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Co-ordination of Research Policies with the Western Balkan Countries

WP2: PRIORITY SETTING TO STRUCTURE PARTICIPATION IN FP

National background report on Environment for SERBIA

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Executive Summary

The objective of this report is to provide an overview of the environment protection research in the Republic of Serbia (hereinafter: Serbia), and to identify the environmental research priorities for Serbia for the period 2008-2012. There are no policy documents at the moment which define strategic goals for the future in the R&D sector in Serbia, including environment research. However, the work on a new *National strategy for science and technological development* is currently in its final stages, and is scheduled to be completed by the end of June 2009. It is expected that it will define national strategic priorities of Serbia's development in the S&T field, including the environment sector. For decades the main funding body for environment research in Serbia has for decades been the MSTD. While the funding of research projects is based on regular competitive calls for project proposals (for a typical duration of 5 years), these are not thematic (i.e. no areas/themes predefined by the MSTD). Since the main research performers in the environment sector in Serbia are in the academic sector, comprised of both higher education and research organizations, research in the environment area has so far been driven by the interests of the main research performers themselves. As a result, few common broader research targets, and subsequently, priorities, can be defined. Analysis is based on the consultation process with experts in the field of the Environment, and the extensive analysis of the ongoing project supported by the Ministry of Science and Technological Development. Experts include their own experience in the environmental protection problem in this specific area. The focus was spotted on the prediction of WBC ecological systems changes, on tools and on technologies for monitoring, prevention and mitigation of environmental pressures and risks, and on the sustainability of the natural and man-made environment. As the result we suggest the two groups of priorities: *Environment* Research Priority Sectors and *Environment* Research Priority Themes.

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Introduction

1. Purpose of the national background report and methodology / Summary of the consultation process

The objective of this report is to provide an overview of the environment protection research in the Republic of Serbia (hereinafter: Serbia), with a SWOT analysis of the research capacities and identification of environmental research priorities for Serbia for the period 2008-2012, based on the consultation process with experts in the field. The objective of the Environment Theme (according to FP7 Specific Programme for 'Cooperation'): is the promotion of a sustainable management of natural and human environment and its resources based on existing knowledge and the interactions among the biosphere, ecosystems and human activities with the idea of developing new technologies, tools and services, in order to adopt an integrated way of resolving global environmental issues. Emphasis will be put on the prediction of WBC ecological systems changes, on tools and on technologies for monitoring, prevention and mitigation of environmental pressures and risks, and on the sustainability of the natural and man-made environment.

This report is intended to contribute to shaping the future European Union (EU) - West Balkans (WB) research cooperation, through relevant European Commission (EC) initiatives, policies and funding programmes, so as to meet the interests and actual needs of environment protection in the region.

A consultation process took place from January to March 2009 in order to identify research priorities in the field of environment protection. The questionnaires were sent to the project managers of all ongoing environment protection research projects, except the managers for innovation projects (144 projects, 120 in basic research and TND and 24 innovation projects) funded by the Ministry of Science and Technological Development of the Republic of Serbia. The responses were obtained from 28 experts directly involved in the area of environmental protection.

Based mainly on the outcomes of the consultation process, and extended analysis of the published papers in the field of the environment protection, this report identifies a set of four research priorities for Serbia in the field of environment protection for the period of 2008-2012, in line with the proclaimed objective of the **wbc-inco.net** project. The idea is to identify RTD potentials and priorities for taking part in FP7 and other European research programmes and the funding schemes, as well as to increase the participation of researchers from the region in the European projects.

2. The *Environment* S&T system in *SERBIA*

2.1 The overall Environment policy

2.1.1 The overall *Environment* policy framework

The government and Parliament of Serbia adopted the National strategy for sustainable development in 2007. The strategy has eight parts from which part five was dedicated to the Environmental protection issue and to the sustainability of natural resources in the Republic of Serbia together with the impact of economical development on the environment. This part contains the goals, measures and priorities connected to the natural resources protection (air, water, soil, biodiversities, forests, mineral raw material resources and renewable energy sources), protection against various risk factors that influence the environment (climate changes, waste, chemicals, accidents, ionising and electromagnetic radiation, noise, natural disasters), protection from risk factors in various economical sectors (industry, mining, transport and tourism), together with developing clean technologies.

Four important laws in the field of environmental protection passed in 2004.

- Environmental Protection Law; final version of this Law was passed in 2004.

  Published in the "Official Gazette of the Republic of Serbia", No. 135/2004 ("Službeni glasnik Republike Srbije", br. 135/04)
- Law on environmental impact assessment (EIA)

  Published in the "Official Gazette of the Republic of Serbia", No. 135/2004 ("Službeni glasnik Republike Srbije", br. 135/04)
- Law on integrated environmental pollution (IPPC) prevention and control

  Published in the "Official Gazette of the Republic of Serbia", No. 135/2004 ("Službeni glasnik Republike Srbije", br. 135/04)
- Law on strategic environmental impact assessment (SEA)

  Published in the "Official Gazette of the Republic of Serbia", No. 135/2004 ("Službeni glasnik Republike Srbije", br. 135/04)

Besides the above the Government prepared a proposal of amendments to the Environmental Protection Law, as well as amendments to the Law of environmental impact assessment, together with a new law proposals of nature protection, air protection, noise protection, sustainable usage of fish found, packaging waste and waste management.

Integration into the Environmental Protection Management System:

- Domestic and international standards and regulations for management, certification and registration of the environmental protection management system
- Legal and private entity may certify the environmental protection management system according to **JUS-ISO 14001**, in compliance with the law.
- Legal and private entity may register the certified environmental protection management system in order to get involved into the system of environmental

protection management and control of the EU (hereinafter: **EMAS system**), in compliance with this Law.

Systems of Environmental Protection in Serbia:

- Protection of natural and cultural environments;
- Restoration of rivers and streams;
- Water protection areas, river basins;
- Releases of animals and plants;
- Action programmes for threatened species

2.1.2 The elements of *Environment* research policy making

The work on a new *National strategy for science and technological development* is currently underway, and is scheduled to be completed by the end of June 2009. It is expected that national strategic priorities of Serbia's development in the S&T field will be defined including the environmental protection sector.

While the Serbian Ministry of Science and Technological Development (MSTD) provides strong funding (currently 144 research grants) in the area of environmental protection, there are no explicit target research areas/themes as such (i.e. no areas/themes predefined by the MSTD). Instead of that the standard MSTD approach is bottom-up: MSTD typically announces calls for proposals for research grants in various fields (all include the themes of environmental protection). There were no special calls for environmental protection. Proposals go through an evaluation process by institutionalized research groups of reviewers qualified (external) for selecting projects to be funded.

Budgetary allocation for scientific research and technological development in 2008 was about 100 million EUR which present 0.3% of GDP.

Direct MSTD's support for environmental protection projects in 2008 was 9.7 million Euros which present 9.7% of whole budgetary allocations for S&T activities (2.3% for the Basic Research program and 7.4% for T&D).

While the projections for coming years were to increase this amount by a certain percent (as occurred during the whole 2001-2008 period), in view of the global economic crisis it is not realistic to expect an increase in 2009.

2.2. Overview of Environment research activities

2.2.1. *Environment* research projects

There are presently 144 ongoing research projects regarding environmental protection funded through the MSTD's latest completed call for proposals: *Research programme in the field of technological development for the 2008.-2011. period.*

These projects are led by research institutions:

Name of research institution
Institute of Geological Research Serbia, doo Belgrade
Electrical Engineering Institute "Nikola Tesla"
IMS – Institute for Materials Testing
Institute of Virology, Vaccines and Sera TORLAK, Belgrade
"Siniša Stanković" Institute for Biological Research
Institute for the Development of Water Resources “Jaroslav Černi”
Scientific Veterinary Institute "Novi Sad"
Institute of Land Management
Scientific Institute of Veterinary Science of Serbia
Institute for Criminological and Social Research
Institute for Multidisciplinary Research-IMSI
Institute of Chemistry, Technology and Metallurgy
"VINČA" Institute of Nuclear Sciences
Institute of Fundamental and Physical Chemistry
Institute of Mining and Metallurgy Bor
Institute of Physics
Institute for the Technology of Nuclear and Other Mineral Raw Materials
Institute of Forestry
Institute of Architecture and Urban & Spatial Panning of Serbia
Institute of Archaeology
IKS - 'Kirilo Savić' Research Institute
Institute for Animal Husbandry, Belgrade-Zemun
Institute of Forestry
Institute of Chemistry, Technology and Metallurgy
Institute for Plant Protection and Environment
Institute for Hygiene and Technology Meat
Institute of Field and Vegetable Crops, Novi Sad
Maize Research Institute, Zemun Polje
„Dr Josif Pančić“ Institute
"Mihajlo Pupin" Institute Belgrade
IHIS Techno experts d.o.o. Beograd
Institute of Architecture and Urban & Spatial Planning of Serbia
Faculty of Stomatology Pancevo Academy of Economy Novi Sad
University of Belgrade, Faculty for Building Management „Union“
University of Belgrade, Faculty of Mining and Geology
University of Belgrade, Faculty of Agriculture
University of Belgrade, Faculty of Biology
University of Belgrade, Faculty of Civil Engineering
University of Belgrade, Faculty of Electrical Engineering
University of Belgrade, Faculty of Forestry
University of Belgrade, Faculty of Geography
University of Belgrade, Faculty of Mathematics
University of Belgrade, Faculty of Mechanical Engineering

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Name of research institution
University of Belgrade, Faculty of Physics
University of Belgrade, Faculty of Chemistry
University of Belgrade, Faculty of Security Studies
University of Belgrade, Faculty of Technology and Metallurgy
University of Belgrade, Faculty of Transport and Traffic Engineering
University of Belgrade, Faculty of Veterinary Medicine
University of Belgrade, Technical faculty in Bor
University of Kragujevac, Faculty of Mechanical Engineering
University of Kragujevac, Faculty of Natural Sciences and Mathematics in Kragujevac
University of Niš, Faculty of Electronic Engineering
University of Niš, Faculty of Civil Engineering and Architecture
University of Niš, Faculty of Mechanical Engineering
University of Niš, Faculty of Occupational Safety
University of Niš, Faculty of Natural Sciences
University of Niš, Medical Faculty
University of Novi Sad, Faculty of Agriculture
University of Novi Sad, Medical Faculty
University of Novi Sad, Faculty of Sciences
University of Novi Sad, Faculty of Technical Sciences
University of Novi Sad, Faculty of Technology
University of Novi Sad, Technical faculty 'Mihajlo Pupin' in Zrenjanin
University of Priština, Faculty of Sciences Kosovska Mitrovica
University of Priština, Faculty of Technical Sciences Kosovska Mitrovica
University of Priština, Faculty of Medical in Kosovska Mitrovica

Besides that, there are 25 bilateral projects with Greece, Hungary, Croatia, Slovenia, France, 14 of them concerning the various aspects of the environmental protection problems.

In SEER-ERA Net call seven Serbian projects passed reviews but were not accepted because of the lack of funding by the MSTD side.

Beside the projects funded by the MSTD, there are also 42 projects in the EC Framework Programmes 5, 6 and 7 (Annex III) in which Serbian research institutions are taking part with aggregate EC contribution amounting to EUR 1.37 million

The involvement of Serbian research institutions in European environmental protection research projects are presented in Annex IV.

2.2.2 Key competencies in *Environment* research fields

From 144 ongoing research projects in the field of environmental protection funded by the MSTD (*Research programme in the field technological development for the 2008.-2011. period*, Areas: **Technological development** - Electronics and telecommunications; Industrial software; Mechanical engineering; Transportation;

Urban and Civil Engineering; Biotechnology; Energy efficiency; Regulation, protection and usage of water; Materials and Chemical technologies; Environment; and **Basic research** - Chemistry; Physics; Geology; Biology), 22 are related to the analysis of the economical aspects of various environmental situations and their impacts on the system behaviour (addressing various applications of intelligent system, safety aspects, environmental impacts, energy efficiency, level of service considerations). There are 44 projects devoted to applications of new materials in the environmental protection technologies together with developing new technologies for specific waste treatment (technological development and environmental considerations). There are also 27 projects related to basic research in the field of environmental protection optimisation, and strategic considerations and management, 26 projects of which are dealing with the energy efficiency problems in environmental protection.

Collaboration on environmental protection research projects between research institutions and commercial enterprises seems insufficient due to the lack of an initiative for research in environmental protection from stakeholders, as well as to the poor transfer of research findings (results) into (operational) practice. More recently there have been certain initiatives for bringing together the industry and research institutions, such as the programme coordinated by the Ministry of Environmental protection and spatial planning, but with no concrete results as yet.

2.2.3. *Environment* research infrastructure

List of organisations involved in the environmental research:

Name	Postal address	Web-site
1	2	3
Institute of Geological Research Serbia, doo Belgrade	Rovinjska 12, 11000 Belgrade	
"Nikola Tesla" Electrical Engineering Institute	Koste Glavinića 8a, 11000 Belgrade	www.ieent.org
IMS – Institute for Materials Testing	Bulevar Vojvode Mišića 43, 11000 Belgrade	www.ims.uconn.edu
Institute of Virology, Vaccines and Sera TORLAK, Belgrade	458 Vojvode Stepe 11221 Belgrade P.O. Box 1, Serbia	www.torlakinstitut.com
"Siniša Stanković" Institute for Biological Research	Bul. Despota Stefana 142, 11060 Belgrade	www.ibiss.bg.ac.yu
Institute for the Development of Water Resources “Jaroslav Černi”	Jaroslava Černog 80, 11000 Belgrade	www.jcerni.co.yu
Scientific Veterinary Institute "Novi Sad"	Rumenacki put 20, 21000 Novi Sad	niv.ns.ac.yu
Institute of Land Management	Teodora Drajzera 7, 11000 Belgrade	
Scientific Institute of Veterinary Science of Serbia	Vojvode Toze 14, 11000 Belgrade	
Institute for Criminological and Social Research	Gračanička 18, 11000 Belgrade	www.iksi.bg.ac.yu
Institute for Multidisciplinary Research-IMSI	Kneza Višeslava 1, 11000 Belgrade	www.imsi.rs
"VINČA" Institute of Nuclear Sciences	Mike Petrovića Alasa 12, 11001 Belgrade	www.vin.bg.ac.rs

Table continued

1	2	3
Institute of Chemistry, Technology and Metallurgy	Njegoševa 12, 11001 Belgrade, P.O.B. 473	www.ihtm.bg.ac.yu
Institute of Fundamental and Physical Chemistry	Studentski trg 12-16, 11000 Belgrade	
Institute of Mining and Metallurgy Bor	Zeleni bulevar 35, 19210 Bor	www.mininginstitutebor.com
Institute of Physics	11001 Belgrade P.O. Box 57	www.phy.bg.ac.yu
Institute for the Technology of Nuclear and Other Mineral Raw Materials	Franše d Eperea 86, 11000 Belgrade	www.itnms.ac.rs
Institute of Forestry	Kneza Višeslava 3, 11000 Belgrade	www.inforserb.org
Institute of Architecture and Urban & Spatial Panning of Serbia	Bul. Kralja Aleksandra 73, 11000 Belgrade	www.iaus.org.yu
Institute of Archaeology	Knez Mihajlova 35, 11000 Belgrade	www.ai.sanu.ac.yu
IKS - 'Kirilo Savić' Research Institute	Vojvode Stepe 51, 11000 Belgrade	www.iks.co.rs
Institute for Animal Husbandry, Belgrade-Zemun	Autoput 16 P.O.B. 23 11080 Zemun	www.istocar.bg.ac.yu
Institute of Forestry		www.inforserb.org
Institute of Chemistry, Technology and Metallurgy	Njegoševa 12, 11001 Belgrade, P.O.B. 473	www.ihtm.bg.ac.yu
Institute for Plant Protection and Environment	Teodora Drajzera 9, 11000 Belgrade	
Institute for Hygiene and Technology Meat	Kaćanskog 3, 11000 Belgrade	www.inmesbgd.com
Institute of Field and Vegetable Crops, Novi Sad	Maksima Gorkog 30, 21000 Novi Sad	www.nsseme.com
Maize Research Institute, Zemun Polje	Slobodana Bajića 1, 11000 Belgrade, Zemun	www.mrizp.co.rs
„Dr Josif Pančić“ Institute	Tadeuša Košćuška 1, 11000 Belgrade	www.mocbilja.rs
"Mihajlo Pupin" Institute Belgrade	Volgina 15, 11050 Belgrade	www.imp.bg.ac.yu
IHIS Techno experts d.o.o. Belgrade	Batajnički put 23, 11000 Belgrade -Zemun	http://www.kompanije.net/firma.php?id=8240
Institute of Architecture and Urban & Spatial Planning of Serbia	Bul. Kralja Aleksandra 73, 11000 Belgrade	www.iaus.org.yu
Faculty of Stomatology Pancevo Academy of Economy Novi Sad	Žarka Zrenjanina 179, Pančevo	www.stomfakpan.edu.yu
University of Belgrade, Faculty for Building Management „Union“	Cara Dušana 62-64, 11000 Belgrade	www.fgm.edu.yu
University of Belgrade, Faculty of Mining and Geology	Đušina 7, 11000 Belgrade	www.rgf.bg.ac.rs
University of Belgrade, Faculty of Agriculture	Nemanjina 6, 11000 Belgrade - Zemun	www.agrifaculty.bg.ac.rs
University of Belgrade, Faculty of Biology	Studentski trg broj 16, 11000 Belgrade	www.bio.bg.ac.yu

Table continued

1	2	3
University of Belgrade, Faculty of Civil Engineering	Bul. Kralja Alesandra 73/1, 11000 Belgrade	www.grf.bg.ac.yu
University of Belgrade, Faculty of Electrical Engineering	Bul.r Kralja Aleksandra 73, 11000 Belgrade	www.etf.bg.ac.rs
University of BelgradeFaculty of Forestry	Kneza Višeslava 1, 11000 Belgrade	www.bg.ac.yu/eng/memb/facult/techn/en_sumarski.php
University of Belgrade, Faculty of Geography	Studentski trg broj 3/3, 11000 Belgrade	www.gef.bg.ac.yu
University of Belgrade, Faculty of Mathematics	Studentski Trg 16, 11000 Belgrade	www.matf.bg.ac.yu
University of Belgrade, Faculty of Mechanical Engineering	Kraljice Marije br. 16, 11000 Belgrade	www.mas.bg.ac.yu
University of Belgrade, Faculty of Physics	Studentski trg 16, 11000 Belgrade	www.ff.bg.ac.yu
University of Belgrade, Faculty of Chemistry	Studentski trg 12-16, 11000 Belgrade	www.chem.bg.ac.yu
University of Belgrade, Faculty of Security Studies	Gospodara Vučića 50, 11000 Belgrade	www.fb.bg.ac.rs
University of Belgrade, Faculty of Technology and Metallurgy	Karnegijeva 4, 11000 Belgrade	www.tmf.bg.ac.rs
University of Belgrade, Faculty of Transport and Traffic Engineering	Vojvode Stepe 305, 11000 Belgrade	www.sf.bg.ac.rs
University of Belgrade, Faculty of Veterinary Medicine	Bulevar JNA 18, 11000 Belgrade	www.vet.bg.ac.yu
University of Belgrade, Technical faculty in Bor	Vojske Jugoslavije 12, 19210 Bor	www.tf.bor.ac.rs
University of Kragujevac, Faculty of Mechanical Engineering	Sestre Janjić 6, 34000 Kragujevac	www.mfkg.kg.ac.yu
University of Kragujevac, Faculty of Natural Sciences and Mathematics	Radoja Domanovića 12, 34000 Kragujevac	www.pmf.kg.ac.rs
University of Niš, Faculty of Electronic Engineering	Beogradska 14, 18000 Niš	www.elfak.ni.ac.rs
University of Niš, Faculty of Civil Engineering and Architecture	Aleksandra Medvedeva 14, 18000 Niš	www.gaf.ni.ac.rs
University of Niš Faculty of Mechanical Engineering	Beogradska 14, 18000 Niš	www.masfak.ni.ac.yu
University of Niš, Faculty of Occupational Safety	Čarnojevića 18a, 18000 Niš	www.znrfak.ni.ac.rs
University of Niš, Faculty of Natural Sciences	Višegradska 33 , 18000 Niš	www.pmf.ni.ac.rs
University of Niš, Faculty of Medical	Braće Taskovića 81, 18000 Niš	www.medfak.ni.ac.rs
University of Niš, Faculty of Civil Engineering and Architecture	Aleksandra Medvedeva 14, 18000 Niš	www.gaf.ni.ac.yu
University of Novi Sad, Faculty of Agriculture	Trg Dositeja Obradovića 8, 21000 Novi Sad	www.polj.ns.ac.yu
University of Novi Sad, Faculty of Medical	Hajduk Veljkova 3, 21000 Novi Sad	www.medical.ns.ac.yu
University of Novi Sad, Faculty of Sciences	Trg Dositeja Obradovica 3, 21000 Novi Sad	www.ns.ac.rs

Table continued

1	2	3
University of Novi Sad, Faculty of Technical Sciences	Trg Dositeja Obradovića 6, 21000 Novi Sad	www.ftn.ns.ac.rs
University of Novi Sad, Faculty of Technology	Bulevar Cara Lazara 1, 21000 Novi Sad	www.tehnol.ns.ac.yu
University of Novi Sad Technical faculty 'Mihajlo Pupin' in Zrenjanin	Đure Đakovića b.b., 23000 Zrenjanin	www.tf.zr.ac.yu
University of Priština, Faculty of Sciences Kosovska Mitrovica	Zgrada srednje tehničke škole, 8220 Kosovska Mitrovica	
University of Priština, Faculty of Technical Sciences Kosovska Mitrovica	Knjaza Miloša 7, 38220 Kosovska Mitrovica	www.ftnkm.info
University of Priština, Faculty of Medical in Kosovska Mitrovica	Anri Dinana bb, 38220 Kosovska Mitrovica	

2.3 Key drivers of Environment research

2.3.1 Main *Environment* sector trends in Serbia

Waste management in Serbia has not yet been formed, it is still largely dominated (monopoly or quasi-monopoly) by political decisions and priorities. Besides the fact that National strategy of waste management was adopted in 2003, but due to changes in government policy, it has not yet institutionally framed in order to be executed. The main disadvantage is that policy of waste treatment and environmental protection do not have the key issue in the government plans nor a long term strategy. Even in the past nine years the governing of the environmental protection policy has changed from Ministry through the Directorate to the corporate Ministry, with no clear developing strategy, especially in water protection. The protection of water resources is not within the domain of Ministry of Environmental Protection.

According to the official statistics, the contribution of *Recycling* sector to Serbia's GDP is low (less then 0.1% of GDP), and was rising only between 2006 and 2007.

The category of water services contributed by 0.6% to Serbia's GDP in 2007 (compared to 0.8% in 2005 and 0.7% in 2006).

The Environmental sector employed around 12,000 personnel in nearly 400 enterprises in 2007 and direct received foreign investment of about EUR 120 million. In the same year the export of waste services cost Serbia EUR 50 million, of which 80% was paid to EU member-states and 20% was paid for the export to European non-EU countries and Russia.

2.3.2 Main socio-economic challenges in Serbia

Serbia is a middle-income country with a great potential for fast economic development, as the country is endowed with natural and mineral resources and fertile and arable agricultural land. Serbia is also well positioned for development of transportation infrastructure, given its strategic location at the crossroads of major

road and rail routes in South-Eastern Europe. Most economic activity is concentrated in services (about 65% of GDP), industry (24%), and agriculture (11%).

After the turmoil of the 1990s, Serbia has made significant progress with a wide ranging program of democratic and economic reforms which started in 2001. Macroeconomic stability has been restored which provided basis for fast growth of the economy, and incomes have risen considerately. GDP per capita, estimated at $2,100 in 2002, has reached $5,400 in 2007. During the same period, poverty has fallen from 14% of the population to about 6.6% (according to last year's *Living Standards Measurement Survey*).

Recent economic developments

During the 1990s, Serbia was exposed to wars and economic sanctions. The political changes since 2000 have laid the foundation for making a clean break with the past decade of economic decline. The changes have created the basis for economic and social reforms as well as for the increased donor support.

Strong economic progress has been achieved since 2001, particularly in expanding private sector participation in the economy. The macroeconomic stability, achieved swiftly in the first years of transition, has been broadly maintained. During the first seven years of transition the economy grew on average 5.6% per annum, peaking in 2004 with 9.4% GDP growth, one of the highest growth rates among transition economies. In 2007, the growth remained strong at an estimated 7.5%. There have also been major improvements in the business environment that saw Serbia ranked as the top reformer globally in *Doing Business 2006* report (for reforms carried out in 2004-2005). Still, further reforms to strengthen the environment for sustained private sector led growth, including continued structural reforms and privatization. They are vital in ensuring that living standards continue to converge with those in Europe.

However, despite Serbia's strong growth performance, significant **challenges** remain. External weaknesses are apparent in double-digit and expanding current account deficit. Despite the significant decline of the public debt, external debt remains about 60% of GDP as private external liabilities continue to grow quickly. Although policy action and fiscal restraint will be required to address external weaknesses, Serbia's position as far as reserves are concerned is currently comfortable as a result of strong private sector inflows including foreign direct investments (FDI). The FDI average has 7.2% of GDP over the last 5 years placed Serbia among the top countries in Europe and Central Asia. The FDI was especially strong in 2006, as a result of several large privatization deals, including the sale of a mobile telephone operator.

At over 40% of GDP, public expenditures remain high. While a fiscal adjustment occurred between 2003 and 2005, with expenditures falling from almost 44% of GDP to just over 40%, those gains have been reversed with recent wage rises and spending pressures as a result of election promises in run-up to the series of parliamentary elections, and a deficit has again emerged. Fiscal loosening has also created inflationary pressures and pushed the annual average inflation rate close to 7%. Rising inflation in Serbia has also been the result of the global increase in oil and food prices.

Unemployment, poverty, and poor inclusion of the vulnerable still remain concerns in Serbia. During the past decade, a long period of instability, international isolation, and economic turmoil adversely affected the living standards of the vast majority of the population. The country's poor economic performance over that period led to a decrease in real earnings and was accompanied by deterioration in social protection and health services. As a result, poverty rose sharply in the 1990s. Although currently around 6.6% of the population falls below the poverty line (according to *Living Standard Measurement Survey*), one third of the country's people are barely above the poverty line and remain in danger of slipping into poverty if any adverse economic developments occur. The unemployment rate (as per internationally comparable Labour Force Survey) is still high at 14% of the labour force despite the significant decline from a year ago. Unemployment is affecting young people and minority groups in particular.

Challenges ahead

- Harmonizing the fragmented political scene. Despite major improvements, the fragmented political scene hinders the development of a more stable political environment.
- Accelerating EU integration. The Stabilization and Association Agreement with the European Union has been signed, but is still not effective.
- Maintaining macroeconomic stability. Due to fiscal deficit and high current account deficit, macroeconomic stability remains vulnerable, particularly to external shocks.
- Improving governance and building effective state institutions. Building effective state institutions to improve governance and transparency, and implementing comprehensive legal and judicial reform are essential to improve government performance, increase foreign investment, and ensure sustainable growth.
- Improving the well being of the most vulnerable and building human capacity. The political sustainability of the reform efforts will depend to a large extent on the government's success in shielding the vulnerable and building human capital. Improving social protection mechanisms and boosting the quality and efficiency of health services and educational system are the key challenges. Particular efforts will also be required to alleviate poverty among minority groups, the rural poor, and in depressed regions formerly home to large industrial and mining industries.
- Addressing environmental problems and mitigating disaster risks. Significant environmental issues associated with the legacies from heavy mining and manufacturing industries will have to be addressed and managed. Also, recent floods, droughts, and fires have highlighted the need for effective regional disaster preparedness and response capabilities. These issues are also thrown into focus by the increasing need for climate change mitigation and adaptation measures.

3. Integration of *Serbia* in the European Research Area in the field of *Environment*

Thessalonica Agenda for the Western Balkans: Moving towards European integration

At the European Summit in Thessalonica held on 21 June 2003, the European Union offered **European Partnership to the Western Balkans countries** as one of the key instruments of the EU pre-accession strategy for the potential EU membership candidates. The EU Council of Ministers adopted the Decision on the principles, priorities and conditions contained in the European Partnership with Serbia-Montenegro including Kosovo, in compliance with the UN Security Council Resolution 1244 of 10 June 1999.

The Partnership lists short term (12-24 months) and mid-term (3-4 years) priorities for the preparations for further integration in the EU. This mechanism shall determine the relations between the EU and Serbia until the Stabilisation and Association Agreement has been signed.

One of the most important facts regarding European Partnership is that the financial assistance is conditioned by the implementation of the priorities (Annex to the document, Article 5). In other words, the document shall exclusively arrange relations between the EU and our country all the way through to the signing of in the Stabilisation and Association Agreement-it is a new framework for defining relations between the EU and the Western Balkans. Financial assistance is also conditioned by the progress achieved in meeting the Copenhagen criteria, although these are the criteria set to be met for the membership, not for the association.

On the publication of this document, Serbian Government adopted Information of European Partnership and the need to adopt the Action Plan in order to meet the priorities set in the European Partnership.

Source: The EU Integration Office of the Government of Serbia. Reference

3.2. The Stabilisation and Association Agreement between EU and Serbia

On 9 September 2008, National Assembly of the Republic of Serbia ratified the Stabilisation and Association Agreement (SAA) and Interim Trade Agreement. This formally marked the end of the process initiated on 10 October 2005, when negotiations for conclusion of this agreement were started between the Republic of Serbia on one side and the European Communities and their member states the other. SAA and Interim Agreement were initiated on 7 November 2007, and they were signed on 29 April 2008. SAA will enter into force after its ratification by the EU Council of Ministers and the European Parliament and after it is ratified by all signatories i.e. Member States of the EU. The Interim Agreement will enter into force after it is ratified by the EU Council of Ministers and the European Parliament.

Source: European Union's Framework Programmes for research and technological development reference

Serbia is an associated country to the EU's Framework Programmes for research and technological development, making all legal entities established in Serbia eligible for funding on the same footing as legal entities from the Member States.

4. SWOT analysis of the *Environment* research capacity in *Serbia*

4.1. Strengths

- Environmental protection recognized among national priorities.
- Number of realized projects
- Institutional support for RTD in environmental protection by the MSTD
- Number of public institutions participating in environmental protection research
- Increasing performance of researchers as measured by the number of publications in SCI journals
- Presence in EU research programmes.
- Presence of sound EU policy in environmental protection actions

4.2. Weaknesses

- Lack of specific environmental protection research themes (predefined by the MSTD)
- Insufficient application of projects results in industry
- No clear environmental protection research strategy.
- No clear focus on areas that might provide most benefits for the environmental protection as a whole-Lack of skills for the preparation of proposals for EU-funded research programmes
- Lack of project management skills
- Uneven research infrastructure among and within research institutions
- Small percentage of research equipment usage
- Complicated procedures for visiting EU research facilities

4.3. Opportunities

- National strategy for science and technological development to be accepted in the coming months
- Environmental protection research among one of the priorities.
- Presence in EU research programmes.
- Special WBC calls
- EU accession process in perspective

4.4. Threats

- Economic crisis – endangered RTD funding.

- Unstable economic situation
- Possible lack of institutional support for acquisition of latest technologies
- Brain drain. Loss of environmental protection researchers to both foreign research institutions and to the private sector

5. Environment research priorities for Serbia

As stated previously, there are no policy documents at the moment which define strategic goals for the future in the R&D sector in Serbia, including environment research. However, the work on a new *National strategy for science and technological development* is currently in its final stages, and is scheduled to be completed by the end of June 2009. It is expected that it will define national strategic priorities of Serbia's development in the S&T field, including the environment sector. However, being strategic priorities, these will not translate into specific priorities / themes. In addition, the strategic priorities are being formulated with two goals in focus:

- to straighten cooperation with industry and private sector together with other WBC regions
- to include all existing research capacities and human resources in both basic and technological development research in the field of environmental protection in order to improve the ecological efficiency and recycling capability of the industry

For decades the main funding body for environment research in Serbia has for decades been the MSTD. While the funding of research projects is based on regular competitive calls for project proposals (for a typical duration of 5 years), these are not thematic (i.e. no areas/themes predefined by the MSTD). Rather, the approach is bottom-up, as is described in 2.1.2.

Since the main research performers in the environment sector in Serbia are in the academic sector, comprised of both higher education and research organizations, research in the environment area has so far been driven by the interests of the main research performers themselves. As a result, few common broader research targets, and subsequently, priorities, can be defined in such a setting (they translate to each performer's own field of interest).

Based on all of the above, rather than identifying a set of actual thematic priorities, areas of strong research capacities and human resources within the environment sector for both: readiness and future potential are defined.

Group A *Environment* Research Priority Sectors

Based on the existing infrastructure, human resources and recent performance (as judged by the number of publications in SCI indexed journals), the top fields in the Serbian environmental protection research sector include:

- Environmental technologies
- Developing materials for environmental protection
- Energy efficiency

- Monitoring and waste management

Various topics within these disciplines may be supported as priorities in terms of both existences of the necessary human and material resources and of research interest for the country.

Among these, based on success within the FP programmes, the issues of the prevention of river basins, renewable energy production, modelling lake life circles and water protection in them, developing and implementation of the recycling technologies, have been identified as themes of readiness to pursue cutting-edge research and development at the EU level.

Group B *Environment* Research Priority Themes

More areas are envisaged to enhance performance in case of the availability of capacity building programmes. One of the tasks is to involve more SMEs, and to start up companies to take more active role in the environmental protection projects in Serbia. EU programmes for enhancement of environmental protection are therefore strongly advocated by the Serbian environmental protection research sector.

B. Priority 1 Environmental Hazards in Cultural Heritage - Development of Knowledge Base for Effective Western Balkan Protection Strategy

In recent years, Western Balkan countries have suffered from changes in ambient conditions (higher temperatures and increase of UV radiation, humidity and fluctuations of temperature and humidity, increased hours of sunshine, wind, rainfall and cyclic wetting and drying) and disastrous floods. The changes occurred across regional borders and included neighbouring states from Slovenia to Serbia (along the river Sava), from Hungary, Croatia and Romania (the Danube and the Tisa). These changes caused enormous damage in built environment and there is still not enough knowledge for adopting the common strategy and policies in prediction, prevention and restoration.

Besides economic losses which are extremely high, the immovable Cultural Heritage/architectural heritage in the broader region has also suffered serious damages.

As the floods cannot be prevented, the Balkan will have to face further accidents due to the change of climate.

There is a serious lack of relevant data and documentation on material characteristics and building structural elements of architectural heritage which can be used in multidisciplinary research of prevention, mitigating and repairing damages caused by climate changes and specially floods.

The objectives of the proposed project are:

- explore strategies to build the regional network and a database on the immovable cultural heritage classified according to its sensitivity to climate changes and flood exposure along the most sensitive river corridors;
- to review existing protocols, methodology and best practices in Europe concerning the risk assessment and prevention measures in the field,
- to improve and develop non-destructive techniques and methods for detection of types and mechanisms of damages on specific structures and materials caused by chemical, physical and biological effects,
- to develop strategies for both prevention and reparations in the case of defined action type.

These sub-activities address multidisciplinary research contributing to the conservation and safeguarding of cultural heritage and include the need to respond to the challenges resulting from the changes of our natural environment as well as from man-made activities and focusing on damage assessment and preventive conservation of the cultural heritage.

The major goal of the project is the initiation of an effective interdisciplinary collaboration for the development of interregional approach and strategy for the cultural/architectural heritage protection based on knowledge and information of risk hazards of climate changes. Besides the contribution to cultural heritage protection, these activities will contribute to further building activities in flood-prone regions.
Common regional problems are the damaging of valuable arable land and the industrial and urban wastewater pollution at the middle and down streams of the rivers. The main causes of soil contamination include the effects of the densely populated urban areas (i.e. land use, lack of waste disposal sites and bad waste water management, traffic pollution). Enhancing of common responsibility for natural heritage is one of the key issues which can help to achieve the overall objective of the Programme. Responsibility for environment can be achieved through minor actions and through co-operation between authorities on the two sides of the border in the field of environmental and water management planning, as well as in animal health issues, or general protection of biodiversities.

B. Priority 2 Conservation and sustainable management of natural and man-made resources and biodiversity

Recent advancements in land systems science stress and the need to improve the understanding of complex human-environment interactions can enable and constrain sustainable land use transitions and offer a tool for integrated resource management. The dynamics of land systems appear to be non-linear, uncertain and prone to sudden, unexpected changes. This poses challenges to forest biodiversity management and policy. Hence, it indicates a need to develop capacity to detect, cope with and intervene into land system changes in a sustainable way. The research will develop novel approaches aimed at understanding, assessing and forecasting socio-economic and ecological interdependencies and feedbacks within coupled human-environment systems as well as between natural resources management and policies. The project calls for critical pathways and hot spots of land transformation to be identified in a variety of environmental conditions and management systems, representative of WBC.

The ecosystem approach requires a unifying multidisciplinary holistic framework at various scales to address system-related issues ("from observation and understanding to adaptive management"). There is a need for strengthening research co-operation in the field of biodiversity research in WBC. Efficient research cooperation needs to be based on a continuously-developed European biodiversity research strategy that takes into account all WBC countries into the ERA for biodiversity, and that helps to underpin sub-global assessments including any follow-up to the Millennium Ecosystem Assessment. This call is for an ERA-Net for further developing cooperation among biodiversity research funding agencies, and to develop shared biodiversity research strategies and infrastructures, thereby developing a stable WBC cooperation structure for biodiversity research. This project should help to identify and develop/support important biodiversity research. It will further develop a coherent vision of research planning and use of WBC research infrastructures.

Activities are foreseen in relation to water and air resources management, biodiversity urban systems and forest. The activities aim essentially at building-up innovative methods for protecting and managing resources in a changing environment, mitigating risks and developing new balances between the availability of resources and the livelihoods and between the protection of the ecosystems and economic and social needs. There are also activities (forest research) aiming at developing research platforms for longer-term provision of data of use for resource management. Most of these activities are of high relevance to WBC cooperation. The main objective of the research in this domain is to contribute to developing methods for managing natural and man-made resources (e.g. soil, water, air, biodiversity, forests, and urban environments) based on an integrated ecosystem approach and taking into account environmental changes acting as major drivers. It is expected that EU level research supported in this domain should contribute to developing methods that would allow human activities affecting the ecosystems and the environment to be managed in an integrated manner promoting conservation (long-term objective) and sustainable use in an equitable way of resources , thus assuring sustainability, the provision of services and the protection of the ecosystems capacity to deliver resources and services, and minimizing risks for society and ecosystems

B. Priority 3 ***Expanding the capacity to protect and manage the biodiversity of WBC waters including technologies and mitigation tools for urban water services***

The recent EU initiatives for improving energy efficiency and creating a post-carbon economy present additional challenges to the current models of urban water systems, and their corresponding infrastructure, in terms of cost effectiveness, performance, safety and sustainability. It is therefore, urgent to expand those activities in order to develop new techniques in the area of reliability and risk assessment of urban water system, especially in the context of water scarcity conditions and irregular supply conditions. The development of leakage control and the improvement of technologies for advance asset management will increase water utilities' energy self-sufficiency facilitating the appraisal of adaptation. Options across multiple water-dependent sectors will be mitigated so water re-use efficiency and water demand/water supply

management will be improved assessing the sustainability of alternative water resources in cities.

The project should develop models to investigate and predict how freshwater biodiversity and services will provide response to the outside influences, including social and economic pressures and climate change, at scales from the local to the global. The project will provide the tools in order to analyse and detect changes in distribution patterns and conservation status of species and habitats of community or special scientific interest at appropriate scales of space and time. To achieve this, it should link distributed databases of partner organisations and others to create a platform with a well-designed portal. This will allow scientists across the WBC to share updated scientific knowledge biodiversity and management regimes. The project will identify critical gaps in information and will act to fill those gaps where possible. The project will include measures to ensure that any properly qualified organisation may supply appropriate data through the platform, and that the platform is properly maintained after the end of EC financing. Where possible, any rival consortia should agree beforehand that they will collaborate to help the federation with appropriate data sets. In order to help the organisations, that are not in the consortium, to link their databases to the portal, extra financial resources have to be included. Wide inclusiveness of the proposals will be assured. Significant effort will be devoted to outreach and awareness-raising of issues and results among scientists, policy makers and the public.

Solutions should be optimised for each case (urban, agricultural areas,…) and also applicable to all WBC countries. Solutions should be opened and integrative, technically simple and cheaper to operate and maintain. Emphasis should be given to the development of innovative decentralised water supply and sanitation systems that may reduce the risk of wastewater reuse for irrigation purposes. Special attention will be paid to the risk evaluation (chemical and microbiological) to ensure safe water and effluents for people and ecosystem protection. Development of new analytical tools for easy monitoring of waters will be required in order to avoid current analytics costs.

B. Priority 4 ***Atmospheric chemistry and climate change interactions- Desulphurization of gas emission from large electric and thermal power generation plants***

The aim is to improve the understanding of the processes linking biosphere emissions of active trace gas constituents, anthropogenic emissions, their chemical transformations and climate change. Research should include causes and effect of regional accumulations of air pollutants, changes of the atmospheric self-cleansing capacity and its links and feed-back with climate. Changes in troposphere composition and chemistry should be quantified on the background of – and giving feedback to - climate change and processes over the next 50 years or so. Anthropogenic emission scenarios of relevant compounds must be taken into account with the biogenic ones and their interplay (e.g. in O_3 and OH chemistry). Interactions and feedbacks should be considered at regional to global scale. In Serbia, like in other EU countries, all available types of energy sources are used for electric and thermal power generation. National fuel resources such as local or national availability of coal, lignite, biomass, oil or natural gas, largely influence the choice of fuel used for energy generation in each country. Combustion plants are

operated according to energy demand and requirement, either as large utility plants or as industrial combustion plants providing power (e.g. in the form of electricity, mechanical power), steam, or heat to industrial production processes. Most combustion installations use fuel and other raw materials taken from the earth-s natural resources, converting them into useful energy. Fossil fuels are the most abundant energy source used today in Serbia, as well as in other parts of the world. However, their burning results in relevant and, at times, significant impact on the environment as whole. The combustion process leads to the generation of emission to the air, water and soil, of which emissions to the air are considered to be one of the main environmental concerns.

The most important emissions to air from combustion of fossil fuels are SO_2, NO_X, CO, particulate matter (PM_{10}), and green house gases, such as N_2O and CO_2. Other substances such as heavy metals, halide compounds and dioxins are emitted in smaller quantities.

Serbian lignite contain sulphur ranging from 1.0 to 3.5%, and existing power plants use old technologies generating large quantities of SO_2 and NO_X. Serbia is party to Energy Treaty and due to that fact it is obligatory to adjust emissions values of above mentioned pollutants, from its large combustion (over 50 MWh power) till December 31, 2017. This is great challenge in economic but also in technological terms. Some research activities already started, offering possibility to employ domestic research results instead expensive imported but not efficient technologies.

* Besides the authors mentioned above, the National background for *Environment* for *SERBIA* report was done with the assistance of Gordana Stefanović, Vlada Veljković, Zoran Matović and Nenad Jaćimović.

Annex II Literature Survey

Environment										
Title	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**Total Of SifCat**
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
AGRICULTURAL ENGINEERING	1	1	1	1		3		4	7	18
AGRICULTURE, SOIL SCIENCE	1		2	1	3	1	2	4	1	15
BEHAVIORAL SCIENCES		3		3	7	4	4	5	5	31
BIOCHEMICAL RESEARCH METHODS	3	4	7	5	12	16	16	13	22	98
BIOCHEMISTRY & MOLECULAR BIOLOGY	53	59	64	42	44	70	63	81	77	553
BIODIVERSITY CONSERVATION		1			1	1	6	3	2	14
BIOLOGY	5	4	3	20	21	17	32	20	35	157
BIOTECHNOLOGY & APPLIED MICROBIOLOGY	7	11	11	10	14	12	26	30	27	148
CHEMISTRY, MULTIDISCIPLINARY	128	110	98	119	136	147	140	189	151	1218
CHEMISTRY, ORGANIC	13	16	10	16	22	18	26	25	38	184
CHEMISTRY, PHYSICAL	19	28	34	54	67	72	72	134	92	572
ECOLOGY		4	3	7	10	8	13	12	13	70
ENDOCRINOLOGY & METABOLISM	24	17	37	23	46	32	47	74	55	355
ENERGY & FUELS	12	7	10	10	9	15	20	15	19	117
ENGINEERING, CHEMICAL	15	13	17	18	29	18	43	43	50	246
ENGINEERING, CIVIL	4	1	5	5	5	8	11	6	12	57
ENGINEERING, ENVIRONMENTAL	3	3	4	2	7	8	9	8	14	58
ENVIRONMENTAL SCIENCES	16	19	9	19	20	31	41	50	56	261
ENVIRONMENTAL STUDIES		1		1	3	1	1			7
FORESTRY	1			3	1	2	2	3	2	14
GEOGRAPHY, PHYSICAL		1	1				2	2	4	10
LIMNOLOGY		1			1					2
MARINE & FRESHWATER BIOLOGY	1	1	3		3	1	1	8	8	26
METEOROLOGY & ATMOSPHERIC SCIENCES	7	3	2	3	8	6	6	5	8	48

Table continued

1	2	3	4	5	6	7	8	9	10	11
MICROBIOLOGY	5	9	4	13	11	14	9	22	27	114
OCEANOGRAPHY				1				1		2
PLANT SCIENCES	30	15	19	35	31	34	50	68	71	353
PUBLIC, ENVIRONMENTAL & OCCUPATIONAL HEALTH	5	4	6	10	19	24	29	28	23	148
REMOTE SENSING									1	1
REPRODUCTIVE BIOLOGY	7			1	2	6	7	3	6	32
TOXICOLOGY	7	12	5	10	16	13	36	24	45	168
WATER RESOURCES	5	2	8	1	9	7	8	19	8	67
ZOOLOGY	8	3	11	8	12	19	9	29	35	134
	380	**353**	**374**	**441**	**569**	**608**	**731**	**928**	**914**	**5298**

Annex III List of some FP and Eureka Projects

Acronym	Coordinator	Institution
1	2	3
Framework Programe		
ACCENT	Marija Todorović	University of Belgrade, Faculty for Agriculture
ADAGIO	Dragutin Mihajlović	University of Novi Sad, Faculty of Sciences, Center for Meteorology and Environmental Predictions
AGROIWATEC	Božo Dalmacija	University of Novi Sad, Faculty of Sciences
ALARM		University of Novi Sad,
AQUATERRA	Momir Paunović	Ministry for Protection of Natural Resources and Environment – R. Serbia
BAFN	Milica Mojašević	University of Belgrade, Faculty for Agriculture
CECRA	Božo Dalmacija	University of Novi Sad, Faculty of Sciences
CEEC AGRI POLICY	Natalija Bogdanov	University of Belgrade, Faculty for Agriculture
CROPWAT	Radmila Stikić	University of Belgrade, Faculty for Agriculture
ECO-PCCM	Aleksandar Dekanski	Institute of Chemistry, Technology and Metallurgy
EMCO	Petar Jovančić	University of Belgrade, Faculty of Technology and Metallurgy
INCO RISE	Miodrag Zlatanović	University of Belgrade, Faculty for Electronic Engineering
INDUWASTE	Zora Žunić	"VINČA" Institute of Nuclear Sciences
INTAILRISK	Zora Žunić	"VINČA" Institute of Nuclear Sciences
INTARESE	Milena Jovašević-Stojanović	"VINČA" Institute of Nuclear Sciences
INTERESE	Milena Jovašević-Stojanović	"VINČA" Institute of Nuclear Sciences
INTREAT	Željko Kamberović, Vlastimir Trujić	University of Belgrade, Faculty for Technology and Metallurgy, Institute for Cooper Bor
IPB-CNP	Zoran Petrović	Institute of Physics, Belgrade
OPSA	Zoran Popović	Institute of Physics, Belgrade
PREWARC	Željko Kamberević	University of Belgrade, Faculty for Technology and Metallurgy
RECOFUEL	Predrag Radovanović	"VINČA" Institute of Nuclear Sciences
RECOVER	Nenad Đajić	University of Belgrade, Faculty of Mining and Geology
REP-LECOTOX	Radmila Kovačević	University of Novi Sad, Faculty of Sciences
RES INTERGRATION	Milorad Bojić	University of Kragujevac, Faculty for Mechanical Engineering
RIMAWA	Anđelka Mihaljov	University of Novi Sad, Faculty of Technical Sciences
RISE	Miodrag Zlatanović	University of Belgrade, Faculty of Electrical Engineering
RRP-CMEP	Dragutin Mihajlović	University of Novi Sad, Faculty of Sciences
SAFIR	Radmila Stikić	University of Belgrade, Faculty for Agriculture
SARIB	Sanja Vraneš	"Mihajlo Pupin" Institute, Belgrade
SEEFIRE	Zoran Jovanović	University of Belgrade, Computer Centre
WATERWEB	Radmila Stikić Mile Božić	University of Belgrade, Faculty for Agriculture, Institute "Jaroslav Černi"
WEB-ENV	Miroslav Trajanović	University of Nis, Faculty for Mechanical Engineering

Table continued

1	2	3
EUREKA		
EUROENVIRON SEPAR	Božo Dalmacija	University of Novi Sad, Faculty of Sciences
PUREWATER	Nevenka Rajić Viktor Nedović Milorad Golubović	University of Belgrade, Faculty Of Technology and Metallurgy, University of Belgrade, Faculty Of Agriculture, Gm Water, D.O.O.
WETPUR	Dragan Marković	Singidunum University, Faculty Of Applied Ecology Futura
FACTORY BESTPRODUCT-TENEEST	Jovanovic Mica Stokic Dusan	University of Belgrade, Factulty Technology and Metallurgy, Chamber Of Commerce And Industry Of Serbia
ECONTEC EWCT	Zoran Radaković Marko Rakin Vladan Devedžić Narciso Stanković	University of Belgrade, Faculty of Mechanical Engineering University of Belgrade, Factulty Technology and Metallurgy University of Belgrade, Faculty Of Business Administration, Uno-Lux Ns D.O.O.
EUROENVIRON BIOPOLS	Maja Radetić Zvezdan Blagojević	University of Belgrade, Factulty Technology and Metallurgy, A.D. Intex Mladenovac
INWASCOMP	Ljiljana Petrašinović-Stojkanović Dragan Matić	University of Belgrade, Centre For Multidisciplinary Studies, Zorka-Keramika Doo Sabac
MEC-REC	Petar Uskoković Dejan Ninković Mitra Miličević	University of Belgrade, Faculty Of Technology and Metallurgy, University of Belgrade, Faculty Of Mechanical Engineering, Hip-Petrohemija A.D.
HEMIRON	Viktor Nedović Aleksandar Sedmak Diana Bugarski Ivanka Popović Muriz Turkovic	University of Belgrade, Faculty Of Agriculture, Innovation Center D.O.O., Institute For Medical Research, University of Belgrade , Faculty Of Technology, Turkovic, D.O.O.

Annex IV T&D Environmental Research Projects

Technological Development		
Title	**Research Organization**	**Tim Lider**
1	**2**	**3**
Electronics and telecommunications		
Development of systems and instruments for water, oil and gas investigations	University of Novi Sad, Faculty of Technical Sciences	Miloš Živanov
Industrial softwear		
Application of information technologies in digitalization of scientific and cultural heritage	University of Belgrade, Faculty of Mathematics	Žarko Mijajlović
Mechanical engineering		
Development and improvement of infrastructure for evaluation of product pursuing according to EU Directives of New and Global Approach	"VINČA" Institute of Nuclear Sciences	Predrag Popović
Development of safe, efficient and ecological (SE-ECO) ships	University of Belgrade, Faculty of Mechanical Engineering	Milan Hofman
Numerical optimization of conceptual solution for FAP vehicle to meet the EU Directives	"VINČA" Institute of Nuclear Sciences	Željko Šakota
Development of models and technologies of communal waste transport logistics	University of Niš, Faculty of Mechanical Engineering	Zoran Marinković
Development of integrated and sustainable system of motor vehicle recycling	University of Novi Sad, Technical faculty 'Mihajlo Pupin' in Zrenjanin	Milan Pavlović
Transportation		
Program for reducing harmful gas emission and noise in the air transportation system	University of Belgrade, Faculty of Transport and Traffic Engineering	Slobodan Gvozdenović
Recommendation of methods for evaluation of developing scenario of the air transportation system	University of Belgrade, Faculty of Transport and Traffic Engineering	Vojin Tošić
Study of the effect of rail service modernization on the formation of a unique and environmental friendly means of transport in Serbia	University of Belgrade, Faculty of Transport and Traffic Engineering	Miloš Ivić
Development of rolling stock management for CO_2 emission decrease	University of Belgrade, Faculty of Transport and Traffic Engineering	Vladimir Papić
Urban and Civil Engineering		
Study of contemporary concrete composites based on domestic raw materials and recycled concrete aggregate	University of Novi Sad, Faculty of Technical Sciences	Vlastimir Radonjanin
Study and application of geosinthetic materials for resolving of geotechnical problems	University of Belgrade, Faculty of Mining and Geology	Slobodan Đorić
Sustainable development and organization of tourist and spa resorts	Institute of Architecture and Urban & Spatial Planning of Serbia	Mila Pucar
Ambient, social and ecological aspects of mining sites	Institute of Architecture and Urban & Spatial Planning of Serbia	Nenad Spasić

Table continued

1	2	3
Abrasion induced damages of the water concrete walls risk assessment	University of Niš Faculty of Civil Engineering and Architecture	Jelena Marković-Branković
New profitable and ecological sustainable integrated mine waste treatment of RTB Bor	University of Belgrade, Technical faculty in Bor	Rodoljub Stanojlović
Biotechnology		
Advancing production and quality of goat and kid meat within environmental friendly system of breeding	Institute for Animal Husbandry, Belgrade-Zemun	Miroslav Žujović
Development of environmental friendly corn cultivation technology	Maize Research Institute, Zemun Polje	Milena Simić
The choice of adequate cultivation parameters of pine trees with the aim of obtaining high quality wood	University of Belgrade, Faculty of Forestry	Ljubivoje Stojanović
Characteristics of forest ecosystems in national parks Kopaonik and Tara in relation to the principles of sustainable management	University of Belgrade, Faculty of Forestry	Milan Medarević
Planting technology in the forestation of degraded terrains	University of Belgrade, Faculty of Forestry	Vasilije Isajev
Biological, chemical and ecotoxicological studies of herbicides and their application	Institute for Plant Protection and Environment	Vaskrsije Janjić
Advances in semi-intensive carp (Cyprinus carpio) production in sustainable aquaculture	Scientific Institute of Veterinary Science of Serbia	Zoran Marković
Changes in forest ecosystems under the influence of global worming	Institute of Forestry	Ljubinko Rakonjac
High resolution satellite images in the collection and processing of geographical data in forest ecosystems	Institute of Forestry	Mihailo Ratknić
Wooden biomass as a resource of sustainable development of Serbia	University of Belgrade, Faculty of Forestry	Gradimir Danon
Optimization the quality parameters of soil and substrate in the production of high-quality vegetables in restricted areas	Institute of Land Management	Radoš Pavlović
Improving of energy and ecological efficiency of tractors and mobile systems	University of Novi Sad, Faculty of Agriculture	Ratko Nikolić
Revitalization effects of brown field sites in Serbia	University of Belgrade, Faculty of Forestry	Miodrag Zlatić
Productivity increase of the agricultural land as a function of sustainable development	Institute of Field and Vegetable Crops, Novi Sad	Petar Sekulić
Remediation techniques for the improving quality of polluted soils	Institute of Field and Vegetable Crops, Novi Sad	Mira Pucarević
Sustainable agriculture development of new technologies in vegetable production	Institute of Field and Vegetable Crops, Novi Sad	Žarko Ilin
Protection of eroded areas and groundwater by anti-erosion ecological and fito-material application	University of Belgrade, Faculty of Forestry	Vjačeslava Matić

Table continued

1	2	3
Preservation, repair and rational use of Serbian agricultural land to improve food production and environmental protection	Institute of Land Management	Srboljub Maksimović
Manage the production of milk and milk products on the principles of organic production and sustainable development	University of Belgrade, Faculty of Veterinary Medicine	Slobodan Jovanović
Biodegradation of specific agro-industrial and municipal waste and the quality of environment	University of Belgrade, Faculty of Veterinary Medicine	Vera Raičević
Sustainable development of rearing white mallow (*Althaea offcinalis* L.) to ensure stable production and preservation of natural resources	„Dr Josif Pančić“Institute	Slobodan Dražić
Pathology and diagnosis of current animal disease threatening public health and environment	Scientific Veterinary Institute "Novi Sad"	Dušan Orlić
Technology improvement of raising protective forest belts	University of Belgrade, Faculty of Forestry	Stevan Dožić
Improvement of safety management systems and quality processes in the production of traditional meat products	University of Belgrade, Faculty of Agriculture	Dušan Živković
Monitoring of water ecosystems in order to obtain accurate and sanitary safety products competitive to the EU market	Institute for Hygiene and Technology Meat	Aurelija Spirić
Production of microorganism’s biomass for bioremediation by mobile bioreactor	Institute of Chemistry, Technology and Metallurgy	Miroslav Vrvić
Control of biohazard agents at farms and the application of biotechnological procedures for risk reduction in the system of safe food production	University of Novi Sad, Faculty of Agriculture	Branka Vidić
Development of product and methods for sustainable use of pesticides	University of Novi Sad, Faculty of Agriculture	Branko Konstantinović
Energy efficiency		
Development and application of models and software for the purpose of increasing energy efficiency in furnaces	"VINČA" Institute of Nuclear Sciences	Miroslav Sijerčić
Energy and ecological efficiency of the central wastewater purification installation	University of Kragujevac, Faculty of Mechanical Engineering	Milan Despotović
Research of alternative fuels and technologies for operation of city buses in accordance with European regulations	"VINČA" Institute of Nuclear Sciences	Zlatomir Živanović
Enhancing energy efficiency of renewable resources in function of suistainable development	University of Belgrade, Faculty for Building Management „Union“	Svetlana Stevović
Regulation, protection and usage of water		
Development of water protection technologies in hot zinc treatment process	IMS – Institute for Materials Testing	Bisenija Petrović
Development of new hydroinformatic systems for water resources management	University of Belgrade, Faculty of Civil Engineering	Miloš Stanić

Table continued

1	2	3
Protection of water quality in lake basins by erosion process contole	University of Belgrade Faculty of Forestry	Stanimir Kostadinov
Methods development and application for pressure estimation and risk assesment for implementation of Water Framework Directive (WFD, 2000/60/EC)	Institute for the Development of Water Resources “Jaroslav Černi”	Božidar Stojanović
Study of extreme hydrological situations – floods and droughts in Serbia	Institute for the Development of Water Resources “Jaroslav Černi”	Stevan Prohaska
Sustained development of melioration in Vojvodina	University of Novi Sad Faculty of Agriculture	Sima Belić
Water basins management and protection	University of Belgrade, Faculty of Civil Engineering	Radomir Kapor
Water and sediment remediation and risk assessment in Vojvodina	University of Novi Sad, Faculty of Sciences	Srđan Rončević
Quality water assessment in open water resources based on the GPRS communication	"Mihajlo Pupin" Institute Belgrade	Željko Despotović
Aerobic level influence on integral porous areas in Serbia	Institute for the Development of Water Resources “Jaroslav Černi”	Milan Dimkić
Model of water protection walls based on the GIS and georadars technologies	University of Novi Sad, Faculty of Technical Sciences	Miro Govedarica
Risk assessment in implementation of EU directives in Serbia	University of Belgrade, Faculty of Civil Engineering	Jovan Despotović
Environmental protection		
Characterization of ash, slag and sulfur gypsum for road making	University of Belgrade, Faculty of Mining and Geology	Slobodanka Marinković
Technological process and plant for oil and mercaptanes removal from refinery waste waters	University of Belgrade, Faculty of Technology and Metallurgy,	Mića Jovanović
Development and application of high frequency ecological equipment for air pollution removal in industry	University of Belgrade, Faculty of Electrical Engineering	Slobodan Vukosavić
Integral treatment of mine waste waters in Bor cooper mines	Institute of Mining and Metallurgy Bor	Mile Bugarin
Characterization of resperable particles indoor and outdoor environment	"VINČA" Institute of Nuclear Sciences	Milena Jovašević-Stojanović
Developing of systems for waste gases treatment	University of Nis, Faculty for Occupational Safety	Ljiljana Živković
Standardization of referent material samples and geomaps design: gama spectrometric analysis of environmental samples	University of Novi Sad, Faculty of Technical Sciences	Vesna Spasić-Jokić
Influence of the construction parameters on environment and some solution of light walls	University of Niš, Faculty of Electronic Engineering	Dejan Ćirić

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Technical aspects of protection and material recycling in graphical industry	University of Novi Sad, Faculty of Technical Sciences	Jelena Kiurski
Implementation of coherent activities in health promotion, ethical codex and life quality of employees	University of Niš, Medical faculty	Mirjana Aranđelović
Development methods and materials for waste industrial gases treatment	University of Belgrade Faculty for Building Management „Union“	Marina Ilić
Ecology, monitoring and technological procedures for invasive plant control	Faculty of Forestry, University of Belgrade	Mihailo Grbić
Trepca plant influence on river Ibar pollution and protection measures	University of Pristine, Faculty of Technical Sciences Kosovska Mitrovica	Milan Barać
Protected natural resources of Serbia: safety risks and protection management	University of Belgrade, Faculty of Security Studies	Ivica Radović
Developement of the new solid waste recultavitation procedures in Kostolac thermo power plant	University of Belgrade, Faculty of Agriculture	Vlado Ličina
Development of an expert system and methods for ergo-ecological risk assessment in power plants	University of Nis, Faculty for Occupational Safety	Miroljub Grozdanović
Electro and electromagnetic fields influence on environment	Electrical Engineering Institute "Nikola Tesla"	Petar Vukelja
Basic mobile telephone station environmental risk assessment	University of Niš, Faculty for occupational safety,	Dejan Petković
Development mesurements and monitoring system for the local ecological and meteorological parameters according to the world standards	University of Niš , Faculty of Electronic Engineering	Milan Radmanović
Integral ship waste material management model for river corridors	Institute 'Kirilo Savić' u Belgrade	Marija Vukić
Greenhouse gass emission quantification and expert system development for the source emission reduction in populated places	University of Niš , Faculty of Mechanical Engineering	Gordana Stefanović
Medical waste management in stomatological practice	Faculty of Stomatology Pancevo, Academy of Economy Novi Sad	Dušica Popović
Environment influence on human oral tissues in Pancevo	Faculty of Stomatology Pancevo, Academy of Economy Novi Sad	Desanka Cenić-Milošević
Ecoplants on locality Obedska bara research for hazardous human and animal virus etiology diseases	University of Belgrade, Faculty of Veterinary Medicine	Bosiljka Đuričić
Factors of soil sliding and influence on the rivers of Serbia	Institute for a water resources 'Jaroslav Černi' a.d. Belgrade	Duško Sunarić

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Material developement		
Geopolimers - new materials based on electro filters ash from thermal power plants in sustainable development frame	Institute for Multidisciplinary Research-IMSI	Miroslav Komljenović
Ecological weld technology development	Institute of Mining and Metallurgy Bor	Ana Kostov
Mineral waste valorization by using mechanochemical process	Institute for Technology of Nuclear and Other Mineral Raw Materials	Milan Petrov
Development of electrochemical productin of $FeO4^{(2-)}$ and $FeO4^{(3-)}$ as powerful ecology safe oxidizing agents	IHIS Techno experts d.o.o.Beograd	Milan Čekerevac
Development of ecological process for low quality Cu concentrate containing increased levels of toxic ingredients	University of Belgrade, Technical faculty in Bor	Nada Štrbac
WEEE waste metal recycling process	University of Kragujevac, Faculty of Mechanical Engineering Kragujevac	Bogdan nedić
Development model of optimal valorization for the ecological olefin production from the Refinery	IMS – Institute for Materials Testing Belgrade	Dragoljub Urošević
Fundamental Research		
Title	**Research Organization**	**Tim Lider**
Physics		
Emission and transmission of pollutants in an urban atmosphere	Institute of Physics Belgrade	Mirjana Tasić
Geology		
The intensity of chemical and mechanical erosion and accumulation in East Serbia	University of Belgrade, Faculty of Geography	Predrag Manojlović
Geochemical investigation aimed at exploration of new fossil fuel deposits and environmental protection	University of Belgrade, Faculty of Chemistry	Branimir Jovančićević
Mineral species of Serbia: the composition, structure, genesis, implementation and impact on the environment	University of Belgrade, Faculty of Mining and Geology	Mihovil Logar
Diversity of fossil and recent flora and fauna of Serbia – evaluation of diversity degree and estimate of threat status as an indicator of natural values conservation	University of Belgrade, Faculty of Mining and Geology	Vladan Radulović
The influence of mining activities in exploitation lead-zinc mineral on the geological change and the environment as well as the health aspect of human population in the area of the northern part of Kosovo and Metohija	University of Priština, Faculty of Technical Sciences Kosovska Mitrovica	Blagoje Nedeljković
Biology		
Aphids, aphid parasitoids and eriophyid mites: diversity and phylogenetic relationships	University of Belgrade, Faculty of Biology	Željko Tomanović
Diversity of flora and vegetation of the central Balkans - ecology, chorology and conservation	University of Belgrade, Faculty of Biology	Vladimir Stevanović

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Running waters of Serbia - study on biodiversity and using data in typology, design of ecological index and ecological status monitoring	"Siniša Stanković" Institute for Biological Research	Predrag Cakić
The ecophysiological characteristics of plants and their potential for restoring the biodiversity of disturbed ecosystems	"Siniša Stanković" Institute for Biological Research	Pavle Pavlović
Floristic Diversity of Pannonian Part of Serbia, Endangerment by spreading of invasive weeds and their influence on human healt	University of Novi Sad, Faculty of Sciences	Boža Pal
Investigations of ecotoxicological aspects of xenobiotics and biological agents action in populations of mouse-like rodents	"Siniša Stanković" Institute for Biological Research	Dragan Kataranovski
Studies on diversity, protection and sustainable use of fish fauna as key components in developing the strategy for integral management of water resources in Serbia	"Siniša Stanković" Institute for Biological Research	Mirjana Lenhard
Patterns of amphibian and reptile diversity on the Balkan Peninsula	Institute for Biological Research"Siniša Stanković"	Miloš Kalezić
Rizospheral interactions and functional mechanisms of adaptation of plants in the process of spontaneous regeneration of damaged land pyrite chats	Institute for Multidisciplinary Research-IMSI	Miroslav Nikolić
Chemistry		
Development of methods and materials for separation, preconcentration, analysis and removal of the environmental pollutants	University of Belgrade, Faculty of Technology and Metallurgy	Mila Laušević
The Development of Methods for Monitoring the Quality of Environment and Industrial Products	University of Niš, Faculty of Sciences	Snežana Mitić
To Green Chemistry via Catalysis	University of Novi Sad, Faculty of Technology	Goran Bošković
Development of new and improvement of the existing procedures for monitoring and advancement of the quality of environment	University of Novi Sad, Faculty of Sciences	Biljana Abramović
Advanced techniques and methods for separation, speciation, and source apportionment of trace elements, organics and radio nuclides	"VINČA" Institute of Nuclear Sciences	Antonije Onjia
Investigation of chemical and physical phenomena in radioactive and hazardous waste management	"VINČA" Institute of Nuclear Sciences	Ilija Plećaš
Physicochemical phenomena on alumosilicate mineral surfaces-the basis for development of new ecological materials	Institute for Technology of Nuclear and Other Mineral Raw Materials	Aleklsandra Daković
Development of quality control systems and improvement of water protection processes	University of Novi Sad, Faculty of Sciences	Božo Dalmacija
Development of new and improvement of existing spectroscopic and electrochemical methods for the follow-up of the quality of environment	University of Kragujevac, Faculty of Natural Sciences and Mathematics in Kragujevac	Randjel Mihajlović

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Spectroscopic and laser research of surfaces, plasma and the environment	"VINČA" Institute of Nuclear Sciences	Milan Trtica
Development of new analytical methods and their application for determination the amount of hard metals in different samples of human environment	University of Priština, Faculty of Sciences Kosovska Mitrovica	Ranko Simonović
Identification of sources and correlations between the contents of organic compounds and elements in abiotic and biotic matrix for monitoring and improving the state of the environment and risk assessment	University of Novi Sad, Faculty of Technology	Biljana Škrbić