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# PROPOSAL OF A MODEL FOR THE IMPLEMANTATION OF ENVIRONMENTALLY SUSTAINABLE PURCHASING IN WOOD PROCESSING INDUSTRY

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## ABSTRACT

Environmentally sustainable purchasing, often called green purchasing, is a method of purchasing with the help of which public and private institutions purchase goods and services with the lowest possible negative impact on the environment and thus replace goods or services that would normally be purchased to perform the same function but with worse impact on the environment. The main objective of the paper is to propose a model of environmentally sustainable purchasing implementation in wood processing companies in Slovakia. The model is compiled based on the evaluation of the survey and the subsequent confirmation of the established hypotheses. The results confirmed that purchasing process companies improve the efficiency of business processes by introducing environmental requirements in their supply chains. Identified relationships will contribute to the implementation of environmentally appropriate purchasing by wood processing companies.

**Keywords:** wood processing industry, environmentally sustainable purchasing, green supply chain, companies' performance.

## INTRODUCTION

Environmentally sustainable purchasing or green purchasing is generally defined as purchasing a product that has a reduced negative effect or increased positive effect on human health and the environment, when compared with competing products that serve the same purpose. Incorporating environmentally sustainable purchasing in the procurement process considers raw materials acquisition, and production, fabrication, manufacturing, packaging, distribution, operation, maintenance, reuse, and disposal of the product. This term includes sourcing recyclable products, recycled products, reusable products, and products that conserve energy or natural resources. Environmentally sustainable purchasing is used interchangeably to mean either environmentally sustainable purchasing or an environmentally sustainable product (Esfahbodi *et al*., 2017). It involves choosing products and services that will have no negative effect on the human body, society and the environment when competing with products and services that serve the same purpose, adding to the traditional parameters of price, quality and functionality (Ramayah *et al*., 2010).
Environmentally sustainable products are products with better environmental performance compared to competing products or services that serve the same purpose. Buying and using sustainable products results in benefits for the environment, improves efficiency, and often

saves money. In recent years these practices have become an integral part of public procurement (Chaihanchanchai and Anantachart, 2023).
Green products are more environmentally sound with lower water and electricity consumption, green manufacturing processes etc., they avoid containing toxic substances, and consist of harmless alternatives, including non-toxic, water-based, hypoallergenic, and biodegradable cleaning agents, zero volatile organic compounds paints, certified organics (PEFC, FSC), are recyclable, do not contribute to landfill accumulation (Likumahwa *et al*., 2019).

However, with environmentally sustainable purchasing, also known as green procurement, or responsible procurement, considerations such as social, ethical, and environmental are taken into account when making purchasing decisions. When making such a purchase, the following issues should be considered: whether the purchase is necessary; materials the products are made of; the conditions under which they have been made; distance they have travelled; product usage/consumption; and the method of disposal (Harza, 2016). The benefits of adopting an environmentally sustainable purchasing approach are numerous. The receiver of the benefits can be the environment, the purchaser or the supplier. Benefits to the purchaser can include securing best value for money and achieving more efficient use of public resources; generating financial savings through greater energy efficiency, reduced waste (including reduced packaging to waste), reduced use of water, and reusing materials and products, thereby lowering the cost of a product over its life cycle; achieving positive publicity associated with the purchase and use of such products and services and a good environmental and social responsibility records. It promotes innovation and encourages suppliers to invest in sustainable products, processes, and technologies (Slaštanová and Paluš, 2022).

Suppliers can be socially responsible by adopting ethical practices, forest certification (PEFC, FSC) and being compliant with legislative obligations and other actions that benefit society such as equality, diversity, collection of used products, regeneration of materials and recycling. Social impacts that can be taken into consideration across sustainable procurement activities include support and promotion of fair-trade suppliers and adoption of ethical practices by government; due consideration of the impacts on human health; supporting local small businesses; assessing the impact of occupational health and safety concerns; staying in line with rules and regulations (Elbarky *et al*., 2023).

The wood processing industry is a labour-intensive industry that uses wood as its basic material. Additional materials such as metal, foam, fabric and plastic are used in the production process, mainly in the furniture industry. By applying it in practice, Green Supply Chain Management (GSCM) of a company can improve its performance and competitiveness through compliance with environmental regulations (Teixeira *et al*., 2020). Overall, GSCM practices are proven to vary across industries. According to Susanty *et al*. (2017), the relationship between the implementation of GSCM practices and environmental performance varies due to different scale and type of business. Huang *et al*. (2012) clearly confirmed differences in GSCM practices in the woodworking and furniture manufacturing sectors compared to other industrial sectors. There are many reasons why businesses implement a green supply chain. One of the reasons is to improve competitiveness through performance improvement, specifically from environmental, operational, economic and social aspects (Likumahwa *et al*., 2019). Modern companies have understood the importance of solving environmental problems through the introduction of GSCM in order to maintain competitiveness and obtain an improvement in the performance of their enterprises (Sarkis *et al*., 2011). The implementation of GSCM practices in the furniture industry was the subject of research by authors such as Teixeira et al. (2020) in USA, Alvarenga and Santori

(2015) in Brazil, Susanty *et al*. (2017) and Djunaidi *et al*. (2018) and Likumhwa *et al*. (2019) in Indonesia. The research results of Zhu and Sarkis (2004) in China showed that companies with a higher level of GSCM implementation had better performance (environmental and economic). The following research results of manufacturing enterprises in China showed that GSCM had a significant impact on company performance (Zhu *et al*., 2012). Another survey among enterprises in China (Liang and Chang, 2008) confirmed the positive impact of GSCM implementation on the performance of SMEs. In the United States, the results of the study (Green *et al*., 2012) also confirmed that the implementation of GSCM practices in enterprises had positive effect on business performance. Companies believe that GSCM will increase their performance and competitiveness (Rao and Holt, 2005). Choosing a green supplier is a key strategic task for developing a sustainable supply chain partnership. All environmental, social and economic dimensions must be taken into account at choosing a suitable supplier that can increase the performance of the supply chain. Part of the supplier selection process is the evaluation of suppliers in relation to the important aspects of the supply chain, production management and operations (Motwani and Youssef, 1999). Sarkis *et al*. (2011) suggests that the rationale for implementing environmentally sustainable purchasing and responsible supply chain management practices can be built on two supporting theories. The first is interest group theory, according to which companies can integrate environmental or social issues into purchasing as a response to interest group pressure, while it is assumed that socially and environmentally responsible purchases are made in response to external stakeholder pressures (Ferri and Podrini, 2017, Sarkis et al. 2011, Zhu and Sarkis 2004). Companies can achieve better supply chain performance by collaborating with multiple stakeholders (Narasimhan *et al*., 2008; Wolf, 2014). Interest group theory also claims that responsible or sustainable managed purchasing is the result of a company's reactive behaviour to the pressure of interest groups, through which companies aim to reduce or prevent attacks and criticism from external entities (Hofmann and Col, 2014; Surroca and Col, 2013). The second theory suggests that companies sometimes have a more proactive approach and effort to implement responsible or sustainable purchasing practices because they are aware of the benefits it can bring. This perspective suggests that socially and environmentally responsible purchasing can contribute to increasing the competitive advantage of companies (Sarkis *et al*., 2011). Benefits can result from better or unique resources or capabilities (Reuter et al. 2010), reduced costs through eco-efficiency, improved product quality, new revenues generated in niche markets, improved image and reputation (Esfahbodi *et al*., 2017; Rao and Holt, 2005).

Enterprises by creating requirements for input products and services (nature-friendly products, recyclable products, recyclable packaging of products and products with a reduced content of toxic substances) and requirements for the supplier (established environmental management system at the supplier, assessment of product life cycle by the supplier, ability of the supplier to minimize pollution and harmful waste) will support/create green production in their company. Green production improves business processes, which leads to an improvement in environmental performance, which is subsequently reflected in the greening of processes and in an improved (ecological) image of the company.

Jiang and Bansal (2001) claim that the benefit of the introduction of environmentally sustainable purchasing is mainly the improvement of the state of the environment, the reduction of costs in the area of consumption of raw materials, waste management, reduction of product failure, reduction of the number of failures and accidents in technological systems, improvement of work safety and emergency readiness, improvement of environmental indicators, reduction of energy consumption and overall improvement of the economic and environmental efficiency of the enterprise, reduction of the environmental

burden, improvement of the environmental profile. Wolf (2014) gives many examples of environmentally beneficial characteristics such as products and services that save energy and water, minimize waste generation, products from recycled materials, energy from renewable sources, etc. By purchasing green, it is possible to increase the share of products made from recycled materials (Hazra, 2016). Also, Ramayah *et al*. (2010) and Turner (2010) claim that businesses that implement environmentally sustainable purchasing as an activity aimed at eliminating waste can save additional costs. Rao and Holt (2005) found in their research that implementing environmentally sustainable purchasing can improve a company's competitiveness and economic performance. Porter (1991) claims that companies can reduce production costs and increase economic efficiency by applying environmental initiatives.

The main aim of this study is to propose a model of environmentally sustainable purchasing implementation in the wood processing companies. The model is compiled based on the evaluation of the survey and the subsequent confirmation of the established hypotheses.

## MATERIALS AND METHODS

Firstly, four hypotheses as an elementary starting point were established and were tested using the data collected from the survey. Based on the literature review, the following hypotheses were determined:

Hypothesis 1: Companies with an established social responsibility policy or environmentally sustainable purchasing policy more significantly influence the greening of the supply chain.

Hypothesis 2: The introduction of environmentally sustainable purchasing improves the efficiency of companies' environmental processes.

Hypothesis 3: Pressure from stakeholders is the reason for introduction of environmentally sustainable purchasing.

Hypothesis 4: The introduction of environmentally sustainable purchasing improves the competitiveness of businesses and economic performance.

Based on the literature review and established hypotheses, this research proposes a conceptual model as shown and Fig. 1. The model demonstrates a network of relationships among the variables and the proposed linkages.

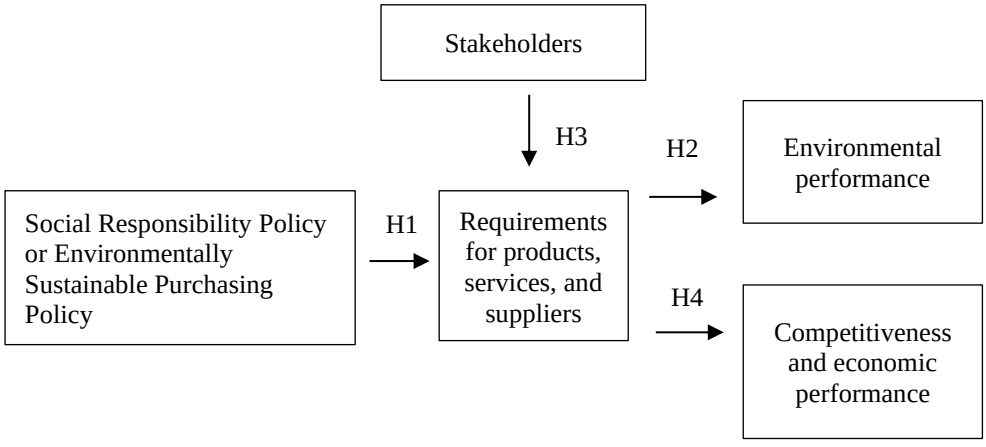


**Fig. 1 The conceptual model.**

Hypothesis testing is used to assess the plausibility of a hypothesis by using sample data. Statistical analyses test a hypothesis by measuring and examining a random sample of

the population being analysed. First, a tentative assumption is made about the parameter or distribution. This assumption is called the null hypothesis and is denoted by H0. An alternative hypothesis (denoted Ha), which is the opposite of what is stated in the null hypothesis, is then defined. The hypothesis-testing procedure involves using sample data to determine whether or not H0 can be rejected. If H0 is rejected, the statistical conclusion is that the alternative hypothesis Ha is true.

The evaluation of the implementation of environmentally sustainable purchasing in the wood processing sector in the Slovak Republic was carried out using an online survey. The basic method of data collection was a questionnaire, which is a research evaluation tool to quickly find out information about the knowledge, opinions or attitudes of respondents about the given issue. The questionnaire was compiled and sent out as an electronic online questionnaire, proceeded by a telephone call or a personal inquiry during autumn 2021. The questionnaire contained questions compiled on the basis of theoretical assumptions about the functioning of the process of green purchasing in companies. Companies operating in all subsectors of the wood processing industry were interviewed – wood production and wood trade, pulp and paper production, sawmills, furniture production, production of wood-based panels, printing, wood fuel, wooden constructions, including their suppliers of wood raw material in Slovakia.

The specific objective of this research was to propose a model of environmentally sustainable purchasing in the wood processing industry. The methodological approach of the research was as follows: 1. Establishment of hypotheses: based on theoretical knowledge. 2. Compilation of the questionnaire: The questionnaire consisted of 3 parts – the first part was focused on business data, the second part examined how the respondent understands the environmentally sustainable purchasing and the last part was focused on GSCM, improvement of business processes, implementing environmentally sustainable purchasing, stakeholders, improving the competitiveness of enterprises by implementing the environmentally sustainable purchasing. 3. Collecting the data: Setting a minimum sample of respondents. The questions were closed-ended and used the Likert scale - the respondents had the opportunity to express their agreement or disagreement with the statement on a four-point scale where 1 means agreement and 4 disagreement. 4. Processing the data: The database of answers was processed in the statistical software SPSS. Using the descriptive statistics; namely frequency analysis, the percentages of responses to individual questions were evaluated. 5. Analysing the impact of environmentally sustainable purchasing: the established hypotheses H1, H2, H3, H4 were tested using the Mann Whitney U test. 6. Proposal of model of environmentally sustainable purchasing: hypothesis results. The minimum sample of respondents was calculated from the total size of the population of 15,513 enterprises (Kovalčík, 2018), with a margin of error of 5%, a variance of 50% and a confidence level of 90%. The required minimum sample then was 266 companies that needed to be surveyed. During the survey, we were able to collect questionnaires from 320 respondents. The evaluation of the data was carried out using statistical analyses in MS OFFICE EXCEL software.

## RESULTS

Based on the results of the empirical study and the confirmation of hypotheses, it is possible to propose objective, specific procedures, in the field of environmentally sustainable purchasing, to be implemented into the company policies in the wood processing industry. Becoming an environmentally responsible business is a way to stay on trend in today's

changing market and deal with environmental pressure. If companies do not try to follow the path of sustainability and ecology, it is very likely that they will be overtaken by the competition. Businesses must be able to prove their environmental performance. It gives an answer to why WPI companies should implement the concept of environmentally sustainable purchasing in their purchasing policies. The model of obtaining a comprehensive competitive advantage after implementing environmentally sustainable purchasing is shown in Fig. 2. The model schematically identifies all the processes that are part of the implementation. The proposed model consists of several phases, the relationship between them have been identified and demonstrated:

1. social responsibility policy or environmentally sustainable purchasing policy introduce and support environmental requirements for products, services and suppliers,
2. introduction of requirements for products, services and suppliers leads to the improved environmental performance,
3. introduction of requirements for products, services and suppliers leads to the increased competitiveness and economic performance.

Direct or indirect relationships between the processes presented in the model are highlighted through defined research hypotheses. The obtained research results indicate the importance of the initial phase itself, in which companies introduce environmentally sustainable purchasing, which includes requirements for the supply chain, including requirements for green products or services, as well as requirements for the suppliers themselves and their processes, in order to build and manage green supply chains. By creating requirements for suppliers and products or services, the company moves towards environmental performance. Environmental performance results in increased environmentally responsible business performance of the company. By creating requirements for suppliers and products or services, company increases its competitiveness and economic performance. The mentioned relationship and compliance with the entire model may contribute to the understanding, functioning and implementation of environmentally sustainable purchasing in WPI enterprises.

The reliability of factors regarding the agreement of companies was tested by using the Cronbach's alpha coefficient. A reliability coefficient of 0.95 was considered as very high for the level of item consistency. Established hypothesis H1 that "Companies with an established environmentally sustainable purchasing policy or social responsibility policy, more significantly influence the greening of the supply chain", is confirmed. This hypothesis was applied only to companies with an established environmental policy or social responsibility policy. Companies with an established policy of social responsibility showed statistically significant differences connected with the environmental requirements in the purchasing process compared to those without such a policy in place. This has been proved specifically for environmentally friendly products ($U= 834.0$, $\alpha<0.001$), recyclable products ($U = 489.0$, $\alpha<0.001$), recyclable product packaging ($U = 1084.5$, $\alpha<0.001$) and products with a reduced content of toxic substances ($U = 709.5$, $\alpha<0.001$), that are part of the companies's purchases. At the same time, these companies have established requirements for suppliers, specifically they required an established environmental management system, the ability of the supplier to reduce the consumption of materials and energy, a green image of the supplier and green innovativeness, but their introduction is not influenced by the existence of a social responsibility policy in the company. Based on the results, the established hypothesis H2 "The introduction of environmentally sustainable purchasing improves the efficiency of environmentally performance" was confirmed. It was confirmed that companies with an established environmentally sustainable purchasing recorded an

improvement in the efficiency of business processes, specifically in the greening of processes (U = 10377.0; $\alpha<0.001$).
Hypothesis H3 "Pressure from stakeholders is the reason for introduction of environmentally sustainable purchasing" was not confirmed. Factors characterizing stakeholders represent environmental performance and social interest, which could be a reason for introducing environmentally sustainable purchasing. However, the influence of these factors was not shown. Therefore, it can be concluded that companies do not introduce environmentally sustainable purchasing due to pressure from the stakeholders (environmentally responsible business performance), but from the internal "conviction" of the company (company image, economic performance and competitiveness). The established hypothesis H4 "The introduction of environmentally sustainable purchasing improves the competitiveness of businesses" was confirmed. Enterprises with established environmentally sustainable purchasing experienced an improvement in competitiveness and economic performance (U = 9686.0; $\alpha<0.001$).

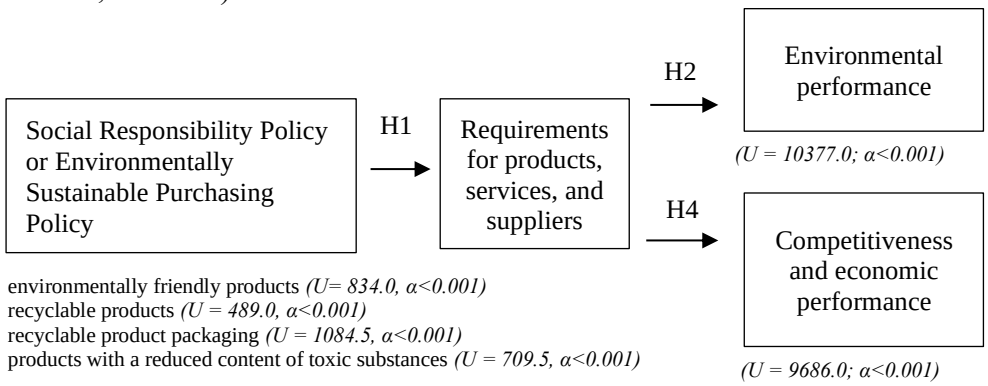


**Fig. 2 Proposal of a model for the implementation of environmentally sustainable purchasing**

## DISCUSSION

As a part of the questionnaire results, companies considered environmental requirements related to products being more important in the purchasing process compared to requirements for suppliers. However, suppliers remain key players keeping the environmentally sustainable purchasing work well in a business. It can be concluded that companies with an established policy of social responsibility, compared to those without such a policy in place, significantly influence the greening of products or services, thus indirectly (through requirements for products and not directly to the supplier) they also affect the greening of the supply chain. A study by Rao and Holt (2005) showed positive results in the introduction of environmental requirements for suppliers in improving the competitive advantage. Therefore, in their research, they suggested that companies should work closely with suppliers and integrate them into their business processes, thus achieving joint environmental goals. According to the results of the survey, companies perceive the efficiency of business processes by incorporating environmental requirements into the purchasing process. With the environmentally sustainable purchasing comes the pressure on businesses from both internal and external stakeholders, such as customers, employees, unions, shareholders, business partners, governments, non-governmental organizations and the media, which show a growing concern for the environment (Surroca *et al.*, 2013). The research investigated interest group pressure as a reason for the introduction of environmentally sound purchasing, which was based on interest group theory, according to

which companies can integrate environmental and social issues into purchasing in response to stakeholders' pressures. The second theory builds on the dependence on resources that businesses need to create stronger economic performance and competitive advantages, i.e. internal pressure (Cao, 2011; Ferri and Podrini, 2017). We found out that the WPI companies in Slovakia decide in favour of the introduction of environmentally sustainable purchasing due to the improvement of their economic performance and competitiveness, and not because of the pressure from external stakeholders. Competitiveness is important for maintaining productivity growth and raising the level of the economy (Likumahwa *et al*., 2019). Companies improve their competitiveness, image and can entry more easily into new markets, obtain licenses and certificates due to adopting environmentally sustainable purchasing. Similar results were revealed by Wagner and Schaltegger (2004), who considered comparable factors as improving the image of the company, increasing sales, increasing market share, improving management and employee satisfaction, increasing profits, saving costs, increasing productivity, etc. for measure competitiveness in manufacturing companies in the EU.

There are research gaps that could be explored based on a literature review. Several authors (Teixeira et al., 2020; Green et al., 2012; Likumahwa et al., 2019; Rao and Holt, 2005) established a relationship between environmental performance and competitiveness and economic performance. Future research potential lays in predicting the impact of environmental performance on increased competitiveness and economic performance. This effect has not been directly investigated in our study.

## CONCLUSION

As more procurement managers understand the link between broader environmental and social issues, and purchasing decisions, sustainable strategies are being adopted to reduce the adverse environmental and social impacts of business purchasing decisions. Environmental, health and safety issues are increasingly integrated into strategic sourcing. Waste, emissions, and environmental risks are often directly linked to the quantity and quality of goods and raw materials, the certification of products that companies procure. This proposed model for the implementation of green procurement is intended to assist enterprises in the WPI in introducing such procurement into their policy, which will help them increase sustainable development, as well as their competitiveness and economic performance. Following the determined hypotheses and results of their statistical testing we can confirm a significant influence of the environmentally sustainable purchasing policy on the improvement of companies' competitiveness and economic performance. The evaluation of the questionnaire helped to design a relation model for more effective implementation of environmentally suitable purchasing into company policies and thus increase their economic performance and competitiveness. The relationships mentioned above can contribute to facilitating the implementation of environmentally appropriate purchasing practices in wood processing companies.

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