Environmental Marketing and Public Policy

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1 INTRODUCTION

This chapter examines some economic aspects of environmental marketing and related policy issues. We use the term 'environmental marketing'[1] to cover those activities and transactions of companies associated with the design, development, sale, distribution, and recycling of 'environmentally superior products'[2], or 'environmental products' for short. These activities, transactions, and products should cause less environmental damage than comparable alternatives. Thus, we refer to the operational marketing elements of producing companies, that is the traditional marketing mix with corporate product management, pricing, distribution and recycling management, as well as corporate communication.[3]

The design of environmental products involves considerations of issues such as product life extension or optimization, change and substitution of material and packaging selection, waste minimization, disassembly, repair, remanufacture, and recycling. Product designers should consider the minimization of environmental impacts during products' consumption or use phases as well as during production, pre-production, and waste treatment (see Oosterhuis, Rubik and Scholl, 1996, for example). With regard to distribution and recycling options, companies may be able to act directly or use intermediaries. Indirect distribution and recycling necessitates cooperation with companies involved in different stages of the product life cycle. Decisions about the physical forward distribution and recycling, that is, the transportation and logistics, mainly involve choosing less environmentally damaging transportation systems in terms of energy use, emissions and transportation risk.

In certain circumstances, companies may be able to raise prices to cover the additional costs of product-related environmental measures. More often, companies attempt to use environmental products to settle in attractive niches of otherwise fiercely competitive markets. These companies then advertise in a way that attempts to promote their environmental products and to create public trust in the environmental awareness and performance of the entire company.

The emergence and spread of environmental marketing is hampered by a variety of economic phenomena. These include positive externalities of environmentally superior products, asymmetric distribution of information, opportunistic behavior of economic actors, and the public good characteristics of certain types of environmental knowledge. These inefficiencies and market failures provide the rationale for public policies to foster the supply of environmentally superior products. Public policy can enhance the ability of

companies to separate themselves from competitors with the environmental superiority of both individual products and the company as a whole. To accomplish this, public policy can provide incentives for environmental product innovation and promotion. The focus of these measures is the companies' environmental advertising. In addition, public policy can stimulate efficiency improvements in other marketing activities by addressing inefficiencies and failures which emerge in pricing, distribution, and recycling. In the remainder of the chapter we examine potential policy responses to problems of externalities of environmentally beneficial behavior (considered in section 2), credibility in environmental communication (section 3), definitions of environmental superiority (section 4), and cooperation and network benefits in environmental marketing (section 5). In addition, public policy itself may suffer from failures (for example, regulation capture), so we will also consider the cost of policy measures.

2 EXTERNALITIES

The production of many commodities is linked with negative externalities such as pollution. Moreover, positive externalities exist if the development and market supply of environmentally superior products raise the utility of externally affected parties. With the help of environmental innovations related to product design, distribution, recycling, and so on, companies can reduce environmental damages over the whole course of the product life cycle or in parts of it. The resulting benefits are not only obtained by the ('internal') purchaser of the specific product but also by external individuals who can not be excluded from the benefit from the reduction in environmental impacts. Because the external individuals can utilize the environmental benefits without necessarily paying for them, they do not offer their actual willingness to pay for the environmental benefits of environmental innovations. Therefore, this utilization of external benefits by other individuals is, in general, not reflected in the prices of environmentally superior products. In other words, the environmental products have some characteristics of a 'public good'.[4] Because consumers who are buying such products cannot fully internalize the external utility of their purchase, prices for environmental products and other environmental innovations may be insufficiently low to cover their costs (Kaas, 1993; Cleff and Rennings, forthcoming). As a result, fewer incentives for innovations are set and the level of environmental innovations is relatively low.

To solve this problem, companies may use environmental marketing to differentiate their environmentally superior products, to lower the price elasticity of demand, and to create a sufficient price premium for environmental products. However, many of the relevant consumer markets are fiercely competitive and possess a high price elasticity of demand, making it difficult for firms to charge price premiums or shift the costs of environmental innovations to customers. And even environmentally concerned consumers may be unwilling to pay a price premium for environmental products (Henion, 1976; Peattie, 1995; Kapelianis and Strachan, 1996). Environmental awareness and consciousness[5] may not result in corresponding buying behavior for a number of reasons. First, the low prestige and recognition of environmentally conscious behavior, the limited direct personal ability to perceive environmental effects, the additional transaction costs[6] related to changes in purchasing, and sometimes the relative unavailability of environmentally superior goods may outweigh the willingness of consumers to buy environmentally superior products (Hemmelskamp and Brockmann, 1997). Second, research studies show that a substantial proportion of consumers believe that environmental products are less effective in their function or technical performance and therefore seek a discount (Kapelianis and Strachan, 1996). Finally, some environmentally aware consumers are willing to make significant own efforts during purchase, consumption, or disposal of products to behave in an environmentally responsible manner (for example, separate waste) but have a limited willingness to pay a price premium (Kaas, 1993).

Low consumer willingness to pay makes it hard for firms to cover the costs of environmental innovations. Developing and marketing environmentally superior products often requires expensive and time-consuming research, changes in production processes or establishment of a recycling system, and 'explanation-intensive' environmental advertising. Whether such measures bring market success through higher prices or increased market share often remains uncertain. Solutions to this dilemma can be either market-endogenous or market-exogenous. The broad range of companies' environmental marketing strategies, explained in detail in the remainder of the chapter, is the market-endogenous attempt to resolve this problem. However, shortcomings and market failures hinder the market's ability to solve these problems itself. A market-exogenous public policy solution may be needed to remedy these failures or to support market-endogenous solutions. In particular, public policy can enhance the opportunities for environmentally superior firms to send credible signals of the superiority of their products to customers.

Another public policy objective is to provide incentives for all firms to improve the environmental quality of their entire marketing activities. The companies' product man-

agement, distribution, and recycling are specific focuses of environmental policy due to their significant impacts on the natural environment. Economic instruments like emission licenses or fees, for instance, on the use of virgin material, on specific hazardous substances used in products, or on waste disposal treatment, can create incentives for environmental marketing activities. Similar results can be obtained by combining economic instruments with environmental and technology policies such as direct governmental demand for environmental products, support for research and development, subsidization of pilot projects, and provision of technological infrastructure (see also Hemmelskamp, 1996; Cleff and Rennings, forthcoming; for a discussion of environmental policy see Barde in this volume).

3 CREDIBILITY IN ENVIRONMENTAL COMMUNICATION

3.1 The Adverse Selection Problem

The bulk of contractual relationships and market transactions involving environmental marketing feature asymmetrically distributed information[7] regarding the environmental attributes of the products, materials, or the environmental protection activities of the transaction partners. One of the reasons for asymmetric information in environmental marketing transactions is that the specific attributes of environmental products may lead to market situations of 'adverse selection' (or 'precontractual opportunism'). In general, commodities can have search, experience, and credence attributes (for a taxonomy see Nelson, 1970, 1974; Darby and Karni, 1973), with the distinction hinging on whether the quality of the good can be determined prior or after purchase or not at all. Customers of goods with search attributes can identify the quality of the good prior to purchase, for example by inspection. The quality of goods with experience attributes can only be determined after purchase and during the consumption or use of the good (for example, the taste of food). Inability to observe quality either before or after purchase or use characterizes goods with credence attributes. Environmentally superior products are mainly characterized by credence attributes. Even after purchase and consumption, making judgments about environmental quality is generally impossible for consumers. For example, consumers can hardly gauge the environmental impacts of a product during its production process because such information is mainly available only to the producer. That means, this type of information is mainly a private good of firms.[8] Moreover, most consumers do not have sufficient ecological knowledge to evaluate environmental im-

pacts even if such information were publicly available. The individual transaction costs of investigating, evaluating and comparing the wide range of environmental characteristics of different products are prohibitive in relation to the marginal benefits of environmental products for each consumer (Foss, 1996; Tietenberg, 1998).

The credence attributes of environmental products makes it difficult for consumers to evaluate environmental advertising, resulting in opportunistic behavior on the part of producers and increasing skepticism on the part of consumers (for example, Zinkhan and Carlson, 1995). The reasons are manifold. Consumers have, in general, little or no knowledge, less comparative information, or limited understanding regarding the relevant environmental issues to evaluate the value or credibility of the environmental marketing claims. For example, consumer surveys show that many consumers do not fully understand the content of environmental marketing terms such as 'recyclable', 'source reduction', or 'biodegradable' (US EPA, 1993a). Moreover, many environmental advertising claims have proven to be inaccurate, unexplained, meaningless, or excessive. Unexplained environmental claims of a single attribute such as 'phosphate free' are often understood by the consumer to imply overall environmental superiority. Terms such as 'environmentally friendly', 'degradable', or 'ozone friendly' are ambiguous (Kangun, Carlson and Grove, 1991): recently, there is no commonly accepted and widespread definition about the content or the underlying activities of environmental protection related to these terms. We consider the recent development of defining and standardizing environmental terms below. Claims can be excessive if they emphasize the general 'environmental friendliness' of products when it is obvious that products have negative environmental impacts (Welford and Gouldson, 1993). Furthermore, some statements of product attributes are obviously false or misleading (Kangun, Carlson and Grove, 1991; Kangun and Polonsky, 1995; Polonsky et al., 1998) and discredit environmental claims in general; for instance, when producers claim to sell a 'recyclable' product without having access to an appropriate recycling infrastructure (US EPA, 1993a). Additionally, environmental campaign organizations or consumers themselves often detect a less stringent company behavior with respect to environmental responsibility when companies claim to sell environmentally superior products on the one hand, but cause significant environmental damages, for instance during natural resource extraction or waste disposal, on the other hand.

The problem of inaccurate environmental advertising worsens if new scientific knowledge makes existing claims of environmental superiority obsolete. This reflects the general problem of defining environmental superiority. Several obstacles to comparing

environmental aspects of products over their life cycles make general statements of environmental superiority of products vulnerable to criticism (see section 4).

Information asymmetries regarding environmental quality may cause market failures and, in some cases, the breakdown of markets. Consumers have less product information than sellers, and therefore expect sellers to behave opportunistically by marketing as 'environmentally superior' products which are in fact of poor or average environmental quality. Consumers are only willing to pay a corresponding, average, market price. Hence, the equilibrium price only covers the average costs (see for example, Kaas, 1993; Caswell and Mojduszka, 1996; Morris, 1997). Under these market conditions, producers who offer products with high environmental quality have no chance to gain a price premium. Their costs of producing superior environmental quality are not rewarded and the high quality producers cannot establish or sustain themselves in the market. Because their production costs are above the average level, the sellers of high-quality products will be driven out of the market. Since inferior quality products remain on the market, the supply of quality is 'selected' adversely, and hence the market suffers from 'adverse selection' (Akerlof, 1970). To ameliorate these market failures some countervailing institutions are organized either endogenously by the market itself or exogenously by public policy intervention, which we describe in the following.

3.2 Market-Endogenous Solutions and Self-Regulation

The economics literature discusses a number of ways to mitigate problems arising from 'adverse selection', such as screening, signaling, non-salvageable assets, guarantees and warranties, and reputation. However, most of these approaches are not applicable to markets for products with credence attributes and strong information asymmetries (Caswell and Mojduszka, 1996). For example, guarantees, warranties, and repeated purchase are not appropriate because buyers of environmental products cannot form a complete judgment of the environmental quality of products even after purchase and consumption.

Since information regarding product quality attributes is of value to consumers, we might expect the development of a market in which firms act as reviewers and offer their judgments for sale (Faulhaber and Yao, 1989). This approach to overcoming market failure may itself fail if consumers are afforded public access to the review judgments and act as free riders. In our search for a more realistic way to overcome the outlined

dilemma we will encounter other 'counteracting institutions' which can signal high environmental product quality.

3.2.1 Sophisticated Environmental Communication

The 'adverse selection' problem cannot be resolved using image-orientated, 'non-informative' claims that do not decrease the asymmetrical distribution of information. Rather, environmental advertising must provide consumers with credible information about credence attributes so that consumers can identify products or brands with superior environmental performance. As a first step, environmental advertising could provide objective, factual information about specific environmental characteristics and benefits of the relevant product. For instance, the seller could explain the main environmental impacts and its relative level compared to other products. Armed with this information, consumers could better recognize the environmental benefits of their purchases (Davis, 1993). Such advertising could increase 'perceived consumer effectiveness', that is, the extent to which the environmentally concerned consumer believes that her or his individual action contributes effectively to matters of environmental protection (Scholder Ellen, Wiener and Cobb-Walgren, 1991). Furthermore, detailed, fact-based, and precise product information (for example, the detailed description of the product ingredients and used substances) creates the possibility for verification by third parties (for example, test institutes or consumer organizations).

Detailed, fact-based environmental advertising often involves a complex array of data. Sophisticated communication may necessitate extensive costs and may have the characteristics of a public good, for example, information about the health effects of product ingredients. Additionally, some studies have shown that consumers have a limited comprehension of detailed product-related environmental information (for example, see Morris, Hastak and Mazis, 1995). Detailed environmental information, especially at the point of purchase, may result in an 'information overload' situation when limited ability to process information is confronted with large amounts of information. This may lead rational buyers to simply ignore information concerning the environmental characteristics of goods or the environmental behavior of companies. Thus, there is a need for condensed information in the form of symbols, brands and concise statements.

3.2.2 Guidelines and Standards

Industry guidelines and standards for environmental communication are examples of private self-regulation, which tries to solve on a voluntary basis the problem of adverse selection. Self-regulators must solve the conflict between the goal of influencing buyers on the one hand and the necessity to convey information that is reliable and accurate on the other hand. To that end, attributes of 'environmental terms' or 'environmental marketing claims' have been defined, standardized and made verifiable. Various initiatives in numerous countries have established common guidelines and standards for environmental communication which allow suppliers to offer meaningful information to buyers and to distinguish themselves from suppliers with lower product quality. These guidelines decrease the costs of information provision for producer and the costs of information processing for buyers.

Successful standards for communication and information require common rules about the way to report the credence attributes of products. Standards must be clearly defined and observable, and there has to be monitoring to determine compliance, arbitration proceedings to address conflicts, and sanctions for violators. These tasks can be undertaken by state and/or private organizations. In practice, a number of hybrid groups have developed standards, including the International Chamber of Commerce, the Incorporated Society of British Advertising, and the International Advertising Association. Guidelines for environmental marketing claims, together with 'case to case' decisions, can also be found in the European Advertising Standard Alliance and in the British Advertising Standards Authority. The media associations decide on complaints made about companies' environmental advertising claims. On the international level, the International Organization for Standardization (ISO) covers the so-called type II environmental labeling in the ISO/DIS 14021 standard, which concerns direct environmental claims made by manufacturers, importers, distributors or retailers without passing through any third-party organization (self-declaration). Frequently, the standard addresses only a single attribute, defining for example terms such as 'no use of ozone-depleting substances', 'recycled material', 'reduced resource use', 'energy-efficient', or 'designed for disassembly'.

3.2.3 Private Environmental Labeling

The overall purpose of environmental labeling is to overcome market failure caused by asymmetries of environmental quality information (for a detailed discussion, see Karl and Orwat, 1999). Environmental labeling or certification in general can act as a coun-

teracting institution by establishing standards for product quality which inform the consumer about quality levels. The environmental labeling organization sets up a scale of measurements corresponding to current quality levels that applying products have to fulfill. The incentive for producers to demand environmental labeling is the extra revenue from selling environmental products at a higher price (i.e., the rents of a separating high-quality equilibrium for environmentally superior products). However, increasing costs for screening and monitoring imply a reduced demand for such services (see also Leland, 1979; Shapiro, 1986; De and Nabar, 1991).

Signaling environmental superiority in terms of Spence (1974), by labeling products, requires a reputable certification agent, the accreditation agent, whom consumers consider trustworthy (Caswell and Mojduszka, 1996). For the sake of credibility and trustworthiness, these accreditation bodies must certify products which conform to a high environmental standard and maintain an efficient control and sanction system. The certification schemes must be based on clear pre-set environmental criteria which are established by a competent body. Environmental criteria are scales of measurement such as quantitative thresholds or limit values for specific environmental impacts of the product during its life cycle or other qualitative product requirements (for example, production method requirements). Under these circumstances ecolabeling reduces evaluation and comparison costs for consumers at the point of sale (Foss, 1996) and enables consumers to discriminate between high and low quality products. The ecolabels turn the credence attributes of environmentally superior products into search attributes.

Once again, the International Organization for Standardization (ISO) strives for global harmonization of environmental labeling systems. Here, the relevant standard is the ISO 14024 for the so-called type I environmental labeling for voluntary third-party environmental labeling schemes. According to this standard, environmental labeling programs have to fulfill certain characteristics, for example, to be based on available scientific methods that cover the entire product life cycle. This leads in most cases to the use of life cycle analyses to determine the environmental impacts of the product under consideration. However, several methodological problems in defining environmental superiority (see section 4) put the credibility of such schemes at risk.

At this point, we can summarize some advantages and disadvantages of self-regulatory standards and guidelines as well as private ecolabel programs. These instruments have the potential to be effective in creating markets for goods that have a superior environmental performance if they are reliable, clearly defined, supervised, and applicable to sanctions.

In contrast to governmental regulations, they have the advantage of greater flexibility: private standards, guidelines and ecolabel programs can be adjusted more easily in response to new experiences and knowledge. One essential criticism of a pure private self-regulation is that compliance is voluntary. Producers who do not apply the standard or ecolabel will not be sanctioned and can therefore make misleading statements. Furthermore, the enforcement mechanisms are considered too weak because arbitration and legal proceedings are time-intensive and may be vested with too little authority.

3.2.4 Signaling with Non-Salvageable Assets

Another possible solution to the problem of adverse selection is to provide certain kinds of signals to identify high-quality supplier to customers. To this end, activities which function as signals need to be less costly for suppliers with high environmental quality than for suppliers with low environmental quality (Spence, 1974). Customers would recognize that the signal is associated with higher environmental quality. One signaling activity is the investment in nonsalvageable capital assets, which are firm specific costs that are not recoverable in uses outside the firm (Klein and Leffler, 1981). In the context of environmental marketing, nonsalvageable assets include environmental brands or trademarks, logos, company-own retail and service organization or specific employee skills. A company's recycling activities are also an important instrument to signal environmentally superior performance because the high investments necessary to set up and run an extensive recycling infrastructure demonstrate the producer's interest in his products over all steps of the product life cycle. This may also be efficient, because the producer determines the opportunities and costs of recycling or final disposal by his decisions about the material composition of the product.

However, signaling via investments in non-salvageable assets is in some cases too costly in comparison to the profits gained by supplying environmental products. They may also result in losses in efficiency if the company takes on tasks that could be performed better by third parties. For instance, retail organizations specialized in supplying environmental products may realize greater economies of scale. Additionally, investments in non-salvageable assets are permanently threatened by the possible emergence of new knowledge about environmental attributes of products. For example, the good reputation of an environmental brand could be destroyed if consumers gain knowledge of a hazardous ingredient of only one product within the brand.

3.3 Public Policy Tasks Concerning Environmental Communication

3.3.1 Support and Regulation of Environmental Advertising

Independent of the market-endogenous possibility to solve the adverse selection problem, it is useful from an economic perspective to ban misleading statements in environmental communication because misleading claims can destroy markets and induce misallocation (Beales, Craswell and Salop, 1981; Shapiro, 1983a). Misleading advertising covers not only false statements but also vague claims, inaccuracies, or omissions that cause customers to have false ideas about the environmental attributes of products and their life cycles. The resulting problems are aggravated if deceptive advertising confronts the bounded rationality of recipients (see, in general, Nagler, 1993).

The most obvious way to deal with misleading advertising is general legal regulations that prohibit false statements (Beales and Murris, 1993). We can find this approach in the majority of European countries. They mainly judge environmental advertising according to general rules of competition law rather than special advertising regulations. They all demand an extensive explanation of the claimed environmental benefits, and do not tolerate ill-defined advertising terms, especially concerning health issues. Potential violations are judged mainly in 'case to case' decisions. For instance, in Germany, no special legal regulation of environment protection claims or the use of environmental terms in advertisement exists. Instead, rules of the general competition law, in particular of the 'law against unfair competition' ('Gesetz gegen den unlauteren Wettbewerb'– UWG) apply. In addition, there are the guidelines of the International Chamber of Commerce and the German Advertising Federation (Zentralverband der Deutschen Werbewirtschaft). All member firms of both organizations have to accept these guidelines as rules of advertising self-regulation, although they have no jurisdictional effects.

Regulations can also specifically address environmental claims. One example[9] can be found in the USA, where the Federal Trade Commission (FTC) regulates the advertising of environmental product attributes. Before 1992, diverse US states enacted individual statutes restricting environmental advertising. This decentralized approach created inconsistently standardized communication measures that became increasingly different, hampering the efficiency of markets, preventing economic scale effects, and increasing transaction costs. In response to the adverse effects of the plethora of sometimes conflicting environmental advertising statutes at the state level, the FTC issued its 'Guides for the Use of Environmental Marketing Claims' in July 1992, and modified them in

1996 and 1998.[10] Because the guides do not have the force of law, they do not preempt state and local regulations. However, some states have codified requirements to follow the FTC guidelines. Other states have stricter statutes, indicating that a race to the bottom does not exist. In some cases, the stricter standards set the *de facto* standard for environmental marketing claims. Nevertheless, some authors fear that inconsistent and potentially conflicting state and local regulations and standards will engender high information costs for the consumer (US FTC, 1992, 1998; Thomas, 1993; US EPA, 1993a; Gray-Lee, Scammon and Mayer, 1994). This is an argument for harmonizing public standards and influencing the process of private self-regulation[11] (Ruhnka and Boerstler, 1998).

The FTC directive has provided a framework for interpreting legal regulations issued for protection from misleading advertising. Companies can show their commitment by voluntarily adopting the directives. Thus, the directive is a hybrid form between solely private and solely governmental solutions. In detail, the FTC principles require that (1) environmental advertising cannot mislead consumers. Misleading environmental claims concern deceptive representation, omissions, or false details about material issues referring to the product life cycles or environmental behavior of companies. (2) All statements, qualifications, and disclosures have to be clearly understandable and the specific environmental benefit of the packaging, the distribution or the product itself should be clearly recognizable. Consequently, a product cannot just be marketed with the slogan 'recycled', but must indicate the share of reused materials and differentiate information concerning the product and its packaging. In this sense, the directive gives specific requirements for the use of qualifications such as 'degradable', 'biodegradable', 'compostable', 'recyclable', 'ozone safe', or 'ozone friendly'. (3) Exaggerations have to be omitted. These occur, for example, when a product is offered as 'recyclable' but a corresponding recycling system does not exist. (4) Clear criteria of environmental advertising must be used when making comparative claims. This is in order to increase the competition between suppliers (Beales, Craswell and Salop, 1981; Wynne, 1991; Sellers, 1992; Thomas, 1993; Scammon and Mayer, 1993; Beales and Muris, 1993; US FTC, 1998). General guidelines for environmental advertising encourage the production of beneficial, informative advertising because companies have a well-defined area in which to operate (Nagler, 1993). Additionally, the FTC directive treats communication measures on the basis of the analysis of marketing effects and scientific environmental criteria. The FTC's cooperation with the US Environmental Protection Agency (US EPA) offers the

advantage of merging the FTC's specific knowledge concerning marketing issues with the ecological knowledge of the EPA (Sellers, 1992).

Both U.S. and European types of regulation of misleading advertising depend on a time-consuming complaint procedure. Together with their inflexibility, the time requirements for screening and reviewing environmental claims on a 'case to case' basis makes it difficult for these regulations to curtail misleading advertising and thereby avoid 'adverse selection'. An alternative way of promoting accurate environmental advertising is permitting and encouraging comparative advertising. Competitors with superior environmental performance and the necessary environmental and market knowledge can easily detect false statements and misleading information. Against this background, the prohibition of comparative advertising is inefficient. Competitive advertising gives competitors an opportunity to make direct comparison with substitutable products and point out possible inappropriate claims of ecological qualities. Although Germany and other European countries have long-standing prohibitions against comparative advertising, it is going to be permitted Europe-wide in the future and will be complementing the European directive on protection from misleading advertising. According to this directive, comparative advertising is allowed if it is relevant in its contents and verifiable (Reader, 1995).

Additional public policy measures could encourage the coordination of environmental advertising among companies and increase the transaction costs of deceptive advertising (Nagler, 1993). First, public policy could initiate advertising self-regulation by encouraging advertising coordination among companies. To this end, governments could support the establishment and maintenance of market-endogenous councils and associations that monitor environmental advertising. These government-supported institutions could also provide environmental knowledge such as analyses and evaluations of environmental product impacts to build a common knowledge base for a fact-based environmental advertising. Antitrust regulators must ensure that coordination of advertising activities does not lead to inter-firm agreements that illegally reduce competition among companies. Second, public policy could increase the costs for deceitful companies by making it easier for misled consumers to bring complaints against them, for example, by offering free legal advice and relevant environmental product knowledge (Nagler, 1993). This is particularly necessary to increase consumers' ability to recognize and define the environmental damages of certain products due to the credence attributes of environmental products. The public good characteristic of this type of environmental knowledge justifies its public production and provision.

Moreover, with the establishment of a system of metrics to measure environmental product characteristics, government can reduce the search costs of consumers (Schwartz and Wilde, 1979), thereby creating a more competitive market situation and, hence, benefits for consumers. Displaying environmental product metrics near the product itself also helps to change credence attributes into search attributes which can be observed prior to purchase. These metrics are standardized scales for the measurement of environmental product performance, for example quantitative values of resource uses or environmental releases per product unit, values of minimum recycling quotes, or values of environmental efficiency regarding input factors such as fuel. The obvious public good character of metrics establishes a reason for their provision by government (see, in general, Shapiro, 1983a). However, standardization of environmental performance measures could also have negative side effects. Because of the underlying complexity of environmental attributes, standards, indicators and other measures can only treat parts of them. Thus, installing particular standards and indicators may shift attention, activities, and investments to specific product aspects. This may lead to the negligence of more environmentally efficient activities. Standard requirements for certain product attributes and for the use of certain technologies require companies to focus on specific research and development approaches. However, it is more efficient for companies' efforts to be more widely spread, potentially enabling them to uncover better alternatives that are not encompassed by the standards.

3.3.2 Public Policy Issues of Third Party Information Provision

In addition to the buyer and seller, third parties could produce environmental information which is relevant in environmental marketing communication. These third parties could be environmental experts or ecolabeling organizations (see, in general, Shapiro, 1983a). Public policy tasks concerning third party activities range from the establishment or subsidization of local information networks or experts to direct participation in environmental labeling programs.

One example of a third party information provider is a local information network such as a local market or a consumer information system that uses current information technologies. Such a network increases the consumer's ability to compare environmental products, to reduce their search costs, and to evaluate a company's reputation. The public good nature of these benefits establishes the rationale for governmental subsidization. Other examples are third party experts who can efficiently provide relevant product in-

formation based on their environmental expertise. They can gain economies of scale by inspecting and evaluating products for a large number of recipients. For instance, the German Foundation for Consumer Goods Testing (Stiftung Warentest) enlarged the scope of their product tests beyond the traditional quality focus to include environmental aspects. However, the difficulty of evaluating the advice of experts may lead to the governmental establishment of expert organizations (for example, consumer advise centers or the above mentioned quasi-governmental Stiftung Warentest) or to regulation of professional experts (see in general, Shapiro, 1983a).

Governments can also play a variety of roles in environmental labeling, ranging from the complete provision of an ecolabeling system to partial establishment and support of a program to the provision of basic environmental research to complete absence (for a detailed discussion, see Karl and Orwat, 1999). Within ecolabeling programs, the accreditation body is responsible for ensuring that ecolabelled producers achieve a specific level of environmental quality. The institutional system and background of the accreditation body therefore play a crucial role in determining the effectiveness of environmental labeling.

To decide whether governmental organizations are superior to private organizations, we have to address several issues. First, we note that a cooperation of private firms utilizing its own ecolabel can be permanent and stable because the incentive to produce high environmental quality increases as the group's reputation improves and therefore enables the group to earn increased rent (Tirole, 1996). As a prerequisite for establishing group reputation, the group must apply a well-functioning mechanism of quality control (i.e., monitoring and sanctions).

Second, we have to compare government and private provision of particular environmental criteria schemes. The quality of criteria schemes is determined by both the number of different environmental aspects being considered (for example, the set of environmental damages for which threshold values are defined) and the stringency of the criteria (for example, the level of each limit value). The quality of different criteria schemes is comparable by observing the different sizes of the criteria sets and the various threshold levels of each criterion. A private program may install a broad set of environmental criteria with strict values in each category just as well as a government institution. The establishment of an environmental criteria scheme hinges mainly upon the participants and procedures of decision-making, which can be effective or ineffective for private as well as for governmental institutions. The mechanisms to prevent biased decision making in favor of special interest groups are decisive. Private ecolabel programs

installed by high environmental quality producers may have an advantage if the interests of the participants are more aligned to high environmental quality.

Third, a certification program with the right to control entry, such as a (private) ecolabeling program, may act like a monopoly. It may offer too few certificates, charge too high prices or set the standards for certification inefficiently high or low (Leland, 1979; Shaked and Sutton, 1981; Shapiro, 1983b). Additionally, as a monopoly, the certification body may increase its profits by pooling firms with high and low environmental quality, thus gaining the fees of low quality producers (Lizzeri, 1994). This provides some rationale for public ecolabeling programs. However, public monopolies for certifying environmental quality can also be used by producers as a barrier against competition (Stigler, 1971). Restrictive competition practices, however, become vulnerable to attack if the right for private ecolabeling programs exists (Shaked and Sutton, 1981) and the price bonus for environmental quality is sufficiently high. Practical usage has shown that, under certain circumstances, producers with high environmental quality can establish and participate in an own ecolabeling scheme which, then, could put the credibility of governmental programs at risk. Since government ecolabeling programs generally have to give consideration to diverse interest and social groups in their ecolabeling procedure, a consensus-based procedure sets the environmental product standards in which the least environmentally advanced producers may influence the average results.

In general, the parallel existence and competition of diverse ecolabeling programs can enhance the credibility of ecolabel programs if they compete on the basis of the quality of their environmental criteria schemes. The parallel existence offers opportunities of choice for both consumers and producers to determine the appropriate combination of labeled environmental quality and market segment. Furthermore, by making a greater variety of product alternatives eligible for ecolabels, multiple programs provide a hedge against 'lock-in' effects. Lock-in effects are the possible path dependencies if the ecolabel scheme establishes, confirms and hardens specified product requirements which may favor inferior technologies and investments even when superior technologies exist (Morris, 1997).

However, the parallel existence and competition of ecolabel programs also may cause consumer confusion and situations of 'information overload' that make additionally institutions (fourth parties) necessary. These institutions, such as test or research institutes, could support consumers in their buying decisions, for example, by investigating and comparing different ecolabel schemes and providing scoring systems for the quality of ecolabel programs. Moreover, they can observe the internal procedures and participants,

the utilization of environmental knowledge, monitoring and sanction procedures, and the financing of programs, and thus can detect undue influences of certain interest groups.

To sum up the results concerning environmental advertising: We elaborated some measures that emerge from the market itself to overcome the credibility problem. However, several shortcomings of the private solutions (extensive costs, public good characteristics of the measures, and missing standards and institutions) allow the application of such instruments only in exceptional market situations. This provides the general justification for public policy to support market-endogenous solutions by providing standards and metrics or by supporting the provision of information by third parties.

4 DEFINING ENVIRONMENTAL SUPERIORITY

One of the most important obstacles to environmental communication is the difficulty of defining environmental superiority. In the context of environmental marketing, firms are often faced with decisions about the environmental superiority of the considered products. For example, during product development, comparison of product alternatives, partial or total optimization of existing products, and use of environmentally less damaging transport and waste treatment options, firms have to investigate the environmental impacts occurring within the course of the product life cycle to make proper environmental amendment decisions. This requires systematically investigating environmental impacts during different product life cycle stages, as well as environmental product information from previous and subsequent life cycle stages. To this end, analytical tools, in particular, life cycle analyses, ecobalances, eco-profiles, or at least lists of product-related materials and other checklists, can be used (see also Freimann, 1995). However, the application of these tools by firms is hampered by several problems, especially methodological problems and limitations of company budgets or personnel resources.

4.1 Methodological Problems

The reasonable analysis of environmental impacts of products comprises defining the scope of the analysis, gathering quantitative data of environmental impacts in an environmental inventory, and qualitatively evaluating the quantitative data. These steps par-

allel those of a life cycle assessment, which we therefore briefly describe (for the methodology of life cycle assessment see SETAC, 1993; US EPA, 1993b, 1995; EEA, 1997).

An ideal environmental inventory investigation includes all material and energy inputs, outputs, flows, and transformations for all stages of the product life cycle which occur before, during, or after the manufacturing stage of the product. However, the extensive amount of data which would result requires limiting this scope to avoid unfeasible complexity. The investigation must concentrate on the intuitively expected, main environmental impacts within the selected stages and omit those which initially seem minor (see in particular SETAC, 1993). This necessary definition of analysis boundaries may lead to the neglect of important environmental effects and, hence, affect the accuracy of the life cycle assessment (see Guinée et al., 1993b, for example). Without clearly defined cut-off criteria, the consideration or non-consideration of certain feedstocks, materials, emissions, or other releases seems arbitrary. Moreover, the results of the life cycle assessment become disputable if environmental impacts which were initially omitted become relevant when new environmental knowledge is acquired.

The environmental evaluation estimates the environmental effects of the quantitative material and energy inputs and outputs on ecosystems, human health, and natural resources. For this purpose, environmental knowledge is linked to each inventory item in order to analyze the total contribution of the considered product to specific environmental problem areas (for example, resource depletion, pollution, or human health effects, degradation of ecosystems and landscape). However, the stage of environmental evaluation is also problematic (Wynne, 1994; US EPA, 1995), because it is hampered by uncertainties in environmental knowledge about the 'cause-and-effect' or 'dose-response' relationships between inventory items and ultimate impacts on human health or the ecosystem[12], as well as by the non-comparability of different environmental impacts (Ayres, 1995). Non-comparability hinders the reduction of multiple environmental dimensions to a single evaluation measures such as eco-points.

4.2 Resource Problems of Companies

The production of the specific environmental knowledge concerning products under consideration can involve extensive costs. In particular, the acquisition of necessary data for an environmental inventory can be extremely cost-intensive or even impossible. Input materials can originate from anonymous resource markets, or it can be difficult to follow the several stages of used products and their fractions up to final waste treatment. Other

firms may be unwilling (proclaiming confidentiality) or unable to provide some or all of the vast amount of data required. Therefore, data sources are unverifiable and some parts of data are not available, necessitating the use of 'synthetic' or 'idealized' data from third-party sources. These 'data modules', which are mainly averaged data of environmental impacts belonging to comparable parts of the product life cycle (for example, averaged energy uses for different kinds of transport), may not be appropriate for all kinds of product groups or suitable in obviously similar life cycle situations. In their place, Ayres (1995) emphasizes that firms should calculate missing data by applying the 'mass-balance principle', that is the first law of thermodynamics concerning the conservation of mass-energy. Since the mass of inputs equals the mass of (converted) outputs, the life cycle analyst can calculate the missing inventory data or verify the measurements.

Another problem is the environmental evaluation step that requires the utilization of 'basic environmental knowledge' (for example, knowledge of ecology or 'cause-and-effect' relationships). The results of basic environmental research are, in general, available to the public because of their character as a public good and the fact that their provision is mostly state-subsidized. However, the gathering and processing of this kind of knowledge also incurs costs. Moreover, the interpretation of the environmental inventory is difficult and often necessitates external expert judgments. In general, there is a lack of a stringent, commonly usable evaluation system that makes it possible for firms to make rational judgments and ranking decisions about the relative severity of the environmental impacts of products, production processes, and other elements of environmental marketing.

Because of the limitations of data collection and scientific methods and models, as well as obtainable data, the results of most environmental analyses are, at best, approximations. The resulting uncertainties often lead to radically different estimates of the environmental superiority of factors, products, production processes, and distribution and recycling systems. Moreover, (company) resources that are needed to conduct analyses to resolve the uncertainties are seldom adequate. As a consequence, declarations of environmental superiority are subjective, that is, dependent on the source of the analysis, which in the environmental marketing context is mainly the company. Therefore, it only seems possible to state environmental superiority under specific assumptions. Consequently, analysis results must be transparent, revealing the underlying methodological assumptions and omissions. Such disclosure may improve public confidence and understanding of the analysis results. Moreover, since omissions of parts of the product life cycle are often necessary, then only the declaration of the partial environmental superi-

ority of the considered product seems reasonable and has to be sufficiently communicated to the customer. However, partial environmental improvements may lead to aggravation in other parts of the product life cycle.

4.3 Public Policy Issues

Facing these problems of defining environmental superiority by firms, there might be a call for public policy. In particular, it seems plausible that governmental tasks arise where results of individual activities have the characteristics of a 'public good', indicating a role for governments to directly provide the public good itself or to support its provision by private firms.

Basic environmental research is one example of a public good. Here, the utilization of environmental knowledge can hardly be restricted and, as a normative issue, no one should be excluded from its utilization. Additionally, specific environmental knowledge implicitly created during environmental product analyses, as well as the methodology of environmental product analyses themselves, can have the characteristics of public goods. Therefore, the production of these different types of environmental knowledge can be seen as an issue of public policy and, hence, justify government support for universities, research institutes, governmental agencies, private companies, and so on. The government itself can conduct life cycle assessments or ecobalances (for the governmental comparative study of plastic and paper bags see, for example, UBA, 1988; for an overview see Rubik and Baumgartner, 1992). Additionally, there is also a role for governments to play in developing the methods of environmental product analyses. In many countries, government agencies contribute to the development of methods of life cycle analysis (for example, US EPA, 1993b, 1995; UBA, 1995; EEA, 1997). The methodological task is often related to efforts to standardize the methods and to make the results of different product analyses comparable. Here, an example would be the standardization work of the International Organization for Standardization (ISO) in cooperation with governmental agencies and governmentally supported research institutes.[13] An additional governmental task may be the establishment of a ranking system of environmental problems to aid company decisions about the relative seriousness of their environmental problems. This requires consensus-based decisions made with the use of democratic procedures and the involvement of different interest groups within society.

5 COOPERATION AND VERTICAL INTEGRATION

5.1 Reasons for Cooperation and Vertical Integration

For many environmental marketing activities, inter-firm cooperation or collaboration between companies involved in 'downstream' or 'upstream' stages of a product's life cycle is economically efficient or even necessary. Such cooperation can address problems of information availability, information asymmetry, and opportunistic behavior, yield network benefits, and otherwise increase the efficiency of economic transactions.

Companies build up certain kinds of vertical cooperation to ensure a constant flow of information or input factors with a sufficient quality. Most of the activities of environmental product development and design require the involvement of other companies. Product developers must obtain as much information as possible about the environmental impacts of product ingredients and residuals and about disposal or recycling opportunities. This necessitates the exchange of information with companies from previous and subsequent stages of the product life cycle and often leads to types of cooperation. Additionally, if the company wants to improve environmental attributes in 'upstream' or 'downstream' parts of the product life cycle, it will have to influence the decisions of other firms. This is made possible in most cases by cooperation with relevant firms, also called 'environmental comakership' (Cramer and Schot, 1993; Wasik, 1996). For instance, the copier manufacturer 'Xerox' cooperates with suppliers to develop materials with greater recycled content, create product designs that are more appropriate for remanufacturing, and improve material recognition systems (Reinhardt and Vietor, 1996).

Cooperation with firms involved in previous stages of a product's life cycle engenders appropriate effort on the part of material suppliers to provide the necessary quantity and quality of inputs. Similarly, a substantial and continuous flow of potentially useful secondary materials is one of the prerequisites for a successful resource recovery system (Fuller, Allen and Glaser, 1996). (The alternative to recycling, waste treatment and disposal, is discussed in detail in Turner in this volume). Cooperation between recycling partners is needed to ensure a sufficient quantity and quality of the material and product flows. One example of such cooperation is the establishment of network relationships between automobile manufacturing firms and automobile dismantling and shredding companies to solve the problem of hazardous shredder waste (Hond and Groenewegen, 1993).

Cooperation is also evident in the distribution channels for environmental products. Close, long-term relations between manufacturers and intermediaries enable them to

avoid opportunistic behavior and to reduce transaction costs. Instead of direct distribution[14], cooperation with intermediaries can be profitable if the relevant products can be sold within distribution systems, such as conventional retail channels or specialists such as 'The Body Shop', which make products available and accessible to target markets more efficiently. Distribution systems specializing in environmental products have an advantage in attracting customers with environmental preferences, and may have expertise concerning environmental product attributes and production processes. A producer's choice of distribution channels hinges upon the specifics of the relevant market segment, customers' desire for service, and transaction costs related to various distribution channels (see Picot, 1986).

Within distribution channels, some retailers set product standards for environmental quality and performance and put pressure on suppliers to enhance the environmental quality of their products. In a few cases specialist 'green' retailers conduct investigations to evaluate the environmental attributes of products they are considering carrying. Retailers also often demand specific production methods or other efforts from suppliers, such as 'organic farming' or 'without animal testing'. These efforts require close cooperation between retailers and suppliers so that retailers can obtain some insights into the environmental performance of suppliers.

Another objective of inter-firm cooperation is to gain network benefits. These include economies of scale gained by the reduction of average costs of a commodity and economies of scope from the transfer of knowledge regarding products, materials, energy, releases, and so on. Cooperative partners in a knowledge exchange can gain by building the basis for further knowledge creation. In the environmental marketing context, network benefits are most visible in recycling and waste treatment systems (see also Turner in this volume). In general, recycling is economically attractive if the avoidance of waste treatment and disposal costs as well as the price premium for environmentally superior products cover the costs of collection, sorting, preparation, and transformation of waste (Zikmund, and Stanton, 1971; Fuller, Allen and Glaser, 1996; Hecht and Werbeck, 1998).

Beyond cooperation between legally and economically separated companies, vertical integration within companies allows manufacturer to create integrated recycling and waste disposal systems. These systems are primarily installed for reusable and recyclable products, such as toner cartridges, bottles, and so on, although it would be possible to use them for waste treatment and disposal. Vertical integration of recycling seems favorable if economies of scale exist, high transaction costs (for example, for measuring uncertain

quality of traded recycling goods) prevent cooperation with independent firms, and if the guarantee of an environmentally less damaging recycling or waste treatment and terminal disposal is decisive for the buyers.

The choice of the most efficient type of recycling network or channel is mainly determined by their costs and benefits, and by the institutional framework of waste disposal legislation. In general, the comparisons between the transaction costs required for cooperation and the network benefits favor a vertically integrated structure if a company's products need a specialized system of collection, transport, and treatment because of their environmental risks, if the consciousness of the buyers about the recycling system and the final waste treatment and disposal is relevant for their decision to buy or not to buy, and if high transaction costs prevent the use of intermediaries (Williamson, 1985). Economies of scale may influence the size of vertical integration. If the capacity of recycling channels is sufficient to collect and transport the material flows of many firms, inter-firm cooperation and joint use of these infrastructure systems are economically attractive.

5.2 Problems of Cooperation

In all types of environmental marketing cooperation, the success of each firm depends significantly on the efforts of the other firms. One major problem is that these cooperative channels are fragmented and complex systems involving a large number of independent parties with inherent potential for conflict (Peattie, 1995). Observing and monitoring the actions of cooperation partners can be difficult and may cause prohibitive transaction costs. For example, the efforts of recycling partners regarding the level of quality or purity of the secondary materials or reused products are hardly observable. As a result, asymmetrically distributed information, and therefore opportunistic behavior, hampers inter-firm cooperation. Information concerning the environmental aspects of products, materials, ingredients, or production processes is often exclusively held by one participant. That company may fear that providing such information may make them liable for their products' environmental impacts (Cramer and Schot, 1993) or disclose confidential data that could benefit competitors. Information provision is, thus, less than what is optimal for cooperation.

In actual environmental marketing transactions with private (environmental) information and possible unobservable actions of participants no 'complete contracts', which would ideally specify the outcomes for each contingency, can be written as well as

enforced. Contract partners are confronted with limited foresight, imprecise language, costs of specifying reactions on contingencies, and the costs of writing detailed contracts ('bounded rationality'). Since contract specification incurs costs, the parties will write incomplete contracts that leave gaps and missing arrangements for some obligations or benefits of cooperation in some states of the world (Williamson, 1975, 1985; Klein, Crawford and Alchian, 1978). With incomplete contracts, participants may not always be motivated to act in the optimal way for achieving the common objectives of the cooperation. When unforeseen circumstances occur, there is a possibility for opportunistic behavior ('moral hazard') (for example, Milgrom and Roberts, 1992). Each cooperation participant has independent economic interests which may conflict. For instance, certain ingredients of an environmental product may have different economic implications for each participant, because the material is less environmentally damaging during the manufacturing process but necessitates high recycling costs. Cooperation partners may act on private interests which are not necessarily aligned with the interests of other cooperation participants. They may attempt to influence the cooperation decisions in order to achieve their own objectives, for example, by lying about their environmental protection opportunities or about the environmental attributes of their products. The costs of measuring the characteristics and performance of cooperation participants and enforcing contracts may be extensive, leading to inefficient cooperation or even keeping potential participants from entering the cooperation.

Moreover, incomplete contracts require costly renegotiations or ex post bargaining when contingencies occur (Hart and Moore, 1988). Since contracts between cooperation participants are mainly incomplete, the interpretation of contracts and the renegotiations or the ex post bargaining is costly. This possibility impairs cooperative behavior, especially those requiring relationship-specific investments. If a cooperation partner invests in transaction-specific assets, such as the installation of an environmentally less damaging production process, the other partners would gain bargaining power to use during (re)negotiations (the 'hold up' problem). Without complete contracts, participants can not specify adequate protection against opportunistic behavior ('postcontractual opportunism'). Foreseeing this potential vulnerability to opportunistic behavior, cooperation participants are likely to underinvest or invest in relatively non-specific assets. Since efficient investments are not realized, cooperation outcomes will be suboptimal (Williamson, 1975, 1985; Hart and Moore, 1988; Milgrom and Roberts, 1992).

5.3 Market-Endogenous Solutions

Some supposed market-endogenous solutions for the aforementioned cooperation problems, such as better specification of cooperation efforts, enhanced cooperative communication, or periodic reviews of each company's performance (Anderson and Narus, 1990, for example), are hampered by problems stemming from the specific characteristics of environmental performances of collaborating companies. They remain difficult to measure because environmental attributes of the supplied products, materials, services or other environmental performances mainly have credence attributes. Furthermore, because of their limited monitoring abilities, cooperation partner may not gain sufficient information about the factual efforts of the partners. Sophisticated contractual agreements are hard to verify as well as to enforce, and may involve prohibitive transaction costs.

Economic theory provides other solutions for problems of incomplete contracts, namely relational and implicit contracts, but they seem of limited applicability to environmental marketing cooperation. With relational contracting, the cooperation partners seek for an agreement with general objectives without providing a detailed plan of action, and provide decision criteria or dispute resolution mechanisms in cases of conflict (Milgrom and Robert, 1992). For instance, the cooperation concerning product development could be based on a relational contracting agreement in which specific levels of commitment, mechanisms of sharing costs and benefits, or general consultation and bargaining processes are settled. However, in many cases, the underlying common mechanisms and processes are not developed for environmental marketing cooperation and its development and spread could produce extensive transaction costs. Implicit contracts, which fill contractual gaps with unarticulated but (presumably) commonly shared expectations (Milgrom and Robert, 1992), also seem less efficient in environmental marketing cooperation. Here, cooperation often involves completely new fields of product-related environmental protection measures in which common expectations, about for example information exchange or sharing of cooperation gains, are non-existent.

Another market-based solution to the cooperation problem is vertical integration by one company obtaining hierarchical control over the previous or subsequent stages of supply, production, distribution, and so on. This solution exceeds the concepts of cooperation among separate firms. Vertical integration can be especially advantageous if one party of the economic transaction has significant transaction-specific investments that create a significant threat for postcontractual opportunistic behavior (Williamson, 1985). This happens, in particular, if manufacturing firms decide to invest in environmentally less damaging production processes. Since most environmental marketing transactions

necessitate considerable information exchange over different stages of the product life cycle, vertical integration can improve the provision of relevant information. By vertically integrating the previous production stage, the producer gets more knowledge about the quality of the output of this stage since he can better observe the inputs of this stage as available proxies for measuring or estimating the output quality. Thus, vertical integration can reduce measurement costs (Barzel, 1982) and improve coordination and transfer of information, especially those associated with environmental credence attributes (see also Hennessy, 1997). However, vertical integration also has limits. Integration becomes inefficient if the company uses standardized inputs which are competitively supplied, if independent suppliers can realize economics of scale or scope, if transaction-specific investments do not exists, or if the increased costs of managing the integrated organization exceed its benefits (Milgrom and Roberts, 1992). Vertical integration can also concentrate power and reduce consumer choice, leading to possible legal sanctions. As a result, the choice of vertical integration of environmental marketing activities has to be decided in 'case to case' decisions taking the specific companies' situations into account.

5.4 Tasks of Public Policy

Public policies can support environmental marketing cooperation by reducing contract risks. This could be done by increasing opportunities for measuring the performance of cooperation partners. Establishing a common system of standards, metrics and indicators for environmental performance and quality may reduce transaction costs, such as costs of search and of performance and quality verification (see, in general, North, 1981). Furthermore, standardization of intermediate materials or products provides more market alternatives for suppliers and facilitates gains from economies of scale. More market alternatives also reduces the risk of specific investments. The standard system should comprise standards of environmental quality and performance that are related to materials, ingredients, and products as well as companies' processes, activities and organization (see EEA, 1998, for example). For instance, specialized subsequent producers or retailers could require the application of metrics when advertising their environmental products.

Standards should be applicable to both forward distribution chains and recycling channels. They should be embedded in standards of environmental management systems such as ISO 14000. The international circulation of these standards secures economies of scale in their use by multinational firms. The standards could facilitate product-related

information exchange by, for instance, formalizing and incorporating environmental data into material data sheets. However, standardization of environmental performance measures may lead to the previously mentioned adverse effects that occur when a standard takes into account only a limited number of environmental protection activities. Furthermore, requirements for environmental management systems, which are the main part of the certification procedure of the European Environmental Management and Audit Scheme (EMAS) or the ISO 14000 series, are less successful when it comes to obtaining information about actual environmental performance. These kind of certification systems promote the establishment and maintenance of a management system rather than actual results in the form of reduced levels of environmental damage (Karl, 1994). Establishing standards which lay more stress on quantitative measures may limit these disadvantages.

Public policy can also support the provision of product-related information by establishing an information exchange system for gathering, aggregating, evaluating, and anonymizing the relevant product and material data (Cramer and Schot, 1993). Here, the public policy plays a decisive role in conducting life cycle assessments and applying other analytical tools. For instance, a system of knowledge about product ingredients and their environmental impacts, especially during the production stage, makes it easier for companies to specify their product information needs to their cooperation partners or suppliers. This would also help to verify the reliability of the suppliers' information by allowing it to be compared to the public knowledge system. Since the standard and information system mainly has the characteristics of a public good, the market-endogenous provision of the system seems unlikely and public provision seems justified.

In addition to these information-provision tasks, public policy could stimulate inter-firm cooperation by setting appropriate environmental policy incentives, most visible in recycling and waste treatment. In particular, waste disposal policy increases the incentives to reflect environmental impacts of waste disposal and encourages inter-firm cooperation to solve waste problems. Increasing costs of landfilling or incorporating waste service or product (packaging) charges at the point of purchase could lead to more attention being paid to environmental aspects of waste treatment and recycling (Cairncross, 1992).

In some cases, direct regulation of waste treatment and recycling activities may be needed to avoid free-rider behavior and illegal waste disposal. From the point of view of environmental economics, a rationale for public regulation of all waste treatment and recycling measures of companies does not exist (for a discussion of this topic see Karl and Ranné, 1999). For example, free riders can be excluded from privately established

deposit refund systems (for example, for glass or polyethylene terephthalate (PET) bottles), and these and other recycling infrastructure networks work well. Government-imposed deposit refund schemes and voluntary recycling programs can offer incentives to increase recycling rates while leaving firms free to choose the most efficient way (Cairncross, 1992).

6 CONCLUSION

In response to consumers' increased environmental awareness, companies may seek to gain competitive advantages with environmental marketing by developing, distributing, advertising, and selling environmental products. However, we have seen that the supply and demand sides of the market for environmentally superior products have some peculiar attributes. The development of environmentally superior products provides positive externalities, resulting in inefficiently low supply. The externality problem could be solved if sellers were able to credibly advertise their environmental products and, thus, to skim off the higher willingness to pay for environmentally superior products. However, inaccurate environmental advertising and insufficient production of environmental knowledge to define environmental superiority credibly hinder the internalization of the externalities by the market itself. Considering these inefficiencies and market failures of environmental marketing transactions, there are many issues for public policy to address. Public policy can support the resolution of credibility problems in environmental advertising, and, in this way, provide incentives for environmental product development and other innovations of environmental marketing. Public policy can also foster the large-scale supply of environmental products by facilitating the solution of certain economic problems in order to make environmental marketing transactions more efficient. To this end, public policy can provide certain kinds of environmental knowledge, product-related information, as well as metrics and standards of environmental performance measurement that mainly have the characteristics of public goods. With the help of these measures, companies should be able to better define the environmental superiority of their products and activities and develop more efficient cooperation.

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NOTES

[1] Like the term 'marketing' itself, the term 'environmental marketing' is, in general, not precisely defined (see, for example, Henion, 1976; Peattie, 1995; Wasik, 1996; Ottman, 1998).

[2] When we refer to 'environmentally superior products' or 'environmental products', it is understood that we are emphasizing the relative environmental superiority of the products. Since every product leads to certain kinds of environmental resource use and environmental damage, a product can only be relatively environmentally superior in comparison to others and not 'environmentally benign' in general terms. In this context, the product's environmental quality denotes its environmental superiority.

[3] The term 'product' encompasses various types of utility services. We do not consider the special marketing of environmental non-profit organizations, the conventional marketing of environmental protection technology, or the environmental marketing of services.

[4] In economic theory, public goods are characterized by the absence of excludability and rivalry. If no one can be excluded from the use of a commodity, service or other benefit, and if there is no rivalry in its use, the good will not be provided by individuals in private markets, because, nobody is willing to pay for it.

[5] An overview of several studies regarding environmental consciousness can be found in Hemmelskamp and Brockmann (1997).

[6] In economic theory, transaction costs encompass (a) costs of preparing contracts (search and information costs) (b) costs of concluding contracts (bargaining and decision costs), and (c) costs of monitoring and enforcing the performance of a contract (Williamson, 1985).

[7] A host of economic research work, mainly assigned to the economics of information, considers 'asymmetric information'. If one party has or will have an information advantage regarding the characteristics or variables of a contract (private information) before or in a contractual relationship, economists talk, in general, about asymmetrically distributed information. When one party holds private information before the relationship has begun and the other party does not, a situation arise that is generally referred to as a problem of 'adverse selection' or 'precontractual opportunism' (Akerlof, 1970). If the relationship has been initiated and one party then receives private information or if the action of the party is unverifiable, the situation is generally named a 'moral hazard' or 'postcontractual opportunism' (Ross, 1973).

[8] In many cases, knowledge is regarded as a durable public good, because knowledge does not lose validity due to its use or due to the passage of time, it can be used jointly, and the exclusion from access to it is costly. However, for some types of knowledge, intellectual property rights, like patents, copyrights or company and trade secret laws, can establish excludability. The purpose of intellectual property rights is to offer knowledge producers economic rents such as monopoly profits, and, hence, to set incentives for the production of knowledge (Dasgupta and David, 1994). These conditions are particularly relevant for the technical or organizational knowledge of companies, which include knowledge about the causes of environmental damages (for example, the releases of production processes) and about (technical) possibilities for environmental protection. These types of knowledge can be private goods unless they are released by the producers.
In contrast to technical and organizational knowledge, scientific knowledge has more of the characteristics of a public good, because it is often costly or socially undesirable to exclude its use. The value of scientific knowledge is not depleted by joint use, and in fact use often adds to its value (Dasgupta and David, 1994). Scientific knowledge encompasses, for example, basic environmental research regarding the natural environment, the environmental impacts of certain released substances (for example, 'dose-response' relationships between pollutants and final environmental damage), and complex ecological processes.
Within a market mechanism, producers of scientific knowledge are not sufficiently able to appropriate the value of their produced knowledge, because they cannot establish excludability (the 'free rider' problem). To address the resulting underproduction of scientific knowledge, direct governmental involvement or priority incentive schemes have to be established. For instance, the scientific incentive scheme of priority induces fast disclosure of scientific knowledge by allowing producers to secure the (informal) intellectual property rights of their discoveries and inventions (Dasgupta and David, 1994).

[9] Another example is Switzerland, which regulates environmental advertising in the 'directive of environmentally hazardous substances' ('Verordnung über umweltgefährdende Stoffe'). The directive prohibits vague environmental claims which are not explained in detail and mandates that terms such as 'environmental protecting detergent' must be replaced by the exact description of the detergent ingredients.

[10] Additionally, a 'Joint Federal Task Force', a cooperation of the federal states with the US Environmental Protection Agency (EPA) and the 'Office for Consumer Affairs' should harmonize the guidelines for environmental claims (Sellers, 1992).

[11] The US EPA offers a voluntary 'Environmental Leadership Program' in which companies with relatively less environmental damage can demonstrate their superior environmental performance. To this end, the US EPA evaluates and certifies the 'leading' environmental protection measures of participating companies.

[12] Although there are commonly accepted dispersion and conversion models for the translation from emissions at the different stages of the product life cycle to the environmental impacts, these models are uncertain and the subject of much controversy (see also Gruenspecht and Lave, 1989).

[13] Recently, several standards or draft standards for the life cycle assessment exist in ISO 14040 (Principles and framework), ISO 14041 (Goal and scope definition and inventory analysis), ISO 14042 (Impact assessment), and ISO 14043 (Interpretation).

[14] Direct distribution by a producer itself may be advantageous if, for example, its internal sales organization does not require extensive financial support from the firm. Additionally, some environmentally superior products are 'explanation-intensive', and direct distribution can

secure the appropriate conveyance of product information to the customer and may help in acquiring credibility and reputation. Furthermore, it is often profitable to simplify distribution channels, for example, by circumventing certain distribution levels and gaining the markups of the intermediaries.