

## WHAT IS THE APPLICATION OF SELECTED GREEN GROWTH INDICATORS IN WOOD-PROCESSING ENTERPRISES IN SLOVAKIA?

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### ABSTRACT

The aim of this paper was to identify the application of selected green growth indicators, specifically voluntary environmental policy instruments of in wood-processing enterprises in Slovakia. The mapping of the researched issue was carried out in the form of questionnaire. The evaluation of the questionnaire was performed by the single-proportion hypothesis test. Pearson's Chi-square test was used to verify the representativeness of the examined sample and the consistency of the questionnaire was confirmed using Cronbach's alpha. Based on the achieved results, it can be stated that at least half of the enterprises do not use green procurement and do not label their products with an eco-label. These companies have neither implemented an Environmental Management System nor an Environmental Management and Audit Scheme. The achieved results show that enterprises in the wood-processing industry in Slovakia mostly do not apply green growth indicators □ voluntary instruments of environmental policy.

**Key words:** green growth, green growth indicators, enterprises, wood-processing industry.

### INTRODUCTION

Mankind is currently facing the challenge of managing large environmental changes, such as climate change and its effects, rapid change in land use, biodiversity loss and much more. Even though the impact of systematic management of carried out behavior through politics is impossible to incite, the urgency of many future challenges requires the identification of further options for a rapid and far-reaching transformation to secure key planetary processes (ABSON *et al.* 2017; FOLKE 2019; MINÁROVÁ *et al.* 2020). For this reason, countries around the world seek to transform their industrial and economic structures with the goal to promote green growth (WANG *et al.* 2021). There are several definitions of green growth, but the most commonly used is the formulation of the OECD (CAPASSO *et al.* 2019). OECD (2011) defines green growth as an effort of the process of economic growth and development under the conditions of sustainable use of natural resources to ensure the continued provision of resources and environmental services on which our well-being depends. Green growth is a subset that defines strategies and develops measurable indicators to monitor progress towards sustainable development (PAN *et al.* 2018). Sustainability is one of the most important contributions of the wood processing industry (WPI) to green growth

(ŠULYOVÁ and KOCÁK 2020). The current situation in environmental policy and its partial strategies requires the application of voluntary instruments in the form of green growth indicators, namely EMAS, EMS, green procurement and environmental labelling. Voluntary instruments, complemented by appropriate innovative environmental management methods, are expected to become key environmental product policy instruments aimed at promoting sustainable production and consumption through eco-innovation of production and service processes and the open provision of environmental information to the consumer public (MAY *et al.* 2017). Voluntary instruments of environmental policy are agreements between industry and public programs that enterprises can use on a voluntary basis. Authors (MALÁ *et al.* 2019; BLASER 2021) see such agreements as opportunities to address environmental issues, in a flexible, low-cost way, building consensus between different stakeholders. On the contrary, others (STAHL 2014; LIANG *et al.* 2018; WIEGAND *et al.* 2022) believe that such agreements provide few environmental approaches. Wood is a renewable material that contributes to the income of the national economy and can be competitive in foreign markets, even though most wood-processing enterprises currently use outdated technologies (ARMIR *et al.* 2020; BLASER 2021). WPI in Slovakia consists of the woodworking, furniture and pulp and paper industries. It has enormous potential in terms of ecological orientation and it is necessary to use it as much as possible (MORESOVÁ *et al.* 2019; SEDLIAČIKOVÁ *et al.* 2021). Slovakia is relatively independent concerning imports of inputs from natural sources, it is built on a domestic resource base of a sustainable character. WPI presents an important area of industry for the Slovak national economy (SEDLIAČIKOVÁ *et al.* 2020; KRIŠTOFÍK and MEDZIHORSKÝ 2022; MALÁ *et al.* 2019). WPI has a long tradition in Slovakia and is one of the most important traditional industries (PALATOVÁ *et al.* 2019).

This paper aims to identify the application of selected green growth indicators, specifically voluntary instruments of environmental policy in wood-processing enterprises in Slovakia.

## METHODOLOGY

The methodology of the paper was divided into three stages. The first stage was focused on the analysis of secondary sources on the issue of green growth indicators and the wood-processing industry in Slovakia. At this stage, the scientific work methods of summarization, knowledge synthesis, analogy and deduction were used.

In the second stage, the primary data in the practice of WPI enterprise were analyzed, for which a survey method in the form of a questionnaire was used (TOMŠÍK 2017; PACÁKOVÁ 2009; RIMANČÍK 2007). Subsequently, the achieved results were evaluated by selected mathematical-statistical methods.

In the third stage, the results were evaluated through analogy, deduction, and summarization of the acquired knowledge.

The questionnaire contained a total of 20 questions, which were closed and semi-closed, with the answer option “other”. According to FINSTAT (2022) and SK NACE classification of economic activities, a total of 3807 enterprises operate in the WPI sector, which forms the scope of the basic population. This was corrected to 472 WPI enterprises due to the exclusion of the micro-enterprise segment. The questionnaire was sent to these enterprises. According to the recommendation of the European Commission no. 2003/361/EC, a micro-enterprise consists of 1 to 9 employees and the annual turnover does not exceed € 2,000,000. According to FINSTAT (2022), micro-enterprises present 87.60% of the wood processing industry. Due to the impact of the Covid-19 pandemic and the consequences of the ongoing

war in Ukraine, micro-enterprises challenge existential problems. For this reason, this segment of enterprises has only limited opportunities to introduce sustainable technologies, innovations, and green growth indicators. In the context of these facts, micro-enterprises were excluded from the survey.

The internal consistency of the questionnaire was verified by the Cronbach's alpha coefficient ( $\alpha$ ), where  $k$  is the number of items tested,  $s_i^2$  is the sum of the variance items, and  $s^2$  is the total variance. The Cronbach's alpha coefficient was determined by the following formula (CRONBACH 1951; MARKO 2016):

$$\alpha = \frac{k}{k-1} \times \left( 1 - \frac{\sum_{i=1}^k s_i^2}{s^2} \right) \quad (1)$$

According to RIMANČÍK (2007), Cronbach's alpha values of 0.7 and higher mean sufficient internal consistency.

To meet the condition for generalizing the measured data and obtained results to all WPI enterprises, it is necessary to fulfil the minimum research sample size ( $n$ ) determined by the following relation to the calculation under the conditions of an acceptable margin of error of 5% ( $e = 0.05$ ) and a confidence level of 95% ( $z = 1.95$ ) at known basic population ( $N = 472$ ) and at  $p$  level ( $p=0.05$ ) (FAERON 2017; LOUNGRATH 2017):

$$n \geq \frac{p \times (1-p)}{\frac{e^2}{z^2} + \frac{p \times (1-p)}{N}} \quad (2)$$

The questionnaire was sent to WPI enterprises through their e-mail contacts in the period from 01. 02. 2021 to 31. 01. 2022. The results of the questionnaire were processed in the Statistica program and a single-proportion hypothesis test was used to verify the assumed hypotheses, which is used to test the statistical hypothesis that the proportion of a certain value of a variable in the population equals a given constant. The test criterion is as follows (PACÁKOVÁ 2009; SODOMOVÁ 2000):

$$\mu = \frac{f - \varphi_0}{\sqrt{\frac{f \times (1-f)}{n}}} \quad (3)$$

The research sample should be representative of the population; therefore, it was verified using Pearson's Chi-square goodness-of-fit test based on two features, namely the size of the enterprise and the self-governing region in which the enterprise is located. Pearson's Chi-square test is one of the most known goodness-of-fit tests, which is based on the difference between observed ( $X_i$ ) and expected ( $Np_i$ ) frequencies. As reported by LYÓCSA *et al.* (2013), the test characteristic for the Chi-square test (where  $k$  is the number of addends) is:

$$\chi^2 = \sum_{i=1}^k \frac{(X_i - Np_i)^2}{Np_i} \quad (4)$$

The following hypotheses are assumed:

H1: It is assumed that at least half of Slovak WPI enterprises do not use green procurement.

Green procurement is a voluntary instrument that enterprises do not use effectively. The identified barriers to its use include financial constraints of contracting authorities, insufficient administration and fear of discrimination in the incorporation of environmental criteria into tender documents (MALATINEC 2021; SONNICHSEN *et al.* 2020).

H2: It is assumed that at least half of WPI enterprises in Slovakia do not use the Environmental Management System (EMS).

According to KRÁLIKOVÁ and RUSKO (2013), the EMS system is a more suitable tool for larger companies. Many small and medium-sized enterprises in Slovakia criticize it for its complexity, high implementation costs and lack of qualified employees to work with it (RUSKO *et al.* 2007; FUZI *et al.* 2020).

H3: It is assumed that at least half of WPI enterprises in Slovakia are not involved in the Environmental Management and Audit Scheme (EMAS).

70 enterprises in Slovakia have the EMAS designation, most of which operate in the construction sector (SAŽP 2022; MAJERNÍK *et al.* 2013). EMAS positively motivates companies to take a responsible approach and to improve environmental performance, nevertheless, the number of registrations has decreased (NOVELLI *et al.* 2020).

H4: It is assumed that at least half of Slovak WPI enterprises do not label their products with an eco-label.

The survey of the authors GUŠTAFÍKOVÁ (2014) showed that there has been a declining trend of a number of products with an environmental label since 2009. WPI enterprises do not see a relationship between rising demand and eco-labelling of products (MARKO 2019).

## RESULTS AND DISCUSSION

The calculated level of Cronbach's alpha coefficient ( $\alpha$ ) was 0.77, which means that the questionnaire is acceptable in terms of consistency. Using the above formula, it was possible to calculate the minimum sample size for the survey. The sample must consist of at least 212 WPI enterprises. 221 WPI companies took part in the survey, which shows that the results can be generalized to all WPI enterprises in Slovakia. Using Pearson's Chi-square goodness-of-fit test based on two features, it can be stated that the p-value is higher than  $\alpha$  ( $\alpha = 0.05$ ), and thus the research sample is representative according to the examined features (Tab. 1).

**Tab. 1 Results of Chi-square test.**

Chi-square	0.15
sv	7
p-level	0.988

In terms of enterprise size, the structure of the research sample consisted mainly of small enterprises (80.91%), medium-sized enterprises accounted for 17.89% and the least represented 4.20% were the large ones. According to the classification of economic activities, the research sample contained the most companies from the woodworking industry sector (44.98%), followed by furniture companies (18.44%) and the lowest share was represented by pulp and paper companies (8.09%).

To verify the validity of hypothesis H1 that at least half of Slovak WPI enterprises do not apply green procurement, a statistical verification was performed by the single-proportion hypothesis test with a result of  $p = 0.000$  (Tab. 3). From the authors' statements (JANSSEN and JAGER 2002; BLASCO *et al.* 2021) it can be deduced that WPI enterprises do not apply green procurement sufficiently, thus not supporting the sustainable use of natural

resources leading to a sustainable transformation process and especially innovation. Although green procurement contributes to nature protection and the fight against climate change, up to 62.90% of Slovak WPI enterprises do not use it (Table 2). Hypothesis H1 was confirmed with 95% confidence and it can be stated that WPI enterprises in Slovakia, not using green procurement, have a majority share.

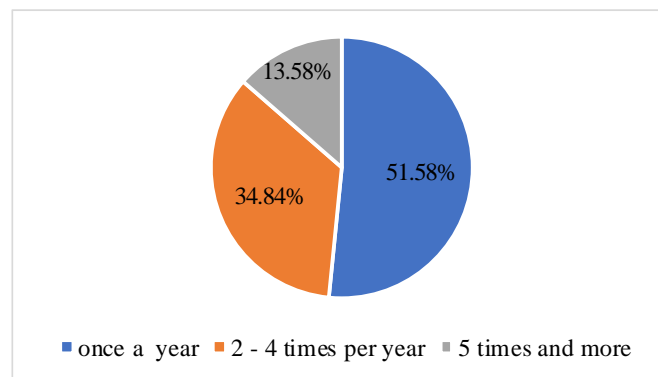
**Tab. 2. Frequency table of the sample.**

Green procurement	Absolute frequency	Cumulative absolute frequency	Relative frequency (%)	Cumulative relative frequency(%)
Yes	82	82	37.10	37.10
No	139	221	62.90	100.00
Total	221		100	

**Tab. 3. Hypothesis H1 test on the relative frequency.**

Hypothesis	Research area	Alternative hypothesis	<i>p</i>	<i>n</i>	<i>u</i>	<i>p-level</i>
H1	Non-green WPI enterprises	$\pi > 50\%$	62.90%	221	4.00	0.000

A question arises from the above facts, how often do WPI enterprises innovate their technologies, where it is assumed that the enterprises in question innovate their technologies only once a year. The percentages of individual time intervals are shown in Figure 1, and according to the results, most WPI enterprises innovate only once a year.



**Fig. 1 Time interval of innovations per year in the enterprises.** Source: authors

In the second hypothesis H2, it was assumed that at least half of WPI enterprises in Slovakia do not use EMS. Regarding the formulation of hypothesis H2, it was verified by the single-proportion hypothesis test. Based on the p-level result ( $p = 0.000$ ) (Table 5), hypothesis H2 was confirmed. In the survey, more than 90% of WPI enterprises in Slovakia do not use EMS (Tab. 4).

**Tab. 4. Frequency table of the sample.**

EMS	Absolute frequency	Cumulative absolute frequency	Relative frequency (%)	Cumulative relative frequency (%)
Yes	22	22	9.95	9.95
No	199	221	90.05	100.00
Total	221		100	

**Tab. 5. Hypothesis H2 test on the relative frequency.**

Hypothesis	Research area	Alternative hypothesis	$p$	$n$	$u$	$p$ -level
H2	EMS	$\pi > 50\%$	90.05%	221	19.89	0.000

In connection with the indicator of voluntary instruments of environmental policy, the Environmental Management and Audit Scheme is also interconnected, which motivates enterprises to take a responsible approach and to improve environmental performance. The available data for this green growth indicator showed that up to 92.31% of WPI enterprises do not use EMAS (Table 6). Based on the single-proportion hypothesis test results with a result of  $p = 0.000$  (Table 7), hypothesis H3 was confirmed. It can be deduced that there is a majority of WPI enterprises not using the EMAS.

**Tab. 6. Frequency table of the sample.**

EMAS	Absolute frequency	Cumulative absolute frequency	Relative frequency (%)	Cumulative relative frequency (%)
Yes	17	17	7.69	7.69
No	204	221	92.31	100.00
Total	221		100	

**Tab. 7. Hypothesis H3 test on the relative frequency.**

Hypothesis	Research area	Alternative hypothesis	$p$	$n$	$u$	$p$ -level
H3	EMAS	$\pi > 50\%$	92.31%	221	23.61	0.000

The last surveyed area was the labelling of products with an environmental label. The eco-label takes into account the whole transformation process of the product up to its disposal or recycling. Based on the results of the single-proportion hypothesis test, in which the frequency was set at 50% and the  $p$ -level ( $p = 0.000$ ) is higher than  $\alpha$  ( $\alpha = 0.05$ ), thus H4 was confirmed (Tab. 8 and Tab. 9). It can be stated that at least half of WPI enterprises in Slovakia do not label their products environmentally.

**Tab. 8. Frequency table of the research sample.**

Environmental labelling	Absolute frequency	Cumulative absolute frequency	Relative frequency (%)	Cumulative relative frequency(%)
Yes	51	51	23.08	23.08
No	170	221	76.92	100.00
Total	221		100	

**Tab. 9. Hypothesis H4 test on the relative frequency.**

Hypothesis	Research area	Alternative hypothesis	$p$	$n$	$u$	$p$ -level
H4	Environmental labelling	$\pi > 50\%$	76.92	221	9.50	0.000

The analysis of the obtained results showed (Table 3) that WPI enterprises in Slovakia do not procure inputs and products into the transformation process through green procurement. The information on the implementation of the National Action Plan for Green Procurement, where green contracts accounted for only 3.5% of the total number of

contracts, also corresponds to the above facts (MINZP, 2018). According to MALATINEC (2021) and the OECD (2022), green procurement also contributes to energy savings and helps companies to reduce costs and thus save money. An example of this is the purchase of energy-saving products and technologies that significantly reduce expenses on electricity and gas, which constantly grow due to the crisis in Ukraine. In the context of this, the survey examined the interval of innovation in WPI enterprises. The authors LORINCOVÁ *et al.* (2020) and ALNUAIMI *et al.* (2021) point out that innovation activities are one of the basic preconditions for the success of WPI enterprises based on sustainable development in the market economy. On the contrary, WPI enterprises reported in the survey the innovation of technologies only once a year. The findings do not correspond to the survey KOCIANOVÁ *et al.* (2022), where up to 67.52% of Slovak WPI enterprises were interested in the development of production technologies. In recent years, attention and support for environmental protection, which is also associated with certification, has been growing (DARDANONI and GUERRIERO 2021). The importance of wood and paper products from certified sustainable sources has been increasing in the last two decades, which is in parallel with the overall interest in global sustainability issues. The association of certified wood and paper products with legality issues, monitoring the source of origin of supplies, and prevention of illegal logging has been proven (DE PELSMACKER *et al.* 2005; FISCHER *et al.* 2005). The most well-known voluntary certifications include EMAS and EMS, while the authors MAJERNÍK *et al.* (2013) and BARÓN *et al.* (2020) point out their significance for the management and protection of the environment by enterprises. For this reason, hypotheses H2 and H3 were verified by the single-proportion hypothesis test, which predicted that at least half of WPI enterprises in Slovakia do not use EMS and EMAS. After performing a statistical verification with a p-level result ( $p = 0.000$ ) for both hypotheses, they were both confirmed. Rates of up to 92% for WPI enterprises were demonstrated for EMAS and 90% for EMS. The last hypothesis, H4, examined whether WPI enterprises label products with an eco-label, which is important for sustainability. LARSON *et al.* (2011) agree and claim that eco-labels provide manufacturers with an economic incentive to create products that reduce negative environmental impacts. Despite this mentioned advantage, the single-proportion hypothesis test with a result of  $p = 0.000$  confirmed the assumption that the non-eco-labelled WPI enterprises present the majority share. This paper aimed to identify the application of selected green growth indicators, specifically voluntary instruments of environmental policy in WPI enterprises in Slovakia. Based on the results of the survey, it can be stated that the majority of WPI enterprises in Slovakia do not apply the indicator of voluntary instruments of environmental policy. As previous surveys show (MELICHOVÁ and SEDLIAČIKOVÁ 2021; MELICHOVÁ *et al.* 2021a; MELICHOVÁ *et al.* 2021b; MELICHOVÁ *et al.* 2021c), WPI enterprises consider the orientation of producers in the context of environmental pollution to output control as the biggest internal barrier to non-application of the green growth indicators in question, and the lack of financial support from the state as the external barrier.

## CONCLUSION

The paper aimed to identify the application of selected green growth indicators, specifically voluntary instruments of environmental policy in wood-processing enterprises in Slovakia. 221 Slovak enterprises in the wood processing industry took part in the survey. The results clearly showed the non-application of green procurement in wood processing enterprises in Slovakia. Small, medium, and large wood processing enterprises in Slovakia innovate their technologies only once a year, which is insufficient from the point of view of

sustainability. Also, over half of the companies have not implemented an Environmental Management System or an Environmental Management and Audit Scheme. The aim of the contribution was met and based on the results; it can be stated that Slovak wood processing enterprises do not apply the indicator of voluntary instruments of environmental policy in their enterprises. The results of the research can serve as a basis for the development of wood processing enterprises in the context of sustainability. For the success of wood processing enterprises, it is vital to invest and apply the voluntary instruments of environmental policy, which will help increase their performance and competitiveness. The presented findings in the research issue are an incentive for a further detailed examination of the reasons for the lack of interest in green growth indicators.

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