



# **Proposal for Measures to Improve the System of Returnable Beverage Containers to Prevent Waste Generation**

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## **PROPOSAL FOR MEASURES TO IMPROVE THE SYSTEM OF RETURNABLE BEVERAGE CONTAINERS TO PREVENT WASTE GENERATION**

This study was prepared on the basis of Resolution of the Government of the Czech Republic No. 1621 of December 14, 2005 “on Measures to implement Government Regulation No. 197/2003 Coll., on the Waste Management Plan of the Czech Republic, and on cooperation of the ministries in its implementation (Stage II)”. This is related specifically to Measure 7.7. “Prepare a proposal for measures to improve the system of returnable beverage containers in order to prevent waste generation”.

### **1 Reason for Preparation**

Waste management in the 1990’s in the European Union was typically characterized by discussion about the environmental consequences of management of one-way beverage containers and instruments of management through which the impact of this packaging waste on the environment could be mitigated. Similar discussions have taken place at the governmental level in the Czech Republic in recent years.

The main incentive for this discussion lay in the increasing number of one-way beverage containers in the distribution network that were at the end of their lifetimes and the lack of responsibility of the manufacturer in disposal of them without use of their material and energy potential. Simultaneously, this process occurred at the expense of reusable beverage containers and their recovery in beverage production. Consequently, part of the European Union (led by Germany) decided to implement, into the national legislation, the requirement of increased manufacturer responsibility for one-way beverage containers through deposit systems.

The discussion also encompassed the preparation of a number of expert analyses that, on the one hand, were concerned with the environmental impact of one-way and reusable beverage containers (LCA) and, on the other hand, calculated the costs of transition from the existing (well-functioning in a number of countries) system of separate collection of beverage containers to a deposit system. These analyses also included comparison of the financial costs of a deposit system with the achieved environmental effects.

The main goal of the following text thus consists in analysis of potential instruments to promote re-use and recycling of beverage containers in the Czech Republic, on the basis of analysis of the results of professional foreign studies prepared in recent years for the purpose of finding optimal instruments. Although it is possible to identify a total of 3 most important instruments of support for re-use and recycling of beverage containers – packaging tax, licenses and deposit systems, the greatest part of the text will be devoted to the most extensively used system – deposit systems. As deposit systems for reusable beverage containers already function successfully in a number of countries of the European Union (including the Czech Republic), consideration will be given primarily to the possibility of employing deposit systems for one-way beverage containers.

In the framework of this study, emphasis will be placed primarily on the following aspects:

- a. comparison of deposit and other instruments of management

- b. comparison of deposit systems and the existing systems of separate collection of packaging waste to achieve the targets of the WMP, Act No. 477/2001 Coll., on packaging, or the packaging Directive 94/62/EC (including the role of authorized packaging companies)
- c. foreign experience with deposit systems (Germany, Sweden, Estonia)
- d. the environmental impact of one-way and reusable beverage containers
- e. social-economic impacts of deposits on one-way beverage containers for the individual entities participating in the system (manufacturers and fillers of one-way beverage containers, retail and wholesale outlets, consumers)
- f. legal and organizational requirements on introduction of deposit systems for one-way beverage containers
- g. financial costs of introduction of deposit systems for one-way beverage containers in relation to the environmental effects of these systems.

## 2 Definition of the Subject Matter

### 2.1 Legislative framework

The basic legislation decisive for management of beverage containers and deposits for them consists in Act No. 477/2001 Coll., on packaging and amending some other laws (Act on Packaging)<sup>1</sup> and its implementing Decree of the Ministry of Industry and Trade No.116/2002 Coll., on the manner of labelling returnable deposit packaging.

In addition to the Act on Packaging and its implementing decree, the Government Regulation setting the amount of the deposit for selected kinds of returnable deposit packaging, No. 111/2002 Coll., is also important. Following accession to the European Union, the provisions of European Parliament and Council Directive 94/62/EC on packaging and packaging waste (and European Parliament and Council Directive 2004/12/EC of 11 February 2004 and European Parliament and Council Directive 2005/20/EC of 9 March 2005, amending Directive 94/62/EC on packaging and packaging waste) became binding for the Czech Republic.

### 2.2 Explanation of terms and their relationships

beverage container = this term is not directly defined by Act No. 477/2001 Coll., on packaging. Consequently, it is necessary to employ the definition of the term *packaging* according to Section 2 (a) of this Act and the definition of *beverage* in the sense of the provisions of Section 23 (2) of the Act on protection of the public health (No. 258/2000 Coll.). According to this provision, a beverage means a food prepared by a cold or hot method or treated otherwise so that it can be served for consumption either directly or after heat-

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<sup>1</sup> In the wording of Act No. 274/2001 Coll., Act No. 94/2004 Coll., Act No. 237/2004 Coll., Act No. 257/2004 Coll. and Act No. 66/2006 Coll.

ing, provided that it is considered to be a beverage in relation to its state, composition, etc.

returnable packaging = packaging for which there exists a specially created means of returning the used packaging to the person who put it into circulation (Section 2 (h)) of Act No. 477/2001 Coll.) on packaging). This person is obliged to provide for repeated use of this packaging in the framework of an open or closed system according to subparagraphs B1 and B2 of Annex No. 2 of the law or to use the waste from this packaging according to Section 12 of this law.

nonreturnable packaging = any packaging for which there does not exist a specific means of returning the packaging from the consumer or final recovery.

returnable beverage container = a beverage container (packaging) for which there exists a specially created means of returning the used packaging to the person who put it into circulation (Section 2 (h)) of Act No. 477/2001 Coll., on packaging).

returnable deposit packaging = if part of the measure pursuant to Section 8<sup>2</sup> consists in charging a certain amount of money (hereinafter the “deposit”), which is directly related to the returnable packaging used for sale of the product and whose return on return of this packaging is guaranteed to the purchaser on sale of the product, then this packaging is returnable deposit packaging according to this law (Section 9 (10) of Act No. 477/2001 Coll., on packaging).

reusable packaging = packaging that was designed and intended to undergo a certain minimal number of rotations or cycles (Section 2 (g) of Act No. 477/2001 Coll., on packaging).

one-way packaging = packaging that does not comply with the criteria of Section 2 (g) of Act No. 477/2001 Coll., on packaging and cannot be reused.

The difference between the individual terms will be apparent from the following figure:

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<sup>2</sup> Section 8 reads: “A person who places on the market or into circulation products, whose packaging is returnable, shall be obliged to provide for re-use of this packaging according to subparagraph B.1 or B.2 of Annex No. 2 to this Act or for recovery of this packaging pursuant to Section 12”.

Products that are not packaging	Reusable packaging		One-way packaging	
	Nonreturnable packaging  Fabric softener bottles with substitute packaging  EUR palette	Returnable packaging  CO <sub>2</sub> bottles for draught sales Water automat filling	Chemical canister  Film box	Nonreturnable packaging  Bags for baked goods Cardboard boxes Shrink foil Tins PET bottles
		Deposit packaging  Beer bottles Crates		

Source: PETRŽÍLEK, P. (2002)

### 3 Systems of Returnable Beverage Containers in the Czech Republic and the EU

#### 3.1 System to promote returnable beverage containers in the Czech Republic

##### 3.1.1 Legislative framework

The system of returnable beverage containers in the Czech Republic is subject primarily to the provisions of Act No. 477/2001 Coll., on packaging and packaging wastes. Pursuant to Section 8 of the Act, a person who places on the market or puts into circulation products, whose packaging is returnable, is obliged to provide for reuse of this packaging or use of the wastes from this packaging pursuant to Section 12 of this Act. The obligation to reuse packaging is fulfilled by the creation of the following systems<sup>3</sup>:

1. closed system – this is a system in which the reusable packaging is put into circulation by the a person or organized groups of persons;
2. open system – this is a system in which the reusable packaging is put into circulation between unspecified persons.

Criteria for provision for a system for reuse of packaging are stipulated for these systems pursuant to subparagraph B or Annex No. 2 of the Act. The requirements on reusable packaging are stipulated by a combination of requirements on the packaging itself and on the system of reuse of the packaging, in which it is functional. The following criteria are relevant:

1. Criteria for the closed system:

<sup>3</sup> These systems are defined in subparagraph B.1 or B.2 of Annex No. 2 of the Act on Packaging.



- a) the reusable packaging remains permanently in the ownership of the person or organized group of persons;
- b) the packaging is repeatedly placed on the market by the person or organized group of persons who own it;
- c) the structural type of packaging is stipulated according to specifications approved by the participants in this system and is also used according to these specifications;
- d) the systems of collection and redistribution of this packaging is located at a suitable collection site;
- e) the persons or organized groups of persons are obliged to reaccept reusable packaging that was used according to the agreed specifications;
- f) all the persons placing the packaged product on the market are obliged to provide information on the use of the packaging and on places where the packaging can be left for the purpose of reuse;
- g) a system of control is used on the basis of the specifications agreed amongst the participants in the system.

2. Criteria for the open system:

- a) the user of the packaging may, himself, decide whether to reuse the packaging;
- b) the reusable packaging is always owned by the person who is momentarily using it;
- c) the structural type of packaging is stipulated according to generally accepted specifications;
- d) renewal of the packaging for reuse can be ensured by the user of the packaging or is available on the market;
- e) the systems of collection and redistribution of this packaging can be located at a suitable collection site;
- f) a system of control based on generally accepted specifications is used.

In this connection, it should be added that the methodology of evaluating packaging from the standpoint of meeting requirements for repeated use and the procedure for evaluating the individual criteria are defined in CSN EN 13429. Annex B (informative) also states a set of criteria in relation to this standard, on the basis of which it is possible to decide whether used packaging and packaging material meet the requirements for reusable packaging. These requirements are considered to be met if the set of questions can be answered favourably.

If a special amount of money (deposit) is charged for returnable beverage containers, which is directly bound to the returnable packaging used to sell the product and whose return is guaranteed to the purchaser on purchase of the product, then this packaging is a returnable deposit packaging according to Section 9 of the Act on Packaging. This provision further defines the obligations of persons placing products on the market or into circulation in returnable deposit packaging, which must be fulfilled:

- the obligation to stipulate the amount of the deposit for returnable deposit packaging, similar to the manner of labelling this packaging as returnable according to the implementing legal regulation
- the obligation to purchase returnable deposit packaging without limitations on the amount and without binding this purchase to buying goods
- in case of sale of products in returnable deposit packaging to the consumer in a place of operations, to ensure that this returnable deposit packaging is purchased in this place of operations for the entire working time
- the obligation to inform persons, who place products on the market or put them into circulation by sale to the consumer in this packaging, of a prepared change in a kind of returnable deposit packaging or of termination of purchase of the returnable deposit packaging at least 6 months prior to the introduction of these changes or prior to termination of purchase; purchase of this returnable deposit packaging must not be stopped during this period
- the obligation to accept returnable deposit packaging under the conditions valid for the deposit packaging to date for a period of at least 1 year following the last date of placing this packaging on the market or into circulation if the person who placed returnable deposit packaging on the market or into circulation states that he will cease to use the deposit packaging used to date
- a person who places beverages in circulation in packaging (Section 23 (2) of Act No. 258/2000 Coll.) that is not returnable deposit packaging shall be obliged to also offer the same beverages in returnable deposit packaging if the beverage is placed on the market in them. This obligation shall not apply to persons putting these beverages into circulation on a sales area less than 200 m<sup>2</sup>.

### 3.1.2 The current system of returnable beverage containers in the Czech Republic

Returnable beverage containers are part of a system of accepting them from the consumer for the producer. The citizen is motivated to participate in the collection (return to the network of stores) by the monetary deposit<sup>4</sup>. Used packaging is collected using collection automats located at the sale outlets or by some other system of purchasing (the citizen **is not** obliged to return the returnable deposit packaging to the place of sale, but may return it to any other collection site). However, the obligation of paying a deposit is not valid for nonreturnable beverage containers and thus their collection system is based on other rules – these beverage containers are part of a system of separate collection of recoverable components of municipal waste (incl. packaging components).

The system of deposits on reusable beverage containers in the 1990's was typically characterized by a gradual shift in consumer preference, reflected in a transition towards one-way beverage containers (simpler handling, lower weight and possibility of disposing of the packaging waste close to the home). The subsequent accumulation of mostly glass beverage containers in the warehouses of sellers and producers led to a gradual decrease in the amount of the deposit (down to the borderline of 10

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<sup>4</sup> However, it should be emphasized once again that not all returnable beverage containers are subject to deposits!

halers), which further reduced the motivation of consumers to return used beverage containers to the collection sites.

This problem led to a discussion on the choice of suitable instruments to promote reusable beverage containers that would simultaneously re-establish trust of consumers in the deposit system and preference for returnable packaging in consumption. Part of this discussion consisted in support for the existing deposit system through a new law (e.g. introduction of the minimum amount of deposit), increased consumer awareness of the environmental profile of individual beverage containers and application of taxes or compulsory deposits for one-way beverage containers.

In 2001, the new legislation on management of packaging waste came into effect and substantially resolved the problem of deposits for reusable beverage containers. The relationship of the consumer to returnable deposit packaging is governed by Section 9 of Act No. 477/2001 Coll., on packaging and packaging wastes. To begin with, returnable deposit packaging must be suitably labelled (the manner of labelling is defined in Decree of the Ministry of Industry and Trade No. 116/2002 Coll.) and simultaneously the amount of deposit is set (Government Regulation No. 111/2002 Coll. for selected types of beverage containers). This measure is intended to make the system transparent and stable for the consumer, so that his expectations related to deposits are fulfilled (purchase must not be bound to the amount and purchase of goods, a guaranteed amount of deposit).

Simultaneously, sellers of beverages are obliged to ensure the consumer the possibility of a choice between returnable and non-returnable beverage containers. All these measures are intended to enable the consumer to choose a beverage container according to his subjective preferences. If he prefers returnable beverage containers, then he must be able to not only purchase this packaging, but also to return it with the corresponding return of the deposit. It is assumed that, if this possibility is guaranteed to the consumer, then he loses motivation to deposit beverage containers in mixed waste or to manage them illegally (to establish illegal landfills, to throw this packaging away in public places, etc.).

In addition to returnable beverage containers, consumers are able to utilize the system of separate collection of recoverable components of municipal waste. In the framework of this system, consumers are able to dispose of beverage containers close to their homes in prepared containers. On the one hand, this reduces the amount of beverage containers disposed illegally and, on the other hand, the amount of separated useable components increases and can be subsequently recovered materially.

It can thus be concluded that the deposit system for returnable beverage containers has stabilized as a consequence of the beverage legislation after 2001. As is apparent from the following table, some segments of beverage containers exhibit constant growth in the numbers of returnable beverage containers (spirits and wine). On the other hand, the fraction of returnable beverage containers is decreasing in some segments (soft drinks and beer).

### 3.1.3 Current system of separate collection of the useable components of municipal waste in the Czech Republic

The existing systems of separate collection of the recoverable components of municipal waste are organized by municipalities in cooperation with the authorized packaging company EKO-KOM, a.s. Separate collection currently also encompasses one-way beverage containers. If a system of deposits were introduced for one-way beverage containers, this waste flow would be separated from the system of separate waste collection, which would lead to incomplete utilization of the existing capacity of created infrastructure. Consequently, it is necessary to consider the valorization of investments into separate collection, which could be devalued to a considerable degree by a system of deposits for one-way beverage containers.

An important component of the implemented investments consists in investment into the collection network, which encompasses collection in the form of collection in containers, sacks, collection in collection sites, purchasing centres for secondary raw materials and mobile collection. The following table gives the estimated volume of investments.

**Tab. 1. Investment into the collection network in the Czech Republic in 2005**

Commodity	Number of containers in 2005 (items)	Available volume of containers in 2005 (m <sup>3</sup> )	Average unit price – top/bottom emptying containers (CZK/m <sup>3</sup> )	Investment into containers (CZK)
Metal	873	1 420	5200	7 381 733
Beverage cartons	1 570	930	5200	4 835 532
Paper	31 156	35 373	5200	183 938 196
Plastics	49 708	58 941	5200	306 490 704
Coloured glass	40 211	46 894	7800	365 775 267
Clear glass	4 751	5 082	7800	39 638 157
<b>Total</b>	<b>128 269</b>	<b>148 639</b>		<b>908 059 589</b>

Source: EKO-KOM, a.s. (2006)

As approximately 70% of the separated waste in containers consists in packaging, then the investments related to packaging can be estimated at CZK 635,641,712. The amount invested for separate collection through collection sites is estimated at CZK 311,400,000, of which approximately 20% of these costs are directly associated with packaging. Consequently, a total of CZK 62,280,000 has been invested in collection of packaging waste. Thus, the total amount of investments into the collection network corresponds to CZK **697,921,712**.

Further investments were expended for transport of separated collected waste, both the separated components of municipal waste and mixed and large-volume wastes. As the vehicles are employed in a combined manner, only a qualified estimate can be made of investments into transport technology, given in the following table.

**Tab. 2. Investments into transport technology**

Number of vehicles for transport of three basic commodities, approx. 1 vehicle for 40 thousand inhabitants	255 items
Average price per vehicle (taking into account special PRESS vehicles and container carriers with hydraulic arms)	CZK 3,900,000/item
<b>Estimated investments</b>	<b>CZK 994,500,000</b>

Source: EKO-KOM, a.s. (2006)

If it is assumed that investments into transport technology related to packaging again correspond to approximately 70% of total investments into transport technology, then this corresponds to CZK **696,150,000**.

The last important investment item for separate collection consists in treatment of the collected waste. The separated components of municipal waste are treated primarily in final sorting lines (facilities) and also in various halls with manual sorting on the floor and using a press. Transfer sites are also an essential component in some areas. The following table gives an estimate of investments into these facilities.

**Tab. 3. Investments into final sorting lines**

Number of sorting lines (facilities (items))	40
Construction of final sorting lines (CZK/item)	15 000 000
<b>Estimated investments (CZK)</b>	<b>600 000 000</b>
Number of other final sorting operations (items)	60
Investments (CZK)	3 000 000
<b>Total other</b>	<b>180 000 000</b>
<b>TOTAL</b>	<b>780 000 000</b>

Source: EKO-KOM, a.s. (2006)

The investments related to packaging are estimated at 50%, i.e. investments directly related to packaging are estimated at CZK **390,000,000**.

In addition to these investment activities, some other investments can be identified, such as manipulation, manipulation sites and warehouses and manipulation facilities. While these areas are used for general management of wastes, management of packaging is also included. A total of 600 places of operation and individual investments of CZK 800 000 will be considered. Thus, total investments equal approximately CZK 680,000,000, of which investments related to packaging (approximately 30%) correspond to CZK **144,000,000**.

Total investments related to packaging waste and its separate collection thus correspond to approximately **CZK 1.9 bil.** The success of the existing system (and thus the rationality of expended investments) in the form of recycling of beverage containers is described in the following chapter. These investments could be endangered by a potential system of deposits on one-way packaging, as a consequence of deflection of part of the waste flow out of this system<sup>5</sup>.

### 3.1.4 Beverage containers placed on the market and recycled (or recovered) in the Czech Republic

The following tables indicate developments in the market in beverage containers in the Czech Republic between 2003 and 2005. Data for 2002 are not included in the analysis because of their limited information content. In relation to recycling, the data obtained cannot be separated on the basis of returnable or non-returnable beverage containers.

**Tab. 4. Production of returnable and non-returnable beverage containers in the Czech Republic according to the type of material (in tons)**

		nonalcoholic beverages – carbonated and still water, juice, soft drinks and other nonalcoholic beverages			alcoholic beverages – spirits, wine			beer		
		2003	2004	2005	2003	2004	2005	2003	2004	2005
non-returnable	metals	723	650	960	95	124	61	1 281	1 296	1 344
	paper	1 424	1 226	1 003	359	453	286	71	60	74
	plastics	56 965	56 537	53 838	205	270	341	294	354	290
	glass	4 659	4 535	5 533	76 692	65 683	76 716	2 090	2 610	3 120
	beverage cartons	3 442	3 474	2 387	512	583	603	0	0	0
	<b>1. TOTAL</b>	<b>67 213</b>	<b>66 422</b>	<b>63 721</b>	<b>77 863</b>	<b>67 113</b>	<b>78 007</b>	<b>3 736</b>	<b>4 320</b>	<b>4 828</b>
returnable	plastics	1 246	1 049	430	47	25	64	584	426	393
	glass	119 632	108 783	105 620	28 775	30 768	33 557	447 176	507 173	500 336
	<b>2. TOTAL</b>	<b>120 878</b>	<b>109 832</b>	<b>106 050</b>	<b>28 822</b>	<b>30 793</b>	<b>33 621</b>	<b>477 760</b>	<b>507 599</b>	<b>500 739</b>
	<b>SUM (1+2)</b>	<b>188 091</b>	<b>176 254</b>	<b>169 771</b>	<b>106 685</b>	<b>97 906</b>	<b>111 628</b>	<b>481 496</b>	<b>511 919</b>	<b>505 567</b>

zdroj: EKO-KOM, a.s. (2006)

This table reveals some trends that characterized the monitored period for the market in beverage containers. To begin with, there was a general decrease in the market in beverage containers in the segment of nonalcoholic beverages and beer. On the other hand, there was a clear increase in the market in beverage containers for the segment of alcoholic beverages. Amongst nonreturnable beverage containers, there was an increase in the fraction of metal beverage containers (tins) and glass in the segment of nonalcoholic beverages and beer (glass is the dominant beverage container in the segment of alcoholic beverages and beer). In contrast, for the same types of nonreturnable beverage containers,

<sup>5</sup> For more details, see Chapter 4.3.

there was a decrease in the fraction of plastic packaging although, in spite of this decrease, plastic packaging remains unambiguously the dominant type for nonalcoholic beverages.

Glass is by far the most dominant returnable beverage container. Its use is increasing particularly for the segment of the market in alcoholic beverages, while its fraction has decreased in the segment of nonalcoholic beverages and beer since 2003. The fraction of plastic returnable beverage containers has decreased in the segment of nonalcoholic beverages and beer. In contrast, there has been an increase in the fraction of returnable plastic packaging in the segment of alcoholic beverages (however, this increase is negligible in relation to the overall fraction of returnable plastic beverage containers).

**Tab. 5. Recycling of beverage containers (cannot be differentiated for the individual groups, in tons or %)**

	2003	2004	2005
metals	767	896	917
paper	315	353	405
plastics	20502	23672	26663
glass	47348.55	47405	57893
beverage cartons	10	47	128
<b>TOTAL</b>	<b>68 943</b>	<b>72 373</b>	<b>86 006</b>
	2003	2004	2005
metals	36.6 %	43.3 %	38.8 %
paper	17.0 %	20.3 %	29.7 %
plastics	35.7 %	41.4 %	49.0 %
glass	56.7 %	65.1 %	67.8 %
beverage cartons	0.3 %	1.2 %	4.3 %

Source: EKO-KOM, a.s. (2006)

The trends in recycling of beverage containers according to the type of material are apparent from the previous table. It is apparent that the amount of recycling is increasing in absolute terms for all material types of beverage containers (most for glass and plastics). Simultaneously, there has been an increase in the fraction of recycled beverage containers in relation to total beverage containers placed on the market (see Tab. 1). Only the fraction of metal beverage containers decreased in 2005; however, it must be emphasized that this is only a relative decrease. In absolute terms, the fraction of recycled metal beverage containers is increasing.

Increased recycling of beverage containers as a consequence of combination of the system of deposits for returnable beverage containers and the system of separate collection of the recoverable components of municipal waste contributes substantially to achieving the required degree of recycling and recovery of waste packaging according to Annex 3 of Act No. 477/2001 Coll., on packaging and packaging wastes.

## **3.2 Systems of support for returnable and nonreturnable beverage containers in the EU countries**

Germany, Sweden, Finland, Denmark and Estonia were chosen for analysis of the systems of returnable beverage containers in the countries of the European Union. This choice was motivated not only on the basis of the extensive experience of these countries with systems of returnable beverage containers, but also in relation to the possibility of transposition of foreign experience to the conditions in the Czech Republic.

The most important instruments of support for the recovery and recycling of beverage containers in these countries of the European Union are primarily:

- a deposit system for reusable beverage containers (Germany, Sweden, Estonia, Finland)
- a deposit system for one-way beverage containers (Germany, Denmark)
- tax on packaging (Estonia, Finland)
- prohibition of use of one-way beverage containers (Denmark)

### **3.2.1 The deposit system for one-way beverage containers in Germany**

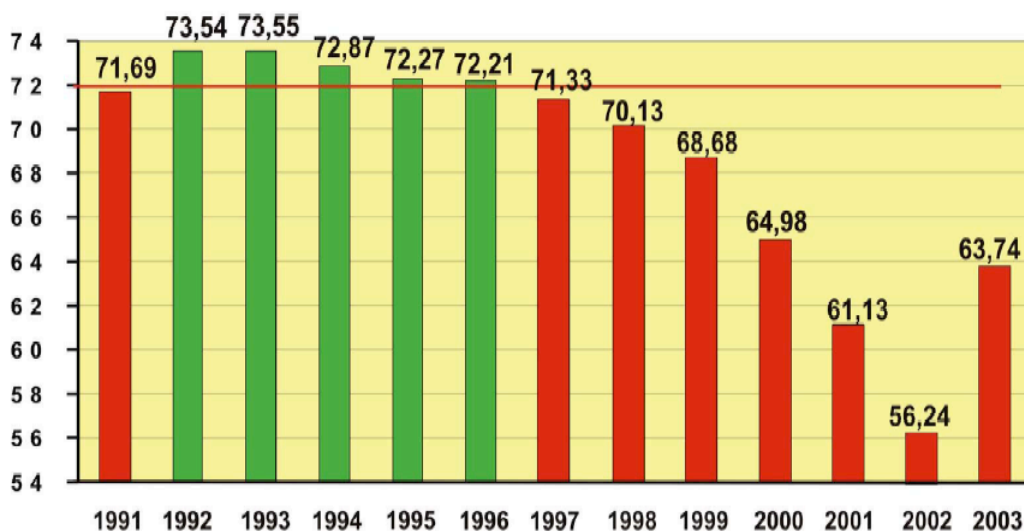
Making deposits for one-way beverage containers in Germany is based on the provisions of the law on packaging (VerpackV) of 1991. This Act stipulated the obligation to introduce a deposit system for one-way beverage containers by setting a reference limit for the fraction of reusable beverage containers on the beverage market of 72%. If the real fraction of reusable beverage containers on the market did not reach this limit, then a deposit system would be automatically created.

This situation occurred in 1997, when the fraction of reusable beverage containers reached 71.33%. As the reduction in the fraction of reusable beverage containers on the market was confirmed in the following two years (including a subsequent additional survey), the obligation of charging a deposit was imposed on all one-way beverage containers where a decrease in the fraction on the market below 72% had occurred (depending on the specific beverage market). The amount of the deposit was set exactly at a limit of a minimum of 0.5 DM for beverages to 1.5 l and 1 DM for beverages over 1.5 litre. The automatic creation of a deposit system for one-way beverage containers according to the law follows 6 months after an additional survey of the fraction of reusable beverage containers on the market, which must be published in the bulletin of the federal government.

The trend in the fraction of reusable beverage containers is depicted in the following graph:

**Fig. 1 – Trend in the fraction of reusable beverage containers in Germany (%)**





zdroj: [www.umweltministerium.de](http://www.umweltministerium.de)

Specific data for the individual kinds of beverages show that the fraction of reusable beverage containers decreased compared to 1991, especially for beer, mineral waters and wine. As the legally defined fraction of reusable beverage containers decreased below 72% in 1997, the process of implementation of the obligations for one-way beverage containers was commenced. This obligation came into effect in 2003.

However, a two-year period preceded entrance of this obligation into effect (from 2001), when there were intensive discussions of the usefulness and costs of introduction of the deposit obligation. Simultaneously, possible amendments of the law were discussed, which would remove some one-way beverage containers from the jurisdiction of the deposit obligation, where these would be beverage containers that do not damage the environment. Simultaneously, discussions were held both at the national level and at the international level (European Court of Justice) on whether the German deposit system was contrary to legislative obligations following from European Regulations and Directives.

At the end of 2002, the most important enterprises promised to create a deposit system, to come into effect from October 2003. After the provisions of the law on the deposit obligation came into effect on January 1, 2003, work was commenced on the creation of the actual deposit system. This work was performed in an atmosphere of uncertainty, caused by the discussion of the deposit obligation at a national and international level.

Individual deposit systems (Insellösung), created by some chain stores, came into force from October 2003. These systems applied primarily to selected beverage containers that the consumer had to return to the place of purchase. There was no central system that would allow the consumer to return the beverage container in any outlet. The lack of a uniform system at a national level was criticized by the European Union, especially for reasons of limitation of free trade (disadvantage particular for foreign fillers of beverage containers).

Consequently, in 2004, the Federal Council discussed an amendment to the law on packaging that, after intensive discussion, was published in the collection of laws on May 27, 2005. This amendment came into legal force on May 1, 2006 and, on this date, the validity of the individual systems ended and a uniform national deposit system was introduced for one-way beverage containers.

### **The current state of the deposit system**

On May 1, 2006, the amendment to the law on packaging (Verpackungsverordnung – VerpackV) came into force; this amendment changed some of the provisions of the original law relating to the deposit system for one-way beverage containers. The amendment extended the deposit obligation for one-way beverage containers with a volume of 0.1 to 0.3 litres for noncarbonated nonalcoholic beverages and mixed alcoholic beverages (especially “Alcopops”). Fruit and vegetable juices, milk, wine and spirit beverage containers thus remain without a deposit, similar to environmentally sound one-way beverage containers (cartons, PE-packaging and aluminium foil). The amount of the deposit is set at 25 Eurocents.

The fact that, from May 1, 2006, it has not been possible to operate an individual system of taking-back of beverage containers placed on the market by the manufacturer (or filler) is an entirely fundamental change in the law. In the framework of these systems, an outlet could refuse to accept the beverage containers of a producer that it did not sell. However, since this date, deposit bottles may be turned in anywhere immaterially of where they were purchased. The seller is obliged to reaccept all deposit one-way beverage containers that materially correspond to the beverages offered for sale, without regard as to whether they are from the same or a competing company.

If the seller offers only one-way PET beverage containers, then he is not obliged to reaccept tins or glass bottles but, on the other hand, is obliged to reaccept PET bottles without regard to size, form and brand. The only exception consists in outlets with an area of less than 200 m<sup>2</sup>, which may additionally limit taking-back to selected brands of one-way beverage containers that they, themselves, sell.

### **The DPG system (Deutsche Pfandsysteme GmbH (DPG) - [www.dpg-pfandsystem.de](http://www.dpg-pfandsystem.de))**

The German DPG deposit system was established in June 2005 by the Federation of German Food and Drink Industries (BVE) and the German Retail Federation (HDE). This system was intended to create a uniform deposit system for one-way beverage containers for all of Germany. The system was created on the basis of voluntary initiatives of industry and trade, and associated entrepreneurs that participate in the life cycle of one-way beverage containers. It also encompasses fillers of packaging, manufacturers of tins, printing of labels, importers, wholesale and retail outlets and also services concerned with taking-back and clearing of deposits.

#### **- obligations following from the DPG system**

Entities that put one-way beverage containers into circulation in Germany are obliged to label this packaging with the symbol of the DPG system and the EAN code. The symbol of the DPG system consists in the stamp of the DPG system with a special colour on the packaging. This colour is recognized by various take-back automats and the accounting centre of the entity obliged to reaccept them. The EAN code is used to assign the DPG packaging to an entity that puts the one-way beverage containers into circulation.

#### **- transition to the DPG system**

At the beginning of 2006, entities putting one-way beverage containers into circulation were able to order labels and packaging labelled with the DPG and EAN code from an authorized and certified entity performing printing of labels and manufacturing of packaging (using the DPG colour). The following rules are valid in the sense of authorized transition:

- for beverage containers that are already in circulation (e.g. from individual systems)
  - o from May 1, 2006, entities putting packaging into circulation may use only packaging from the DPG system (labelled with the EPG system and EAN code)
  - o as of May 1, 2006, already filled old beverage containers (without DPG labelling and the new EAN code) may also be purchased (by the entity putting the packaging into circulation)
- for new deposit beverage containers placed on the market after May 1, 2006 (e.g. ice tea, liquers)
  - o from May 1, 2006, only deposit packaging with labelling of the DPG system and the new EAN code may be put into circulation
- Clearing

The fact that the consumer may turn in the deposit bottle anywhere leads to the need for clearing – accounting for the deposits between the fillers of the beverage containers and the outlet. The representatives of industry and trade agreed on the creation of clearing and created the DPG system. This system subsequently declares standards, on the basis of which accounting for deposits can function and cover the entire territory of Germany.

Clearing of deposits for old beverage containers ended on December 31, 2006. Since that time, the EAN codes of old packaging have been stored in the data bank and will no longer be accepted by the automats and accounting centres. This old packaging will be able to be accepted only manually and the clearing will have to be adjusted bilaterally between the seller and the entity that first put the packaging into circulation. The affected entrepreneur should ensure that only packaging with labelling of the DPG system is put into circulation after May 1.

The transition period also applied to automats, as it was expected that, as of May 1, not all sellers would have automats for taking-back that would be capable of identifying the labelling of the DPG system. Up until October 1, the outlets (or accounting centres) could have automats that recognize the EAN code, but not the labelling of the DPG system. These automats obtained temporary certification. However, by October 1, these automats had to be fitted with equipment to identify the DPG system and these automats had to be certified.

### **Taking-back of old or damaged packaging**

Old or damaged one-way beverage containers – i.e. packaging with the label of the DPG system must also be taken back, i.e.:

- old packaging for which a deposit was paid before May 1, 2006 (with the corresponding designation of deposit) in individual systems

- damaged packaging or packaging with a damaged label, on which the labelling is still recognizable.

a. take-back using automats

In the DPG system, the seller can use automats for taking-back. However, taking-back of older and damaged packaging encounters technical problems when automats are used. For older packaging, the person who first placed the packaging on the market (e.g. the filler), must enter the EAN code of this packaging into the data bank of the DPG system (packaging for which deposit was paid prior to May 1, 2006 and that were labelled in the appropriate manner). On the other hand, packaging with an EAN date older than July 1, 2005 or packaging without deposit labelling will not be recognized by the automats and will be rejected.

If the packaging is damaged, it is necessary that it be able to rotate in the automat – the labelling of the DPG and EAN system must be legible on the packaging. It thus follows that:

- the packaging must not be crushed or otherwise bent
- the label with the DPG/EAN symbol must still be attached to the bottle
- the DPG symbol or bar code must not be dirty

The automat automatically rejects deformed or dirty packaging. The DPG system recommends that sellers prevent long queues and consumer frustration by informing customers during sale about proper handling of packaging, so that taking-back in automats is problem-free.

b. manual acceptance and payment of the deposit

It holds for manual taking-back of deposit bottles that the deposit must be paid immediately. The seller need not pay the deposit if it is (no longer) apparent that a deposit was collected for the particular packaging. This holds for the following cases:

- **packaging without denoting of a deposit** – the packaging does not have any symbol indicating that a deposit was paid. This case is mostly related to foreign packaging that was put into circulation without a deposit or packaging that was put into circulation prior to entrance of the deposit obligation into validity on January 1, 2003 or its extension to May 1, 2006. This packaging does not bear any labelling about a deposit.
- **packaging with missing label** - the label with possible denoting of a deposit has been removed from the beverage containers and it is not apparent from the packaging itself that it is subject to the deposit obligation
- **packaging with substantial damage** – the beverage container or the label is so damaged that the denoting of a deposit is no longer apparent

In case of uncertainty of the seller in accepting an old beverage container from the individual take-back system, the list of deposit packaging, provided by the DPG system, can be used. If the seller takes back a one-way beverage container without apparent designation of deposit, he loses the right to reimbursement for the deposit from the entity that put this packaging into circulation.

## **Note**

The DPG system is a system for one-way beverage containers, i.e. there is no obligation to take back reusable beverage containers. These beverage containers will be accepted only by those sellers who agreed to participate in the voluntary system for reusable beverage containers. Sellers who sell only one-way beverage containers are authorized to point out to their customers that they do not take back reusable beverage containers.

It is not clear to what degree the deposit obligation for only some one-way beverage containers is consistent (SRU, 2002; p. 410). The problem lies in the fact that the deposit obligation is not dependent on the kind of one-way beverage container, but rather on its content. Thus, the deposit obligation applies to beer, mineral water and carbonated beverages, but not to other beverages packaged in the same one-way beverage containers. This fact is not only inconsistent and hard to understand for the consumer, but also constitutes a suitable incentive for a negative reaction of the affected entities (SRU, 2004, p. 352).

The condition for implementing deposit systems for one-way beverage containers – i.e. attaining a level of a 72% fraction of reusable beverage containers on the market – is also questionable. Does this limit mean that the deposit obligation will be cancelled after this quota is achieved again? This would lead to a cyclic process of introduction and cancellation of the deposit obligation as the prescribed quota was attained and not attained (SRU, 2004, p. 353).

## **Results of support for the use of reusable beverage containers in Germany**

As indicated by the results of the *Infoteam Königstein*<sup>6</sup> institute, the fraction of reusable beverage containers decreased substantially following introduction of the deposit obligation for one-way beverage containers, which meant that this support instrument missed its originally intended effect – i.e. support for reusable beverage containers in the market. In the sector of nonalcoholic beverages, the fraction of reusable beverage containers decreased by 7.8% in 2005 compared to the previous year (from 61.0 to 53.2%)<sup>7</sup>. In the sector of mineral waters, the fraction of reusable beverage containers decreased by 8.5 % in 2005 compared to the previous year (from 62.50 to 54.0 %)<sup>8</sup>. There was a smaller reduction in reusable beverage containers for beer (by 1.3% in 2005 compared to 2004, with an increase in the fraction by 4.9% compared to 2003).

It is apparent from this information that the original intention of introduction of the system of deposits for one-way beverage containers, consisting in support for reusable beverage containers, was not realized in the expected 3 year period. To the contrary, the deposit obligation led to a substantial reduction in the recovery of reusable beverage containers. One of the explanations could lie in the preference for one-way beverage containers by chain stores, which prefer this packaging because of the lower opera-

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<sup>6</sup> More detailed information can be found on the web site <http://www.neue-verpackung.de/>.

<sup>7</sup> In 2003, the fraction of reusable beverage containers corresponded to 66.2% - i.e. this fraction had decreased in 2005 by 13% compared to 2003.

<sup>8</sup> In 2003, the fraction of reusable beverage containers corresponded to 69.5 % - i.e. this fraction had decreased in 2005 by 15.5 % compared to 2003.

tional demands on storage (one-way beverage containers are crushed and thus take up less room than reusable beverage containers).

### **Applicability of German experience under the conditions in the Czech Republic**

German experience provides important guidance for potential attempts of the Czech Republic to introduce a deposit system for one-way beverage containers, both in adjusting the system and in the advisability. However, attempts to transpose German experience to Czech conditions require that two important factors that could encumber this transposition be taken into account. To begin with, the cost of the system is an important factor; secondly, the ability of Czech producers to alter production in favour of reusable beverage containers should be considered.

If the costs of joint performance and the costs of operation of separate collection in Germany are compared, then these are approximately the same quantities. However, this fact has important consequences for the position of beverage producers in case of introduction of deposits, for which the payments in the framework of joint performance and for operation of the deposit system are not very different. However, this ratio of costs does not correspond to conditions in the Czech Republic, where a deposit system would lead to an increase in the costs of beverages by up to 7% in some cases (see Chapter 4.1.3.5).

The second factor consists in the ability of Czech beverage producers to reorient towards the production of reusable beverage containers. Under German conditions, it is assumed that medium-sized and large manufacturers can arbitrarily change the structure of production of beverage containers (one-way or reusable) according to the demand on the market. However, this is not possible under Czech conditions, because only a very small number of producers have production lines for both types of products. Investment into new filling lines and returnable packaging for medium-sized and large enterprises attain a figure of CZK 1-4 bil. with start-up within 2 years. This fact substantially reduces the reaction ability of manufacturers in case of introduction of the deposit obligation for one-way beverage containers (and basically the effectiveness of any other instruments to promote reusable beverage containers mentioned in Chapter 4.2).

Except for small residual capacities, manufacturers in the Czech Republic do not have practically any technology for reusable packaging in the beverage segment, with the exception of beer. Even though the manufacturers had the relevant technology at their disposal in Germany, the introduction of deposits on one-way beverage containers led to a reduction in the amount of reusable beverage containers. Consequently, it could also be expected in the Czech Republic that the introduction of deposit systems would have no or a negative effect on the amount of reusable beverage containers. On the other hand, an impact on the price of beverages could be expected because, in contrast to Germany, where the costs of deposits on one-way beverage containers are comparable with the costs of separate collection, in the Czech Republic the costs for deposit systems would be higher than the current costs of separate collection of the recoverable components of municipal waste.

In attempts to employ German experience in practice in the Czech Republic, it is also necessary to devote considerable attention to the assumptions and postulations of the system created under the conditions in Germany, which cannot be transposed to the conditions in the Czech Republic.

### **3.2.2 The deposit system for returnable beverage containers in Sweden**

Instruments promoting the recovery and recycling of packaging have a long tradition in Sweden. Deposits on selected types of beverage containers – glass and, during the 1980's, also aluminium – were primarily a key instrument. At that time, the deposit on aluminium packaging (which, however, was not set by law) reached a level of € 0.05. Importers of these types of packaging were obliged to register them with the State Board of Agriculture and to simultaneously pay a surcharge of € 0.004 for each tin, because these entities did not participate in the take-back system. Funds derived from this surcharge were turned over to the authorized company Returpack AB, which operated the system and paid for collection and recycling of tins included in the system from the collected funds. The main purpose of this surcharge was to eliminate the advantage for importers of tins compared to domestic producers who participated in the Returpack AB system. If an importer participated in the Returpack AB system, then it was exempt from the surcharge.

The law of 1991 also introduced obligatory deposits on PET beverage containers, particularly as a consequence of environmentally unsound waste management of this packaging (see Littering, mentioned elsewhere in the text). This law laid down the obligation of manufacturers of PET packaging and importers to obtain a permit for management of these beverage containers from the State Board of Agriculture (1.100 €), which is granted only if the relevant beverage container is part of a system with attained recovery and recycling to a level of 90%, with a defined deposit (€ 0.11 for beverage containers to 1 litre and € 0.22 for beverage containers over 1 litre) and simultaneously the packaging is labelled with information that it is part of the system.

Sweden has prolonged experience with deposit systems for glass beverage containers for beer and nonalcoholic beverages. Up to 1998, this system also included beverage containers for wine; however, this system was abolished after the fraction of reusable beverage containers on the market decreased to a level of 35% (as a consequence of abolishing of the state monopoly on the import of alcohol in 1995, because of changes in taxation of alcohol – transition from taxation based on price to taxation based on alcohol content, leading to a reduction in the difference in prices between domestic and foreign producers and thus in consumer preference. Sweden attains a high level of recycling of glass beverage containers, exceeding the obligation defined in the national legislation.

According to the legislation, which came into effect on January 1, 2006, some changes have occurred that are important from the point of view of attaining the obligation of taking-back and recycling beverage containers. To begin with, it should be stated that the deposit system is being extended to all plastic packaging and tins intended for direct consumption (however, the deposit does not apply to dairy products, vegetable products and fruit or other berry products).

Every participant in the system is obliged to pay an annual fee of € 1080 to the State Board of Agriculture to cover the costs of monitoring and control. Simultaneously, beverage containers must be labelled and must contain information stating that they are part of the created system and the amount of deposit required. The consumer must be informed about all the details of taking back of beverage con-

tainers. The legislation also contains a new level of recovery and recycling of selected beverage containers (the current levels of the degree of recycling are given in the following table).

**Tab. 6. Degree of recycling in Sweden in 2008 (%)**

kind of beverage container	recycling
metal beverage containers	90 %
plastic beverage containers	90 %
glass packaging	70 %

Source: Ministry of the Environment of Sweden

Every new participant in the Returpack system is obliged to pay a fee of € 1100, which is then transferred to the State Board of Agriculture, for PET packaging and metal packaging. Importers and producers pay a deposit of € 0.05 directly into the Returpack system for aluminium tins, without a handling fee, because the operating costs of the system are covered by the value of aluminium on the market. Importers and producers pay a deposit of € 0.05 for steel tins and also a handling fee of € 0.03 for each tin.

The amount of deposit for PET packaging is given in the following table:

**Tab. 7. Deposits and handling fees for PET beverage containers in Sweden (SEK)**

	tins	one-way PET (<1 l)	one-way PET (>1 l)	reusable PET	glass (33 cl)	glass (50 cl)
<b>net deposit</b>	0.45	0.89	1.79	3.57	0.50	0.80
<b>gross deposit</b>	0.50	1.00	2.00	4.00	0.56	0.90
<b>net handling fee</b>						
sales (with RVM)	0.14	0.50	0.60	--	--	--
sales (without RVM)	0.00	0.40	0.40	0.60	0.18	0.18
brewery (bottles counted at seller)	0.06	0.14	0.36	--	--	--
brewery (bottles counted at brewery)	0.20	0.09	0.34	--	--	--
<b>net administrative fee</b>						
administrative fee	0.00	0.27	0.77	0.60	0.18	0.18
fee for sorting coloured PET	--	0.15	0.15	--	--	--

Source: [www.returpack.se](http://www.returpack.se)

According to the newest information, the Swedish system has led to an increase in recycling PET packaging, which reached a level of 80% in 2004. However, it is apparent from the table of recycling targets that even this high level of recycling is less than the level of 90% required by the law. Recycling of tins attained a level of 85% in Sweden in the same year, where this fraction has decreased gradually since 1996 (when it equalled 92%).



In this connection, it should be pointed out that, in spite of the high performance of the deposit system in recycling beverage containers, overall recycling is not very successful in Sweden. The strong orientation towards a deposit system for beverages in the area of management of packaging waste could be one of the reasons why, e.g., recycling of plastics in Sweden is less than in the Czech Republic (in 2004, recycling of wastes reached a level of 41.4% in the Czech Republic, but only 25.2% in Sweden).

### **3.2.3 The deposit system for returnable beverage containers in Estonia**

Support for recycling and recovery of beverage containers in Estonia has two forms – (a) a tax on packaging and (b) a deposit system. The following text summarizes the experience gained in Estonia in the past few years. These systems are intended to assist Estonia in achieving the targets defined in Directive 2004/12/EC, which sets the target of recycling at least 55% (maximally 80%) of packaging waste for 2008 (December 31, 2008).

#### **a. Tax on packaging (packaging tax)**

Packaging tax was introduced in an attempt to increase the motivation of packaging producers to prefer environmentally sound materials in manufacture and subsequent recovery and recycling. This intention stipulated, on the one hand, the amount of tax, which had to create a real stimulus for achieving these targets, and, on the other hand, a definition of the limits for the recovery and recycling of the relevant packaging. Introduction of this instrument of state policy also exerted pressure on close cooperation between manufacturers of packaging and the operators of facilities authorized to process packaging waste. The creation of a fund (*the Environment Fund*) was an important side effect of implementation of this instrument; 50% of the collected funds were transferred to this fund (the remaining 50% of the collected funds were an income for the state budget). Means from the fund were subsequently used to finance activities related to management of packaging waste.

Packaging tax has been in effect in Estonia since March 1997, when it was imposed on beverage containers for beer, wine and spirits. In December 1998, this tax was extended to include beverage containers for nonalcoholic beverages, juices, mineral waters and flavoured milk. The last step involved extending the tax to all beverage containers in June of 2000. The packaging tax consisted of two parts – tax according to volume (l) and tax according to packaging. The assessed tax was thus calculated as the sum of these two parts. The amount of the tax was set in relation to the environmental soundness of the material from which the beverage container was made. An important factor in assessing tax on beverage containers consisted in the fact that payment of the tax could be avoided if at least 60% of the particular beverage container was separated, recovered materially or recycled, or used as fuel. The amount of tax is given in the following table:

**Tab. 8. Packaging tax in Estonia (in €)**

	tax by volume	tax by packaging
glass and ceramics	0.14	0.04
plastics	0.14	0.07
metals	0.14	0.05
other (cartons, etc)	0.07	0.02

Source: Ministry of the Environment of Estonia

A change occurred in January 2005 and the packaging tax was then set according to weight and simultaneously the target in recovery of the packaging was defined (see the following table):

**Tab. 9. Amount of packaging tax in Estonia after January 2005 (€/kg)**

	metals and plastics	cardboard and combined material	glass and ceramics
tins for nonalcoholic beverages and beer	2.4	--	--
other deposit packaging	2.4	1.2	0.6
other beverage containers	2.4	1.2	0.6

Source: Ministry of the Environment of Estonia

#### **b. compulsory deposits**

The new system of deposits on beverage containers has been in operation since May 2005 (EPP) and applies to one-way and reusable beverage containers (glass, metals and plastics). The following beverages are involved:

- nonalcoholic beverages (carbonated and uncarbonated)
- beer
- beverages with low alcohol content (< 6% ethanol)
- mineral water and juice
- concentrates and nectars

The deposits are set in the following amounts according to the nature of the beverage container:

**Tab. 10. Amounts of deposits in Estonia (€)**

beverage container	deposit
tins	0.03
one-way plastic packaging (0.5 l or less)	0.03
one-way plastic packaging (more than 0.5 l)	0.07

one-way or reusable glass packaging	0.07
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Source: Ministry of the Environment of Estonia

*Eesti pandipakend* (EPP) is the operator of the system; this is a nonprofit organization owned by the national associations of beverage producers, importers and trade in Estonia. This system functions so that producers (fillers) of beverage containers pay a specific fee (€ 32.50) to the system, where the EPP system ensures that the beverage containers collected from sellers will be recovered or returned to the beverage production process. Sellers must simultaneously be registered in the system, because they receive back the fee from the EPP system for handling and taking back beverage containers. Consumers can return beverage containers that are part of the EPP system at all collection sites without regard to the original place of sale.

Producers (or importers) must also pay a fee for registration and assignment of a bar code in the framework of the system, depending on the type of packaging, in an amount of € 6.50 and also a fee for the beverage container of € 0.007 (however, only for glass and plastic packaging, as this fee was not collected for tins in 2005).

The obligation to label beverage containers that are part of the EPP system is an important aspect of the deposit system in Estonia. The labelling consists of a specific symbol that also contains information on the amount of the deposit. The obligation of collection sites to take back beverage containers thus applies only to packaging that is appropriately labelled.

### 3.2.4 System of promotion of the use of reusable beverage containers in Finland<sup>9</sup>

Two types of instruments are employed in Finland to favour reusable beverage containers:

- taxes on packaging
- a deposit system

Tax is paid on beverage containers for alcoholic and nonalcoholic beverages and its main purpose is to reduce the amount of waste and packaging waste intended for disposal and prevention of the “Litter” problem. The level of taxation currently equals a level of EUR 0.51/litre for one-way beverage containers<sup>10</sup>. Beverage containers whose material composition is suitable for subsequent material recovery and for which there exists a system of collection and material recovery are taxed at a level of 8.5 cents /litre for a temporary period from 2005 – 2007; after this time, they will be exempt from taxes. In 2005, the income from these taxes was expected to equal EUR 13 million.

<sup>9</sup> The main source of information on the system of promotion of the use of reusable beverage containers in Finland was the official report of the Finnish Ministry of the Environment (Ministry of the Environment of Finland: Recycling of Beverage Packages, available on the web: <http://www.environment.fi/default.asp?contentid=113054&lan=EN>)

<sup>10</sup> At this point, it should be pointed out that this tax has basically led to elimination of one-way beverage containers on the market (the fraction of these beverage containers has decreased to only 2%). It is thus apparent that the relationship between the amount of tax and the cost of the beverage plays a fundamental role. The higher the tax in relation to the overall cost of the beverage, the greater the consequences for sales of the beverage on the market. A similar result could be expected in the Czech Republic if the amount of tax corresponded to EUR 0.51/litre (i.e. approx. CZK 13).

The tax need not be paid if the packaging is part of a deposit system, where participation in the created system is controlled by the Ministry of the Environment. The system of taxation of packaging supports producers, importers and retailers in creating a system for taking-back, recovery and recycling of beverage containers. This system is simultaneously pleasant for users. Income from the taxes is relatively negligible for the State and the main reason for functioning of this system lies in environmental benefits.

A report published by the Finnish Environment Institute states that the system of taxation of beverage containers works very well, resulting in a 98% level of recycling of nonalcoholic beverage containers. Similar to other countries of the European Union, a broad discussion has also been held in Finland on the environmental soundness of individual types of beverage containers. Consequently, 2 studies were drawn up in 1995 and 2000, analyzing the environmental impacts of 0.33 – 0.5 litre glass beverage containers, PET bottles and tins. As a consequence of these studies, it was found that the impact of the individual beverage containers decreased during the analyzed years.

The LCA studies also indicated that reusable beverage containers are better than recycled aluminium tins for all the selected indicators; the latter have a greater detrimental impact on acidification, climate change and destruction of the ozone layer.

The transport system also logically plays a very important role in evaluation of environmental soundness. In this respect, the Finnish system is considered to be effective, because it was possible to optimize transport of beverages and simultaneously of empty bottles back to the producer (or service centres). This step minimizes transport of beverage containers and thus the environmental impact.

The report of the Ministry of the Environment further states that, while the volume of beverages sold is increasing, the number of kilometres of beverage transport is decreasing, reflecting better logistic planning. Simultaneously, there is an increase in the fraction of railway transport. As far as the fractions of the individual beverage containers is concerned, there is a transition from glass bottles to PET bottles, with a corresponding decrease in the weight of the transported beverage containers. All these trends contribute to a reduction in the amount of emitted substances into the air as a consequence of transport.

### **3.2.5 System of promotion of the use of reusable beverage containers in Denmark<sup>11</sup>**

In 2002, the Government of Denmark decided to prohibit the use of tins for beer and certain kinds of nonalcoholic beverages. At the same time, Danish breweries were prohibited to use one-way beverage containers on the Danish market. These prohibitions were imposed under conditions where the collection and deposit system for reusable packaging would continue to function. Dansk Retursystem A/S was entrusted with operation of the deposit system and the system of collection of empty one-way packaging.

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<sup>11</sup> The main sources of information on the system of promotion of the use of reusable beverage containers in Denmark were the official reports of the Danish Ministry of the Environment (Ministry of the Environment of Denmark (2005): More about new tool for regulating disposable packaging for beer and soft drinks, access on the web: <http://www.mim.dk/Nyheder/Engelsk+nyhedsbrev/Arkiv/2005/Danish+Environment+Newsletter+no.+6+2005/further+info.htm>)

In addition, one-way beverage containers were labelled on the basis of special rules. A total of 3 deposit stamps were used (A, B and C according to the volume of the beverage container). This system simplified the decision about whether a one-way packaging was correctly labelled and whether the correct deposit was collected.

With the introduction of prohibition of tins, the import and sale of beer and nonalcoholic beverages in one-way beverage containers increased. Simultaneously, there was an increase in the number of outlets that did not meet the requirements of the deposit system. In the summer of 2002, the Danish EPA identified approximately 250 outlets that did not meet the requirements on the deposit system for one-way packaging that they were obliged to fulfil. Simultaneously, EPA and Dansk Retursystem A/S identified sellers, importers and producers that did not comply with the regulation conditions that had already come into force.

In 2004, Danish Coca-Cola A/S carried out a study that indicated that 34% of the nonalcoholic beverages in stores was imported. 76% of these imported beverages did not meet the conditions for regulation of deposit stamps and 55% of imported one-way 2-litre beverages were sold without a deposit. A similar study in 2002 yielded 32% of these beverages.

These facts led to a situation where a large number of beverage containers were not returned for recovery through the take-back system, but ended up in the normal system of separate collection of municipal waste or were a cause of the “Litter” problem. Inadequate accordance with the legal regulations led to substantial distortion in the competition on the market between importers, producers and sellers who complied with the conditions and those who did not comply. This is because some sellers not paying the deposit could sell beer and nonalcoholic beverages at a price of over DKK 1 less than the other sellers.

Consequently, the Danish government decided on a measure to prevent this conduct and to ensure compliance with the legal requirements, in the framework of the government Fair Play campaign. The instrument consists in effective control.

## 4 Evaluation of the Possibility of Employing a System Other than the Existing System of Returnable Beverage Containers in the Czech Republic

### 4.1 Introduction of a system of deposit one-way packaging

#### 4.1.1 Legal and organizational limits

On the basis of foreign experience, it can be expected in connection with the introduction of a deposit system for one-way beverage containers that some of the existing legal regulations will have to be modified. To begin with, it would be necessary to modify **Act No. 477/2001 Coll., on packaging and packaging wastes**, as amended, from which it would have to be apparent that one-way beverage containers are also returnable packaging. In this case, they would be subject to the wording of Section 9 of the Act on Packaging.

The change would also apply to definition of terms for the purpose of specification of one-way and reusable beverage containers (or even the very definition of beverage containers, which are not de-

fined in this law). As the management of one-way beverage containers is substantially regulated by the legal regulations (introduction of the deposit obligation) and, simultaneously, not all one-way beverage containers have a negative impact on the environment, then it can be expected that there would also be a definition of one-way beverage containers that are not subject to the relevant regulation (similar to *Verpackungsverordnung* in Germany).

The Act on Packaging would also have to define the beverages (or one-way beverage containers) to which the deposit obligation would be related (e.g. according to the volume of the beverage container or the kind of beverage). Simultaneously, the amount of the deposit would also have to be unambiguously stipulated. Regulation of the relationship between consumers, beverage sellers, distributors and producers of beverage containers would also have to be an integral part of the legal changes.

A further change relating to the introduction of the deposit obligation for one-way beverage containers would probably be related to **Act No. 634/1992 Coll., on protection of the consumer**, as amended, particularly in connection with obligations relating to the sale of products and provision of services. This would be related particularly to guarantees for return of deposits at any sales outlet where one-way beverage containers are sold and informing the consumer of the amount of deposit (this is especially related to Sections 9 and 10 of the law).

Simultaneously, it would be necessary to consider the degree to which the nature of the deposit would be related to the competence of **Act No. 235/2004 Coll., on value added tax**, as amended. If the deposit were to fulfil the conditions defined in Section 36 on the tax base, then amendment of this law could also be anticipated.

The accepted deposit could also become an object of tax on the income of natural persons or legal persons under the competence of **Act No. 586/1992 Coll., on income taxes**, as amended. In this case, amendment of the relevant provisions defining the subject of taxes can be expected. Simultaneously, it would be necessary to decide whether deposits constitute expenditure in the sense of the law.

A deposit for one-way beverage containers would also be substantially reflected in the methods of management of packaging at the level of sellers, and also producers of these beverage containers. Consequently, it is necessary to consider the degree to which **Act No. 185/2001 Coll., on waste**, as amended, would be affected. It would also be necessary to decide to what degree the storage (and to a substantial degree also treatment) of selected one-way beverage containers would be in accordance with the existing hygiene and health regulations. This is also related to the interpretation of **Act No. 110/1997 Coll., on foodstuffs and tobacco products**, and on amendment to and supplementation of some related laws.

Finally, it would be necessary to also take into consideration the fact that the introduction of a deposit obligation for one-way beverage containers would make beverage containers a security that would have to contain protective elements preventing participation in the system of accounting for entities who have not concluded the relevant contract. Falsification of the label on one-way beverage containers would be a crime. Simultaneously, the entrance of other entities into the accounting system (together with granting of the relevant authorization) must not be prevented as, otherwise, this could be considered to be an obstacle to the free market in the framework of the EU. All producers and espe-

cially importers would have to have sufficient time to adjust to introduction of the deposit obligation (including attaching the relevant label to beverage containers).

Germany had similar fears of restriction of the free market in the European Union, but these fears were eliminated as a consequence of decisions of the European Court of Justice C 463/01 and C 309/02. This decision recognized that:

- the deposit system for one-way beverage containers is compatible with the law of the European Union
- there is a possibility of creating obstacles to trade; however, they are justifiable in relation to the environment and, in addition, reusable beverage containers have an undoubted advantage from the standpoint of waste management
- the necessity of stipulating a transition period for producers of beverage containers so that they can adapt to the new conditions
- the obligation of every Member State to ensure that all producers participate in the system and simultaneously the necessity of ensuring that consumers have an adequate number of collection sites for returning beverage containers, where these need not be the places where the consumer purchased the beverage

Consequently, prior to introducing the deposit obligation for one-way beverage containers, it is necessary to perform a detailed legal analysis of all the legal regulations that will be affected by this obligation. This legal analysis is important especially in relation to minimization of problems with related costs connected with enforcing this obligation in practice.

#### **4.1.2 Organizational requirements**

Organization of the entire system – the relationships between the producers, fillers, retail and wholesale outlets and consumers plays a key role in introduction of deposit systems for one-way beverage containers. The following possibilities for organization follow from foreign experience<sup>12</sup>:

- A. purchase of one-way beverage containers at all outlet levels up to the producers (or fillers)
- B. purchase of one-way beverage containers at sales outlets or in their vicinity through automats operated jointly by fillers and outlets
- C. purchase of one-way beverage containers in the vicinity of the homes of consumers through local, regional and national cooperation of all the links in the distribution network
- D. purchase of one-way beverage containers in the vicinity of the homes of consumers through an authorized packaging company
- E. purchase of one-way beverage containers at the places of sale or in their close vicinity through an authorized packaging company

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<sup>12</sup> The following division of organization of the system is based on EWRINGMANN, D. u.a. (1995; p. 36).

#### **A. Purchase of one-way beverage containers at all outlet levels up to the producers (or fillers)**

In this system, the retailer organizes a take-back system and pays the deposits himself, where he turns the collected beverage containers over to his supplier. He then turns over the beverage containers to “his” supplier and so forth until the packaging reaches the producer. At each level, a deposit is paid out against acceptance of the beverage container. The greatest disadvantage of this system seems to be pressure on adequate capacity for storage of beverage containers. This system is typically characterized by the fact that the entity that obtains the sum of uncollected deposits is not the retailer but rather the producer of the beverage containers (the flow of beverage containers begins and ends at the producer or filler of the packaging).

If the obligation to provide for recovery of taken-back beverage containers and their reuse in production were to be borne by all links in this system, then a cooperative strategy would have to be created emphasizing the joint responsibility of all the links in the system for the generation of packaging wastes. The basic precondition for functioning of this principle consists in the fact that, if it is not possible to transfer the costs of recovery or reuse to the consumer, there will be an increase in the tendency of producers to search for means to reduce used packaging or rationalization of its material composition in relation to simplification of subsequent recovery or reuse.

This system is employed in the Czech Republic for reusable beverage containers, where the consumer is motivated to return empty returnable beverage containers to the outlet network through deposits.

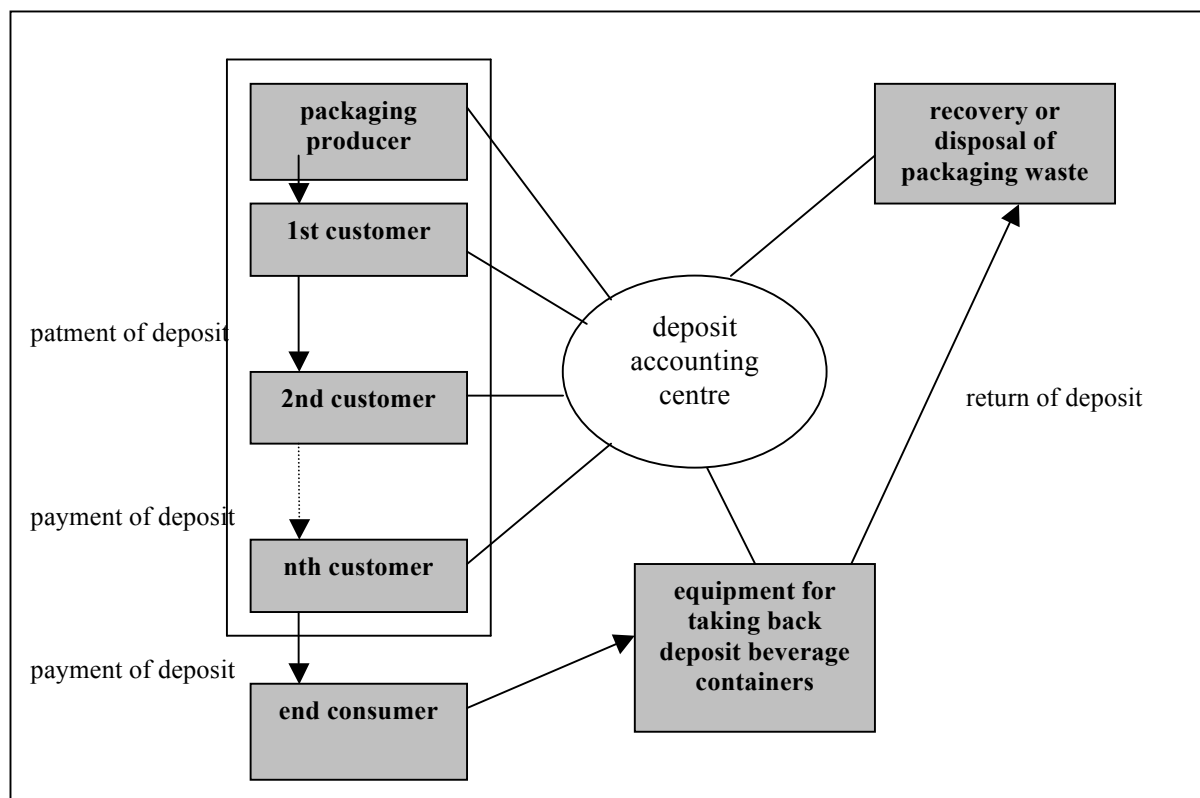
#### **B. Purchase of one-way beverage containers at sales outlets or in their vicinity through automats operated jointly by fillers and outlets**

In this system, the producers (or fillers) of beverage containers operate facilities for taking-back deposit beverage containers from the end consumer, located in the vicinity of sales outlets. These entities simultaneously ensure that these facilities always have sufficient funds for paying out and that they are regularly emptied and organize recovery of the packaging materials (or reuse in production).

In the framework of this system, a deposit accounting centre is created, releasing the retail outlet of the obligation to manage the accepted beverage containers in any way. This result leads to rationalization of the entire process, resulting in lower overall costs. The deposit centre simultaneously provides information to the individual links in the system on the amount of beverage containers intended for recovery or reuse in production (the functioning of the system is depicted in the following figure).

The accounting centre performs settlement operations and assists in smooth operations in the framework of the system. It obtains information on the amount of paid-out deposits from both the producer of the packaging and from the individual customers. Simultaneously, it processes information on deposits paid out by the facility for taking back deposit beverage containers. The accounting centre also coordinates the recovery or disposal of wastes and payment therefor. Thus, the producers and customers do not have direct obligations towards the facilities for waste recovery and disposal, but rather towards the accounting centre. This manages the whole process of settlement amongst these entities.





Source: EWRINGMANN, D. u.a. (1995; p. 39)

### **C. Purchase of one-way beverage containers in the vicinity of the homes of consumers through local, regional and national cooperation of all the links in the distribution network**

This system assumes local, regional and national cooperation of all links in the distribution network. If we consider the example of Germany, then this system basically means that, if the participating entities create a system of regular collection of beverage containers from the consumer and simultaneously fulfil the conditions for separate collection pursuant to the Act on Packaging, then they are released from the take-back and recovery obligation. In practice, this would mean the creation of a similar system of separate collection of the recoverable components of municipal waste, which already exists at a general level in the Czech Republic at the present time (paper, glass, plastics). In this case, one-way beverage containers would be removed from the existing system of separate collection and a parallel system would be created.

### **D. Purchase of one-way beverage containers in the vicinity of the homes of consumers through an authorized company**

The existing system of separate collection could be effectively combined with a deposit system for one-way beverage containers. The existing system of authorized packaging companies could be interested in the creation of a deposit system if the deposit system were to guarantee more effective meeting of the quotas for recovery and recycling of packaging wastes.

The producers and fillers of beverage containers form an integral part of the present system of separate collection of the recoverable components of municipal waste. If there were a danger that these enti-

ties would leave this system, then it could be in the interest of an authorized company to create a system of taking back beverage containers. The authorized company can provide for a sufficient number of facilities for taking back one-way beverage containers and automatic paying out of deposits without a substantial increase in costs for the participants in the system. The costs incurred could be covered by increased fees for participation in the system; however, deposits not paid out could be a much more important income.

If it were found in time that the system is not capable of being financed in this way, then it would still be possible to employ the alternative of increased fees. However, at this point, it is necessary to be aware that self-financing through unreturned deposits could encounter difficulties only if 100% of sold beverage containers were taken back. However, if this fraction is lower, then it is hypothetically possible to achieve an increase in income and thus balancing with costs by increasing deposits.

Similarly, it could be simpler for producers and fillers of packaging to participate in the system of taking back deposit one-way beverage containers if the costs of creation of the system are greater than the benefit. It could also be important for these entities that the risk is borne by the authorized company if it participates in the system.

Participation in the deposit system becomes interesting for the authorized company when it obtains more sorted material through the facilities for taking back deposit beverage containers than through the existing system of separate collection. On the other hand, the deposit system could hypothetically be a suitable complement for the existing system of separate collection, because it could increase the fraction of recovered material to a level of 90% (estimated on the basis of the German system).

#### **E. Purchase of one-way beverage containers at the places of sale or in their close vicinity through an authorized company**

Participation of an authorized company in the deposit system is conceivable even if the purchase of one-way beverage containers does not occur close to households, but at the places of sale of beverages. Arguments for the participation of an authorized company are the same as in the previous case. It is assumed that, if initial investments are ignored, then the participation of an authorized company in a similar system is cost-neutral.

If a decision were made to introduce a deposit system for one-way beverage containers in the Czech Republic, then all the mentioned possibilities could be used for choice of organization of this system – both through the organization of an authorized packaging company and without its participation. A stable situation in the system of deposits for returnable beverage containers could be an indication that this system could be supplemented by deposits for one-way beverage containers (however, with all the consequences for the existing system of separate collection of the recoverable components of municipal waste, which will be discussed in the text below). Because of the potential negative consequences for the existing system of separate collection of the recoverable components of municipal waste, the alternative of participation of an authorized company, which would simultaneously extend the provided services to include the service of taking back one-way beverage containers in the framework of a separate system from the existing system, seems reasonable.

However, recommendation of a specific manner of organization of the deposit system for one-way beverage containers in the Czech Republic would require a much deeper analysis based on evaluation according to pre-defined parameters (multi-criteria analysis).

### **4.1.3 Social-economic consequences<sup>13</sup>**

Before monitoring the impacts of deposit systems for one-way beverage containers, it is necessary to take basic steps in identifying key factors that influence the effectiveness of deposits in increasing recycling quotas (or quotas for recovery of packaging waste) and support for the recovery of reusable beverage containers in the market and simultaneously the risks that are also associated with this system. Right at the beginning, it is necessary to state that identification of factors is very difficult because of the interactions of a number of entities in the market.

#### **4.1.3.1 Factors influencing the effectiveness of deposit systems**

What are the factors that lead to consumers returning deposit beverage containers after the end of their lifetimes to facilities for taking back and do not throw them into the existing separate collection system (or simply into the countryside)? To begin with, it is necessary to mention the amount of the deposit and the institutional conditions for returning one-way beverage containers to the outlet. If the consumer does not return deposit packaging to the outlet, then the deposit causes an actual increase in the price of the beverage and the deposit has the character of a tax on the packaging for the consumer (see fees for one-way packaging). The larger the deposit, the greater the motivation of the consumer to actually return the packaging, up to a certain amount of deposit, above which he ceases to purchase the particular beverage because of its price. While this fact has an undesirable effect on replacement of one-way beverage containers by reusable packaging, it also has negative consequences for the producers of one-way beverage containers (*Groth-Serger, 2004; p. 261*).

Another important factor consists in the institutional conditions for returning beverage containers to the outlet and their user friendliness. Only if consumers do not incur additional costs relating to the transport of the beverage container to the outlet can it be expected that they will actually return deposit one-way beverage containers to the outlet. This is, of course, valid assuming that it is not necessary to demonstrate that the particular beverage container was actually purchased in the given outlet (e.g. bill of sale). Only then can “third” persons (e.g. socially disadvantaged groups of the population) also be engaged in collection of one-way beverage containers and their return to the outlet (*Groth-Serger, 2004; p. 261*).

Other important factors that affect the degree of returning one-way beverage containers to outlets and subsequent recycling (or recovery) consist in (*SRU, 2000; p. 371*):

- the kind of beverage
- qualitative and other differences between types of packaging

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<sup>13</sup> These consist in the impacts of introduction of deposits for one-way beverage containers on the micro-economic sphere of the national economy – consumers (or households) or other private entities (companies, national and international enterprises, etc.).

- the facility and its equipment for taking back one-way beverage containers
- price differences between one-way and reusable beverage containers

The incomes (or costs) of the whole system are of fundamental importance for adjusting the deposit system for one-way beverage containers. Income from unreturned deposits constitutes a key income for the system (along with income from sales of secondary raw materials and payments from producers). These incomes decrease with increased levels of returning of one-way beverage containers. In contrast, the costs of creation and operation of the system increase with increasing levels of return of one-way beverage containers, where 0% return would require expenditure of fixed costs for operation of the system (purchase of automats, financing the entire infrastructure, etc.). The way in which incomes and expenditures of the system interact is apparent from the following example.

Example: Let us imagine the variation of incomes (P) and costs (C) in the system as presented in the following graph. Here, the optimal level of taken-back one-way beverage containers equals 50%; however, this is insufficient in relation to the requirements placed on the whole system. How can the level of taken-back one-way beverage containers be increased under these circumstances (using the analytical apparatus of the curve, then the question is how to achieve that the income curve moves upwards towards the right), leading to an increase in taken-back one-way beverage containers?

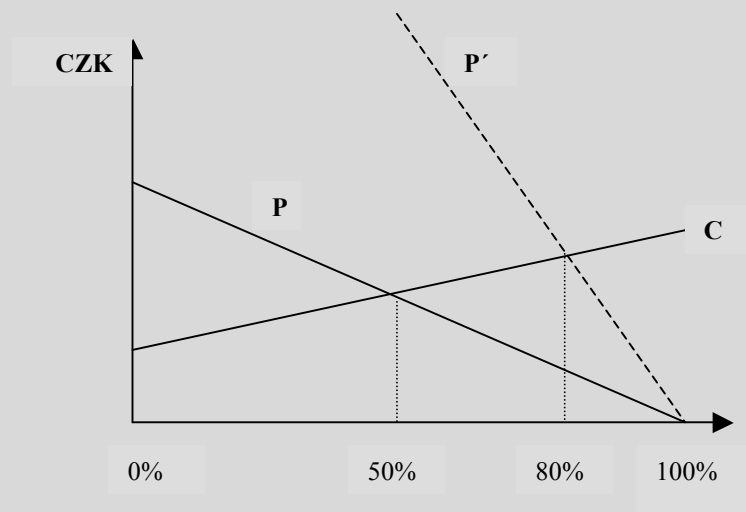
The solution consists either in increasing the deposits or in increasing the price of the beverage container. In both cases, there is an increase in the amount of taken-back one-way beverage containers to 80%, which can be considered to be acceptable meeting of the target. However, on the other hand, an increased level of taken-back beverage containers increases operating (or investment) costs for the system, shifting the cost curve upwards to the left, with a consequent reduction in the level of taken-back beverage containers.

At this instant, it is again possible to increase the deposit or the price of the beverage container; however, this entails the danger that the price of the beverage will be so high that the consumer will replace the beverage in the one-way packaging by some other beverage<sup>14</sup>. In general, a vicious circle is created, with increasing deposits and subsequent increasing of the costs of the system, so that it is very difficult to specify an optimal limit of the amount of deposit where the motivation is still present and the sales of beverages are not reduced; the final decision is up to the consumer and this cannot be exactly predicted.

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<sup>14</sup> It follows from a study performed by AVR Bonn (Arbeitsgemeinschaft umweltfreundliche Verpackungs-Recycling-Systeme e.V.) in 1995 that a deposit of DM 0.63 is sufficient to ensure a level of return of one-way beverage containers of 92%. A deposit of DM 0.83 was estimated to be required to attain a higher level of 94%. However, it is not clear what level of deposit would still make the system motivational and when the effectiveness of the entire system would be reduced (*Ewringmann, 1995; p. 57*).

**BOX „Effect of organization of the deposit system on level of return of one-way beverage containers“**



Note C... costs of the system grow with higher level of taken-back bottles

P... income of the system (mainly from unreturned deposits) decreases, i.e., income is maximal if no customer returns bottles to the outlet. The more bottles returned, the lower the income for the system (the income of the system is equal to 0 for 100% return of bottles).

Further factors that significantly affect the effectiveness of the deposit system include (*Ewringmann, 1995; p. 46*):

- the distance between the consumer and the place of taking back
- simplicity of using the automats to take back beverage containers
- equipping of the take-back site and its user friendliness
- noise or smells at the take-back site
- etc.

The overall requirements on beverage containers that are to be turned in by the consumer at the place of taking back are also important. It is important whether the beverage containers have to be washed or otherwise prepared for taking back. The greater these requirements, the less willing consumers will be to participate in the system of returning deposit beverage containers. Thus, acceptance of the entire system by the consumer is of utmost importance.

#### **4.1.3.2 Parameters of consumer behaviour and their willingness to accept the deposit system**

The Marketn, s.r.o. company carried out a survey in the Czech Republic on the inclination of consumers to separate household waste. This survey can be a useful guide in predicting consumer reaction to the introduction of a deposit obligation for one-way beverage containers. A quite fundamental conclusion can be drawn from this survey: the use of containers for separate collection of the recoverable

components of municipal waste is increasing in the Czech Republic. Simultaneously, there is a decrease in the volume of waste being disposed illegally (e.g. burning in stoves).

Since 2001, there has been a constant increase in the number of consumers actually separating waste (67% according to valorized segmentation in 2005), although the relative growth has decreased in this period (5% in 2003/2004 and 2% in 2004/2005). There has been a gradual decrease in the number of consumers who associate separate waste collection with extra work, lack of containers or lack of space for separate collection or who are insufficiently motivated towards separate collection.

On the basis of this survey, it can be assumed that the potential for increasing the number of consumers participating in separate waste collection has not yet been fully exploited. Elimination of the existing obstacles in combination with an increase in motivation towards separate waste collection (e.g. through motivational adjusting of charges for municipal waste) and public awareness constitute a potential for a further increase in the number of consumers participating in this system. In the period monitored by the study, there was a gradual increase in the acceptable distance of collection containers, not only for separated waste (166 m), but also for hazardous waste (1187 m). Simultaneously, there was an increase in the acceptable distance of collection sites for the other components of municipal waste (1754 m). It also follows from this data that there are an increasing number of containers for separate collection of household waste located close to residences<sup>15</sup>.

The usefulness of steps taken by municipal authorities to promote separate collection is related to aspects of the availability of collection containers. Consumers consider that especially an increased number of sites for containers for separate collection, provision for greater frequency of collection of waste, informing the public about how to separate waste and provision for prolonged opening hours of collection sites would be useful.

Combination of data on the recovery of packaging waste in the Czech Republic during 2002 – 2004 and data from the survey of the Markent, s.r.o. company indicate that the current system of separate collection of the recoverable components of municipal waste is successful. An increasing number of consumers are participating in this system, where elimination of all the mentioned barriers in waste separation can be achieved by increasing consumer participation and thus the amount of recovered waste.

It is thus apparent that acceptance of the system by the consumer constitutes the key risk in the effectiveness of the deposit system. If negative consumer habits towards one-way beverage containers continue (“convenience” behaviour), a change in the fraction of packaging taken back cannot be expected. Entities responsible for implementation of deposit systems are aware of this fact and introduction of the system is preceded by an intensive information campaign (the beverages to which the deposits apply, their amount, where beverage containers can be turned in, in what condition, etc.).

As was mentioned above, it is necessary to provide for the following in relation to the consumer:

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<sup>15</sup> Simultaneously, there has also been an increase in the acceptable distance to food stores, which could be a suitable argument for employing a deposit system for one-way beverage containers. However, this analysis does not tell us anything about how the acceptable distance would change if the consumer would have to return deposit beverage containers to the outlet.

- create technical conditions for taking back such that minimal additional demands are made on the consumer compared to disposal of beverage containers by placing in separate collection (or throwing away in the countryside)
- overcome “convenience” behaviour by provision of information, adapt to consumer conditions, etc.
- increase the environment awareness of consumers

Current consumer habits related to separate collection, based on reducing volume by crushing and, in some cases, maximum separation (incl. tearing off information labels and placing them in the proper container for separate collection) could be a potential risk for implementation of a system of deposits for one-way beverage containers in the Czech Republic. However, as automats are mostly used to return beverage containers (manual service is typical only for outlets to 200 m<sup>2</sup> and stands or bakeries), it is necessary to ensure that the beverage container retains its original shape and that the information label is not removed (contains the identification characters). Otherwise, it would not be possible to accept the packaging. Consequently, it is also necessary to consider an extensive information campaign, on the one hand to reduce these problems and, on the other hand, to prevent potential abuse.

#### **4.1.3.3 Investment costs and costs of introducing the deposit system**

The costs of introduction of the deposit system are the chief subject of interest in **Annex 1** of this study. A simple model was derived to calculate costs, in dependence on various model situations (according to the extent of charging deposits for one-way beverage containers). For comparison, the costs for introduction in selected countries of the European Union (Germany, Denmark, Sweden) were given.

#### **4.1.3.4 Micro-economic impacts on the individual links in the deposit system chain**

Introduction of deposit systems for one-way beverage containers is connected with an increase in costs on the part of supply (sellers), especially because of increased demands on storage space, operation of the system, investments or transport of collected beverage containers to the producer. In dependence on the price elasticity of demand for beverages, increasing costs are reflected either in removal of these beverage containers from the product range or in transfer in the price to the consumer.

However, as pointed out by some authors (e.g. *Ewringmann, 1995*), the costs associated with the introduction of a system for one-way beverage containers need not unconditionally increase but, under certain circumstances, can even decrease (low recovery level, use of potential rationalization measures in taking back beverage containers). The costs of the system could be covered by uncollected deposits on one-way packaging. Costs could also decrease as a consequence of the fact that the producers of one-way packaging need not pay fees in the deposit system for participation in the joint performance system (payments to authorized packaging companies). However, on the other hand, costs must be expected in association with management of selected beverage containers, which could make the system more expensive (*SRU, 2000; p. 411*).

Decreasing costs for the production of one-way beverage containers constitute the main argument in favour of the statement that the introduction of a deposit system will not be reflected in an advantage for reusable beverage containers, but rather in a disadvantage compared to one-way beverage containers. Thus, it cannot be excluded that deposits would lead to a decrease in the use of reusable beverage containers. One of the reasons lies in the fact that increased income from unreturned deposits from consumers will lead to increased interest of producers in these beverage containers (*SRU, 2000; p. 372*).

Another explanation of his statement lies in the expected reaction of consumers and outlets to the deposit system. Consumers make decisions between purchasing on the way home (kiosks, petrol stations, stands) and consumption at home. In the former case, the consumer already expects a higher price for the beverage and thus has no reason for not purchasing beverages in one-way beverage containers (the level of taking back will be low in these cases). In the second case, the deposit does not have a motivating character for consumption at home, as the net price of the beverage without the deposit is relevant. In this case, the consumer will again have no reason to prefer reusable beverage containers (*Groth-Serger, 2004; p. 263*)<sup>16</sup>.

Defense of the attitude of outlets (or beverage container fillers) that deposits supporting the use of reusable beverage containers are not effective is based on technical and economic arguments. To begin with, this is based on the high specialization of beverage fillers, who are increasing the effectiveness of filling one-way beverage containers and are simultaneously orienting towards changed conditions on the market (increasing fraction of one-way beverage containers in small outlets, kiosks, stands and petrol stations). However, a far more convincing argument is based on additional income from deposits not collected by the consumer (estimated to be up to DM 40 for each % of uncollected deposits) (*Groth-Serger, 2004; p. 263*).

It is thus apparent that scientific studies concerned with the aspect of the motivating function of deposit systems can identify highly contradictory opinions. At the present time, the opinion is favoured that a deposit does not lead to preference for reusable beverage containers, but rather to reduction of the price of deposit one-way beverage containers and thus also their greater use. The reduction in price is a result of both rationalization measures in production and also reduced costs relating to charges for participation in joint performance and incomes from deposits not collected by consumers (*UBA, 2001; p. 4*).

### **1. Producers of beverage containers**

Following introduction of deposit systems for one-way beverage containers, these entities will no longer be obliged to contribute to the joint performance system, because one-way beverage containers will be removed from the system of separate collection of packaging wastes. These entities will be subject to the obligations defined in Act No. 477/2001 Coll., on packaging and packaging wastes, i.e. they will have to fulfill the take-back obligation (collection of packaging waste from the consumer)

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<sup>16</sup> However, this opinion is said to be realistic only if the deposits obtained for one-way and reusable beverage containers are actually identical and simultaneously the effect of “convenience” behaviour is not taken into account (*op. cit.*).



and simultaneously will have to provide for material or energy recovery of the taken-back packaging waste, or dispose of it in a sound manner.

Opinions differ on whether the producers of beverage containers are interested in charging deposits for one-way beverage containers. While *Ewringmann* (1995) and *Golding* (via UBA, 2001) are of the opinion that producers will have increasing interest in one-way beverage containers because they will be able to use the additional income following from unreturned deposits, *UBA* (2001; p. 10) is of the opinion that producers will fear restrictions relating to this packaging and will oppose the introduction of deposits.

The producers of beverage containers are simultaneously the entities that react to the development of new technology and change the range of beverage containers on the market in order to rationalize the production process. Simultaneously, they take into account the interests of demand (modify volume, weight, hygiene properties, etc.) to increase attractiveness on the market. Consequently, it is not possible to identify unambiguous resistance to the deposit system. To the contrary, if the “rules of the game” are unambiguously defined, it could be expected that they would be concerned to develop attractive one-way beverage containers (*UBA, 2001; p. 11*).

## **2. Fillers of beverage containers**

For these entities, it is necessary to differentiate between small or medium-sized entrepreneurs and large businesses. For small or medium-sized entrepreneurs, there is only minor financial motivation to change the technical equipment in their places of operation, and consequently the introduction of deposit systems will have only very limited consequences for these entities.

The situation is quite different for large businesses, which usually have operations for both types of beverage containers. It can be expected that the production of one-way beverage containers would be reduced with the introduction of a deposit system only if the savings of fees for the system of joint performance were lower than the increased costs of handling these beverage containers. If this situation occurs, then it can be expected that the deposit system will fulfill its purpose and will promote reusable beverage containers. Whether this situation occurs depends to a considerable degree on the amount of deposit and consumer decisions that, if a large fraction of the deposit packaging is returned, makes the system less attractive for the producers and fillers of beverage containers (*UBA, 2001; p. 11*).

As indicated by the results of the survey by the Fraunhofer-Institute ILM (data for 2000), the use of reusable beverage containers is then more advantageous for these entities than the use of one-way beverage containers. A reusable glass bottle with a volume of 0.7 l with a cost of DM 0.11 exhibits the lowest costs for filling, followed by reusable PET bottles with a volume of 1.0 l with overall costs of

DM 0.16 for filling. In contrast, the cost of filling a one-way bottle equals DM 0.33 for filling (UBA, 2001; p. 11)<sup>17</sup>.

International experience in the use of one-way and reusable beverage containers also indicates that, because of lower costs, fillers prefer reusable beverage containers, while chain stores prefer one-way beverage containers. Where the use of one-way beverage containers is not limited by any policy, the discount market plays a decisive role in forcing out reusable beverage containers. The pressure of international markets and long distribution routes are further factors in forcing out these beverage containers (SRU, 2000; p. 375).

### **3. Retail and wholesale outlets**

For chain stores, the deposit system means making a decision between removing one-way beverage containers from their range of goods and keeping these beverage containers as part of their range, with all the associated financial consequences. It can be expected that chain stores will make a decision according to the criterion of least costs. It can also be expected that one of the consequences for chain stores of the introduction of a deposit system for one-way beverage containers will be the expenditure of investment costs for creation of the system of taking back deposit beverage containers, costs for operation of the system and simultaneously the costs of handling this packaging (preparation for further management) (Groth-Serger, 2004; p. 268).

Because of the high costs of introduction of the deposit system at the level of the outlets, it would be possible to welcome an initiative for the creation of a uniform system of taking back one-way beverage containers in the whole country, which would simultaneously be responsible for fulfilling operative tasks. This could optimize the logistics of the whole system and create space for achieving savings on quantity (*Clearing centrum*) (*ibid*).

It is not simple to answer the question of the relationship of chain stores to deposit systems for one-way beverage containers. Some sources state that the increasing costs of operation of automats for taking back one-way beverage containers will be covered by incomes from uncollected deposits; from the standpoint of depreciation, this would lead to a tendency to increase sales of these beverage containers. In addition, a number of retail outlets do not have additional space to operate 2 take-back systems – a system for one-way beverage containers and a system for reusable beverage containers. As the profit from one-way beverage containers is greater than for reusable beverage containers, this would provide further motivation for retail outlets to remove reusable beverage containers from their product range (SRU, 2002; p. 411).

On the other hand, experience gained from introduction of the German system indicates that, especially for smaller discount stores, supermarkets and outlets specializing in beverages, deposit one-way beverage containers tend to be removed from stock. The cause of this state of affairs is attributed to the lack of a uniform system for taking back deposit one-way beverage containers immediately after the charging of deposits came into effect (October 2003). At the beginning of functioning of the sys-

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<sup>17</sup> In attempts to employ this data for comparison purposes in the Czech Republic, it is necessary to take into account other economic environments and different costs of transport and separate collection in the Czech Republic.

tem, consumers were forced to return deposit beverage containers to the outlet where they purchased the beverage (*SRU, 2004; p. 352 and Groth- Serger, 2004; p. 266*).

The introduction of deposits for one-way beverage containers also has specific impacts on small beverage sellers such as kiosks, stands, etc. It can be expected that sale of one-way beverage containers will decrease in these outlets, primarily because of the lack of storage space (or automats). The seller is obliged to take back the beverage container if he sells it. If this situation occurs, the availability of beverage containers with smaller volumes (0.33 l) is reduced on the market for consumers. These trends in the market can also have effects on producers, as the margin is highest for beverages with the smallest volume and loss of sales of beverages with this volume means a loss for producers. In contrast, the margin decreases for the larger volumes of beverage containers, along with producer profits.

The reactions of small or medium-sized sellers (to 800 m<sup>2</sup>) were also confirmed by a survey performed by the *Konzept&Markt GmbH Wiesbaden* company in 2001. In this survey, 46.5 % of questioned respondents of the target groups confirmed that, if deposits were introduced for one-way beverage containers, they would remove this packaging from their product range. Only 2.6% of those questioned stated that they would remove reusable beverage containers from their range of goods (*UBA, 2001; p. 12*). This result is highly questionable because the consumer makes the final decision on purchasing. The consumer makes the decision between one-way and reusable beverage containers according to his preference and businesses (and producers) respond to these needs.

#### **4. The consumer**

The reaction of consumers to deposits for one-way beverage containers has already been mentioned a number of times in the text above and thus basic information will be summarized here. A decisive factor in whether one-way beverage containers will be replaced by reusable beverage containers does not depend on producers or sellers, but primarily on consumers. A survey performed in Germany following introduction of the deposit system for one-way beverage containers indicates that more than 36% of consumers purchased fewer one-way beverage containers (e.g. tins) after introduction of the system but that the behaviour of 62% of consumers did not change. The remainder of the consumers purchased more one-way beverage containers even after introduction of the system (*Groth- Serger, 2004; p. 266*).

The properties of the packaging are an important aspect in decision-making by consumers between the two types of packaging. Through introduction of deposits for one-way beverage containers, the difference between the two types of packaging disappears in the eyes of the consumer, so that an undesirable substitution effect cannot be excluded – preference for one-way beverage containers (*SRU, 2002; p. 411*). Ewringmann (1995) states that the consumer has no motivation to prefer reusable beverage containers because he considers it probable that both types of packaging are equivalent in relation to environmental soundness (*Groth- Serger, 2004; p. 266*).

On the other hand, he states that, for a deposit of DM (0.05) (EUR 0.25) for one-way beverage containers, approximately 57% of questioned consumers stated that they would prefer reusable beverage containers (however, as future developments showed, the facts completely overturned these assumptions). The price ratio between beverages in the two types of beverage containers will thus be im-

portant. As, however, the difference in the price of the two beverage containers is not great, it is not possible to predict consumer reaction. However, if the deposit on one-way packaging were greater than for reusable beverage containers, it could be expected that the results of the survey would be confirmed (UBA, 2001; p. 13).

The deposit should act as a motivation for the consumer towards increased returning of one-way packaging to the producer for material or energy recovery. This thus corresponds to application of the principle of “producer responsibility” for his product and, indirectly, also the principle that “the polluter pays” as, when the consumer does not return the packaging and does not get back the paid deposit, then he is penalized regardless of whether the management of this beverage container was environmentally harmful or not (i.e. when he places the packaging in a container for separate collection).

An important effect in charging deposits for one-way packaging consists in overcoming “convenience” behaviour on the part of consumers. However, on the basis of current experience, it is very difficult to unambiguously determine which factors lead to the consumer preferring return of one-way packaging to the outlet rather than its disposal.

#### **4.1.3.5 Macroeconomic impacts**

Monitored macroeconomic impacts include primarily the impact on unemployment, inflation effects, tying up of funds in the system and the impacts on GDP, foreign trade and tax revenue.

##### **A. Impact on unemployment**

It is very difficult to monitor factors that affect employment in a particular region because of the great variability of various factors. Experience in some of the EU Member States has demonstrated that unemployment is not the consequence of a brief transition period in supply and demand for work and skills, but is rather a consequence of medium or long-term lack of jobs. This unemployment leads to costs that should be considered. These costs include the economic burden of unemployment support and the social well-being of unemployed persons (health and comfort) and their families. Thus, the costs and benefits generated by some policies can be very important. On the other hand, quantification of net employment generated by recycling is not a simple matter. Recycling will definitely generate new jobs in collecting, sorting and processing materials, but other jobs will be lost (processing and extraction of raw materials, management of municipal waste), although there will be fewer jobs because of the extent of activities and the high automation of systems for processing of primary raw materials.

Thus, it should be emphasized that complete evaluation of the effects on employment as a consequence of various policy measures will be possible only after full consideration of macroeconomic effects (e.g. the *crowding out* effect). However, this lies outside of the framework of this study (PIRA, 2005, p. 48).

##### **B. Inflation effects**

It can be expected that the introduction of the deposit system for one-way beverage containers will have serious impacts on the development of price levels in the area of deposit beverage containers. The costs of creation of the deposit system will be reflected in the final prices of beverages on the market. It follows from the simple model<sup>18</sup> created for the purpose of this study that the following average increase in the prices of beverages according to the kind of beverage can be expected:

- |  |      |
|--|------|
| - packaged water, soft drinks and carbonated beverages | 3.7% |
| - fruit and vegetable juices, children's beverages     | 6.8% |
| - beer (alcoholic and non-alcoholic)                   | 1.7% |
| - wines and spirits                                    | 1.6% |

Similarly, an increase can be expected not only in the prices of one-way beverage containers alone, but also in the costs of waste management (services in waste management).

### **C. Tying up financial resources in the system<sup>19</sup>**

This is again based on a simple model prepared for the purposes of this study. It is thus necessary to know the amounts of deposits in order to determine the amounts of funds tied up in the system. For now, it will be assumed that 80% of the funds to finance the system come from uncollected deposits and 20% from fees paid by producers of one-way beverage containers, reflected in the prices of the final product. In order to avoid an excessive increase in the price of final production and for maintenance of this ratio, the optimum amount of deposit would be CZK 10. This would lead to an increase in the price of final production by 4% (if the deposit were smaller, there would be a greater increase in the price of final production).

If only deposits on bottles are considered, then the number of bottles on the market (2.3 billion bottles) would correspond to CZK 23 billion paid out for deposits). As it takes at least 2 months for the relevant beverage container to return back to the producer, then approximately CZK 4 billion is in circulation during those 2 months. These funds are tied up in the system, leading to additional financial costs for producers in the form of loss profits on activation of capital (dependent on the cost of money on the financial market).

### **D. Expected impact on GDP, foreign trade and tax revenue**

It is not possible to tell at the moment what effects the introduction of deposit obligations would have on one-way beverage containers. The simple model created for the purpose of this study does not encompass a similar analysis. It can be recommended that this analysis be prepared if this study were to be elaborated.

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<sup>18</sup> See Annex 1 of this study!

<sup>19</sup> These are funds that the individual links in the chain do not have available because they are in the form of paid deposits in circulation.

#### 4.1.4 Environmental impacts

The main purpose of introducing deposits for one-way beverage containers consists primarily in prevention of the creation of negative environmental impacts through beverage containers that become waste after the end of their lifetimes. Particularly life-cycle analysis (LCA<sup>20</sup>) of products indicates the degree to which one-way beverage containers are detrimental to the environment. For beverage containers, this corresponds to comparative analysis of the life cycles of one-way and reusable beverage containers in relation to their environmental impacts.

In the past, a number of LCA's have been performed for various kinds of beverage containers in relation to the type of beverage and for various kinds of management – recycling vs. disposal of packaging wastes. The main purpose of these analyses consisted in providing recommendations for policy practice on which packaging wastes should be a subject of regulation by the state. Almost every Member State of the European Union has experience in the creation of these analyses, as it is not possible to perform a generally valid analysis for all the Member States.

Consequently, the following chapter is intended to present the results of the most important LCA's performed in the past in the European Union Member States in order to generalize the main factors that have a decisive effect on the environmental soundness or detriment of the relevant beverage container for the environment. Simultaneously, the basic arguments for and against the introduction of the deposit obligation, following from study of foreign experience, will be considered. An integral part of study of these arguments also consists in evaluation of the degree to which positive effects of introduction of the deposit obligation are simultaneously cost-rational.

This chapter will be based mainly on the experience of the countries of the European Union that analyzed the environmental impact of introduction of the deposit obligation.

##### 4.1.4.1 Foreign LCA's comparing one-way and reusable beverage containers

Primarily, it is necessary to emphasize that the results of individual studies depend to a considerable degree on the selected parameters of the system (e.g. the boundaries of the system) and the initial assumptions (e.g. the manner of producing energy, transport distance, level of return of bottles, level of recycling, existence of control mechanisms or the nature of motivation – deposits, etc.). Simultaneously, it is also necessary to consider the various characters of the companies that are active in the particular system of management of packaging waste – consumer decision-making and choice (*PIRA, 2005; p. 215*). In a number of cases, these facts lead to different conclusions of the individual studies and subsequent recommendations for policy decisions. The conclusions of these studies can be briefly summarized in the following points (*ibid*):

1. studies concerned with systems with *small transport distances* (e.g. local production, distribution and consumption) and a *high level of returned bottles* (usually attainable through sufficiently controlled distribution systems such as industrial systems or deposit consumer systems). These studies have a tendency to conceive reusable beverage containers as environmentally and economically desirable.

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<sup>20</sup> LCA = Life Cycle Assessment/Analysis

2. studies concentrating on systems with *a low level of returned bottles and longer transport distances*, on the other hand, have a tendency to conceive one-way beverage containers as more advantageous.
3. studies that are somewhere in between the previous two – they assume a high level of returned bottles and long distribution distances or, on the other hand, a low level of returned bottles and short distribution routes, frequently lead to insufficiently conclusive results. This is not because of any defects in the studies themselves, but rather because the environmental (and frequently also economic) differences between the individual systems are not sufficiently obvious.

It is obvious from the above that it is very difficult to draw an unambiguous conclusion on which system of management of beverage containers is more advantageous from an environmental (or economic) standpoint, because it is necessary to consider a number of factors and assumptions. These can differ, not only between the individual European Union Member States, but also in the various regions and at various times. Technical innovations, which gradually lead to forcing environmentally detrimental beverage containers out of the market and replacement by environmentally sound substitutes, play a key role here.

From the standpoint of importance, a study prepared in Germany between 1995 and the present time can be considered to be one of the most important LCA studies. In addition to studies that will be discussed in greater detail in the following chapter, studies prepared in Norway, Denmark and Holland should be mentioned (*PIRA, 2005; p. 216*).

The Norwegian LCA of 2003 was concerned with comparison of reusable and one-way beverage containers for mineral water and non-alcoholic beverages. This system was characterized by a high level of returned bottles (98%) and a transport distance of 240 – 490 km. This study came to the conclusion that the two systems (reusable and one-way beverage containers) are equivalent from an environmental standpoint.

The Dutch LCA study of 2001 was prepared for 3 different scenarios relating to 1.5 l PET bottles: contemporary reusable, modified reusable and future one-way. This system also expected a high level of returned bottles (99.8%) and a transport distance of 150 – 350 km. This study concluded the analysis by stating that it considered reusable PET containers to be environmentally more sound than one-way packaging.

The Danish LCA of 1998 was prepared for reusable and one-way PET and glass bottles and for aluminium and steel tins. This system assumed a return level of one-way beverage containers of 90% and of reusable beverage containers of 98.5%. The transport distance equalled an average of 170 km. This study came to the conclusion that reusable beverage containers and aluminium tins are most advantageous from an environmental standpoint.

## **A. LCA's performed in Germany**

### **a. Fraunhofer Institute (1999)**

The LCA was concerned with comparison of one-way beverage cartons with reusable beverage containers for milk. This analysis yielded the following conclusions:

- the environmental impact of these containers differed according to their individual components
  - cartons were better for some components of the environment, while reusable beverage containers were better for other components
- however, at the present time, practically all types of packaging are equivalent
- possibilities for improvement were identified for all types of packaging.

In relation to the individual components of the environment, the study came to the conclusion that the detrimental environmental impact of cartons is greater than for reusable containers in relation to overall consumption of energy, production of municipal waste and consumption of water. In contrast, for a number of other indicators (e.g. the greenhouse effect, eutrophication and acidification of the soil), the detrimental environmental impact is greater for reusable beverage containers.

#### **b. UBA (1995)**

This analysis is concerned with comparison of reusable and one-way beverage containers for milk and beer<sup>21</sup>. It followed from this study that, for milk, a glass bottle is unambiguously better for the environment than a carton, but no difference was found for the PE packaging (the PE packaging was found to be better for the environment following sensitivity analysis). For beer, it was found that the reusable beverage container is unambiguously sounder for the environment than all the types of one-way beverage containers (Groth- Serger, 2004; p. 256).

#### **c. UBA (2000)**

The LCA was related to several nonalcoholic beverages and wine and compared one-way beverage containers with reusable containers<sup>22</sup>. The German Minister of the Environment summarized the results of this LCA in the following statement:

*“In relation to the environment, there is no difference between reusable glass beverage containers and one-way beverage cartons ... The dividing line does not clearly lie between reusable and one-way beverage containers, but rather between environmentally sound and environmentally harmful packaging”.*

This study indicated that, for mineral waters and other refreshing beverages, reusable PET beverage containers are better for the environment than reusable glass. On the other hand, one-way glass and

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<sup>21</sup> For milk, reusable glass beverage containers were compared with one-way cartons and PE packaging. For beer, a comparison was made between reusable glass beverage containers and one-way glass beverage containers, tin-plated tins with aluminium closing and aluminium tins.

<sup>22</sup> The following were compared for mineral waters: reusable and one-way glass, PET, carton (Tetra-Pack). For uncarbonated beverages: reusable and one-way glass, carton (Tetra-Pack). Refreshing beverages and alcohol-free beer: reusable and one-way glass, PET, tins. For wines: reusable and one-way glass, PET and carton (Tetra-Pack).



tins were connected with disadvantages compared to reusable beverage containers. The comparison of reusable glass with cartons for mineral waters, refreshing uncarbonated beverages and wine led to a surprising conclusion. In this case, no difference was found in the environmental impact of these beverage containers (*Groth-Serger, 2004; p. 257*). Similarly, SRU states that, with an increasing number of rotations and increasing transport distance, reusable PET is environmentally sounder than reusable glass (*SRU, 2000; p. 373*).

Cartons are friendlier to the environment compared to reusable beverage containers primarily in relation to the greenhouse effect, ground-level eutrophication or demands on primary material resources. On the other hand, cartons exhibit worse impacts compared to reusable packaging in relation to water eutrophication, requirements on storage space and forest stands. Cartons yield better results compared to reusable beverage containers especially in relation to new methods of recycling (recovery of aluminium) and because of prohibition of landfilling after May 2005, with a favourable effect on the production of landfill gas.

One of the conclusions of this study was also the finding that, for reusable beverage containers, the most important environmental impact is caused by rinsing bottles and the distribution of this packaging, while, for one-way beverage containers, the greatest environmental impact is caused by production of the packaging and packaging materials. The results of the study of the environmental impact for both types of beverage containers are highly dependent on consumption of energy (*PIRA, 2005; p. 217*).

These results were then significantly reflected in amendment of legislation in Germany and these one-way beverage containers were removed from the deposit obligation (only beverage containers that are environmentally detrimental are subject to deposits). This fact has important implications for the future, because any innovation activities related to one-way packaging intended to reduce the detrimental environmental impact may lead to the relevant beverage container being included in the group of environmentally sound one-way beverage containers and thus removed from the scope of the law in relation to deposits.

#### **d. IFEU – Institute (2004)**

The LCA is related to comparison of reusable glass beverage containers with one-way cartons for juices (in general, uncarbonated beverages). This study yielded similar results in relation to the individual components of the environment as the previous study (a favourable impact of cartons was also found for tropospheric ozone). Further results of this study include:

- both 1-litre glass bottles and 1-litre beverage cartons have substantially better environmental impacts
- the improvement is similar for both types of beverage containers
- the smaller the volume of the beverage container, the greater the advantage of using carton over a reusable beverage container – a 0.2-litre beverage carton is better in almost all indicators than reusable packaging (this is again not valid for water eutrophication, requirements on storage space and forest stands).

The last studies concerned with the aspect of the environmental impact of various types of beverage containers indicate that a favourable trend in improving the relationship to the environment can be recorded for all types of beverage containers. These studies also take into account developments in the area of legislation on waste management and especially stricter legislation (prohibition of landfilling and preference for incineration of waste, and also stricter regulations relating to transport and deliveries). The transport distance from the filler of the beverage containers to the consumer plays a key role in evaluation of the environmental impact. This is especially true for heavier glass beverage containers.

## **B. Conclusions of the LCA studies**

It was found on comparison of the effectiveness of one-way beverage containers with reusable beverage containers that greater costs are usually associated with reusable beverage containers at the level of filling and distribution, while greater costs are incurred for one-way beverage containers in relation to packaging and disposal of the packaging. The differences in costs depend on the packaging material, number of rotations and transport distances. For 22 rotations and a transport distance above 250 km, the costs of the system for reusable glass beverage containers for beer are only slightly higher than for tins. This ratio of costs favours reusable beverage containers for smaller transport distances and a larger number of rotations. For one-way carton packaging for milk as an alternative to reusable glass bottles, the costs of the system are clearly lower for one-way packaging (*SRU, 2000; p. 373* from the study of Fraunhofer IVV).

As mentioned above, the main limiting factors determining environmental soundness or lack of soundness of the individual types of packaging consist primarily in the transport distance and the level of returning bottles into circulation. A certain area can be identified between the borderline situations that favour either reusable beverage containers (with small transport distances and a higher level of returning bottles) or one-way beverage containers (the contrary is true), where the environmental soundness of the two types of beverage containers is not clear. This area can be delimited by transport distances of 100 – 1000 km. At the lower limit of this range, most studies favour the environmental soundness of reusable beverage containers while, for transport distances of about 1000 km, the studies favour one-way beverage containers. In the 100 – 1000 km range, the results of the LCA studies are dependent on a number of factors and also on the selected boundaries of the system.

The environmental soundness of these two types of packaging can also change as a consequence of certain endogenic factors. As shown by the PIRA study (2005, p.214), the preference for reusable beverage containers can decrease if:

- there is an increase in international trade or a gradual decrease in transport costs in real quantities (low transport costs and an open market lead to greater availability of non-local products)
- society looks for ways to extend sales through export or centralization of production in order to achieve savings on quantity (centralized production makes reusable packaging less advantageous – fillers are constantly expanding and centralizing production, which increases their interest in one-way packaging)

- consumers prefer a greater choice of imported goods (reusable packaging is less advantageous for these goods) or have a tendency to choose products packaged in attractive packaging or with unique brand names (reusable packaging is frequently employed for a non-brand model and looks like unmarked, one-way packaging).
- consumer needs or changes in style occur faster than reusable packaging is capable of adapting (investments into reusable packaging mean that the packaging cannot be changed as quickly as one-way packaging)
- consumers demand a greater range of choices in packaging size in relation to increasing variability of households (such as an increasing number of people living alone: packaging that exceeds consumer needs can lead to production of waste, which usually has a greater environmental impact than suitable large packaging; if reusable systems rely on standardized containers, then they will be less capable of meeting consumer needs of a choice amongst various sizes).

On the other hand, the advantageousness of one-way beverage containers decreases when:

- consumers begin to prefer local products and reject imported products
- society becomes more homogeneous and more oriented toward their homes (so greater variability of sizes of packaging and products intended for simple consumption away from home is important) and less urbanized (so that consumers are closer to food producers)
- there is an increase in transport costs or they prevent increased trade (so that domestic products are preferred)
- society is motivated towards decentralization and construction of local production plants (i.e. incentives towards localization balance out incentives towards centralization)

## **4.2 Introduction of other approaches**

In addition to deposits for one-way beverage containers, two basic instruments can be identified in economic policy practice, which promote the use of reusable beverage containers – fees (or taxes) and licenses.

### **4.2.1 Fees (or taxes)**

The principle of this instrument consists in imposing a tax (or fee) on one-way beverage containers to reduce their price advantage over reusable beverage containers. The producers of beverage containers have two options – either bear the higher costs for producing one-way beverage containers (as a consequence of the fee) or change to production of reusable beverage containers. If producers continue to concentrate on production of one-way beverage containers, it can be expected that they will transfer the higher costs of production of the packaging to the consumer in the price of the final product.

The fee for the one-way beverage container will then increase its price on the market, motivating the consumer to greater consumption of final products in reusable packaging. Although this conclusion could lead to the expected increase in the fraction of reusable beverage containers on the market, it is

necessary to carefully consider consumer decision-making. They make decisions not only on the basis of price (if the fee for one-way packaging were to increase its price over the price of reusable packaging), but also on the basis of a number of other equally important factors (product appearance or quality, functional properties, shelf-life, “convenience” behaviour, etc.). The final effect of this instrument cannot be simply predicted.

This is also connected with the aspect of the *Litter problem*<sup>23</sup>. In general, a reduction can be expected in the number of one-way beverage containers that will lie about in public areas as a consequence of the replacement of one-way packaging by reusable packaging, but the final effect could be less than in the case of charging a deposit (UBA, 2001; p. 5).

Simultaneously, it is necessary to answer a basic question relating to the amount of fee (or tax). How high should the fee be for one-way beverage containers? In general, it can be stated that it should be sufficient to compensate the disadvantages experienced by consumers in using reusable beverage containers. For various reasons (e.g. lack of knowledge of individual consumer preferences), the optimum amount of the fee for reusable beverage containers cannot be determined ex-ante. In some cases, it is recommended that the fee be increased until the policy target is achieved on the beverage market (Linscheidt, 1998; p. 148).

It is also not clear whether the amount of the fee should be differentiated for various kinds of beverage containers (e.g. according to the material composition), especially to differentiate the various environmental impacts. For tax and fee instruments, it is also necessary to take into account the political tolerance for the amount of fee (or tax) that is desirable from the standpoint of meeting quantitative targets. As fees and taxes are sensitive subjects in political decision-making, it can be expected that tolerance will be low because of negative reactions on the part of the affected entities (especially producers).

As has been shown by experience in some countries of Europe, a tax on packaging is an effective instrument to promote the use of reusable packaging. Finland is a country where this instrument has been introduced. A report published by the Finnish Environment Institute states that the system of taxation of beverage containers works very well, resulting in a 98% level of recycling of glass beverage containers for beer and nonalcoholic beverages (for a tax of EUR 0.51/litre on one-way beverage container).

#### **4.2.2 License for one-way beverage containers**

This instrument is based on the idea of preference for reusable beverage containers over one-way containers. Because of this preference, a policy decision is made on the acceptable quantity of one-way beverage containers on the market, where this quantity also corresponds to the number of licenses

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<sup>23</sup> This is related to throwing away beverage containers in public areas (streets, parks, ditches along highways, waste baskets in public places, etc.).

subsequently divided up amongst the individual producers of one-way beverage containers on the market<sup>24</sup>.

The acceptable amount of one-way beverage containers is the result of a policy decision, where the policy effect is also apparent in the allocation of licenses to individual producers. This fact is considered to be one of the disadvantages of this instrument, because it creates scope for bribery or other methods of corrupting persons making decisions on allocation of licenses.

The rules for allocation of licenses are defined by the State and can basically be of two kinds<sup>25</sup>:

- auctioning of licenses or
- charge-free allocation of licenses according to the quantity of one-way beverage containers used in the production of beverages in the past (called *grandfathering* – allocation of licenses on the basis of the historical principle).

What is the mechanism of functioning of a license for one-way beverage containers if the licenses are distributed amongst the individual producers? Each beverage producer on the market obtains a license for a certain amount of one-way beverage containers, which it can use in production of the final product. If his requirements for this type of beverage containers are greater than corresponds to the number of licenses available, then additional licenses can be purchased on the market from a producer whose requirements for licenses is less than it actually requires.<sup>26</sup>

Another way in which a producer can react to lack of licenses necessary for producing the final product is to take certain measures that enable him to employ different beverage containers in production – e.g. reusable. However, this measure will lead to costs (in economic terminology, these are called *marginal abatement costs*) that would not have been incurred if one-way beverage containers could have been used (e.g. investment costs for new production lines).

Every producer that is in possession of fewer licenses than are actually needed for production will then compare the price of a license in the market with the costs of reducing his need for one-way beverage containers in production. This comparison will lead to the cost-optimal measures to achieve the targets defined in the policy, because the producer will choose the variant that leads to the smallest costs (either purchasing licenses or expenditure of marginal abatement costs). It is generally accepted that this mechanism of trading in licenses on the market works best when the market is least limited in its action by external effects (e.g. new legislation or other market regulation).

The main benefit of this instrument to achieve targets in the amount of one-way beverage containers on the market is that it is connected with savings of costs for producers. However, for the license mechanism to function sufficiently effectively, it is necessary to create a conclusive and transparent system of monitoring one-way beverage containers on the market. If producers use more one-way

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<sup>24</sup> It is also possible to establish alternative quantitative targets – such as the required quantity (or fraction) of reusable packaging on the market.

<sup>25</sup> The allocated number of licenses can correspond to the expected need for consumption of beverages in free time or while travelling.

<sup>26</sup> The tradability of licenses on the market (the ability to transfer licenses to other beverage producers) is a key precondition for functioning of this instrument. Trading in licenses and the prices that are the result of trading on the market will ensure that licenses for the amount of one-way beverage containers will be used in production of beverages where they have the greatest value for the producer and consumer.

beverage containers in production than corresponds to the number of licenses available, then they must pay a fine, which is generally higher than the price of licenses on the market (*Jílková, 2003; p. 43*).

The economic effectiveness of this instrument is a result of the fact that the decisions of the entrepreneur on expenditure for costs for reduction are not a result of external intervention (as a result of a decision by the State), but are quite voluntary. As the entrepreneur attempts to rationalize the amount of these costs, costs caused by this instrument for society as a whole are minimal (*UBA, 2001; p. 6*).

The main disadvantage of this instrument is the aspect of allocation of licenses amongst the individual producers of beverage containers on the market, leading to the danger of corruption of the entities that make decisions on allocation. Simultaneously, a difficulty would arise in association with new entrepreneurs in the field. It is necessary to create a reserve of licenses so that licenses can also be allocated to these entities.

Application of this instrument is advantageous especially in those areas of environmental protection where it is possible to unambiguously identify the generators of environmental pollution (in this case, beverage producers using one-way beverage containers) and where it is simultaneously possible to define quantitative targets in terms of environmental quality. From this point of view, the Czech Republic would be a suitable environment for implementation of this instrument; however, actual introduction into practice would require detailed analysis and answering of key questions related to the quantified target itself, identification of entities affected by this instrument, the rules of allocation of licenses, the manner of trading, etc. Trading in emission allowances, which has been functioning in the Czech Republic since 2005, could serve as a pattern for implementation of licenses for one-way beverage containers.

#### **4.2.3 Advantages and disadvantages of alternative instruments to promote reusable beverage containers**

For convenience, this chapter will summarize the main advantages and disadvantages of packaging taxes and licenses for one-way beverage containers. These are given both by the theoretical limitations of these instruments and also by their practical application.

**Tab. 11. Advantages and disadvantages of packaging taxes and licenses**

	<b>ADVANTAGES</b>	<b>DISADVANTAGES</b>
<b>packaging taxes</b>	<ul style="list-style-type: none"> <li>- stimulate certain activities and do not prohibit (or instruct)</li> <li>- the affected entities have scope for searching for their own solution, in the framework of which they can optimize costs</li> <li>- possibility of using tax revenues for investments connected with protection of the environment</li> <li>- resolves “<i>littering</i>” to a certain degree</li> <li>- price disadvantage for one-way beverage containers compared to reusable packaging</li> </ul>	<ul style="list-style-type: none"> <li>- impossibility of setting the optimum amount of taxes</li> <li>- the motivation character of this instrument does not ensure that the goal will be achieved</li> <li>- it can be expected that the tax will be passed on to the consumer</li> <li>- contribution to an increase in price levels</li> <li>- difficult political enforceability</li> </ul>
<b>licenses</b>	<ul style="list-style-type: none"> <li>- stimulate certain activities and do not prohibit (or instruct)</li> <li>- the affected entities have scope for searching for their own solution, in the framework of which they can optimize costs</li> <li>- achieving the required quantity of one-way beverage containers on the market through administrative setting of the number of licenses</li> </ul>	<ul style="list-style-type: none"> <li>- risk of corruption in allocation of licenses to individual producers</li> <li>- problems associated with allocation to entities that are not in the market at the time of allocation</li> <li>- in allocation of licenses on the basis of a historical approach, producers that have already invested into equipment for production of reusable beverage containers are at a disadvantage</li> <li>- low effectiveness in case of an excessive number of licenses on the market</li> <li>- necessity of control of whether the producer produces beyond the framework of the number of licenses owned</li> <li>- does not take into account technical progress and development of new packaging materials</li> </ul>

Source: own conclusions

#### **4.2.4 Arguments for and against introduction of deposit systems for one-way beverage containers**

How can the effect of deposits be defined? It is definitely possible to differentiate between the effect on the producers of beverage containers and on consumers. Amongst producers, deposits lead to increased demands on organization of the system and the corresponding increase in costs, as he is obliged to create suitable measures for taking-back, storage and subsequent management of packaging waste (whether disposal or recovery is involved). Thus, the producers of one-way beverage containers are faced with the decision of creating a deposit system and exposing themselves to future demands relating to this system or ceasing to produce these beverage containers (*Groth-Serger, 2004, p. 260*).

At this point, the producer can pass the increased costs of the deposit system on to the consumer, but this is risky in a competitive market. If the producer decides to keep one-way beverage containers in

his product range, then he transfers the motivation character of deposits to the side of demand – to the consumer.

On the part of the consumer, the deposit is intended to eliminate the basic advantage of one-way beverage containers, consisting in *convenience behaviour*, i.e. in the ability of the consumer to dispose of this waste after the end of its lifetime either at home (e.g. by burning, throwing in mixed municipal waste) or on his way to work or elsewhere. The deposit means the consumer is faced with the decision as to whether he should continue to purchase the one-way beverage container because it provides greater benefit in spite of the higher price than purchasing a reusable beverage container or else to prefer a reusable beverage container. Price relations between one-way and reusable beverage containers play a quite fundamental role in this decision-making (*Groth-Serger, 2004, p. 261*).

If consumers prefer reusable beverage containers, then it is expected that the industry will adjust to the changed conditions and increase the supply of reusable beverage containers. However, a considerable number of variables, which will be considered in the text below, will determine whether the application of deposit systems will have the suggested consequences for decision-making by producers or consumers.

The main arguments of those defending deposit systems for one-way beverage containers include the expected increase in their taking back and subsequent recovery (or recycling) compared to the existing take-back system. It follows from experience in the countries of the European Union and a study by the collective at the FiFo Institute at the university in Köln am Rhein (*Ewringmann, 1995*), implementation of the take-back obligation and charging deposits for one-way beverage containers can reach a level of 90% in the medium term. A further increase in this volume is possible only on the assumption of optimization of the whole system and application of additional management instruments (*Ewringmann, 1995; p. 63*).

Some studies (*Sprenger, 1997*) state that the amount of deposit plays a quite fundamental role in increasing the number of beverage containers taken back. However, as indicated by experience in some provinces of Canada, this assumption need not always be fulfilled. The greatest fraction of taken-back packaging was achieved for a deposit of 5 ¢, while this fraction was much lower for the highest deposits (*Ewringmann, 1995; p. 44*). This example is just a confirmation of the fact that the fraction of beverage containers taken back is determined not only by the amount of deposit, but also other factors (e.g. the kind of beverage, packaging material, distance to the purchase centre, etc.).

Another argument of those defending deposit systems for one-way beverage containers is the problem of *littering* (*SRU, 2000; p. 373*). This argument is based on the following hypothesis: charging deposits on one-way beverage containers reduces the motivation of consumers to throw away one-way beverage containers in public places after the end of their lifetimes (as a consequence of “convenience” behaviour) and increases the motivation to return these beverage containers to the appropriate facility<sup>27</sup>. Thus, on the one hand, beverage containers would no longer clutter up the landscape and, on the

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<sup>27</sup> In this respect, it is necessary to consider “clean-up” of cities and municipalities to remove one-way beverage containers by socially disadvantaged individuals (e.g. homeless people), for whom the deposit would constitute a source of additional income.



other hand, there would be a reduction in expenditures of municipalities for remediation of these illegal means of waste management.

However, some authors do not consider this to be an adequate argument in favour of deposit systems. They are of the opinion that it solves the problem of littering to a certain degree but, on the other hand, this corresponds to a very tiny fraction of the total amount of wastes that contribute to littering and that, in any case, must be collected mostly in the framework of organized cleaning up of the city<sup>28</sup>. Thus, beverage containers do not constitute a special problem that it would be necessary to resolve through the introduction of deposit systems (*Ewringmann, 1995; p. 63*).

In connection with the litter problem, another important argument that throws doubt on the justification for the deposit system as an instrument for solution should be mentioned. This argument consists in the costs entailed. A decision on whether littering is an adequate reason for introduction of deposit systems can be made only following evaluation of the costs of creation of deposit systems with the effect that they would bring in preventing littering (*SRU, 2000; p. 373*).

Finally, mention should be made of the argument of proponents of deposit systems, consisting in the expected reduction in the amount of packaging waste that must be deposited in landfills or disposed in some other manner after the end of its lifetime. However, as is apparent from official statistics, the fraction of one-way beverage containers in the overall amount of waste produced is very small and even 90% reduction in the quantity of beverage containers would reduce the overall amount of waste by only approx. 132,000 tons (0.5%). The decrease in the amount of waste deposited in landfills would be similarly negligible<sup>29</sup>.

In addition to favourable impacts of deposit systems on one-way beverage containers (as is apparent from the previous text, these impacts are also criticized by some authors), a number of further effects that could even have the opposite impact can be seen. These include, e.g., endangering of quotas for recovery and recycling of packaging wastes, as defined in Act No. 477/2001 Coll., on packaging. Removal of beverage containers from the existing system of separate collection can lead to reduction of the effectiveness of separate collection and the amount of packaging waste intended for recovery and recycling. It can be expected that this fact will necessitate revision of recycling quotas and a subsequent adjustment of the process in the entire system (modification of the capacities of separate collection, organization of collection, agreements with facilities for recovery and recycling, etc.).

It can be expected that the introduction of deposit systems would lead to increased demands on transportation, both on the part of supply (transport of selected beverage containers to the producer) and on the part of demand (the consumer will not be able to use the systems of separate collection in collection containers located close to their homes, but will have to transport beverage containers to facilities authorized to take back this packaging). Increasing demands on transport are also connected with increased emissions of pollutants into the air.

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<sup>28</sup> Although the exact fraction of one-way beverage contained in the litter problem is not known, it has been estimated that the introduction of deposits on this packaging would reduce littering by 30-40%. The litter problem also encompasses waste from market places and street litter (*Ewringmann, 1995; p. 47*).

<sup>29</sup> This argument comes from *Ewringmann, 1995; p. 47*, but specific data were also calculated for the Czech Republic.

Technical provision for collection of deposit beverage containers from consumers can also have environmental impacts. Improper handling of beverage containers can produce smells and the energy consumption by automats for purchasing beverage containers from consumers can also not be ignored.

Another study that was performed in Austria in 2000 should also be mentioned in connection with monitoring of the environmental impact of beverage containers. This study was concerned with comparison of one-way and reusable beverage containers in relation to their environmental impact, where this impact was subsequently compared with the savings in costs brought about by the transition from reusable beverage containers to one-way packaging.

In general, this study came to the conclusion that the transition to one-way beverage containers is connected with savings in costs by producers, which was also confirmed by the trend preferring this type of beverage container. On the other hand, this study states that, while one-way beverage containers are more detrimental to the environment than reusable beverage containers, these disadvantages (e.g. emissions into the air or amount of wastes deposited in landfills) are quite negligible following calculation. The following table gives a summary of this study:

**Tab. 12. Savings in costs at the level of enterprises in case of substitution of reusable beverage containers by one-way containers**

beverage	filling 100 mil. l ..... caused by:	cost savings at company level million ATS p.a.	additional CO <sub>2</sub> emissions (in tons p.a.)	additional CO <sub>2</sub> emissions as a ratio to costs for abatement million ATS p.a.
mineral water	one-way PET instead of reusable glass	105	9.460	8.2
mineral water	one-way PET instead of reusable PET	38	13.660	11.9
beer	tin instead of reusable glass	80	33.310	29.0
non-alcoholic beverage	one-way PET instead of reusable PET	53	8.670	7.5
milk	carton instead of reusable PC	86	- 1.390	-1.2

Source: GUA - IFIP (2000); p. V

It is apparent from the table that the transition of producers to one-way beverage containers is associated with savings of costs, which are higher than the costs of reduction of environmental pollution caused by this transition. This fact could explain why producers of beverage containers prefer one-way beverage containers over reusable packaging.

In connection with the environmental impacts of the deposit system, mention should also be made of the results of a study in 2000 which the Federation of German Industries had prepared. The study is based on the data of the Federal Environmental Agency (Umweltbundesamt – UBA) and attempts to determine the results that would ensue from an increased level of use of reusable beverage containers

on the market by 3% compared with expenditures. This study employs expected costs of implementation of the deposit system of DM 4 bil. (EUR 2 bil.). The result is apparent from the following table<sup>30</sup>:

**Tab. 13. Environmental impacts of a higher level of use of re-usable beverage containers**

Environmental impact	improvement in the quality of the environment	costs	comparable quantities
greenhouse gas	220,000 t	18.181 DM/t	<ul style="list-style-type: none"> <li>- highest realistic tax for CO<sub>2</sub> (Denmark, Norway) 50 DM/t</li> <li>- fictive increase in the price of petrol for the same expected environmental burden per t of greenhouse gas 46 DM/t</li> </ul>
water consumption	1,490,000 m <sup>3</sup>	2.670 DM/m <sup>3</sup>	fee for water withdrawal: 24 DM/m <sup>3</sup>
waste production	227,000 t	17.620 DM/t	<ul style="list-style-type: none"> <li>- landfilling of waste: 250 DM/t</li> <li>- incineration of waste: 800 DM/t</li> <li>- disposal of hazardous waste 2,500 DM/t</li> </ul>

Source: BDI (2000)

It is apparent from this table that the environmental effects do not fully correspond to expenditures. Consequently, it is proposed that a discussion be reopened on the justification for the introduction of expensive deposit systems and on whether the existing systems are not adequate for meeting the environmental targets. The arguments of BDI are based on the performed environmental balances of 1995 and 2000 and it is concluded that persisting differentiation between “good” and “bad” beverage containers is no longer relevant. It is increasingly necessary to consider the actual environmental impact of a beverage container without regard as to whether it is a reusable or one-way beverage container (*BDI, 2000; p. 8*).

The German Federal Environment Ministry in cooperation with the Federal Ministry of Economics and Technology (BMU and BMWi) also came to similar conclusions where, on the basis of environmental balance of the monitored beverage containers, they state that the overall environmental burden from these beverage containers (mineral waters, refreshing carbonated beverages, uncarbonated beverages and wine) corresponds to 0.1% of the total environmental burden in Germany (relevant for 10,000 to 100,000 inhabitants). In the joint report, these ministries state that it is very difficult to evaluate the effect of deposits on favouring environmentally sound beverage containers, as it is not possi-

<sup>30</sup> At this point, it should be pointed out that German industry is not fundamentally opposed to the introduction of deposit systems. As will be apparent from the following text, it is necessary to differentiate between the positions of large and medium-sized producers of beverage containers, and also fillers. Thus, the prepared BDI study only contributes to the general discussion on the justification for implementation of new, expensive systems whose favourable impact on the environment does not correspond to expenditures. These funds could be expended far more effectively in other areas of environmental protection!

ble to predict the reaction of a great many participants in the market with various interests (consumers, business, producers, etc.). Nonetheless, the opinion prevails that the effect of deposit systems in increasing the amount of collected one-way beverage containers has favourable environmental impacts (*BMU-BMWi, 2001; p. 2*).

### **Some recommendations for further developments**

In relation to the above-mentioned disadvantages of deposit systems for one-way beverage containers, *Umweltrat* recommends issuing of quotas for the fraction of reusable beverage containers on the market and proposes internalization of external costs for individual packaging systems through packaging fees, whose payment would, in the long run, be a burden for the consumer (*SRU, 2002, p. 411*). The greater the environmental impact of the production, transport, cleaning and disposal of a beverage container, the more expensive it will be. Thus, the fraction of reusable beverage containers need not be set by policy. It is a result of market adaptation mechanisms, where compliance with environmental targets is guaranteed through application of the economic instrument of the policy. In this approach, a deposit obligation is not important. When purchasing packaging, the consumer will always be faced with the decision of which beverage container he will prefer (taking into account all costs) (*SRU, 2000; p. 374*).

## **4.3 Usefulness of application of other systems of returnable beverage containers in the Czech Republic**

The initial precondition for implementation of new deposit systems for one-way beverage containers consists in inadequate recycling and recovery of beverage containers, as a consequence of the existing system of separation and recovery of packaging waste. This system is organized by municipalities in cooperation with an authorized packaging company.

As indicated by the official information of the ME CR, the total level of recycling and recovery of packaging wastes in the Czech Republic has been increasing since 2003. While the level of recycling (or recovery) equalled 51.4% in 2003 (59%), it had increased to 59% (65.8%) by 2005. If, of packaging waste, only beverage containers are considered (see Tab. 2), then recycling of this packaging waste increased from 46.3% in 2003 to 58.7% in 2005. There has been an increase of more than 10% for individual materials (glass, plastics and paper).

This increase is a consequence of the functioning of the existing system of separate collection, which has been created with expenditure of considerable investments (especially the infrastructure of collection, separation and recycling). Thus, over the years, a quantity of capital assets has been created, that is directly connected with functioning of the system. The success of this system can be derived from the given data. From this, it follows that the targets for recycling (or overall recovery) for 2006, defined in *Annex No. 3 of Act No. 477/2001 Coll., on packaging*, had already been achieved in 2005.

An additional favourable effect of the existence of separate collection of the recoverable components of municipal waste (including beverage containers – it is estimated that approx. 50% of packaging

wastes end up in separate collection<sup>31</sup>) can be considered to consist in “lightening” of the system of collection of mixed municipal waste and thus a reduction in municipal costs for waste disposal in landfills. This is connected with a reduction in the amount of waste deposited in landfills (“lightening” of the capacity for waste disposal).

At the present time, one-way beverage containers are an integral part of the system of separate collection of packaging wastes by the authorized packaging company (EKO-KOM, a.s. in the Czech Republic). Fees for this system (for providing for compliance with the obligation to take back and recover packaging wastes through the EKO-KOM joint performance system), paid by the person placing the one-way beverage containers on the market or into circulation, are thus an important income for the whole system.

The introduction of a system of deposits for one-way beverage containers would thus result in removal of an important component of the entire system. Simultaneously, this could lead indirectly to threatening the current fraction of recycling (or recovery) of packaging waste defined in *Annex No. 3 of Act No. 477/2001 Coll., on packaging*. The current increase in recycling (or recovery) of packaging waste could thus be replaced by an increased fraction of recycling of one-way beverage containers<sup>32</sup>. Consequently, the current authorized packaging company could be interested in organizing collection of deposit one-way beverage containers (*SRU, 2000; p. 372*).

Foreign experience (the German DSD system) indicates that the decrease in license income in this system could correspond to 25%. However, this also corresponds to a decrease in costs for organization of separate collection of beverage containers directly from consumers (close to home). The capital assets required for functioning of the existing system can be further utilized (for collection of the other packaging waste), where a gradual adaptation (prolonging) of the frequency of emptying of collection containers can be expected; nonetheless, these capital assets need not be fully utilized. Consequently, the creation of a deposit system for one-way beverage containers could lead to devaluation of created capital assets (*Ewringmann, 1995; p. 60*).

It is apparent that the introduction of a deposit system for one-way beverage containers has significant impacts on the existing system of separate collection, including the role of authorized packaging companies (reduction in income and endangering of achieving the set recycling quotas); however, on the other hand, this does not mean that the system of joint performance would completely collapse. Thus, to ensure the continued functioning of the system, it would be necessary to review the obligations imposed on the joint performance institution.

It is also important that the creation of a deposit system for one-way beverage containers and the currently functioning system of separate collection for other packaging wastes, organized by an authorized packaging company are functionally structurally two quite different systems. This prevents realization of savings to the extent that would be possible if only one system were to function. In addition, some studies state that a deposit system organized by outlets is much more expensive than the existing system of separate collection, entailing wasting of available funds (*SRU, 2002; p. 411*).

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<sup>31</sup> EKO-KOM (2003): *Waste management in municipalities*, Prague, p. 1/008.

<sup>32</sup> This trend could be resolved by adjusting recycling quotas (or quotas for use of packaging waste) which are defined in Act No. 477/2001 Coll., on packaging.

## 5 Summary and Proposal of Measures

### 5.1 Conclusions and recommendations following from foreign experience

It is apparent from the previous text that the introduction of deposits for one-way beverage containers could lead to favourable environmental effects on the one hand but, on the other hand, could also have detrimental effects. These negative effects can be classified as:

- technical
- performance
- systemic
- macro-economical

#### **A. Technical effects of the deposit obligation**

If a deposit obligation were introduced for one-way beverage containers, the group of producers of this packaging would be divided into those that would become part of this system and those acting outside of this system. Consequently, it is primarily necessary to create a sufficiently effective defense against “nonpaying passengers” who would not participate in the system, but would nonetheless attempt to exploit its advantages. This defense would consist in specific labelling of beverage containers participating in the system through: a) the symbol of the system, including designation of the amount of the deposit, b) the EAN code and c) a special colour of the packaging according to which the collection automat and the accounting centre for entities obliged for taking-back would identify the deposit packaging.

The creation of this barrier to entrance into the system for producers who do not pay the entrance fee would, however, create scope for searching for ways to avoid these barriers (counterfeiting trademarks and specific colours). This fact will lead to the need for regular control of beverage containers on the market which, however, will substantially increase the costs of the whole system of labelling beverage containers.

However, problems are also associated with the process of collecting beverage containers by the collection automats or manually in case of sales over the counter. To begin with, it is necessary to ensure that the beverage container is not crushed or otherwise bent, so that the label with designation of the relevant system (or EAN code) is still attached to the bottle or so that the symbol of the system (or bar code) is not dirty. This could be a problem, especially in relation to the current habits of Czech consumers participating in the existing systems of separate collection in municipalities who crush beverage containers before throwing them into collection containers and sometimes (in an attempt to achieve the maximum environmental soundness) remove the label. In sales over the counter, acceptance of a beverage container without labelling of participation in the deposit system is a matter of benevolence of the seller where, however, he loses the right to payment of the deposit from the entity that first put the packaging into circulation.

#### **B. Performance effects of the deposit obligation**

The amount of the deposit (and the consequent price of the beverage) plays a quite fundamental role for the effectiveness of the deposit system for one-way beverage containers. It holds that the larger the deposit, the greater the motivation of the consumer to actually return the packaging, up to a certain amount of deposit, above which he ceases to purchase the particular beverage because of its price. However, it is very difficult to establish an amount of deposit that, on the one hand, motivates the consumer to take the packaging back but, on the other hand, does not reduce motivation to purchase the beverage container.

Where the consumer does not have any financial motivation and simultaneously both kinds of beverage containers have the same environmental impact, then a negative substitution effect cannot be excluded (i.e. preference for one-way beverage containers). As, after introducing deposits for one-way beverage containers, the same obligation will be associated with all waste beverage containers – to return them to the store in order to obtain the deposit, then differences in prices can be considered to be the main factor in consumer decisions to purchase a particular beverage.

Together with the choice of a suitable amount of deposit, it is necessary to create user-friendly conditions for returning beverage containers to the store as, otherwise, consumers will not use these systems in spite of potential loss of the paid deposit.

Introduction of deposit systems for one-way beverage containers is connected with a change in costs on the part of supply (increased demands on storage space, operation of the system, investments or transport of collected beverage containers to the producer) and also on the part of demand (for the consumer).. Any increase in costs as a consequence of deposits on the part of demand would lead to a disadvantage for this beverage container compared to reusable beverage containers. However, on the other hand, some studies confirm the opposite trend in the costs of the deposit system for one-way beverage containers. Under certain circumstances (low recovery level, utilization of the potential for rational measures in taking back beverage containers, producers of one-way beverage containers need not pay fees for participation in the joint performance system), costs could decrease which, paradoxically, could be reflected in an advantage for one-way beverage containers compared to reusable beverage containers.

The argument of decision-making in households between consumption during the trip home (purchase in kiosks, petrol stations, stands, etc.) and consumption at home is sometimes given as a reason why reusable beverage containers are not as extensively used in the market. In the former case, the consumer already expects a higher price for the beverage and thus has no reason for not purchasing beverages in one-way beverage containers (the level of taking back will be low in these cases). In the second case, the deposit does not have a motivating character for consumption at home, as the net price of the beverage without the deposit is relevant for the consumer. Thus, in this case, the consumer will not prefer reusable beverage containers.

### **C. Systemic effects of the deposit obligation**

Negative systemic effects of the introduction of deposit obligations for one-way beverage containers include primarily:

1. endangering of meeting quotas for recovery and recycling of other packaging wastes, as defined by Act No. 477/2001 Coll., on packaging, as a consequence of removing beverage containers from the existing system of separate collection;
2. increased demands on transportation, both on the part of supply (transport of selected beverage containers to the producer) and on the part of demand (the consumer will not be able to use the systems of separate collection in collection containers located close to their homes, but will have to transport beverage containers to facilities authorized for taking back this packaging), leading to increased pollutant emissions into the air;
3. substantial costs for introduction of the deposit system into practice (for foreign systems, the costs of introduction varied around a level of € 200 mil.); it is especially important to compare the costs with environmental effects (increased recycling, smaller amount of waste deposited in landfills, reduction of littering, etc.).

In connection with introduction of the deposit obligation for one-way beverage containers, it is also necessary to consider another effect that is not apparent at first glance. A certain part of currently produced one-way beverage containers are placed in collection containers for separate collection of the recoverable components of municipal waste and the remainder in containers for mixed municipal waste. If, in relation to plastics, the consumer separately collects mainly PET and other plastics only as a supplement, then the introduction of the deposit obligation for one-way beverage containers would mean that the consumer would return PET to the collection sites. In this connection, it is not clear whether the consumer would continue to be motivated to separate mixed plastics or, as a consequence of “convenience” behaviour, would throw them into the containers for mixed municipal waste. In this case, the introduction of a deposit obligation would paradoxically mean that there would be greater pressure on the capacity intended for disposal of mixed municipal waste. Part of the waste that was originally placed in containers for separated waste would be placed in containers for mixed municipal waste and disposed following introduction of the deposit obligation. This could also apply to other fractions, such as glass and cardboard.

The deposit system for one-way beverage containers could also lead to devaluation of created capital assets in the existing system of separate collection of the recoverable components of municipal waste. This is particularly true of the capacities of collection containers or collection vehicles that would not be fully utilized as a consequence of the reduction in separate collection by the volume of deposit beverage containers. Together with the reduced level of recovery and recycling of waste, this fact would indirectly lead to pressure for revision of obligations following from joint performance.

#### **D. Macro-economic effects of the deposit obligation**

In monitoring the effects of introduction of the deposit obligation for one-way beverage containers, it is not possible to ignore the macro-economic effects – employment, inflation, resources tied up in the system and GDP. In relation to employment, because of the complex relations in the economy, it is very difficult to determine whether the deposit obligation and the consequent increase in recycling



would increase the demand for work or to the contrary (potential loss of jobs in the sector of processing and extraction of primary raw materials or in management of municipal waste).

In relation to a change in price levels, the deposit obligation can be expected to lead to price increases in all the segments of deposit beverages – packaged water, soft drinks and carbonated beverages, fruit and vegetable juices, children’s beverages, beer (alcoholic and alcohol-free) and wine and spirits. In relation to tying up of financial resources, these are funds that, in the form of deposits, rotate in the system between the producers of beverage containers, the seller and the consumer. In relation to the rotation time (approximately 2 months), these funds cannot be augmented on the capital market, leading to additional costs for producers in the form of lost profits.

Last but not least, mention should be made of impacts of the deposit system on the GDP, tax revenue and foreign trade. Specific impacts can also be expected in this case; however, they were not quantified for the purposes of this study.

In addition to the potential negative effects of the introduction of a deposit obligation for one-way beverage containers, account must also be taken of positive effects, which are amongst the main arguments for the introduction of deposits. These consist primarily in the key assumption that one-way beverage containers are less advantageous from an environmental standpoint than reusable beverage containers. A number of professional LCA studies have been carried out in the European Union to confirm this hypothesis. Summarizing the conclusions of the individual analysis, it is apparent that, because of developments in technology, reusable beverage containers are gradually becoming less advantageous in relation to the environment and, to the contrary, the two types of packaging are becoming more or less equivalent.<sup>33</sup>

One of the advantages of deposits on one-way beverage containers consists in the elimination of “convenience” behaviour, i.e. in the ability of the consumer to dispose of this waste after the end of its lifetime either at home (e.g. by burning, throwing in mixed municipal waste) or on his way to work or in the framework of the existing system of separate collection or elsewhere. Deposits are capable of overcoming this consumer behaviour to a substantial degree, but only if the motivation role of deposits is accompanied by an intense information campaign promoting the environmental consciousness of the consumer and if technical conditions are created for taking back that lead to minimal additional demands on the consumer compared to disposal of beverage containers by placing in separate containers (or out in the countryside).

Deposit systems for one-way beverage containers are also expected to eliminate littering, i.e. the motivation of the consumer to just throw out beverage containers after the end of their lifetimes in public places (as a consequence of “convenience” behaviour). In contrast, the introduction of the deposit obligation would increase motivation to return beverage containers to collection facilities.

However, it is not clear to what degree the mentioned favourable effects of introduction of the deposit obligation for one-way beverage containers would be rational from the standpoint of expended costs. As indicated by foreign studies and a simple model created for the conditions in the Czech Republic,

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<sup>33</sup> However, simultaneously, it is necessary to take into account the smells that could be created by incorrect handling of one-way beverage containers and the energy consumption by automats for buying back beverage containers from consumers.

the costs expended for 1 t of increased recycling as a consequence of introduction of the deposit obligation for one-way beverage containers exceed the usual costs for recycling through the existing system of separate collection of the recoverable components of waste.

## 5.2 Conclusions and recommendations for the Czech Republic

The main purpose of the submitted study consisted in analysis of potential instruments to promote reuse and recycling of beverage containers in the Czech Republic. Primarily, attention was paid to the deposit obligation for one-way beverage containers, packaging taxes and licenses for one-way beverage containers. All these instruments are utilized to varying degrees and in varying amounts in the individual Member States of the European Union. At the present time, attempts to increase the fraction of recycling and recovery of packaging wastes are associated primarily with introduction of the deposit obligation for one-way beverage containers, and thus greater scope was devoted to this instrument in this study.

A simple model to estimate the costs of introduction of a deposit obligation was drawn up for analysis of this instrument, depending on the beverage containers that would be subject to the deposit obligation. Several important facts follow from this model for making decisions on implementation of this instrument:

- the costs of introduction of the deposit obligation vary from € 83 – 175 mil. according to the kind of deposit beverage containers (the deposit obligation for all beverage containers entails the greatest costs); lower costs compared to foreign systems are a result primarily of lower labour costs;
- in all the model situations, the introduction of the deposit obligation with the assumption of 90% recovery leads to an increase in recycling of beverage containers (from approx 18 to 45 thous. t)<sup>34</sup>, in the period immediately following introduction of the system;
- in all the model cases, the introduction of the deposit obligation would lead to an increase in the percentage of recycling and recovery of waste by 0.6 – 2.4%; the increase in overall recycling would equal 1 – 4% and the increase in recovery would correspond to 0.9 – 3.6% compared to conditions prior to introducing the deposit obligation;<sup>35,36</sup> if we consider the costs for society as a whole for introduction of the deposit obligation (i.e. not only the costs of introduction of the system itself, but also the expected loss for the existing system of separate collection), then these costs would equal € 4.2 – 5.9 thousand for an additional ton of recycling;

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<sup>34</sup> The reference year 2005 was chosen for comparison of the effects of the deposit system for one-way beverage containers on the recycling of beverage containers. On the basis of information on recycling of beverage containers in the Czech Republic in 2003 – 2005, it can be concluded that recycling of beverage containers will increase in coming years in the framework of the existing system of separate collection of recoverable components of municipal waste, which is currently functioning at a municipal level.

<sup>35</sup> In this case, the reference year for comparison the % of recovery and recycling is again 2005, in the classification according to the type of beverage containers (see Table 2 in Annex 1).

<sup>36</sup> Once again, it is necessary to emphasize that an increase will occur in recycling if consumers will continue to utilize separate collection for other packaging products, similarly as to date, even after introduction of the deposit obligation for one-way beverage containers.

- however, as a consequence of introduction of the deposit obligation for one-way beverage containers, it can also be expected that there would be a reduction in the number of consumers participating in the existing system of separate collection, by 5 – 10% (at the present time 67% of consumers participate in separate collection, according to a survey by the Markent, s.r.o. company);
- an interesting consequence of the simple model consists in the estimate of the % of people that would have to participate in the separate collection system and the returnable beverage containers system, in order to achieve the same increase in recycling and recovery of packaging waste as would occur as a consequence of introduction of the deposit obligation – in this case, this corresponds to 2 – 8% of consumers according to the considered extent of the deposit obligation system.

From these results, it follows that the effects for the environment as a consequence of introduction of the deposit obligation (increased recycling and recovery of packaging waste) are associated with costs that exceed the costs of alternative means of waste management. This study thus comes to the same conclusions as the BDI study (2000). In other words, the deposit obligation would lead to positive effects for the environment (if we assume that recycling is more environmentally sound than alternative means of waste management), but at high costs. However, these funds could be used far more effectively in some other way (e.g. to eliminate obstacles to the existing system of waste separation).

It thus follows from the submitted study that:

- the existing system of separate collection of the recoverable components of municipal waste at a general level and the system of returnable beverage containers, following from the legislation in the Czech Republic, is **adequate** for meeting the targets of recycling and recovery defined in Act No. 477/2001 Coll., on packaging and packaging wastes, and it is not necessary to amend this system in a fundamental manner;
- the deposit obligation for one-way beverage containers as an instrument to promote recycling and recovery of beverage containers would only negligibly increase the overall level of recycling and recovery achieved in the current system of separate collection and the system of returnable beverage containers, and this would be at the expense of high costs. Positive effects on the environment (e.g. increased recycling or elimination of the litter problem) as a consequence of deposits for one-way beverage containers do not correspond to the expended funds that could be utilized more effectively elsewhere (e.g. for elimination of obstacles seen by consumers as most important if they decide to participate in the existing system<sup>37</sup>).

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<sup>37</sup> For example, the lack of collection containers close to homes, inadequate frequency of pick-up of separated waste, lack of awareness of how to separate waste or unsuitable opening hours of collection sites. If these obstacles are eliminated (and the survey of the Markent s.r.o. company indicates that this is happening at the present time), then greater participation of consumers in separate collection can be expected, and thus the effect for the environment would be greater, compared to implementation of the deposit obligation. The same effect in increasing the % of recycling and recovery can be achieved through consumer participation in the current system of separate collection and returnable beverage containers.

It is apparent from these facts and analyses that the deposit system, by itself, cannot be perceived as a measure to increase the amount of used reusable packaging (see the example of Germany). The only reliable means of increasing the amount of reusable packaging seems to be introduction of a special tax on one-way packaging, in an amount that would significantly discourage consumers from using one-way packaging. Finnish experience indicates that this tax should be of the order of CZK 10 per litre of beverage. However, it is not clear if such a tax is justifiable in relation to the not very great environmental advantages of reusable packaging. The advantages of this packaging is seen by most studies only in the case of reusable PET packaging and not universally for all types of reusable packaging (for example, if the tax were derived from the sum of the environmental impacts, then the tax on reusable PET would have to equal zero, while the tax on one-way PET packaging and reusable glass packaging would have to be similar as, according to most studies, their environmental impact is similar).

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