ENVIRONMENTAL MANAGEMENT SYSTEMS CERTIFICATION IN SERBIA: THE INFLUENCE OF TRADE AND ENVIRONMENT

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Abstract

Nowadays, emerging economies tend to open their markets to foreign investors, because they see the key to accelerated economic growth in foreign capital. It is true that foreign investments are an instrument of accelerated economic growth, however, the ecological side of sustainable development should also be considered, and not only economic and possibly social pillar. Thus, the aim of this paper is to review and examine the impact of trade, economic growth and environmental degradation on ISO 14001 certification in Serbia. For research purposes, secondary data from the World Bank were used, for the period from 2006 to 2023, using Pearson product-moment correlation. The results revealed very strong, positive and statistically significant correlations – between the number of ISO 14001 certificates and trade, the number of ISO 14001 certificates and gross domestic product and the number of ISO 14001 certificates and regulatory quality. The results of the research could be useful to policymakers, especially those in the field of environmental protection.

Key words: *EMS, Environment, ISO 14001, Trade, Pearson product-moment correlation.*

1. Introduction

Domestic and foreign economic activities that are necessary for economic growth and development participate in environmental pollution due to the

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production of greenhouse gas emissions (GHGs) (Mladenović, Sokolov-Mladenović, Milovančević, Marković & Simeunović, 2016) which are harmful because they affect global warming. The best-known GHGs are: carbon dioxide (CO_2) – the result of burning fossil fuels; methane (CH_4) – mostly comes from agriculture, namely animal husbandry; nitrogen dioxide (NO_2) – most often the result of certain industrial processes, the use of nitrogen fertilizers, but also the burning of fossil fuels; hydrofluorocarbons (HFC), perfluorocarbons (PFC) and sulfur hexafluoride (SF_6) and nitrogen trifluoride (NF_3) – synthetic gases. Considering the causal influence of CO_2 on environmental degradation (UNCTAD, 2020; Taub, Miller & Allen, 2008; Government of the Republic of Serbia and United Nations Country Team in Serbia, 2017), it is an unwritten rule among scientists in the field of ecological economics that CO_2 is taken as a representative (proxy) of GHGs in scientific research.

The essence of the concept of sustainable development is the interaction of economic and social development and the environment, while in the paradigm of sustainable development economic goals lose their relative importance, which makes this concept of development different from all previous concepts of economic development (Cvetanović & Mladenović, 2013). The concept of sustainable development can be realized only if all three of its components are respected: economic, ecological and social. As multinational corporations are the main drivers of foreign capital and their actions change the economic environment of the host country (Voica, Panait & Haralambie, 2015), if only one of the mentioned components is neglected, which is usually the environmental component, there is no concept of sustainable development.

A man made a promise to the environment to protect it. However, in 2022, pollution records were broken at the global level, which meant a broken promise – new maximums of CO_2 emissions were reached, temperature records were tumbling, and the negative impacts on the climate are getting stronger and faster (UNEP, 2023). The good thing is that „awareness of environmental problems is growing in most countries and it is believed that current development patterns cannot be sustained in the long term, thus, governments are increasingly enacting legislation aimed at protecting the environment, and customers are requiring their suppliers to incorporate best practices and demonstrate compliance with environmental requirements" (ISO, 2017, p. 8). „The publication of the ISO 14001 standard for environmental management systems (EMS) has proved to be very successful, as it is now implemented in more than 159 countries and has provided organizations with a powerful management tool to improve their environmental performance" (ISO, 2017, p. 8). „An environmental management system helps organizations to identify, manage, monitor and control their environmental issues in a „holistic" manner" (ISO, 2015, p. 3). ISO 14001 is a universal standard that maps the requirements for an environmental management framework that companies regularly deliver and achieve better environmental performance in reducing costs and waste, and express management and stakeholders who develop them in a sustainable way (Shah, Singh, Tripathi, Hussain & You, 2022).

Transnational companies represent key carriers of foreign direct investments (FDI) and key players in international trade (Stojanović Jovanović,

2008). With the FDI growth, CO_2 emissions in the host country also grow, because investors from countries with strong environmental protection laws seek refuge in countries where such regulations are weaker, thus, such countries are considered pollution havens. Numerous studies confirm that Serbia and the countries in the region are pollution havens (Jun, Zakaria, Shahzad & Mahmood, 2018; Acharyya, 2009; Koçak & Şarkgüneşi, 2018; Bakhsh, Rose, Ali, Ahmad & Shahbaz, 2017; Behera & Dash, 2017). The assumption is that countries with high ISO 14001 adoption rates absorb the largest share of world exports, thus, „if countries with high ISO 14001 adoption rates also absorb the bulk of world exports, then trade could become a vehicle to encourage ISO 14001 adoption" (Prakash & Potoski, 2006, p. 351).

This paper aims to determine whether the environmental issues and trade affect the ISO 14001 certification in the Republic of Serbia. The first part of the paper presents an overview of the previous research made on the subject of effects that environmental issues and trade have on ISO 14001 certification. The second part is about ISO 14001 certificates in Serbia and the world – a brief overview. The third part of this paper presents data and methodology used in study. The fourth part is about results and discussion about the research results, and the fifth part of the paper presents conclusions and guidelines for future research.

2. Literature review

A group of authors (Arimura, Darnall, Ganguli & Katayama, 2015) concluded that institutional pressures arising from differences in regulatory settings between countries, as well as within countries, are related to ISO 14001 outcomes, thus, Japanese ISO 14001-certified facilities will reduce the use of natural resources compared to non-certified facilities, as natural resources are strictly regulated in Japan. Another group of authors (Fura, Sroufe & Hajduk-Stelmachowicz, 2023) analyzed the benefits of EMS implementation, in accordance with the requirements of the ISO 14001 standard, on the example of manufacturing companies in Poland. For research purposes, primary data – collected by surveying companies, and secondary data – including financial information, were used. The results revealed significant differences in the companies' perception of benefits from the application of the ISO 14001 standard, depending on factors such as: origin of capital, geographical scope of activity, financial condition, etc. Among the most significant benefits are: compliance with legal requirements, image improvement, increase in the number of customers, as well as increase in operational efficiency. Authors (Vomero Reis, de Oliveira Neves, Hikichi & Gomes Salgado, 2018) came to the conclusion that the companies' benefits from ISO 14001 certification can be classified into internal, external and relations benefits. Also, they concluded that the impact of certification on financial and organizational performance is positive. They highlighted the following as important benefits in the company's business results: improvement of internal processes, prevention of potential problems and a larger number of stakeholders. Hayat and Das Lohano (Hayat & Das Lohano, 2024) analyzed the factors influencing a company's decision to adopt ISO 14001, on the example of 245 companies listed on the Pakistan Stock Exchange. The results

showed that older companies and those that have already implemented the ISO 9001 standard are more likely to adopt the ISO 14001 standard. Likewise, a manufacturing company's decision to adopt ISO 14001 is strongly influenced by pressure from foreign customers, as well as companies that show higher levels of competitiveness are more predisposed to ISO 14001 adoption. Gorlova (Gorlova, 2023) concluded that the sustainability of the model of individual environmental behavior of employees in the company represents the ability to transfer environmental values from the workplace to private life.

On the other hand, the results of research conducted by Gomes dos Santos and de Oliveira e Aguiar (Gomes dos Santos & de Oliveira e Aguiar, 2019) showed the existence of weak correlations among countries international trade and motives to get certification. Therefore, Bouziri and Diaye (Bouziri & Diaye, 2015) found that ISO 14001 standard's coverage rate is positively related with the number of ISO 9001 certifications, as well as with the trade openness measured as the ratio export to GDP. A group of authors (Liu, Yuan, Hafeez & Li, 2020) revealed that the existence of a positive motivation for trade openness in developing countries affects the growth of ISO 14001 certification, because there is an awareness that it is the main tool for dealing with trading partners that have a high level of environmental management on the international market.

3. ISO 14001 certificates in Serbia and the world – a brief overview

A recent survey conducted by Jovanović (Jovanović, 2023) included a questionnaire of 18 questions, where the greatest focus was placed on answers related to the implementation of the ISO 14001 standard and the inclusion of environmental activities in the company's operations. The research was conducted on a sample of 179 companies that have the obligation to submit data on sources of pollution to the National Register of Pollution Sources in Serbia. Of the 59 companies that responded to the questionnaire, 33 have implemented the ISO 14001 standard, while 26 companies have not. In companies that have declared that they have implemented the ISO 14001 standard, the management states that the implementation contributed to the improvement of environmental performance, market competitiveness, efficiency and profitability.

Serbia has significant natural resources (arable land, hydro potential, coal, wood, copper, etc.), however, the level of environmental degradation is high, mostly because individuals and organizations still do not have a developed awareness of the conservation of natural resources, which are limited and rare. Also, a big problem is the pollution brought to the Serbian market by polluters – foreign companies, in whose home countries environmental legislation is strict, and, as Serbia sees the key to the rapid economic growth in foreign capital, foreign investors are offered various incentives in order to attract them. The most endangered is the air. In recent years, air quality in Serbia has degraded to a large extent. „In total air emissions of pollutants, the greatest share related to SO_2 and NO_x, thus, the greatest share of SO_2 emissions is related to the section of electricity, gas, steam and air

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conditioning supply (about 92%), the section of manufacturing (about 3%), other sections of economic activities (about 3%) and emissions from households (about 2%)" (Statistical Office of the Republic of Serbia, 2022, p. 36).

Therefore, in the following figure (figure 1) it is possible to see the trend of the number of ISO 14001 certificates in the last decade in Serbia.
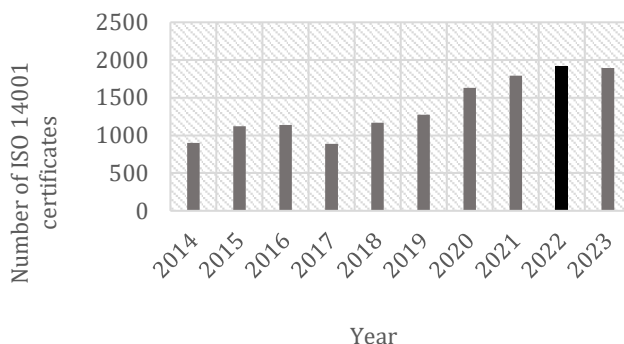

Figure 1: Number of ISO 14001 certificates in Serbia, in the last ten years.
Source: ISO (n.d.), Author's creation.

From 2014 to 2016, there was an increase in the number of ISO 14001 certificates in Serbia, hereafter, in 2017 there was a significant decrease (887), and from 2018 to 2022 there was a constant increase in the number of certificates, with the maximum value in 2022 (1921), while in 2023, that number dropped to 1892.

The following figure (figure 2) represents the trend of the number of ISO 14001 certificates in the last five years in world, by industrial sectors.
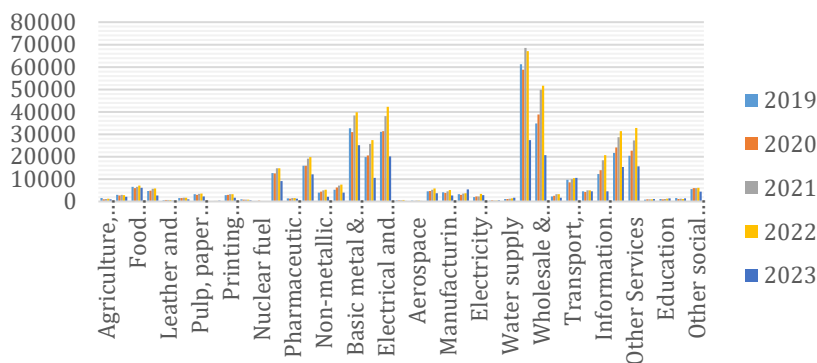

Figure 2: Number of ISO 14001 certificates in world, in the last five years, by industrial sectors.
Source: ISO (n.d.), Author's creation.

The largest number of ISO 14001 certificates was achieved in 2021 in the construction sector (68551), and then in the wholesale & retail trade (51695), in 2022. A significant number of certificates was also recorded in the electrical and

optical equipment sector (42235) in 2022, as well as in the basic metal & fabricated metal products sector (39741), and engineering services sector (31377), also in 2022. The lowest number of ISO 14001 certificates was achieved in the nuclear fuel sector (66) in 2023, the publishing company sector (151) in 2019, and the gas supply sector (330) also in 2019.

4. Data and methodology

For the purposes of this study, the data were collected from the official website of the World Bank – World Development Indicators and World Bank – Worldwide Governance Indicators. The observation period is from 2006 to 2023, given the availability of data. The research was conducted on the sample of one country – the Republic of Serbia. The objective was to examine the linear relationship between the following variables – *ISO* (the number of ISO 14001 certificates in Serbia), *Trade* (trade openness as the sum of exports and imports of goods and services measured as a share of gross domestic product (World Bank, n.d.a)), *CO$_2$* (emissions of carbon dioxide), *Energy* (energy intensity as an indication of how much energy is used to produce one unit of economic output (World Bank, n.d.b)), *GDP* (Gross Domestic Product per capita as the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products (World Bank, n.d.c)), and *Regulation* (regulatory quality as percentile rank among all countries (ranges from 0 – lowest, to 100 – highest rank) (World Bank, n.d.d)). To that end, Pearson product-moment correlation was applied, to analyze more than two variables at once. Correlation is a statistical technique used to describe the relationship between two variables. In other words, correlation is a numerical value that describes three characteristics of the relationship between two variables, X and Y: direction, shape, and strength. Most often, the term correlation is used in the context of a linear relationship between two or more continuous variables and is expressed as Pearson product-moment correlation (Schober, Boer & Schwarte, 2018). Table 1 gives definitions of variables with their unit and sources.

Table 1: Definition of variables, unit, and data source

Variable	Definition	Unit	Source
lnISO	The number of ISO 14001 certificates in Serbia	Total number	World Bank
lnTrade	Trade openness	% GDP	World Bank
lnCO2	CO$_2$ emissions	kt	World Bank
lnEnergy	Energy intensity	MJ/$2017 PPP GDP	World Bank
lnGDP	GDP per capita	Current US$	World Bank
lnRegulation	Regulatory quality	Rank (0-100)	World Bank

In order to achieve linearity, all values are logarithmized by the natural logarithm (ln). Statistical data processing was performed using IBM SPSS Statistics 25 software. The missing data for variable lnCO$_2$ are from 2021 and 2023, for lnEnergy is for 2023, and for lnRegulation is also for 2023.

5. Results and discussion

Before calculating the Pearson's correlation coefficient, the relationship of the variables represented by the scatter matrix is analyzed (figure 3).
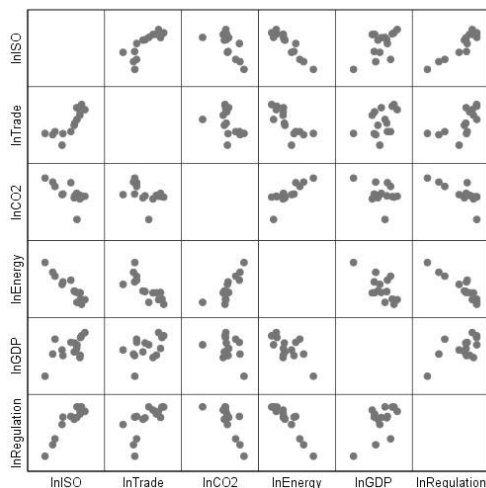

Figure 3: Relationship between the number of ISO certificates, trade openness, CO₂ emissions, energy intensity, GDP per capita, and regulatory quality in Serbia.
Source: SPSS output.

The figure shows potential bivariate relationships between the analyzed variables. It can be concluded that there is probably a positive, very strong linear relationship between lnISO and lnTrade, lnISO and lnGDP, lnISO and lnRegulation, lnTrade and lnGDP, lnCO$_2$ and lnEnergy, thus, positive strong linear relationship between lnTrade and lnRegulation, and lnGDP and lnRegulation. Furthermore, there is probably a negative, very strong linear relationship between lnISO and lnCO$_2$, lnISO and lnEnergy, lnTrade and lnEnergy, lnCO$_2$ and lnRegulation, lnEnergy and lnGDP, and lnEnergy and lnRegulation, as well as negative correlations that are not statistically significant (lnTrade and lnCO$_2$, and lnCO$_2$ and lnGDP). The next step is to calculate the Pearson's correlation coefficient (R).

Based on the results obtained for the entire observed period, from 2006 to 2023 (table 2), it can be concluded that there is a positive correlation between lnISO and lnTrade, due to the positive value of correlation coefficient (R = 0.844). Since $0.80 < 0.844 < 1$, this is a very strong correlation, thus, since $p < 0.01$, there is a statistically significant relationship between the observed variables. There are also five more positive, statistically significant and very strong correlations between lnISO and lnTrade, lnISO and lnGDP, lnISO and lnRegulation, lnTrade and lnGDP, lnCO$_2$ and lnEnergy, and two positive, strong and statistically significant correlations between lnTrade and lnRegulation, and lnGDP and lnRegulation.

Table 2: Correlation between the number of ISO certificates, trade openness, CO2 emissions, energy intensity, GDP per capita, and regulatory quality in Serbia, from 2006 to 2023.

		lnISO	lnTrade	lnCO₂	lnEnergy	lnGDP	lnRegulation
lnISO	R	1	0.844**	-0.649**	-0.948**	0.689**	0.903
	p		0.000	0.009	0.000	0.002	0.000
	N	18	18	15	17	18	17
lnTrade	R	0.844**	1	-0.418	-0.806**	0.711**	0.604*
	p	0.000		0.121	0.000	0.001	0.010
	N	18	18	15	17	18	17
lnCO₂	R	-0.649**	-0.418	1	0.806**	-0.344	-0.375**
	p	0.009	0.121		0.0000	0.210	0.002
	N	15	15	15	15	15	15
lnEnergy	R	-0.948**	-0.806**	0.806**	1	-0.728**	-0.884**
	p	0.000	0.000	0.000		0.001	0.000
	N	17	17	15	17	17	17
lnGDP	R	0.689**	0.711**	-0.344	-0.728**	1	0.537*
	p	0.002	0.001	0.210	0.001	0.000	0.026
	N	18	18	15	17	18	17
lnRegulation	R	0.903**	0.604*	-0.735**	-0.884**	0.537*	1
	p	0.000	0.010	0.002	0.000	0.026	
	N	17	17	15	17	17	17

R – Pearson's correlation coefficient; p – significance level; N – number of observations
**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).
Source: SPSS output.

There is a negative correlation between lnISO and lnCO₂, since there is the negative value of correlation coefficient (R = -0.649). Moreover, given that $0.60 < 0.649 < 0.799$, this is a strong correlation ($p < 0.001$, thus, there is a statistically significant relationship between the observed variables). There are also five more negative, very strong, statistically significant correlations between lnISO and lnEnergy, lnTrade and lnEnergy, lnCO₂ and lnRegulation, lnEnergy and lnGDP, and lnEnergy and lnRegulation.

As well, two negative correlations can be observed – one of medium strength (between lnTrade and lnCO₂) and the other is weak (between lnCO₂ and lnGDP), but they are not statistically significant ($0.121 > 0.001$ and $0.210 > 0.001$).

It is shown that greater market openness, regulatory quality and GDP per capita in Serbia will affect the increase in the number of ISO 14001 certificates (there is a strong positive influence on the ISO 14001 certification). On the other hand, it has been shown that the increase in CO₂ emissions and energy intensity has a negative effect on ISO 14001 adoption.

6. Conclusions

The contribution of this study lies in the ecological aspect of sustainable development, as it examines the relationship between environmental issues, trade and the number of ISO 14001 certificates in Serbia. The relationship between environmental issues (proxy CO_2 and energy intensity), market openness and the number of ISO 14001 certificates in Serbia was examined using Pearson product-moment correlation. The variables gross domestic product (GDP) and regulatory quality are also included in the analysis, as they are considered important for this study, and the idea is to extend the research with a regression analysis where these two additional variables would be taken as control variables. The research results revealed that there is a positive, very strong, statistically significant relationship between trade openness and the number of ISO 14001 certificates, which means that as the market openness of a country increases, so does the number of ISO 14001 certificates, because only in this way countries, and especially developing ones, can survive in the global market competitors – companies that are ISO 14001 certified and comply with strict environmental legislation. Another significant correlation was discovered – a very strong, negative, statistically significant relationship between number of ISO 14001 certificates and CO_2 emissions. This would mean that if the number of companies that adopt the ISO 14001 standard increases, the environmental responsibility and environmental protection activity will be greater, which will lead to a decrease in CO_2 emissions in the country.

The recommendation to future researchers of this issue is to expand the existing model with a regression model, as well as to have more research in this area in Serbia and the region.

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