of Cofinancing	Appraisal Estimate (USD millions)	Actual/Latest Estimate (USD millions)	Percentage of Appraisal
Borrower (not including tax exemptions granted by the Ministry of Finance)	Direct	0.60	0.57	95.6
Global Environment Facility (TF054908)	Co-finance	9.02	8.62 [1]	95.6
Sweden: Swedish Int'l Dev. Coop. Agency (SIDA) (TF056212)	Co-finance	3.93	5.46 [2]	139.0
Embassy of the Netherlands	Co-finance	-	0.01	-
Local Communities	Co-finance	8.46	5.92	70.0
EC: European Commission	Parallel co-finance	0.13	0.13	100.0
TOTAL		22.14	20.73	93.6

1 – A total of US$9.02 million was received from the GEF, of which US$8.62 million was disbursed. The remainder was refunded back to the GEF.
2 – Includes the original grant amount of SEK29.4 million (US$4.23 million) plus the additional contribution from the Government of Sweden of SEK9.975 million (US$1.42 million) for Component 2 activities. A total of US$5.46 million was disbursed with US$188,000 refunded back to SIDA.

Annex 2. Outputs by Component

Component 1: Support to Policy and Regulatory Reform

The objective of this component was to strengthen the policy and regulatory frameworks that regulate nutrient run-off and discharge from livestock farms and slaughterhouses, in line with the European Union Nitrate Directive (EU ND). In particular, the Project was to support (i) a study to identify nitrate-vulnerable areas in Serbia; (ii) development of an implementation plan for the EU ND; (iii) transposition of the EU ND into the Law on Fertilizers; and (iv) development of a Code of Good Agricultural Practices (CoGAP).

However, in early 2009 MATFWM and the Bank agreed to amend this component to include only (a) preparation of a strategy and action plan for the adoption and implementation of the Nitrate Directive, including its transposition into domestic legislation, and (b) development of a Code of Good Agricultural Practices. These amendments were justified by the fact that Serbia's early stage of EU harmonization required only the development of an overall strategy and action plan for the ND, rather than the more advanced steps originally listed under (i), (ii) and (iii) above.

(i) Preparation of a strategy and action plan for the adoption and implementation of the Nitrate Directive, including its transposition into domestic legislation

The Project assisted in preparation of the study "Preparation of the Nitrate Directive Implementation Plan and Legal Framework for Serbia", in which short, medium and long term steps related to the introduction of ND were presented.

The study provided essential baseline information for and against the introduction of ND in the entire territory of the country or in sensitive areas (Nitrate Vulnerable Zones). Based on workshops held during the preparation of these studies by representatives of the Hydrometeorological Service (HMS), Soil Science Institute (SSI), the Institute of Animal Husbandry (IAH), the Institute "Jaroslav Cherni", Water Directorate, representatives MAFWM and MEP reviewed proposals for both the introduction of ND solutions throughout the territory or in sensitive areas (NVZ) and what effect this would have on agricultural production and farmers, as well as socio-economic aspects.

The study represents a Strategic Document to guide the process of preparing Serbia to implement the EU ND prior to, and after, its anticipated entry into the European Union. The study specifically aims to:

- Raise awareness of the full obligations of the EU ND by providing relevant background information together with examples and explanation of the Directive's implementation in the EU-27 Member States;
- Help guide relevant stakeholders in making appropriate choices about key aspects of practical implementation of the Directive, and;
- Present a series of recommended actions to assist preparation for implementation of the Directive. These recommended actions are summarised into a Strategy and Action Plan which clearly identify **short-**, **medium-** and **longer-term** actions.

In contrast to the situation in many Western European countries, the impact of Serbian agriculture on water quality and the aquatic environment is not generally considered to be a major problem at present.

Although chemical fertilizer use (notably Nitrogen, Phosphorus and Potassium (NPK) compound fertilizers and urea) is widespread amongst farmers in Serbia, the average annual application rate is reported to have declined from 115 kg/ha in 1991 to 36 kg/ha in 2002 (although it is assumed that fertiliser use has been gradually increasing again in recent years). Likewise, livestock numbers decreased by more than 30% after the beginning of the 1990s due to a number of factors including the overall reduction in the number of farms, decreased demand for animal products, small farm size and poor animal husbandry.

These trends are reflected in the average soil nitrogen balance of 11.9 kg N per hectare of agricultural land which has been calculated for Serbia in recent years and which is relatively low compared to other countries. For example, within the Danube River Basin countries Germany and Austria were estimated to have soil nitrogen balances of 90.9 and 44.0 kg N per hectare of agricultural land respectively. Soil nitrogen balance is a key indicator of the surplus of nitrogen accumulating within agricultural soils that may be susceptible to loss from the soil. A low balance such as that found in Serbia indicates a low overall risk of losses such as nitrate leaching.

All of these factors suggest that the incidence of diffuse and point source agricultural pollution is likely to be relatively small at present. This is certainly reflected in the available data on nitrate concentrations in surface waters which indicate no significant problems with elevated nitrate concentrations in the surface waters that are currently sampled.

However, there are other indications that agricultural pollution may be a problem in some regions and this should be kept under careful observation. Firstly, the available data on nitrate concentrations in groundwater shows that 6 out of 63 groundwater sources regularly monitored actually have nitrate concentrations in excess of the limit of 50 mg/l of nitrate (equivalent to 11.3 mg/l nitrate-N) set by the Nitrate Directive. These higher nitrate concentrations are found particularly in the Morava River Basin in Central Serbia.

Despite the reduced intensity of Serbian agriculture in recent years, concerns remain about three key issues:

1. Although there are relatively few large-scale intensive livestock farms (pig and cattle), environmental management on these farms is very low and significant point source pollution (chemical and bacteriological) of ground and surface waters is caused by poor manure management. Typically these farms have insufficient storage for slurry/manure and treat it simply as a waste product to be disposed. Farmers generally do not plan the land application of manure and slurry, but dispose of it immediately once their (limited) storage capacity is full. This implies they are spreading manure/slurry throughout the year and often in very inappropriate conditions (e.g. on snow covered soil or in autumn before ploughing and sowing winter cereals). This not only risks polluting the environment, but also represents a significant loss of money through the poor utilization of the nutrient value of the manure/slurry;
2. The majority of small farms commonly keep some livestock, including cattle and/or sheep which are grazing on common pastures around the village and kept in sheds and barns at night and during the winter. Manure accumulating from these animals is rarely treated with any special precaution, but is commonly stored somewhere around the household yard where it creates a risk of small point source pollution to nearby streams and rivers. Although pollution caused by individual farming households is relatively small, multiple small point source pollution from a village (for example) can be a problem. Plus of course there is the risk of polluting the shallow wells used for drinking water by the farming families.

Improvements in livestock housing combined with simple waste handling facilities (including organization of communal manure stores to collect and store manure from households and small farms) would greatly reduce the risk of water pollution, improve environmental quality and living conditions in many villages and improve the recycling of nutrients to agricultural land. However, access to capital is a major limitation;

3. It is likely that the structure and intensity of agricultural production in the Republic of Serbia will change rapidly in the coming years in response to economic growth, the opening of markets for export and approximation to the EU. For example, it is likely that average farm size will grow, production will intensify and the use of fertilizers and pesticides will increase. These factors may all contribute to the increased risk of agricultural pollution, especially if farmers continue to remain largely unaware of the environmental impact of their activities.

Nitrate pollution should not be underestimated in Serbia. Although agriculture is clearly much less intensive than it was before the beginning of the 1990s, there are still signs of localised pollution problems. Much more data and investigation is therefore needed, plus application of the precautionary principle would be advised.

It must also be remembered that nitrate leaching is only one aspect of poor nutrient management. For example, poor management of animal manures and chemical fertilisers is also linked to increased gaseous emissions of ammonia (NH_3), methane (CH_4) and nitrous oxide (N_2O) which are implicated in other environmental problems such as soil acidification and global warming. Full and effective implementation of the Nitrate Directive can therefore also have important benefits for air quality and mitigation against climate change.

(ii) Development of the Code of Good Agricultural Practice:

A voluntary Code of Good Agricultural Practices (CoGAP) adapted to Serbian conditions was prepared with Project funding and adopted by MATFWM in 2008, and 2,000 copies of CoGAP were distributed to representatives of ministries, municipalities and other local government representatives, inspectors, agricultural extension services and farmers. The Code was updated in early 2011 and 5,000 reprinted and distributed to agricultural extension services and farmers by the Institute for Science Application in Agriculture (ISAA). Furthermore, during training activities of the project, teachers from high agricultural schools (7 schools) were trained at IAH about CoGAP. It was agreed with MATFWM and the Bank that trained teachers prepare similar versions of the brochure for students. The brochure was prepared in organization and cooperation of all schools who attended trainings at the IAH. This material was presented to students and used during practical training of students at field work.

The publication enables a large number of farmers who were not direct participants in the DREPR Project to get acquainted with good agricultural practices, including farm manure and nutrient management. It will be used as a teaching material in agricultural high schools and reference material by agricultural advisors when advising farmers on good agricultural practices. Therefore the CoGAP will likely encourage other Serbian farms to adopt practices that will reduce nutrient pollution of waterways connected to the Danube River and Black Sea. Also the elaborated version of the Code will serve as the platform for further regulations on this matter and serve as the driving document in promoting environmentally-friendly practices in agriculture.

Component 2: Investment in Nutrient Reduction

This component directly contributed to the Project Development and Global Environment Objective of reducing nutrient pollution from enterprises.

This component was crucial to the Project, with investments in nutrient reduction on farms and slaughterhouses to practically demonstrate to farmers the main reason of implementing the Nitrate Directive and protect underground and surface water against nutrient pollution. During implementation the PIU faced implementation challenges with investments on farms and slaughterhouses. The first issue was related to local and municipal water permits for the construction of manure pads and manure tanks on farms. The PIU team decided to organize meetings and visit municipalities and local authorities and explain Project targets and environmental issues. This action by the PIU/LAU team increased the number of participating farmers from 2008 till 2010. Further, to achieve the Projects' target (60 farms) it was decided to motivate farmers to complete works on farms themselves since this will give them the opportunity to receive equipment for spreading manure on fields.

During implementation the PIU realized that nutrient reductions at slaughterhouses would be very difficult given water quality parameters specified in permits and given the amount of time required to finish construction works for waste water treatment plants at slaughterhouses. A decision was made to only assist slaughterhouses with connections to the local sewage system, supplying containers and cooling chambers for animal by-products.

Sub-component 2A: Investments in manure management at livestock farms

During first two years of Project implementation two advertisements were published to increase the number of potential beneficiaries. The increased number of beneficiaries to the second advertisement was due to the efforts of the Local Advisory Units. In addition, it was evident that the majority of applicants were from the Region of Šabac. However, upon PIU/LAU visiting and working in the field it was concluded that the most important potential beneficiaries in terms of livestock production and financing ability would come from the Regions Vrbas/Novi Sad and Pozarevac. In total 105 cow and pig farms were supported in the Project. Support was given for construction works of manure pads and manure tanks, as well as equipment for manure spreading. The maximum level of grant support per farm was 70% or 140,000 Euro and for demonstration farms (8 farms) 80% or 160,000 Euro.

Note: To increase participation grant levels were increased to 70% or 140,000 Euro and for demonstration farms (8 farms) 80% or 160,000 Euro. After these changes the Project started to receive more farmer applications.

Sub-component 2B: Investments in slaughterhouse manure management

Assistance in handling of hazardous waste was realized on the following slaughterhouses:

- **"Yuhor AD"**, Jagodina - as a demonstration slaughterhouse support was given to connect to the local sewage system;
- **"Pantomarket Stocar Cacak"**, Cacak – support by supplying small containers for collecting animal by-products from slaughterhouses and from the rendering plant in Cuprija;
- **"KiM-Kraljevacka industrija mesa",** Kraljevo – supported with the procurement of small containers for collecting animal by-products from slaughterhouses. Furthermore, the Project supported construction works of a manure pad to collect manure from transport trucks and boxes that house animals 24 hours before slaughtering; and a cooling

chamber for keeping animal by-products in containers after slaughtering. Animal by-products from containers were collected from the rendering plant in Cuprija.

During Project implementation issues were discovered with collecting and transporting animal by-products to rendering plants. After visiting and collecting equipment information at rendering plants the information was provided to the Veterinary Directorate of the MATFWM. The Veterinary Directorate agreed to support 11% of equipment investments and requested Project support for 89% (trucks with containers and cistern for collecting blood) of investments. Support was given to the following rendering plants:

- **Rendering plant in Sombor** - supported 2 larger trucks for collecting animal by-products;
- **Rendering plant in Belgrade**[8] - supported 1 smaller truck for collecting animal by-products;
- **Rendering plant in Cuprija** - supported 2 larger trucks for collecting animal by-products and 1 cistern for collecting blood.

Sub-component 2D: Establishment of Training and Information Center (TIC) and rehabilitation of Institute for Animal Husbandry (IAH) facilities

Upon successfully completion of initial training of IAH professionals, conducted by international consulting company (VVMZ), the Training and Information Centre (TIC) in the IAH was officially established. From December 2006 to December 2010, more than 600 participants passed training courses in the TIC. TIC trainers organized a series of brief two-day trainings for a number of interested professionals (farmers, slaughterhouse managers, veterinary officials, agricultural and environmental inspectors, MATFWM staff, agricultural advisors, professors from Agricultural High Schools) related to CoGAP and other areas of relevance to the Project. The participants evaluated these trainings as excellent: professionally organized, interesting and beneficial. The number of TIC trainees by specialty, year and training program are presented in Tables 1 and 2.

Table 1. Number of participants at TIC for the period 2006-2010.

Calendar year	**2006**		**2007**		**2008**		**2009/2010**		**Total 2006-2010**	
Professionals trained	Target	Actual	Target	Actual	Target	Actual	Target	Actual	Target	Actual
TIC trainers	8	8	0	0	0	0	0	0	8	**8**
Agricultural advisers	20	6 LAU advisors	20	60	40	60	40+40	40+20	160	**186**
Veterinary (V) Agricultural (A) inspectors	20V 0A	20 V 0 A	20V 20A	40V 20A	40V 20A	20 V 20 A	60V 0 A	60 V 0 A	140 V 40 A	**140V 40A**
Slaughterhouse and meat	10	0	10	20	10	20	10	0	40	**40**

[8] This truck was eventually found to be nonoperational and transferred to Cuprija (see also Section 2.5).

Calendar year	2006		2007		2008		2009/2010		Total 2006-2010	
processing enterprise managers										
Water quality and environmental inspectors	15	0	15	9	15	30	15	15	60	**54**
"Lead" farmers	0	0	0	6	40	40	20	20	60	**66**
Agricultural high school teachers	0	0	0	0	40	40	40	20	80	**60**
Central and local policy makers	10	0	10	0	20	60	20	0	60	**60**
Total	83	**34**	95	**155**	225	**290**	245	**175**	**648**	**654**

The TIC was established as a self-standing training unit in the IAH and specialized experts were contracted to prepare training material and provide the training to selected short-term consultants. The TIC conducted training modules on proper manure and slaughterhouse animal waste management to reduce nutrient pollution to water bodies, conduct on farm demonstrations and be a national repository of knowledge on evolving EU regulations in this field. The IAH's own manure and slaughterhouse animal waste management facilities were upgraded so that they could be used for demonstration purposes even after Project completion.

A list of main topics of training program is below:

1. Policies and Regulation Standards for EU Nitrate and Animal By-Products Directive

- EU policies and regulation standards and enforcement requirements;
- Knowledge of relevant EU agricultural and environmental directives and how to meet them, including legal requirements for the use of mineral and animal manure, pesticides, protection zones and timing and waiting periods and water quality;
- Specific information on EU Nitrate Directive and Animal By-products Directive and their enforcement procedures;
- Experience with enforcement in EU countries**.**

2. Manure and Slurry Storage, handling and processing

- Principles and farm practices for protection of water from nutrient pollution and other environmentally responsible activities in farmland area;
- Solid and liquid storage space required by an animal for waiting periods;
- Amount of manure produced and their nutrient content;
- Functioning of farms in view of EU environmental requirements for animal management;
- Farm manure (nutrient) management plans;

- Different manure and slurry holding structures; their cost and operation for different sizes of animal farms, farmland structures and draining systems to avoid leakage and water contamination;
- Design, installation and operation of structures for the planning and proper use of animal and slaughterhouse waste on farms, and;
- Experience with enforcement of the above in EU countries.

3. Plant Nutrient Management

- Principles of plant nutrient management - balancing crop needs with what is supplied by animal manure, other organic manure generated on the farm and chemical fertilizers while meeting the EU Nitrate Directive;
- Development of nutrient management plans for different size farms, crop rotations and other good management practices and pasture management to meet the EU relevant Directives and improve farm income;
- Experience with computer generated nutrient management plans based on crop needs, yield and available soil nutrients from soil tests; rate, time and different methods of manure application;
- Handling and operation of needed equipment;
- Experiences with on-farm nutrient management in EU countries.

4. Handling, Treatment and Recycling of Slaughterhouse Waste

- Processes carried out in slaughterhouses and meat processing plants;
- EU Animal By-product Directive and its application and enforcement in other EU countries;
- General principles of waste minimization applicable to slaughterhouse and meat processing;
- Segregation required for product streams and their waste materials and cost-effective and environmentally safe methods of dealing with animal waste in slaughterhouses and meat processing facilities;
- Relevant regulations concerning solid and wastewater treatment and sanitation processes for organic materials from waste storage facilities, including composting and anaerobic digestion;
- Organization of facility operations, including hygiene;
- Principles of hazard analysis, critical control path and environmental impacts of organic waste recycling to land and their mitigation;
- Monitoring and inspection of slaughterhouses and farms applying slaughterhouse waste and environmental requirements;
- Experience with the above practices in EU countries.

5. Soil and Water Monitoring

- Principles, methods and international standards for water analysis for major and trace elements and residue analysis for herbicide and pesticides, including sampling, analysis and interpretation of results;
- Hydrological flow of pollutants in surface and ground water, soil quality and procedures in establishing piezometers and other soil sampling procedures;
- EU accepted methodology and standards for soil and water analysis and quality parameters;

- Information needed for inspectors from MATFWM, MSEP and the Water Directorate in monitoring and enforcing the implementation of Serbian /EU regulations by farmers, animal producers and slaughterhouse and meat processors;
- Practical training with hands-on experience in soil and water sampling, analysis and interpretation and EU requirements for water quality requirements;
- Experience with practices in EU countries.

6. Agricultural Engineering /civil engineering

- Design, construction, and maintenance of storage and processing facilities, equipment and system design, farm buildings and related ancillary structures, including drainage and waste disposal;
- Engineering requirements and standards for key animal species with regard to farm structures and waste disposal;
- Legal and environmental requirements for all farm and slaughterhouse construction, cost-effective and approved designs with material and standard specifications;
- Engineering solutions of acceptable animal accommodation, feeding and waste management inside farm buildings and rehabilitation of existing structures; and practical experience in constructing and managing farm / slaughter house structures and facilities;
- Necessary equipment choice, availability and their use and maintenance, legal and environmental requirements for farm and enterprise structures;
- Experience with practices in EU countries.

7. Organization and Effective Operation of Agricultural Advisory Service

- Principles and techniques of agricultural extension and advisory services and follow up;
- Identification, mobilization and motivating target groups to participate in projects;
- Developing producers associations;
- Needs assessment and guiding principles in helping beneficiaries and follow up;
- Different extension models and experience in the use of different media and information campaigns;
- Organizing / conducting on-farm trials and demonstration of new technologies in farmers' fields, field days, farmer study tours, training and discussions;
- Experience with practices in agricultural advisory services in EU countries.

8. Farm Economy

- Principles of economics of farm management, gross margin and investment analysis;
- Analysis of profitability of farm nutrient management investments and incorporation of farm nutrient management planning.

Table 2. Training program per activity and professional occupation

Training program	**Veterinary inspectors**	**Agricultural inspectors, "Lead" farmers**	**Environmental inspectors**	**Slaughter-House managers**	**Agricultural advisors, Agricultural high school teachers**	**Central and local policy makers**
Course duration	2 days	2 days	2 days	1 day	4 days	1 day
Policies, regulations,	+	+	+	+	+	+

Training program	Veterinary inspectors	Agricultural inspectors, "Lead" farmers	Environmental inspectors	Slaughter-House managers	Agricultural advisors, Agricultural high school teachers	Central and local policy makers
standards						
Manure and Slurry Storage, Handling and Processing	+	+	+	+	+	+
Plant Nutrient Management		+	+		+	
Handling, Treatment and Recycling of Slaughterhouse Waste	+		+	+	+	+
Soil and Water Monitoring			+		+	+
Agricultural/Civil Engineering	+	+		+	+	+
Agricultural Advisory Service					+	
Farm Economics		+			+	

As a demonstration farm, the IAH set up a trial field with the objective to monitor manure application impacts on yields of various crops (per ha). This was also used for practical training for the TIC and will remain a useful tool for further educational activities and trainings.

In order to reach a greater number of agriculture producers, it was decided to assist seven agriculture schools with training, equipment and facilities for manure management. One of the main reasons was the number of students mainly coming from agriculture households and at the same time they represented future agriculture producers. These investments helped transfer knowledge from students to other farmers and directly supported Project concepts on sustainable and environmentally-friendly agriculture.

Sub-component 2E: Local Advisory Units to raise awareness among farmers on proper manure management

The Local Advisory Units (LAUs) were of valuable support in the course of Project implementation. The LAUs established good working relations with potential beneficiary enterprises (farms, slaughterhouses and agricultural high schools). Furthermore, LAUs prepared approximately 130 Nutrient Management Plans (NMPs), conducted training for farmers, in addition to establishing excellent communication with the local Agricultural extension service.

LAU – geographical organization and number of staff:

- LAU Pozarevac - 1 agricultural engineer – livestock production;
- LAU Sabac - 2 agricultural engineers – crop production;
- LAU Novi Sad/Vrbas - 1 agricultural engineer – livestock production.

During training at the TIC, LAUs and PIU staff demonstrated very good results and received certificates. The LAUs/PIU worked together with the local Consultant on the preparation of Preliminary and Detail Designs for manure storage facilities. The LAUs strictly adhered to Bank rules and procedures (procurement and finance). They were provided with brief training by the PIU and Bank Procurement Specialists. Also, the LAUs continue to assist to PIU procurement specialist regarding shopping-commercial practices for farm grants under Component 2, and other administrative procedures. In general, the LAUs very successfully motivated new potential Project beneficiaries – farmers, and promoted CoGAP.

Component 3: Water and Soil Quality Monitoring, Public Awareness Raising and Replication Strategy

Sub-component 3A: Capacity building and support to Water and Soil Quality Monitoring[9]

This sub-component concentrated on soil and water quality monitoring activities involving the Soil Science Institute (SSI) and Republican Hydro-meteorological Service of Serbia (HMS), as principal partners. As a part of the capacity building component, SSI and HMS experts attended a two-week soil and water quality monitoring training and the relevant Institute within the University of Iowa (USA).

The Contract for soil quality monitoring was signed with SSI in September 2006. The equipment for SSI was delivered and installed under the supervision of the PIU Environmental Specialist. In addition, training on soil, liquid and solid manure sampling for LAU staff was organized by SSI and coordinated by the PIU Environmental Specialist. Training of LAU staff in manure and soil analyses by SSI / PIU Environmental Specialist, created the basic data for preparing NMPs as recommendations to farmer for manure spreading on fields. This NMP along with free of charge soil testing for farmers aided in the application of good agriculture practices and in the longer term contributed to the implementation of Nitrate Directive requirements - since it is expected that these services and practices will be used by a larger number of farmers.

Equipment, a specialized vehicle and modeling software (GMS MODFLOW) were delivered to the HMS. The installation of software was supervised by the PIU Environmental Specialist, including in-house training provided for HMS staff.

Piezometers were supplied and installed on 8 demo farms, IAH and meat-processing plant "Nisprodukt". Installation was supervised by HMS experts. HMS continues to take water samples from piezometers and prepare laboratory analyses and reports to the DREPR Project, the Water Directorate, MATFWM and Government of Republic of Serbia (Annual Report). According to plan HMS will prepare a transposition model of nutrients in underground water as well as a prediction of nutrient movement based on data after collecting water samples from piezometers installed on demo farms.

[9] Capacity building and equipment support to the SSI, HMS and local laboratories significantly enhanced the capacity and monitoring functions of these institutions. For example, with parallel co-financing by the European Agency for Reconstruction the Project procured several pieces of laboratory equipment worth several hundred thousand Euro (e.g. HPLCMS (>$230,000), ICPMS (>$200,000), GCMS (>$75,000), four spectrophotometers, and a mobile lab (>$100,000)).

HMS began collecting water samples and performing analyses in 2009-2010, after the installation of piezometers in 2008. Preliminary results suggest that pollution after construction of manure pad and manure tank, and proper use of equipment for manure handling, stopped and that the level of nutrients were not increasing. Based on experience from other EU countries, it takes nearly 10 years to observe a decrease in underground water. It also depends on the soil structure, rainfall amounts and crop rotation.

The collection of water samples from piezometers will help the MATFWM during preparation for ND implementation and the decision of application in the whole territory or in vulnerable zones.

Specific local laboratories (within Agricultural Stations) for soil and manure sample testing were selected (Sabac, Pozarevac, Novi Sad and Vrbas). Local laboratories were equipped with necessary equipment for manure/soil analyses and continue to perform farm analyses. Increasing the capacity of local laboratories is important in relaying information to farmers in terms of manure application timing. This will have a significant impact on the reduction of pollution by these nutrients and contribute to further reductions to water sources in Serbia.

Sub-component 3B: Public Awareness Rising

Project PR activities were targeted at the beginning of the Project with the intention of a larger effort once demonstration effects could be drawn upon and lessons learned. Good results in raising awareness of DREPR project were achieved, especially among the main target group (farmers and other important stakeholders). Despite a few kinks in the road, feedback from the beneficiary survey revealed an overwhelmingly positive response from Project beneficiaries (see Annex 5). Awareness raising was achieved by employing basic communication practices, using various kinds of printed PR material, face-to-face communication, LAU work among farmers in the field, project presentations and similar gatherings (mostly in 4 key areas of Project interest). PR promotional articles in several local newspapers and the agriculture TV Show on the B92 station were very successful in achieving dissemination goals. TV communication (on various TV stations) proved to be the most efficient tool for PR activities among all types (see Annex 1 of Borrower's ICR for a more detailed account of the public awareness activities supported by the Project).

It is also important to note that previously there was very little awareness raising campaigns on pollution reduction from agriculture households. The applied methodology and tools focused directly on the target group and brought new knowledge and information to farmers. These actions, together with the promotion of benefits and results on demonstration farms introduced the possibilities to farmers. This increased farmer interest in new technologies and demonstrated the potential of environmentally-friendly agriculture. It can be expected that forthcoming implementation of Nitrate Directive will be easier to promote and realize due to the promotion work conducted by the Project.

Sub-component 3C: Replication Strategy

The purpose of the Replication Strategy was to ensure continuation of activities after Project closing. The Project supported the following studies:

1. "*Preparation of IPARD measure for pollution reduction from agricultural sources*": Experience of EU member states, especially new members, show that implementation of the ND is costly and demanding. In order to comply with the requirements of water protection, farms must invest in impermeable manure storage with capacity for the period of six months

and adequate equipment for the handling and application of manure. For most farmers this is a huge investment. This is the reason why most new EU member states provide financial support programs and the EU itself provides funding for the construction of facilities and equipment for adequate manure storage through pre-accession assistance programs.

These funds will soon be available for Serbia. Once it receives candidacy status, Serbia will be eligible for IPARD funding through which it can finance water protection from agricultural pollution.

Building on nutrient management activities from the Project and recognizing increased interest among farmers for mechanization of manure handling, the MAFWM introduced a support measure in the National Program for Rural Development, using the principles and lessons learned from the Project. Results from the DREPR Project were incorporated into the MAFWM subsidy system, securing the continuation of support in establishing environmentally-friendly agriculture.

The overall objective of the IPARD programme is to support candidate countries for EU membership in the development of agricultural policy and the preparation of implementing the Common Agricultural Policy. This program will contribute to the sustainable adaptation of the agricultural sector and rural areas in the implementation of the *acquis communautaire* that relates to the Common Agricultural Policy.

2. *"Pre-Feasibility Assessment of an Anaerobic Digestion Project in Serbia"*: The aim of this study was to continue promoting environmentally-friendly practices in agriculture while also addressing issues of global warming and energy security. The Ministry wishes to build on the achievements of the DREPR Project by focusing on renewable energy production through bio-digestion of manure and other animal waste. The PIU together with Bank team submitted a new Project proposal, "*Employing bio-mass/manure from agricultural production as renewable energy source*".

The PIU tendered a consultant who completed the pre-feasibility report, however by October 2010 the Government was informed that the new Project would not go forward with World Bank assistance.

Looking forward, the MAFWM supported the idea of continued education and increasing the capacity of agricultural advisors since implementation of ND will be very important during the pre-accession and accession period of Serbia. Through the Serbia Transitional Agricultural Reform (STAR) Project and the Institute for Science Application in Agriculture (ISAA) there will be continued education of agricultural advisors on the preparation of NMP's and the ND. It was agreed that 5,000 copies of CoGAP brochure will be delivered to farmers, agricultural advisors and Ministry Agricultural Network through ISAA. All of these activities will help in the replication and continuation of DREPR Project outcomes, and provide future preparation for ND implementation and preparation of a new project for using renewable source energy from agriculture.

Component 4: Project Management and Project Impact Monitoring

Project Management

A Project Implementation Unit (PIU) was established to implement the project and to carry out day-to-day activities of the project under the overall supervision of the MAFWM. The PIU, on

behalf of the responsible ministries, provided project coordination and administration of staff, procurement, financial management, reporting and overall project monitoring and evaluation activities for all components. The project contracted individual experts with required expertise and proven records in providing advisory services and necessary support to farmers, livestock producers and slaughterhouse operators. Their work also included disseminating Project information and ensuring proper implementation of beneficiary level interventions in Project areas. All experts were selected on a competitive basis and approved by the MAFWM.

To secure adequate support and assistance in the field, the PIU was supported by three Local Advisory Units (LAUs). Three LAUs were established, one in Šabac, one in Požarevac and one LAU in Vrbas. Each LAU had at least one full time advisor/manager and one office assistant based on the work load. At the beginning of the Project each LAU had two experts specialized in farm nutrient/manure management and, slaughterhouse animal waste management. They were selected on a competitive basis and approved by the Project Steering Committee (PSC). Each LAU was responsible for providing technical assistance and necessary information requested by Project beneficiaries; ensuring that Project investments were appropriately used; organizing field days and training for farmers; help in developing nutrient management plans; conducting on-farm demonstration of good agricultural practices to reduce nutrient pollution; and undertaking other activities identified by PIU and PTAC.

During Project implementation two LAU offices operated with only one advisor since it was realized that the original number of advisors was not appropriate due to the size of regions and the number of potential beneficiaries. One LAU staffs' contract was cancelled and the other was moved to the PIU office to assist in preparation of tender documentation and to assist other LAUs when needed.

The PIU planned to have a Project Director, but because of selection difficulties it was decided that the Lead Agriculture Engineer be given the role of Team Leader with tasks to manage all PIU activities and to report to the Assistant Minister of MAFWM in charge of agro-environmental issues.

The Project had several expert changes, mostly in the Procurement Specialist position, but also in with the Environmental Specialist. Changes had an effect on implementation due to the long procedures for candidate selection and also because of the lack of qualified and available specialists, capable or trained to work under Bank rules and procedures; but these delays paled in comparison to the other implementation challenges such as local permitting and construction delays.

All day-to-day PIU activities were monitored and coordinated by the Project Coordinator, nominated by the Minister, who also assisted in establishing good connections between the PIU and other relevant Units of the Ministry and other Institutions involved in Project realization. This position was also very important in ensuring continuous Project implementation during frequent restructurings in MAFWM and assisted in document management according to official government procedures.

The PTAC was responsible for overall direction and strategic oversight of the Project, approval of designated project activities, and for ensuring proper coordination of activities among the ministries and agencies of the Republic of Serbia involved in Project implementation. PTAC representatives included the Ministry of Finance, the MAFWM, the MSEP/DEP, the Ministry of International Economic Relations, the Council of the Autonomous Region of Vojvodina as well as, in non-voting capacity, representatives of livestock producers, farmer associations, NGOs, and

local authorities from Project areas. The Assistant Minister of MAFWM was the chair of the PTAC. The PIU worked as a secretariat to the PTAC, and the PIU manager acted as the PTAC secretary and represented a non-voting member of the PTAC.

Annex 3. Economic and Financial Analysis

(including assumptions in the analysis)

An incremental cost analysis (ICA) was conducted at appraisal as per GEF requirements. This Annex reviews the ICA against Project implementation results.

Incremental Cost Analysis

a) ICA at Appraisal

The ICA compared the baseline scenario with the GEF-Alternative scenario. The baseline included numerous ongoing and planned activities sponsored by several different donors and Governments (see Table 1, Annex 15 of PAD). Although many of these activities were related to nutrient reduction, taken together they still did not comprise a set of actions that would directly address the issue of nutrient reduction. For example several activities were related to international river basin management, wastewater treatment and agro-processing pollution reduction. For the purposes of forming a baseline scenario activities were grouped into three focal areas: i) policy, legal and institutional framework, ii) investments in waste management, and iii) water quality monitoring and raising public awareness. The cost of these activities was US$42.01 million.

Table 1. Incremental cost matrix as of Project Appraisal and Completion (US$ million)*

Component	At Appraisal				At Completion			
	Baseline Cost	Incremental Cost		Total	Baseline Cost	Incremental Cost		Total
		GEF grant	Other			GEF grant	Other	
Support to Regulatory Reform and Capacity	23.70	0.24	0.03	23.97	23.70	0.11	0.39	24.20
Investment in Nutrient Reduction	16.80	7.15	12.43	36.38	16.80	7.11	11.05	34.96
Water and Soil Quality Monitoring, Public Awareness Raising and Replication Strategy	1.51	0.94	0.58	3.03	1.51	0.31	0.36	2.18
Project Management and Project Impact Monitoring	0.00	0.69	0.09	0.78	0.00	1.09	0.31	1.40
Total	42.01	9.02	13.13	64.16	42.01	8.62	12.11	62.74

Source: PAD, Annex 15.

* Including physical and price contingencies.

The GEF-Alternative scenario, at an incremental cost of US$22.14 million of which the GEF would finance US$9.02 million, would support:

1) Strengthening the policy and regulatory framework that regulates nutrient run-off and discharge from livestock farms and slaughterhouses, in line with the EU ND;
2) Investments in nutrient reduction to demonstrate cost-effective methods by livestock farms and slaughterhouses to reduce nutrient run-off and discharge into the Danube River and its tributaries; and
3) Strengthening agricultural advisory services through the establishment of the TIC, monitoring capacities and the development of a replication strategy and public awareness campaign.

The local benefits of the GEF-Alternative scenario included the financial benefits of improved marketability of livestock products to the EU, financial benefits to farmers from the use of manure as fertilizers and the avoidance of health hazards of water pollution. Global benefits comprised the reduction of threats to (aquatic) biodiversity and water quality in the Danube and Sava River Basins. Strengthening monitoring ability will also enhance the credibility of regulating polluting activities.

Assumptions on nutrient reduction amounts were approximations based on experience from other countries. The reduction in N leaching achieved through investment in proper manure storage and recycling on land was estimated to be 3.55kg N/year/pig and 15.48 kg N/year/cow. Extrapolating these assumptions to a set of 30 cattle farms (with an average of 100 head) and 30 pig farms (with an average of 2,000 pigs) total N reduction was about 260-280 tons N/year. Nutrient reduction from slaughterhouses processing 150 pigs per hour was estimated at about 38 tons N/year and across 4 plants this would represent about a reduction of 150 tons N/year. Taken together reductions from farms and slaughterhouses would amount to 430 tons N/year. These assumptions were studied further during implementation and summarized in the report "*Serbia Danube River Enterprise Pollution Reduction (DREPR) Project: Avoided Losses of Nutrients*", which offered more precise estimates for farms. Details are provided below.

b) ICA at Completion

Project targets were achieved, and exceeded in several cases, at an incremental cost of US$20.74 million including the GEF Grant of US$9.02 million (Table 1). From a cost-efficiency standpoint the Project can be rated satisfactory.

c) Nutrient Reduction on Farms due to Proper Manure Management

During Project implementation a study was undertaken to estimate avoided N and P losses on farms due to Project interventions (ADAS, 2011). Sources of loss included i) unlined liquid manure lagoons, ii) faulty or non-existent solid manure stores, iii) direct access to surface water and iv) unsatisfactory spreading on land. For each farm the amount of N and P considered to be lost from different pathways, prior to the DREPR project, were estimated. The annual 'savings' were then summed from the time that the farm began to benefit from investments until the end of April 2011. At each farm there was usually some time interval between the commissioning of new stores and the arrival of new spreading equipment – thus the time interval began when farms started to benefit from the prevention of storage losses to the time when farms began to benefit from potentially reduced spreading losses. To simplify the procedure and remain consistent, the 'start date' for all farms was taken to be the date of final payment for equipment and stores.

Field observations from 100 farms were completed with the following results:

i) *Unlined lagoons*: Eleven farms had unlined lagoons and approximately 27.1 tons of N and 10.0 tons of P_2O_5 would have been lost annually by seepage through the base and side walls of these lagoons;
ii) *Manure stores*: There were 69 farms where solid manure was stored pre-Project. Solid manure was stored satisfactorily on only 15. This referred to the situation where all manure was stored on well-maintained, 'leak-free' concrete pads and there was sufficient containment of liquor during the six-month winter period. On 10 farms, there were manure pads with some liquid containment but either the pad or walls were in disrepair or the containment tank leaked; an estimate of the liquor escaping into the surrounding soil was made for these pads. On the remaining 44 farms, either the pad was very faulty or the

manure was stored directly on the soil - in which case all liquor from the manure drained into the soil. It is estimated that annual total loss from this source would be approximately 49.2 tons of N and 12.7 tons of P_2O_5;

iii) *Direct to stream*: At one farm, slurry was piped directly into a stream. This represented an annual loss of approximately 0.9 tons of N and 0.4 tons of P_2O_5;

iv) *Spreading losses*: Avoided losses due to spreading were considered on the basis of: (a) whether the farm had a satisfactory spreader for the type(s) of manure being applied to the land – all but two farms did not have satisfactory spreading machinery, and (b) whether slurry was applied to the land – this occurred for 49 of the farms. It is estimated that total avoided annual spreading losses amounted to approximately 95.5 tons of N. It was also estimated that the median avoided loss of manure N on spreading areas of farms was 10 kg N/ha (range 2-39 kg N/ha).

Taken together, total *annual* saved losses from the 4 different pathways were approximately 172.7 tons of N and 23.1 tons of P_2O_5 (Table 2). This was considered to be the amount of nutrients 'saved' from loss due to measures in the DREPR project. Over the Project's lifetime, it is estimated that 293.5 tons of N and 37.9 tons of P_2O_5 from manures were prevented from loss to water bodies. In terms of a percentage reduction, losses from unlined lagoons, poor manure pads and direct losses to streams have completely ceased – a 100% reduction. However a lack of pre- and post-project farm practice information did not permit estimation of the percentage reduction in spreading losses – thus during the Project lifetime avoided losses from pathways other than spreading is 123.7 tons of N and 37.9 tons of P_2O_5 – or a 44 percent reduction in N and 100 percent reduction in P_2O_5. Both of these results exceed the initial GEO target set at a 20 percent reduction.

Table 2. Summary of avoided annual losses from different pathways (tons)

	Annual N losses (Tons N)	**Over Project lifetime (Tons N)**	**Annual P_2O_5 losses (Tons P_2O_5)**	**Over Project lifetime (Tons P_2O_5)**
Unlined lagoons	27.1	47.5	10.0	18.0
Poor solid manure stores	49.2	74.0	12.7	18.9
Direct to stream	0.9	2.2	0.4	1.0
SUBTOTAL	**77.2**	**123.7**	**23.1**	**37.9**
Spreading	95.5	169.8	0.0	0.0
TOTAL (incl. spreading)	**172.7**	**293.5**	**23.1**	**37.9**
Percentage reduction	**44.7**	**42.1**	**100.0**	**100.0**

Source: ADAS (2011)

d) Cost-effectiveness of Nutrient Reduction

Financial cost effective (CE) ratios were calculated for reductions in nutrient leakage (to ground and surface waters) associated with manure platforms constructed at 100 beneficiary farms. CE ratios are calculated as the ratio of total annualized cost of farm nutrient management, including investments in manure storage structures, manure handling and land application equipment, over tons of nitrogen or phosphorus removed per year. Costs include all investment costs incurred during the Project period, funded by the GEF, SIDA or farmers themselves. Investments made by farmers before the Project, notably manure pads, are not included. However costs incurred to

repair or upgrade, to meet eligibility criteria for complementary investments such as slurry tank and or manure handling equipment, were included. An interest rate of 10% and a useful life of 20 years were assumed for the annualization of investment costs. Nitrogen and phosphorus reductions are those achieved due to Project investments as discussed in ADAS 2011. Defined in this way, N reduction occurred in 100 farms and P reduction occurred in 63 farms. Therefore CE ratios are calculated for the same number of farms.

CE ratios range from Euro 1.61 to 54.06/ kg N loss avoided and from Euro 6.39 to 315.36/ kg P loss avoided (Figures 1 and 2). CEs average from Euro 14.24/ kg N reduced and Euro 85.32/ kg P reduced (Table 3). As expected, CE ratios are negatively correlated with number of animals owned by farmers at the time of investments (t-values are -2.44 and -2.31, respectively); however, the correlations are quite weak (r^2= 0.06 and r^2= 0.05, respectively).

CE ratio comparisons with other countries are difficult to make because of the lack of a consistent methodology. However, the bulk of values (or the average) found in this assessment are broadly consistent with those in calculated in other projects. For example, in Romania communal manure management cost US$30-40/ kg and in Poland's Rural Environmental Protection Project, CEs ranged from US$18.5/ kg N to US$24.8/ kg N. Differences are likely to be a function of local construction costs and the supply chain of specialized manure spreading equipment.

Figure 1. Frequency distribution of CE ratios for N reduction (Euro/kg N reduced) (N=100)

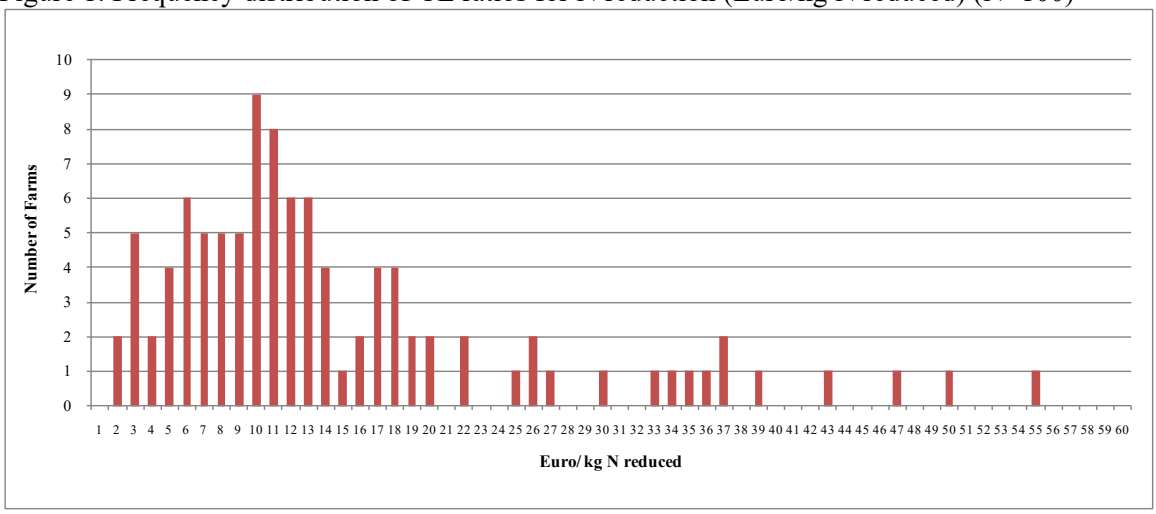

Figure 2. Frequency distribution of CE ratios for P reduction (Euro/kg P reduced) (N=63)

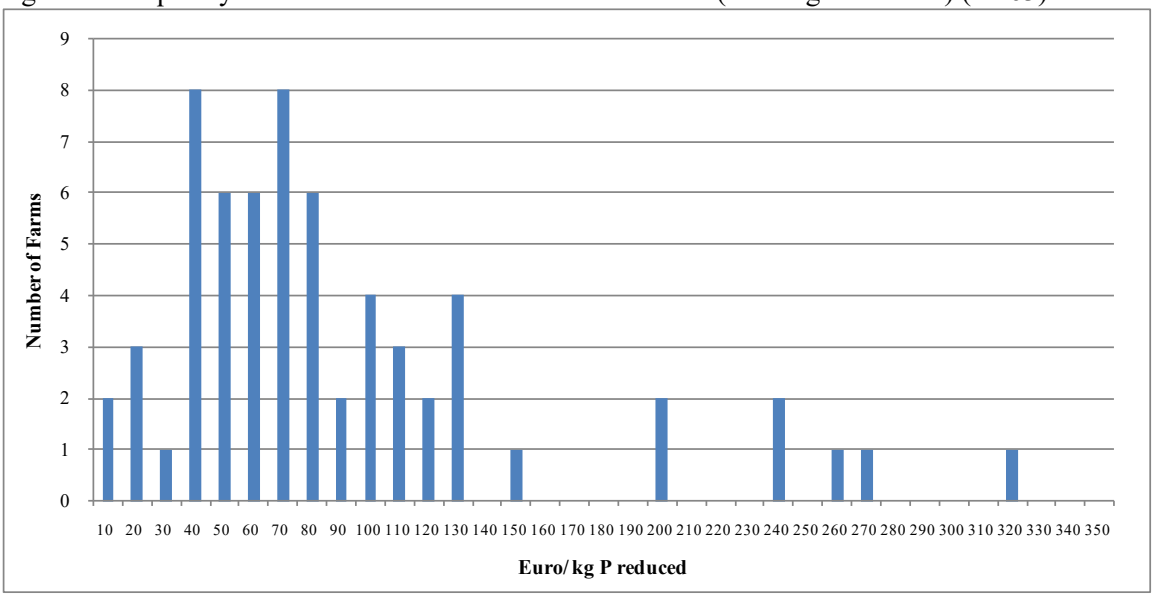

Table 3. CE ratios for N and P loss reduction

	Euro/kg N	Euro/kg P
Average	14.24	85.32
Median	10.67	67.08
Minimum	1.61	6.39
Maximum	54.06	315.36
Standard deviation	11.05	65.63
N	100	63

Annex 4. Bank Lending and Implementation Support/Supervision Processes

(a) Task Team members

Names	Title	Unit
Lending		
Tijen Arin	Sr. Environmental Economist, Task Team Leader	ECSSD
Elmas Arisoy	Sr. Procurement Specialist	ECSPS
Michael Gascoyne	Sr. Financial Management Specialist	ECSPS
Anders O. Halldin	Sr. Environmental Specialist	ECSSD
Jan Pakulski	Senior Social Development and Civil Society Specialist	ECSSD
Nikola Kerleta	Procurement Analyst	ECSPS
Joseph Paul Formoso	Senior Finance Officer	LOAG1
Barbara Letachowicz	Operations Officer	ECSSD
Vesna Kostić	External Affairs Officer	ECCYU
Miroslav Frick	Operations Analyst	ECCYU
Nikola Ille	Sr. Rural Development Specialist	ECSSD
Grennady Pilch	Senior Counsel	LEGEC
Lucy O. Hancock	Operations Analyst	ECSSD
Bernard Baratz	Consultant, Environmental Specialist	ECSSD
Nenad Brkić	Consultant, Livestock Production Specialist	ECSSD
Pierre Gerber	Consultant, Livestock Policy Officer	FAO
Rameshwar S. Kanwar	Consultant, Water and Soil Quality Monitoring Specialist	ECSSD
Dan Vadnjal	Consultant, Economist	ECSSD
Philip Metcalfe	Consultant, Agro-industrial and Farm Nutrient Management Specialist	ECSSD
Krzyzstof Skapski	Consultant, Manure Management Specialist	FAO
Miča Jovanović	Consultant, Environmental Specialist	ECSSD
Jitendra P. Srivastava	Consultant, Agriculturalist	ECSSD
Supervision/ICR		
Tijen Arin	Sr. Environmental Economist, Task Team Leader	ECSS3
Valencia M. Copeland	Program Assistant	ECSSD
Aleksandar Crnomarkovic	Financial Management Specialist	ECSO3
Nikola Ille	Sr. Environmental Specialist	ECSS3
Olivera Jordanovic	Operations Officer	ECSS3
Plamen S. Kirov	Sr. Procurement Specialist	ECSO2
Vesna Kostic	Sr. Communications Officer	ECCYU
Mirjana Popovic	Program Assistant	ECCYU
Rohan G. Selvaratnam	Operations Analyst	SASDA
Olav R. Christensen	Sr. Public Finance Specialist	HDNED
Michael Gascoyne	Sr. Resource Management Officer	CFRPA
Martin H. Lenihan	Social Development Specialist	ECSS4
Craig M. Meisner	Environmental Economist, ICR Author	ECSS3
Mustafa U. Alver	Jr. Professional Associate	ECSS1
Karin Shepardson	Sr. Operations Officer	ECSS3
Bogdan C. Constantinescu	Sr. Financial Management Specialist	ECSO3
Desanka Stanic	Team Assistant	ECCYU
Anne N. Ranasinghe	Procurement Assistant	ECSO2
Jasna Vukoje	Program Assistant	ECCYU

(b) Staff Time and Cost

Stage of Project Cycle	Staff Time and Cost (Bank Budget Only)	
	No. of staff weeks	USD Thousands (including travel and consultant costs)
Lending		
FY04	11.92	58.29
FY05	33.01	115.02
FY06		0.00
FY07		0.00
FY08		0.00
Total:		173.31
Supervision/ICR		
FY04		0.00
FY05		0.00
FY06	26.06	63.04
FY07	29.84	59.06
FY08	39.28	85.28
FY09	33.13	87.68
FY10	25.44	78.45
FY11	28.02	80.00
Total:		453.51

Annex 5. Beneficiary Survey Results

Methodology: A two-step survey methodology was employed in order to gauge relative awareness, opinion and Project experience among stakeholders and the general population:

1. Annual surveys (2007-2010) were conducted among the general population and family agricultural holdings to evaluate awareness of problems related to Danube River basin pollution; agricultural pollution and its causes; and to what extent they are familiar with the DREPR Project, its aims and activities in Serbia.

2. Beneficiary surveys (at end of project) were conducted to evaluate the success of DREPR through the attitudes of Project beneficiaries (including both farm and non-farm beneficiaries as well as a sample of those who began the process but eventually dropped out). Non-farm beneficiaries included Directors of agricultural schools (7), management of slaughterhouses (3), rendering plants (3), agricultural stations in the field (labs within stations) (4), Institutes (Institute of cattle breeding, Institute for Soil Management, Institute for Agriculture, HMS). Questions included:

- Perception of the "before and after Project" situation in terms of agri-environmental practices and impacts
- Degree of satisfaction with the Project
- Successfulness of the Project
- Assessment of environmental and economic benefits
- Evaluation of procedures for obtaining a tank building permit
- Perception of Ministry of Agriculture regarding implementation at different stages (e.g. public awareness and advertising grants; application and selection; obtaining necessary permits and licenses; disbursing and controlling financing; and, follow-up advisory services)
- Perception of work by the Ministry of Science and Environmental Protection
- Suggestions for future and continuation of Project work

An integrative report was completed combining the results of the two sets of surveys. The following is a summary ordered by main topic:

Awareness about environmental pollution and pollution of the Danube

Awareness of environmental pollution

- General population considers environmental pollution to be a very important problem
- The interest expressed in environmental issues is very high and remained unchanged during the previous four years
- Family farms attach less importance to environmental protection compared to the general population
- Findings are specific to the awareness of DREPR: In both populations, those who believe that pollution is an important issue also emphasize importance of DREPR and a large percentage of these individuals were interested in following DREPRs' implementation and results

Awareness about river pollution in general and in the Danube

- Slightly more than half of family farmers believe that rivers are in bad condition (except in 2009, where less than half of respondents though so) while two-thirds of the general population share this opinion

- Through all four survey waves the general population more frequently expressed regret that the Serbian portion of the Danube is more polluted than in other countries and stated they would personally contribute to solving this problem
- Family farmers did not express the same kind of sensitivity; they believed that it is the State which has the sole responsibility for improvement of the situation
- A majority of both the general population and family farmers do not use Danube resources (fish or swim)
- During the four-year period, an overwhelming majority of both the general population and family farmers were not aware of any cases of disease related to swimming in the Danube or consuming Danube fish

Farms, manure and slaughterhouses as factors of pollution

- When asked about the largest river polluters in an open-ended question neither the general population nor family farmers mentioned farms, manure or slaughterhouses
- When asked directly on the extent to which farms, manure and slaughterhouses pollute rivers, the majority of the general population rated farms as polluters, while family farmers tended to minimize the role of farms in river pollution. Both the general population and farmers attach far greater importance to slaughterhouses as a factor influencing river pollution than farms. Still, when directly asked to rate the hazards of improper manure disposal, more than half of both the general population and farmers think this contributes to river pollution
- Among the general population, awareness of farms, manure and slaughterhouses as important polluters is not related to awareness about project DREPR; farmers who had heard about DREPR and were interested in participating thought farms, manure and slaughterhouses endanger the condition of rivers to a greater extent

Awareness of the DREPR Project

- Only a small percentage of the general population was aware of the DREPR project – and this observation remained relatively unchanged during the four-year period; farmers had a noticeable increase of DREPR awareness, with rising percentages from year to year (2007: 26%, 2008: 49%, 2009: 65%, 2010: 66%)
- The dominant source of Project information among the general population was television; while among family farmers, it was participation in previous surveys
- The majority of the general population was poorly informed about essential details of DREPR project; whereas farmers had a higher degree of familiarity with certain Project in the last wave of the survey (2010). It is however apparent that general Project information, in particular Project activities, remained vague to the majority
- A majority of the general population (88% in year 2010) rated DREPR project as important for Serbia; but ratings of project importance are somewhat less favorable among family farmers
- Approximately a half of the general population considered Project objectives to be realistic (i.e. reduction of Danube pollution from farms and slaughterhouses); and family farmers were even more optimistic – two thirds considered objectives to be realistic
- The general population expressed a high level of interest in following the Project and its results (59% were interested), yet family farmers expressed only half as much interest (30%)

Beneficiary satisfaction

Motivation for taking part in the project and barriers preventing from it

- According to farmers, the main motivation for participating in the DREPR Project was the desire to contribute to reduction of environmental pollution

- The greatest majority of non-beneficiaries (70%) reached only the first phase of the project, i.e. the formal expression of interest, while a small number started collecting documentation for the second phase (13%)
- Non-beneficiaries stated similar reasons as beneficiaries for participation, but the main reason for dropping out of the Project was the lack of financial resources needed to cover farmers' share of the investment

Impact and benefits from the Project

- Beneficiaries rated their practices before Project implementation quite favorably; however they think the Project had an impact on relevant practices of manure storage and application; it also had a positive impact on workload reductions among family members
- A majority of Project beneficiaries realized a reduction of manure management costs as a result of Project implementation (75%)
- A ranking of benefits revealed that the reduction of Danube pollution and more efficient agricultural production were the first and second most important Project benefits, while introduction of EU standards to agriculture was third
- Half of the beneficiaries stated they already perceive environmental benefits from the Project, and another third believes impacts are going to be felt with a continuation of the Project; a majority state that participation had a positive impact on introduction of more efficient production, cleaner and tidier courtyards as well as workload reductions related to manure management; while the least felt benefit was improvements in selling their products
- A majority of beneficiaries also felt that participation yielded indirect benefits such as improved use of manure as fertilizer and improvement of animal health
- Significant differences were observed between family and corporate farms regarding perceptions of whether participation has improved their chances for export to the EU market; 63% of corporate farms believed that participation has contributed a great deal to better opportunities for placing their products on the EU market, while this opinion was shared by only 28% of family farmers
- Non-farm beneficiaries (institutes, laboratories, schools and the private sector) mostly thought that the Project had a positive impact; mostly visible in the reduction of pollution through manure and nutrient management. Local laboratories, the HMS and SSI emphasized that with adequate equipment manure analysis was now possible and was the most significant benefit from the Project
- The IAH stressed the importance of their team having participated in all phases of the Project and was now viewed as a good opportunity to become a future centre for knowledge transfer; local laboratories stressed the importance of knowledge acquired through training that was now applicable to manure analysis and advisory work with agricultural producers
- Agricultural schools perceive participation benefits as being the reduction of pollution due to proper manure disposal, as well as improvement in their work efficiency and the opportunity to spread knowledge about pollution among their students
- Certain difficulties were encountered by beneficiaries in continuing with newly established practices, but were rarely mentioned so as to not diminish the significant positive impacts of the Project; the greatest difficulty (mentioned by 10% of beneficiaries) was considered to be the lack of a labor force properly trained for manure handling. However, significant gender differences were also observed regarding equipment operating and maintenance – where this was found to be more difficult for women
- For the most part, beneficiary institutes, laboratories, schools and private sector did not mention any difficulties and praised the obtained equipment as high quality, modern, compatible with existing equipment and well-suited to their needs. Some laboratories, schools

and slaughterhouses mentioned problems related to equipment malfunctions and insufficient number of service providers

Nutrient Management Plans

- An overwhelming majority of beneficiaries received a Nutrient Management Plans (91%)
- Beneficiaries thought they were useful and that explanations provided about the plan by LAUs were sufficiently detailed and could be successfully applied
- Beneficiaries perceived prevention of environmental pollution as the greatest benefit from realization of these plans (69%)
- Eighty-five percent of those who received plans realized all recommendations from the plans during the year for which the plan had been prepared; a similar percentage (87%) also realized an increase in crop yields since plan implementation
- Eighty-one percent of NMP recipients updated them and 89% plan to update them in the next planning year

Satisfaction with Project realization

Satisfaction with the DREPR Project

- Generally, beneficiary farmers expressed a high level of satisfaction with different aspects of Project realization; some differences were observed, for instance between pig and cattle farms – where pig farmers rated investment in storage facilities, as well as the guidelines and advice provided less favorably than cattle farmers
- Beneficiaries indicated the two greatest difficulties experienced during Project implementation were the amount of financial resources needed for participation, as well as complicated and time-consuming administrative procedures
- Non-beneficiaries farmers (those who dropped out) rated difficulties related to Project implementation as more serious than beneficiaries, and stressed financial problems to an even higher degree
- The terms and conditions of competitive bidding, application processes and selection were evaluated positively by beneficiaries; but rated lower by non-beneficiaries
- A few differences were observed regarding satisfaction among different groups of beneficiaries; women rated several aspects less positively with the exception of 'speed of realization' and pig farmers were less satisfied as noted above
- LAUs and promotional materials were rated as the most important sources of Project information

Familiarity with the work of Local Advisory Units and evaluation of their work

- A large majority of beneficiaries (79%) consider themselves to be familiar with the work of LAU
- A majority of beneficiaries rated the performance of LAU's advisory function very favorably and 89% regarded LAUs as important for the DREPR Project; they were also very satisfied with advisor communications - 74% expressed satisfaction with oral and 77% with written communication

Additional activities

- A majority of beneficiaries participated in Field Days (59%), while a smaller percentage of beneficiaries took part in training organized by TIC – with as few as one third of them participating (depending on group type)

Satisfaction with the work of the Ministry of Agriculture during project implementation

- The majority of beneficiaries (84%) stated they had some form of contact with the Ministry during Project implementation and the same percentage indicated they were satisfied with this communication
- Most beneficiaries felt that the Ministry could improve its work by establishing more direct contact with beneficiaries, as well as by introducing more efficient procedures; although they received high ratings for procedures of application, selection, finance control and disbursement
- Non-farm beneficiaries (Institutes, laboratories, school and the private sector) evaluated the Ministry even more favorably than beneficiary farmers

Suggestions for sustainability and replicability of project investments

- Beneficiaries indicated they needed support to continue with practices introduced; only 11% stated they did not need any assistance
- Farmers suggested several ways in which Project efficiency could be improved: more intensive public awareness campaigns (57%), more active participation of local communities (41%) as well as less complicated procedures (36%); non-beneficiaries believed that the most important step would be making procedures less complicated
- Regarding financial and technical sustainability, non-farm beneficiaries generally stated they were able to maintain Project investments and could provide both technical conditions as well as cover costs related to regular services and fuel. These costs were not perceived as a problem, having in mind the quality and the additional savings provided by modern mechanization
- Local laboratories mentioned the issue of additional costs required for "cartridges" and they plan to cover these costs from current resources for equipment maintenance, EU funds and revenues from commercial activities
- Farm beneficiaries believed that the greatest barrier preventing other farmers from participation was a lack of information about the Project, a lack of financial resources and a general distrust of state institutions; however, they believed it possible to motivate other farmers to participate by introducing rewards for the most environmentally-aware farmers, covering all the expenses by grants as well as giving certain privileges to participating farms
- According to non-farm beneficiaries the most important barrier was the lack of financial resources, but there were other issues with legislation; the unfavorable state of agriculture as well as the country's economy; the resulting difficulty with making plans; as well as insufficiently well-defined strategies by the Ministry of Agriculture; possible solutions to these replication issues could be more strategic partnerships, regulation of large polluters and their participation in the construction of waste disposal facilities, and the introduction of an appropriate system of control and stricter inspections

Attitudes towards Good Agricultural Practices and plans for future investment

- Seventy-five percent of beneficiaries are familiar with the Code of Good Agricultural Practices; 96% had the opportunity to read it and found information related to manure and animal husbandry the most useful
- Beneficiaries were mostly positive towards the Government's introduction of regulations for agricultural production (78%); however opinions of non-beneficiaries were the opposite - 72% believe that additional regulations should not be introduced, since farmers already have enough challenges without them
- Most farmers (48% of both beneficiaries and non-beneficiaries) were uncertain of what penalties would be appropriate for farmers who do not posses proper manure storage facilities

- Fifty-nine percent of all beneficiaries plan further investment in manure storage in the following two years and 42% have plans for further investment in the construction of biogas facilities; among those not prepared to invest, they state the main reason as it is not needed; crucial to this investment interest was the realization of efficiency improvements of manure use as fertilizer (67%)
- Non-beneficiaries were somewhat less prepared to invest – 44% plan to invest in the next year
- An overwhelming majority of farmers (91%) express preparedness to participate in similar projects in the future
- Farmers who stated they were not prepared to take part in similar projects in the future said their lack of interest was due to financial reasons – they believe that participation entails large investments
- Plans of non-farm beneficiaries (institutes, laboratories, schools and the private sector) differ depending on their field of work, but a general preparedness was expressed for further investments with similar objectives as DREPR:
    - The IAH plans to participate in a biogas project and expects to acquire a more important role in the process of education and advising of farmers; they rely on Project financing since the institute is primarily a service of the Ministry of Agriculture. The SSI and HMS also emphasized that the realization of their plans depends on government decisions and relevant ministries
    - Plans for the following period differ among the laboratories. While laboratories from Vršac and Šabac state that while they were uncertain about participating in new projects, mostly for financial reasons, laboratories in Požarevac and Novi Sad have developed plans for the following period, and intend to finance from own revenues and project financing
    - Agricultural schools plan to continue with investments in the next 5 years and mostly relate to the use of bioenergy, development of production of organic food, procurement of new machines and education. Their objectives were production modernization, reduction of costs and increases in profit, education of students and adult farmers as well as environmental protection. They mention the State budget as the main source of funding
    - Plans by slaughterhouses were also different. The slaughterhouse in Kravljevo plans to introduce a wastewater purification system; in Jagodina they plan to modernize refrigerated trucks, develop a modern system for waste and construction comprising biogas facilities for solid waste in order to save resources for services of rendering plants; the slaughterhouse in Čačak already began building a “cabbage plant” for the production of organic food and they stressed the need for waste water pools from cabbage processing. Sources of financing include European funds, resources of the enterprise, and subventions from the Ministry of Agriculture
    - Some rendering plants have already initiated new projects. The rendering plant in Ćuprija already initiated an air purification project and plans to introduce a wastewater purification system. In Sombor they plan to introduce bio-digesters for wastewater purification and production of biogas. They envision possible sources of finance from the World Bank and ministries, but are also counting on their own revenues. The main reasons for these investments was for environmental protection and harmonization with EU standards

SWOT analysis from beneficiary survey

STRENGTHS

- DREPR offers an o**pportunity to experience positive impacts of one's investments**, which is an important reinforcement for developing awareness and positive attitudes towards sustainable and environmentally-friendly practices.
- Project demonstrated a **capacity to fulfil different expectations and motivations** to a fairly similar extent.
- Judging from the understanding of Good Agricultural Practices, it appears that **farmers are beginning to perceive a connection between environmental protection and more modern, effective and sustainable production** - beneficiaries expressed accordingly positive attitudes towards a stricter regulation of agricultural production.
- **Farmers benefited from contact with LAUs to a great extent** - beneficiaries stated they were provided with detailed and useful instructions.
- **Interest and engagement on the part of institutions was motivating for beneficiaries** (probably both in practical and psychological aspects).

WEAKNESSES

- Beneficiaries experienced **difficulty with providing the needed financial resources**, **both for investment and for covering additional costs** - a crucial barrier preventing from participating in the project, despite the motivation and interest expressed by non-beneficiaries.
- **Procedures were complicated.**

OPPORTUNITIES

- **Support is needed for continuation of established practices, especially** beneficiaries need assistance with updating of their Nutrient Management Plans, since a majority stated they lack the needed expertise. It is crucial that **they are provided with the information on where to seek assistance**. Efficient procedures should be established in order to provide a continuing practice of preparation and usage of NMPs. **Experience from the Project suggests that working with members of LAU is a good organizational model for this work.**
- In future projects it would be advisable that different approaches target two groups: **a group of small, family farms and larger, corporate farms** since they possess **different motives and expectations from the Project.** For small farms the primary motivation to participate are practical improvements of their production and cleaner courtyards. On the other hand, large corporate farms were primarily motivated by the desire to adapt their production to the standards of the EU, with a perspective to improving their export chances to this market. It is likely that large producers also want to portray an image of environmental awareness.
- An excellent source of motivation is the opportunity to experience positive results of changes in practice, as the beneficiaries in DREPR were able to do. **These farmers should be given the opportunity to share their experience** with others, through associations or the local community. Also replication strategies should go in the direction of **better education to farmers**, especially through the formal educational system as shown through the good experience with agricultural schools.
- Lastly, it is important that **legal measures are provided**.

THREATS

- The **lack of financial resources** needed for participation in this kind of project significantly influences the probability of future investment.
- **More support for agricultural producers is needed**, in particular small scale and female farmers.

Annex 6. Stakeholder Workshop Report and Results

The beneficiary workshop held in Belgrade on March 3, 2011 was a valuable opportunity for beneficiaries and stakeholders to share their project experience. Participants in the workshop included farmers, representatives from rendering plants, slaughterhouses, MAFWM, Soil Science Institute, Republic Hydrometeorological Service, Institute of Animal Husbandry, Agricultural Schools, Water Directorate (MAFWM), Provincial Secretariat of Environmental Protection and Sustainable Development, UNESCO, UNDP and the Embassy of Sweden (SIDA). Participants described how they benefitted from the project, what challenges they faced and directions forward. Some of the key issues raised included:

- Farmers were initially motivated by potential fertilizer savings and the 70% co-financing for equipment, storage and the personalized, hands-on service the project offered; yields increased on treated crops; usage of fertilizers and pesticides fell; and manure handling was less labor intensive leading to cost reductions.
- There is new interest in replicating results, especially by smaller farms; however, financial support under the project is limited to farms with at least 18 cows and many are under this limit. MAFWM currently offers 50% subsidization, but only to those with 100+ milk cows.
- Farmers found local regulations difficult to navigate, but worked with agricultural engineers to come to cost-effective solutions. Large farms also stated challenges with project documentation and procedures, but MAFWM stated that these are simpler than those under IPARD (Instrument for Pre-Accession – Rural Development) – the anticipated process hereon.
- MAFWM is looking for ways to continue water quality monitoring for the next two years in order to establish a statistically significant time trend; current observations over three years are too small. The Hydrometeorological Service relies on State budget funding, which may be uncertain in the future, hence there is an implicit reliance on external funding.
- Agricultural schools were limited by local regulations in terms of development, but project investments led to visible improvements in not only in curriculum, but in the practical nature in which manure management is taught. Schools now have the documentation to teach this topic and in a local environmental context. The Soil Institute attributed project investments in equipment to quicker laboratory accreditation. They said that manure management is currently only an "extension" issue, and given its significant impact in Serbia, it should be integrated into the University curriculum as well.
- Currently there is a draft strategy and action plan for the adoption of the EU Nitrate Directive (91/676/EEC). The Water Directorate estimates that Serbia's cost of compliance with the directive would be on the order of €3 billion.
- A representative from the construction industry suggested they set up a course on construction codes, design and regulatory aspects in response to the challenges experienced at the outset of the project; it was also noted that the project represents a novel approach to public-private partnerships, especially in context of the economic crisis.

Annex 7. Summary of Borrower's ICR and/or Comments on Draft ICR

Project Objective

The Serbia **D**anube **R**iver **E**nterprise **P**ollution **R**eduction Project (DREPR) was a project under the World Bank – GEF Investment Fund for Nutrient Reduction in the Black Sea/Danube Basin and was implemented by the Ministry of Agriculture, Forestry and Water Management – Republic of Serbia. The project was financed partly from the WB-Global Environmental Facility (GEF) grant, Swedish International Development Cooperation Agency (SIDA) grant, European Agency for reconstruction (EAR) grant and Government of Serbia together with participating enterprises on the Project.

The development objective of the project is to reduce nutrient flows into water bodies connected to the Danube River from selected enterprises of the Republic of Serbia. Achievement of this objective contributed significantly to long-term strategic goals of Government by making changes to sector policies and activities linked to the trans-boundary environmental concern of degrading specific water bodies. One of the specific goals of the MAFWM is to improve water resources management, its efficient use and protection of underground and surface waters from agricultural pollution and other sources.

The global environment objective of project DREPR project is to reduce nutrient flows into bodies of water connected to the Danube River from selected Republic of Serbia enterprises. In particular, the Project focused on nutrient pollution from livestock farms, notably pig and cattle farms, as well as nutrient discharging industries, notably slaughterhouses and meat processing industries.

Significant achievements were made with farmers, awareness raising of agriculture producers on environmental impacts and implementing best available practices in agriculture production - meeting important targets in the Agriculture Strategy of Serbia. Detailed documents, guidelines, legal regulations, education material and lectures assisted farmers in preparation for acceptance of new terms and conditions that are becoming more applied in the EU and are becoming part Serbian requirements. The achievements also raised the capability of Serbian Governmental officials to prepare legal documents linked to environmental issues and trained a sufficient number of advisors for further dissemination of knowledge among farmers.

As Serbia is in the process of harmonization with EU legislation and is in the phase of preparation of required documents and regulations, the outputs of this project are already being used for developing these materials. Knowledge dissemination is important since it raises the capability of agriculture producers to respond to upcoming challenges and requirements associated with EU approximation. Realized workshops and promotional activities are a sound platform for future introduction of environmental requirements in agriculture production and serve as an introduction of obligatory use of Code of Good Agriculture Practice (CoGAP). Conducted activities demonstrated how best practice can be implemented and at the same time created tool that can be used in coming years.

It is important to stress that practical examples in the field, and in different locations with different farm structures, managed to demonstrate CoGAP implementation on farms can benefit not just to the environment but also to farmers who practice it.

Project Design

Project was prepared by the Ministry for Environment Protection targeting the reduction of pollution of river basins. According to collected data, it identified agriculture as a significant source of nutrients polluting ground and surface waters. Since the main source of nutrients was animal farms, the Project identified proper actions for best practice demonstration and at the same time indicated the need for problem resolution on a longer-term basis. The prepared Project had two main objectives: development and environmental.

The *development objective* of the Project was to reduce nutrient flows into water bodies connected to the Danube River from selected enterprises of the Republic of Serbia.

The *global environmental objective* of the Project was to demonstrate measures for reducing agricultural nutrient pollution in the Danube and the Black Sea.

Since main target of the Project was agriculture households it was decided to shift implementation of the DREPR project to the Ministry of Agriculture, Forestry and Water Management (MAFWM).

The Project was to achieve its objectives through the following four components:

Component 1: Support to Policy and Regulatory Reform

The objective of this component was to strengthen the policy and regulatory framework that regulates nutrient run-off and discharge from livestock farms and slaughterhouses, in line with the EU ND. In particular, the Project supported:

(i) Preparation of a strategy and action plan for the adoption and implementation of the Nitrate Directive, including its transposition into domestic legislation;
(ii) Development of a Code of Good Agricultural Practices.

Component 2: Investment in Nutrient Reduction

The objective of this component was to demonstrate to livestock farms and slaughterhouses cost-effective methods to reduce nutrient run-off and discharge into the Danube River and its tributaries; and to improve agricultural advisory service capacity to extend knowledge and adoption of these technologies in the Project area. The Project supported:

(i) Investments in manure management in livestock farms;
(ii) Investments in slaughterhouse animal waste management;
(iii) Establishment of a TIC to update knowledge and skills of agricultural advisors, trainers, staff of MAFWM, MSEP/DEP, local authorities and enterprise managers on proper nutrient, manure and slaughterhouse waste management; and
(iv) Support Local Advisory Units 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 objective of this component was three-fold:
(i) To assess the impact of Project investments on water and soil quality in the Serbian Danube Basin;

(ii) To increase local communities' and enterprises' awareness of water pollution from livestock farms and slaughterhouses and of improvements made through the Project, and;
(iii) To devise a strategy and build capacity to replicate Project interventions in other parts of the Danube River Basin in Serbia and beyond.

The above mentioned components were achieved through three sub-components: 3A – Capacity Building and Support for Water and Soil Quality Monitoring; 3B – Public Awareness Campaign; and 3C – Replication Strategy Development.

Component 4: Project Management and Project Impact Monitoring

This component supported project management, including project co-ordination and administration, procurement, financial management and all reporting. All Project outcomes and results monitoring were realized under this component. The MAFWM managed overall Project implementation responsibilities since it has legal mandate in the Republic of Serbia for most of the activities supported by the Project. This ensured mainstreaming of environmental protection into livestock agricultural production and meat processing. Due to the lack of human capacities at that time in the Ministry, the Project Implementation Unit (PIU) was established in order to secure proper and quality realization of Project goals and activities.

Project Implementation by Component

See Annex 2 of ICR for details.

Procurement

The PIU was staffed with one Procurement Specialist. Procurement for the proposed project was carried out in accordance with the World Bank's "Guidelines: Procurement under the IBRD Loans and IDA Credits" dated May 2004, and "Guidelines: Selection and Employment of Consultants by World Bank Borrowers", dated May 2004 and the provisions stipulated in the Legal Agreement. The PIU in cooperation with MAFWM developed a procurement plan for project implementation which provides the basis for the procurement methods. This plan was agreed between the Ministry and the Bank Project Team.

During Project implementation this plan was modified several times to reflect changes in Project activities and to better fit the timeline. The beginning of the Project encountered several failures in tendering procedures because of lack of interest from producers of goods and the lack of needed specialized mechanization. Some tenders were only successful in third attempt. These delays in tender procedures were also caused by inappropriate applications and less than three quality offers which influenced the low performance of the Project at the outset.

Repeated tendering procedures for construction delayed works and had to be shifted to another year. The construction season did not last all year, subsequently influencing implementation. Also it should be noted that no companies specialized in the construction of facilities for manure handling, and among those who expressed interest were not sufficiently qualified for the job.

In order to resolve this issue and to avoid contracting of unqualified or fake companies, the PIU prepared a list of eligible companies per region, that could provide the required services and goods. This process was developed by a call for applications and the PIU would perform an evaluation and select those who were eligible to be bidders. This list was updated over the life of the Project.

The largest number of tenders was for farms and in order to give some freedom in selection of goods or services the farmers could select which companies they wanted to receive applications; but at the same time they were requested to accept the lowest received offer which met tendering requirements.

The PIU, but by and large the LAU experts, provided strong support to farmers in this process and to reduce waiting time.

The Project had four Procurement Specialists and each change had an impact on Project realization. In order to ease possible changes the PIU trained LAU staff for basic procurement operations resulting in a significant improvement tendering procedures.

Environmental Management

The Environmental Assessment (EA) identified potential environmental impacts of civil works, facilities and equipment commissioned under the Project. An Environmental Management Plan (EMP) was developed consisting of a set of mitigation, monitoring, and institutional measures undertaken during Project implementation to eliminate adverse environmental, social and health impacts, offset them, or reduce them to acceptable levels.

These activities were coordinated and monitored by the Environment Specialist who was employed part-time on the Project and who was also in charge for preparation of the Environmental Impact Assessment documents where needed. This specialist also assisted in preparing specific technical documents for tender procedures and was in charge of monitoring and coordination of work related to environmental issues and institutions that were in charge of soil and water analysis. The LAUs and Local Laboratories completed soil, solid and liquid manure samples for approximately 105 farms and agricultural schools. Most of the samples are processed by Local Labs. The Soil Science Institute was in charge of soil, solid and liquid manure samples from demonstration farms and IAH. The Environment Specialist managed data collected from piezometers and gave guidance to PIU.

The Project had three Environment Specialists. The first two selected candidates were not able to fulfil the requirements of this position and their contracts were cancelled in line with standard WB procedures and in line with definitions and statements in their contracts.

Project Impact Monitoring

To ensure the mainstreaming of environmentally-friendly practices into agricultural production, water quality and other environmental impact monitoring were coordinated by the PIU. Monitoring the impact Project interventions required a good cooperation and assistance among the three institutes. The SSI was in charge of monitoring soil testing and the HMS was in charge of monitoring ground and surface waters. The PIU annually monitored and evaluated Project performance by conducting beneficiary surveys. The results of M&E activities were used for the introduction of needed changes and for further PR activities.

Sustainability and Replicability of Project Outcomes

Over the 5.5 years of implementation a large number of activities were conducted. A wide number of interventions and large number of institutions participated in Project realization, resulting in a substantial number of positive outcomes. Although one of the main principles of the

PIU was to secure and coordinate implementation of agreed tasks, it was also to ensure ownership by beneficiaries. In this regard, the Project managed to secure sustainable outcomes and transfer responsibility to final beneficiaries.

There were different mechanisms to secure this process. One was for the PIU to prepare tendering procedures as a service advisor while beneficiaries played a leading role in the preparation of technical requirements and conducting the evaluation procedures. Also in the instance where consultant services were required, selected consultants were closely cooperating with beneficiary institutions and were only paid upon satisfactory performance.

Regarding the sustainability of outcomes related to farms, the fact that farmers took part in the financing, selection, procurement and installation of equipment/ goods it can be expected that investments will be used in the future. Also, the conducted trainings and awareness rising among farmers ensure that outcomes will be sustainable in the future. In order to secure further replicability, as mentioned before, the MAFWM prepared a set of support measures to continue work. Through the demonstrated farm-level actions it can be shown that these are replicable in the future.

Assistance provided to slaughterhouses varied across each enterprise and tailored to fit their needs. Along with the upcoming restrictions and harmonization with EU requirements, it can be expected that all slaughterhouse interventions will be used and maintained in the future. Regarding the investments in other (new) slaughterhouses it is unlikely to expect that these interventions will be replicated, mainly because of the lack of funding from the national budget for the design of such support measures. On the other hand, this type of investment in Serbia is quite expensive, especially regarding facilities for wastewater treatment since only a few municipalities possess communal Waste Water Treatment (WWT) Plants. Their existence will significantly reduce required investments by slaughterhouses. Currently the process of constructing municipal WWT plants is now underway in a large number locations, thus it is anticipated that, and because of EU environmental requirements, slaughterhouses will begin with these investments.

The Project supported 7 agriculture schools with equipment, facilities and training. Perhaps the largest impact of these interventions can be expected from the instilled knowledge by new potential farmers; and coupled with the practical education tools supported by the Project it can be expected to be a sustainable outcome. Regarding the replicability of investments in facilities and equipment to other schools, it is difficult to judge at this stage since they are under the responsibility of another ministry. However, promoted practices at demonstration schools were well known and it can be expected that new schools may prepare requests for similar interventions. The importance of demonstrating what can be done at schools became highly visible to others and in this regard proved that education is one of the best tools for promoting knowledge and practices on a wider scale and over the long-term.

Three institutes were supported with procurement of needed equipment and provision of specific training. Each is specialized in certain activities and supporting investments to perform their work better and in a more sustainable manner made sense. Prepared training courses can be continued through support for education of farmers and the organization of winter schools for farmers. All these types of training activities exist in the support system for advisory services. The SSI and HMS who received equipment for monitoring and analysis will continue to provide services in their respective fields as before. The monitoring of groundwater pollution, by the HMS, is in negotiation with Province Secretariat for Environment Protection to cover, at least, the

piezometers located in Vojvodina, and that there will be an attempt to cover those located on demonstration farms.

A large number of participants who passed training courses in the TIC provided sufficient knowledge on good agriculture practices and environmental issues, not only to representatives from Government institutions, but also to a large number of relevant stakeholders. Furthermore, trained advisors from the National Advisory Service continued dissemination of gained knowledge directly to farmers in their respective territories. All of these accomplishments brought new knowledge and prepared representatives of Government and local stakeholders to deal with environmental issues in the coming period.

Activities related to the targeted communication and visibility campaign are described in Annexes 2 and 5 of the ICR. It managed to raise the importance of environmentally-friendly practices and changed some aspects of a farmer's way of thinking. This change is needed in order to have an easier introduction of the ND in Serbia, and PR activities were instrumental in transforming this behavior. The prepared communication campaign and results obtained from the surveys were used in the preparation of the Communication and Visibility Plan for National Program for Rural Development and IPARD program.

More intensive investments in facilities and equipment procurement influenced market conditions of these goods and services. Several construction companies now offer these services to the Serbian market. At the same time, this increased offer of goods and services reduced prices and made it more affordable to farmers.

Performance Evaluations

Borrower

The MAFWM as the borrower was responsible for proper implementation of DREPR project. At the beginning of Project implementation the Ministry accomplished a set of activities related to preparation of legal basis for preparation of the Grant Agreement; Sub-Grant Agreements; opening of Special Accounts, preparation of initial tender documents; and, tendering and engagement of consultants for PIU. There were no similar projects in the Ministry beforehand, thus there was a lack of sufficient knowledge about project requirements and procedures. Despite this these tasks were still accomplished on time.

Through the 5.5 years of Project implementation, seven Ministers changed. These processes caused some delay, but with on-time withdrawal of funds on sub-account and preparation of direct payments requests on time. This significantly helped in bridging institutional gaps. Also since the Project Coordinator remained the same this assisted in transfer stages and during the introduction of new Ministry staff with Project goals and requirements, as well as with obligations. With these Ministerial changes at times there were delays in payment approvals or signing of contracts. Some of these changes were resolved when the Project Coordinator was authorized to sign documents and payments which speeded up implementation dramatically.

One of the largest obstacles for Project realization were the permits for construction and the MAFWM assisted in negotiating with municipalities and Water Directorate to agree on procedures and to speed up the process of issuing conditions and compliance with given conditions for built facilities.

The MAFWM provided office space to the PIU, supporting and constantly monitoring their work. It is important to note that documents coming from the PIU for signing and payments were treated with high priority. Some delays in implementation occurred when the responsible Assistant Minister moved to another location, and that resulted in some delays in document transfer.

Some of the recommendations could be summarized as:

- Before transferring the Project to the beneficiary – the World Bank should be assured of sufficient institutional capacity to manage the Project. For nominated persons a brief training about rules, procedures and requirements should be organized in order facilitate the proper introduction to the Project in the beneficiary institution;
- For smooth transition to changes in Government, the Project Coordinator should be nominated to sign documents in the interim period;
- The PIU should be placed near the cabinet to help address issues on Project implementation;
- Conduct constant monitoring of PIU activities and be ready to introduce changes in the Grant Agreement and in project design if that will assist in the achievement of goals and objectives;
- The beneficiary has to ensure that the PIU has adequate facilities to work and to act promptly on open issues that appear in the process of implementation.

Having this in mind, due to latest changes in the MAFWM, DREPR was not able to disburse all funds; it is obvious how important is the existence of an authorized person during the transition period. The transition also occurred at the very end of the project, thus there was not enough time to deal with this issue. In spite of that, the DREPR project, rated at the MTR as marginally unsatisfactory, managed to nearly, fully disburse (and considering that all funds were committed) in last year. Regarding the above mentioned it can be concluded that Borrowers' performance was highly satisfactory.

World Bank

As previously mentioned, the MAFWM took over the Project from another Ministry for implementation and the World Bank was very helpful in this process; by providing expert help and advice to responsible staff in the Ministry and to the Minister, as well. This was important since it boosted the whole process and eased preparation and implementation of all required steps and documents. Regular missions by the Bank team and their expert support were very useful in project management, monitoring and evaluation processes and definitely contributed to the achievement of Project objectives.

Since the Project had several revisions to the Grant Agreement to achieve, it was recognized that this process was long and influenced the lower performance during that period. Introduction of changes was required to reduce time delays. These changes occur in all projects which transgress from preparation to implementation. This is why it is important to create a quick way to introduce necessary changes and assist project realization.

During the structural changes in the Ministry, the Bank acted promptly and managed to secure proper implementation. It can be said that all Bank team members were always available to assist in resolving questions and issues that occurred during the Project. The Bank team had excellent cooperation with the PIU and MAFWM, offered new ideas and was open to proposals from the beneficiary side. All this contributed to the accomplishment of the DREPR Project and is an indication that Bank performance was satisfactory.

Key Implementation Issues

Some of the main obstacles during the first two years of implementation (2006-2007) identified were:

- Low interest of slaughterhouses and agricultural processing industry
- Readiness of farmers to invest in environment protection
- Undeveloped local market for large and specific manure management equipment - repetition of tenders
- Local permitting procedures for manure and wastewater treatment facilities were not foreseen in the preparation phase of the Project
- Large portions of funds committed but could only be disbursed upon delivery of equipment or upon completion of construction works and obtaining an operating permit
- Construction season limited the period for realizing field Project activities

Lessons Learned

From all inputs in this ICR a list of key points for improvements in project implementation are presented below:

1. Simplify permitting procedures and provide incentives to industry to invest in WWT facilities;
2. More flexible approaches in introducing necessary changes in project documents;
3. Adjust procedures to the situation in the field;
4. Project preparation - conduct small scale pilot projects;
5. Procedures and activities predicted in the Project preparation phase could be changed due to the time difference and legal and social environment changes;
6. Secure that Project always has one authorized person for special accounts - Project Manager/ Coordinator
7. Training of Ministry coordinators on:
    a. Relevant rules and procedures - how, who, help, assistance, etc;
    b. M&E Reporting procedures.

Specific lessons learned in the finance field:

1. It is important that the Financial Specialist is highly experienced with a track record with NGOs and in accounting; preferably a Financial Manager, since it would aid in daily decision making.
2. Planning is very important for smooth project implementation and presents a basis for reporting. A lot of issues need to be planned: available resources, their allocation, operational costs, expected payments and commitments, etc.
3. To respond to financial needs it is necessary to have Special Accounts with appropriate resources and Withdrawal Applications prepared monthly.
4. Preparing payment orders must be done on a daily basis to enable a short payment term and increase project disbursement and turnover. The impact of these best practices is highly appreciated, especially among farmers.
5. Also is very important for the Financial Specialist to use good software for project accounting. Good software leads to reduced time for reporting and avoids potential errors in Financial Management Reports. The software should be adapted to the needs of Financial Specialist and updated regularly.

6. It is important that the Financial Specialist possesses knowledge of local regulations in the tax field, foreign trade regulations, customs regulations and pension and health insurance - besides knowledge of World Bank procedures.

REPUBLIC OF SERBIA
MINISTRY OF AGRICULTURE, TRADE, FORESTRY AND WATER MANAGEMENT
Belgrade, Nemanjina 22-26
No. official
Date: October 17th, 2011

Mr. Loup Brefort
Country Manager

THE WORLD BANK COUNTRY OFFICE
FOR SERBIA AND MONTENEGRO
Bulevar Kralja Aleksandra 86
11 000 Beograd

Subject: *Re: Serbia Danube River Enterprise Pollution Reduction Project- Implementation Completion and Results Report, letter from October 4, 2011*

Dear Mr. Brefort,

Thank you for your letter received on 4th October 2011 and allow me to use this opportunity to thank you and the World Bank Team for great support and assistance in realization of DREPR project. Based on the provided text of the final document we are pleased to inform you that all our previous comments were taken in consideration and inserted in the document. However there are still some minor comments and corrections which are inserted in track change mode, and sent to TTL by e-mail. Here is the summary of conducted changes:

- Page 8- Table- Summary of reallocation of SIDA (TF-096289) grant proceeds is deleted and replaced with new table- Summary of reallocation of SIDA (TF-056212 & TF-096289) grant proceeds- There were two grants from SIDA and those were two different grant agreements.

- Page 12, 14 and 26- Funds returned to financiers- corrected from 560.000 USD to 588.000 USD, calculated on Serbian middle exchange rate on 24th August and total project expenses.

- Page 14- Disbursement paragraph, figures for returned funds are corrected. Correct figures are 400.000 USD is returned to GEF and 188.000 USD to SIDA.

- Page 21- Highlight removed, text revised, since the work and funding of institutes is arranged with existing contracts. No separate contracts were developed for funding of maintinace and operating costs for provided equipment.

- Page 26, footer No.2- Original grant amount from Sweden Government in first donation was (4.23 million USD) as corrected in the brackets.

- Page 36, footer- corrected from more to less than 1.0 million euro, since all component 3, where all payments for laboratories and two institutes were together with public awareness expenses, was 669,448 USD.

Please find attached Implementation Completion and Results Report No: ICR00001916 with comments inserted in the track changes.

Once again, alowe me to express gratirude and appreciation to the World Bank for realised cooperation and achieved results on DREPR project, and to reassure you that Ministry of Agriculture, Trade, Forestry and Water Management of Republic of Serbia will continue to work on realization of replication strategy developed on this project.

Yours sincerely,

Minister

Dušan Petrović

Annex 8. Comments of Cofinanciers and Other Partners/Stakeholders

See Section 7(b).

Annex 9. List of Supporting Documents

ADAS UK Ltd (2011) Serbia Danube River Enterprise Pollution Reduction (DREPR) Project: Avoided Losses of Nutrients, Project Report, Wolverhampton, UK (June).

World Bank (2011) Cost effectiveness ratios, Excel spreadsheet.

IPSOS Strategic Marketing (2011) Integrative Report: Awareness and Satisfaction with DREPR Project, Report to Ministry of Agriculture, Forestry and Water Management, Government of Republic of Serbia.

MAFWM (2011) Borrower's ICR. DREPR Final Communications Report, Annex 1.