NATURAL RESOURCE TAX AND ITS EFFECTS ON PACKAGING INDUSTRY TRENDS

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Abstract
One of the main tools for promoting sustainability and reducing environmental pollution is the Natural Resources Tax (hereinafter NRT). It influences the development trends of the packaging industry, promoting the transition to sustainable solutions, for example, reducing the amount of solid household waste produced and disposed of in the environment and significantly reducing the quantity of resources used in production. The aim of the study was to investigate and assess the impact of the NRT on the sustainability of the packaging industry and provide recommendations for its more effective implementation. This research paper used a narrative review and scoping review of the analytical literature, which provided an understanding of the operating principles of the NRT and its impact on packaging trends, paying close attention to tax policies aimed at both recyclable and non-recyclable plastic packaging. In addition, the motivation of packagers to prefer recyclable packaging solutions was studied. The study includes an analysis of the operating principles of the NRT, discusses practical aspects related to the choice of plastic packaging, and addresses the challenges faced by manufacturers in adapting to the new tax regulations. The study used the monographic method, analysis and synthesis methods as well as the graphical method. An in-depth assessment revealed that the NRT is an indirect determinant that influences and shapes trends in the packaging industry, as in the current situation, market demand has a more significant role in the choice of packaging materials.
Keywords: packaging industry, food industry, environmental policy, environmental tax, sustainability.

Introduction

Nowadays, an increasing amount of attention is being paid to packaging sustainability issues, with the main emphasis being on the choice and recycling of packaging materials. According to the Statistical Office of the European Union's Eurostat data, the amount of packaging waste has been gradually decreasing in recent years, however, in the period from 2011 to 2022, it had a tendency to increase. In the European Union in 2022, a total of 83.4 million tons of packaging were used, which is approximately 186.5 kg packaging waste per capita (Eurostat, 2024).

There has always been a certain contradiction between industrial development and its impact on the environment. In the modern entrepreneurship world, the main goal is profit, leaving the environmental impact of the production process in the background. This approach has led to rapid resource loss and environmental pollution, negatively impacting the overall ecosystem. Research conducted to this date has shown that Environmental taxes play an important role in contributing to the symbiosis of the economy and ecology (Hua, 2024). They are one of the sustainability policy instruments that limit environmental pollution, promoting economic growth (He et al., 2023).

In the European Union, Environmental taxes are referred to four large groups: transport, energy, resources and pollution. The packaging industry affects both the number of resources and the amount of pollution caused by its activities. As countries with the most effective implementation of Environmental taxes, the Scandinavian and Baltic countries are indicated (Ziolo et al., 2019).

Nowadays, the packaging industry rapidly develops to meet the needs and demands of consumers. Additionally, plastic pollution in the environment is a growing concern, despite efforts to reduce plastic waste. According to data provided by the global data and business intelligence platform Statista.com, the plastic packaging market is on a growing route – in 2023 it was 396 billion US dollars, but in 2034 it is predicted that the market size will be almost twice as large as 637 billion US dollars (Statista, 2025).

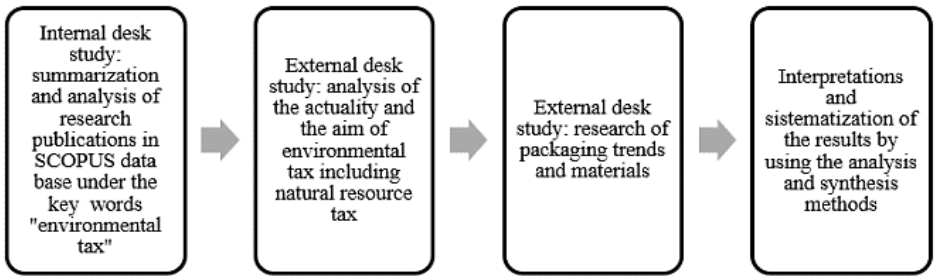
Nowadays, a tendency to view packaging as a sustainable solution for protecting food products and reducing waste, emphasising packaging and sustainability, but not sustainable packaging is visible (Verma et al., 2024).

Thus, the authors set the goal of the study to assess the impact of Environmental tax, entailing Natural Resource tax on the choice of packaging materials and design. Research tasks: 1) analyse previously conducted studies on the principles of operation of Natural Resource tax in the packaging industry, 2) collect information on packaging trends in the food industry, 3) provide a summary of problems, weaknesses and recommendations for improvement.

Materials and Methods

The study used a narrative review to provide a comprehensive overview of Environmental tax based on the authors' perspective. The monographic method was used to obtain a comprehensive overview of the publications published in the scientific database Scopus in the period from 2011 to 2024, which were searched for using the keywords 'environmental tax' and 'packaging trends' mentioned in scientific studies published after 2023. In this current study, the author concentrated on Scopus database papers because Scopus is one of the largest abstract and citation databases, including both papers, book chapters and patents, trade publications across multiple disciplines, which was particularly important for the current study. The methods of analysis and synthesis were used to assess the impact of the Natural Resource tax on packaging industry trends, and the graphical method to reflect the information obtained 'Figure 1'.

Figure 1
Research methodological steps

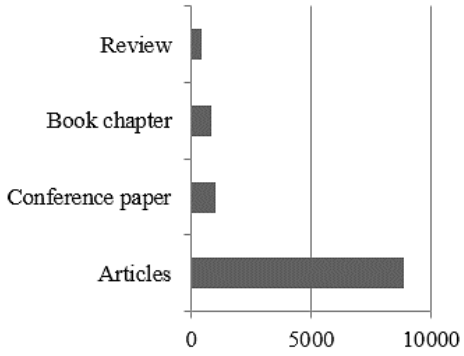


Source: author's compilation based on research steps.

Results and Discussion

When conducting the research based on the keyword Environmental tax in the scientific publication database Scopus, for the period from 2011 to 2024, 11,477 documents were available, of which: 8,875 (77.3%) articles, 985 (8.6%) conference papers, 823 (7.2%) book chapters and 403 (3.5%) reviews 'Figure 2'.

Figure 2
Types of documents published in the scientific publication database Scopus under the keyword 'environmental tax'



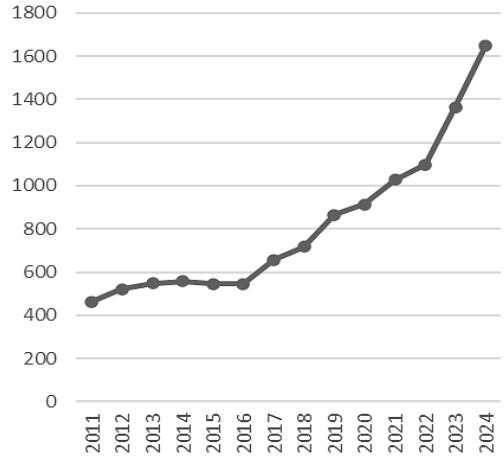
Source: author's compilation based on Scopus data.

In the period from 2011 to 2024, Environmental taxes remained a relevant research topic, as indicated by the increase in the number of publications during this period. The initial increase in research was observed after 2016, which continues to this day 'Figure 3'.

The increase in the number of publications could be explained by the adoption of the Paris Agreement, which is an international treaty on climate change, at the UN Climate Change Conference (COP21) in Paris, France on 12 December 2015, which came into effect on 4 November 2016. It was the first legally binding global climate agreement to combat climate change. The implementation of the Paris Agreement required social and economic changes that facilitated the development of science to establish long-term strategies. The next rapid increase in publications can be observed after 2022.

The explanation for this increase in the number of publications is the European Climate Law, which came into effect on 29 July 2021. Contrarily, at the United Nations Climate Change Conference (COP27), held on 20 November 2022 in Sharm el-Sheikh, no agreement was reached on new measures that would facilitate faster progress towards achieving the goals set out in the Paris Agreement.

Figure 3
Number of papers published in the Scopus scientific publication database from 2011 to 2024 under the keyword 'environmental tax'



Source: author's compilation based on Scopus data.

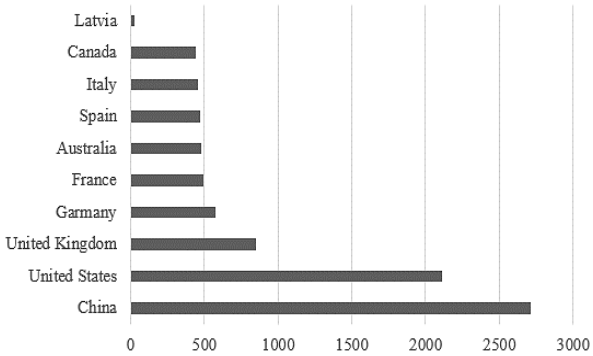
The rapid increase in the number of publications after 2022 indicates the efforts of scientists to explore and find new solutions to improve the situation (European Parliament, 2024).

When assessing the number of publications by the country where the research is conducted, China takes the leading position, followed by the United States, the United Kingdom and Germany 'Figure 4'.

During this period, Latvia had only 26 publications published in the scientific publication database Scopus under the keyword 'environmental tax'.

When evaluating publications by subject area, the majority of publications under the keyword 'environmental taxes' are associated with Environmental Science (5328 publications), followed by Economics and Finance (3116 publications) and Social Science (3106 publications), with practically the same number of publications.

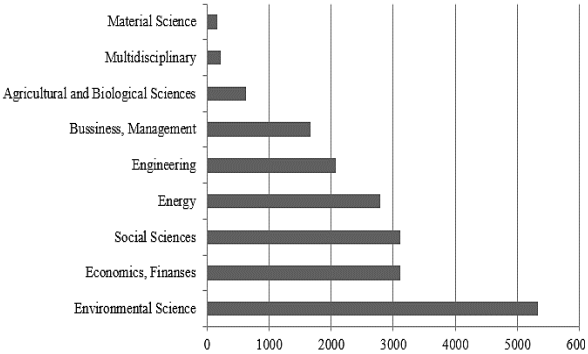
Figure 4
Number of documents published in the scientific publication database Scopus by country under the keyword 'environmental tax'



Source: author's compilation based on Scopus data available under the keyword 'environmental tax'.

Energy has 711 publications more than Engineering. However, Business, Management and Accounting have 1672 publications 'Figure 5'.

Figure 5
Number of documents published in the Scopus scientific publication database by sector from 2011 to 2024 under the keyword 'environmental tax'



Source: author's compilation based on Scopus data.

During the period from 2011 to 2024, only 163 publications in materials science with the keyword 'environmental tax' were published in the scientific publication database Scopus. In contrast, there were 223 publications from an interdisciplinary perspective, which is 60 publications more than in the materials sciences.

In the European Union Member States, Environmental taxes are one of the instruments of sustainable management. Revenues from Environmental taxes are used to solve the environmental management problems of each EU Member State (Leibus & Filipova, 2024).

The Environmental tax system includes a resource tax on raw materials, tax incentives for recycling and repair, and taxes after the end of the product life cycle. The impact of the above-mentioned tax can be seen from all stages of the product life cycle: production, product use, and disposal (Milios, 2021).

The Natural Resource tax is part of the Latvian Environmental tax system. It is applied to packaging, which is one of the objects of the tax. The purpose of the Natural Resource tax is to promote the sustainable and efficient use of natural resources, limit environmental pollution and promote the introduction of environmentally friendly technologies. Tax rates for packaging are determined based on the packaging material used. The tax exemption is applied if the amount of packaging used by the company does not exceed 300 kg per year, and the manufacturer participates in the waste packaging management system. As well if the taxpayer ensures compliance with the waste packaging recovery norms set out in environmental protection regulations or chooses one of the options, either establishing or applying an extended manufacturer responsibility system for the management of used packaging or concluding an agreement with a registered manager from an existing management system (The Saeima, 2006).

The management of packaging waste in Latvia, in accordance with the requirements set out in regulatory enactments, and the reduction of pollution in the environment is ensured by a set of measures or an extended manufacturer responsibility system (EMRS). This is ensured following the Natural Resources Tax Law, the Law on Reducing the Consumption of Plastic-Containing Products and the Regulations of the Cabinet of Ministers. Manufacturers and importers of packaging or EMRS objects must pay the Natural Resources tax on the quantity of goods released in the market.

By entering into a contract with EMRS, an exemption from paying the Natural Resources tax can be received and ensuring the management of used packaging waste (Latvian State Environmental Service of the Republic, 2024).

To reduce the amount of plastic packaging waste, European Member States are required to pay mandatory contributions proportional to the amount of plastic packaging not recycled (Waszczylko-Milkowska et al., 2024).

This is in line with the 'polluter pays' principle, which encourages manufacturers to review the efficiency of the material used in packaging and the environmental impact after its use. Waste management in Europe is ensured by public and private sector cooperation, the main task of which is not only to ensure waste reduction and management but also to stimulate secondary recycling of raw materials (Mattson et al., 2024).

Packaging material and its production technology are factors that determine its attractiveness in the eyes of consumers. From the consumer's point of view, environmentally friendly packaging is not only visually attractive but also meets their requirements regarding packaging materials and a responsible production process. With the increase in consumer awareness of environmental issues, the demand for environmentally friendly products increases in the market. However, as researchers point out, there is a difference between

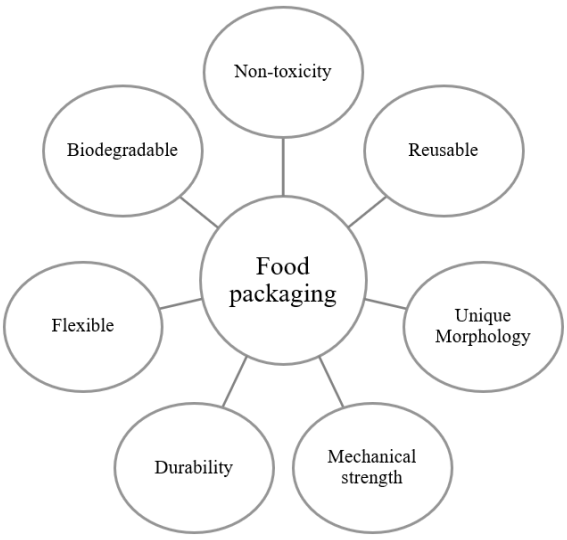
scientists' and consumers' understanding of environmentally friendly packaging. Consumers think about the impact of packaging on the environment after its end of use, without paying attention to the overall packaging life cycle - the production, packaging, transportation and end-of-life phase. As the better packaging material, the more widely known and used materials are chosen. Therefore, while consumers understand the negative impact of plastic on the environment, they still highly value the protective properties of plastic packaging. Without understanding the packaging production processes and the impact of materials on the environment, it is difficult to objectively evaluate environmentally friendly packaging (Nguyen et al., 2020).

As scientists point out, education is a significant factor influencing the choice of packaging materials based on waste management (Eslami et al., 2023).

Since the ingress of plastic into the environment cannot be completely prevented, it is important to pay attention to the environmental sustainability of the selected materials during the packaging design. This allows to reduce the negative impact on the environment after the product is used. As researchers point out, it is important to reduce ecological risk at the design stage itself, without linking it to consumer behaviour or waste management systems (James et al., 2024).

As one of the options for reducing the use of plastic in the market, biological materials are increasingly being offered in packaging production. By replacing conventional materials with biological (biomaterials), environmental pollution and consumption of non-renewable resources in the packaging industry are reduced. By studying and evaluating the properties of biomaterials in food packaging 'Figure 6', these materials are increasingly being used in other industries as well.

Figure 6
Advantages of biomaterials for food packaging



Source: authors' compilation based on Mahmund et al., 2024.

As researchers indicate, the food packaging industry is more often using biomaterials such as polymers, metals and alloys, ceramics and composites. According to researchers, the biggest challenge in introducing bio-based materials is cost-effectiveness and sustainability. To improve the quality assurance of food products and extend their shelf life, the use of nanomaterials in the packaging industry is becoming increasingly popular. However, as scientists point out, there are still many challenges associated with the use of nanomaterials (Mahmund et al., 2024).

Bioplastics are propounded as another environmentally friendly alternative to plastic. However, not all bioplastics are environmentally friendly. It can be either biodegradable or not. This difference is determined by their composition. This feature is often used in marketing communication, misleading consumers about the composition of the material and endorsing them to make wrong choices, thinking about environmental pollution and sustainability. Therefore, it is essential to label bioplastic packaging so that the consumer can determine the type of bioplastic by its composition. As researchers point out, biodegradable plastic is a more expensive material, as its production process requires greater resource and energy consumption (Parveen et al., 2024).

In the study by Petrenko et al., as environmentally friendly packaging materials the following are mentioned: bioplastics, paper, cardboard, glass and metal. In the context of sustainability, attention is paid not only to materials but also to the use of environmentally friendly technologies and solutions, such as the use of nanoparticles, plants, biodegradable and recycled materials and 3D printing. Such solutions expand the use of environmentally friendly packaging, reducing the damage caused to the environment. According to researchers, the main factors that contribute to the development of the market for environmentally friendly and biodegradable packaging are the growing demand, the provision of legal regulation and government support (Petrenko et al., 2024).

From the context of sustainability, Caner C. et al. in their study put forward three main factors that determine the sustainability of packaging: packaging recycling, the use of innovative materials and design (Caner et al., 2024).

Innovation of packaging materials and design is one of the ways to reduce the negative impact of packaging on the environment while maintaining the basic functions of packaging. Packaging must ensure product quality, its preservation, storage and transportation functions. In turn, from the consumer's point of view, it must be easy to use. From the perspective of sustainability and design, packaging must be of appropriate size. To ensure the functions mentioned above, more than 80% of the total environmental impact of packaging is already determined at the design phase. During the design phase for food packaging, it is important to pay

additional attention to the type of food for which the specific packaging is intended. Smart packaging is offered as a modern solution that could ensure sustainability requirements, but as the problem, its cost, functionality and safety are recognized (Versino et al., 2023).

According to statistical data, the total value of the global sustainable packaging market in 2024 was around 293 billion U.S. dollars and is expected to grow by 130 billion U.S. dollars in 2029, composing approximately 423 billion U.S. dollars (Statista, 2025). A factor that contributes to the effectiveness of Environmental taxes is price elasticity since the demand is sensitive to price changes. Natural Resource taxes do not reflect the costs of packaging but promote the choice of sustainable materials. From the perspective of the packaging industry, the goal of Environmental tax policy is to reduce the market demand for packaging made from materials that are subject to Environmental taxes (Cela & Kaneko, 2011).

Conclusions

1. The number of studies on Environmental taxes has tripled in the time period from 2011 to 2024. Most of the research is in environmental science and comes from China and the USA. However, this issue is also becoming increasingly relevant in Europe, faced with environmental pollution and the transition to a circular economy.
2. A current trend in the packaging industry is a holistic approach. The choice of packaging materials is made by evaluating the entire life cycle, thinking about packaging and sustainability as two different concepts.
3. The author's study revealed that, despite the ambitious goal of the Natural Resource tax, it currently does not significantly affect packaging trends, because market demand has a more significant role in the choice of packaging materials.
4. The Natural Resource tax introduced in Latvia mainly promotes packaging waste management by ensuring a process of accounting and recycling, which promotes the reduction of the amount of pollution created in the environment. However, it does not significantly contribute to the introduction of new technologies in the packaging industry, since the choices of manufacturers are much more significantly influenced by product quality assurance and the amount of total costs. A significant factor that would influence the choice of packaging manufacturers is consumer demand for environmentally friendly materials. Therefore, it is important to educate consumers about packaging materials and their impact on the environment and health.

Acknowledgements

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