

## STANDARD OF LIVING, ENERGY CONSUMPTION AND ENVIRONMENT IN BULGARIA

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## STANDART OF LIVING, ENERGY CONSUMPTION AND ENVIRONMENT IN BULGARIA

- The countries from Eastern Europe – change of the attitude society – environment in the transition period;
- Bulgaria – assessment of the complex efficiency;
- Energy consumption and pollution of the environment.

Three main points are discussed

### The countries from Eastern Europe – change of the attitude society – environment in the transition period.

- Classification of the countries in Europe according to their complex efficiency ( territory, population, GDP, pollution of the air).

### Method for estimating of the complex efficiency

- There are n numbers of factors about spatial objects, such as demographical and ecological density.

$$F = \frac{\sum \alpha_i E_i}{\sum \alpha_i}$$

Where  $E_1, \dots, E_n$  are factors and  $\alpha_i$  are % share.

### Method for estimating of the complex efficiency

- Two indexes:
  1. Relative share of given country in respect to four principal indexes of the Europe:
    - Territory - A
    - Population - B
    - Gross domestic product - C
    - Emissions in the air - D

The territory is constant, so it is important to know, what has happened on it.

### Method for estimating of the complex efficiency

2. Conditional coefficients of density in relation to the territory of the given country (A) :
  - demographical density -  $E=B/A$
  - economical density -  $F=C/A$
  - ecological density -  $G=D/A$

This method allows harmonizing of the results, independently of the considerable differences in the demographical, economic and ecological parameters.

## Method for estimating of the complex efficiency

### ■ Social Economic coefficient

$$H = F - (E + G) / 2,$$

Where:

F – economical density;

E – demographical density;

G – ecological density.

The social economic coefficient is used for arranging the countries within a given group.

## Method for estimating of the complex efficiency

| Country         | Relative share from the Europe |            |       |                      | Conditional coefficients of density |            |            | Social ecological coefficient |
|-----------------|--------------------------------|------------|-------|----------------------|-------------------------------------|------------|------------|-------------------------------|
|                 | Tertiary                       | Population | GDP   | Emissions in the air | Demographical                       | Economical | Ecological |                               |
|                 | A                              | B          | C     | D                    | E=B/A                               | F=C/A      | G=D/A      | H=F-(E+D)/2                   |
| <b>I type</b>   | <b>V</b>                       |            |       |                      |                                     |            |            |                               |
| Bulgaria        | 1.83                           | 1.39       | 0.47  | 4.81                 | 0.76                                | 0.26       | 2.63       | -1.44                         |
| <b>II type</b>  | <b>\</b>                       |            |       |                      |                                     |            |            |                               |
| Armenia         | 0.49                           | 0.64       | 0.10  | 0.02                 | 1.31                                | 0.21       | 0.04       | -0.47                         |
| <b>III type</b> | <b>/</b>                       |            |       |                      |                                     |            |            |                               |
| Spanish         | 8.32                           | 6.60       | 7.11  | 8.91                 | 0.79                                | 0.85       | 1.07       | -0.08                         |
| <b>IV type</b>  | <b>Λ</b>                       |            |       |                      |                                     |            |            |                               |
| Germany         | 5.89                           | 13.73      | 19.13 | 9.35                 | 1.99                                | 3.25       | 1.59       | 1.46                          |

The European countries are grouped in four groups according different proportion between the coefficients of density.

## I<sup>st</sup> type countries – inefficient development - symbol V



|           | E=B/A | F=C/A | G=D/A | H     |
|-----------|-------|-------|-------|-------|
| Bulgaria  | 0.76  | 0.26  | 2.63  | -1.44 |
| Serbia    | 1.05  | 0.14  | 1.39  | -1.08 |
| Poland    | 1.26  | 0.63  | 2.04  | -1.02 |
| Moldova   | 1.29  | 0.20  | 0.91  | -0.90 |
| Hungary   | 1.10  | 0.74  | 2.10  | -0.86 |
| Ukraine   | 0.85  | 0.19  | 1.01  | -0.74 |
| Czech     | 1.33  | 1.01  | 2.03  | -0.67 |
| Macedonia | 0.79  | 0.21  | 0.85  | -0.61 |
| Roumania  | 0.96  | 0.33  | 0.85  | -0.58 |
| Bosnia    | 0.75  | 0.08  | 0.48  | -0.54 |
| Albania   | 1.19  | 0.23  | 0.31  | -0.52 |

This group includes 16 countries and all of them are from the former socialist European counties. They are united in a group on the base of the symbol for complex economic efficiency. It is combination between low Economic density and high demographical and ecological density. Which means that there is a big stress on the environment which do not lead to high standard of living.

## II<sup>nd</sup> type countries – depressive development – symbol \



|            | E=B/A | F=C/A | G=D/A | H     |
|------------|-------|-------|-------|-------|
| Armenia    | 1.31  | 0.21  | 0.04  | -0.47 |
| Azerbaijan | 0.92  | 0.17  | 0.08  | -0.33 |
| Georgia    | 0.78  | 0.20  | 0.12  | -0.25 |

The Caucasus countries have not so big anthropogenic stress on the environment which is result from low economic activity.

## III<sup>rd</sup> type countries - extensive development – symbol /



|         | E=B/A | F=C/A | G=D/A | H     |
|---------|-------|-------|-------|-------|
| Greece  | 0.81  | 0.83  | 1.31  | -0.23 |
| Spanish | 0.79  | 0.85  | 1.07  | -0.08 |
| Iceland | 0.03  | 0.04  | 0.08  | -0.02 |
| Sweden  | 0.20  | 0.26  | 0.14  | 0.09  |

The III<sup>rd</sup> group of countries have high standard of living and it is the result of especially big anthropogenic stress on the environment.

## IV<sup>th</sup> type – sustainable developing countries – symbol Λ



|               | E=B/A | F=C/A | G=D/A | H    |
|---------------|-------|-------|-------|------|
| Denmark       | 1.25  | 1.89  | 1.56  | 0.49 |
| France        | 1.08  | 1.57  | 0.82  | 0.62 |
| Austria       | 0.99  | 1.46  | 0.45  | 0.74 |
| Italy         | 1.92  | 2.53  | 1.55  | 0.80 |
| Great Britain | 2.67  | 3.62  | 2.25  | 1.16 |
| Belgium       | 3.11  | 4.65  | 3.51  | 1.34 |
| Germany       | 1.99  | 3.25  | 1.59  | 1.46 |
| Switzerland   | 1.75  | 3.01  | 0.62  | 1.83 |
| Holland       | 4.24  | 6.17  | 2.18  | 2.96 |

This group includes ten developed countries from Western Europe. They have low demographical and ecological density but high economic density which provide high standard of living and low environmental degradation.

## Energy efficiency – key elements of the complex efficiency

### Classification of the European countries according to their energy efficiency

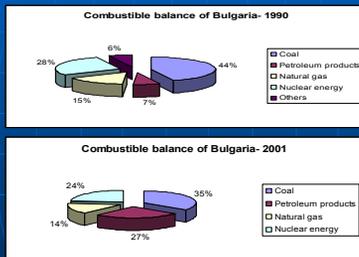
| Countries     | Ton/fuel/\$1000 GDP | Countries      | Ton/fuel/\$1000 GDP |
|---------------|---------------------|----------------|---------------------|
| Italy         | 0.09                | Slovenia       | 0.21                |
| Switzerland   | 0.11                | Macedonia      | 0.21                |
| France        | 0.11                | Czech Republic | 0.21                |
| Portugal      | 0.11                | Estonia        | 0.21                |
| Denmark       | 0.11                | Bosnia         | 0.21                |
| Ireland       | 0.11                | Poland         | 0.22                |
| Great Britain | 0.11                | Latvia         | 0.23                |
| Austria       | 0.12                | Litha          | 0.23                |
| Germany       | 0.12                | Croatia        | 0.23                |
| Spanish       | 0.12                | Roumania       | 0.23                |
| Greece        | 0.12                | Moldova        | 0.24                |
| Nederland     | 0.14                | Slovakia       | 0.24                |
| Belgium       | 0.15                | Iceland        | 0.26                |
| Norway        | 0.15                | Belarus        | 0.28                |
| Hungary       | 0.17                | Bulgaria       | 0.29                |

Bulgaria is the country with one of the lowest energy efficiency in Europe.

## Energy efficiency – key elements of the complex efficiency

- The main reason for the lowest energy efficiency - lack of efficient energy resources and high extent of using of the lignite.

## Energy efficiency – key elements of the complex efficiency



The ineffective fuels are leading in the energy balance of Bulgaria.

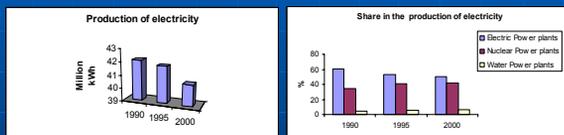
## Is there a transition toward sustainable development in Bulgaria?

### Structure of the Total Industrial production in Bulgaria (%)

| Industrial activity        | 1989 | 1992 | 1994 | 1996 | 1998 | 1999 |
|----------------------------|------|------|------|------|------|------|
| Chemical industry          | 16   | 20   | 22   | 26   | 19   | 21   |
| Food products              | 25   | 25   | 22   | 19   | 20   | 20   |
| Machine - building         | 27   | 17   | 15   | 14   | 15   | 14   |
| Energy                     | 5    | 11   | 10   | 10   | 18   | 19   |
| Metallurgy                 | 6    | 8    | 10   | 13   | 11   | 10   |
| Logging and Paper and pulp | 3    | 5    | 6    | 5    | 4    | 4    |
| Others                     | 12   | 7    | 8    | 6    | 6    | 6    |
| Total                      | 100  | 100  | 100  | 100  | 100  | 100  |

There is not a transition toward sustainable development in Bulgaria according to economy restructuring.

## Is there less Energy consumption in Bulgaria?



Yes, there is. At present Bulgaria produces less electricity than 1990. But the reduction of the electricity production is different for particular Power stations. It decreases by 10% for thermo-electric power stations; and increases by 6.9% for Nuclear power stations and also increases by 2.3% in Hydro-Electric power stations.

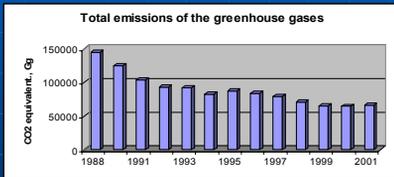
## Consumption of Energy

### Energy efficiency of the economy

| Countries       | Consumption of energy \$GDP | Countries       | Consumption of electricity \$TIP (kWh) |
|-----------------|-----------------------------|-----------------|--|
| <b>Bulgaria</b> | 0.79                        | Roumania        | 2.92                                   |
| Poland          | 0.65                        | <b>Bulgaria</b> | 1.83                                   |
| Roumania        | 0.60                        | Poland          | 1.82                                   |
| Nederland       | 0.37                        | Greece          | 1.20                                   |
| Greece          | 0.28                        | Spanish         | 0.75                                   |
| Great Britain   | 0.28                        | Nederland       | 0.73                                   |
| Germany         | 0.28                        | Austria         | 0.54                                   |
| France          | 0.25                        | France          | 0.45                                   |
| Denmark         | 0.22                        | Great Britain   | 0.39                                   |
| Spanish         | 0.21                        | Germany         | 0.36                                   |
| Austria         | 0.20                        | Denmark         | 0.36                                   |

Bulgaria has the lowest energy efficiency which define the lowest complex efficiency.

Is there a decrease or an increase of harmful effect of the energy consumption ?

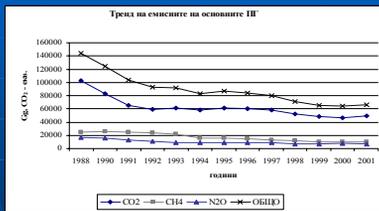


The emissions during 2000 are decreased with 55% in comparison to 1988, so as a result of this the state of the atmosphere becomes better.

Is there a decrease or an increase of harmful effect of the energy consumption ?

- The Energy sector has largest share from total emissions in the air – about 75%, following by agriculture and industrial processes.

Is there a decrease or an increase of harmful effect of the energy consumption ?



The state of the of atmosphere becomes better in the transition period due to decreasing in emissions in the air.

## Main conclusions

- The improvement of the atmosphere is not the result from long-term ecological policy and optimization of the economy structure. It is consequence from economic crisis;

## Main conclusions

- The slow economy restructuring toward sustainable development is result of the influence of the two main factors:
  1. Lack of financial resources for long-term investments with ecological direction.
  2. The predominant foreign investments are directed to the Energy, Metallurgy, Chemical Industry, Cement Industry and Paper and pulp. These branches of the economy form above 70% from air emissions.

## Tendencies in the development of the Economy of Bulgaria

- The possible variants for overcome economic crisis are:
  1. Bulgaria continues to develop Heavy Industry which intensify the ecological crisis;
  2. Long – term restructuring of industry includes:
    - an increase in % share of the High-Technology Industries and a decrease in % share of the export-directed branches of the Heavy Industry.

## Tendencies in the development of the Economy of Bulgaria

- The success of this policy could be guaranteed with significant financial – economic support from developed European countries.

## Tendencies in the development of the Economy of Bulgaria

- This approach will contribute for the improvement of the ecological state in local, regional, and global scale.