

## CLOSING THE LOOP - PACKAGING WASTE MANAGEMENT AND THE DEPOSIT SYSTEM IN POLAND

Krzywda D.\*

**Abstract:** In the face of increasingly widespread environmental pollution and resource consumption, the need to actively implement concepts such as waste hierarchy, circular economy or closed loop is increasingly being discussed. In practice, these approaches include the implementation of a range of waste management solutions. At present, 11 European countries operate a deposit-refund system (DRS) as part of these measures. Poland is one of the countries that plans to introduce such a system, which will most likely come into force in 2025. This paper attempts to present Poland's plans for this system and the problems it will face in this regard. To this end, using Krippendorff's content analysis, a collected corpus of discourse texts taking place in Poland on the subject of the DRS was analyzed. From these, 11 problems were extracted and then classified and evaluated. The findings included that most of these problems are going to be organizational in nature, and that it is already reasonable to predict, on the basis of existing indications, that it will be possible to solve them through proper planning of the system and its management. Thus, this allows for a certain optimism concerning the introduction of DRS in Poland.

**Keywords:** closed loop, deposit-refund system, packaging waste management

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### Introduction

The need to reduce environmental pollution caused by waste has long been recognized in the European Union and in many other countries. On the conceptual level, this need manifests itself in the form of such notions as life cycle thinking, waste hierarchy, circular economy, zero waste or closed loop. These concepts are known from theoretical studies (Eisenreich et al. 2022; Figge, 2022; Khumthai 2022), but they also take the form of concrete practical solutions. In the European Union, these concepts are pursued through the implementation of relevant directives in individual countries, which are then implemented in the legal systems of individual member states. Such solutions include, for example, the concept of extended producer responsibility (EPR). Extended producer responsibility is the mechanism governing the management systems for certain wastes. It applies in particular to waste types such as packaging waste, waste electrical and electronic equipment, waste batteries and car batteries and end-of-life vehicles. EPR policy makes producers responsible for the entire life cycle of the products that they introduce on the market, from their design until end of life (including waste

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\* **Dariusz Krzywda**, PhD., Faculty of Management; Czestochowa University of Technology; ✉ Corresponding author: [dariusz.krzywda@pcz.pl](mailto:dariusz.krzywda@pcz.pl),  
ORCID: 0000-0001-9234-1686

collection and recycling). Producers accept their responsibility when designing their products to minimise life-cycle environmental impacts, and when accepting legal, physical or socio-economic responsibility for environmental impact that cannot be eliminated by design. It “focuses on the end-of-use treatment of consumer products and has the primary aim to increase the amount and degree of product recovery and to minimize the environmental impact of waste materials” (Johnson et al., 2014) In practice, the implementation of an EPR policy requires specific tools, dedicated to particular products. For plastic packaging, such a tool in some countries is the DRS (Lu et al., 2022).

Deposit-refund systems for packaging (DRS) is known in 11 countries of EU. In some of them, such as Sweden, they were established back in the 1980s, in others they have been in place for a shorter time. There are also countries that intend to introduce this system. One such country is Poland. Work on a legislative solution that would introduce a deposit system has been underway here for some time now. Article 9 of Directive 2019/904 of the European Parliament and of the Council (EU) 2019/904 of June 5, 2019 on reducing the impact of certain plastic products on the environment includes an obligation to ensure segregated collection of packaging waste generated from single-use plastic beverage bottles of up to 3l, together with their caps and lids, at a level of 77% in 2025 and 90% in 2029. This obligation can be implemented, for example, by means of deposit refund systems. The imperative to adapt Polish law to EU requirements is the main but not the only motive for implementing the system. This is because it is assumed that the deposit system will help tackle the problem of refuse, the main component of which is packaging waste. The experience of countries that have introduced a deposit system allows for optimism in this regard, but certainly many difficulties can also be expected. The purpose of this paper is to show the possible structure of these problems, as well as to present their nature and some feasible/potential solutions.

## Literature Review

### *DRS for packaging*

DRS is a surcharge on a product being purchased and a rebate/discount when it is returned. DRSs operate in different parts of the world and cover many different types of products and materials, such as bottles, batteries, and tires (Walls, 2011). The deposit itself is often compared to the Pigouvian tax imposed on activities that generate negative externalities. (Fullerton and Wolverson, 2000). DRSs are the subject of research emphasizing different aspects of these systems.

In Europe, DRSs are applied primarily to beverage packaging. In addition to the trend focused exclusively on research, there are also remarkably extensive studies and reports on the operation of deposit systems in various European countries (Spasova, 2019; Deloitte, 2019). In contrast, the academic research focuses on models of operation of different varieties of the system (Agnusdei et al. 2022; Calabrese et al., 2021) and their performance in different countries (Balcers et al., 2019). Research is also being conducted on the effectiveness of the systems. It has

been found that waste management systems do not perform equally in each country where they are implemented and the countries adopting DRS consumer closing mode performed better than those that did not. DRSs do not represent in absolute terms an effective waste prevention system compared to others and are not enough to decrease, for example, glass packaging waste generation or increase recycling (Agnusdei, et al., 2022). Attempts are also made to identify the determinants of the effectiveness of the system e.g., it was found that public engagement determines the effectivity of waste collection mechanisms. Public perception of the DRS is sensitive to the information being provided. Availability of information reduced the expected adoption of the DRS (Roca, et al., 2022). The success of the DRS also depends on whether the infrastructure for separate waste collection is in place early enough. Additional recycling with the use of the DRS is more effective when current recycling rates are low (Linderhof et al., 2019) and so certainly is its public perception (Roca et al. 2020).

Even if DRSs have proven to be effective in different situations, it is only a small part of the European countries that adopt them. Only ten countries have a DRS among the 27 EU members, plus Norway, Iceland and the UK (Spasova, 2019). While DRSs vary greatly from country to country, there are also some common issues in terms of integration with smart collection, promoting green design and developing a multi-percentage, circular business model (Zhou, et al., 2020). Some studies confirm that while there are many different systems, they can still be systematized into four archetypal models. Each archetype has a different money-material flow and a different cost burden for each actor. (Calabrese et al., 2021; Makiela et al., 2022)

Thus, the system appears very similar everywhere, but on a smaller scale, each system has its own problems, specific to a particular country or region. The purpose of this paper is to show what problems in the deposit system Poland is likely to face.

#### ***DRS in Poland and other countries***

The data provided by Eurostat (Eurostat, 2022) shows that over the past few years the recycling levels achieved in this regard have increased - as recently as 2010, the level of recycling of packaging waste in Poland oscillated around 39%, while currently (data for 2019) the level is 55.5 %. In the meantime, regulations are being introduced in Poland resulting from EU regulations which determine the annual levels of recycling of packaging waste from 2022 through 2030, which those introducing packaged products will be obligated to achieve. According to the regulations, product introducers will be required to achieve increasing levels of recycling of packaging waste, i.e. 59 % in 2022, in 2023 – 61 %, in 2024 - 63%, in 2025 – 65 %, in 2026 – 66 %, in 2027 – 67 %, in 2028 – 68 %, in 2029 – 69 %, and in 2030 – 70 %. In Poland, it has been assumed that these goals can be achieved by introducing the DRS for beverage packaging. Following the example of countries that have already introduced this solution, Poland has decided to introduce one of the four systems described in the literature, which is also the most common (Agnusdei, et al., 2022). Its operation is shown in Figure 1.



**Figure 1: General scheme of the DRS operation \**

**Source:** author's own compilation based on Agnusdei et al. 2022

Generally, the process is as follows:

- 1) Beverage producers initiate the deposit by paying it into a designated deposit account.
- 2) Retailers pay the deposit to producers/distributors/importers at the wholesale stage.
- 3) Consumers pay the deposit to retailers, along with the price of the beverage.
- 4) Consumers claim a full refund when they return their used beverage container to a designated return location.
- 5) The return location is reimbursed for the refunded deposit from the deposit account.
- 6) The returned used beverage containers are transported to a central location to be processed and recycled. The material can be used to manufacture new beverage containers. (Cordle et al, 2019)

Currently in Europe, there are 12 countries that have introduced DRS, the first being Sweden, where the system began in 1984. They differ, for example, in terms of who is required to carry out the collection. In some countries all stores are obliged to collect packaging, in others only some, which may depend on the surface area of the store or, for example, its location (e.g. it is different in rural areas and different in urban areas, which depends on the structure of commerce in the country). Collection is carried out manually or by means of automatic machines called drop-off machines (or RVMs - Reverse Vending Machines). Many countries have also opted for protective mechanisms for small stores, e.g. in Denmark, retail units only buy back the packaging in which they sell products in a particular store. There are also different solutions regarding the system operator itself. There are cases where the system operator is the state (e.g. Croatia), affiliated individual producers (e.g. Denmark), associations of producers and retailers (e.g. Estonia, Norway). Finally, the scope of packaging subject to deposit and the amount of deposit vary. A common feature of all systems is the way in which they are financed as the obligation is on the entities introducing packaging to the market, i.e. on producers.

Drawing on these available solutions, the implementation of the DRS has been launched in Poland. The main principles of the system were defined in June 2022. According to the (preliminary) drafts, the deposit system is planned to be introduced nationwide. The system will cover aluminium cans of up to 1 litre, glass bottles of up to 1.5 litres and plastic bottles of up to 3 litres. The deposit system is to be comprehensive, mandatory throughout the country and convenient for consumers. It is to be receiptless, which will mean that when returning a can or bottle it will not be necessary to show proof of purchase. The new draft is to maintain the principle that stores up to 100 sqm will be able to enter the system on a voluntary basis. For larger retail establishments, it will be mandatory. It will definitely be possible to return a bottle or can in such stores. The regulations do not specify whether there is to be one system operator or whether there can be more of them. Those placing packaging on the market will be able to organize a deposit system by entering into an agreement with a deposit system operator. These operators will do business on free competition terms. The amount of the deposit (deposit rate) is to be fixed and set by a ministerial ordinance. Operators will be allowed discretion in setting their fee. Unclaimed deposit will be credited to the system. Bottles will carry special marking and their collection is to be carried out by hand or RVMs (Reverse Vending Machines).

### Conceptual framework

As mentioned, the deposit systems currently in effect in various countries differ from one another. While the advantages of introducing a deposit system and its effectiveness in reducing packaging waste have been emphasized everywhere for a long time (Bohm, 1981; Palmer and Walls, 1997; Numata, 2009), at the same time, many studies note that solutions existing in one country cannot always be copied to other countries in their entirety. (Dace et al., 2012). This is due to the fact that each country has its own specific characteristics shaped by the waste policy which they have developed, as well as social, cultural and economic aspects. Thus, the deposit system is a complex solution, the final form of which is determined by a number of factors, not only economic.

The planned organization of the system in Poland, which is a combination of various solutions from the systems that are already operational in other countries and the analysis of the literature on the subject allows the following research hypotheses:

- h1. the designed system will have to face numerous problems arising from the specific economic, cultural and organizational conditions of waste management in Poland*
- h2. the anticipated problems of the system are most likely to be problems at the organizational level*
- h3. most of the problems predicted by the experts can be solved at the planning stage on the basis of already existing premises.*

### Research Methodology

While cost analyses related to the implementation and operation of the deposit system are justified and, above all, very much needed, its complexity means that the study of deposit systems cannot be reduced to economic models. And such contextuality, uniqueness and complexity of the phenomena is, in turn, a rationale for using qualitative methods in their study (Glinka and Czakon, 2021). The article uses the content analysis research technique developed by Klaus Krippendorff. This is a methodology used to derive structured information from unstructured texts (Krippendorff, 2018), which is classified as a qualitative method. The choice of methodology was dictated both by the nature of the deposit system solution itself as well as by recommendations from the literature on the application of this approach. In accordance with the recommendations of the content analysis technique, the study used a corpus of texts from the discourse that has been ongoing in Poland since the announcement of a soon-to-be implemented deposit system. The corpus included opinions reported as part of public consultations on the deposit law, as well as statements by experts, i.e. people from the system's stakeholder groups, i.e., organizations that are representatives of producers who put packaging on the market, trade representatives, waste management organizations (chambers), recycling organizations, municipalities, environmental organizations and law firms specializing in environmental protection and waste management. The experts' statements were sourced from the Government Legislative Centre, where information on the work on the bill is available, as well as conferences held across Poland in connection with the announcement of the deposit law draft, and also from written materials (articles, interviews, press materials). Audio statements were transcribed. The collected materials were then used in the content analysis. In doing so, an iterative approach was used and it was found that expert discourse was dominated by the following four subject areas: the state of packaging waste management in Poland, models for the operation of the deposit system, the situation of different stakeholders in the waste management system in Poland, and the advantages and disadvantages of the system described in the "deposit" law draft.

In this study, due to its purpose, only statements that relate to the advantages and disadvantages of the designed system were analyzed. The successive phases of the study described by Krippendorff were applied. This means that the study consisted of the following phases: unitizing, sampling, coding, reducing and abductively inferring contextual phenomena.

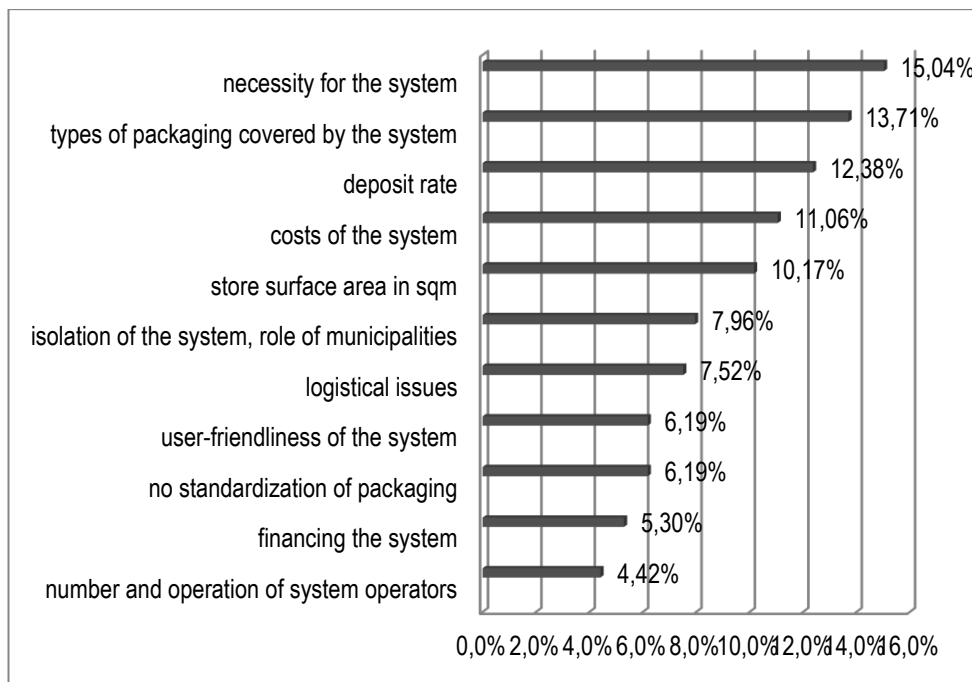
In the unitizing phase, those texts that were of interest to be analysed were selected from a continuum of written and spoken texts made available on the Internet, due to the subject matter of the planned DRS in Poland. The texts were collected until a certain saturation was reached, which occurs when each newly found text is a reprint of another and brings no new representations (Mautner, 2011; Khan et al., 2022). The texts that became units were divided into samples, i.e., according to Krippendorff, to economize on research efforts by limiting observations to a manageable subset of units that is statistically or conceptually representative of the

set of all possible units of interest. In the next step, coding relying on coding instructions was carried out, which in the case of this study consisted of finding synonyms for the word "problem", followed by explanations and descriptions used in this context. In the reducing phase, statistical calculations were made (the number of times the problem appeared in the texts was calculated - Figure 2).

The discussion part of this paper is also the last phase in the study, which in Krippendorff's research technique is called narrating the answer to the research question.

### Research Results

In the collected corpus of 71 texts of various length representing the discourse on the deposit system in Poland, there were 226 references to problems that experts believe the system is going to face. In the coding process, "weaknesses of the system", "concerns", "what is missing", "shortcomings" appeared as problems. There were 11 problems (issues raised) recorded. Most of them were formulated in written form (positions reported in public consultations, written interviews and newspaper articles) and spontaneously by speakers (in spoken texts, e.g., recordings of thematic conferences). The topics raised and the proportions in which they were addressed are shown in Figure 2.



**Figure 2: Problems addressed in the discourse on the deposit system**

Source: author's compilation from the corpus based on the content analysis

The problems presented in the figure can be classified according to their characteristics, as organizational problems, financial problems, as well as those arising from the culture and mentality of the Polish society.

### Discussion

The most frequently raised issue was the question of the necessity of the system in Poland. More than 15% of the statements dealt with the fundamental question of whether its implementation is necessary. Although it is already known that it will be put in place and become operational in 2025, the participants in the discourse are almost equally divided between its supporters and opponents. This means that it can be expected that the system will face numerous problems, thus confirming hypothesis h1. The most important argument in favour of the system is considered to be that it will make it possible to meet the required recovery and recycling levels and will allow fighting littering, in which the existing system has been ineffective so far. The introduction of the system is also supported by the research which shows that almost 88% of the Polish public want it (ARC 2022). It should also be noted that Poland has a deposit system for beer bottles, which is organized by individual breweries, and this is a signal that Polish society is ready for the introduction of a deposit system for other packaging. Not insignificant are the mentality considerations here as some of the experts' statements suggest that the system is expected to contribute to a change in society's mentality regarding packaging waste, and in the long run, other waste groups. Enthusiasts of the system, however, condition its success by saying the system must cover all beverage packaging, because this will guarantee its transparency and simplicity. Only then - they maintain - will it gain consumer acceptance. Other cultural issues are also important in this regard. Part of the public know that such systems work in Germany or Sweden, for example, and would like, following the example of these societies, to have such a system in their country. Thus, h2 and h3 are partially confirmed.

The opponents of the system's implementation cite a number of concerns and anticipate numerous problems that might cause disruptions in its operation. The study identified 10 problems that may be categorized as organizational, legal and cultural problems. It is these anticipated problems that are an important argument against the system. The most frequently raised problem is the scope of the system. 13.71% of the statements analyzed included deliberations on the types of packaging to be covered by the system. This is one of the elements where the systems already in operation differ. Depending on the rules, the systems cover different types of packaging from a group of PET bottles of different sizes, metal cans, non-returnable and returnable glass bottles. In Poland, the deposit system will cover PET packaging of up to 3l, reusable beverage glass packaging of up to 1.5l and aluminium cans of up to 1l. An earlier proposal that disposable glass bottles up to 1.5l would also be included in the system was abandoned. Also raised was the issue of quarter-pint liquor bottles and other small liquor bottles, which are found among the glass



containers littering public space. This is due to the drinking culture prevalent in Poland. Drinking culture is a phenomenon that has been discussed in the literature (Savic, 2016) and should certainly be taken into consideration when planning a deposit system for a country. The question of which packaging to include in the system is of utmost importance to all participants. There are various voices in Poland ranging from those calling for the exclusion of aluminium cans from the system due to the fact that their recovery levels are quite high and, for example, the exclusion of glass bottles, which are cumbersome to store and pose a danger to both customers and store personnel. The bill proposes extending the deposit system to include reusable beverage glass packaging of up to 1.5L, as there are already such systems in operation, set up mainly by breweries. However, these systems are not regulated by law and have not been subject to waste management records and reporting. Therefore, they will require compliance with the basic conditions under the deposit system. Disposable glass packaging, on the other hand, is collected under municipal systems, so it will not be covered by the deposit system. However, extending the system to other packaging makes logistical and technical issues difficult; stores would have to have large areas dedicated to returnable packaging. There also remains the issue of other packaging that is not considered beverage packaging, such as yogurt or jam packaging. However, it should be noted that these products, consumed at home, do not pose such a problem in terms of littering. These types of packaging can certainly still be managed within municipal systems. The scope of the system is therefore an organizational issue (h2). It also seems that the solutions present in other countries, as well as the success of the beer bottle collection system organized by breweries, is a premise that allows us to predict that the deposit system in Poland is going to work (h3).

The issue of deposit also appeared in the surveyed corpus of texts. The maximum deposit is expected to be PLN 2, but as noted, its amount will be set by the Ministry, depending on the type of packaging. However, it seems that the most important thing is that the deposit should be the same for everyone, no matter how many operators the system would have, and this is the condition that the system must meet at the organizational level (h2)

The cost of the system is another issue that has been raised. The issue of costs arises in various contexts, e.g., it is assumed that with the introduction of the DRS, the costs of operating municipal waste collection systems will increase, as municipalities, having various investments completed or in progress, will try to finance the costs of these investments. Deprived of income from the sale of the packaging, they might try to pass the costs of operating the system on to residents. Another problem raised was the issue of the area of stores obligated to participate in the collection. The current bill increases to 200 sqm the area of stores that will be under obligation to participate in the system "to the extent of at least collecting and returning deposits and collecting empty packaging and packaging waste" (previous legislation assumed that stores as small as 100 sqm would be covered by this obligation). All commercial units, on the other hand, will be obliged to collect deposits. Thus, the system will not

be voluntary. It should be mentioned that such obligations arise in different countries from their specific characteristics, such as the share of rural areas in general.

The voices gathered for the analysis in the study under the heading of "system isolation" were also extremely important. Experts stress that the deposit system should be part of an overall functioning waste management system. It is supposed to be an element of the ERP, however, it is unclear how the entire ERP is supposed to operate. Meanwhile, the introduction of the system may render the operation of other laws obsolete. Indeed, the work on the entire waste management system is not integrated. It should be remembered that packaging waste is, in the current model operating in Poland, collected within municipal waste collection systems in the form of two selectively collected fractions: plastics and glass. Thanks to this, municipalities in Poland have been able to achieve certain recovery and recycling levels to which they were obligated in 2012. The deposit system will eliminate from the waste stream in municipalities a very important part of packaging waste, which from the point of view of achieving recovery and recycling levels are of key importance. At the same time, no adjustments are being made to the law on maintaining cleanliness and order in municipalities. This calls into question the achievement by municipalities of the relevant recovery and recycling levels specified in the regulations. Furthermore, existing municipal installations in Poland, which have been invested in for a long time (since 2012) were adapted to the waste stream, which enabled the separation and sorting of packaging fractions. All the time, investments were made and infrastructure dedicated to such a system was developed and now the packaging fraction appears to be going to be excluded from the stream that goes to municipalities for waste management. This is quite a significant organizational problem that has not been solved at this stage. However, it seems to require the introduction of separate legislation or the modification of already existing legislation as part of amendments to existing laws (h2)

In addition, experts anticipate logistical problems. They believe that the greater the range of packaging covered by the system, the greater the logistical problem for stores, as they will become collection points for packaging waste. Stores will have to be restructured, incur costs for manual collection or purchase recycling machines (RVMs). On the other hand, limiting the scope of packaging covered by the deposit system will complicate the system and confuse consumers, who will not know which packaging is subject to deposit and which is not. However, it is important to recall here again the studies that show that the public wants a deposit system and is willing to use the DRS. This problem is related to the user-friendliness of the system. There are claims that the system will be inconvenient not only for stores but also for consumers, as they will have to collect packaging at home and then take it back to the store. The user-friendliness of the system will also result from other features of the system, such as the area of stores covered by the collection system. Applying any exemptions for retail units from the obligation to accept packaging and return deposits will make it significantly more difficult for consumers to function in the system. With a threshold of 100 sqm, consumers will not be able to return the

packaging and recover the deposit at more than half of the retail outlets operating in Poland. In the case of a higher threshold, such as 250 sqm, the number of available outlets where it will be possible to return the packaging and reclaim the deposit will drop to as low as several percent. Any restriction on the ability to return packaging and reclaim the deposit will ultimately result in consumers having to search for places that will accept their packaging, and consequently frustrate and discourage those consumers from the entire system. It would certainly help, too, if there were standardization of deposit packaging, which would facilitate logistical issues and reduce the cost of operating the system. It should be estimated that any restrictions are indeed most likely to make the system "unfriendly" from the consumers' point of view. However, it is worth reminding again that the deposit system for beer bottles works, and that the majority of the public in Poland wants a deposit system, and that despite the fact that there are restrictions in other countries as well, the systems work well in them. (*h1, h2, h3*).

Regarding the financing of the system, it is commonly emphasized that operators in such systems operate mainly on a non-profit basis. There are also questions arising about who is to finance drop-off machines (RVMs). A problem will also arise regarding "encouraging" beverage sellers to participate in the deposit system through economic factors (e.g., the threat of a product fee). On the one hand, this is an insufficient solution, and on the other hand it is legally incorrect (the product fee is a sanction for not achieving the required level of recycling, and not a penalty for failing to comply with a formally voluntary action).

The last issue raised is also organizational in nature and concerns the number and operation of the system operator or operators. In the proposed system, it is assumed that the operator can be one or many. There are arguments both for a system with a single operator and with multiple operators. The existence of multiple operators entails the risk of dangerous competition among operators in the market, or even the threat of pushing out domestic operators by foreign operators or the diversion of the packaging waste stream abroad by operators operating in the Polish market. On the other hand, the existence of a single operator is criticized because of possible monopolization. The system operator will represent those bringing packaging to the market, and this cannot be considered a monopoly, because the activities of this entity serve a fundamentally different purpose. If the purpose of the operator is established by law and is a societally useful purpose and in the public interest, and any income from operations may be allocated exclusively to this purpose (maintenance of the deposit system, environmental protection, promotional activities), then a single operator cannot be considered a monopolist under both EU law and the proposed national legislation. A deposit system with multiple operators, on the other hand, may actually start to be used for competition or to discriminate against the entire group. It should certainly be considered a very good solution that the deposit in the proposed system is to be uniform. The operation of more than one system operator will likely result in the possibility of setting different deposit amounts for the same product introduced by a variety of manufacturers. This will

cause confusion among consumers, as well as allow for unauthorized/unlawful price competition for products subject to a deposit at the discretion of different operators. The system operator should be a non-profit entity, with all its "profits" allocated to the system operation development. It should be established by the organizations bringing in packaging, that is, by producers. This is undoubtedly an organizational task (h1) and the experience of other countries can be learned from here (h3).

### **Conclusion**

The content analysis conducted confirmed all 3 hypotheses stated in the introduction. Most of the problems that the system will face, even if culturally based, can be solved at the organizational level. Thus, the anticipated reluctance to the system can be overcome with relevant solutions to make the system transparent and simple. This can be achieved, for example, by standardizing packaging to be subject to deposit and marking it with the word "deposit." Certainly, the simplicity of the system will be facilitated by a number of solutions, some of which are included in the bill and others are not. This is, for example, a solution based on a single operator or a uniform deposit for packaging of a given type. This will prevent undesirable competition-related situations. The introduction of mandatory participation in the system for stores larger than 200 sqm will introduce a protective mechanism for smaller stores for which packaging collection is most likely to pose a significant logistical problem. An analysis of the situation in countries where DRS has been in place for some time, as well as studies conducted in Poland and the success of the existing deposit system for beer bottles, are clear indications that extending the system to other packaging will be successful. However, it is necessary to consider that there are problems that may arise, and these are primarily the issue of the isolation of the system and the situation in which municipalities will find themselves, as described above. This is a problem that has not been solved for the time being, and which could result in higher waste collection fees, which are already being perceived in Poland as high.

The work on the DRS in Poland is in progress, so this study might add to the development of the DRS as it shows the likelihood of certain problems and can also be treated as a forecast. Of course, it also has its limitations. These are mainly due to the complexity of the DRS, its many variations in different countries, its dependence on various conditions and, consequently, the impossibility of accurately predicting its success. It seems that, as a next step, this type of research on DRS should move towards abstracting models and their variants taking into account different factors, which can be applied in countries that have not yet introduced DRS.

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## ZAMYKANIE PĘTLI – ZARZĄDZANIE ODPADAMI OPAKOWANIOWYMI I SYSTEM KAUCYJNY W POLSCE

**Streszczenie:** W obliczu coraz bardziej powszechnego zanieczyszczenia środowiska naturalnego oraz zużywania zasobów coraz częściej mówi się o potrzebie aktywnego wdrażania takich koncepcji jak hierarchia postępowania z odpadami, gospodarka obiegu zamkniętego czy zamknięta pętla. W praktyce koncepcje te polegają między innymi na wdrażaniu różnych rozwiązań w zakresie zarządzania gospodarką odpadami. Obecnie w 11 krajach europejskich w ramach takich działań funkcjonuje system kaucyjny opakowań na napoje. Polska jest jednym z krajów, który planuje wprowadzenie takiego systemu i najprawdopodobniej wejdzie on w życie w roku 2025. W niniejszym artykule podjęto próbę przedstawienia planów Polski odnośnie do tego systemu i problemów, z jakimi przyjdzie się tu mierzyć. W tym celu wykorzystując analizę treści Krippendorffa przeanalizowano

zgromadzony korpus tekstów dyskursu, który toczy się w Polsce w przedmiocie systemu kaucyjnego. Wyabstrahowano z nich 11 problemów, a następnie dokonano ich klasyfikacji i oceny. Ustalono między innymi, że większość tych problemów będzie miała naturę organizacyjną i że już teraz, na podstawie istniejących przesłanek, można przewidywać, że będzie się je dało rozwiązać poprzez odpowiednie zaplanowanie systemu i zarządzanie nim. Tym samym pozwala to na pewien optymizm w kwestii wprowadzenia systemu kaucyjnego w Polsce.

**Słowa kluczowe:** obieg zamknięty, system depozytowo-refundacyjny, gospodarka odpadami opakowaniowymi

### 闭环——波兰的包装废弃物管理和存款系统

**摘要:** 面对日益普遍的环境污染和资源消耗, 积极推行垃圾分级、循环经济或闭环等概念的需求越来越多地被讨论。实际上, 这些方法包括实施一系列废物管理解决方案。目前, 作为这些措施的一部分, 有 11 个欧洲国家实施存款退款系统 (DRS)。波兰是计划引入该系统的国家之一, 该系统极有可能在 2025 年生效。本文试图介绍波兰对该系统的计划以及在这方面将面临的问题。为此, 使用 Krippendorff 的内容分析, 分析了在波兰发生的关于 DRS 主题的话语文本的收集语料库。从中提取了 11 个问题, 然后对其进行了分类和评估。调查结果包括, 这些问题中的大多数本质上将是组织性的, 并且根据现有迹象可以合理地预测, 可以通过对系统及其管理进行适当规划来解决这些问题。因此, 这让人们对在波兰引入 DRS 持乐观态度

**关键词:** 闭环, 押金返还系统, 包装废弃物管理