

Executive summary

Effects of deposits on beverage packaging in Germany

Study commissioned by:

APEAL / The Association of European Producers of Steel for Packaging

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Content of Executive Summary

Lessons learnt

Starting point of deposits on non-refillable beverage packaging in Germany:

Legal basis, political objectives, type of beverages and packaging systems affected by compulsory deposits on non-refillable beverage packaging

Market effects:

Shares of non-refillable/refillable beverage packaging as well as shares of different packaging materials/systems

Economic effects:

Sectoral effects, macroeconomic monetary effects and impacts upon employment

Littering and street cleaning effects:

Volume of littering and cost of street cleaning

Ecological effects:

Greenhouse gas emissions, consumption of energy resources, emissions of airborne gases

Lessons learnt (1/3)

(1) In the beverage sectors of beer, soft drinks and waters, a **mandatory deposit** for non-refillable packaging of glass, metal and plastics has been enacted in Germany since Jan. 1, 2003 (based on the National Packaging Ordinance of 1991).

(2) The present study examines the question whether or not the main **political objectives** linked to this measure have been reached, by looking at the **effects** of mandatory deposits on **market shares** of refillable packaging, on **economic impacts**, on **environmental impacts** and on **littering** during the period of 2002 to 2006.

(3) The **results and findings of the study** hereto can be summarized as follows:

Objective 1: Stabilisation / Increases of the Market Shares of refillable packaging

Results: The market share of refillable beverage packaging was at 58 % in 2002, went up to 65 % in 2003 (year of enactment of deposits) and has decreased continuously thereafter in 2004, 2005 and 2006 down to a level of 53 %.

Conclusion: The **political objective** regarding **market shares of refillables** has **not been reached**.

Objective 2: Reduction of Littering in streets and public areas

Results: According to recent studies beverage packaging contributes only to a minor extent to littering, and there are no significant quantitative effects in litter reduction and no economic effects in street cleaning identifiable as result of the introduction of deposits on non-refillable beverage packaging.

Conclusion: The **political objective** regarding **littering** has **not been reached**.

Lessons learnt (2/3)

Objective 3: **Reduction of Environmental Impacts** attributable to beverage packaging.

Results: For 2002, the **CO₂ emissions** attributable to beverage packaging are calculated to be at 3,8 Mill. tons. This is a share of 0,4 percent - compared to total annual CO₂ emissions of about 865 Mill. tons in Germany. In 2006, CO₂ emissions attributable to beverage packaging are calculated to be at 3,3 Mill. tons. This reduction of 0,5 Mill. tons has improved the national CO₂ balance in Germany by 0,05 percent. As to the consumption of **energetic resources** and the **emissions of airborne gases** the calculations show similar results regarding shares and rate of improvement.

Conclusion: The **significance** of emissions and energy consumption attributable to beverage packaging is **rather low** (shares of 0,4 % and less). The **improvements** following the introduction of mandatory deposits are **only very minor** (about 5 hundredth-percent and less).

(4) **Objectives** related to **economic effects** of deposits on beverage packaging have **not** been named in the political process preceding the enactment. There have been, however, as the present study shows a number of **substantial economic effects** caused by the introduction of mandatory deposits. These are in brief:

- The calculations of the **direct monetary effects** due to the installation and operation of the new return system result in a total yearly amount of **640 Mill. Euro**. This sum comprises the necessary expenditures for personnel and for amortisation costs of investments (reverse vending machines, clearing centres etc.). In addition, there have been **up-/downstream effects** of about **340 Mill. Euro**.
- These monetary effects are at first financed by the economic operators affected, however, ultimately they are **passed on to and borne by the end consumer**.

Lessons learnt (3/3)

(5) Concerning the **economic sectors** affected, there have been very different (and contrary) effects:

- The **highest positive effects** are assessed for the **sector of mechanical engineering**, and there in particular for producers of automatic reverse vending machines, with 170 Mill. Euro (plus 140 Mill. Euro indirect up-/downstream effects) and 1.200 employees (plus 1.100 up-/downstream effects).
- In the area of packaging, **distinct negative effects** on turnovers are assessed for the **producers of beverage cans** and for the **producers of glass bottles**, leading to losses in employment of minus 2.100 (cans) and minus 800 (glass).
- On the other hand, there have been **gains** in employment for the **producers of packaging of plastics and cardboards**, with plus 2.600 (plastics) and plus 500 (cardboards).

(6) Evaluation of the **efficiency of the political measure of mandatory deposits** on non-refillable beverage packaging in the light of “**costs**” and “**benefits**”:

- The **costs** of the new deposit system for non-refillables in Germany are assessed to be about **640 Mill. Euro**. The **reduction of CO₂ emissions** is calculated to be 0,5 Mill. tons (2006 vs. 2002). This corresponds to **specific abatement costs of about 1.300,- Euro per ton of CO₂**.
- Based on various recent studies, the German Environmental Agency (UBA) recommends the following range of **cost figures** for the appraisal of measures aiming at **CO₂ abatement**: 20 € / t CO₂ (lower value); 70 € / t CO₂ (average); 280 € / t CO₂ (upper value).
- In view of these ratios, the political measure of **deposits on non-refillable beverage packaging** can be rated **among the most expensive measures** for **CO₂ abatement**.

Starting point of deposits on non-refillable beverage packaging in Germany (1/2)

- In the **beverage sectors including beer, soft drinks and waters**, a **mandatory deposit for non-refillable packaging of glass, metal and plastics** has been enacted in Germany on **Jan. 1, 2003**. This enactment is based upon the implementation of the **German Packaging Ordinance of 1991** which foresees mandatory deposits on non-refillable beverage packaging if the quota of refillables was to sink below 72 %.
- The deposit presently stands at 0,25 Euro per packaging unit (for all bottles and containers up to 3 Litres). In 2006, around **14,7 billion non-refillable beverage packaging** and a domestic **market volume of about 17,6 billion litres in non-refillable packaging** (of a total market volume of 33,3 billion litres) were affected by the introduction of the mandatory deposit.
- The deposit-bearing non-refillable packaging must be **taken back nationwide at the points of sales** for further recycling. Prior to Jan 1, 2003, these non-refillables were subject to the obligatory take-back under the **national Green Dot System** (Duales System Deutschland - DSD), i.e. kerbside household collection and forwarding of sorted packaging to recycling.

Starting point of deposit on non-refillable beverage packaging in Germany (2/2)

Political objectives of mandatory deposits on non-refillable beverage packaging:

Obj. A: A **stabilisation** and (if possible) an **increase** of the **market share of refillable beverage packaging**:

This share had declined continuously, and with a level of **58 % in 2002** the share was well below the **political target** of **72 %**. Objective A is considered to be the main political objective.

Obj. B: A **reduction** of **littering** in streets and public areas:

Beverage packaging thrown away on streets and public areas are alleged to account for a substantial share in litter.

Obj. C: A **reduction** of **environmental impacts**:

On the basis of LCA's of the German Federal Environment Agency (UBA), refillable drinks packaging are assigned lower specific environmental impacts than most non-refillable containers. Consequently, positive environmental effects are expected due to the potential rise of the market share of refillable drinks containers.

Further political objectives which, however, are not dealt with in the context of this study:

Obj. D: An **improvement** of the **recycling rates** of used packaging:

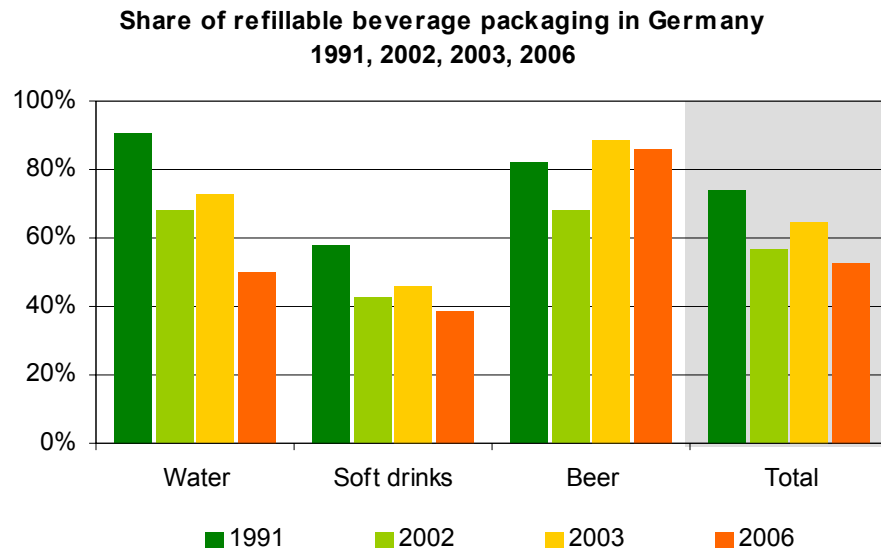
Due to the new deposit it is expected that the rate of collection and reuse of post-consumer packaging material would be higher than in the Dual System.

Obj. E: A **protection** of the economic sector of **small and medium-sized beverage producers**:

The economic situation of these producers for local and regional markets is alleged to be increasingly threatened by the rise in market share of non-refillables. (This economic policy goal was not explicitly outspoken in public, but rather in a number of unofficial political statements.)

Market effects (1/2)

- The **market share of refillables** in the year prior to the introduction of mandatory deposits on non-refillable beverage packaging was **at 58 % (2002)**. In the following year there was a **unique rise to 65 % (2003)**, followed by renewed **yearly decreases in 2004 to 2006** to a level of **53 % (2006)**, which is a reduction of **12 percentage-points in only 3 years**. – This decrease of market shares of refillables (and the corresponding market share increase of non-refillables) is primarily due to the development in the **waters** sector where there had been a drop of the refillable quota by 23 percentage-points (2003-2006). In the **soft drinks** sector, there had been a reduction of 7 percentage-points. Only in the sector of **beer** the share of refillables has not only risen distinctly in 2003 (vs. 2002) but also remained relatively constant since then on a higher level than in 2002.



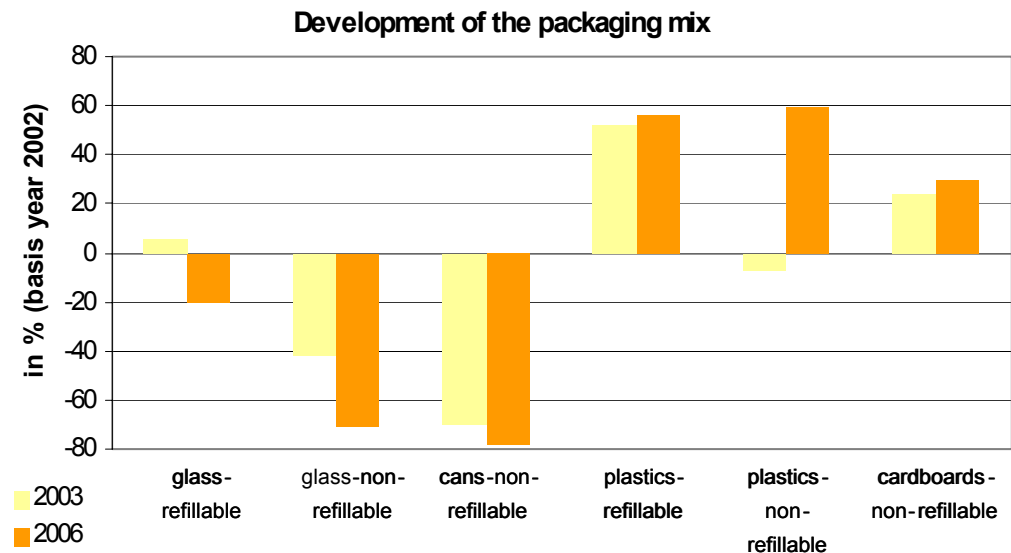
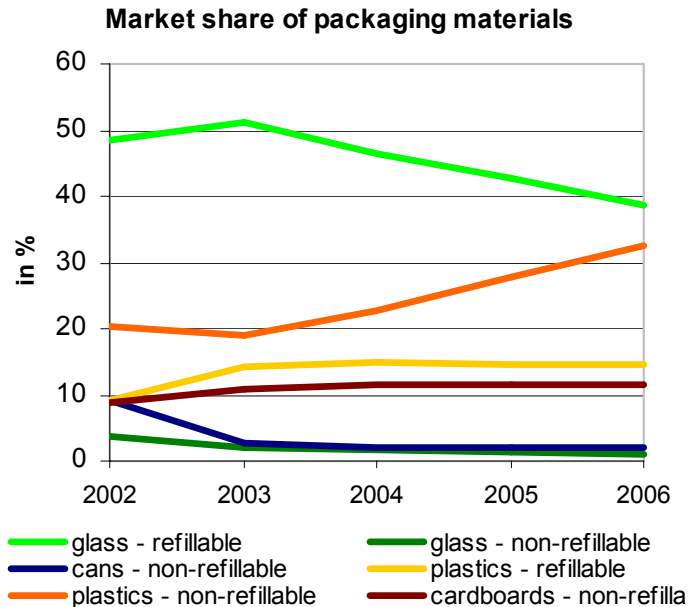
- The **prime objective of a stabilisation or (even) an increase of the overall market share of refillable beverage packaging** is therefore **not achieved**.

On the contrary, strong decreases are registered in the waters and soft drinks markets, resulting in a significant overall loss of market shares of refillables.

Market effects (2/2)

The **packaging mix** has also undergone **strong changes** in the short period between 2002 to 2006, with

- **High losses of glass refillables: minus 10 percentage-points;**
- **High losses of beverage cans: minus 7,3 percentage-points** (leading to a nearly complete disappearance of metal cans from the domestic beverage market);
- **High gains of plastic non-refillables: plus 12 percentage-points**, mainly a result of the strong structural changes in the waters sector.

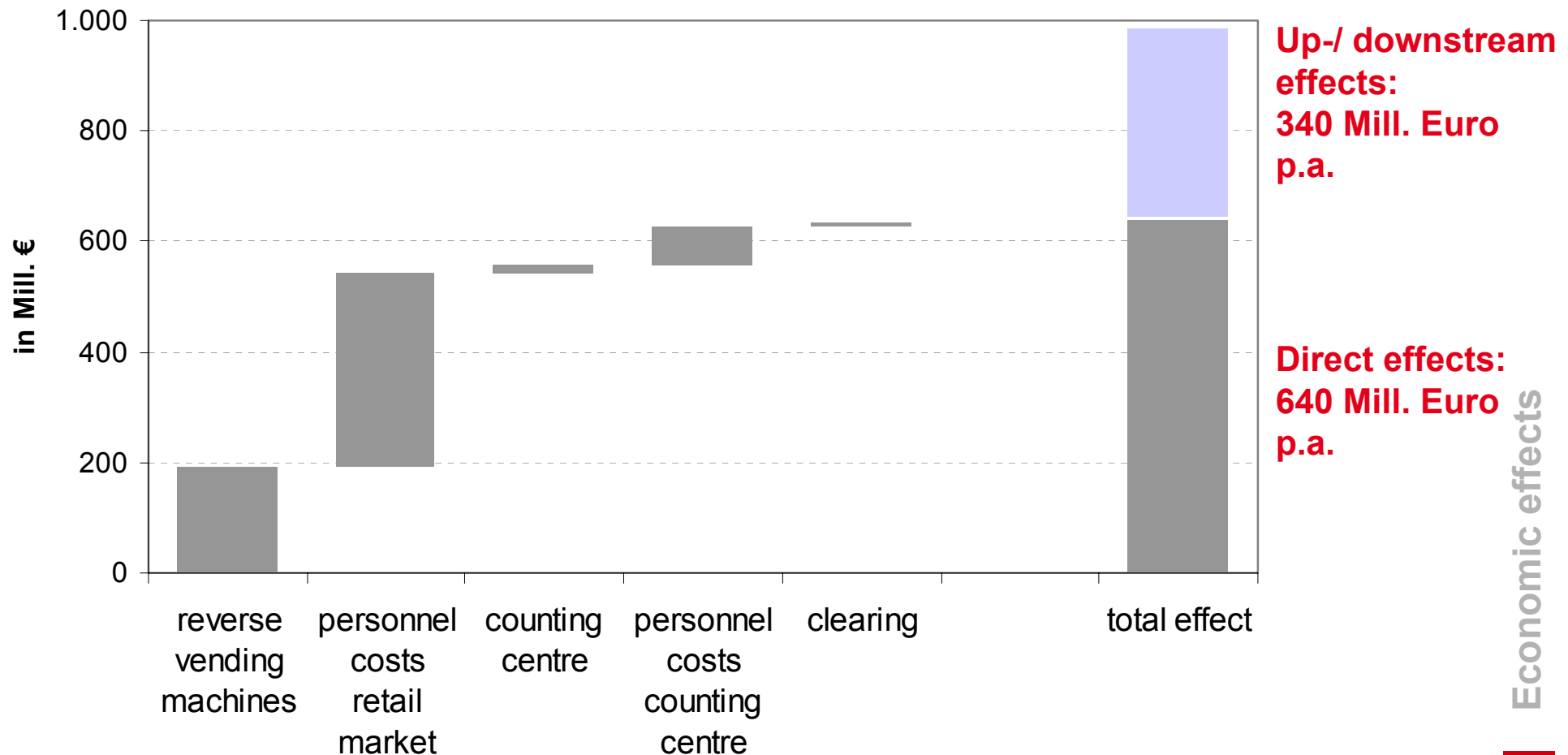


Economic effects (1/4)

- The introduction of mandatory deposits for non-refillable beverage packaging has imposed **additional tasks** upon the economic sectors affected (handling at points of sale, clearing centres etc.), causing respective **expenditures for personnel and investments**. In addition, there are the **sectoral consequences** of the **gains and losses of the individual packaging systems** (plastics, cans etc.) shown above.
- The analysis of total annual monetary effects due to the performance of additional tasks and the sectoral changes is based upon the assessment of the **direct effects in the economic sectors** affected **plus** the assessment of **subsequent effects in up- and downstream economic sectors** (by application of the Prognos macroeconomic input-output model).
- The calculations of the **direct monetary effects** result in a total amount of **640 Mill. Euro**. This sum comprises the necessary expenditures for personnel and for amortisation costs of investments (reverse vending machines, clearing centres etc.). In addition, there have been **up-/downstream effects** of about **340 Mill. Euro**.
- These monetary effects are at first financed by the economic operators affected, however, they are **in the end passed on to and borne by the end consumer**. The effects on costs, turnover and employment in the economic sectors affected by the new mandatory deposit (described in detail below) are thus accompanied by the effects of the decrease of purchasing power. Consequently, from a macroeconomic point of view there has been a **redirection of financial resources**, by a **withdrawal of purchasing power** from the end consumer **to finance the new system** of deposits and reverse vending for non-refillable beverage packaging.

Economic effects (2/4)

Annual monetary effects of the new return system in the different involved sectors



Economic effects (3/4)

The **effects in the various economic sectors affected** by the new deposit are as follows:

■ **Production of beverages and of beverage packaging**

Direct monetary effects in **beverage production** due to the reduction of demand, and this primarily in the sector of beer breweries, are calculated at minus 150 Mill. €. This corresponds to an effect on employment of minus 600 employees.

The changes in the **packaging mix** have resulted in both wins and losses:

- **High losses** are assessed in the production of **metal beverage cans** and for **glass bottles**. The negative effect on employment is assessed to be at minus 2.100 for beverage cans and at minus 800 for glass (in the period between 2002 and 2006).
- **Positive effects** for employment are assessed in the production of **plastic** beverage packaging (+2.600) and beverage **cardboards** (+500).

■ **Retailers (point of sales)**

Due to the additional tasks necessary for the new return system of deposit-bearing non-refillables by employees in the retail sector, the average labour productivity has declined (reduction of time available for the tasks of selling, stock keeping etc.). A complete compensation of this loss by an increase of employment corresponds to about **9.000 employees** and a direct monetary effect of **+350 Mill. Euro**. The subsequent effects in up- and downstream economic sectors, calculated with the input-output model, are about +1.500 employees and +190 Mill. Euro.

Economic effects (4/4)

- **Financial services**

The high volume of investments necessary for the installation of the return system (reverse vending machines, counting centres etc.) leads to increases in turnover in the sectors of banking and financial services in a magnitude of +40 Mill. Euro per year. This volume corresponds to an effect on employment of some +300 employees.

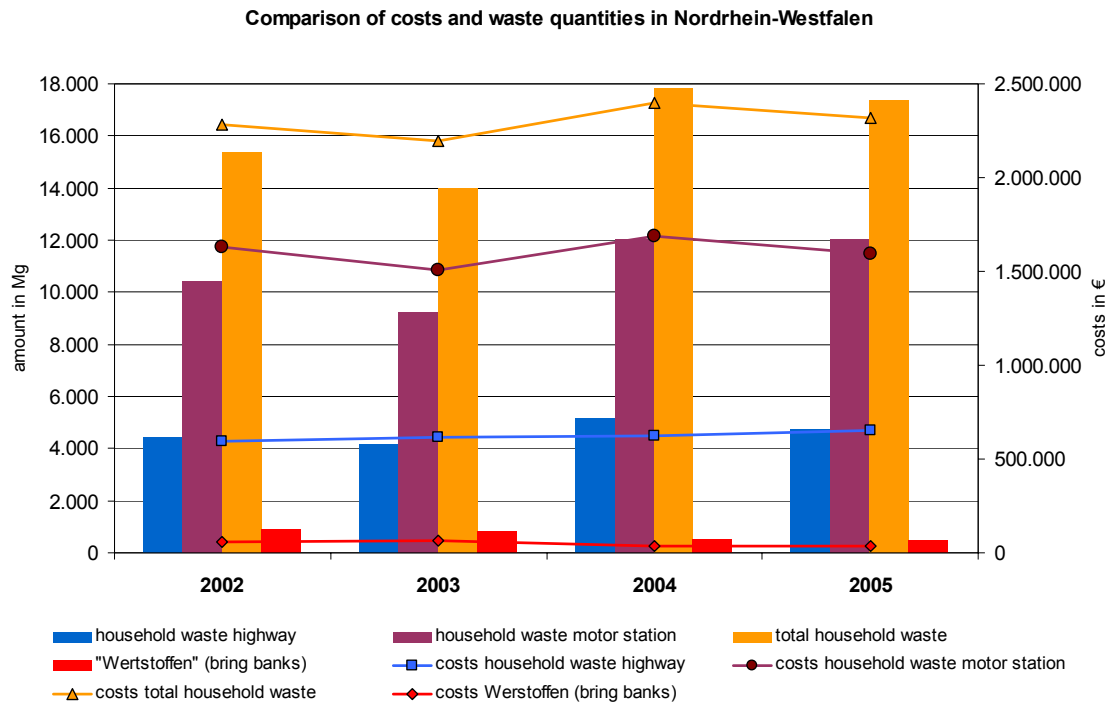
- **Mechanical engineering**

Mechanical engineering is the economic sector which is benefiting most from investments in reverse vending machines and their operations. Direct effects on turnovers are calculated to amount to +170 Mill. Euro per year, corresponding to employment effects of close to +1.200. The subsequent effects in up- and downstream economic sectors, calculated with the input-output model, are about +1.100 employees and +140 Mill. Euro p.a..

- **Waste management**

For this sector, it is assumed that reductions in income fee for the DSD organisation (collection/recycling of post-consumer packaging) would be counterbalanced by the new contracts concerning collection/recycling of deposit-bearing non-refillables in the retail sector. Slight increases in turnover have taken place by the new service performed in counting/clearing centres, with direct employment effects of +400 and monetary effects of +70 Mill. Euro p.a..

Effects on littering and on costs of street cleaning (1/2)



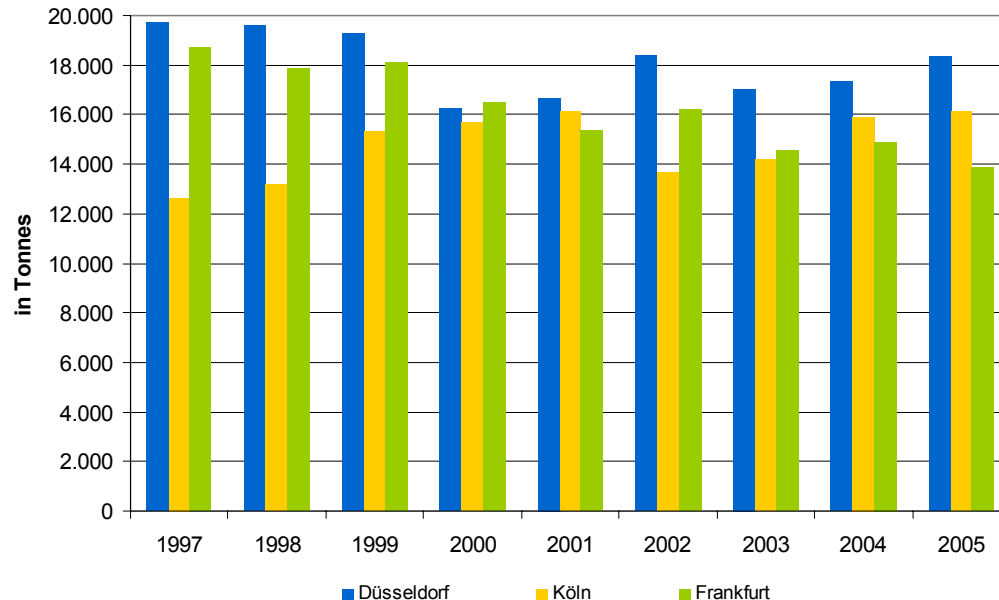
Findings of a 2003 littering study in European cities, performed by the university of Vienna, show a **share of beverage packaging in littering of about 0,45 %**.

And, in spite of the mandatory deposit on non-refillables in Germany, the city of Frankfurt has - in comparison with other European cities - the highest amount of beverage packaging in littering.

Statistics of the “Bundesanstalt für Straßenwesen in Nordrhein-Westfalen (BAST NRW)” show **no effects** in waste amounts and costs of cleaning on **motorways, highways and motorway stations** between 2002 and 2005.

Effects on littering and on costs of street cleaning

Waste Quantities from street cleaning in selected cities



Statistics on waste show **no effects** in waste quantities from street cleaning in **German cities** between 1997 and 2005.

Deposit-bearing non-refillable beverage packaging has nearly totally **disappeared** from street cleaning waste - because of their **collection by deprived persons**.

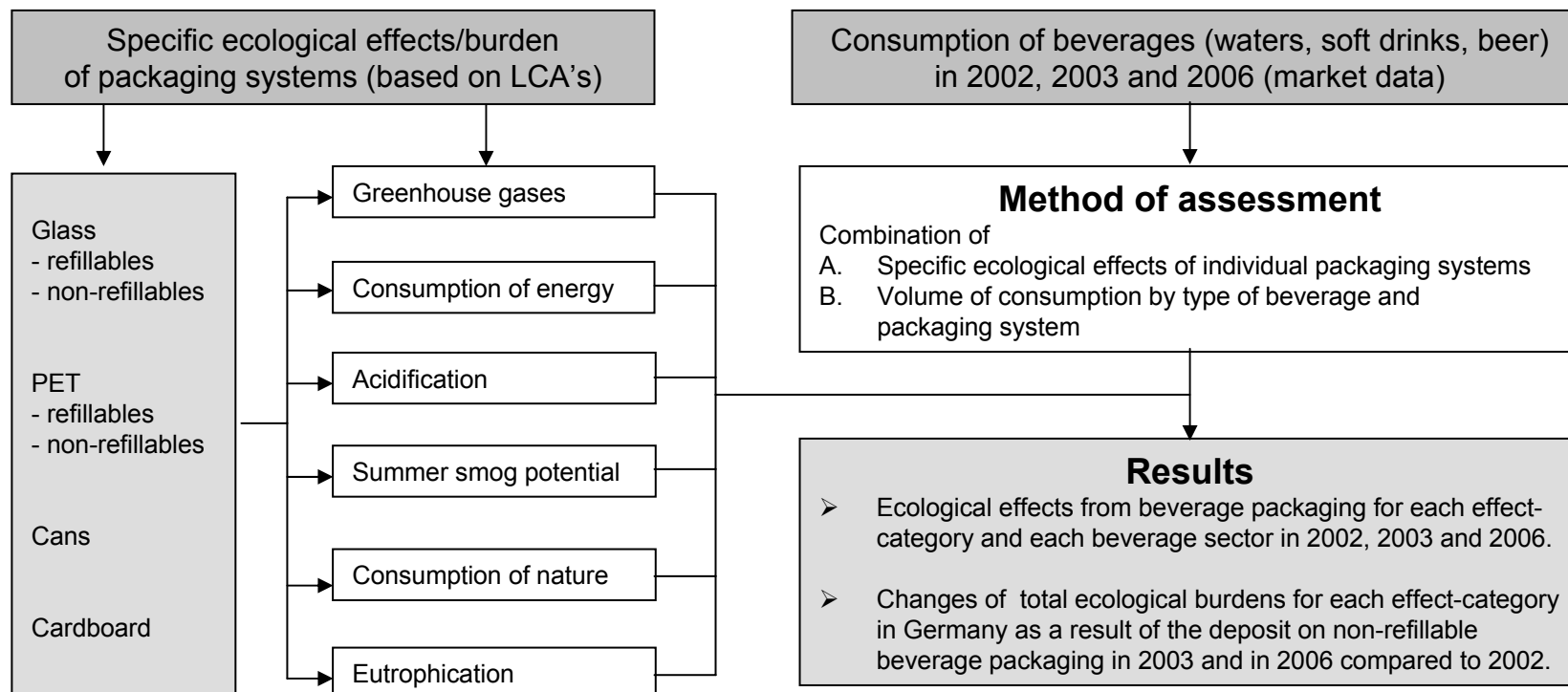
From a **subjective perception**, cities seem to be cleaner; but there is now significantly more broken glass in litter.

Conclusion: There are **no quantitative effects in litter reduction** and **no economic effects in street cleaning** identifiable as a result of the introduction of deposit on non-refillable beverage packaging.

Environmental effects (1/4)

Methodological approach:

- **Annual environmental effects** related to beverage packaging are assessed on the basis of:
 - **Market data** (domestic consumption in 2002, 2003 and 2006 by type of beverage and type of packaging system)
 - **Specific ecological effects** of individual packaging systems (based on LCA's).



Environmental effects (2/4)

Results (numerical figures are shown in the table on next page):

- In 2002, **CO₂ emissions** attributable to all beverage packaging for waters, soft drinks and beer are **3,8 Mill. tons**. In relation to total annual CO₂ emissions in Germany in 2002 this is a **share of 0,4 %**.
- The **energy consumption** in **2002** is calculated to be at **0,92 Mill. tons** (tons of Oil Equiv./TOE) In relation to total annual consumption of energy in Germany (2002) this is a **share of 0,5 %**.
- In the **period of 2002 to 2006**, the annual volume of **CO₂ emissions** attributable to beverage packaging has **decreased by about 0,5 Mill. tons**. - In relation to total annual CO₂ emissions in Germany this is a decrease of **0,05 %**. In relation to the volume of CO₂ emissions attributable to beverage packaging in 2002 (3,8 Mill. tons) this is a decrease by about 12 %.
- In the **period of 2002 to 2006**, the **energy consumption** related to beverage packaging has decreased by about **0,04 Mill. tons** (TOE). - In relation to the total annual consumption of energy in Germany, this is a decrease of about **0,02 %** (and related to the consumption attributable to beverage packaging a decrease of about 3 %).

Environmental effects (3/4)

Ecological effects of beverage packaging in Germany: 2002, 2003 and 2006			Ecological impact categories			
			Greenhouse gases	Energy consumption	Acidification	Summer smog
			CO ₂ -Equiv. in tons	TOE in tons	SO ₂ -Equiv. in tons	NO _x /C ₂ H ₄ -Eq. in tons
Total effects: 4 beverage-sectors (waters, beer, and soft drinks)	Absolute values	2002	3.798.766	919.251	22.785	6.587
		2003	3.463.726	878.874	21.485	6.573
		2006	3.300.381	877.951	19.401	7.512
		2003 vs. 2002	-335.040	-40.377	-1.300	-14
		2006 vs. 2002	-498.385	-41.300	-3.384	926
Significance of total effects (1)	Total burden in Germany		tons (p.a.)	tons (p.a.)	tons (p.a.)	tons (p.a.)
		2002	864.000.000	200.760.000	4.575.000	600.000
	Changes of total burden from beverage packaging	2003 vs. 2002	-0,04%	-0,02%	-0,03%	0,00%
		2006 vs. 2002	-0,06%	-0,02%	-0,07%	0,15%
Significance of total effects (2)	Total burden in Germany		tons	tons	tons	tons
		2002	864.000.000	200.760.000	4.575.000	600.000
	2005/06	865.000.000	201.000.000	4.000.000	600.000	
	Contribution to total burden from beverage packaging	2002	0,44%	0,46%	0,50%	1,10%
		2006	0,38%	0,44%	0,49%	1,25%

Packaging mix
share of refillables in %
57,7%
65,1%
53,1%
Refillables: 2006 vs. 2002: - 4,6%-pts.

Sources of data: Prognos-calculations based on "Ökobilanz für Getränkeverpackungen II, Phase II, Umweltbundesamt, Berlin 2000"; UBA-Umweltdaten (osiris.uba.de; env-it.de)

Environmental effects (4/4)

Conclusion

- With a **share of 0,4 %**, compared to total annual CO₂ emissions in Germany, the **significance of CO₂ emissions attributable to beverage packaging** is rather low.
- The **same** holds true for the **consumption of energy resources** and the **emissions of airborne gases**, for which the **shares** are **0,5 %** or less.
- The introduction of **mandatory deposits** for non-refillable beverage packaging in 2003 has **caused only very minor improvements of the national CO₂ balance**:
 - **minus 0,05 %** (2006 compared to 2002).
- The **same** (minor improvements) holds true for the **consumption of energy resources**:
 - **minus 0,02 %** (2006 compared to 2002).

Environmental effects (4/4)

Conclusion

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