

**Integrated Land-use Management Modelling of
Black Sea Estuaries (ILMM-BSE) Project:
Ergene River Basin**

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Tekirdađ

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Black Sea Joint Operational Programme (2007 -2013)

The Black Sea Basin Joint Operational Programme 2007-2013 (hereafter Black Sea JOP) is a programme under the European Neighbourhood and Partnership Instrument (ENPI) of the EU.

The New Neighbourhood Strategy and JOP Black Sea Global objective of the Cross Border Cooperation in the new Neighbourhood strategy is to support sustainable development along both sides of the EU's external borders, to help ameliorate differences in living standards across these borders, and to address the challenges and opportunities following on EU enlargement.

Global objective of JOP Black Sea is to achieve a stronger regional partnership and cooperation to promote sustainable economic and social development of the regions of the Black Sea Basin, based on stronger regional partnership and cooperation.

The Black Sea JOP covers three priorities and a technical assistance component. Each of the three priorities has a number of Measures:

Priority 1: Supporting cross border partnerships for economic and social development based on common resources

Measure 1.1: Strengthening accessibility and connectivity for new intra-regional information, communication, transport and trade links

Measure 1.2: Creation of tourism networks in order to promote joint tourism development initiatives and traditional products

Measure 1.3: Creation of administrative capacity for the design and implementation of local development policies

Priority 2: Sharing resources and competencies for environmental protection and conservation

Measure 2.1: Strengthening the joint knowledge and information base needed to address common challenges in the environmental protection of river and maritime systems

Measure 2.2: Promoting research, innovation and awareness in the field of conservation and environmental protection for protected natural areas

Measure 2.3: Promotion of cooperation initiatives aimed at innovation in technologies and management of solid waste and wastewater management systems

Priority 3: Supporting cultural and educational networks for the establishment of a common cultural environment in the Basin

Measure 3.1: Promoting cultural networking and educational exchange in the Black Sea Basin communities.

Partner Countries and Covered regions of the Programme

Bulgaria: Severoiztochen, Yugoiztochen;

Greece: Kentriki Makedonia, Anatoliki Makedonia Thraki; Romania: South East Region;

Turkey: TR10 (İstanbul), TR21 (Tekirdag, Edirne, Kirklareli), TR42 (Kocaeli, Sakarya, Duzce, Bolu, Yalova), TR81 (Zonguldak, Karabuk, Bartın), TR82 (Kastamonu, Cankırı, Sinop), TR83 (Samsun, Tokat, Çorum, Amasya) ve TR90 (Trabzon, Ordu, Giresun, Rize, Artvin, Gümüşhane);

Russia: Rostov Oblast, Krasnodar Krai, Adygea republic;

Ukraine: Odesa, Mykolaiv, Kherson, Sevastopol, Zaporosh'ye and Donetsk Oblast, Crimea Republic, Sevastopol;

Armenia, Azerbaijan, Georgia, Rep. of Moldova - all regions.

Integrated Land-use Management Modelling of Black Sea Estuaries (ILMM-BSE) Project

Applicant

- Bourgas Regional Tourism Association (BRTA), Bulgaria

ENPI Partners

- Bourgas Prof. Assen Zlatarov University, Bulgaria
- Ukrainian Marine Environment Protection Assoc., Ukraine
- Civitas Georgica, Georgia

IPA Financial Beneficiary

- Hayrabolu Municipality (HBM), Turkey

IPA Partners

- Turkish Marine Environment Protection Association, Turkey
- Namık Kemal University, Turkey

Background

Deltas are the most valuable but also the most vulnerable components of coastal area, both in terms of ecosystem and natural capital. The natural setting of deltas is most often bounded by mountains on one side and coastal zones on the other and may include post-industrialized zones. In consequence, the areas surrounding deltas provides excellent opportunities and landscapes for habitation; forestry, agriculture and the tourism sector, while deltas themselves offer opportunities for fisheries and aquaculture. As a result, the direct and indirect impact on sensitive ecosystems in Europe has considerably reduced their ability to meet an ever-increasing demand for their utilisation and development. In order to meet competing interests for the long term, an integrated, balanced and multifunctional land-use management strategy for deltas must be defined and implemented. Such a management approach must not only consider the interests for their use in promoting socio-economic development, but also the limits of such natural resources for the delivery of goods and services and the potentially catastrophic consequences of over-utilization. Therefore, decisions on the land-use management of deltas should be based on scientific ecological and socio-economic information and be applied using the best available tools and models available. For these reasons, it has been agreed by the partners that it is essential that such a project should be realised in order to develop, enhance and integrate these tools and models to achieve a multifunctional approach within the coordination umbrella of a Black Sea Basin (BSB) Centre of Excellence.

Need for the Project

Prior to the preparation of the proposal for the action, local authorities (local municipalities, local government agencies, etc.) and universities have been consulted about the objectives and possible outcomes of the project. They, almost in common, emphasized the fact that;

- there is significant level of development pressure placing target delta areas in danger,
- there is considerable management void in these areas, where already prepared management plans are inapplicable,
- there is significant lack of information and knowledge about ecosystems of target areas,
- there are initiatives to promote these areas for tourism purposes, without proper land-use plans, which may endanger target deltas and their watersheds areas.

Objectives of the Project

- To develop and evaluate, impact assessment and management tools for the sustainable land use of the watershed areas of coastal deltas, by integrating existing expertise and resources, strengthening scientific and technological excellence, creating a progressive and durable integration of research capacities and advancing knowledge of the topic, via achieving;
- creation of a well-designed integrated database system involving all relevant European research and application practices to ensure lasting integration studies and coordination of research and information exchange,
- fostering communication and collaboration on land management for sustainable use and development of estuaries and their watershed areas by using advanced information and networking technologies,
- development of land-use models for use in decision-making and in analysing the costs and benefits of each alternative land-use choice,
- induction of a cooperative institutional structure (organization) that will provide involvement for all stakeholders in resource management decision-making,
- development of methodologies to promote inter-jurisdictional problem solving in the sustainable management of estuaries and their territories and the commitment of all levels of decision-making, by linking the sustainable development strategies in participating countries, Turkey, Bulgaria, Ukraine and Georgia,

- creation of cooperation and networking among scientists, land developers and decision makers in Black Sea basin to promote consensus of the means of avoiding value loss and to further the application of participatory approaches by joint congresses, workshops and training courses,
- development of an environmental education program to ensure long-term sustainability of a participatory process.

Activities of the Project

Main activities of the project may be classified into four,

- Integrating activities,
- Joint research programme,
- Spreading excellence activities, and
- Management activities.

Each activity has specific purposes and deliverables

Outcomes of the Project

The basic outcome will be sharing knowledge, ensuring the lasting integration of information and data, networking experts and stakeholders throughout Black Sea basin, expanding the use of scientific tools to promote sustainability in the use of the territories of coastal deltas and to spread excellence worldwide.

Research Objectives

Coastal deltas are shallow aquatic ecosystems, which develop at the interface between coastal terrestrial and marine ecosystems. The rates of structural and functional changes of both hydro geomorphological units and biological communities of the estuaries are thus highly dependent on the very active exchanges on auxiliary energy and mass, with the surrounding ecosystems, in particular. However, they develop for themselves particular mechanisms for structural and functional regulations, which in turn lead to specific productive and carrying capacities. This group of activities aim at estimation of the carrying capacity which is extremely important for sustainable land-use without adversely affecting future yields and the integrity of ecosystems of these semi-enclosed coastal areas.

Expected Outputs of the joint Research Activities (JRA)

Project outputs of Joint Research Activities (JRA) are grouped into four Work Packages (WP).

WP1

Research carried on, (i) Development of integrated GIS for coastal deltas and associated watersheds as a tool for sustained management practices; (ii) Establishments of a model bank; (iii) Assessment of carrying capacity and potential for aquaculture production by modelling; (iv) Modelling possibilities of future of deltas under climate changes, sea level rising and disaster; (v) Assessment of the result of modelling and monitoring studies of existing projects; (vi) Real-time monitoring strategies and methodologies.

WP2

Research carried on, (i) Assessment of ecosystem characteristics and biodiversity of Black Sea deltas; (ii) Assessment of SES characteristics and biodiversity of Black Sea deltas; (iii) Assessment of present transport, energy and natural resources capacity in the territory of deltas within Black Sea basin; (iv) Development of a methodology for estimation of NC value; (v) Assessment of geological / geo-chemical characteristics of deltas; (vi) Soil characteristics and their potential for various land-use options, including agriculture and forest;(vii) Air-Land-Sea interaction problems; (viii) Classification of Black Sea deltas.

WP3

Research carried on, (i) Review of existing EIA/SIA/CIA regulation for land-use planning and the development of new regulations; (ii) Risk assessment of the results of a lack of sustainable land use planning; (iii) Sustainability impact assessment of land management and regional development strategies; (iv) Evaluation of cost-benefit analysis; (v) Evaluation of cost-effectiveness methodologies.

WP4

Research carried on, (i) Development and evaluation of criteria and standards for implementation of integrated sustainable land-use planning and management; (ii) Development of indices and index for assessing land-use impacts on delta ecology; (iii) Erosion and desertification risks assessment for watersheds; (iv) Development of tools for predictions required for decision-making; (v) Methodologies for qualitative and quantitative accounting of the multifunctional effects of land management and development strategies with regard to environmental protection, rural development, land use, landscape, tourism, recreation, agriculture and forestry activities; (vi) Assessment of trans-boundary problems; (vii) Thresholds of sustainability; (viii) Guide for the development of decision-support systems; (ix) Strategies for public and stakeholders' participation in the decision making process; (x) Institutional strengthening for land-use planning authorities; (xi) New institutional legislation for land-use planning authorities; (xii) Evaluation criteria for Natural

Parks, Natural Assets, and World Heritage Sites in estuary watersheds; (xiii) Development of an integrated framework analysis; (xiv) Impact assessment and management tools for sustainable land use; (xv) Development of P-S-R of indicators for the use of decision makers.

Expected Results of Joint Research Activities

Both carrying capacity of sensitive target areas and level of these beneficial uses for sustainable and cost-effective estuary ecosystems will be addressed by joint research activities which are grouped in four work packages, i.e. WP1, WP2, WP3 and WP4. This will be through the development of an integrated and object-oriented model, coupled to GIS and through quantifying the all fluxes of various land-use alternatives through the ecosystem, in order to assess potential impacts on the function and structure of this ecosystem. For this, the approach is through enhanced/developed models and tools to be used for integrated sustainability impact assessment. Consequently, the following research activities focuses on understanding, analysis, integration and evaluation will be carried out.

Target Deltas/Estuaries/watersheds of ILMMBSE projects

- Ergene River basin in Turkey;
- Ropotamo and Veleka Rivers' basins and their deltas in Bulgaria;
- Danube, Dniester and Dnieper deltas in Ukraine,
- Guria region in Georgia

were selected as target deltas, for the implementation of the activities of the action, for their commonalities, from the view point of their current conditions and characteristics.

The term “river mouth” is also used instead of “estuary” and “delta” since they are types of river mouths. However, the research results of Ergene River basin in Turkey, which is defined as watershed/river basin, were obtained and presented as comparison between deltas and watershed and between Aegean Sea and Black Sea.

Project Partners

Applicant:



BOURGAS REGIONAL TOURIST ASSOCIATION

Bulgaria, 8000 Burgas; 29A, Ferdinandova, Str., floor 4; tel/fax: +359 56 841966; e-mail: brta@abv.bg; www.brta.eu

BOURGAS REGIONAL TOURIST ASSOCIATION (BRTA) was established in 1998 as an organization in public benefit. It unites the existing in Burgas region local tourist organizations, regional tourist associations and local authorities (municipalities). The goal of BRTA is to support and encourage the development of tourism in Burgas region and alone or in cooperation with other organizations working to develop the region as a tourist destination.

BRTA is registered in accordance with the requirements of the Tourism Act in Bulgaria.

BRTA is the only regional tourism organization in Bulgaria, a member of the National Board of Tourism in Bulgaria from its establishment until now. National Tourism Board is a state public advisory and coordinating body to the Minister of Economy and Energy (MEE).

BRTA is a member of the Regional Committee on Employment in Burgas region.

ENPI Partners:



“Prof. Dr Assen Zlatarov” University

Bulgaria, 8010 Burgas; 1, Prof. Yakimov, Bul., tel/fax: +359 56 86 00 41; e-mail: rector@btu.bg, www.btu.bg

“Prof. Dr Assen Zlatarov” University is the only state university in Southeast Bulgaria. It was founded on 6th October 1963 by Decree № 162 of the Council of Ministers as a Higher Chemico-technological institute “Prof. Dr Assen Zlatarov” which connected forever it with the name of its patron. “Prof. Dr Assen Zlatarov” University was ratified as such by a resolution of the National Assembly in 1995.

More than 320 highly qualified lecturers, 127 of them habilitated, teach at the university. Organization and management of the educational process at the university comply with the European requirements and criteria for qualitative educational and research process. A university evaluation and education quality maintenance system has been worked out. The University has been rated among the first in Bulgaria according to the quality of the research on Hirsch system for scientific contribution. Carrying out the policy of the university

management for rejuvenating and heightening the qualification of the academic staff, there has been a practice established for announcing competitions on all levels - from “assistant professor” to “professor”.



UKRMEPA Ukrainian Marine Environment Protection Association

Ukraine, 65023 Odessa; 6, L. TolstoyStr., tel/fax: +38 0482 333 888; e-mail: info@ukrmepa.org; www.ukrmepa.org

Ukrainian Marine Environment Protection Association (UKRMEPA) is a member of the International Association for the Protection of the Marine Environment INTERMEPA. In 2008, it was formally recognized by the international community and the Marine already internationally successfully cooperated with other affiliates INTERMEPA.

UKRMEPA created on the basis of Odessa National Maritime Academy, Nautical Institute of Ukraine - Department of Marine Institute UK, the Institute of Postgraduate Education, maritime executives and specialists of Water Transport of Ukraine, the Ukrainian Central design Bureau "Slipway" with the support of the Odessa regional organization "Green Party".

Its main goal is to consolidate the capabilities of members of the Organization for the advancement of the marine environment and the coastal zone of the Black Sea and the Azov Sea, as the basis for the existence and further development of civil society.

International Association **Civitas Georgica** was established in 1996 by those, who believe that Georgia is a country of European values. Our mission is to promote establishment of democratic and efficient local government in Georgia, to assist democratic reforms and to advance the competent public participation in local decision-making.



Civitas Georgica

Georgia, 0164 Tbilisi; 97, Tsinamdzgvrishvili Str., tel: +995 32 951991, fax: +995 32 911948; e-mail: office@civitas.ge; <http://www.civitas.ge/>

Civitas Georgica specializes in effecting policy change through institution building, organization and management development and training. Civitas Georgica has already conducted over 50 large and small-scale projects in sectors including public sector reform, local government capacity building,

regional/community development, pre-school and primary education, youth empowerment and engagement in public life, civic participation and advocacy.

To achieve its goals, Civitas Georgica enters in strategic partnership with other organizations. We are the members of Central and Eastern European Citizen's Network (CEE CN), European Network of Training organizations (ENTO), the national NGO coalition on decentralization.

IPA Financial Beneficiary:



Hayrabolu Municipality

Turkey, Hayrabolu Municipality, TR2; tel: +90 282 315 4471; e-mail: baskan@hayrabolu.bel.tr; www.hayrabolu.bel.tr

Hayrabolu is one of the oldest settlements in Thrace. **Hayrabolu Municipality (HBM)** will be the IPA Lead Beneficiary of the project. HBM will be responsible for project coordination activities in Turkey. Its public institutions are established to meet the common needs of people in this city. The primary mission of the municipality is to provide services based on the common goals as effectiveness, efficiency, and quality of service. Also, it works on improving the quality of life in the area and the municipalities nearby.

Hayrabolu Municipality try to implement the idea that all municipalities, towns and village organizations have to meet the common needs of the people in a healthy and sustainable way, and must satisfy the needs of the people of the city.

IPA Partners:



Turkish Marine Environment Protection Association

Turkey, Istanbul; 1 34674 Aziz Bey Sokak; tel: +90 0216 310 9301, fax: +90 0216 343 2177; www.turmepa.org.tr

Turkish Marine Environment Protection Association (TURMEPA) is a civil society movement founded by Rahmi M. Koç and the Shipping Chamber of Commerce on April 8, 1994 with the objective of making the protection of our coasts and seas a national priority and creating a legacy of a sustainable Turkey for future generations.

TURMEPA's mission is to contribute to the preservation of seas and coasts as a national priority and to create a country that has reached sustainable development goals for future generations.



Namık Kemal University

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Namık Kemal University was founded in 2006, with the Act numbered 5467, under the administration of the Higher Education Council. The University is based on a strong and old background of more than 30 years. Faculty of Agriculture, opened in 1982, and Çorlu Faculty of Engineering, founded in 1992, build up the academic foundation with their education, researches and publications.

The University offers Postgraduate's degree with three Institutes, Undergraduate's degrees with its nine faculties and three schools, and associate degrees with eleven vocational schools to nearly 32000 students. It has more than 1000 academic and 500 administrative staff. The University is a member of the European University Association and is in the Balkan Universities Network.

Outline of the Book

In this Book, the research results of ILMM-BSE project on Ergene River Basin covering all issues listed under four work packages were presented while the results on Ropotamo and Veleka Rivers' basins and their deltas, Danube, Dniester and Dnieper deltas and Guria region were presented in the research books published in Bulgaria, Ukraine and Georgia, respectively.

A wide range of data for Ergene River basin including, Corine land use and land use change data, elevation vector layer, detailed hydrologic data (catchment-microcatchment boundaries, lakes, dams, drainage network, etc.), soil map, geological map, protected area map, forest map, erosion map were created for sustained management practices (**Chapter 1**) The created data were integrated by GIS-based web software as a decision support system and the guide of decision support system for land use planning authorities were given in **Chapter 2**.

Ergene River Basin has different development axes due to agricultural and industrial activities hosted within the basin. Rapid industrial development for about 25 years in the southern part of the Basin, which comprises majority of Saray, Corlu, Cerkezkoy, Muratli and Luleburgaz towns close to Istanbul, has brought population growth and intensive urbanisation. Recently realised rehabilitation of organised industrial zones (OSB) has revealed that only 45-50% of industry allocated zone is occupied presently. However, it is believed that land use changes are inevitable in the future. This part of Ergene River basin has a dynamic land use change and defined as "hot spot" of the basin. In this part, land use changes of 2023, 2030 and 2050 were simulated considering the demands for land determined in accordance with the linear trend analysis using the modelling approach of CLUE-s (Conversion of Land Use and its Effects at Small regional extent) in **Chapter 3**.

In **Chapter 4**, the brief information on the the existing Project on Land Use managemet in Europe (PEGASO, IASON, EnviroGRIDS) and Action Plan of Ergene River Basin under application were reviewed.

Soil characteristics, land use classes and their potential for various land-use options and the extent of miss use or miss managed land in Ergene River basin were discussed in **Chapter 5** whereas geology and geochemical structure of the basin was reviewed in **Chapter 6**.

Biodiversity is one of the most important and the most fragile issue to be taken into consideration in watershed and land use management. Biodiversity of Ergene River Basin was investigated with the assessment of ecosystem and Social Environmental Status (SES) characteristics into two parts: fauna (**Chapter 7a**) and flora (**Chapter 7b**).

In the development of watershed management policy, much data are needed. Real-time monitoring produce more frequent and prolonged data in comparison

to the classical monitoring methods. Additionally, classical monitoring methods are vulnerable to produce more deviation during sampling, carrying, analysing process. Therefore, real-time monitoring should be preferred to manage watersheds correctly. Real-time monitoring systems are very new system. Depending on the technological development, much more sensitive devices and systems capable of performing analysis of more parameters will emerge. In this context, real time monitoring, present real time monitoring status and real time monitoring strategy of Ergene River Basin were analysed in **Chapter 8**.

Atmosphere, ocean and biosphere are one interconnected system and air-land-sea interactions are the most important mechanisms for the changes in the atmosphere-ocean-biosphere system. In **Chapter 9**, air-land-sea interaction problems in Maritsa-Ergene River Basin are evaluated in the aspect of pollutant transport and deposition cases.

Present natural resources (soil and water), energy (solar, wind, biomass, coal, oil) and transport (highway, rail, sea, air) capacity in the territory of Ergene River basin were evaluated in **Chapter 10**.

In **Chapter 11**, existing EIA/SIA/CIA regulation for land-use planning and the development of new regulations and sustainability impact assessment of land management and regional development strategies were reviewed.

Ecological thresholds defined as the points at which there is an abrupt change in an ecosystem quality, property or phenomenon, or where small changes in an environmental driver produce large responses in the ecosystem, were determined for four threshold issues as suggested by European Commission (DG Environment) and the European Environment Agency (EEA): eutrophication, freshwater quantity, soil erosion, and non-renewable resource use of Ergene River basin in **Chapter 12**.

Erosion and Desertification Risks Assessment for Ergene River Basin were made using Universal Soil Loss Equation (USLE) in **Chapter 13**.

The potential climate change and its effects on water resources and the yield of both wheat and sunflower, the two vital plants for the Thrace Region were predicted in **Chapter 14a** and flood risk assessment was made and flood risk map was created in **Chapter 14b** for within the context of disaster management.

Transboundary problems may emerge by land, water and air. Since Ergene River has no connection to Greece and Bulgaria. Therefore, the hydrologic transboundary problem of Ergene River Basin is not considered. The air born transboundary problem was discussed in **Chapter 15** as well as in **Chapter 9**.

In **chapter 16**, the risks as a result of lack of sustainable land use planning were assessed for Ergene River Basin in terms of territorial development, natural resource management, protection of biodiversity, national park and buffer zone management, food security, disaster risk management, adaptation to and

mitigation of climate change, development in a drugs environment conflict prevention and resolution, responsible land governance.

Development of P-S-R (Pressure-State-Response) of indicators for the use of decision makers and development of indices and index for assessing land-use impacts on delta ecology were discussed in **Chapter 17**.

Cost-Benefit Analysis and Cost-Effectiveness Methodologies were evaluated in **Chapter 18** whereas strategies for public and stakeholders' participation in the decision making process and institutional strengthening for land-use planning authorities were discussed in **Chapter 19**.

An integrated framework analysis was developed and new institutional legislation for land-use planning authorities was evaluated in **Chapter 20**.

Criteria for national parks, natural assets and important species areas in general and in Gala Lake National Park in Maritsa-Ergene River Basin were evaluated in **Chapter 21**.

Development of a methodology for estimation of Natural Capital (NC) value was evaluated for Ergene River Basin in **Chapter 22**.

A list of all relevant publications on Ergene River Basin and land use management and land use change modelling were provided in **Chapter 23**.

Content and Authors Contributed

		Page
Chapter 1	Development of integrated GIS for coastal deltas and associated watersheds as a tool for sustained management practices: Ergene River Basin. Fatih KONUKCU, Selcuk ALBUT, Reşat AKGÖZ.	
Chapter 2	Development of Software as a Tool for Sustainable Land Use Management and Guide for Decision Support System. Selcuk ALBUT, Fatih KONUKCU, Reşat AKGÖZ.	
Chapter 3	Land Use Change Modelling of Erene River Basin for Future Scenarios and Sustainability impact assessment of land management and regional development strategies. Bahadır ALTURK, Fatih KONUKCU, Selcuk ALBUT.	
Chapter 4	Assessment of the Result of Modelling and Monitoring Studies of Existing projects. Fatih KONUKCU, Bahadır ALTURK.	
Chapter 5	Soil Characteristics and Their Potential for Various Land-Use Options. Fatih KONUKCU, Israfil KOCAMAN, Ahmet ISTANBULLUOGLU.	
Chapter 6	Assessment of Geological/Geo-chemical Characteristics of Deltas: Ergene River Basin. Fatih KONUKCU.	
Chapter 7	Assessment of Ecosystem Characteristics and Biodiversity of Black Sea Deltas: a) Fauna of Ergene River Basin. Deniz SIRIN, Nadim YILMAZER. b) Plant Diversity of the Ergene River Basin. Evren CABI, R. Murat AYDINKAL.	
Chapter 8	Real-Time Monitoring Strategies and Methodologies of Ergene River Basin. Bulent DIKMEN, Sukran DENIZ.	

- Chapter 9** Air-Land-Sea Interaction Problems of Maritsa-Ergene River Basin. **Lokman Hakan TECER, Asude HANEDAR.**
- Chapter 10** Assessment of Present Natural Resources, Energy and Transport Capacity in the Territory of Deltas within Black Sea Basin. **Fatih KONUKCU.**
- Chapter 11** Review of Existing EIA/SIA/CIA Regulation for Land-Use Planning and the Development of New Regulations and Sustainability Impact Assessment of Land Management and Regional Development Strategies. **Mamuka GVILAVA.**
- Chapter 12** Thresholds of Sustainability for Ergene River Basin. **Fatih KONUKCU.**
- Chapter 13** Erosion and Desertification Risks Assessment for Watersheds: Ergene River Basin. **Reşat AKGOZ, Fatih KONUKCU, Israfil KOCAMAN.**
- Chapter 14** a) Prediction of Climate Change and Its Impact on Water Resources and Crop Yields in Ergene River Basin. **Huzur DEVECI, Fatih KONUKCU.**
- b) Assessment of Flood Risk of Ergene River Basin. **Erol Aptoula MOUSTAFA, Fatih KONUKCU.**
- Chapter 15** Assessment of Trans-Boundary Problems. **Emilia GEORGIEVA, Ilker ORUC, Elena HRISTOVA, Krum VELCHEV, Hristina KIROVA, Dimiter SYRAKOV, Maria PRODANOVA, Rozeta NEIKOVA, Blagorodka VELEVA, Damyan BARANTIEV, Anton PETROV, Maria KOLAROVA, Valeri NIKOLOV, Ekaterina BATCHVAROVA, Hristomir BRANZOV.**

- Chapter 16** Assessment of Geological/Geo-chemical Characteristics of Deltas: Ergene River Basin. **Fatih KONUKCU.**
- Chapter 17** Development of P-S-R (Pressure-State-Response) of Indicators for the Use of Decision Makers and Development of Indices and Index for Assessing Land-Use Impacts on Delta Ecology. **Mamuka GVILAVA.**
- Chapter 18** Evaluation of Cost-Benefit Analysis and Evaluation of Cost-Effectiveness Methodologies. **Harun HURMA.**
- Chapter 19** Strategies for Public and Stakeholders' Participation in the Decision Making Process and Institutional Strengthening for Land-Use Planning Authorities. **Fatih KONUKCU.**
- Chapter 20** Development of an Integrated Framework Analysis and New Legislation. **Fatih KONUKCU.**
- Chapter 21** Evaluation Criteria for National Parks, Natural Assets and Important Species Areas in the delta of Maritsa-Ergene River Basin. **Elif Ebru SISMAN.**
- Chapter 22** Development of a Methodology for Estimation of Natural Capital (NC) Value. **Harun HURMA.**
- Chapter 23** Further Reading.

Preface of the Rector

On behalf of Namik Kemal University, I would like to express my deep gratitude to be one of the prominent partners of ILMM-BSE Project. I believe that the outcomes of this project will significantly contribute to the solution of environmental problems of Black Sea countries including Turkey and, particularly Ergene River Basin.

All kinds of investment and industrial development promoting employment opportunities for the people should be supported. However, sustainability of the development in the aspect of environment should also be seriously considered.

Environmental pollution is a common problem of industrial and populated areas, though the severity of problem varies. Ergene River Basin with fertile plains has become the agenda of both Thrace Region and whole Turkey due to the pollution problems occurring for the last three decades. This situation has been noticed by the authorities and an action plan to save Ergene River and its Basin has put into implementation. It seems that the improvement process will take times and need costly investments. The cheapest and easiest way of dealing with this problem is to take precautions before the problem emerges.

The best way to take action without polluting depends on the existence of the tools to predict how and to what extent investments and land use change will affect basin ecosystems. In this context, the outcomes of ILMM-BSE Project will be extremely useful for local authorities and decision makers as a decision support instrument.

The benefits of the Project are not limited by the research results obtained and decision support system. It also provided capacity development and cooperation opportunities to produce common solutions to our common problems in Black Sea Basin.

Prof. Dr. Osman SIMSEK

Rector of Namik Kemal University
Tekirdag-TURKEY

Preface of the Editor in Chief

Land is a scarce resource increasingly affected by the competition of mutually exclusive uses. Fertile land in rural areas becomes scarcer due to population growth, pollution, erosion and desertification, effects of climate change, urbanization etc. On the remaining land, local, national and international users with different socioeconomic status and power compete to achieve food security, economic growth, energy supply, nature conservation and other objectives. Land use planning can help to find a balance among these competing and sometimes contradictory uses. Within the scope of Integrated “Land Use Management Modelling of Black Sea Estuaries (ILMM-BSE)” project, land use change was modelled in Ergene basin and its delta in Turkey; Ropotamo and Veleka rivers’ basins and their deltas in Bulgaria; Danube, Dniester and Dnieper deltas in Ukraine, Guria region in Georgia for their commonalities, from the view point of their current conditions and characteristics.

Although the primary objective of the project was to model land use change, land use planning application to support sustainable development within given areas or specifically to ensure the protection of ecosystem services, biodiversity and high conservation values, mitigation of climate change and adaptation to it and food security subjects were studied.

Additionally, impact assessment and management tools for sustainable land use, new institutional legislation for land-use planning authorities, strategies for public and stakeholders’ participation in the decision making process and guide for the development of decision-support systems were investigated. I hope the established network during the project will be successfully use to solve our common environmental problems.

Prof. Dr. Fatih KONUKCU
Research Coordinator of ILMM BSE Project

Namik Kemal University, Faculty of Agriculture, Biosystem Engineering
Department, TR59030 Tekirdag-TURKEY.

The expected outputs under (a total of 34 items collected into 4 work packages) of ILMM-BSE project were presented in 23 chapters of the Research Book.

Chapters' order in the book was designed according to the subject of each output. First, outputs related to the identification of the basin were placed in the book to form basin information system. Second, outputs related to the problems of the basin took part. Next, outputs related to the basin planning and solutions to the problems were put. Finally, institutional aspects, frameworks and legislation-related outputs were placed.

While some closely-related output are combined in one chapter, some items were covered more than one chapters and one item not applicable with Ergene River basin was omitted.

The research results of Ergene River Basin were presented in the book published in Turkey whereas the results on Ropotamo and Veleka Rivers' basins and their deltas, Danube, Dniester and Dnieper deltas and Guria region were presented in the research books published in Bulgaria, Ukraine and Georgia, respectively.

The expected outputs of the Work Packages and associated chapters with some explanations are presented in the following Table.

Table: The expected outputs of work packages and associated chapters

	Expected Outputs	Associated chapter(s) an explanation
Activity 2.1. Implementation of first set of joint research activities (Work package 1)		
i)	Development of integrated GIS for coastal deltas and associated watersheds as a tool for sustained management practices	Chapter 1
ii)	Establishments of a model bank	Chapter 2
iii)	Assessment of carrying capacity and potential for aquaculture production by modelling	Not applicable for Ergene River basin since "carrying capacity" issue is applied for wetlands and aquacultures. Ergene River Basin shows a watershed characteristic not wetland and aquaculture.
iv)	Modelling possibilities of future of deltas under climate changes, sea level rising and disaster	Chapter 14a and Chapter 14b (Disasters of climate change and flood is considered. Sea level rise is not applicable for Ergene River basin)
v)	Assessment of the result of modelling and monitoring studies of existing projects	Chapter 4
vi)	Real-time monitoring strategies and methodologies	Chapter 8
Activity 2.2. Implementation of first set of joint research activities (Work Package 2)		
i)	Assessment of ecosystem characteristics and biodiversity of Black Sea deltas	Chapter 7a and Chapter 7b. Biodiversity of Ergene River basin

		was investigated into two parts: fauna (7a) and flora (7b).
ii)	Assessment of SES characteristics and biodiversity of Black Sea deltas	Chapter 7a and Chapter 7b Biodiversity was Ergene River basin investigated into two parts: fauna (7a) and flora (7b).
iii)	Assessment of present transport, energy and natural resources capacity in the territory of deltas within Black Sea basin	Chapter 10
iv)	Development of a methodology for estimation of NC value	Chapter 22
v)	Assessment of geological / geo-chemical characteristics of deltas	Chapter 6
vi)	Soil characteristics and their potential for various land-use options, including agriculture and forest	Chapter 5
vii)	Air-Land-Sea interaction problems	Chapter 9
viii)	Classification of Black Sea deltas	Chapter 5. Since Ergene River basin is not a delta, classification of Ergene River basin's land is done instead of delta
Activity 2.3. Implementation of first set of joint research activities (Work Package 3)		
i)	Review of existing EIA/SIA/CIA regulation for land-use planning and the development of new regulations	Chapter 11
ii)	Risk assessment of the results of a lack of sustainable land use planning	Chapter 16
iii)	Sustainability impact assessment of land management and regional development strategies	Chapter 3 and Chapter 11
iv)	Evaluation of cost-benefit analysis	Chapter 18
v)	Evaluation of cost-effectiveness methodologies	Chapter 18
Activity 2.4. Implementation of first set of joint research activities (Work Package 4)		
i)	Development and evaluation of criteria and standards for implementation of integrated sustainable land-use planning and management	Chapter 3
ii)	Development of indices and index for assessing land-use impacts on delta ecology;	Chapter 12 and Chapter 17
iii)	Erosion and desertification risks assessment for watersheds;	Chapter 13

iv)	Development of tools for predictions required for decision-making;	Chapter 2 and Chapter 3
v)	Methodologies for qualitative and quantitative accounting of the multifunctional effects of land management and development strategies with regard to environmental protection, rural development, land use, landscape, tourism, recreation, agriculture and forestry activities;	Chapter 3
vi)	Assessment of trans-boundary problems;	Chapter 9 and Chapter 15
vii)	Thresholds of sustainability;	Chapter 12
viii)	Guide for the development of decision-support systems;	Chapter 2
ix)	Strategies for public and stakeholders' participation in the decision making process;	Chapter 19
x)	Institutional strengthening for land-use planning authorities;	Chapter 19
xi)	New institutional legislation for land-use planning authorities;	Chapter 20
xii)	Evaluation criteria for Natural Parks, Natural Assets, and World Heritage Sites in estuary watersheds;	Chapter 21
xiii)	Development of an integrated framework analysis;	Chapter 20
xiv)	Impact assessment and management tools for sustainable land use;	Chapter 11
xv)	Development of P-S-R of indicators for the use of decision makers.	Chapter 17