

Environmental indicators

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Abstract. Environmental indicators currently are considered to be very important in achieving environmental policy objectives. The aim of the paper is to present the most important information on environmental indicators in the European Union. The environmental taxes are measured using indicators, reports and sets of indicators. The evaluation is based on the methodology of the Organization for Economic Cooperation and Development (OECD) and the European Environment Agency (EEA). The methodology for assessing indicators examines the causal link between the current state of environmental taxes and current environmental trends. The effective introduction of environmental taxes based on an environmental strategy can ultimately lead to many desirable effects in European Union countries. Achieving environmental excellence should be a priority objective for both countries and companies, as the development and successful implementation of policies and environmental strategies is a key element of companies around the world.

1 INTRODUCTION

Today's society is characterized by an immediate benefit of business and does not reflect on the threat to the future with respect to the environment. Countries are also trying to tackle the unfavorable situation through taxes. Environmental taxes are key instruments for achieving sustainability in the economy by increasing the prices of environmentally harmful goods or the cost of production inputs. Developed countries, such as the European Union, have been drawing attention to this area of the economy more and more recently.

Growing concerns about climate change have put environmental issues at the forefront of the economic agenda in many European countries. Global warming is one of the most important challenges facing the world [1]. Taxes, fees, tradable permits and other economic instruments play an important role in achieving cost-effective greenhouse gas emission control. Their potential scale and revenues increase the much broader implications of economic and fiscal policy. European countries introduced carbon taxes in the 1990s, although the proposal for a European energy tax was ultimately unsuccessful. Recently, the focus has been on emissions trading. Several tax measures have been introduced in the EU, mainly with environmental objectives. They included national environmental taxes along with the existence of environmental tax measures. The increasing use of environmental taxes, emissions trading and other economic instruments has been partly conditional on the

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recognition of the limitations of conventional environmental regulation. They can initiate the necessary changes in the economy, resource use, behavior and universal access to nature [2]. The relationship between environmental knowledge, attitudes and behavior is complex. Moreover, electricity consumption in the six Gulf Cooperation Council countries has increased rapidly over the last decades as a result of rapid population growth and relatively rapid economic growth [3]. Energy is an integral part of our daily life in society in a market economy. We need it for heating, cooling, lighting and movement; this is important for the functioning of our offices, workplaces and the whole economy [4]. This is one of the reasons why the Commission EU has proposed its Energy Union strategy.

2 Data and methods

Indicators are measurable quantities providing information on the development and trends of phenomena and processes, in quantitative and qualitative terms. The environmental indicator significantly helps in planning, setting policy objectives, including monitoring their implementation, and in developing follow-up measures and instruments to achieve them in various policy and strategy documents. It is also a comprehensive source of information on the state and development of the environment and related aspects for the general public [5]. It also constitutes an important basis for the subsequent drafting of the relevant types of reports. The Slovak Environmental Agency processes and regularly evaluates various sets of indicators, namely [6]:

- Key indicators.
- Sector indicators.
- Sustainable Development (TUR) indicators.
- Green growth indicators, **environmental indicators**.
- Resource efficiency indicators.

The stochastic indicator consists of two curves: the % K curve and the % D curve. The Mathematical calculation is apparent from the attached formulas:

$$\%K = 100 \times [(C - Lx) \div (Hx - Lx)] \quad (1)$$

Where C = the last closing price (close) at the relevant time period (timeframe); Lx = the lowest point (low) for a selected time period; and Hx = the highest point (high) for the selected time period.

$$\%D = 100 \times [Hn \div Ln] \quad (2)$$

where Hn = n-day sum (C-Lx); Ln = n-day amount (Hx-Lx) (For daily graph).

The results of these two mathematical expressions are lines that oscillate between 0 and 100. The K(%) curve is usually indicated by a solid line and a slow D(%) curve by a dashed or dotted line. The curve K shows (expressed as a percentage), which is the cost of closing toward the x-day (or period) range. Row D is nothing but the n-day floating version of K. The results of these two mathematical expressions are two lines that oscillate between 0 and 100. The curve shows K (expressed as a percentage), which is the closing price toward the x-day range (or period). Indicators are measurable quantities that provide information on developments in quantitative and qualitative terms. They should be evaluated on the basis of a set of sectoral indicators, green indicators, resource indicators. Sectoral indicators are a means of assessing progress in implementing sectoral policies in relation to the environment. Based on the analysis of indicators and regular evaluation of the European Environment Agency (EEA) [7], the evaluation options of the Organization for Economic Development and Economic Cooperation (OECD) and of the European Union Office of Indicators (Eurostat) were evaluated. Flexible and liquid markets can enable supply and demand to be more efficiently adjusted, reducing production costs and

therefore prices. Such situations should also trigger bilateral contract prices in the most developed markets [8]. Gradually, these separate national wholesale markets are merging with neighboring markets, which together with several interconnections of the transmission network create more efficient markets. Prices are influenced by various factors, including fuel mix, cross-border connections, market connections, market concentration of suppliers and weather conditions. Energy efficiency and weather also affect prices, demand of consumers and industry business, Figure 1.

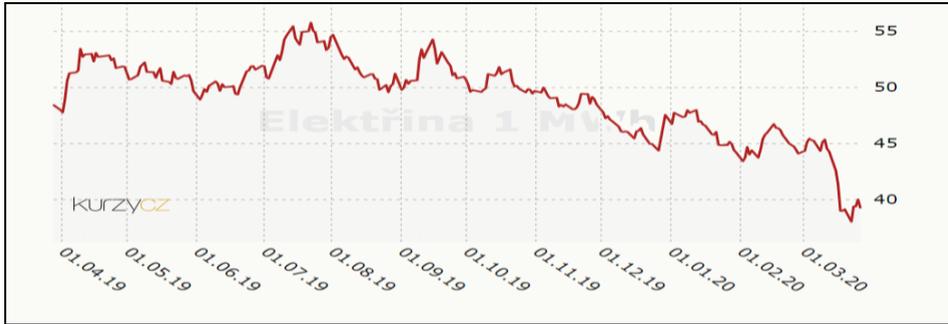


Fig.1. Figure of electricity price development in years 2019-2020. Source: Eurostat

Why are we monitoring the development of electricity prices on the wholesale market? Econometric analysis suggests that a 1% increase in the share of fossil fuels (coal, natural gas and oil) in the energy mix leads to an increase in wholesale electricity prices of EUR 0.2 - 1.3 / MWh depending on the regional market, an increase in several markets. The low marginal cost of solar and wind electricity reduces wholesale prices. The econometric analysis also suggests that each percentage increase in the share of renewable energy on average reduces the wholesale electricity price by EUR 0.4 / MWh in the EU; the actual reduction depends on the regional market and the fuel source is replaced by renewable sources. In Northwest Europe, the Baltic and Central and Eastern Europe, the impact of renewable energy sources is even greater (0.6-0.8 EUR / MWh) Figure 2.

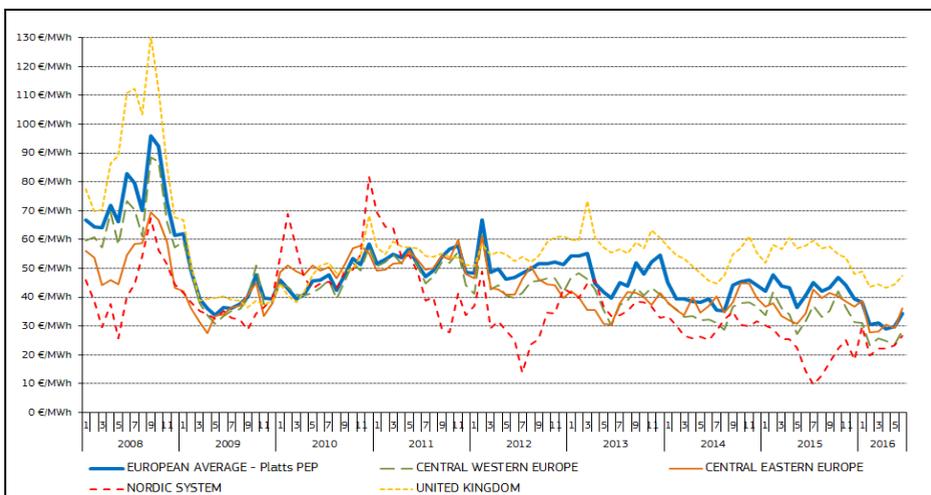


Fig. 2. Trends in European Union, electricity prices. Source: Eurostat

2.1 Environmental indicators

Indicators are measurable quantities providing information on the development and trends of phenomena and processes, in quantitative and qualitative terms. Regarding the indicators, we state that the fundamental aim of the research is to identify key environmental indicators that credibly reflect environmental policy. The basic starting point for their identification was the results of the correlation analysis, where the individual environmental indicators obtained from the data of individual sectors of the sample were used as variables. Based on the analysis of indicators developed and regularly evaluated by the European Environment Agency (EEA), the Organization for Economic Development and Economic Cooperation (OECD), the European Community Statistical Office (EUROSTAT). Environmental taxes are one of the most important means of the European Union's environmental policy. The evolution of total revenue from this tax category can be seen in Figure 3, where the revenue is shown across the EU over a 10-year period. From graph no. 3 and after calculating the evolution index over time, it is clear, that over the last ten years the total EU revenue from environmental taxes has increased by 19.67% between 2008 and 2018. In 2018, total revenues from environmental taxes amounted to 381, 381. 85 Million Eura, which represents an increase in revenues of 59, 891 Million Eura compared to 2007. The data show that the overall revenue from environmental taxes in the EU is increasing [9]. The justification for revenue growth stems from rising environmental tax rates. The exception to this upward trend is the years 2007 and 2009, during which Europe went through the global financial crisis [10].

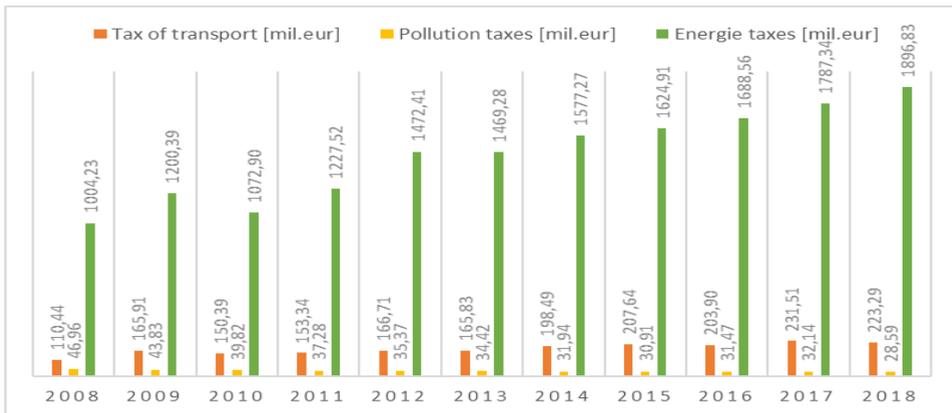


Fig. 3. Evolution of taxes with environmental aspects. Source: Eurostat

From figure no. 4 it is clear, how the Percentage of Total Revenues from Taxes and Social contributions has developed in years 2009-2018 in the seven countries of the European Union. For the numerator, the OECD Secretariat uses revenue figures that are submitted annually by correspondents from national Ministries of Finance, Tax Administrations or National Statistics Offices [11]. Although provisional figures for most countries become available with a lag of about six months, finished data become available with a lag of around one and a half years. Final revenue data for 2017 were received during the period May-August 2019. In 33 OECD countries the reporting year coincides with the calendar year. This has been sought to be achieved through flexible recruitment practices designed to induct quality applicants, a focus on training and development, and the development of systems that capture and allow the repetition of best practice. As they say, globalization is also one of the most important realities [12]. The modern trend for tax agencies is for more

highly skilled officers, with merit-based promotion, and performance management and development systems [13].

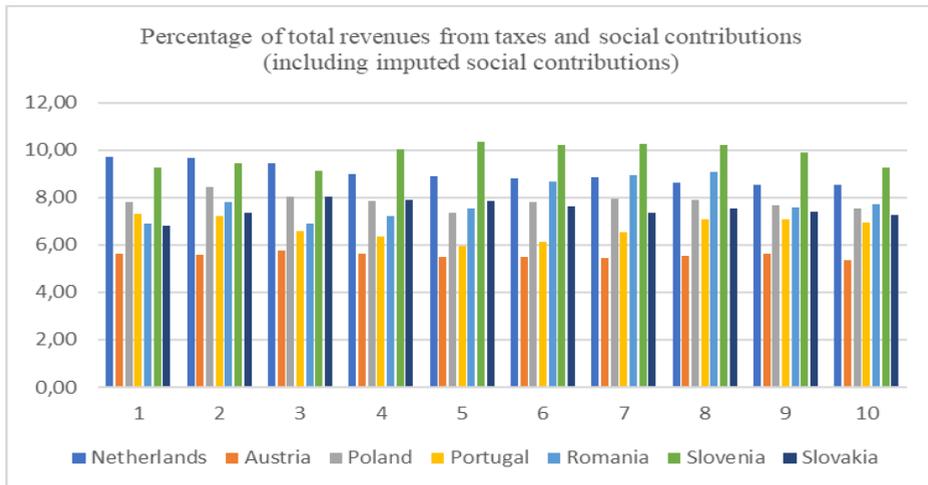


Fig. 4. Percentage of total revenues from taxes and social contributions. Source: Eurostat

The figure 5 is obvious, that in 2018, in OECD countries had an increase in their tax-to-GDP ratio relative to 2017. In all of these countries, GDP growth was positive, although to a lesser degree than tax revenue growth. Of the 15 OECD countries that experienced a decline in their tax-to-GDP ratio in 2018, thirteen had higher levels of tax revenues in nominal terms than the preceding year, but the increase in nominal tax revenues was less than the increase in nominal GDP levels. Two countries (the United States and Israel) had positive nominal GDP growth and negative tax revenue growth; but no countries experienced declines in nominal GDP (Figure 5). The figure 5 is obvious, that in 2018, the governments in the EU collected environmental tax revenue of EUR 324.6 billion. The value represents 2.4 % of the EU gross domestic product (GDP) and 6.0 % of the EU total government revenue from taxes and social contributions.

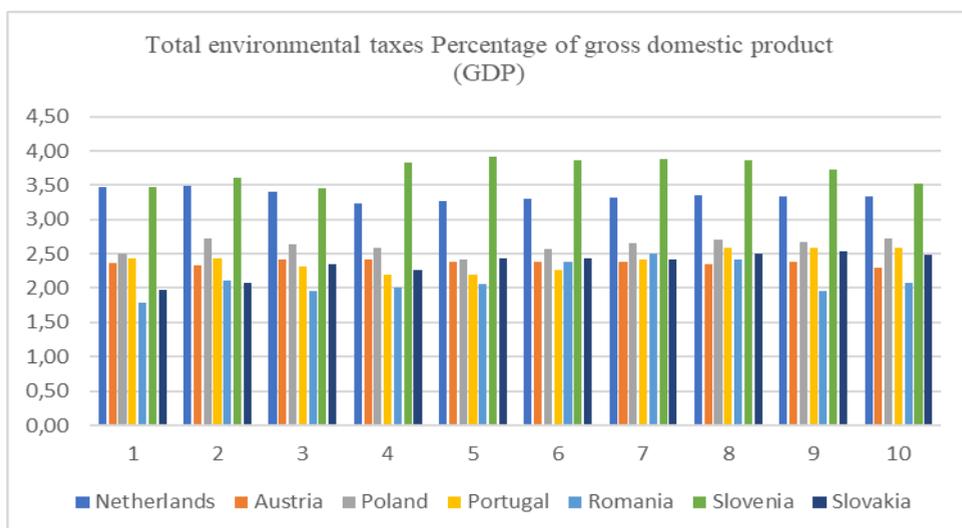


Fig. 5. Total environmental taxes – percentage of gross domestic product. Source: Eurostat

Figure 6 is obvious, still, the evolution of the environmental tax revenue relative to GDP and TSC seems to have changed its pattern in 2008, and again in 2016. After five years of consecutive decrease, it started to increase in 2009 (presumably due to the economic recession and drop in both nominal GDP and government revenue, as a result of the financial crisis) and it remained relatively stable thereafter. Starting from 2016, the ratios have been slowly falling again.

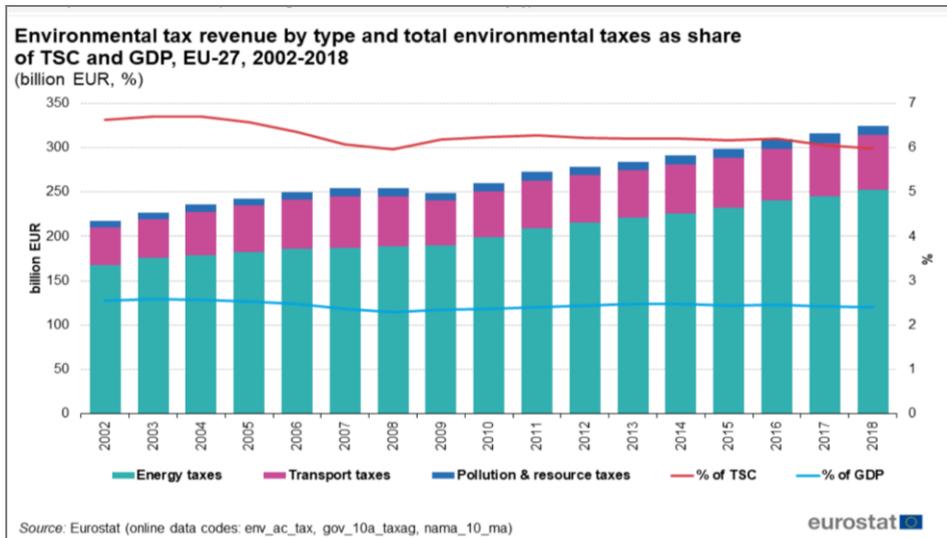


Fig. 6. Environmental tax revenue by type and total environmental taxes as share of TSC and GDP, EU-27, 2002-2018. Source: Eurostat

3 Results and Discussions

Figure 7 is obvious, that economic instruments for pollution control and natural resource management are an important part of environmental policy in the EU Member States [14]. The range of instruments that are available includes, among others, environmental taxes, fees and charges, tradable permits, deposit-refund systems and subsidies. Environmental taxes are used to influence the behaviour of economic operators, whether producers or consumers. The EU has progressively favoured these instruments because they provide a flexible and cost-effective means for reinforcing the polluter-pays principle and for reaching environmental policy objectives. The use of economic tools for the benefit of the environment is promoted in the EU Environment Action Programme to 2020, the EU sustainable development goals and the Europe 2020 strategy .

Environmental indicators, together with indicators supporting Europe 2020, continue a series of Eurostat's major publications supporting Europe 2020 by monitoring progress towards the objectives defined under the three mutually reinforcing priorities of smart, sustainable and inclusive growth. The analysis is based on the Europe 2020 headline indicators chosen to monitor progress towards the objectives of the strategy. Further breakdowns targeting specific sub-groups of society or economy are also used to deepen the analysis and provide a more detailed picture. The data come mainly from official statistics produced by the European Statistical System and disseminated by Eurostat.

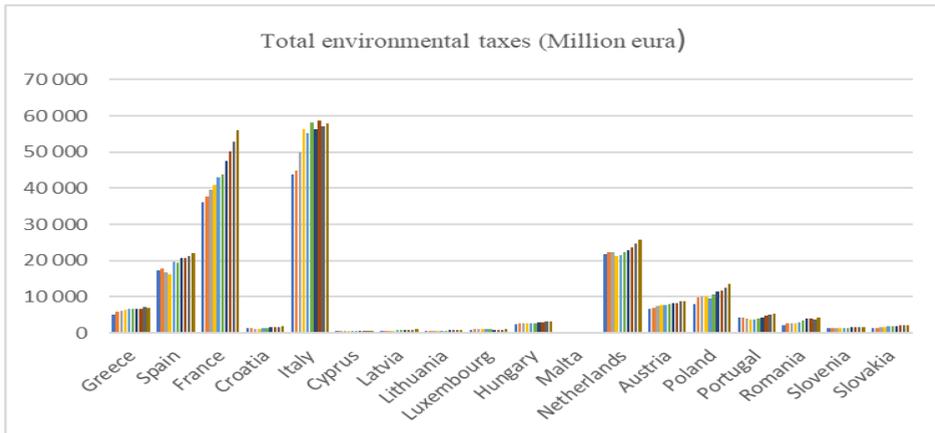


Fig. 7. Total environmental taxes in countries European Union (mill. Eura). Source: Eurostat

4 Conclusion

In the context of environmental indicators, needs considered in energy. Primary energy production is any extraction of energy products in a usable form from natural sources [15]. This occurs either in the exploitation of natural resources (for example, in coal mines, oil fields, hydropower plants) or in the production of biofuels. For example, primary energy production in the EU-28 was 771 million tonnes of oil equivalent (peak) and 757 million peaks in 2016 (from available data) in 2015, while world production reached 13.79 billion peaks in 2015. Members of the G20 include China, the United States and Russia. These countries recorded higher levels of production than in the EU-28. The increased awareness of the need to combat environmental pollution and preserve natural resources has led to an increase in the supply and demand of environmental goods and services, in other words, products to prevent, measure, control, limit, minimise or correct environmental damage and resource depletion. Statistics on environmental protection expenditure enable to identify and measure society's response to environmental concerns and how it is financed. Environmental protection expenditure accounts (EPEA) quantify the resources devoted to environmental protection by resident economic units. The results of the 2018 data collection on environmental protection expenditure accounts (EPEA) provided by European Union (EU) Member States with reporting obligation (Cyprus was granted a derogation) and selected non-EU countries [16]. It provides information on the EU's expenditure on prevention, reduction and elimination of pollution or any other degradation of the environment and covers the total spending by a country (i.e. by its households, businesses and government) on environmental protection services, e.g. waste and wastewater management, protection of biodiversity, as well as protection of soil, research and development, education and training.

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