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SOLUTION FOR SUSTAINABLE DEVELOPMENT: PROVISIONS LIMITING THE CONSUMPTION OF DISPOSABLE PLASTIC CARRIER BAGS IN POLAND

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Abstract. Plastic bags are unusually comfortable solution for consumers (particularly if are free of charge) and constitute a sort of sign of time. However, they are also an enormous environmental challenge, because they become waste after a very short life cycle. In the world this problem had already been noticed some time ago and many states took action being aimed at limiting the use of disposable plastic carrier bags. In 2018 Poland, forced by notations of the EU directive, was also included in the group of these states. This article was devoted to discussion about a solution accepted in Poland and its contribution to the accomplishment of the concept of sustainable development. As the result of the study it can be stated that it is possible to limit the consumption of disposable plastic bags in Poland, however another fear is a fact that the first signals of the leakiness of the system and the possibility of avoiding the recycling fee already appeared.

Keywords: plastic bags, plastic bag levy, lightweight plastic bag, sustainable packaging

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JEL Classifications: Q01, Q53, Q56

1. Introduction

Probably the modern society would not be able to live without plastic. At present this invention of the 20th century has such a wide application that we meet it all along the way. In Europe almost 40% of plastic is used on the packages market (Plastcs Europe, 2015). It is not only about direct packages, but also plastic bags, in which consumers bring shopping from shops to houses. We can divide these bags on disposable and reusable, and definitely the first kind is more popular. For the first time they were entered into use at the end of 70s of the last century and thanks to their convenience and usefulness were quickly accepted both by retail sellers, as well as consumers (Rivers, Shenstone-Harris and Young, 2017; Androniceanu and Drăgulănescu, 2016; Chwistecka-Dudek, 2016). They were extraordinary popular also due to a fact that for many years they were also available to customers for free in practically unlimited amount. However, since the certain time the situation started to change, mainly because of noticing many threats to the natural environment, which result from such universal use of plastic bags. Many states made efforts being supposed to limit their availability by imposing an obligation of charging for given bags on sellers, whether even the introduction of a prohibition of using them. In Poland adequate rules came into force on 1 January 2018.

The purpose of this article is a review of world solutions in the matter of restriction of the use of disposable plastic bags and a discussion about obligatory rules in Poland and their possible influence on the realization of the concept of sustainable development.

2. Sustainable packaging

Packages became an integral element of contemporary manufacturing and consumption systems. They are essential for the protection of goods during the storage and the transport on various stages of the supply chain. They are supposed to prevent damage and to protect goods from the influence of external factors (and inversely). Moreover, they are important in the communication with consumers, providing information about products contained in them (Williams, Wikström and Löfgren 2008, Lewis 2005). However, they have their impact on the environment – the main problem is the consumption of the considerable amount of raw materials (largely non-renewable) used for their production and utilization of packaging wastes (Zailani and others 2012, Oláh and others 2017). Every year vast quantities of packages are produced with intention of their single use and throwing away (Khalil and others 2016). It causes that for many countries packaging wastes constitute a serious problem, which they are trying to solve to a lot of different ways. Traditional prospect, adopted also by the European Union under the directive 94/62/EC on packaging and packaging waste, focuses on reducing the amount of packages, recycling and reuse of packaging wastes. However this approach, even if it contributes to the increase of the level of recycling and to limitation of storing on dumps, is not able to solve the problem of the increasing amount of packaging wastes. Because preventing the production of waste is more complicated and cannot be limited only to recycling and reuse. It is necessary to adopt a broad perspective and thinking based on the life cycle at simultaneous introduction of changes in the model of the production and the consumption (Tencati 2016). Because a comprehensive attempt at the influence of packages on the environment starting from the stage of design, through production, to recycling or reuse is extremely significant (Pålsson, Finnsgård and Wänström 2013, Grabara and Dura and Drigă, 2016). Many researchers also underline that considering the environmental influence of packages the system perspective should be adopted, which will include both the package and the product contained in it (Lindh, Olsson and Williams 2016, de Koeijer, de Lange and Wever 217).

The reply to these requirements is a balanced package implementing the concept of the sustainable development presented in the document "Our common future" from 1987 by including purposes and principles of the sustainable development in the entire life cycle of packages (Martinho 2015). The packaging industry should minimize the negative environmental impact, social costs and economic on stages of manufacturing, distribution, the use and reuse packaging products (Dang, Chu 2016). Despite the growth of an interest in the sustainable packaging idea, in the area of defining it a consensus was not been still made. Two most popular definitions were formulated by Sustainable Packaging Alliance (SPA) in Australia and Sustainable Packaging Coalition (SPC) in the USA (Verghese, Horne and Carre 2010). The SPA presentation is based on four main principles (Figure 1). According to it the balanced package should be effective (both in terms of costs, as well as the functionality), efficient (with reference to using financial resources and the energy), cyclical (enabling the recycling through natural and industrial systems) and safe (harmless and non-toxic, thanks to they are not harmful for people and ecosystems) (Grönman and others 2013).

Fig. 1. The four sustainable packaging principles according to SPA

Source: Dang 2016, p. 1950.

SPC based its vision on the 8 key criteria according to which sustainable packaging should (GreenBlue, 2011):

- be beneficial, safe & healthy for individuals and communities throughout its life cycle
- meet market criteria for performance and cost
- be sourced, manufactured, transported, and recycled using renewable energy
- optimize the use of renewable or recycled source materials
- be manufactured using clean production technologies and best practices
- be made from materials healthy throughout the life cycle
- be physically designed to optimize materials and energy
- be effectively recovered and utilized in biological and/or industrial closed loop cycles.

In these two conceptualizations of sustainable packaging it is possible to notice a lot of similarities. Both they put emphasis on the entire life cycle and requirements connected with the productivity and the functionality of the package, they pay attention on its safety and an efficient use of materials applied for its production. It is also about material cycles and the need to apply renewable materials (de Koeijer, Wever and Henseler 2017). So it is possible to accept that balanced package is such a package, which „is sourced responsibly, designed to be effective and safe to human health or ecosystems, made efficiently with renewable energy and meets market criteria for cost and performance, and once used, is recycled or reused efficiently to provide valuable resources for subsequent generations" (Nordin, Selke 2010).

Counterbalance of packages can be achieved on three levels: raw materials, the production and the waste disposal. On the first level it is connected with using renewable materials or these from the recycling, thanks to what using fossil fuels and the carbon dioxide emission are being limited. On the production level energy-efficient processes are used for a stability. On the level of the waste disposal it can be however achieved through the reuse, the recycling and the biodegradation (Licciardello 2017). Additionally it should be underlined that balanced solutions in the area of packages cannot be drawn up only by one company in isolation from remaining cells of the supply chain. The holistic approach to the sustainable development of packages because lets for minimizing the risk of suboptimization (Lindh and others 2016).

3. Characteristics of plastic bags

Plastic carrier bags are omnipresent in contemporary world. According to the definition included in the directive (UE) 2015/720 of the European Parliament and of the Council "plastic carrier bags shall mean carrier bags, with or without handle, made of plastic, which are supplied to consumers at the point of sale of goods or products". Among them it is possible to distinguish light plastic carrier bags (plastic carrier bags of material thicknesses below 50 microns) and very light plastic carrier bags (plastic carrier bags of material thicknesses

below 15 microns, which are required for hygienic reasons or offered as basic packaging of food, when it helps prevent food waste) (Directive (EU) 2015/720). On account of the reusability plastics bags are being divided into disposable and reusable bags.

Table 1. Types of plastic bags

Type	Description	Weight [g]
Single-use non-biodegradable	They are thin-walled, lightweight plastic carrier bags distributed at the check and used to carry goods from supermarkets and other shops, generally made of high density polyethylene (HDPE). They are single-use in the sense that they are usually only used for one shopping trip	8,6
Single-use biodegradable	Can be fully bio-based, usually a starch-polymer blend. are generally made of bio-based materials and are capable of undergoing physical, chemical, thermal or biological decomposition under certain defined conditions	8,9
Multiple-use (reusable)	They are made either from low density polyethylene (LDPE/LLDPE) or polypropylene (PP) which is even more durable. They are usually sold at supermarket cash registers for a higher price than single-use ones (if ever charged) and some supermarkets will exchange them for a new bag without charge if they become damaged	88,3

Plastic carrier bags owe their huge popularity to the fact that they are inexpensive, have a high endurance to mass ratio (they are light, however tough enough to carry shopping in them), they are waterproof, hygienic and it is possible to use them for many different applications (Lewis, Verghese and Fitzpatrick 2010, Asmuni and others 2015). For consumers they are a favourable solution, however they have a negative impact on the environment. Non-renewable resources are being used for their production (e.g. petroleum), and their disintegration takes hundreds of years (Jakovcevic 2014). What is more important, used plastic bags contribute to air, soil and water pollution, as well as constitute the substantial threat to health and life of many species of animals, and even people (Zhu 2011, Njeru 2006, Ayalon and others 2009, Willis and others *in press*, Steensgaard and others 2017).

European Union countries are one of chief consumers of plastic bags. In 2010 almost 100 billion plastic bags were used in them, which means that the average European used almost 200 bags at that time, both disposable, as well as reusable bags (however it should be remembered that the level of consumption of bags for one resident is different in individual Member States - see Fig. 2). Detailed data concerning average consumption of bags are presented in table 2.

Table 2. Weight and number of plastic carrier bags consumed in EU-27 by type in 2010

	Weight [Mt]	Number of bags [mld]	Share [% of total number]	Bags per capita
Single-use non-biodegradable	0,73	85,3	87	171
Single-use biodegradable	0,02	2,3	2	5
Multiple-use	0,87	11	11	22
Total plastic carrier bags	1,61	98,6	100	198

Source: European Commission 2013, p. 11.

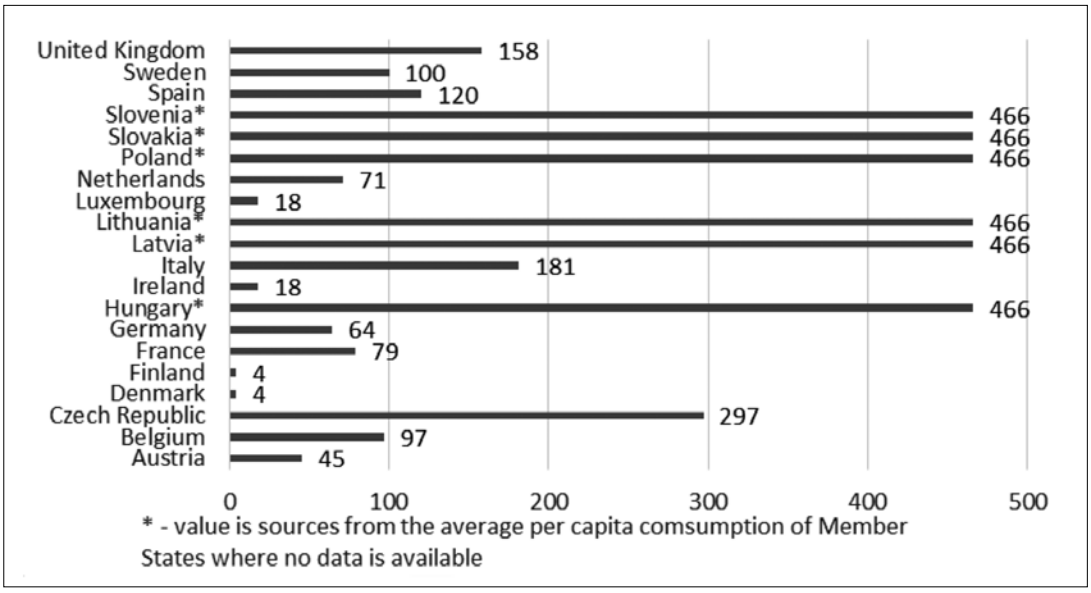

Fig. 1. Per capita consumption of single-use plastic bags for selected Member States

Source: own study based on: Sherrington and others 2012, p. 39.

In order to reduce negative impact on the environment used plastic bags can be recycled, however this solution is applied on a small scale. Almost 40% of used plastic bags collected by council or private waste collection systems in countries of the European Union is used for energy recovery, however still almost 50% of this type of waste is taken away to stockpiles (in addition it should be remembered that the considerable part of plastic bags is not being collected and pollute the environment). It is a proof of a huge waste and ineffective waste disposal. On the assumption that the production of 1 HDPE bag needs 0.39 MJ of energy, every year the equivalent of 19 MJ (5276 GWh) is being stored on dumps in the EU (European Commission 2013).

4. Ways of reducing the consumption of disposable plastic bags in chosen states of world

In relation to the negative influence of disposable plastic bags to the environment a lot of states take action aimed at limiting availability of this type of bags. Such solutions have been already implemented in several dozen states, in addition they have a diverse reach and character. Most often they assume the form of the total ban on using disposable plastic bags, taxes or payments, as well as voluntary agreements with sellers (mainly with supermarket chains) (Poortinga, Whitmarsh and Suffolk 2013, Martinho, Balaia and Pires 2017, Thomas, Poortinga and Sautkina 2016, Xanthos, Walker 2017; Jankalová, Jankal 2017).

Ireland constitutes the most well-known example of system solving a problem of exaggerated consumption of disposable plastic bags. In 2002 0.15 Euro tax was introduced there, as a result of which the demand for these bags fell by more than 90% (from 328 to 21 pieces per capita per year). In the first year of applying this tax income of it amounted about 12 million Euro, in the following years it was 13-14 million Euro per year. This income is being transferred for covering administration costs connected with this tax (circa 3% of income) and for the realization and the promotion of many environmental programs. In 2007 in relation to the growth in consumption of disposable plastic bags tax amount was increased up to 0.22 Euro (Convery, McDonnell and Ferreira 2007, https://www.cga.ct.gov). There are many proofs that introduction of taxes results in reducing the demand for plastic carrier bags (Wagner 2017), however there are also coincidences of countries, in which implemented solutions did not worked put, because they took only a short-term effect (Dikgang, Leiman and Visser 2012).

Apart from public authorities actions it is also possible to find out many initiatives taken voluntarily by commercial networks (Mudgal and others 2011). These initiatives seem to be peculiarly valuable in countries, which not yet became interested in a problem of exaggerated consumption of plastic carrier bags.

5. Polish solution in reducing the consumption of light plastic carrier bags

According to the directive of 2015 Poland, similarly to all other members of the European Union, was obligated for solving out the problem of exaggerated consumption of disposable plastic bags. The transposition of EU rules into Polish legislation was made by the Act of 12 October 2017 amending the act on the management of packages and packaging wastes and some other acts. The legislator decided about the application of the second from two solutions suggested by the European Union that is of the introduction of an obligation of charging for light plastic bags. As it was legalized in a bill, choice of this solution resulted from the current market practice, because the majority of trading networks already gave up giving free bags, what contributed to the fall in the consumption of disposable bags for about 36% (from estimated 470 bags per capita per year to circa 300 bags per capita per year) (Ministerstwo Środowiska, 2017).

According to provisions of this act sellers are obliged to charge recycling fees from their customers for light carrier plastic bags, which are given to them, in addition very light bags are exempt from these fees (which thicknesses is below 15 microns). This payment constitutes the income of the state budget, and its maximum height was set on the level of 1 PLN for one bag, in addition the rate in the given year is being defined by ordinance (Dz.U., 2017, poz. 2056). Under Regulation of the Minister for the Environment of 8 December 2017 on the rate of the recycling fee from 1 January 2018 the rate of the recycling fee is 0,20 PLN for one light plastic carrier bag (Dz.U., 2017, poz. 2389). For giving to customers light plastic bags without colleting recycling fee the trade unit can be punished by an administrative penalty from 500 to 20 000 PLN (https://www.mos.gov.pl).

In relation to interpretation of the Ministry of Finance, which legitimized that the recycling fee is included in the tax base and VAT tax should be added to it, consumers will have to pay at least PLN 0.25 for the light plastic bag (rather than 0,2 PLN, as follows from the Regulation) (http://podatki.gazetaprawna.pl). According to Mateusz Morawiecki's announcements, income from the recycling fee concerning light plastic bags are supposed to be used in the fight against the smog (http://www.rp.pl).

Despite of setting the flat rate of the recycling fee in individual shops and commercial networks customers meet different prices of light plastic bags. This fee is a minimum rate, to which shops can add the costs of purchase of bags, or even a profit margin to their sale. Networks, which had already introduced payments for bags, have usually simply added 0,25 PLN to the previous price. However, there is no lack of ideas of avoiding requirements of the act. An example of such idea can be Biedronka supermarkets, which implemented plastic bags of a thickness of 52 microns, thanks to what they are not embraced with recycling fee. Pepco probably implemented similar solutions. This network offers bags for 0,2 PLN, that is fewer than the recycling fee amounts (http://www.rp.pl).

Conclusions

Disposable plastic carrier bags are very comfortable in use, however they constitute the enormous burden for the natural environment. It is not only about using a lot of non-renewable stores for their production, but above all about their negative influences as waste. They not only pollute air, soil and waters, but also pose an essential threat to many species of animals, and in future also for people, through the permeation to the food chain. Luckily, these problems are more and more universally noticed and many states are adopting measures being aimed at the reduction of the consumption of disposable carrier bags. This actions can assume the form of the ban on using light plastic carrier bags, payments and taxes, or voluntary agreements with commercial networks. International organizations and institutions, like e.g. the European Union which obligated all Member States for dealing with the problem of exaggerated consumption of plastic bags, play very important role in propagating these solutions. Responding to this request, the recycling fee of 0,2 PLN (gross 0,25 PLN) was introduced in Poland from 1 January 2018. It includes all light carrier bags of the thickness from 15 to 49 microns (bags of the thickness below 15 microns are exempt from it, if they are intended to pack loose food, constituting its basic package).

At present it is too early for the evaluation of the effectiveness of the accepted solution and the efficiency of the implemented system. Looking at achievements of other countries one may hope, that also in Poland it is possible to limit the consumption of disposable plastic bags, however another fear is a fact that the first signals of the leakiness of the system and the possibility of avoiding the recycling fee already appeared. At this stage it is also hard to assess the real significance of the adopted solution with regard to the sustainable development. Of course every reduction of the production of disposable plastic carrier bags allows for saving raw materials, which would be used for producing them, however it still do not guarantee positive environmental balance. Disposable plastic carrier bags can be also replaced e.g. with paper bags (not reusable bags), what in the general account can turn out to be a worse solution. Reduction of the demand for plastic bags can also have negative economic and social impacts (rundown resulting closing plants and dismissing workers), however for now we have no data concerning appearance of this problem in Poland.

It seems that from the promotion of sustainable development point of view of, the solution implemented in Poland has no educational aspect, consisting in making the society aware of environmental problems associated with using plastic carrier bags. Introduction of the recycling fee was not preceded by the intensive information action justifying the meaning of its application, therefore cases of avoiding it do not meet the social ostracism, but instead are often approved. Until people do not understand, that the concern for the environment is simply cost effective, they will not pay greater attention to this aspect and they will concentrate only on economic issues and will criticize the need to pay extra charges.

To sum up, the solution implemented in Poland corresponds with goals of the sustainable development and is a step in the right direction, however acceptation of the broad perspective and implementation of more comprehensive actions are still necessary.

References

Androniceanu A., Drăgulănescu I-V. 2016. Survey on the buyers' eco-responsibility and the urban white pollution, *Environmental Engineering and Management Journal*, February, 15(2): 481-487

Asmuni, S.; & Hussin, N.B.; & Khalili, J. Mhd.; Zain, Z.M. 2015. Public Participation and Effectiveness of the No Plastic Bag Day Program in Malaysia, *Procedia - Social and Behavioral Sciences* 168: 328 – 340. https://doi.org/10.1016/j.sbspro.2014.10.238

Ayalon, O.; & Goldrath, T.; & Rosenthal, G.; & Grossman, M. 2009. Reduction of plastic carrier bag use: An analysis of alternatives in Israel, *Waste Management* 29: 2025–2032. https://doi.org/10.1016/j.wasman.2009.02.016

Chwistecka-Dudek, H. 2016. Corporate Social Responsibility: Supporters vs. Opponents of the Concept. *Forum Scientiae Oeconomia.* 4(4): 171-179.

Convery, F.; & McDonnell, S.; & Ferreira, S. 2007. The Most Popular Tax in Europe? Lessons from the Irish Plastic Bags Levy, *Environmental and Resource Economics* 38(1): 1-11. https://doi.org/10.1007/s10640-006-9059-2

Dang, S.; & Chu, L. 2016. Evaluation framework and verification for sustainable container management as reusable packaging, *Journal of Business Research* 69(5): 1949–1955. https://doi.org/10.1016/j.jbusres.2015.10.086

de Koeijer, B.; & de Lange, J.; & Wever, R. 2017. Desired, Perceived, and Achieved Sustainability: Trade-Offs in Strategic and Operational Packaging Development, *Sustainability* 9(11): 1923. https://doi.org/10.3390/su9101923

de Koeijer, B.; & Wever, R.; & Henseler, J. 2017. Realizing Product-Packaging Combinations in Circular Systems: Shaping the Research Agenda, *Packing Technology and Science* 30(8): 443–460. http://onlinelibrary.wiley.com/doi/10.1002/pts.2219/full

Dikgang, J.; & Leiman, A.; & Visser, M. 2012. Analysis of the plastic-bag levy in South Africa*, Resources, Conservation and Recycling* 66: 59– 65 https://doi.org/10.1016/j.resconrec.2012.06.009

Directive (EU) 2015/720 of the European Parliament and of the Council of 29 April 2015 amending Directive 94/62/EC as regards reducing the consumption of lightweight plastic carrier bags

European Commission 2013. Impact Assessment for a Proposal for a Directive of the European Parliament and the Council amending Directive 94/62/EC on packaging and packaging waste to reduce the consumption of lightweight plastic carrier bags

Grabara, J., Dura, C., Drigă, I. 2016. Corporate social responsibility awareness in Romania and Poland: A comparative analysis. *Economics and Sociology*, 9 (4): 344-359. https://doi.org/10.14254/2071-789X.2016/9-4/22

Grönman, K.; & Soukka, R.; Järvi-Kääriäinen, T. & Katajajuuri, J.-M.; & Kuisma, M.; & Koivupuro, H.K.; & Ollila, M.; & Pitkänen, M.; & Miettinen, O.; & Silvenius, F.; Thun, R.; & Wessman, H.; & Linnanen L. 2013. Framework for Sustainable Food Packaging Design, *Packing Technology and Science* 26(4):187–200. http://onlinelibrary.wiley.com/doi/10.1002/pts.1971/pdf

Jankalová, M.; Jankal, R. 2017. The assessment of corporate social responsibility: approaches analysis, *Entrepreneurship and Sustainability Issues* 4(4): 441-459. https://doi.org/10.9770/jesi.2017.4.4(4)

Jakovcevic, A.; & Steg, L.; & Mazzeo, N. & Caballero, R.; & Franco, P.; & Putrino, N.; & Favara, J. 2014. Charges for plastic bags: Motivational and behavioral effects, *Journal of Environmental Psychology* 40: 372-380. https://doi.org/10.1016/j.jenvp.2014.09.004

Khalil, H.P.S.A.; & Davoudpour, Y.; & Saurabh, Ch.K.; & Hossain, Md.S.; & Adnan, A.S.; & Dungani, R.; & Paridah, M.T.; & Sarker, Md.Z.I.; & Fazita, M.RN.; & Syakir, M.I.; & Haafiz, M.K.M. 2016. A review on nanocellulosic fibres as new material for sustainable packaging: Process and applications, *Renewable and Sustainable Energy Reviews* 64: 823–836. https://doi.org/10.1016/j.rser.2016.06.072

Lewis, H. 2005. Defining product stewardship and sustainability in the Australian packaging industry, *Environmental Science & Policy* 8(1): 45–55. https://doi.org/10.1016/j.envsci.2004.09.002

Lewis, H.; & Verghese, K.; & Fitzpatrick, L. 2010. Evaluating the sustainability impacts of packaging: the plastic carry bag dilemma, *Packing Technology and Science* 23(3): 145–160. http://onlinelibrary.wiley.com/doi/10.1002/pts.886/full

Licciardello, F. 2017. Packaging, blessing in disguise. Review on its diverse contribution to food sustainability, *Trends in Food Science & Technology* 65: 32-39. https://doi.org/10.1016/j.tifs.2017.05.003

Lindh, H.; & Olsson, A.; & Williams, H. 2016. Consumer Perceptions of Food Packaging: Contributing to or Counteracting Environmentally Sustainable Development? *Packing Technology and Science* 29(1): 3–23. http://onlinelibrary.wiley.com/doi/10.1002/pts.2184/pdf

Lindh, H.; & Williams, H.; & Olsson, A. & F. 2016. Wikström: Elucidating the Indirect Contributions of Packaging to Sustainable Development: A Terminology of Packaging Functions and Features, *Packing Technology and Science* 29(4-5): 225–246. http://onlinelibrary.wiley.com/doi/10.1002/pts.2197/pdf

Martinho, G.; & Balaia, N.; & Pires, A. 2017. The Portuguese plastic carrier bag tax: The effects on consumers' behavior, Waste Management 61: 3–12. https://doi.org/10.1016/j.wasman.2017.01.023

Martinho, G.; & Piresa, A.; & Portela, G.; & Fonseca, M. 2015. Factors affecting consumers' choices concerning sustainablepackaging during product purchase and recycling, *Resources, Conservation and Recycling* 103: 58–68. https://doi.org/10.1016/j.resconrec.2015.07.012

Ministerstwo Środowiska: Projekt ustawy o zmianie ustawy o gospodarce opakowaniami i odpadami opakowaniowymi [Draft Act amending the act on the management of packaging and packaging waste], 05.07.2017, www.premier.gov.pl [Access on 13.01.2018]

Mudgal, S.; & Lyons, L.; & Kong, M.A.; & Andre, N.; Monier; V.; & Labouze, E. 2011. Assesment of impacts of options to reduce the use of single-useplastic carrier bags. Final report, BIO Intelligence Servive. http://ec.europa.eu/environment/waste/packaging/pdf/report_options.pdf [Access on 17.01.2018]

Njeru, J. 2006. The urban political ecology of plastic bag waste problem in Nairobi, Kenya, *Geoforum* 37: 1046–1058. https://doi.org/10.1016/j.geoforum.2006.03.003

Nordin, N.; & Selke, S. 2010. Social Aspect of Sustainable Packaging, *Packing Technology and Science* 23(6): 317–326. http://onlinelibrary.wiley.com/doi/10.1002/pts.899/full

Oláh, J., Karmazin, G., Máté, D., Grabara, J.K., Popp, J. 2017. The effect of acquisition moves on income, pre-tax profits and future strategy of logistics firms. *Journal of International Studies*, 10(4): 233-245. https://doi.org/10.14254/2071-8330.2017/10-4/18

Pålsson, H.; & Finnsgård, Ch.; & Wänström, C. 2013. Selection of Packaging Systems in Supply Chains from a Sustainability Perspective: The Case of Volvo, *Packing Technology and Science* 26(5): 289–310. http://onlinelibrary.wiley.com/doi/10.1002/pts.1979/pdf

Plastcs Europe: Tworzywa sztuczne - Fakty 2015. Analiza produkcji, zapotrzebowania oraz odzysku tworzyw sztucznych w Europie [Act of 12 October 2017 amending the act on the management of packaging and packaging waste and some other acts] http://www.plasticseurope.org/ [Access on 19.12.2017]

Poortinga, W.; & Whitmarsh, L. & Suffolk, Ch. 2013. The introduction of a single-use carrier bag charge in Wales: Attitude change and

behavioural spillover effects, *Journal of Environmental Psychology* 36: 240-247 https://doi.org/10.1016/j.jenvp.2013.09.001

Rivers, N.; & Shenstone-Harris, S.; & Young, N. 2017. Using nudges to reduce waste? The case of Toronto's plastic bag levy, *Journal of Environmental Management* 188: 153-162. https://doi.org/10.1016/j.jenvman.2016.12.009

Sherrington, Ch.; & Hogg, D.; & Jones, P.; & Doswell, B.; & Cullen, Ch.; & Cole, G. 2012. Assistance to the Commission to Complement an Assessment of the Socio-economic Costs and Benefits of Options to Reduce the Use of Single-use Plastic Carrier Bags in the EU, Eunomia. http://ec.europa.eu/environment/waste/packaging/pdf/study_options.pdf [Access on 20.12.2017]

Steensgaard, I.M.; & Syberg, K.; & Rist, S.; & Hartmann, N.B.; & Boldrin A.; & Hansen, S.F. 2017. From macro- to microplastics - Analysis of EU regulation along the life cycle of plastic bags, *Environmental Pollution* 224: 289-299

Sustainable Packaging Coalition: Definition of sustainable packaging, GreenBlue 2011, https://sustainablepackaging.org/wp-content/uploads/2017/09/Definition-of-Sustainable-Packaging.pdf [Access on 19.12.2017]

Tencati, A.; & Pogutz, S.; & Moda, B.; & Brambilla, M.; & Cacia, C. 2016. Prevention policies addressing packaging and packaging waste: Some emerging trends, *Waste Management* 56: 35–45. https://doi.org/10.1016/j.wasman.2016.06.025

Thomas, G.O.; & Poortinga, W.; & Sautkina, E. 2016. The Welsh Single-Use Carrier Bag Charge and behavioural spillover, *Journal of Environmental Psychology* 47: 126-135. https://doi.org/10.1016/j.jenvp.2016.05.008

Ustawa z dnia 12 października 2017 r. o zmianie ustawy o gospodarce opakowaniami i odpadami opakowaniowymi oraz niektórych innych ustaw. (Dz.U., 2017, poz. 2056)

Verghese, K.L.; & Horne, R.; & Carre, A. 2010. PIQET: the design and development of an online 'streamlined' LCA tool for sustainable packaging design decision support, *Int J Life Cycle Assess* 15(6): 608–620. https://doi.org/10.1007/s11367-010-0193-2

Wagner, T.P. 2017. Reducing single-use plastic shopping bags in the USA, *Waste Management* 70: 3–12. https://doi.org/10.1016/j.wasman.2017.09.003

Williams, H.; & Wikström, F.; &Löfgren, M. 2008. A life cycle perspective on environmental effects of customer focused packaging development, *Journal of Cleaner Production* 16(7): 853-859. https://doi.org/10.1016/j.jclepro.2007.05.006

Willis, K.; & Maureaud, C.; & Wilcox C.; & Hardesty, B.D. (in press) How successful are waste abatement campaigns and government policies at reducing plastic waste into the marine environment?, *Marine Policy,* https://doi.org/10.1016/j.marpol.2017.11.037

Xanthos, D.; & Walker, T.R. 2017. International policies to reduce plastic marine pollution from single-use plastics (plastic bags and microbeads): A review, *Marine Pollution Bulletin* 118(1-2): 17–26. https://doi.org/10.1016/j.marpolbul.2017.02.048

Zailani, S.; & Jeyaraman, K,; & Vengadasan, G.; & Premkumar, R. 2012. Sustainable supply chain management (SSCM) in Malaysia: A survey, *Int. J. Production Economics* 140(1): 330–340. https://doi.org/10.1016/j.ijpe.2012.02.008

Zhu, Q. 2006. An Appraisal and Analysis of the Law of "Plastic-Bag Ban", *Energy Procedia* 5: 2516–2521. https://doi.org/10.1016/j.egypro.2011.03.432

Rozporządzenie Ministra Środowiska z dn. 8 grudnia 2017 r. w sprawie stawki opłaty recyklingowej [Regulation of the Minister of the Environment dated December 8, 2017 on the rate of the recycling fee]. (Dz.U., 2017, poz. 2389)

https://www.cga.ct.gov [Access on 10.12.2017]

https://www.mos.gov.pl [Access on 10.12.2017]

http://podatki.gazetaprawna.pl [Access on 12.01.2018]

http://www.rp.pl [Access on 19.12.2017]

http://www.rp.pl [Access on 12.01.2018]

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