INDICATORS FOR MONITORING GLOBAL ENVIRONMENTAL ISSUES INTEGRATION IN THE PROCESS OF REGIONAL DEVELOPMENT IN BULGARIA – GENERAL DESCRIPTION

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Sofia, March 2009

1. Introduction

2. General Description

The developed system of quantitative indicators, herewith presented, aims to access the progress achieved at global environmental issues integration which is being implemented through application of regional policy and strategic planning of regional and/or local development.

The indicators thus developed concern definite sub-national territorial units and characterise certain phenomenon or process; any change of indicators values is clearly and directly related to the three UN Conventions (Rio Conventions):

- UN Convention on Biological Diversity,
- UN Framework Convention on Climate Change,
- UN Convention to Combat Desertification.

This system of indicators intends to serve as a monitoring tool only and doesn't search neither to describe the existent problems nor to integrate the Rio Conventions in the analytical part of various strategic documents which are being elaborated in accordance with the Bulgarian legislation. That is why it includes only statistical indicators that could display dynamic alterations within short periods.

The system addresses sub-national territorial or administrative-territorial units in accordance with the Regional Development Act[1] (level 2 regions, districts, municipalities); that is why the selected indicators differ significantly from similar initiatives on national level. The explanation lies in the fact that most of the national environmental issues indicators are just inapplicable on regional level or the necessary output data could not be provided. Meanwhile the output data on environment are mostly discreet in nature (point sources) and their localisation (territorialisation) in order to achieve a continual scope which could characterize the entire territory of the administrative unit is too difficult a research task.

By reason of the facts abovementioned, an important part of the indicators proposed could be calculated only by using the analytical capacities of the Geographic Information Systems (GIS) on already existent spatially defined data for the country's territory.

The developed indicators are based whenever possible on official statistical information, namely on data provided by the Executive Environment Agency and the financial reporting statements provided by "Environment and Energy Statistics" Division at the National Statistical Institute (NSI).

3. Principles and Criteria for Creation

[1] In force since August 31, 2008 r. promulgated in State Gazette, No 50 from May 30, 2008.

During the process of system development, the emphasis has been put on the possibility for practical implementation of the identified different indicators and the opportunities for providing output data to use for calculating indicators from sources available in the country. For that reason as well as for clarity considerations, the indicators are supplemented by a list of variables, variables definitions and data sources which are necessary for the calculation of each indicator.

With regard to the clarity we look for, the elaborated indicators are divided into four groups (domains) according to the type of environmental problems they address. [2].

Number of indicators according to the thematic domain

The indicators within the system developed have been divided according to:

- The level at the administrative-territorial division of the country for which they are appropriate and provision of output data for their calculation; so far levels could be:
  - Regional (level 2 regions and districts, NUTS2 and NUTS3), and
  - Local (municipalities, LAU1)
- The significance as regards the monitoring of environmental problems integration ; they could be:
  - Key
  - Standard

The indicators have been selected on the basis of the following set of interrelated and inter-supplementing criteria:

- Relation to the three Rio Conventions
- Relation to other systems of indicators

Those indicators which are related to more than one of the Rio Conventions have been defined as common.

- Relation to national strategies and priorities
- Logical justification (understandability, clarity, unambiguousness, complexity, measurability, sustainability in time and space, relation to policy implemented, etc.)
- Data availability in the country
- Technological security/Availability of necessary technology

4. System of Indicators

In order to guarantee the indicators easy application in practice, the following lists have been prepared; they include:

- Variables, necessary for calculating different indicators, along with data sources, units of measurement, definitions, regularity of output data collection and the level for which they could be calculated. (Annex 1)
- A detailed list of indicators, methods for their calculation, which institution has proposed the respective indicator, the regularity and frequency of data collection, etc. (Table 1).
- Key indicators only drawn out for the purpose of more clarity and visibility (Table 2).

Table 1. INDICATORS OF MONITORING AND INTEGRATION OF GLOBAL ENVIRONMENTAL PROBLEMS IN THE REGIONAL DEVELOPMENT PROCESS IN BULGARIA

Code[3]	Domain	Indicator	Priority	Unit of measurement	Territorial level*	The indicator has been developed by:	Data source:	Frequency of updating
BDV01	Biological diversity	Relative share of the territory included in the ecological framework NATURA 2000 under the Habitats Directive	standard	%	regional, local	European Spatial Observation Network (ESPON)	Executive Environmental Agency	5 years
BDV02	Biological diversity	Relative share of the territory included in the ecological framework NATURA 2000 under the Birds Directive	standard	%	regional, local	European Spatial Observation Network (ESPON)	Executive Environmental Agency	5 years
BDV03	Biological diversity	Relative share of protected territories	standard	%	regional, local	Eurostat Urban Audit Indicators	Executive Environmental Agency	5 years
BDV04	Biological diversity	Relative share of urban territories	standard	%	regional, local	Eurostat Urban Audit Indicators	Executive Environmental Agency	yearly
BDV05	Biological diversity	Relative share of the antropogenically loaded territories (infrastructure, towns and villages, industrial enterprises)	key	%	regional, local	Eurostat Urban Audit Indicators	Executive Environmental Agency	10 years
BDV06	Biological diversity	Relative share of forests	standard	%	regional, local	Eurostat Urban Audit Indicators	Executive Environmental Agency	yearly
BDV07	Biological diversity	Relative share of agricultural/farm land	standard	%	regional, local	Eurostat Urban Audit Indicators	Executive Environmental Agency	yearly
BDV08	Biological diversity	Change in the values of the Normalized Difference Vegetation Index (NDVI)[4]	standard	%	regional, local	Ecological Assessment of the United States Mid-Atlantic Region	Expert assessment in GIS environment	10 years

[3], The codes have been developed within the framework of the current paper in order to achieve better clarity. They could be used as names for attributive fields of vector spatial objects, organized into a specialized spatial data base for work into GIS environment.

Code[3]	Domain	Indicator	Priority	Unit of measurement	Territorial level*	The indicator has been developed by:	Data source:	Frequency of updating
BDV09	Biological diversity	Correlation between forests, agricultural land and urban territories	key	%	regional	Eurostat Urban Audit Indicators	Expert assessment in GIS environment	10 years
CLM01	Climate changes	Growth rate of the emissions of sulfur oxides (SO) in the atmosphere	standard	%	regional, local	Eurostat Sustainable Development Indicators	"Environment and Energy Statistics" Division, NSI	yearly
CLM02	Climate changes	Growth rate of the emissions of nitrogen dioxide (NO_2) in the atmosphere	standard	%	regional, local	Eurostat Sustainable Development Indicators	"Environment and Energy Statistics" Division, NSI	yearly
CLM03	Climate changes	Growth rate of the emissions of non-methane volatile organic compounds (NVOC) in the atmosphere	standard	%	regional, local	Eurostat Sustainable Development Indicators	"Environment and Energy Statistics" Division, NSI	yearly
CLM04	Climate changes	Growth rate of the emissions of methane ($CH_{4)}$ in the atmosphere	standard	%	regional, local	Eurostat Sustainable Development Indicators	"Environment and Energy Statistics" Division, NSI	yearly
CLM05	Climate changes	Growth rate of the emissions of carbon monoxide (CO) in the atmosphere	standard	%	regional, local	Eurostat Sustainable Development Indicators	"Environment and Energy Statistics" Division, NSI	yearly
CLM06	Climate changes	Growth rate of the emissions of carbon dioxide (CO_2) in the atmosphere	standard	%	regional, local	Eurostat Sustainable Development Indicators	Environment and Energy Statistics" Division, NSI	yearly
CLM07	Climate changes	Growth rate of the emissions of nitrous oxide (N_2O) in the atmosphere	standard	%	regional, local	Eurostat Sustainable Development Indicators	""Environment and Energy Statistics" Division, NSI	yearly
CLM08	Climate changes	Growth rate of the emissions of ammonia (NH_3) in the atmosphere	standard	%	regional, local	Eurostat Sustainable Development Indicators	"Environment and Energy Statistics" Division, NSI	yearly
CLM09	Climate changes	Greenhouse gas emissions (equated to CO_2) per capita	key	tons/per capita	regional, local	Eurostat Sustainable Development Indicators	"Environment and Energy Statistics" Division, NSI	yearly

[4] **NDVI** (Normalized Difference Vegetation Index)

Code[3]	Domain	Indicator	Priority	Unit of measurement	Territorial level*	The indicator has been developed by:	Data source:	Frequency of updating
CMN01	Common	Growth rate of expenditures on acquiring environment protection aimed fixed assets	standard	%	regional	Eurostat	"Environment and Energy Statistics" Division, NSI	yearly
CMN02	Common	Value of the environment protection aimed fixed assets in use	standard	%	regional, local	Eurostat	"Environment and Energy Statistics" Division, NSI	yearly
CMN03	Common	Amount of the fines imposed in implementation of any environment-protection related legislative acts	standard	thousand BGN.	regional	Eurostat	"Environment and Energy Statistics" Division, NSI	yearly
CMN04	Common	Relative share of fines imposed in implementation to any environment-protection related legislative acts from the total amount of fines imposed	standard	%	regionalo	Eurostat	"Environment and Energy Statistics" Division, NSI	yearly
CMN05	Common	Number of checks performed on business entities for environment-related offences	standard	number	regional	European Environmental agency (EEA)	Executive Environmental Agency	yearly
CMN06	Common	Number of sanctions (penalties) imposed as a result of checks performed	standard	number	regional, local	European Environmental agency (EEA)	Executive Environmental Agency	yearly
CMN07	Common	Number of eliminated unregulated landfills	standard	number	regional	Eurostat	"Environment and Energy Statistics" Division, NSI Executive Environmental Agency	yearly
CMN08	Common	Amount of treated waste (household and other)	standard	tons	regional	Eurostat	"Environment and Energy Statistics" Division, NSI	yearly
CMN09	Common	Amount of deposited waste according to origin (household and other)	standard	tons	regional	Eurostat	Executive Environmental Agency	yearly

Code[3]	Domain	Indicator	Priority	Unit of measurement	Territorial level*	The indicator has been developed by:	Data source:	Frequency of updating
CMN11	Common	Share of people benefiting by systems for organised waste collection	standard	%	regional	Eurostat	"Environment and Energy Statistics" Division, NSI Executive Environmental Agency	yearly
CMN12	Common	Amount of generated household waste per capita	standard	kg /per capita.	regional	Eurostat	"Environment and Energy Statistics" Division, NSI Executive Environmental Agency	yearly
CMN13	Common		standard	number/km^2	regional, local	European Spatial Observation Network (ESPON)		yearly
CMN14	Common	Technogeneous risks density	standard	number/km^2	regional. localo	European Spatial Observation Network (ESPON)	Expert assessment in GIS environment	yearly
CMN15	Common	Total revenues of taxes and fees and expenditures on household waste	standard	million BGN	regional	Eurostat	List of standard statistical indicators, NSI "Environment and Energy Statistics" Division, NSI	yearly
CMN16	Common	Quantity of water abstracted	standard	thousand m^3/per year	regional	Eurostat	"Environment and Energy Statistics" Division, NSI	yearly
CMN17	Common	Quantity of discharged waste waters	standard	thousand m^3/per year	regional	Eurostat	"Environment and Energy Statistics" Division, NSI	yearly

Code[3]	Domain	Indicator	Priority	Unit of measurement	Territorial level*	The indicator has been developed by:	Data source:	Frequency of updating
CMN18	Common	Correlation between afforested and deforested territories (both natural and technogeneous origin)	standard	%	regional, local	European Spatial Observation Network (ESPON)	Environment Executive Agency	10 years
CMN19	Common	Relative share of the territories with altered purpose	standard	%	regional, local	European Spatial Observation Network (ESPON)	Environment Executive Agency	yearly
CMN20	Common	Share of the territory out of 5km buffer –zone of the existent roads	standard	%	regional, local	Statistics Norway, Indicators for sustainable development	Expert assessment in GIS environment	10 years
CMN21	Common	Expenditures on environment protection aimed fixed assets	key	million BGN	regional	Eurostat	"Environment and Energy Statistics" Division, NSI	yearly
CMN22	Common	Expenditures on environment protection aimed fixed assets per capita	key	BGN/per capita	regional	Eurostat	"Environment and Energy Statistics" Division, NSI	yearly
CMN23	Common	Expenditures on energy efficiency and renewable energy sources	key	million BGN	regional	Energy Efficiency Agency	Energy Efficiency Agency	one year
DST01	Desertification	Relative share of the territory where high risk of erosion exists	key	%	regional, local	European Spatial Observation Network (ESPON)	Environment Executive Agency	10 years
DST02	Desertification	Relative share of the arable land where anti-erosion measures are being taken	standard	%	regional, local	European Spatial Observation Network (ESPON)	Environment Executive Agency	10 years
DST03	Desertification	Relative share of the forestry where anti-erosion measures are being taken	standard	%	regional, local	European Spatial Observation Network (ESPON)	Environment Executive Agency	10 years
DST04	Desertification	Ecological vulnerability	standard	%	regional, local,	Ecological Assessment of the United States Mid-Atlantic Region	Expert assessment in GIS environment	10 years

Code[3]	Domain	Indicator	Priority	Unit of measurement	Territorial level*	The indicator has been developed by:	Data source:	Frequency of updating
DST05	Desertification	Relative share of the arable land with a gradient (slope)of more than 3 degrees	standard	%	regional, local	Ecological Assessment of the United States Mid-Atlantic Region	Environment Executive Agency	yearly
DST06	Desertification	Relative share of the acidic soil areas	standard	%	regional, local	European Spatial Observation Network (ESPON)	Expert assessment in GIS environment	10 years
DST07	Desertification	Relative share of the saline soil areas	standard	%	regional, local	European Spatial Observation Network (ESPON)	Expert assessment in GIS environment	10 years
DST08	Desertification	Relative share of the areas affected by water erosion	standard	%	regional, local	European Spatial Observation Network (ESPON)	Environment Executive Agency	10 years
DST09	Desertification	Relative share of the territory with high risk of deflation	standard	%	regional, local	European Spatial Observation Network (ESPON)	Expert assessment in GIS environment	10 years
DST10	Desertification	Relative share of the territory affected by landslides processes	standard	%	regional, local	European Spatial Observation Network (ESPON)	Environment Executive Agency	10 years
DST11	Desertification	Density/Impenetrability of landslides	standard	number/km^2	regional, local	European Spatial Observation Network (ESPON)	Expert assessment in GIS environment	10 years

*The regional level includes level 2 regions (NUTS2) and districts (NUTS3); the local level includes the municipalities (LAU1).

Table 2. Brief list of key (strategic) indicators for monitoring of global environmental issues integration in the process of regional development in Bulgaria*

№	Indicator	Code and Domain
1.	Relative share of territories subject to anthropogenic impact (infrastructure, residential areas, industrial sites)	BDV05, Biodiversity
2.	Share between forest, agricultural and urbanized territories	BDV09, Biodiversity
3.	Green house gasses emissions (in CO2 equivalent) per capita	CLM09, Climate change
4.	Expenditures for long-term assets with ecological purpose	CMN21, General
5.	Expenditures for long-term assets with ecological purpose per capita	CMN22, General
6.	Share of territories subject to a high erosion risk	DST01, Desertification
7.	Expenditures for energy effectiveness and renewable energy sources	CMN23, General

*Characteristics of the output data necessary for indicators calculation are presented in Annex 1.

5. Strategic indicators profile

A. Indicator

- **Name:**

  A relative share of the anthropogenically loaded territories (infrastructure, towns and villages, industrial enterprises)

- **Reasons for proposal:**

  The shrinking of habitats as a result of human activity is one of the main causes for biological diversity reduction. For that reason the increase or decrease of the surface of anthropogenically loaded areas could serve as an indirect measurement to the state of biodiversity.

  One negative process which is typical for the entire territory of the country exerts significant and easily seen influence on the biological diversity; that is the process of overbuilding and territory deprivation as a result of the intense construction activity.

- **Unit of measurement:** % (of the area of the respective territorial unit)

- **Territorial level:** Regional, local

B. General description

- **Relation to the Rio Conventions:**

  The anthropogenic influence on the territory has been addressed in the UN Convention on Biological Diversity and is without any doubt the main reason for loss of biological diversity.

- **Relation to other systems of indicators:**

  The indicator is been used in all countries where data coverage provided by CORINE Land Cover project is available.

  The proposed indicator has been approved for use in the statistical practice of EUROSTAT and makes part of the standard statistical indicators in the pan-European project Urban Audit. [5]

- **Relation to national strategies and priorities**

- **Data availability in the country:**

  The output data for calculation of the indicator for municipalities, districts and level 2 regions in the country are available through the CORINE Land Cover project 1990, 2000, and 2006. The project was implemented by the Executive Environmental Agency

- **Availability of the necessary technology**

[5] See also. www.urbanaudit.org/

The available data in the country shall be provided to the users by Executive Environment Agency/European Environment Agency after the former have made a proper request in digital format appropriate for work in GIS environment.[6].

[6]More information available at. www.eea.europa.eu/publications/COR0-landcover/

A. Indicator

- **Name:**

  Correlation between forests, agricultural land and urban territories

- **Reason for proposal:**

  The processes of taking land away and afforestation in the same time act in opposite directions; they exert an explicit influence on biological diversity. Any change in that correlation is indirectly related to preserving environment, respectively biological diversity.

- **Unit of measurement:** % of the entire territory

- **Territorial level:** regional, local

B. General description

- **Relation to the Rio Conventions:**

- **Relation to other systems of indicators:**

  The indicator is been used in all countries where data coverage provided by CORINE Land Cover project is available.

- **Relation to national strategies and priorities:**

  Goal 2010 – To stop biological diversity decrease

- **Data availability in the country:**

  The output data for calculation of the indicator for municipalities, districts and level 2 regions in the country are available through the CORINE Land Cover project 1990, 2000, and 2006. The project was implemented by the Executive Environmental Agency

- **Availability of the necessary technology**

  The available data in the country shall be provided to the users by Executive Environment Agency/European Environment Agency after the former have made a proper request in digital format appropriate for work in GIS environment.[7].

[7]More information available at. www.eea.europa.eu/publications/COR0-landcover/

A. Indicator

- **Name:**

  Greenhouse gas emissions (equated to CO_2) per capita

- **Reasons for proposal:**

  Greenhouse gases are at the root of the anthropogenic influence on climate changes. The carbon dioxide is the product of burning fossil fuels as well as a result of some natural processes and makes up 40 % of all greenhouse gases; that is why all the others gases emissions are equated to it. Calculation of the amount of greenhouse gases per capita in the respective territorial unit allows showing any interregional differences and thus carrying out comparative analysis.

- **Unit of measurement:** ton/per capita/per year

- **Territorial level:** regional, local

B. General description

- **Relation to the Rio Conventions:**

  Greenhouse gases emissions are clearly identified as a main problem which is addressed in the UN Framework Convention on Climate Change.

- **Relation to other systems of indicators:**

  The indicator is directly related to UN Framework Convention on Climate Change and its Kyoto Protocol which is ratified by Republic of Bulgaria.

  It also makes part of the EU system of Indicators for monitoring the EU Sustainable Development Strategy.

  The proposed indicator is widely known and used in both Bulgaria and the other EU countries. It is recognized as a key indicator for sustainable development in EU and data about it are been systematically organized and disseminated by EUROSTAT. [8].

- **Relation to national strategies and priorities:**

  - Bulgarian National Sustainable Development Strategy
  - EU Sustainable Development Strategy
  - Kyoto Protocol

- **Data availability in the country:**

  The output data for calculation of the indicator as regards municipalities, districts and level 2 regions in the country are available from the NSI and cover relatively long period.

[8] More information available at:
http://epp.eurostat.ec.europa.eu/pls/portal/url/page/PGP_DS_SUSTDEVIND/PGE_DS_SUSTDEVIND_01

A. Indicator

- **Name:**

  Expenditures on environment protection aimed fixed assets

- **Reason for proposal:**

  The amount of expenditures on environment protection aimed fixed assets plays a significant role for environmental protection.

  The output data for calculating the indicator for the districts and level 2 regions in the country are available at the NSI on the basis of statistical reporting provided by business entities.

  For adequate interpretation of this indicator detailed knowledge on the specific territory and the situation of business entities is essential so that any misinterpretation be avoided.

- **Unit of measurement:** million BGN per year

- **Territorial level:** regional

B. General description:

- **Relation to the Rio Conventions**

  In total expenditures on environmental protection and recovery are directly related to all problems addressed in the Rio Conventions.

- **Relation to other systems of indicators:**

  The indicator is in use in all EU countries (EU 27); however, it is difficult to perform comparisons because of different methodologies for collecting information, different currencies, purchasing power parity, etc. [9]

- **Relation to national strategies and priorities:**

  - National Regional Development Strategy of Republic of Bulgaria (2005-2015)
  - Encouragement of Investment Strategy of Republic of Bulgaria
  - Directive 2006/32/EC of April 5, 2006 of the European Parliament and the Council on energy end-use efficiency and energy services
  - Directive 2002/91/EC of December 16, 2002 of the European Parliament and the Council on the energy performance of buildings
  - National Long-Term Programme for Usage Encouragement of Renewable Energy Sources 2005-2015
  - Energy Strategy of Republic of Bulgaria

- **Data availability in the country:**

  The indicators of expenditures on environmental protection aimed fixed assets are included in the National Programme for statistical research; output

[9] Using a purchasing power parity (PPP) is a standard procedure in statistical practice; it allows comparison of financial values between states in which different currencies are in circulation. More information is available at: http://en.wikipedia.org/wiki/Purchasing_power_parity

data which form long dynamic row and allow comparison between and among different years' values are available by "Environment and Energy Statistics" Division, NSI.

A. Indicator

- **Name:**

  Expenditures on environment protection aimed fixed assets per capita

- **Reasons for proposal:**

The information on expenditures on environment protection aimed fixed assets per capita will allow comparison between different units on the same level in the country's administrative-territorial division.

The output data necessary for calculating the indicator 's values as regards districts and level 2 regions in the country are available by the National Statistical Institute.

- **Unit of measurement:** thousand BGN/per capita/per year
- **Territorial level:** regional

B. General Description:

- **Relation to the Rio Conventions:**

  In total expenditures for environmental protection and recovery are directly related to all problems addressed in the Rio Conventions.

- **Relation to other systems of indicators:**

  The indicator is in use in all EU countries (EU 27); however, comparison is difficult to make because of different methodologies for collecting information, different currencies, purchasing power parity, etc.

- **Relation to national strategies and priorities:**

  - National Regional Development Strategy of Republic of Bulgaria (2005-2015)
  - Encouragement of Investment Strategy of Republic of Bulgaria
  - Directive 2006/32/EC of April 5, 2006 of the European Parliament and the Council on energy end-use efficiency and energy services
  - Directive 2002/91/EC of December 16, 2002 of the European Parliament and the Council on the energy performance of buildings
  - National Long-Term Programme for Usage Encouragement of Renewable Energy Sources 2005-2015
  - Energy Strategy of Republic of Bulgaria

- **Data availability in the country:**

  The indicators of expenditures for environmental protection and the average number of population per year are included in the National Programme for statistical research; output data which form long dynamic row and allow comparison between and among different years' and units of territory values are available at the NSI "Environment and Energy Statistics" Division and "Demographic statistics" Division at NSI.

A. Indicator

- **Name:**

  Share of the area of the territorial unit where high erosion risk exists

- **Reasons for proposal:**

  Erosion activity is one of the most unfavourable issues related to intensive agriculture and deforestation; it is being addressed in a large number of international, national and sub-national legislative and strategic documents.

- **Unit of measurement: %**

- **Territorial level:** regional, local

B. General description:

- **Relation to the Rio Conventions:**

  Erosion activity is the main cause for loss of soil and that is why it is one of the important problems addressed in the UN Convention to Combat Desertification.

- **Relation to other systems of indicators:**

  - Farm Accountancy Data Network
  - Bulgarian Survey on Agricultural and Economic Activities Observation
  - National System for Environmental Monitoring at the Executive Environment Agency, "Land and soil" Subsystem

- **Relation to national strategies and priorities:**

  - Thematic Strategy for Soil Protection (2006/2293(INI))
  - The UN Convention on Biological Diversity
  - The UN Convention to Combat Desertification
  - National Regional Development Strategy of Republic of Bulgaria (2005-2015

- **Data availability in the country:**

  Data on the risk of water erosion could be obtained from the Executive Environment Agency and the "Agrarian Statistics" Directorate at the Ministry of Agriculture and Food.

A. Indicator

- **Name:**

Expenditures on energy efficiency and renewable energy sources (RES)

- **Reasons for proposal:**

Minimising the electric power losses and ensuring environmental friendly electric power produced by RES contributes directly to decrease in using fossil fuels and fuel processes for energy production and thus favours decrease of the human activities influence on climate changes.

- **Unit of measurement:** million BGN/per year
- **Territorial level:** regional

B. General description

- **Relation to the Rio Conventions:**

  Raising energy efficiency and the relative share of RES in energy production is directly related to the observations contained in UN Framework Convention on Climate Change.

- **Relation to other systems of indicators:**

  The indicator makes part of the system of Indicators for monitoring the EU Sustainable Development Strategy.

- **Relation to national strategies and priorities:**
  - National Regional Development Strategy of Republic of Bulgaria (2005-2015)
  - Encouragement of Investment Strategy of Republic of Bulgaria
  - Directive 2006/32/EC of April 5, 2006 of the European Parliament and the Council on energy end-use efficiency and energy services
  - Directive 2002/91/EC of December 16, 2002 of the European Parliament and the Council on the energy performance of buildings
  - National Long-Term Programme for Usage Encouragement of Renewable Energy Sources 2005-2015
  - Energy Strategy of Republic of Bulgaria
- **Data availability in the country:**
  - "Environment and Energy Statistics" Division at NSI, Energy Efficiency Agency

6. Plan and methodology for testing the indicators

Testing the monitoring indicators should be considered as cyclic process; the output data for calculation of the indicators should remain stable during the entire cycle as well as concern spatially well-established territorial units. The following steps (in that very order) should be implemented in practice to test the indicators for monitoring the environment-related problems integration:

1) **Obtaining from the relevant official sources the necessary output data for calculation of the indicators**– work with official output quantity data will guarantee high quality and reliable results**.** Whenever possible, official data shall be used; it is recommended to obtain data from the National Statistical Institute and/or Executive Environment Agency as both institutions accumulate enormous amount of output data with the highest quality possible.

2) **Compliance with definitions and methodological features**

It is essential to consider the specific methodological features related to technology and particularities of the respective data before start to calculate the indicators values. Practical work shall be performed in close cooperation with experts from the institutions which collect, verify and provide the respective data.

3) **Calculation of indicators**

After that comes the process of actual calculation of the indicators for the respective period at strict compliance with calculation principles, in conformity with nature of the output data as well as with the scale of measuring, etc.

4) **Logical control**

The next step is the implementation of logical control aimed to guarantee high quality of data and to avoid errors at making up the indicator through comparing "neighbour" values, data collation and comparing with common rows, etc.

5) **Interpretation**

The final stage is the analysis of values and explication of the factors influencing their alterations, maintenance of the links with the implemented policies on national and regional levels, etc.

7. Conclusion

The essential prerequisite for successful implementation and use of the system we developed is the will and determination on behalf of the interested state authorities for institutionalization of the indicators of the system. With relation to that, it would be an appropriate decision that those indicators be included in the respective secondary/delegated/ legislation and any other documents concerning the process of strategic planning of the regional and local development; in particular, in the Methodological Instructions on strategies and plans development, which are prepared by the Ministry of Regional Development and Public Works.

However, the last suggestion could only be implemented in case that the indicators are being calculated on the basis of properly collected, processed and verified output information. We consider that an easily achievable task due to the fact that the list we prepared includes such indicators that could easily be provided with output information through sources which are available in Republic of Bulgaria.

That is why collecting information on the different indicators and presenting it to the users in comprehensible and user-friendly format on behalf of "The Rio Conventions" project would be of great significance for taking into consideration the environmental problems within strategic planning of the regional and local development.

Annex 1. LIST OF OUTPUT DATA (VARIABLES) NECESSARY FOR CALCULATION of THE INDICATORS FOR MONITORING AND ASSESSMENT OF THE INTEGRATION OF RIO CONVENTIONS

Code	Variable	Definition	Unit of measurement	Territorial level*
VAR01	Emissions of sulfur oxides (SO) in the atmosphere	Data from "Environment and Energy" Division, NSI	tons	regional, local
VAR02	Emissions of nitrogen oxides (NO) in the atmosphere	Data from "Environment and Energy" Division, NSI	tons	regional, local
VAR03	Emissions of non-methane volatile organic compounds (NVOC) in the atmosphere	Data from "Environment and Energy" Division, NSI	tons	regional, local
VAR04	Emissions of methane (CH_4) in the atmosphere	Data from "Environment and Energy" Division, NSI	tons	regional, local
VAR05	Emissions of carbon oxide (CO) in the atmosphere	Data from "Environment and Energy" Division, NSI	tons	regional, local
VAR06	Emissions of carbon dioxide (CO_2) in the atmosphere	Data from "Environment and Energy" Division, NSI	tons	regional, local
VAR07	Emissions of nitrous oxide (N_2O) in the atmosphere	Data from "Environment and Energy" Division, NSI	tons	regional, local
VAR08	Emissions of ammonia (NH_3) in the atmosphere	Data from "Environment and Energy" Division, NSI	tons	regional, local

Code	Variable	Definition	Unit of measurement	Territorial level*
VAR09	Yearly average number of population	Arithmetic mean of the number of population at the end of the year precedent and the year in review.	number	regional, local
VAR10	Surface of the territorial unit	Current area size (sum of lands belonging to respective towns/villages) by the respective date obtained by the Cadastre Agency or GIS database.	sq.m.	regional, local
VAR11	Areas included in the NATURA 2000 Network under the Habitats Directive	GIS- based assessment of the area for each territorial unit within areas included in NATURA 2000 on the basis of Directive 94/43 EEC and the Biological Diversity Act from 2002.	sq. m.	regional, local
VAR12	Areas included within the NATURA 2000 Network under the Birds Directive	GIS- based assessment of the area for each territorial unit within areas included in NATURA 2000 on the basis of Directive 94/43 EEC and the Biological Diversity Act from 2002.	sq. m.	regional, local
VAR13	Area of protected territories	Area situated within the respective territorial unit and benefiting from the "protected area" status in accordance to the Protected Areas Act and generated by GIS database. .	sq. m.	regional, local

Code	Variable	Definition	Unit of measurement	Territorial level*
VAR14	Area of urban territories	The area of urban territories shall be defined in GIS environment on the basis of the data from CORINE Land Cover project for 1990 and 2000 respectively in accordance with the generally accepted classes of land cover.	sq. m.	regional, local
VAR15	Area of forests	The area of forests shall be defined in GIS environment on the basis of the data from CORINE Land Cover project for 1990 and 2000 respectively in accordance with the generally accepted classes of land cover.	sq. m.	regional, local
VAR16	Area of agricultural/farm land	The area of the agricultural/farm land shall be defined in GIS environment on the basis of the data from CORINE Land Cover project for 1990 and 2000 respectively in accordance with the generally accepted classes of land cover	sq. m.	regional, local
VAR17	Expenditures on environment protection and recovery	Data from “Environment and Energy” Division, NSI	thousand BGN	regional
VAR18	Expenditures on acquiring environment protection aimed fixed assets	Total amount of the expenditures on acquiring environment protection aimed fixed assets	thousand BGN	regional

Code	Variable	Definition	Unit of measurement	Territorial level*
VAR19	Expenditures on maintenance of environment protection aimed fixed assets and for performance of environment related events	Total amount of the expenditures on maintenance of environmental-protection aimed fixed assets	thousand BGN	regional
VAR20	Availability of environment protection aimed fixed assets by the end of the year	Respective fixed assets available by the end of the period/calendar year .	thousand BGN	regional
VAR21	Amount of the imposed fines and penalties in implementation of legislative acts related to environment protection	Amount of the imposed fines and penalties within the investigated territorial unit Output data from the annual statistics of the "Environment and Energy Statistics" Division, NSI.	thousand BGN	regional
VAR22	Amount of generated household waste	Amount of generated household waste within the investigated territory Data source: NSI	tons	regional
VAR23	Amount of the treated waste	Amount of the treated waste (household and other) within the investigated territory. Data source: NSI	tons	regional
VAR24	Disposed/Deposited waste (household and other)	Amount of the treated waste (household and other) within the investigated territory. Data source: NSI	tons	regional
VAR25	Total revenues of taxes and fees and expenditures on	Revenues in million BGN according to the data provided by municipal	million BGN	regional

Code	Variable	Definition	Unit of measurement	Territorial level*
	household waste	administrations and National Revenues Agency		
VAR26	Areas of the high erosion risk territories	Results from GIS based analysis on the base of Universal Soil Loss Equation (USLE) and Revised Universal Soil Loss Equation (RUSLE).	sq. m	regional, local
VAR27	Area of the agricultural land territories where anti-erosion measures have been implemented	Output data from GIS database .	sq.m.	regional, local
VAR28	Slopes gradient	Spatial data in GIS environment for calculation of indicators concerning desertification .	degrees	regional, local
VAR29	NDVI index for the investigated territory	Values of the vegetation index NDVI, on the basis of data received through resource satellite such as Landsat.	index (0 -1)	regional, local
VAR30	Surface of homogenous territories	Surface calculated through GIS based analysis of the degree of homogeneity.	sq.m	regional, local
VAR31	Areas of the fragmented territories	Surface calculated through GIS based analysis of the degree of homogeneity.	sq.m.	regional, local
VAR32	Roads and highways network	Spatial data in GIS environment for calculation of buffer with 5 km padding (CMN20)		regional, local
VAR33	Areas of the territories affected by water erosion	Data from the National System for Soil Monitoring	hectares	regional, local

Code	Variable	Definition	Unit of measurement	Territorial level*
VAR34	Areas where high risk of deflation (wind erosion) exists	Data from the National System for Soil Monitoring	hectares	regional, local
VAR35	Areas affected by landslide processes	Data from the National System for Soil Monitoring	hectares	regional, local
VAR36	Number of landslides	Data from the National System for Soil Monitoring	number	regional, local

* The regional level includes level 2 regions (NUTS2) and districts (NUTS3);the local level includes municipalities (LAU1).