Improvement of the scientific background for assuring sustainable development in the Black Sea coastal zone - pre-feasibility study

1. General information

A. Title of the project

Improvement of the scientific background for assuring sustainable development in the Black Sea coastal zone - pre-feasibility study

B. Name of the Lead Partner and contact person in-charge for the project (project manager)

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2. Description of the project

2.1 Purpose

The greatest threats to the oceans and seas consist of coastal zone pollution,eutrophication, overexploiting or resources, introduction of non-indigenous species, etc.

For natural and anthropogenic reasons, the Black Sea is a particularly sensitive and threatened environment since the early ‘ 60 ies.

During the last 50 years, the Black Sea ecosystem has changed dramatically and human beings living around this nearly land-locked sea have played no small role. A recent report from the Global International Waters Assessment (GWA),an initiative led by the United Nations Environment Programme, indicates that around a third of the Black Sea’s fish stocks have been lost in the past 20 years. Only six of the species commercially exploited in 1960 remain in commercial quantities. More than 60 plant and animal species deemed essential to the Black Sea ecosystem, including dolphins and seals, are now endangered or extinct.

The main purpose of this project, based on the recently launched concept of ecosystem approach („integrated management of human activities based on best available scientific knowledge about the ecosystem and its dynamics in order to identify and take action on influences which are critical to the health of the marine ecosystem goods and services and maintenance of ecosystem integrity’’), is to increase the contribution of scientific research to any decision taken with respect to marine and coastal environment.

In order to sustain the decision on marine environment management several conditions are necessary:

- To base decision on best available scientific knowledge
- To improve scientific capacity to a better understanding of ecosystem structure, functioning and productivity
- To implement the management of marine activities based on ecosystem approach

2.2 Objectives

2.2.1 Improve the national and regional research expertise capacity through implementation of ecosystem approach in coastal and marine management.

The modern concept of ICZM and its application is strongly supported by all Black Sea coastal states by their environmental laws or their appendices. A special attention is attributed to the National strategy of integrated coastal zone management and related action plans for their implementation.

Deliverables of practically all project working packages will contribute to improvement of the national research expertise capacity in the field of marine sciences and connected socio-economic activities.

The objective is based on networking, upgrading/renewal of existing integrated marine monitoring system, visiting fellows, training Ph.D,study visits, workshops, hiring of new scientist.

2.2.2 Reach a level of excellence of Black Sea marine research institutions, for permitting integration in European and international specific networks.

Hiring and training new researchers within oceanographic institutions around the Black Sea will increase national marine science related contributions to ERA.

Conferences, local meetings, international workshop will imply an active involvement of Black Sea partners in the European Research Area(EMAS, MARIS, NATURA 2000).

2.2.3 Improve the quality on environmental policies in the coastal and marine areas through best scientific knowledge.

This objective will be achieved via dissemination of obtained knowledge resulting from the research achieved in participating centers, active participation to conferences, and others.

2.2.4 Project of an informational data system for the coastal and marine area (a decision makers and stakeholders dedicated tool developmentally based both on data knowledge as on scientific interpretation and assessment/extrapolating modeling) is intended to be put down.

Many of the marine scientific research achievements around the Black Sea reveal the necessity of deeper investigation of phenomena connections to discover and define „ hidden type parameters'' of the marine ecosystem; the time and space distribution of processes(analyzed through harmonic/frequency analysis as well as processes connectivity and correlation through statistical and factorial analysis are the implied steps to a better knowledge of the marine/coastal zone processes and phenomena though to a better management. The similar scientific developments in different countries (France, Italy, The Netherlands, etc) prove the necessity of such a global top-down approach.

As to the Lead partner there are a lot of different data streams to/from the NIMRD institute departments, both external and internal:

a) The decision makers level:

- Ministry of Environment and Sustainable Management
- Other ministries (of Agriculture, Industries, etc)
- Local agencies: Environment Protection Agency, Water Directorate Dobrogea Littoral, Danube Delta Biosphere Reserve Administration
- Local authorities

b) National data producers:

- SIMIN – National Meteorological Integrated System – (meteorological) weather survey and prediction system (Lockheed implemented)
- NIM–National Institute for Meteorology – public or marine dedicated meteorological forecasts
- Universities

c) Internal:

- NIMRD monitoring activities related to :
    - Physical and chemical oceanography
    - Marine biology (phytoplankton, zooplankton, phytobenthos, zoobenthos)
    - Marine biodiversity
    - Para-marine lakes ecology
    - Marine pollution (heavy metals, polyaromatic hydrocarbons)
    - Marine living resources and fisheries
    - Marine and coastal habitats
    - Marine protected areas
    - Coastal engineering
    - ICZM specific issues
- Real –time Black Sea level survey within the European Sea Level System (ESEAS)
- Different special(occasional) research activities to improve the knowledge of the marine phenomena and solve society requirements which imply *in situ* or *in vitro* measurements/experiments
- Environmental impact studies and environmental audits, etc.

All historical and even recent data (direct or related to the above-mentioned data streams) and their specific metadata have to and are worth to be reevaluated and coherently stored within an unique dedicated database management system (DBMS) with a highly secured management of data; these information are/have to be accessed through National Data Fund and also converted to visual GIS displaying with specific layers. These outputs like those mentioned are to be taken into account in the information flow.

2.3 Activities

The specific activities for achievement of above objectives will be developed in following fields:

Integrated physical, chemical and biological monitoring
Marine biodiversity
Natural habitats and protected areas
Marine living resources
Information data system for coastal and marine and scientific tools for facilitation of rapid access of scientific community and decision makers to information, dissemination networking and co-operation.

The specific objectives of the pre –feasibility study are to review and analyze the state of the art of above discussed topics and to prepare project description ready to be submitted for funding.

2.4 Description of project activities to be undertaken in enlarged project

Work package 1 - Improved Black Sea Integrated Marine Monitoring System

Task 1.1 Elaboration of an integrated monitoring system

European Council's Water Framework and Shellfish Directives as well as the Black Sea Integrated Monitoring and Assessment Programme coordinated by the Black Sea Commission request specific parameters to be monitored.

Task 1.2 Upgrading/renewal the analytical and sampling equipment and in house training in accordance with the new integrated monitoring system

Some of the laboratory equipment and all sampling equipment are either old or morally aged. In order to increase the performance on integrated monitoring and to enable the competence of partners in regional and international projects the specialized equipment needs to be either upgraded or even renewed.

Task 1.3 Improvement of QA/QC procedures for the physical and chemical pollution monitoring

In order to fully implement the QA / QC procedures the sampling activities of certain laboratories need to be improved. Accreditation for some monitoring parameters needs to be obtained (PAHs, total hydrocarbons, etc). An external consultant may be employed to check the existent procedures and to perform an in house training in this matter.

Task 1.4: Regional workshop on the state of Black Sea marine ecosystem

The six Black Sea countries are contracting parties to the Convention on the Protection of the Black Sea Against Pollution. They take part in different

regional common programmes concerning pollution monitoring and assessment, biological diversity, fisheries, land based sources, etc. as well as in many projects financed by the European Commission under the 5 or 6 framework or LIFE NATURA or other donors (EROS, DANUBS, ELME, Conservation of the Dolphins from Romanian Black Sea Waters, Sea Search, ARENA). Many data and information are already gathered in different national institutions.

The proposed workshop will be organized with the assistance of European Commission (DG-Environment), Black Sea Commission, Danube Commission, GEF- Black Sea Ecosystem Recovery Project with participants from other regional seas conventions (Helsinki Commission, OSPAR Commission, Barcelona Convention), European Environment Agency, GPA Secretariat, etc. The aim of the workshop is to discuss the existing data, to assess the state of the Black Sea ecosystem and to draw conclusions for the future activities and cooperation.

Work package 2 - Marine Biodiversity

Task 2.1 - Improving the investigation process of marine biodiversity

The first direction of action for attaining the general objectives, proposed by this WP of the project, refers to the improvement/specialization in different research fields concerning the marine biodiversity, as well as the endowment with high performance durable goods necessary for biodiversity research development, consistent with EU requirements.

WP2 implementation will start with training courses presented by EU specialists in the field. The topics are focused n the methodologies for identification and assessment of biodiversity indicators.

Also, researchers will start their specialization within UE institutions for:

- Assimilation of the genetic methods for identification of marine threatened species;
- Assimilation of the specific methods for identification of marine toxic microalgae.

Following the training of the researchers involved in the project, the new methodologies will be implemented within Black Sea partners' laboratories. The modern equipment will be purchased. For example, for genetic research, PCR (Polymerase chain reaction) equipment will be purchased.

Presently, the taxonomic identification of the microalgae is carried out with old fashioned, less performance microscopes. In order to eliminate the identification mistakes of the microalgae species, an epifluorescence microscope together with necessary accessories (objectives, tubs/vats, chemicals, etc.) will be purchased.

In the same situation are the PCs and soft found in the present endowment. In order to improve the biodiversity data processing, six PCs and soft, at the level of EU requests, are to be purchased.

Within this task, the updating of the fund of publications will be made through subscription to periodic and other publications in the biodiversity references.

Task 2.2 - Creating/organizing the Black Sea Network for Marine Biodiversity Centers

In order to organize and facilitate new directions of approaching in marine biodiversity research, within WP 2, a Black Sea Network for Marine Biodiversity Centers will be established. Three workshops will be prepared and organized for debate, with participation of experts in biodiversity field from EU countries. There will be invited representatives of stakeholders from the Black Sea coastal zone. The workshops will be subjected to:

- Workshop 1: identifying the actual problems related to the knowledge, protection and conservation of marine biodiversity;
- Workshop 2: preparing the strategy for functioning of the Network;
- Workshop 3: preparing the action plan.

This task will be developed with assistance from the EU consultant of project.

The Centers are addressing to the large public as well as to the specialists in the field; each of them will have the office in the partner institutes, and will be appropriately arranged and equipped (PSs, video projector, etc.).

In order to increase the Centre's transparency and accessibility, an information campaign will be launched through: official opening, press conference, a very attractive web page, dissemination of printed materials (leaflets, brochures, posters on biodiversity issues).

Task 2.3 Improving the dissemination of information

Within this task, a workshop with participation of the representatives from the countries/institutions traditionally involved in the protection and conservation of marine biodiversity will be organized.

Task 2.4. Integration the research and environmental policy on the Black Sea biodiversity within the EU system

The objectives of WP2 will be achieved also through the activities for harmonizing the Black Sea strategy and action plan referring to the marine biodiversity with EU ones. In this aspect, consulting with EU experts is to be taking play.

Work package 3 – Habitats and protected areas (The conservation of the biodiversity through the implementation of "Birds" and "Habitats" Directives)

Task 3.1: *Identifying the marine and coastal areas that need protection, according to the requirements of the "Birds", "Habitats" Directives, national and regional interests and establishing the priorities for the implementation of proper protection measures*

The action will start from the already existent protected areas network on the Romanian marine and coastal zone, but other potential Special Areas of conservation will be identified around the Black Sea, according to the requirements of the two directives and national/regional interests.

An inventory of the flora and fauna will be realized, as well as of the habitats present in the coastal and marine protected areas, emphasizing the community interest species and habitats will follow.

The transfer of the data regarding the existing protected areas, as well as the proposed Special Areas of Preservation, in a GIS format, obtaining digital maps ready to be included in the Nature 2000 standard format will eventually be achieved.

Task 3.2: *Developing and implementing certain action plans for the new protected areas proposed to become part of the Nature 2000 Network*

The problems that every protected area is confronting with will be identified, as well as the way of solving them by consulting all the interested factors (administrators or custodians of the protected areas, local communities, economic factors);

In collaboration with the interested factors, action plans for the own administrated protected areas will be realized, with the view of supporting the action of species and habitats conservation.

Task 3.3: Establishing a representative specialists network, at a national, regional and European level, through information and experts exchange

Improving the knowledge level of the experts, by organizing training stages in Europe, as well as by organizing courses and workshops regarding the situation of the protected marine and coastal areas

Work package 4 - Marine living resources

Task 4.1: Improvement of methodologies for stock assessment of pelagic and demersal fish species of commercial interest

For obtaining the comparative data, the standardization at regional level is necessary as well as in compliance with the international practice of the methods and ways for sampling, processing, analyzing and interpretation of data and information on stock assessment.

Therefore training courses with EU and FAO assistance are necessary.

In accordance with above courses, to guides will be prepared (Guide for sampling, processing of data and fishing statistics, Guide for stock assessment).

Task 4.2: Implementation of ecosystem based fisheries management

The improvement of fishery management and perfecting the legal and institutional framework can be achieved taking into consideration for communitarian regulations in fishing policy, and the FAO Code for conduct on responsible fishing.

A study on communitarian regulations regarding the assessment of necessary changes following the adhering to EU or a good cooperation with EU and implementation of the Code are needed.

The conservation and sustainable exploitation of aquatic resources will be achieved through a careful planning within a National Management Plan.

Above plan is to be achieved with EU consultancy through workshops with participation of external consultants and stakeholders.

Task 4.3: Upgrading and purchasing of specific equipment for fisheries research

The participation at workshops, seminars, working visits and training in high reputation institutions from EU countries will help familiarize Black Sea researchers with modern working methods and techniques used in marine fisheries research.

For obtaining of comparable data, high fidelity equipment is necessary, at similar level with that used in EU countries.

To fit above requirements the improvement of some existent equipment (Bongo net, trawl for juveniles, pelagic trawl) and purchasing of hydro-acoustic devices for assessment and appropriate software is necessary.

Task 4.4: The development of indicators for a sustainable fishery and aquaculture, develop on ecosystem principles and in accordance with common fisheries policy

The assessment of fishery status will be carried out through a series of indicators used already by the international organization for management of living resources.

This project intends the establishment of indicators for fishing and aquaculture necessary to be implemented according to communitarian policies.

The project will emphasize the existing data and activity plan will mention the necessary activities for data obtaining at national / regional level in order to achieve the indicators in conformity with EU practices

Work package 5 - Information Data System for Coastal and Marine Zone

Task 5.1 Conception and design of the storing, retrieving, processing and modeling /extrapolating informational data system for the marine and coastal environment, in accordance with needs for harmonizing to EU standards

An overview and synthesis of a coherent, strongly scientific based output information flow/stream needed to support and sustain scientific activities, knowledge development and coastal zone improved management will be carried out as a holistic approach of necessary or wish able data and information to sustain directly or mediated the management of the coastal zone:

- historical analysis of the specific characteristics of the north-western Black Sea shelf/ coastal zone variations,
- overview of up-to-date scientific achievements related to coastal zone management of different type zones,
- a synthesis of knowledge on information flow needed in modern and future coastal zone management; this is intended to provide the background for the main activity of the task.

The structure and functionality of the system in the expected data and problems-to-solve environment is the specific objective to clarify and conceive.

Within this task:

- comparative analysis of special data processing methods and coastal zone modeling is planned in a workshop with invited participants from EU scientific world
- selection and acquisition of hardware and operating system software will be accomplished.

A special activity in tasks 1, 2 and 3 will be drawing out an internal working regulation and the working plan.

Task 5.2 Overview and analysis of existent databases, historical data and ways for their integration in the designed data system

Data and especially metadata mining is the major and work-needed activity of the task. There have to be determined not only all internal data sources (data

holders and producers) but also other possible sources, both for historical and actual data sets, as well as the possibilities to access its.
The identified data sets will be studied to establish the metadata fields and quality parameters to be taken into account in the design of the system and its content.
A specific quality control and assessment for data is to be realized.

Task 5.3 Design of the informational data system and of the methodology of implementation

This is the most important task and is partly based on results of the preceding ones.
The structure and functionality of the informational data system (hardware, software and network links and functionality) are to be established for a coherent and user-friendly system.
Implementation methodology and schedule will be conceived to facilitate a good timing in implementation.
Selection and acquisition of the needed software will be the based on the comparative analysis of scientific software during the 9th to 12th month of the project. This is to be achieved with EU consultancy, based on abroad training/documentation.

Task 5.4 Realizing and implementation of the functional structures of DBMS (National Data Fund connection) and of the data processing, modeling and assessment system.

The structures of the DBMS will be a selecting source for the data processing software; both will have to provide parameters and data sets to the modeling/assessment system. The display of the final information stream (either alpha-numerical or graphic) should be obtainable in a web way through intra/inter-net.

- Elaboration of the catalogues
- Establishing the instructions referring to meta-data and data files format depending on input form (direct net keying or files import)
- Realization of subroutines for data entering, verifying, testing and quality coefficient automation
- Realization of subroutines to launch the specific data - processing software
- Realization of subroutines to launch modeling/assessment programs using specified preliminary results.

Task 5.5 Integration of the informational system in the national and local authorities support, in the public data flow and the specialized networks for the EU and Black Sea

The final task should put in place the system:

- to provide marine scientists an efficient tool to facilitate their implication in European and international research and development projects
- to promote and actively take part at EU and regional scientific data exchange
- to provide local and national authorities and decision makers fast and significant data flows in a clear, comprehensible manner

- to permit to a certain level public consultation of data, laws, regulations and decisions (through web)
- to permit the decision-makers / scientists / public feed-back to improve the system

This task contains the dissemination activity too: a general "demonstrator" workshop for mass-media and public and a restrained one for national and local authorities/decision-makers, stakeholders and businessmen implied in activities related to coastal zone; a web-specific demonstrator will have its place in the system web-server.

2.5 Benefits

The expected impact of the project as implementation of an informational data system for the coastal and marine area is:

1. To setup an improved and appropriate informational data system of NIRMD and Partner institutions in the field of Black Sea related marine sciences.
2. To support/improve NIMRD and partner institutions cooperation within European Research Area.
3. To support/improve NIMRD and partner institutions cooperation within any other regional marine areas.
4. To develop new links/possibilities of scientific cooperation with respect to marine environment management and protection within the BSEC Action Plan in the field of Environmental Protection of the BSEC Member States (Bucharest, 3 March 2006).
5. To promote the incorporation of environmentally important approaches in the economic and social development.
6. To improve the functioning of the institutional network of BSEC and coordination with regional organizations, institutions and initiatives.
7. To strengthening cooperation in the Black Sea basin in pollution prevention and biodiversity conservation.
8. To contribute to the implementation of the regional Clearing House mechanism among the BSEC Member States.
9. To constitute a practical example of BSEC supporting of a joint project of regional relevance, as PDF and/or promoted in the framework of an enhanced BSEC- EU interaction and supported through specific EU financial programmes and instruments.
10. To stimulate cooperation among the BSEC Member States with other major international organizations, in particular with EU, EC/FP7, UNESCO/IOC, CIESM, UNEP, UNDP, Commission on the protection of the Black Sea against pollution, ICPDR, a.o.
11. To provide the basis for accomplishment of a new extended R-D-T project in to field of environmental / marine sciences in the Black Sea area (cf. 5.C).

The huge complexity and variability of the marine ecosystem as a whole needs a complex data processing software – to reveal essential parameters and phenomena, their links and key points – and complementary complex models to verify the results, test the prediction capabilities and develop a north-west Black Sea specific „knowledge database''.

This informational data system snapshot in the lines above is intended to be conceived as a project for creation/integration of the capacity to manage not only scientific but also

general (economic, social, etc) problems needed by coastal zone management of the other specified WP activities,. Also as a scientific support to their high level development in a ecosystem approach. It is also conceived to be, at least partly, public through the NIMRD Web server in a new, complex web page, including dedicated / secured connection circuits for decision makers, international projects a.s.o.

3. Work packages / tasks carried out under present pre-fesability study

3.1. Introduction

The Standard Application for funding a Black Sea related project has been send to BSEC by the Ministry of Environment and Sustainable Development, Romania, by the National Institute for Marine Research and Development "Grigore Antipa" (NIMRD) from Constanta / Romania.

The present project has enabled the consideration of four of the initial (five) Work packages, namely WP1, WP2 (initial WP2 + WP3), WP3 (initial WP4) and WP4 (initial WP5).

The four remaining work packages have been achieved by the cooperation of all Project partners, except Project 5 (SBSIO / Russian Federation) for WP3, during project duration.

In accordance with the *Standard Application*, the project **activities** foreseen to be undertaken by the financed operation have included two days expert meetings planned at the beginning and during project accomplishment (Annex 1).

The *first expert meeting* has represented the kick – off meeting and took place at the premises of NIMRD, in Constanta / Romania, between April 7-8, 2008. The meeting has been attended by 21 experts from Bulgaria, Georgia, Romania, Russian Federation and Ukraine (Annex 2). They have discussed the implementation of the BSEC Black Sea project by reviewing and discussing the state of the art of sustainable development in the Black Sea coastal zone and identification of main subjects to be included in project content.

The *second expert meeting* has been organized by IO-BAS, in Skt. Konstantin and Helena / Bulgaria, beetwen October 3-4, 2008, and attended by Project partners 1, 2, 3 and 5 from Bulgaria, Romania and Russian Federation, respectively (Annex 3).

Unfortunately, the second meeting has not been attended by Project partners 4 (WEFRI / GE), 6 (OBIBSS / Ukraine) and 7 (YUGNIRO / Ukraine) for objective reasons justified by missing experts in *Explainatory letters* requested and received by Project leader (Annexes 4, 5, 6). During this meeting the Lead partner (NIMRD) has reviewed partner's already delivered contributions and reactions / responses from some of them on contributions to be delivered in due course for finalizing assumed commitments / responsabilities. The proposal to present BSEC Black Sea project's results at the Second Black Sea Conference (Sofia / Bulgaria, October 6-9, 2008) has been unanimously accepted. Accordingly, a *Power Point* presentation of the project has been assured by Lead partner (NIMRD) at the mentioned conference (Annex 7). As to the meanwhile requested opinions / suggestions about possibilities / opportunity of extending present BSEC Black Sea project at a larger initially designed scale (EC / FP7, EC / Black Sea Cooperation Programme, any others), except partially / poorly responded only by Project partners 4 (WEFRI / GE) and 6 (OBIBSS / UA), no further progress / contributions have been achieved in this respect.

Three relevant project related **deliverables** have been achieved during project implementation:

- Preliminary report (two months after project start),
- Interm / Progress report (six month),
- Final report (month 12).

After the first expert meeting a *Preliminary report* has been provided to BSEC headquarters on April 15, 2008 (Annex 8).

The Preliminary reports has included List of participants, Agenda, and content / layout of four project work packages, as proposed by Lead partner (NIMRD) and agreed by all project partners.

Each work pachage has been illustrated and discussed by mean of Power Point presentations prepared by Project leader's work package leaders.

All participants have expressed their opinions, considerations and suggestions in order to complete WPs with their own inputs in a harmonized / integrated manner during project development.

In order to compile the individual partner's contributions to all WPs, the Lead Partner (NIMRD) has kept its promeses and has distributed appropriate templates in order to enable proper responses for completion of requested informations.

All partners have expessed their availability and motivation to deliver their contributions in due course.

Dead lines for partner's contributions have been established, accepted, and later on partially respected.

The second expert meeting was followed by the *Interim / Progress report* delivered to BSEC headquarters on October 20, 2008 (Annex 9).

The Interim report has stated the progress and the project related activities during the period April – September, 2008. It has revealed the incomplete response of some project partners who have been urged to respect their obligations and to complete own gaps in data delivery in order to enable accomplishmient of all assumed tasks and finishing of Final report. Respective project partners which have promissed to comply to Lead partner's warning did so and fullfiled their duties at their best (Table 1).

Table 1 – National contributions to BSEC Black Sea project (2008 / 2009)

Partner	WP1	WP2	WP3	WP4	Information for extension of pre-feasibility study
RO (1)	√	√	√	√	√
BG (2)	√	√	√	√(p)	
BG (3)		√	√		
GE (4)	√	√	√		√
RU (5)	√	√(p)	n/a		
UA (6)	√	√	√		√
UA (7)	√	√	√	√(p)	

p = partially
n/a = not applicable

After submission of Interim report, with enough trouble, preliminary financial reports have been added (November – December, 2008).

Complete / final financial reports, with justifying documents for project related expenses and according English translation / explaination of those document have been requested to all project partners in view of preparation of joint final financial report

accordance with BSEC request (Annex 9 bis) and its submission together with justifying documents (proofs of expenses) as financial part of Final report.

This report confirms that the BSEC Black Sea project has been presented at Second Black Sea Conference (Sofia / Bulgaria).

No further agreement / progress concerning project extension to a larger desired scale, by present Project partners, has been achieved. .

Concrete actions with respect to such project extension, by identifying and attracting of partners other / new partners for constituing a consortium / partnership by enlarging present Black Sea membership, have been undertakeen only by Lead partner (NIMRD) with some suggestions from Project partner 5 (SBSIO / Russian Federation) (cf. 5 C)..

The present *Final report* synthesises the joint results obtained by the BSEC Black Sea project, by cooperation of seven project partners, within the four assumed Work packages (cf. 3.2.1, 3.2.2, 3.2.3, 3.2.4).

The project has been presented at the 2nd Biannual Black Sea and SCENE EC Project Joint Conference (Sofia / Bulgaria, October 6-9, 2008) in parallel Session IV "Ecological and Sociological impacts on the Black Sea coastal coumunities and resource users – Management scenaries and measures", by Dr. Eng. S. Nicolaev and Dr. A. S. Bologa, on October 8, 2008.

As to this pre-feasibility study, available Economic and financial information (cf. 4), as well as considerations on the economic, social and research impact (cf. 5) are added.

3.2 Work packages / tasks

3.2.1 – Improvement of Black Sea Integrated Marine Monitoring System

Task 3.2.1.1 Elaboration of an integrated monitoring system

The Work package 1/Task 1 has been achieved with contributions from Project partners 1, 2, 4, 5, 6, 7

1. National sampling network

Romanian national monitoring network consists in 13 transects perpendicular to the coast with 34 sampling and observation stations. The network covers the entire 254 km long Romanian Black Sea coast. The monitoring network is figured in the enclosed map (Annex 10).

Bulgarian (IO-BAS) national monitoring program consists in 6 transects perpendicular to the coast with 1-4 samples / year. The monitoring network is figured in the enclosed map (Annex 11).

Georgian monitoring network consists in six stations with 18 seasonally sampling points. The monitoring network is figured in the enclosed map (Annex 12).

Russian and Ukrainian/s national monitoring networks have not been communicated.

2. Monitored parameters

The monitored parameters and the sampling and analytical methodology used by the project partners are presented in Annex 13 and 14, respectively.

The following parameters are monitored in ***water***:

- Physical
  - Secchi depth, temperature, pH, total suspended solids;
- Chemical
  - salinity, dissolved oxygen and saturability, BOD_5, $N\text{-}NO_2$, $N\text{-}NO_3$, $N\text{-}NH_4$, $P\text{-}PO_4$, P-total, N-total, TOC, $Si\text{-}SiO_4$, trace metals, total hydrocarbons, pesticides, PAHs,
- Biological
  - phytoplankton, chlorophyll *a,* zoobenthos, total coliforms, faecal coliforms, faecal streptococi.

The following parameters are monitored in ***sediments*** :

- trace metals, total hydrocarbons, pesticides, PAHs, trace metals; PCBs

The following parameters are monitored in ***biota*** :

- trace metals, pesticides, PAHs, trace metals;

3. Involved institutions

Partner 1- Romania/ NIMRD
Partner 2-Bulgaria/ IO-BAS
Partner 3- Bulgaria/ IFR
Partner 4- Georgia/ WEFRI
Partner 5- Russia/ SB-SIO
Partner 6- Ukraine/OB-IBSS
Partner 7- Ukraine/YUGNIRO

4. QA/QC procedures

Involved laboratories are accredited according to ISO 17 025 / 2005.

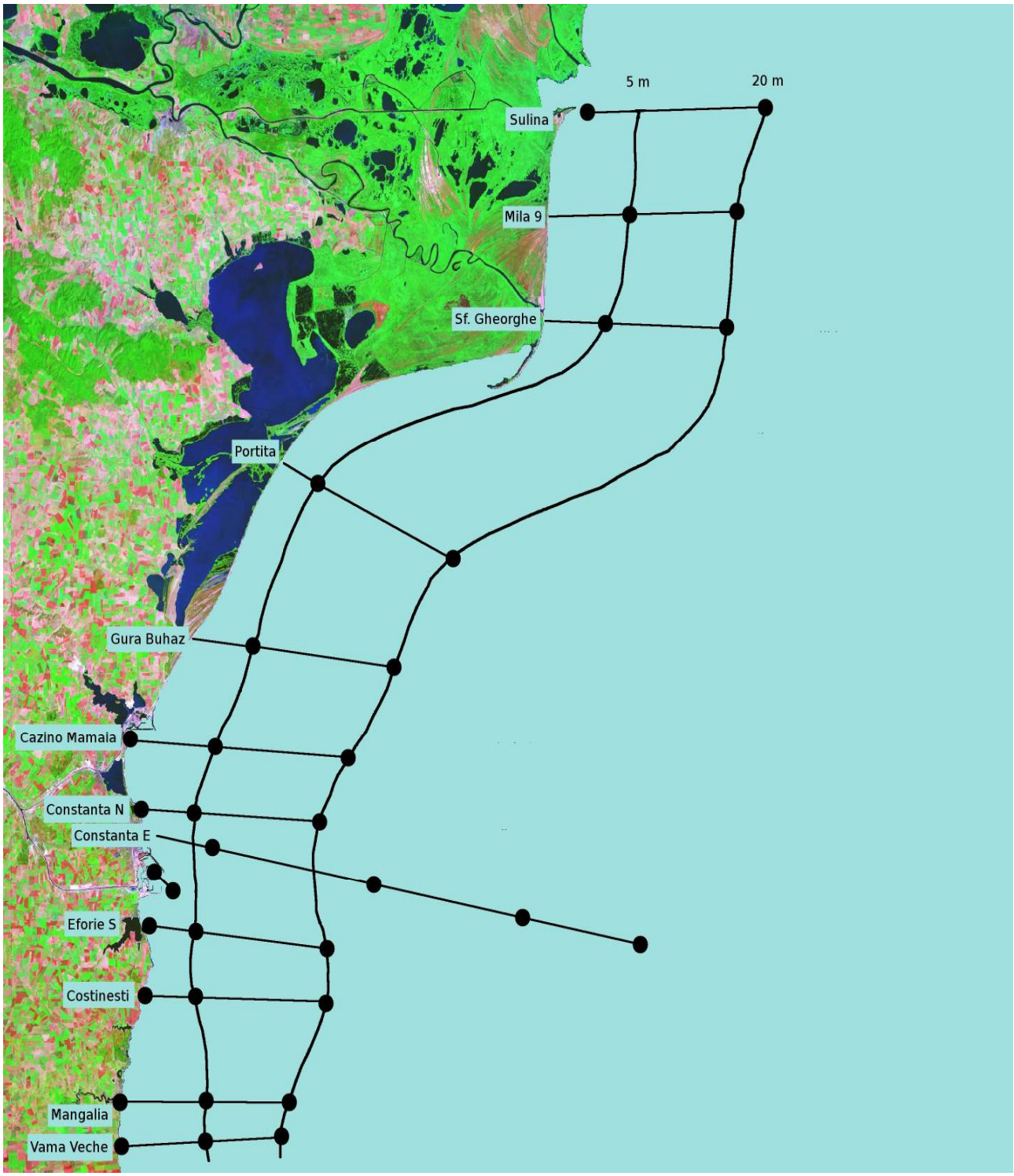
QA/QC procedures will include among others participation in international intercalibration or intercomparison exercises.

5. Reporting formats

Data are reported to the Ministryies of Environment, local authorities, Academies of Sciences, Black Sea Commission. Romania is also reporting to the European Environment Agency- WISE (Kopenhagen-Denmark..

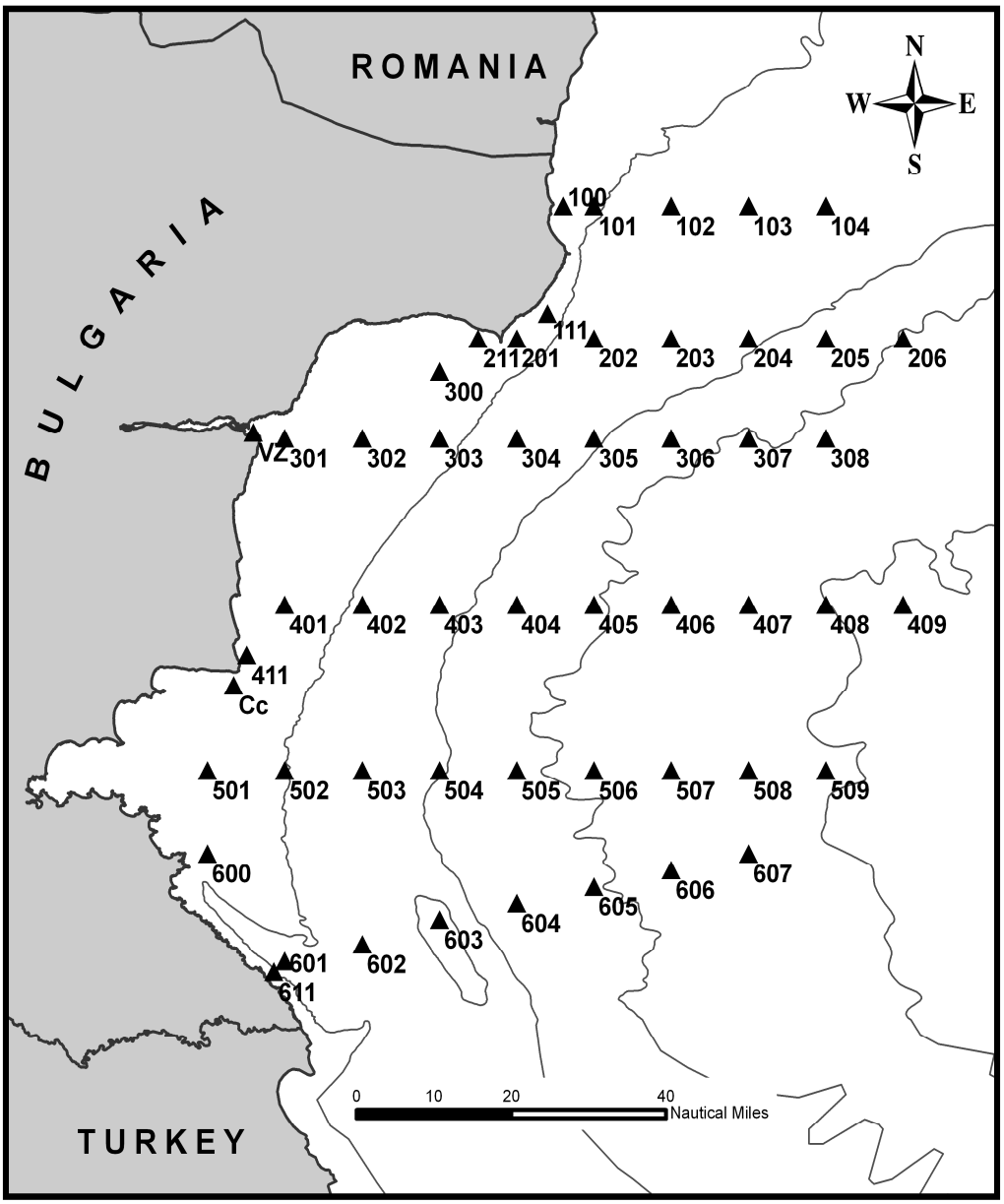
Special formats are developed in order to allow the data are included in specific data bases.

Annex 10



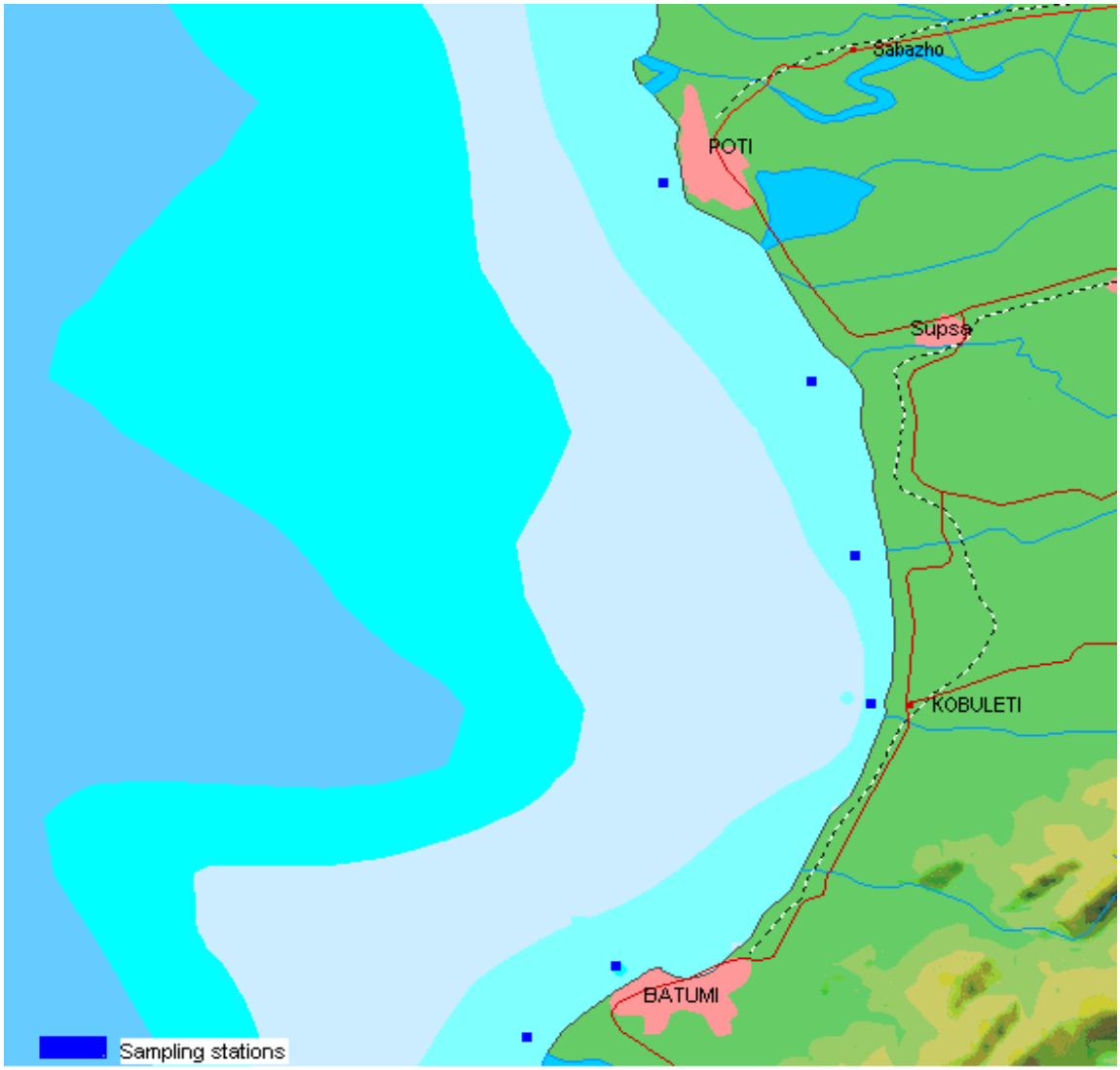
Romanian monitoring network

Annex 11



Bulgarian monitoring network

Annex 12



Georgian monitoring network

Annex 13

Parameters/matrices

		Water		Sediments		Biota	
	Parameters	**M / O***	**Frequency / year**	**M / O***	**Frequency / year**	**M / O***	**Frequency / year**
1	**Temperature** (^{0}C)	M	**4** P2, **5-6** P1,P5,P7 **72** P4, **400** P6				
2	**Secchi disk** (m)	M	**4** P2, **5-6** P1,P5,P7 **72** P4				
3	**TSS** (mg/l)	M	**4** P2, **5-6** P1,P5,P7 **72** P4, **400** P6				
4	**Salinity** (g/l)	M	**4** P2**, 5-6** P1,P5,P7 **72** P4, **400** P6				
5	**Oxygen**	M					
6	**-dissolved** (μM)	M	**4** P2, **5-6** P1,P5,P7 **72** P4				
7	**-%**	M	**4** P2, **5-6** P1,P5,P7				

8	**BOD_5** (µM)	**O**	**4** P2**, 5-6** P1,P5,P7 **72** P4 **400** P6				
9	**P-PO_4** (µM)	M	**4** P2**, 5-6** P1,P5,P7 **72** P4 **400** P6				
10	**P total** (µM)	M	**4** P2**, 5-6** P1,P5,P7 **72** P4 **400** P6				
11	**Si-SiO_4** (µM)	M	**4** P2**, 5-6** P1,P5,P7 **72** P4 **400** P6				
12	**N-NO_2**	M	**4** P2**, 5-6** P1,P5,P7 **72** P4 **400** P6				
13	**N-NO_3**	M	**4** P2**, 5-6** P1,P5,P7 **72** P4 **400** P6				
14	**N-NH_4**	M	**4** P2**, 5-6** P1,P5,P7 **72** P4 **400** P6				
15	**N total** (µM)	O	**4** P2**, 5-6** P1,P5,P7 **72** P4				
16	**TOC** (mg/l)	O	**5-6** P1, **72** P4				

17	**Chlorophyll a** (µg/l)	M	**5-6** P1, **84** P6 **72** P4				
18	**Trace metals**	(µg/l)		(µg/g) dw		(µg/g) dw	
19	Cd	M	**2** P1, P7, **70** P5 **84** P6	M	**2** P1, P7, **50** P5 **84** P6	O	**2** P1
20	Cu	M	**2** P1, P7, **70** P5 **84** P6	M	**2** P1, P7, **50** P5 **84** P6	O	**2** P1
21	Hg	M	**2** P1, P7, **70** P5 **84** P6	M	**2** P1, P7, **50** P5 **84** P6	O	**2** P1
22	Pb	M	**2** P1, P7, **70** P5 **84** P6	M	**2** P1, P7, **50** P5 **84** P6	O	**2** P1
	Fe	O	**1** P2				
	Mn	O	**1** P2				
23	**Pesticides**	O (µg/l)	**2** P1, P7	O (µg/g) dw	**2** P1, P7	O (µg/g) dw	**2** P1, P7
24	**Total hidrocarbons**	O (µg/l)	**4** P1, P5, P6	O (µg/g) dw	**4** P1		

25	**PAH**	O (ng/l)	**2** P1	O ng/g dw	**2** P1	O ng/g dw	**2** P1
26	**PCB**	O (µg/l)	**2** P1	O ng/g dw	**2** P1	O ng/g dw	**2** P1
27	**Phytoplankton**	M		M		M	
	- density (nr.cel/l)		**4** P1, P2, P5, P6				
	-biomass (mg/m^{-3})		**4** P1, P2, P5, P6				
	-blooms (cel/l)						
28	**Zooplankton**	O	**4** P2, **2** P5, P6				
29	**Zoobenthos**			M			
	-density (no/m^{-2})				**1**P2, **2** P1, P6, P7		
	-biomass (g/m^{-2})						
30	**Population characteristic of mollusks**			M			
	-mortality				**2** P6		

	-life span				**2** P6		
	-annual production				**2** P6		
	-growth rate characteristics				**2** P6		
31	**Phytobenthos**			M			
	-S/W (m^2/kg)				**2** P6		
	-IS (unit)				**2** P6		
	-biomass (kg/m^2)				**2** P6		
32	**Total coliforms**	**M***	**12-18** P1				
33	**Faecal coliforms**	**M***	**12-18** P1				
34	**Streptococcus fecalis**	**M***	**12-18** P1				

M = mandatory
O = optional
* = whole year
P1 = Romania / NIMRD
P2 = Bulgaria / IO-BAS
P3 = Bulgaria / IFR
P4 = Georgia / WEFRI
P5 = Russia / SB-SIO
P6 = Ukraine / OB-IBSS
P7 = Ukraine / YUGNIRO

Annex 14

Sampling and analytical methodology

Water quality

Item	Analytical measurement	Outline of method	Limits of detection Precision	Remarks
SEA WATER				
pH (RO, RU)	Potentiometric	With automatic reading of pH	**0-14** ± 0.3 pH units	In the lab.
DISSOLVED OXYGEN (RO, RU)	WINKLER	Manganese (II) chloride and an alkaline iodide solution are added to a measured volume of water. After complete fixation, the sample is acidified to pH 1 - 2.5 and iodine is titrated with thiosulphate.	± 0.3% for oxygen < 3mg/dm^3 ± 0.5% for oxygen > 3mg/dm^3	Fixation of oxygen on boards the ship with $MnCl_2$ and alkaline iodide solution.
BOD_5 (RO, RU)	Winkler	Two samples are taken. One is determined after 2 hours the other is kept on dark and 20^{0}C for five days and then is analysed similar to dissolved oxigen	Similar as above	Similar as above
TSS (RO, RU)	GRAVIMETRIC	The method is based on separation of suspended particulate material by vacuum filtration from a known volume of sea water, using Watman GF/F glass fiber filters previously dried at 105^{0}C and weighted.	± 0.1%	

$N\text{-}NO_3$ (RO, RU)	GRASSHOFF (1970)	The method is based on the reduction of nitrate in a heterogeneous system using cadmium in granules to nitrite, which is then determined via the formation of an azo dye.	**0 – 140 µg/dm^3** ± 14% in range 0–70 µg/dm^3 ± 28% in range 70-140 µg/dm^3	After sampling the water will be frozen at –20^{0}C to prevent biological transformations.
$N\text{-}NO_2$ (RO, RU)	BENDSHNIDER and ROBINSON (1952)	The methods is based on the reaction of nitrite with an aromatic amine leading to the formation of a diazonium compound which couples with a second aromatic amine to form an azo dye. The amount of azo dye formed is proportional to the initial concentration of nitrite. The extinction of the dye solution is measured at 540nm.	**0 – 140 µg/dm^3** ± 2.8%	

N-NH_4 (RO, RU)	KOROLEFF (1969,1970)	The method is based on the reaction of ammonia ions (the sum of NH^+ and NH_3) with hypochlorite in a moderately alkaline medium to give monochloramine, which, in the presence of phenol, catalytic amounts of nitroprusside ions and excess of hypochlorite, gives indophenol blue. The extinction of this blue compound is measured at 630nm	**0.7-560 µg/dm^3** ± 15%	
P-PO_4 (RO, RU)	KOROLEFF (1983)	The PO_4^{3-} reacts with an acidified molybdate reagent to yield a phosphomolybdate heteropoly acid, which is then reduced to a highly colored blue compound. The extinction of this compound is measured at 885nm.	**0.31-850µg/dm^3** ± 15% in range < 6.2µg/dm^3 ± 5% in range 6.2- 28µg/dm^3 ± 2% in range 28-850µg/dm^3	Water will be frozen at –20^0C to prevent biological transformations

Si-SiO_4 (RO, RU)	KOROLEFF (1983)	The SiO_4 ions reacts with an acidified molybdate reagent to yield a yellow silicomolibdenic acid, which is then reduced to a highly colored blue compound with ascorbic acid. The extinction of this compound is measured at 810nm.	**0 -4200µg/dm^3** ±4% in range 0-125µg/dm^3 ±2.5%% in range 125-1250µg/dm^3 ±6% in range 1250-4200µg/dm^3	
TOTAL HYDROCARBONS (RO)	UNEP	The method is based on extraction of total hydrocarbons together with other lipophilic compounds from a known volume of seawater with mixture n-hexane/methylen chloride. Afer extraction, the sample solution is dried, brought to a known volume and the intensity of its absorbance is compared with that of a suitable standard solution (OIL DRO) in UV between 230-320nm.	**0.05-100µg/dm^3** ±0.1%	

Cu, Cd, Mg, V (RO)	AAS method	Samples are preserved in plastic bottles in order to avoid contamination, are acidified to pH 1.5-2.0 with HNO_3 and stored at about 4^0C. They are analysed by atomic absorbtion spectrometry method. The laboratory uses single-element calibration working standards prepared from 1000 μg/ml standards obtained commercially	**1-2 μg/l**	
Faecal pollution indicators (RO)	Multiple fermentation tube or "most probable number"	Samples are incubated at 36 ^{0}C and reconfirmated at 38 ^{0}C . Most probable number (MPN) is calculated using statistical tables McCrady. The method is the one indicated in *Standard Methods for the Examination of Water and Wastewater, 14th* edition, American Public Health Association, American Water Works Association	**MPN**	Samples are collected in sterile bottles. They are taken aseptically from 0.3-0.5 m bellow the surface

Sediments

Item	Analytical measurement	Outline of Method	Limits of detection Precision	Remarks
TOTAL HYDROCARBONS (RO)	UNEP	The method is based on extraction of aromatic hydrocarbons together with other lipophilic compounds from a known volume of seawater with mixture n-hexane/methylen chloride. Afer extraction, the sample solution is dried, brought to a known volume and the intensity of its fluorescence is compared with that of a suitable standard solution in UV between 230-320nm.	**0.05-100µg/dm^3** ±0.1%	Extractiom from dry sediment. Results are reported at 100g dry weight
CD, Mn, Cu	Similar to water samples	Similar to water samples	**Similar to water samples**	

Trace metals are analysed by all involved laboratories by atomic absorption spectrometry method.

3.2.2 Work package 2 – Marine biodiversity and habitat protection

Task 3.2.2.1 Improving the investigation process of marine biodiversity

The work package 2 / Task 1 has been achieved with contributions from all project partners.

The template provided by the project leader in order to facilitate the accomplishment of work package 2 has focused on the following main issues:

a) Assessment of partners' capacity to perform biodiversity studies: advanced research methods / equipments, existent biodiversity centres and biodiversity experts with their field of expertise; to this issue, of all seven partners, the coordinator (NIMRD) and other three partners, IO-BAS and IFR (Bulgaria), and WEFRI (Georgia) have contributed with full information, while other two - OBIBSS and YugNIRO (Ukraine) answered only partially to the mentioned issues.

b) Concerning marine biodiversity inventory and monitoring, partners were asked to send information on: last biodiversity inventory, sampling network and frequency, methodology used, marine groups studied, parameters, QA/QC procedures and biodiversity indicators used for national reporting. All these information are necessary for the preparation of efficient biodiversity conservation measures to be proposed at national and regional level. To these specific issues, all project partners have sent their contribution. Should be mentioned that SBSIO (Russian Federation) has sent only the information regarding marine biodiversity and related monitoring.

c) Assessment of biodiversity conservation status is also important; therefore project partners were asked to send information regarding the number of marine species assessed according to IUCN criteria and categories, number of threatened species in national waters and last updating of National Red Data Book / List of marine species. Except SBSIO, all other partners answered this issue.

d) Classification and mapping of marine habitats, as another important issue has been considered for this work package. Project partners were asked to answer on the classification system and mapping methodology used, if national habitats' Red Data Book is available, and also if in their national waters habitats of regional importance have been identified. The same contributors as above have sent information on this issue.

e) In order to protect different species together with their habitats, an important role is played by Marine Protected Areas (MPA) development. This is an obligation derived from different conventions (CBD, Bucharest Convention, others) of which Black Sea countries are signatory parties. In the work programme of the Black Sea Commission establishment of MPA is a requirement for all countries from the region. Requested information regarding this issue was very concise and refers to: number of MPA's in national waters, their total surface (km^2 and % of shoreline), and transboundary MPA's proposed. Contributors were the same as above.

Reviewing of the received information (Table 2), the WP2 task has been fulfilled by the contribution of almost all project partners, except SBSIO, which has sent only partial informations. We can conclude that all project partners posess advanced research equipments, methods and trained experts and they can be able to develop joint research projects. Unfortunatelly, Black Sea Regional Centre of Biodiversity established in Georgia under the Black Sea Convention is not that active as should be, in preparing research projects, gathering informations from the entire region and making them available for other possible partners from Europe and abroad.

All partners have their own biodiversity monitoring system, not essentially different from one country to another. It will be only a question of common will to be harmonized at regional level. Parameters are also the same and the groups studied as well, which means that the experts can collaborate to make better progress. QA/QC procedures have been set at regional level for all biodiversity component and periodically intercalibration exercises have been carried out. Setting up of a common set of biodiversity indicators for all the Black Sea countries will be challenging, and should be agreed under the Bucharest Convention.

As regards the assessment of biodiversity conservation status, different institutions from the same country (eg. IO-BAS and IFR- Bulgaria or OBIBSS and YugNIRO - Ukraine,) have different species assessed against IUCN criteria and categories, and it will be more effective to elaborate common lists.

Concerning marine habitats' classification and mapping all partners agreed European systems (Palearctic, NATURA 2000, EUNIS); no country has a Red Data Book of habitats, activity included among those that should be carried out at regional level by all Black Sea countries. Another issue to be accomplished is to identify the habitats of regional importance in all the Black Sea countries.

Table 2

Research capacity

Advanced research methods/equipements (genetics, etc.)	Biodiversity Centres	No. of biodiversity experts	Contributors
Sampling vessel, motorspeed boat, adequate sampling equipments for all abiotic and biotic components as agreed at regional level, inverse and other different microscopes with special software for image transfer to computer (Zeiss), equipments for genetic studies of micro-organisms (bacteria) and opportunities for genetic studies of marine invertebrates (especially molluscs and crustaceans)	In preparation a National Centre of Marine Biodiversity, which will be hosted by the NIMRD	16 (1 marine bacteria, 1 phytoplankton, 1 zooplankton, 2 macrophytes, 4 zoobenthos, 6 fish and mammals, 1 genetics)	**NIMRD**
Sampling facilities: Research vessel "Akademik": Research submersible PC-8 Side scan sonar system CTD - system with 12 barometers 5 litres each Sampling nets In situ fluorometer Box corer Van Veen grabs (0.1 m-2), set of sieves, washing table Scuba diving equipment and staff Laboratory facilities: Binocular light microscopes Olympus and Hund Trinocular microscopes Olympus and Hund with digital cameras Image analysis systems Microscales and scales Spectrophotometer Centrifuge Filtration system			**IO-BAS**

Research vessel; adequate sampling equipments for all monitoring components of IFR;microscopes with software for image transfer to computer (Olympus);aparatus for starch gel electrophoresis;aparatus for izoelectric focusing, for DNA analysis; biochemical-genetic laboratory, benthic grab, marine mammals survey, trawl surveys -by catch composition, migratory routes	IFR-Varna,Green Balkans NGO	11 (1chemistry, 2 phytoplankton, 1 zooplankton, 2 zoobenthos,3 fish, 2 genetics) 4 consultants (1 bacterioplankrton, 1zoobenthos, 1 fish, 1 genetics)	**IFR-VARNA**
Catamaran "Delfin"Judy netBathometer (1,5 liters)Van-Vee grab Spectrophotometer DR/2010 Oximeter OXITOPElectronic scalesScalar, FluorimeterMicroscope (Leica) (KRUSS)Back-filtration apparatusNuclear (nylon) filters	Black Sea Regional Centre of Biodiversity of Georgia	16	**WEFRI**
		30	**OBIBSS**
Shepard's, Shannon's Criterias		4	**YugNIRO**

Marine biodiversity

Inventory and monitoring							
Last biodiversity inventory	**Sampling network and sampling frequency**	**Sampling and samples' processing methodology**	**Marine groups studied (e.g. fish, Amphipoda, Ostracoda, Nematoda, Bivalvia, etc.)**	**Parameters (e.g. biomass, abundance)**	**QA/QC procedures**	**Biodiversity indicators used for national reporting**	**Contributors**
2003-2005	Along Romanian littoral between 0 and 20 m depths on 18 transects perpendicular on shoreline; seasonally	According with approved regional methodology for sampling and samples' processing	phytoplankton (Bacillariophyta, Dinophyta, Chlorophyta, Cyanobacteria), macrophytes (green, red and brown algae), planktonic and benthic invertebrates (Cladocera, Copepoda, Polychaeta, Mollusca - Bivalvia, Gastropoda- , Crustacea - Amphipoda, Isopoda, Mysidacea, Decapoda, Tanaidacea), pelagic and bottom fishes, mammals	species composition, abundence, biomass, spatial distibution; biodiversity indices (Margalef, Shannon, Pielou)	As agreed at regional level; through intercalibration exercises	- **state indicators** (number of marine species by taxonomic group, area of distribution, level of threatened and habitats diversity); - **pressure indicators** (number of marine commercial species, exotic species, number of anthropic activities with impact, wetlands area); - **impact indicators** (vulnerable species, extinct species/total species ratio and number of acclimatized species).	**NIMRD**

Konsulov A. (ed.), 1998. Black Sea Biological Diversity – Bulgaria. United Nations Publ., New York, Black Sea Environmental Series, vol. 5, 131 pp. Karapetkova M., M. Zivkov, 2006. Fishes in Bulgaria. Publ.House "Gea-Libris", 215 pp (in Bulgarian)	Network of IO-BAS, 49 stations; Network of the Basin Directorate of the Black Sea, 20 stations; samling frequency - annual, seasonal	Todorova V. & Konsulova T., 2005. Manual for collection and treatment of soft bottom macrozoobenthos samples. Online: http://bsc.ath.cx/documents/ExpertNetwork/docs/Expert%20Network%20-%20Zoobenthos/Todorova%20Manual_zoobenthos.doc Zooplankton sampling is performed from bottom up to the surface by vertical closing Juday plankton net with the mouth 36 cm diameter (0,1 m2 mouth area) and 150 µm mesh size.	Zoobenthos - Polychaeta, Crustacea, Bivalvia, Gastropoda, Polyplacophora, Anthozoa, Turbellaria, Echinodermata, Ascidiacea; Pisces; Zooplankton - Cnidaria, Ctenophora, Rotatoria, Copepoda, Cladocera, Chaetognatha, Appendicularia identified to species level; Hydrozoa, Bivalvia, Gastopoda, Polychaeta - to high taxa level	zoobenthos - abundance [ind.m-2], biomass (wet weight) [g.m-2] zooplankton - abundance [ind.m-3], biomass [mg.m-3]	Todorova V. & Konsulova T., 2005. Manual for collection and treatment of soft bottom macrozoobenthos samples. Online: http://bsc.ath.cx/documents/ExpertNetwork/docs/Expert%20Network%20-%20Zoobenthos/Todorova%20Manual_zoobenthos.doc	Number of species (S), Shannon-Wiener diversity (H), Evenness (E)	**IO-BAS**
2002-2007	1 time a month-shelf water;4 time per year seasonally Along the Bulgarian BS coastline and 4 transects up to 30 miles	According with approved regional methodology for sampling and samples' processing in accordance with the Manuals for phytoplankton, zooplankton, zoobenthos.To collect the	phytoplankton zooplankton, zoobenthos , commercial fishes, mammals .	species composition, biomass, abundance, spatial distribution, biodiversity indeces.	regional methodology	state, pressure and impact indicators	**IFR-VARNA**

		hydrobiological sample we will use CTD, Nansen bathometers, Jedy and Bongo nets and Van-Vee grab. Definition of hydro chemical parameters will use the standart technical instruments.					
2007	The samples will be taken seasonally from three stations in depth 0 m and 25m : Station 1 – Kvariati; Station 2 - Batumi Station 3 - Poti	Sampling and analytical methods will be in accordance with the Black Sea Commission Manuals for phytoplankton, Zooplankton, zoobenthos, Nutrients and pigments. To collect the hydrobiological sample we will use Nansen bathometer, dredging of Petersen, Jedy-nets and Van-Vee grab. Definition of hydro chemical parameters will be made by the modern technical instruments: Dissolved Oxigen	Phytoplankton, zooplankton, benthos, commercial fish endagerend fish species	abudance, biomass abudance, biomass abudance, biomass stock, statistic data List of fish species and categoria IUCN	For data quality control there is used the method of the Black sea counries laboratories (intercalibration). Research methods are viwed in international meetings, workshops (Odessa, Varna), information is changed between specialists periodicaly (In 2008 the chemical laboratory of Monitoring and prognostic cantre will be	abundance and biomass of phytoplankton, zooplankton, benthos	**WEFRI**

		Analyser (dissolved oxygen quantity, Portable Salinometer Mod 8410 (Salinity), Scalar, Fluorimeter					
2007	4-8 time a month - coastal water; 2 time a month - shelf water; 1-2 time a season - deep water	1)Zooplankton net sampling;2) hand catching macrozoo (diving); 3) batometer - phytoplancton, chemistry sampling; chlorophyll, illuminance taking	Macro and mesozooplancto n (all groupes, including larvaton)	Biomass, abundance, reproduction, ecophysiology,li fe cycle of Ctenophora, Scyphozoa, calanus, some of parasite gelmints		index H' (Shannon), Dmg (Margalef), PIE	**SBSIO**

2007	northwestern Black Sea shelf 25 cruises	plankton and benthic frames, Van veen grab, dredge, plankton nets, bathymeters, multicorers	fish, Amphipoda, Ostracoda, Polychaeta, meiobenthos, Bivalvia, seaweeds, microalgae, phyto-zooplankton, fungi, nutrients, pigments	species composition, abundance, biomass: phytoplankton, zooplanktjn, macrophytes, veio- and macrozoobentho s (mollusk population characteristics: mortality rate, life span, growth rate, annual production)		Phytoplancton: ratio of total abundance and biomass Diatoma/Dinaflagellat e, Zooplancton: ratio of biomass Noctiluca/total zooplankton, Macrophytobentos: characteristics of specific surface of mass species, Meiobenthos: ratio of total abundance/biomass, ratio of abundance Nematoda/Harpacticoi da, Macrozoobenthos: number and main characteristics of benthic biocenosis, mollusk phenotypic diversity, for pelagic and benthic communities: ratio of forage /nonforage biomass),	**OBIBSS**
to be created	regular scout-fishing vessels surveys in the Azov and Black Seas, fixed fish-catching control points along shoreline of the Crimean Peninsula / all year duration	Standard	mammals, pelagic and bottom fishes, molluscs, invertebrates, seaweeads	species composition, abundence, biomass, spatial distibution, life cicle	Standard	species composition, abundence, biomass, spatial distibution	**YugNIRO**

Assessment of biodiversity conservation status

No. of marine species assessed according to IUCN criteria and categories	No. of threatened species in national waters	National Red Data Book/List (marine species) - last updating	Contributors
219 (19 macrophytes and vascular plants, 54 invertebrates, 142 fishes and 4 mammals)	53 (15 CR, 23 EN, 15 VU)	National Red Data List - 2007	**NIMRD**
30 Black Sea Red Data Book, 1999. (www.lefo.ro/iwlearn/bsein/redbook)	134 including inhabitants of coastal habitats - wetlands and terrestrial	Red Book of Republic of Bulgaria, 1984. BAS, vol.1 (Plants), vol.2 (Animals); Second edition is in preparation. Zivkov M., K. Prodanov, T. Trichkova, G. Rajkova-Petrova, P.Ivanova, 2005. Fishes in Bulgaria – state of the art, conservationand sustainable utilization. Current state of Bulgarian biodiversity – problems and perspectives. Bulgarian Biodiversity Platform, Ministry of Environment and Water. Reports presented at the National Meeting devoted to the International Day for Biological Diversity - 22 May 2004, Sofia, 3-4 May, 2004, 247 -281 pp. (in Bulgarian) Karapetkova M., M. Zivkov, 2006. Fishes in Bulgaria. Publ.House "Gea-Libris", 215 pp (in Bulgarian)	**IO-BAS**

53	4 CR,6 VU, 43 EN; 117 fish species		**IFR-VARNA**
81 species assessed according to IUCN criteria and categories:11 species of phytoplankton; 60 species of pisces; 5 species of mollusca; 5 species of marine mammals	in Georgian Red List - 10 marine species		**WEFRI**
159	15		**OBIBSS**
20	8	2008 (update in progress)	**YugNIRO**

Classification and mapping of marine habitats

Classification system used for marine habitats	Mapping methodology used	National Red Data Book of habitats	Habitats of regional importance identified	Contributors
Palearctic, NATURA 2000 (Habitats Directive), EUNIS (under development)	GIS	to be developed	To be identified	**NIMRD**
NATURA 2000	Side-scan sonar imaging; ground truthing by scuba diving visual census, grab sampling of sediments and taxonomic analysis of fauna, underwater photography	In process of preparation.	1110 Sandbanks which are slightly covered by seawater all the time 1140 Mudflats and sandflats not covered by seawater at low tide 1160 Large shallow inlets and bays 1170 Reefs 8330 Submerged or partially submerged sea caves	**IO-BAS**
should be developed concerning the EU regulations	Research surveys national,international,SURFER software	to be developed	Fattening,wintering,spawning areas of adults and juveniles,eggs and larvae of commercially important fish species and invertebrae – BSERP Phase II,2007	**IFR-VARNA**

Identification of EUNIS habitat types Describing new / endemic habitats Adding EUNIS descriptions to the database Assessment of the 'importance' of habitat types	Mapping of species distribution (point and 10 km tetrad) using GIS	Elaborated		**WEFRI**
EUNIS -classification	Landscape observation whith diving equipment and sampling with standart quadrat	absent	82	**OBIBSS**
should be developed concerning the EU regulations	GIS	to be developed	to be developed	**YugNIRO**

Setting up of a coherent network of MPA's at Black Sea level

No. of Marine Protected Areas in national waters	Total surface of Marine Protected Areas in your country (km2 and % of the shore)	Transboundary Marine Protected Areas proposed	Contributors
2 and 6 areas designated as SCI (of Special Conservation Interest)	1080 km2; 68%	2 Mai - Vama Veche Marine Reserve to be extended towards Bulgaria; Danube Delta Biosphere Reserve already exist as transboundary reserve with Ukraine	**NIMRD**

2 MPAs under the Protected areas act. 14 sites from the NATURA 2000 network.	MPAs under the Protected Areas Act - 11.6 km2, 0.2 % of the Bulgarian territorial sea, 0.1 % of the shelf area. Marine area included in NATURA 2000 sites is 611 km2, 9.4 % of the Bulgarian territorial sea, 5.6 % of the shelf area and 2.4 % of claimed EEZ.	The marine area between Cape Krapets – cape Sivriburun at the northern borther of Bulgaria. To extend the Romanian marine reserve Doi Mai-Vama Veche.	**IO-BAS**
		Transboundary expansion of Romanian Vama Veche-2 Mai reserve with Bulgaria	**IFR-VARNA**
1(Kolkheti National Park located to the south of the Caucasus range, in the coastal area of the Black Sea and in the western section of the Kolkheti Lowlands)	157.42 sq.km		**WEFRI**
19	1235 km2, 76%	will be discise	**OBIBSS**
to be estimated	to be estimated	Kerchenska Strait, Danube Estuary	**YugNIRO**

3.2.3 Work package 3 – Marine living resources

Task 3.2.3.1 The development of indicators for a sustainable fishery and aquaculture, on ecosystem principles and in accordance with common fisheries policy

The work package 3 / Task 1 has been achieved with contributions from Project partners 1, 2, 3, 4, 6 and 7.

Managing fisheries for sustainable development is a multi-dimensional and multi-level activity, which must deal with a wider range of considerations than survival of the fish stocks and the fisheries alone. It requires information, and hence indicators, on dimensions well beyond fish stocks and fishing activity. Changes to fisheries activity should be assessed with reference to the driving forces of economic and ecological change that bear on both the demand for and the supply of fish. These external forces will include competing claims on use and management of marine ecosystems.

Ecosystem based fisheries management goal is to rebuild and sustain population, species, biological communities and marine ecosystems at high level of productivity and biological diversity, so as not to jeopardize a wide range of goods and services from marine ecosystems while providing food, revenues and recreation for humans (FAO Glossary).

The assessment of fishery status will be carried out through a series of indicators used already by the international organization for management of living resources.

Indicators are not an end in themselves. They are a tool to help make clear assessments of and comparisons between fisheries, through time. They describe in simple terms the extent to which the objectives set for sustainable development are being achieved.

The following scheme of management system must be used:

- identification of specific management objectives
- setting of indicators
- defining of parameters and assessment methodologies
- design of data gathering system based on national systems of all coastal countries, which should be designed on common agreed scheme

There are several objectives to consider under the heading of fisheries sustainable development:

- Sustaining fisheries harvesting and processing activities based on specified and identifiable marine ecosystems;
- Ensuring the long-term viability of the resource which supports these activities;
- Catering for the well-being of a fishery workforce within a wider community and broader economic context; and
- Maintaining the health and integrity of marine ecosystems for the benefit of other uses and users including biodiversity, scientific interest, intrinsic value, trophic structure and other economic uses such as tourism and recreation.

Indicators are now needed that can be used to determine how well these objectives are being pursued and whether the broader goals of sustainable development are being achieved.

Indicators used previously in fisheries management have tended to be biological and to focus on target species. A wider range of indicators will need to be used in assessing progress towards sustainable development, including indicators that reflect the broader ecological, social, economic and institutional objectives.

An indicator is a quantitative or qualitative value, a variable, pointer, or index related to a criterion. Its fluctuations reveal the variations of the criteria. A reference point indicates a particular state of a fisheries indicator corresponding to a situation considered as desirable (target reference point, TRP), or undesirable and requiring immediate action (limit and threshold reference points, LRP and ThRP). Reference points relate directly to human objectives (TRPs) or system constraints (LRPs). The position and trend of the indicator in relation to the target or limit reference points or values indicate and qualify the present state and dynamics of the system. They provide the elements needed to assess the situation and a bridge between objectives and actions.

The role of the scientist in this system is to suggest indicators, monitor the state of the resource and environment using standard or agreed indicators measured in a standard way, and to determine the annual value of the indicators, and the probability that indicator values have reached pre/established LRP's built into the management system.

Indicators can support effective decision making and policy setting at every stage of the decision-making cycle - during problem identification, policy formulation, implementation, or policy evaluation.

Indicators can help simplify and harmonize reporting at various levels.

At the **regional** level, indicators can assist in the process of harmonizing strategies for management of transboundary resources and for measuring the overall health of large-scale marine ecosystems. At the **national** level, countries can use indicators to produce a holistic picture of the fisheries sector and its environment.

At the fishery level, indicators provide an operational tool in fisheries management, as a bridge between objectives and management action. For example, an indicator such as an estimate of current biomass from a stock assessment model may feed into a decision rule that specifies next year's catch limit. Indicators may also be used to trigger a more general management response, such as achievement with respect to a more integrated coastal management plan.

Interpretation of the indicator:

Below the limit reference point: The fishery is likely to be seriously over-capitalized due to ineffective fisheries management of fishing capacity. It causes a net loss to the economy. Corrective management action is required together with close monitoring of the indicator (e.g. on a yearly basis).

Close to the limit reference point: The fishery is close to the bio-economic open access equilibrium (which may be stable or unstable). Fisheries management is ineffective or non-existing. Precautionary management action is needed to ensure that the limit is unlikely to be passed and that the situation is improved. Frequent monitoring of the indicator required (e.g. every 2-3 years).

At or above target reference point: The fishery is likely to be effectively managed and economically efficient resource rent could be extracted if not already capitalized in quota prices or captured through taxes or license fees. Less frequent monitoring of the indicator is required (e.g. every 3 to 5 years).

To facilitate their use within a broader management system and their accessibility to a wider audience, indicators and their interpretation need to be presented in a form easily understood by the user.

In many instances, indicators will be presented as a simple value. However, to be able to compare indicators within and between different systems rescaling will be needed. This means converting the indicator into a ratio, i.e. dividing it by a base value, which in many instances

would be the value of the related reference point. For example, if the original indicator was the current spawning biomass the rescaled indicator would be the ratio of this value to the virgin biomass, thereby ranging from 0-1.

Table 3

Table 3 presents an example.

		State (B/Bv) [1]	Pressure (F/F_{MSY}) [2]	Pressure (F/F_{MEY})[3]	Response (participation)
Scale	Good	0.5 - 1.0	0.6 - 0.8	0.8 - 1.0	0.8 - 1.0
	Fairly good	0.3 - 0.5	- 0.6 0.8 - 1.0	0.5 - 0.8 1.0 - 1.2	0.6 - 0.8
	Average	0.2 - 0.3	1.0 - 1.3	1.2 - 1.4	0.4 - 0.6
	Poor	0.1 - 0.2	1.3 - 2.0	1.4 - 2.0	0.2 - 0.4
	Very poor	0.0 - 0.1	> 2.0	> 2.0	0.0 - 0.2

(FAO Technical Guidelines for Responsible Fisheries. No. 8. Rome, FAO. 1999)

[1] Assuming a limit reference point at 30% Bv and a target reference point at 50% Bv
[2] Assuming a target reference point at F = 60 to 80% of F_{MSY}
[3] Assuming a target reference point of 80-100% of the maximum economic yield (MEY)
Notes: B = Biomass, B_v = Virgin biomass, F = fishing mortality, F_{MSY} = Fishing mortality at the maximum sustainable yield (MSY) point, MEY = maximum economic yield

DATA

Indicators need to be underpinned by data. Data availability and costs are major issues in the selection of indicators

Indicators are generally developed from data that are already available, e.g. in institutional databases and industry records.

There are several possible sources of data that should be considered. In general, first use should be made of existing data and programs of data collection and information. This may include standard statistical reporting and monitoring, such as of catches and market information. However there is also the potential and need to use existing information that is not generally compiled or reported, such as information from fishers, communities and indigenous groups. The value and use of expert judgements should not be underrated.

At regional and global scales, international agreements on standards and data exchange are essential to reasonable assessment.

Assessment of the availability of data from international and national sources

For many countries, suitable data to calculate these indicators are scarce and often deficient or unreliable. For example, there are serious deficiencies in data series for annual catch owing to poor statistical design, failure to estimate catches by small-scale fleets or illegal fishing, local consumption, or other forms of misreporting. In such cases, corrected estimates by qualified scientists may have to be used.

Data needed: In order to generate the above indicators and reference points, data are required for annual catch, fishing effort, fishing mortality rates, biomass estimates, and stock size and age. Other supplementary data needs may include mean size or age of the catch (which fall as fishing pressure rises), the percentage of mature fish in the catch, the overall current mortality rate and the proportion of long-lived fish in the catch (for a multispecies fishery).

Data availability: Most countries collect data on annual catch. Not many countries maintain data on fishing effort by national fleets; still fewer standardize effort levels by different fleets and arrive at an annual total. Unless size and age compositions are collected and/or estimated from properly sampled catches in landing places, fishing mortality rates will not be estimated. The latter require a cadre of trained fisheries scientists working in an equipped fisheries or marine science laboratory. Regular biomass estimates will require regular fisheries surveys using standard vessels and procedures with trained observers/fisheries biologists on board.

Data sources: National statistical offices often collect data on catches and fleet size, but often require assistance in distinguishing species in the catch. At present, effort and mortality estimates are nearly always made by national marine resource institutes or universities, who usually supply the other biological information used to develop the indicators mentioned above.

Some of the data requirements for ecological, economic and social criteria and indicators.

1. Ecological criteria

Catch structure

The catch structure refers to the size of fish, species composition and numbers, and the trophic level of each species in the catch. Shifts in the catch structure are strong signals of potential non-sustainability in the fishery. Shifts in catch structure may reflect a "fishing-down the food chain" process in which excessive pressure is exerted on individual stocks (of high value predators) leading to a shift of fishing pressure to less-preferred species or size classes (e.g. of lower value preys). Changes in catch structure that would signal non-sustainability may be hidden unless the data is gathered at sufficiently fine scales of spatial and temporal resolution to show the patterns of change in catch structure within the subunits of each fishery.

Information on catch structure should be gathered from fishers and, where species composition is complex, supported by observer programmes and taxonomic identification aids to verify species identities. The data on catch structure should be captured in the finest space and time scales that are achievable in each fishery.

Area and quality of important or critical habitats

Vegetated habitats (such as seagrasses, algal beds, mangroves and marshes), estuaries, coral reefs, offshore canyons and seamounts, and trawlable soft-bottom habitats are fundamental elements of marine ecosystems. For specific fisheries these can be considered as very important or even critical, e.g. as spawning and feeding areas as well as trawling grounds. Critical habitats provide critical and direct support for fisheries production, such as seagrass or mangrove systems

through which all recruits to a fishery may have to pass, or reefs that may be the main source of larvae for a large reef complex. Both would also be important for biodiversity in general as well as source of food for exploited species. Change in the area of habitat, as measured using habitat inventory tools, can indicate changing conditions in the environment that could be caused by fishing, or might affect fishing activities. Loss of seagrass beds caused by pollution can affect fisheries, while trawling or dredging in seagrasses can destroy many types of seagrass habitat. The quality of habitats, as measured by the extent of coral cover or ratio of live to dead coral on coral reefs, for example, or by faunal composition in seagrass beds, is closely related to the value of habitats for fisheries purposes. Changes in habitat quality signal changes in ecosystems that can have very important ramifications for fisheries, irrespective of their causes. All fisheries need to be aware of the extent to which critical and important habitats support the fishery, and the nature and extent of any changes that might be occurring, irrespective of the causes.

Fishing pressure - fished vs unfished areas

Not all areas within any given fishing grounds are fished with equal intensity. Some locations may be difficult to reach, or may only be fishable in certain weather conditions. For some types of fishing, such as trawling or seining, fishing grounds often contain areas that cannot be safely fished because of risk to gear (posed, for example, by reefs, canyons, pinnacles or other obstructions). Moreover, fishing grounds are not usually considered to be homogeneously productive, so some areas will be more intensively fished because of a greater perceived return or catch rate. In addition, reserves and other forms of closure are used to protect spawning stocks, or sensitive young life stages from harvesting or other detrimental effects.

This means that there may be substantial areas, even within designated fishing grounds, where fishing does not occur, or occurs only very infrequently. These areas may be considered to be natural refuges where samples of habitats and ecosystems are, to some extent, immune from the effects of fishing. They may also contribute to the maintenance of target stocks, by providing recruits for the fishery, or feeding grounds for stocks fished in other places.

Monitoring of the extent of fished and unfished areas is a useful proxy for the extent of protection and refuge provided for local sedentary species and samples of habitats. To measure and document this proxy, detailed information is required on fishing locations, the type of gear used and the frequency of fishing activities. Data on this indicator could be gathered in cooperation with fishers and recorded in the form of maps or GIS-compatible spatial records.

Identifying the extent of fished and unfished areas and tracking changes provides crucial information that can be used to evaluate the extent to which fishing management practices provide support for the conservation of non-target species. The extent and location of fished areas provides key information on the spatial patterns of fishing effort and any exploitation patterns that could be unsustainable.

2. Economic criteria

Profitability

In the absence of major market distortions such as extensive subsidies or the existence of price controls, profitability is the single most important economic criteria. Low or negative profitability usually indicates that fish stocks are exploited in an economic wasteful manner and fishing capacity and effort are excessive on both economic and biological grounds. Only in rare instances would low profitability result from an unfavourable combination of relatively low fish

prices and high fishing costs. Most commercial fish stocks can yield high or satisfactory returns on investment with present fishing technologies and when subjected to effective fisheries management. In a theoretically perfect market economy, profit would be equal to resource rent as all inputs and outputs are correctly priced at their opportunity cost or willingness to pay level.

Value of fishing entitlements

Where management is done through transferable entitlements such as individual transferable quotas (ITQs), the resource rent becomes capitalized in the value of the entitlement. In theory, the entitlement is worth the sum of the discounted stream of future profits or rent (i.e. the net present value). In the absence of speculative trading, a change in the market price of quota entitlement, thus, reflects a change in the, by market participants, estimated profit potential of the fishery. Such a change can occur, for example, as a result of a decline in stock abundance, a drop in fish prices or an increase in fishing costs. Second generation holders of fishing entitlements may realize only low or zero profit because of the capital cost incurred when purchasing the entitlement.

Subsidies

Apart from failing to effectively regulate access to the fishery, the single most important cause for economic waste and overfishing is the provision of subsidies for fishing inputs such as for fuel and for the construction and purchase of fishing vessels and gear. The extent of such subsidies does not only provide an indication of the poor economic performance of the fishery or fisheries but also of the likely large political difficulties of attaining effective fisheries manage. These difficulties relate to the large overcapacities prevailing in heavily subsidized fisheries and the consequent need to reduce excess capacity and employment. Such adjustments might only be politically feasible when accompanied with compensatory measures such as buy-backs and temporary re-training and income support for displaced fishermen.

3. Social criteria

Employment

Work in the fisheries sector, especially fishing, is often regarded as employment of last resort in many countries, because of the limited training and educational requirements. Typically, there are many more fishermen than fisheries can absorb and maintain because of the high fishing pressure this can bring to bear on fish stocks. Changes in the total amount of paid labour or employment in a fishery can be a useful indicator of both the condition of a fishery and its value to the local populations that may be dependent on fisheries for their livelihood.

Protein consumption

Fish provides more than two-thirds of the animal protein consumption of the population of many developing countries, especially in coastal communities. However in recent years the per capita availability of fish has been falling in an increasing number of countries because of declining catches and the export of highly valued catch for overseas consumption. As demands for production increase, so does the risk of unsustainable practices to produce more catch for more lucrative markets at the expense of local consumption. Change in per capita fish consumption, and fish consumption as a proportion of total protein consumption, are important criteria that relate to the significance of the contribution of fisheries to the livelihood of coastal communities, and can be related to the community pressure for sustainable development of fisheries.

Tradition and culture

Local knowledge derived from oral traditions passed between generations can be an important aspect of fisheries management in many countries, both developing and developed. These traditions establish the "do's and don'ts" of fishing, and in some countries cultural taboos are established and maintained. The loss of traditional practices can indicate substantial changes in fishing practices, and may signal the loss of traditional fisheries management systems and reduced controls in loosely organized and subsistence fisheries. Information on the prevalence of traditional fisheries practices can be obtained by consulting fishers and local community leaders.

In the case of the Black Sea, the starting point represent the objectives provided by Black Sea Strategic Action Plan and those selected in special seminar organised in Sile (Turkey) in 2003 by Black Sea Commission (BSC) and General Fisheries Council for the Mediterranean (GFCM).

Selection procedures of specific indicators for marine living resources took place in the frame of The Advisory Group on Environmental Aspect of Management of Fisheries and Other Marine Living Resources (AG FOMLR) taking into consideration the following elements:

- keeping the parameters used traditionally in the Black Sea area for assuring the historical data sets;
- introduction of new modern approaches for fisheries indicators recommended by specialised European institutions and EU strategies;
- assessment of fishery resources will be initial focused only on six species considered key species for the Black Sea: sprat, anchovy, horse mackerel, turbot, whiting and spiny dogfish.

The AG FOMLR considers process of elaboration of the fisheries indicators only at beginning and we need to validate him at concrete activities.

For these reasons AG FOMLR decide to test initial designed indicators in annual national and regional reporting to the Commission.

The list of indicators contain about 20 basic proposals structured on four groups: pressure, impact, state and response.

Pressure - These indicators tell us about the pressure that is being applied on some aspect of the fisheries sustainability system. It can be difficult to determine whether a level of pressure is acceptable or whether it is too high, unless information is also available on the state of the environment. Therefore these indicators generally need to be read alongside the state indicators. However, variations in pressure indicators can be early warnings of problems before they cause a change in the state indicators.

Impact - These pressures may have an immediate impact on the functioning of the system (such as collapse of fisheries, social unrest, decline in compliance).

State - These indicators report on the current state of some aspect of the fisheries sustainability system. They provide information on where the system stands at the moment it is observed. The observation of a time series of one indicator indicates trends in the state of the system.

Response - These indicators report on what action decision-makers and managers are taking in response to signals they receive on the state of the fisheries sustainability system or, very often, in response to pressures from stakeholders. If indicators suggest that the state of the system is satisfactory then no action may be required. These indicators form an important part of the feedback loop into the management system.

Basic sources of analysis were:

- EU Common Fisheries Policy (CFP)
- Green Paper on Future of the CFP
- Towards a Strategy to Protection and Conservation of the Marine Environment (EC)
- Proposed EEA Core Set of Fisheries and Aquaculture Indicators (EEA/EC)
- Biodiversity Action Plan for Fisheries (EC)
- Review and Gap Analysis of Environmental Indicators for Fisheries and Aquaculture (2003, IEEP)
- Tools for Measuring (integrating) Fisheries Policy aiming at a Sustainable Ecosystem (2002, EEA-EEC)
- Monitoring Changes in the Black Sea Ecosystem and Fisheries using indicators in support of management decision-making (J.F. Caddy et al.)

Specific needs for Black Sea indicators

• Each indicators addresses specific fisheries/aquaculture issues or ecosystem related issues/objectives.

• For indicator assessment available support data are needed.

• The support data are produced trough existing or under building informational system (e.g. fisheries statistics, fish stock assessment, multi-disciplinary research, ecosystem monitoring etc.)

• For reporting reason, the definition of indicators must be simple and their calculation should be easy.

• Where it is appropriate, a combination of standard indicators in order to create new complex indicators should be possible.

Fisheries sustainability indicators should be:

• Observable by stakeholders, either directly or by transparent process;
• Understandable;
• Acceptable by fishers and the public at large;
• Efficient and within economic resources for research on a sustained basis;
• Related to management and have associated reference values (limits, targets, precautionary etc) and responding management measures.

Conforming OECD criteria for indicators for environmental performance reviews (OECD 1993) an environmental indicator should:

• provide a representative picture of environmental conditions, pressures on the environment or society's responses;
• be simple, easy to interpret and able to show trends over time;
• be responsive to changes in the environment and related human activities;
• provide a basis for international comparisons;
• be either national in scope or applicable to regional environmental issues of national significance;
• have a threshold or reference value against which to compare it so that users are able to assess the significance of the values associated with it.
• be theoretically well founded in technical and scientific terms;

- be based on international standards and international consensus about its validity;
- readily available or made available at a reasonable cost/benefit ratio;
- adequately documented and of known quality;
- updated at regular intervals in accordance with reliable procedures.

INDICATORS SELECTED

Presssure

- environmental constrain factor
  - occurrence of algal blooms
  - extension of hypoxia areas
  - rate of biomass jelly fish
- rate of fishing effort
- rate of catches and discard level

Impact

- rate of species whose stocks are out of safety limits (species whose biomass / or catches are under decline in last 20 years)
- rate of changes in mean CPUE
- rate of changes in size structure of catches
- rate of by-catch (especially impact of fishing methods targeting small size fishes)
- rate of registered stranding dolphins
- changing rate of spatial extension of critical habitats
- rate of increasing sensitivity of habitats (by quality, biodiversity, etc.)
- biodiversity near mariculture farms compared with away from farms
- number of exotic species naturalized or which become commercially resources

State

- stock biomass of target species
- size of spawning stock biomass
- rate of biomass of living resources stocks whose exploitation is under regulation
- evolution of growth parameters
- mortality rate
- evolution of spawning intensity and stock recruitment
- evolution of population structure

Response

- integration of environmental changes in the fisheries management (fisheries management based on ecosystem approach)
- integration of fisheries management system policies and practices in ICZMI procedures
- number of stocks regulated through fishing quota (TAC)
- enforcement system for control of fishing effort, TACs, and restriction
- Fishery ban during spawning season
- Closed areas for fisher

Management regulations/TAC's and quotas Data gathering system

In order to achieve the indicators in conformity with EU practices, the existing data and the necessary activities for data obtaining at national / regional level will be emphasized.

NATIONAL LEVEL

Existing data
-environmental data
- annual catch and landing
- fishing effort
- CPUE for some species
- fishing mortality rates
- biomass estimate
- structure on size and age of catches
- percentage of mature fish
- population parameters
- structure on size and age of the stocks
- recruitment data
- trophic level of each species
- data on introduced species, some of them became resources
- management regulations/TAC's and quotas

Necessary data
- data and information that is not generally compiled or reported, such as information from fishers, communities and indigenous groups
- data on catches by small-scale fleets or illegal fishing, local consumption, or other forms of misreporting
- CPUE of all commercial species
- stock assessments for all target species
- more data from VMS
- echo-surveys and larvae and fingerlings investigation
- age readings, population dynamics of main exploited species
- data on trophic relationships

Activities
- identification of specific management objectives
- setting of indicators
- design of data gathering system based on national systems
- use of the existing data and programs of data collection and information.
- use existing information that is not generally compiled or reported, such as information from fishers, communities and indigenous groups.
- use of expert judgements
- monitoring of the extent of fished and unfished areas
- correct estimates by qualified scientists of the catches by small-scale fleets or illegal fishing, local consumption, or other forms of misreporting.
- training of the fisheries scientists;
- working in an equipped fisheries or marine science laboratory;
- regular biomass estimates;
- annual stock assessments for all target species
- collection of CPUE data for all commercial species
- regular fisheries surveys using standard vessels and procedures with trained observers/fisheries biologists on board;

- other biological information used to develop the indicators
- collect data from VMS center
- research on effects of dredging over the sea bed

BLACK SEA LEVEL

Necessary data
-Black Sea annual catch on species
-Black Sea fishing effort
-fishing mortality rates
-biomass of main commercial species
- biomass and abundance of migratory stocks
- recruitment patterns of local and migratory and highly migratory species
- data on population structure of demersal, migratory and highly migratory species
- updating the critical habitat status
- long-term dataset on climatic factors, marine environment
- data on scientific research for possibilities of establish TAC's

Activities
- selecting a framework;
- clarifying objectives and identifying criteria;
- identifying methodologies and models used in generating indicators and reference points (methodology sheets);
- refining the indicators and reference points;
- development of indicators specific for the Black Sea in order to monitor and assess the state of key resources/habitats;
- identifying data sources, including traditional knowledge;
- consider feasibility, data availability, cost and other factors determining the practicality of implementing the indicators;
- realization of a support data for indicator assessment through an informational system e.g. fisheries statistics, fish stock assessment, multi-disciplinary research, ecosystem monitoring etc.);
- clarifying the interpretation of the indicators and changes in them;
- Black Sea network creation
- international agreements on standards and data exchange
- determining a reporting format, including deciding which graphical representation to use to present the results;
- including all Black sea countries under data collection regulations rules
- coordination at regional level regarding the assessment of fish stocks and the environmental factors influencing them;
- stock assessment trainings;
- development of a Regional Black Sea Program and national programs on monitoring of state of aquatic living resources
- common investigations and surveys, training courses
- to take into consideration the information about critical areas during fish stock or aquatic communities lifetime;
- restrictions leading to measures for constrain critical habitats enlargement

- to undertake research and data collection in order to improve scientific and technical knowledge of fisheries including their interaction with the ecosystem;
- creation of system of immediate response of possible invaders
- incorporation of some variables of environment in scientific research
- to encourage regional cooperation in research and assessment of all marine living resources including compilation of regional fisheries statistics;
- introduction of regulative measures and appropriate funding to fulfill these activities

3.2.4 Work package 4 – Information data system for coastal and marine zones

Task 3.2.4.1 Conception and design of storing, retrieving, processing and modeling, extrapolating informational data system for the marine and coastal environment, in accordance with needs for harmonization to U.E. standards

Work package 4 related task has been elaborated by Lead Partner with some contribution of Project partner: 2 (IO-BAS / Bulgaria), and 7 (YUGNIRO / Ukraine).

An overview and synthesis of a coherent, strongly scientifically based output information flow/stream needed to support and sustain scientific activities, knowledge development and coastal zone improved management aims at a holistic approach of necessary or wish-able data and information to sustain directly or mediated the management of the coastal zone:

- historical analysis of the specific characteristic of the Romanian and Ukrainian (north-western Black Sea shelf) coastal zone variations,
- overview of up-to-date scientific achievements related to coastal zone management of different type zones,

and a synthesis of knowledge on information flow needed in modern and future coastal zone management.

These above mentioned issues are intended to provide the background for the main activity of this task.

The structure and functionality of the system in the expected data and problems-to-solve environment is the specific objective to be clarified and conceived.

<u>Database structure:</u>

- position (point, zone/surface)
    - date / interval
        - data type + parameter
            - metadata
                - data
            - synthesis (statistics, harmonics, main factor, krigging, homogeneity scale)

Input format interface:

- position (point, zone/surface/shape)
  - date / interval
    - data type + parameter
      - metadata
        - data
          - synthesis (statistics, harmonics, main factor, krigging, homogeneity scale)

Storage:

- (GIS layers)
- Database with GIS connectivity

Output

- specified listing
- GIS map form

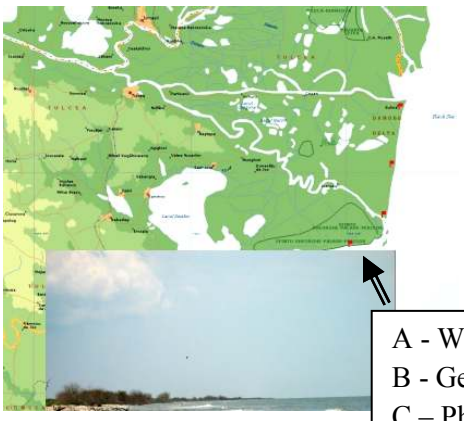
~~(.cdf forms)~~

Operating system / DBMS

- {Windows XP / ESRI 9.2}
- SuSE 10 / GRASS

Dissemination:

- {networked GIS server}
- Map on WEB page and context 'menu'



A - Weather
B - Geophysics
C – Physical-chem
D - Biology
E - Nutrients
F - Pollution

- FPK density
- FPK biomass
- ZPK density
- ZPK biomass
- **PPP**

Annual mean:
3.2 ± 1.1 mg/(m^3.day),
(1980-2003), 152 estimates,
Dataset RO12345

3.3. Conclusions

- Monitoring data are mainly used by the national and local authorities of all Black Sea states. They are also introduced in the data base of the Black Sea Commission and used for developing the five year's Reports on the State of Environment. States are using the monitoring data in their participation in internationally financed projects (European Commission, GEF, NATO, etc.).
- EU member states as well as the ones in the accession stage drafted their monitoring programs in accordance with the European Council directives regarding the marine environment (Water Framework Directive and Maritimre Strategy).
- More parameters need to be moved from optional to mandatory.
- Research capacity information on biodiversity has been evaluated and found to be satisfactory in the institutions involved within the present project.
- Results show that joint projects can be developed by these research institutions if they will prove to be more co-operative with each other.
- The biodiversity research should be more focused on marine habitats (inventory, classification, species composition and posible threats (in order to be able to set a coherent network of Marine Protected Areas at the Black Sea level.
- For the Black Sea, the assessment of fishery status will be carried out through a series of indicators used already by the international organizations for management of living resources. At the fishery level, indicators provide an operational tool in fisheries management, as a bridge between objectives and management action. They describe in simple terms the extent to which the objectives set for sustainable development are being achieved.
- Selection procedures of specific indicators for marine living resources took place in the frame of The Advisory Group on Environmental Aspect of Management of Fisheries and Other Marine Living Resources (AGFOMLR) taking into consideration the following elements:
    - keeping the parameters used traditionally in the Black Sea area for assuring the historical data seta;
    - introduction of new modern approaches for fisheries indicators recommended by specialised European institutions and EU strategies.
- The list of indicators contains about 20 basic proposals structured on four groups: pressure, impact, state and response.
- In order to achieve the indicators in conformity with EU practices, the exting data and the necessary activities for data obtaining at national / regional level was emphasized.
- The aim of the 4th Work package was to conceive the structure of a database dedicated to a "storing, retrieving, processing and modeling / extrapolating informational data system for the marine and coastal environment, based on knowledge management" but most of the Project partners showed a limited interest into it in spite of its potential value.
- As the concept of such informational system implies some hard and cooperative work, at highest given expertise, this goal was not achieved in this low financed pre-feasibility study.
- The completion of coherent sets of data / parameters / knowledge as well as the database, as they have been conceived, could be carried out within an enlarged more generous project.

- The pre-feasibility study has identified present scientific and organizational gaps in partner research institutions around the Black Sea.
- It obviously evinces and recommends the necessity of involvement of Turkey by its specialized institutions in the elaboration of further Black Sea related extended environmental R-D-T projects.

4. Economic and financial information

A. Estimates coast of the project

Only two partners (WEFRI / Georgia and OBIBSS / Ukraine) have sent activity plan and financial proposals for their commitments to extend present project at a larger scale. Therefore this information is insufficient for the pre-feasibility study in this respect. Anyway a follow up of this pre-feasibility has been achieved (cf. 5 C).

B. Analysis cost – benefit

Same as point A.

C. Finance source of the project.

The main finance source should be European funds.

5. Impact of the project

A) Economic

The project promotes the integration of environmenal considerations into all relevant policy areas and delivers the environmental pillar of the future marine strategy and maritime policy for the Black Sea states and especially their coastal zones.

B) Social

The social impact of the project consists of:
- increasing job opportunities for young scientists engaged in marine and coastal research and management;
- support to researchers to participate in conferences and to prepare other research proposals;
- promoting the mobility of researchers in the European Research Area;
- reinforcement of place and role of woman in science and research both as perspective of equal opportunities and gender relevance of the topics covered.

C) Research

At the suggestion of Project partner 5, Prof. R. Kosyan, a consultation with Dr. Eng. S. Nicolaev, Director General of Lead partner and Dr. A.S. Bologa, Scientific Director of NIMRD, for the further extension of BSEC Black Sea project as an EC FP7 application took place during Second Black Sea Conference (Sofia / Bulgaria), with Mr. P. Davis (EUROCONSULT / The Netherlands), Dr. P. Goriup (FIELDFARE / UK), Dr. E. Yakushev (NIVA / Norway), Dr. R. Lisovskyi (UKrSCES / Ukraine), Dr. V. Raykov (IFR / Varna / Bulgaria), Dr. A. Oldemir (CFRI / Turkey) and Miss A. Cakmakci (Turkey).

An extension of Work packages 2 and 3 of present BSEC Black Sea project, including the Caspian Sea, has been agreed as EC FP7 application to "Ecosystem – based management of living resources in closed European Seas (EcoManCES)", under the call "Sub-Activity 6.2.2. Management of marine environments, Area 6.2.2.1. Marine resources, ENV. 2009.2.2.1.1, Options for Ecosystem – based management", with participation of NIMRD / Romania, IFR / Bulgaria, Ministry of Agriculture and Forest, two universities, Belde Ltd. / Turkey, besides other partners.

So, as a follow up of present BSEC Black Sea project, the project "Integrated ecosystem approach to marine environmental management in the Black Sea and Caspian Sea (BLACKCASP – ECOMAMA)" summing up 35 partners from the Black Sea, Caspian Sea, other European maritime countries and international organizations, has been submitted, for the mentioned EC FP 7 call on January 2, 2009 (EPSS No. 243899).