

## **ENVIRONMENTAL INDICATORS FOR RURAL AREAS - SUSTAINABLE POTENTIAL IN THE NEW AND OLD EU MEMBER STATES**

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**ABSTRACT:** *Environmental indicators are new instruments in the European Union to assess the impact of agriculture on the environment in rural areas. Using these indicators in the EU member states, changes in rural areas can be analysed and compared. Thus, strong and weak points in rural areas in terms of environmental protection can be investigated. The aim of the paper is to discuss environmental indicators, recommended by the European Commission in 2006, for chosen new and old EU member countries. This indicator analysis can help to state about potentials in rural areas to protect natural resources. Thereby, fields and countries can be specified requiring higher potential of environmental protection.*

**KEY WORDS:** *Agri-environmental indicators, rural development, sustainability, environmental protection, European Union*

### **1. INTRODUCTION**

Agri-environmental indicators and environmental indicators for rural areas are new evaluation instruments for the policy for rural areas in the European Union since the last few years.

Best known indicator sets for analysing changes of natural resources in rural areas were developed by the European Environment Agency (EEA, 2005), the European Union (EUROPÄISCHE KOMMISSION, 2001) and the OECD (OECD, 1997).

The very first indicators for rural areas and agri-environmental indicators were developed within the Agenda 21 during the United Nations Conference on Environment and Development in Rio de Janeiro in 1992. These indicators were based on sustainability indicators initiated with the Brundtland report "Our common future" in which the aim of sustainable development was defined as follows: "to meet the needs of the present generation without compromising the ability of future generations to meet their own needs".

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The new indicators for integration of environmental issues in the Common Agricultural Policy were defined by the European Commission in the strategic document „Wegweiser zur nachhaltigen Landwirtschaft“ (KEG, 1999: 31). According to this document and other recommendations of the European Commission, the indicators for rural areas and agri-environmental indicators should cover ecological, economical and social aspects.

In September 2000 a new project IRENA (“Indicator Reporting on the Integration of Environmental Concerns into Agricultural Policy”) was established by the General Direction for Agriculture and Environment, Eurostat, the Common Research Unit and the European Environment Agency. The basis for these indicators was DPSIR-Modell<sup>1</sup> developed by the European Environment Agency (EEA, 2006; EUROPÄISCHE KOMMISSION, n.d.).

In March 2001 the European Commission presented new indicators in the report „Statistical Information Needed for Indicators to Monitor the Integration of Environmental Concerns into the Common Agricultural Policy“ (CEC, 2001).

Despite the intensive development of indicator methodology for rural areas, any coherent definition of environmental indicators is known. Both EEA and EU and OECD set different criteria and definitions for successful indicators. Irrespective of this fact, the objectives of environmental indicators for rural areas are the same: to evaluate the impact of agriculture on the environment and to reflect sustainable potential in rural areas. By means of indicators successfully proved in the most EU-15 countries the use of environmental resources can be planned and possible environmental threats for rural areas in the respective EU-member states can be predicted.

## 2. RESEARCH OBJECTIVE

The main objective of the paper is to discuss the question of sustainable environmental potentials in rural areas in the old (EU-15) and new EU member states (EU-10). Special attention should be paid to the new EU member states which are characterised by valuable and well maintained natural resources.

In this paper chosen environmental indicators recommended by the EUROPEAN COMMISSION (2006) in the report “Rural Development in the European Union” were analysed. The goal of the analysis is to compare available natural potentials in rural areas in the new and old EU member states, as expressed with discussed indicators. In the paper following environmental indicators for rural areas were considered: land cover, areas under organic farming, utilised agricultural area (UAA) under less favoured areas, areas of extensive agriculture, Natura 2000 areas, biodiversity, development of forest areas, areas at risk of soil erosion, and climate changes.

Basing on the comparison analysis between the respective EU countries conclusions on the existing environmental needs with regard to environmental protection in rural areas can be drawn. Additionally, development possibilities and directions in the respective countries in this term can be stated. Therefore, the fields and countries can be indicated in which environmental protection requires more

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<sup>1</sup> DPSIR (Driving force – Pressure – State – Impact – Response)

support. Thereby, higher competitiveness with regard to environmental resources and sustainability in agriculture can be projected in the respective EU member states.

### **3. METHODOLOGY AND RESULTS**

With this study environmental indicators for rural areas, recommended by the EUROPEAN COMMISSION (2006), were analysed for chosen EU member states. For the research purpose following indicators from the group of 'indicators improving the environment and the countryside through land management' were chosen:

1. Land cover
2. Less Favoured Areas
3. Areas of extensive agriculture
4. Natura 2000 area
5. Development of forest area
6. Biodiversity
7. Areas at risk of soil erosion
8. Organic farming
9. Climate change

In the following, the listed indicators for chosen EU member states will be analysed and compared. For the current research, countries with a highest or lowest index of the analysed indicators, both in the group of the new and in the group of the old EU member states were selected. Additionally, the average for the EU-10 and EU-15 was analysed and discussed. Thus, potentials in natural environment and consequently sustainability of natural resources in the respective EU member states were investigated.

Due to the missing statistical data the analysis does not include Romania and Bulgaria which assessed the European Union in January 2007.

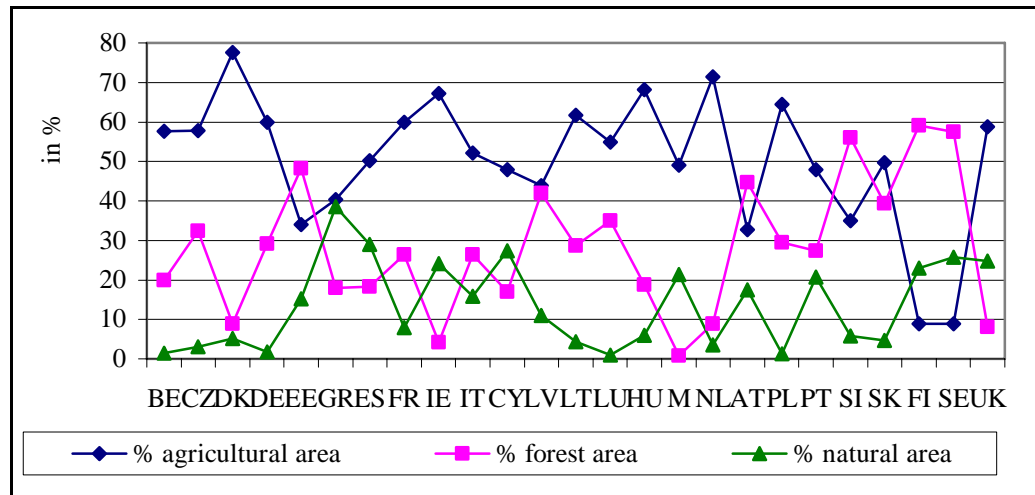
**Land cover.** The indicator 'land cover' is defined as the percentage of area in agricultural/ forest and natural classes. According to the EUROPEAN COMMISSION (2006) land cover is defined as distribution of forests, water, desert, grassland and other physical features of the land, including those created by human activities. For estimation of land cover in the European Union the CORINE Land Cover (CLC) database, relating on the computer assisted interpretation of satellite images acquired in 1990 and 2000 was used. The CLC is a uniform methodology and nomenclature across Europe, highly consistent and the only complete dataset for EU-27.

The indicator index for the named classes in all EU member states is displayed in figure 1.

According to the CORINE Land Cover database the highest percentage of agricultural area in the whole country area is to find in Denmark (almost 80 %) and the Netherlands (more than 70 %) followed by Hungary, Ireland, Poland and Latvia (between 60 and 70 %). The lowest percentage of agricultural areas is to find in Finland and Sweden (less than 10 %).

The CORINE Land Cover data show that the agricultural areas cover the largest area of almost all of the EU member countries. As an exception Estonia, Austria, Slovenia, Finland and Sweden can be named. In these countries the largest

area is covered by forest. Furthermore, the natural area covers the lowest percentage of the whole area of all EU member states. The highest percentage between all member states indicates Greece (38.5 %) and Spain (29 %) followed by Cyprus, Ireland, Sweden, United Kingdom and Finland (between 20 and 30 %); the lowest percentage indicate again Luxembourg, Belgium, Denmark, Poland and the Netherlands.



Source: Own performance according to EUROPEAN COMMISSION (2006)

**Figure 1. Area in different categories of land cover in the EU-15 in 2000**

The presented indicators of different categories of land cover confirm differentiated natural conditions in each EU member state. These conditions influence and determine further the potentials in rural areas in terms of the sustainable use of natural resources. The presented categories of land cover in the EU member countries give a background of possibilities and potentials which will be discussed in the following.

**Less Favoured Areas (LFA).** Less favoured areas are defined in the European Union as areas under particular difficult conditions which, in the most cases, depend on natural conditions. To improve the competitiveness of farmers in these areas, less favoured areas are supported from the European Agricultural Guidance and Guarantee Fund (EAGGF).

According to the Council regulation (EC) No 1698/2005 (COUNCIL OF THE EUROPEAN UNION, 2005) following areas are eligible for financial support:

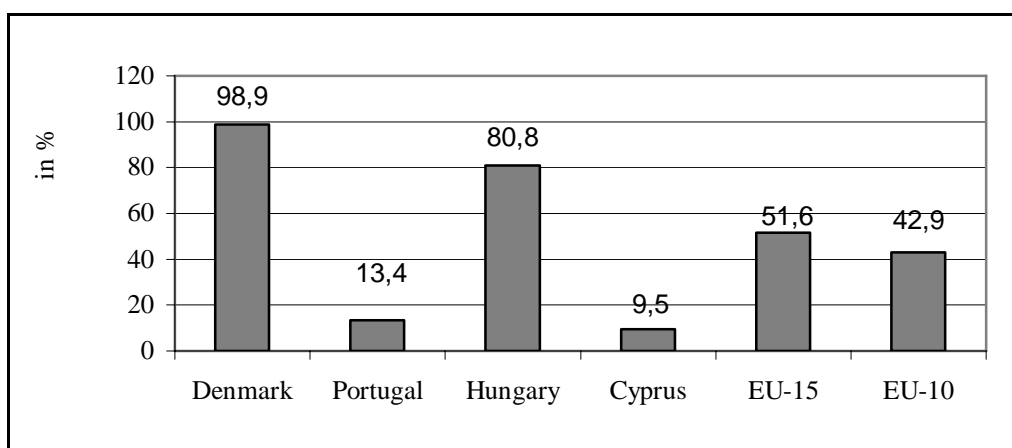
- Mountain areas or regarded as areas north of the 62nd parallel and certain adjacent areas,
- Areas affected by significant natural handicaps and
- Areas affected by specific handicaps.

Problematic is the collection of the information, particularly at regional level and for the areas affected by specific handicaps. Furthermore, the information is not systematically reported in Rural Development programmes and the only survey collecting this information at community level is the Farm Structure Survey. Moreover,

a part of the utilised agricultural areas (UAA) may not be covered by this survey (very small farms and common land) and there is no distinction between areas with significant or with specific handicaps (EUROPEAN COMMISSION, 2006: 192).

The cover of LFA in the UAA can be analysed according to following categories: Non Less Favoured Areas; Less Favoured Areas Mountain; other Less Favoured Areas/ Less Favoured Areas with significant handicaps; Areas with specific handicaps.

In the following the first category was discussed. Analysing the land cover in non less favoured areas, regions with very good and good farming and environmental conditions can be found. According to the EU survey (EUROPEAN COMMISSION, 2006) the whole country area of Luxembourg, Malta and Finland can be classified as less favoured. Other countries are characterised by different percentage of less or non less favoured areas. The results for this indicator are displayed in figure 2.



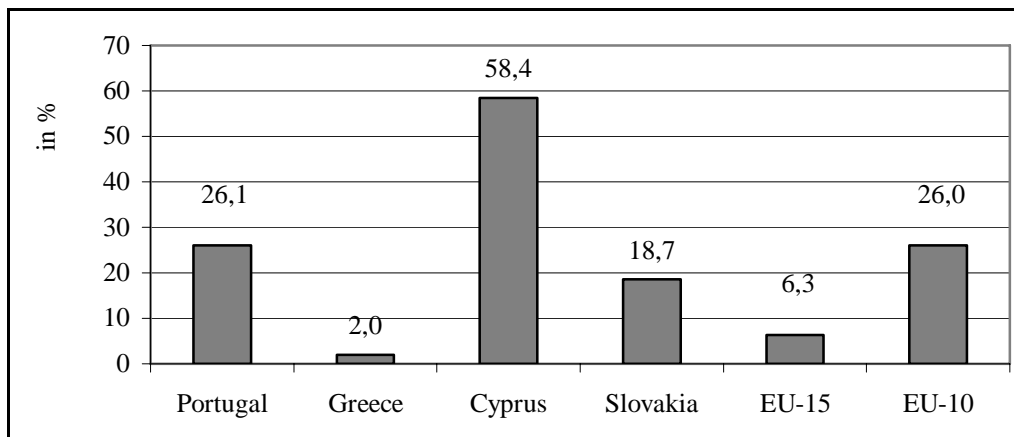
Source: Own performance according to EUROPEAN COMMISSION (2006: 94)

**Figure 2. Percentage of UUA in non less favoured areas**

The figure shows that in the EU-15 most favourable environmental conditions are in Denmark (99 % non less favoured areas) and in the EU-10 – in Hungary (80.8 %). Similarly, the lowest percentage of non less favoured areas is in Portugal (for the EU-15) and in Cyprus (for the EU-10). Comparing the indicators in the EU-15 (51.6 %) and EU-10 (42.9 %) marginal differences can be stated. However, the conditions in the EU-15 are visible more favourable. Rural areas in the EU-10 are more disadvantaged and have, therefore, less natural resources with high environmental potentials.

**Areas of extensive agriculture.** The extensive agriculture is defined as: area under arable crops production (except forage crops), when the regional yield for cereals (excluding rice) is less than 60 % of the EU-27 average; area for grazing livestock production (cattle, sheep & goats), when the stocking density does not exceed 1 Livestock Unit per hectare of forage area (forage crops, permanent pastures and meadows). The evaluation of the extensive character of agriculture should be made at the most detailed geographical level possible.

In this paper the percentage of UAA for extensive arable crops is discussed as a characteristic for the areas of extensive agriculture. According to the EU data, visible differences between the respective EU member countries in terms of this indicator can be stated (figure 3).



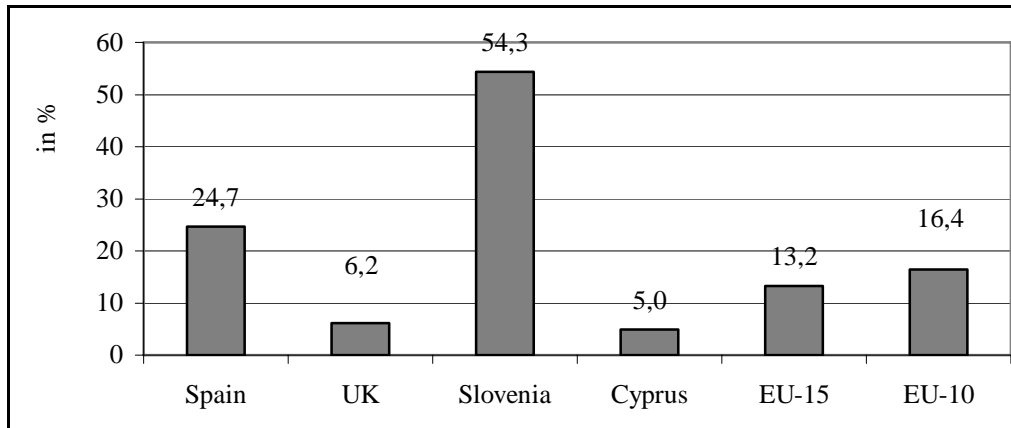
Source: Own performance according to EUROPEAN COMMISSION (2006: 94)

**Figure 3. % UAA for extensive arable crops**

The analysis shows that agricultural production is more extensive in the new EU member states. The highest percentage of UAA for extensive arable crops in the EU-10 is in Cyprus (58.4 %) and the lowest in Slovakia (18.7 %). The latter value is, however, higher than the lowest level for the EU-15 and similarly high compared to the highest level in the EU-15. Moreover, for the countries Belgium, Czech Republic, Denmark, Germany, France, Ireland, Luxembourg, Hungary, the Netherlands, Austria, Finland and United Kingdom the indicator takes the value of zero. This denotes intensive crop production in these countries. Thus, countries with more favourable conditions for environmental protection can be selected (see figure 3).

**Natura 2000 area.** This indicator provides information on the preservation of natural environment and landscape and the protection and improvement of natural resources. Natura 2000 is a network of areas with the aim to conserve natural habitats and species of wildlife which are rare, endangered or vulnerable in the European Community.

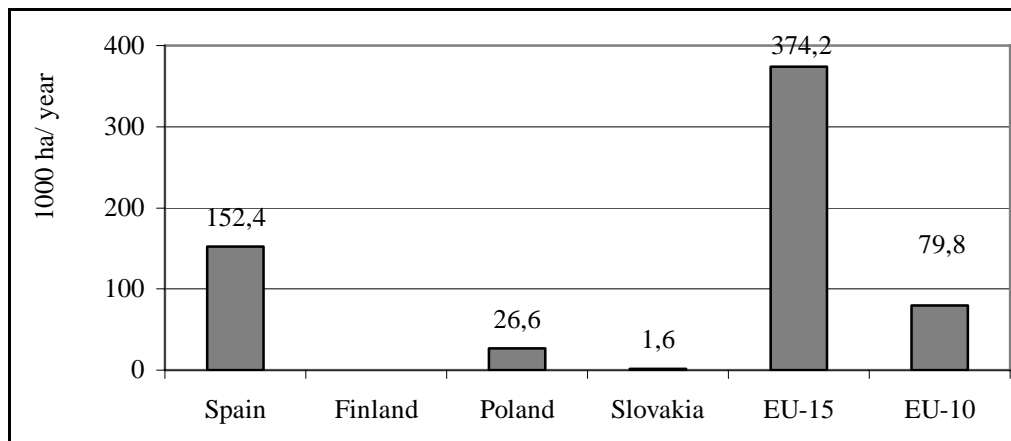
Analysing the territory under Natura 2000 great differences between the old and new EU member states can be found. In the EU-15 the largest territory under Natura 2000 is to find in Spain (24.7 %) which is only less than a half of the territory in Slovenia - the country with the largest protected area under Natura 2000 in the EU-10 (Figure 4). The United Kingdom and Cyprus are the countries with the lowest percentage of area under Natura 2000 (6.2 % and 5 % respectively). The comparison of the average in the EU-15 and EU-10 shows that in the new EU member states more valuable natural resources exist. This denotes that the new EU member states have more sustainable potentials in terms of environmental benefit than the old EU member states.



Source: Own performance according to EUROPEAN COMMISSION (2006: 98)

**Figure 4. % Territory under Natura 2000**

**Development of forest area.** The development of forest area is measured as an average annual increase of forest and other wooded land areas over a certain number of years. As applied for the Global Forest Resources Assessment Update in 2005, the forest is defined as land spanning more than 0.5 hectares with trees higher than 5 meters and a canopy cover of more than 10 percent, or trees able to reach these thresholds *in situ*. It does not include land that is predominantly under agricultural or urban land use. Figure 5 shows that countries of the EU-15 indicate almost five times higher average annual increase of forest area than the new EU member states. The leading country in the EU-15 is Spain with 152.4 thous. ha average annual increase of forest area and in the EU-10 Poland (26.6 thous. ha/ year). In these countries more chances for sustainable development of natural resources are given.



Source: Own performance according to EUROPEAN COMMISSION (2006: 110)

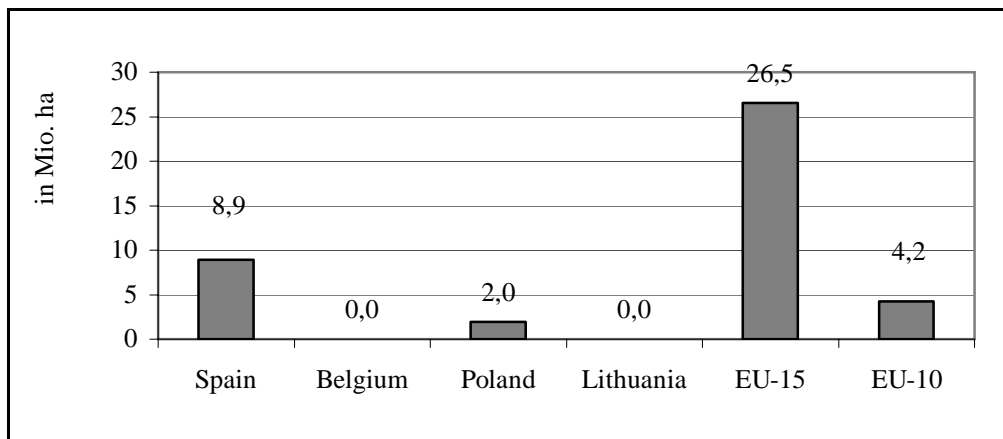
**Figure 5. Development of forest area**

**Biodiversity: High Nature Value farmland and forestry.** According to the European Commission the High Nature Value farmland (HNV) and forestry are associated with high grade of biodiversity. The HNV farmland indicator distinguishes following types of high nature value farmland:

- Farmland with a high proportion of semi-natural vegetation,
- Farmland dominated by low intensity agriculture or a mosaic of semi-natural and cultivated land and small-scale features,
- Farmland supporting rare species or a high proportion of European or World population.

The indicators can be estimated on the basis of land cover data (CORINE database) and agronomic farm level data (in particular FADN) and are expressed as a percentage of UAA of High Nature Value farmland.

The indicators for the new and old EU member states are displayed in figure 6.



Source: Own performance according to EUROPEAN COMMISSION (2006: 104)

**Figure 6. High Nature Value Farmland**

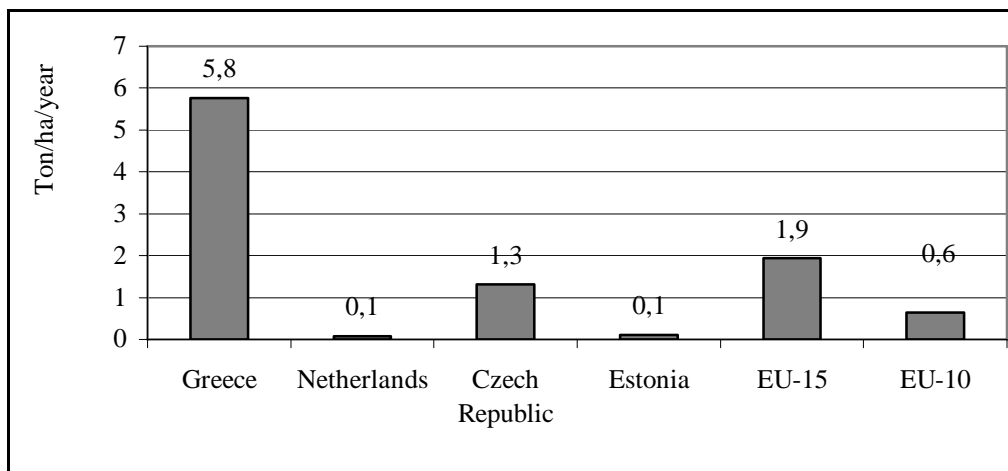
The analysis shows that the largest areas of High Nature Value farmland and forestry in the EU-15 is to find in Spain (almost 9 Mio. ha) while in the EU-10 – in Poland (2 Mio. ha). The lowest coefficient indicate Belgium (0.01 Mio. ha) and Lithuania (0.02 Mio. ha). Comparing the old and new EU member countries great differences can be stated. In the EU-15 almost 26.5 Mio. ha of High Nature Value farmland are registered while in the EU-10 only 4.2 Mio. ha. The analysis confirms that with respect to the biodiversity great differences between the member states exist.

However, in the new EU member states the most valuable natural areas are maintained as protected areas and are not used for farming. On the other hand, the farming areas are rather used for production purposes without any attention to natural resources. To get to the average of the EU-15 member states with regard to the areas of High Nature Value farmland a lot of afford has to be made in the new member states. This, however, is possible in a long term period also by means of agri-environmental programmes as obligatory political measures for policy of rural areas in all EU member states.



**Areas at risk of soil erosion.** The indicator can be used to measure the level of sustainability in agricultural production. On the one hand soil erosion is determined by natural conditions, on the other, however, farming practices influence the risk of soil erosion. Sustainable management contributes to less soil erosion. The higher coefficients of this indicator reflect, therefore, that farming in the analysed region (country) can not be called sustainable. The effects of the sustainable management can be measured by means of the Pan-European Soil Erosion Risk Assessment model in Tons/ha/year.

According to statistical data for Europe (Figure 7) Greece is the country with the highest soil erosion risk in the EU-15 (5.8 Tons/ha/year) which can be explained with natural conditions in this country. In the EU-10 the highest coefficient of soil erosion was found for Czech Republic while the lowest for Estonia. Comparing the EU-15 and EU-10 one can state that in the EU-15 higher risk at soil erosion exists. This indicates less favourable natural conditions, more intensive farming practices, and consequently lower potentials for sustainable development of rural areas in the EU-15 member states.

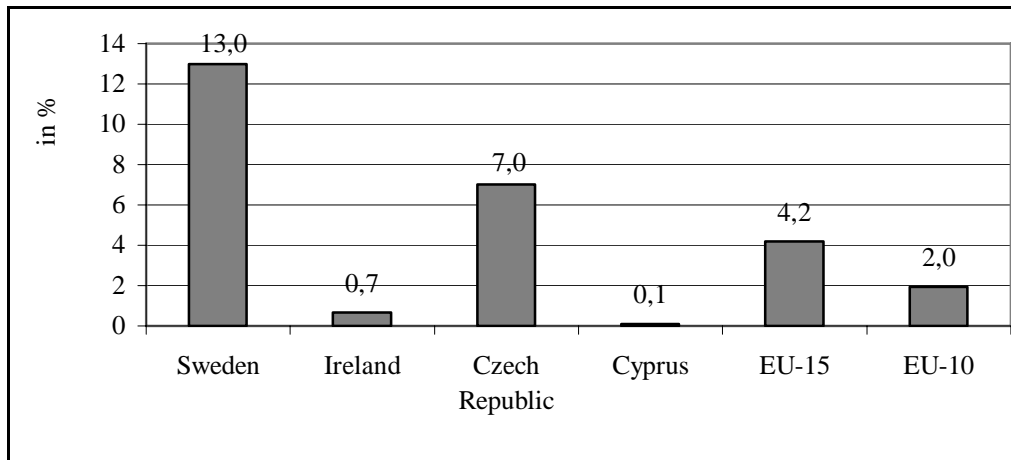


Source: Own performance according to EUROPEAN COMMISSION (2006: 118)

**Figure 7. Areas at risk of soil erosion**

**UAA under organic farming.** The indicator of UAA under organic farming is based on statistical data for national and regional levels. According to statistical data from Eurostat, Sweden is the country with the highest share of Utilised Agricultural Area under organic farming (13 %). The lowest indicator in the EU-15 was found for Ireland (0.7 %). In the EU-10 the largest area under organic farming is in Czech Republic while the lowest in Cyprus.

In general, the EU-15 member states are characterised by more UAA under organic farming (4.2 %) than the EU-10 (2 %) (Figure 8). This indicates that currently the EU-15 member states contribute to a greater extent to environmental protection than the new EU member states.



Source: Own performance according to EUROPEAN COMMISSION (2006: 118)

**Figure 8. Share of Utilised Agricultural Area under organic farming**

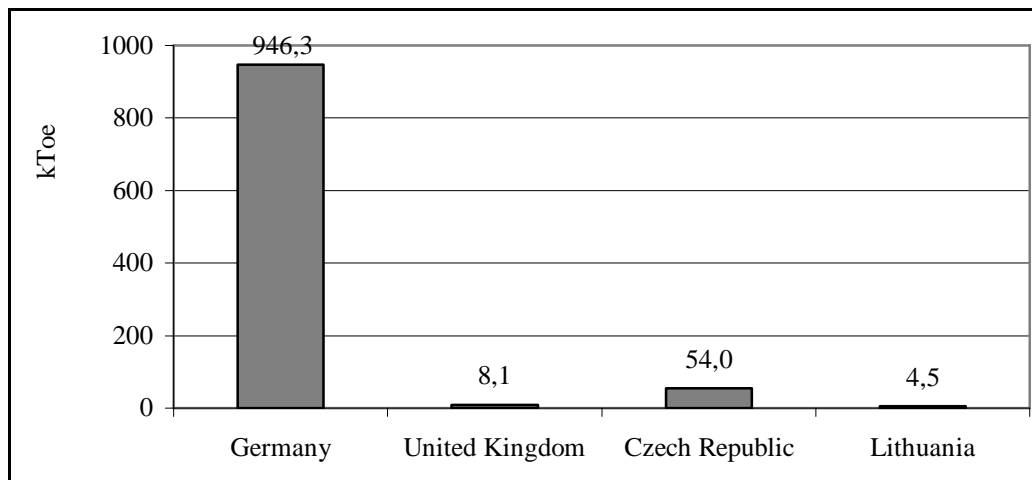
**Climate change: Production of renewable energy from agriculture and forestry.** The climate change can be measured with several indicators such as: ‘Production of renewable energy from agriculture and forestry’, ‘UAA devoted to renewable energy’ and ‘greenhouse gas emissions from agriculture’. As renewable energy is one of the most important questions in the European Commission the first indicator will be analysed in this paper. For this indicator, data regarding biodiesel from oilseeds crops and ethanol from starch/ sugar crops are considered. Any other energy sources like energy from short rotation forestry, energy from agricultural biogas (livestock manure) or energy from cereal straw are included.

According to the EUROPEAN COMMISSION (2006: 181) production of renewable energy from forestry covers:

- Purpose-grown energy crops (poplar, willow, etc.),
- Woody material generated by an industrial process (wood/ paper industry) or provided directly by forestry and agriculture (firewood, wood chips, bark, sawdust, shavings, chips, black liquor etc.),
- Wastes such as straw, rice husks, nut shells, poultry litter, crushed grape dregs etc.

While the indicator for agriculture is based on indicators-set IRENA 27 (EEA, 2003), the analysis for the renewable energy from forestry is based on Eurostat – Energy Statistics.

Figure 9 shows that the production of renewable energy from agriculture is high differentiated in the EU. According to the available data the highest production of renewable energy from agriculture is to find in Germany (946.3 KToe 1000 tons of oil equivalent) while the lowest in the EU-15 in the United Kingdom (8.1 KToe). In the new EU member states the highest coefficient can be found for Czech Republic (54 KToe) and the lowest for Lithuania (4.5 KToe). Due to the lack of data for all EU member states a comparison between the EU-15 and EU-10 is not possible at the current time.



Source: Own performance according to EUROPEAN COMMISSION (2006: 122)

**Figure 9. Production of renewable energy from agriculture**

#### 4. CONCLUSIONS

In this paper, environmental indicators for rural areas in the old and new EU member states were analysed and discussed. The indicators were investigated for chosen member states which are characterised by the highest or lowest indicator indexes.

The analysis of the land cover shows that agricultural areas make the highest percentage of the total area in all EU member states. This indicates that environmental issues have a great importance while analysing sustainable changes in economies of the EU member countries.

In terms of the chosen indicators the analysis confirms great differences in environmental conditions which influence sustainable potential in the respective EU member states. However, no clear tendency between the respective EU member states can be found.

Undoubtedly, the EU-15 member states have more sustainable potential with respect to the following indicators: 'Less favoured areas', 'Development of forest area', 'Biodiversity: High Nature Value farmland and forestry', and 'UAA under organic farming'.

With respect to other indicators such as: 'Areas of extensive agriculture', 'Natura 2000 area', and 'Areas at risk of soil erosion' the new EU member countries indicate more advantages. This means that information exchange and cooperation between countries in terms of experience in implementation environmental measures, is highly necessary to improve and accelerate the process of making rural areas more sustainable for the future.

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