ENVIRONMENTAL TECHNOLOGY AND POLICY DEVELOPMENT IN A REGIONAL SYSTEM:
Transboundary Water Management and Pollution Prevention in Southeastern Europe

by

Christi Electris

B.S.E. in Computer Science Engineering
University of Pennsylvania, 2002

Submitted to the Engineering Systems Division
in Partial Fulfillment of the Requirements for the Degree of

Masters of Science in Technology and Policy

at the

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Abstract

In order to surmount the barriers to transboundary integration and coordination of environmental technology and regulatory policy in Southeastern Europe, the environmental capabilities and needs of the region are discussed, and a regional cooperation and coordination systems framework is developed. The thesis focuses on a case study of transboundary water resource management of the Mesta/Nestos River Basin between Bulgaria and Greece is presented in order to understand the coordination problems between a particular locality's level of integration in environmental technology development and use, and environmental regulatory policy, as well as the barriers to cooperation between two localities sharing a transboundary resource.

For the case study, the physical characteristics and environmental stresses on the basin are described in detail. Next the policy governing local water resource management and environmental technology development is reviewed in terms of national laws and regulations, the bilateral diplomatic agreements, and the EU framework that drives much of the current activity in the basin today. Finally, the gaps in current policy and the barriers to coordinating water resource-related technology policy and environmental regulatory policy development are analyzed. The end result is a set of recommendations pertaining to the particular basin, but which can be generalized to other basins in the region. The focus is primarily on the coordination in both countries at the local and transboundary levels, but will also be explored within the context of the nation-wide and region-wide levels. Through this narrow case study, insight is gained as to how environmental technology policy can be coordinated with regulatory policy to surmount the obstacles faced in water resource management and the broader context, and how the institutional and legal framework in place affects the regulatory scheme and in turn the technology placement in both countries.

Thesis Supervisor:

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Special Note

I submitted a petition in Summer 2005, which was accepted by the MIT Graduate Dean, Isaac Colbert, to create a self-designed dual degree program between MIT's Technology and Policy Program (TPP) and The Fletcher School at Tufts University. For this, I was approved to write one thesis for both my MIT TPP Degree and my Fletcher Degree, provided the thesis (a) can be certified by faculty from both universities and (b) that can satisfy the requirements of both programs. These conditions were met.

At MIT, my thesis was supervised by Dr. Nicholas Ashford. At The Fletcher School, Tufts University, my thesis was supervised by Dr. William Moomaw.

Biographical Note

EDUCATION

Massachusetts Institute of Technology, Engineering Systems Division, Cambridge, MA
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University of Pennsylvania, School of Engineering and Applied Science, Philadelphia, PA
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WORK EXPERIENCE

MIT Sloan School of Management Cambridge, MA
Teaching Assistant, System Dynamics for Business Policy *January 2007 – May 2007*
- Lead weekly recitation classes, held office hours, and graded weekly system dynamics assignments.

Global Water Partnership-Mediterranean Athens, Greece
Research Intern *June 2006 – August 2006*
- Pursued research work on a case-study of integrated transboundary water basin management between Greece and Bulgaria in the Nestos/Mesta river basin. Work is linked to the Petersberg Phase II Process / Athens Declaration Process for transboundary waters in Southeast Europe.
- Traveled to the river basin region in both countries to speak with local stakeholders in government and civil society.
- Participated in International Roundtable on Integrated Shared Lake Basin Management in Southeastern Europe in October '06 at Ohrid, FYR Macedonia, organized by GWP-Med and GEF IW:LEARN.

Massachusetts Institute of Technology Cambridge, MA
Research Assistant, Technology and Development Program *September 2004 – July 2007*
- Lead the development of an educational computer game, Global Agenda!, teaching international relations and sustainable development concepts.
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- Worked with Dr. Choucri on several projects involving global accords, sustainable development, and e-governance, including work on the Global System for Sustainable Development (GSSD)
- Wrote grant applications, articles and a book chapter. Presented the work of GSSD and Global Agenda! often.
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US-Greek Initiative for Technology Cooperation in the Balkans (ITCB) Athens, Greece
Internship *June 2005 – August 2005*
- Carried out interviews of environmental experts, consultants and policy makers in Greece, Serbia, Romania, Bulgaria, and Cyprus as field research for my MIT/Fletcher Joint thesis on developing the environmental technology in Southeastern Europe. Thesis advised by both Dr. Nicholas Ashford, MIT, and Dr. William Moomaw, Fletcher.

- Worked in collaboration with the Greek environmental consultancy office, Ergonomia, in Athens, Greece.
- Interviewed European Union environmental and development experts dealing with such issues in the Balkans, in January '06, in Brussels, Belgium.

Massachusetts Institute of Technology Cambridge, MA
Research Assistant, Laboratory for Energy & Environment *September 2004 – January 2005*
- Worked with Dr. Ernest Moniz and the Alliance for Global Sustainability (AGS) to develop an enterprise plan for developing the Cyprus Institute (CI). Assisted in June '05 CI-AGS Conference.

MIT Lincoln Laboratory Lexington, MA
Assistant Staff, Group 32: Advanced Concepts and Technologies *August 2002 – August 2004*
- Designed and built both data-driven and knowledge based probabilistic models.
- Managed the work and progress of 10 scientists for a government sponsored project.
- Presented work to varied audiences of both technical staff and government sponsors.

PUBLICATIONS & POSTERS

- C. Electris and D. Mistree, "*Global Agenda!* Version 1.0: Toward Web-Based Gaming and Simulation of World Politics." Chapter 18 in Mapping Sustainability: Knowledge e-Networking and the Value Chain by N. Choucri, T. Mezher, F. Haghseta, W.R. Baker, C.I. Ortiz and D. Mistree. *In Press-2007.*
- N. A. Ashford, C. Electris. "The role of the US-Greek Initiative for Technology Cooperation with the Balkans in constructing a unified environmental technology plan in the region." Special Issue on: Environmental Sustainability and Collaboration in Southeastern Europe, *Journal of Southeast European and Black Sea Studies*, Vol.6: 3, September 2006.
- C. Electris, "A Case of Trilateral Cooperation for Sustainable Development: The Prespa Lakes." Citizen Science Online Journal, SustainUS, 2006. Presented at side event of UN Commission on Sustainable Development 14, May 11, 2006.
- N. Choucri, C. Electris, D. Goldsmith, D. Mistree, S.E. Madnick, J.B. Morrison, M. Siegel, and M. Sweitzer-Hamilton,, "Understanding & Modeling State Stability: Exploiting System Dynamics" (January 2006). Selected for IEEE Aerospace Conference, March 4-11, 2006, Big Sky, MT. MIT Sloan Research Paper No. 4574-06 http://ssrn.com/abstract=876962
- C. Electris, D. Goldsmith, D. Mistree M. Sweitzer-Hamilton. "Modeling State Stability", poster accepted for the Center for eBusiness Annual Conference, May 17, 2005, Cambridge, MA.
- C. Ortiz, C. Garcia, C. Electris. "Knowledge and Information for Sustainable Development: AGS Project on the Value of Knowledge", poster accepted for the Alliance for Global Sustainability Annual Meeting 2005, March 20 – March 23, 2005, Cambridge, MA.
- J. Williamson, K. Dunn, S. Rubel, C. Electris. "A Bayesian Network Approach to Discrimination", paper presented at the American Institute of Aeronautics and Astronautics (AIAA) 2nd Missile Defense Conference and Exhibit, March 22 – 26, 2004, Washington DC.

HONORS & AWARDS

- Tufts Institute of the Environment Graduate Student Fellowship Recipient (2006-2007)
- Henry R. Luce Environmental Internship Grant Recipient (2006)

LEADERSHIP ACTIVITIES

- President, Mediterranean Club at The Fletcher School (2006-2007)
- Leader, SustainUS Boston Geocluster (2005-2006)
- Founder and Director, Zero-Waste Party, MIT Graduate Student Activity (2005-2006)
- Student Technology Representative, Fletcher Student Council (2005-2006)
- Committee Member, MIT Technology and Policy Student Society (2004-2005)

FOREIGN TRAVEL

- Numerous family visits and work experiences in Greece; extensive travel and stay in France
- Research work in Bulgaria, Romania, Serbia, FYR Macedonia, Belgium, Cyprus, and Albania
- Travel to Italy, England, Spain, Peru, Mexico, Turkey, Iceland, Canada and the Netherlands.

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I would like to thank a variety of people and institutions for their help and support throughout my graduate studies:

First of all, my wonderful advisors Nicholas Ashford and William Moomaw for their guidance and support throughout in my course selection, thesis topics, and career development, and for seeing the importance of what I was trying to accomplish by doing both degree programs;

The faculty and staff at the Technology and Policy Program and MIT, especially Sydney Miller, Frank Field, and Dean Colbert, for all their support in helping me realize my unique dual degree program with The Fletcher School;

The Fletcher School faculty and staff for an amazing program and education that pulled me out of my engineering comfort zone;

Nazli Choucri for the opportunities she gave me to work in a variety of projects and her support in my pursuit of my personal academic and professional goals;

TPP, the Tufts Institute for the Environment, The Fletcher School, and the US-Greek Initiative for Technology Cooperation with the Balkans for supporting my research and summer internships with financial support;

GWP-Med for providing guidance and knowledge in developing my research project, especially Prof. Michael Scoullos, Vangelis Constantianos, and Dimitris Faloutsos for their excellent advice and support;

Ergonomia for providing facilities and guidance in developing my field research over the summer;

People I met traveling around Southeastern Europe and those I met in Greece and Bulgaria for case study;

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1 Introduction and Motivation

Appropriate environmental policies can stimulate the development of environmental technology[1] in a nation, aiding the environmentally sustainable development of that country. When neighboring countries, however, have conflicting or contradictory policies for resource use, environmental regulations and technology strategies, stakeholders from all countries can lose out in the long run both because pollution can be of a trans-border nature and because of the classic free-rider problems encountered when nations pursue fundamentally different policies. The aim of this thesis is to contribute to the broader question of how to improve the coordination of national and local policies with other nations or regions in the context of environmental technology development and policy in selected areas of Southeastern Europe (SEE).[2] A case study on integrated water resource management in a transboundary water basin allows for a concrete analysis of problems through application of a framework developed for the general problem.

1.1 The Question

This thesis looks at international environmental issues affecting a multi-state region, and attempts to understand and analyze the systemic failures in transboundary integration and coordination of environmental policies in regional issues of vital interest to multiple parties, and to develop what steps can be taken to overcome these barriers. Specifically, the thesis will explore the barriers to (1) integrating and coordinating within and between the countries *the technology development/adoption initiatives* needed to meet the technology-related needs for both water treatment and source reduction and (2) integrating and coordinating within and between the countries the corresponding relevant *environmental regulatory policies* (addressing both water treatment and source reduction).

[1] The term 'environmental technology' encompasses both (1) technology that captures or treats pollution (a) after it exits production, manufacturing, agricultural, and transportation systems or (b) that results from product use and disposal, and (2) technology that produces little or no pollution to begin with. The former refers to end-of-pipe controls, while the latter is termed pollution prevention, source reduction, or cleaner technology.

[2] Note that Southeastern Europe is also often referred to as 'The Balkans,' as well as 'South Eastern Europe,' 'South East Europe,' or abbreviated as 'SEE.'

Figure 1: Questions Discussed in Thesis

This thesis aims to contribute to the broader *General Question*, through focusing on *Specific Questions* in the regional context of Southeastern Europe. A *Case Study* is used to make concrete analysis based on the developed framework and make appropriate recommendations.
General Question: What are the barriers to transboundary integration and coordination of environmental technology and regulatory policies in regional issues of vital interest to multiple parties, and what steps can be taken to overcome these barriers? *Specifically*: What are the barriers to (1) integrating and coordinating within and between the countries the **technology development/adoption initiatives** needed to meet the technology-related needs for both water treatment and source reduction and (2) integrating and coordinating within and between the countries the **corresponding relevant environmental regulatory policies** (for both water treatment and source reduction), and what steps can be taken to overcome these barriers? *Case Study*: How do two countries (Bulgaria and Greece) cooperate on the transboundary water resource management of one river basin? What barriers do they face for integrating and coordinating **local, national, transnational, and European** policies for both technology development/adoption initiatives and corresponding relevant environmental regulatory policies for the river basin in question?

1.2 The Region of Focus

The thesis research focuses on the Southeastern European region where many small countries are concentrated into a region that is considering to be developing rapidly as the countries are trying to satisfy the necessary requirements for joining the European Union. The countries within the scope of this research are Albania, Bulgaria, Bosnia and Herzegovina, Greece, Former Yugoslav Republic of Macedonia (FYROM or FYR Macedonia), Montenegro, Romania, and Serbia. Figure 2 below shows a map of the region. At the outset of this research, Greece was the only European Union member among these countries however in January 2007 Bulgaria and Romania joined the EU. The remaining countries are in various stages of planning or working towards EU accession agreements.

Figure 2: Map of South Eastern Europe
(Source: World Bank, June 2003)

The region of Southeastern Europe, or the Balkans as it is popularly called, has seen tremendous political, economic and social change over the last 30 years. Since the breakdown of the state of Yugoslavia and the fall of Communism throughout the region in the 1990s, the fragmented countries in Southeastern Europe have been rebuilding their governments while building increasingly strong ties with the European Union members and processes. However, there has been reluctance amongst neighboring countries in the region to coordinate their economic and environmental policies for various historical and social reasons. Because this region has a history of political tensions among neighbors, fostering cooperation is an important part of the ability of the individual countries to achieve EU membership status, and environmental cooperation is often the most politically appropriate place to start. Moreover, the geographical characteristics of the region mean that environmental policy and regulation in one area can have a real effect on another. While an extended exploration of these issues is not within the scope of this thesis, I will consider some of the issues most relevant to environmental policy coordination for the region.

One of the strongest cases for regional cooperation is that ninety (90) percent of the area of the Southeastern European (SEE) countries falls within transboundary river basins.[3] For this reason, I will focus on transboundary water management and pollution prevention issues while analyzing the relevant technology and policy coordination challenges of the region. I have chosen one case-study to highlight some of the major issues. The case study looks at transboundary water resource management on a river basin shared between Greece, an EU member since 1981[4], and Bulgaria, a newly acceded EU member as of January 2007.[5] The river in question is called the Nestos River in Greece and the Mesta River in Bulgaria. Through research papers and database research, along with the on-the-ground discussions I have had with experts and stakeholders in the region, I analyze the situation through the diplomatic evolution of the transboundary river agreement, the current situation in terms of environmental needs and challenges in technology and policy cooperation (both internally and cross-nationally), the role technology plays in surmounting the obstacles faced, and the institutional and legal framework in place that affects regulatory and technology placement issues both domestically and cross-nationally through the EU regulations.

1.3 Motivation for this Thesis

The final outcome of this research is set in the context of a larger project of creating an Environmental Technology Development and Management Plan for the SEE countries in order to contribute to the sustainable development of the Balkan Peninsula, in the countries of Albania, Bosnia and Herzegovina, Bulgaria, the Former Yugoslav Republic of Macedonia, Montenegro, Romania, and Serbia. Many of the Balkan states

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[3] GWP, "Information Note." International Roundtable on Integrated Shared Lake Basin Management in Southeastern Europe, October 2006.
[4] European Union, "Greece", Accessed on Oct. 2, 2006 at http://europa.eu/abc/european_countries/eu_members/greece/index_en.htm
[5] European Union, "Bulgaria", Accessed on Oct. 2, 2006 at http://europa.eu/abc/european_countries/eu_members/bulgaria/index_en.htm

are currently struggling to meet European Union environmental standards, and the development of such a plan will be of immense value to the region. This project will incorporate both engineering systems analysis and management approaches for improving the environment in the Balkans through joint US-Greek initiatives, as well as European Union (EU) and private aid.

Thus, the results of this thesis have particular relevance to the region through the efforts of two major stakeholders of the larger project. These stakeholders are the US-Greek Initiative for Technology Transfer in the Balkans (ITCB) and the international efforts of the Petersberg Phase II/Athens Declaration Process, described in detail below.

1.3.1 The ITCB

This thesis will provide a deeper understanding of the challenges facing the United States-Greek Initiative for Technology Cooperation in the Balkans (ITCB) in developing a unified plan for the environmental technology development in the Balkan region.[6] The ITCB was created in order to help promote economic stability in the Balkan region through technology-based cooperation, thus restoring peace and facilitating the transition to free-enterprise economies. The United States (US) and Greece also want to strengthen the relationships between their private sector firms, as well as among public and private entities in the Balkans, and promote cooperation and collaboration among researchers and engineers in technology and industrial organizations in the region. A major priority of the ITCB is improving and protecting the environment as these countries develop.[7]

This study acknowledges all kinds of environmental challenges in the Balkans, but focuses on the case study of transboundary water resource management in order to build a concrete example of the issues faced in the region. Work beyond this thesis is expected to include a fuller analysis of common technical and development problems of pollution such as water, waste, and air, pesticides, unsustainable industrialization and agriculture; the common governance and management problems such as the lack of an adequate regulatory system, a tradition of ignoring legal norms, and the lack of an adequate knowledge infrastructure and institutions; and the potential benefit of the development of a joint Balkan-wide environmental management initiative. Future work will also explore the potential role of ITCB as an integrating force for the multiple assistance efforts of the organizations such as the UN, the EU, the US, and other individual country partnerships. The main objectives of this overall study include identifying key technical environmental problems related to agricultural and industrial activities in the Balkans, and evaluating the technological capabilities, capacities, and gaps these countries have in order to address those problems. The economic, societal, cultural and political benefits of such development of the environment will also be researched and presented.

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[6] Further information on the ITCB Official Website: www.itcb.gr

[7] See Nicholas A. Ashford and Christi Electris, "The Role of the United States-Greek Initiative for Technology Cooperation with the Balkans in Constructing a Unified Environmental Technology Plan." *Southeast European and Black Sea Studies,* 2006, 6(3):391-397

1.3.2 Petersberg-Phase II / Athens Declaration Process

This thesis, and particularly the case study on the Mesta/Nestos river basin, will contribute to both the Petersberg Phase II Process and the Athens Declaration Process.

The *Petersberg Phase II Process* is a Germany – World Bank (WB) partnership. The Petersberg Process began in 1998 as a global-level series of roundtables on transboundary river basin and lake management and strategy. A major part of the Petersberg Process – Phase II is to provide support for development of actions and opportunities is transboundary river, lake, and groundwater management in Southeastern Europe. Phase II was proposed in 2004, and in December 2005 a revised Concept Paper was prepared which presents the background of the process, updates of current activities and future plans.

The *Athens Declaration Process* is a Greece – WB partnership which was initiated in 2003 through the "Athens Declaration concerning Shared Water, Shared Future and Shared Knowledge" during the International Conference on Sustainable Development for Lasting Peace: Shared Waters, Shared Future, Shared Knowledge in Athens, Greece. The declaration provides a framework for supporting cooperative management of transboundary water resources in Southeaster Europe and Mediterranean regions. The process is for helping countries in SEE to prepare Integrated Water Resource Management and water efficiency plans for their major river basins in cooperation with relevant stakeholders. It is also meant to be a coordination mechanism for the better exchange of information and experience among SEE country water management projects.

These two processes have been linked in order to maximize the outcomes of the activities done and the benefit to the SEE region. They are referred to collectively as the Petersberg Phase II/Athens Declaration Process, henceforth the PPII/AD Process. This process concerns cooperation on the management of transboundary waters in the SEE region.[8]

The case study on the Mesta/Nestos River Basin (See Section 5) will provide an in-depth analysis on one transboundary river basin which was included in an inventory of all SEE shared water basins that was one outcome of the PPII/AD Process.[9] Building on the work done, this case study will elaborate on the issues where concrete interventions and strategic investments can be undertaken by international donors producing highly visible results, such as improved governance, ecological and chemical water quality, and/or local infrastructure. The findings and recommendations are intended to be presented to and discussed with the countries within the region during future International Roundtables and Workshops of the PPII/AD Process, sharing these results with policy makers and stakeholders from countries within the SEE region.

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[8] Further information on Petersberg Phase II/Athens Declaration Process: http://www.watersee.net/

[9] Transboundary Waters Information Exchange Network for the South Eastern Europe, "Internationally Shared Surface Water Bodies in the Balkan Region." Accessed on June 10, 2006 at http://watersee.net/

1.4 Roadmap for the Thesis

The following diagram (Figure 3) depicts the roadmap for the thesis. The thesis is divided into eight chapters, and the diagram denotes with a number to which section each of the following chapters corresponds.

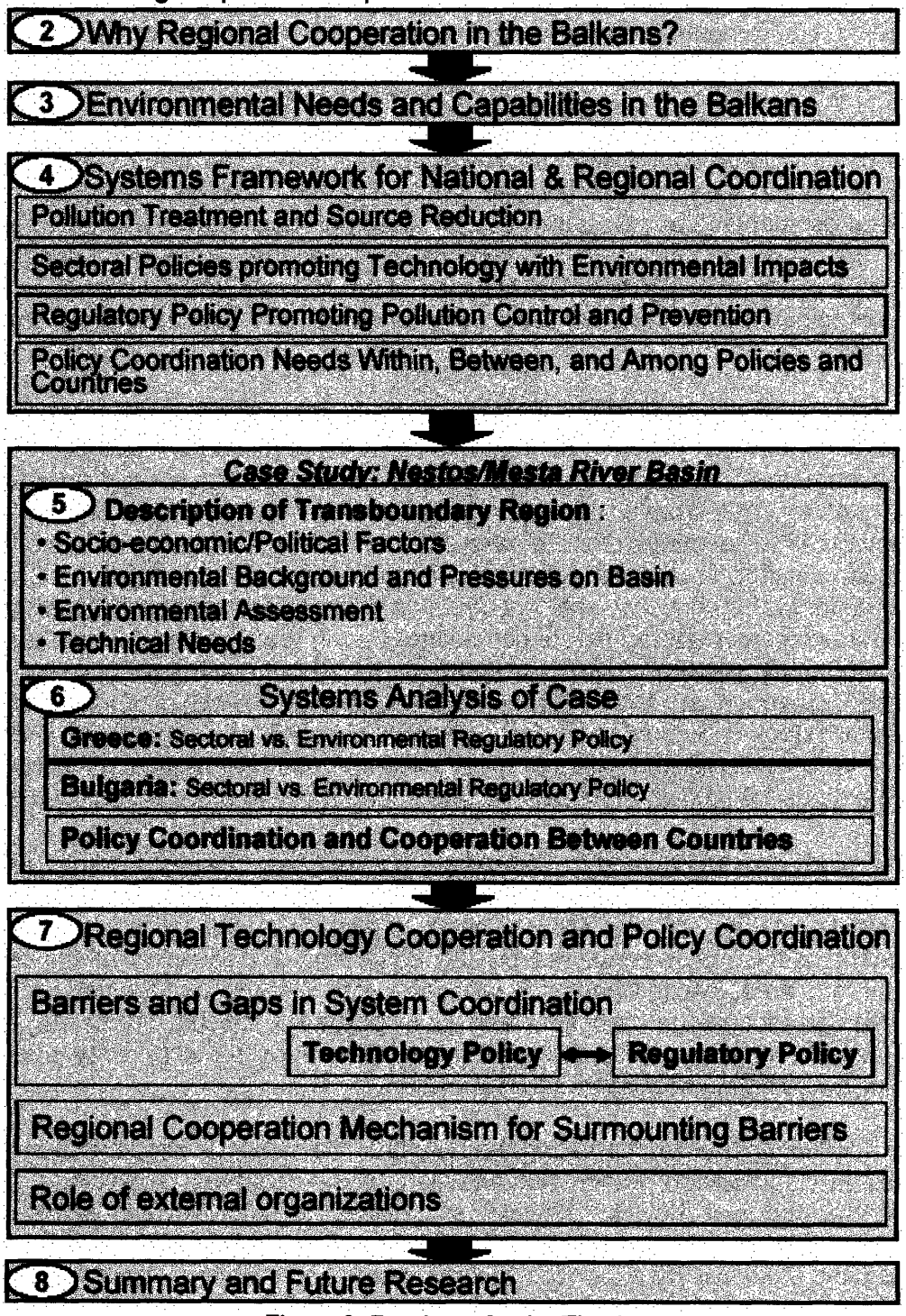

Figure 3: Roadmap for the Thesis

After this introduction and problem definition, Chapter 2 will delineate how the SEE countries stand to benefit from cooperation on environmental issues, and thus from the resulting analysis of this research. The countries in the region have made EU accession a driving goal of their policy-making, and environmental policy coordination is one part of the many requirements which can help these countries meet their goals.

Chapter 3 will describe the current environmental capabilities and needs in the SEE countries in all environmental areas in order to provide context for the following framework of regional cooperation on environmental issues, as well as for the deeper analysis in the more specific case study. While most countries in the Balkans are still considered developing countries, they are far ahead of much of the developing world in terms of education, infrastructure and technology due to the forced development under the previous communist regimes. The collapse of the planned economies resulted in the collapse of relevant environmental services and related jobs, yet much of the know-how still persists.

In Chapter 4, develops a systems framework for regional environmental cooperation. The distinction between pollution treatment and source reduction is explored, along with how environmental *technology use and adoption policy* contrasts with *environmental regulatory policy*. This chapter will also highlight relevant EU legislation on regulation of water resources to set context for the case-study. Finally, the chapter will frame how the needed coordination should be achieved among policies and between local, national and international (EU) governments in both environmental technology adoption and use policy, and environmental regulatory policy. Included in the Chapter 4 in the section on policy coordination between countries, there will be a brief discussion highlighting how Integrated Transboundary Water Resource Management (IWRM) is an important area for regional policy coordination and cooperation because of the tangible and visible effects of local, national and regional water resource use and regulation. This chapter will set the stage for studying one specific and important case of a river basin in SEE.

The case study will be covered in Chapters 5 and 6. First, Chapter 5 will begin with a description of the case study giving the background political details and the environmental details of the Mesta/Nestos basin, followed by an environmental assessment of the major pressures on the basin and a discussion of the technical needs for the area. Next, Chapter 6 will delve into Greece and Bulgaria's relevant environmental technology adoption and use policy, a discussion of its relevant environmental regulatory policy, followed by an analysis of the technology cooperation and policy coordination between the two countries.

Chapter 7 will conclude by integrating the results of the previous chapters to bring forth the gaps in coordination within and between these countries, suggesting possible solutions to improve the coordination of policies to improve the IWRM of the Mesta/Nestos River Basin and throughout Southeastern Europe. The lessons learned from the case study will be expanded to draw general conclusions about the barriers to coordination in environmental policies throughout the SEE Region. This chapter will also

discuss how the regional stakeholders can surmount the barriers to cooperation, and several policy options will be suggested.

Finally, Chapter 8 concludes by summarizing the results of the case study and systems analysis, highlights the most pertinent recommendations, and discusses future work to be pursued.

2 Need for Coordination in the Balkans on Environmental Issues

The countries in Southeastern Europe have been working hard to shed their historical image of Balkanism, of violence and fragmentation, and of being 'the powder keg' of Europe.[10] Many reject the legitimacy of the Ottoman occupation in an effort to appear more 'European', and have worked hard to reconstruct "a respectable record of nationalist struggle and resistance ... to produce the kind of historical pedigree once – if not still – required by Europe itself."[11] The countries of the region see their futures in Europe, as part of the European Union, and even today avoid association and cooperation within the region for symbolic political reasons, even if it could be beneficial to the region as a whole. However, with the exception of Greece which joined the EU in 1981,[12] and to some extent Bulgaria and Romania which have just acceded to the EU in January of 2007, most of the region has a long way to go in terms of reaching the European Union's political, economic and social standards.[13] The Western Balkans, encompassing Albania plus the states that once formed Yugoslavia (Serbia, Montenegro, Bosnia and Herzegovina, the former Yugoslav Republic of Macedonia, and Croatia), comprise the region that is least developed and furthest from the European Union. In order to shed the image of Balkanism and to join the EU, the Balkan countries need to appear to work together, however a possible consequence may be that the more they work together and develop separate institutions, the less pressing it may become for those countries to integrate into the EU.

This chapter examines why fostering Balkan regional cooperation is important even in the context of the individual countries' sight on the EU. First, in Section 2.1 discusses the EU accession prospects for the Balkan countries and how regional integration is in fact imperative for accelerating membership prospects. The benefits and requirements for membership are detailed. Then, the incentives to encourage regional integration within Southeastern Europe will be shown in Section 2.2 to outweigh the disincentives. Section 2.3 will give an overview of the multiple assistance efforts geared toward or including the SEE region for environmental or economic development projects. Finally, Section 2.4 will emphasize how the area of environmental policy coordination might be used to initiate this sort of cooperation through a relatively politically neutral and fundamentally regional issue.

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[10] Pachalis Kitromilides. "'Imagined Communities' and Origins of the National Question in the Balkans." *European History Quarterly,* Vol. 19, 1989, p.151

[11] Mark Mazower. The Balkans: A Short History. New York: Modern Library, 2000, p.*xli*

[12] European Union, History, *EUROPA – The EU at a Glance.* Accessed at http://www.europa.eu.int/abc/european_countries/eu_members/greece/index_en.htm on December 1, 2005.

[13] European Commission, *EUROPA – Enlargement: Pre-Acceding Countries & Candidate Countries.*"Accessed at http://europa.eu.int/comm/enlargement/candidate.htm on December 4, 2005.

2.1 EU accession as a Strategic Decision of the Region

While the regional integration that the European Union offers is the decisive goal for the countries of Southeastern Europe, there are many independent steps the region and the individual countries must make before being granted this prized status. The EU has declared that, "The future of the Balkans is within the European Union,"[14] however, has also stressed that, "the pace of further movement of the Western Balkan countries toward the EU lies in their own hands and will depend on each country's performance...."[15] This individualistic performance measurement encourages each country to look only inwardly when working towards Brussels, and thus creates a disincentive for helping their neighbors in any way, perhaps even reinforcing the divisions that recent conflicts have built between new and old nations.

The current *Stabilisation and Association Process* for the Western Balkan countries is a way to demonstrate the EU's commitment to the region through development projects and inclusive policies, while not going so far as to guarantee membership, and asserts that "The EU's commitment and assistance must be matched by a genuine commitment of the governments of the Western Balkan countries and concrete steps to make the necessary reforms, to establish adequate administrative capacity and to co-operate amongst themselves."[16] This emphasizes that the EU does not see regional cooperation as a substitute for working towards membership, but rather it is a main goal for the region as a prerequisite. Once the countries in the SEE region are able to enter the official Accession process and as they attain full membership, EU development aid flows would increase to the region as they would still have the poorest of EU countries among them and would receive large amounts of EU Cohesion and Structural Funds. Additionally, a more free-flowing economy would bring more European investment into the Balkans and create a stronger sense of 'European-ness' as borders were opened and people would be able to flow to and from the West. However, as the EU struggles to digest the most recent addition of many Eastern European countries that has recently expanded to 27 members with the addition of Romania and Bulgaria, the prospect of further expansion, "is in contradiction with the present mood of the EU following the French and the Dutch referenda rejecting the Constitution that was itself designed to pave the way institutionally for further enlargement."[17] Therefore, the Western Balkans may realistically have to wait quite a long time before they are fully members of the European Union, with even the European Commission's draft regulation for an Instrument for Pre-Accession Assistance[18] suggesting that, "the EU itself does not

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[14] European Commission, Enlargement, *EU-Western Balkans Summit – Declaration.* Press Release 10229/03, Thessaloniki, June 21, 2003. Accessed at http://europa.eu.int/comm/enlargement.see.decl.htm on Dec.1, 2005.

[15] European Commission, Enlargement, *The Thessaloniki agenda for the Western Balkans.* Western Balkans – Council Conclusions, Annex A, June 16, 2003. Accessed at http://europa.eu.int/comm/enlargement/see/gacthess.htm on December 1, 2005.

[16] Ibid.

[17] Michael Emerson, "An Interim Plan for South-East Europe: Customs Union with the EU and a Regional Schengen for the Free Movement of People." *Center for European Policy Studies Policy Brief*, No. 85, November, 2005. Accessed at http://shop.ceps.be/BookDetail.php?item_id=1277 on December 2, 2005.

[18] Commission of the European Communities, "Proposal for a Council Regulation establishing an Instrument for Pre-Accession Assistance (IPA)" Brussels, 29.9.2004, COM(2004) 627, final 2004/0222

believe that the countries of the region will join the Union until at least 2020 – far behind expectations in the region."[19]

Still, the most useful tool the EU has for dealing with the troubled Balkan region is "a *credible promise* that the painful process of resolving outstanding political problems and undertaking root-and-branch policy and institutional reforms will actually bring the region closer to EU membership."[20] Indeed, the EU seems committed to using this leverage and its investment in the Balkans to help stabilize the region, create institutional and political reform, and to advance economic development, especially through the Stabilisation and Association Process for the Western Balkans, which a country must adhere to in order to be considered for EU candidacy. This process includes a regional dimension, where the countries vying for membership candidacy are expected to have a clear commitment to regional co-operation. The EU policy specifically encourages the countries to create regional conventions of cooperation, including bilateral free trade agreements in the region, as well as to "persuade the authorities in the countries of the region to work together to respond effectively to the common threats to the [region]...."[21] Thus, one of the *prerequisites* for the Balkan countries to join the European Union involves "[behaving] towards each other and [working] with each other in a manner comparable to the relationships that now exist between EU Member States."[22] While EU Accession may be the ultimate goal for the Balkan countries, the possibility of not reaching such a status for possibly twenty or more years means that those nations may want to consider working on a regional approach to development in the more immediate future. Such Balkan integration, if done in context of absorbing future European Union goals, will only accelerate the process of reaching the member requirements and acceding as full members of the EU.

2.1.1 Incentives for Becoming a Member

European Union Membership offers many incentives that developing countries in Southeastern Europe would find attractive. While membership is presently limited to the geographical entity of the European Continent, even countries from outside have shown interest in being included in the exclusive organization. The Post-communist countries in Eastern Europe which have benefited the most have been within close geographical proximity to the 15 older EU members, or EU-15. After the dissolution of the Soviet Union, the planned economies of these countries collapsed, along with the political institutions that were supporting them. The EU has an interest in seeing its bordering countries stable and successful, as their performance will affect theirs. Thus, the European Union has been eager to support the development of strong democratic institutions and free market economies in Post-communist Eastern Europe.

(CNS). Accessed at http://europa.eu.int/comm/enlargement/docs/pdf/com2004_0627en01.pdf on Dec.1, 2005.

[19] "Breaking Out Of The Balkan Ghetto: Why IPA Should Be Changed." European Stability Initiative. June 1, 2005. p.1. Accessed at http://www.esiweb.org/pdf/esi_document_id_66.pdf on October 19, 2005

[20] Ibid.

[21] European Commission, *From Regional Approach to the Stabilisation & Association process.* Accessed at http://europa.eu.int/comm/enlargement/intro/sap/sap_process.htm on December 1, 2005.

[22] Ibid.

Governments can see many incentives for being part of the Accession process, such as high levels of development aid and technical assistance, but there needs to be a significant 'carrot' for any country to go through the politically painful, and often unpopular, reforms that are required to encourage the necessary structural and institutional changes needed for democratization in order to successfully become an EU Member. One of the greatest incentives is the economic development that comes with it. EU Membership allows for the free movement of people and goods among all its member states. For the developing countries of the East, this means the ability to trade with the rich countries of the West without large barriers. These richer countries are able to invest with less transaction costs in the developing Eastern countries, even more so when those countries eventually join the Euro monetary zones.[23]

Many of these acceding and prospective member countries have relatively low incomes (for example, the GNI/Capita in Bulgaria was US$2,130 per year in 2006)[24], and are highly educated. Foreign direct investment (FDI) projects from richer EU countries, which benefit from the lowered transaction costs provided by EU Institutions, create more employment opportunities for the citizens of these developing countries. Moreover, the free visa regime may allow their countries to 'export' some of their unemployment problems, as people move to the more developed EU member states which provide higher salaries and standards of living. However, the EU allows member states to impose transitional immigration and labor market restrictions on new members.[25] All EU-15 member states, except Finland and Sweden, have done this for the recent accessions of both Bulgaria and Romania in order to prevent a mass-migration to the more developed economies. Of the ten countries which acceded to the EU in 2004, only Hungary has imposed restricted access to the free visa regime.[26]

Membership in the EU also increasingly encourages FDI from external non-EU countries as strong institutions and low perceptions of corruption reduce the risk for foreign investors. For Bulgaria, FDI total flows have increased over time, especially leading up to its prospects of EU Accession in 2004.[27] The decrease in FDI after the initial date for Accession was delayed (until 2007) may be related to the specific reasons for the postponement, including high levels of corruption in the country. Yet overall, the EU accession process seems to encourage the development of a good investment climate.

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[23]European Union, "Enlargement." Available at http://ec.europa.eu/enlargement/index_en.htm
[24]Freedom House, "Country Reports: Bulgaria". Available at http://www.freedomhouse.org/template.cfm?page=22&year=2006
[25] European Commission, "Free Movement of Workers to and from Bulgaria and Romania." Accessed on July 10, 2007 at http://ec.europa.eu/employment_social/free_movement/docs_en.htm
[26] BBC News, "EU Free Movement of Labour Map." January 4, 2007. Accessed at http://news.bbc.co.uk/2/hi/europe/3513889.stm
[27] Bulgarian National Bank, Statistics. Accessed December 20, 2007 at www.bnb.bg

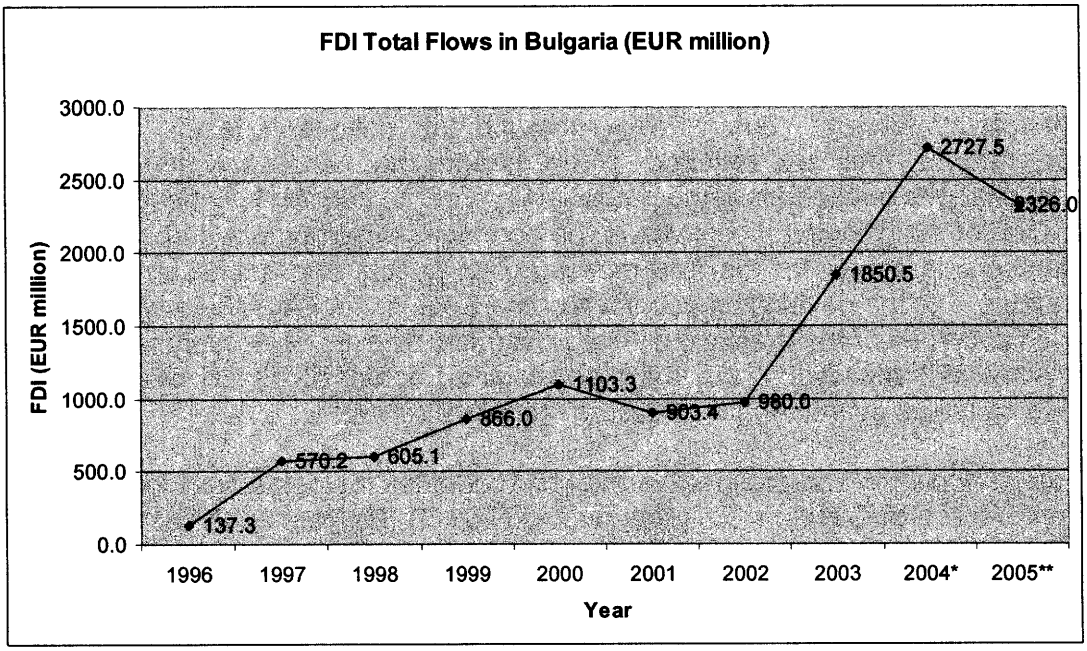

Figure 4: FDI Flows in Bulgaria, 1996 – 2005. (2004* and 2005* values are preliminary). Source: Bulgarian National Bank[28]

According to the World Investment Report 2005, FDI inflows in Southeastern Europe are rising significantly. The levels of FDI inflows nearly tripled to $11 billion since the previous report. Bulgaria and Romania, the two SEE countries that joined the EU in 2007, accounted for more than 70% of the SEE sub-total. While Bulgaria and Romania are not particularly resource rich they still managed to take in more than one-fifth of the total FDI flows to both SEE and the developing countries of the Commonwealth of Independent States (CIS: the former Soviet Republics of Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Russia, Tajikistan, Ukraine, and Uzbekistan; with Turkmenistan as an associate member). Of the CIS countries, the largest investments were in the petroleum rich countries of Russia, Azerbaijan, and Kazakhstan, and together with Ukraine accounted for 93% of FDI in the CIS (See Figure 5).[29]

[28] Ibid.
[29] World Investment Report 2005, "Transnational Corporations and the Internationalization of R&D." United Nations Conference on Trade and Development, New York and Geneva, 2005.

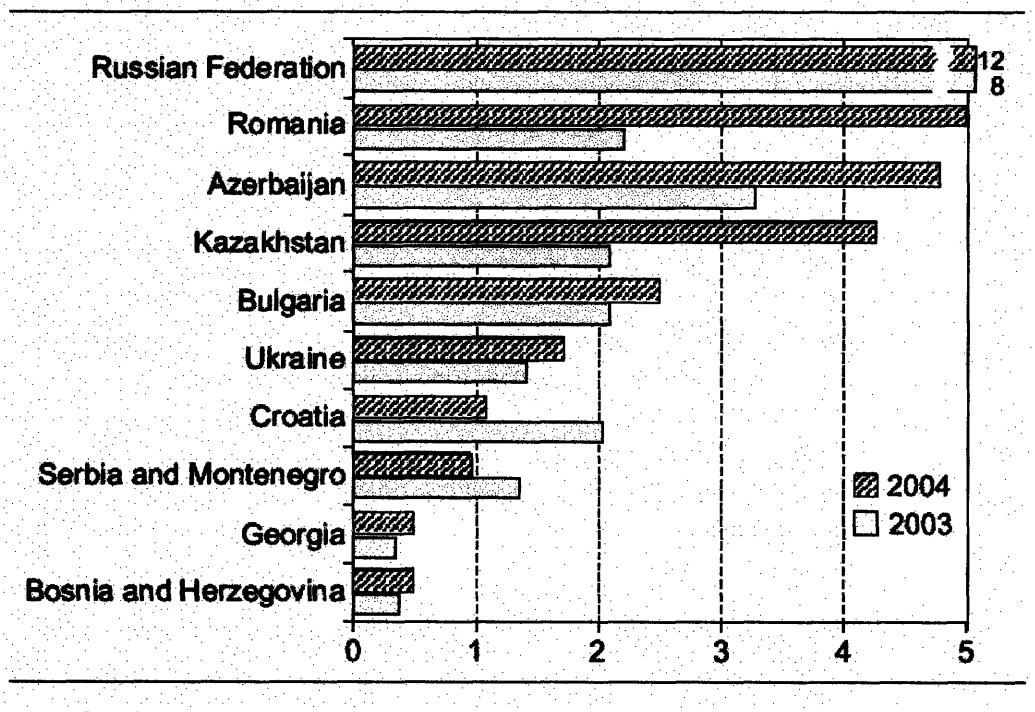

Figure 5: Southeast Europe and CIS: FDI inflows, top 10 recipients, 2003 and 2004 (Billions of Dollars). Source: UNCTAD, FDI/TNC database (www.unctad.org/fdistatistics)[30]

Reinforcing the idea that the EU membership process improves the investment climate, the ten newer EU members, or EU-10, also had a positive experience in the decade preceding their accession. FDI stock grew fivefold between 1995 and 2004, nearly twice as fast as the growth of world FDI stock. The main motivations for foreign investors to invest in pre-accession countries and the EU-10 include the strong economic growth of new EU members (as shown in 2004, where their real GDP grew by more than double the average of the EU-15 with an increase of 5.5%), the competitive unit labor costs, and generally lower corporate tax rates compared to EU-15. New member's access to EU structural funds also improves the business environment through basic infrastructure, human resource, and competitiveness development. Indeed, "full membership of the EU in May 2004 implied the adoption of the full body of EU laws (the *acquis communautaire*) that should reduce risk premiums for investors, while accession to the customs union has lowered transaction costs,"[31] demonstrating the link between the foundation of democratic institutions to economic development prospects.

2.1.2 Requirements for Joining the EU

With all the prospects for economic development that joining the EU offers, there are also very strict requirements for any prospective members which lead to the desirable investment climate discussed above. These are clearly outlined in the Copenhagen Criteria for membership (See Box 2), which are outlined in the Treaty on European

[30] Ibid., p. 76
[31] Ibid., p. 86

Union, in Articles 49 and also 6(1). The requirements include adopting the entire body of legislation of the European Union, called the *acquis communautaire,* which includes a significant amount related to justice and home affairs, as well as environmental legislation.[32] This relinquishes some amount of state sovereignty to the Union, but also includes the added security that comes with membership of such a coalition.

Figure 6: The Copenhagen Criteria for EU Membership

The Copenhagen Criteria for EU Membership[33]	
Political:	• Stability of institutions guaranteeing democracy, the rule of law, human rights and respect for and protection of minorities;
Economic:	• Existence of a functioning market economy • Capacity to cope with competitive pressure and market forces within the Union;
Legal:	• Acceptance of the Community acquis • Public administration should be capable of adopting and applying EU rules • Ability to take on the obligations of membership, including adherence to the aims of political, economic and monetary union.

A democratic government and the institutions that go with it are pre-requisites of joining the EU. This includes the political EU membership requirements of the rule of law, human rights, and respect and protection for minorities. The economic criteria for entrance include having a functioning market economy which has the capacity to withstand the competitive pressures of the EU markets. The level of corruption in a society will have a direct ability on that country's ability to comply with both of the political and economic requirements. The legal requirements, requiring the adoption of EU legislation and rules, are at the basis of developing strong political and economic institutions in these prospective member countries.

The European Union needs to ensure that these democratizing and stabilizing trends continue, and thus require several measures out of candidate and new member countries. Monitoring of the accession process is done both by the EU itself, as well as NGOs, such as the Open Society Institute.[34] There must be transparency and sharing of information to allow proper monitoring to occur. And finally, if a member country, new or old, is found to violate some part of the *acquis,* there are can be punitive measures taken. In the case of the recent candidate countries of Bulgaria and Romania, because

[32]European Commission, "Glossary", Justice and Home Affairs. Available at http://ec.europa.eu/justice_home/glossary/printer/glossary_a_en.htm#Acquis%20communautaire
[33] Treaty on European Union, Article 49 and Article 6(1)
[34] Open Society Institute, "Monitoring the EU Accession Process: Corruption and Anti-corruption Policy." EU Map, 2002.

they were not keeping up with their agreed political reforms, they were penalized by having their accession delayed from May, 2004 to the eventual date of January 1, 2007. Member countries may be fined by the EU for not abiding by EU legislation or for failing to implement the appropriate legislation in their national governments in a timely fashion.

The European Union has adopted several measures and legal instruments to combat corruption in particular, which affects all candidate and member states to some extent. The Convention on the protection of the European Communities financial interests came into force on 17 October 2002, and the European Anti-fraud Office (OLAF) was set up address corruption within EU institutions. The Convention on the fight against corruption involving officials of the European Communities or officials of the EU Member States is still to be ratified. The European Commission proposed a comprehensive EU policy against corruption with measures for preventing and combating corruption in Europe.[35]

2.2 Benefits of Balkan-wide Regional Cooperation

While Balkan regional cooperation can be considered necessary for EU Accession as a practical matter, there are many other reasons that may justify regional integration, leading to a greater prosperity for all in the area and in the EU. While the different countries of Southeastern Europe are in very different stages of development and each has a different pathway to EU accession, there is still good reason to formulate a common approach for the region. Because of the recent violent and fragmenting past, such as the disintegration of Yugoslavia in the 1990s, visible integration in the region would be a way to show the EU that they are prepared to cooperation with their neighbors, improving the security and stability of both the region and the continent through improved relations.[36] Additionally, creating open routes of trade and travel between the countries through improved infrastructure, transportation, and customs cooperation would promote economic development in all the countries, create a greater draw to foreign investors, as well as move the countries closer to the EU.[37] While there has been discussion about such economic regional integration, "there are concrete fears and obvious short term costs that have blocked the idea...," combined with the disincentive from the apprehension that regional integration may become a substitute for EU membership.[38] Many of these fears are grounded in mistrust of others in the region, and that if they give up any part of their control, they may be taken advantage of, as they feel has happened before. Political pressures to show independence from their

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[35] Enlargement Policy Section, "Dealing with corruption in Central and Eastern Europe. Euractive, September 30, 2003

[36] Duško Lopanadić, *Regional Initiatives in South Eastern Europe*. Belgrade: European Movement in Serbia, 2001. p.184

[37] Robert Bosche Stiftung, King Baudouin Foundation, German Marshall Fund of the United States, Charles Stewart Mott Foundation, Report of the International Commission on the Balkans, *The Balkans in Europe's Future*. Sofia 2005. p.31

[38] Ibid.

neighbors is high, and cooperating with the wrong people could mean political suicide for the politician that tries.

Negative attitudes of Balkan regionalism stem from several places, including seeing it as a process that will impede their progress towards the EU, and even the perception of the Stability Pact for South Eastern Europe (See Section 2.3.4.1) as a failure by the regional players themselves. The Pact was "meant to overcome the situation of permanent instability and occasional local conflicts in the Balkans," within the scope of aiming to bring these countries into EU structures and membership.[39] However the Stability Pact, recently renamed the Regional Cooperation Council, is ultimately dependent on the donors and their desires, and the submitted projects are not always selected based on how they fit into an integrated developmental strategy. Moreover, the reluctance the states have to integrate into a Southeastern European region is because "it is perceived to damage their international reputation by associating them with a regional group classified as 'backward'."[40] This negative perception of the region is shared by those who live there, and thus regional cooperation has to build on things that they feel will benefit them, rather than just cooperation because the EU has required it. Indeed, "A practical and interest-driven form of cooperation therefore stands higher chances of local acceptance than forms of cooperation that expect to build, or expect to build on, a sense of belonging to the region."[41] Most of the regional initiatives have been started from the 'outside', through EU or other international pressure or aid, and do not always make a distinction between national problems that are common to the region and may be better dealt with at a national level versus problems that are in fact regional in nature and require a regional solution.[42] When solving a problem, there is a tendency to standardize an approach for the region, when there are very different problems and levels of capacity within each country, and when implementing a solution many countries that are supposed to be part of a regional solution are left out of the process, in lieu of a leading country or two.[43] Local ownership of the process is crucial, and a sense that participation in such a regional program will bring tangible benefits to the nation is the only way to ensure an earnest participation in it.

From the outside of the region, with all historical animosity aside, there are several observable reasons for cooperation such as the sharing of a common language across many different countries in the region, which can be used to promote business and partnerships amongst neighbors. Because in many cases these countries share common cultures and attitudes, the successes and failures of one may help the other in solving a problem in a way that a Western country would not normally solve it. For example, transitioning from centralized, planned economies to a free market scheme is not an experience common to Western Europe, and regional cooperation may bring out

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[39] Duško Lopanadić, p. 140

[40] Gergana Dimitrova, "Strengthening Regional Cooperation and Fostering Local Initiative: Recommendations for Reforming the Stability Pact for Southeast Europe and for Improving International Assistance to Southeast Europe." Research Project, Center for Policy Studies, Budapest, Hungary, 2003. p.45

[41] Ibid.

[42] Ibid., p.27

[43] Ibid.

better, more successful solutions. Additionally, the most obvious reason for regional cooperation in Southeastern Europe is the geographic proximity of the states and the overlapping geological and natural resource base, whose use or misuse has to potential to bring a benefit or great detriment to the region. Geographically, development of common infrastructure for communications, transport and energy delivery is much more feasible on a regional scale.[44]

Also, environmental pollution from one country is likely to affect its neighbors, whether it seeps into the shared water basin, floats over the border as air pollution, or precipitates down as acid rain. Shared resources in the Balkans include the rivers and lakes, crossing many borders and linking the survival of the populations that depend on it without regard for nationality. Valuable ecological wildlife regions are also shared among countries, including the Danube Delta and the Prespa Park, which both have been designated Ramsar sites for the preservation of wetlands.

2.3 Multiple Assistance Efforts

There are many different assistance efforts to the Southeastern European region, including from the UN, the World Bank, the EU, the Stability Pact of Eastern Europe, as well as through individual country initiatives. This section provides a brief overview of the many assistance efforts, particularly those efforts that relate to environmental policy or regulation, infrastructure development, or institutional capacity building. This section is not an exhaustive list, but is intended to highlight the most relevant efforts with relation to environmental technology development in the region.

2.3.1 United Nations

The United Nations, through it's many subdivisions, has many projects in the region touching upon almost all areas of institutional capacity and economic development (UNDP), environmental protection (UNEP and GEF), and cultural preservation and enhancement (UNESCO), among other areas. A major undertaking in the region was UNDP's Danube Regional Project.[45] GEF has given serious funding for conducting the Prespa Lakes study,[46] as well as for the International Waters program, IW:LEARN, which is integrally involved in the PII/A Process. UNESCO has been involved with water resources in the region through the International Network of Water Environment Centers for the Balkans (INWEB), located at the Aristotle University of Thessaloniki, Greece. INWEB develops strategies for environmental education, and expands research and capacity-building in SEE.[47] There is also a UNESCO project on promoting transboundary water management as a tool for peace rather than conflict called Potential Conflict to Cooperation. Often several of these UN bodies collaborate on cross-disciplinary projects.

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[44] Commission of the European Communities, The Stabilisation and Association process for South East Europe: Second Annual Report. Brussels, March 26, 2003. p.13

[45] For more information see: Danube Regional Project: www.undp-drp.org

[46] Personal Communication, Dimitris Karavella, World Wildlife Foundation – Greece, July 12, 2005

[47] For more information see INWEB Website, www.inweb.gr

2.3.2 The European Union

The European Union has instituted many programs for the development of Southeastern Europe and the preparation for eventual EU accession. SEE countries receive different kinds of funding depending on their progress in the accession process and their location (i.e., whether they border other EU members).

2.3.2.1 Pre-Accession Funding

In 2007, a simplified and unified funding mechanism for all pre-accession countries was introduced called the Instrument for Pre-Accession Assistance (IPA).[48] This replaces all former assistance to pre-accession countries, which took the form of the Phare programe, the ISPA program, the SAPARD program, the CARDS program.[49] These programs are discussed in greater detail because of the large role they have played in the past years of pre-accession development.

The Phare program, created in 1989, was one of the pre-accession instruments financed by the EU to aid applicant countries in their preparations for joining the European Union by helping them to make structural economic and political changes.[50] The Phare programming covers the newest member states, including Bulgaria and Romania, but as of 2000 the Western Balkan countries were no longer beneficiaries of the Phare funds. Phare funds have been used for funding "Cross-Border Cooperations" (CBCs) between member states and non-member states.

Instead, as of 2001, the Community Assistance for Reconstruction, Development and Stability in the Balkans (CARDS) had been providing the Western Balkan countries with similar assistance.[51] The CARDS program funding is specifically for promoting stability and peace through the EU's Stabilisation and Association Process (SAP) in the countries of Albania, Bosnia and Herzegovina, Croatia, FYROM, Serbia and Montenegro.

The Instrument for Structural Policies for Pre-Accession (ISPA) was a program specifically designed to finance major environmental and transportation infrastructure in the pre-accession candidate countries. It has funded projects in Central and Eastern Europe, as well as Bulgaria and Romania. Once the countries join the EU, these projects are funded through Cohesion Funds instead.[52]

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[48] European Commission, "Financial Assistance." Accessed on June 30, 2007 at http://ec.europa.eu/enlargement/financial_assistance/index_en.htm

[49] The IPA also replaces the mechanisms of specific pre-accession funds directed toward Turkey.

[50] European Comission, "Phare." Accessed at http://ec.europa.eu/enlargement/financial_assistance/phare/index_en.htm on June 5, 2005

[51] European Commission, "CARDS." Accessed at http://ec.europa.eu/comm/enlargement/cards/index_en.htm on June 5, 2005

[52] European Commission, "Instrument for Structural Policies for Pre-Accession (ISPA)." Accessed at http://ec.europa.eu/regional_policy/funds/ispa/ispa_en.htm on June 5, 2007

The Special Accession Programme for Agriculture & Rural Development (SAPARD) was also designed to help acceding countries in making structural changes to their agriculture sectors and rural areas, as well as in implementing the Common Agricultural Policy and related legislation from the *aquis communautaire*.[53] The program was developed specifically for the 10 beneficiary countries of Central and Eastern Europe, including Romania and Bulgaria.

A variety of projects with specific goals have also been implemented using a variety of the funding mechanisms mentioned above. The Iron Curtain project, which ended in 2004, involved EU members which were bordering countries which were previously behind the 'iron curtain' of communism. Greece was involved with projects along its border with other SEE countries through this program. Funding for specific projects was made possible through EU financing mechanisms including ISPA, Phare, SAPARD, INTERREG III (described below), among others.[54]

2.3.2.2 Structural and Cohesion Funds

There are a variety of structural and cohesion funds, but one that has played a strong role in SEE is the INTERREG program. Interreg has had several stages in promoting inter-regional cooperation starting in 1990. Interreg funding, which began linked to water management and turned into an infrastructure body, has been of the driving forces for financing projects in the Balkans.[55] A previous Interreg II program educated Greek and Bulgarian engineers in 2001 to develop common knowledge.[56] The current funding program, Interreg III, has three stands which specify (A) cross-border cooperation, (B) transnational cooperation, and (C) interregional cooperation. Interreg IIIC helps Europe's regions form partnerships to work together on common projects. By using these partnerships to share knowledge and experience, the regions involved can develop new solutions to economic, social and environmental challenges.[57] A specific Interreg IIB program includes the River Shield Project, which is designed to increase the capacity of the involved members with environmental protection and emergency response services to minimize the impacts of potential industrial accidents.[58] The Eastern Macedonia and Thrace Periphery is a lead partner in the project, which has a budget of 1.28 million Euro and will last until April 2008.[59] The River-Shield partnership consists of competent regional authorities and bodies specialized in environmental protection and regional development from Greece, Hungary, Poland, Czech Republic, Slovenia and Bulgaria.

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[53] SAPARD, Accessed at http://ec.europa.eu/enlargement/financial_assistance/sapard_en.htm on June 5, 2005

[54] The Iron Curtain Project, "Introduction." Accessed at http://www.ironcurtainproject.com on August 16, 2006

[55] Personal Communication, Dimitris Karavella, World Wildlife Foundation – Greece, July 12, 2005.

[56] Personal Communication, Efthymios Darakas, Department of Civil Engineering, AUTh, July 11, 2006.

[57] European Commission, "Interreg III." Accessed at http://ec.europa.eu/regional_policy/interreg3/ on June 20, 2005

[58] Rivers Shield Project, "Project Sumary." Accessed at http://www.rivershield.org/en/ on June 30, 2007

[59] Personal Communication, Dina Nikolaidou, Eastern Macedonia and Thrace Periphery, Kavalas, Greece, July 12, 2006.

2.3.3 *United States*

The United States has been aiding South Eastern Europe through a variety of programs. The US has contributed to the economic development and environmental through the United States Agency for International Development (USAID) and foreign outreach services of a variety of other US departments, such as the US Environmental Protection Agency, the US Geological Survey, and the US Department of Agriculture.

USAID regional infrastructure projects specifically for Balkan countries are organized through the Regional Infrastructure Program for South East Europe, which was designed as a USAID Stability Pact initiative.[60] The program facilitates efforts to spend donor funds on water, transportation, and energy infrastructure. A variety of US partners are involved, such as the prime contractor Booz-Allen-Hamilton. There are also a variety of Public-Private Partnership activities and training projects held in the SEE region. The current major project is improving the transboundary management of the Sava River in Southeastern Europe. The US got involved early in process to create an agreement between Slovenia, Bosnia, Croatia, and Serbia for the River. The project came about because there were transboundary conflicts after the breakup of the former Yugoslavia over the issues of navigation, flood control, and water quality.[61]

Another USAID program which aided Southeastern Europe, along with countries from the former Soviet Union, is Eurasian-American Partnership for Environmentally Sustainable Economies (EcoLinks). The program was designed to facilitate connections and collaborations between cross-border businesses and agencies working on environmental and clean energy technology in order to improve environmental management and infrastructure. The primary goals of the program, which ended in 2006, were to promote market-based solutions for environmental problems, especially in the urban and industrial sectors, promote environmentally focused partnerships between countries and with the US, facilitate trade and investment in environmental goods and services, and provide access to information needed to make environmental technology and management decisions.[62]

2.3.4 *Regional Organizations and Programs*

There are several regional programs and organizations which are in part or entirely focused on Southeastern Europe. Here we only touch upon a few of them to give a sense of some relevant institutions and programs. Of course, the ITCB and the Petersberg Phase II /Athens Declaration Process, described above in Sections 1.3.1 and 1.3.2 respectively, can also be described as regional programs which aim to improve the region of Southeastern Europe through their activities. Other regional programs include the Stability Pact for South Eastern Europe, as well as Black Sea regional organizations which are important to the development vision of the region.

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[60] Regional Infrastructure Program for South East Europe, "RIP Online." Accessed on June 6, 2005 at http://see-rip.com

[61] Personal Communication, Carl Mitchell, USAID, June 6, 2005

[62] EcoLinks, "About EcoLinks." Accessed at http://www.ecolinks.org/about/on June 6, 2005

2.3.4.1 Regional Cooperation Council (The Stability Pact for South Eastern Europe)

The Stability Pact for Southeastern Europe, which is soon to be renamed as the Regional Cooperation Council (RCC)[63], was originally created to maintain stability in the Eastern European countries which were transitioning from communism to democratic societies. The Stability Pact was initiated in 1999 at the EU's initiative to prevent future conflict crises in SEE countries. The Stability Pact has three elements: economic growth, democracy building, and security. The economic growth element has an emphasis on infrastructure development, including water treatment, wastewater, transport, and electric power facilities. The work in this sector complements the work done in the environmental work, which is done mostly through the Regional Environmental Reconstruction Plan (ReREP).[64]

The Regional Environmental Center for Central and Eastern Europe (REC)[65] was founded by the United States, the European Commission, and Hungary in 1990, and today hosts ReREP.[66] The REC has country field offices in in all SEE countries, as well as any Central and Eastern European countries. REC focuses on institutional needs as well as technological 'hardware', and implements REReP programs throughout SEE. The REC has been making a transition from a intergovernmental body into some kind of NGO. It now receives a lot of its support from foundations, and is trying to use its professional capabilities to act more like non-profit environmental consultants.[67]

2.3.4.2 Other

The universities across the Southeastern European region have also recently decided to develop their own network for having debate and dialogue, improve networking among academics, as well as for developing regional policy, education, training, research, assessment, and capacity building. In February 2006, the Balkan Universities Network was founded by the Rectors representing universities across Southeastern Europe.[68] The network universities have, as their main goal, to improve the quality of higher education and research through collaboration in important fields such as social and economic growth, as well as cultural and historical issues. Also, scientific disciplines will collaborate on topics concerning environmental and water issues.[69]

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[63] Stability Pact, "Transforming the Stability Pact: From a conflict prevention and confidence building initiative in South Eastern Europe to a regionally-owned Regional Co-operation Council." Accessed at http://new.stabilitypact.org/about/SPownershipprocessPortal.asp on July 5, 2007

[64] Stability Pact for South Eastern Europe, "Background." Accessed at http://www.stabilitypact.org on June 15, 2006

[65] Regional Environmental Center, "About the REC." Accessed at http://www.rec.org/ on June 2, 2005

[66] Regional Environmental Reconstruction Programme for South Eastern Europe, "Introduction." Accessed at http://rerep.rec.org/ on June 15, 2005

[67] Personal Communication with Staff, Regional Environmental Center (REC) for Central and Southeastern Europe Serbia Field Office, July 2005

[68] Aristotle University of Thessaloniki, "Protocol for the 'Balkan Universities Network.'" Accessed at http://www.auth.gr/inter/memberships/contents/balkan-network_el.html on July 31, 2006

[69] Personal Communication with George Zalides, Associate Professor, Agriculture Department, Aristotle University of Thessaloniki, Greece, July 11, 2006.

Another area which several SEE countries identify with is the Black Sea Region. The Black Sea Economic Cooperation (BSEC) was founded in 1992 by the heads of state of eleven countries: Albania, Armenia, Azerbaijan, Bulgaria, Georgia, Greece, Moldova, Romania, Russia, Turkey and Ukraine. Its purpose is to foster political and economic interaction among member states in a variety of sectors, including environmental protection, energy, agriculture, science and technology, trade and economic development, and exchange of information, among others. BSEC is based in Istanbul, Turkey, and a variety of outside countries are registered as observers, including several EU, Balkan, and Mediterranean countries, as well as the United States.[70]

At the same time, the affiliated Black Sea Trade and Development Bank (BSTDB) was established in 1992, finances a variety of economic development and regional cooperation projects in its member countries. The bank is based in Thessaloniki, Greece, with additional members of Albania, Armenia, Azerbaijan, Bulgaria, Georgia, Moldova, Romania, Russia, Turkey, and Ukraine.[71]

Non-governmental organizations also are playing a larger role in developing the environmental sector of the region. The World Wildlife Foundation does studies related to large donor projects, such as Interreg, as well as monitoring reports. For instance, for the Interreg between Greece and neighboring countries WWF-Greece sits on the monitoring boards. WWF-Greece also conducted a case study of the pipeline being laid between Greece and Turkey. The Orthodox churches also have a role in the area. Recently the Church of Greece and the Patriarch in Istanbul held conference for the Evros River area.[72]

2.4 Transboundary Environmental Cooperation for Peace and Stability

When looking for a live example of how cooperation on the environment has improved the peace and stability of SEE, the Prespa Park case is indeed a stunning example of transboundary environmental issues leading to a stronger and more stable relationship between neighboring countries.[73] At the intersection of the three sovereign nations of Albania, Greece, and the Former Yugoslav Republic of Macedonia (FYROM) lay the Prespa lakes. There is a Macro and a Micro Prespa, and the region shares these lakes and a common water basin, such that activities in one country can immensely impact the quality of the water and of life in another country. These lakes have been the site of an amazing show of trilateral cooperation for the region, both for environmental and political reasons. There are many ecological, cultural, and political elements that have contributed to the degradation of the Prespa region. First and foremost is the conflict of one continuous geographic and ecological area being subdivided by three different governments, each with different approaches for the management and protection of their portion of the region. Also, the local modes of economic activity have put pressure

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[70] Black Sea Economic Cooperation, "About." Accessed at http://www.bsec-organization.org/
[71] Black Sea Trade and Development Bank, "The Bank." Accessed at http://www.bstdb.org/bank.htm
[72] Personal Communication with Dimitris Karavella, July 12, 2005. World Wildlife Foundation – Greece.
[73] C. Electris, "A Case of Trilateral Cooperation for Sustainable Development: The Prespa Lakes." Citizen Science Online Journal, SustainUS, 2006.

onto the ecological region due to farming with chemicals and poor techniques and over-extraction of resources, such as deforestation and water diversion from the rivers and lakes for irrigation. The resulting degradation threatens the endangered and endemic animals that depend on that natural habitat, as well as the survival of the people who depend on that region for their livelihoods.[74]

This has created the need for a 'New Diplomacy,'[75] where a country might have to give up some control over its own territory to improve the overall wellbeing of not only itself, but its neighbors. This New Diplomacy may feel especially uncomfortable for the nations of the Balkans that so recently went through painful struggles to carve out an identity for themselves, often against those very neighbors. The creation of a trilateral 'Prespa Park,' declared jointly by the Prime Ministers of Albania, Greece, and FYROM in February, 2000, was the first of its type of environmental cooperation in Southeastern Europe.[76] The development of a joint management plan for the region has removed some sovereign control of the land, but has created mutual gains for all involved, not only protecting the ecological treasures, but by improving the local economies in the region, and building trust and stability amongst the three countries.[77] Since then there has been a strong following, including the Neretra River between Croatia and Bosnia, which is now using the Prespa Park case as a model. While the Balkan region had at one time been continuous, as recently as the 1990s in the case of the nation-states that once made up Yugoslavia, the productive and sustainable use of these natural resources now need coordination because *nature* knows no borders. In the process, a working relationship, and slowly trust, can be built up over a relatively neutral and clearly fundamental issue, such as the environment. Indeed, out of the Stability Pact for Southeastern Europe,[78] that was intended to build up capacities and return peace to the Balkans after the bloody disintegration of Yugoslavia, "Of all the Stability Pact fields, it was the environment that crossed the borders first."[79]

Regional cooperation does not seem to be merely an option for Southeastern Europe, as the EU has made it quite clear that it is expected and required of countries who wish to join the Accession process. Still, if the integration of the Balkans comes from within, and is based on building mutual gains, rather than just for showing the EU that they can, it will begin a process of building trust between institutions, governments, and most importantly, the people themselves. The regionalization of the Balkans can work in favor of shedding the negative image that is preventing some countries from participating through furthering economic development of the region, while preserving the natural

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[74] World Wildlife Foundation, *Case study on river management: Prespa.* Accessed at http://www.panda.org/about_wwf/what_we_do/freshwater/our_solutions/rivers/irbm/cases/prespa_river_case_study/index.cfm on December. 1, 2005.

[75] William R. Moomaw, "New Diplomacy". The Fletcher School, Tufts University, September 2001.

[76] The Ramsar Convention on Wetlands. *Major Transboundary Park established in Southeastern Europe.* Accessed at http://www.ramsar.org/wwd/0/wwd2000_rpt_prespa.htm on December. 6, 2005

[77] Society for the Protection of Prespa and WWF-Greece, *Strategic Action Plan for the Sustainable Development of the Prespa Park.* Aghios Germanos, Prespa.

[78] The Stability Pact has since been renamed the Regional Cooperation Council (See Section 2.3.4.1)

[79] Regional Environmental Center. Environmental Reconstruction and EU Approximation in South Eastern Europe. REReP 2005. p.73

and historical heritage of the region. A neutral and fundamentally essential issue to further this process along is through cooperation over environmental issues, which are crucial to preserving one of the most valuable assets these countries have, for themselves and for Europe. The creation of a regional environmental regime, with EU goals in mind, can promote the sustainable development of their agricultural and business sectors, without degrading their relatively unexploited nature and resources.

3 Environmental Needs and Capabilities in the Region

During the summer of 2006, we researched the current environmental situation in the Balkan countries of interest to our study. Through a series of interviews, we gathered a good amount of information about the state of the environment and the priority issues in the region, along with what is being done to address these issues. We also gained a better understanding of the technical and regulatory barriers are to the enforcement of the regulations already in place.

The method for studying these issues was primarily through interviewing experts and public figures specializing in environmental issues affecting the region, national or regional policy experts, and from NGOs and other organizations. Interviews occurred in Greece, Serbia, Romania, and Bulgaria during the summer. Additional interviews were done on the same subject in Cyprus while attending a conference in June 2005, and in Brussels, Belgium, in several European Union offices in January 2006.

The questions broadly fell into the following three categories:

- *Environmental Needs*: assessment, priorities, and to what extent does environmental technology contribute to the solution (See Table 1)
- *Technical Capacity*: What are their technical capacities, and their plans for enhancing the capacities (See Table 1)
- *Regulatory Capacity*: What are current regulatory and political supports, what regulatory drivers needed to achieve goals (See Table 2)

The assessment can be broadly summarized in a table as on the following pages. This section discusses some of the major environmental issues that have emerged as regional issues, as shown through the fact that multiple countries have identified these issues as crucial. After the summary charts, we highlight some of the key insights drawn through the series of interviews.

Section 3.1 describes the results obtained from the interviews conducted, allowing for a broad survey of the major environmental issues affecting the Southeastern European region. It brings forward some specific environmental issues which need to be addressed in SEE in the water, air, solid waste and agricultural sectors.

Section 3.2 discusses the countries' priorities, the status of their regulatory system and the capabilities of the region to achieve an improved environmental status, highlighting Bulgaria and Greece, as they are the subject of our case study.

Table 1: Assessment of Environmental Needs/Programs and Technical Capacity

Pollution	Environmental Needs and Programs	Technical Capacity
Water	• Waste-water treatment inadequate or lacking. • Pollution prevention technology lacking or out of date. • The EU Water Framework Directive leads the way. • Many transboundary water initiatives are starting and needed. (i.e.,Petersberg Phase II/Athens Declaration Process)	• Professionals may have the necessary knowledge, but skills are not developed because they don't get the work for these projects as much as do foreign consultants. • There is a 'brain drain' – trained young people prefer private sector or international jobs where they can use their skills and earn more.
Air • Stationary • Mobile	• Power plants are major sources, especially because of low quality local coal, and poor, inefficient technology • Particulates problem from thermal power plants, cement and mining production plants • Cars are generally very old (imported used); some places still have leaded gasoline, or high sulfur content. • Regulations are being put in place to reduce age of cars allowed over the borders	• Less experience in air pollution, but still knowledgeable. • Some technology too difficult to use/develop without experience, but some components could be produced. • Could benefit from stricter regulations on cars, and monitor car quality, etc. • Can develop simulations/ monitoring systems of transboundary pollution. • Renewable energy technologies still relatively minimal. A lot of potential for solar, biomass, and some for wind. Tend to be expensive investments.
Waste • Solid • Hazardous	• Landfills largely not up to EU standards, and in many cases, these are just refuse dumps. • Populace not used to keeping public spaces clean – plastic bottles are littered over the countryside. • Recycling very minimal. • Hazardous wastes are abandoned in old factories which are closed and deserted, often in war-torn areas of former Yugoslavia. • Very old nuclear power stations in Bulgaria.	• Less experience in waste management, but improving. • Some recycling companies developing for profit, however rising energy costs are putting them at economic risk. • Not enough landfills or waste treatment technologies. • Need to develop regional systems that allow collection from small villages, etc., and cross-border 'regions' when it makes sense. • Some nuclear radiation monitoring experience.
Agricultural • Pesticide Use • Soil • Other	• Some regions' farmers have been adding too many agrochemicals because of misinformation. • Other regions are too poor to use enough fertilizers, etc., to yield enough crops. • River drainage systems are not maintained properly, causing floods to be worse. • Soil erosion is a major problem, exacerbated by poor irrigation systems.	• Development of trainings of farmers have increased their awareness. • Irrigation technology can be modernized in many places to minimize soil degradation/erosion and reduce water waste. • Lots of room for improvement in the highly agricultural region.

Table 2: Assessment of Environmental Regulatory Capacity in Southeastern Europe

Regulatory Capacity (Across ALL Environmental Sectors)
• Laws are taken directly from EU regulations & directives, and often result in unclear laws.
• Countries have trouble with frequently changing regulations, sometimes because of frequently changing governments or administrations, resulting in conflicting regulations, with each sector working alone – sectors need better coordination.
• Inspections/monitoring needs improvement (capacity building and training, stronger fines for offenders, etc.).
• Judiciary needs to be stronger – currently process is so long that fines are never enforced in practice.
• Corruption and bribery is a problem.
• Legacy from Communist systems needs work to change – the countries tend towards centralized government, and have less civil society participation for action on a local scale.
• Lots of funds to be had from EU programs and others (WB, U.S.AID, etc), but there is difficulty absorbing the funds.
• Government workers underpaid, which leads to the best people leaving or becoming unmotivated.
• Funds coming from outside donors often come with foreign consultants, who have more experience and can win the tenders, however this leads to less experience for local consultancies and engineers, etc.

3.1 Environmental Issues in the Balkans

The environmental issues in Southeastern Europe are described here in relation to water, air, solid waste and agricultural pollution. This is an attempt to give a broad overview of what is in place both technically and in terms of policies to improve the situation.

3.1.1 Water

There are many freshwater resources in the Balkans, but these resources are often strained by competing uses and multiple states with differing interests. Section 5 describes this issue in greater detail. There are some common environmental issues among these neighboring countries.

Lakes in the Balkans are decreasing in area because of increasing water use for agricultural purposes. Moreover, the freshwater sources are being polluted by runoff of pesticides and fertilizers from agriculture, causing eutrophication.[80] Water pollution is also caused by industrial dumping (often under the cover of night), Oil pollution from refineries, and the dumping of ship wastes directly into the water (i.e., the sea or rivers).[81]

Wastewater treatment plants are greatly lacking in the whole region. In Serbia, even the capital of Belgrade does not have a wastewater treatment plant to protect downstream

[80] Personal Communication with Christos Zerefos, President of the National Observatory, Athens, Greece, July 1, 2005

[81] Giorgos Sideris, Balkan Geophysical Society, June 10, 2005

users of the river basin.[82] In Romania, the capital of Bucharest also does not have a waste-water treatment plant, although a project to build it has begun. In fact, very few cities in Romania have wastewater treatment plants, and if they do, they are old and don't have enough steps to meet the Water Framework Directive, which must have tertiary treatment.[83] There have been EU programs giving many cities 'pre-accession funds,' and after accession, 'Cohesion Funds', which is meant in some part to develop wastewater treatment facilities, as well as other infrastructure. These programs, including PHARE, ISPA (transport), SAPARD (Rural Development), SAMTID, will be used to build or upgrade wastewater treatment facilities to reach EU standards for the Water Framework Directive.[84]

In Bulgaria, the water supply networks are outdated and need to be updated.[85] Also, transboundary water use and pollution is important, since almost half of Bulgarian rivers go through Greece and Turkey.[86] Thus, it is important to have multi-stakeholder collaboration for water, and there have been many projects on this end. Many are the result of the downstream country trying to enforce their rights to some portion of the water. There have been such projects, including a joint project with GWP-Bulgaria, and the Help Unesco Program on the Mesta/Nestos Transboundary River Basin between Greece and Bulgaria, with Prof. Ganoulis in Thessaloniki.[87]

3.1.2 Air

Air pollution used to be a larger problem throughout most of SEE during the expanded industrial development of the communist planned economies. After the collapse of the Soviet Union and the Yugoslavian Communist Government, many of the industries that were contributing heavily to air pollution were no longer competitive in the open market and failed. Thus, the air pollution is relatively much lower. However, the antiquated and polluting technologies are often still being used for electricity generation and other industrial production.

Climate change is also threatening Southeastern European countries as they struggle to manage shared water resources, many which come from upstream countries which may experience similar shortages. Damages from recent environmental disasters, such as floods and storms, have put agriculture in critical situation, and have wiped out villages and critical infrastructure. According to the Intergovernmental Panel on Climate Change, southern European countries will have great challenges as they change towards hotter and drier climates.[88] According to the Fourth Assessment Report, there will be decreasing water availability in southern and southeastern Europe. The hydropower

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[82] Personal Communication with Staff, Regional Environmental Center (REC) for Central and Southeastern Europe Serbia Field Office, July 2005
[83] Personal Communication with Staff, ENINVEST Romanian Consulting Firm, July 2005
[84] Ibid.
[85] Personal Communication with Milkana Mochurova, Bulgarian Academy of Sciences, July 2005
[86] Personal Communication with Scientists from Various Departments, Bulgarian Academy of Science, July 2005
[87] Personal Communication with Milkana Mochurova, Bulgarian Academy of Sciences, July 2005
[88] Joseph Alcamo, José M. Moreno, and Béla Nováky, "Europe." Intergovernmental Panel on Climate Change (IPCC) Working Group II contribution to the IPCC Fourth Assessment Report, Chapter 12, p.547

potential of Europe is expected to decline by the 2070s by an average of 6%, but around the Mediterranean it is expected that the potential will drop by around 20 to 50%.[89]

A lot of the air pollution comes from the use of old technology and poor quality fuels. For instance, 60-70% pollution comes from cars, construction machines, industrial plants, and energy production plants, especially coal plants. Pollution from energy production depends heavily on the quality of fuels, and these countries have poor quality fuel, mostly solid (i.e., coal) with high sulfur content which results in high levels of pollution. Additionally, many SEE countries have old engine technology, and having the newest combustion technology would improve the situation.[90] Greece has the best technology of the region. Power plants are biggest source of SO_4 in Balkans, and maybe Europe.[91]

In Serbia, air pollution is largely generated from the energy sector, from the large thermo-electric plants, District Heating plants, and fuel combustion in homes (wood, oil, coal). Serbian thermal power plants use local coal (lignite), which has a high sulpher content, and the sulpher particulates (i.e., ashes) are a problem. Some of the power plants have received EU credits for desulphurization. Particulates are also a problem from cement plants[92] (there are three or four large plants, mostly privatized by foreign companies, i.e. French and Greek), and the Boar mining production (which is currently going into restructuring).[93]

The air pollution in Bulgaria is also a large issue and the Energy sector is a great contributer. In Starsegorav, where there are several factories, the SO_2 pollution which was plaguing the town is actually occurring from the large electric power plant operating with low quality coal. Interesting meteorological data did not show the flow coming from the factories, and now there is a parliamentary commission to investigate.[94]

Bulgaria is a large exporter of electricity. The Power plants have limits for NO_2 of 350 mg/cubic meter, up to 2007, while the EU limit is 200 mg/cubic meter. Some power plants run with 'brown' coal from Russia (in Russe and Varna), while others run with domestic low-quality lignite coal. There is also some nuclear power generation as well, which through EU regulations must be shut down because the technology is very old. There is a plan for a new nuclear plant built on modern technology.[95]

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[89] Ibid., p.543.
[90] Personal Communication with Panayotis Siskos, Professor of Chemistry, University of Athens, June 2005
[91] Personal Communication with Scientists from Various Departments, Bulgarian Academy of Science, July 2005
[92] Personal Communication with Staff, Regional Environmental Center (REC) for Central and Southeastern Europe Serbia Field Office, July 2005
[93] Personal Communication with Assistant Director International Cooperation and European Integration, Directorate for the Environmental Protection, Ministry for Science and Environmental Protection, Republic of Serbia, July 2005
[94] Personal Communication with Scientists from Various Departments, Bulgarian Academy of Science, July 2005
[95] Ibid.

The many centralized district heating systems use natural gas, yet because of the old technology incur many losses.[96] In Bulgaria, there are measures being taken to improve energy efficiency. Energy audits for large companies and buildings are being conducted, resulting in efficiency Certification. People are becoming more aware about this. The District heating company has an agreement with the World Bank to sell CO_2 pollution credits for the next 10 years. The WB will buy portion of emissions savings resulting from the financed projects.[97]

Renewables are an obvious part of the solution for the SEE region. For example, Romania is trying to develop renewable energy, and there is a lot of hydro-electric plants, some Biomass, solar, and wind. While wind is a great resource for Romania, the efficiency has not yet been proven because the speed and direction of the wind changes so often that the technology cannot cope quickly enough to be efficient. Also, the wind does not stay at a constant speed for long durations in some parts. Attempts at wind energy have been made in Constantza.[98]

In Bulgaria, renewables energy sources are only beginning to be implemented. Only about 1.5% of energy comes from renewable sources, not including wood burned in villages, etc. Solar energy may be convenient, but are very expensive so there aren't many installations – mainly trials. There is not much wind-power, however there is some hydropower stations throughout the country. Some small plants are used as additional energy sources when demand peaks and consumption is very high, but they do not run continually. There is also one Accumulating Hydropower Station, made with Japanese technology.[99]

In Serbia, the government does pay attention to pollution coming from the power plants, and the EC has also given funding to renew the Serbian power plants. The Serbian Michajlo Pupin Institute develops large electrostatic filters for the chimneys on power plants. Foreign investors seem to pay more attention to what pollution they are producing. Before US Steel took over the steel plant, there was chaos, but now the industry pays attention to what they pollute. Since the US Steel plant in Serbia has been very strong in meeting such regulations, people presume that many other foreign companies do also (i.e., Nir, Din, Philip Morris). [100]

A major contributor of air pollution is automobiles and traffic, which is a growing concern in the Balkans. In Bulgaria, the car regulations are not very strict, and not what they must be because people are poor and old cars are cheaper. The situation is improving, but slowly. [101] In Serbia, this is especially true because of the low-quality and leaded gasoline produced in Serbia and the large number of old automobiles on the road in

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[96] Ibid.
[97] Ibid.
[98] Personal Communication with Staff, ENINVEST Romanian Consulting Firm, July 2005
[99] Personal Communication with Scientists from Various Departments, Bulgarian Academy of Science, July 2005
[100] Personal Communication with Scientists from Michajlo Pupin Institute, Belgrade, Serbia, July 2005
[101] Personal Communication with Scientists from Various Departments, Bulgarian Academy of Science, July 2005

Serbia. There are only two oil refineries in Novi Sod and Pancevo do not create the higher grade gasoline required in the EU[102] In order for Serbia to change to unleaded gasoline, it would cost around 1 billion dollars to reconstruct and improve the refinery technologies. Interestingly, the Serbian people feel that this is beyond their responsibilities because it was the NATO bombings which reduced the refineries' capacities and caused many damages for the country. [103] In 2005, a new regulation was passed which does not allow Serbians to import cars more than three years old, however this regulation may change, as it is difficult for Serbians to afford new cars.

Automobile pollution is also a large problem in Romania, especially in the capital, Bucharest, where there is little wind.The pollution creates smog throughout the city. To reduce this, the government imposed gas regulations to eliminate sulfur content, and refineries must adapt. Leaded gasoline is still used, but through the Environment fund, the government stimulates old car owners to get new cars with a grant of 1000 Euros, so slowly the car stock will be changed. Before the 1990s, cars were a huge luxury in Romania, as you had to pay for the car seven years before receiving it. After the 1990s, the importing of second-hand cars from Europe became very popular. Then, because of pollution regulations imposing that the age of imported cars cannot be greater than eight years, people would simply not register the car, but would still import it. Then it was imposed that cars must have catalytic converters. Currently the regulation is very strict, requiring that cars be checked periodically. It will soon become compulsory to put a certain device which reduces pollution on the car as well.[104]

Air pollution from industry is also a big issue, although the SEE countries are not as active as they once were. For example, in Vratsuv, Bulgaria, there is big fertilizer factory, where some ammonia tanks had gas escaping in fumes.[105]

Transboundary air pollution is an issue in such a small region with so many individual countries. For instance, there was a Bulgarian factory on the Danube River which was producing Chlorine in the air, and damaged the city of Russe on the Romanian side of the river. There was a Joint Bulgarian and Romanian commission to resolve the problem. In any case, the factory closed because of economic reasons. [106] Transboundary Air pollution to Bulgaria is common because the prevailing wind is from West to East.[107] Also, through simulations of air pollution transport in the Balkans and pollution exchange in these countries, levels of SO_2 were found to be high in Thessaloniki without a local source. It was then discovered that this pollution was

[102] Personal Communication with Staff, Regional Environmental Center (REC) for Central and Southeastern Europe Serbia Field Office, July 2005
[103] Personal Communication with Assistant Director International Cooperation and European Integration, Directorate for the Environmental Protection, Ministry for Science and Environmental Protection, Republic of Serbia, July 2005
[104] Personal Communication with Staff, ENINVEST Romanian Consulting Firm, July 2005
[105] Personal Communication with Scientists from Various Departments, Bulgarian Academy of Science, July 2005
[106] Ibid.
[107] Ibid.

coming from the North-East from the Maritia Power Plants, and in some cases up to 80% comes from Bulgarian sources and sometimes significant parts from Romania.[108]

3.1.3 Solid Waste

Solid waste management is a common issue in SEE because of the lack of infrastructure and often because of a different waste-disposal culture on the local level. Recycling is generally not very common, although there is great potential in the region. Additioanlly, most hazardous waste is not properly treated, and in most areas of the region, it is buried.[109]

In Serbia, waste management has been focused on building regional landfills which can be shared by multiple municipalities. A new plan was adopted in July 2003. However it is crucial to develop the entire system of waste management beyond the landfills, including recycling stations and transfer stations where small towns far away from landfills would transfer the waste from small trucks to large trucks. [110] In Romania, there were traditionally open dump sites, however landfills were not used. Now there is an association of waste management operators which are private collectors who building and operate the landfills.[111]

In Bulgaria, landfills mostly were not built to fit any requirements/standards. Sofia, which generates 1000 tons of waste per day, had completely filled its landfill as of 2005, and there was not yet another place chosen for a landfill. They were temporarily packing and storing the waste. Other Bulgarian cities have big problems too. With financing from the EU PHARE program, several landfills are beginning to be built, but only about 10 landfills near big cities so far.[112]

During Soviet times, there was some recycling because resources were more limited, but now during the 15 years of transition, it has become much worse. In Bulgaria, most solid waste collection still does not separate waste from recyclables, except from enterprises. For the general public, waste collection is not organized that way, although in some municipalities, there seems to be an effort to begin changing this culture. However, people not used to keeping public places clean. Much waste is found on the highways, roads, and in fields. Littering regulations are typically not enforced.[113]

Plastic bottles for sodas are a big problem in the Balkans. In Serbia alone there are estimated to be 25 billion bottles littered along roads, in fields, and in the countryside. [114] Plastic bags are also a big problem in the region. The current culture in the region is to

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[108] Ibid.
[109] Personal Communication with Christos Zerefos, President of the National Observatory, Athens, Greece, July 1, 2005
[110] Personal Communication with Staff, Regional Environmental Center (REC) for Central and Southeastern Europe Serbia Field Office, July 2005
[111] Personal Communication with Staff, ENINVEST Romanian Consulting Firm, July 2005
[112] Personal Communication with Scientists from Various Departments, Bulgarian Academy of Science, July 2005
[113] Ibid.
[114] Personal Communication with Scientists from Michajlo Pupin Institute, Belgrade, Serbia, July 2005

use and toss the trash anywhere. There is currently no motivation for gathering the bottles. Some believe that the producers of these bottles must pay to have these collected or encourage recycling (i.e., the manufacturers such as Coca Cola).[115] In Serbia there is a recycling plant planned near Novi Sod, and there are some other small recycling initiatives.[116]

Recycling in Romania is beginning to take root on a private basis. In urban areas, the private garbage collectors are sorting and recycling the solid waste themselves because they can increase the efficiency of the landfills, and thus there is some value to them. Elsewhere, the Roma people in Romania collect metal and plastics because they can get some money for it.[117] It is unclear whether the recycling industry will make it in Romania because, while some companies are making profits, their plans are based on energy costs which are increasing dramatically.[118] More efficient technologies may improve these prospects.

3.1.4 Agricultural

Because many regions within SEE are relatively poor, the agricultural pollution is not as extensive as it may have been during the communist period when agrochemicals were more affordable. However, proper education is lacking in the safe amounts and application of these agrochemicals and the excess chemicals introduced through the run-off of the upstream treated fields. Intensive livestock production also contributes to the

Livestock farms can be problems in this region because of poor wastewater management. For example in Romania, where there are 145 pig and poultry installations, the water quality is being affected by a lack of proper technology. Many such installations need first projects to improve the technology for pollution prevention and then the construction of proper wastewater treatment facilities.[119]

There is a great need for a private or public service which could advise farmers how to improve their crop quality and production through teaching them how to best deal with pests, either through integrated pest management or correct application of pesticides and fertilizers. Some chemical companies try to do this; however they also sell the agrochemicals, and thus have an incentive to push the extensive use of these. In Serbia, there are firms selling everything needed by farmers. There are some government institutes which control the quality of the food before reaching the market, but there is no feedback to the farmers to allow for improvements.[120] In Bulgaria, farmers still don't have enough money to buy enough fertilizers, so over-fertilizing is not a big problem yet. Official data from the Bulgarian Ministry of Agriculture on the

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[115] Ibid.
[116] Personal Communication with Staff, Regional Environmental Center (REC) for Central and Southeastern Europe Serbia Field Office, July 2005
[117] Personal Communication with Staff, ENINVEST Romanian Consulting Firm, July 2005
[118] Personal Communication with Staff, ENINVEST Romanian Consulting Firm, July 2005
[119] Consular for EU Integration for IPPC Directive, (works with Ministry of Environment), Romania
[120] Personal Communication with Scientists from Michajlo Pupin Institute, Belgrade, Serbia, July 2005

implementation of fertilizers say that farmers as a whole use two times less fertilizer than needed, so there is a much lower wheat/corn yield.[121]

In Romania, farmers are often buying more product than they need from DuPont, called Aektra in Romania, and other such companies.[122] These chemical companies hold a lot of power over the agricultural sector in Romania. A farmer complained about Aektra efficacy, and was told to take it to court, however farmers are not currently organized, and cannot easily bring cases to court. While currently there is some organization around particular products, like particular fruits, vegetables, or wine, there is no broad organization of farmers on the issue of plant protection products or pests. This may happen in several years and will allow the farmers a greater power against the pesticide companies.[123]

Disposal of remaining agrochemicals and their containers is also a problem in the region. In Romania, county unit inspectors search for pesticides that remain after use. For example, if a farmer purchases 200 kL of agrochemcials, and after the season 20 kL remain, the inspector will look to see what the farmer will do with the remaining product and container. In 2005 there was a program with Germany to collect unused pesticides which had expired or were not used and bring them to Germany to be disposed of properly. In the past, some Romanian farmers were throwing out the remaining products in the fields, or storing them past their shelf-life. Over the past 5 years, however, this has been reduced because of more proper training has been provided to farmers.[124]

3.2 Priorities, Regulatory Status and Capabilities

The environmental priorities in Southeastern Europe are not identical between countries, but have significant overlap. All SEE countries have dramatic needs in all sectors, with Water Resource Management, solid waste management, effluence management, air pollution, and agricultural pollution at the top of each countries lists.[125] The ReREP taskforce develops regular reports of regional priorities in REC regions.[126]

Overall, the environmental field is not yet very demanded or mature. The legislation coming from the old communist period was very confusing for the environment. Some countries had extremely strict environmental standards, some of which were technologically impossible. However, no one was applying the standards or controlling and enforcing them, and so they have started from an extremely low implementation

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[121] Personal Communication with Scientists from Various Departments, Bulgarian Academy of Science, July 2005
[122] Romanian Ministry of Agriculture, Forests, and Rural Development, Ministry of European Integration
[123] Romanian Ministry of Agriculture, Forests, and Rural Development, Ministry of European Integration
[124] Romanian Ministry of Agriculture, Forests, and Rural Development, Ministry of European Integration
[125] Personal Communication with Marc Bonazountas, VP of EPSILON International SA Consulting, July 5, 2005
[126] Personal Communication with Staff, Regional Environmental Center (REC) for Central and Southeastern Europe Serbia Field Office, July 2005

point, as if there were no legislation for many environmental parameters. In other countries, there was no environmental legislation, and no reports on the state of the environment. Today all countries tend to include all the EU requirements – so has been a big jump from nothing being regulated to everything being regulated.[127]

The capacity of the ex-communist countries is greater than many other developing countries because they have developed some technology and have retained some capacity from the highly bureaucratic states.[128] However the bureaucracy is not well-organized, and there is a lack of institutions to do what is needed. There are still not many worthwhile decentralized action plans for environmental protection, especially from within the Balkans.[129] The countries of the region have not all updated regulations, and some countries, like Greece, are not implementing or enforcing environmental standards because they are aloof.[130]

While these countries traditionally had a high level of theoretical scientists, they had very poor applied scientists, i.e., environmental engineers. There was limited application of environmental technology, and did not have a regular and organized network for environmental data.[131] The Balkan countries have a lot of scientific experience in Geophysical studies, coming from the University of Bucharest, the Bulgarian Academy of Science, the Tirana Academy, and the University of Belgrade, among others.[132] However, the countries in the region are poor, and there are few research institutes. They cannot buy new technologies alone and need support through EU projects.[133] In the past, they had means from Russia and China, but after the fall of communism, they were left with old equipment, utilities, and technology in general. Even after one year, it becomes old.[134] Bulgaria, Serbia, Romania have had their own companies creating environmental technology systems, but the technological level is much lower than EU standards require. These countries will have to transform their old experience into the application of new technologies in order to succeed.[135] BiH, Albania, FYROM have no technology experience at all, and must build this capacity through creating the local infrastructure, or they can 'buy' the technology from other countries.[136]

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[127] Personal Communication with Spyros Papagrigoriou, ENVECO S.A. Greek Environmental Consulting Company, July 2005
[128] Personal Communication with Marc Bonazountas, VP of EPSILON International SA Consulting, July 5, 2005
[129] Personal Communication with George Kallis, University of the Aegean, Athens, Greece June 10, 2005
[130] Personal Communication with Marc Bonazountas, VP of EPSILON International SA Consulting, July 5, 2005
[131] Personal Communication with Spyros Papagrigoriou, ENVECO S.A. Greek Environmental Consulting Company, July 2005
[132] Personal Communication with Giorgos Sideris, Balkan Geophysical Society, June 10, 2005
[133] Ibid.
[134] Ibid.
[135] Personal Communication with Spyros Papagrigoriou, ENVECO S.A. Greek Environmental Consulting Company, July 2005
[136] Ibid.

3.2.1 Bulgaria

Bulgaria has a good background for improving its environmental situation through technology and regulations. Bulgarian society has a deeper scientific knowledge than some SEE countries, but also has limited financial possibilities. While the country is a bit richer than its neighbors, it has had to focus on complying with issues in the order of EU's priority in order to become a member, and thus could not focus on developing its own priorities.[137]

3.2.1.1 Challenges

There are many environmental issues in Bulgaria – with lots of room to improve. This includes water, waste water treatment, solid waste, use of pesticides, and air pollution, all of which have become very big issues (See Table 3 below).[138]

Table 3: Priority Environmental Issues for Bulgaria

Priorities	**Details**
Water, Waste Water Treatment	Freshwater use management needs to be improved. There are many leakages in the current system. There are great needs for construction of waste water treatment facilities for human settlement areas.
Solid Waste	Solid waste management is a problem – many smaller communities do not properly dispose of solid waste, sometimes dumping directly into rivers.
Use of Agrochemicals	Agricultural pollution, because industrial development has slowed, has become a primary source of pollutants in freshwater surface and ground waters.
Air Pollution	Poor combustion technology and poor-quality fuels has lead to excessive air pollution in some areas.
Energy	Many industries and the building sector are very energy inefficient. Energy from the nuclear power plant will be reduced when closed because of EU fears of safety, and there is a potential for a large energy deficit.

While trying to reach EU accession, Bulgaria has had to comply with EU priorities for environmental and economic regulations. The order of how they deal with their environmental challenges are often determined by the donors' priorities and the projects which get funded. For example, the USAID priorities for Bulgaria included economic growth, local government capacity, rule of law, and making their programs sustainable so they will continue once USAID has left after EU accession.[139]

[137] Personal Communication with Emmanuel Damigos, Senior Consultant on Quality Environmental, Safety Management and on Business Excellence, Athens, Greece, June 10, 2005
[138] Personal Communication with Ivanina Beleva, USAID, Sofia, Bulgaria, July, 2005
[139] Personal Communication with Ivanina Beleva, USAID, Sofia, Bulgaria, July, 2005

Energy efficiency is also a large problem in the country, and EU requirements to shut down the nuclear power plant which provides large amounts of electricity to the country because of its old technology. If the country doesn't begin taking measures for more energy savings, there will be a deficit. However, there is great potential for energy savings, especially in the building sector (which is in fact a regional problem). All new buildings should be made with new technologies. Big cooperatively owned buildings (with ~100 families) should all agree to make some energy saving measures. This can be solved by some regulatory measures[140]

3.2.1.2 Regulatory Environment

The regulatory situation in Bulgaria has improved greatly from approximation efforts to the EU *aquis* and international agreements. The Bulgarian government has adapted to EU legislation, and all elements should be realized by 2007. Bulgaria is even planning to join CO2 emissions trading scheme in 2007/2008.[141] Laws transcribed from EU legislation include laws for environmental protection, and laws about public access to information and participation. The problem is the application of laws, administrative capacity, and functioning of judicial system.[142]

Bulgaria has very good laws and international agreements, but for law to become practice you need sub-law documents, or "regulations" However, there are still problems. For instance, some articles in legislation are not formulated well, with contradictions confusing those who must comply.[143] There is a lack of balance between laws and bylaws. Laws sometimes go into too much detail in which they are become too specific (especially in the Water Act) regulating, for example, ways of giving permits. The laws quickly become outdated. If regulated by bylaws instead, the Council of Ministers and the environmental agency can do it much easier.[144]

Administratively, there are still remnants of the Communist era. For instance, there is still a big centralization of government, a lack of civil society, which works on low levels for its own surrounding. The situation affects cities as well, as municipalities do not have enough money for local implementation to clean up the towns because the central government takes almost all the tax revenue.[145] However, many investments have been made through EU pre-accession funds, and now Bulgaria is adapting to structural and other funds that will come with accession. The main sources so far have been from the PHARE program, SAPPART (for agriculture), RENV, ISPA. Other investments have come from the World Bank and the Global Environmental Facility.[146]

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[140] Personal Communication with Scientists from Various Departments, Bulgarian Academy of Science, July 2005
[141] Ibid.
[142] Personal Communication with Milkana Mochurova, Bulgarian Academy of Sciences, July 2005
[143] Ibid.
[144] Personal Communication with Scientists from Various Departments, Bulgarian Academy of Science, July 2005
[145] Ibid.
[146] Ibid.

Enforcement of regulations in Bulgaria is generally a problem because of poor implementation, a weak judicial system, and penalties which are either too low or not enforced very often.[147] The judicial system doesn't function as effectively as it could, as court cases are very slow, and crime and corruption are high. However, with the base level now very low, there is a lot of room to improve on this aspect.[148]

3.2.1.3 Local Capacity

There is enough technological capacity with trained people in Bulgaria. There are numerous companies, certified consultancies, etc., which deliver technology and equipment for all needs of environmental industry; however everything is a matter of money.[149] Many industries will have to close when they must comply fully with the new EU-based regulations because they don't have the money to invest in new technologies. Many small agriculture-related industries may not survive, i.e., milk, cheese, dairy production. Other newer EU members, such as Hungary and the Czech Republic, are both dealing with this now as well.[150]

The Administrative capacity of Bulgarian administration is not good enough to absorb all the funds that have been provided by the various donors, and as of the 2007 accession date there will be more funds coming from the EU. Greece also had trouble absorbing the structural funds for similar reasons. One reason is that people not paid sufficiently well in the administrations. Young qualified people often work for the ministries for several years, get trainings through the government and international programs, and leave for private sector because they are not motivated. Another contributing factor is that, because the heads of divisions and some of the deputy ministers are political appointees, the instability in the government has frequently changed the ministries' direction.[151] Because the political framework changes often, when one legislative or regulatory document is completed, it must be redone.[152]

3.2.2 Greece

Greece, although a member of the European Union since 1981, has had serious difficulty in dealing with the environmental problems it faces. Legislation has been lagging behind EU deadlines, and implementation is generally lacking. The capacity for the technology to be developed and disseminated is great, because there is a highly educated population. However, the administration, which is part of a highly bureaucratic and inefficient public sector, has not had the capacity to fully absorb EU funding effectively to implement legislation meeting EU regulations.

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[147] Personal Communication with Ivanina Beleva, USAID, Sofia, Bulgaria, July, 2005
[148] Personal Communication with Scientists from Various Departments, Bulgarian Academy of Science, July 2005
[149] Ibid.
[150] Personal Communication with Ivanina Beleva, USAID, Sofia, Bulgaria, July, 2005
[151] Ibid.
[152] Personal Communication with Scientists from Various Departments, Bulgarian Academy of Science, July 2005

3.2.2.1 Challenges

Greece's priority environmental concerns involve the high level of air pollution, poor water resource management and waste water treatment, insufficient management of solid waste disposal, and agricultural pollution caused by excessive use of agrochemicals (See Table 4).

Table 4: Priority Environmental Issues for Greece

Priorities	**Details**
Air pollution	Pollution from excessive automobile traffic, low-quality coal power generation, and poor technology has plagued Greece, especially in the greater Athens area, where the geography heightens the problem. The case study area has a fertilizer plant which emits toxic fumes, causing problems for the nature immediately surrounding it.
Water and waste water treatment	Agriculture consumes much of the freshwater resources and tends to be inefficient, especially by crop choices made. There is an overall lack of waste water treatment capacity, especially in smaller towns and rural areas. Even Athens has only recently caught up with its WWTP needs.
Solid waste	Proper disposal of solid waste is a problem throughout Greece. Old habits of tossing unwanted garbage out in the open has resulted in many dump sites which are not up to EU and Greek regulations. This affects water quality and the appearance of the landscape. Recycling is only starting to take foot in the Athens area, and has not been expanded to the rest of the country in any real way.
Agrochemical pollution	Farmers use agrochemicals, including chemical fertilizers, often in excess of the real needs. There is a lack of unbiased advice on the use of these. There are subsidies which affect the farmers choice of crop and production method. There are cases of agrochemical levels being beyond allowable limits in various freshwater surface and ground water sources.

Air pollution has been a big problem for Greece, especially in the densely populated Athens area. It was first tackled first by desulfurizing the oil, and has also been improved by controlling emissions with catalytic converters in the cars since 1990, and thus the problem has stabilized in Greece. Greece's problem is now mostly ozone and both manmade and natural aerosols (bioemissions from trees).[153] However many

[153] Personal Communication with Christos Zerefos, President of the National Observatory, Athens, Greece, July 1, 2005

companies keep polluting because it's too expensive not to.[154] The Greek power company (DEI) burns poor quality lignite, and is notorious polluter. They are being sued by the EU for their polluting activity.[155]

Greek water resource problems are caused by a conflict of users and by inefficient management of the resources. Agriculture is using 80-85% of available resources, but the tourism industry is increasing its demand. In the numerous coastal areas of Greece's mainland and islands, the salinization of aquifers, especially on islands, is occurring from over-extraction.[156] The lakes on the border of Greece and FYROM are drying up because of diversions of the rivers which feed them.[157]

Waste water treatment facilities are lacking throughout the country, especially in smaller communities. Even in Athens, there had been a growing problem from the city's waste water treatment plant on the Psyttaleia Island.[158] Large amount of waste-water sludge produced because it had only conducted primary treatment., however after years of uncertainty over what would become of the 150 thousand tons accumulated sewage sludge, a secondary stage treatment and drying plant was developed and initiated in June, 2007.[159]

There is a growing problem with agricultural pollution and nitrates in the water. Greece over fertilizes largely because of the heavy subsidies to agriculture and the lack of education about the consequences. While the EU and Greece have a noble intent to help support the farmers through subsidies, there are personal health and safety issues that must be considered. The farmers end up polluting water resources, and often produce crops which are not valuable to the economy.[160] In Lake Koronia, a Ramsar protected site in Greece, excessive agricultural pollution, along with urban waste water, contributed to a catastrophe where thousands of birds and fish died.[161] Indeed the top source of water pollution in Greece is from agriculture, from over-fertilization.[162] Agrochemicals pollute surface and underground water sources. For instance, in the Farsala and Larissa areas, ther are nitrate level limits of 50 ppm, however nitrates have been measured as high as 75 ppm.[163]Cotton, rice, and tobacco have been heavily subsidized in Greece, and farmers go on strike when there are reductions in these subsidy. Moreover, many cotton and rice areas are reclaimed wetlands from years ago.

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[154] Personal Communication with Manolis Stefanakis, the then President of the American Farm School, Thessaloniki, Greece, July 11, 2005
[155] Ibid.
[156] Personal Communication with George Kallis, University of the Aegean, Athens, Greece June 10, 2005
[157] Personal Communication with Manolis Stefanakis, the then President of the American Farm School, Thessaloniki, Greece, July 11, 2005
[158] Personal Communication with Christina Theochari, Technical Chamber of Greece, Advisor to General Confederation of Labor Issues, Athens, Greece, June 8, 2005
[159] Athens News Agency, "PM and environment minister visit Psyttalia sewage works." July 6, 2007. Accessed at http://www.hri.org/news/greek/apeen/2007/07-06-07_1.apeen.html
[160] Personal Communication with George Kallis, University of the Aegean, Athens, Greece June 10, 2005
[161] Ibid.
[162] Personal Communication with Manolis Stefanakis, the then President of the American Farm School. Thessaloniki, Greece, July 11, 2005
[163] Personal Communication with Giorgos Sideris, Balkan Geophysical Society, June 10, 2005

Prior to becoming cropland, these wetlands acted as biofitters for contaminants going into the sea, lakes, and ground water, but now many of these contaminants flow directly into the water.[164]

3.2.2.2 Regulatory Environment

Environmental legislation in Greece is looking at serious issues looked at by the EU Commission.[165] However Greece has had some delays in harmonizing to EU legislation/directives. Moreover, even for appropriate legislation, there has been a lack of implementation. This has caused the EU courts to bring charges against the Greek Government.[166] Greece must obey EU directives, as all European Union members must; otherwise they pay penalties, as they have for failures in the implementation of directives on Water, Protection of Forest areas and National Beauty, and others.[167]

In fact, Greece has been taken to EU court approximately 60 times – mostly related to poor vertical and horizontal organization in the Ministry of Environment. It is an organizational problem because inspectorates are not reporting regularly and efficiently about the environmental issues.[168] The Greek government is supposed to monitor the water quality every three months; however it is unclear whether inspections are actually occurring. One barrier is the lack of financing, but it is also that they do not seem to care about this.[169] Another is that there is no effective enforcement of the regulations in place.[170]

Industry in Greece sometimes influences government – depends on sector. Because it is often necessary to invest money to meet regulations, the companies pretend not to have the money in order to get governmental exceptions, however they will often invest in other areas. These companies need to be convinced that they need to invest in environment in order to survive.[171]

The poor state of regulation in Greece is about a lack of will, not just knowledge. The civil service in Greece is bloated, and people are paid not to work.[172] If one person starts doing too much, others around them will look bad, so there is a downward pressure. Right now Greece is only crisis-driven, but in the long term it will not be able

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[164] Personal Communication with Manolis Stefanakis, the then President of the American Farm School, Thessaloniki, Greece, July 11, 2005
[165] Personal Communication, Dimitris Karavella, World Wildlife Foundation – Greece, July 12, 2005
[166] Personal Communication with Christina Theochari, Technical Chamber of Greece, Advisor to General Confederation of Labor Issues, Athens, Greece, June 8, 2005
[167] Personal Communication with Giorgos Sideris, Balkan Geophysical Society, June 10, 2005
[168] Personal Communication with Christos Zerefos, President of the National Observatory, Athens, Greece, July 1, 2005
[169] Personal Communication with Giorgos Sideris, Balkan Geophysical Society, June 10, 2005
[170] Personal Communication with Manolis Stefanakis, the then President of the American Farm School, Thessaloniki, Greece, July 11, 2005
[171] Personal Communication with Christina Theochari, Technical Chamber of Greece, Advisor to General Confederation of Labor Issues, Athens, Greece, June 8, 2005
[172] Personal Communication with Manolis Stefanakis, the then President of the American Farm School, Thessaloniki, Greece, July 11, 2005

to cope with the growing supply of crises. Moreover, the prevailing attitude is that the Greeks should tell the EU what to do – not the other way around. It may be easier to integrate environmental innovation in an emerging democracy/economy than an established one because they have a stronger will to succeed in the short to medium term.[173]

3.2.2.3 Local Capacity

Old and small Greek industries are often forced to close because they cannot afford to meeting the European standards. This causes conflicts for the workers and inhabitants surrounding a firm, however a company is not competitive if it is not modernized.[174]

Greece has the technical capacity, through university and private research centers and environmental consultancies to meet virtually all of the environmental challenges. Greece has locally designed sensor technologies for monitoring surface waters and ground aquifers,[175] and for monitoring air quality.[176] Even when these systems are practically automated with no maintenance, there is little response to mitigate the problems.

Still, even with all of its internal problems, Greece has the financial and technological capacity to help other countries in the Balkans. There have been government aid programs to help modernize hospitals (two in Sarajevo, BiH), gifts of busses to Bana Luca, renovations of Orthodox Christian churches. There has also been extensive private investment in all SEE countries by Greece. Greece is one of the biggest investors in the region, with approximately 80% of foreign investments in FYROM are Greek, around 50-60% in Bulgaria, around 30% in Romania, around 50% in Serbia and Montenegro, and about 80% in Albania.[177] Because of Greece's connections with the region, even the French embassy of Athens is coordinating many of its multilateral relationships of the Balkans with Greek partners.[178] The Balkans are dying for leadership – and Greece is in an ideal positions if it can get its act together.[179]

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[173] Ibid.
[174] Personal Communication with Christina Theochari, Technical Chamber of Greece, Advisor to General Confederation of Labor Issues, Athens, Greece, June 8, 2005
[175] Personal Communication with Giorgos Sideris, Balkan Geophysical Society, June 10, 2005
[176] Personal Communication with Emmanuel Damigos, Senior Consultant on Quality Environmental, Safety Management and on Business Excellence, Athens, Greece, June 10, 2005
[177] Ibid.
[178] Ibid.
[179] Personal Communication, Dimitris Karavella, World Wildlife Foundation – Greece, July 12, 2005

4 Systems Framework for Regional Environmental Cooperation

A major issue today in science and technology is the amount of pollution being produced – and figuring out how to reduce that pollution. Of course, this problem is being addressed by governments and industry because it has serious implications for public health and for the preservation of the earth for future generations, as well as more immediate concerns for the health of the plants and animals that are living now. However, the issue of reducing pollution is not always treated in a holistic fashion, taking into account economic and societal factors, but it is often regarded as a technical problem. Pollution creation and reduction can be considered an engineering system, and while the case-study in later sections will illustrate these ideas with water pollution reduction, in considering pollution reduction from a systems perspective, it is necessary to consider all forms of pollution reduction.

First, to understand how the issue of pollution creation and reduction should be framed as a system, we can look at it in the context of the six basic characteristics of engineering systems. The system is *technologically enabled* as the pollution we must reduce is inherently a result of the technological artifacts we produce and the energy we exploit to create and use our technology. Moreover, the methods that we can use to reduce the pollution often involve creating new technologies that either remove pollution, or produce alternatives with less pollution than older technologies. The system is *large scale* because in order to reduce pollution we must focus on all parts of the globe and the effects of reducing pollution will be felt by all parts as well. For instance, even the polar ice caps feel the harm of global warming, caused by air pollution, and thus all those who will benefit by the reduction of rising waters due to melting polar ice caps will benefit from a global reduction in air pollution as well. The outputs of reducing pollution are much greater than the sum of the inputs of separate efforts, making the Pollution Creation and Reduction system *complex.* As pollution is reduced through efforts on the part of individuals in society, through government, industry, and economic regulation, the resultant healthier ecosystem is better able to absorb and breakdown the smaller amount of pollutants that remain. The system is *dynamic* because it will change over time as our world becomes more dependent on technology, and as that technology changes. For example, as technology for producing renewable electricity becomes more feasible, and more technologies will begin to employ such energy, such as electric cars, and thus hopefully less air pollution will be created by the combustion of fossil fuels. There is inherent *uncertainty* in the system as to whom and what will be affected by the pollution, or reduction thereof, and how serious the effect will be in each individual. The system's *social and natural interactions* with technology include society's dependence on the products and processes which are a source of pollution and the simultaneous detriment to society's health by the pollution those products and processes create. Nature degrades and changes as a result of pollution, so the system can positively affect the natural world. Finally, *emergent properties* that come from a pollution reduction system include a healthier society with less disease, lower health care costs and a more productive society.

The issue of reducing pollution is not being truly handled with a systems perspective, as there are many different approaches to solving the problem through policy, technology and education. There is a unique opportunity for regions like the Balkans to develop a systems framework to understand how to coordinate the policies needed to promote the dissemination of appropriate and best-practice technologies, as well as to develop cutting-edge solutions to many of the regional environmental issues.

This section develops this framework for national environmental policy coordination and regional environmental cooperation. Figure 7 below graphically represents how the environmental regulatory policy and the technology policy promoting solutions in an industry that may impact a particular environmental area need to be coordinated within a locality of a country, as well as relevant transboundary areas, such as within a water-basin when considering water-related environmental management. This will be discussed in further detail throughout this chapter.

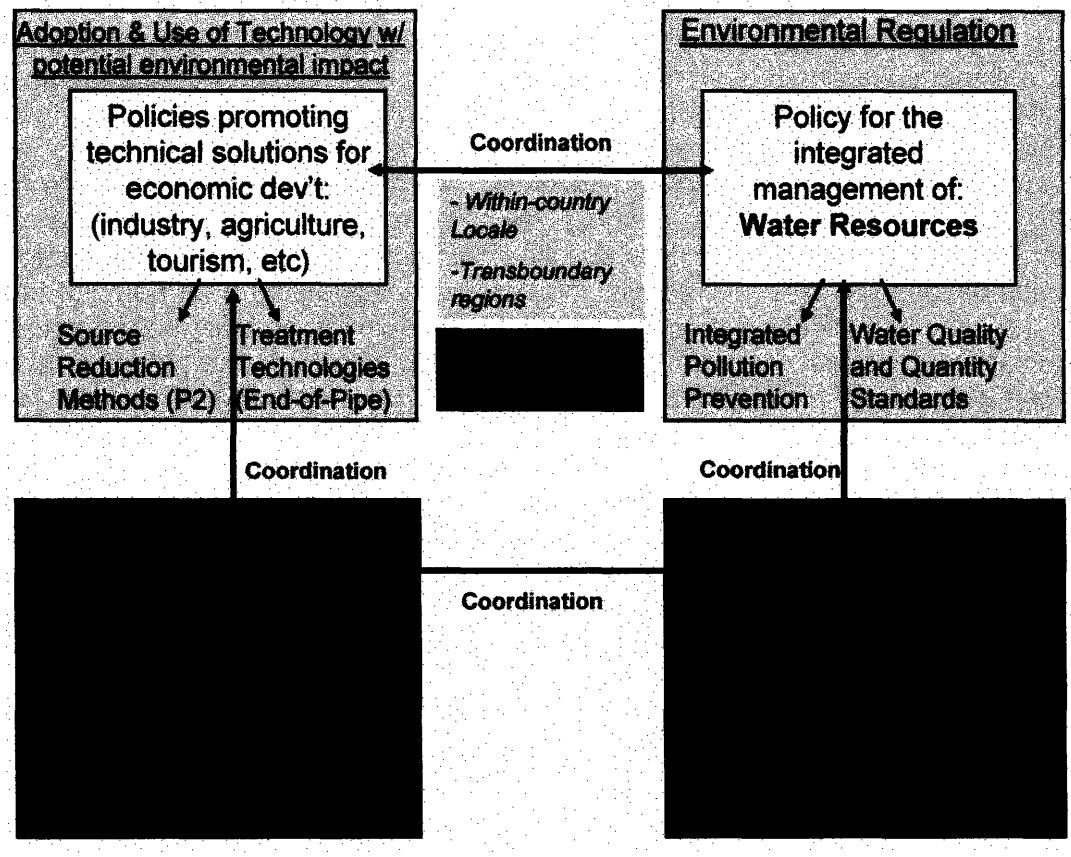

Figure 7: System Framework for Environmental Cooperation
This chart gives an overview of the coordination needed in Technology Adoption & Use Policy and Environmental Regulatory Policy. This figure represents the work that this thesis covers (in blue) along with the work projected for future work which is beyond the scope of this thesis (in green).

Each type of policy can result in pollution treatment or source reduction measures being taken. Section 4.1 will describe the fundamental differences of pollution prevention or source reduction versus 'end-of-pipe' control, and how policy interventions can provide

incentives for one or the other. To set the stage for the case study at hand, it will also examine the role technology can play in water pollution prevention and control.

The goals of industrial or other sectoral policies overlap with the goals of environmental policies, as depicted in Figure 8 below. These two policies are often thought to have conflicting goals, drawing resources from industries away from economic efficiency gains and towards environmental protectionism. However, the proper environmental policies will affect both which technologies are chosen, what innovations are created, and the ultimate path into which various industries develop.

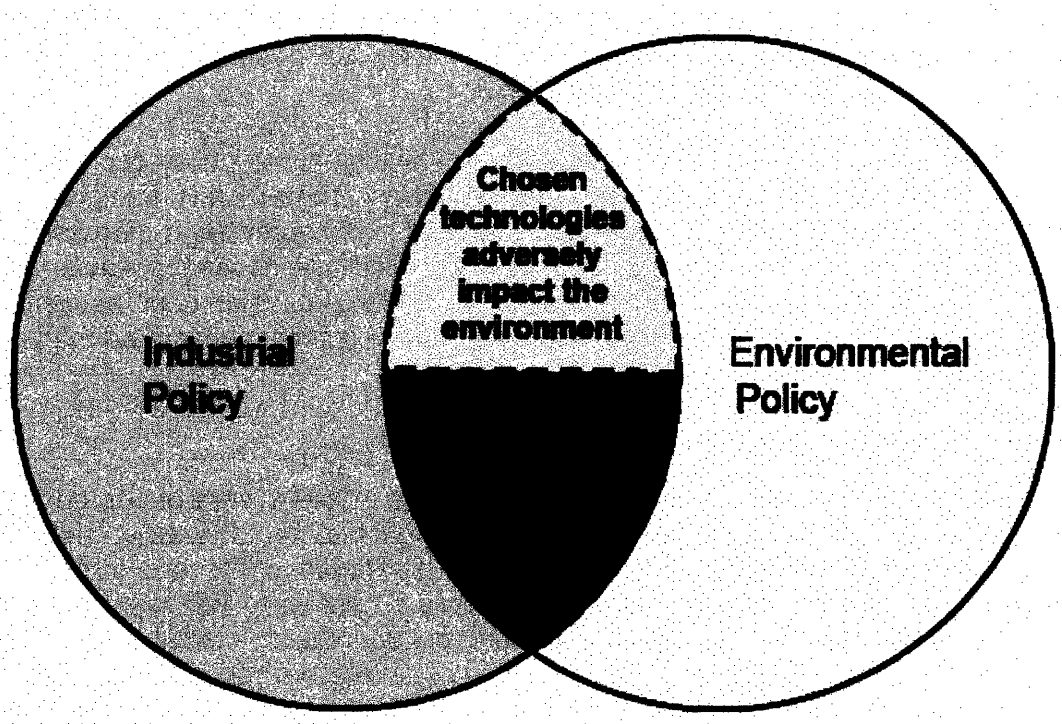

Figure 8: Overlapping of Industrial and Environmental Policies
This area of overlap gives policy-makers opportunities to influence the direction of technology development and diffusion.

Section 4.2 will discuss the extent to which industrial, agricultural, or other sectoral policies influence the adoption or development of a particular technology, particularly those technologies which can have an impact on the environment. In practice, this sectoral promotion policy is often independent of the assessment of the environmental impacts of such technologies. This section will then focus in on the case of technologies which can potentially create water pollution in order to provide context for the case study on water resource management.

Section 4.3 will explore different ways a government can influence pollution source reduction and pollution treatment solutions through conventional environmental

regulatory policy and through initiatives designed to promote environmental technology adoption and use. It will then focus in on the regulatory framework for water resources in the region of the case study.

There are four overall areas for policy coordination that are laid out in this framework. The first three are within one country, and the last one is between partner countries. Section 4.4 will develop the framework for policy coordination within one country among all sectoral technology development and environmental regulatory policy areas, and Section 4.5 will lay the framework needed for policy coordination and cooperation between countries for a specific transboundary region. Finally, section 4.6 will briefly discuss both the issue of coordinating sectoral technology development policies and environmental policy throughout a country, as well as the issue of cooperating on policy throughout a region, i.e. among multiple countries.

While this research, as shown in the Figures above, highlights the policy coordination and cooperation on the water sector in a transboundary context, this framework is relevant to all environmental forms of pollution. Indeed, the coordination discussed in Section 4.5 highlights the importance of a country to coordinate national policy among all environmental problem areas with the policies for sectoral development, as well as for regions of multiple neighboring countries to cooperate in a similar integrated manner.

4.1 Pollution Treatment vs. Source Reduction

Pollution treatment and *pollution source reduction* are two different ways of approaching the management of polluting processes, whether industrial or otherwise (such as agricultural and urban polluting processes). Pollution treatment is intended to mitigate the danger of the pollution outflow of a process, while source reduction is intended to prevent that pollution from being created in the first place. Industry's initial response to increased environmental awareness and increasingly severe environmental legislation was to adopt systems and technologies that control and treat the pollutant emissions in order to reach compliance. However, more recently, source reduction technological and management approaches have been used to both reduce emissions and increase production efficiency and reduce costs. Both pollution treatment and source reduction are applicable to all forms of pollution, including the creation of air pollution, water pollution, and solid waste. The source reduction is fundamentally different and more desirable than pollution treatment. Preventing pollution before it is created is preferable to trying to manage, treat, or dispose of pollution after it is generated.

4.1.1 Definitions

Pollution treatment, also called pollution control or 'end-of-pipe' treatment, involves techniques which treat the wastes of a process to render them less harmful or recycling the wastes off-site for other uses. Pollution control also may include processes such as the concentration of pollutants to reduce the volume of wastes to be disposed, and the dilution of wastes to reduce toxicity before disposal. In general, although treatment processes have changed over time, "the underlying logic has remained that of

accumulating and modifying the generated waste in line with the current legislation, transforming certain forms of pollution into different forms considered to be of less impact." These reactive adjustments to current regulatory policies and social pressure can be costly and often create resistance within organizations to further changes in regulations.

Many of today's environmental problems originated from past decisions which lead to environmental degradation, and there has been a move for taking a long-term perspective on the management of environmental issues through source reduction, often referred to as Pollution Prevention (P2). P2 is intended to consider an entire production process and improve it using techniques such as process modifications, cleaner technologies, and improved management practices to reduce the amount of polluting wastes and increase production efficiency. With this increased production efficiency often comes the reduced usage of inputs, including raw materials, water use, and energy consumption, as well as the redesign of processes which may exclude hazardous or toxic substances. Technological innovation can be simultaneously focused on improved utility and elimination of environmental hazards. Thus pollution prevention efforts are ideally incorporated into technology development or adoption at an early stage.

Literature and legislation on environmental management suggest various hierarchies of how to manage and dispose of wastes, and can be classified in the following order of priority:[180]

1. Source Reduction - Reduction of the creation of the pollutant at the source.
2. In-Process Recycling – Recycle effluent/waste within the production process to be reused for the same process.
3. On-Site Recycling – Recycle effluent/waste at the same production site, but for a different process.
4. Off-Site Recycling – Recycle wastes at a different production site for a different product/industry.
5. Treatment – Treat wastes to reduce the potential danger when disposed of or released into the environment.
6. Safe Environmental Disposal – Disposal which is controlled to prevent damage to the environment.
7. Direct Disposal – Directly release wastes as they are after production into the environment.

The definition of a boundary for P2 and Pollution Control techniques among these environmental management options vary in the literature, and is reflected in Figure 9 below.

[180] Enrico Cagno, Paolo Trucco, Lorenzo Tardini, "Cleaner Production and Profitability: Analysis of 134 Industrial Pollution Prevention (P2) Project Reports." Journal of Cleaner Production, 13, 2005. p. 593-605

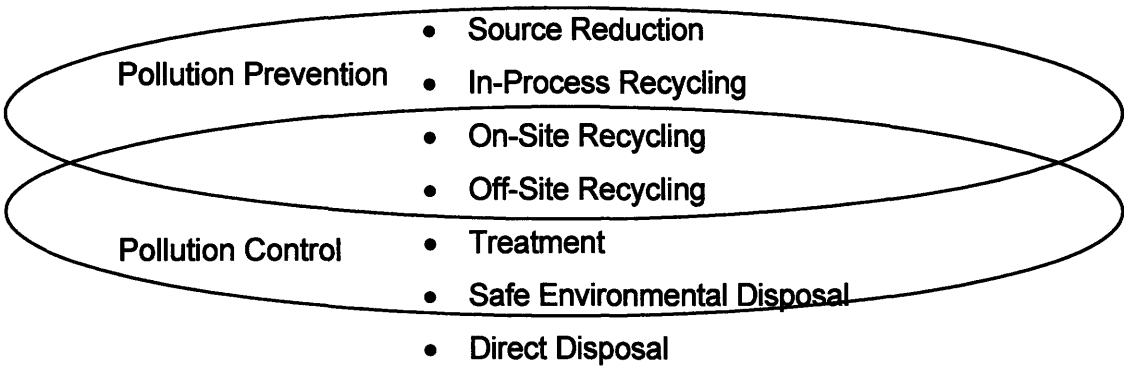

Figure 9: The boundary between techniques for pollution prevention and pollution control according to varying authors and legislation.
(Adapted from Enrico Cagno, Paolo Trucco, Lorenzo Tardini, "Cleaner Production and Profitability: Analysis of 134 Industrial Pollution Prevention (P2) Project Reports." Journal of Cleaner Production, 13, 2005. p. 593-605).

4.1.2 Motivations for Implementing Source Reduction

Even though significant environmental benefit and cost savings have been shown to result from P2 methods, these techniques have still not been fully accepted or integrated into most environmental management schemes, and they are diffusing at a far lower rate than would be expected. In a survey of 134 industrial pollution prevention projects between 1990 and 2002, while the most frequent objectives of such an initiative were waste minimization in the early years of P2 projects, recently, cost reduction has been the primary motivator. This shift indicates that "the environmental management of production processes has changed from a compliance point of view into a strategic issue for company long-range competitiveness." Cost-efficiency is gained with P2 through increased productivity, the better use of resources, improved process efficiency, and a reduced environmental impact. Thus, the reduction in waste generated results in an increase in a company's cost-efficiency. The survey also found that technological change was the most common pathway for source reduction interventions, tied mostly to process-improvement projects. Also, the most frequent type of recycling projects implemented were in-process recycling, which also were found to be most profitable in relative terms compared to other interventions.

4.1.3 Factors for success

However, there are limitations to the ability of the implementation of P2 program to change an organizations overall behavior. The uptake of pollution prevention principles in an organization depend strongly on the internal commitment, leadership, support, communication, staff involvement, and program design. One study found the two most important factors to the success and sustainability of a P2 project in an organization to be commitment and on-going improvement.

Pollution prevention and environmental management literature typically has the necessary commitment for success rest with the top-level management, and indeed,

this has often made the difference for whether an organization pursues cleaner production methods. The P2 guides, however, do not focus on how that top-level commitment might be won or enhanced in a situation where it is lacking. These guides will often advise that an internal 'change agent' perform the pre-assessment of an organization to find the low-cost opportunities with a quick pay-back period in order to help gain top-level support. However, the use of time and resources to conduct such a pre-assessment may not be feasible or justifiable in an organization without that top-level support, and an internal, subordinate 'change agent' may not be able to get the authority needed to proceed with the necessary work.

The pollution prevention literature and tools also mention and stress the importance of making on-going improvements to P2 projects, however these tools give little direction on how to develop this or integrate it into the organization. While the examined projects did reduce pollution and costs in most cases through common P2 methods – especially through a waste and emissions prevention assessment with an input/output analysis and identification of P2 options, on-going improvements were unlikely to occur to the processes. Because methods for on-going improvements to the P2 processes were not defined at each stage of the project development, their sustainability was not ensured. To ensure that on-going improvements can be sustained, there need to be iterative cycles built into the organization's production process of technology adoption or change, performance and environmental assessment, improvement and review. One way to do this would be to link the frequency and timing of this cycle to the project budget and budgeting cycle, depending on the special needs or circumstances of the project. Also, specific activities could be used to encourage iteration, such as the establishment of programs or incentives to promote employee involvement or the allocation of responsibility to designated employees.

In order to create sustainable pollution prevention projects, it is necessary to integrate the P2 concepts into the philosophy and strategy of an organization and create visionary goals to drive continuous improvement. Not only must there be a willingness to do this, but there must be the ability and the know-how among the employees and throughout the organization. In order to achieve sustainability, the programs must be "customised according to specific activities, needs and culture of individual businesses ... to ensure that an iterative process of learning is established that leads to critical assessment of existing assumptions, identification and invention of new ones, testing, and ultimately, internalisation of a sustainability ethic within the organisation's culture."

4.1.4 Technology's role in Water Pollution Treatment and Source Reduction

Pollution can enter surface and ground waters from point sources and from diffuse, or non-point, sources. These sources can be addressed in different ways using technology by either reducing the amount of pollution that is being created or treating the pollution to remove it before it enters the water, as discussed below.

4.1.4.1 Point and Non-Point Pollution Sources

A point source of pollution refers to a localized source of pollution entering the water, including factory effluents, urban wastewater, and wastewater treatment facility outflows. These sources can be easily monitored and controlled because the point of creation is visible.

Diffuse non-point sources include agricultural run-off containing excess pesticides or other agrochemicals, salt from irrigation practices, and bacteria and nutrients from fertilizers and livestock wastes. Also diffuse pollutants can come from toxins, oils, and grease from urban and industrial run-off, seepage of bacteria and nutrients from faulty septic systems, acid drainage or chemicals from abandoned mines, seepage or run-off from improper landfills, and sediment from crop and forest land, eroding river banks, and poorly managed construction sites. Atmospheric deposition can result in diffuse air pollutants entering the water.

Hydromodification, or the forced alteration of the flow of a river, is also considered a non-point source of water pollution. Hydromodification includes the dredging, straightening, or relocating a stream, or "construction in or along streams, construction and operation of dams and impoundments, channelization in streams, dredging, and land reclamation activities."

4.1.4.2 Technology for preventing and treating pollution

Figure 10 below illustrates various types of diffuse and point sources that can affect the quality and quantity of the freshwater resources in a river basin. In such a river basin system, there are many points that the pollution can be prevented from occurring or treated before entering the water stream.

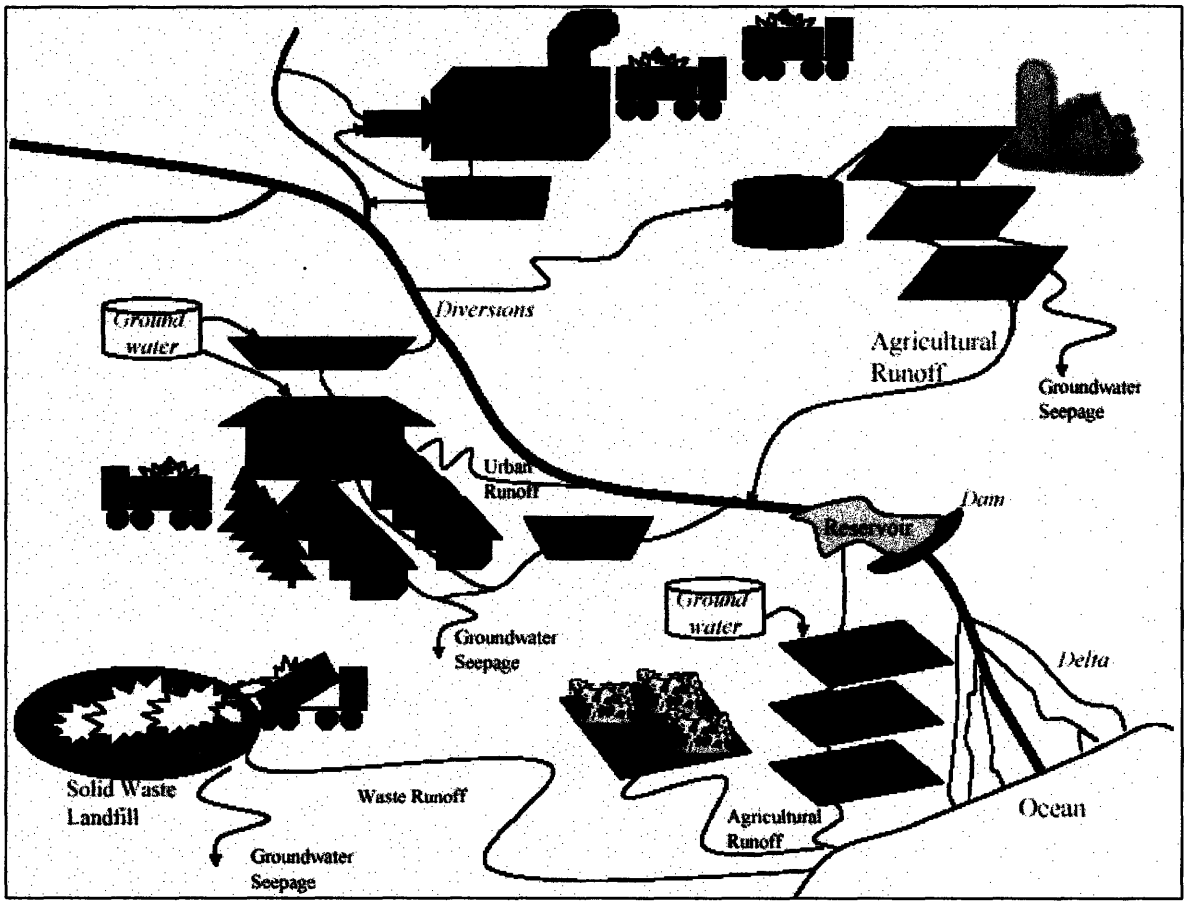

Figure 10: Illustration of How Pollution from Diffuse and Point Sources Reaches Water Resources in a River Basin.

Water Pollution can be dealt with at the input phase of an entity using preventative measures, or at the output phase using treatment measures (See Figure 11 below). Water pollution in an industrial setting can be altered by dealing with the various inputs and outputs from the industry or factory. Pollution can be prevented by using technology to alter the needed inputs to an industry, both in terms of toxic materials that would create the pollution, and in terms of the volume of water resources that would potentially be impacted. Alternatively, or in addition, pollution that is created can be prevented from polluting water resources by treating the water and removing the pollutants before the effluent leaves an industrial site.

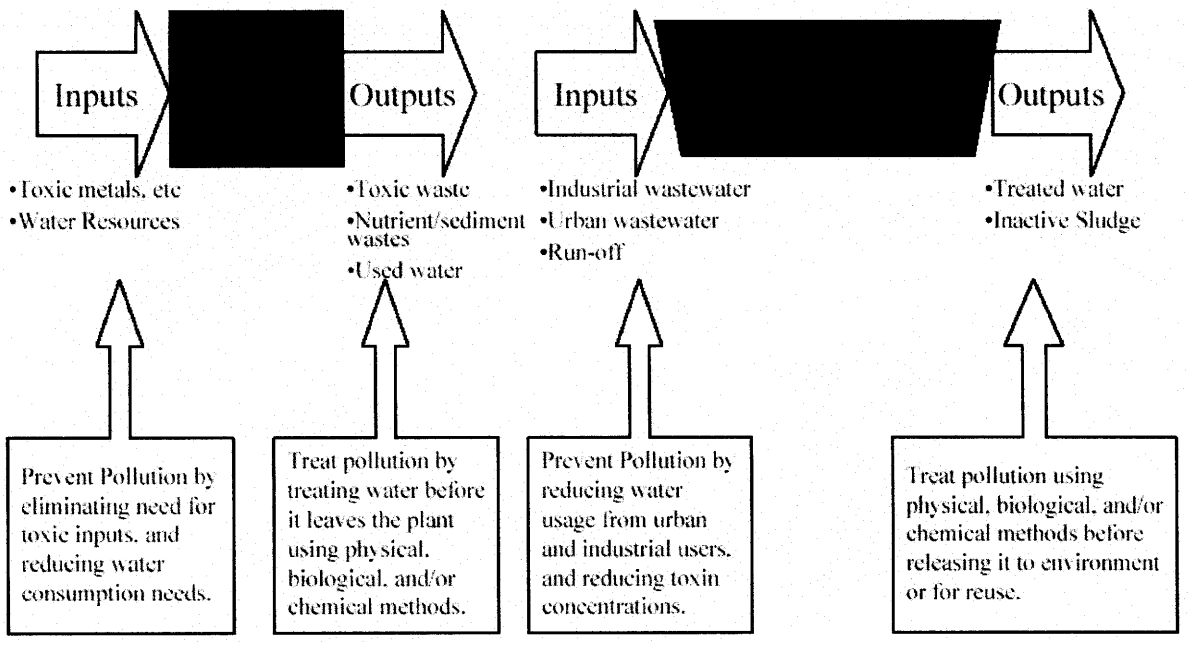

Figure 11: Various Stages in the Water-Use Cycle where Water Pollution can be Prevented or Treated
The notion of pollution prevention and pollution treatment is different depending whether using the industry or the treatment plant as the reference point for inputs and outputs.

A waste water treatment plant (WWTP) must consider different inputs and outputs to its process, where inputs are in fact the outputs of industrial wastewater, urban wastewater, and run-off from industrial, urban and other sites which enter the sewage system. Various technologies can be implemented to reduce the volume of wastewater coming into the WWTP, such as by upgrading urban infrastructure reducing leaks and run-off entering the system or by monitoring and limiting the levels of pollutants and volumes coming from industrial effluents into the treatment plant. Outputs could have lower pollutant levels by employing additional or more effective treatment technologies within the WWTP before releasing the treated water.

4.2 Sectoral Policies Promoting Technologies with Environmental Impacts

Countries develop policies in many sectors which are intended to promote the country's economic and political success. Some of the important sectors include industrial policy, agricultural policy, tourism promotion, and research and development. Choices made during the development and implementation of these policies directly affect what technologies are promoted and used in practice throughout the country. These technologies may be optimized to create the greatest commercial output, and thus the highest economic benefit, but what is needed to co-optimize the effects a promoted technology will have in terms of economic benefit, environmental protection and social impacts.

For example, agricultural policy has the goal of increasing agricultural outputs and efficiency. This may mean increasing the use of pesticides, herbicides and chemical fertilizers, or increasing the use of irrigation infrastructure to reach water-scarce areas. The results of these policies may increase agricultural, and hence economic, performance at the expense of the environment. The diffuse pollution caused by water run-off discharged into surface waters (lakes and rivers) and absorbed into groundwater may affect other people or ecosystems downstream, or may need to be treated before use by drinking water or waste water treatment plants. Industrial policy and policies for other sectors are designed to maintain and improve the growth and productivity of a country. These policies are intended to help that country achieve greater industrial output and international competitiveness. The growth of the economy is often linked to creating employment opportunities for the citizens and optimally using the human resources of the country.

While there are many factors that contribute to whether a particular industry or a farmer will consider implementing a particular technology, the development and dissemination of such technologies ultimately depend on the capacity of the national innovation system. A national innovation system is made up of a community of actors and it is the interactions between the supporting institutions and the processes involved which will determine the innovative performance of the country.[181] National innovation systems are defined by the national differences between countries from historical, cultural and organizational differences, and can be seen in the differences of their laws, policies, and institutions – which include large industrial research laboratories and smaller firms, as well as university and public government research laboratories.[182] However, as industries become increasingly internationalized and as education and trade barriers continue to diminish between countries, national borders do not define the market in which a firm is competing, as "the internationalization of business and technology erodes the extent to which national borders, and citizenship, define boundaries that are meaningful in analyzing technological capabilities and technical advance." [183] It is more difficult for a national government to create and implement a national technology policy, especially one that promotes sustainability and pollution prevention ideals, when "national" firms are able to relocate to international locations. Thus, regional policies, such as the European Union's regional Directives for water and integrated pollution prevention and control have evened the playing field within one geographic area while keeping the standards high. Southeastern Europe is now attempting to meet these directives, but without the same level of institutional capacity within their national innovation systems.

Technological innovation has historically been the driving force of economic growth in industrialized countries, and has aided in the transformation of agrarian societies into industrial- and service-based economies. While traditionally the design of technological systems only take into consideration the system's environmental impact in terms of

[181] Richard R. Nelson and Nathan Rosenberg, "National Innovation Systems: A Comparative Analysis." Oxford University Press, New York, 1993.
[182] Ibid.
[183] Ibid.

pollution control and end-of-pipe solutions, "innovation, radical innovation in particular, contains the promise of achieving triple sustainability via new materials, products and processes."[184] Thus, in a region which must struggle to reinvent its industrial sector to be competitive with the rest of the EU, Southeastern Europe can benefit from building up strong national innovation systems, and more importantly, a strong regional innovation system that will allow it to develop and adopt the technologies necessary to succeed economically and prevent the use of technical systems which create unnecessary pollution which so many industrialized societies now must control.

Section 4.2.1 discusses how technologies and innovation are generally promoted and how a source reduction technology may become favored through implementing the proper policies and programs. Section 4.2.2 puts this in the perspective of the water polluting activities, related to the case study at hand.

4.2.1 Technology Development and Adoption Policies and Initiatives

The potential of a nation to maintain economic growth depends on several factors, including the factor endowments of the nation, the innovative potential, and the ability to involve the nation in trade activity with other nations. Factor endowments are the different kinds of capital that a nation possesses, and include unchangeable characteristics such as the land and natural resources, built capital and physical capital, but also the more adjustable elements of human capital, information and communication technology. Innovation systems are made up of private and public research centers, financing institutions and the commercial infrastructure of a nation. In order to compete on technological performance, rather than economies of scale and cheaper production, the government can put in place policies that help stimulate the factor endowments that involve making better use of our natural resources through education, innovation and technological development, and the institutions that make up the innovation system.

Governments can create policies and initiatives to promote the adoption, or diffusion, of technologies to improve economic performance which in turn could reduce the pollution creation of a particular industry or which will require pollution treatment based on current regulatory standards. For industry, innovation can be promoted through tighter regulations on environmental and labor standards that force current industries to redefine their processes and technologies and gives new entrants an opportunity to innovate their way into the market. They can promote the research and development of either type of technology, depending on what incentives they create for the industries and what goals they set for future regulations. Governments can also make decisions on what kinds of technologies are important to the development of their economic well-being and promote them through various incentives. Unlike regulatory policy, initiatives can also be non-binding. They can be by sponsored or organized by both governmental or non-governmental organizations, and these initiatives can also induce or provide both the diffusion and the development of both pollution treatment and prevention

[184] Nicholas A. Ashford, "Innovation – The Pathway to Threefold Sustainability." Chapter 6 in The Steilmann Report: The Wealth of People: An Intelligent Economy for the 21st Century. Lehner, Franz, Charles, Anthony, Bieri, Stephan and Paleocrassas, Yannis (eds.), Brainduct, 2001. pp. 233-274.

technologies. These policies are often in place as part of their industrial policies, their approach on competitiveness, or even in an effort to improve a government service, such as water service delivery.

Figure 12 relates the various methods that can be used to promote technological development and adoption within a given sector which has the potential to create an environmental problem. These include some *regulatory incentives* as discussed previously and also *market mechanisms* which attempt to reward desired behaviors and penalize undesirable behaviors through affecting prices of inputs and outputs. *Voluntary programs* can be supplementary government-industry agreements to improve performance beyond regulated levels, or an initiative organized by a particular industry, NGO, or intergovernmental organization such as the United Nations which may provide educational campaigns, capacity building trainings, or standardized voluntary reporting methods. Finally, *technology development programs,* a country's government can fund research and development (R&D) which will aid in developing the methods needed for improving a country's economic development, as well as its pollution prevention and treatment needs. Also included are bilateral and international projects that intend to aid the transfer of improved technology or processes to the receiving country, both through international governments or through private partnerships between countries.

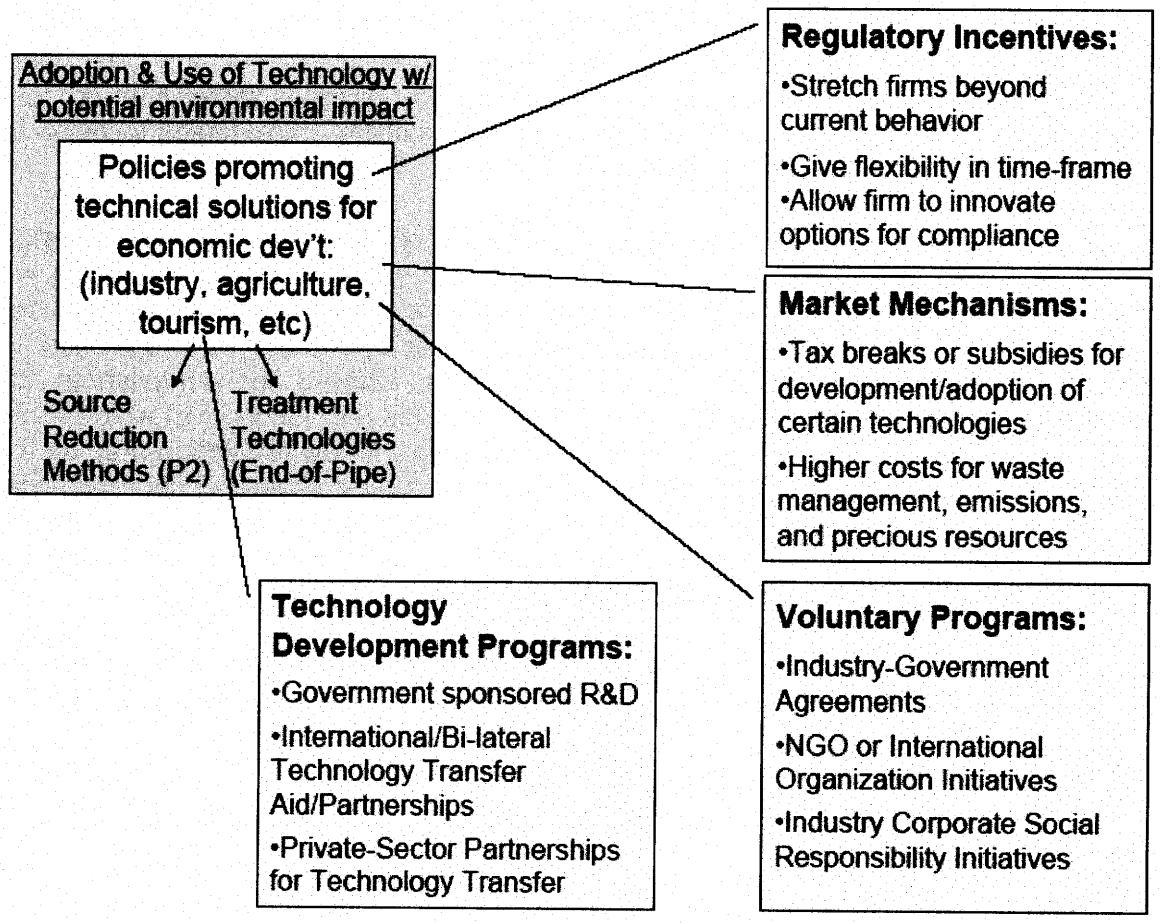

Figure 12: Methods for Promoting Technology Development and Adoption in a Given Sector
Methods include Regulatory Incentives, Market Mechanisms, Voluntary Programs and encouraging Technology Development Programs.

Innovation in the needed environmentally-related technologies may be promoted through a variety of these programs in the broad categories of Regulatory Incentives, Market Mechanisms, Voluntary Programs, and Technology Development Programs. However, there is increasing evidence that the incremental and marginal reforms that are often agreed to through cooperative approaches which bring together government, industry and other stakeholders are insufficient, and may actually impede the necessary major product, process, and system transformations that need to occur. Moreover, the potential for major innovation and transformations will be especially hindered if the government processes involved are influenced or captured by the industry in question.[185]

4.2.1.1 Regulatory Incentives

Some regulations can induce the adoption of a particular technology for a particular industry. These technologies may be polluting (and may require pollution treatment or control technologies, depending on regulatory legislation), while others will induce the development or adoption of technologies that in fact reduce the use of polluting inputs, thus reducing pollution at the source. Regulations which place a new constraint on an organization can force it to rethink its strategy towards optimization. On the other hand, regulatory policies can be well-designed by focusing on outcomes rather than process or product (as discussed in Section 4.3), allowing the flexibility a firm needs to weigh its long-term options and make the best decision.

Ideally, designers of regulatory signals will consider the effects on the technological innovation in the sector being regulated. The internal structure of the regulation will affect the innovation potential in the sector, and this regulation structure includes whether it is a product or process regulation, whether it is a performance or specification standard, the stringency of the standard, the time allowed for compliance, the uncertainty involved, and the existence of other incentives (i.e., economic) which might complement the regulation.[186] The industry responding to a new regulation may be the industry being regulated, but it also may be another industry altogether. For instance, the pollution control industry may be stimulated into developing new technologies to meet the new industrial needs, or other industries may develop new products or processes which surpass the new regulations and are ideally less polluting.[187]

An example of regulatory policies that can promote the development of technologies which *control* pollution levels is the use of the best available control technology (BACT)

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[185] Nicholas A. Ashford, "Government and Environmental Innovation in Europe and North America." *American Behavioral Scientist*: Special Issue on Globalization, Governance and the Environment, 2002, Vol. 45, No. 9, pp. 1417-1434.
[186] Nicholas A. Ashford, Christine Ayers, and Robert F. Stone. "Using Regulation to Change the Market for Innovation." *Harvard Environmental Law Review*, Summer 1985, Vol 9, No. 2. pp.419-466.
[187] Ibid.

and lowest achievable emission rate (LAER) types of standards, which require each industry to comply with the level of emissions a particular top-performing end-of-pipe treatment technology can achieve. When this type of standard is combined with a strict timetable with little room for negotiation, there is little incentive for a firm to try to develop a P2 technology or to take time to redesign a plant to reduce the pollution source. Instead, the end-of-pipe technology that meets the BACT/LAER standard is installed and the company, in incurring the costs of compliance, will have reduced its incentive to invest in redesigning its process for higher efficiency. If the regulations are not intended to change very often, in-house and outside technology developers may not have incentives for creating better performing control treatment technologies.[188]

Pollution prevention technologies can also be promoted through well-designed regulations which place a significant enough constraint on the firm so that it cannot simply add on an end-of-pipe technology to comply. In designing such a regulation, the intention should be to make the firm examine its operations in a way which would likely not have been a priority without the regulation, and since a firm will typically be operating at some static efficiency, the government should have a good basis for believing that stringent regulation will result in superior pollution prevention technology development.

Some environmental regulations allow for 'innovation waivers' which are designed to provide firms an incentive to develop a more effective and/or less expensive pollution prevention or control technology. These waivers provide a more relaxed regulatory environment for a set period of time by exempting the industry from the penalties during the trial periods of the new technology. However, in a study on the innovation waivers which were implemented for the U.S. Clean Air Act, Clean Water Act, and Resource Conservation and Recovery Act, it was determined that the waivers did not achieve their intended effect. Thus, designers of such innovation waivers to environmental regulations must be careful in defining the goals of the waiver, not limiting it to "end-of-pipe" technologies, but also giving industry strong incentives to make changes in production processes and product design.[189]

4.2.1.2 Market Mechanisms

Policy interventions to improve technology adoption and use can also use market mechanisms to change the incentives for a particular firm or industry. Many systems for the purchasing, use, recycling and disposal of industrial products, such as chemicals, don't incentivize the product's efficient use, leading to lower than desired productivity. There are often even incentives encouraging the production of environmental externalities, for example, through the treatment of waste in facilities which may be benefiting from the higher outflow of industrial wastes because of the economic benefit from the charges given for pollution permits or treatment services.

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[188] Sumit K. Majumdar and Alfred A. Marcus, "Rules versus Discretion: The Productivity Consequences of Flexible Regulation." *Academy of Management Journal*, Vol. 44, No. 1, February, 2001. pp. 170-179.
[189] Nicholas A. Ashford, Christine Ayers, and Robert F. Stone. "Using Regulation to Change the Market for Innovation." *Harvard Environmental Law Review*, Summer 1985, Vol 9, No. 2. p.419-466.

To address these externalities, taxes can be placed on the undesirable pollutants in order to "internalize" the costs on the environment and society. Such taxes are used often in Europe, such as with relatively higher gasoline taxes, although this intervention is often to raise revenues as much as or more than to change behavior. There can also be taxes or fees placed on the processes of waste disposal or treatment, giving the incentive for firms to deal internally with their waste issues. The pricing or taxing of raw resources, including things that are often not priced accurately such as water, can also make a firm consider the waste-minimization, recycling or reuse techniques. Graduated pricing schemes are often cited as a way to prevent excessive usage or resources such as water, without pricing out the poor. Alternatively, subsidies or tax breaks can be applied to less-polluting products and processes so as to encourage these industries to succeed. This will stimulate more innovation in the sector to take advantage of the economic benefits that come with the subsidies.

One of the more recent market mechanisms for pollution control is emissions trading, which has been used extensively in the United States for air pollutants under a cap and trade system, as well as in Europe with the new carbon ($C0_2$) market established since the passing of the Kyoto Protocol. Emissions trading schemes allow a firm to profit from its ability to lower its emissions of harmful pollutants by selling its excess permits, but also give a firm the flexibility to decide whether to invest in the necessary technological changes to reduce emissions to its capped limit or to pay the fee for extra pollution credits. This trading scheme can allow a firm to gain tangible profits if it is able to reduce its emissions to the point where it can sell its permits on the market. The improvements in pollution reduction will thus be made in the most cost-efficient manner among all industries participating in the particular market.

4.2.1.3 Technology Development Programs

In order to develop the proper technology to address a nation's economic development through industries, agriculture, and other sectors, a government can fund research and development in relevant areas. This can be done through public universities, national academies of science (which are quite prevalent in Southeastern Europe), or through commissioned research projects. These research and development institutions are at the core of the national innovation system, and can be used to improve specific industries with technological advances or they can improve the basic science and increase the nation's human resource capacity.

International initiatives are also important in promoting new technologies and processes, especially to developing countries. Often technology transfer occurs from one country or multinational firm to another country's firm. Bi-lateral or intergovernmental aid is often geared toward infrastructure and capacity building projects in the recipient country using the technical consulting and solutions of the donor country. Thus, major public works that are funded through EU Structural funds, for example, will likely be up to the standards of most EU member countries.

Private-sector partnerships between firms in different countries can also be a powerful method for transferring technology. These partnerships can take different forms. One

example is a multinational company which has, for instance, its headquarters and some plants in developed countries with relatively high environmental standards, and additional plants or partner organizations in developing countries which may have lower environmental standards. Many such companies feel pressure from their various stakeholders, such as their shareholders, to continue their best practices for environmental and social well-being of the international locations, even when they are not required to do so. Thus, improved environmental technology and practices are often transferred from parent company to partner company. Another partnership can occur when a firm in a developing country seeks a similar firm from a more developed country which can transfer knowledge and technology to improve the performance of the original firm, for example, as in a joint-venture.

4.2.1.4 Voluntary Programs

Voluntary programs can include government-industry agreements, NGO or International Organization initiatives, and industry corporate social responsibility initiatives.

There is a class of policy interventions which create programs to encourage voluntary industry agreements with the government for achieving certain goals. When these goals are emissions reductions, the ability of these to effect the necessary pollution reductions depends on the specific context of the society. For example, the Dutch government's covenants with industry are voluntary business-government agreements which are supposed to act as binding contracts with the government, and thus had mixed results.

While P2 programs are generally simply one choice among a firm's operating options, there have been many successful examples of promoting pollution prevention through publicly-owned treatment works and government agency programs. Publicly-owned water treatment works have been found to be good 'change-agents' as they are already monitoring the waste discharges from industry and, because the have more contact with the public than state or national agencies, they are able to understand the community concerns. They have an incentive to see industrial users succeed in reducing their waste effluents which are discharged into their treatment facilities because their treatment facility's capacity will be better able to handle the localities load, allowing them to better protect the environment and public. In a U.S. study of such publicly-owned treatment works, the personnel had relationships with the industrial users which allowed them to give waste management advice, and thus had a strong influence on such promoting a particular method, such as P2.[190]

Various NGO and international organizations have created their own initiatives to spur awareness and improvement of environmental impacts from companies. This includes the implementation of environmental management systems, such as the International Standard Organization's ISO 14000 family.[191] Various voluntary environmental performance schemes are also becoming popular, such as the Global Reporting

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[190] Tim Lindsey, "Utilization of publicly owned treatment works to promote pollution prevention." *Journal of Cleaner Production* 6, 1998, p.261-268

[191] International Standards Organization, ISO Website. Accessed April 20, 2007 at http://www.iso.com/

Initiative (GRI) G3 reporting framework.[192] The Global Environmental Facility (GEF) supports various projects in developing countries on the issues of biodiversity, climate change, international waters, land degradation, the ozone layer, and persistent organic pollutants. The implementing agencies for these projects are the United Nations Development Programme (UNDP), the United Nations Environment Programme (UNEP), and the World Bank. The United Nations has several ways to affect technology development and diffusion, including developing environment and development projects (through UNEP and UNDP, respectively) in developing countries which may promote the diffusion of particular technical solutions, and allowing ministries from governments around the world to hear what is happing in other countries and come to global goals for future environmental improvements, as with their UN Commission for Sustainable Development (CSD) and other environmental regimes.

With a global conscience growing about real and potential social and environmental concerns, corporations are beginning to take their own initiatives to reduce their impact and improve their surroundings, often referred to as corporate social responsibility (CSR). Many corporations are pressured by their shareholders to report on their sustainability, and they use ISO and GRI reporting frameworks or design their own to do so. The increase in Green investment organizations is promoting the most environmentally innovative firms to compete on their environmental sustainability, among other traditional business indicators. Entire sectors of industry which emit carbon dioxide (CO_2) in the United States have voluntarily joined carbon trading markets because they prefer not to be left behind in the environmental technology innovation that is beginning in countries which are signatories to the Kyoto Protocol and have more progressive limitations on CO_2.

However, voluntary initiatives cannot be used alone for encouraging technology development and adoption. To the extent that voluntary programs involve only the incumbent firms in the polluting industry, these firms do not have incentives to develop radically different technologies or system innovations which would displace their current organization. While a particular firm within the industry may have the willingness and opportunity to change, it may lack the capacity to transform into sustainable industries.[193] Thus, voluntary initiatives will tend to reinforce sustaining innovation, which further develops or refines a current technology or process.

4.2.2 Policies Promoting Potentially Water Polluting Technologies in Case Area

There are many sectors which can potentially pollute freshwater resources through the variety of technologies they employ. For the SEE region, the European Union policies now guide the member state and prospective member states' legislation and regulation. Most policies which promote technologies and activities that could potentially be water-polluting are intended to improve competition and economic development in the EU.

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[192] Global Reporting Initiative, GRI Website. Accessed April 20, 2007 at http://globalreporting.org

[193] Nicholas A. Ashford, "Government and Environmental Innovation in Europe and North America." *American Behavioral Scientist*, 2002, 45, p.1417

The EU has an Enterprise Policy which includes policies promoting research and innovation and sectoral development. This includes many sectors which can have major externalities on the environment, specifically through water pollution. There are specific policies for tourism development, the chemical industry, and other types of industrial activity. A big focus is on how to improve EU Member States' competitiveness in a global market for the various industries.

EU Enterprise and Industry Policy aims to create more and better jobs, and create economic benefits to the member states.[194] There is a strong focus on competitiveness and innovation as the global economy has created a threat of deindustrialization in the EU. Thus, industrial policy in the EU seeks to create regulation that fosters enterprises and industries to thrive. These policies are designed to interact with other policies, including policies specifying how to balance sustainable development along with the environment.[195] The European Lisbon Strategy is a commitment to undertake sustainable development. It is specifically aimed at making the EU "the most competitive economy in the world and achieving full employment by 2010," based on the three pillars of sustainable development: economic, social, and environmental.[196] Specific policies for the promotion of different sectors, both at the EU- and country-level, often result in the more polluting solution being promoted in the hopes to improve the economic development and employment of a region. Some sectoral policies which can promote water-polluting technologies include the policies for agriculture, fisheries, regional development, transportation, energy, chemicals, external relations, competition, and research.[197]

Tourism is a sector which is a cross-cutting industry linked to many different economic activities and jobs, and is very important for all EU member states, especially for SEE as it develops.[198] Tourism promotion policies may focus on expansion of infrastructure and accommodations rather than preservation of the natural resources that are attractive to the tourists in the first place. Tourist installations often demand great amounts of clean freshwater for drinking and bathing. Moreover, they emit large quantities of wastewater which, if in a smaller region, often goes untreated. This may result in harm to both clean water supplies and ecosystems. Tourism installations will now compete with water resources along with agriculture and industry.

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[194] European Commission, "Enterprise Policy." Accessed April 21, 2007 at http://ec.europa.eu/enterprise/enterprise_policy/index_en.htm

[195] EUROPA, "Interaction Between Enterprise Policy and Other Policies." Accessed April 21, 2007 at http://europa.eu/scadplus/leg/en/s25003.htm

[196] European Commission, "Lisbon Strategy." July 30, 2007. Available at http://www.lisbonstrategy.net/ and http://ec.europa.eu/growthandjobs/index_en.htm

[197] Adapted from both: EUROPA, "Timetable for WFD Implementation." Accessed April 21, 2007 at http://ec.europa.eu/environment/water/water-framework/info/timetable_en.htm, and, European Commission Staff Working Document, "Accompanying Document to the Communication from the European Parliament and the Council 'Toward Sustainable Water Management in the European Union.'" SEC(2007) 362, Brussels, March 22, 2007. Available at http://ec.europa.eu/environment/water/water-framework/implrep2007/pdf/sec_2007_0362_en.pdf

[198] European Commission, "Tourism." Accessed on April 20, 2007 at http://ec.europa.eu/enterprise/services/tourism/index_en.htm

Energy policies, while trying to get member states away from carbon sources, and in the case of Bulgaria away from nuclear energy sources, are encouraging the introduction of more small-scale hydro-electric power stations. While this is not a direct pollutant, the water diversions and the blockages of the flow of water and fish can cause great harm to the ecosystem and populations living below the dam. While hydraulic is an important mix in the renewable energy portfolio (22.2 % of the renewable energy in 2005), the benefits of developing new installations must be carefully weighed against the competing needs of the water basin.[199]

As for agricultural promotion, it is widely believed that agrochemicals are necessary for industrial production, along with irrigation infrastructure. Heavy irrigation of fields draws heavily upon surface and groundwater resources, and basic gravitational systems often over-irrigate and wash the agrochemicals into lakes and rivers. Policies encourage heavy agrochemical application to agricultural fields while also stimulating the chemical industry into developing new pesticides and herbicides and chemical fertilizers. The non-chemical, less polluting, and more sustainable solution to improved agricultural production is not promoted as often, perhaps because these policies require more work to implement or cost more. For instance, implementing a policy teaching farmers to use techniques for integrated pest management and rotating crops requires large agricultural outreach staff with ongoing education and monitoring, whereas helping farmers access more agrochemicals may be as easy as offering a subsidy or allowing agrochemical industry representatives provide agricultural outreach services in return for promoting their products. Encouraging less water use through EU-required water-pricing policies, which would encourage water-saving irrigation technologies, is often much too difficult politically to be implemented.

4.3 Regulatory Policy Promoting Pollution Control and Pollution Prevention

Government policy can be used to incentivize either pollution treatment or source reduction, yet it is often it is up to industry to choose how to meet the current regulations. Government policy interventions can be through regulations, market-based incentives, or voluntary initiatives. Non-governmental interventions can be through industry-initiatives and stakeholder involvement, although these can also be mediated through government policies and agencies.

As discussed in Section 4.1 above, pollution prevention or source reduction technologies and processes are preferable to end-of-pipe treatment options, and these solutions can indeed be more beneficial to industry as well. However, standard regulations which identify maximum effluent levels that a particular industry can emit may result in implementation of simple-to-understand conventional pollution treatment measures to be taken because many organizations do not understand or wish to partake in P2 methods, which are relatively recent developments compared to many industries. The technology that will be promoted and developed through such regulatory

[199] European Commission, "Innovation and technological development in energy." Accessed April 20, 2007 at http://ec.europa.eu/energy/res/index_en.htm

action would be 'end-of-pipe' treatment technologies, such as physical, chemical, and biological water treatment facilities, scrubbers on smoke-stacks, and new methods for reusing or recycling the waste.

Government can, however, create the right environment for industry to adopt and develop the more-desirable pollution prevention techniques. By creating strong disincentives for direct disposal of wastes into the environment, such as strict legal and monetary penalties, and for implementing other pollution control options such as increasing the costs of environmentally safe land disposal and use of public water treatment facilities, the capital and operating costs of developing in-house treatment facilities will then need to be compared only to introducing P2 processes and technologies. This can also be done by creating strong incentives through measures such as tax breaks for the addition of P2 modifications to technology or processes. Cost-savings from minimized resource use and waste-disposal are also major incentives, and need only be promoted through appropriate technology adoption initiatives, such as industry conferences and trainings.

Indeed, while many firms work off the belief that any environmental regulation or costs will hurt their competitiveness, there is actually strong evidence supporting the Porter hypothesis, which essentially states that environmental regulation can in fact improve competitiveness of a firm because firms do not typically optimize for the dynamic innovation-based market they operate in.[200] However the regulation is not enough to ensure increased competitiveness, as efficiency gains have been found to be the results of continuous efforts and adaptations and a pro-active approach, and it is often the best performing industries which are first able to deal with the new regulations efficiently. The key is that environmental rules and regulations must be well-designed. A well-designed regulation must focus on the outcomes, not specifying the control technology, allowing flexibility in terms of design options and time limits in order to develop the best approach to reaching that standard, and it should stretch firms beyond their current behavior in order to stimulate innovative solutions. The properly designed environmental regulations can induce innovation which can reduce or eliminate the cost of compliance, "but can even lead to absolute advantages over firms in foreign countries not subject to similar regulations."[201] Because global environmental goals are constantly being raised, jurisdictions which have more progressive environmental standards will have placed its firms in an advantageous position, as they should be able to have the first mover advantage when the global standards change.

Below is an overview of regulations, market-based, and voluntary policy interventions that could be used to create such an environment. Then, there is a discussion of what kind of initiatives can used to promote the development and adoption of the best environmental technologies for both source reduction and treatment.

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[200] Michael E. Porter and Claas van der Linde, "Toward a New Conception of the Environment-Competitiveness Relationship." The Journal of Economic Perspectives, Vol. 9, No. 4 (Autumn, 1995), pp. 97-118

[201] Ibid.

4.3.1 Regulatory Policies for Pollution Prevention and Control

Environmental regulations used to improve pollution reduction and treatment can be defined by the *setting of quality and quantity standards,* by *setting the prices* for inputs and outputs in a given industry to create the right incentives, by *regulating the methods* by which certain processes are handled, and by requiring the *reporting of important data and information* from industries (See Figure below).

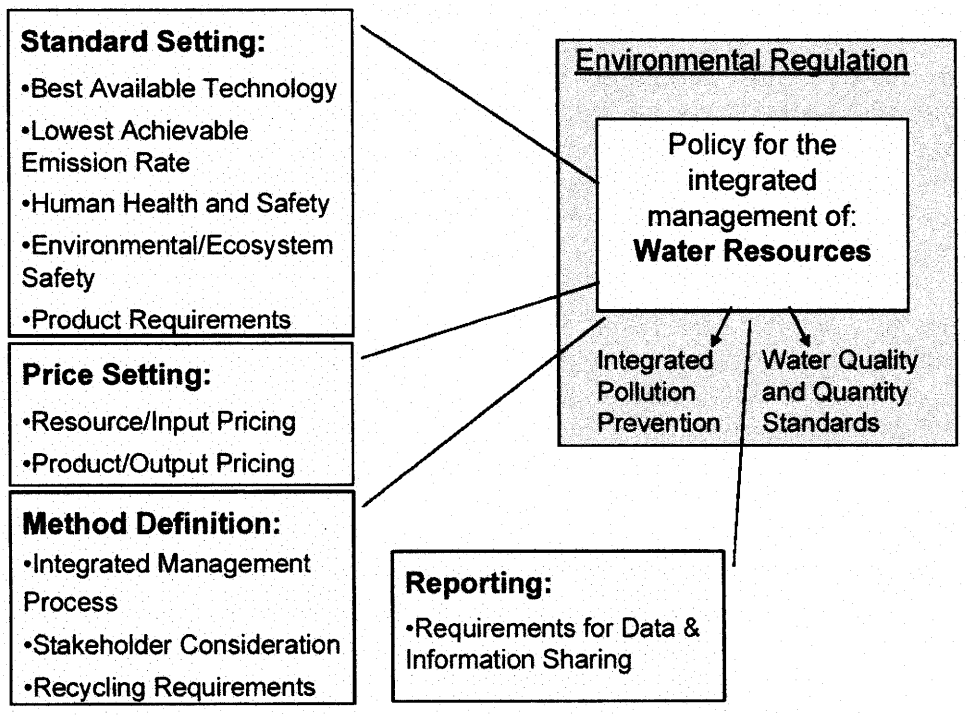

Figure 13: Environmental Regulations which Result in Pollution Treatment and Pollution Prevention

Pollution treatment and pollution prevention can be achieved through Standard Setting, Price Setting, Method Definition, and in response to mandatory Reporting.

4.3.1.1 Standard Setting

Regulatory policies to prevent pollution and reduce source levels can include setting maximum pollution levels. These can be set according for a particular pollutant at the known safe level for maintaining human health or environmental safety. Regulations can also be set on an industry-by-industry basis, allowing some industries to emit more pollutants than other, often based on the results of a risk-benefit analysis and whether there are the current technological advances to change the industry practices. There are both industry-based standards that can be set, as well as environmental quality-based standards, in this case, water-quality-based standards.

A commonly used industry-based standard is known as the Best Available Technology (BAT), and is actually an emissions regulation which requires each industry to comply with the level of emissions achievable using a particular top-performing environmental

technology that has already been developed for that industry. This standard could be used to diffuse the BAT throughout the industry, or to stimulate more developments in environmental technology that could satisfy or surpass the regulation.

Water-quality-based standards are different than industry-based standards, which essentially specify maximum levels of pollution effluent, because water-quality standards specify the maximum allowable level of pollutant that is allowed in a water source. For example, drinking water-quality-standards tend to be the most stringent because the water must be fit for human consumption, regardless of how much effluent is released from economic activity. Thus, if the water source is too high in certain pollutants, then the water must be treated before used for drinking. There are water-quality standards set for all major uses of fresh water at the EU and national levels, and depending on how it is implemented, such regulations may reinforce treatment technology development rather than pollution prevention technology development.

4.3.1.2 Price Setting

Valuable and rare resources are often under-priced and thus are consumed too quickly and for unnecessary purposes. This includes natural and renewable resources, such as forests and water, as well as non-renewable resources, such as petroleum and mined metals and minerals.

Environmental regulation can set prices of various inputs and outputs of an industry. For instance, one resource which is being undervalued and thus over-exploited throughout the world is fresh water. By regulating water prices with a more pricing scheme which more accurately reflects its value, a government may alleviate some of the unnecessary over-use, such as watering of lawns in a water-scarce or drought-prone location.

On the other hand, if there is a product or resource that is not produced enough, the price could be raised through regulation. For instance, environmentally sustainable products that help maintain forest resources may have a premium price set in order to promote the success of that practice. Also, electricity production is often price-regulated, although the goal is often to provide more access to electricity and to limit the profits of power generation monopolies by lowering the price, rather than to conserve electricity by raising the price.

It should be noted that the same effects of price setting can be achieved by some of the market mechanism, especially taxation and subsidies, which can raise the consumer's price and influence behavior.

4.3.1.3 Method Definition

Regulatory policy has also found ways to not only regulate the methods used for production, but also the methods used for managing environmental issues.

The integration of environmental management techniques into regulations is relatively new. For instance, in the European Union's Integrated Pollution Prevention and Control

(IPPC) Directive, environmental permitting takes an integrated approach by taking "into account the whole environmental performance of the plant, covering e.g. emissions to air, water and land, generation of waste, use of raw materials, energy efficiency, noise, prevention of accidents, and restoration of the site upon closure." These permitting processes must also be flexible, according to the location of the installation, the local state of the environment, and the technical characteristics of the installation in question. Also, the regulation requires that the permitting process be open to public participation. Many of these environmental management techniques are indeed recommended, but now they are also being regulated.

Command and control policies are often discussed in the literature as requiring an industry to use a particular technology or method, however such technology-based standards, such as BAT, usually do not require the reference technology to be implemented, only the associated pollution levels of those technologies must be adhered to. End-of-pipe industrial pre-treatment programs are designed to shift the burden back to the polluter, however they are not as desirable as source reduction measures because deal with the problem after creating it. It also may be more difficult to provide effective enforcement of such regulations, as industries can find ways to hold and release pollutants when they are not being monitored, as is often done in the region and elsewhere. The added costs of the pretreatment of wastes also become a business concern. According to one conservative estimate, the wastefulness from the lost raw materials can account for 70 – 75% of the expenses associated with industrial wastes.

Regulations can also be placed on other parts of the process, including energy efficiency or recycling requirements, such as the German law which has made packaging disposal the responsibility of the manufacturer through the new value chain called extended producer responsibility (EPR). The German packaging ordinance resulted in firms redesigning their products to redesign their products and packaging both in form and materials in order to avoid excess unnecessary packaging and to be easier to reuse or recycle.

4.3.1.4 Reporting

Regulations can also require industries to report various types of information to the government, to the consumer, or some other data collection agency. The goal of such reporting regulations is to increase the availability of information on pollution to the relevant stakeholders, including the workers, consumers, shareholders and the general public. The government is also responsible for ensuring that the provided information is reliable.

This can be data about the types and quantities of emissions or the chemicals used in the processes within the firm. Before some products can be mass produced, such as chemical food additives or pharmaceuticals, the safety of the product must be ascertained through certain validated data. Firms may be legally required to provide information in the case of a pollution emergency.

4.3.2 Policies Promoting Water Pollution Control & Prevention in the Case Area

The Southeastern European countries have all made clear decisions to work towards European Union integration, meaning that the EU directives created for EU member states must also be implemented in these candidate and potential candidate countries. EU member states are all required to implement these directives through their own legal processes, and may be fined if not completed within the allotted time. Non-EU countries may be denied membership prospects, or have these prospects delayed, by the failure to correctly implement these directives. These EU directives lay out the frameworks with which the countries in the region must manage their natural resources, environment, industry, and economy. Although many SEE countries are still far from being able to implement these directives to the full extent required for membership, they will need to follow the process of implementation of the *aquis communitaire* in order to continue on their accession process. Each EU member state has fully entered these policies into their own legislation and regulatory frameworks, however the coordination of policies is not always as well-integrated as intended by the policy-designers.

Here we give a brief overview of some of the relevant EU directives to the case study of water resource management and economic development. Some of the following directives have not been integrated with the industry and other sectoral policies for a common purpose and direction, either at the EU level, at the country level, or both.

There are a variety of EU policies which are relevant to the status of water quality in the member states, as listed in Table 5 below. Some are referenced specifically in the Water Framework Directive (WFD) and Integrated Pollution Prevention and Control (IPPC) legislation, discussed in greater detail in the following subsections. The implementation of some of these listed policies is crucial to the achievement of the WFD, and the linkages are directly acknowledged (See Section 4.3.2.1). Some of the other policies in Table 5 (shown in bold) are less directly linked to water, yet these policies are still crucial to the sustainable protection of water resources and may benefit from a clearer integration of water and environmental management goals.

Table 5: EU Legislation and Policies Relevant to Water[202]

Water and public health Legislation integral to the WFD	• Urban Waste Water Treatment Directive (91/271/EEC) • Nitrates Directive (91/676/EEC) • Bathing Water Directive (2006/7/EC repealing 76/160/EEC) • Drinking Water Directive (98/83/EC)
Environmental Legislation essential to sustainable water protection	• IPPC Directive (96/61/EC) • Habitats and Birds Directives • **Pesticides and biocides legislation** • **Mining Waste Directive** • Seveso and Environmental Liability Directives
Other relevant EU policies	**Community policies for** • **agriculture,** • **fisheries,** • **regions and cohesion,** • **transport,** • **energy,** • **chemicals,** • **competition,** • **external relations** • **research**

In addition, in June 2006 the European Union adopted a renewed Strategy for Sustainable Development to guide the future development for all EU countries.[203]

4.3.2.1 Water Framework Directive

One of the main guiding policy frameworks on water is the recently developed Water Framework Directive (WFD). The WFD is designed to lay out a holistic approach to managing and protecting water resources in the European Union, and to achieve a "good" level of water status by the year 2015. The directive's language states that its purpose is, "to establish a framework for the protection of inland surface waters, transitional waters, coastal waters and groundwater"[204] that encompasses the protection of ecosystems, promotion of sustainable water use, improvement of the aquatic environment, reduction of groundwater pollution, and mitigation of the effects of floods

[202] Adapted from both: EUROPA, "Timetable for WFD Implementation." Accessed April 21, 2007 at http://ec.europa.eu/environment/water/water-framework/info/timetable_en.htm, and,
European Commission Staff Working Document, "Accompanying Document to the Communication from the European Parliament and the Council 'Toward Sustainable Water Management in the European Union.'" SEC(2007) 362, Brussels, March 22, 2007. Available at http://ec.europa.eu/environment/water/water-framework/implrep2007/pdf/sec_2007_0362_en.pdf

[203] Council of the European Union, "Review of the EU Sustainable Development Strategy (EU SDS)–Renewed Strategy." Brussels, 26 June 2006. European Council : DOC 10917/06. http://ec.europa.eu/sustainable/docs/renewed_eu_sds_en.pdf

[204] European Parliament, Directive 2000/60/EC, October 23, 2000. Official Journal L 327, 22/12/2000 P. 0001 - 0073

and droughts. In this way, it will contribute to, "the provision of the sufficient supply of good quality surface water and groundwater as needed for sustainable, balanced and equitable water use, a significant reduction in pollution of groundwater, the protection of territorial and marine waters."[205]

This framework directive has set the stage for specific legislation to follow which is more integrated in reaching the environmental objectives listed above. This includes identification and analysis of water bodies in all EU member states, management and protection measures for future sustainability of these water bodies, and administrative measures for the European Commission to regularly publish the status of the WFD implementation. An ambitious timetable has been set for the implementation of various articles from the WFD, as shown in the below table. While Bulgaria has been forced to comply with all the articles and timetables for legislation as a precondition to EU membership, Greece has not fulfilled all of its responsibilities as of the writing of this document, as the following table shows.[206]

[205] Ibid.

[206] European Commission, Commission Staff Working Document (SEC(2007) 362 final): "First report on the implementation of the Water Framework Directive 2000/60/EC." Available at http://ec.europa.eu/environment/water/water-framework/implrep2007/pdf/sec_2007_0362_en.pdf

Table 6: Timetable of Key Milestones and Deadlines for WFD implementation[207]

Year	Issue	Reference	Bulgaria	Greece
2000	Directive entered into force	Art. 25	☒	☒
2003	Transposition in national legislation	Art. 24	☒	☒
	Identification of River Basin Districts and Authorities	Art. 3	☒	☒
2004	Characterization of river basin: pressures, impacts and economic analysis	Art. 5	☒	Requirements only partially fulfilled
2006	Establishment of monitoring network	Art. 8	☒	Report or information not submitted
	Start public consultation (at the latest)	Art. 14		
2008	Present draft river basin management plan	Art. 13		
2009	Finalize river basin management plan including program of measures	Art. 13 & 11		
2010	Introduce pricing policies	Art. 9		
2012	Make operational programs of measures	Art. 11		
2015	Meet environmental objectives	Art. 4		
2021	First management cycle ends	Art. 4 & 13		
2027	Second management cycle ends, final deadline for meeting objectives	Art. 4 & 13		

The implementation of the WFD is to coordinate the previously fragmented Directives by organizing water management on the basin-level. Some of the fragmented Directives are being phased out, while new specific legislation has been developed in response to the WFD. This includes the Groundwater Directive (2006/118/EC) which was made in response to Article 17 of the WFD, a Directive on Priority Substances[208], which is still in negotiation in response to Article 16, and Directives on Surface Water Protection against Pollution, the Flood Risk Management, and for a Marine Strategy, for which there are currently proposals.[209]

The WFD also refers to the implementation of measures from many previously existing Directives. The following Tables (Table 7 and

[207] Adapted from both: EUROPA, "Timetable for WFD Implementation." Accessed April 21, 2007 at http://ec.europa.eu/environment/water/water-framework/info/timetable_en.htm, and,
European Commission Staff Working Document, "Accompanying Document to the Communication from the European Parliament and the Council 'Toward Sustainable Water Management in the European Union.'" SEC(2007) 362, Brussels, March 22, 2007. Available at http://ec.europa.eu/environment/water/water-framework/implrep2007/pdf/sec_2007_0362_en.pdf

[208] (COM(2006)397 final)

[209] European Commission, Communication (COM(2007) 128 final) "Towards Sustainable Water Management in the European Union." Available at http://ec.europa.eu/environment/water/water-framework/implrep2007/pdf/sec_2007_0362_en.pdf

Table 8) list the related directives and supplementary measures for the member states to take in order to meet the environmental objectives of the WFD, as described in Article 4 of the WFD.

Table 7: Required Measures to be Used by Member States to Achieve WFD Environmental Objectives[210]

Measures Required under the following Directives:	
Directive Name	*Official Legislative Code*
(i) The Bathing Water Directive	(76/160/EEC)
(ii) The Birds Directive	(79/409/EEC)[211]
(iii) The Drinking Water Directive	(80/778/EEC) as amended by Directive (98/83/EC)
(iv) The Major Accidents (Seveso) Directive	(96/82/EC)[212]
(v) The Environmental Impact Assessment Directive	(85/337/EEC)[213]
(vi) The Sewage Sludge Directive	(86/278/EEC)[214]
(vii) The Urban Waste-water Treatment Directive	(91/271/EEC)
(viii) The Plant Protection Products Directive	(91/414/EEC)
(ix) The Nitrates Directive	(91/676/EEC)
(x) The Habitats Directive	(92/43/EEC)[215]
(xi) The Integrated Pollution Prevention Control Directive	(96/61/EC).

[210] Adapted from Directive 2000/60/EC, ANNEX VI, Official Journal of European Communities, OJ L 327 , 22/12/2000 P. 0001 - 0073

[211] Official Journal of European Communities, OJ L 103, 25.4.1979, p. 1.

[212] Official Journal of European Communities, OJ L 10, 14.1.1997, p. 13.

[213] Official Journal of European Communities, OJ L 175, 5.7.1985, p. 40. Directive as amended by Directive 97/11/EC (OJ L 73, 14.3.1997, p. 5).

[214] Official Journal of European Communities, OJ L 181, 8.7.1986, p. 6.

[215] Official Journal of European Communities, OJ L 206, 22.7.1992, p. 7.

Table 8: Non-exclusive List of Supplementary Measures for Reaching WFD Environmental Objectives[216]

Member States within each river basin district may choose to adopt any of these measures as part of the program of measures required under WFD Article 11(4):
(i) legislative instruments
(ii) administrative instruments
(iii) economic or fiscal instruments
(iv) negotiated environmental agreements
(v) emission controls
(vi) codes of good practice
(vii) recreation and restoration of wetlands areas
(viii) abstraction controls
(ix) demand management measures, including promotion of adapted agricultural production such as low water requiring crops in areas affected by drought
(x) efficiency and reuse measures, including promotion of water-efficient technologies in industry and water-saving irrigation techniques and construction projects
(xii) desalination plants
(xiii) rehabilitation projects
(xiv) artificial recharge of aquifers
(xv) educational projects
(xvi) research, development and demonstration projects
(xvii) other relevant measures

While a list of Priority Substances has been proposed, there are also a variety of directives that already exist to regulate emission levels of certain substances. Below, Table 9 lists the relevant Directives referred to in the WFD as establishing the environmental quality standards.

Table 9: Relevant Directives for Emission Limit Values and Environmental Quality Standards[217]

The 'limit values' and 'quality objectives' established under the re Directives of Directive 76/464/EEC shall be considered emission limit values and environmental quality standards, respectively, for the purposes of this Directive. They are established in the following Directives:	
(i) The Mercury Discharges Directive	(82/176/EEC)[218]
(ii) The Cadmium Discharges Directive	(83/513/EEC)[219]
(iii) The Mercury Directive	(84/156/EEC)[220]
(iv) The Hexachlorocyclohexane Discharges Directive	(84/491/EEC)[221]

[216] Adapted from Directive 2000/60/EC, ANNEX VI, Official Journal of European Communities, OJ L 327 , 22/12/2000 P. 0001 - 0073

[217] Adapted from Directive 2000/60/EC, ANNEX IX, Official Journal of European Communities, OJ L 327 , 22/12/2000 P. 0001 - 0073

[218] Official Journal of European Communities, OJ L 81, 27.3.1982, p. 29.

[219] Official Journal of European Communities, OJ L 291, 24.10.1983, p. 1.

[220] Official Journal of European Communities, OJ L 74, 17.3.1984, p. 49.

(v) The Dangerous Substance Discharges Directive	(86/280/EEC)[222]

The EU WFD and related legislation has required other legislative requirements including, for instance, that Member States, including Greece and Bulgaria, begin charging the true value of water, however many member countries are slow to make these changes for fear of political backlash. While adoption of the appropriate legislation has occurred in many of these countries, including the countries of the case study, there is a lack of integration of the goals between different sectors and many financial, cultural and bureaucratic barriers to implementation.

4.3.2.2 Integrated Pollution Prevention and Control Directive

The Integrated Pollution Prevention and Control (IPPC) Directive defines the required procedures for authorizing industrial and agricultural activities which can be highly polluting by setting minimum requirements for the permits for operating such installatoins, especially in terms of pollutant emissions. The goal of the IPPC Directive is to prevent or reduce the total amount of pollution arising from industrial and agricultural installations, including to the water, air, soil and the production of solid waste.[223] The IPPC Directive is integral to ensuring that industrial and agricultural development goals do not overtake environmental goals.

The IPPC Directive requires that the industrial or agricultural installation employ the best available techniques and technologies in order to first prevent pollution, and where not practicable, control pollution. In order to receive a permit to operate, there are many additional obligations for the installation, including preventing large-scale pollution, preventing or minimizing all wastes, using energy efficiently, ensuring accident prevention and limiting damages, and returning the site of their installation to its original state after the activity is over.

Permit decisions must also contain specific requirements for an installation, including emission limit values for all polluting substances except greenhouse gasses if the emission trading scheme applies and any measures required to protect the air, water and soil, to manage waste, and to handle exceptional circumstances such as malfunctions. Moreover, the decision must also contain specific requirements for minimization of long-distance and transboundary pollution, monitoring of the released pollutants, and any other appropriate measures.

The broad categories of activities that are included under the IPPC regulations cover most industries, and are listed in the following table:

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[221] Official Journal of European Communities, OJ L 274, 17.10.1984, p. 11.
[222] Official Journal of European Communities, OJ L 181, 4.7.1986, p. 16.
[223] EUROPA, "Integrated pollution prevention and control: IPPC Directive." Accessed June 10, 2007 at http://europa.eu/scadplus/leg/en/lvb/l28045.htm

Table 10: Regulated Activities under IPPC Directive[224]

IPPC-Regulated Activities
Industries and Activities
Energy industries
Production and processing of metals
Mineral industry
Chemical industry
Waste management
Other activities – including • Pulp and paper production • Textile plants • Leather tanning • Food processing (meat, dairy, and vegetable) • Activities and installations with large amounts of animal wastes • Charcoal/graphite production.

The IPPC Directive "lays down measures designed to prevent or, where that is not practicable, to reduce emissions in the air, water and land from the abovementioned activities, including measures concerning waste, in order to achieve a high level of protection of the environment taken as a whole, without prejudice to Directive 85/337/EEC and other relevant Community provisions."[225]

While the IPPC Directive seeks to regulate pollutants to air, water, and soil, the main water-polluting substances taken into account are listed in the following Table.

[224] Adapted from IPPC Directive, Annex I, Official Journal of European Communities, OJ L 257 , 10/10/1996 P. 0026 - 0040

[225] IPPC Directive, Article I, Official Journal of European Communities, OJ L 257, 10/10/1996 P. 0026 – 0040. Available at http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:31996L0061:EN:HTML

Table 11: Main Water-Polluting Substances which the IPPC Directive Seeks to Regulate[226]

IPPC-Regulated Water Pollutants
1. Organohalogen compounds and substances which may form such compounds in the aquatic environment
2. Organophosphorus compounds
3. Organotin compounds
4. Substances and preparations which have been proved to possess carcinogenic or mutagenic properties or properties which may affect reproduction in or via the aquatic environment
5. Persistent hydrocarbons and persistent and bioaccumulable organic toxic substances
6. Cyanides
7. Metals and their compounds
8. Arsenic and its compounds
9. Biocides and plant health products
10. Materials in suspension
11. Substances which contribute to eutrophication (in particular, nitrates and phosphates)
12. Substances which have an unfavourable influence on the oxygen balance (and can be measured using parameters such as BOD, COD, etc.).

4.4 Policy Coordination within a Particular In-Country Locality

The following three areas of policy coordination are needed within a particular locality of a country to ensure a sustainable and holistic approach to environmental protection is taken. Here we define locality, or locale, as a contiguous geographical area with interchange, which includes agricultural lands around the basin. It differs from a region, which is defined as bigger than national, and must be transboundary.

4.4.1 Balancing the portfolios of Technology Diffusion and Development for all Sources of Pollution

In order to create improvements in a given country's capacity to continue to develop its economy while protecting the environment, the existing technologies which can appropriately reduce and prevent pollution and waste must be available and must be diffused to and adopted by the appropriate industries. This means that there must be the appropriate incentives to adopt source reduction technologies or methods as well as the appropriate technologies to treat the pollution from industry effluents to levels that are safe for human health and the environment. To the extent that polluted water is treated at WWTPs, appropriate technology needs to be adopted there as well.

[226] Adapted from IPPC Directive, Annex III, Official Journal of European Communities, OJ L 257, 10/10/1996 P. 0026 - 0040.

Moreover, there must be significant attention given to the development and support of the national innovation system and technology policy to encourage indigenous research and development leading to new technologies or approaches within industrial, academic and government research facilities. The links between these institutions and possible industrial users of their research should be reinforced, and appropriate funding should be allocated for priority research concerns.

It is crucial, however, that there be coordination between the various policy-makers and stakeholders to encourage the optimal technological approaches for this to be successful. While a particular environmental policy or regulation which may make sense for the prevention and control of pollution from one source, such as a particular toxin that is being emitted, it may not take into account the optimal reduction of pollutions and wastes that could be implemented through the adoption of one unified technology or process. If the air, water, and waste regulations in a particular locality are not coordinated for an industry, there may be a situation where many different parts of a process are regulated separately, requiring different technologies for each regulation. The installation of appropriate technological end-of-pipe solutions may bring a firm into compliance, but may ultimately cost the firm more money than a more integrated approach to the problem. Thus, a coherent policy strategy amongst all environmental areas must be developed to take into account what kinds of technologies should be promoted for adoption. Coordination must be done among all industry regulations for air, water, and waste pollution.

4.4.2 Coherent Policy for Regulatory Incentives

Other regulatory initiatives that are there to help deal with environmental management must also be coordinated among the different policies for the environment. This means that when regulating to reduce air, water, waste, and soil pollution, an integrated set of incentives should be set up to steer the industries in the optimal direction of pollution treatment and especially pollution prevention.

The incentives signaled by regulations for different industries, sectors, and pollutants are often conflicting. For instance, a regulation may charge an industry a fee for waste-water treatment in order to deter its polluting activities, yet the waste-water treatment plant itself may find the resulting income rate regulated as a percentage of pollution removed as an incentive to maintain the industry's level of pollution rather than to help it prevent its outputs. Alternatively, some regulations dictate the maximum level of pollutant that can be in a factory's effluent, so a given firm may dilute its wastes in order to meet these requirements. This has the unintended consequences of increasing water use and challenging the capacity of the waste-water treatment plants themselves as they must deal with larger volumes of polluted water.

The regulatory incentives provided by the mix of command-and-control regulations and market-based regulations must lead to the same ultimate goal. By projecting to long-term societal goals and creating a flexible environment for industry to achieve the necessary transformations, the policy-makers can then "backcast" to set clear current

standards and policy goals which will encourage the development and adoption of sustainable technologies.[227]

4.4.3 Coherent Policy to match the incentive signals with the technological desires

While there are many EU reports detailing the need for integration of enterprise and environmental policies, there is also the widely-held belief that the progressive environmental regulations will harm the competitiveness of the Member States' industries on the international markets by creating new costs that international competitors may not have.[228] However, there is also the understanding that there are numerous benefits to having some industries bear these costs, such as a shift toward less-polluting, less resource-intensive products and services, encouraging innovation in this direction and stimulating dynamic growth in some sectors.[229] Additionally, by having the EU take on a 'leadership' role in environmental regulation and global accords, the member states will be placed in the more competitive position to later help third countries in meeting higher environmental standards, both through knowledge and technology.[230] Indeed, the Lisbon Strategy mentioned earlier argues for sustainable economic practices.

As new pollution control technologies emerge or as new health and safety risks are discovered, environmental regulations are constantly being revised. This creates uncertainty for the firm as to what it will be expected of it in the long-term. There is also uncertainty with the adoption of new technologies as to whether they will be able to bring future returns, or even hold-up to the changing standards. With this kind of uncertainty, the firm may experience difficulty adopting new technologies and processes which could bring it the greatest benefit in the long-run.

In coordinating the environmental policies in a particular locale, it is important to understand what the long-term technological goals are. If the region wishes to promote more advanced environmental innovation, these goals need to be ambitious and flexible, and should include a greater future goal in order to allow firms to take the time to invest in the necessary research and development which could achieve it. If, though, a locality prefers to see the widespread diffusion of existing technologies, this goal might be best met by implementing BAT standards or market mechanisms, along with a combination of other voluntary initiatives.

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[227] Nicholas A. Ashford, "Pathways to Sustainability: Evolution or Revolution?" in Innovation and Regional Development in the Network Society, Marina van Geenhuizen, David V. Gibson, and Manuel V. Heitor (eds.), QUORUM Books: Series on "Technology Policy and Innovation", Volume 7.

[228] European Commission, Commission Staff Working Document, "The Effects of Environmental Policy on European Business and its Competitiveness: A Framework for Analysis." SEC(2004) 769, Brussels, June 10, 2004. p. 5-6

[229] Ibid., p. 8-9

[230] Ibid., p. 10

4.5 Policy Coordination & Cooperation between Countries for a Transboundary Region

When dealing with a transboundary area which is clearly geographically and environmentally connected, such as a single water basin which is used in this study, the policy choices on one side of the border can affect the other side. When a transboundary regions to be considered holistically, it is possible to consider a way to optimize the development and environmental and human well-being on both sides of the border. The key to this is open communication, including the sharing of environmental assessment and monitoring data, technical issue identification, and integrated policy responses.

Section 4.5.1 describes this on a general level, while Section 4.5.2 goes into the Case Study's focus on Transboundary Integrated Water Resource Management.

4.5.1 Transboundary Cooperation on Environmental Issues

Often bordering countries may not consider sharing any internal information with their neighbors because of security or strategic considerations. However, if a trusting relationship can be built over common environmental goals that are co-defined, all parties can benefit from such a relationship. In order to optimize the use and protect local resources, such as fresh water or forests, members from all sides of a transboundary region should meet regularly to discuss the current and projected uses of the resource and pressures on the region. Moreover, if an environmental risk occurs in one part of the region, such as a flood or toxic spill, it will likely have effects on the other parties as well, so information needs to be communicated about this as well.

Technical issues that have been identified should be shared in order to learn from each others experiences, as it is very likely that a similar obstacle has been met by neighboring countries in the same region. For example, declining fisheries in a transboundary lake region may be affecting all parties, yet a solution may not be possible without communicating the technical issues surrounding it, such as industrial pollution, and so on.[231]

Once the technical causes of a problem have been understood, the cures can be considered to alleviate the problem, however in order to be successful, it must be implemented through an integrated policy response from all members of the transboundary region. If the pressures on the region are being predominantly caused by one party in the region, and regulatory action and policy initiatives are only implemented only in that area, the pressures may simply be pushed into the other parts of the region. For instance, if declining fisheries is thought to be caused by over fishing, and one side decides to ban or severely restrict fishing activities in the lake, the other side might

[231] The ITCB was chartered specifically to use US and Greek joint efforts to bring technology – including environmental technology – to the Balkan region. See Ashford and Electris, 2006. (Nicholas A. Ashford, Christi Electris, "The Role of the United States-Greek Initiative for Technology Cooperation with the Balkans in Constructing a Unified Environmental Technology Plan." Southeast European and Black Sea Studies, Volume 6, Issue 3 September 2006 , pages 391 – 397)

continue producing its industrial pollution which may in fact be the root cause– making the initial policy intervention useless. Only an integrated response to the problem can identify and correct the technical problems through the appropriate regulatory and technology adoption incentives.

Indeed, it is crucial for all parties in a transboundary region to be involved in the well-being of the entire region so that integrated policy responses can be taken to alleviate environmental pressures and risks. Open communication among neighboring countries and localities in a transboundary region is the key to the ultimate environmental health and sustainable development of all parties involved.

4.5.2 Transboundary Integrated Water Resource Management

Economic development can come with increased environmental degradation in many areas, including through increased air pollution, soil degradation, solid waste, and water pollution. This study has chosen to focus in on water pollution to illustrate how regional cooperation and policy coordination can improve the resulting use of resources and development.

Section 4.5.2.1 first gives an overview of the concept of Integrated Water Resource Management (IWRM). Section 4.5.2.2 describes why water resource management is an important focus for this study on regional cooperation in Southeastern Europe.

4.5.2.1 Integrated Water Resource Management

Integrated Water Resource Management (IWRM) is a way of managing water resources in a holistic way through integration of all sectoral policies. The realization that freshwater resources need to be managed in an integrated way was stated in the Agenda 21, Chapter 18, Paragraph 18.6,

> The holistic management of freshwater as a finite and vulnerable resource, and the integration of sectoral water plans and programmes within the framework of national economic and social policy, are of paramount importance for action in the 1990s and beyond. The fragmentation of responsibilities for water resources development among sectoral agencies is proving, however, to be an even greater impediment to promoting integrated water management than had been anticipated. Effective implementation and coordination mechanisms are required. [232]

Agenda 21 lays out goals for local, national and global action on developing integrated water resource management.

Integrated resource water management must consider the price and value of water resources as an economic and social good in order to create efficient allocation.[233] On average worldwide, countries use 69% of their freshwater for agriculture and 23% for industry; however OECD countries have almost the opposite of 65% for industry and

[232] Agenda 21, Chapter 18, Paragraph 18.6, UNEP, Available at http://earthwatch.unep.net/agenda21/18.php

[233] Peter Rogers, Radhika de Silva, and Ramesh Bhatia, "Water is an economic good: How to use prices to promote equity, efficiency, and sustainabililty." *Water Policy* 4, 2002. pp. 1-17.

only 30% for agriculture.[234] As the developing countries try to move their economies from agrarian to industrial, there will be a shift towards the OECD water distribution as well. This creates a strong incentive for these developing countries to get the economic and regulatory incentives right early on to coordinate with water service providers' goals as well as economic industrial/agricultural goals. Thus, the integrated water resource management discussed in Agenda 21 requires all freshwater-related authorities to work together to coordinate complimentary incentive schemes in order to efficiently price and regulate the water to create the greatest social and economic good.

The benefits to the population will not necessarily be financial in nature, and may take time to accrue and moreover, these benefits may accrue to different groups than those who put in the initial investments.[235] This means Agricultural policy authorities, Industrial policy authorities, Environmental authorities, Urban Water and Wastewater Service providers, and Public Health and Social Equity policy authorities, need to discuss the costs and benefits and calculate the full values and full costs of each use. For instance, there need to be the right incentives to develop industries that prevent or minimize water use and pollution to allow water service providers the ability to handle changes in consumption, while increasing services to the poor and underserved.

While water pricing may be the simplest way conceptually to promote equity, efficiency, and sustainability in the water sector, it is also the most difficult politically to implement. Moreover, economic measures will not work properly without being integrated with a proper regulatory backbone. The framework developed in Section 4 can be used to create the right scheme of incentives across sectors by integrating the needs of economic development and environmental protection.

4.5.2.2 Water as a Strong Case for SEE Regional Coordination

Regional cooperation in Southeastern European can be concretely framed around protecting water resources because of the high dependence on neighboring countries for the security of each supply. Ninety percent of the SEE's 61.4 million hectares of land area falls within transboundary river basins, including the Danube, Drin, Martisa/Evros, Neretva, Mesta/Nestos, Sava, Struma/Strimon, Vardar/Axios and others. These and other transboundary rivers flow first into one of the shared lake basins, which include Doiran, Ohrid, Prespa, and Shkoder lakes, or directly into the Adriatic, the Aegean, the Ionian or the Black Seas, affecting the quality of the region's lake- and sea-dependent industries such as fishing and aquaculture. More than half of the transboundary basins are shared by three or more riparian states. Countries such as Bulgaria, Croatia, Serbia and Montenegro, with runoff more than 1700 mm per year, depend mainly on external resources of freshwater water. On average, the regional dependency on transboundary

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[234] Rogers, et. al., p.9

[235] Guy Hutton and Laurence Haller, "Evaluation of the Costs and Benefits of Water and Sanitation Improvements at the Global Level." *Water, Sanitation and Health Protection of the Human Environment*, World Health Organization, Geneva, 2004.

water resources is 66 percent, emphasizing the importance of effectively address the transboundary water resources management issues in the region.[236]

The total renewable water resources in SEE region is estimated at 580 billion cubic meters per year, varying significantly by year and season. These resources are not evenly distributed among the region, and despite having nearly twice the average per-capita water availability of the whole of Europe with approximately 10,600 cubic meters per capita, some SEE countries still must deal with localized shortages. Approximately 55% of the region's population of 55 million people live in urban areas, and around 90% of this urban population is served by water supply networks, however of the remaining population in rural areas, only approximately 50% is reached by water supply networks.[237]

The SEE region shares many of the same concerns in managing their water supplies, both environmentally and institutionally. A major concern for many cities in the region is the chemical and microbiological quality of drinking water supplies due to contamination from chemical, nutrient, and other pollution. Much of the drinking water in the region comes from groundwater which is often untreated, and is often threatened by contamination from sewage or landfill leakage, seepage of agrochemicals, or from excessive water pumping. Excessive groundwater pumping near the coastlines of SEE has led to the sometimes irreversible intrusion of salt water into coastal aquifers and degradation of wetlands. [238]

The institutional settings of many SEE countries create similar challenges to managing environmental concerns such as IWRM. The process of transition toward decentralized free-market economies has been a slow one, and centralized administrations still exist. While integrated framework legislation is beginning to be introduced, spurred on by hopes of EU accession, there is still a lack of coordination between the necessary implementing institutions, such as the ministries of water and of environment. Coordination often takes place on an informal basis, and needs to be institutionalized to become sustainable. Additionally, there is a common lack of human, technical and financial resources which limits the capacity of implementing institutions. This leads to insufficient regulatory frameworks, ineffective enforcement and compliance, and weak permitting systems. Moreover, a common problem in the region has been inadequate public participation.[239]

The transboundary river basins are often managed with conflicting approaches by neighboring countries, which often may have very different goals for the riparian locality's economy and the use of the water resources. Potential challenges for

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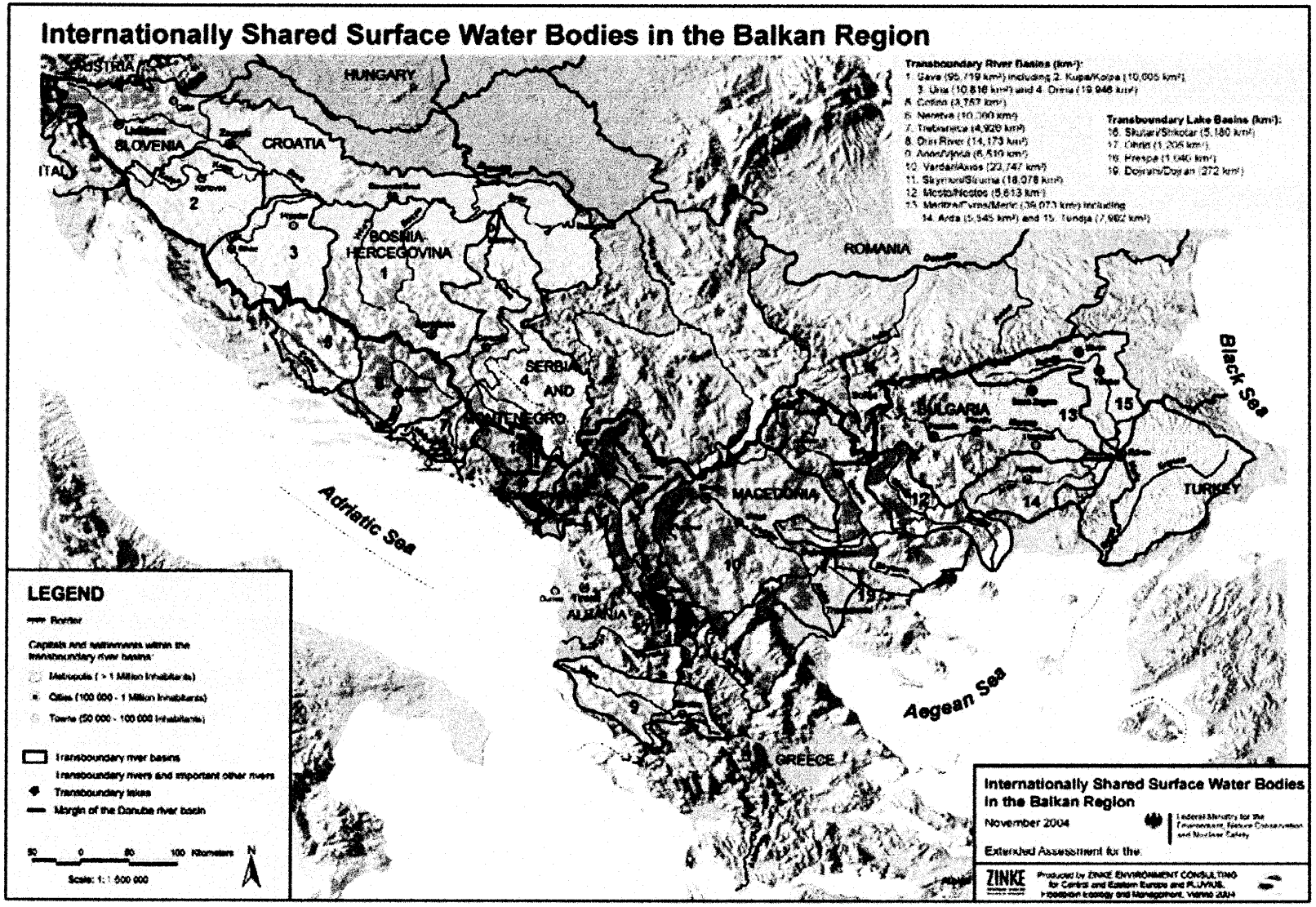
[236] GWP "Information Note." International Roundtable on Integrated Shared Lake Basin Management in Southeastern Europe, October 2006.
[237] Global Water Partnership-Mediterranean, "Key issues on Integrated Water Resource Management in SEE Region at national and transboundary level: With an emphasis on Institutional Arrangements." IW:LEARN, Athens, 2004.
[238] Ibid.
[239] World Bank, Water resources management in South Eastern Europe Volume I, "Issues and Directions." 2003.

transboundary rivers basins include water quantity and quality management, navigation, balancing ecosystem needs with national development, and emergency management of floods and other disasters.[240]

As climate change begins to have a greater impact on the region, water quality and quantity allocation will become more pressing in the region, especially for downstream countries which may not have the leverage to ensure the necessary water resources will be allowed to flow to them. Thus, the potential for international conflicts as a result of water scarcity, degradation of water quality and inadequate cooperation in the management of shared waters, poses a risk to stability and economic development of the SEE region.

[240] Water resources management in South Eastern Europe Volume I, "Issues and Directions". World Bank, 2003.

Figure 14: Map of Internationally Shared Water Bodies in the Balkan Region



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4.6 Policy Coordination & Cooperation for Country-wide & Multiple Country Regions

Country-wide policy coordination and cooperation in multiple country regions is a crucial element to encouraging the appropriate pollution prevention and treatment technologies and achieving sustainable development. Such country-wide and region-wide analysis is not within the scope of the included case study, and will remain as an area for future work. This section, however, gives an overview of these elements of the framework.

4.6.1 Need for coordination within country

There is a need for coordination within a country among its different environmental policies (for air, water, waste, and soil issues) implemented *in different localities* in order to create the proper incentives for *national* sustainable development, so that one locality does not protect and prosper only to have another locality consume and degrade some of the nation's precious resources. Not only is it important to have a coherent environmental policy, but this must also be coordinated with other policy areas, including industrial, agricultural, and economic policies which can often contradict the goals of the others. It is for this reason that many nations have begun developing national strategies for sustainable development, in order to involve all stakeholders in defining a common goal which they can work towards together.

Also it is important to consider how, while national laws and strategies may be made with the best of intentions, they often don't make take into consideration the local realities on the ground. Thus, it local to national coordination is also essential in environmental and economic development needs and goals.

4.6.2 Regional Coordination

Like Transboundary Region, multi-country regions share geographic and environmental conditions, and may be facing similar challenges. They may also have similar social, cultural and economic characteristics which could make previous experiences and lessons-learned from other parts of the region most relevant and most helpful. Thus, the sharing of technical and policy obstacles and solutions that have worked may be greatly beneficial to neighboring countries within a region such as Southeastern Europe. Additionally, cooperation on environmental assessments and monitoring data can be beneficial to the identification of technical issues throughout the region.

Most importantly, cooperation on environmental issues can provide a platform for organizing integrated policy responses for the most important issues affecting the region. Developing regional demands for improved environmental technologies can spur the development of appropriate technology to be developed or imported into the region. By coordinating the individual national innovation systems the region can pool the innovating capabilities of the region and by creating a regional market which is larger than any one national market for the potential innovations, the regional incentives may encourage the development of radical transformations in industrial technologies and processes.

5 Case Study: Description of the Mesta/Nestos River Basin

Approximately ninety percent of the water basins in Southeastern Europe are shared between two or more countries.[241] There are several transboundary rivers flowing through both Bulgaria and Greece into the Aegean, including the Struma/Strymon, Mesta/Nestos, Maritza/Evros/Meric, Arda Rivers. This case study is focused on the Mesta/Nestos transboundary river between Bulgaria and Greece.

The Mesta River – as it is called in Bulgaria, or the Nestos River – as it is called in Greece, begins from a spring water source in the Rila Mountains in southwestern Bulgaria at an elevation of 2,716 m. The river has many tributaries as it flows through the Blageovgrad Province of Bulgaria, through northern Greece's Macedonia and Thrace provinces until it flows out into the North Aegean Sea. It is the most important water source for the development of the region, as both the Bulgarian and Greek sides of the river depend on the river for their livelihood.

Figure 15: Showing Location of Mesta/Nestos River[242]

There have been numerous studies on the Mesta/Nestos river basin, so this case study attempts to gather, coordinate, and update that information into one document.

[241] GWP, "Information Note." International Roundtable on Integrated Shared Lake Basin Management in Southeastern Europe, October 2006.
[242] Efthymios Darakas, "The Transboundary River Nestos and Its Water Quality Assessment: Cross-Border Cooperation between Greece and Bulgaria." *The Environmentalist*; December 2002; 22, 4; ABI/INFORM Global pg. 367

Some of the studies which have been conducted have been through the following programs or organizations:

- Transcat
- Interreg
- Iron Curtain
- UNESCO/INWEB
- Aristotle University of Thessaloniki (AuTH)

New information has also been gathered for this study by discussions with local stakeholders in the water basin on both sides of the border.

This section will provide the political background of Bulgaria and Greece's political relationship over the Mesta/Nestos river, in order to better understand the diplomatic evolution of the story and the current status of the situation. Next, this section will present the current status of the environment in the Mesta/Nestos river basin by characterizing the physical system, discussing the present environmental stresses on the basin, and discussing the technical needs for improvement. Section 5.1 will give the socio-economic, political and historical backgrounds of both countries overall, and will then address the diplomatic evolution of the regional cooperation surrounding the Mesta/Nestos river and region. Section 5.2 will focus on the environmental status of the Mesta/Nestos river basin, focusing on the physical characteristics of the river and competing uses of the basin. Section 5.3 will go over the overall stresses to the environment caused by various activities in the region, and Section 5.4 will discuss the apparent technical needs of the basin to address these stresses.

The following chapter (Chapter 6) will apply the systems framework to the region, and address Greece's and Bulgaria's environmental technology adoption and use policy, environmental regulation policy, and their coordination between technology adoption and use policy and regulatory policy within and across borders.

5.1 Socio-economic and Political Factors

Both Bulgaria and Greece have long histories leading to the development of their nations, which contributes to strong nationalistic feelings and pride. Their turbulent political pasts have contributed to the development of some traditions of corruption and distrust of the government and political institutions, especially in Bulgaria, who transitioned from a communist regime only as recently as 1990. To get a full understanding of how the Mesta/Nestos region fits in to each country's outlook, this section looks at the socio-economic, historical and political backgrounds of each country, as well as the river basin region. Then, we will overview the long evolution of the Mesta/Nestos river negotiations. Finally, we'll examine the physical characteristics of the basin and the various stresses upon the water resources and environment in the Mesta/Nestos region.

5.1.1 Characteristics of each Country

To get a better picture of the different situations of the two countries around the Mesta/Nestos river basin, this section gives an overview of the socio-economic and

historical backgrounds of each country. While they have shared parts of their history, the communist period and its demise in Bulgaria have held the country, and indeed the region, back in development.

5.1.1.1 Bulgaria

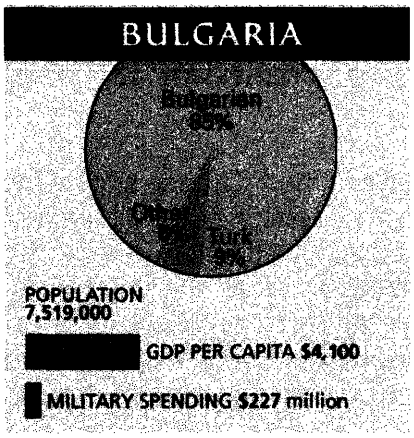

Figure 16: Bulgaria's ethnic composition, population, GDP and military spending.[243]

Bulgaria, officially called the Republic of Bulgaria, is a country composed of mostly Orthodox Christians, yet has a significant ethnically Turkish Muslim minority. The population of now approximately 7.8 million has an average life expectancy of 72 years and a Gross National Income (GNI) per capita in US dollars of $1,700.[244] The language is one of Europe's oldest written languages, and is related to Slovenian, as well as Serbo-Croatian and Macedonian. The Bulgars, arrived in the Balkans just after the Slavs in the 7th century. They were a predominantly Turkic tribe from the lower Volga region. They combined their cultures to create what became the Bulgarian empire, spanning from the Black Sea to the Adriatic.[245]

Since it has gained its independence from the five hundred years of Ottoman domination in 1878, Bulgaria "has usually been governed by royal/military or Communist dictatorships that explicitly rejected democratic institutions as 'anarchic' or 'bourgeois.'"[246] During Communism, Bulgarians "developed a reputation for passivity"[247], as they were very compliant with the Soviet Union, and had a long tenure with their Soviet-seeking government, giving the appearance of political immobility among the people. However, many of the Bulgarian political actors and the people desired and contributed to the development of democratic values in the region, and

[243] National Geographic Society, *The Balkans* [map]. National Geographic Society: Washington D.C., 2005.
[244] Freedom House, "Country Reports: Bulgaria". Available at http://www.freedomhouse.org/template.cfm?page=22&year=2005
[245] National Geographic Society, *The Balkans* [map]. National Geographic Society: Washington D.C., 2005.
[246] John D. Bell, "Democratization and political participation in "postcommunist" Bulgaria", in Politics, power and the struggle for democracy in South-East Europe (eds Karen Dawisha and Bruce Parrott). Cambridge Univ Press, Cambridge 1997, p. 354
[247] Ibid.

beneath the surface "the country experienced fundamental economic and social changes"[248] that would lead to the society's demand for a change in government in the 1980s. Soviet Communism helped this in some ways, as it transformed Bulgaria from having a predominantly rural population (about three-fourths of the population) engaged in small-scale, primitive farming at the end of WWII to an industrial society, with a highly educated population, and by the 1980s, about only one-fifth Bulgaria's population was still involved in farming, and approximately two-thirds of the people were urban.[249] Education of the people was so successful that "Bulgaria ranked among the most advanced nations in terms of the proportion of its eligible population that received secondary and higher education."[250] At this point, Bulgaria for the first time "possessed the equivalent of a Western middle class" in the sense of its "psychology and outlook, skepticism toward inherited dogmas, desire for material success and personal autonomy", and this social group began to culturally influence the rest of the country.[251]

In 1989 after rejecting its communist regime, Bulgaria acquired a "reputation as an island of stability in the Balkans" as it had made surprising progress on creating a democratic order even though it lacked a "prosperous economy, a large middle class, and a developed civic culture – factors that scholars maintain provide the most fertile soil for democratic growth."[252] However, Bulgaria's later experience disappointed many because "economic reforms have been glacially slow and have been stained by corruption and the rise of criminal activity,"[253] even though the government has attempted to build a framework against such corruption. Transparency International ranked Bulgaria 54th out of 146 countries surveyed in their 2004 International Corruption Perceptions Index.[254] The government, however, does operate with relative openness, and the constitution's democratic government machinery has been functioning without crisis, and elections have occurred without serious fraud or violence.[255] The political opposition has been so disorganized that to some extent, the heirs of the Communist Party have continued to play a big role in the government.

The constitution also guarantees freedom of the press, however there is still inappropriate influence exerted on the media by the government. Freedom House recounts some examples of this in their country reports, stating that "many journalists complain of feeling harassed about their reporting."[256] However, internet access is not restricted, and freedom or religion is generally respected, although Freedom House mentions that "the government has in recent years made it difficult for 'nontraditional'

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[248] Ibid., p.355
[249] Ibid.
[250] Ibid
[251] Ibid., p.355-356
[252] Ibid. p.353
[253] Ibid.
[254] Internet Center for Corruption Research. Corruption Perceptions Index. Berlin: Internet Center for Corruption Research. 2005. Available at http://www.icgg.org/corruption.cpi_olderindices.html
[255] John D. Bell, "Democratization and political participation in "postcommunist" Bulgaria", in Politics, power and the struggle for democracy in South-East Europe (eds Karen Dawisha and Bruce Parrott). Cambridge Univ Press, Cambridge 1997, p. 353
[256] Freedom House, "Country Reports: Bulgaria". Available at http://www.freedomhouse.org/template.cfm?page=22&year=2005

religious groups to obtain registration permits allowing them to be active,"[257] with "nontraditional" referring to religions other than mostly Orthodox Christianity, Islam, Jewish, and Catholicism. The country's goal of entering the European Union has been a strong force for making steady progress toward better protection of the population's civil liberties and better governance.

5.1.1.2 Greece

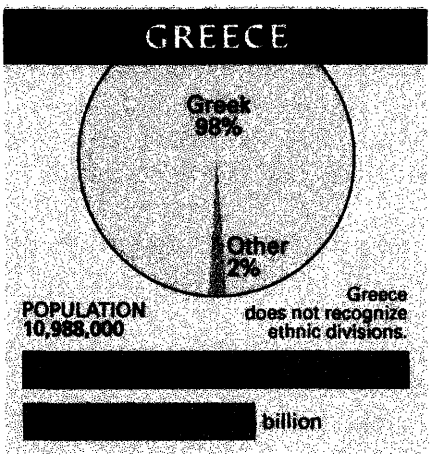

Figure 17: Greece's ethnic composition, population, GDP and military spending. [258]

Greece, officially called the Hellenic Republic, has a population composed of 98% ethnically Greek people, approximately all of which are Orthodox Christian. There are a small number of Albanians, Pomaks and Turks which live as assimilated minorities in Greece, and the only neighboring countries which have significant Greek communities are Turkey and Albania.[259] The Greek population of approximately 11 million people earns an average GNI of $11,660 per capita, and has an estimated life expectancy of 78 years old.[260] The Greeks have a strong cultural identity rooted in 3,000 years of an ancient history and language, and often are credited with creating the first "democracy" in the world in Ancient Greece.

This historical legacy helped to inspire the Greek people to revolt against the Ottoman Empire and become the first Balkan nation to gain its independence in 1830. The British strongly supported Greece in its struggle for sentimental reasons with the philhellenic movement, but also for geopolitical purposes, as Britain wanted to safeguard its access to its shipping routes to India, and Russia wanted to see the Ottoman Empire dismembered. After a period of rivalry among the great powers from 1833 to 1856, Greece came under British influence. Greece basically imported different pieces of its institutions from the West, including bringing Western royalty and democracy to the state. During WWII Italian and then German forces occupied parts of Greece, and

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[257] Ibid.
[258] National Geographic Society, *The Balkans* [map]. National Geographic Society: Washington D.C., 2005.
[259] Ibid.
[260] Freedom House, "Country Reports: Greece". Available at http://www.freedomhouse.org/template.cfm?page=22&year=2005

following the war, the government was returned to the royalist system which led to a civil war between Nationalists and Communists. This civil war between 1946 and 1949 took a grave toll on the human resources of Greece, having a long term effect on Greek society and politics.[261]

The United States became the major influence after the British in 1946, and supplied military aid and advisors who, with the Greek government, formed a joint General Staff to conduct operations to fight some of the first battles of the Cold War.[262] After the civil war, the years of the 1950s through the 1970s were a time of dramatic socioeconomic change, where "Greece was literally transformed from an underdeveloped economy and society into a very promising, newly industrializing country."[263] The rebuilding of infrastructure destroyed by German occupation during WWII and civil strife, a rural electrification program, intense urbanization, large increases in literacy, a rise in industrial production, and "the gradual but unmistakable ascendancy in Greek society of cultural practices and values intimately linked with modernity" all reflected the transformation Greece was experiencing during that period.[264] After a period of an authoritarian regime by Greek colonels who ruled between 1964 and 1974, Greece finally established its "first-ever fully democratic political system", and Greek politics began to normalize and converge with the modern and democratic political systems that existed in the West.[265] Greece was accepted to the European Union in 1981, lauded as a success story of socioeconomic and political modernization.

The international community had great expectations for Greece, but during the 1980s and 90s, Greece's performance began to disappoint as it stagnated over those decades. Out of the Post civil-war Greek policies that helped the country grow so dramatically, structural weaknesses were created in the governance that later led to harm the future growth possibilities. For instance, Greece had a poor strategy for distinguishing the victors and the losers through discriminatory policies such as "the use of explicitly political, nonmeritocratic, and clientelistic criteria for state employment", leading to an inefficient civil and state sectors and state-owned enterprises as they were often were staffed with unqualified individuals.[266] Moreover, the state operated in a way that led to the fragmentation of the structures that were productive, and created a dependence on the state's protective manner to continue growth and the survival of the economy, leading to the emergence of a paternalistic state, which in many ways continues today in the people's expectations and attitudes toward the government. Therefore, it can be seen that overall, "the weak economic and especially the weak industrial structure of Greece were not in a position to adapt successfully to the new

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[261] Thanos Veremis, *Greece's Balkan Entanglement*. Hellenic Foundation for European & Foreign Policy (ELIAMEP), Athens, 1995. Chapter 1.
[262] Ibid.
[263] Nikiforos Diamandouros "Greek Politics & Society in the 1990s" in *The Greek Paradox: Promise vs. Performance* (eds. Graham T. Allison, Kalypso Nicolaidis). The MIT Press, Cambridge, MA., 1997. p.23.
[264] Ibid., p. 24.
[265] Ibid.
[266] Ibid., p. 26.

economic environment of the country, leading to a divergence from the EU average in the 1980s."[267]

Today, corruption is still a problem in Greece, and despite the Bureau of Internal Affairs of the Ministry of Public Order taking disciplinary measures, corruption is still a problem within the police forces themselves. Out of the 146 countries ranked by Transparency international, Greece received 49th place on the Corruption Perception Index, receiving the lowest rank of all European Union members.[268]

The Greek constitution provides for freedom of the press and freedom of speech; however there are limits to some speech which may create disharmony, fear, or violence in the country, or media that may be considered obscene, are offensive to religious beliefs, or promote the overthrow of the political system through violent means. Still, there are independent media, and they do not hold back in their criticism of the government. Freedom of religion is also respected, however the constitution does consider the Eastern Orthodox Church as the "prevailing religion", and people of minority religions often face legal barriers and social discrimination. The Orthodox Church is subsidized by the Greek state, and other religious groups are required to obtain permits in order to open places of worship. The constitution allows freedom of association, yet ethnic and religious groups also often face barriers. Moreover, non-Muslim ethnic groups, such as Slavic people, are not recognized by the government. Still, freedom of assembly is a constitutional right that is generally protected by the government.[269]

5.1.2 Economic Indicators

According to the World Bank, Greece is classified as a High Income Country, while Bulgaria is in the Lower-Middle-Income category.[270] Bulgaria was also classified as 'moderately indebted'.[271] Tables 5 and 6 summarize several economic indicators for Bulgaria and Greece, and compare data beginning from 1995 to more current values from 2006.[272]

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[267] George Petrakos and Christos Pitelis, "Peripherality and Integration: The Experience of Greece and its Implications for the Balkan Economies in Transistion" in *The Development of the Balkan Region*. Ashgate Publishing, Ltd, Aldershot, 2001. p.307

[268] Freedom House, "Country Reports: Greece". Available at http://www.freedomhouse.org/template.cfm?page=22&year=2005

[269] Ibid.

[270] The World Bank divides countries among the following four income categories: low income, where individuals earn $825 or less in a year; lower middle income, with $826 - $3,255 per capita; upper middle income, with $3,256 - $10,065 per capita; and high income, with $10,066 or more.

[271] World Bank, "Country Classification" available at http://web.worldbank.org/WBSITE/EXTERNAL/DATASTATISTICS/0,,contentMDK:20420458~menuPK:64133156~pagePK:64133150~piPK:64133175~theSitePK:239419,00.html

[272] Because data reporting was not regularly or accurately collected from the transition countries from Eurostat and other data sources, some dates differ in the analysis, yet were included in order to convey the general trends of growth of approximately the previous decade. The differing dates are noted within Tables 5 and 6.

As shown in the figures in Table 5, the Gross Domestic Product (GDP) per capita in Bulgaria went through a turbulent nine-year period, but in 2004 settled at the same level as it had been in 1995. After this, we see that Buglaria's GDP per capita has continued to increase, reaching a total increase of 15.9% in Purchasing Power Standards over 11 years. Greece's performance in 1995 may be considered comparatively better than Bulgaria, as shown in Table 6. During the same time period, Greece's GDP increased by 22.4%, and this occurred with a much more consistent pattern.

In 1997, Bulgaria had 105.1% of its GDP as general government debt, however, by 2006 and through the strict economic reforms it was required to do as a requirement for EU membership, Bulgaria was able to reduce this to only 22.8% of GDP. In 1995, Greece had a similarly high general government debt of 108.7% of its GDP. However, Greece has not succeeded in significantly reducing this level of debt, and still stands in 2006 with general government debt of 104.6%. Bulgaria was able to lower its 1998 high inflation rate of 18.7% down to 7.4% in 2006. Greece has also reduced its inflation rate from 5.4% in 1997 to 3.3% in 2006.

After the fall of communism, Bulgaria was left with declining industries and low labor productivity per person. By 2006, however, Bulgaria has both greatly improved its employment growth and its labor productivity. Labor productivity per person has increased by 16.5% since its 1996 level. While employment growth in 1997 in Bulgaria was negative, with a loss of 3.9% of jobs, in 2006, this trend had been reversed with a growth of 2.4% of employed population. Greece's labor productivity, starting at a much higher level than Bulgaria in 1995, increased by 2006 by 24% at a steady pace over that time period. Also, Greece's employment growth has been overall positive and steady, with 0.9% increase in employed population in 1995, and in 2006 a 1.4% increase.

While the European Union began the accession process with Bulgaria and many other post-communist countries at the same time, it accepted most of these countries into the EU in 2004 (EU-10), while putting off Bulgaria and Romania's entrance until 2007. For Bulgaria, this was due its delayed progress in several of the Accession criteria. We see in these indicators a high percentage of government debt and a high inflation rate in Bulgaria, which contributed to the EU's decision for its postponed accession; however a lagging behind in performance improvements on social governance and civil liberties issues also contributed significantly.

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Selected Economic Performance Indicators for Bulgaria

Indicator	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
GDP per capita in PPS - GDP per capita in Purchasing Power Standards (PPS), (EU-25=100)	30.8	27.4	25.4	25.9	26.1	26.5	28	28.3	29.7	30.6	33.7	35.7
Real GDP growth rate - Growth rate of GDP volume - Percentage change on previous year	2.9	-9.4	-5.6	4	2.3	5.4	4.1	5.6	5	6.6	6.2	6.1
Labor productivity per person employed - GDP in PPS per person employed relative to EU-25 (EU-25=100).	-	29.1	28.1	28.8	29.5	28.9	30.1	30.2	31.9	32.2	32.6	33.9
Total employment growth - Annual percentage change in total employed population.	-	-	-3.9	-0.2	-2.1	4.9	-0.8	0.2	3	2.6	2.7	2.4
Inflation rate - Annual average rate of change in Harmonized Indices of Consumer Prices (HICPs).	-	-	-	18.7	2.6	10.3	7.4	5.8	2.3	6.1	6	7.4
General government debt - General government consolidated gross debt as a percentage of GDP.	-	-	105.1	79.6	79.3	73.6	66.2	54	45.6	37.9	29.2	22.8

Table 12: Basic objective indicators of Bulgarian Economic Performance[273]
Data is from the European Commission's Eurostat, available at http://epp.eurostat.cec.eu.int/. Note: Some data may be estimated. Some indicators shown are not available for all years from Eurostat, and are indicated with a '-'.

[273] Eurostat Website, European Commission. Accessed on June 26, 2007. Available at http://epp.eurostat.cec.eu.int/

Selected Economic Performance Indicators for Greece

Indicator	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
GDP per capita in PPS - GDP per capita in Purchasing Power Standards (PPS), (EU-25=100)	70.8	70.3	70.9	70.6	70.7	72.7	73.2	77.2	80.2	81.4	84	86.7
Real GDP growth rate - Growth rate of GDP volume - Percentage change on previous year	2.1	2.4	3.6	3.4	3.4	4.5	5.1	3.8	4.8	4.7	3.7	4.3
Labor productivity per person employed - GDP in PPS per person employed relative to EU-25 (EU-25=100).	84.3	84.9	87.3	86.1	87	90.7	92	97.1	99.7	98.4	101.3	104.5
Total employment growth - Annual percentage change in total employed population.	0.9	-0.4	-0.5	2.9	0.3	0.5	0.3	0.2	1.5	3.4	0.9	1.4
Inflation rate - Annual average rate of change in Harmonized Indices of Consumer Prices (HICPs).	-	-	5.4	4.5	2.1	2.9	3.7	3.9	3.4	3	3.5	3.3
General government debt - General government consolidated gross debt as a percentage of GDP.	108.7	111.3	108.2	105.8	105.2	114	114.4	110.7	107.8	108.5	107.5	104.6

Table 13: Basic objective indicators of Greek Economic Performance[274]
Data is from the European Commission's Eurostat, available at http://epp.eurostat.cec.eu.int/. Note: Some data may be estimated. Some indicators shown are not available for all years from Eurostat, and are indicated with a '-'.

[274] Ibid.

Agriculture is still an important part of the European Union's economy. While the EU-27 were found to have an increase of 3.8% in agricultural income per labor unit (Indicator A) in 2006. Bulgaria was found to have an increase of 6.4%, mostly because of a sharp fall in labor input to agriculture. Greece only saw an increase of 1.2% of income per labor unit, below the EU average. The agricultural output volumes have decreased overall in the EU-27 by 1.6%, in Bulgaria output volume has increase by 0.6%. However, while Bulgaria produced 1.1% of the EU-27 agricultural output in 2005, it used 4.5% of the EU-27 labor input. Interestingly, the 2006 average agricultural producer prices are up in the EU-27 by 1.8% since 2005, however Bulgaria has seen a reduction in the producer prices by 3.8%.[275]

The following Table breaks down the main components of agricultural income in the EU-27, as well as in Bulgaria (BG) and Greece (EL). The heavy subsidization in Greece is drastically above the EU-27 average, and far differing from Bulgaria's taxation on production.

[275] (EAA) submitted to Eurostat by the Member States at the end of January 2007

Table 14: Main components of agricultural income in the EU-27, % 2006/2005[276]

Values in real terms (i.e. deflated)	EU-27	BG	EL
OUTPUT OF THE AGRICULTURAL 'INDUSTRY'	**-3.1**	**-3.2**	**-17.1**
CROP OUTPUT	-4.3	-0.7	-21.9
ANIMAL OUTPUT	-2.2	-10.0	-7.7
ANIMALS	-0.8	-10.4	-12.3
ANIMAL PRODUCTS	-4.5	-9.5	-1.7
AGRICULTURAL SERVICES	+0.9	+0.4	-2.7
SECONDARY ACTIVITIES	+0.0	+4.7	-1.8
- INTERMEDIATE CONSUMPTION	**-0.3**	**-2.1**	**-4.4**
= GROSS VALUE ADDED AT BASIC PRICES	**-6.4**	**-4.5**	**-23.1**
- CONSUMPTION OF FIXED CAPITAL	+0.1	-4.5	-1.6
- OTHER TAXES ON PRODUCTION	-1.9	-22.4	+2.9
+ OTHER SUBSIDIES ON PRODUCTION (a)	+38.3	-0.9	+467.5
= FACTOR INCOME (1)	**+1.1**	**-4.3**	**+0.1**
AGRICULTURAL LABOUR INPUT (2)	-2.6	-10.0	-1.1
INDICATOR A (1)/(2)	**+3.8**	**+6.4**	**+1.2**
Indicator A, Indices in 2006 (2000=100)	**112.1**	**104.3**	**86.2**

5.1.3 Characteristics of River Basin

The Mesta/Nestos river is the most important water source for the development of the river-basin region, as both the Bulgarian and Greek sides of the river depend on the river for their livelihoods. This is based mostly on the primary sector of agriculture, agribusiness, forestry and fishing. The river water also contributes to many other important aspects of the regions economic development, including hydroelectric power, tourism, and industrial development. The areas on both sides of the border are both some of the less-developed regions of their countries.

The mountainous terrain isolates many parts of the region, and makes it difficult to travel through the region, and there has been a shortage of transport links between the

[276] Adapted from Table 3 in http://epp.eurostat.ec.europa.eu/cache/ITY_OFFPUB/KS-SF-07-038/EN/KS-SF-07-038-EN.PDF

two sides of the Greek-Bulgarian border. This has recently begun to improve, with the construction and improvement of roads and railways between the port towns in Greece and Sofia, the capital of Bulgaria, and as a new border crossing opened in 2005 at Ilinden-Exohi.[277]

The Mesta/Nestos river basin is well-known and has been jointly explored by Greek and Bulgarian scientists since the early 1990s.[278] There have been many international universities involved in studying the river basin and its characteristics over the years, and it continues to be a subject for many doctoral and diploma studies.

5.1.3.1 Mesta River Basin in Bulgaria

The Bulgarian part of the river basin is located in the Blagoevgrad Province in the South West Region of the country. The province makes up 5.8% of Bulgaria's territory, and is quite mountainous. The population of the province is concentrated in the valleys along the two major rivers and their tributaries, both the Mesta River and the Struma River – also a transboundary river shared with Greece (Styrmona). The total population in the Bulgarian side of the basin is 135,000 people, out of a total basin population (between Bulgaria and Greece) of 170,000. There are fourteen municipalities in the Blagoevgrad province, although not all of them lie within the Mesta river basin. The largest towns on the Bulgarian side of the basin are in the towns of Razlog (21,500 people), Gotze Delchev (33,000 people) and Satovcha (18,000 people).[279]

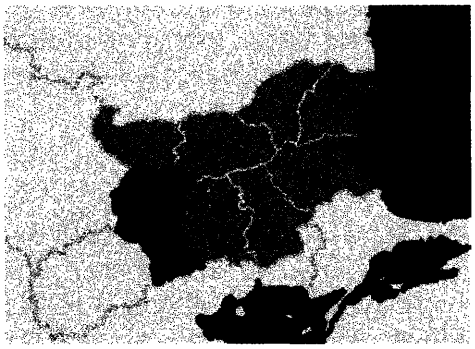
[277] "New Bulgarian-Greek border crossing inaugurated" Accessed at http://www.setimes.com/cocoon/setimes/xhtml/en_GB/features/setimes/newsbriefs/2005/12/11/nb-08 on June 26, 2007

[278] Personal Communication with Professor Roumen Arsov, Dean of the Faculty. of Hydrotechnics, University of Architecture, Civil Engineering and Geodesy, Sofia, Bulgaria, July 21, 2006

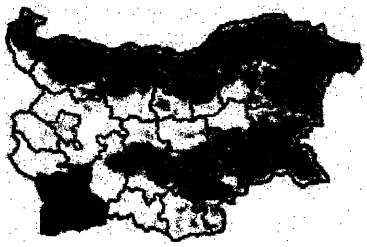
[279] UNESCO HELP Basin document

Table 15: Maps Detailing Administrative Locality of Mesta River Basin in Bulgaria

Location of South West Region of Bulgaria[280]:



Location of Blagoevgrad Province of Bulgaria[281]:



Detail of Municipalities in Blagoevgrad Province, Bulgaria[282]

In Blagoevgrad Province, there are 14 municipal districts, but only 8 are in the Mesta water basin.[283] The Mesta River is under the management of the West Aegean Basin Directorate, or WABD, which is one of the four river basin directorates that manage all of Bulgaria's river basins. The largest water users in the WABD's jurisdiction were reported as the following industries: a Pharmaceutical company, mining (coal and stones), textile, tobacco, steel, and building material companies (ex: bricks, cements, etc). WABD currently has project for the development of river basin management plan for Bulgaria and Greece jointly. First phase was Phare project for preparation/development for the Mesta/Nestos. Tender had been announced for second phase – consulting.[284]

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[280] "Eastern Macedonia and Thrace". Accessed at http://www.innovating-regions.org/network/whoswho/regions_search.cfm?region_id=32&printversion=1 on June 26, 2007

[281] Guide Bulgaria, "District Blagoevgrad". Accessed at http://www.guide-bulgaria.com/SW/Blagoevgrad on June 26, 2007

[282] Ibid.

[283] Personal Communication with Alexander Yanef, Chief expert of regional development, Administration of Blagoevgrad Province, Bulgaria, July 19, 2006.

[284] Personal Communication with Milkana Mochurova, BAS Institute of Economics, Sofia, Bulgaria, July 18, 2006.

The economy of the region is based on food and tobacco agriculture and processing industries, tourism, timber and furniture industries. There are no universities in the locality, and only a Tobacco Institute in Gotse Delchev. The average per-capita income on the Bulgarian side is 1,790 US$/year, and the Gross Domestic Product is 6,600 US $/year. [285] While the region is quite poor, the general opinion of the people there is that they are very clean, honest, and good.[286] In the Bansko and Razlog municipalities, most live through the tourism industry. In the Northern part of the basin, people live mainly from the wood industry – timber and wood-working. In the southern part of the basin, many are involved in the textile companies from foreign industries, such as Greece, Turkey, and Italy. However, because the laws are not so well organized, the foreign businessmen are not always "top businessmen." They take advantage of the weak laws that are in place to use child labor, pay low salaries, and they do not provide insurance to the many women who work in the textile industry. [287] They do not adhere to the same standards of health and safety as they would in their own countries. [288]

5.1.3.2 Nestos River Basin in Greece

The Greek part of the river basin is part of three prefectures in Greece – Drama, Xanthi, and Kavalas[289]. These three prefectures are organized as the Drama-Kavalas-Xanthi super-prefecture, working as a second degree organization of local governance.[290] All of these prefectures are part of the administrative region of the Periphery of "East Macedonia and Thrace." Most of the basin region is mountainous, with the exception of the delta region. Within the Nestos basin, there are 82 communities, with a total of approximately 35,000 people. The largest town on the Greek side of the basin is Chrisoupoli (8,004 people). [291] While the city of Kavalas, the capital of the Kavalas prefecture, is the largest city in the three prefectures concerned, it is geographically situated outside of the Nestos River basin, and thus does not affect the pollution of the river and its delta, however it does have an impact on the Aegean Basin, as its effluents are discharged in the same bay, and can affect the same fisheries and wildlife as the water coming from the Nestos. Moreover, it is able to withdraw water resources from the river to satisfy its population as well.

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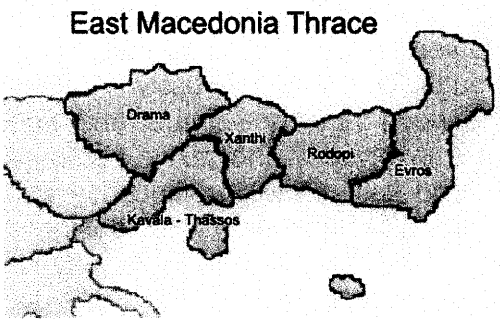
[285] UNESCO HELP Basin document
[286] Personal Communication with Emil Bournaski, Bulgarian Academy of Sciences, July 17, 2006.
[287] Ibid.
[288] One person mentioned a story which was published in the local newspapers about a woman from a nearby village who died from the chemicals in the glue use in the textile or paper industry that she was working with.
[289] Note: Kavalas is also often referred to as Kavala.
[290] This super-prefecture designation (in Greek, "Nomos") is only given to three areas in Greece, including the Rhodopi-Evros, and Athens-Piraeus super-prefectures.
[291] UNESCO HELP Basin document

Table 16: Maps Detailing Administrative Locality of Nestos River Basin in Greece

Location of the East Macedonia- Thrace Periphery Region in Greece[292]	Details of the Prefectures in the East Macedonia-Thrace Periphery[293]
	

The region is one of the most productive agricultural regions in Greece due to the plentiful waters and fertile soil of the Nestos Delta area. The average per-capita income on the Greek side is 9,408 US$/year, and the Gross Domestic Product is 15,200 US$/year.[294] Most of the basin region is involved in agriculture or fishing, especially in the Nestos Delta. There is also some industrial development, including several produce and meat packaging plants, a sugar factory, and fertilizer factory. The region used to thrive off of the tobacco industry, which is still important to the region, but has not been as profitable as in the past due to changes in demand, and the implementation of subsidy programs for other crops.

5.1.4 Diplomatic Evolution between Countries

Bulgaria and Greece have a long history of diplomatic relations over the Mesta/Nestos river which began in the 1960s with the negotiation between both governments over the water quantity. In 1964, the two countries, which were politically structured quite differently than they are today, agreed on cooperation of the use of watercourses flowing between the two countries, which includes the Mesta/Nestos, the Maritsa/Evros and the Struma/Strymonas rivers. At that time, the People's Republic of Bulgaria and the Kingdom of Greece ratified an agreement on the use of the Mesta/Nestos river waters. However negotiations lasted a few decades until a final decision was made in 1995, and this agreement was finally put in force in 1996.

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[292] "Eastern Macedonia and Thrace. Accessed at http://www.innovating-regions.org/network/whoswho/regions_search.cfm?region_id=32&printversion=1 on July 30, 2007

[293] "East Macedonia – Thrace". Accessed at http://www.luxuryhotelsgreece.gr/East_Macedonia_Thrace.htm on July 30, 2007

[294] Hydrology for the Environment, Life and Policy (HELP), "Mesta-Nestos (Bulgaria-Greece)" UNESCO.

Mesta begins in Rila Mountain and most of the runoff is in the Bulgarian territory. There are no large dams in use in Bulgaria, but in the last 20 years the Greek government has built three dams. The dispute was over the percentage of runoff that must cross the border. The Bulgarian side wanted to allocate 25%, and the Greek side wanted 35% of the annual runoff. This dispute remained until the mid 1990s when the governments achieved an agreement of 29%, which is where the agreement currently stands. According to one source, however, is that in reality almost 80% of the annual runoff actually goes across the border.[295] Yet another source points out that the runoff has not included runoff from the Dospat River, which naturally would flow into the Mesta but is entirely dammed, with the majority of its waters diverted towards the Maritza River Basin.[296]

Signed in Sofia, Bulgaria in 1995, the agreement was the most concrete bilateral agreement over the Nestos, and is called the "Agreement between the Government of the Hellenic Republic and the Government of the Republic of Bulgaria for the waters of the river Nestos/Mesta."[297] The scope of the agreement included both quantity (that 29% of annual mean run-off will cross into Greece) and quality issues for the Mesta/Nestos river, which were to be regulated in a concrete way, as well as the creation of a committee which would monitor the implementation of the agreement. According to the agreement, both parties must,

- Share information over the quality of waters and any planned or ongoing works which might affect the flow of the river
- Commit to undertake all measures provided for in international agreements and EU directives regarding the quality of the waters, and
- Define criteria for assessing water quality with a methodology within EU standards.[298]

The Agreement is to last for 25 years. Some deficiencies of this agreement are that it is not very specific in many of its designations of quantity and quality requirements, and the institutions it is meant to work with are not functioning in a productive way.

The Greek territory has several reasons for wanting to ensure that enough water comes through from the Bulgarian side of the river basin. The protected areas of the river and the delta must maintain at least minimum flows to ensure the survival of critical ecosystems. Also, the livelihood of the Greek basin area depends on water resources from the Nestos river for industrial and agricultural uses. Greece has built two large hydroelectric dams on the Nestos River, Thesavros and Platanovrisi, and needs to ensure that there will be enough water to supply these.

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[295] Personal Communication with Professor Roumen Arsov, Dean of the Faculty. of Hydrotechnics, University of Architecture, Civil Engineering and Geodesy, Sofia, Bulgaria, July 21, 2006.
[296] Transboundary Waters Information Exchange Network for the South Eastern Europe, "Mesta/Nestos River Sub-basin." Accessed on June 10, 2006 at http://watersee.net/
[297] Signed in Sofia Dec. 22nd, 1995. Ratified by Greece with Law 2402/4.r6, OG A 98.
[298] Maria Mousmouti, "Hellenic-Bulgarian Bilateral Agreements for the Protection and Use of Transboundary Watercourses." Project on Hellenic-Bulgarian Cooperation on the Protection and Use of Transboundary Watercourses: The EC Water Framework Directive (WFD) 2000/60, Nomos + Physis, Sofia-Athens, Dec. 20, 2003.

Bulgaria already has a diversion of waters to the Evros River for irrigation since 1989. In the relations over Mesta/Nestos, Bulgaria has concerns over having enough money for constructing dams to improve the areas agriculture and to protect it from floods. Bulgaria is also concerned about keeping good relations with Greece, since it is one of the best investors in Bulgaria, and has been a strong supporter of its entrance to the EU. However, there is a belief that more water should be used in Bulgarian territory than is currently being used to improve the development, since the perception is that in Greece they are using that water for electricity generation.[299]

In 1996, the Hellenic Republic was being led by Simitis of the Panhellenic Socialist Movement party (the Social-Democrat party), or PASOK, and the Republic of Bulgaria was the Bulgarian Socialist Party. In negotiating over Mesta/Nestos waters, the Greek government promised to open a new crossing point between Gotse Delchev and Drama.[300] At the time, there was no crossing in the area, and people had to travel through Thessaloniki to cross the border and get to the other region. This influenced Bulgaria to agree to the water treaty. One year later, both Greece and Bulgaria applied for EU support and promised to construct the roads and border-crossing customs buildings by 1998. The Greek side did not succeed in meeting this deadline because they said that there is an important brown bear migration path that first must be managed by building a tunnel crossing. They then promised to finish construction of the road and customs buildings by 2001. The Bulgarian side of the border, however, was completed by 1998. Greece received money from the EU INTERREG program to build the tunnel linking the northern Greek town of Drama to the Bulgarian municipality of Gotse Delchev.[301] While the Greek government promised it would be ready in 2003, however it did not open until 2005.[302]

The local Bulgarian and Greek people supported this project because it would be beneficial to the localities on both sides of the border. The tunnel crossing links two villages, Ilinden on the Bulgarian side, and Exochi on the Greek side. While these two villages were only 10 km apart, they were separated by a four-hour long drive because the only previously existing border crossings were at the extreme ends of the 494km Greek-Bulgaria border. [303] While the locals were happy about the new crossing, "the lengthy process of opening the border has not instilled much public confidence."[304] For the Bulgarian people, it was not clear why Greece appeared to be afraid to open the border and what they might feared would come of it. While the Simitis administration

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[299] Personal Communication, Alexander Yanef, Chief expert of regional development, Administration of Blagoevgrad Province, Bulgaria, July 19, 2006.
[300] Athens News Agency, "Close Greek-Bulgarian ties reaffirmed," Hellenic Resources Network, April 16, 1998. Accessed at http://www.hri.org/news/greek/apeen/1998/98-04-16_1.apeen.html on April 7, 2007.
[301] Hellenic Ministry of Foreign Affairs, "Inauguration of the new border crossing point between Greece and Bulgaria," December, 2005. Accessed at http://www2.mfa.gr/www.mfa.gr/Articles/en-US/08_12_05_B_4.htm on April 9, 2007.
[302] Matthew Brunwasser, "Greece and Bulgaria open bear-friendly crossing" International Herald Tribune, Dec. 9, 2005. Accessed at http://www.iht.com/articles/2005/12/09/news/border.php on April 9, 2007.
[303] Ibid.
[304] Ibid.

promised the crossing, it finally was implemented during Greek Prime Minister Karamanlis' term.[305]

The neighboring cross-border municipalities have been cooperating and interacting even more since the border crossing has opened. For instance, Bansko municipality has been cooperating with Drama through the Euroregion program.[306] Many Greeks cross the border now to shop in the less expensive markets, which makes some Bulgarians fear that this will make the prices rise.[307] However, cross-border tourism has also been made easier.

The Mesta/Nestos River legal regime is also influenced by international multilateral treaties which have been ratified by both countries. This includes the Convention on Protection and Use of Transboundary Watercourses and International Lakes, signed in Helenski on March 18, 1992. The convention includes applicable measures such as the adoption of rules for international cooperation on transboundary water bodies through water quality monitoring, information exchange, and mutual aid in critical situations

The following table (Table 17) outlines the various legal agreements which were made bilaterally or internationally that have affected each country's responsibilities on the Mesta/Nestos River Basin. Some minimal national water legislation is mentioned with reference to the EU WFD.[308]

Table 17: Timeline for Mesta-Nestos Cooperation and Development of Water Legislation

Year	Bulgaria (Mesta)	Greece (Nestos)
	People's Republic of Bulgaria	*Kingdom of Greece*
1964	**Agreement on co-operation for the use of watercourses flowing through the two countries**	
	Second Protocol of the Greece and Bulgaria Agreement about the regulation of economic questions and development of the economic co-operation (1964).	
	Agreement on the use of Mesta/Nestos River waters (ratified in 1964, in force since 1996).	
	Agreement on flood protection that refers to the section downstream of a series of reservoirs in Bulgaria at the Maritsa/Evros River Basin (1964).	
		Military junta in power (1967 – 1974)
1971	**Agreement concerning the formation of a joint committee for the cooperation in the field of electric energy and the use of the waters of the rivers crossing both countries (Sofia, 1971).**	
1973	Agreement on scientific and technical cooperation (Athens, 1973).	
		Hellenic Republic founded (1974)

[305] Personal Communication with Emil Bournaski, Bulgarian Academy of Sciences, July 17, 2006.
[306] Personal Communication with Mayor of Bansko Municipality, Bulgaria, July 20, 2006.
[307] Matthew Brunwasser, "Greece and Bulgaria open bear-friendly crossing" International Herald Tribune, Dec. 9, 2005. Accessed at http://www.iht.com/articles/2005/12/09/news/border.php on April 9, 2007.
[308] For more information on the status of WFD implementation in each country, see Chapter 4.

1980	Protocol for the co-operation of experts for flood control of Struma/Strymon River (approved on 1980).	
		Greece joins the European Community (1981)
	Republic of Bulgaria–Transition from communism begins (1989)	
1990	Protocol for the Joint Technical Working Group and Environment Group (approved in 1990).	
1991	Protocol of the Meeting of the Joint Committee of Experts for the preparation of a common proposal to the EU for the monitoring and control of water quality and quantity of the transboundary rivers Maritsa/Evros, Struma/Strymon and Mesta/Nestos (1991).	
1992	Bulgaria signed the Helsinki Convention for protection of transboundary water flows and international lakes	
1994	Ministry of Environment and Waters– begins implementing relevant legislation for National Program for the Adoption of the Acquis Communautaire (aquis).	
1995	**Agreement for the regulation of the Mesta/Nestos River waters (Sofia, 1995).**	
	Agreement to open three new border crossings between Greece and Bulgaria, including one by 1998 linking Gotse Delchev, Bulgaria, to Drama, Greece.	
1996	March 28th: the 1995 agreement is ratified (referred to as the "Law of 28")	September 6th, the 1995 agreement is ratified
	September 19th: Treaty of 1995 came into force	Greece obtains right to use 29% or the mean annual runoff of the Mesta
	October 6th: Helsinki convention Ratified in Bulgaria, ending a long period of bilateral discussion with GR on cooperation	Greece began enforcing Helsinki for BU
1997	Mesta/Nestos Euroregion set up – Both Greece and Bulgaria participated in developing a cooperation within the provisions of the Greek-Bulgarian friendship agreement. Two associations, the Mesta border region association and the Nestos border region association, agreed to cooperate and identify common factors for friendship and development of the respective populations of the regions.[309]	
1999	New Water Law passed – (State Gazette)	
2000	New Water Law went into effect	October 23: EU Water Framework Directive adopted by EU

[309] Transboundary Waters Information Exchange Network for the South Eastern Europe, "Mesta/Nestos River Sub-basin." Accessed at http://watersee.net/ on June 10, 2006

2002	New Environmental Protection Law prepared to provide the basic framework for environmental policy in harmony with EU legislation	
	Agreement between Greece and Bulgaria on Cooperation in field of Environment	
2003	September, Helensiki convention was ratified	Law 3199/2003 passed on integrated management of water resources for the transposition of EU WFD[310]
2004	January, Helensiki convention came into force	
2005	December 9: After many delays, the Ilinden-Exochi border crossing opens, linking the municipalities of Gotse Delchev, Bulgaria and Drama, Greece.	
2007	Jan 1: Republic of Bulgaria becomes a member of the EU	

Academic collaboration between the University of Architecture, Civil Engineering and Geodesy (UAGEG) in Bulgaria and the Aristotelian University of Thessaloniki (AUTh) in Greece began in 1991 and 1992, yet at this time the governments had not yet achieved agreement over the water quantity issue. Thus, the universities could only study water quality issues. They produced a quality report card which was used as a basis for further negotiations.[311] Since then there have been many international collaborations and studies on the Mesta/Nestos river-basin. For instance, there has been recent collaboration between the UACEG and AUTh to develop a project with the Chamber of Greece about decreasing industrial activities and pollution in the region.[312]

Bulgaria tries to give attention to all of its river basins, yet the development of projects depends on EU funding. Because Greece has had more power in the region, and because Greece wants more information about the incoming water from its transboundary rivers, Bulgaria has been able to get enough funding for projects on Mesta/Nestos, Struma/Strymona, and Maritsa/Evros. There have been too many projects that have occurred on the Mesta/Nestos river basin for such a small river basin, and they often just end up manipulating the same data. [313] Mesta is the most studied basin in Bulgaria, even though Strymon is more complex and has more problems. But Greece is very much interested in Nestos because it fears that Bulgaria will stop the water flow. Greece worries because Bulgaria makes noise about diverting water.[314]

[310] Hellenic Official Journal of the Government, OJ G 280A/2003
[311] Personal Communication with Professor Roumen Arsov, Dean of the Faculty. of Hydrotechnics, University of Architecture, Civil Engineering and Geodesy, Sofia, Bulgaria, July 21, 2006.
[312] Ibid.
[313] Personal Communication,with Professor Roumen Arsov, Dean of the Faculty. of Hydrotechnics, University of Architecture, Civil Engineering and Geodesy, Sofia, Bulgaria, July 21, 2006.
[314] Personal Communication with Professor Ohanes Sànturdjan, Director of Institute of Water Problems, Bulgarian Academy of Sciences, July 18, 2006.

5.2 Current Environmental Status

This section will review the current status of the environment in the Mesta/Nestos River Basin by reviewing the physical characteristics of the system, highlighting the various stresses on the water basin and technical issues in the area.

5.2.1 Physical Characteristics of System

The Mesta River flows from the Rila mountains through parts of the Pirin, Slavyanka, and Rhodopes mountains. The river is about 230 km to the sea, the entire catchment area is 5,613 km^2. The Bulgarian side has about 126 km of the river, with 2770 km^2 of the catchment, and the Greek side has 130 km of the river length, with 2,843 km^2. While approximately the river's length is approximately evenly split between the two countries, over 60% of the river catchment is on the Bulgarian side.[315]

Water quality today is generally considered to be of high quality. The main concerns for quality are the lack of proper industrial and household wastewater treatment, the diffuse agricultural pollution from agrochemicals, and the addition of refuse from illegal dumping in rivers. Industrial development of the Bulgarian side during its communist past had been a great source of water pollution, but today has been greatly scaled back and upgraded. However, growing populations and the decline of agricultural opportunities put pressure in both regions to develop more industries. Growing tourism in the region on both sides of the border can also put pressure on the river due to increased building developments and the increased population during the high-traffic tourism season.

Water quantity is not a concern in the Bulgarian side of the river, and they are unable to make the investments they would like for flood protection and irrigation infrastructure. In Greece, however, there are many competing uses of the river water. For environmental conservation the protected regions, especially the Delta area, need at least a minimum flow of at least 6 m^3/s.[316] in order to maintain the critical ecosystems. Intensive agriculture and irrigation needs take large amounts of water, as do the variety of industries in the area. During drought periods, this can become a large concern, as some farmers pump groundwater for irrigation and drinking needs. This has lead to the salinization of coastal aquifers and degeneration of farm lands.

There are a few gauging stations along the river. The following Figure shows the gauging stations in the Bulgarian riparian area. The most important one is the one at the border. The mean variable runoff is estimated by statistical calculation. There is a dispute over whether the measure is from the average or peak run-off.[317]

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[315] Transboundary Waters Information Exchange Network for the South Eastern Europe, "Mesta/Nestos River Sub-basin." Accessed at http://watersee.net/ on June 10, 2006

[316] Ibid.

[317] Personal Communication with Professor Roumen Arsov, Dean of the Faculty. of Hydrotechnics, University of Architecture, Civil Engineering and Geodesy, Sofia, Bulgaria, July 21, 2006.

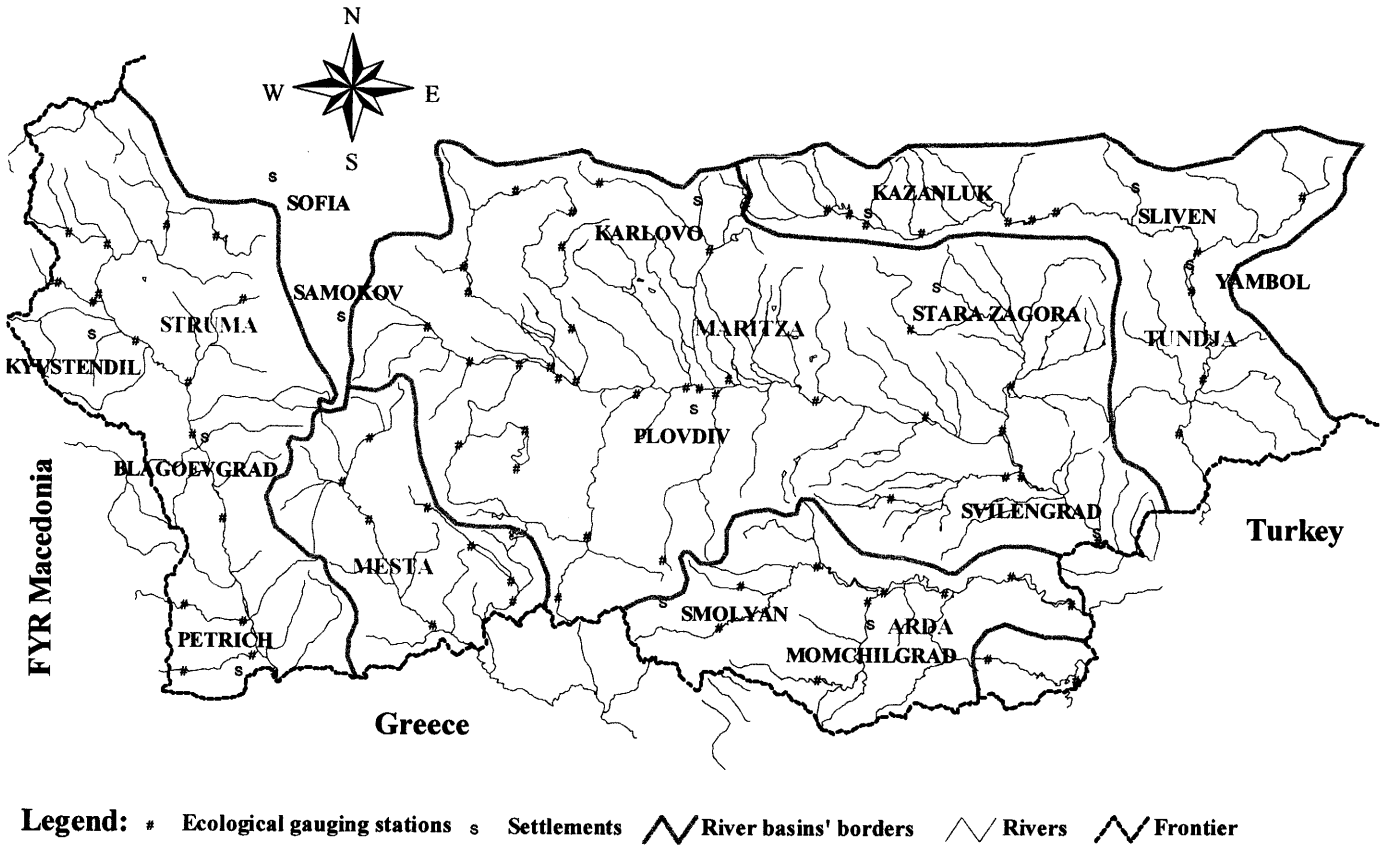

Figure 18: Southern Bulgarian rivers belonging to the Aegean Sea catchment, and the Bulgarian settlements and ecological gauging stations[318]

[318] Roumen Arsov, "Report of Bulgarian Branch of INWEB," International Co-operation in the Balkans, Black Sea, S.E., Mediterranean and the Caspian Sea, in the field of Environment, Physical Planning and Sustainable Development Conference, January 27, 2001, Athens, Greece

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The competing uses of the river basin and its water are described in the following section, and the major concerns for quality and quantity posed by each use.

5.2.2 Competing Uses of the River Basin Land and Water Resources

There are many competing uses of the river basin, including for protected environmental areas, household use, agriculture, hydroelectric power generation and flood protection, forestry, mining, fisheries, industry, and cultural and touristic attractions. These competing uses put various pressures on the surface water and groundwater resources through pollution and overuse, and threaten the long-term sustainability of the region. These pressures are described below, using the benefit of the judgment and perceptions of local experts and public servants.

5.2.2.1 Protected Environmental Areas

There are several noteworthy parks and nature reserves in the Mesta/Nestos River Basin. These protected areas depend on appropriate quality and quantity of water resources, and in turn, help ensure the sustainability of the region through preventing erosion and protecting important ecosystems.

The Bulgarian region has part of the Rila National park and Pirin National park, as well as the biosphere reserve Slavyanka. There is a declared Euroregion that encompasses most of the Mesta/Nestos basin on both sides of the border. The Greek Nestos Delta is protected as a RAMSAR site, as well as a Natura 2000 site. The following table (Table 18) gives an overview of the various protected areas. The following subsections briefly detail some additional information on the history of some of these protected areas, and how these are arranged and managed.

Table 18: Selected Protected Nature areas within the Mesta/Nestos River Basin in Bulgaria (BG) and Greece (EL)

Protected Area	**Size (hectares)**	**Location**	**Brief Description**
Pirin National Park	40,067	BG	IUCN Category III UNESCO World Heritage Site
Rila National Park	81,046	BG	Part of the Rila National Park lies within the Mesta River Basin. National Preserve, IUCN Category III
Alibotoush Biosphere Reserve	1,628	BG	In Slavyanka Mountain – While the reserve was established in 1951 in order to protect the largest forests of Heldreich pine (Pinus heldreichii) in the Balkans, it was designated as a UNESCO –

[319] UNESCO, "Biosphere Reserve Information". Accessed July 20, 2007 at http://www.unesco.org/mabdb/br/brdir/directory/biores.asp?mode=gen&code=BUL+02

			MAB biosphere reserve in 1977.[319]
Nestos Delta and Adjoining Lagoons	21,930	EL	Protected as national park land, by the Ramsar Wetlands Treaty, and NATURA 2000.
Straits of Nestos Kavalas – Xanthi	2,380	EL	Protected forest area along the Nestos River, IUCN Category V

Pirin National Park

Half of the Pirin Mountain is in the Mesta catchment. The length of the Pirin Mountain is approximately 40 km, and a bit of the mountain reaches into Greek territory. The mountain has a similar characterization to the Alps. The lowest elevation point is approximately 1000m, and the peak is 2,914 m.[320]

Pirin National Park is the oldest national park in Bulgaria. It was created in 1962 by a government order and began in 1963. It was originally designated as 6,000 hectares around the Vilarin peak. In 1979, the park's territory was enlarged to 27,800 hectares and a separate directorate was organized for the park, supported through the budget of the Ministry of Forests. The main task at National Park Office is to preserve the biodiversity in the forest, animals, land, the ecosystems, and maintain the national processes into the mountain for future generations to have nature. The eight forest services for each municipality surrounding the park give the national park service jurisdiction for management of the territory. The main function is to maintain the land in the natural condition.[321]

In 1983 the park was included in the UNESCO World Natural Heritage List. In 1987 the territory was enlarged to 43,300 hectares and now this is the current size. In 1999, Pirin changed from the "People's Park" to a "National Park" which was a new International Union for Conservation of Nature and Natural Resources (IUCN) Category II. Two reserves within the National Park were designated as in the Category I according to IUCN and have very strict regimes in which it is not possible to do anything.[322]

There is a management plan for the Pirin National Park for the years 2004 – 2013. It took four years to prepare this management plan which shows the different management techniques for different zones, as described by the Pirin National Park staff.[323]

- 1st Zone A – in these reserves, only scientific research about natural processesa are allowed. These territories continue to have new specieis found. There are a lot of endemic species – only found in Pirin, including the trees, with the Bosnian

[320] Personal Communication with Blagoi Klecherov and Borislava Furnadjieva, Pirin National Park, July 20, 2006
[321] Ibid.
[322] Ibid.
[323] Ibid.

and Macedonian Pine. The average age of the forest is around 300 years, but the Bosnian Pine is as old as ~1,300 years. Visits are allowed only with permission from the national park, with a National Park guide.

- 1st Zone B – is close to the 1st Zone A. In this area, human activity is preserved and called 'ecological corridor'. Going on tourist paths without a guide is allowed here, and most basic trails in the mountain go through this.
- 2nd Zone A – Mostly in the southern part, and is the biggest zone. Rangers can do different things for the preservation of the forest ecosystem – they can cut the trees if they are sick, etc. In the Reserve (1st Zone A) they cannot do this, even if they burn in a fire. But in this zone, they can cut burnt trees and replant them.
- 2nd Zone B – Alpine area and pastures. Animals can graze there – maintaining meadows above 1800 to 2500m. Mainly sheep and cows. Goats are not allowed (because they eat everything). Traditional activities of the population around the park are allowed. In the past, thousands of animals were going there, but now less. Grazing is important to maintain meadows and prevent invasive bush species from coming.
- Touristic Zone – Small area, about 1,100 hectares. Inludes Bansko and Ski area (2%) and Doubronish ski and tourism area.
- Chalet/Hut Zone – 8 shelters around the mountain – a building with a yard, 1000m2 allowed (about 300 hectares). These buildings are red, and considered in the tourist zone.

Some zones of the forests are practically 'virgin'- since 1979 when the park was established, and thanks to the management of the park, the forest stays in very good condition.[324]

The threats to the protected areas in the Pirin National Park are not considered to be significant. The major threats are during the winter in the tourist zone because it becomes overloaded with tourists. The major tourism occurs during the winter time. Tourism in the summer to the Pirin National Park is much less compared to 15-20 years ago. However, there are no hotels in the national park, and only the ski runs and lifts, and some buildings for fast food, etc., are located within the borders of Pirin National Park. The infrastructure connected with tourism is all located in the municipality of Bansko. There are no hotels in the mountains, which is quite unique for Bulgaria.[325]

There were some concerns that the production of artificial snow could be creating pollution, however the Park has received have guarantees from the firms making the snow machines from Germany and Austria that there is nothing polluting from the snow. The Basin Directorate has done a lot of research on the snow and there is absolutely no track coming from the artificial snow. It is made from the water from a small lake in the mountain which is fed by springs. It has to be below 4 or 5 degrees Celsius to make snow. They also only make it at the beginning of the season in order to make a base, and after that natural snow is used.[326]

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[324] Ibid.
[325] Ibid.
[326] Ibid.

The Glazna River, which goes through Bansko, is a tributary to Mesta River and has been polluted by the excess wastewater caused by the tourism boom. The Municipality of Bansko is planning a new WWTP is being planned in Bansko. Also, in the Pirin National Park there are special appropriate chemical toilets in use in the mountain to prevent wastewater polluting the area.[327]

The Pirin Park Administration conducts monitoring in the forest of the fauna, flora, soil, and water from the lakes and rivers. The data are kept in at Pirin National Forest office, as well as at the Blagoevgrad Province offices along with the local inspections of water and the environment for water and soils which they monitor. [328]

Rila National Park

Rila National Park, established on February 24, 1992, is located in the highest central regions of the Rila Mountains. It is the largest national park in Bulgaria, and includes rare and endangered wildlife species as well as historical and cultural sites. The National Park Directorate is a regional body established by the Ministry of Environment and Waters, and it manages the Rila National Park with a management plan covering the period of 2001-2010.[329]

Rila National Park is listed as Category II by the World Conservation Union.[330] The Park has four nature reserves. The Parangalitsa Reserve and the former Marichini Ezera Reserve (now considered part of the Central Rila Reserve) are both part of the World Biospheric Reserves Network under the UNESCO Man and Biosphere Program.

Nestos Delta and Wetlands

The Nestos Delta and surrounding area has been protected in several ways, including through the Ramsar Convention, Natura 2000, and as a Greek National Park.

Historically, more than 50 to 70 years ago, the Nestos Delta was a bird delta. Approximately a third of the area was a gigantic riparian forest – the largest riparian forest in the Balkans. The Nestos River has a mountainous part and Delta – there is no low part. The result is a large delta of 500 km^2 which was built in a short time, and was probably an amazing swamp system. Then man came along with waves of civilization and land reclamation. A large inflow of people came from Turkey in 1921, and there was a big need for new land, so the Greek government drained the land as a protective measure for the people since malaria was a big problem until around WWII. In the 1950s there was an organized campaign to reclaim land from forest and secure the area from floods, so they built dikes and cut down big parts of the forest. In the 1960s, there was a huge irrigation system built taking water from the Nestos River at the

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[327] Ibid.
[328] Ibid.
[329] "Rila National Park". Accessed July 20, 2007 at http://www.rilanationalpark.org/en/index.phtml
[330] "World Database on Protected Areas". Accessed July 20, 2007.at http://www.unep-wcmc.org/wdpa/sitedetails.cfm?siteid=62485&level=nat

Toxotes dam. This was fine for the first 20-30 years until intensive farming and new crops came up, such as corn, demanding more water. Some years, the farmers would consume up to 100% of the river's water. The Greek government planted poplar trees for paper and the ground water dropped dramatically. In the 1970s, the National Power Corporation (DEI) wanted to build three hydroelectric dams on the Nestos River. It took a long time for the studies to be done, but finally in 1996 the Thesavros dam was finished and became one of the biggest earth dams in the EU. It created 40 km of lake. In 1999, Platanovrisi was completed, with a 95m high concrete wall. The highest level of the dam is at the lowest level of the Thisavros dam, so you can re-pump the water up again.[331]

The Ramsar Convention, or The Convention on Wetlands, was signed in Ramsar, Iran, in 1971. It is an intergovernmental treaty which provides the framework for the conservation of wetlands and the wise use of their resources through national and international action and cooperation. The Nestos delta and the adjoining lagoons were added to the list of Wetlands of International Importance on August 21st, 1975. The area included is 21,930 ha. By adding this area to the list, it acquired a new status at the national level and is recognized by the international community as being of global significance. [332] The Ramsar zoning of the Nestos Delta with "A" (Alpha) which is the most protected, "B" (Beta) with intermediate protection, and "Γ" (Gamma) which allows for some businesses to operate. However, the Gamma zone is still prohibitive because, for instance, they cannot have gas stations, and therefore it prohibits related businesses.

The Nestos Delta is also designated as a Natura 2000 site, which means Greece has identified it as a site of European importance. Natura 2000 is the cornerstone of EU biodiversity and nature protection policy. This also means that all planning and activity must be in line with EU nature protection policies.[333]

There are also many projects in the Delta and surrounding ecosystems. The Life-Nature project was funded by the EU budget for Natura 2000 sites. The project has been running for several years. There are in-depth measures for certain habitats and certain species. The project has three areas of actions:

1) Repairing ecosystems close to the Nestos Delta's mouth,
2) Protecting certain bird species, and
3) Protecting certain large raptors and reptiles in the Gorge. [334]

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[331] Personal Communication with Hans Jerrentrup, EPO - Society for Protection of Nature and Ecodevelopment, July 16, 2006.
[332] "The List of Wetlands of International Importance". Accessed July 20 at http://www.ramsar.org/sitelist.pdf
[333] European Commission, "Nature and Biodiversity." Accessed June 10, 2006 at http://ec.europa.eu/environment/nature/home.htm
[334] Personal Communication with Hans Jerrentrup, EPO - Society for Protection of Nature and Ecodevelopment, July 16, 2006.

The Living Lakes project works on the scientific and theoretical side for a wetlands management plan, using wetlands to filter drainage water, etc. The Greek administration, especially in the countryside, is behind in wetlands management. The perception is that they especially don't like NGOs. However, the Living Lakes project was given support in the end by the local Prefecture.[335]

The management plan for the area has set up three areas as National Parks. The Greek Government signed the Ramsar convention in 1974 and designated Nestos and other two parts, and after 30 years set up the management, including a management board of 11 members, with one seat going to the NGOs, served by Hans Jerrentrup. The NGO is almost the only specialist. Now the government is trying to make the legal framework for the National Park. At the time of this research, they had not yet defined clear boundaries and rules about what is allowed in what areas.[336]

It is the role of the NGOs to think a bit ahead. The salt water has been intruding into the groundwater, so the NGOs proposed that the management board reopen the dikes of the river in two places to bring water back into the riparian forests. This has been implemented, and is bringing freshwater back to the area.[337] Other things proposed which NGOs were able to accomplish in the area include replanting certain spots of the wider mouth are of the riparian forest to get a large, more integrated batch of forest. The forest service did this, however the NGO proposed it. It made the forest larger and also continuous. Also, they constructed breeding islands/rafts for bird species in the coastal lagoons, because there is a problem with stray dogs and jackals attacking nesting areas on the mainland. In the Gorge of Nestos, they proposed and are now realizing a feeding area for vultures that is organized with the special goal to keep them inside the protected areas. They now collaborate with other rivers (i.e., Evros) and two Bulgarian organizations in two sites close to the border for common monitoring and feeding activities. Now, for all three action sites – forest, lagoons, and gorge, there are measures being taken for visitors to show them what is being done and they try to get them there in a controlled way and keep them out of certain parts.

There are several pressures on the Nestos Delta that have occurred due to the construction of the large dams upstream. The groundwater level has improved, and there is a recharge of fresh water. While the dams have helped keep the agriculture fields supplied with freshwater, thus helping to prevent the salt water intrusion along the coastal aquifers from over-extraction, there have been several problems associated with these dams. These include the lack of necessary sediments from upstream to feed the delta, changes in water temperature, and changes in water flow. This has a big impact.[338]

The large dams upstream catch all the sediments because they were not built to release sediment (although this is technologically possible). The sediment problem is obvious in

[335] Ibid.
[336] Ibid.
[337] Ibid.
[338] Ibid.

some places on the coastline where the regression has reached 120m in some places. We are losing our coastal dunes as protection and habitat. The sea is going inland now. It is important mid to long-term problem of the Nestos dams because the Dunes protect the areas behind, and the farms are not far behind that. Within a few years, it may cause a problem to tourism. Keramotis has sand dunes. The currents from East to West are very aggressive, so without sediments from the river, the coast is eroding. [339]

Water temperature changes had not been anticipated because no one foresaw that the high level of water in the hydroelectric dam would result in very cold water being released. The water in the Delta is up to 12 degrees colder. The fish body functions are regulated by temperature, so this is being affected. The fishermen began to question this in 1996 because the fish were not there – because the water was too cold. However, there is no data on the economic impact of this.[340]

Additionally, there has been a big change in river flow. The goal of dams to make electricity in the summer means that there is much more water in the summer than before, which is good for agriculture. But, one or two times a day, you have a small flood, and the rest of the day you have much less. There is 20-30 cm differentce in the water level, resulting in erosion of the river bed. [341]

There is a serious misunderstanding in many responsible services that the water which is going into the sea is 'lost' or 'wasted' – they don't understand it is necessary. The local Fishery Research Institute (FRI) has evidence of what has happened to the ecosystem from the closing of the dam. Local politicians say water is 'lost' in the sea, leading them to political statements of building more dams. Drama, for instance, wants to build a 20 km tunnel through the mountains, and also east of Xanthi. All scientists say that water is not wasted, and if we take out more water, we will probably kill the place. [342]

The environment is not the big argument that worries them so much. We are not sure what the future will be, but if they divert large quantities in Bulgaria or Greece, the Delta will suffer. [343]

Other Areas

Biodiversity is very important. There are unique herbs in the mountains which cannot be found elsewhere. Some could be medicinal, and could be used as pure substances or as tea. Also, there are unique plants, trees, birds, animals, and brown bears. The brown bear population has increased greatly recently. There is a tunnel in the Nestos basin for the bears to cross the border.[344]

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[339] Ibid.
[340] Ibid.
[341] Ibid.
[342] Ibid.
[343] Ibid.
[344] Personal Communication with Professor Roumen Arsov, Dean of the Faculty. of Hydrotechnics, University of Architecture, Civil Engineering and Geodesy, Sofia, Bulgaria, July 21, 2006.

There are some NGOs working on an activist level. There is a movement now of organizations of people who are against the installation of oil tanks in the wetlands. Greece was the only EU country at the moment near the Balkans, and they said they would allow oil storage tanks inside the national park. Hans Jerrentrup's NGO is only NGO working on a scientific basis in a long-term way. He works as a scientific advisor, and supplies some basic information to the people.[345]

5.2.2.2 Human Settlements

Human settlement or household use of water includes drinking water and sanitation needs. Wastewater generated from households often makes its way into the river water, either directly discharged, or indirectly. Urban settlements in the Mesta/Nestos basin area are not very large, with the largest town being Gotse Delchev with approximately 33,000 people. However, the small and dispersed settlements of the region make it difficult to finance and provide appropriate wastewater treatment. Drinking water is typically groundwater or from springs, and quality is generally monitored by the government and considered to be safe.

Local officials in Greece believe that the water quality from the Nestos River is very good. Each month the quality and quantity is measured at the Toxotos Dam.[346]

Bulgaria

The driving force for water consumption and wastewater generation within the Bulgarian part of the river basin is the growing population and its activities – both industrial and agricultural. The drinking water quality is controlled in Bulgaria by the regional health inspectorates. Since agriculture and industry have relatively declined since the fall of communism, the big problem these days is wastewater from urban settlements. Pollution from the settlements is the main cause of environmental problems because of the lack of treatment plants and solid waste collection. However, the population is decreasing in all of Bulgaria, and also in the Mesta river basin locality. [347]

The urban wastewater problems are trying to be addressed through the planning and construction of wastewater treatment plants. While Razlog and Bansko have sewage system coverage for 98% and 71% of the populations, respectively, the lack of WWTPs means that the wastewaters are all discharged to surface waters.[348] Razlog has approximately 13,000 and is currently constructing a WWTP with funding from the EU Phare Program.[349] Bansko has a population of around 9,000, but during the winter

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[345] Personal Communication with Hans Jerrentrup, EPO - Society for Protection of Nature and Ecodevelopment, July 16, 2006.
[346] Personal Communication with Staff from Prefecture, TOEB Kavalas, Greece, July 13, 2006.
[347] Personal Communication with Emil Bournaski, Bulgarian Academy of Sciences, July 17, 2006.
[348] Transboundary Waters Information Exchange Network for the South Eastern Europe, "Mesta/Nestos River Sub-basin." Accessed June 10, 2006 at http://watersee.net/
[349] Personal Communication with Staff members, Regional Administration for Irrigation in Blagoevgrad, Bulgaria, July 19, 2006

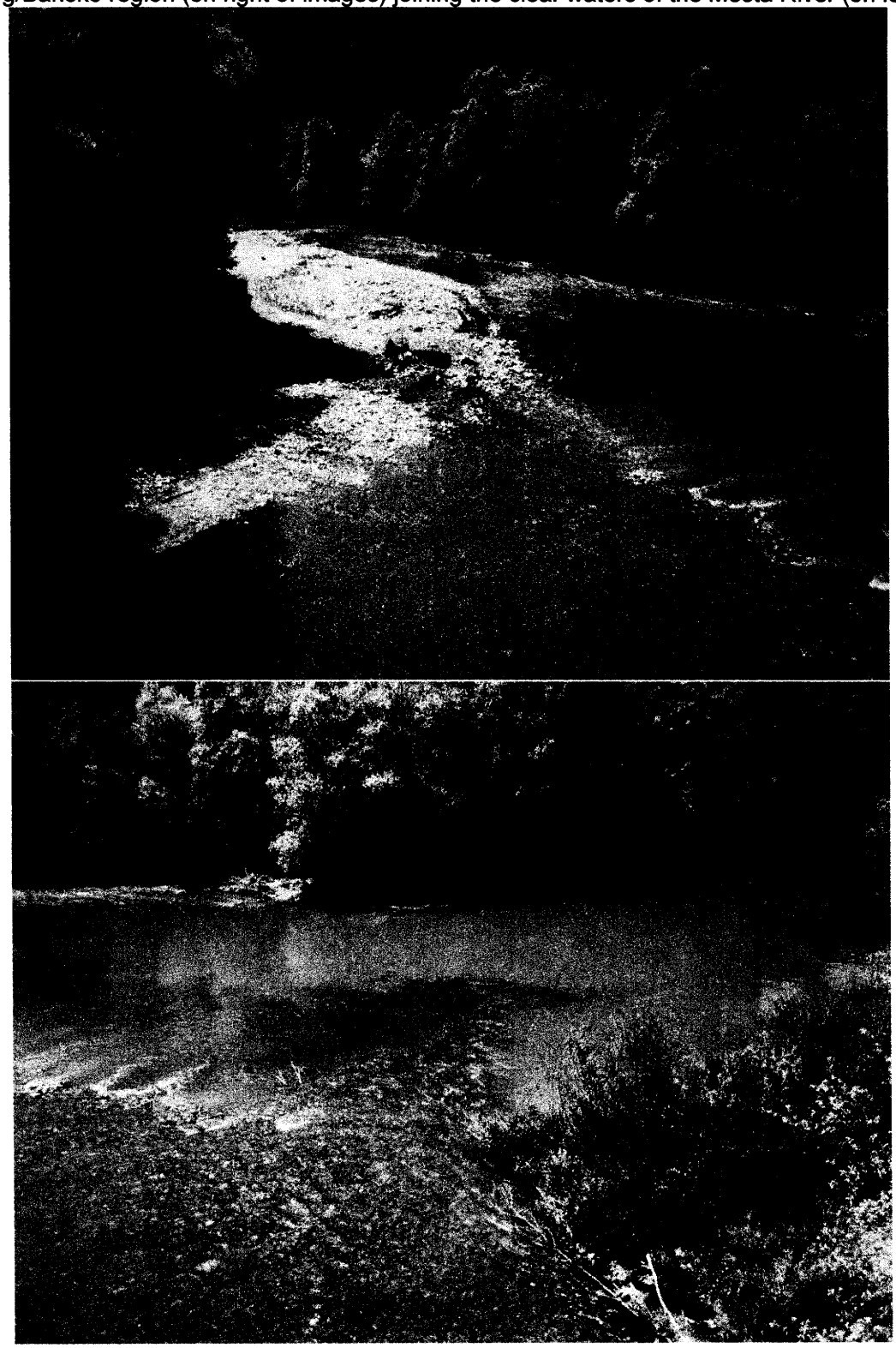
tourist season the population increases by one or two thousand people, and has yet to build a WWTP. Bansko and Razlog are quite near to each other, and we observed the effluent leaving the area in the Glazna River, a tributary to Mesta, to be quite turbid visually at the point where the water joins the Mesta River. The following photographs are from our site visit of this point.

Gotse Delchev has no wastewater treatment plant (WWTP), and although it has old plans to build one, it has had problems with financing the project.[350] Gotse Delchev has initiated a project with a Finish company for the construction of a new WWTP, however it is in the planning phase. In March 2006, Gotse Delchev contacted the Finish company, and together they will apply for EU funding. All industries in the municipality will use the new WWTP. Even the nearby Gurmen municipality would like to transfer their wastewater to this new WWTP when it is completed.[351]

Gotse Delchev has a drinking water purification plant, so there are no problems with drinking water. This is not only providing drinking water to the town, but also to the municipality's villages. Two pipelines supply the water, however the national water distribution network is very old and needs to be replaced. One is made of an old material made of Asbestos and needs to be replaced. The other supply pipeline is new and of good quality.[352]

[350] Ibid.
[351] Personal Communication with Mustafa Velishe, Deputy Mayor of Gotse Delchev, July 20, 2006.
[352] Ibid.

Figure 19: Photographs of the Visibly Polluted Mesta River
The turbid water of the Glazna River, a tributary to Mesta, is shown coming from the Razlog/Bansko region (on right of images) joining the clear waters of the Mesta River (on left).



Another major problem in the region is that solid wastes are often left in open territory, even though the MOEW knows and maintains the requirements of the EU, and there is an EU directive for solid urban wastes. Waste collection has been organized, and there is an effort to enforce proper waste disposal in appropriate landfills.[353] In July 2006, the solid waste company in Gotse Delchev even organized separate waste collection of paper and plastic.[354] However, there are often dumping sites close to the river, and solid waste is finding its way into the river. Garbage often floats across the border into Greek territory, and causes problems for Greek people residing above the Thisavros dam, which prevents this from flowing beyond it.[355] For example, in the Satocha village, most people throw their waste directly into the river. Even when the mayor ordered the town to stop doing so and began fining the residents, he was not able to succeed in the long run. The problem is social and cultural; the people's cultural practices are not organized in the way that is required and it will take time to change these practices. Also, there is a big technological component to the problem. There is a lack of technology in small villages for building incineration or landfill infrastructure, mostly because of lack of financing.[356] Another example is in Gotse Delchev, where there is a landfill which is used by four municipalities, however it is filling up and they will soon need to construct a new one. Even though each town has a company to collect solid wastes and transport it to the legal dump, the towns have also had problems with villages dumping solid wastes illegally,[357]

Greece

There are similar problems on the Greek portion of the river basin. There is both a lack of wastewater treatment facilities within the basin for households, and a tendency to dump waste illegally. Chrisoupouli, the largest settlement within the Nestos basin, has been building a wastewater treatment plant since 1976, however it is not in operation.[358] The majority of houses have underground septic tanks and they are cleaned every 10 years or so. In January 1st 2001, the government obliged all townships with more than 3000 people to have a WWTP in the protected zones *A* and *B* of the National Park.[359]

Solid waste is also a problem. Every village collects solid waste, but there is still no recycling collection in the area. The garbage collection is often dumped in valleys or the river. People living in the A-zone protected areas, such as the town of Keramoti, often simply bury garbage, often at the groundwater level of the B-zone of the National Park. The garbage is sometimes dumped in protected areas, such as the Keramoti dump which is in the salt marshes.[360]

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[353] Personal Communication with Emil Bournaski, Bulgarian Academy of Sciences, July 17, 2006.
[354] Personal Communication with Mustafa Velishe, Deputy Mayor of Gotse Delchev, July 20, 2006.
[355] Personal Communication with Hans Jerrentrup, EPO - Society for Protection of Nature and Ecodevelopment, July 16, 2006.
[356] Personal Communication with Emil Bournaski, Bulgarian Academy of Sciences, July 17, 2006.
[357] Personal Communication with Mustafa Velishe, Deputy Mayor of Gotse Delchev, July 20, 2006.
[358] Personal Communication, Efthymios Darakas, Department of Civil Engineering, AUTh, July 11, 2006.
[359] Personal Communication with Hans Jerrentrup, EPO - Society for Protection of Nature and Ecodevelopment, July 16, 2006.
[360] Ibid.

However, the communities must now cover and seal the illegal dumps and start using a legal one which is up to environmental code. According to the Greek national plan for solid waste, each prefecture must have at least one landfill up to standard, and currently only the Xanthi prefecture has a proper landfill. The main goal has been to get funding through the EU 3rd Framework package for 2000-2006 to finance the project construction.[361] The communities have had many chances to get money from the EU to do build the proper facilities, however the mayors of the towns do not seem to care about building the proper infrastructure if the people aren't pushing for it. Some communities have taken the money and kept it without completing the projects.[362]

Some households draw water from private groundwater wells. The municipalities draw water from the river as well. During the summer months water is in greatest demand from the municipalities as well. The Kavalas municipality, which is the largest town near the Nestos basin, draws the most river water (155,000 cubic meters) during the hottest months from June to September.[363]

5.2.2.3 Agriculture

Agricultural use of the Mesta/Nestos river basin is a major source of pressure on the water quality and quantity available. This is due to the large dependence on agriculture for the majority region's livelihoods. Water use for agriculture has caused many of the diversions from the river and its tributaries, and has put pressure on groundwater resources. The use of pesticides, herbicides, fungicides and fertilizers has resulted in diffuse pollution of the groundwater and surface water through run-off and seepage. Finally, the increasing tendency to raise livestock in a concentrated area, as opposed to the traditional mountain-grazing style, has lead to large amounts of animal wastes that often find their way untreated into ground and surface waters.

The combination of drawing large amounts of water resources for irrigation, the use of agrochemicals, more concentrated livestock, and a lack of the needed agricultural outreach services are a concern on both sides of the border of the Mesta/Nestos river basin.

Bulgaria

CROPS AND LIVESTOCK

Agriculture in the Bulgarian side of the river basin is mostly centered on the tobacco industry, but there is also some production of corn and, in the Northern part in the mountain, bean production. There are also some personal gardens and pasture territory for livestock, including mostly goats, sheep, and cows. Recently some bigger farmers have been trying to introduce wheat, potatoes, strawberries, and modern agricultural

[361] Personal Communication with Staff from Prefecture, TOEB Kavalas, Greece, July 13, 2006
[362] Personal Communication with Hans Jerrentrup, EPO - Society for Protection of Nature and Ecodevelopment, July 16, 2006.
[363] Personal Communication with Staff from the Nomarxeia, TOEB Kavalas KAVALAS, July 13, 2006

techniques. There is some use of mechanical tractors in the region, however there are some small, semi-mountainous regions, which must be farmed by hand.[364]

The municipality of Gotse Delchev municipality has 80 villages with mainly agricultural production, especially tobacco. There is a belief, however, that joining the EU will affect the production of tobacco because of the world campaign against smoking. The production demand is already a third less than usual and farmers are feeling this.[365] There are also problems because the price for dry tobacco is lower than the same quality tobacco from Greece.[366]

Figure 20: Tobacco Crop drying alongside the road

In order to inform the farming population to think about new crops, the Gotse Delchev municipality invited five professors from the Plovdiv Agricultural University in June 2006. The professors suggested introducing new crops for medicinal uses, for perfume, and fruits and for alcohol and gardens. A similar meeting happened in Satochva municipalities earlier that year. Additionally, there is an opportunity to promote ecological production here (organic/biological) because production in the area is already very clean and the farmers could work that direction. Additionally, the local thermal waters could be also used to grow crops in green houses, but there are not yet active people organizing this.[367]

Pirin National Park Management Plan is looking for ways to stimulate local breeds of cattle and sheep, but it is very difficult now because 'civilization' is coming quickly to the

[364] Personal Communication with Staff of Administration of Irrigation in Gotse Delchev and Razlog, July 20, 2006.
[365] Personal Communication with Mustafa Velishe, Deputy Mayor of Gotse Delchev, July 20, 2006.
[366] Personal Communication with Emil Bournaski, Bulgarian Academy of Sciences, July 17, 2006.
[367] Ibid.

region, and people are not as willing to watch animals the way they traditionally did. There is even an EU program to encourage people who look after traditional breeds, sheeps, horses, local dogs, wolves, etc., with a goal to keep the grassy areas there to stay as meadows in order to encourage maintenance of the local biodiversity.[368]

During the time of cooperative farms, there were many big farms, and many cows, sheeps, and pigs. The large farms were equipped with small sedimentation reservoirs and wastes were left there for fermentation to be later used for fertilizer. However there are now very few such kinds of farms. [369] Small animal breeding farms have decreased in number, but still exist today. For instance, there is a pig farm of Hadidimovo near Greece, and there are small cattle farms as well. These are the source of some animal waste pollution.[370]

Irrigation System

The Bulgarian irrigation system was built approximately 70 years ago. At the beginning the conditions were different. During that time, the water was enough for irrigation and the system was constructed using the available conditions. Originally there was no need for water accumulation systems (i.e., dams and resevoirs). However, eventually the water resources needed to be rearranged to meet other needs. In the Rila Mountain, at an elevation of 1,900m there are diversions of part of the Mesta waters into the Maritsa River, which joins the Evros River. Some water is also diverted to the capital city, Sofia, for drinking water purposes. In the Mesta Valley, some water is transferred to the Dospat hydroelectric cascade on another river system. As the growth of the local population resulted in greater water consumption, along with the various diversions described, the region reached a point where there was not enough water flowing in the Mesta River for the irrigation of the fields. This has led the region to a perceived need to catch Mesta's waters for irrigation.[371]

It has been a difficult transition from the collective to the individual system for agriculture. The current systems are mainly designed for collective/cooperative irrigation, thus it is difficult for small fragments of farm land, but easier for big farms. Before 1989, because of the collectivized land arrangements, the drip irrigation was more distributed and more territory was using sprinklers. [372] After the land was returned to the people and broken into smaller pieces, this approach was no longer used because of the fragmentation of land that resulted.

Currently, there are two irrigation systems in the southern part of the Mesta basin territory in Gotse Delchev which are still active. In the Northern part of Razlog, the

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[368] Personal Communication with Blagoi Klecherov and Borislava Furnadjieva, July 20, 2006
[369] Personal Communication with Staff members, Regional Administration for Irrigation in Blagoevgrad, Bulgaria, July 19, 2006
[370] Personal Communication with Professor Roumen Arsov, Dean of the Faculty. of Hydrotechnics, University of Architecture, Civil Engineering and Geodesy, Sofia, Bulgaria, July 21, 2006.
[371] Personal Communication with Staff members, Regional Administration for Irrigation in Blagoevgrad, Bulgaria, July 19, 2006
[372] Ibid.

existing infrastructure is not in operation because the land was returned to the people after communism, so the government/cooperative structure is no longer there to support the irrigation system.[373] The irrigation system in Gotse Delcev, which has the old name of Nevrokop, is between 400 and 700 meters long, beginning near Razlog between the Rila and Pirin mountains. The system for irrigation is a mix of open channels and pumping stations in the Gotse Delchev field. There is another irrigation field in Razlog administratively which also reaches Bansko, Yokoruda, Belitsa, which is approximately 3,800 hectares large. There are also separate fields with local importance and conditions. These small parts add up to about another 3000 hectares. [374] For instance, in villages of Ablanitsa and Velcosel, there is an irrigation system which pumps water 370m up through three stages of incline because the farms are on the mountain. The water is taken from Mesta, and there is 24km of river channelized with dikes and some vertical dikes.[375]

The largest irrigation fields in Gotse Delchev have infrastructure for irrigating approximately 5,900 hectares, however only 4,200 hectares are actually planted. This system was built from 1935 to 1938. Most of this infrastructure is irrigation from river water, and approximately 700 hectares are irrigated with a pumped system from groundwater wells. Currently, only gravitational irrigation is used; there is no drip irrigation or sprinklers used. The original system had two pumping stations into open channels. The system's channels are made both with cement and are uncovered. The water runs on the right bank of the river at 4.5 – 5m^3/s, and the left bank system is smaller, running at 2 m^3/s, and at the end of the right channel there is a 1MW hydroelectric station.[376]

This system is no longer very suitable for the irrigation needs of the area, and thus there is a new system planned, including sprinkler and drip irrigation. The project is ready, but not financed. A benefit will be water economy. The new system will save water with modern measuring devices. Not going to irrigate more land. [377]

Table 19: Summary of Irrigation Infrastructure in Mesta River Basin

Irrigated Fields	**Size (approx)**
Gotse Delchev	5900 hectares
Razlog/Bansko	3800 hectares
Separate fields	3000 hectares

The Regional Administration for Irrigation located in Blagoevgrad manages the irrigation for the Mesta, Struma and Dospat rivers. At the moment, the irrigation system is functioning with insufficient water quantities. In the Regional Administration for Irrigation, they do their best to find water to help the farmers because arable land in the Mesta

[373] Personal Communication with Emil Bournaski, Bulgarian Academy of Sciences, July 17, 2006.
[374] Personal Communication with Staff members, Regional Administration for Irrigation in Blagoevgrad, Bulgaria, July 19, 2006
[375] Personal Communication with Staff of Administration of Irrigation in Gotse Delchev and Razlog, July 20, 2006.
[376] Ibid.
[377] Ibid.

basin is relatively small. However, the population density in the Mesta area compared to the rest of Bulgaria is very dense and a big part of the population depends on agriculture. Irrigation allows these farmers to produce more with a small amount of land. This is especially true because the soil in the territory is light and sandy, which means the soil doesn't hold water well and needs to be watered often for the best crop success. [378]

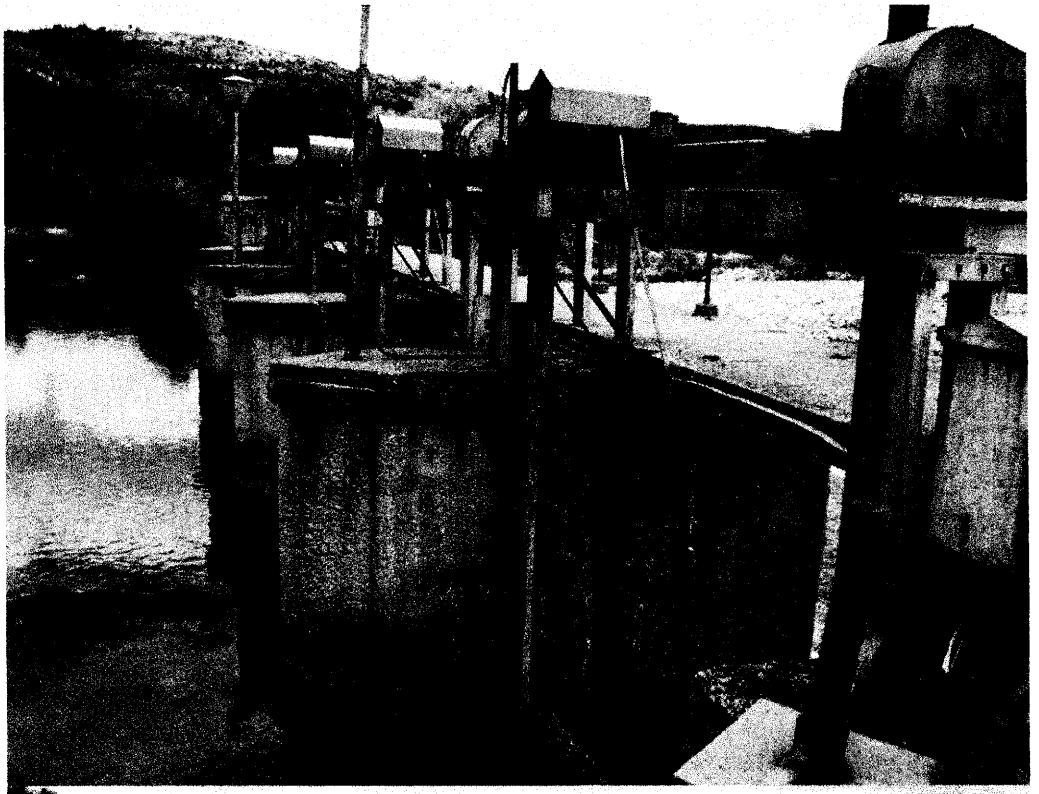
Figure: Image of Map from Mesta Irrigation Service

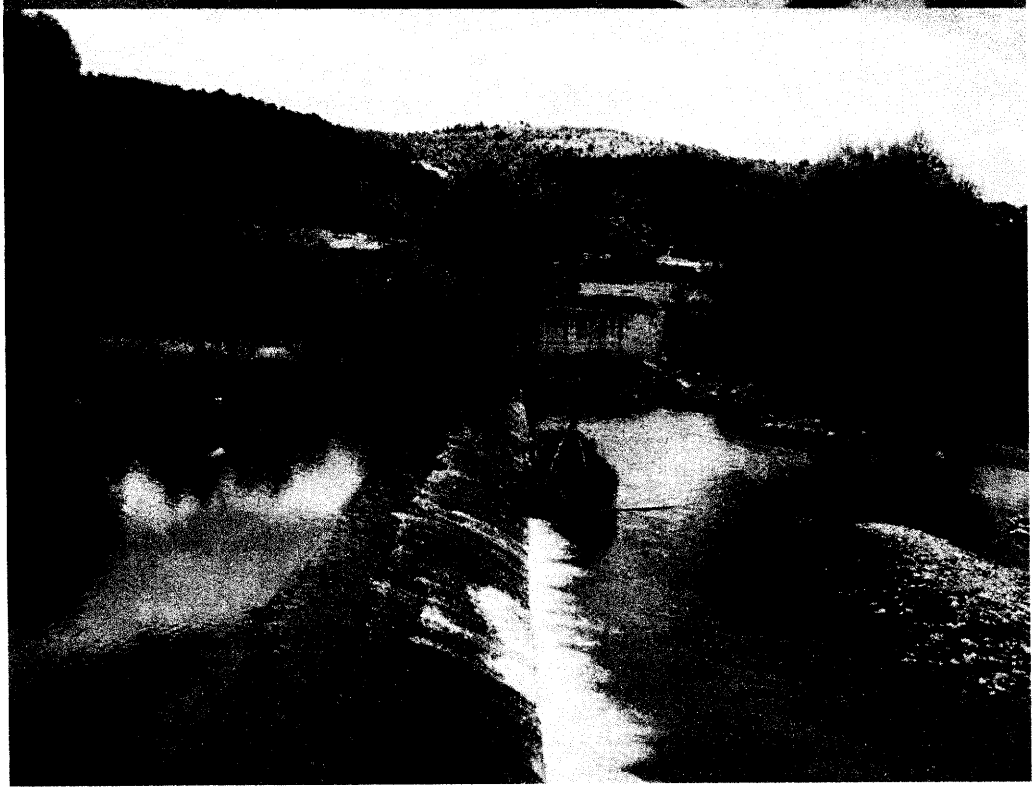
[378] Personal Communication with Staff members, Regional Administration for Irrigation in Blagoevgrad, Bulgaria, July 19, 2006

Water comes mainly from surface river waters, and there are very few wells for irrigation. Small dams provide irrigation water to be diverted to the fields (See Figure). The two main irrigation systems are gravitational systems. Most are open cement channels with water distribution to the land from big to small canals. Some fields use sprinklers, and very few use drip irrigation, only for grapes, apples, strawberries. Some irrigated territories have drainage canals. The drainage goes back to the river, but some canals catch the wastewater from irrigation and others use it downstream again to irrigate more fields. Unfortunately, the Regional Administration does not have data about the reuse of used irrigation water. A major concern is that agrochemicals will run off during irrigation to become a source of diffuse pollution. If that water is reused, there may be residual agrochemicals in the water which may result in an 'over-dose' of the appropriate agrochemicals for a particular farm. However, in the region agrochemicals are said to be used separately from irrigation, and farmers usually apply them after irrigation, so there is no 'run-off' problem because the fertilizer is 'consumed'.[379]

Figure 21: Pictures of Site Visit of Irrigation Dam
On the following page, the pictures show the small dam which provides irrigation water to both left and right banks, yet allows fish to migrate up the low dam as well.

[379] Ibid.





To finance the irrigation system, some of the budget comes from the government, while the remainder is through charging the users, or farmers. The system of collecting user fees is still not well organized, so it is often difficult to collect enough to run and maintain the system properly. The main problem is that the property rights of the land are not clear after the collective system broke down. The former owners of the land have followed the tradition of leaving their land to their children who divide the land amongst themselves. There is a register of the land owners, the crops grown, and the water quantity used for the crops, however it is not full and exact, so they cannot collect 100% of the payments. The Administration, however, is working in this direction so that they may to remediate this gap. The system is currently designed so that a farmer pays each time they irrigate, however it may not be the best system, according to the Administration. They would like to consider charging according to the land area, as they do in Greece, because they still do not have good measuring devices for the water quantity used by each farmer. [380]

AGROCHEMICALS

During communist times, fertilizers and pesticides were cheap and there was not any control of its use. Arable lands were over-fertilized. After the political changes, agrochemicals became very expensive, and cooperative farms were destroyed and privatized. New farmers were not able to apply fertilizers or use advanced techniques for agriculture. [381] Currently, fertilizers and pesticides are used, but not as much as in previous times. Moreover, the agricultural territory is much smaller than that of the Greek side of the basin, because of the mountainous terrain, and thus there is less opportunity to use the large quantities of agrochemicals. Modern agriculture needs agrochemicals, and thus for big producers involved in industrial production, more pesticides and fertilizer are used. However, when farmers produce for their own consumption, they use less agrochemicals because of the prohibitive costs. For instance, the regionally important tobacco production requires the use of some, however the farmers have less money now.[382] For instance, in the Bansko Municipality, there is animal breeding and tobacco, corn and wheat production; however there is not a large use of agrochemicals because it is too expensive. However, during the historical cooperative farming, chemicals were used.[383]

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[380] Ibid.

[381] Personal Communication with Professor Roumen Arsov, Dean of the Faculty. Of Hydrotechnics, University of Architecture, Civil Engineering and Geodesy, Sofia, Bulgaria, July 21, 2006.

[382] Personal Communication with Staff members, Regional Administration for Irrigation in Blagoevgrad, Bulgaria, July 19, 2006

[383] Personal Communication with Mayor of Bansko Municipality, Bulgaria, July 20, 2006.

Greece

CROPS AND LIVESTOCK

The main agricultural area of the Nestos basin is in the Nestos Delta area, where the land is flat and especially fertile. The farmers in the Nestos river basin grow traditional wheat, corn, cotton, beans/lentils (which are profitable), melons and watermelons (which also are profitable), and more recently asparagus (for the last 20 years) and kiwi (for about 10 years). The main crops are corn, beans, asparagus, rice, cotton, and kiwi.[384] Vegetables would be much more profitable to grow in the Nestos area, but require more work than some of the other crops chosen, and thus have been less attractive to the farmers in the area.

The agricultural market is poor in the region, and is not coordinated with Athens markets.[385] The government services do not have enough staff, or are not effectively servicing the area. There are no agricultural advisors for organic farming in the area, and the agronomists who advise the farmers all also sell products, such as fertilizers and pesticides, so they are not interested in lowering the use of these agrochemicals.[386] The farmers in the area are often aided and represented by an Agricultural Cooperative, such as the Co-op of Kavalas. There are 45 such groups in Kavalas, with around 5,000 people involved. In Chrisoupouli there are around 23 groups, and about 2,100 people.[387]

The agricultural co-ops are used to make joint decisions among the farmers. There are now many different co-ops. They negotiate good deals for the farmers needs between the commercial system and the farmers. They also buy and sell the farmers products. Many producers plant corn because there is nothing better. Around 80,000 ares (800 hectares) out of 150,000 ares (1,500 hectares) of farmland in the plain of Chrisoupouli is corn. The main earnings of the producer is the EU financing, just enough for the job – without any extra to live on. The tendency is toward fewer farmers. Farmers are not well-informed, although some are becoming more informed in the last five years. About 30 years ago, there were national programs for informing farmers, but today there are private agronomists who sell the seeds, fertilizers, etc. There are around 50 stores like this. The ministry plays a small role, and the EU CAP plays a role.[388]

The Kavalas Co-op has processing plants for the wide variety of crops that are grown in the region, including plants for processing cotton, processing animal

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[384] Personal Communication with G. Papadiochsiou, Director of Agriculture, Kavalas Prefecture. July 13, 2006.
[385] Personal Communication with Agronomist at the Agricultural Co-op of Kavalas, July 13, 2006.
[386] Personal Communication with Hans Jerrentrup, EPO - Society for Protection of Nature and Ecodevelopment, July 16, 2006.
[387] Personal Communication with Agronomist at the Agricultural Co-op of Kavalas, July 13, 2006.
[388] Ibid.

feed, drying corn, producing olives and olive oil, refrigeration for asparagus and kiwi crops, and they even do marketing in their own supermarkets. The Co-op also does paperwork and applications for the farmers to get assistance or join government and EU programs. The Co-op has a program for the farmers on the best practices in agriculture, which teaches what to grow and when. More than 50% of the asparagus farmers enter these programs. The Greek Ministry of Agriculture and the Co-op give information to the farmers. For Kiwi farming, the Co-op has meetings and trainings to talk to and inform the kiwi producers, and they organized collective refrigerators to increase the price for the kiwi crops.[389]

Fertilization in the region happens in May. Herbicides and pesticides are applied mostly when the plants are small. Intensive agriculture and crop rotation is used. For the rice crops, farmers add agrochemicals to the water.[390] Reuse of irrigation water which has already picked up some of the agrochemicals is common downstream where discharge channels collect unused irrigation water and pass by farms which are not serviced by the irrigation infrastructure. This may lead to watering crops with unknown mixes of chemicals, and then unknowingly over-applying additional agrochemicals.

The region also has livestock breeding. In the past, animals were shepherded around, but today all animals in the region are kept in stables, and include cows, pigs, sheep.[391] In Kavalas, there are about 200,000 goats and sheep, either raised traditionally in the mountains or in Chrisoupouli. There are also around 15,000 cows.[392] Currently, there is no organic meat produced. However, there are subsidies available to promote the rare breeds of animals which are in the area, such as water buffalos. The farmers are encouraged to begin breeding these animals and the NGOs are also pushing in this direction. The nearby Kerkini Lake became a local attraction because of the water buffalo raised there for meat and milk. There is also an old breed of cows which is well adapted to the mountains there and could also be reintroduced. In the Delta, there is some amount of free grazing in the riparian forests, but overall free grazing has gone down because people no longer want to shepherd the animals all day.[393]

EU and Greek law dictates that all stables are obliged to have WWTP for the stables.[394] However, it is doubtful that many of them have it, except a large

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[389] Ibid.
[390] Personal Communication with Staff from Prefecture, TOEB Kavalas, Greece, July 13, 2006
[391] Personal Communication with Staff from Prefecture, TOEB Thallasias Kremastos, Greece, July 14, 2006.
[392] Personal Communication with G. Papadiochsiou, Director of Agriculture, Kavalas Prefecture. July 13, 2006.
[393] Personal Communication with Hans Jerrentrup, EPO - Society for Protection of Nature and Ecodevelopment, July 16, 2006.
[394] Personal Communication, with Panayotis Georgiadis, Eastern Macedonia and Thrace Periphery, July 14, 2006

animal farm Kreka, which has a treatment system which seems to work. There is a need for better management.[395] Farmers can compost the animal wastes in a tank constructed to prevent seepage into the ground water and covered by a nylon top to keep air out, and then use the resulting material as fertilizer.[396]

There is a lot of competition from Spain and Italy, which are much closer to the main markets in Europe. One of Greece's largest disadvantages is the high cost for transportation of products from Greece. The land route through the former Yugoslavia had been fast and easy before the breakup of the country, but since then has been too difficult. The Balkan war was very negative for farm production in the Nestos area, and also in terms of tourism, because it cut off Greece from the continental Europe.[397] Now farmers mostly ship their products by land to Patra on the Adriatic coast, put their products on a ferry to Ancona, Italy, and then ship the items by land into the core European markets. This circuitous route has been made in order to avoid poor road conditions and potentially volatile areas in the Balkans, however this may change as new European infrastructure projects progress, and as Bulgaria and Romania's entrances to the EU have connected Greece geographically to the EU.

Another disadvantage for Greece's agricultural market is that there is a higher production cost in Greece. There are many small plots and the rents for the land are said to be the highest in Europe. [398] The Banks will easily lend money to farmers without verifying if it is a good investment or not, and thus many farmers are in debt. The EU policy is to get people out of Agriculture. There are a lot of subsidies right now for cash crops like wheat, corn, rice – but farmers can not make a living from these crops today, especially as the productivity of the fields is no longer stable because of overuse of the same crop in the same place. [399] In 2013, when the subsidies decrease, most farmers will have to leave the business and there will be few farmers surviving with only 10,000 – 20,000 stremata. The Greek farmers haven't done what they needed to do with all the Greek and EU programs to become sustainable.[400] With many people leave farming in the next 5 – 10 years, this will cause a large problem because industry has not developed well in Greece and there will be even higher unemployment.[401]

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[395] Personal Communication with Hans Jerrentrup, EPO - Society for Protection of Nature and Ecodevelopment, July 16, 2006.
[396] Personal Communication with Panayotis Georgiadis, Eastern Macedonia and Thrace Periphery, July 14, 2006
[397] Personal Communication with Hans Jerrentrup, EPO - Society for Protection of Nature and Ecodevelopment, July 16, 2006.
[398] Personal Communication with Agronomist at the Agricultural Co-op of Kavalas, July 13, 2006.
[399] Personal Communication with Hans Jerrentrup, EPO - Society for Protection of Nature and Ecodevelopment, July 16, 2006.
[400] Personal Communication with Staff from Prefecture, TOEB Thallasias Kremastos, Greece, July 14, 2006.
[401] Personal Communication, Agronomist at the Agricultural Co-op of Kavalas, July 13, 2006.

With the high quality soil, water and sun in this region, farmers could produce a better profit, but the crops that would fetch a higher price also need more work. The local perception is that young people in the area do not want to work, and instead they prefer to pay Albanians and Bulgarians to do the work.[402] Farmers learned that with the subsidies from 20 hectares of corn fields, it was possible to be rich with little work. Other crops need more work or more hands. For instance, the white asparagus crops are very labor-intensive and can be very profitable if they reach the markets early, so they can fetch the highest price. If the crop is late, after adding the transportation costs to the asparagus, which go almost exclusively to Germany, there isn't much profit left. Now there is a large asparagus production in the region. Spain was producing green asparagus for France, but now also produces white for Germany.[403] Even the packaging industry is inefficient, because rather than joining forces, there are about 30 different packaging companies in the area because everyone wants to be the boss.[404]

Irrigation System

The Greek irrigation system is concentrated at the Nestos Delta region, in the prefectures of Kavalas and Xanthi, however Drama has been trying to get some access to the Nestos River water as well. Kavalas and Xanthi use 150 million cubic meters for irrigation.[405] In the 1950s, they built up the banks of the river. Collectivization happened in the 1950s in Kavalas, but not as much in Xanthi. The gravitational irrigation channels were built in the 1960s.[406] The large dams on the Nestos collect water during the winter wet months and release it during the summer dryer months for irrigation use. The Greek People's Power Corporation (DEI) says they need to release a minimum of 6 cubic m/s out, but others, such as NGOs, believe that more water is needed to maintain the unique and fragile ecosystems of the Nestos River and Delta systems. In 2000, there was a severe drought which decreased the water amounts, and became a large threat to the agriculture and natural ecosystems.[407]

Irrigation water is carried from the river using open canals made of cement. Water is lost through evaporation and with the cement. Water could be brought with plastic pipes, which conserves more water, but this is more expensive to put

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[402] Ibid.
[403] Personal Communication with Hans Jerrentrup, EPO - Society for Protection of Nature and Ecodevelopment, July 16, 2006.
[404] Personal Communication with Agronomist at the Agricultural Co-op of Kavalas, July 13, 2006.
[405] Personal Communication with Georgos Kampas, Eastern Macedonia and Thrace Periphery, Kavalas, Greece, July 12, 2006.
[406] Personal Communication with Staff from Prefecture, TOEB Kavalas, Greece, July 13, 2006
[407] Personal Communication with Panayotis Georgiadis, Eastern Macedonia and Thrace Periphery, July 14, 2006

in place. Smaller channels flow between the crops in the various fields. Dirt channels collect the run-off from the fields and drain the used water to the ocean.[408] Gravitational channels are used in about 80% of the irrigation in the Nestos basin. This is not something that will change, except with the needs of new crops, such as the recently introduced kiwi trees in the region. Drip irrigation or microjets are used when there are trees or watermelons. Asparagus is mostly irrigated with channels. Well pumping is also done in areas that do not have access to the river irrigation infrastructure. However, during some years of severe drought, over-pumping began to draw in salt from the coast. The zone of land that has had salt-water intrusion is now where rice is grown. Rice needs to always be in a basin with water, thus it requires large amounts of water resources.[409]

The Kavalas irrigation channel takes up to 23 cu m/s, but gets around 20 cu m/s. Water is wasted from watering in the middle of the day – up to 50% loss, especially with sprinkler jets. There are not any hard rules for when you can use such systems, but this is needed.[410]

The total agricultural land in Kavalas is 559,000 ares (5,590 hectares).[411] Of that, approximately 62% is irrigated, with 349,000 ares (3,490 hectares). The local irrigation administration is known as a TOEB. TOEB Chrysoupolis and TOEB Chrisichario together have 123,000 ares (1,230 hectares) of land irrigated by the system, with water from Nestos river. The completion of a new irrigation project will raise this to 150,000 ares (1,500 hectares).[412] Chrysoupolis has new system of irrigation which also takes from the Paradise Springs.[413]

The TOEB Kremastis Thallasias is in Xanthi, and administers approximately 26,000 ares (260 hectares) with main and secondary channels for irrigation, and approximately 30-40 shallow wells, up to 20 meters deep, and around 5 or 6 deep wells. The current system they use only has one pump to pull the water up and send it to the irrigation channels, but it could be improved if they had a pump at the bottom of the well for lifting the water, and another pump at the surface for the irrigation. The water used for the asparagus and kiwi production is coming only from groundwater.[414]

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[408] Personal Communication with Staff from Prefecture, TOEB Kavalas, Greece, July 13, 2006
[409] Ibid.
[410] Personal Communication, Panayotis Georgiadis, Eastern Macedonia and Thrace Periphery, July 14, 2006
[411] Note: 1 are = 100m^2. In Greece, property is often measured in a unit called "strema", or "stremata" in plural, which is equivalent to the unit are. 1 hectare = 100 ares.
[412] Personal Communication with Staff, TEB Kavalas, July 13, 2006.
[413] Personal Communication with Panayotis Georgiadis, Eastern Macedonia and Thrace Periphery, July 14, 2006
[414] Personal Communication with Staff from Prefecture, TOEB Kavalas, Greece, July 13, 2006

Xanthi has approximately 30,000 ares (300 hectares) with open irrigation channels with water diverted from Nestos at the Toxotes dam. In Xanthi and Toperov, they use groundwater for irrigation for the rest of the fields. There was a study on irrigation in Xanthi to take water from a dam with a closed network so as not to lose water, taking just what you need. The study happened through the Ministry of Agriculture and the Ministry of Development in June 2000. At the TOEB Thallasias Kermastis they had not been alerted as to whether the project had gone forward. The excess water after irrigation goes down through drainage canals past some small villages which do not have irrigation infrastructure, and this water is often reused. This reused wastewater has some agrochemicals and industrial wastes.[415]

The Prefecture of Drama wants to begin drawing water from the Nestos River, but currently is not doing so. They have deep wells and pressurized pipes to water their crops using sprinkler jets.[416]

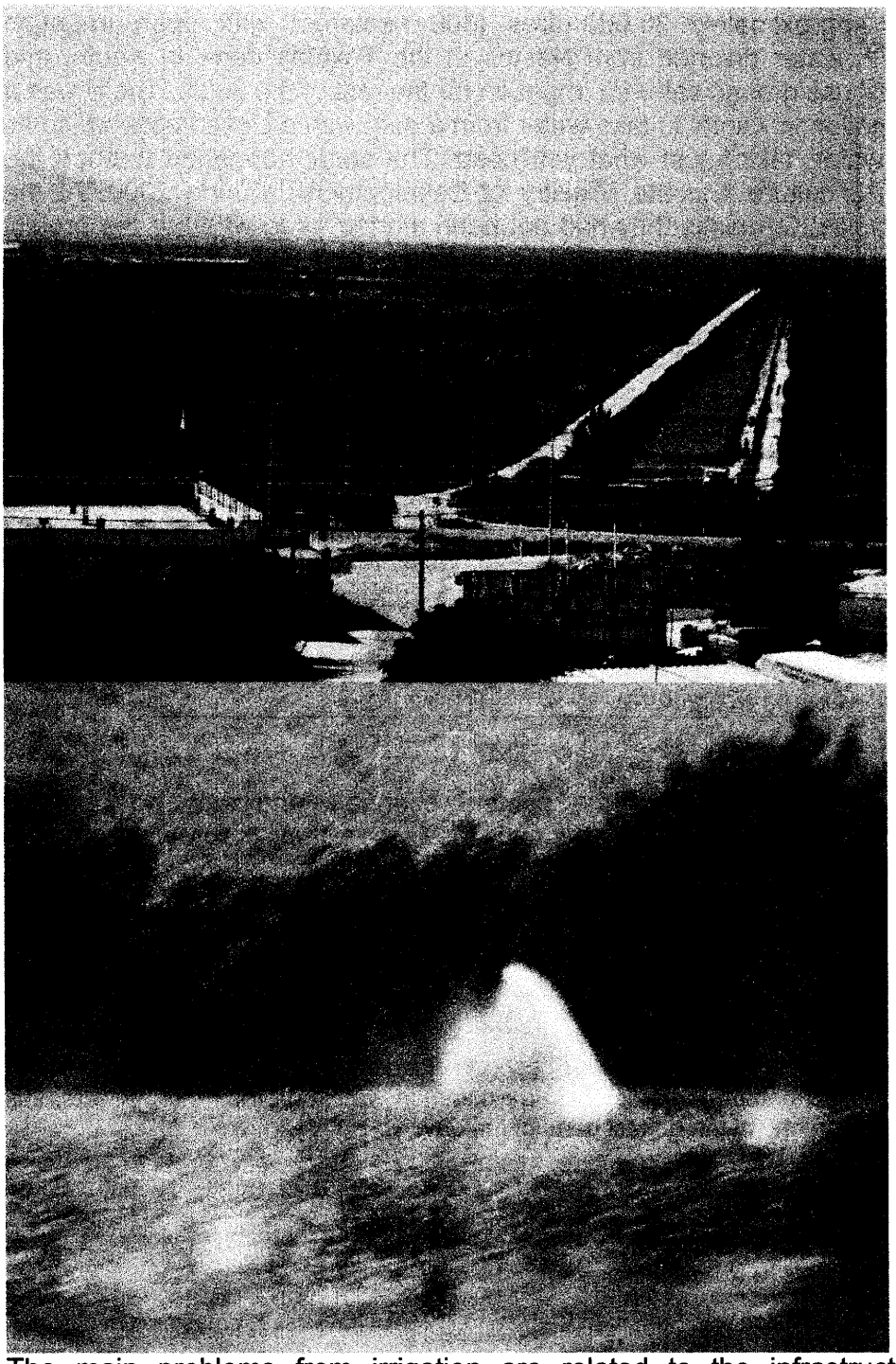
Table 20: Summary of Irrigation Infrastructure in Nestos River Basin

Irrigated Fields	**Size (approx)**
Kavalas Prefecture	3,490 hectares
Xanthi Prefecture	260 - 300 hectares
Drama Prefecture	0 hectares

Many in Xanthi do not have the cement channels and they do not use gravitational irrigation techniques. Instead, they water their crops with sprinkler jets with water drawn from groundwater wells. They only pay for the electricity used to pump the groundwater. There has been a recent study on increasing irrigation water to the Xanthi Prefecture. [417] Xanthi's expansion of irrigation and agricultural intensification is not an EU priority, but a political move. [418]

Figure 22: Pictures of Irrigation Techniques
The top image shows an outgoing channel used to discharge excess/used irrigation water to the Aegean. The bottom image shows the common watering crops through jets, this picture taken during one of the hottest parts of the day.

[415] Personal Communication with Staff from Prefecture, TOEB Thallasias Kremastos, Greece, July 14, 2006.
[416] Personal Communication with Staff from Prefecture, TOEB Kavalas, Greece, July 13, 2006
[417] Personal Communication with Panayotis Georgiadis, Eastern Macedonia and Thrace Periphery, July 14, 2006
[418] Personal Communication with Hans Jerrentrup, EPO - Society for Protection of Nature and Ecodevelopment, July 16, 2006.



The main problems from irrigation are related to the infrastructure and a misunderstanding that water is over-abundant. The infrastructure is old and this results in loss of water and structural hazards. There is water wasted from poor use of the resources with water-intensive crops and poor irrigation techniques.

There is poor maintenance of shared infrastructure, and the irrigation works are often incorrectly operated. Additionally, there is a lack of the necessary infrastructure to have the system work efficiently.[419]

Agriculture is very important to Greece, but it is a struggling sector that depends heavily on subsidized and threatened water resources. The Nestos region is trying to promote an irrigation system that is environmentally friendly with covered channels. However, farmers use much more water than they need. There is a loss of approximately 30-40% in transit. Additionally, there may be 50% evaporation when watering. This water could be used for other purposes if it were not lost.[420] Farmers often don't care about spoiling the water and over-using it. The use of sprinklers wastes the most water and drains the channels, and many water-intensive crops are grown, such as clover and rice. Farmers would be better using drip irrigation to conserve water and crops that require less water, but they do not consider this urgent or cost-effective because of the current freely available irrigation water.[421]

Some pump irrigation water from the same wells as those used for drinking. Chrisoupouli, for instance, uses wells for drinking water. Because of over-pumping for both agriculture and household use, the saltwater has intruded into the groundwater.[422] Rice is grown where there are salt intrusion issues, and these crops need a lot of water. Some farmers use the flushing system with continuous water through the rice fields. Up to last year, the rice fields were increasing.[423]

There is a desire to expand the irrigation network because there is a misunderstanding that there is surplus water. They don't see the problems yet that will come from over-building a dependence on the Nestos waters. Yet one of the large problems with the irrigation infrastructure is that the current network is not systematically maintained.[424] Moreover, because of the Ramsar and Natura 2000 areas, the local authorities cannot build new channels there, and cannot clean the ones that are already there without an Environmental Impact Assessment (EIA). The channels fill with dirt sediment, trees, and vegetation, but it cannot be cleared without pre-approval. Starting in August 2006, they will finally clean some important channels after a 3-year long delay in clearing the EIA.[425]

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[419] K. Tsompanoglou, Transcript of talk given at SAP in Kavala, Greece, on May 11, 2000.
[420] Personal Communication with Agronomist at the Agricultural Co-op of Kavalas, July 13, 2006.
[421] Personal Communication with Hans Jerrentrup, EPO - Society for Protection of Nature and Ecodevelopment, July 16, 2006.
[422] Personal Communication with Agronomist at the Agricultural Co-op of Kavalas, July 13, 2006.
[423] Personal Communication with Hans Jerrentrup, EPO - Society for Protection of Nature and Ecodevelopment, July 16, 2006.
[424] Ibid.
[425] Personal Communication with Staff from Prefecture, TOEB Thallasias Kremastos, Greece, July 14, 2006.

AGROCHEMICALS

The Greek government supports farmers not to use pesticides and fertilizers, and to reduce the use of chemicals in all farmers in the Kavalas, Xanthi, and Rhodopi area.[426] While the Greek Ministry of Agriculture has on their website a budget line for support of farmers for reducing fertilizers and pesticides in the Nestos basin, the program was never opened and run. The farmers don't use it because they are uninterested, they are not pushing for it, and/or they are unaware of the opportunity. There are also general EU programs to reduce chemicals and encourage organic production.[427]

Under the EU Common Agriculture Policy (CAP) one of the goals is to reduce the use of agrochemicals. Under the CAP Framework, they care about the area they have, and not that much about the amount of production, so they give money to make quality products. But Organic production does not earn more money. [428] The farmers have begun putting any crops in the fields just to keep the fields from being idle because the CAP financing is only until 2013. Moreover, because many are dependent on agricultural subsidies from Greece and the EU, often their total output or method of production is not as important.[429]

Approximately 20-25 years ago, they used to put twice the needed amount, and there were serious issues with the agrochemicals getting into the sea.[430] Today pesticide use is very little, but the real problem is the use of fertilizers. They affect the underground water with nitrates and nitrites.[431] Because of the added expense, the farmers don't have an incentive to put more chemicals than needed. There is also a concern with the impact of the agriculture on the drinking water. Agrochemicals sometimes seep into the drinking water wells.[432]

Statistically there is some monitoring, but no control of your agrochemical use unless you're an organic (biological) farmer. Many people put fertilizers without seeing what their soil needs by analyzing it. Pesticide companies give seminars/dinners for the farmers to promote their products. [433] The reuse of

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[426] Personal Communication with G. Papadiochsiou, Director of Agriculture, Kavalas Nomarcheia. July 13, 2006.
[427] Personal Communication with Hans Jerrentrup, EPO - Society for Protection of Nature and Ecodevelopment, July 16, 2006.
[428] Personal Communication with G. Papadiochsiou, Director of Agriculture, Kavalas Nomarcheia. July 13, 2006.
[429] Personal Communication with Agronomist at the Agricultural Co-op of Kavalas, July 13, 2006.
[430] Ibid.
[431] Personal Communication with G. Papadiochsiou, Director of Agriculture, Kavalas Nomarcheia. July 13, 2006.
[432] Personal Communication with Hans Jerrentrup, EPO - Society for Protection of Nature and Ecodevelopment, July 16, 2006.
[433] Ibid.

drainage waters is strictly forbidden and wrong because of the chemical and industrial wastes that find their way into it. Moreover, most farmers drop all tins, boxes, and bottles of used pesticides into the drainage channels. There is no control system or consequences. [434]

5.2.2.4 Dams

Dams are used on the Mesta/Nestos River and its tributaries for trapping and diverting irrigation waters, generating hydroelectric power, and managing floods and droughts. While Bulgaria has several small-scale dams, the larger plans for developing such infrastructure have not gone through for various reasons. Greece, on the other hand, has a series of two large dams which generate significant amounts of electricity especially during the summer months.

Bulgaria

The hydroelectric potential of the Mesta river is very high, and among the highest in comparison with other Bulgarian rivers. However, this potential is not really being used. There are only three hydro-power plants, and they are quite small in size. They are not constructed for the regulations of the river flow and have a small impact on the river system. The Dospat River, which is a tributary to Mesta, is almost entirely diverted outside of the Mesta catchment.[435] There are also some small dams for irrigation purposes in some of the other Mesta tributaries.

The small water power stations which are on the river currently do not impact the river or groundwater. Now there are permits for four new hydro-electric stations. It is not clear what impact these will have on the river. While there are EIAs for the stations, they were prepared by other organizations and the impact is still not clear, although the permission was given in WABD.[436] There are big hydroelectric constructions in other parts of Bulgaria, but not in Mesta. Some years ago, Bulgaria was third in the world for having the greatest number of big dams compared with its population, having at that time approximately 600 dams. Today the US is first, and the perception is that Bulgaria has fallen far behind – especially on the Mesta River.[437]

Most of the electricity in the territory comes from the Rila Mountain and the Blagoevgrad switching station. Approximately 40% of the electricity comes from the Bulgarian nuclear power plant. The rest comes from a thermal power plant

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[434] Ibid.
[435] Personal Communication with Haris Skonlikaris, PhD Student at Ecole des Mines, France, and AuTH, Thessaloniki, Greece, July 11, 2006.
[436] Personal Communication with Bladimir Dinov, ing., Director of West Aegean Basin Directorate, July 19, 2006.
[437] Personal Communication with members of Razlog Water Council, July 19, 2006.

located nearby, in Bobovdol, and from the Belmeken dam, the biggest water reverse-pumping dam for hydro power located in the Evros basin.

The hydroelectric station in Mesta village has a series of three small hydroelectric installations. The water begins in Popova lake, which has a spring for the Retize river, and is the highest and largest lake in the Balkan mountains. The first installation has a drop of 30m, and generates 1.9 – 2 MW, the next has a drop of 80m, and generates 0.5 MW, and the final segment has a drop of 600m, and can generate 5 MW.[438]

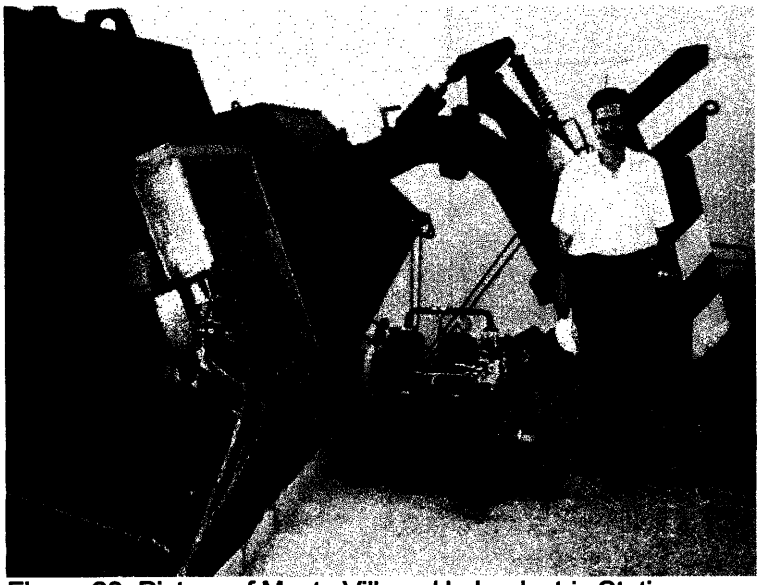

Figure 23: Picture of Mesta Village Hydroelectric Station

Mesta is one of the rivers with the most water in Bulgaria, with approximately 1 billion cubic meters per year on average. The Bulgarian territory is at an elevation of 400m above sea level. There have been several proposals from engineers for using Mesta by transferring the waters to the Maritsa Valley so that they can use the 250m difference of elevation. The mean level of the Maritsa Valley is 100m, so about 300m of reserve could be used for irrigation to help develop the area. However, this proposal is very expensive, and the financing is not available. Also, it is not well studied whether it will be lucrative. Because the agreement with Greece requires some 500 million cubic meters/year to pass through at a minimum, in the worst case scenario of a dry year, all the run-off of Mesta would have to go to Greece.[439]

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[438] Personal Communication with Staff at Mesta Village Hydroelectric Station, July 20, 2006.
[439] Personal Communication with Professor Ohanes Sànturdjan, Director of Institute of Water Problems, Bulgarian Academy of Sciences, July 18, 2006.

The Razlog Water Council has proposed a new dam construction plan, and believes it is a good one. There are many different specialists in the Razlog Water Council, and they know that an EIA is needed for their project once implementation is to begin. They believe that the new dam would contribute to irrigation, electricity production, cleaner water, sediment removal.[440]

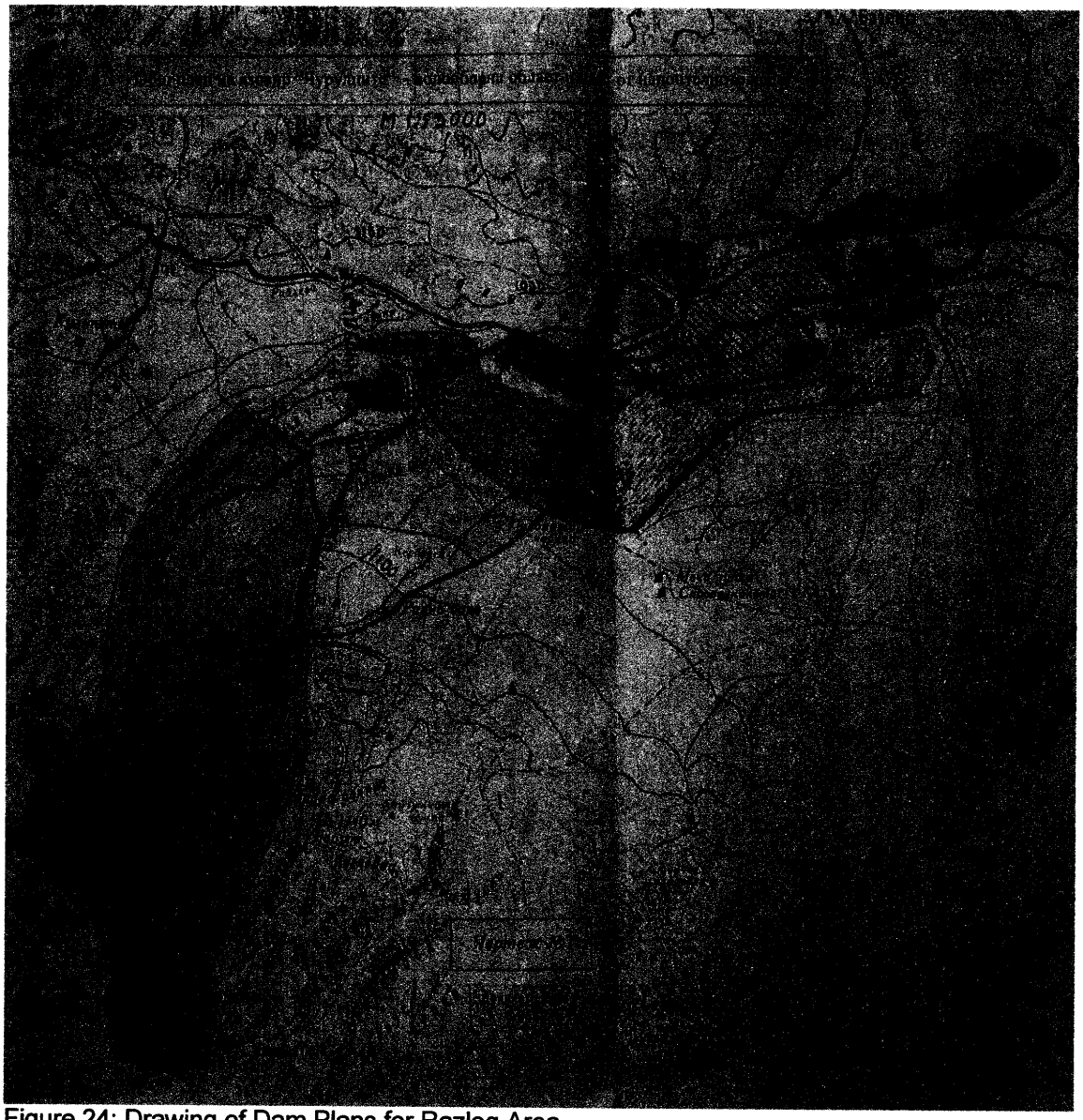


Figure 24: Drawing of Dam Plans for Razlog Area

[440] Personal Communication with Members of Razlog Water Council, July 19, 2006.

There was an idea to put a new dam/reservoir near the Breznitsa village, but Project realization is very expensive. If it is realized, then all the villages will be supplied with water. There is also the idea to construct a hydropower station with that dam. But it is not realized. (Tuftche River)[441]

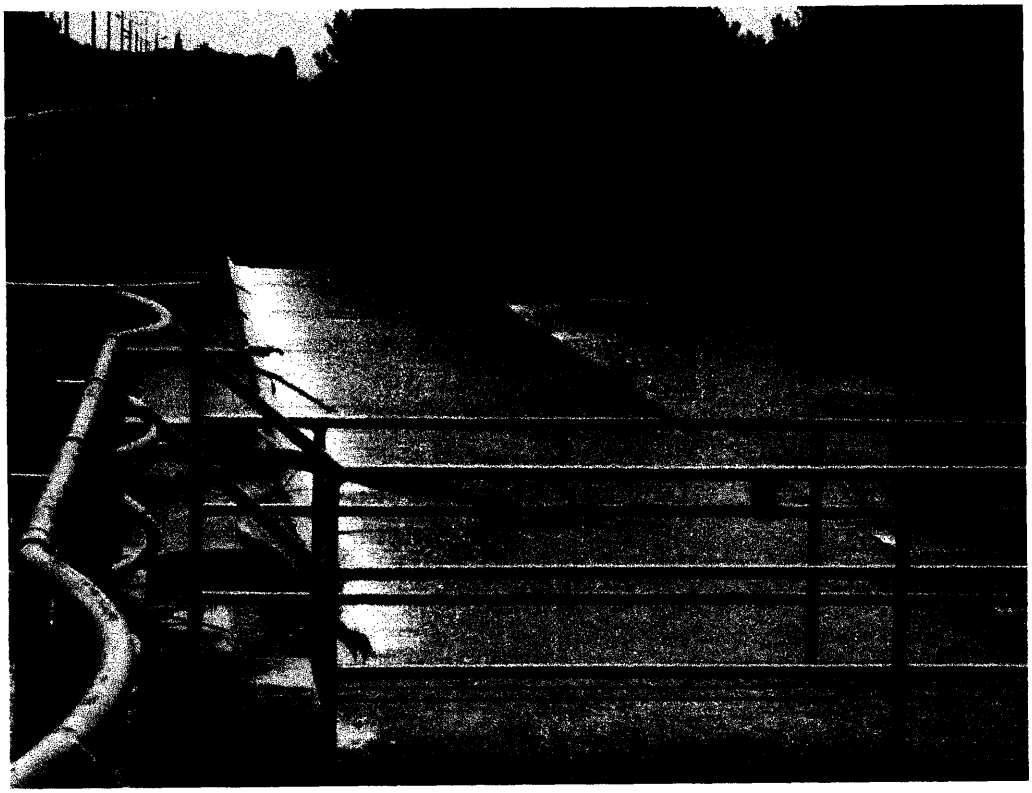
Greece

Greece has built several large dams on the Nestos River, most notably the Thesavros dam, which is one of the tallest in Europe. The Greek Public Power Corporation (DEI) has been helpful to the region because it holds water for use in the drier summer months, and also controls flooding. The dam must release at minimum 6 cubic meters/second.[442] The Thesavros hydroelectric plant has a total capacity of 384 MW. There is a second major hydroelectric station of Platanovrisi, which is downstream from the Thesavros dam, and can produce 116 MW.[443]

There is a smaller dam used for irrigation purposes called the Toxotes dam, and it would be capable of generating 0.75 MW electricity as going to the Kavalas Irrigation network because there is a 5m drop. However, because it is in the Zone A of the Ramsar protected area and they hydro-plant would affect the fish, they were not granted a permit.

Figure 25: Picture of Toxotes Irrigation Dam

[441] Personal Communication with Mustafa Velishe, Deputy Mayor of Gotse Delchev, July 20, 2006.
[442] Personal Communication with Georgos Kampas, Eastern Macedonia and Thrace Periphery, Kavalas, Greece, July 12, 2006.
[443] DEI, "Public Power Corporation". Access July 20, 2007 at http://www.dei.gr/ecportal.asp?id=146&nt=123&lang=2



There have been questions as to whether the large dams (Thesavros and Platanovrisi) have had an influence on the water temperature in the river, and whether this affects the irrigated plants or the natural ecosystems. In May 2001, water was measured as 16.0 degrees Celsius. In May, 2006, the water was 12.5 degrees Celsius. Some people have said the water is too cold for the plants, but this may be mitigated by the channeling system, as the water warms up in the main pipes and open channels.[444]

The Ecole des Mines in France created a model, Modcou, to model the surface flows of the Mesta/Nestos river. It accounts for the Nestos has Thesavro and Platanovrisi dams which control the flow of water, preventing floods and regulating irrigation water. The dams trap the sediment flows, and thus the Delta is not getting fed. The results show how the shoreline is coming in over time. The temperature of water has also changed a lot because of how the tall dams of 190 m high have changed the condition of the water flowing downstream. The model also shows how the water is indeed colder, which changes fish patterns and may be too cold for plants.[445]

[444] Personal Communication with Staff from Prefecture, TOEB Kavalas, Greece, July 13, 2006
[445] Personal Communication with Haris Skonlikaris, PhD Student at Ecole des Mines, France, and AuTH, Thessaloniki, Greece, July 11, 2006.

However, some have the opinion that the dams have done more good than bad. While they have changed climate of region and indeed blocks the sediment flow, the dams allow for the farmers have constant supplies of water for irrigation, thus, the groundwater wells in Kavalas are not used, protecting the arable cropland from saltwater intrusion. The dams also allow Greece to produces a large amount of electricity when needed, especially in the summer when there is a high electricity demand. There is now always water in river, and the region no longer has floods because DEI pays attention to floods coming from upstream and prepares. However, currently DEI does not communicate with Bulgaria.[446]

[446] Personal Communication with Panayotis Georgiadis, Eastern Macedonia and Thrace Periphery, July 14, 2006

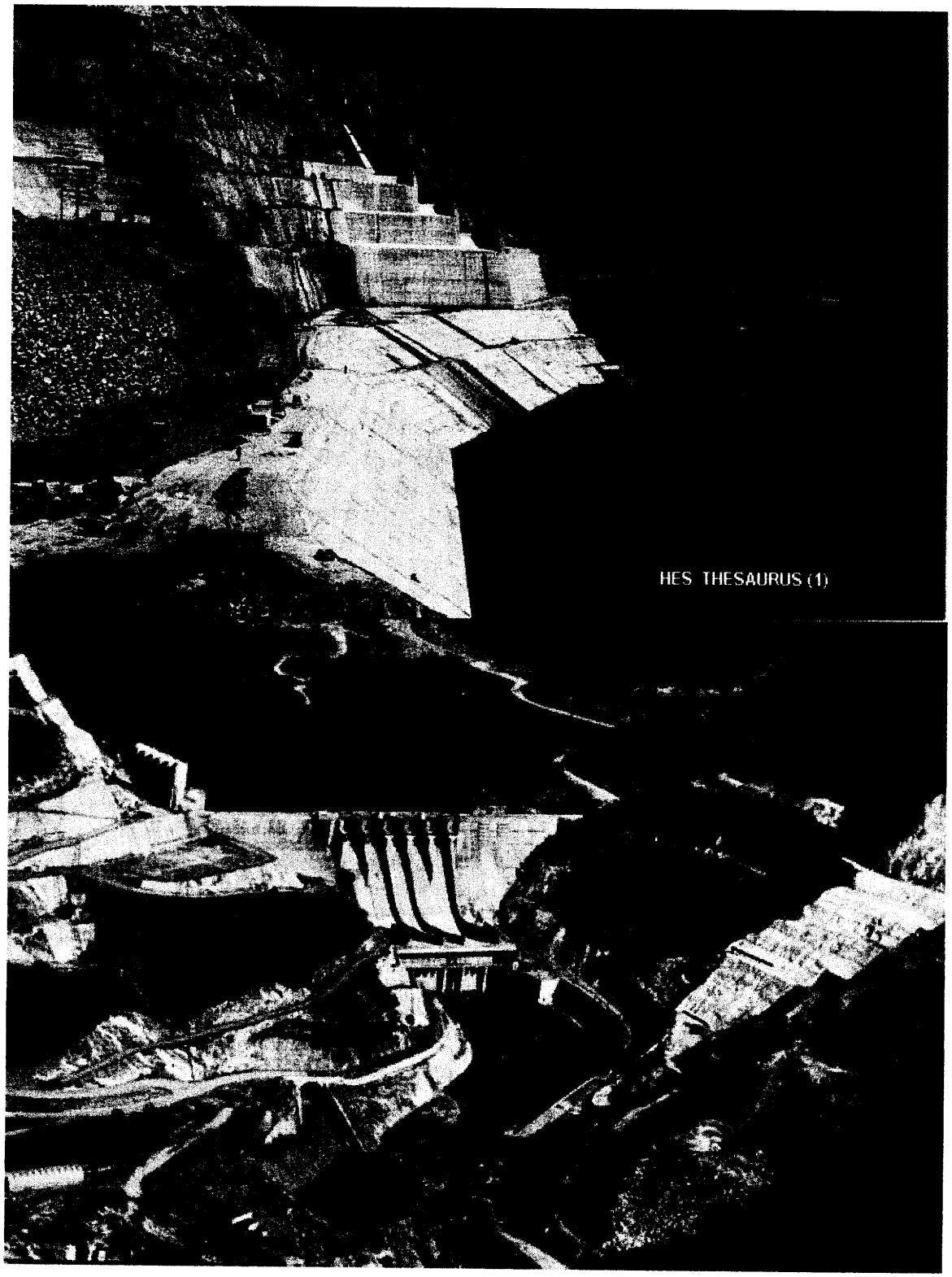

HES THESAURUS (1)

Figure 26: Pictures of Thesavros (top) and Platanovrisi (bottom) Hydroelectric Power Plants
Source: Hellenic Public Power Corporation (DEI)

5.2.2.5 Forestry

In the Greek part of the basin, forestry is not a large industry. There is some minor forestry in the mountains, near Drama. In Kavalas and Xanthi, however, the Nestos Delta now has large amounts of protected areas, and most useable land is taken by agricultural uses. The paper mill in Xanthi "Xartopoia Diana" gets wood partly in the Nestos area. Poplars are for paper and construction and paneling. There is no problem with forestry in the lowland. In the mountain area the forest management seems to be relatively good.[447]

In the Bulgarian part of the river basin, the area is covered by approximately 40% forests. During the communist era, the wood industry was quite large - timber was cut, prepared, and all the waste materials were dumped into the river. During high water or storms, the river transported all this material even all the way to the Greek territory. [448]

[447] Personal Communication with Hans Jerrentrup, EPO - Society for Protection of Nature and Ecodevelopment, July 16, 2006.
[448] Personal Communication with Emil Bournaski, Bulgarian Academy of Sciences, July 17, 2006.

Figure 27: Picture of Lumber Being Transported in Mesta Region

Forestry is still important, and these wood wastes may still be an issue.[449] About three to five years ago, there was some illegal timber industry and trading to Italy and/or Greece, but now this is not happening as much. It changed because the government is more active and is monitoring and guarding the forests, and more people are involved in preserving the forest resources. [450]

Because of economic changes since 1989, there were some illegal cutting of trees in the Bansko/Razlog areas, but the forest services managed to stop this because the rangers went day and night to patrol these areas, and a many people were punished for these activities. It was easy to access the forests by the road, however in the southern part of the National Park the terrain is very steep and difficult to reach. Since 2005/2006, this trend has been almost absolutely stopped.[451]

Every year people are allowed with permission of the park to take some trees for heating and building. They must request a permit and they are taken with a ranger who chooses which trees can be cut. For the large amount of construction that is happening in the Mesta region, especially Bansko, the large new buildings are not built with much timber – and what is used comes from other parts of the country. Also, for heating you need oak or some other woods but the region's forests do not have this type of tree, so it is brought from other areas. There is a project to bring natural gas to the town because it is growing so much. Private houses are using wood for heating, and hotels are using diesel. Bringing natural gas to the region will be a way to preserve forests all over.[452]

5.2.2.6 Mining

There has been some mining in the Bulgarian territory; however this mine has since closed. There was a uranium mine near the village of Eleshnitza and Dospat near a tributary to the Mesta River. The mine has since been closed, and covered with sand, but rainwater which seeps into the closed mine can become contaminated. The uranium levels are acceptable, however the Manganese which remains from when it was used in the mining process is the main concern. Now the contaminated groundwater is being pumped into a water purification plant, treated, and then released.[453] The water treatment plant removes only Manganese– reducing the groundwater level from 30 mg/L to less than 0.008

[449] Ibid.
[450] Ibid.
[451] Personal Communication with Blagoi Klecherov and Borislava Furnadjieva, July 20, 2006
[452] Ibid.
[453] Personal Communication with Emil Bournaski, Bulgarian Academy of Sciences, July 17, 2006.

mg/L once released. The regulation maximum is 0.08 mg/L, so there is an extra 10 times margin on the resulting treated water. It is a chemical treatment plant which pumps contaminated ground water out from under the mining landfill, before treating it and releasing safe water. It was built and is currently run by Germans. The contract expires September 2007. After that, it may run another 10 years or so.[454]

The uranium mine closed more than 15 years ago, and after the project to purify the groundwater, there is no longer a problem coming from the mine.[455] However, the local agencies in Greece had misunderstood what pollutant was threatening them, and were not aware that the problem has been remediated.

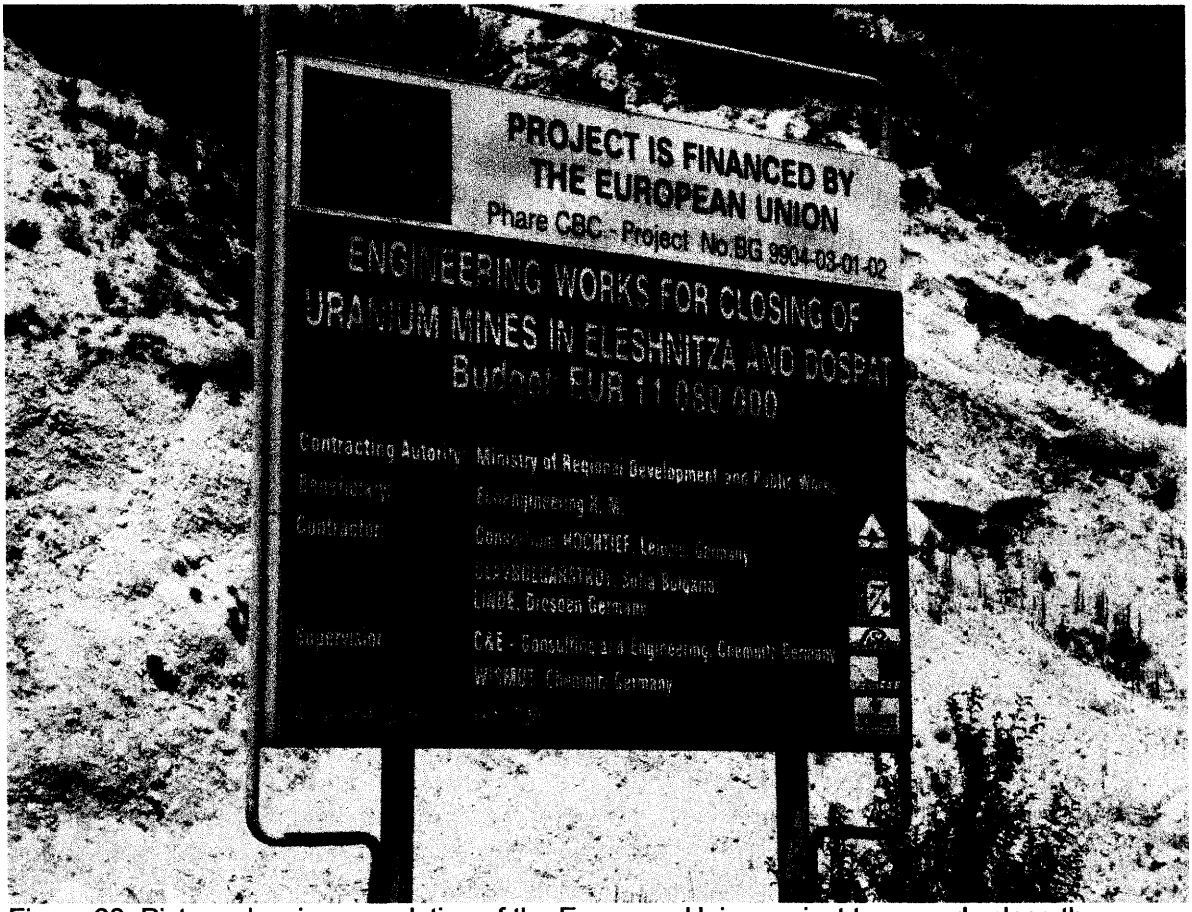


Figure 28: Picture showing completion of the European Union project to properly close the uranium mines in the Mesta Basin.

[454] Personal Communication with Staff of the Water Purification Center, Eleshnitza, Bulgaria, July 20, 2006.
[455] Personal Communication with Bladimir Dinov, ing., Director of West Aegean Basin Directorate, July 19, 2006.

The closing of the mines created great unemployment in the area. The population has decreased drastically – it has been cut in half in the last 15 years. Some people went to Turkey, especially the Turkish/Muslim Bulgarians, but now they are coming back because Bulgaria has entered the European Union. Some went to Spain, Portugal, and all over the EU. Some work part-time in Greece gathering olives or oranges.[456]

5.2.2.7 Fisheries

Both Greece and Bulgaria have trout fisheries, and it is important to maintain clean water to best cultivate the trout. There are such fisheries in the mountains of Xanthi.[457] There is a concern that water of poor quality will affect the quality of the fisheries. For instance, in the Greek part of the basin, there is an aquaculture fishery built up between two garbage dumps, and there is a high chance that the groundwater and runoff is contaminated.

The main location of fisheries, however, is in the sea. Greece is the largest aquaculture producer in the EU and in the Mediterranean. The Nestos River outlows into an important area for the cultivation of mussels and fish, so the quality of water is very important. The Nestos Delta region has a large number of fisheries. There are aquaculture ponds around Nestos at Keromati and Toxotes, and in the coastal lagoons, especially Vassova and Eratino.[458]

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[456] Personal Communication with Professor Roumen Arsov, Dean of the Faculty. of Hydrotechnics, University of Architecture, Civil Engineering and Geodesy, Sofia, Bulgaria, July 21, 2006.

[457] Personal Communication with Efthymios Darakas, Department of Civil Engineering, AUTh, July 11, 2006.

[458] Georgios Sylaios and Vassiliki Theocharis. "Hydrology and Nutrient Enrichment at Two Coastal Lagoon Systems in Northern Greece." *Water Resources Management*, 16: 171-196, 2002.

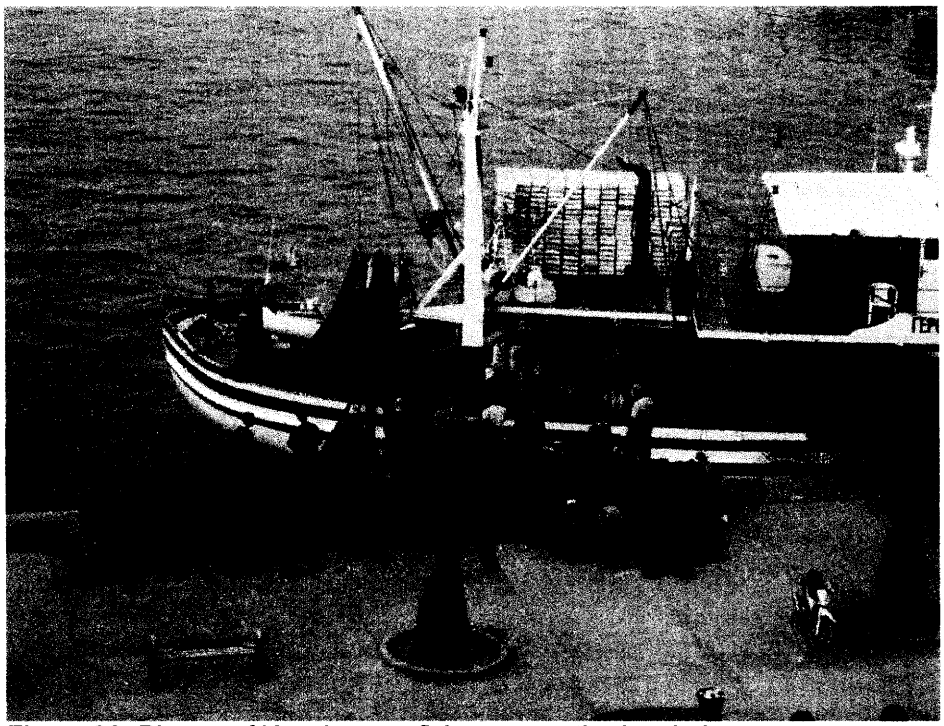
Figure 29: Picture of Kavalas sea fishermen gathering their nets.

The Fisheries Research Institute (FRI) is located in Kavalas, and is part of the Greek NAGREF Agricultural Research Foundation. FRI is a scientific research institute promoting technological development in the fishery sector.[459] FRI is involved in cross-border projects with INTERREG, as well as local and national research projects. They monitor the quality of the water and the results of the diminished sediments from the dam construction.[460]

There is a lack of fish migration from the Aegean and Mediterranean Sea, especially from Mesta/Nestos. The Greek Thesavros dam does not allow for fish passage, creating a problem for Bulgaria because there is no fish migration up and down the river. There is one specific fish, the eel, which used to migrate a very long way through the Aegean to Mesta river, but now the eels cannot make the journey past the Thesavros dam. There has been a decision to have this fish separately in this territory. In Bulgaria, the proposal for the construction of a new dam emphasizes fish passage.[461]

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[459] Hellenic Republic, "National Agricultural Research Foundation". Accessed July 20, 2007 at http://www.fishri.gr/

[460] Personal Communication with Hans Jerrentrup, EPO - Society for Protection of Nature and Ecodevelopment, July 16, 2006.

[461] Personal Communication with Members of Razlog Water Council, July 19, 2006.

5.2.2.8 Industry

While the Bulgarian region around Mesta had a history of industrial development, it has fallen to much lower levels after the fall of the planned economy during communism. The Greek region is primarily agricultural, however some industry has developed in relation to the growth of the agricultural sector.

Bulgaria

Industry is the main user of water in Bulgaria; however the Mesta River Basin does not contain as much industry as it once did.[462] With the changes coming from entrance to the EU, industry will perhaps remain at the current level, and perhaps will increase.[463] During the communist era, industrial activity was very active and the pressure on the environment was high.[464] According to current water quality monitoring there is no data showing that the river water is being polluted.[465]

For instance, in Razlog there were a large pulp and paper plant and a factory producing food additives for animals, both producing large amounts of water pollution. However, both factories have since been closed.[466] In 1985, the polluted air reached huts in the high mountains, and one could see the river changing colors. [467] After 1999, the political and economic changes resulted in a drastic decrease in industry, and thus in water pollution, resulting in virtually no problems today. [468] The pulp and paper mill still exists, however it is no longer in full operation. It has sedimentation ponds which they clean when there is flooding or high water level by dumping in the river. Because pollution is counted and polluters should pay for pollution, they do this to avoid paying. [469]

The Gotse Delchev is the most industrialized area in the Mesta River Basin region. During the communist era, this area has had industrial activities producing machinery and electric items such as radios. Since the activity decreased, the wastewater has also decreased, and now the treatment of

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[462] Personal Communication with Milkana Mochurova, BAS Institute of Economics, Sofia, Bulgaria, July 18, 2006.
[463] Personal Communication with Professor Roumen Arsov, Dean of the Faculty. of Hydrotechnics, University of Architecture, Civil Engineering and Geodesy, Sofia, Bulgaria, July 21, 2006.
[464] Personal Communication with Emil Bournaski, Bulgarian Academy of Sciences, July 17, 2006.
[465] Personal Communication with Staff members, Regional Administration for Irrigation in Blagoevgrad, Bulgaria, July 19, 2006
[466] Personal Communication with Emil Bournaski, Bulgarian Academy of Sciences, July 17, 2006.
[467] Personal Communication with Professor Roumen Arsov, Dean of the Faculty. of Hydrotechnics, University of Architecture, Civil Engineering and Geodesy, Sofia, Bulgaria, July 21, 2006.
[468] Ibid.
[469] Personal Communication with Staff members, Regional Administration for Irrigation in Blagoevgrad, Bulgaria, July 19, 2006

wastewater is increasing.[470] The town used to have the only radio factory in the Eastern Block, however it closed around 1990. It also had a zipper factory, which although old, is still working today with approximately 200 employees. Today, there are many garment factories with international investors. The opinion of a Mayor is very important to the development of a small town, and the Mayor of Gotse Delchev is very open to foreign investments. The municipality helps with permits and other documents in order to help foreigners invest in the municipality. This has led to a lower unemployment rate for the region. The average unemployment in Bulgaria is around 14%, and in Gotse Delchev it is only 6%.[471] From Germany, there is a Rollman factory, which employs 2000 people and makes suits. There are also Greek investments for garment factories, and two Italian investments for shoe factories. Also Italy and Greece invest in the wood furniture industry in Gotse Delchev. Additionally, there is a clinical hospital built with German investments, and they are currently creating a center for children up to 18 years old with mental disabilities. The Germans will construct it, but the municipality will operate it. Germans will help transfer their experience in treating such children.[472] Once completed, all industries in the municipality will use the new WWTP which is currently being planned, however is not yet constructed.

Industrial development is being promoted in the are, and there are business centers which have been developed in Razlog, and Gotse Delchev has a UNDP business incubator program.[473] There has been some research conducted looking at large and medium industrial enterprises in the Western Aegean Basin to understand their attitude toward IWRM, and a case-study has been published about whether they know about the Water Framework Directive, and their attitude toward the legislation and toward partnerships. The results of a survey of these companies showed that enterprises in the region are generally focused on short-term goals and problems, and the bi-laws for the water quality and quantity. However, the enterprises were not aware of the long-term objectives of the WFD and IWRM. To them it was strange to think about long-term goals for 2015. It is important to change this attitude in companies. Another conclusion is that there are contradictions in the Bulgarian laws and between different institutions. Companies take advantage and try to avoid implementing some parts of the regulation. Sanctions are not very strict, and they often prefer to pay the non-compliance fees rather than invest in new technology.[474]

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[470] Personal Communication with Professor Roumen Arsov, Dean of the Faculty. of Hydrotechnics, University of Architecture, Civil Engineering and Geodesy, Sofia, Bulgaria, July 21, 2006.
[471] Personal Communication with Mustafa Velishe, Deputy Mayor of Gotse Delchev, July 20, 2006.
[472] Ibid.
[473] Personal Communication with Emil Bournaski, Bulgarian Academy of Sciences, July 17, 2006.
[474] Personal Communication with Milkana Mochurova, BAS Institute of Economics, Sofia, Bulgaria, July 18, 2006.

Moreover, the enterprises surveyed were not very interested in partnerships. A small number of the companies had participated in partnerships; however it was NGOs who initiated these arrangements. Companies in the region are passive and wait or expect to be invited into such arrangements. For instance, only a small number of companies are represented in public-private consulting boards. Most companies didn't know they could be involved with the management of the basin because they lacked the information.[475]

Greece

The region in the Nestos River basin does have some industry, mostly related to the agricultural sector. There are many packaging industries, especially for food, which is exported to Germany and the Netherlands.

There is a Hellenic Sugar Manufacturing Plant (EBZ)[476] on the road to the city of Xanthi, in Xanthi Prefecture. It is not technically located within the basin, however it draws water from the Nestos river. While it uses a lot of water from Nestos, it sends its wastes to the Laspias stream which is in another basin.[477] The sugar plant also has some kind of WWTP.[478]

A paper product plant in Xanthi, Thrace Paper Mill S.A. (Diana Paper Products), which is currently the largest private company in Thrace has an effluent treatment plant.[479] However, this WWTP does not seem to be operating because of financing issues, and instead the industry dumps their wastes into the canals that irrigate all of the plain.[480] The factory produces 28,000 tons of tissue paper annually from imported pulp and recycled local waste paper.[481]

The tobacco industry includes a Cooper cigarette factory[482] and the tobacco co-op in Xanthi. There are two large vegetable packaging plants in Xanthi,[483] including the Seva canning company/co-op for preserving food, and the

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[475] Ibid.
[476] EBZ, "EBZ Hellenic Sugar Manufacturing". Accessed July 20, 2007 at http://www.ebz.gr/contact_en.htm
[477] Personal Communication with Panayotis Georgiadis, Eastern Macedonia and Thrace Periphery, July 14, 2006
[478] Personal Communication with Hans Jerrentrup, EPO - Society for Protection of Nature and Ecodevelopment, July 16, 2006.
[479] Zeretis Group, "Diana." Accessed July 20, 2007 at http://www.zeritis.gr/diana/default.htm#.
[480] Personal Communication with Staff from Prefecture, TOEB Thallasias Kremastos, Greece, July 14, 2006.
[481] Zeritis Group, "Diana." Accessed July 20, 2007 at http://www.zeritis.gr/diana/default.htm#
[482] Personal Communication with Hans Jerrentrup, EPO - Society for Protection of Nature and Ecodevelopment, July 16, 2006.
[483] Ibid.

SEPEKAE meat packing factory.[484] There is also a Germanos Batteries factory in the area.

Water from the Paradeiso springs is diverted to a fertilizer plant in Kavalas and the Industrial Park in Kavalas. Approximately 50% of the spring water comes from the Nestos waters high in the mountain which filters down through rocks, and the rest comes from regular rainfall. The Industrial Park in Xanthi takes from Nestos and also has groundwater wells.

The fertilizer factory in Kavalas, Phosphoric Fertilizers Industry, S.A.,[485] while outside the river basin, poses a great risk for region. It draws water from Nestos, mostly from the Paradeiso Springs, and the emissions from the factory are harmful for both human health the area's environment. The factory employs approximately 800 people.[486] Phosphorous and nitrogen fertilizers are produced there. The water in the lagoon is circulating, so it could be contaminated. Greece signed the Kyoto protocol, but asked for special conditions for this factory for of the wastewater, air pollution, and soil they pull from "Gipson" deposits. "Gipson" usually has arsenic and other dangerous particles. The area in front of the factory is a dead zone. There are a lot of ozone and NOx emissions. The factory is on the edge of being closed down because of competition. It is very big and is state owned and supported. There are rumors that it will close down because there is too many staff and the technology is too old. [487]

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[484] Personal Communication with Efthymios Darakas, Department of Civil Engineering, AUTh, July 11, 2006.
[485] Phosphoric Fertilizers Industry S.A., "The Company." Accessed July 25, 2007 at http://www.pfi.gr/en/pfigr.htm
[486] Personal Communication with Panayotis Georgiadis, Eastern Macedonia and Thrace Periphery, July 14, 2006
[487] Personal Communication with Hans Jerrentrup, EPO - Society for Protection of Nature and Ecodevelopment, July 16, 2006.

Figure 30: Fertilizer factory

There is currently an oil refinery located nearby the basin on the way to the airport of Kavalas (Kavala Oil AE). The oil plant removes sulphur, and they are working relatively well for Greek standards. They complete the first step of refining and then they ship it to other refineries. Now they want to build large storage tanks next to the factory.[488] These planned Revoil storage tanks created a controversy because they were planned to be built in an area that is currently designated as a protected area. Additionally, there is a new agreement between Greece and Bulgaria to have a pipeline come out in Greece, which will increase activity in area.

5.2.2.9 Cultural and Tourist areas

Tourism in the Mesta/Nestos River area has been increasingly growing over the past years. The river is too small for navigation, however the natural beauty of the region has attracted many visitors.

In Greece, the towns of Kavalas, Xanthi and Drama also attract a good deal of tourism. Ecotourism is also developing around the Meandros, the forestland, rock climbing, and hiking along river. No motorized vehicles are allowed in protected areas of river, however there is horse riding, and a bike path along 2 km of the

[488] Ibid.

river.[489] In the Xanthi prefecture, there are recreational activities in the river, including rafting and tours, and the natural beauty of the Nestos Delta attracts many visitors. In 1990-2000, Nestos had over 100,000 visitors. The Eco-museum had a lot of visitors, especially from other countries. There was a clear reduction of visitors after the Balkan wars, and they don't come any more since the road is more difficult.[490]

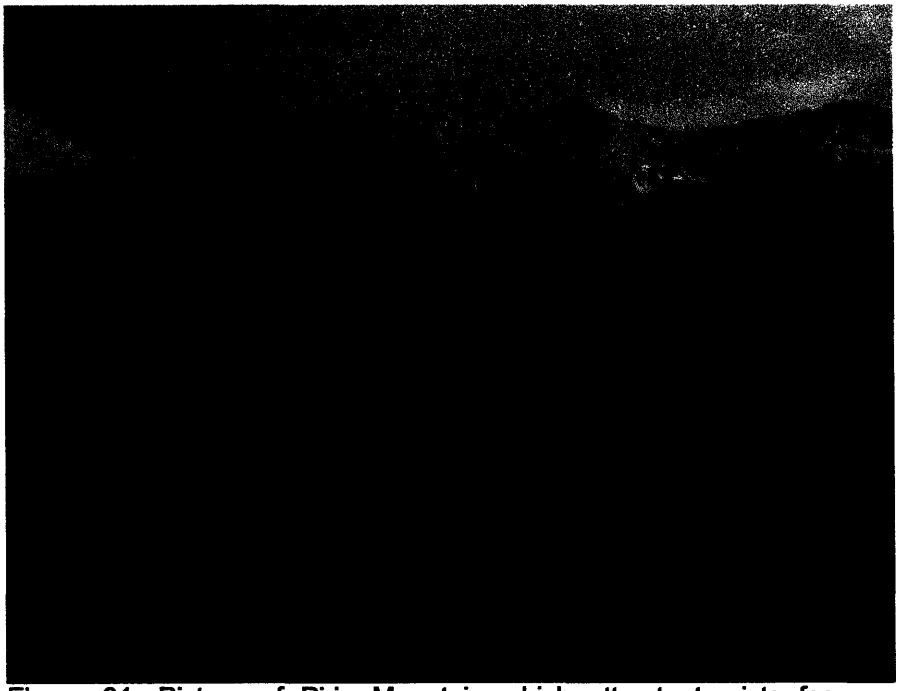

Figure 31: Picture of Pirin Mountain which attracts tourists for summer and winter activities.

In Bulgaria, the Rhodope Mountain is one of the oldest sacred places of the ancient world as the place where Orpheus is said to have lived. It is important internationally for history and tourism.[491] However, the region is developing chaotically. There is great potential for the development of the tourism industry. However, for this you need a clean environment and a transportation infrastructure. The increase in cars in the area, however, will increase the air and

[489] Personal Communication with Staff from Prefecture, TOEB Thallasias Kremastos, Greece, July 14, 2006.
[490] Personal Communication with Hans Jerrentrup, EPO - Society for Protection of Nature and Ecodevelopment, July 16, 2006.
[491] Personal Communication with Professor Roumen Arsov, Dean of the Faculty. of Hydrotechnics, University of Architecture, Civil Engineering and Geodesy, Sofia, Bulgaria, July 21, 2006.

water pollution. There are already plenty of cars, approximately one car per two or three people, and they are very old cars in poor condition. [492]

There is a military airport close to Gotse Delchev, and the municipality has proposed to make it into a civil airport to be used for touristic activities. According to the Deputy Mayor of Gotse Delchev, there is not enough advertisement that this region is clean and beautiful, and thus the tourism possibilities have not been developed.[493] For instance, there are hot mineral waters only 10 km from the town, and the town is looking to develop tourism around this. This would also bring more tourism to the rest of the Mesta Basin. Geographically, Gotse Delchev sees itself as on the crossroads in four directions: on the West is FYROM, to the East is Eastern Bulgaria and Turkey, to the North is Blagoevgrad, and to the South is Drama, Greece. Since Gotse Delchev is close to the Greek border, there are Greek people here daily. They municipality has very good relationships with the cities of Drama and Kavalas, as well as Kato Nerrokopi, a small Greek village. These towns work together with the Nestos-Mesta Euroregion.[494]

There are important ski centers in Pirin and Bansko.[495] There has been a boom in tourism and development in the Bansko area as a winter ski resort town. As a result, there is some pollution from the hotels and urban waste water, so the town is looking for new water supplies for Bansko. There is almost no chemical pollution.[496] Because Pirin Park is listed as a protected UNESCO site, there are some National Reserves where no activities are allowed. However, there is also a program for preserving territory for National Parks through the UNESCO list for biodiversity. In Bulgaria, there is not any tourism connected directly with river (such as kayaking, etc). [497]

The mountains are rich with mineral waters, such as the mineral baths in Dubrinochte village. Approximately 60% of the Mesta territory has rivers, mineral springs and a favorable climate for relaxation and spa treatments. There is some tourism is in Gotse Delchev for spa/tehermal mineral waters, [498] There are also hot springs in the Pirin National Park – but not in the municipality of Bansko. There are some green houses heated by thermal mineral waters, with a temperature of approximately 43 degrees Celsius. One hotel close to the center

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[492] Ibid.
[493] Personal Communication with Mustafa Velishe, Deputy Mayor of Gotse Delchev, July 20, 2006.
[494] Ibid.
[495] Personal Communication, Prof. Roumen Arsov, Dean of the Faculty. of Hydrotechnics, University of Architecture, Civil Engineering and Geodesy, Sofia, Bulgaria, July 21, 2006.
[496] Personal Communication with members of Razlog Water Council, July 19, 2006.
[497] Personal Communication with Jacques Ganoulis, UNESCO/HELP, AuTH Professor. Thessaloniki, Greece, July 11, 2006.
[498] Ibid.

of Bansko made a sauna by digging deep in the ground and using the different temperature from below the ground to get the heat.[499]

Some believe that Tourism has had a negative impact on Bansko. For instance, because of heavy use of wood fuels for heating in the winter, the smoke pollutes the territory. Domestic wastewater from local and tourism residences pollutes the river, and there is a problem with the volume of garbage generated. Right now, there is one garbage dump open until 2009, and then a new one will open near Razlog.[500]

The plan proposed to build a new dam in the Razlog area would also include the possibility of creating golf courses, and other entertainment or recreational areas. This area, as it is only 300m from the highway connecting Drama to Sofia, would be very accessible to Greek and Bulgarian tourists. Also, the 72 hot springs of Vinichen Banya could be developed as a touristic resort.[501]

5.3 Assessment of Stresses on Environmental System

From the previous section's details of the different uses of the Mesta/Nestos river basin, we can summarize the environmental stresses on the region. The priority concerns for both countries are listed in the following table, Table 21.

[499] Personal Communication with Blagoi Klecherov and Borislava Furnadjieva, July 20, 2006
[500] Personal Communication with Mayor of Bansko Municipality, Bulgaria, July 20, 2006.
[501] Personal Communication with Members of Razlog Water Council, July 19, 2006.

Table 21: Summary of Environmental Stresses in Mesta/Nestos River Basin
▪ Withdrawing water resources for irrigation o Inefficient use of water drawn o Choice of water-intensive crops
▪ Dams, Hydro-electric plants, and diversions o Reduce water flow to lower portions of river o Block sediments from reaching the Delta, which is now shrinking o Prevent natural fish migrations
▪ Reduced flow of water threatens ecosystem health of the Nestos Delta (protected as a Ramsar and Natura2000 site)
▪ Pollution threatens o Aquatic ecology o Unique and valuable habitats (Nestos Delta, Pirin and Rila National Parks, etc.) o Groundwater drinking resources o Bathing water quality in the Delta and along the Aegean Coast
▪ The major water-polluting sources are: o Agricultural chemical pollution o Industrial activity in the basin o Urban issues with inappropriate solid waste disposal o Waste water treatment is lacking or not appropriate in urban areas o Timber Industry and pulp and paper wastes often go in river o Tourism development boom increasing strain on water and waste o No longer mining wastes, because the site has been remediated

The Bulgarian river basin region is behind in technology related to water use, and thus their problems are very different than those of Greece. In Greece, they must also deal with groundwater salinization and coastal erosion because of intensive agricultural production, and mismanagement and overuse of water. Tourism pressures from highway and airport development have affected the Greek part of the river basin, and threaten to do the same in the Bulgarian portion as highway development continues and there is talk of expanding airport services.[502]

5.3.1 Bulgaria

The Bulgarian region of the Mesta/Nestos River Basin is a fast developing area, yet the region's infrastructure has not kept up with the expansion. The region's

[502] Personal Communication with Jacques Ganoulis, UNESCO/HELP, AuTH Professor. Thessaloniki, Greece, July 11, 2006.

environmental technology and implementation of waste water treatment and solid waste disposal needs improvement.

The economy is based on agriculture, but tourism is growing rapidly, especially around the ski resort and national park in the Razlog/Bansko area. Agriculture is heavily dependent on irrigation water coming from the Nestos River and its tributaries, and is relying on antiquated irrigation infrastructure which is not properly maintained. The current irrigation system is old technology and was designed for collectivization, making it inefficient for the presently fragmented fields. There is no modern agricultural technology, and many work with basic subsistence farming practices. Tobacco is the main crop of area, but the EU accession may decrease the tobaccos market for them and they will need to develop new crops. There have been some efforts to educate farmers on ways to change to more profitable crops for region, which may be the crucial to the survival of agricultural competitiveness in the area. The low economic level of the region means that they cannot afford large amounts of agrochemicals that would cause the pollution, nor high-tech irrigation infrastructure, such as an extensive drip irrigation network which would conserve water. They could use this to their advantage by developing and marketing organic agricultural products using modern non-agrochemical farming methods, such as integrated pest management.

The boom in tourism is creating excess waste water which is not yet being treated properly, and is visibly affecting the Mesta River. Waste water treatment plants need to be built, especially In the Bansko/Razlog area for the increased tourism, and in Gotse Delchev for the discharge from urban and industrial activity. There are several WWTPs in the planning and construction phases, however financing will be important to the region for both construction and operation of these WWTPs.

The region does not have the extensive industry it once had. There is still some industry, however most of the companies collapsed along with the fall of communism. While the current industries do not currently contribute much pollution to the river basin because of the low activity, if there is industrial growth in the region, this could become a threat to the river and downstream communities. Gotse Delchev has been the industrial center of the basin, and is quickly developing as a transit point from Greece, yet has trouble financing the appropriate water and waste-water infrastructure. Solid waste run-off is contaminating the river water and often finding its way into the river and across the border. Also, there are some purely hydrological problems of erosion and

instability of the river banks because of the removal of sand and gravel for construction, especially around Gotse Delchev.[503]

Overall, the Bulgarian region around the Mesta River do not use or pollute the water very much, however they would like to take more advantage of the water resources. Mesta is one of Bulgaria's rivers with the most water with approximately 1billion cubic m/year, and there are several proposals how to use it as a resource by further diverting the tributaries to other rivers or by building dams and hydroelectric plants on the Mesta or its tributaries. For instance some want to build a dam or divert the river water to the Dospat to gather enough water to create a hydro plant. Razlog wants to create a dam to prevent flooding, control the river, and provide irrigation for the area, but the plan has not been approved, even though it is believed that the engineering plan was solid.

The obstacles to improving the region include financing and diplomatic relations. The region does not have the necessary infrastructure for irrigation, major hydroelectric generation, or wastewater treatment. The main issue is finding appropriate financing. The EU has been helping for certain large infrastructure investments; however foreign investment is also necessary.

Diplomatic relations with Greece is an obstacle for Bulgaria to developing the for river region, because of the previous agreements and tensions over the amount of water that must cross the border. The Mesta River is one of the most studied rivers in Bulgaria, largely because Greece has had political pull on influencing funding from the EU programs; however some believe there are other rivers more in need of such attention. Another source of tension between the countries is that there is a lack of information flow from Bulgaria to Greece. Monitoring stations exist along the Mesta River, but some do not work because they are not being maintained properly. It is difficult to maintain because there is not enough money to maintain monitoring in modern way. Recently it has been difficult to measure from these stations, and thus it is difficult to predict water flow, quantity and quality because of this lack of data. There is an EU- Phare program trying to help improve this.[504] A large concern of the local Greek population is that there was some sort of radioactive pollution coming from Bulgaria. However, the radioactive pollution was not from nuclear plant, but from the old Uranium mine within the Mesta basin, which has long-since been closed, and remediated. The mine's waste site was contaminating groundwater, but has now been properly closed with funding from an EU project, and the groundwater is pumped and treated to removes the high levels of Manganese.

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[503] Personal Communication with Bladimir Dinov, ing., Director of West Aegean Basin Directorate, July 19, 2006.
[504] Ibid.

The current transition to EU will be made more difficult because the EU delegation had been in charge of many projects, and these projects were to be transferred to Bulgaria's ministries after accession. Moreover, Bulgaria has the huge task to construct a WWTP for all settlements of 10,000 people by 2010, and for settlements of 2000 people by 2015.[505] The National Government has already transposed all the required legislation required by the EU; however there is not yet the appropriate level of implementation and enforcement. In some cases, such as the proper disposal of solid wastes, it is the local level which has not truly integrated these regulations into their culture. Companies in the region do not seem to understand significance of the WFD and other relevant environmental laws, and most importantly they do not see the relevance of planning ahead to timescales such as 2015, as in the WFD.

5.3.2 Greece

The people in the Greek portion of the Mesta/Nestos River Basin are heavily dependent on subsidized agricultural practices. EU and Greek subsidies promote over-use of scarce water-resources, which could endanger the fragile and important ecosystems of the Nestos delta. Water flow used to be a bigger issue, but recent years there has been plenty of water both because of more rainfall and because the Thesavros Dam has been able to store water in the months of heavier rainfall and regulate the flow. Flooding of the river banks and Delta has also not been a problem either, thanks to the control of the dams.

The dependence on large amounts irrigation water has caused persistent problems for farmers. During drought periods when the Nestos did not have enough water for irrigation, many farmers pumped groundwater for irrigation use, and the excessive pumping along the coastline and delta area drew up so much groundwater that salt started intruding into the aquifers. Some farmers who are not hooked up to an irrigation infrastructure still pump groundwater and this could continue to be a problem. The salinized aquifers have made some land unsuitable for most crops, so now more water-intensive crops of rice are planted there so that by running excessive amounts of water in the rice paddies the farmers can keep the salt down in the soil. Moreover, competing water use in industry is also a concern. Some local industries use large amounts of water. The Sugar and Fertilizer industries draw from the river, even though it is located in a different basin.

The main pollution source in the area is from agriculture. The agrochemicals from pesticides and fertilizers are often applied inappropriately, and there are no incentives for applying lower amounts of these products, as most advisors for these products are also the salespeople. Irrigation water which flows through agricultural fields will pick up excess chemicals and discarded refuse in the fields

[505] Ibid.

which then runs into drainage canals and is often reused downstream. There is no control of the reused water from the drainage canals, thus some farmers using this may be applying elevated agrochemical levels to their fields inadvertently through their use of this irrigation water. Fisheries are very intensive in the area, which are built in some canals of the river, in some lakes, and especially in the delta. There is little information about the quantity of agrochemicals farmers really need, and although agricultural unions are there to help, most information going to the producers comes from sellers of the pesticides.

The next biggest pollution issue is human and animal waste. There is no WWTPs in the basin area. There are some in construction, but they are not yet functioning. Cattle breeding in the Nestos Delta region also results in a lot of wastes, and such farms should have individual WWTP for the delta area or most of the basin. Some large farms may have them, but there is no guarantee that they are working. Most parts of the Delta rely on septic tanks which need emptying every few years. There are cases where the wastes seep into water.

The fragile and important environmental area is also threatened by the industrial development of the region. The local fertilizer company is located near the coast, and could create a large disaster for the Aegean Sea and Nestos Delta if there were to be an accident. Already the area around the building looks barren, and people have complained about health issues from air pollution. Also, the new oil storage tanks which are planned for the area could create a disaster in a sensitive area if there were any spills. The local people are against it because is will be located in what was designated a protected area, but the Greek government decided to exempt that area. The Thesavros Dam generates a large amount of electricity for the region, especially in the summer months, and has caused the Delta to lose the natural sediment feeding, resulting in the Delta shrinking over the past years. The fauna in the Delta suffer because of the reduced nutrients, and there is a concern that the water temperature is slightly lower and may affect the fauna's natural cycles.

The local economy is threatened because with agriculture at the base of economy, the reduction or elimination of EU subsidies by 2009 will dramatically affect the region. Currently most agricultural producers live off the subsidies for cash crops, which are often discarded at the requirement of the EU. Without these subsidies, much of the land may end up going to only a few large-scale farmers and the rest of the farmers will be left without livelihoods. There has been some transition to more suitable, and price-effective crops (i.e., asparagus, kiwis, strawberries), however these crops take much more work and expertise and they have not drawn in all the farmers. The local people don't see the value in environmental protection as much as they could, and they often feel that it is a burden which doesn't allow them to live freely in certain areas. Slowly, this

attitude is changing, and the area has seen the development of some eco-tourism, and the town of Chrisoupouli has held city events and created television programs to promote the area.

5.4 Technical Needs

There are some clear sectors within the Mesta/Nestos Transboundary River Basin which could benefit from enhanced technology and process development and/or diffusion of existing technologies and methods. Through the adoption and development of some technologies or techniques relating to the major economic and social sectors in the region, sustainable development of the region could be enhanced - especially if these technologies were shared across borders. Moreover, the pressures on water resource quantities could be reduced, and the quality of the existing resources would be preserved or improved. Below,

Table 22 lists many relevant technologies and techniques in the major sectors of industry, agriculture, tourism, household dwellings and consumption, energy, and environmental management.

Table 22: Technologies Relevant to Transboundary Nestos/River Basin Water Management

Sector	Relevant Technologies and Techniques
Industry	• Improved production processes (Pollution Prevention – P2) o Higher efficiency use of resources (less waste generation) o Elimination or reduction of need for toxic inputs • Closed-loop water use systems (P2) o Reduced need for freshwater resources o Elimination or reduction of toxic outputs o Use of ocean waters for cooling processes where feasible • On-Site Water Treatment facilities (Pollution Control - PC)
Agriculture	• Improved Irrigation Methods to reduce water demands (P2) o Drip Irrigation, Covered channels to prevent evaporation, etc. o Better irrigation timing and dosing based on crops and climate o Water metering devices to manage use (or price effectively) • Improved Pest Management (P2) o Use integrated pest management techniques and technologies to avoid using water-polluting agrochemicals o Improve application method, through better, un-biased trainings • Reduced use of chemical fertilizers (P2) o Use organic (biological) production techniques o Use technologies which allow better creation of natural compost o Use soil preservation techniques (such as crop rotation, etc) o Use nutrient-rich semi-treated wastewater to feed crops • Improved farming techniques (P2) o Technologies specific to farming mountainous terrain, i.e., rain water collection o Mechanized farming where feasible • Better waste-management for animal and crop wastes (PC) o Technologies which reduce waste generated (i.e., harvest equipment which leaves more of the plant in tact) o Technologies for using wastes productively (energy from biomass or methane production)
Tourism	• Improve infrastructure to handle large volumes of tourists (PC) o Improve network connections to municipal WWTPs, increase capacity o Develop new WWTPs for isolated installations • Encourage eco-tourism development, discourage mass-tourism (P2)
Human Settlements	• Proper Solid Waste Disposal (PC) o Develop/adopt collection technologies and network o Develop/adopt recycling technologies o Develop landfills for proper disposal without water contamination • Reduced Freshwater Consumption (P2) o Water-efficient fixtures and Appliances such as toilets and sink faucets • Improve wastewater treatment (PC) o Build WWTP for settlements o Appropriate small-scale technologies for isolated dwellings o Develop methods for treating wastewaters, i.e., constructed wetlands

Energy	• Reduce the energy demand in all sectors (P2) o Develop or adopt more energy-efficient appliances o Better building technology that requires less heating/cooling • Increase cleaner energy sources, especially renewables (P2/PC) o Solar panels for Electricity, Solar water heaters o Develop biomass energy from farm-waste and solid waste • Improved Dam/Hydroelectric Technology and Management (P2) o Develop ecologically-friendly technologies, allowing sediment/fish to pass o Managing river flows so they better imitate natural flows
Integrated Management	• Better information flow o Improve monitoring technology for ground and surface waters o Improve methods for sharing data across borders (locally/nationally) o Information Technology Development for transboundary communications and coordination • Properly maintain current and new infrastructure o Develop technologies which are easier to maintain o Create better training programs for local authorities

With a discussion about technology and development needs, financing cannot be ignored. Financing is often one of the limiting factors to technology development in developing countries such as those in SEE, as well as lack of human resources, full information, and political will. There has been much progress in developing Bulgaria and Greece's infrastructure through European Union funded projects (See Section 2.3). Because financing the construction of WWTPs is often the main obstacle to complying with the EU regulations for waste water treatment, there have been several opportunities for local-level and regional-level funding for such works (although many opportunities have been missed, especially for the Greek side of the basin). Figure 32 shows a project announcement to build a WWTP for the town of Razlog, which was currently in progress at the time of the site visit. It is co-financed by the European Union and the Republic of Bulgaria, with a budget of 4,835,433 EUR, and was scheduled for completion in December 2006. The financing of large infrastructure projects can rarely be done at the local level alone and thus national and super-national (i.e., EU, UN, WB, etc) funding is often required. However there are plenty of opportunities for localities to network with other local governments and private companies to create partnerships and other coordination mechanisms.

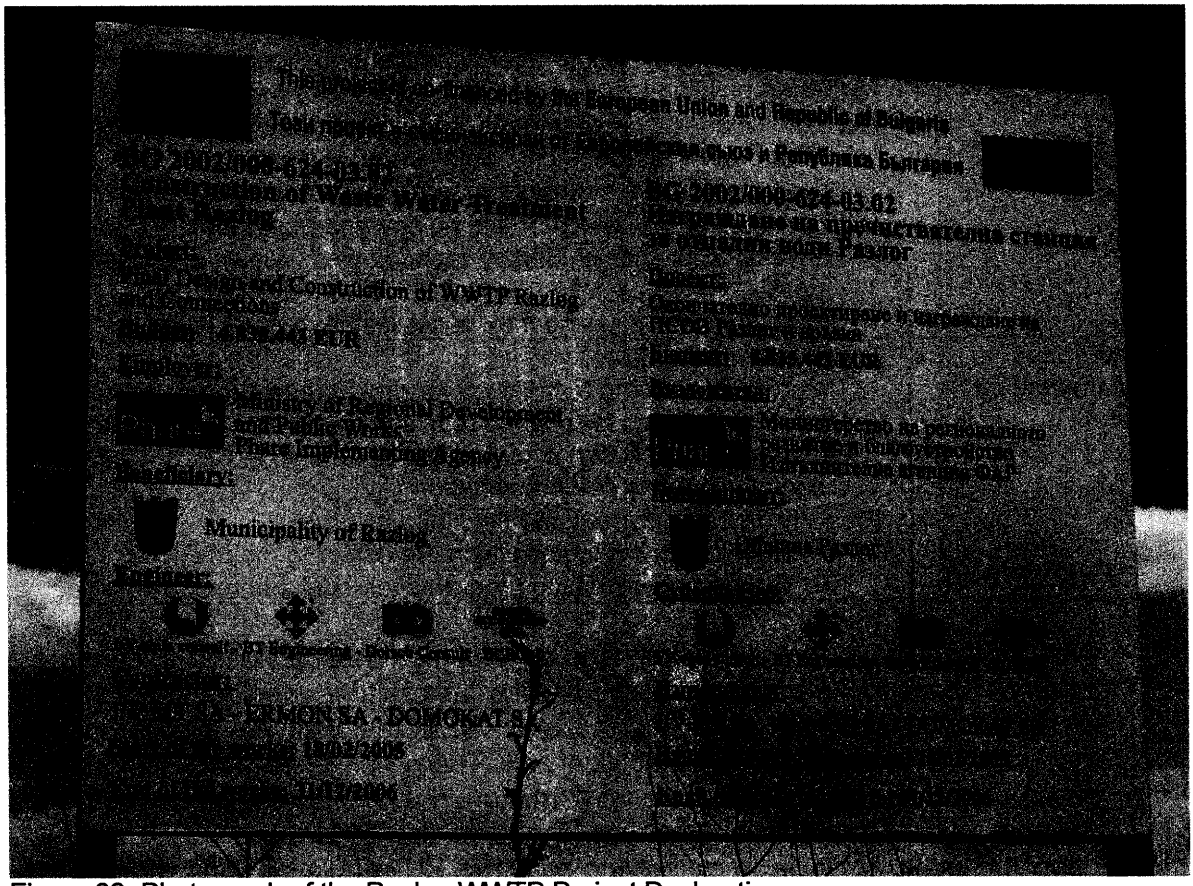

Figure 32: Photograph of the Razlog WWTP Project Declaration

The following sections describe some of the technical needs of the region regarding the above sectors.

5.4.1 Industry

With a variety of industrial developments along the Mesta/Nestos River and the potential for significant growth as Bulgaria's membership in the EU draws greater investment, there are many opportunities for developing new or adopting existing technologies and production processes. The existing and new industries in the Mesta/Nestos region can benefit from the development of improved production processes which reduce their demand for water resources, and reduce the output of wastes. Policies could be developed to draw new industries which embody these principles or adhere to the high level of environmental standards.

Some Pollution Prevention (P2) technologies that could be applied include higher efficiency processes which create the same output with the use of fewer resources, and hence less waste generation. Some processes can be redesigned to eliminate or reduce the need for toxic inputs.

For example, an industry requiring water resources can be designed with closed-loop water use systems (P2) in order to reduce the need for freshwater resource inputs. The food processing plants in the Nestos River Basin could find more effective washing technology which requires less water to wash the same amount of produce, and they could filter and treat water used to wash the vegetables in order to reuse it. By reducing and reusing the same water in industrial processes, the biological pollutants and toxic materials can be concentrated into a lesser volume of water which can help, through additional processes, to eliminate or reduce the toxic outputs leaving the industry. Also, to avoid using freshwater resources, the use of ocean waters for cooling processes can be implemented where feasible (i.e., in coastal regions). Moreover, when regulations catch up with the rhetoric on the need for water pricing, these industries will be well positioned to stay competitive.

A pollution control (PC) solution is needed to capture any pollution that is created but cannot be reused or recycled. On-site water treatment facilities could control pollution from industries that are not located near sewerage networks, otherwise additional capacity can be built off-site (in municipal WWTPs).

5.4.2 Agriculture

The heavy agricultural demand on the Mesta/Nestos River Basin can result in low water resource levels and high agrochemical pollution levels which can threaten the delicate and important ecosystems throughout the basin.

In order to reduce water demands, improved Irrigation methods should be implemented. P2 technologies include drip-irrigation, covered channels (or pipes) to prevent evaporation during distribution of the resources, as well as water metering devices to help farmers realize the extent of their water use. Moreover, when pricing policies take effect, authorities will be better able to price the water use. Other techniques include educating farmers about when is best to water crops for maximum water economy, and how to water crops without washing away necessary nutrients (or agrochemicals). Research in both countries has explored how to use water effectively, and the information needs to be disseminated.[506]

Improved farming techniques could prevent overuse of water resources in agriculture while increasing agricultural outputs and income. For instance, in mountainous areas where few irrigation networks reach, developing rain-water collection systems may improve farming output. Also, increasing the mechanization of farming through the use of shared tools may increase productivity without increasing the demand for resources as much.

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[506] Ilia D. Christov. "Scientific Basis and Technology for Effective Use of Water and Environment Protection in Mesta River Basin." *Journal of Balkan Ecology*, 2005, Vol.8, No.4, p.422.

P2 techniques can be used to reduce demand for agrochemicals as well. Pest management can be accomplished with integrated pest management techniques and technologies to avoid using water-polluting pesticides. Chemical fertilizer use can be reduced by transitioning to organic (biological) production techniques, soil preservation techniques, such as crop rotation, and the adoption of technologies which allow easier or more accessible creation and application of natural compost. A low-cost technique which could be further developed, and which has been used in some developing countries and may be an option, is to use the nutrient-rich semi-treated wastewater to enrich poor and arid soils. A high-cost technical solution is precision agriculture, which uses satellite data to monitor where the crop is not good, and monitors the exact needs so you only apply agrochemicals where they are needed. [507]

Better waste-management for animal and crop wastes can also control the pollution coming from agricultural run-ff. Technologies could include those which reduce the waste generated (such as harvesting equipment which leaves more of the plant in tact), as well as technologies for using animal and plant wastes productively. There are a variety of energy technologies being developed and already available, such as creating ethanol from biomass, or producing methane in biodigesters.

5.4.3 Tourism

While tourism is an important component for the Mesta/Nestos region's future economic development, if the natural beauty is destroyed in the process of expanding the industry it will be unsustainable and profits will be shortlived. The region's infrastructure must be expanded to handle large volumes of tourists (PC), through the improvement of roadways, electric, water, and sewerage networks, as well as through increased capacity of municipal waste water treatment plants. Isolated resorts must also have pollution control technologies to prevent their wastewaters from contaminating the area, and may include septic tanks or isolated WWTPs.

Other infrastructure which has been developed include the plans for construction of Highway Struma, which will connect to other highways near the capital, Sofia, although it was unclear when construction would start. Also, Pirin National Park, and Rila Mountain have attracted a lot of construction activity in Bansko and Razlog. These areas are currently very famous with people for the skiing in winter and the thermal mineral waters. There are investments from abroad in tourism. [508] In the Greek part of the basin, there is not as much of a boom in tourism developments. However, there was construction planned for a second visitor's center near the Nestos Delta to encourage educational visits and eco-tourism. It seemed that the value of the protected natural sites was being realized for its potential in tourism.

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[507] Personal Communication with George Zalides, Associate Professor, Agriculture Department, Aristotle University of Thessaloniki, Greece, July 11, 2006

[508] Personal Communication, Alexander Yanef, Chief expert of regional development, Administration of Blagoevgrad Province, Bulgaria July 19, 2006.

The target of tourism development also needs to be analyzed. While government documentation encourage eco-tourism development, there may be too much mass-tourism being developed in areas like Bansko, where resorts and hotels are being built like crazy. Developing high-paying boutique tourism, as well as eco-tourism, cultural tourism, and religious tourism, can mean less of an impact on the environment and higher returns in the long-term sustainability of the industry.

5.4.4 Human Settlements

Solid waste and waste water treatment for human settlements are some of the greatest technological gaps on both sides of the border in this transboundary river basin. The lack of appropriate treatment threatens not only the environment, but also the community's health, the future sustainability of the tourism industry, and the ability to use the river and groundwater as a productive resource.

Pollution control, through proper solid waste disposal, could be accomplished by developing or adopting waste collection technologies and a local network which can share the expenses. Moreover, recycling technologies could be adopted, along with recycling separation and collection. Most importantly, the region needs to develop proper landfills for proper disposal which, in compliance with EU and state regulations, will prevent ground water contamination.

One reason for improper solid waste disposal is a lack of proper landfills and collection. Also, there many rural people are accustomed to dumping waste in the river or in an unoccupied ditch or valley. In Bulgaria, there had been discussions of constructing solid waste landfill for Blagoevgrad and Western Bulgaria, and a large depot for solid wastes coming from Blagoevgrad has been planned to be located near the Kocherinovo village. The landfill will also take solid wastes from Bansko/Razlog area, and will have a transfer center in the city of Blagoevgrad. The plans are in the design phase, and funding support has been applied for from the EU. Different municipalities in the region are applying to participate in this program so that they may make use of the landfill as well. It is outside of the territory of the Mesta River Basin, however it will accept solid wastes from the Mesta region.[509]

In order to reduce the volume of water to be treated by municipal WWTPs, the amount of freshwater consumed could be reduced through the implementation of water network repairs and maintenance, as well as the use of modern network technology and monitoring systems. On a household level, communities could switch to water-efficient fixtures and appliances, such as low-flush toilets and aerated sink faucets.

[509] Ibid.

The wastewater treatment methods must be improved by building appropriate WWTP for the larger settlements, and implementing appropriate small-scale technologies for isolated dwellings, such as septic tanks. However, conventional treatment plants may be out of order in about 7 to 8 years because the high end technology needs sophisticated management. Thus, as an alternative, the region could develop other, less expensive and easier to maintain methods for treating wastewaters, such as constructed wetlands or low-cost bioremediation for small-scale situations is sometimes as effective.[510]

Currently on the Bulgarian side of the basin, one WWTP is being constructed in Razlog, through funds from the Phare Program. There is a need for reconstruction of a waste water treatment facility for the pulp and paper factory in the Razlog area as well.[511] There is also the special water treatment plant for the closed Uranium mine in order to remove toxins which have seeped into the groundwater there.[512] There have been drafts proposing additional WWTPs for Yokaruda, Bansko, and Gotse Delcheve, among others. Bansko's WWTP had not yet been financed, but the plans had already been made. It will be run through public-private partnership with the municipality of Bansko. As of July 2006, they had not applied for EU financing.[513] In Gotse Delchev and Hadjmide, a project had been designed some thirty years ago, but it was not implemented. Now a new design is needed, as technology and implementation specifications have changed.[514]

On the Greek side of the river basin, there are currently two WWTPs in the Kavalas prefecture. One was built in 1990 and its technology has been outdated. At the time of interview, it had only primary and secondary treatment to wastewaters. In August 2006, the system was going to be upgraded for better reductions of pollutants and higher capacity. In about five years, tertiary treatment with UV light was planned to be added. The other WWTP, built in 1998, has one more stage of treatment where it removes the odor during primary treatment box.[515] The prefecture of Xanthi has a WWTP with the same stages (only primary and secondary treatment), but different technology is employed. Chrisoupouli has not yet started work on building its WWTP. The prefecture of Drama has a relatively new WWTP which is now several years old. The industrial

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[510] Personal Communication with George Zalides, Associate Professor, Agriculture Department, Aristotle University of Thessaloniki, Greece, July 11, 2006

[511] Personal Communication with Professor Roumen Arsov, Dean of the Faculty. of Hydrotechnics, University of Architecture, Civil Engineering and Geodesy, Sofia, Bulgaria, July 21, 2006.

[512] Personal Communication with Emil Bournaski, Bulgarian Academy of Sciences, July 17, 2006.

[513] Personal Communication with Mayor of Bansko Municipality, Bulgaria, July 20, 2006.

[514] Personal Communication with Professor Roumen Arsov, Dean of the Faculty. of Hydrotechnics, University of Architecture, Civil Engineering and Geodesy, Sofia, Bulgaria, July 21, 2006.

[515] Personal communication with manager of Kavalas WWTP July 12, 2006

park of Kavalas was supposed to have a WWTP for Industrial Wastes, but it was unclear whether one was in operation there. Water for the industrial park was drawn from the Paradeiso springs. Many settlements use septic tanks for their household waste-water; however some of this wastewater is either emptied into open areas, or in a position to contaminate groundwater.

5.4.5 Energy

Energy use in the Mesta/Nestos region could be improved, as current infrastructure and technologies are often inefficient or have losses due to degraded technology or poor construction. P2 techniques to reduce energy demand in all sectors could be implemented by adopting and developing more energy-efficient appliances or processes, better building technologies which require less heating and cooling, switching to production processes which do not require as much (or any) energy, and through improving and maintaining electricity and heat infrastructure to minimize currently large losses.

To control the pollution, the energy mix could increase the use of cleaner fossil-fuel energy sources, and especially renewable biomass sources. Pollution could be prevented through the increased use and development of solar panels for electricity, solar water heaters, through developing biomass technologies to extract energy from farm-waste and solid waste. Of particular interest in the Mesta region is the possibility of geothermal electricity generation and heating, as there are several hot springs in the region. Also, in 2006, there were discussions beginning about building a place which will burn some available biomass, such as scraps from timber and other ecological waste only for central heating systems. Because in the past there were already some pipes for central heating, the system would use the existing network at first. So, in around 5 years, perhaps no one will go to the forest to cut trees. The proposed technology is made by an Austrian firm.[516]

Use of electricity generated through hydroelectric energy dams could be improved through better technology and management. There is a great need for more ecologically-friendly technologies to be adopted or developed which can allow sediment to flow through and reach the Nestos Delta, which ahs been shrinking due to blockages caused by current dams. Also, fish migrations have been blocked due to the large dams place in the Greek side of the basin. In order to preserve the delicate and important ecosystems, remediation technologies and techniques should be developed. Also, better management techniques for when to release dammed waters have been developed, and the ideal river flows imitate the natural rises and falls of flow, stimulating natural processes that can help with the survival of the ecosystems' unique species of fauna and flora.

[516] Personal Communication with Blagoi Klecherov and Borislava Fumadjieva, July 20, 2006

5.4.6 Integrated Management

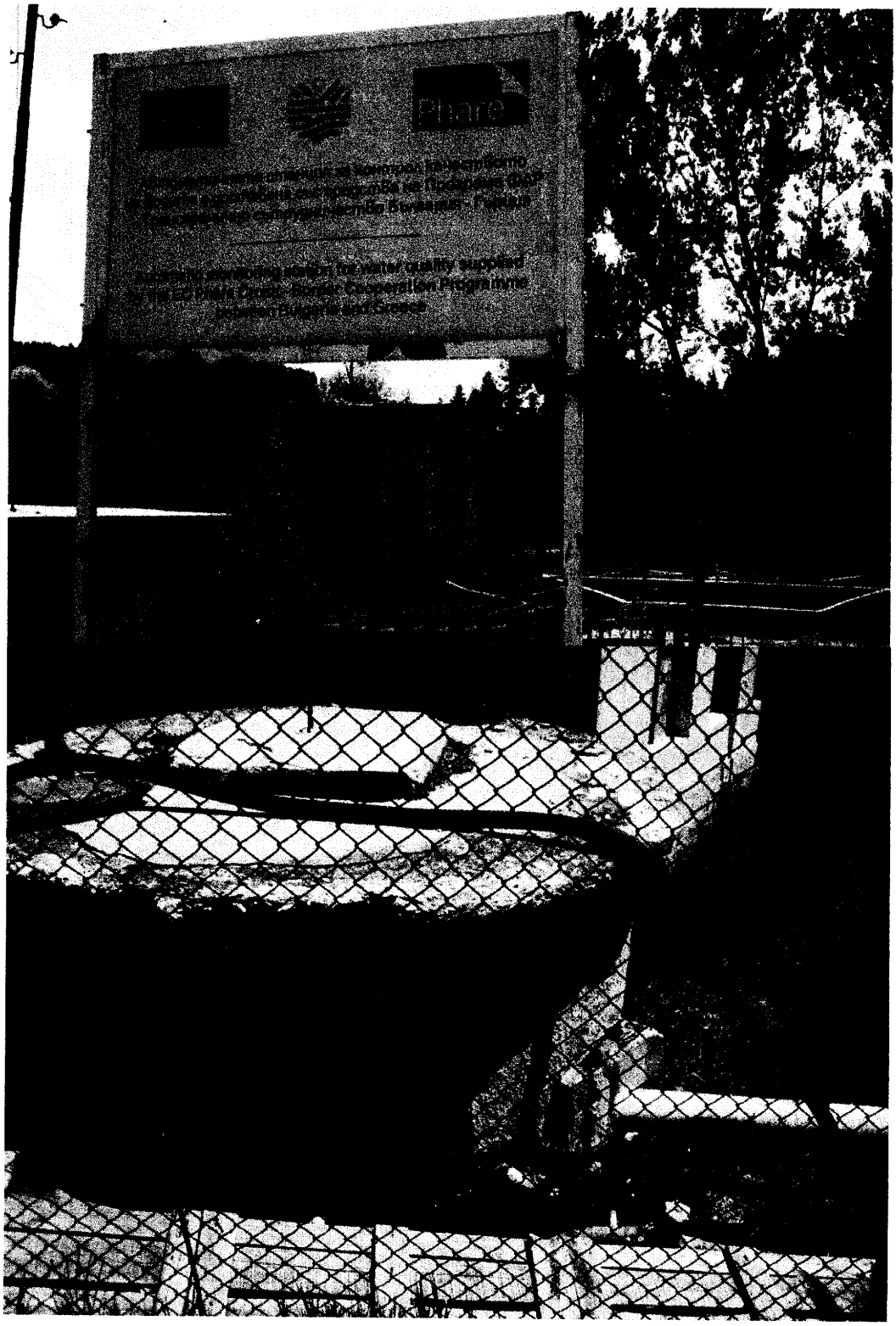
Along with hard technology improvements, many of the recommended technical needs for the region have been management related. Management of industrial, agricultural, energy, and household systems can be improved individually. But the biggest challenge is to integrate management in order to co-optimize environmental, economic and social outcomes.

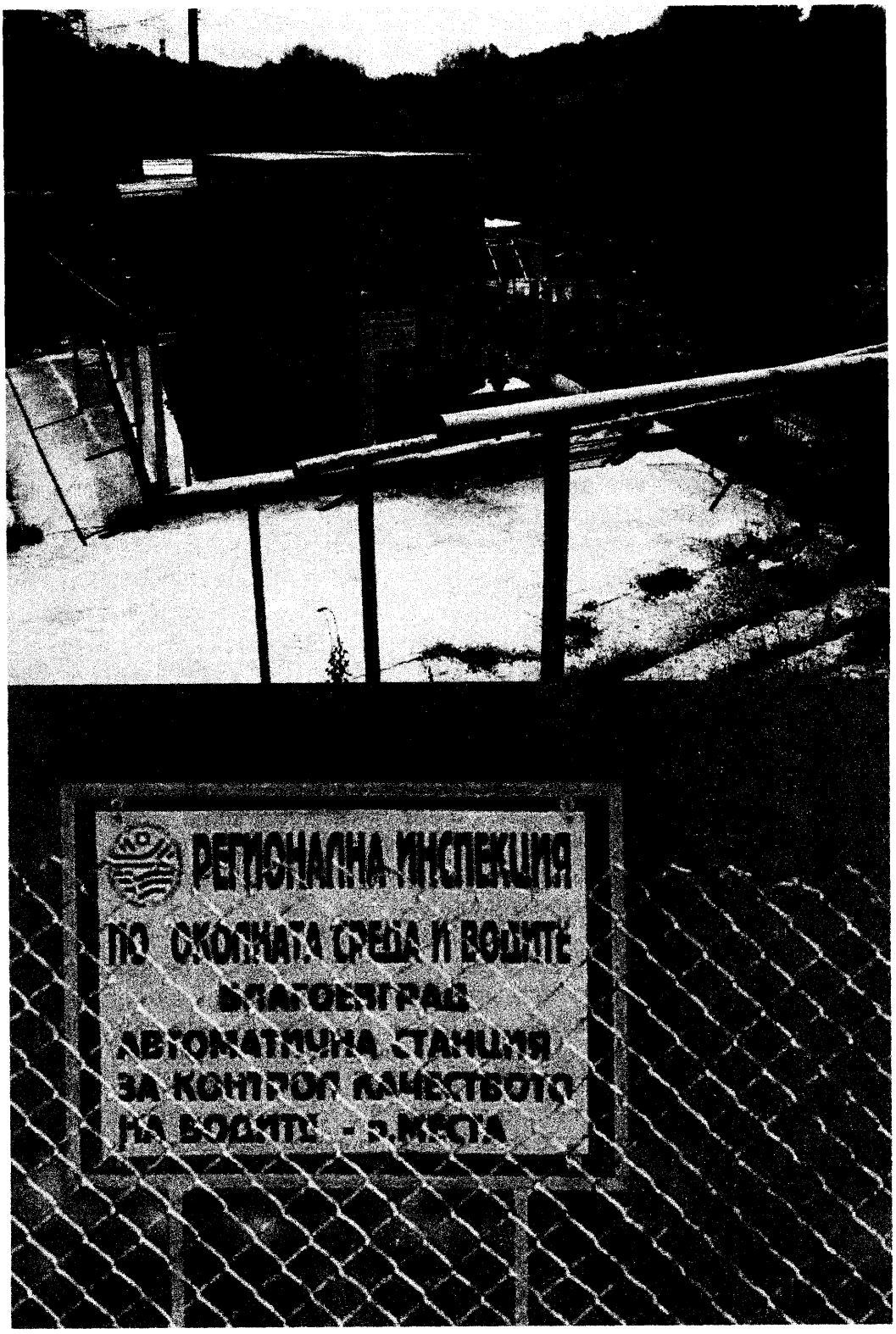
To do this, a crucial technical need in the transboundary region is better information flow. Monitoring technology for ground and surface waters need to be improved, maintained, and regularly used. On the Greek side of the basin, there are six sub-basin stations for monitoring measurements, which are owned by the Greek power company (DEI) and the Ministry of Agricultural. However, they are only reported to be used approximately once per month, and only in the summer months.

There has been a lack of proper maintenance and use of current monitoring devices, even with relatively new infrastructure. The following images show one water monitoring station on the Bulgarian side of the river basin in disrepair. They come from the Automatic Monitoring Station for Water Quality that was funded by the Phare-CBC program between Greece and Bulgaria. The condition of the site is poor, with rusting pipes and disintegrating concrete. While this does not preclude that the equipment was still useable, it is clear that it was not being maintained for future long-term use, as it should be. One need that comes from this evidence is that technologies should be developed which are easier to maintain, but also that management needs to be more diligent in maintaining all technologies, even 'automatic' ones.

Figure 33: Pictures of Poorly Maintained Phare-CBC Funded Automatic Monitoring Station for Water Quality in Bulgaria

The following three pages are images of the same water monitoring station which, by all appearances, seems to have been neglected in terms of maintenance.




РЕГИОНАЛНА ИНСПЕКЦИЯ
ПО ОКОЛНАТА СРЕДА И ВОДИТЕ
АВТОМАТИЧНА СТАНЦИЯ
ЗА КОНТРОЛ НА КАЧЕСТВОТО
НА ВОДИТЕ - 3.МЕСТА

The environmental monitoring data, which should be collected more regularly, should be shared and used locally, regionally and nationally for better planning and protection. Moreover, the methods for sharing data across borders need to be designated and implemented. There is an opportunity to use and improve the information communication technology (ICT) development in the region for transboundary communications and coordination.

Data sharing is one of the greatest pressures for the Greek local authorities because Bulgaria doesn't give them any data about quantity or quality of the water coming through. While it is supposed to be 29% of the mean annual runoff, they do not clearly allow Greece that amount. Sometimes the water comes with a lot of garbage as well. About 40 years ago, water coming from Bulgaria had some hormones, burnt plastics, and possibly some radioactive elements, leading local authorities to believe that they may have buried nuclear wastes next to Nestos. Bulgaria says that it is not the case, but Greece says it is.[517]

There have been programs to improve access to information in the region, for example REC-Bulgaria published a leaflet on how to access information on waters and information about relevant legislation, as well as the regional environmental inspectorates. REC was also part of a UNDP Danube Regional Project to increase access to information.[518]

The Bulgarian WABD reportedly needs more time to identify issues such as this in the basin and to solve them. Some funding sources will only finance projects in which the needs are specifically outlined, however, and this makes it difficult to request your needs without understanding them. They are continuously learning how to work to find solutions, and welcome new trainings on this new subject of integrated water basin management. There have been some good training programs, but they are not sufficient. Applying this knowledge is a long process. Specifically river management and transboundary language trainings would be useful for the West Aegean Basin Directorate. [519]

Also, local and transboundary exchanges of experiences would be useful to the local authorities working on the integrated basin management. Currently, they provide information to municipalities, and the municipalities provide information to the people. Sometimes they organize roundtables about issues like energy-efficiency in Blagoevgrad, sometimes including experts from the national administrative agency who come and organize the round table with a high-level specialist. They invite people from the different municipalities to learn about the

[517] Personal Communication with Panayotis Georgiadis, Eastern Macedonia and Thrace Periphery, July 14, 2006
[518] Personal Communication with Milkana Mochurova, BAS Institute of Economics, Sofia, Bulgaria, July 18, 2006.
[519] Personal Communication with Bladimir Dinov, ing., Director of West Aegean Basin Directorate, July 19, 2006.

new laws and norms and regulations. The Blagoevgrad provincial administration is a co-organizer. The trainings are for the administration, regulations, companies, and local people, and people from the leading companies and firms participate.[520]

Overall, local and regional authorities need to be better trained on management techniques, on monitoring methods, on data-management and sharing, and on how to promote data flow for maximum impact. They also need to provide more frequent and integrated trainings to the various industries in the region, including tourism and agriculture. If local citizens are better informed, they will also be able to aid in the monitoring process.

[520] Personal Communication with Alexander Yanef, Chief expert of regional development, Administration of Blagoevgrad Province, July 19, 2006.

6 Case Study: System Analysis

In order to understand the local environmental challenges faced by the Mesta/Nestos River Basin, it is important to look closer at the policies for technology use and adoption and the national environmental regulatory policy which affect the localities on both sides of the border. We now return to the systems framework introduced in Section 4, reproduced in the figure below (See Figure 34), and focus again on the top half of the diagram for analysis. The policies that promote various sectors of the economy, such as industrial policy, can promote the development and adoption of various technical solutions for economic development. Some of these technical solutions may be polluting and will need end-of-pipe pollution treatment, while others, if policies are sufficiently coordinated with environmental regulations, may prevent previous sources of pollution altogether. The national environmental regulations can promote integrated pollution prevention by regulating processes and technologies used, or the regulations may simply give end-of-pipe water quality and quantity standards that can be met without questioning the processes by which they are achieved. By focusing on how these two classes of policies interact within a locality of a country (Sections 6.1 and 6.2) and in a transboundary region (Section 6.3), we can better understand the areas where Greece and Bulgaria have strengths, and other areas where each can be improved.

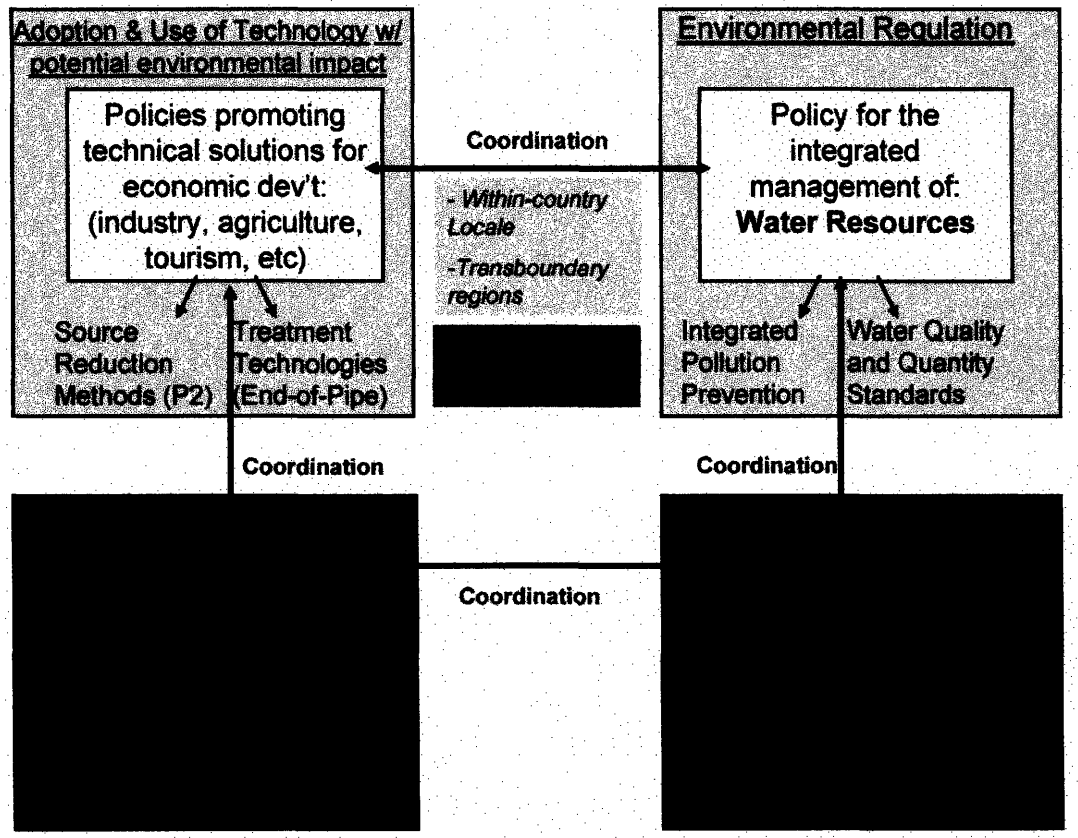


Figure 34: Systems Framework for Regional Environmental Cooperation
We focus on the coordination of "Within-Country Locales" and "Transboundary Regions".

The first part of this chapter, Section 6.1 discusses environmental technology adoption and use policy, environmental regulatory policy, and the coordination between these two areas of policy-making which affect the Greek locality in the Nestos River Basin, often as implemented at the national level. Next, Section 6.2 will discuss the same relevant policies affecting the Bulgarian locality around the Mesta River Basin. Section 6.3 will highlight relevant transboundary institutions and policies which promote technology adoption and use and environmental regulation, and the extent to which these are coordinated, and will recommend some policy responses needed to respond to these gaps.

Recall from the previous chapter that there are a variety of technical needs which, if met, would improve the economic and environmental state of the Mesta/Nestos River Basin region. Below, Table 23 summarizes the discussion from the previous chapter's section on technical needs in the region (Section 5.4). Technologies and techniques could be developed to meet these goals regionally, nationally, or through transboundary cooperation to meet specific needs, or the technologies could be adopted from existing methods from outside the region. While the goal of the case-study is to look at improving the integrated water resource management of the basin, a technology and innovation push for the region would provide spillover economic development and employment benefits as well.

Table 23: Summary of Technologies Relevant to Case Study
(See

Table 22 for a more detailed description of technologies)

Sector	Relevant Technologies and Techniques
Industry	• Improved production processes (Pollution Prevention – P2) • Closed-loop water use systems (P2) • On-Site Water Treatment facilities (Pollution Control - PC)
Agriculture	• Improved Irrigation Methods to reduce water demands (P2) • Improved Pest Management (P2) • Reduced use of chemical fertilizers (P2) • Improved farming techniques (P2) • Better waste-management for animal and crop wastes (PC)
Tourism	• Improve infrastructure to handle large volumes of tourists (PC) • Encourage eco-tourism development, discourage mass-tourism (P2)
Human Settlements	• Proper Solid Waste Disposal (PC) • Reduced Freshwater Consumption (P2) • Improve wastewater treatment (PC)
Energy	• Reduce the energy demand in all sectors (P2) • Increase cleaner energy sources, especially renewables (P2/PC) • Improved Dam/Hydroelectric Technology and Management (P2)
Integrated Management	• Better information flow • Properly maintain current and new infrastructure

What is apparent from the actual actions taken in the localities of the Mesta/Nestos River Basin is that pollution control (PC) techniques are the most frequently applied technology policies. Pollution Prevention (P2) solutions are not pushed at the local level either because of a lack of information, or a lack of political will to force change. This is not to say that there is a complete absence of P2 technologies being adopted; however most solutions are motivated by the perceived economic benefit rather than environmental sustainability.

6.1 Greece

Greece has been making an effort to improve its technology development and use policies, which could spill over into technologies for pollution prevention and control. While Greek legislation and rhetoric emphasizes industrial policy which keeps environmental concerns in mind, this is not shown to be the case in practice. The EU directives have a strong influence on the Greek environmental regulatory system. Greece follows and participates in all the relevant international regimes of the EU and the UN for sustainable development and the environment.[521]

Sections 6.1.2 and 6.1.2 go more into these policies and relevant institutions, emphasizing how they affect the Nestos locality. Section 6.1.3 discusses the type of coordination between these policies and institutions within Greece.

[521] Hellenic Republic Ministry for the Environment, Physical Planning and Public Works, "National Strategy for Sustainable Development Greece – Executive Summary." Athens, Greece, May 2002.

6.1.1 Institutional and Legal Framework

The institutions and legal framework that affect the Greek Nestos River Basin area are dictated by national institutions and legal frameworks. At the local level, the three prefectures of Drama, Kavalas and Xanthi which are in the Nestos River Basin are organized on a super-prefecture, or Nomos, level, so there is in essence an extra layer of administration than most other Greek Prefectures do not have. The same national laws apply, many of which are the Greek interpretations of EU directives and legislation.

The Greek national institutions which promote development and environmental protection have been recently restructured. The Ministry of Development, the Ministry of Environment, Physical Planning and Public Works, and the Ministry of Agriculture are the major bodies involved with water resources at the national level, and their regional-level and local-level offices take the role of implementing their policies. Each of these ministries has a different interest in Greece's development and the management of water resources, and recent changes have tried to improve this by moving all water management responsibilities to the Ministry of Environment, Physical Planning and Public Works, however the level of integration is still unclear. Because it is a transboundary river involved, the Ministry of Foreign Affairs is also involved.

European Union institutions influence the development of national-level and regional-level institutions, especially through the enforcement of EU legislative directives in the European Courts. The effectiveness of this approach might be questionable since Greece has continued to have difficulties in implementing and meeting EU timetables despite being charged and fined repeatedly by the European courts.

6.1.1.1 Technology Adoption and Use Institutions and Legal Framework

Greece's economic development is managed by the Ministry of Development, which was created to take over the roles of the Ministry of Industry, Energy and Technology, the Ministry of Commerce and the Ministry of Tourism. It is now composed of the following six departments,[522]

- Department of Energy and Natural Resources
- Department of Industry
- Department of Commerce
- Department of Research and Technology
- Department of Consumer Affairs
- Department of Competitiveness.

The mission for the Ministry is to develop and implement policy for these areas, to manage several EU and Greek National programs, as well as the "Promotion and encouragement of industrial activity in the private sector."[523] Interestingly, there is no explicit reference to environmental goals within the mission statement of the Ministry of Development.

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[522] Hellenic Ministry of Development, "Structure." http://www.ypan.gr/structure_uk_c.htm
[523] Ibid.

Most of the research and technology development takes place through the public universities and public research centers. The General Secretariat for Research and Technology (GSRT), under the Ministry of Development, is the main authority on research policy and funding. It supervises the thirteen most important public research centers, and provides funding for academic, industrial and cooperative research and technology development. There is also a National Council for Research and Technology which assists the GSRT and the Ministry of Development in advising the government on national priorities for Research and Technology Development.

The Hellenic Innovation Relay Center (HIRC) links Greek businesses to new technology innovations throughout the EU.[524] The Technical Chaber of Greece (TEE)[525] works in cooperation with the Ministry of Environment, Physical Planning and Public Works and other bodies to organize a biannual international environmental exhibition with the goal of helping the diffusion of those environmental technologies.[526]

Universities and research centers, as well as small and medium sized enterprises (SMEs), also are active in developing the research and innovation direction for the country. They often work in collaboration with the government ministries, and can obtain funded through government and EU grants geared toward technology development, adoption and use.

6.1.1.2 Environmental Institutions and Legal Framework

In Greece, the responsibilities of the national environmental policy management are spread between several ministries. The Ministry of Environment, Physical Planning and Public Works (YPEHODE) is responsible for coordinating all other ministries with regard to Sustainable Development.[527] Moreover, it is also in charge of implementing integrated water resource management. However, the responsibilities of IWRM are shared among three Ministries, and this creates a problem in the Greek system. The Ministry of Agriculture and the Ministry of Development have different priorities for water management than the Ministry of Environment. These ministries fight for the rights to water management.[528]

For several decades, the Ministry of Agriculture managed most water in the region because around 70% of the water resources used is for agriculture.[529] This management was done at the local level through the local Water Irrigation Companies (TOEVs), which are paid by the Ministry of Agriculture. Each TOEV manages, maintains, and builds new extensions of the irrigation system. They repair damages, control water quantity for each farm, and maintain roads and public works. TOEV also

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[524] Hellenic Innovation Relay Centre, http://www.hirc.gr/hirc/el
[525] Technical Chamber of Greece, See http://www.tee.gr
[526] European Commission, "Action Plan for Environmental Technologies: Greece." Accessed July 20, 2007 at http://ec.europa.eu/environment/etap/roadmaps_en.htm
[527] Hellenic Ministry of Environment, Public Planning and Public Works (also referred to as: Ministry of Environment), www.minenv.gr
[528] Personal Communication with Staff from Prefecture, TOEB Kavalas, Greece, July 13, 2006
[529] Ibid.

constructs wells when needed.[530] In many ways, the Ministry of Agriculture's TOEV local branches have the best outreach capabilities into communities.

However, according to the EU Water Framework Directive (WFD), one ministry must have all the control as the Central Water Authority, and Greece chose the Ministry of Environment, Physical Planning and Public Works. The main goal is to have coherent management for true integrated water management because the new service must be responsible for both water *quantity* and *quality*. The regional environmental authorities must document quantity and quality measures of all water bodies in Eastern Macedonia and Thrace Prefecture.[531] In many ways, however, the extended reach of the Ministry of Agriculture through the local TOEV offices throughout Greece may have been a better choice for being the Central Water Authority, which may have also been better able to implement reductions of the large amounts of water consumption coming from the agricultural sector.

Greece is still behind in conforming to EU requirements for the institutional structure of the water basin management. Bulgaria is in fact much closer to fully implementing the requirements of the WFD, and already has the institutions in place. Bulgaria had the advantage of building some of these institutions from scratch, while Greece has had to restructure these older bureaucracies into compliance.

6.1.2 Policy Framework

The Greek Constitution places the duty of protecting the environment in the hands of the state, declares the rights of citizens to a healthy environment, and defines the state's principles of prevention/precaution and sustainability (Article 24). The Greek National Strategy for Sustainable Development adopted in May 2002 describes the national goals for linking sectoral policies to environmental goals to promote economic and social aspects of sustainable development. It includes sectoral policy goals for: regional development, physical planning and urban planning; civil society; the energy sector; the transportation sector; agriculture and fisheries; the industrial sector; the tourism sector; as well as employment policy to increase the employment rate largely through the implementation of the above sectoral policies.[532]

Greek regional development policy seeks to reduce inter-regional inequalities by promoting development through incentives and creating basic infrastructure, however this development was not historically linked to any physical planning policies. After World War II, because of the lack of physical planning policies and weak planning and regulatory frameworks, Greece saw chaotic urban and rural development patterns which have resulted in land use conflicts in many cases. Only recently was a law on physical planning adopted which allows for strategic regional planning, and has the main objectives of promotion of economic and social cohesion, management and

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[530] Ibid.
[531] Ibid.
[532] Hellenic Republic Ministry for the Environment, Physical Planning and Public Works, "National Strategy for Sustainable Development Greece – Executive Summary." Athens, Greece, May 2002.

protection of natural resources and cultural heritage, and the promotion of an integrated and competitive regional development.[533]

For the energy sector, the Greek goals include decreasing energy intensity and decoupling it from economic growth through conservation and regulatory measures and improved electricity infrastructure, and introducing renewable energy sources and cleaner carbon-based fuels into the energy and fuel mix through the promotion of natural gas, increasing renewable energy sources to 20% of power production by 2010. Economic instruments are also used to internalize the external costs of Greece's high energy intensity. Around 40% of Greece's total energy consumption is a result of the increased demand of the transportation sector. The Greek Strategy for Sustainable Development intends to begin to decouple transportation from economic growth through a series of interventions targeting air emissions.[534]

More than 20% of the active population is employed by the agricultural sector, and it contributes to a large share of Greece's GDP. The EU Common Agricultural Policy (CAP), which emphasized increased production, had been a strong influence on the Greek agricultural policy, which has lead to farm industrialization and increased consumption of agrochemicals and fertilizers. The restructuring of the CAP in 1992 has begun to shift the intensive practices; however lack of adequate funding has been a problem. Policy objectives include promotion of best agricultural practices and sustainable production methods, promotion of organic production methods, sustainable use of water resources, development of an integrated fisheries policy, prevention of land degradation, and a "gradual reform of agricultural support and market mechanisms."[535]

The Greek industrial sector is decreasing its pressure on the environment mainly because manufacturing is not expanding as much as in the past, but also because of some recent institutional changes have helped use natural resources more effectively. Still, specific goals for industrial policy include increasing environmental performance to enhance Greece's competitiveness, income and employment situation. The main priorities are to shift from an end-of-pipe approach to regulations, and increase proactive pollution prevention measures in industries' production patterns, product supply chains. Other measures include taking actions for increasing energy conservation and efficiency, diversifying the fuel mix with more renewable energy sources, and promoting an integrated product policy to instigate innovation in the design, production, use and recycling of the industrial products. The Hellenic Ministry of Development implemented the Operational Programme "Competitiveness" through the EU Third Community Support Framework[536] to improve and expand the recycling, reuse, and dismantling of solid material and waste. It also further promotes environmental management schemes, pilot studies for internalizing environmental costs in the product prices of key sectors, regular monitoring and assessment of businesses'

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[533] Ibid.
[534] Ibid.
[535] Ibid.
[536] "Hellas 2000-2006 Community Support Framework, "Programmes 2000-2006." http://www.3kps.gr/index_en.htm

environmental performance, competitiveness and employment capacities, as well as pilot introductions of environmental economic instruments to alter the industrial and consumer behavior.[537]

The tourism sector represents around 6% of the Greek GDP and creates significant employment and contributes to regional development. However while increasing numbers of tourists increase the pressures on the environment, tourism-related income is decreasing because of a trend toward mass-tourism.[538] Mass-tourism, which is predominant on many Greek islands and coastal regions, requires the development of hotels and related facilities for large numbers of tourists, increasing the strain on local food and water supplies, fragile habitats, and a variety of species.[539] This is especially true for the coastal and island tourism, so the Program for the Sustainable Development of Greek Coastal Zones and Islands provides guiding principles and sectoral directions for zoning these areas, and is getting members of the Ministry, several universities, and other governing bodies to work out policy issues for the coastline beaches and ecosystems, the physical planning and residential development, and islands specifically.[540] The national goals are to have a balanced integration of the touristic activity and the natural environment, and through the Operational Programme "Competitiveness",

6.1.2.1 Technology Adoption and Use Policy

The Greek industrial system has slowed down in recent years due to poor focus on technological transformation after the second world oil shock. Greece's technology policy over the past twenty years has been heavily influenced by the European Union's policy goals, and not enough on its own priorities. The Greek industrial system specialized in low-tech areas where competition is based on low-cost labor, yet this comparative advantage has decreased as new states have entered the EU, especially with the recent accession of Bulgaria and Romania.[541]

The Greek government is trying to pay particular attention to the peripheral regions of Greece due to the decline of industry and jobs there, and sees a strategic role for the Eastern-Macecdonia and Thrace Periphery following Bulgaria and Romania's accession to the EU and other altered geopolitical relationships. At a recent conference on the Macedonia-Thrace Periphery on June 13th, 2007, the national development minister, Dimitris Sioufas, said that the regions in Northern Greece faces crises in the textiles, clothing and tobacco sectors, partly due to the cheaper labor available in the

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[537] Hellenic Republic Ministry for the Environment, Physical Planning and Public Works, "National Strategy for Sustainable Development Greece – Executive Summary." Athens, Greece, May 2002.
[538] Ibid.
[539] UN Atlas of the Oceans, "Mass tourism (land based)." Accessed July 20, 2007 at http://www.oceansatlas.org/servlet/CDSServlet?status=ND0xOTc0OSY2PWVuJjMzPSomMzc9a29z
[540] Hellenic Republic Ministry for the Environment, "Program for the Sustainable Development of the Greek Coasts and Islands" http://www.minenv.gr/1/12/123/12303/e1230300.html
[541] Ioanna Kastelli, "Science and Technology Policy in Greece: Policy Initiatives for R&D Cooperation." FEEM Working Paper No. 69.2000, September 2000. Available at SSRN: http://ssrn.com/abstract=247206 or DOI: 10.2139/ssrn.247206

neighboring countries of Southeastern Europe which is drawing away investment.[542] However, he said that Greek investment capital in Bulgaria is in second place among international donors, and in third place in Romania, as Greece is seeking the role of the economic leader for the Balkan region. The government is taking measures to improve competitiveness of the peripheral regions of Greece through a new Development Law which offers subsidies of up to 60% of the investment to a Small and Medium Enterprise (SME) in the Eastern Macedonia and Thrace Periphery.[543]

The recent intensive development of the energy sector in the region, including the construction of a Greek-Turkish natural gas pipeline and a Burgas-Alexandroupolis oil pipeline, will increase jobs and benefit the local and national economies. It will also add to the development of SEE as a regional energy hub.[544] Additionally, there is 25 million euro being channeled to the Eastern Macedonia-Thrace Periphery for the development of specialized forms of tourism, for the improvement of the competition, consumer protection, and the business environment, and for the upgrading of public infrastructure.[545]

Greek industry is not very interested in research and development, yet Greek policy has been trying to intensify the concentration of funding for industrial research while cutting back on basic research funding. Greece has been spending far less funding on research as a percent of GDP than all other European Union countries. Moreover, as Greece's real GDP grows at one of the highest rates of the EU, the innovativeness is one of the lowest in the EU, as measured by the European Innovativeness Scoreboard (EIS).[546]

Greece, through the EU Environmental Technologies Action Plan (ETAP), developed a roadmap of the actions that it would take in order to develop and disseminate environmental technology. The plan focuses on the following actions:[547]

- Getting from Research to Markets
    - Strengthening of and focus on research, demonstration and distribution. Improving coordination of related programs (Universities, research organizations and firms participate in tenders offered through the GRST, the Operational Competitiveness Program, and the Regional Operational Programmes)
    - Establishing technological platforms (promotion of Regional Innovation Centers throughout Greece through the GRST).
    - Establishing European networks of testing centres, verification of protocols and standardization (through the Ministry of Developent)

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[542] Athens News Agency, "Conference on Macedonia-Thrace periphery", June 14th, 2007. Available at http://www.hri.org/news/greek/ana/

[543] Ibid.

[544] Ibid.

[545] Ibid.

[546] OECD, "Country Response to Policy Questionnaire: Greece." OECD Science, Technology, and Industry Outlook, 2006.

[547] European Commission, "Action Plan for Environmental Technologies: Greece." Accessed July 20, 2007 at http://ec.europa.eu/environment/etap/roadmaps_en.htm

- Improving Market Conditions
  - Defining and approving targets on the performance of live products, procedures, and services (increasing the share of biofuels in the Greek market to 5.75% of total petrol and diesel by December 31, 2010)
  - Partnership between public/private sectors (through new legislation)
  - Renewing State aid guidelines (Strengthing of investment plans for sectors related to innovation in environmental matters, such as production of biofuels and renewables, fostering use of renewables, introducing and adjusting environmentally-friendly technology into the production process, etc)
  - Encouraging the Procurement of environmental technologies (through having the largest bus fleet running on natural gas in Europe)
  - Awareness raising for business and consumers (through the Pan-Hellenic Association of Environmental Protection Companies' annual awards[548], and information dissemination)
  - Provision of targeted training (trainings on renewable energy source and energy savings by the Center for Renewable Energy Resources[549])

The Integrated Pollution Prevention and Control Directive (IPPC 96/61/EC) has been implemented in Greece by a variety of legislation and ministerial regulations[550] on industry and environmental protection.[551] Representatives from the Greek government and industry participate was actively involved in technical working groups which produced Best Available Techniques Reference (BREF)[552] Documents.[553] Permits are required for operation of industries, require an Environmental Impact Assessment Study, and must be defined by the Best Available Techniques (BAT). There are currently 324 IPPC installations in Greece, and existing installations must demonstrate their compliance with IPPC by September 30, 2007. The Hellenic Environmental Inspectorate is the public authority in charge of inspecting and reporting any violations of environmental regulations.[554]

In the local administrations in the Nestos region, there is a serious misunderstanding in many responsible services that the water which is going into the sea is 'lost' or

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[548] Pan-Hellenic Association of Environmental Protection Companies, See www.paseppe.gr
[549] Center for Renewable Resources, See www.cres.gr
[550] Hellenic Republic, YPEXODE, "Integrated Pollution Prevention and Control: Greek Legislation." Accessed on Aug. 10, 2007 at http://www.minenv.gr/4/ypexode4/nomo8eti.htm
[551] Hellenic Republic, Law 1650/86 (OFFICIAL JOURNAL OF THE HELLENIC REPUBLIC 160/A): "For the protection of environment".
[552] Available at http://www.jrc.es/pub/english.cgi/0/733169
[553] G.P. Gallios, M. Tsimidou, E. Panagopoulo, "The State of Play of the IPPC/96/61/EC Directive: The Case of Food Industries with Special Reference to Greece." *NATO/CCMS Pilot Study Meeting on Clean Products and Processes: Environmental Challenges in the Process Industries,* Oviedo, Spain, May 6-11, 2001.
[554] Hellenic Republic, YPEXODE, "National Reporting to the Fourteenth & Fifteenth Sessions of the COMMISSION for SUSTAINABLE DEVELOPMENT of the UNITED NATIONS (UNCSD 14 – UNCSD 15)." Athens, 2006. Available at www.un.org/esa/agenda21/natlinfo/countr/greece/industry.pdf

'wasted'.[555] They don't understand it is necessary for water to flow into the sea. There is scientific evidence of how preventing water flow through the Nestos and Delta is harmful to the ecosystems, and even the local Fishery Research Institute (FRI) has evidence of what has happened to the ecosystem from the closing of the dam. However, local politicians say water is 'lost' in the sea, leading them to political statements of the need to build more dams. The prefecture of Drama, for instance, wants to build a 20 km tunnel through the mountains to deliver more water for agriculture, and there are people east of Xanthi who want to divert waters as well. All scientists say that water is not wasted, and if we take out more water, we will probably kill the place. Moreover, the more technical works and dependency made on the river, the more arguments there are for Bulgaria not to cut off our water. With Bulgaria becoming an EU member, they may get funds for such projects and this can soon become a sensitive political game on this level.[556]

6.1.2.2 Environmental Regulation Policy

Greek environmental regulations have often placed EU priorities above Greek national priorities,[557] yet this seems to have had a positive effect on forcing the Greek policy to develop. However, Greece has been one of the most common offenders of EU Environmental directives repeatedly for failing to institute conforming legislation, or failing to enforce the appropriate relevant Greek legislation. Where there are conflicts between ministries for the control or development of resources, there is a clear lack of integration. This is especially obvious in water resource management in which Greece, despite EU directives for integrated policy approaches, has resisted full or proper implementation of the needed changes.

Authorities and local populations in Greece still treat water resources as inexhaustible resources which should be fully exploited, and this is often seen in the lag to meet EU directives. The basic framework for water resource policy is the EU Water Framework Directive (2000/60/EC); however there are serious issues with how Greece implemented this directive, as well as other water-related directives, such as the Nitrates Directive (91.676/EEC), and the legislation is not properly enforced.[558] Despite Greece's attempt to introduce water basin based water management, the responsibilities of the management were so scattered among ministries and national, regional and local authorities that the water resources were poorly managed and there was "an emphasis on the enhancement of water supply to meet an ever growing demand."[559] In March, 2005, the European Commission opened infringement

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[555] Personal Communication with Hans Jerrentrup, EPO - Society for Protection of Nature and Ecodevelopment, July 16, 2006.
[556] Ibid.
[557] National Center for the Environment and Sustainable Development, "Greece: The State of the Environment." October, 2001
[558] Theodota Nantsou, "Commitments without Implementation: Environmental Legislation in Greece: Executive Summary." Trans. Ioli Christopoulou. Athens: WWF Greece, 2005. p. 4
[559] National Center for the Environment and Sustainable Development, "Greece: The State of the Environment." October, 2001

proceedings for the WFD for Greece's failure to designated river basins.[560] The different Ministries for the environment, for agriculture, for development, for health, and for culture, have different uses for water and resource development, and this "complex situation results in lack of coordination and the inability to achieve integrated monitoring of the national water potential."[561] Moreover, a lack of an integrated national control system for measuring the quality and quantity of water has contributed to a lack of regular official information dissemination. Locally, very few people in the Nestos area actually want to apply the Water Framework Directive.[562] And it is possible that Bulgarian local authorities were better informed about the WFD than Greek local authorities, as one Bulgarian who visited had the impression that the local authorities didn't know about the WFD several years ago, perhaps because it had not been set up institutionally there at that time.[563]

Nationally, water withdrawals for agriculture comprise 87% of the total freshwater consumption in Greece, and irrigation water demand has nearly doubled since 1980. The current water pricing system does not give farmers an incentive to modernize the antiquated irrigation infrastructure or to conserve through choosing less water-intensive crops.[564] Farmers do not pay for their actual water consumption, but only by land area per $100m^2$ of land for the function and maintenance of boreholes/wells, and irrigation systems. In the Nestos region farmers currently pay 8 Euros per $100m^2$ of typical crops and 11 Euros per $100m^2$ when growing rice. In the Nestos area, there is a lot of rice grown, with Kavalas being the second Municipality after Serres in rice production in Greece. The problem with the water pricing has been recognized, and according to the WFD, the farmers must begin paying for their irrigation water based on their actual consumption. Greece was supposed to apply this into its regulations beginning in 2003, yet they still have not done so.[565] A more appropriate pricing of water will happen soon, but they don't know it in the Prefecture Office.[566] Because agriculture is still such a large part of the economy and so much of the region and country's population is involved in agriculture-related work, water-pricing is considered politically impossible, and some local authorities have warned that the farmers 'will be blocking the highways in protest if this law were ever to be applied.' The current system has only 6 or 7 regional water directorates. Even some of these regions do not have the necessary personnel because there is a lack of financing in the directorates. The Ministry of Environment, Physical Planning and Public Works requires that each region must install regional water services, yet they have not given funding to do that.[567]

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[560] Theodota Nantsou, "Commitments without Implementation: Environmental Legislation in Greece: Executive Summary." Trans. Ioli Christopoulou. Athens: WWF Greece, 2005.
[561] Ibid.
[562] Personal Communication with Staff from Prefecture, TOEB Kavalas, Greece, July 13, 2006
[563] Personal Communication, Ohanes Sànturdjan, Prof. DrSc. Director of Institute of Water Problems, Bulgarian Academy of Sciences, July 18, 2006.
[564] National Center for the Environment and Sustainable Development, "Greece: The State of the Environment." October, 2001
[565] Personal Communication with Staff from Prefecture, TOEB Kavalas, Greece, July 13, 2006
[566] Ibid.
[567] Ibid.

The Nestos region has made large use of the river's water resources for hydroelectric generation, yet there has been little done to take advantage of the great potential for solar energy. Greece has begun the emissions' trading program, supported by the EU, for the implementation of the Kyoto Protocol.[568] Yet because there is little planning for the development of the renewable energy sector, the energy sector uses extremely polluting energy sources, including lignite and oil. Only recently have they moved to increasing natural gas as part of the mix. The permitting process for wind parks is complicated, and is a barrier to the expansion of wind energy. Greece has great potential for developing these renewable sources, yet Greece has already gotten off-track for adherence to the Kyoto Protocol, and by 2010 will have exceeded its target by at least 14%.[569]

Information collection, processing, and dissemination are crucial to meeting the objectives of the Hellenic National Strategy for Sustainable Development by supporting policy decisions for national and international decisions, as well as increasing public awareness of the current situation.[570] However, the responsible local and national authorities have not received official information on the existence of legislation providing citizens with access to environmental information, and are unable to respond to the increased public demands for information led mostly by NGO efforts. As of 2005, the recent EU Directive on public access to environmental information from 2003 has not been transposed (2003/4/EC), and the preceding Directive's (90/313/EEC) transposition into Greek national law was delayed as well. Moreover, there is a lack of regular reports from the Ministry of Environment, Physical Planning and Public Works and a lack of public awareness on their rights to access to the information.[571]

The Greek Environmental Impact Assessment (EIA) instrument is crucial to the successful implementation of the National Strategy for Sustainable Development. The EIA system has three levels of government which give permission for the realization of prospective development projects. On the Federal level, the Ministry of Environment, Physical Planning and Public Works is responsible for big projects and works in protected areas. The Ministry of Environment has a special service, "Rambo of the Environment", where if one person says that some company is not following the EIA, the Ministry can come and see if the citizens or the company are correct. On the Regional level, Regional Services are responsible for the majority of EIAs. Finally, at the Local level, the Prefecture's environmental services are responsible. All the EIA studies at superior levels must discuss with the local Prefecture authorities as well, even if the other level will issue the EIA. The newspapers publish announcements, and 15 days are given to discuss the issue at the local level. However, the top-level consultants have the right to say whether or not the public can be involved in the process. The local

[568] Hellenic Republic Ministry for the Environment, Physical Planning and Public Works, "National Strategy for Sustainable Development Greece – Executive Summary." Athens, Greece, May 2002.
[569] Theodota Nantsou, "Commitments without Implementation: Environmental Legislation in Greece: Executive Summary." Trans. Ioli Christopoulou. Athens: WWF Greece, 2005.
[570] Hellenic Republic Ministry for the Environment, Physical Planning and Public Works, "National Strategy for Sustainable Development Greece – Executive Summary." Athens, Greece, May 2002.
[571] Theodota Nantsou, "Commitments without Implementation: Environmental Legislation in Greece: Executive Summary." Trans. Ioli Christopoulou. Athens: WWF Greece, 2005.

environmental authorities are given the responsibility to control the extent to which the companies/people follow the EIA.[572]

However, there is "extensive corruption in the EIA evaluation system and the inability of the responsible authorities to properly assess their quality and reliability," resulting in environmental assessments of poor quality to be approved.[573] Some projects are even approved before the submission of an EIA. Moreover, the deficiencies in national spatial planning and the legislation for building rights in non-urban or planned housing areas is one of the largest problems which is preempting the EIA's precautionary character. The presence of extensive illegal building in Greece has made EIAs powerless against much of the environmental impacts. Again, the absence of, delay of, or poor transposition of EU Directives on environmental assessments have held the effectiveness of EIAs back. Corruption is hard to control because the current practice is to have the EIA be commissioned by the directly interested party, and they are able to influence the EIA outcomes. Finally, a lack of capacity in the national and local authorities has decreased the effectiveness of the EIA system due to a lack of personnel for monitoring and the review of EIA studies, lack of financing, and lack of independent control mechanisms for monitoring the compliance with environmental regulations.[574]

While Greece is a signatory to many international environmental agreements, it sometimes has failed to implement its responsibilities under these. For instance, the Government of Greece recognized a wetlands area in the Nestos river basin as a Ramsar site in 1975, however repeatedly did not answer requests of the Ramsar treaty members for specific boundaries, even while admitting that these areas were being threatened by ongoing activities in the area. Finally in 1996, Greece defined the boundaries of the protected areas, and doubled the size of the Nestos site in July 1996. "The failure of the Greek government to accurately delineate the boundaries of the wetlands included in the Ramsar site allowed the expansion of incompatible activities, including garbage dumping, intensive farming, and grazing. The lack of a management plan for the area, as called for by the member countries of Ramsar, also undermines protection and wise use of these areas."[575]

6.1.3 Coordination between Institutions and Policies

To achieve its environmental and sectoral goals, the Greek government has promoted the use of horizontal actions which include all financial sectors and encourage the participation of social stakeholders. In terms of economic instruments, Greece has

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[572] Personal Communication with Staff from the Prefecture, TOEB Kavalas, Greece, July 13, 2006
[573] Theodota Nantsou, "Commitments without Implementation: Environmental Legislation in Greece: Executive Summary." Trans. Ioli Christopoulou. Athens: WWF Greece, 2005, p. 2
[574] Ibid.
[575] Global Nature Fund, "Living Lakes – The International Network." Accessed Aug. 10, 2007 at http://www.globalnature.org/docs/02_vorlage.asp?id=11166&domid=1011&sp=E&addlastid=&m1=11089&m2=11103&m3=11166

created an incentives program for businesses through the subsidization of environmental products and technologies on the market.[576]

When looking at the collection of institutions and policies that make up the Greek environmental system, a clear coordination between sectoral policies for technology adoption and use and environmental regulations is not accomplished. There is a lot of statements and rhetoric about the need for coordination among economic, environmental and social goals for the purpose of reaching a level of sustainable development. The National Strategy for Sustainable Development and many of the ministries self-declared focuses discuss the need for coordination of environmental goals with economic development. However, in reality, there is a much greater focus on first economic measures of well-being and economic areas of development, and environmental considerations come second. This form of 'coordination' means that Greece will continue to develop technologies and processes for the industries it is promoting which pollute and are inefficient users of the local resources - both within the Nestos locality and throughout Greece.

At the local level, the Nestos region benefits by being part of one of the few super-prefecture structures which Greece has designated (called a Nomos)[577] because the prefectures are thus automatically linked in their development goals and administrative functions. However, because of the different thrusts of the economies in each prefecture, there is some disconnect between Drama, which is in the northern-most mountainous region of the Super-Prefecture (Nomos), and Xanthi and Kavalas which are at the Nestos Delta and have coastal access. Drama does not have direct access to the Nestos River, but wishes to develop irrigation networks which draw upon those waters. Xanthi and Kavalas have one of the most productive agricultural sectors in Greece, however they are heavily dependent on large amounts of irrigation waters and agrochemicals to produce the quantities of the crops chosen. This has led to local citizens and administrative bodies to push for expanding the irrigation networks even further

As discussed above, the coordination between Greek national-level institutions and policies is still lacking, although there has been a positive influence from the obligation to assimilate legislation toward EU Directives. At the local level, institutions are more likely to take direction from above (regional and national governments) than to work directly together. In the Nestos region, however, there has some awareness at the need for integrated policy-making because of the efforts at working on a transboundary level.

One example is that there seems to be a lack of coordination among different ministries and policies to find a holistic solution to the high energy and water demands during the summers. The technological development in renewable energy has great potential in Greece because of its plentiful renewable resources, particularly the sun, sea, wind, and agricultural biomass. However, most energy development in Greece and the region

[576] Hellenic Republic Ministry for the Environment, Physical Planning and Public Works, "National Strategy for Sustainable Development Greece – Executive Summary." Athens, Greece, May 2002.
[577] See Section 5.1.3.2

focuses on fossil fuel development and linkages to regional networks, especially in the Eastern Macedonia and Thrace sub-region of Greece is becoming the prime Greek location for pipelines and storage facilities rather the more ecological renewable sources. While the large-scale dams are capturing a form of renewable energy from the Nestos River, the hydroelectric potential is tapped mostly in the summers when increased air-conditioning needs increases the electricity demands, and as farmers demand more water resources downstream. Finding a way to reduce water resource demand during the summers, through improvement of irrigation techniques, better crop choices, and better farming techniques, would free up some of the hydroelectric potential to be spread out throughout the rest of the year.

6.2 Bulgaria

Bulgaria has been operating under intense EU scrutiny as it worked hard to create legislation and institutions that conformed to the *aquis communitaire* in all sectors, including the environment, industry, and other areas of the economy, and as it continues to improve implementation. For this reason, much of the institutional and legal framework has been developed in the past ten years from scratch in accordance with EU directives, and in many ways it has been easier to comply than for Greece since it did not have to restructure existing rigid institutions. However, while environmental regulations may be transposed into legislation, the largest issues for Bulgarian environmental regulations are the lack of implementation of existing legislation, lack of enforcement, and poor follow-through on penalties once enforced.

Sections 6.2.1 and 6.2.2 go more into these policies and relevant institutions. Section 6.2.3 discusses the type of coordination between these policies and institutions within Bulgaria.

6.2.1 Institutional and Legal Framework

The Mesta River Basin is within the Blagoevgrad provincial jurisdiction, and is included in the South West Region for planning purposes. There are several provincial-level institutions which implement national policy. Only eight of the fourteen municipalities of Blagoevgrad are within the Mesta Basin, and these municipal governments have their own institutions for providing policies for development and environmental protection. (See Section 5.1 for more details). There is no uniform municipal structure, but rather each municipality has its own institutional frameworks for implementing national, regional and local policies.

The responsibilities for economic development and environmental services are shared among many ministries in the Republic of Bulgaria. Regional planning is done for the Bulgarian South-Western Planning Region, as well as at the District and Municipal levels. The directions of the institutions depend heavily on the composition of the government. In 2005, a new government was elected and everyone had to wait for three

or four months to reform the government.[578] This uncertainty, which has also been evident in other Balkan countries, may hinder the effectiveness of the country's institutions.

One of the main objectives for Bulgarian regional development is to improve integration into European structures in order to develop economic and social cohesion with the rest of EU regions. The transition into the EU will shift the funding and program focus from Accession funds to EU Structural funds. Bulgaria will have to spend the money by 2010 which means that the institutions must be ready to spend it with all necessary EIA and feasibility studies completed. It will be very difficult at the beginning because throughout the accession process, the delegation to the EU has had the responsibility, but after EU Accession the relevant Ministries will now be in charge.[579]

6.2.1.1 Technology Adoption and Use Institutions and Legal Framework

At the local level, the municipalities work to stimulate local development through various methods. To help improve the local economy, local governments in the Mesta River Basin have organized trainings on industrial methods and legal requirements (e.g., implementing the WFD), as well as agricultural techniques and better crop choices. Often these trainings are in cooperation with regional administrations for Blagoevgrad or the South Western Bulgaria, or even the national ministries or universities.

Bulgaria's Ministry of Economy and Energy was formed in August 2005, through the merger of the Ministry of Economy and the Ministry of Energy and Energy Resources. Its role is to develop economic and energy policies for the country through improving the competitiveness of the Bulgarian economy and its institutions, and through encouraging investments, innovations, entrepreneurship, exports, modernization of the industrial base, and the increased use of its renewable energy resources. The Ministry also has a role in the implementation of EU integration policy and economic cooperation with foreign countries. Through this ministry's work, sectoral strategies and policies are developed for industry, trade, tourism, and privatization.[580] However the overall sectoral strategies for agriculture, fisheries, forestry, and rural development are handled by the Ministry of Agriculture and Forestry.[581]

Regional planning and major projects and infrastructure development are handled by the Ministry of Regional Development and Public Works (MRDPW). The ministry has a Regional Operational Program which is a sectoral program. As its first priority it is the managing authority for the structural funds for regional development.[582] The MRDPW

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[578] Personal Communication with member of Ministry of Regional Development and Public Works. Sofia, Bulgaria, July 18, 2006.
[579] Ibid.
[580] Republic of Bulgaria, "Ministry of Economy and Energy." Accessed on July 30, 2006 at http://www.mee.government.bg/eng/
[581] Republic of Bulgaria, "Ministry of Agriculture and Forestry." Accessed on July 30, 2006 at http://www.mzgar.government.bg/mz_eng/default.asp
[582] Personal Communication with member of Ministry of Regional Development and Public Works. Sofia, Bulgaria, July 18, 2006.

manages the international programs such as ISPA, Phare, and Interreg (See Section 2.3). This ministry is also in charge of the water supply and sewerage networks, as well as the planning of large dams throughout Bulgaria. Figure 35 below shows the institutional arrangement where the MRDPW in coordination with the Ministry of Environment and Water (MoEW) and the municipalities regulate the commercial operators of water supply and sewerage systems, which are in turn regulated by Regional and State regulatory bodies for environment, health, etc. While some provinces have municipal ownership of their water supply and sewerage networks, Blagoevgrad has 100% state ownership.[583]

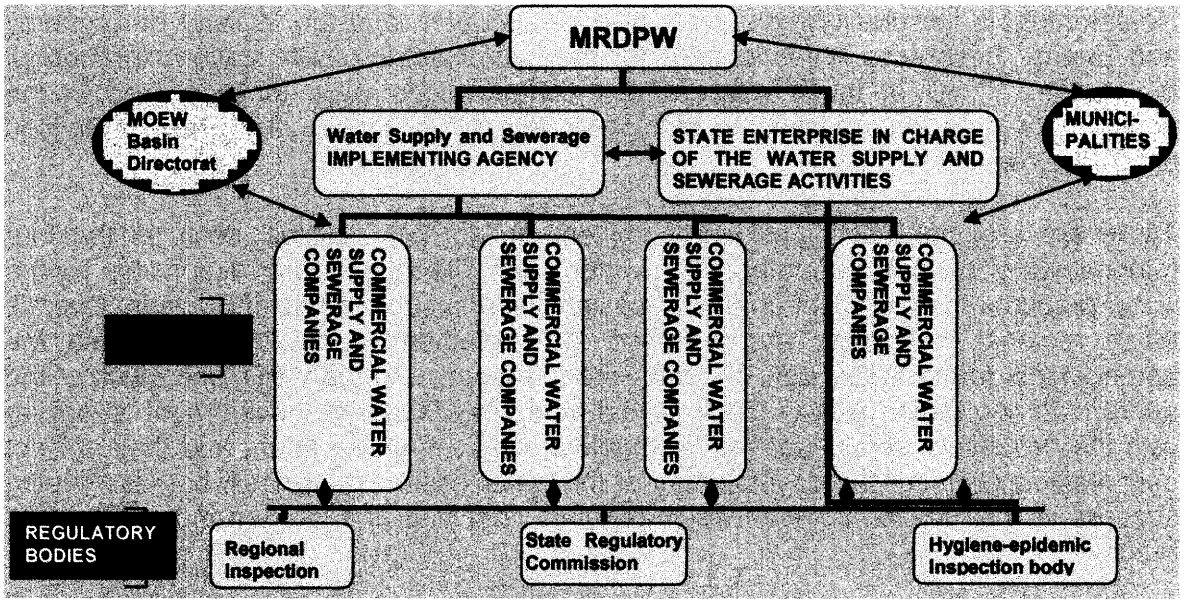

Figure 35: Bulgarian Institutional Arrangement of the Water Supply and Sewerage Sector
Adapted from presentation on Strategy for Management and Development of the Water and Sewerage Sector in the Republic of Bulgaria (Source: Bulgarian Ministry of Regional Development and Public Works).

6.2.1.2 Environmental Institutions and Legal Framework

In Bulgaria, the responsibilities of environmental planning and regulation lie with the Ministry of Environment and Water (MoEW). The Ministry of Environment and Water plans and sets policy for environmental matters, regulates through the granting of appropriate permits for development projects, and collects and maintains information and data on environmental indicators.

Before 1999, Bulgaria did not have a central authority on water. It had a National Council of Waters and some other structures, but they had little authority over the

[583] Bulgarian Ministry of Regional Development and Public Works, "Strategy for Management and Development of the Water and Sewerage Sector in the Republic of Bulgaria." Accessed on July 20, 2007 at http://www.mrrb.government.bg/doctypesen.php?P=46&T=18

management of the nation's resources. The Bulgarian institutions responsible for water resource management have now been restructured so that they can be coordinated through the MoEW, however other ministries still have policy roles regarding their sectoral competencies. The MOEW and the Ministry of Regional Development and Public Works have a conflict over who should manage and maintain the environmental infrastructure because a lot of funds are expected in the future for environmental infrastructure. For instance, the Ministry of Regional Development and Public Works still defines and implements state policy for the protection against harmful impacts of water in human settlements and for water supply and sewerage systems.[584] More tensions are found among the competing interests among other ministries. For example, the Ministry of Agriculture and Forestry is still in charge of irrigation systems, and the Ministry of Health controls the quality regulations of drinking water, and the Ministry of Economy and Energy Resources is responsible for the hydroelectric power stations throughout the country.[585] All of these management contradictions were to be settled in the parliament's new amendments to the Water Act, to be further discussed in Section 6.2.2.2 below.

There are regional institutions which implement MoEW's policies, such as the four regional water basin directorates. The water basin directorates are responsible for the water resource management on a river-basin level of a sub-regions of Bulgaria. Overall, these regional institutions are prepared for implementing the WFD because the amendments to the Water Law in 2000 were in response to the WFD, and much of the appropriate legislation was in place at that time. The Bulgarian government is looking with the necessary seriousness to the subject, which is unlike them, and they are not only making *plans* for the development of the water basin directorates, but also seeing success in their *implementation* which requires financing and is often more difficult to reach.[586]

The basin directorate which is responsible for the Mesta region is the Western Aegean Basin Directorate (WABD). It was created by the Bulgarian Water Law in 2000 and established in 2002. WABD has to manage common freshwater sources, including surface water, ground water, precipitation, water consumption and abstraction, collection of waste waters, water treatment, and even the sediments in the river. The responsibilities in Greece and Bulgaria are the same due to the WFD, only the institutional structure is different.[587] The WABD is responsible to create the first plans for river management by 2009, with one for each of the main rivers of Struma, Mesta and Dospat, and the WABD is working on preparing these plans. However, the limited

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[584] Liliana Maslarova, "The Management and Sustainable Development of Protected Transitional Waters in Bulgaria." TWReferenceNet Project on Management and Sustainable Development of Protected Transitional Waters [Cooperation between Italy, Greece, Romania, Bulgaria, Albania], Lecce-Athens, February 1, 2004.
[585] Ibid.
[586] Personal Communication, Ohanes Sànturdjan, Prof. DrSc. Director of Institute of Water Problems, Bulgarian Academy of Sciences, July 18, 2006.
[587] Personal Communication, Bladimir Dinov, ing., Director of West Aegean Basin Directorate, July 19, 2006.

number of staff limits the effectiveness of this and other basin directorates. For instance, there are only six people conducting monitoring functions at WABD.[588]

Municipalities also play a role in monitoring and implementing national legislation. Each municipality gets some money from the national budget, and some from local taxes from the firms and companies.[589] There are also local water councils in some municipalities of the region. The Water Council of Razlog is quite active, while the one in Gotse Delcev is not as active. The Razlog Water Council is a voluntary advising body which thinks about what should be done for the municipality, the region and the nation in terms of water. They consult the municipality and the municipal council, and prepare proposals for acceptance by the municipal council. When the municipality accepts a proposal, but it will be implemented by the municipality. However sometimes they accept the proposal, they cannot realize it for a variety of often complex reasons, involving financing and national policies. Sometimes proposals are advanced which may be considered more important by the municipality, even if the Water Council believes otherwise.[590]

Universities and research bodies are also important institutions for carrying out the scientific work required for government institutions. Some local universities in Blagoevgrad are involved in disseminating environmental data and information to local stakeholders through municipal and regional trainings. The Bulgarian Academy of Sciences (BAS) is a national body which contributes to implementing MoEW's objectives, such as projects as part of the river basin management plans. Most of the Ministry's work uses special scientific experts, often from the BAS institutes. For example, currently the BAS Institute of Water Problems is developing water resource economy balance studies (See Section 6.2.2.2).[591]

6.2.2 Policy Framework

While Bulgaria has been working on a national strategy for sustainable development since 1999, it is still in the draft stages. [592] The Bulgarian 1991 Constitution[593] embodies the state's overall responsibility to the environment and rational use of natural resources (Article 15), defines the scope of costal beach strips and waters, parks and nature reserves which belong exclusively to the state (Article 18), the rights of citizens to a healthy and favorable environment and the responsibility of all citizens to protect the environment (Article 55).[594] In the recent years, the major policy framework for Bulgaria

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[588] Ibid.
[589] Personal Communication with Mayor of Bansko Municipality, Bulgaria, July 20, 2006.
[590] Personal Communication with members of Razlog Water Council, July 19, 2006.
[591] Personal Communication, Ohanes Sànturdjan, Prof. DrSc. Director of Institute of Water Problems, Bulgarian Academy of Sciences, July 18, 2006.
[592] Note that no English translation of the draft was available at the time of this study.
[593] Republic of Bulgaria, "Constitution of the Republic of Bulgaria" Available at http://www.parliament.bg/?page=const&lng=en
[594] Liliana Maslarova, "The Management and Sustainable Development of Protected Transitional Waters in Bulgaria." TWReferenceNet Project on Management and Sustainable Development of Protected Transitional Waters [Cooperation between Italy, Greece, Romania, Bulgaria, Albania], Lecce-Athens, February 1, 2004.

has been adhering to European Union directives, regulations, and principles in order to successfully reach accession.

However national and regional priorities for development have and continue to be established. The regional planning for the region of South-West Bulgaria is done by the Ministry of Regional Development and Public Works, in accordance with the Regional Development Act of 2004.[595] The plan develops the objectives and priorities for the regions development as an element of the whole country in correspondence with the National Strategy for Regional Development. The plan also conforms to EU regional policy requirements, as well as national priorities and financial constraints. Blagoevgrad is one of five administrative districts within the South West planning region. The strategic planning is done to contribute to an integrated development approach in order to reach stability.

The leading strategic goal for the development of the South West planning region of Bulgaria is *to balance the development through achieving growth in the regional economy, ensuring higher employment, improved standards of living, and preservation of natural, cultural and historic heritage, and the protection and restoration of the environment.*[596] The main path for achieving this regional goal is outlined by three policy objectives of (1) encouraging economic activity, attracting new investments, improving business infrastructure and developing human resources; (2) achieving sustainable regional development and reducing interregional differences in infrastructure, access and quality of public services, and human resources; and, (3) decreasing differences in socio-economic development in the regional level, taking part of transnational networks for partnership, and approach the economic and social levels of the EU. [597] Interestingly, the policy objectives for the region do not integrate the regional and national goal of environmental protection and restoration.

The regional priorities that come out of this are as follows

- to increase the competitiveness of the regional economy (through encouragement of economic activity, technological innovation and attracting of investments)
- to develop and improve the transport infrastructure and ecological environment
- to improve the qualities of the living environment in inhabited places and the way of life (through health and social services, social integration of minority groups, education, protection of cultural and historic heritage, etc.)
- to strengthen the administrative capacity of the local and regional authorities and develop interregional cooperation (improving the ability of administrations to absorb EU funding; developing partnerships between local/regional authorities, Non-governmental sectors, businesses, and trans-border cooperation with other EU regions)

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[595] Republic of Bulgaria, "The Regional Plan for Development of Southwestern Planning Region (2007-2013)." Accessed Aug. 10, 2007 at http://www.mrrb.government.bg/pageen.php?P=377&SP=380
[596] Ibid., p.19
[597] Ibid., p.20

While the regional plan for South West Bulgaria highlights many areas for future focus, it seems to lack integration across the sectors of energy development, industrial development and agriculture. Instead, the Ministry of Economy and Energy is in charge of developing the energy, industrial and tourism policy directions, and the Ministry of Agriculture is in charge of developing the agricultural and rural development policy directions.

Bulgaria's industrial policy now broadly complies with EU principles of enhancing competitiveness, employment rates and living standards. The push from the EU for privatization and restructuring of the economy has brought significant change to Bulgaria's industrial system. The industrial policy has become stable and predictable, and is now market-based. Bulgaria has attracted foreign investment through its improved business environment. [598] There is a good opportunity for growth in the industrial sector, as there is a well-trained and skilled work force, low labor costs compared to other EU countries. The food processing industry is dependent on the agricultural output, and does not operate at full capacity because of the loss of its markets of the Former Soviet Union. The textile industries are operating with relatively good technologies, and foreign investments and exports are popular in this sector. However, the technology used in some industrial sectors is now obsolete or highly inefficient, with high energy consumption, and low labor productivity.[599]

There has been a push to develop renewable energy sources in Bulgaria, especially as they are being required to close down their nuclear power plant which supplies the country with a significant amount of its energy and even exports to neighboring countries, including Greece. There is especially a push on developing the plentiful geothermal resources around the country. The Mesta River Basin also has thermal waters, but so far no project has been started within the basin. The thermal mineral waters in the locality have been mostly used for therapeutic/spa purposes as well as for some heated greenhouses.

Developing the tourism sector has been a priority of Bulgarian policy, and its share of the GDP has been steadily growing. Infrastructure improvements to accommodate the tourism industry have been made, but are unbalanced throughout the country and this continues to be an important part of policy, especially for the main infrastructure of transport and communications.[600] In the Mesta region, tourism has especially been developing around the Bansko area, which is known as a winter ski-resort-town. The locality has been trying to diversify its attractions through the development of its thermal mineral water spas, summer trekking on the Pirin Mountain. A proposal to build a dam in the Razlog/Bankso area is influenced by the plan to develop tourism around the dammed lake with water sports and a golf course. As access to the region improves and the area draws greater number of tourists, water and waste infrastructure must be

[598] EUROPA, "Summary of Legislation: Bulgaria."Accessed on July 30, 2007 at http://europa.eu/scadplus/leg/en/lvb/e06101.htm
[599] Ministry of Economy and Energy of the Republic of Bulgaria, "Strategy for Improvement of the Productive Sector." Available at http://www.mee.government.bg/eng/integration/eu/docs.html?id=24321
[600] Ibid.

improved to accommodate the extra population during the busy winter and summer seasons without degrading the river basin area. The national, regional and local authorities, however, have been encouraging the promotion of ecotourism and other forms of tourism which will have lower impacts on the environment.

6.2.2.1 Technology Adoption and Use Policy

After the transition from a planned economy, the Bulgarian industrial system slowed down dramatically as its previous markets in the Former Soviet Union disintegrated. The planned economy meant that inefficient technologies and processes did not limit the firm's ability to sell its products because there was no competition in the market. However, by approximating EU regulations on competitiveness and free markets, and through their membership to the World Trade Organization, many of Bulgaria's industries quickly realized that they were not able to compete with their antiquated technology on the global market. However in recent years as Bulgaria approached accession, industrial development has been increasing as European development projects and foreign investment have increased. Still, Bulgaria's competitiveness is based on labor- and raw material-intensive low-cost products, and most industries are considered low- and medium-tech.[601]

In the Bulgaria Strategy for Improvement of the Productive Sector, based on the Economic Development Plan 2000-2006, the national goal is presented as to develop strong and sustainable economic growth to improve the living standards and smoothly integrate into the EU economy and social environment. The main focus is to improve the competitiveness of the industrial, tourism, and small and medium-sized enterprise sectors. [602]

Joining the EU has increased the regulation of the business environment, causing many inefficient or antiquated industrial installations to struggle. Most technology used to comply with regulations is currently of the 'end-of-pipe' variety because it seems cheaper in the short run. However, cleaner production and pollution prevention techniques can be more cost effective in the long run. To show them this, industries must first think in terms of the long run, at least from the economic point of view. Yet this has been difficult given the economic situation. Many businesses need to focus on survival, and mostly "industrial companies do their business and have no time to waste."[603] It is difficult to gather industrial people together for information dissemination because they are only interested in specific information targeted to the success of their particular business. They need information about new technologies and processes which they could directly apply in their production process. They want cost-effective technologies, Best Available Technologies, Clean Production, Database, technologies

[601] European Commission, "Overview of Innovation Policy: Bulgaria." European Trend Chart on Innovation, 2007. Accessed on July 30, 2007 at http://trendchart.cordis.lu/tc_country_list.cfm?ID=21
[602] Ministry of Economy and Energy of the Republic of Bulgaria, "Strategy for Improvement of the Productive Sector." Available at http://www.mee.government.bg/eng/integration/eu/docs.html?id=24321
[603] Personal Communication with Milkana Mochurova, BAS Institute of Economics, Sofia, Bulgaria, July 18, 2006.

and contacts, and the experience of 'Western' Companies, and the expertise of the EU.[604]

In September 2004, Bulgaria adopted an Innovation Strategy in order to promote the modernization of Bulgarian industry. Funding support for innovative industrial enterprises was planned to be 5 million BGN in 2005 (approx. 2.6 million EUR), 8 million BGN in 2006 (approx. 4.1 million EUR), and 13 million BGN in 2007 (6.6 million EUR). The industrial enterprises would be expected to renovate their production structures and strengthen their international presence.[605] Still, an overall scientific research and technology development strategy is lacking, and the government and business expenditure is still relatively low.[606] While resources have been increasing over the past two years, in 2006 resources allocated to research in Bulgaria is only 0.38% of GDP.[607] However by 2010, Bulgaria needs to reach the target level of 3% of GDP for scientific research and technology development, as set by the Barcelona European Council.[608]

While there have been projects directed at environmental technology adoption and use in other regions of the country, the results were not found to be sustainable or transferable to other regions of the country. The GEF Transfer of Environmentally Sound Technologies (TEST) project, implemented by UNDP and executed by UNIDO in countries along the Danube River Basin, was able to build capacity in the relevant Cleaner Production Center. In Bulgaria, however, it was difficult to identify an institution which could hold this role, and after two failed attempts, the project found an effective partner with industrial production and engineering expertise within the Technical University of Sofia. Still, the TEST project saw good results in the three Bulgarian industries it worked with in sugar and alcohol production, fish processing, and textiles. After working with the technical experts in cleaner production, the industries were shown assessments of the extent of their pollution and energy-loss, and the well as pollution-prevention technologies and process improvements which would drastically reduce these factors and would make them more competitive in the European markets.[609] The experts in the program noted that the penalties for wastewater discharge are far too low in Bulgaria to act as a disincentive to polluting, and thus in order for companies to change their processes, regulations need to be stronger.[610]

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[604] Ibid.
[605] UN Commission on Sustainable Development, "Industrial Development." Accessed on Aug.10, 2007 at http://www.un.org/esa/agenda21/natlinfo/countr/bulgaria/industry.pdf
[606] European Union, "Research and Innovation: Bulgaria – Adoption of the Community Aquis." Accessed on July 20, 2007 at http://europa.eu/scadplus/leg/en/lvb/e21101.htm
[607] European Commission, "Overview of Innovation Policy: Bulgaria." European Trend Chart on Innovation, 2007. Accessed on July 30, 2007 at http://trendchart.cordis.lu/tc_country_list.cfm?ID=21
[608] European Union, "Research and Innovation: Bulgaria – Adoption of the Community Aquis." Accessed on July 20, 2007 at http://europa.eu/scadplus/leg/en/lvb/e21101.htm
[609] Global Environmental Facility, "GEF Final Evaluation: Transfer of Environmentally Sound Technology (TEST) to reduce Transboundary Pollution in the Danube River Basin." 2005, p. 23
[610] Ibid., p. 27

The EU's directive on Integrated Pollution Prevention and Control has been transposed into national law,[611] under the Environmental Protection Act of 2002.[612] In this legislation, the task of environmental inspections (Article 128) is given to the Regional Inspectorates of Environment and Water (RIEW), and the RIEWs along with MoEW must work for preventative control environmental pollution and degradation (Article 148, Article 152). The authorities have been granted legal rights to access sites and information, must report findings and any violations, and can prescribe any necessary measures after inspection (Articles 149, 155-156). Coercive administrative measures and penalty liabilities can be applied by MoEW or officials authorized by them, the RIEW directors, the National Park directors and the Water Basin Directorate directors in order to prevent, terminate, or remediate environmental pollution (Article 158-169).

On a regional level, some authorities have been promoting the creation of a hydro-electric dam in the Mesta River Basin. Because most of the runoff which feed the Mesta/Nestos River is in Bulgaria, there is a sense of entitlement to use the water productively; however there are no big dams in Bulgaria yet because of the relief, terrain, and land use. If a dam is built, the locality will lose arable areas.[613] However, to cover the water needs of drinking water (domestic), irrigation, electricity production, and industry, the Blagoevgrad area would need a large dam of around 200 cubic meters capacity or more. There is one planned, but no official design. It would be about 10 to 40km after the "Eleshnitsa Road", the between Razlog and Gotse Delchev. The preliminary research for such a dam has been done, and it has been discussed and proposed a lot, but this stopped. The preliminary cost was ~$450,000,000 which is very high. This cannot be realized by only 2 or 3 municipalities alone – it requires financing and planning at the national level.[614]

The proposed new dam proposed would change the ecological richness of the territory. According to the local water council of Razlog, the artificial lakes will improve the climate in the region and make it less harsh in the winter. It will also have a recreational purpose. It will only be 300m away from the highway going from Drama, Greece, through Razlog and Blagoevgrad, all the way to the capital of Sofia. The artificial lake will be suitable for supplying water for golf courses and other entertainment. The flooded land will need to be compensated for. Because there is a hill which is 90 m above the city level, the water will be high and will be able to irrigate 80 hectares of farmland and have a small hydropower station. The plan is for a small dam with approximately 1.5 million cubic meters. However, it needs EU funding to be realized, so

[611] Republic of Bulgaria, Ministry of Environment and Water, "Guideline on the Control of IPPC Permits." Sofia, 2003.
[612] Republic of Bulgaria, National Assembly, Environmental Protection Act, State Gazette No.91/25.09.2002, corrected, SG. No. 96/2002. Available at http://www.moew.government.bg/index_e.html
[613] Personal Communication, Prof. Roumen Arsov, Dean of the Faculty. of Hydrotechnics, University of Architecture, Civil Engineering and Geodesy, Sofia, Bulgaria, July 21, 2006.
[614] Personal Communication, Alexander Yanef, Chief expert of regional development, Administration of Blagoevgrad Province, Bulgaria, July 19, 2006.

it must be approved at the national level to get it. [615] The municipality of Bansko supports the Razlog water plans, as they would welcome the water for irrigation use.[616]

Currently, some of the 'excess' river water is redirected to Evros River Basin (in Greece, called the Maritsa River). The transfer happens at 1300m elevation.[617] There is a large hydroelectric station in the Evros basin, and it is still only using around 50% of its capacity because there is not enough water for running the cascade fully. The diversion of more water to this station would increase power generation.[618] Because Bulgaria must close some nuclear stations around the country, they must compensate somehow The diversion to Evros has been proposed in order to compensate some amount of electricity by running the station there at full capacity. It would be impossible to build a large dam on the Strymon River because of infrastructure objects on the river, however in Mesta, it is possible. Moreover, there is a local need for irrigation and water constructions which could be aided as well.[619]

6.2.2.2 Environmental Regulation Policy

Bulgarian environmental laws and regulations have been changing frequently because the government was trying to harmonize to the EU standards, but also because of the effect of frequent changes in political parties. The poor judicial system has been weak in enforcing the regulations which are in place, and the penalties do not deter many from polluting because they are too low.[620] However, most water policy and regulations are developed in accordance with EU directives, as discussed in Chapter 4.

Fifteen years ago, Bulgaria had one of the strictest water pollution laws, but didn't have the know-how to implement it.[621] A new Water Act was adopted which increased the interests of public and private company for public-private partnerships. Parliament originally adopted this Water Act in 1999 before the WFD. In 2000 when the Water Framework Directive (2000/60/EC) needed to be adhered to, they ended up making many amendments to harmonize the Water Act with the WFD.[622] This Water Act has been amended at least yearly since it was first promulgated in 1999, and many companies have been confused by the contradicting regulations and requirements which keep changing. The conclusion is that legislation should be improved and that the

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[615] Personal Communication with members of Razlog Water Council, July 19, 2006.
[616] Personal Communication with Mayor of Bansko Municipality, Bulgaria, July 20, 2006.
[617] Personal Communication, Prof. Roumen Arsov, Dean of the Faculty. of Hydrotechnics, University of Architecture, Civil Engineering and Geodesy, Sofia, Bulgaria, July 21, 2006.
[618] Personal Communication, Alexander Yanef, Chief expert of regional development, Administration of Blagoevgrad Province, Bulgaria, July 19, 2006.
[619] Ibid.
[620] Personal Communication with Milkana Mochurova, BAS Institute of Economics, Sofia, Bulgaria, July 18, 2006.
[621] Personal Communication with Manolis Stefanakis, the then President of the American Farm School. Thessaloniki, Greece, July 11, 2005
[622] Personal Communication with Milkana Mochurova, BAS Institute of Economics, Sofia, Bulgaria, July 18, 2006.

responsible body should be clear and should stay stable. The new Waters Act[623] should regulate the most important issues so there are not as many issues regulated by bylaws, as is currently the case. There needs to be a better balance between law (which should be hard to change) and bylaws (which are easier to update).[624]

The Water Act gives the opportunity for different stakeholders to be represented on local and national levels – but this potential is not used in practice and the benefits of participation are not gained. A study showed that the Basin Directorates are very open and enthusiastically willing to cooperate, as they helped disseminate the study questionnaire and gathered companies for trainings on WFD and Water Act implementation. At the national level, the MoEW was also willing to cooperate.[625]

The EU Phare program supported one project on the first stage of planning the river management of Mesta, as it was a transboundary project. The Ministry of Regional Development was responsible for conducting this project. The draft program was completed, and the second stage for the implementation of finding a company to implement the program was occurring in 2006.[626] At first, because Bulgaria was not yet part of EU, the river management plan was developed only for dealing with the Bulgarian portion of the Basin, with plans to develop an integrated management plan with Greece when Bulgaria joined the EU. In 2005 there were several meetings organized for collaborating on the plan with Greek and Bulgarian authorities responsible for management. The MoEW directs the Bulgarian portion of the joint work for this collaboration.[627]

Nationally, there are two urgent deadlines for Bulgaria regarding the WFD: one for the creation of WWTPs for settlements of 10,000 people or more, and another deadline for small settlements of 2,000 – 10,000 people. For the WFD, Bulgaria must have some 450 WWTPs built, but only had 63 installations as of the interview in 2006. Settlements with less than 2,000 people will not have WWTPs, but rather the project will deal with these small settlements by applying small-scale or simple technologies (such as wetlands), which are easy to operate.[628]

At the regional level, the WABD will be involved with accomplishing the policies of the MoEW. Modest water pricing is instituted through WABD, which gives permission to citizens of the region for everyday water use. It is around US$50 for a permit to withdraw water, which is seen as more of a symbolic fee. Applications must conform to certain design parameters before getting permission. People pay very little for water

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[623] For the English translation of the Bulgarian Waters Act, please see http://www.mee.government.bg/eng/gzakone/gzakone/docs.html?id=190637

[624] Personal Communication with Milkana Mochurova, BAS Institute of Economics, Sofia, Bulgaria, July 18, 2006.

[625] Ibid.

[626] Personal Communication, Bladimir Dinov, ing., Director of West Aegean Basin Directorate, July 19, 2006.

[627] Ibid.

[628] Personal Communication, Prof. Roumen Arsov, Dean of the Faculty. of Hydrotechnics, University of Architecture, Civil Engineering and Geodesy, Sofia, Bulgaria, July 21, 2006.

drawn from the river stream for irrigation, industry, etc. However for water which is collected, transferred, purified, then it costs more, at around 2 stutinki per cubic meter (0.02 Bulgarian Leva, or 0.01 EUR).[629]

The WFD is mainly interested in water quality, ecosystems and maintenance,[630] but the Bulgarian policy is developing Water Economy Balance Management Plans for each basin, which are more focused on water-use schemes. The Bulgarian Academy of Sciences is working for MoEW, studying the water resource balances of major Bulgarian catchments. Of the 14 main transboundary catchments, BAS is preparing four of these water resource economy balance management plans.[631] Users estimate their use, calculate the balances and reliability of the supply of the demand in the future (to 2015), and the probability of reliability of supplying the demand. If there will be shortages, the study must attempt to recommend how to manage such a shortage. Using Geographical Information Systems (GIS), it is easier for water users to access information about their supply. Currently BAS is implementing this system for the Ministry because they do not have the internal expertise to do it themselves, and they need to use the new methods and technology to implement this policy. [632]

There is a perceived lack of balance between local needs and decisions and the national level's decisions. For example, river flooding in the Glasne River from Bansko causes many problems, but there is no proper dam for the regulation of flooding. The Razlog Water Council has proposed a dam with preliminary research for the location and physical parameters. It was accepted by the Municipality of Razlog, but the national ministries did not react. Also, in August 2005 there was flooding near Churna Mesta, and to reconstruct the damages, the government only supported funding for local reconstruction in Yokoruda – not all the places which were affected, and the reconstruction was mostly cosmetic in nature and did not implement any permanent solutions. Still, up to now there are no decisions to construct the dam to stop flooding. Using only river corrections and regulations will not solve the problem – the council believes the dam is needed to resolve the problem. The concrete proposal could be financed through relevant financing, especially for construction from EU structural funds. There is the belief that Greece was allowed to solve their water shortage and flooding problems for the next 150 years with the construction of the Thisavros and Platanovrisi dams using EU funds, and the local Mesta region would like to do the same.[633]

6.2.3 Coordination between Institutions and Policies

There seems to be a lot of effort going into coordinating development with the environment, however most of this seems to be a result of the pressure to conform to

[629] Personal Communication, Bladimir Dinov, ing., Director of West Aegean Basin Directorate, July 19, 2006.
[630] See Chapter 4 for more details about the WFD
[631] Personal Communication, Ohanes Sànturdjan, Prof. DrSc. Director of Institute of Water Problems, Bulgarian Academy of Sciences, July 18, 2006.
[632] Ibid.
[633] Personal Communication with members of Razlog Water Council, July 19, 2006.

the EU regulations and values. The policy thrust toward EU approximation has meant that environment could not been left out of the picture, however it does not mean that the policy implementation is occurring in an environmentally-conscious manner, as intended by the EU. Most of the reductions in pollution since Bulgaria's transition from communism have resulted from the reduction in business, not the improvement of facilities, production processes, or conservation processes. As the industrial development picks up, the gaps in coordination will become more apparent.

The relative poverty in the Mesta region means that economic development, increased employment, and improved standard of living have been given priority. While the Mesta region is forced to pay attention to integrated water resource management through national legislation and international projects, the region still sees the water resources as something that should be exploited to its full potential. This is apparent in the desire to dam and divert resources for tourism, hydroelectric power generation, and for agriculture by expanding irrigation networks.

Similarly in agriculture, they are not really using agrochemicals now because most farmers are too poor, but when the EU begins giving them subsidies, or if they are able to afford them, it might become an issue. [634] Indeed, EU policy subsidizes farmers to buy fertilizer, which pollutes, and then subsidizes the clean-up of the pollution. The incentives for organic or less-polluting production methods do not yet outweigh the incentives for greater production volumes, although the Bulgarian government has been trying to promote these. While irrigation infrastructures are old and inefficient, the regional priorities have not in been improving the system because of the large costs and belief that water resources are plentiful. If water for agriculture is priced at a value that more reasonably approximates its value, this may become a greater priority.

In industry, the focus has been on constructing municipal waste water treatment plants which can treat the effluents of the factories in the Mesta River Basin, rather than on reducing the pollution by improving the technologies and processes used in the industries across the basin. While people know of violations of environmental policies, such as illegal dumping of wastes in the river (as with the paper mill which dumps wastes whenever the river floods), policies are not in place to help the companies change their processes to prevent the violations through technology adoption and use.

The construction of appropriate waste water treatment plants has been slow to catch up with the growth of human settlements and increased tourism in the region, and there seems to be little concern about minimizing the pressures from water withdrawals for human use.

6.3 Policy Coordination and Cooperation between Countries in River Basin

Greece and Bulgaria currently have an institutional and legal framework set up for managing water resource issues in their respective sides of the Mesta/Nestos River

[634] Personal Communication with Milkana Mochurova, BAS Institute of Economics, Sofia, Bulgaria, July 18, 2006.

Basin, and through a variety of international treaties and institutions (namely the EU) have a set of guidelines for managing the transboundary aspects of the basin. Indeed, the institutional and legal framework for transboundary coordination and cooperation in the Mesta/Nestos region is the strongest for any of Greece's agreements with Bulgaria, and there is a long history of transboundary diplomatic relations between the two countries (outlined in greater detail in Section 5.1.4).

The coordination of technology adoption and use policies and environmental regulations for a transboundary region can be accomplished in one of two ways. Either there will be an extension of each country's respective national coordination of policies to the localities, or, the region will use the transboundary issues of concern as a way to focus on the integration of policies in the process of solving their transboundary concerns. For the Mesta/Nestos transboundary region, it appears that the integration of policies, while not complete, have been pushed along by the focus on transboundary programming from the EU and bilateral efforts.

The main vehicles for cooperation are through the 1995 Agreement for the waters of the Nestos/Mesta River, the Nestos-Mesta Euroregion cooperation, and a variety of EU-led and funded programs (See Section 2.3) for the development of cross-border infrastructure and cooperation (Interreg, Phare-CBC, etc.). However, there is little actual coordination going on over the management of the water resources on a regular basis, as envisioned in the 1995 agreement. However, these agreements are not all being implemented in the manner they were intended, and perhaps not at all.

Greece and Bulgaria's Cross Border Cooperation over Blagoevgrad and the northern parts of Greece is one of the oldest CBC projects, beginning in 1994.[635] Phare CBC was introduced to the border region to help overcome specific development problems and to help integrate more closely with the EU and with the Bulgarian economy itself. [636]

6.3.1 Water Resource Coordination

The 1995 agreement between the Greek and Bulgarian governments was designed to create a basis for coordinating water resource use in the Mesta/Nestos River Basin. The different interests for the water resources in Greece (for hydroelectric and agriculture) and in Bulgaria (for agriculture and tourism) have lead to difficult negotiations in the past.[637] However, there are some common goals for both sides of the border, such as developing tourism in the area, and especially ecotourism, which could give incentives to preserve the river basin.

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[635] Personal Communication with member of Ministry of Regional Development and Public Works. Sofia, Bulgaria, July 18, 2006.

[636] The European Commission Representation in Bulgaria, "PHARE Programme." Accessed on July 30, 2006 at http://www.evropa.bg/en/del/eu-programmes/additional-information/phare-programme.html#Element4805

[637] Personal Communication, Jacques Ganoulis, UNESCO/HELP, AuTH Professor. Thessaloniki, Greece, July 11, 2006.

The cooperation is not really functioning as intended, with coordination meetings required by the 1995 agreement not occurring regularly, and the monitoring and sharing of data parameters only occurring sporadically on both sides. However, the hydro-economic committee met about the Mesta/Nestos River and came to an agreement in Spring 2006 about the specification for data for different basin parts (i.e., coastal, lake, river, and transit waters between land and coastal waters).

Also, another problem is that the negotiations and laws are not up to date on the coordination of water resource use. The original 1995 agreement was made in a top-down fashion while a bottom-up formulation of the transboundary framework would have been more effective. Both sides did not ask the stakeholders how it would affect them.[638] One of the results of this is that both sides have misperceptions of what the other country's intentions are in terms of the water resource use. On the Greek side, the perception is that this is because Bulgaria does not particularly care to cooperate, but rater wishes to divert the river for its own economic gain. This is clearly unsustainable for the transboundary management of the basin. Also, it is perceived that Bulgaria's motivation for cooperation is because of its status as an EU candidate, and it wants to have a good relationship with Greece because of the good-neighbor policy, and of course there is a common Balkan culture which ties the two localities and countries together.[639] On the Bulgarian side, the perception is that Greece has built up these large dams to set a precedent which will prevent Bulgaria from developing its water resources and its economy in the area. There's a sense of "unfairness" which results from each side of the basin looking at how to maximize its own well-being, while the proper integration of policies would look for how to maximize all of the basin's well-being through the sustainable management of the Mesta/Nestos River.

There are a variety of transboundary projects and agreements which include the Mesta/Nestos River Basin region and its water resources. For instance, the Water Window Project for Biodiversity and Water Quality is targeting the Greece and Bulgaria cross-border area, including Mesta/Nestos, Struma/Strymon, Arda, Maritsa/Evros, and Tesdja. The Project was launched by the Bulgarian Ministry of Regional Development and Public Works. It is targeted towards very small settlements along the border and includes a budget of 3 million Euros for the next two years, with the bids for implementation opening in Oct/Nov, 2006. The task was to suggest proper technology and prospective settlements. The funding is 90% from the EU, with 10% from the local community and national governments.[640]

6.3.2 Social and Economic Cooperation

Cooperation between the Bulgarian and Greek sides of the Mesta/Nestos River Basin has been relatively successful in developing stronger ties between the business sectors. This has been done especially through the Euroregion Nestos-Mesta, which encompasses most of the Mesta/Nestos Basin. The entire Bulgarian portion of the river

[638] Ibid.
[639] Ibid.
[640] Personal Communication, Prof. Roumen Arsov, Dean of the Faculty. of Hydrotechnics, University of Architecture, Civil Engineering and Geodesy, Sofia, Bulgaria, July 21, 2006.

basin is included, and only the Drama Prefecture is officially part of the region in Greece (See Figure 36).[641] In recent years, neighboring communities to Drama have requested access to the cooperation activities, demonstrating its success. A Euroregion is a designation of important transboundary regions between at least one EU member. The region was designation began with a planning process began in 1989 in an effort to link people who were separated by only 70km, yet isolated by borders and mountains. In 1997, an agreement was signed by the regional authorities from the Mesta River valley and Drama.

[641] The lower part of the Nestos River Basin is excluded, comprised of Xanthi and Kavalas Prefectures.

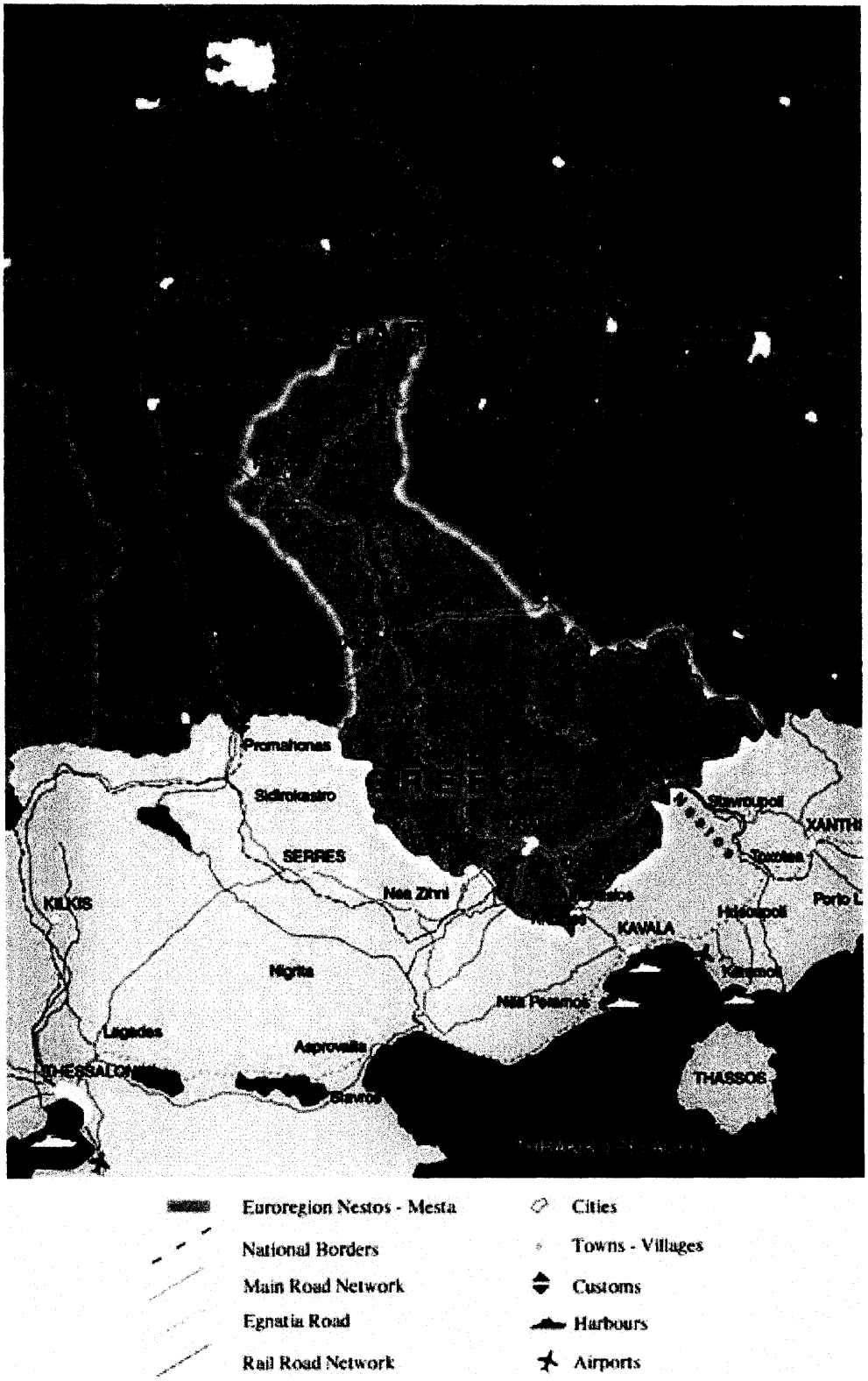

Figure 36: Map of Cross-Border Nestos-Mesta Euroregion
(Source: Euroregion Nestos-Mesta Homepage, http://www.euroregion.gr/)

6.3.3 How the Mesta/Nestos Basin Policies Could Lead to the Integration of Environmental Technology Adoption Policy and Environmental Regulatory Policy

The cooperation on integration of environmental technology adoption policy and environmental regulatory policy can be potentially furthered by following, or being incorporated into, the structure of the Euroregion Mesta-Nestos cooperation, which is organized through two parallel institutions in each country, called "Border Region Associations". Each Border Region Association must operate under its respective national laws, yet both sizes have agreed to take the form of non-profit, non-governmental organizations.[642] While the two organizations are separate entities, the Administration of the organizations includes a common Administrative Council, as well as six Common Working Groups which study and organize the variety of activities in which the organization is involved. These are called Activity Fields, and are comprised of: (A) Communication, Exchange of Information and Networking; (B) Economic Transport and Infrastructure; (C) Tourism-Entertainment; (D) Culture and Society; (E) Environment and Agriculture; and (F) Transfer of Technology. Figure 37 below shows the mirrored structure of the institutions.

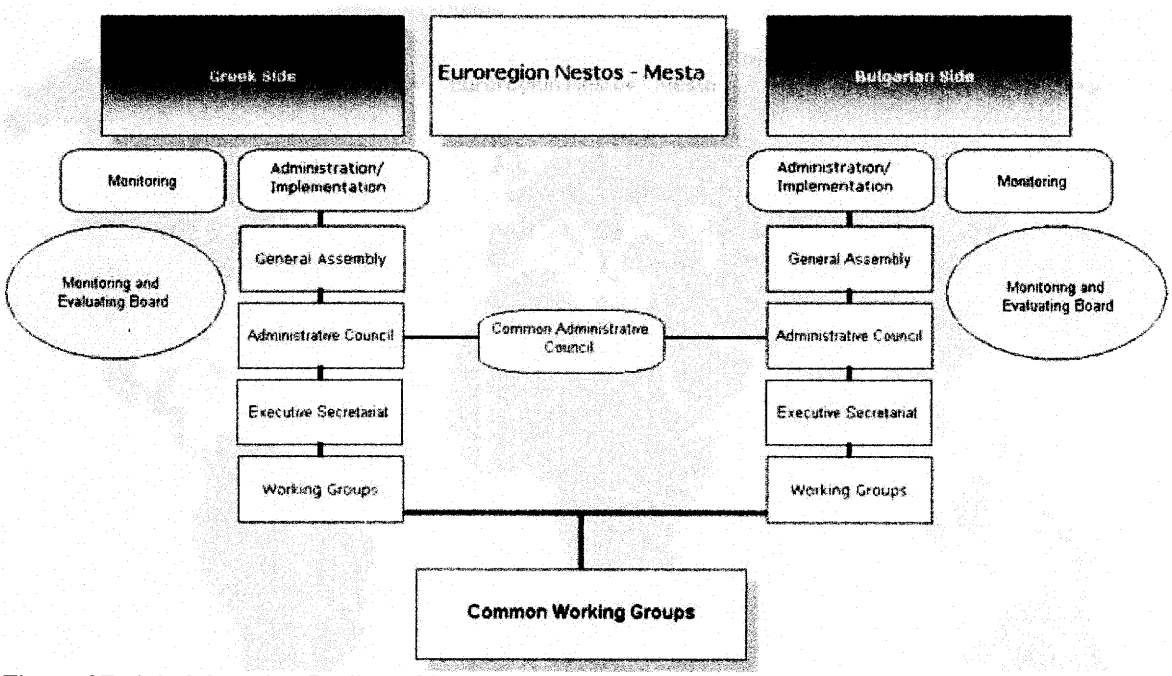

Figure 37: Administrative Bodies of Euroregion Nestos-Mesta
(Source: Euroregion Nestos-Mesta Official Website, http://www.euroregion.gr/euroregionen.htm)

In 1998, the Euroregion Nestos-Mesta became an official member of the Association of European Border Regions (AEBR).[643] Through this broader forum, the Mesta-Nestos Euroregion has benefited from interacting with others involved in transboundary regional

[642] Euroregion Nestos-Mesta Official Website, "Organizational Structure and Operations." Accessed on July 29, 2007 at http://www.euroregion.gr/mbgr.htm
[643] Association of European Border Regions, http://www.aebr.net/

cooperation within the European context. In October, 2005, the Euroregion Nestos-Mesta hosted the AEBR Annual Conference on "Contribution of Cross-Border Co-operation to Implementing the Lisbon Strategy" where the value-added to the goals of reaching the Lisbon Strategy's three pillars of economic growth and competitiveness, social inclusion and environmental concerns was discussed drawing from the cross-border cooperation experiences of AEBR members.[644]

The various communities included within this Euroregion are intended to cooperate on social, economic and environmental concerns to the region. The efforts of the Nestos-Mesta Euroregion seem to have been most effective in adding to the economic activity and social cohesion of the region through establishing new cross-border business relationships, increasing the active involvement of local citizens and authorities, and participating in social, cultural, or religious activities together.[645]

The Euroregion cooperation seems to be helping to integrate policy in this part of the Mesta/Nestos River Basin region through coordination over economic development and some technology transfer which would improve the region's sustainable development. Thus, the coordination of technology adoption and use policies, and environmental regulations for the transboundary region can in fact begin at the local level, through the Euroregion/AEBR structure. While the extension of each country's national policies has set legal and regulatory frameworks for the development of the respective Border Regions and their activities, it will perhaps be the cross-border efforts to first improve transboundary environmental conditions through environmental technology adoption and use. With a successful implementation, the environmental technology adoption and use policies that were used at the transboundary regional level will spread to other localities within each country and eventually to the national policies of each country.

[644] Association of European Border Regions, "Contributions of Cross-Border Cooperation to Implementing the Lisbon Strategy: Final Declaration." AEBR Annual Conference, Oct. 20-21, Drama.
[645] Euroregion Nestos-Mesta Official Website, "Organizational Structure and Operations." Accessed on July 29, 2007 at http://www.euroregion.gr/

7 Regional Technology Cooperation and Policy Coordination

There is substantial advice and support available to the Southeastern European region. However, the technological advice for development and environmental sustainability is not coordinated. This section provides a framework for coordination and cooperation based on the analysis of the case study on the Mesta/Nestos River Basin.

Both the parties themselves (the local, regional and national authorities within a transboundary region, such as SEE), and the donors and development partners must deal with the gaps created by a large number of technical needs, a lack of regulatory infrastructure, and the poor coordination between environmental technology adoption and use, and regulation. There are parallel roles for both parties and the external organizations in building a more integrated coordination of the goals of economic development with those of environmental sustainability for the region. Solutions are broad-based, and must involve a combination of industry incentives, regulatory system strengthening, and institutional development.

Section 7.1 provides an overview of the barriers and gaps in system coordination.

Section 7.2 looks at the role of the parties in a region themselves, and how they can deal themselves with overcoming the barriers to technology adoption and use, regulatory policy coordination, and regional cooperation mechanisms.

Section 7.3 explores the role of external organizations in contributing to this coordination process.

7.1 Overview of Barriers and Gaps in System Coordination

From the discussion in Chapter 6, we see that both Greece and Bulgaria are trying to implement the European Union's policies which require an integrated approach to development and environmental protection. However, at the local level the sectoral policy implementation is more likely to include after-the-fact pollution control systems rather than a truly integrated approach including process and technology development and adoption for pollution prevention.

Recall that in Section 4.1.4 we discussed how pollution can be prevented or treated at different points within the water-use cycle. The diagram showing these intervention points is reproduced below in Figure 38.

The most preventative option is to reduce the use of water-polluting inputs into the industrial process (or other sectoral activity), as well as reducing the amount of water resources required. The second approach is to treat pollution effluents from a process before discharging the waste waters, which will reduce the outgoing pollution. While the preferred solution of the EU is a pollution prevention approach, it is more common to see the second approach taken. IPPC regulations dictate the maximum levels of effluents leaving an industry, based on Best Available Techniques, with the intention to stimulate the use of such technologies. However they do not require the process to be the most effective or pollution preventing technology, only that the pollution output meets those standards. In order to stimulate a true preventative approach, rather than regulating outputs of an industry or process, the maximum resource and toxic inputs should be regulated based on the most efficient technologies in order to force industries to find innovative processes which minimize water-resource use and toxic-input use.

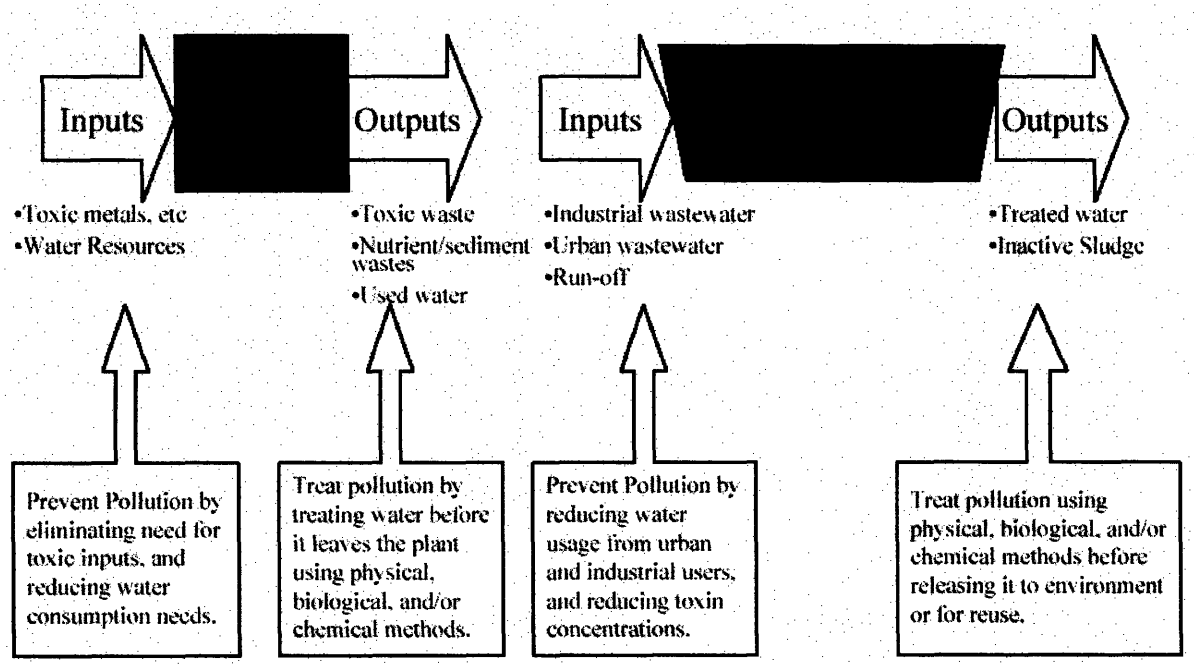

Figure 38: Reproduction of Figure 11 from Chapter 4.
Water pollution can be prevented or treated at various stages in the water use cycle. The notion of pollution prevention and pollution treatment is different depending whether using the industry or the treatment plant as the reference point for inputs and outputs.

From the perspective of the waste water treatment plant, the IPPC regulations do in fact limit their pollution inputs of wastewater coming from industries. However, the WWTPs know the limits of their pollution load based on the permits assigned, but may have little incentive to further reduce their inputs through interacting directly with the industries. Many WWTPs are being operated by private

contractors for the government, so they are not compensated for treating lower volumes, but rather greater volumes of wastewater. Moreover, the WFD-related regulations on water quality standards will determine how much treatment is needed in the WWTP facility, and there is little incentive for the WWTP to go beyond these guidelines because of the extra cost without benefit.

The major barrier to system coordination is due to the fact that, despite good intentions of considering the impact of activities on the environment, economic development is the primary goal (and driver of initiatives) of local policy-makers and administrations. There are many consequences of this realization.

To local level policy implementers and citizens, development means something very different than it does to national planners. Agricultural development means getting more irrigation infrastructure and more water to farmers so more farms can become productive, and so more food and wellbeing can be enjoyed. Industrial development often means keeping existing antiquated factories alive as long as possible, operating as cheaply as possible, so that jobs can be maintained in the area. While national and EU policy tries to impart the importance of wise use of water resources, on the local level water is considered a resource to be fully exploited for economic benefit, and not 'wasted' by letting it be. For the tourism sector, increased tourism means bringing as many people as possible to visit, and building as many hotels as possible to accommodate them, without foreseeing the impact that may have on the environment or on future tourism. This can result in environmental integration as an after-thought, or a requirement that is only dealt with when needed, and often by applying end-of-pipe technology.

7.1.1 Sectoral development and policies for technology adoption and use

Another barrier to truly integrating industrial and sectoral development with environmentally oriented goals is that changing business practices in the Balkan region does not come easily. Old organizations, many which were set up under communist, planned economies, are either set in their ways, have little knowledge or support on how to change, or have little financing to upgrade their technology and/or processes. Expertise in technology modernization and cleaner technology is hard to come by in these regions.

There are few who understand the situation in a multidisciplinary context. While national governments support the concept of integrated pollution prevention sectoral policies, they also do not have extensive experience or appropriate institutions for implementation. The general knowledge of technological options is limited, and most focus is on pollution control. For water resource management, this means building WWTPs and occasionally following up on monitoring. The distinctions between building water treatment systems to remove pollution and focusing on the primary sources of pollution (industry, agriculture, and mining) in order to prevent them are not made. It may be that the building treatment plants

is much more tangible and obvious as a solution, rather than rethinking the processes creating the pollution to begin with. Administrations on both sides of the border discussed the importance of promoting organic crop production in order to prevent agrochemical pollution; however it did not seem to be an active part of the agricultural sector yet. In the end, pollution prevention technologies do not seem to be a focus of local authorities.

There are currently very few WWTPs for the human settlements within both sides of the Mesta/Nestos River Basin. This is a priority of national and international funding, as it is a crucial part of the EU Water Framework Directive. Several projects were in the planning stages, and some were already in construction.

Based on the technical assessment of the Mesta/Nestos region, the technology that they are exploring tends to be of the variety which can clean up the pollution being created from human settlements and industrial activity, i.e., pollution control wastewater treatment plants. The local authorities and citizens on both sides of the border are looking to increase water resource use through expanded irrigation networks and tourism activities. There was little discussion of upgrading the existing irrigation networks and freshwater residential delivery networks in order to reduce the demand.

The scientific communities on both sides of the border, however, understand the importance of water resource conservation and protecting the region from pollution. They are capable of monitoring, analyzing, and reporting the status of quantity and quality on both sides if given the resources to do so. However their knowledge and experience with promoting pollution prevention methods of industrial or agricultural production are limited.

However, the Bulgarian scientific recommendations demonstrate that they believe there is excess water available for exploitation since the country is allowing more water to cross the border into Greece than is required by the 1995 Agreement (i.e., 29% of annual mean run-off). Their future plans include increasing the use of water resources to aid in the development of the local region and to supplement the national electricity production through diversions toward hydroelectric plants in other basins or the creation of a new hydroelectric dam. These plans threaten to create an over-dependence on the river waters in the area, which may lead to conflict if, or when, the river's water resources become scarcer (due to seasonal droughts, or climate change). They are concerned with the quality of water mostly from human settlement waste water and industrial discharges. Agricultural pollution has been considered less of a problem in the region, as most farmers are too poor to use them, however the future impact may be significant. There are efforts to improve the crops chosen for production based on local conditions. While some Bulgarian scientists have been involved with promoting environmental management and pollution prevention in a previous project, it does not appear that there is much experience

with pollution prevention methodology in the scientific communities working in the region.

The Greek scientific community does not recommend the need for additional water infrastructure to be built, and is more concerned with the management of what is in place. They are concerned with the effects of the current large-scale dams which are in place, and how it affects the Nestos Delta by preventing the flow of sediments, whether it affects the water temperature and how that may affect the lifecycles of fish and crops. They are concerned with the quality of the water as affected by agrochemical usage and industrial discharges. The larger civil society movement is concerned with the protection of the fragile and important ecosystems, including the Nestos Delta. The scientific community has the know-how to implement pollution prevention solutions in the region; it is unclear whether there has been a concerted effort to implement these strategies with business or government partners.

There has been a lot of knowledge generated about the state of the river basin and how to pursue integrated management. There have even been projects involving firms and cleaner production methods; however the information often gets lost after projects are finished.[646]

7.1.2 Local awareness and demand for environmental regulation

Environmental goals in development policy are influenced by the primacy of the economic concerns discussed above. Local citizens seldom see the importance of co-optimizing environmental, economic, and social goals. This is especially true of developing countries, where affluence is not widespread, especially outside the major cities.

Environmental awareness has only recently taken root in local communities, and normally, affluence affects environmental awareness and action. When the average yearly income is below 4000 Euros GNP/capita, as it is in most of the Southeastern European countries, there is very little concern for environment.[647] When income is between 4000-7000 Euros GNP/capita/year, citizens know about the environment but don't care. In the range of 7000-12000 Euros GNP/capita, they are environmentally aware but not willing to pay, and when they are earning over 15000 Euros GNP/capita, citizens can afford to demand a higher quality of environment. This pattern of behavior can be shown in the environmental Kuznets curve, which demonstrates the relationship that describes the behavior of the countries over time as they develop, and implies that

[646] Personal Communication with Milkana Mochurova, BAS Institute of Economics, Sofia, Bulgaria, July 18, 2006.
[647] Personal Communication with Marc Bonazountas, VP of EPSILON International SA Consulting, July 5, 2005

developing countries will reach some "turning point", at which point they will also begin to demand a cleaner environment as well.

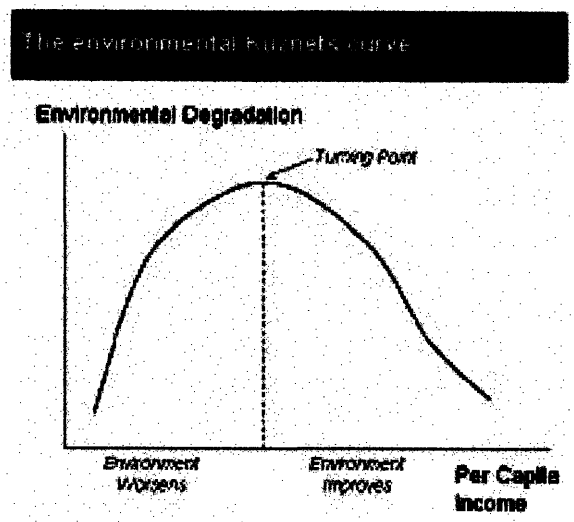

Figure 39: The Environmental Kuznets Curve is true for Public Awareness in SEE (Source: aBetterEarth, "Environmental Kuznets Curve." Available at http://www.abetterearth.org/Core_Concepts/CoreID.2529/Core_detail.asp)

This curve, as shown in Figure 39 above, demonstrates that with measures of increased economic development (shown on the horizontal axis), the amount of environmental degradation (on the vertical axis) increases until, at some turning point, the higher demand for a better quality of environment begins to decrease the amount of environmental degradation. In Southeastern Europe, advances in regulations due to EU approximation may prevent the excessive degradation of the environment, but the lower pre-capita income does still correlate with the willingness to pay to prevent or control pollution.

Moreover, it is even more difficult for them to think of optimizing the situation for citizens of the neighboring country as well. Citizen action and participation are not yet normal practice, so even local/regional government leadership may not yield sufficiently strong results. However, the process of EU integration has improved environmental awareness greatly, and has given support to the minority in these countries which have the foresight to see the importance of taking action early and preserving the natural endowment of the region.

7.1.3 Integrated management capacity

There is a lot of room for improving the capacity for integrated management of the Mesta/Nestos River Basin. While scientific data is easily generated with the aid of the well-qualified scientific communities in both countries, data are not always gathered and may not be used properly to make integrated decisions.

There is poor communication and data sharing across the border. There are miscommunications about each other based on hearsay or lack of information. Better communication would be helped through more cross-border interactions and also joint responsibility for the region.

There are data and details for the region which seems to be repeated in every project, without a detailed analysis (some of this has been improved through this research). One issue is the language barrier which may contribute to the problem of poor communication. Many consultants and researchers work through translators, or in a third language (English), which may reduce the effectiveness of exploring important management and cooperation options. Additionally, there is very little information available online about the current projects occurring in the region or environmental protection that is needed. With so many projects and such a vast amount of experience in the region, it would be of huge benefit to consolidate the projects, results, and lessons learned for the Mesta/Nestos transboundary region and disseminate that experience. In addition, there may be a lack of internet connectivity in the mostly rural communities which would preclude an extensive website for sharing information from being the ultimate solution to communication. Still, it would help local authorities, consultants, and regional planners to better assess what has been done and what is needed.

The local authorities both have limited capacity due to inexperience in coordinating environmental concerns with sectoral development policies, leading to sustainable development policy implementation. Both localities suffer from the brain-drain to the major capital-cities and abroad. Young talent leaves the region for education and work,[648] and many experienced citizens leave their countries for better opportunities and pay.[649] This can be positive if the young people are trained elsewhere but return to the region with greater knowledge and understanding of integrated management techniques.[650] However it is more often the case that there are not enough positions in the regional and local administrative bodies, or that the pay is too low and the circumstances un-motivating.

Overall, there is a need for more trained and educated people who are willing to work in the locality. This could be accomplished through higher compensation or subsidization of employees in the implementing agencies. Additional training for existing and new administration is crucial in the areas of integrated management, current laws and regulations, proper monitoring practices, and even language for cross-border communication. If either government is serious about making environmental goals integral to economic development, they need to re-train local communities to think and act with that perspective.

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[648] Personal Communication with members of Razlog Water Council, July 19, 2006.
[649] Personal Communication with Giorgos Sideris, Balkan Geophysical Society, June 10, 2005
[650] Dominique Guellec, "Brain Drain." The Science and Development Network, Accessed August 16, 2007 at http://www.scidev.net/dossiers/index.cfm?fuseaction=dossierfulltext&Dossier=10

7.2 Role of the Parties (National, Regional, Local Governments)

The parties in Southeastern Europe must simultaneously deal with technical needs, regulatory infrastructure weaknesses, and lack of coordination between institutions, laws, and policy directions. These barriers, and ways to overcome them, are described in this section.

7.2.1 Regional Technology Use Cooperation Barriers

Parties have a role to play in reducing the barriers to environmental technology use cooperation in the region in order to improve their own prospects for sustainable development. As their neighbors improve the condition of the environment, they will jointly benefit. As the region's industries become more productive with lower impact, investment risk in the region will decrease and foreign direct investment will increase. *All levels of government (local, regional and national) must be involved in the process in order to reach the larger multinationals and smaller firms operating at local levels.*

Currently, industries (and other sectors) in Southeastern Europe are dealing with a slew of new regulations simultaneously on competitiveness, free markets/privatization, environment, health and safety. In Greece, they've had some time to adjust, but slow and poor implementation of EU directives has kept businesses from fully realizing the changes necessary to meet these new requirements. The states working toward EU accession are forced to follow EU priorities, but the self-interest may differ at each level (local, regional, national). The result is that there are contradictory directions for technology development.

In order to deal with all these changes in regulations for the various sectors, *national and regional priorities need to be clearly identified for greater emphasis, and sector-specific advice should be available and disseminated.* Unbiased technological advice that is applicable specifically to SEE should be provided, albeit from a government agency or a non-profit or non-governmental organization.

The Southeastern European countries have developed a tradition of competing on low-cost production methods and with short-term survival solutions. This needs to transition to long-term sustainability solutions, which can maintain the environment, and conserve the resources which allow them to be productive. Thus, *there needs to be sector-specific training to instill this long-term perspective to industries.* The training, however, *needs to be seen as valuable to the organizations*, which is difficult to do. If there is an emphasis promoted for economic gain, then there may be more interest. In order to incentivize businesses to participate willingly (and not necessarily by legal obligation), local and national authorities could create economic incentives for long-term

performance measures that go beyond regulations and require change in technological processes.

There is a lack of knowledge about integration of environmental technologies in the various sectors. Many times, this is because information is coming from self-interested parties, or in a very top-down fashion from national or supra-national authorities. Donors fund projects with particular goals, technologies, and solutions, in mind. Companies which are trying to sell their products and technologies are often the ones that bring technology option information to the localities. For example in agriculture, the majority of agronomists who give advice to farmers on what seeds and agrochemicals to purchase are working for the agrochemical companies and pushing their product. *There is a great need for the Parties to develop independent advisory bodies within the country (or for SEE as a whole), not allied to monied interests, or as part of a government-institution not affected by internal corruption.* This body will need to develop the local, regional, and national-level understanding of what it means to have an integrated perspective.

Consultants may have a narrow view when approaching new projects, which is based on work they have already done for similar problems in the same place or elsewhere. Consultants who work for internationally funded projects are most often from the more developed countries outside the region because they have the experience and ability to successfully apply for tenders, often from the donor countries themselves (especially when this is a condition stipulated by the international funding).

Sometimes consultants will hire local sub-consultants who charge much less and know the region and the language best, but these groups often have little outside experience. Local consulting groups complain about this system where they end up doing the work, but most of the funding goes to external consultants because of the higher rates they are able to charge. Moreover, these consultants are often able to do much of the work on a project tender, but simply do not have the skill or the background to successfully apply and win tenders. There are some collaborations that do take place to help these local consultants gain the skills to do work in their own country, but the issue of limited capacity to deal with integrated solutions may still exist.

To improve the situation and the effectiveness of international projects, *there needs to be a collaboration of 'outsiders' and 'insiders' who together understand the technologies available, how to apply them, and what the current thinking and mentality is in the country.* This will promote knowledge transfer to the region, rather than a dependence on international advisors and projects. The Parties can contribute to this knowledge transfer through improving donor project specifications, and requesting the use of internal and external experts who can

implement holistic pollution prevention technologies for the project to be implemented.

The knowledge that should be transferred includes all aspects of integrated environmental management and sustainable sectoral development through the use of environmentally sound technologies. Some specific techniques to be transferred are how to calculate economies of pollution prevention and how typical environmental management systems work and are implemented. The method for solving problems needs to developed so that Parties can approach the problem with the right perspective vis-à-vis controlling the primary polluting activity versus merely treating the pollution (i.e., through water treatment).

A major barrier, which is often blamed for the slow development of environmental technology, is a lack of financing for such projects. Because SEE governments are stretched over many priorities, there is limited funding available in the national, and hence regional/local levels. Some of these governments have carried on a heavily centralized institutional structure, a remnant of the planned economies of communism, and regional and local governments have very little flexibility in developing their own projects. These factors combine to prevent the implementation of necessary infrastructure projects, as well as smaller-scale training programs for businesses of a local community.

Moreover, because many industries are running on a low-cost structure, they do ot have excess funds for investing in technology upgrades and redesigning of production processes. It is often very difficult for small businesses to get loans in the region, as it is hard to prepare loan applications and sufficiently prove to banks that it is a worthy pursuit. Financial institutions in the region may not even understand the implication of implementing pollution prevention techniques. This prevents the implementation of necessary industrial technical changes which are needed.

There is an attitude by many in the region that all that is needed to fix their environmental and social problems is more money, and they will be able to solve them. While there are some cases that funding is the limiting factor, the reality is that many SEE countries are often unable to absorb large amounts of funding because the institutional and regulatory infrastructure is not in place, is ladened with corruption, and/or does not work efficiently.

However, a possible solution to the low availability of funds would be to *develop a revolving loan fund for use by industries (on a sectoral basis or more generally) specifically for the adoption of environmental technology and techniques.* Local and regional governments could promote the use of the fund to clean up polluting activities in the locality, including from local public utilities. This would best be done by an external organization, rather than a government agency, and could be open to the whole Southeastern European region. For this reason, the idea of

this financial fund is further explored below in Section 7.3 on the role of external organizations.

Governments could contribute to the process of developing and diffusing environmental technologies which could help the local industries work by *making investments in infrastructure to support an effective regulatory system*, including proper monitoring devices, information technology for data sharing and effective data use. They could take advantage of their rich academic infrastructures by *investing in research and development in environmental technology* and *encouraging partnerships between researchers and industries*. Furthermore, Parties could *invest in expanding the capacity of local, regional and national authorities to work with local industries* on the basis of reducing the impact of their activities.

7.2.2 Regional Regulatory Policy Coordination Barriers

The Parties have a major role in developing and enforcing the regulatory policy which promotes environmental protection, and hence, they also have a major role in reducing the barriers caused by the poor coordination of different regulatory policies.

Strong regulations are lacking throughout SEE. Even though most countries of the region have already codified EU regulations in their laws, the implementation of these regulations is another story. Often there are conflicting measures from within one ministry, or across ministries. More importantly, there are often conflicting measures within the legislation itself. Often the penalties which are actually legislated are too weak to be a disincentive to polluting activities. It is often less expensive to pay the fines (even repeatedly) then pay for the technological changes, especially with the limited knowledge of options that the polluter often has.

Poor regulatory performance also stems from a view that there is little purpose for the legislation itself, either because the implementers don't care for the EU-required reforms or they do not believe that they can truly have an effect. Administrations excuse poorly performing firms, turn a blind eye, or lack the capacity to monitor and enforce regulations. When the administration does take someone to court for regulatory violations, the weak, overloaded, and often corrupt judicial systems are slow to bringing justice, implement low fines, are bought off, or simply never get to hearing the case.

Thus, there is a major role for the Parties to *improve understanding among the public authorities about the significance of the environmental and pollution prevention regulations that are being implemented.* Additionally, there must be *education about importance of these goals to the general public throughout the region*, and more specifically, why they are required to adhere to the regulations. Because people see other individuals or industries getting away with regulatory

violations, they are more likely to push the limits, especially if they do not understand the purpose of the regulation.

A major barrier to effective regulatory policy is that often the government workers are ineffective because they are disappointed with the state of the government, they are paid extremely low wages, or they are unable to see change happening as a result of their efforts. There is often little change happening because there are not enough people working in the inspectorates and ministries to do all the work necessary to be effective. The average wages in many Balkan countries can be as low as US$100-$200 per month, and typically government employees are among the lower paid professionals. Unlike most of the SEE countries, in Greece there are more than enough state-workers with adequate pay. In this case, this makes them inefficient because the system is bloated. Additionally, people working in the Greek Ministry of Environment, Public Works and Physical Planning are blocked by the lack of support of the other ministries and public in general. Even when government agencies are involved with internationally financed projects, funding mechanisms from some donors forbid state-institutions to get the funds (to prevent corruption, etc). The employees' inability to see a way for things to get done eventually makes them give up trying, and many highly qualified employees leave to work for local or international consultancies for the higher pay and external opportunities.

The lack of interest by the public is disappointing to those trying to make a difference, including government workers. Awareness-raising campaigns, for instance in the Nestos Delta, have successfully made some people realize why they needed to protect it. By *showing the public why they can gain from protecting the environment and conserving resources, especially by demonstrating the economic benefit to them*, they are more likely to support regulations. Additionally, the support may be even stronger by giving them an additional incentive through market-based tools, such as a monetary reward for participating in recycling programs or local funds for the reduction of pollution levels.

Governments also complain about their lack of available funds to enact the programs necessary to stimulate development and protect the environment. The poor financing leads to low salaries for administration workers and not enough staff for the ministries and inspectorates. Ultimately, there are not enough resources to maintain enough qualified people to get the work done. Additionally, poorly paid and disgruntled workers are more likely to become corrupted or not care about the outcomes of their work. One possible solution would be to *give better pay or other incentives to attract more quality workers to the ministries and administrative bodies*. Another possible solution to *increase the number of people watching out for the environment would be to develop non-profit/non-governmental bodies to inspect or 'police' the local communities for violations of environmental regulations, funded by the local communities themselves or on a*

voluntary basis. This goes hand-in-hand with increasing the environmental awareness of local citizens.

What is lacking in the Balkans are 'concerted actions'. People don't speak out even when they are involved with a project using a stakeholders approach.[651] The parties must *create a concerted effort in the Balkans through developing participation in local communities and through educational institutions.*

7.2.3 Regional Cooperation Mechanisms to Surmount Barriers

There are several regional cooperation mechanisms present in the region, some which are successful and others which are not. Environmental technology adoption and use has not often been promoted through regional cooperation mechanisms.

The Stability Pact of South East Europe, soon to be renamed the Regional Cooperation Council (RCC), has housed many programs for development of democracy, economy and security in the Balkans. The environmental program, REReP, reaches into each of the SEE countries and attempts to share experiences from one project to the next. However, limited funding for the inter-governmental organization has led it to function more like a consulting firm – bidding on project tenders along with other private and non-profit groups.

Regional cooperation on trade has recently improved drastically. Through the support of the Stability Pact, the Central European Free Trade Agreement (CEFTA) was originally signed by many of the Central European countries in 2001, including Bulgaria and Romania, and last year it was expanded to include the rest of the Balkans. The CEFTA was signed in December, 2006, by all non-EU members in Southeastern Europe, and entered into force in June 2007.[652] The EU has strongly supported this process, although it is not a member to the trade agreement. While trade has been relatively free between EU countries and the Balkans, the trade within the SEE region has in many cases been restrictive due to many trade barriers. The CEFTA 2006 allows trade which is freer within the region through the liberalization of trade in goods and the modernization of trade rules.

Some small transboundary regions have developed successful policy coordination and cooperation on focused issues, such as the Euroregion Mesta-Nestos which encouraged economic and social ties between the bordering communities. This sort of coordination *promotes shared concern for the*

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[651] Personal Communication with George Zalides, Associate Professor, Agriculture Department, Aristotle University of Thessaloniki, Greece, July 11, 2006

[652] Stability Pact for South Eastern Europe, "Agreement on Amendment of and Accession to the Central European Free Trade Agreement (CEFTA 2006)." Accessed August 10, 2007 at http://www.stabilitypact.org/wt2/TradeCEFTA2006.asp

economic and environmental situation of the neighboring communities, and can be built up to include environmental coordination in technology adoption and use policies.

7.3 Role of External Organizations

External organizations can help a region to overcome gaps in connectivity, centralization of data sources, language barriers, and networking with appropriate experts. This section discusses how external institutions can further the integration of environmental policies with development policies which promote technology adoption and use, specifically through assisting the transfer of technology and knowledge.

7.3.1.1 Role of GWP

Sometimes external international organizations can serve as coordinating bodies like the Global Water Partnership has in implementing the Petersberg II/Athens Declaration Process. GWP has centralized much of the information needed for implementing integrated water resource management (IWRM). The PII/AD Process and GWP-Med have helped the region through developing the water basin inventory, along with the UNESCO/HELP program. IWRM techniques and experiences have been made accessible to the interested SEE Parties through a series of networking and educational workshops. The PII/AD Process was able to become more effective because GWP's coordination allowed an effective allocation of resources and knowledge.

While the GWP-Med and the PII/AD Process have been successful in coordinating useful trainings and collecting and sharing management information about all SEE water basins, the solutions looked at focused only on water-related issues and solutions. Some experiences included pollution prevention techniques; however the integration between economic goals and environmental goals is not always made explicit. More importantly, unless this external organizational process and related activities are continually funded by donors or the Parties themselves, there is a strong likelihood that the knowledge on IWRM which has begun to build up in the region will be lost.

7.3.1.2 Role for the European Union

The EU has taken a decisive role in promoting the sustainable development of the region as these countries are moving toward EU accession, and has been become the most involved in funding development projects in SEE. While technology coordination is a goal of the EU, it has not been fully realized even in member states, for example, in Greece and many others. Funding of projects is still often for specific purposes, such as necessary infrastructure development or cross-border cooperation activities. However with the structure of the new Instrument for Pre-Accession (IPA), there may be more opportunities for

coordination among projects. One of the major priorities for pre-accession programming is transition assistance and institution building (the other focuses of IPA assistance are cross-border cooperation, regional development, human resources development, and rural development). While one part of this institution building involves investment in physical and regulatory infrastructure, there is also a focus on the transfer of 'know-how.' This is done in large part through the Twinning programs and TAIEX (described below), and is focused mostly on governmental capacity.

The Twinning program began in 1998 to help countries which are close to becoming (or have just become) EU Member States to develop modern and efficient administrations. This is done through a sort of mentorship program whereby an expert from a Member State works on a specific project built around EU objectives directly with the candidate or potential candidate country, providing administrative and technical assistance.[653] Twinning has allowed EU Member State administrations to aid these countries working on EU approximation with specific projects which the EU deems vital to fully implementing the *aquis communitaire*.

The Technical Assistance and Information Exchange (TAIEX) instrument of the European Commission under the Directorate General of Enlargement policy provides short-term technical expertise to assist and advise a variety of stakeholders in countries looking toward EU Accession, as well as new Member States, in the transposition, implementation and enforcement of EU legislation.[654] TAIEX is a demand driven program in which, for instance, civil servants working at national, sub-national, and local administrations, as well as commercial associations and trade union representatives, can get specific knowledge and technology transfer assistance for dealing with specific problems. However, this is not a program which supports private citizens or individual companies. While TAIEX is a good step in building up the capacity of government in those specific technical needs, it also presupposes that the administrations of the Parties will demand the appropriate technical support. While some authorities may realize there is a need for a particular technical expertise, many (as described previously above) are not aware of that there is a need to integrate their environmental regulations with their development policies. Moreover, the industries that want to improve their specific production methods and processes cannot take advantage of the services.

This transfer of 'know how' is crucial to improving SEE governmental administrations, and both the Twinning program and TAIEX are appropriately working on improving the Parties' ability to implement and enforce regulations through these capacity-building exercises. However, for a program to be initiated

[653] European Commission, "Building Europe Together." European Communities, 2006. Accessed at http://ec.europa.eu/enlargement/pdf/twinning_brochure_2005_en.pdf
[654] European Commission, "TAIEX." Accessed August 10, 2007 at http://taiex.ec.europa.eu/

in order to have this knowledge-transfer occur, either that the EU must deem that an area of the *aquis* has not been implemented well, or the Party itself must find an area of legislation or implementation in which it needs assistance. This is rather limiting because if the countries themselves do not know of their weaknesses, they will have difficulty seeking out technical assistance. Or in the case of the Twinning program, if the EU wishes to improve environmental policy making in a country, they may send environmentally focused experts who are good at what they do, but do not necessarily have the holistic perspective, or reach, to achieve an integrated solution involving industrial policy and environmental technology adoption and use.

The EU could encourage this type of interactions by *creating a separate category of Twinning and TAIEX interactions which are promoted to the participant countries, focusing on how to incorporate environmental goals in local, regional and national policy and regulation of industrial activities* in order to promote development with pollution prevention. They could also *develop a third program in which sectoral experts from EU Member Countries work with the actual industries from the participant countries in developing strategies to improve competitiveness by preventing pollution.*

7.3.1.3 Role for International Organizations (UN and WB)

International Organizations have a great deal they can do to improve the adoption of development with a pollution prevention stance because they hold the key to so much of the program funding in developing countries. The various UN Bodies are able to bring a lot in terms of expertise and financing, however the different goals of different groups means that the most integrated help will come from cooperation from across several groups, which is often the case.

The UNESCO Hydrology for the Environment, Life and Policy (HELP) project has been involved with improving integrated water basin management techniques. The Mesta/Nestos River Basin was classified as a Demonstration HELP basin, and the knowledge base about the transboundary issues was enriched through the program. The UNESCO INWEB program has specifically helped network the environmental centers working on water issues throughout the Balkans, and has contributed to the PII/AD Process.

The Global Environmental Facility (GEF) is an independent financial organization which provides grants and technical assistance to developing countries for projects which promote sustainable development and benefit the global environment, and is funded by a collection of international donors, including the EU, individual EU countries such as Greece, and the United States. The global issues of biodiversity, climate change, international waters, land degradation, the ozone layer, and Persistent Organic Pollutants (POPs) are addressed through its program work. GEF projects work on capacity-building, often in cross-cutting issues such as strengthening institutions, providing assistance in enacting

legislation and regulations, developing public awareness and education, and developing training material. GEF projects are implemented through its partners of UNEP, UNDP, and the World Bank. It also works with several other partners, including executing agencies and NGOs. There is also significant effort to engage the private sector as a partner in projects which are country-driven, such as innovation and pollution prevention projects.[655] A strategy has been developed in 2006 to enhance private sector engagement, with the main goal of the strategy being, "to generate global environmental benefits in a sustainable and cost-effective manner through enhanced engagement with the private sector."

In 2006, the GEF began a restructuring in order to improve the effectiveness of investment in the global environment and sustainable development.[656] This, along with its recent efforts to engage the private sector more could provide opportunities for GEF to *develop sectoral development programs focused on restructuring the private sector to pollution prevention techniques through capacity building, data sharing, and technology transfer.*

The GEF's International Waters project, IW:LEARN, is working with UNDP, UNEP, and the World Bank to strengthen International Waters management. For example, IW:LEARN has been involved with PII/AD Process, with core partners of the German and Greek ministries of environmental affairs, GWP-Med, the World Bank, UNESCO-IHP International Shared Aquifers Resource Management Programme (ISARM) and International Network of Water-Environment Centres for the Balkans (INWEB), and the UN Economic Commission for Europe (UNECE). The project IW:LEARN programming has providing face-to-face and virtual training, capacity building and knowledge sharing cooperation between Southeastern European stakeholders. It has also launched the Internet-based Transboundary Waters Information Exchange Network for the SEE Region (TWIEN-SEE) in 2005, which is to be sustained by regional partners when the project ends in June 2008.[657] Their work has been instrumental to connecting people and information in region, and connecting donors with needed projects.

The World Bank (WB) has been able to provide financing assistance for important infrastructure and development projects. The WB was instrumental to the Petersberg Phase II Process and the Athens Declaration Process, and has been involved with the implementation of the PII/AD Process. Especially through its work with the GEF, the WB has been able to fund and coordinate projects

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[655] Global Environment Facility, "About the GEF." Accessed August 10, 2007 at http://www.gefweb.org/interior.aspx?id=50

[656] Monique Barbut, "The New GEF: A Proving Ground for our Sustainable Future." Global Environment Facility Council Meeting, Washington DC, December 5, 2006. Accessed August 10, 2007 at http://www.gefweb.org/uploadedFiles/Council_speech_MB_Dec_2006_English.pdf

[657] Transboundary Waters Information Exchange Network, "The GEF IW:LEARN D2 Activity." Accessed June 10, 2007 at http://www.watersee.net/

which improve environmentally sustainable development. Its financing role in the region can be crucial to the implementation of many projects, and its influential *role in the development of infrastructure can be taken advantage of by encouraging pollution prevention techniques and technologies.*

The United Nations Industrial Development Organization (UNIDO) has a specific program for cleaner production (CP) (i.e., pollution prevention), which is aligned with the goals of transitioning away from end-of-pipe pollution treatment to pollution prevention techniques being applied to industrial development. The program's goal is to develop national CP capacity, foster dialogue between industry and government, and improve the development and adoption of environmentally sound technologies. National Cleaner Production Centers (NCPCs) have been set up in 31 countries, and many have become self-sufficient, as UNIDOs belief is that "CP can only be sustained if capacity is in place to adopt and adjust it to local conditions."[658]

The Balkan region does not have any NCPCs in place, with the nearest center being in Slovakia. However, the UNIDO Transfer of Environmentally Sound Technology (TEST) project on the Danube River Basin included Bulgaria and Romania in an innovative attempt to move industries along the river basin to cleaner production through pollution prevention technologies and environmental management techniques.[659] Donors included the GEF, UNIDO, and the Hungarian and Czech governments. There were positive results in the capacity built in the national counterparts acting as NCPCs, and environmental and social dimensions were integrated (to different levels) to the participating industries' business strategies. Moreover, the cleaner production strategies that were implemented amounted to significant annual financial savings for the companies and significant environmental benefits accrued by reducing the industrial pollution loads on the Danube.

The success of the UNIDO TEST project suggests that the thing that is needed in SEE is the capacity to identify and change sectoral practices, and a knowledge base which gives access to the solutions. The financial savings coming from transition to environmental technology can give sufficient incentive to the polluting industries, and through such a process of production process evaluation and analysis of technology options, there will develop a new way of thinking about business development which includes the environment. UNIDO would do well to *initiate the development of NCPCs and CP national programs in the countries of Southeastern Europe*, as development continues to increase with the prospect and actualization of EU accession.

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[658] UNIDO, "The NCPC Programme." Accessed August 10, 2007 at http://www.unido.org/en/doc/5133

[659] UNIDO, "Transfer of Environmentally Sound Technologies (TEST) in the Danube River Basin." Accessed August 10, 2007 at http://www.unido.org/doc/26190

7.3.1.4 Role for the ITCB

The role for the US-Greek Initiative for Technology Cooperation in the Balkans (ITCB) could be in providing the integrated broader perspective on sectoral environmental technology development which is so desperately needed in the Balkans region. The ITCB will be able to provide an outsider perspective (from the US) with an insider perspective (from Greece) in environmental technology adoption and use in the region. The ITCB can use the recommendations of this report to develop a unified environmental technology plan for the Balkans which can overcome many of the barriers discussed which occur throughout the region. This plan would be supported by a technology advisory body and a financing body. Figure 40 below presents an overview of this potential new role for the ITCB.

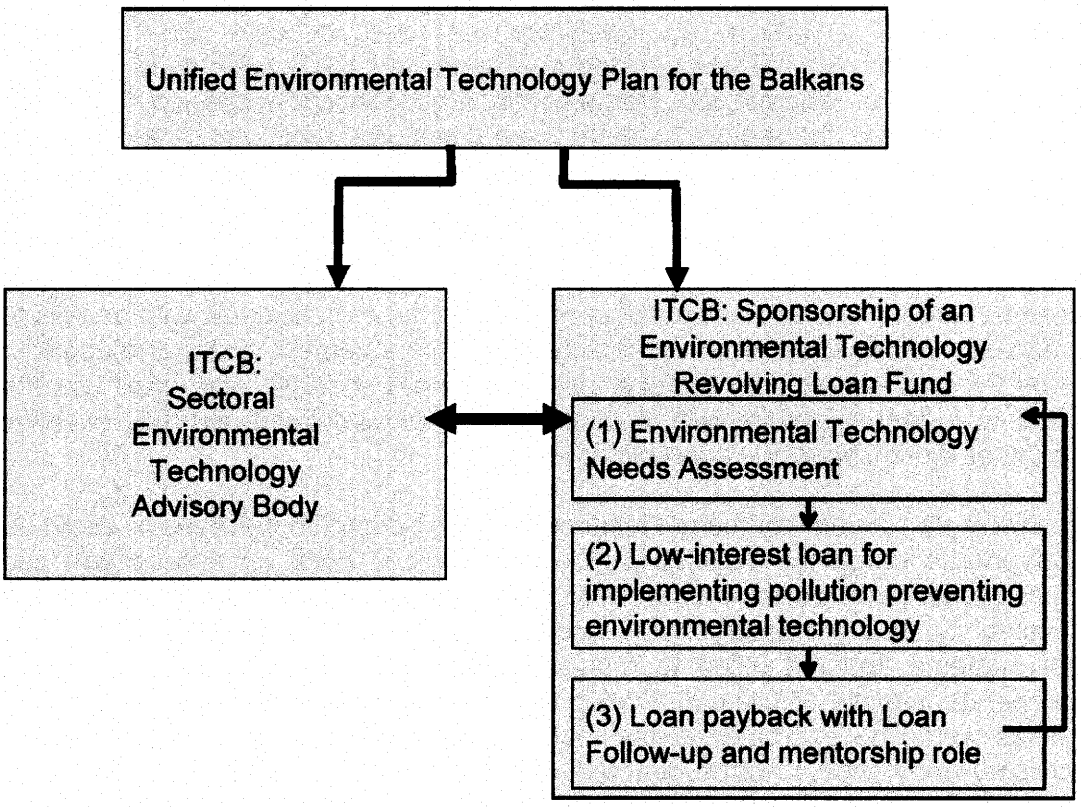

Figure 40: Vision for the Role of the ITCB in Environmental Technology Development in the Balkans

A unified environmental technology plan for the Balkans could connect Greek businesses with regional needs, and American technical expertise with Southeastern European needs. Greece has an insider role to play in the region, and it holds a unique geopolitical position to assist in both capacity-building and

confidence-building in SEE.[660] The Greek government and industry has already encountered many of the same problems as SEE countries with weak institutions, and poor regulations. Greece could both teach from its experiences in implementing EU regulations and learn from other countries in the region on overcoming many of its own barriers. Because Greece is one of the leading investors in the SEE countries, by engaging Greece in a key role in developing and disseminating environmental technology in the region, industrial production methods could be promoted from the inside, as Greek companies working in the Balkans could be required to maintain the pollution prevention industrial standards throughout the region.

The United States played a vital role in the stability and development of Southeastern Europe through its involvement in the Stability Pact for South East Europe (soon to be renamed RCC), its NATO presence in the region, and through USAID programs. As the Balkan countries become closer with the European Union, the US has decided to remove its USAID operations, and thus has pulled out of Bulgaria and Romania since their recent accession. There will still be projects in the region, as there have continued to be with other countries as they joined the EU, however there will be a loss of the US technical expertise to the region. The US has had important experience coordinating SEE technical assistance with local needs through the EcoLinks project promoting market-based providing environmental solutions with emphasis on the urban and environmental sectors, and providing environmental professionals with access to information on environmental technologies and management systems, along with other things. However the EcoLinks initiative ended in 2006, and could use the ITCB to further this work and to continue to give assistance to SEE, even as countries work toward EU approximation.

A unified plan for environmental technology development in the Balkans could be supported through the development of an advisory body on assessment and implementation of pollution prevention technologies and techniques for various sectors. Such an advisory body would need to be independent of regional governments and not allied to monied interests, with a strong focus on the independent sector. While cooperation with governmental programs and advisory bodies would be encouraged, the technical assistance being provided by this advisory body should not be directed towards government capacity building, as the national governments are getting the majority of the technical capacity building from the EU accession programs and others. The advisory body could either provide environmental technology project analysis, or it could control for the quality of such analyses done by experts in the public or private sectors.

Many industries are unable to make investments in environmental technology in the region because of a lack of financing opportunities. There are many high-risk

[660] See Nicholas A. Ashford and Christi Electris, 2006.

companies in the region, and they do not have access to funding for such improvements. The financial benefit of the recommended pollution prevention strategies is often unknown to the business owner and to the bank which may not give a loan easily for such a project. Thus, it is recommended that the ITCB facilitate the creation of a revolving environmental technology fund, focused specifically on sectoral technology transfer in the SEE region. The revolving fund could be established with a partnership with a bank, but could have an important impact.[661]

Such a fund could be made in cooperation with an existing financial institution, such as with the Black Sea Trade and Development Bank, or could be independently developed. The GEF programming for private sector engagement and integrated approaches for sustainable development may make GEF a partner organization which could provide seed funding. Work done on funding from the loans would give preference to consultants from within the region – rather than external consultants alone - in order to build up knowledge base inside the country, possibly working with external consultants from the US or EU working as full partners (not 'sub' consultants).

It could be made attractive by offering a below-market rate loan to the industries willing to go through an environmental technology needs-assessment and analysis of environmental technology options by the associated advisory body in accordance, or beyond, EU environmental, economic and social regulations. The ITCB fund could give loans for implementing environmental technologies which are deemed best for the project and parameters (based on unbiased assessments). Loans would be repaid (with reasonable interest rates) and used to fund more projects.

In order to build sustainable capacity in the participating firms, the ITCB could facilitate the necessary trainings for Pollution Prevention, resource/energy-efficiency, integrated environmental management. This could be based loosely on the UNIDO TEST project (described above in Section 7.3.1.3), or in cooperation with UNIDO. Additionally, in order to maintain the technical knowledge transfer in the firms, there should be regular follow-up with companies, and they could possibly work as mentors to others in the industry throughout the region. Moreover, to get the initial mentor-companies ready to promote the program, there would need to be some pioneers in each industry to take on the project/loan and show the positive results.

[661] Personal Communication with Manolis Stefanakis, the then President of the American Farm School. Thessaloniki, Greece, July 11, 2005

8 Summary and Further Research

In order to surmount the barriers to transboundary integration and coordination of environmental technology and environmental regulatory policy in Southeastern Europe, the environmental needs and capabilities of the region were discussed, and a regional cooperation and coordination systems framework was developed. The thesis focused on a case study of transboundary water resource management of the Mesta/Nestos River Basin between Bulgaria and Greece in order to understand in depth the coordination problems between a particular locality's level of integration in environmental technology development and use, and environmental regulatory policy, as well as the barriers to cooperation between two localities sharing a transboundary resource.

For the case study, the physical characteristics and environmental stresses on the basin were described in detail. Next the policy governing local water resource management and environmental technology development was reviewed in terms of national laws and regulations, the bilateral diplomatic agreements, and the EU framework that drives much of the current activity in the basin today. Finally, the gaps in current policy and the barriers to coordinating water resource-related technology policy and environmental regulatory policy development were analyzed. The end result was a set of recommendations pertaining to the particular basin, but which can be generalized to other basins in the region. The focus was primarily on the coordination in both countries at the local and transboundary levels, but was also explored within the context of the nation-wide and region-wide levels. Through this narrow case study, insight was gained as to how environmental technology policy could be coordinated with regulatory policy to surmount the obstacles faced in water resource management and the broader context, and how the institutional and legal framework in place affects the regulatory scheme and in turn the technology placement in both countries.

At this time, what emerges from the analysis and case study is that there is a need for a regional authority for developing holistic technology development plans for industries, farms, and communities. Engaging in pollution prevention to solve pollution in one medium alone may be prohibitively. However, when all the types of problems of pollution, along with economic competitiveness and technology development are realized, then a pollution prevention approach can be much more cost-effective, and moreover, it can generate economic savings for the implementers. Economic enhancement may be one way to sell programs to the governments and environmental and development donors as technological solutions benefit from economies of scale in a multi-media context. A regional authority, as described in the possible role for the ITCB, could offer a way to overcome many of the barriers found in Southeastern Europe in advancing integrated environmental technology adoption and use policy, co-optimized with environmental regulatory policy.

8.1 Overview of Thesis

This thesis set out to understand and analyze the systemic failures in transboundary integration and coordination of environmental policies in regional issues of vital interest to multiple parties, and to develop what steps could be taken to overcome these barriers. It focused on Southeastern Europe in general, and on a specific case-study between a Bulgarian and Greek transboundary environmental issue.

The research has shown how fostering Balkan coordination on environmental issues will not preclude, but in fact will enhance the common goals of entering the European Union. Regional cooperation also will benefit the Southeastern European countries through the development of culturally appropriate, bottom-up solutions to the common barriers these countries face as a result of common political and cultural histories. The variety of donor organizations and countries contribute to the region's development, with the EU pre-accession programs leading the direction of the development of all of the countries' legislative frameworks and infrastructure developments. Examples of transboundary environmental cooperation in SEE have resulted in joint management projects which promote mutual understanding across borders. This has led to more sustainable development practices for the transboundary regions, and, as resource conflicts become less likely, more peace and stability in the region.

Needs and capabilities were assessed to be similar across the Balkan region, including the use of poor quality fuels in power generation and automobiles, inefficient water resource management and insufficient waste-water treatment from urban centers, lack of appropriate solid waste disposal sites and a common tradition of dumping wastes in the open, and misapplication of agrochemicals to crops, and inefficient irrigation techniques which wastes precious water resources and lead to erosion and degradation of soils. There is a potential for deploying the existing technical capacity of countries in the region to solve environmental problems of air, water, waste, and agricultural pollution largely by end-of-pipe approaches; however there is much room to implement pollution prevention technology solutions. The regional regulatory capacity, which affects all environmental sectors, has common problems stemming from poor implementation or understanding of EU regulations and directives, weak regulatory and judicial systems, remnants of centralization of government from the Communist past, poor motivation of employees in the public sector leading to a leaching of talent to external consultants.

A specific systems framework was developed for national environmental policy coordination and regional environmental cooperation in industrial and regulatory policies. The industrial policies chosen can affect how a particular sector develops, and its coordination with environmental regulatory policies can influence whether the technologies chosen in a particular sector prevents pollution or alternatively creates and then treats pollution. The coordination between these *environmental technology policies* and *environmental regulatory policies* must occur at many levels to be truly integrated and effective. The thesis focused on the integration of policies at the local level and within a specific transboundary region, while emphasizing the importance of the need for broader integration throughout each country and region-wide. The systems

framework was described in the context of integrated water resource management, laying the foundation for the case-study, and EU water-related policies were explored, as this sets the legislative framework relevant to the case study countries.

For the case study on the transboundary Mesta/Nestos River Basin shared by both Bulgaria and Greece, the thesis described the social, economic, political and environmental conditions of each locality and country. The current status of environmental pressures on the basin's resources was described, an assessment of environmental stresses was presented, and the technical needs of the basin were explored.

The systems framework was applied to the case study to analyze the barriers and gaps in cooperation within and between the two localities and governments. Based on the analysis, a recommendation was made to improve the local-level transboundary coordination of environmental technology adoption and use with environmental policy goals, using the existing Euroregion Mesta-Nestos institutional structures. Successful implementation on both sides of the border will incentivize this appropriate integration of policies in other localities and nationwide.

Finally, an analysis of the barriers and gaps in system coordination discovered through the case study were analyzed and recommendations of how to overcome these barriers were proposed. The roles of the Parties involved in the regional cooperation have the major role to play in integrating environmental technology and regulatory policies together. The following are recommendations for the Parties to overcome the barriers in achieving integration between sectoral development and environmental regulatory policies:

- All levels of government (local, regional and national) must be involved in the process in order to reach the larger multinationals and smaller firms operating at local levels.
- National and regional priorities need to be clearly identified for greater emphasis, and sector-specific unbiased advice should be available and disseminated.
- Sector-specific training should be promoted to instill a long-term perspective to industries, reflecting added value to the industries.
- The Parties should develop independent advisory bodies within the country (or for SEE as a whole), not allied to monied interests, or as part of a government-institution not allied to internal corruption.
- Parties should promote a collaboration of 'outsiders' and 'insiders' who together understand the technologies available, how to apply them, and what the current thinking and mentality is in the country.
- Parties must encourage and seek out knowledge transfer of all aspects of integrated environmental management and sustainable sectoral development through the use of environmental technologies.
- Parties could develop a revolving loan fund for use by industries (on a sectoral basis or more generally) specifically for the adoption of environmental

technology and techniques. Or, they could promote the use of a similar such fund provided by external organizations.

- Parties should contribute to the process of developing and diffusing environmental technologies which could help the local industries work by
    - Making investments in infrastructure to support an effective regulatory system, including proper monitoring devices, information technology for data sharing and effective data use.
    - Investing in research and development in environmental technology
    - Encouraging partnerships between researchers and industries.
    - Investing in expanding the capacity of local, regional and national authorities to work with local industries
- Parties should improve understanding among the public authorities about the significance of the environmental and pollution prevention regulations that are being implemented
- Throughout the region, parties must enhance education of the general public about importance of these goals, and more specifically, why they are required to adhere to the regulations, showing the public why they can gain from protecting the environment and conserving resources, especially by demonstrating the economic benefit to them
- Parties should increase the quality of monitoring and enforcement of regulations by:
    - Increasing public sector workers' motivation by providing better pay or other incentives to attract more quality workers to the ministries and administrative bodies
    - Increasing the number of people watching out for the environment would be to develop non-profit/non-governmental bodies to inspect or 'police' the local communities for violations of environmental regulations, funded by the local communities themselves or performed on a voluntary basis
- Parties must contribute to creating a concerted effort in the Balkans through developing participation in local communities and through educational institutions.

External organizations also have a vital role in realizing the above recommendations, and increasing regulatory and technical capacity throughout Southeastern Europe. Recommendations of how to improve upon the current efforts in the region include:

- Promoting a shared concern for the economic and environmental situation of the neighboring communities which can be built up to include environmental coordination in technology adoption and use policies,

- Creating a separate category of EU Twinning and TAIEX interactions on how to incorporate environmental goals in local, regional and national policy and regulation of industrial activities,
- Develop an EU program in which sectoral experts from EU Member Countries work with the actual industries from the participant countries in developing strategies to improve competitiveness by preventing pollution,
- Develop, possibly through GEF, sectoral development programs focused on restructuring the private sector to use pollution prevention techniques through capacity building, data sharing, and technology transfer,
- Include pollution prevention techniques in all WB and other infrastructure investments, leading by example and transferring knowledge and experience to local communities and firms, and
- Initiate the development of UNIDO National Cleaner Production Centers and Cleaner Production national programs in the countries of Southeastern Europe.

The thesis then makes recommendations attempting to address the majority of barriers to integration of environmental technology policy and environmental regulatory policy coordination in Southeastern Europe. By using an external organization such as the US-Greek Initiative for Technology Cooperation (ITCB) which holds both an insider and outsider role in the economic, environmental and technical development of the region, a unified environmental technology plan for the Balkans could improve the level of integration of these policies throughout the region. The ITCB could provide advisory services as well as facilitate the creation of an environmental technology revolving loan fund which could provide private sector with the much needed financing for implementation of the unified plan utilizing a vision for environmentally sustainable sectoral development. The unified plan, the advisory body, and the environmental technology fund would contribute to building local capacity in approaching development with an integrated approach between economic and environmental goals.

8.2 Future Research

This research could well be expanded to include the development of a unified environmental technology plan in the Balkans. The scope of the study should be broadened to encompass the nation-wide and regional aspects of environmental technology cooperation and policy coordination in Southeastern European environmental problems in areas beyond water pollution. Specifically, further analysis is needed on understanding the barriers to:

- Integrating and coordinating within and between the countries the technology development/adoption initiatives to meet the technology-related needs for pollution treatment and source reduction in all media,
- Integrating and coordinating within and between the countries the corresponding relevant environmental regulatory policies for pollution treatment and source reduction,

- Coordinating technologies and regulatory initiatives with neighboring countries and for the countries in the region as a whole.

A closer analysis is needed of the evolution of environmental regulations from the former communist countries of Albania, Romania, Bulgaria, and unified Yugoslavia, through the breakdown of the respective communist regimes and fragmentation of Yugoslavia, to the recent prospect of EU membership. The broader goal would be to make recommendations that will be applicable to all countries in Southeastern Europe for overcoming the barriers to the coordination of environmental technology and regulatory policy in order to promote technology transfer and dissemination.

How can coordinating environmental technology policy and regulatory policy promote the use and development of the best available technology that not only reduces pollution, but prevents it from the outset? Is it stricter regulation, economic incentives, or better knowledge diffusion that is most effective? How do developing countries' governments bring this into practice when they have other economic, social and political priorities, including reducing poverty and increasing employment opportunities for their populations? How can governments justify allocating their limited resources for long-term technological policy solutions, or 'expensive' environmental regulations, when there are people in need for economic betterment in the short run? Is their a way to optimize this system of technology diffusion to developing countries?

Building on research in this thesis, there is a unique opportunity in this region to develop a full systems framework to understand how to coordinate the policies needed to promote the dissemination of appropriate and best-practice technologies, as well as to develop cutting-edge solutions to many of the regional environmental issues. Through future research, one should seek to understand why certain technologies are, or are not, adopted in developing countries, and plan to develop innovative solutions through the systems paradigm in order to gain the greatest social and economic benefit from the development of environmental technology.

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