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EXTENDED PRODUCER RESPONSIBILITY

PHASE 2

CASE STUDY ON THE GERMAN PACKAGING ORDINANCE

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FOREWORD

Many OECD countries -- in accordance with the Polluter Pays Principle (PPP) -- are taking measures to expand private sector responsibility for conserving resources and energy and reducing the quantity of pollutants released and wastes destined for final disposal. This approach of Extended Producer Responsibility (EPR) is aimed at making the private sector responsible for efforts to reduce environmental impacts from both use and disposal of their products and to use and benefit from recycling, recovered resources and reclaimed materials in so doing.

In 1994, an OECD project on EPR was initiated, focusing particularly on programmes to address what many regard as the “weakest link” in the product responsibility chain: the final disposal of products after their sale to and use by consumers. The overall themes of each phase under the EPR Project are:

- Phase 1* Review of legal and administrative approaches in OECD Member countries and development of initial policy options for EPR programmes (1994-1995);
- Phase 2* Analysis of economic efficiency and environmental effectiveness of various approaches to EPR (1996-1997); and
- Phase 3* Examination of EPR approaches and issues through a series of multi-stakeholder workshops, culminating with a joint workshop combining efforts under EPR and Waste Minimisation OECD work programmes. Synergies are expected and the joint workshop outcome will serve as input to the development of comprehensive policy options (1998-1999).

The *Phase 1* Report was based on extensive interviews and information gathered across the OECD area and was published in 1996 (OECD Environment Monographs No 114, OCDE/GD(96)48).

Phase 2 consists of four areas: *a)* in-depth case studies on existing EPR systems, *b)* possible trade implications, *c)* economic analysis of EPR options, and *d)* development of an overall “Phase 2 Framework Report” for implementing EPR programmes with a particular focus on the policy and legal considerations for *sharing* responsibility.

This in-depth case study focuses on the **German Packaging Ordinance**, which has been in force since 1991. The case study was originally drafted by Margaret Brown Nels, a specialist in international environmental policy and technology transfer who was employed from 1978 to 1983 by the United States Environmental Protection Agency. Since 1985 she has been an environmental consultant. The final draft was produced within the OECD Secretariat by Alain Rajotte. It was prepared for publication with the assistance of another consultant, John Smith.

Delegates to the Pollution Prevention and Control Group have had the opportunity to review this document and have agreed that it should be declassified. This document is published under the authority of the Secretary-General of the OECD.

TABLE OF CONTENTS

EXECUTIVE SUMMARY	6
1. INTRODUCTION.....	9
2. EPR PRINCIPLES AND THEIR LEGISLATIVE APPLICATION	11
3. DESCRIPTION OF THE GERMAN PACKAGING ORDINANCE.....	13
3.1 Background and history of legislation	13
3.2 Legislative basis for the Packaging Ordinance	13
3.3 Delegation of authority to states	14
3.4 Overview of requirements of the Packaging Ordinance	14
3.4.1 Requirements for quotas	15
3.4.2 Responsible parties.....	16
3.5 Policy issues and problems related to legislation	17
3.5.1 The problems of packaging in legislative systems	17
3.5.2 Failure to designate a primary responsible party	18
3.5.3 Key parties in implementation	18
3.5.3.1 The role of fillers	18
3.5.3.2 The role of retailers	19
4. THE DUALES SYSTEM DEUTSCHLAND (DSD).....	20
4.1 Start-up of the DSD	20
4.2 Waste collection systems and contracts.....	21
4.3 Structure of licence fees for the Green Dot System	22
4.4 Abuse of Green Dot licence fees	24
5. IMPACTS OF THE PACKAGING ORDINANCE.....	25
5.1 Avoidance and elimination of unnecessary packaging.....	25
5.1.1 Elimination of unnecessary packaging	25
5.1.2 Motives for optimisation	25
5.2 Recycling of packaging wastes.....	27
5.2.1 The state of packaging recycling in Germany	27
5.2.2 Development of new recycling and sorting technologies	28
5.2.3 Recycling capacities and secondary materials markets	29
6. ECONOMIC EVALUATION OF THE PACKAGING ORDINANCE.....	32
6.1 Costs of the Green Dot System.....	32
6.2 Hidden costs and indirect economic impacts.....	32
6.3 Costs for the Green Dot System in the overall framework of waste management costs	33
7. EVALUATION OF ENVIRONMENTAL IMPACTS OF THE GREEN DOT SYSTEM.....	34

7.1 Verifiable benefits of the Green Dot System.....	34
7.2 Indirect impacts on existing waste management systems	34
7.3 Environmental impacts of new recycling technologies	34
7.4 Other environmental impacts	35
8. PROBLEMS RELATED TO IMPLEMENTATION.....	36
8.1 Free riders	36
8.2 Identifying responsible parties.....	36
8.3 Double payment for waste management services under PRO schemes	37
8.4 The PRO as a monopoly	37
8.5 Misinterpretation of the Green Dot Symbol	37
8.6 Ownership	37
8.7 Public participation and information	38
APPENDIX 1. DSD NINE POINT RECONSOLIDATING PLAN.....	39
APPENDIX 2. DSD CONTRACT RENEGOTIATIONS.....	40
REFERENCES	41

LIST OF FIGURES

FIGURE 1 - PACKAGING ORDINANCE QUOTAS FOR COLLECTING AND SORTING.....	16
FIGURE 2 - LICENCE FEE STRUCTURE	23
FIGURE 3 - MOTIVES FOR OPTIMISING.....	26
FIGURE 4 - DISTRIBUTION OF PACKAGING MATERIAL BEFORE AND AFTER OPTIMISATION	26

LIST OF TABLES

TABLE 1 - RENEGOTIATION PLAN FOR LOANS TO DSD	21
TABLE 2 - ITEM FEE.....	23

EXECUTIVE SUMMARY

Objectives of the study

Phase 2 of the OECD Project on Extended Producer Responsibility (EPR) started in 1995 by focusing on the analysis of the economic efficiency and environmental effectiveness of various approaches to EPR. Among other work, two in-depth case studies have been undertaken on the Dutch Packaging Covenant and the German Packaging Ordinance. Both approaches provide examples of the implementation of an EPR programme. Each approach entails distinct characteristics, as the Dutch approach is a negotiated agreement while the German regime is mandatory. Both approaches have been carefully evaluated, providing a good basis for comparison.

This report investigates the economic aspects and environmental impacts of the German Packaging Ordinance, the most extensive piece of legislation for which a significant body of information on the implementation of EPR exists. The German experience therefore provides valuable information regarding the impact of mandatory legislation and the problems encountered in implementation and enforcement. The report highlights problems and benefits experienced in implementing a “Producer Responsibility Organisation” (PRO), using the “Green Dot System”, and the extent to which the goals of EPR are being met. An assessment of economic and environmental impacts of the Ordinance is provided, with a view to identifying problems and appropriate solutions which might also be suitable for other Member countries.

EPR Principles and their legislative application

OECD Member countries are placing increasing importance on EPR as a policy approach for closing material cycles. Viewed as a powerful environmental policy instrument in a number of OECD countries, EPR has been the leading principle underlying take-back programmes, which require retailers, distributors and producers to take-back products, e.g. packaging after consumer disposal. Take-back programmes can have a significant impact in reducing solid waste and improving the environmental attributes of consumer products. The examination of current national experiences for controlling packaging wastes may therefore provide insights with regard to the benefits and shortcomings of implementing EPR principles into concrete actions.

The German Packaging Ordinance

Section 3 describes the background and legislative basis which led to the adoption of the Packaging Ordinance. Packaging as a product category presents unique problems in waste management based on an EPR approach. The characteristics of the packaging waste are non-ideal, as it is highly mixed, may be contaminated, and is disposed of in high volumes from many sources, generally within a short time span after production. With the Packaging Ordinance, which entered into force on 12 June 1991 under the German Waste Act, Germany was the first country to introduce binding requirements for the recycling and recovery of sales packaging. The main requirement of the Ordinance is the obligation for

retailers and producers to take back a fixed and yearly increasing percentage of packaging materials, and to recycle them in accordance with the principles laid down in the Ordinance.

The above mentioned characteristics of packaging wastes have created the problem of finding responsible parties for take-back programmes. From the onset, the Packaging Ordinance has given joint responsibility to producers and distributors, while placing responsibility on retailers, as distributors, to take back used packaging. Retailers, with producers, then ensure recycling of packaging wastes to meet quotas. Individual producers can, however, be exempted from this obligation if a PRO is organised to meet the requirements. The Packaging Ordinance provides the option for introduction of a PRO, which has resulted in the creation of the Duales System Deutschland (DSD). The philosophy of giving the private sector a “free hand” to make product changes and manage waste has been seen as the most effective and flexible means of regulation. However, it has also led to problems in implementation regarding partial failure to determine a primary responsible party.

The Duales System Deutschland

Section 4 describes the main issues and problems associated with the establishment of the DSD. The DSD provides the widest experience with a fully operational PRO system for collection and recycling funded solely by producers. Founded in September 1990, the DSD passed from start-up into full operation in January 1993 with the declaration of the 16 State Environment Ministers that fully-established State-wide collection, sorting and recycling systems were in place. Problems such as free riders, non-effective co-ordination with local waste management services, and non-optimum licence fees are discussed. The preliminary results of a reconsolidating plan, which has recently been undertaken to stabilise the DSD, are introduced. These results and related prospects for the future are further discussed in Section 8.

Impacts of the Packaging Ordinance

In Section 5, the environmental and economic impacts of the Packaging Ordinance are described and discussed. Quantitative and qualitative evaluations are being carried out in order to assess the relative successes and failures of the implementation of the Ordinance. Set targets are examined from different perspectives: their impacts on waste generation and on the development of recycling technologies and capacities, as well as on markets and on the relative cost-efficiency of the system. Results from surveys conducted by DSD with producers and distributors provide additional insight into the main factors which affect the design of environmentally sound packaging materials. The status and trends of packaging recycling in Germany allow identification of the most promising options for meeting upcoming quotas, and establish an environmental level playing field for an EPR system. The costly problem of free riders is also analysed in relation to the implementation of the Green Dot System. Examples of efforts to control free riders and encourage the use of the Green Dot System are provided.

Economic evaluation

In Section 6, the economic viability of the DSD is examined. Cost assessments are provided in order to evaluate the DSD’s relative success and future challenges. The main issues of the reconsolidating plan are addressed, notably the renegotiation of contracts with local waste managers, price adjustment for the Green Dot, particularly in the area of plastics, and the need for better co-ordination of waste collection with local authorities. The problem of free riders is also assessed from an economic perspective.

Evaluation of environmental impacts

Section 7 reviews the environmental results of the Green Dot System, using available statistics on recycling of packaging material and the impacts of new recycling technologies. Unintended negative impacts of the DSD, e.g. increasing waste management costs, and increased energy consumption due to the transport of collected materials, are also examined.

Problems and solutions related to implementation

Section 8 briefly reviews the most pressing issues and problems identified in this study. Problems such as free riders, the identification of responsible parties, the duplication of waste management services at the local level, issues related to the PRO as a monopoly, and the increasing importance of public information and participation are revisited. Possible solutions to some problems are proposed, as far as feasible and appropriate, in the form of current policy, while others are examined with a view to identifying the most relevant path of action. The two appendices outline the nine points of the reconsolidating plan for DSD, and the details of the DSD contract renegotiations with local waste managers.

1. INTRODUCTION

Under Phase 1 of the OECD's programme on Extended Producer Responsibility (EPR), the basic concept of EPR and elements relevant to drafting of environmentally sound waste policies were identified. These were discussed in the Proceedings of the Washington Workshop on Waste Minimisation in 1995, and in the Phase 1 Report on Extended Producer Responsibility in the OECD Area in 1996. Phase 2 focuses on analysis of the economic efficiency and environmental effectiveness of various EPR approaches. Legal issues concerning domestic competition, international competitiveness, and potential trade implications are also examined.

As a new way of thinking and of implementing the Polluter Pays Principle, EPR seeks to place responsibility for the life-cycle of a product, including waste management, on producers. As an extension of EPR, the concept of shared responsibility has been introduced to address various actors' responsibility throughout the product's life-cycle. Together these concepts intend to identify product responsibility throughout the life-cycle, so that activities and related costs will be required from the proper actors. Hereafter, the term EPR will be used to refer to the entire concept of extended and shared producer responsibility.

A significant body of EPR legislation has emerged in OECD Member countries, increasing the role of producers in the management and recycling of post-consumer products. Voluntary waste management programmes have been introduced by producers for post-consumer electronic products, batteries, computers, tires and vehicles. These programmes are in various stages of development and implementation. They generally involve co-operative efforts between the affected industry and regulatory bodies. The largest body of legislation with specific programmes, including mandatory measures, is in the area of packaging materials. All such legislation is waste management driven and is based on the necessity to diminish landfill capacity and public opposition to incineration. The legislation has a variety of implementation options, including taxes, sharing of costs by industry and municipalities, and the creation of industry exemption schemes. Industry exemption schemes involve private sector organisations which set up waste management systems on behalf of the affected industry parties. For the purpose of this study, such schemes will be referred to as the **Producer Responsibility Organisation (PRO)**.

This case study examines the German Packaging Ordinance. The Packaging Ordinance is the most extensive piece of legislation for which a significant body of information regarding implementation exists. Owing to the introduction of legislative measures, Germany has gained a lot of experience and knowledge and can therefore provide valuable information regarding the impact of mandatory legislation and the problems encountered in implementation and enforcement. Among the options available to regulators, the German law has taken the most far-reaching position in implementing mandatory controls with time-based quotas for material re-use and recycling, and requiring mandatory return to retailers of waste packaging. It provides the *option* for introduction of a PRO, which has resulted in this case in the creation of the Duales System Deutschland (DSD). The DSD provides the widest experience with a fully operational PRO system for collection and recycling funded solely by producers. Statistics on recycling

and costs for waste handling are available, as well as extensive information regarding implementation of a PRO scheme.

The objective of this case study is to examine how a given set of legislative tools has functioned in achieving the goals of EPR and the legally mandated waste management goals of waste avoidance, re-use and recycling. The primary issues to be addressed are:

1. the extent to which goals of waste avoidance, re-use and recycling can be achieved;
2. whether the Polluter Pays Principle has been applied;
3. what the environmental impacts of the system are; and
4. what the costs are in terms of unit weight of material going to recycling which would have been otherwise disposed of.

2. EPR PRINCIPLES AND THEIR LEGISLATIVE APPLICATION

The primary purpose of EPR is to provide incentives to producers to redesign products to make them more environmentally sound. In practice, EPR legislation can only ensure that producers have the ultimate product responsibility, since costs may be passed on to consumers as the free market system permits. Nonetheless, it can be assumed that producers will respond to legislation by reducing such costs to a minimum through product changes. Passing responsibility to producers as polluters is not only a matter of environmental policy, but is the most effective means of achieving higher environmental standards in product design.

EPR has been associated with the Polluter Pays Principle, considering the environmental and financial consequences of waste disposal. EPR legislation ideally seeks to identify a primary responsible party who would be the final producer of a product. However, a number of producers are involved with most products before they reach the marketplace. Thus, in practice, EPR legislation often gives responsibility to a number of parties under a system of Extended and Shared Producer Responsibility.

Under the German Packaging Ordinance, all producers and distributors have equal responsibility. In practice, the filler of packaging material has assumed responsibility for compliance. To comply with legislation, producers must be able to take back their products and assume responsibility for waste management after use. For some products, an actual return to the producer is not feasible. In the case of packaging material, the mixed nature of the municipal waste stream, and the large number of articles and producers, makes identification and return of a product to an individual producer virtually impossible. To assist producers, PRO schemes may be introduced to assume responsibility for collection, sorting and recycling of regulated materials. In basic terms, the producer or responsible party pays fees to the PRO in proportion to the amount of waste products contributed to the system.

In the German system, a licence fee is paid based upon the amount and type of packaging introduced into the marketplace by a given producer on an annual basis. The Green Dot symbol is then placed on packaging by the producer to identify the product for the PRO. Thus, the Green Dot acts as a licence symbol to identify the products of companies participating in the DSD collection system. Whether systems are voluntary or mandatory, and whether industry shares costs with municipalities (as in French legislation) or assumes full responsibility as in the German system, a licence symbol, or some other form of label, is employed to identify the products of participating producers.

Some concerns have been raised regarding PRO schemes, since they create waste management monopolies. The opportunity for a PRO to engage in price fixing or other forms of non-competitive trade practices varies depending upon the system itself. In the German system, the PRO was required to co-ordinate with existing local systems, which gave waste managers the advantage in negotiations. Nonetheless, a cartel complaint was issued by the EU against the German PRO for providing material to recyclers at no cost.

To ensure communication and co-operation among PROs in different countries, and to address potential hindrance to free trade through introduction of "symbols", the Packaging Recovery Organisation

Europe (PRO EUROPE) was founded with headquarters in Brussels. PRO EUROPE is an initiative of the DSD, seeking to promote the use of the Green Dot symbol within Europe by other national PROs. In agreement with the Monopolies Commission, PRO EUROPE will develop criteria for awarding the Green Dot.

In general, it may be said that the EPR legislation, which permits PRO systems, should consider provisions for the oversight of PRO activities and for setting standard fee structures for waste management activities.

3. DESCRIPTION OF THE GERMAN PACKAGING ORDINANCE

3.1 Background and history of legislation

The Packaging Ordinance was introduced after many years of political discussion in Germany. It was an inevitable result of German waste management policy, and of ongoing environmental discussions. The waste management hierarchy of avoidance, re-use and recycling was established with the passage of the Waste Avoidance, Recycling and Disposal Act in 1986, and the Polluter Pays Principle was widely accepted. Well established systems for recycling of glass and paper, as well as for composting, were in existence and households were accustomed to separation and recycling practices. For more than a decade prior to the passage of the Packaging Ordinance, the problems of municipal waste and the structuring of environmental policies to reduce waste going to landfills were critical issues. Germany had the most extensive programme in Europe for the development of incineration capacity for municipal waste. As public opposition to incineration increased, recycling became a widely discussed popular option for waste management. In parallel, avoidance and reduction at source of packaging, which comprises 50 per cent of the volume of municipal waste in Germany, was a major public issue.

Germany had attempted to encourage packaging reduction and recycling through voluntary measures. When industry failed to respond, mandatory measures were introduced with the passage of the Packaging Ordinance in June 1991. The German States wanted more stringent regulations, which were not introduced in order to avoid conflict with EU measures. The EU Directive on Packaging and Packaging Waste did not become effective until December 1994. During the drafting of the Ordinance, the German Minister for Environment played a major role in gaining acceptance for the legislation. Both the public and private sectors were involved in extensive discussions regarding the role of the Ordinance as part of German waste management policy. Prior to passage of the Packaging Ordinance, producers had already created the DSD to serve as a PRO. Plans were underway in the individual States to organise waste management systems in co-operation with the new PRO. Therefore, the Ordinance was introduced to an informed and environmentally aware public and private sector.

3.2 Legislative basis for the Packaging Ordinance

The Packaging Ordinance has been in force since June 12, 1991. The legal authority for the Packaging Ordinance is established under the German Waste Act (Waste Avoidance, Recycling and Disposal Act 1986, amended in September 1994), which is the primary instrument for regulation of wastes in Germany. Amendments to the Ordinance have been drafted (NOVELLE V) and their full parliamentary acceptance was anticipated in the first quarter of 1997. Passage of the amendments was expected in late 1996 or early 1997. The NOVELLE V will include a new provision to address the problem of free riders, which requires producers not participating in the Green Dot System to report amounts of packaging generated and to verify that packaging waste has been managed in compliance with the Ordinance. Use of energy recovery technologies, which were not considered to be recycling under the Packaging Ordinance, would be permitted for products from renewable resources.

3.3 Delegation of authority to states

The Packaging Ordinance provides for State control of implementation, reporting and compliance, in keeping with the power of the German States to implement national legislation on an individual basis. The area for compliance is defined as the State in which packaging entered into commerce. The Ordinance requires that the mandated systems for sorting, separate collection, and recycling of packaging wastes be set up on the State level and demonstrate their capacity to meet provisions of the Ordinance through reporting to State officials.

3.4 Overview of requirements of the Packaging Ordinance

The Packaging Ordinance mandates the separate management and recycling of all types of sale packaging outside the public waste disposal system. It sets mandatory quotas for recycling in accordance with the waste management hierarchy, established by the Waste Act, of avoidance or reduction at source, re-use and recycling. Energy recovery, which follows recycling in that hierarchy, is not an option in the Packaging Ordinance; however, under the proposed amendments, energy recovery would be permitted for packaging materials from renewable resources. The goals of the legislation are stated in Article 1 of the Packaging Ordinance as follows:

1. Packaging is to be produced from materials that are environmentally acceptable and do not hinder recycling;
2. Waste from packaging is to be avoided, if that packaging:
 - is reduced to that volume and weight necessary to protect the contents and to market the product;
 - is so produced as to be refillable, insofar as it is technically possible and feasible ; and
 - is recycled when refill is not possible.

Mandatory quotas provide the specific guidelines for reaching recycling goals. The responsible parties for compliance are producers and distributors. Removal of packaging waste from the public waste disposal system is guaranteed through the mandatory requirement for retailers (as distributors) to take back packaging at the point of sale. Take-back covers all types of sale packaging sold by the retailer. Even though responsibility for initial take-back is placed on the retailer, the responsibility for management of wastes (collection, sorting and recycling) is jointly shared by producers and distributors (retailers).

The provision allowing for PRO schemes requires that they be established and approved at the State level and provide so-called “area coverage” or full services State-wide for (regular and adequate) collection, sorting and recycling. They must be co-ordinated with the responsible local waste management body. They may contract, in exchange for payment, with local waste management systems to utilise existing infrastructures for collection and sorting. The system must demonstrate, to the competent State authority, the capability to provide collection, sorting and recycling services in compliance with the Ordinance. A State’s failure to demonstrate compliance on a State-wide basis results in the withdrawal of its exemption from the obligation to take back packaging at the point of sale for the material in question .

The Ordinance is implemented in three stages, as follows:

Stage 1, effective as of December 1, 1991

Manufacturers and distributors are required to take back all transport packaging. Transport packaging includes barrels, canisters, sacks, pallets, etc. required for protection of goods during transport from manufacturer to distributor. For transport packaging, take-back upon delivery is mandated at the time of delivery or, in the case of regular deliveries, at the time of the next delivery.

Stage 2, effective as of April 1, 1992

All distributors must take back secondary packaging at the point of sale. Secondary packaging is additional packaging, on top of sales packaging, that is not essential to protect goods (self-service packaging, blister packs, advertising, decorative).

Stage 3 effective as of January 1, 1993

All distributors must take back sales packaging.

3.4.1 Requirements for quotas

The Ordinance sets quotas for collection and sorting of packaging waste. Recycling quotas are not set as such, but are understood to be identical to sorting quotas since all sorted materials are to be of recyclable quality and must go to recycling after sorting. The quotas are given by individual packaging material (i.e. glass, paper/paperboard/carton, tin plate, aluminium, plastic and composites) and are calculated on a weight per cent basis.

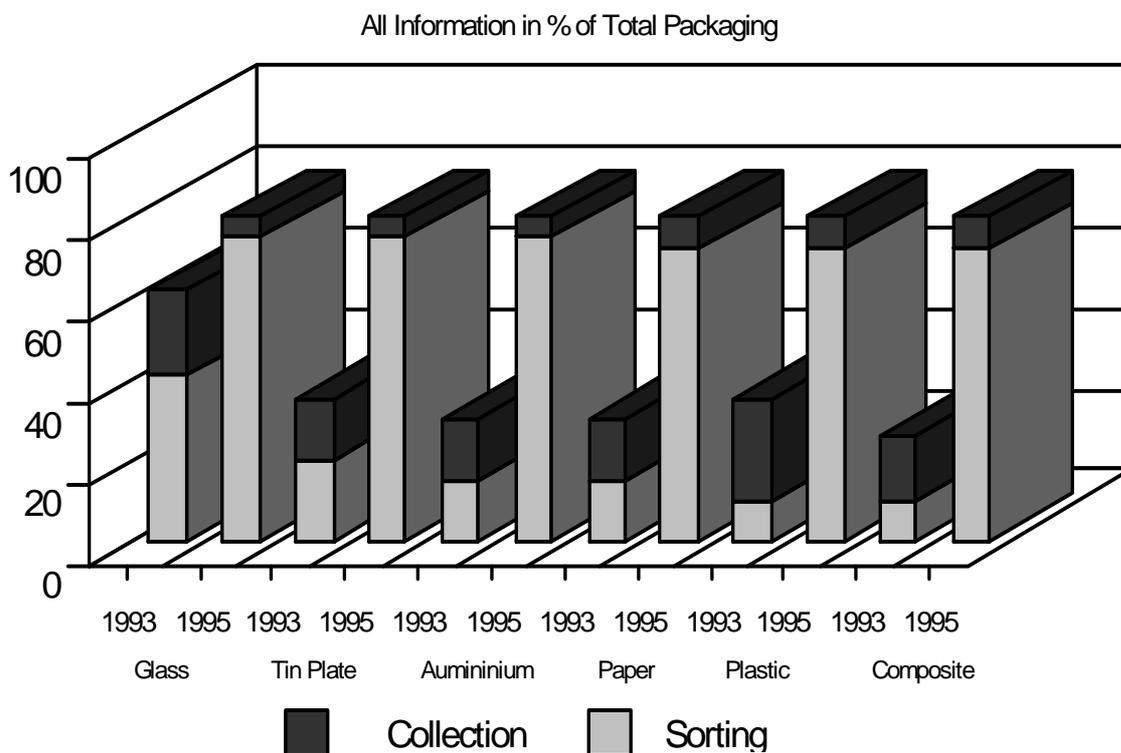
Collection quotas specify the weight per cent of a given packaging material to be collected from the total amount in circulation. Sorting quotas are based on weight per cent of the total volume of a given material collected. Data for amounts collected and sorted is recorded at the sorter. Collected material brought to the sorter is weighed on an incoming (collection) and outgoing (sorted for recycling) basis.

Weights collected and sorted are recorded in the "quality stream document" which follows the material to the recycler. Information in the quality stream document, showing amount in and out of sorting and delivered to recyclers, is provided to State authorities. The data is reported annually to Federal Authorities to provide verification at the Federal level that States are complying with mandated quotas. Weight of packaging in circulation, on a per capita basis, is reported in Germany every three years. Since collected material is initially separated into three fractions (glass, paper, and light material), information on amounts of individual packaging material in the partially separated light fraction is based on local surveys of municipal waste bins, to provide statistical distribution profiles for the percentage of a given material relative to the overall volume of packaging. These percentage estimates for typical regional distribution of individual packaging materials are used to calculate total weights of individual material in yellow bins.

To allow for start-up of collection, sorting and recycling activities, quotas were phased in on a two-stage basis. Initial quotas for 1993 required collection rates of 20-40 per cent for all material except glass (60 per cent). Quotas for 1995 required collection of 80 per cent by weight of packaging in circulation for all packaging material groups. Sorting quotas (e.g. recycling quotas) required that 90 per

cent of the collected material for glass, tin plate and aluminium and 80 per cent of the collected material for paper, paperboard, carton, plastic and composite packaging be sorted by 1995. The sorting quotas given in the legislation as a percentage of collected material could be converted to “effective” quotas, based on percentage of total material in circulation, by taking the product of the collection and sorting quotas. On the basis of effective sorting quotas, these values represent approximately 72 per cent of total glass, tin plate and aluminium and 64 per cent of total plastic, composite and paper products. **Figure 1** shows collection and sorting quotas for 1993 and 1995 based on the effective sorting values.

Figure 1 - Packaging Ordinance Quotas for Collection and Sorting



Source: Geschäftsbericht 1994, Duales System Deutschland

Quotas for 1996 and 1998 are outlined in the proposed amendments to the Packaging Ordinance (NOVELLE V). These quotas represent approximately the quotas of 1995, but are stated in terms of percentage of the total packaging in circulation or recycling quotas. Required quotas are 70 per cent for glass and tin plate through 1998, with rates of 50 per cent in 1996 and 60 per cent in 1998 for all other materials.

3.4.2 Responsible parties

Under the Ordinance, producers and distributors are the responsible parties for compliance. The “producer” is defined as one who produces packaging or material to be used solely for packaging (hereafter designated as “packaging producer”, as distinguished from the final producer, filler, or

packaging user). The term “distributor” is defined as any individual who places into commerce packaging, materials intended solely for packaging, or goods contained in packaging, including catalogue houses. Distributors include not only retail concerns selling pre-packaged products, but also other small businesses such as bakeries, boutiques and butcher shops which introduce “non-shelf” packaging in the form of paper or plastic wrappings and carry-away bags. These non-shelf packaging sources contribute significantly to the free-rider problem discussed under Section 8.1.

Based on these definitions, responsible parties include:

- manufacturers of packaging;
- manufacturers of materials intended for use in packaging;
- fabricators/assemblers of packaging articles;
- fillers (commercial);
- distributors selling packaged goods (retail and catalogue); and
- distributors placing goods (whether packaged or unpackaged) in packaging at the point of sale (non-commercial fillers).

The distributor (point of sale/retailer) has the initial responsibility for the take-back of packaging from the consumer. Distributors must also provide return points (containers) in the immediate area of the point of sale. The customer can deposit the secondary packaging, unless he wishes to keep it. “Immediate area” means on the premises. Locating central containers in the neighbourhood is not acceptable.

Distributors and producers must then ensure that the material is recycled or re-used in accordance with the requirements of the Packaging Ordinance. The distributor may be released from the initial responsibility for take-back of sales packaging through the introduction of a PRO scheme. Transfer of responsibility to the PRO requires verification by the 16 State Environmental Ministers that PRO systems are complying with collection, sorting and recycling quotas.

3.5 Policy issues and problems related to legislation

3.5.1 The problems of packaging in legislative systems

Packaging as a product category presents unique problems in an EPR-based waste management system. The decision to regulate packaging was based on waste management considerations, with the objective of reducing the volume of municipal waste going to landfills. In Germany, packaging represents 50 per cent by volume and 30 per cent by weight of all municipal waste. As waste material, packaging is not suited to meet the primary goals of return to the producer and recycling. For these purposes, the ideal material would be large, easily identifiable products with relatively few major producers which are disposed of infrequently (long use cycle) and are easily separable and uncontaminated.

The characteristics of the packaging waste stream (in particular the light fraction plastics and composites) are non-ideal. It is:

- highly mixed;
- sometimes contaminated;
- disposed of in high volumes from many sources;

- generated by a large number of producers (many small and medium-sized); and
- generated within a short time span after production due to its short life-cycle (product is usually returned to waste cycle in less than a year).

These characteristics compound the problem of finding responsible parties and legitimise the introduction of the PRO scheme. Further, the effect of changes by the packaging producer to make products easier to recycle cannot address the problem of sorting and separation.

Identifying a final producer is complicated by the fact that packaging is a product sold with a product. Ultimately, the producer of goods contained or filler is the last point of production before retailers. He is the most reachable responsible party, and fillers have assumed the role of *final producer* in the implementation of the legislation although the filler is not a packaging producer. For the package product itself, the large number of upstream “packaging” producers means that imposing direct requirements on shared responsibility partners upstream of the filler is impractical. There is further discussion of the role of fillers as primary responsible parties under the Packaging Ordinance under Section 3.5.3.1 below.

3.5.2 *Failure to designate a primary responsible party*

Ideally, the assignment of responsible parties in an EPR system reflects the relative influence of and/or control over the life-cycle environmental impacts of the product system. The Packaging Ordinance defines no specific responsible party among the EPR partners. Instead, the legislation gives joint responsibility to producers and distributors, but places responsibility on retailers as distributors to take back packaging. Retailers were selected for take-back because the point of sale is the only identifiable point of return for packaging. Retailers, with producers, must then ensure recycling of packaging waste to meet quotas.

The philosophy of giving the private sector a “free hand” to make product changes and manage wastes is seen as being the most effective and flexible means of regulation; however, the free hand in terms of designation of responsible parties can lead to problems in implementation. Failure to define a primary responsible party means that, among the EPR partners, a free market establishment of primary responsibility will occur. The free market may select the principal actor(s) or it may lead to the selection of the EPR partner who is most reachable, or who by the nature of his placement in the chain of producers and distributors is least able to pass on primary responsibility. In the case of the Packaging Ordinance, the primary role given to retailers meant that pressure was exerted on the filler, who was the most reachable responsible party. It was clear that retailers alone could not provide a system for management of the total packaging waste stream. The mandatory requirement for the take-back of packaging waste by the retailer provided the impetus for the creation of a system of collection, sorting and recycling. Failing industry co-operation in setting up a PRO scheme, and absent specific guidelines in the legislation for identifying individual responsible parties, an unmanageable situation could have occurred.

3.5.3 *Key parties in implementation*

3.5.3.1 *The role of fillers*

Fillers (the “final producers”) represent the majority of the licence holders in the DSD system. The filler is a user of packaging material. Nonetheless, for regulatory purposes the filler can best assume responsibility for packaging in a system of collection, sorting and recycling. Under the Green Dot system,

placing an identifying symbol on the package was generally most feasible by the filler. For the purposes of implementation of the legislation, the filler became the primary responsible party. The packaging materials industry does not share equally in the EPR system. For some types of secondary packaging, such as rolls of film used by retailers (butchers, bakers, gourmet take out, etc.) for non-packaged products, there is no filler as for pre-packaged goods and no single package is produced. The Green Dot cannot be placed on the package. The solution has been to pre-stamp the roll at regular intervals along the border. This allows the user to dispense the packaging material in units as needed, while retaining the symbol for identification in the waste stream. Packaging producers pay licence fees for the Green Dot, but require the user to reimburse them through increased prices for the roll of film. Costs are thereby passed on to the “filler” at the point where the material is used to package goods.

3.5.3.2 The role of retailers

The retailer has played several key roles in the implementation of the Packaging Ordinance. The legislative provision for return to retailers of all secondary and sales packaging is the primary enforcement tool of the Ordinance. Verification by the State Environmental Ministers that the DSD has met quotas established the DSD as the primary responsible party for sales packaging, but the provision for return of secondary packaging to retailers remains.

Retailers in the food sales sector, where turnover and volume of packaging is greatest, exerted pressure on suppliers to participate in the DSD system to reduce subsequent problems of waste management for products not carrying the Green Dot. In Germany, 75 per cent of the food industry is controlled by fewer than ten large chains. One major food chain announced a policy of selling exclusively Green Dot products. In food sales, this has led to virtually all products carrying the Green Dot. Some retailers, who become “fillers” since they use packaging such as carry-out bags or plastic wrapping or foils, have still resisted paying for licences for their packaging, thus contributing to the free-rider problem.

Retailers have significant control over the packaging on their shelves, and have been able to influence producers to eliminate or alter packaging. In the area of secondary packaging, such as blister packs and display, retailers had the strongest interest. Until secondary packaging entered the Green Dot system in 1993, retailers received no reimbursement for costs incurred as a result of take-back requirements. To avoid costs for handling secondary packaging, they exerted pressure on producers to eliminate all unnecessary secondary packaging. Retailers have also influenced price increases for products carrying the Green Dot. In the case of chains that offer low prices, the option for fillers to pass Green Dot costs on to the consumer has been limited by retailers who have held price levels. Retailer pressure continues to motivate the system, since failure of the DSD to meet quotas in any of the States would result in a nation-wide reversal of the decision to lift the take-back requirement for sales packaging, with the disappearance of the DSD and a return to the legally mandated system of return to retailer. This counterbalance between retailers, industry and the DSD appears to be an effective enforcement tool for the legislation.

4. THE DUALES SYSTEM DEUTSCHLAND (DSD)

The Duales System Deutschland (DSD) was organised in September 1990 in anticipation of the passing of the Packaging Ordinance. It was founded by 95 firms (*Gesellschafter*) from the retail, consumer goods and packaging industry, each providing start-up capital of 5000 DM to create the DSD. Sponsoring investors numbered nearly 600 at the time of writing. The investors provided the organisational initiative for the DSD, but they have no decision-making or financial power over the DSD. The DSD passed from start-up in September 1990 into full operation in January 1993 with the declaration by the 16 State Environment Ministers that fully established State-wide collection, sorting and recycling systems were in place. The DSD operates as a non-profit firm, covering its costs through the sale of the Green Dot symbol.

The DSD was organised to collect, sort and transport material to recyclers. The founders of the DSD recognised the need to create a partnership with recyclers having experience in the various packaging materials sectors. In parallel to the DSD, they organised an association of recycling (guarantee givers) from the major recycling sectors who are committed to accept all sorted waste from the DSD system. As the DSD recycling partners, they are responsible for recycling (themselves or through third parties) of all DSD waste and for documenting recycling activities and reporting data to the DSD. The establishment of recycling guarantee givers was essential to ensure the smooth functioning of the DSD system, independent of bottlenecks due to fluctuations of recycling markets.

4.1 Start-up of the DSD

The establishment on a nation-wide basis of a system of collection, sorting and recycling which could demonstrate ability to meet regulatory quotas was critical to the survival of the DSD. The provision calling for the PRO's co-ordination with local waste management bodies complicated the system, creating not one but many differing systems. The first critical step for the DSD was to establish contracts with waste managers in each of the German States. DSD anticipated a slow start-up or pilot phase, with the opportunity to fine-tune the system. By early 1992, problems arose due to the unexpectedly enthusiastic response from the public. Larger amounts of material than expected were collected, exceeding the required quotas for 1993 before the end of 1992 and ensuing high waste management costs. The number of licence fee holders was still small (2 600 in 1992, compared with 17 000 at the time of writing). Licence fees were based on volume of total packaging material and failed to account for widely differing costs of individual materials. Income from licensing fees could not cover costs. By the end of 1993, the debt to waste managers had reached approximately 800 million DM.

The costly problem of free-riders, or waste volumes which are not licensed but nonetheless are deposited/collected in the DSD system, arose from several sources. Households deposited non-Green Dot packaging with licensed material in the yellow bin. Consumers also deposited non-packaging plastics as well as contaminated materials, resulting in costly "rest material" (non-DSD recyclable material that can only be separated through sorting) which in turn went to separate disposal. Some waste handlers collected black market wastes, combining these with the DSD wastes going to sorting. The licence holders

themselves placed the Green Dot on larger volumes of material than they had registered, and others abused the use of the Green Dot symbol without paying licences. The DSD estimated that of all packaging carrying the Green Dot in 1993, only 55 to 60 per cent had paid licence fees. These practices led collectively to the near breakdown of the system in 1993.

The financial crisis came in August 1993. Failure of the DSD would have meant a return to the mandatory policy of return to retailer and discontinuance of all pick-up, leading to chaos at the retailer and no means of effective management of material. In an emergency session with the Environment Minister on 3 September 1993, a re consolidating plan was developed to save the DSD. The programme was designed to provide temporary financial aid through loans by the industry and the waste handlers, and savings through renegotiation of waste handling contracts to eliminate unnecessary extras. Revenues were further stabilised by altering the licensing fee basis, controlling use of the Green Dot symbol, and increasing participation of licence holders. For details of the re consolidating plan, see Appendix 1. Details of license fees are given in Section 4.3. Details of waste contract renegotiations are given in Appendix 2.

The first step to save the DSD was loans by waste managers, industry and retailers. Sums totalling 712 million DM from waste managers (from outstanding monies owed) and 290 million DM from industry and retailers, for a total of 1.1 billion DM, were guaranteed to the DSD. Negotiations underway since 1995 are intended to reduce the loan balances by transferring a portion of the remaining debt to silent ownerships – where shareholders have ownership without voting rights – and forgiving percentages of the outstanding debt.¹ Details of separate negotiations with waste managers and industry/retailers are shown in **Table 1**.

Table 1 - Renegotiation plan for loans to DSD

Industry and Retailers		Waste Managers	
Loan balance (DM)	290 mil	Loan balance (DM)	712 mil
To be forgiven	30%	To be forgiven	45%
Transferred to silent ownership	70%	Transferred to silent ownership	25%
Loan balance to be paid	0%	Loan balance to be paid	30%

Source: Geschäftsbericht (annual report) 1994, Duales System Deutschland

By 1994, the financial crisis had stabilised and the DSD expected to operate within costs through 1996 and to pay back existing renegotiated emergency loan balances.

4.2 Waste collection systems and contracts

A major problem for the DSD in the start-up phase was the negotiation, on a State-by-State basis, of contracts with waste managers. The requirement for State-level organisation of waste

¹ Geschäftsbericht 1994, Duales System Deutschland

management systems, and the strong language of the Packaging Ordinance requiring harmonisation with existing systems, resulted in the establishment of many different systems on a regional or community basis. No common system could be developed; instead, newly established DSD collection systems represent some combination of services of existing municipal and private waste managers. This has the advantage of serving regional differences and allowing intact systems to continue to operate, but has the disadvantage that the system cannot be optimised or overseen as effectively as in a single uniform system. In most States, both pick-up and drop-off systems have been organised. For glass and paper, existing collection systems (centrally located containers) have for the most part continued to be used. In parallel, the yellow sack (bin) has been provided to households for the light fraction (plastic, composite and metal). In some States yellow bins are not provided, but separated material should be brought to recycling centres.

The power given to the State entities under the harmonisation provision gave local waste managers an advantage in negotiations. The DSD had no experience with the new system, and could set no standard contract or fee structure. Over 546 separate contracts were negotiated in the 16 German States. The necessity to negotiate a large number of contracts with waste managers operating within differing local, political and structural frameworks led to excessive costs for waste management. The initial contracts included a base fee for the weight of total material collected, based on weight in at the sorter, plus various item fees or extras. Extras included a so called "*Preisgleitklausel*" to cover inflationary costs for salaries, vehicles and gasoline. Additional extras were negotiated in separate "*nebenentgelte*" contracts to cover side costs. These contracts for side costs covered 18-month periods and set annual charges of 0.50 DM per capita for materials handling and up to 1 DM per capita for public information activities. In addition, annual costs of 3 DM per capita for containers were incorporated. With the financial crisis in 1993, costs for waste contracts were reviewed and a programme for renegotiation of contracts was included in the reconsolidating plan. The primary goal was to phase out or reduce fees for extras. Details of contract renegotiations are outlined in Appendix 2.

In the renegotiation since 1993, savings of more than 1 billion DM had been made at the time of writing. The third phase of renegotiations now underway will base the fee for weight of material collected on the material leaving sorting. Basing fees on material weight after sorting controls fraudulent collection of non-packaging waste and encourages waste managers to police yellow bins, thereby reducing costs for non-recyclable sorting rest material. In the light of the announced amendment to the Packaging Ordinance, which will impose the same duties on non-participants as apply to companies participating in the system, numerous companies have joined the DSD. So, in the last two years in particular, the revenues of the DSD have increased to such an extent that regular operations even showed a slight surplus for the fiscal years of 1995 and 1996.

4.3 Structure of licence fees for the Green Dot System

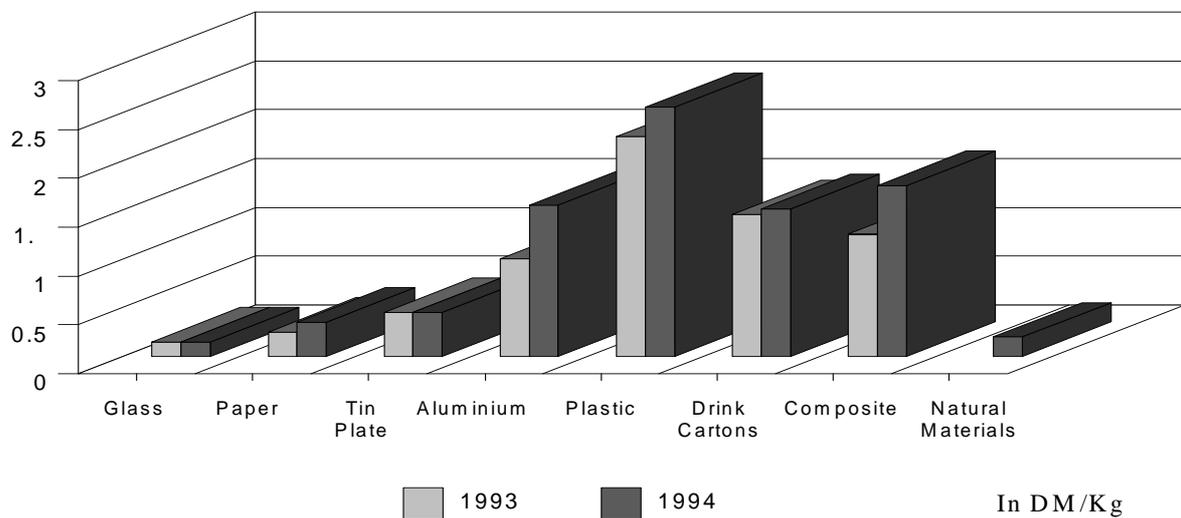
Initially, licence fees were based on volume of packaging material regardless of type and density. The Green Dot fees were intended to cover collection and sorting of packaging material only, with an exception for plastics where recycling costs were covered, because the industry would not make the necessary investment in recycling capacity. Nevertheless, the volume-based fee structure failed to account for differences in weights of material processed per volume unit and for widely differing costs of sorting and recycling individual packaging materials. No incentive was provided for manufacturers to minimise or alter difficulties in recycling material such as plastics and composites. High costs for these materials were borne equally by all licence fee holders. In October 1993, a new fee structure was introduced based on weight and packaging material type. The new licence fee structure reflects the relatively higher costs for plastic (and composite) materials. The new licence fees were raised in October 1994, and no further increases are anticipated through 2000.

The current licence fees in DM/kg are as follows:

Glass:	0.15	Paper:	0.40
Tin plate:	0.56	Aluminium:	1.50
Drink Cartons:	1.69	Composites:	2.10
Plastic:	2.95		

Licence fees for 1993 and 1994 are further illustrated in **Figure 2** below.

Figure 2 - Licence Fee Structure



It was further recognised that additional costs were not directly related to handling of individual materials. To cover these miscellaneous costs (overhead, inflationary costs, public information efforts, etc.), an item fee was introduced in October 1994. The item fee is based on volume or area of packaging items. Item fees are shown in Table 2.

Table 2 - Item Fee

(Pfenning/item)

Volume basis			Container basis		
<50 ml	<200 ml	Over 3 L	<150 cm ²	<300 cm ²	Over
To 200 ml and > 0.3g	To 3L		To 300 cm ² and > 3 g	To 1 600 cm ²	1 600 cm ²
0.1 to 0.6	0,7 To 0,9	1,2	0.1 to 0.4	0.6	0.9

Source: Geschäftsbericht 1994, Duales System Deutschland

A further source of revenues from licences was in the area of secondary packaging. The Green Dot licence was originally issued for sales packaging only. Secondary packaging remained the responsibility of the retailer. Potential revenues of 500 million DM annually were estimated based on an amount of 300 000 tonnes of secondary packaging. As a result of discussions during the financial crisis and based on the stated goals of the reconsolidating programme, the DSD was given the right to issue licences for secondary packaging. The DSD developed a five-point plan with industry and retailers for implementing the secondary packaging programme. It required licensing of secondary packaging after October 1993. Secondary packaging licensees provide the DSD with estimates of material to be licensed. Retailers report amounts of secondary packaging received, and provide monthly data for secondary packaging returned.

4.4 Abuse of Green Dot licence fees

Following the 1993 financial crisis, efforts to control free riders and encourage the use of the Green Dot system were intensified under the reconsolidating plan. The DSD was given authority to require verification (by an independent accounting firm through the examination of records) that amounts of packaging certified by licence holders as carrying the Green Dot were not exceeded. Retailers voluntarily participated in identifying products from manufacturers not included in the list of licence holders, but appearing on their shelves with the Green Dot. The DSD was given authority to levy fines for such activities. These efforts have eliminated most fraudulent free riding resulting from illegal use of the Green Dot symbol.

Nevertheless, the problem of free riding resulting from co-disposal by households of non-Green Dot packaging in the yellow bin continues. However, in light of the announced amendments to the Packaging Ordinance, which will impose the same duties on non-participants as apply to companies participating in the system, numerous companies have decided to join the DSD scheme.

5. IMPACTS OF THE PACKAGING ORDINANCE

5.1 Avoidance and elimination of unnecessary packaging

5.1.1 *Elimination of unnecessary packaging*

Reaction to the Packaging Ordinance in terms of waste reduction occurred early in the implementation phase. Between 1992 and 1993, the volume of packaging material in circulation was reduced by 500 000 tonnes. Since the passage of the Ordinance, total packaging has been reduced by a volume of 1 million tonnes. This represents a per capita reduction of 15 kg². The reduction reflects the elimination of some types of unnecessary packaging, such as shrink or blister packaging, and the increased use of refillable packaging. Use of composite and plastic packaging fell as other materials were substituted. Significant design changes were made to reduce the amount of material used in packaging. Container shapes and sizes were altered to reduce volume, and thin-walled films and containers were introduced.

5.1.2 *Motives for optimisation*

To measure the initial response, DSD conducted a survey in November 1992 of the then 8 600 licence holders. Twelve per cent responded, with the following results:

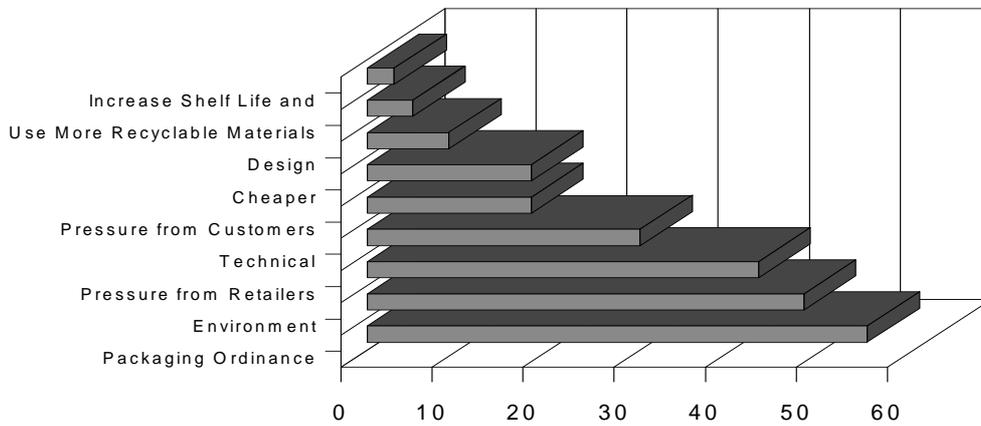
- 66 per cent had optimised at least 50 per cent of their packaging;
- 17 per cent had made no changes;
- 25 per cent had increased use of secondary materials, with 21 per cent using more than 50 per cent secondary materials;
- 60 per cent showed no increase in use of secondary materials between 1990 and 1992, but one-third indicated plans to increase use of secondary materials between 1992 and 1994 (27 per cent planned increases of 50 per cent or more); and
- 63 per cent had discontinued use of composite packaging.

Vital to the issue of packaging changes is the question of who makes decisions regarding package design. In the survey:

- 86 per cent of respondents indicated they had some influence over design of the package;
- 62 per cent had total influence; and
- among retailers, 50 per cent claimed to have 100 per cent influence over packaging on their shelves.

The DSD assumes that retailers and manufacturers have comparable influence over package design. Individual motives for optimising packaging were given in the survey of licence holders and are shown in **Figure 3**.

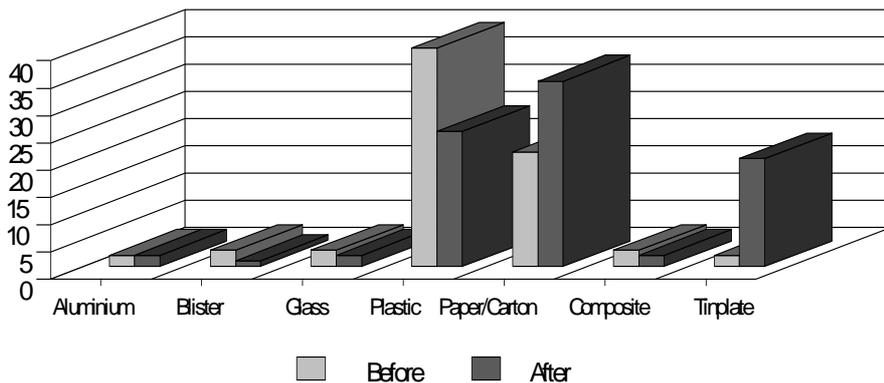
Figure 3 - Motives for Optimising



Source: Der Ökologische Wandel Bei Verpackungen, Duales System Deutschland

The overall market showed a shift away from plastics, with a reduction in total volume from 40 to 27 per cent. This drop reflects avoidance and minimisation of plastic packaging altogether, and changes with regard to glass and paper as shown in Figure 4. Also seen within the plastic packaging sector were shifts away from PVC to PE and PP.

Figure 4 - Distribution of Packaging Material before and after Optimisation



Source: Daten und Fakten Zum Grünen Punkt, Wertstoffrecycling in Zahlen - Techniken und Trends

5.2 Recycling of packaging wastes

5.2.1 *The state of packaging recycling in Germany*

At the time the Packaging Ordinance was passed, technologies and capacities were available for glass, paper/paperboard and metal as a result of recycling programmes predating the packaging legislation. For these materials, capacities in 1993 were adequate to cover quotas for 1995. New capacity was developed early for composite beverage cartons. The primary problem has been with plastics recycling.

Although specified targets are being met at the nation-wide level, certain States are falling short of quotas for individual materials by as much as 15 per cent. Collection, sorting and recycling quotas for sales packaging in 1996 were as follows:

Material	Collection quotas	Sorting quotas	Recycling quotas
Glass	85%	100%	85%
Paper, cardboard and cartons	94%	98%	92%
Plastics	80%	88%	68%
Tin plate	82%	99%	81%
Aluminium	95%	88%	81%
Compounded materials	84%	96%	79%

The system for recycling plastics broke down in 1993, when households placed four times the amount of material required by collection quotas in the DSD system. Recycling of collected material in excess of stated quotas was not required. In a politically unpopular decision, the DSD announced it would only separate for recycling the easily recyclable material such as bottles and would send excess material back to the public waste system. This created public image problems for the DSD with households, which had voluntarily separated wastes ultimately disposed of in landfills.

In parallel, the plastic guarantee giver was involved in a waste export scandal in France and Eastern Europe. The DSD was forced to disassociate itself and announced the creation of the new DEKUR-Kunststoffe Recycling (DKR). Capital for the DKR was provided by waste managers (51 per cent) and the DSD (49 per cent). Shortly thereafter, the Association of Plastic Recyclers (Bund für Kunststoffe Verwertung [BKV]) offered financing of 25 per cent and the DSD reduced holdings to 24 per cent. The DKR receives additional financial support from the DSD through recycling subsidies of approximately 500 million DM annually.

Since the creation of the DKR, recycling quotas are being met for all material fractions; however, not all material is recycled within Germany. Domestic capacity, even though on the increase, will first be available in 1998 to cover total amounts required by quotas. In the interim, surplus material is exported for recycling. In 1994, 461 000 tonnes of plastic was sent to recycling. Of this amount, 256 000 tonnes or 55 per cent was recycled abroad, primarily in China and the European Community. Of the 205 000 tonnes recycled domestically, 153 000 tonnes went to traditional raw materials recycling and

52 000 tonnes went to new recycling processes to convert plastics to other secondary materials. Export of packaging waste for recycling will no longer be allowed after 1997.³

5.2.2 *Development of new recycling and sorting technologies*

Even though significant refinements have been made in all recycling technologies as a result of increased recycling requirements under the Packaging Ordinance, the development of new technologies has occurred primarily in the area of plastics.

Existing technologies for glass and paper have been refined to increase recycling potential and create new markets for secondary materials. Technologies from the paper processing industry have been successfully adapted to develop new technologies for recycling of drink cartons. An exceptionally high quality recycled paper can be produced due to the fibre length and strength of paper used in drink cartons. New processes for mixed glass have been developed to produce glass balls for insulating material.

In the case of plastics, available technologies were based on raw materials processes to convert waste plastics to new plastic products. To meet quotas, it was necessary to find other processes for conversion of waste plastic to create new markets for secondary materials. The emphasis in new technologies is on recycling to recover oils, gas and chemicals and the use of plastics as a reducing agent in steel production. New recycling technologies using pyrolysis, hydrogenation, reduction and synthesis gas production are described in the text box below.

To ensure that new recycling technologies meet standards of efficiency and technological development, they must be certified by the German technical standards association, the Technischen Überwachungsvereine (TÜV). TÜV inspects facilities to determine whether technologies are suitable, and whether facilities can meet quotas agreed to in contracts with the DSD. Once technological capabilities and input and output ratios are verified the process receives a TÜV certificate. In parallel, the DSD acts as a second control point and plans to require the ISO 9000 certificate for recycling facilities. In the following section, a description is given of recycling technologies developed as a result of the legislation.

Development of new sorting technologies has played an equally important role in increasing recyclability of materials. Sorting facilities now number 320, with 200 facilities dedicated to separation of the light fraction from yellow bins.⁴ New techniques are increasingly automated and use hydrocyclones or centrifuges to separate individual plastics. The Thyssen Henschel process uses hydrocyclones to separate polyolefins, polystyrol and PVC. The process has a throughput of one tonne per hour and achieves 99 per cent purity.

The firm of KHD Humbolt Wedag AG uses a three-step centrifuging process to separate mixed plastic fraction, metal and contaminants. Separation of plastic fractions occurs after two steps. In the third step, three additional fractions are separated. They contain metal, a rest fraction of paper, and a rest fraction of mixed plastics. Product Quality Specifications are included in DSD contracts with sorters, to ensure quality controls for sorting facilities. The specifications indicate, for each packaging material, the types and amounts (weight per cent basis) of foreign materials that are permitted. The DSD makes random sample checks at the sorter, or at the recycler after delivery. Sorting facilities are also audited by the TÜV in a similar manner to recycling facilities.

3 Geschäftsbericht 1995, Duales System Deutschland

4 Wandlungen Kunststoffrecycling heute, Daten und Fakten zum Grünen Punkt

Description of New Recycling Technologies:

BASF Pyrolysis Process

Material is cracked at 300°C under vacuum in the absence of hydrogen to produce naphthalene, hydrocarbons, gases and oils. Products are separated in a fractionating column and oils are converted to methanol.

Hydrogenation in the Kohle-Öl-Anlage

The process uses hydrogenation to produce synthetic crude oils and gases. Plastics are cracked under a pressure of 300 bar at 480°C in the absence of oxygen to break the hydrocarbon chains into short segments forming a fluid mass. The fluidised material is fed into a reactor, where hydrogen is introduced, and binds to active sites on the open chains. Pressure is reduced to recover remaining solid waste materials.

Synthesis Gas Production Technology

The firm of Schwarze Pumpe GmbH utilises temperatures of over 800°C in an atmosphere of oxygen and steam to convert plastics to gases. The process is optimised to produce primarily carbon monoxide and hydrogen gases. The high temperatures break down residual chlorine compounds, which are then converted to usable materials. Residues of heavy metals are converted to glass-like slags which can be used in road construction. Rapid cooling of gases prevents formation of dioxins and furans. Synthesis gases can then be used to produce methanol.

Plastics as a Reducing Agent in Steel Production

The firm of Klockner has developed a process which utilises plastics as a reducing agent in steel production. Material is heated in a kiln to 2000°C in the presence of iron oxide. In the reducing atmosphere, polymers form gases which combine with the oxygen from the iron oxide to release elemental iron. Residual gases (carbon monoxide, carbon dioxide and steam) are recovered and used in other production steps. Unlike incineration, reduction releases no heat but utilises the energy produced within the system. Because of the molecular similarity of plastics to oils, the substitution ratio from waste plastic to oils is 1:1.

5.2.3 *Recycling capacities and secondary materials markets*

Aluminium:

Because of the easy recyclability and value of aluminium, recycling capacity and strong secondary markets have always been available. Currently 50 per cent of aluminium comes from secondary aluminium sources. Aluminium from packaging has therefore not created new markets, but has provided a new source for aluminium recyclers. Aluminium packaging takes various paths to recyclers, both within and outside the DSD system. The production of recycled aluminium increased from 405 000 tonnes in 1980 to 438 000 tonnes in 1994.

Paper and carton:

Recycling of paper used in packaging increased from 55 per cent in 1993 to 70.6 per cent in 1994. From a total paper production in Germany of 14.5 million tonnes, 8.2 million tonnes is recycled. Paper used in packaging is combined with other paper for recycling and returns to the recycled paper market. Although capacity for paper recycling is adequate to meet quotas, recycled paper markets are often glutted. In 1993, the price for recycled paper fell by 30 per cent compared with 1989 levels, recovering in 1994 to a level 10 per cent below 1989 prices. Exports increased from 1.4 million tonnes in 1990 to 2.1 million tonnes in 1994 in order to find markets. In parallel, between 1990 and 1994, the recycling rate in Germany rose from 48.6 per cent to 54 per cent. Markets for recycled paper remain uncertain, even though prices have recovered.

Recycling of drink cartons has been one of the most successful ventures resulting from the Packaging Ordinance. ReCarton GmbH in Wiesbaden serves as guarantee giver to the DSD for all drink cartons. Contractually guaranteed capacities for 1994 were 43 000 tonnes, with capacity of 123 000 tonnes guaranteed by 1995. Due to the high quality of the recycled paper product, markets are available and prices are positive compared with other recycled paper markets.

Glass:

Glass recyclers indicate that capacities and markets are potentially available to achieve 100 per cent recycling of glass; however, prices for recycled glass remain approximately the same as those for primary raw materials. The limiting factor in recycling is separation by the consumer of coloured glass. The production of clear glass requires that 0.5 per cent or less coloured glass be present in the collected material, whereas green glass has a high tolerance for mixtures of brown and green. Currently, 90 per cent of green glass in Germany is produced from recycled mixed glass. This allows for utilisation of amounts of mixed glass currently in the waste system. Quotas of 72 per cent recycling are currently possible; however, as green glass production becomes saturated, the feasibility of increasing recycling will be limited by the quality of separation and by the development of new technologies using mixed glass.

Tin plate:

The recycling capacity for tin plate is unlimited. In 1994, 400 000 tonnes of packaging material from a total amount of 700 000 tonnes (including transport, display and sales) were recycled. Volumes of tin plate from the packaging industry are small, compared with 13 million tonnes of scrap processed by the steel industry annually. Since any steel works can theoretically serve as a recycler, the guarantee giver estimates that capacity and markets for recycling of tin plate are at 100 per cent of what is available.

Plastic:

Plastic recycling capacity in 1989 reached 10 000 tonnes using raw materials technologies. By 1994, new technologies were developed with a capacity of 40 000 tonnes, while raw material technologies were providing 380 000 tonnes of capacity. Projections for 1997 estimated increases in feedstock capacities of 400 000 tonnes. Recycling capacity of 580 000 tonnes was required to meet 1996 quotas. Markets are not available for many secondary materials being produced. Markets for products derived from raw materials technologies (plastic articles, bags, drainpipes and cable coverings) exist, but fluctuate. The market for plastics as a reducing agent in steel production (whereby no secondary material is produced) is growing. Even though use of plastics in steel production is not feasible for all processes, a number of steel producers are considering adaptations to permit use of plastics. For secondary materials from other recycling processes, markets are generally not available. The high costs of sorting, preparing

and processing make prices for secondary materials non-competitive in the marketplace. For processes to convert plastics to oils and chemicals, costs of secondary materials may be two to three times that of raw materials. Where markets are not available, technologies are currently subsidised by the DSD to ensure available capacities to meet recycling quotas. It is hoped that refinements in technologies will bring prices down, but viable markets are not expected for secondary materials in the immediate future.

6. ECONOMIC EVALUATION OF THE PACKAGING ORDINANCE

6.1 Costs of the Green Dot System

The total costs for a tonne of material in the DSD system which would otherwise have gone to final disposal is around 700 DM. DSD reported a material volume of 4.7 million tonnes in 1994, with total system costs of 3.4 billion DM. The costs for a tonne of material was 723 DM. Out of 3.4 billion DM, 3.1 billion represented waste management costs alone.⁵ In 1995, collected material reached 5.1 million tonnes with a total system cost of 4.0 billion DM. A tonne of material cost 784 DM. Waste handling costs alone were 3.8 billion DM. These overall costs for a tonne of material also reflect the high costs for plastics and composites.⁶

Under the original structure of the Green Dot system, the licence holders pay for collection and sorting while the material industries (e.g. glass, paper, etc.) pay for recycling, with the exception of plastics, whose recycling costs have been included in the fees. Licence fees are set at 2 950 DM per tonne for plastics and 2 100 DM per tonne for composites (except drink cartons at 1 690 DM per tonne), as compared with costs of 150 DM per tonne for glass and 400 DM per tonne for paper. The development and subsidising of new technologies for plastics is a major cost factor. Costs for some hard to recycle plastics exceed 6 000 DM per tonne.⁷ In 1995, plastic recycling subsidies totalled 498 million DM. The DKR estimates costs for raw materials recycling processes for plastics at 250-800 DM per tonne with new recycling methods estimated at 550-1500 DM per tonne. Projections through 1998 estimate annual system costs of around 4.0 million DM with no increase in licence fees.

Although the DSD is still bound by a number of existing contracts which require high fees to be paid for plastics recycling, new contracts are expected to incur costs ranging between 150 and 700 DM per tonne, depending on the quality of the packaging material. In particular, large volume hollow containers and large plastic sheets only require the payment of low rate. Likewise, recycling of plastics as a substitute for heavy oil in the blast furnace is reasonably cost-effective, with a cost of 150 DM per tonne. In this area, free-of-charge recycling will become possible in the future.

The DSD estimates that, out of total costs, 80 per cent is related to collection, transport and sorting. Plastic recycling subsidies represent 15 per cent, 1 per cent covers personnel costs, and the rest goes to miscellaneous overhead.

6.2 Hidden costs and indirect economic impacts

Not included in the costs shown for the DSD system are the costs to regulators and industry associated with reporting and compliance. These costs will increase if amendments to the Ordinance are passed requiring reporting of collection, sorting and recycling by all producers/fillers not participating in

5 Geschäftsbericht 1994, Duales System Deutschland

6 Geschäftsbericht 1995, Duales System Deutschland

7 Prof. Dr. Buchner, Müll und Abfälle, 11/93, pg 805.

the Green Dot system. However, there are no significant additional costs involved for industry apart from those arising from the DSD.

Waste disposal charges, i.e. landfill and incineration costs, have increased over the last few years. A doubling of costs was seen in the first two years following the passage of the Packaging Ordinance. The extent to which the loss of volumes of waste to the DSD may have led to higher landfill costs is sometimes raised as an issue. On the contrary, amounts of packaging material diverted from the municipal waste collection system as a result of the Packaging Ordinance have in fact relieved waste disposal facilities. Increasing costs in waste disposal are rather related to tightening environmental standards in the field of waste management.

Indirect effects related to employment shifts in the waste management sector are generally seen as positive. It is estimated that 20 000 new jobs have been created in the sorting industry. Some jobs have been lost in the skilled labour sector. However, the waste management industry in Germany, which enjoys growth rates of up to 10 per cent a year, has created a large number of highly qualified jobs.

6.3 Costs for the Green Dot System in the overall framework of waste management costs

Costs of 700 DM for recycling of a tonne of municipal waste exceed the costs of incineration and effectively approach the costs of handling a tonne of hazardous waste. Based on costs for household waste going to landfill five years ago, costs for the Green Dot seem disproportionately high. However, landfill cost increases are based on higher costs to cover environmental regulations and phasing in of fees for closure and aftercare of landfills reaching capacity. In addition, landfill costs are increasing in anticipation of regulations under the TA Abfalle Siedlung provision, which will be effective in the year 2000 and will require incineration of all wastes having more than 5 per cent biological content. The effect of reduced volumes going to landfill as a result of the TA Abfalle Siedlung and the Packaging Ordinance will continue to drive landfill prices up. In the next decade landfill capacity will disappear, leaving incineration and recycling as the main waste management options. To be competitive with incineration costs of 300 DM to 500 DM, recycling costs for plastics must therefore be reduced.

New technologies for recycling are in the initial phase of development, with reasonable expectation that prices will fall. Current costs may be seen as start-up costs. Nonetheless, costs of some new technologies (which exceed costs of raw materials processing by a factor of 3 to 5) are not likely to reach competitive levels. The DSD estimates that subsidies for recycling will be reduced in the next two years, but has no plans to reduce licence fees and estimates that costs for a tonne of material will remain at approximately the 700 DM level.

Incentives to implement legislation will vary in OECD Member countries in which diminishing landfill capacity is the primary motive to regulate. Increasing implementation of legislation in countries with diminishing landfill capacity will mean higher costs for producers. In those countries with mandatory programmes, the issue of municipal waste management costs and landfill availability can be seen as an important factor with regard to international competition in the future.

7. EVALUATION OF ENVIRONMENTAL IMPACTS OF THE GREEN DOT SYSTEM

7.1 Verifiable benefits of the Green Dot System

The positive environmental impacts of the Green Dot System can be seen in statistics indicating a one million tonne reduction of packaging material weight. Current recycling levels have reduced the weight of packaging waste going to landfill and incineration by approximately 66 per cent. However, the influence of DSD collection on reduction of the total amount of waste destined for incineration is estimated to be only about 8 per cent.

7.2 Indirect impacts on existing waste management systems

In some regions, the waste volumes are no longer available to support existing incineration and energy recovery facilities. This has led to transporting of waste from neighbouring States, resulting in complaints about waste traffic. Some facilities now under construction, and others in the final planning stage, may no longer be needed. Where collection schedules for waste to landfill continue on a weekly basis, it may be argued that energy consumption for transport and collection has doubled due to parallel collection by DSD. However, this may be circumvented by effective organisation of waste collection and transport.

It is sometimes argued that the reduction of waste streams may imply unintended negative environmental effects, i.e. insufficient waste streams to support incineration plants. However, *stricto sensu*, waste that is avoided saves more energy than is recovered by an incineration plant. Moreover, the shortage of waste is more likely related to a shift in the disposal of certain waste streams, in the short term, from expensive waste incineration plants to less expensive landfill.

7.3 Environmental impacts of new recycling technologies

Even though recycling is accepted as a necessary option to achieve waste minimisation, the impacts of legislation requiring recycling must be carefully examined to determine their overall environmental benefits and costs. Legislative measures requiring recycling encourage shifts away from hard-to-recycle materials to substitutes with a better recycling potential. However, recycling is no guarantee of ecological superiority. This can only be proved by life-cycle assessments (LCA). In the case of packaging, it may be questioned whether it would be environmentally preferable to recycle paper and plastics or recover their energy. For plastic material, new technologies should also be considered. A recent DSD study on the ecological effects of different plastic recovery processes reveals complex results: material recycling of well separated monofractions has clear ecological superiority over all recovery processes, provided that the secondary product substitutes virgin material in a relation close to 1:1. If the lower quality of the secondary product requires 30-40 per cent more material to have the same functionality as the virgin material, recycling loses its environmental benefits in comparison with certain recovery processes (blast furnace reduction agent, BASF thermolysis, KAB hydration) or special energy

recovery in a fluidised bed combustor. Even low-ranked alternatives (incineration with energy recovery or gasification processes) were considerably more environmentally sound than traditional landfilling. For paper products, too, many findings support material recycling because of its ecological superiority.

7.4 Other environmental impacts

High recycling costs for plastics and composites have led to initiatives aimed at reducing the amount of packaging. This may be partly related to a correlation between license fees and weight. Use of PVC has fallen in favour of other plastics, and the use of composites has been reduced by 50 per cent. In parallel, increases in the use of paper as substitutes can be seen in Figure 4. Even though the recyclability of glass and the demand on raw materials are positive environmental factors relative to plastics, the weight of glass packaging results in increased energy consumption through transport.

8. PROBLEMS RELATED TO IMPLEMENTATION

8.1 Free riders

It is estimated that free riders cost the DSD 400 million DM annually. A common example of “free riding” is when wastes for which Green Dot licenses have not been paid enter the DSD system. Failure of households to separate packaging not carrying the Green Dot leads to disposal in yellow bins of non-Green Dot packaging along with licensed material. In this manner, non-participating producers get a free ride. Identification and separation of non-licensed packaging in the waste stream is impossible. Free riding also occurs when non-packaging wastes are disposed of in the yellow bin; however, the DSD estimates that amounts are now minimal due to public information.

To control free riders, new provisions have been included in the proposed amendments to the Packaging Ordinance. Under these provisions, firms not participating in the Green Dot system will be required to demonstrate through annual reporting that they are able to reach the same collection, sorting and recycling quotas as the DSD. Failure to meet these requirements, or incorrect information, could lead to fines up to 100 000 DM. This means that non-participating firms must either join the DSD, form their own system for collection, sorting and recycling, or find existing private waste managers for their wastes.

8.2 Identifying responsible parties

Under the Packaging Ordinance, costs of collection, sorting and recycling are borne solely by licence holders. Fillers represent the majority of all license holders. In the strictest sense of the Polluter Pays Principle and the concept of EPR, fillers are not primary producers of packaging. The primary product for the filler is the contents, with packaging a separate product sold with the filled goods. For other consumer products such as batteries and electronic equipment, the “container” is part of the item the consumer purchases. It is disposed of together with the product. Packaging may be seen as a separate consumer product, since it remains intact and is disposed of separately either while the consumer product is still in use (secondary packaging) or after use (sales packaging). For the packaging product itself, there are a number of upstream producers of raw materials for packaging which could more appropriately be seen as primary packaging producers. In addition, opportunities are given to the chemical industry through recycling subsidies to develop new technologies for recycling of packaging wastes. This could result in subsidising the original producer of the raw materials for packaging through licence fees paid by fillers.

The extent to which responsible parties have passed costs on to consumers cannot be accurately determined. The per capita costs for the DSD are calculated at 40 DM to 50 DM annually. Considering the number of packaging articles purchased annually on a per capita basis, it is clear that this amount is not readily discernible in market price increases.

8.3 Double payment for waste management services under PRO schemes

The issue of double payment for waste management services has been raised, since the same volume of waste is now being shared by the DSD and municipalities without a reduction in municipal waste management costs. Duplication of collection services occurs when the same volume of waste is collected by the DSD and municipalities. Some municipalities are considering pick-up on a bi-weekly instead of weekly basis to reduce costs. This problem can be solved through flexibility on the part of the municipalities. It is not due to the establishment of the DSD or the introduction of the Packaging Ordinance. In terms of overall costs to households, direct comparisons cannot be made due to rising landfill costs, which increase municipal waste costs independent of DSD effects.

8.4 The PRO as a monopoly

The inclusion of PRO schemes in EPR legislation may create waste collection monopolies. Under the German system, the power of the DSD was limited by powers of States and municipalities. The requirement for co-ordination with existing waste handling systems weakened the position of the DSD in the negotiation process with local and municipal waste managers. Waste managers had the advantage in setting standards and prices for waste contracts. Critics argue that the Green Dot system has created profitable waste management monopolies for private waste managers and municipalities, at the expense of consumers. The DSD filed a complaint against the State of Bavaria for charging waste fees for sorting Green Dot material that were several times the costs for municipal waste. Nonetheless, small waste handlers have complained that they were not given equal opportunities in negotiations for waste management contracts with the DSD.

The European Union filed a cartel complaint against the DSD, which provided sorted material to recyclers at no cost. As a result, recyclers will now pay for materials that have a positive market value and the DSD will require rebates from waste managers for materials sold.

Licence fees paid to the DSD are used to provide subsidies for plastics recycling, which in turn ensures that the DSD can meet quotas. Critics argue that most new recycling technologies consume too much energy and have no viable markets due to high costs. Provisions in the NOVELLE V amendments recommend setting minimum requirements for the per cent of plastic packaging destined for new recycling processes.

8.5 Misinterpretation of the Green Dot Symbol

The Green Dot may be incorrectly recognised by consumers as a sign of environmentally improved packaging. This may have created sales advantages for Green Dot products initially. Since most products now carry the symbol, competitive advantages are minimal, but consumers continue to be misled by the use of labels. As mentioned previously, the Green Dot is only a licence symbol to identify products of companies participating in the DSD.

8.6 Ownership

The Packaging Ordinance does not define the ownership of material. The termination of ownership by the consumer after use is implicit. Should the consumer give material to a third party, that party becomes the new owner. Disposal of material in a waste bin by a consumer can be assumed to pass

ownership to the owner of the bin. This is the case for municipal waste disposal. Under the Green Dot system, licence holders accept responsibility for waste and pass responsibility to the DSD. Waste managers are paid by the DSD to collect and deliver waste to sorting and recycling. Any implied ownership through assumption of responsibility for wastes then becomes unclear in the chain of responsible parties. The DSD respects the right of consumers to transfer ownership by depositing wastes in yellow bins, which are the property of waste managers. For the purpose of the sale of materials to recyclers (now required as a result of the EU cartel complaint), waste managers are designated as owners. Nonetheless, the DSD requires a set fee rebate (1.25 DM per capita) from sale of recyclable materials by waste managers as compensation under existing waste contracts, which are negotiated on a cost basis. Since the DSD is a non-profit organisation, all incomes received effectively go to reduce overall costs to licence holders. In practice, any financial benefits of ownership to waste managers are returned to licence holders through the DSD.

8.7 Public participation and information

Extensive public information efforts are essential to the implementation of legislation. The role of consumers in separating waste for recycling determines the success of recycling programmes. Consumer acceptance of products with minimal display and sales packaging, and of refillable and returnable packaging, influences producer decisions to switch to environmentally improved packaging. In Germany, acceptance of the Packaging Ordinance and participation in the Green Dot system were immediate. Extensive press coverage of legislation, and a long history of environmental campaigns, had created an environmentally aware public. The DSD maintains an active consumer information programme to ensure continued support for the Green Dot. The DSD was initially viewed as a representative of the industry, but through media campaigns it now has a positive image. In 1994, more than 340 “information days” in 170 locations were sponsored. In 1995, a total of 14 000 media actions (press articles and announcements, television presentations, brochures and promotional items carrying the Green Dot, etc.) were initiated. Moreover, the Association of German Housewives has undertaken a national campaign to voluntarily police abuses of the Green Dot.

APPENDIX 1. DSD NINE POINT RECONSOLIDATING PLAN

1. To provide financial relief for the DSD, outstanding debts to private waste handlers would be converted to interest loans. Additional loans from affected parties in the retail and industry sectors would be secured to provide operating capital;
2. Outstanding debts to municipal waste handlers would be converted to interest loans;
3. To ensure liquidity of the DSD, the following measures would be undertaken:
 - Independent auditors would be used to investigate records of licence holders to identify abuses of the Green Dot;
 - Licence holders must provide a statement of verification of the amounts of packaging material carrying the Green Dot;
 - Falsification of verification statements would be prosecuted; and
 - Failure to submit a statement of verification in a timely manner would result in interim assessments by the DSD.
4. Stringent measures would be undertaken to collect outstanding fees from Green Dot licence holders;
5. The retail industry would participate in the inclusion of secondary packaging in the Green Dot system as of October 1, 1993;
6. To strengthen the infrastructure of the DSD, expertise from the private sector would be solicited as follows:
 - An independent management consultant would be engaged to evaluate the organisational structure of the DSD;
 - A task force of experts from the waste management, industry and retail sectors would be convened; and
 - The Board of Directors of the DSD would initiate efforts to establish closer co-operation with and solicit support from the municipal and private waste management sectors.
7. The intention of the DSD to pursue the issue of licensing and to ensure that the appropriate level of licensing would be reached was re-emphasised;
8. Priority would be given to a stabilisation of the DSD balance sheet by 1994. To achieve this, an agreement with private waste handlers must be reached in order to limit the per capita costs for waste handling to 40 DM. Such agreements would also be negotiated with municipal waste handlers; and
9. In parallel, discussions would be held at the national and state level to review the provisions of the Packaging Ordinance with regard to the environmental and economic impacts of implementation based on the experience of the DSD.

APPENDIX 2. DSD CONTRACT RENEGOTIATIONS

	Initial Contracts	First Renegotiation	Second Renegotiation	Third Renegotiation
Basic fees	Based on total volume collected	Based on per capita volume for each packaging material		Based on total volume leaving sorting
Inflation clause (<i>Preisgleitklausel</i>)	Annual fee of 0.50 DM	Suspended through 1996		Suspended through 1998
Side cost contracts	Annual per capita fees of: 0.50 DM for handling of materials Up to 1.00 DM for public information 3.00 DM for containers		Annual per capita fees of 1.00 DM total*	
Other				Waste managers reimburse DSD 1.25 DM per capita for fees from sales of recyclable material. Collection responsibilities expanded to cover recreational parks and other new sources.

* Transition fees of 1.50 DM for side costs were paid until the end of 1994.

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