Economic Aspects of Environmental Labelling

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1 INTRODUCTION

In recent years, the discussion regarding instruments of environmental policy has slightly changed its focus. When inefficiencies in direct regulation became obvious, economic instruments, such as emission fees or tradeable emission permits, attracted more attention, at least in economic theory. Environmental policy has also focused more intensively on those informational approaches which are already applied to environmental policy or have been conceived for potential application (Tietenberg, 1997). Environmental information policy seeks, through the dissemination of environmental information, to change the behaviour of economic units. In this context, the term "environmental information" covers information concerning environmental pollutants, damage and environmental improvement measures which are related to products, production processes or company organisations and management. In particular, the informational approaches[2] aim to affect firms' behaviour indirectly with consumer, stakeholder, public, or community pressure which may be the result of the provision of product-specific or company-specific environmental information. These pressures, such as consumer, capital or insurance market reactions or legal claims, can generate sufficient incentives for firms to take environmental protection measures (Karl and Orwat, 1995). Informational approaches of environmental policy encompass a broad range of instruments with diverse attributes having different economic implications. These attributes include the condition of participation (voluntary or mandatory), the kind of information dissemination ("active" on the initiative of the information source and "passive" on request), the involved parties (first party as the direct source of information and third party which processes, verifies or aggregates the information), the source of necessary methods, procedures or standards (governmental, semi-governmental, or private organisations), the content (hazard warnings, environmental risks, resource uses, environmental releases or environmental measures etc.), the level of information aggregation (ranging from multiple information to a single sign).

Besides environmental labelling, the most popular instruments of the informational approaches are environmental disclosure or environmental reporting (e.g., Harte and Owen,

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2 Information instruments of environmental policy can further encompass, for example, environmental education, governmental environmental statistics and information networks, or fundamental environmental research (e.g., conducting ecobalances) and knowledge provision.

1991; Roberts, 1992; Gray, Bebbington and Walters, 1993; UBA, 1995a), diverse types of community rights to knowledge regarding environmental information held by environmental authorities, such as the US Toxic Release Inventory (TRI) (US EPA, 1997) or the European Directive 90/313/EEC on freedom of access to environmental information (EEA, 1997) and the Eco-Management and Audit Scheme (EMAS) provided by the European Regulation 1836/93/EEC (Clement, 1991; Karl, 1994, 1995).

In this study, we have attempted to work out the points of successful environmental labelling (chap. 2) and to analyse them from the economic viewpoint (chap. 3). As a main emphasis of the economic analysis, we shall show that the specific informational characteristics of environmental superior products cause problems of credibility which in turn lead to market failures (chap. 3.1). As solution to credibility problems, we shall discuss environmental labelling as the certification of environmental superiority of products (chap. 3.2). Environmental labelling gives rise to questions of regulation (chap. 3.3) or of the competition between different labelling programmes (chap. 3.3.3). Regulation of environmental labelling can have negative side-effects, such as regulation capture (chap. 3.3.2) or protectionism (chap. 3.3.4). Furthermore, the ecolabelling procedure is impeded by several methodological obstacles (chap. 4) which put the programmes' credibility at risk. We shall describe, with examples of different environmental labelling programmes, the appearance of the economic, regulation and methodological problems in reality and show how the programmes attempt to react to them (chap. 5).

2 ENVIRONMENTAL LABELLING

Environmental labelling—or ecolabelling for short—can take different forms, but all of them have certain common characteristics. The information conveyed by environmental labels—or ecolabels for short—is related to the environmental implications of products. Ecolabels inform buyers at the point of sale about one, a few or almost all ecological impacts of the product during the product’s life cycle. The product life cycle ideally ranges from the extraction of raw material through several previous or subsequent production, transportation, distribution and consumption stages to disposal or recycling. The purpose of environmental labelling is to help buyers make a distinction between competing product alternatives and choose the least environmentally damaging option. Ecolabels, therefore, emphasise the relative environmental superiority of the products. Since every product leads to some kind of environmental resource use and damage, a product can only be relatively environmentally superior in comparison with others and not "environmentally benign" in general terms. When we talk about "environmental products" in this paper, it is understood that we are emphasising the relative environmental superiority of the products. In this context, the product's environmental quality

denotes its environmental superiority. In order to find out what products have a higher environmental quality level for them to be awarded the ecolabel, the products have to be comparable, meaning that there must be direct competition between product alternatives. In other words, the compared products have to be functional equivalents, i.e. they should provide similar functions for the users. Goods which might be generally environmentally superior, but are not directly similar in function, are excluded from comparison (e.g., bicycles when transportation units are considered). Moreover, the answer to the question of the general need for the product is left to the consumers' choice and is in most cases not given by the environmental labelling programme.

Like the general informational approaches, various types of environmental labelling can be differentiated (US EPA, 1993c) with the aid of certain attributes. (1) On the one hand, environmental labels can impart the environmental information as more or less detailed descriptions of the environmental impacts of the product, such as those given by a report card, providing categorised and quantified environmental product information. On the other hand, the information may be presented in an aggregated form, mostly as a single sign, such as a brief declaration or logo affixed to products. (2) Environmental labels can refer to multiple environmental aspects of the product life cycle or, in extreme cases, to only one environmental issue such as recyclability. (3) First-party or third-party environmental labelling can also be found. With first-party ecolabelling the producers or the producers' associations use environmental self-declarations and their own environmental logos in a direct way. Producers or their associations assess the product's environmental quality themselves. Nonetheless, a third-party environmental labelling organisation investigates the environmental aspects of the products for which an ecolabel application has been made. To this end, the ecolabel body pre-sets the environmental criteria which are scales of measurements of the product's environmental quality. The third-party ecolabel institutions can be governmental, semi-governmental or private. Governments can play different roles in environmental labelling, ranging from the complete provision of an ecolabelling system through the partial establishment and support of a programme to the provision of basic environmental research, or complete absence.[3] As a result, diverse forms of governmental-private hybrid programmes can exist. Furthermore, (4) environmental labelling may be government-mandated, such as hazard warnings (e.g., cigarette warning labels or pesticide hazards, health effect warnings) or product-related information disclosure (e.g., the fuel economy label from the United States Environmental Protection Agency). In most other cases environmental labelling is voluntary.

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3 Private first party ecolabels, such as "eco-trademarks" are not covered by the analysis. Beside first and third party environmental labelling, there is second party environmental labelling, which is the labelling undertaken by retail organisations or chains.

The environmental labelling discussed in this paper concerns the voluntary, third-party certification programme which provides mainly single sign information at the point of sale.[4] These programmes may be either governmental or private or may take a hybrid form as government-initiated or government-financed privately administrated programmes (see table 1 below). Most of the environmental labelling schemes cover multiple environmental issues, such as different kinds of pollution or amounts of waste, for which environmental criteria are defined on the basis of environmental analysis. Environmental criteria are, in particular, quantitative threshold or limit values for specific product-related environmental damage or other qualitative product requirements (e.g., production method requirements) of minimum environmental features which applied products must meet. However, some ecolabelling schemes are based on a few or only one environmental criterion. To establish environmental criteria for the considered product group, a formal independent body judges the product, whereby one, a few, or almost all environmental effects of the product are investigated. This leads in most cases to the use of approaches of life cycle assessment (LCA) (for details of life cycle assessment see chap. 4.2) for the purpose of finding the environmental impacts of the product under consideration. Before awarding the ecolabel, the body evaluates the applied product by comparing the environmental damage of the product with the environmental criteria. If the product passes the examination, the multiple environmental product information regarding several forms of environmental damage at different life cycle stages is then reduced to a single sign of a certain environmental product quality.

Environmental labelling as an informational instrument of environmental policy has certain specific advantages. These benefits are shared by all other informational approaches, too. Command and control instruments of environmental policy have induced companies to reduce ecological damage only to a certain extent. Pollution is not voluntarily reduced beyond the specified legal standard. Informational instruments, on the other hand, may provide incentives for firms to reduce environmental discharges beyond the level required by environmental law. Environmental measures that are both anticipatory and preventive possibly result because different types of exogenous pressures influence the level of the firm's pollution prevention. Therefore, environmental information instruments can induce reactions from the companies which may correspond to the environmental preferences of citizens and, in the case of environmental labelling, to the preferences of consumers in particular. In addition, these policy instruments can take several types of resource use and environmental release into consideration. Types of environmental damage which are not considered by direct regulation or economic instruments remain uninfluenced. Informational instruments, on the other hand, manifest a comparatively flexible structure which can include—relatively quickly in some cases—

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4 It should be mentioned that this kind of environmental labelling corresponds to the type I definition of environmental labelling of the International Organization of Standardization (for details see chap. 5.4). Negative labelling, such as warnings of hazardous attributes of products, is excluded from the analysis.

a broader range of environmental damage. Furthermore, information approaches generally afford firms greater freedom of choice when it comes to reacting to exogenous pressures. Thus, efficiency may increase because companies can choose those technologies, processes or product amendments, or other measures which best suit their specific situation. Moreover, informational instruments are often less expensive than the complex administrative instruments of direct environmental regulation.

Sometimes, informational instruments even seem to be the best solution to the problem of deficient environmental policy in cases where direct control and market-based instruments are hampered by incapacity or corruption, such as in some developing or transition countries (Tietenberg, 1997). Here, public pressures induced by information instruments may be an efficient possibility of pollution control. However, with regard to the current situation of advanced environmental policy, informational instruments in general and environmental labelling in particular do not seem to function as complete substitutes for economic instruments and direct regulation in every situation of environmental policy, but rather as appropriate additional instruments which provide further incentives for environmental damage reduction. Informational approaches focus more on the additional environmental improvement of firms' production processes, organisations and products than on fundamental environmental damage and risk prevention. Several limitations and problems are the reasons for the mainly supplemental role: the effectiveness of informational approaches depends largely upon the behavioural reactions of the information recipients, namely the individuals affected by environmental damage or those conscious and concerned about the quality of the environment. In other words, it seems plausible that the recipients process the given information and draw the appropriate conclusions from it, altering their relationship with the firm. However, these reactions may prove to be uncertain or non-existent. The reasons are, in particular, a lack of credible information, or an inappropriate distribution of costs which are related to the information instruments. Even if the recipients and, in particular, the consumers are environmentally aware, the responses to the information provision are uncertain. Unfortunately, environmental awareness, for example, does not automatically result in corresponding buying behaviour because many influencing factors determine the buying decisions of consumers (e.g., the prestige and recognition of environmentally conscious behaviour, the direct personal ability to perceive environmental effects, the additional transaction costs relating to changes in purchasing, or the availability of environmentally superior goods). Hence, other factors may outweigh the direct willingness of consumers to practise an environmentally conscious buying behaviour (Hemmelskamp and Brockmann, 1997; McNeill and Wilkie, 1979). The use and hence the success of informational instruments hinge to a great extent on their final arrangement and design, such as, for example, the distribution of the costs of production, provision, accessing, and processing of information between the providing and receiving parties. Since the construction, maintenance, and application of the information instruments relies heavily upon the

support of the information sources respectively the firms, the interests of the involved parties may conceal the original purposes of the information instruments. Moreover, diverse situations of asymmetric information between the involved parties have to be resolved by the appropriate institutions. These asymmetric distributions of information may coexist behind the visible relationship between firms and pressure groups, for instance, between the firm and the body operating the information instrument.

The particular success of environmental labelling depends mainly upon the ability to convert the environmental consciousness of buyers into corresponding buying behaviour (Hemmelskamp and Brockmann, 1997). Demand shifting from the unlabelled to the labelled product or higher prices for ecolabelled products are intended to reward environmentally superior producers and to induce less advanced ones to make environmental improvements. There are several decisive factors which ecolabelling programmes have to satisfy in order to convert from latent to real changes in buying behaviour. (1) The crucial point of environmental labelling is the credibility of the ecolabel information. To this end, the evaluation and certification of the environmental product quality has to be based on a sound scientific foundation with the most advanced methodologies. In order to achieve transparency and public acceptance, the unbiased participation of all involved parties has to be obtained. Furthermore, the impartiality and neutrality of the ecolabelling body must be guaranteed, and this has to be achieved by an appropriate institutional arrangement of the programme. Moreover, (2) the comprehensiveness of the ecolabel information at the point of purchase is a main prerequisite for success, and is best achieved with a single sign. However, a single sign may suppress other information which is necessary for evaluating environmental product quality. Comprehensiveness via transparency is achieved if consumers are informed about the methods of aggregation, evaluation etc. operating behind the single sign. The parallel application and competition of several ecolabel programmes also have implications for its comprehensiveness. (3) The processing of the ecolabel information by the buyer or the purchase of the ecolabelled product has to achieve certain direct or indirect utility incentives for the buyer. Immediate utility can be achieved when ecolabelled products have less directly adverse (health) effects for the buyer. Consumers will then purchase the ecolabelled product for their own risk reduction (indoor paints, for example). In addition, ecolabelled products can provide indirect benefits if consumers can perceive a contribution to environmental protection by buying the product. Besides the intended market and consumer effects, environmental labelling has to fulfil another constraint. (4) Environmental labelling is only successful if the shift of deman from unlabelled to ecolabelled products leads to net environmental improvement.

3 ECONOMIC ANALYSIS

3.1 Market Failure

Consumers are interested in goods as a bundle of different characteristics (Lancaster, 1966). Primarily, the demand for product information is derived from the demand for products themselves (Beales, Craswell and Salop, 1981) where information is necessary for increasing the level of satisfaction. Consumers observe the environmental attributes of products because, for example, they affect their own individual health. There are also consumers who generally give environmental product quality a high priority. Buyers with environmental preferences are generally interested in the environmental effects of products in their life cycle. Therefore, they will be primarily interested in suppliers who seek to optimise the environmental quality of their products. According to traditional economic theory, knowledge concerning relevant product characteristics is equally distributed between buyer and seller. However, in reality, information about product characteristics is for the most part asymmetrically allocated between buyer and seller. In general, sellers know more about the products they supply. This "information asymmetry" is a much treated aspect within information economics and new institutional economics. Some of the results obtained in these branches of theory can thus be applied to environmental labelling.

Taking into account the various possibilities which buyers have of obtaining information about the quality and other attributes of products, we can distinguish products by search, experience (Nelson, 1970, 1974), and credence (Darby and Karni, 1973) attributes (Krouse, 1990; Tirole, 1997). These different characteristics of products have different economic implications. In particular, they determine the existence and form of market transactions and, in some cases, they may necessitate governmental intervention. Thus it is necessary, for the further analysis of ecolabelling, to categorise the products according to these attributes.

- Firstly, let us consider products with search attributes. The quality attributes of these products can be identified prior to purchase, for example by inspection. The buyer can diminish and eliminate the information asymmetry by searching, whereby relatively low pre-purchase quality determination costs (pre-costs) are incurred. In rare cases, the consumer is able to search for environmental quality characteristics. For example, the consumer may determine, prior to purchase, the amount of waste resulting from the kind of packaging used. The main problem posed by products with search attributes are the transaction costs incurred when obtaining an overview of available products (information costs).
- Secondly, let us consider products with experience attributes. The situation becomes more complicated if the product quality can only be determined after purchase, during the course of consumption, because in such cases the consumers' pre-costs are relatively high. Under these circumstances, the buyer learns through product usage whether or not it features the desired qualities. In this situation, the post-purchase quality determination costs (post-costs) are relatively low. If the frequency of transactions is small (e.g., for washing ma-

chines or cars), the respective market may shrink or disappear. This phenomenon is referred to in economic theory as "adverse selection". For the used car market, Akerlof (1970) demonstrated that product quality continuously decreases if quality information is distributed asymmetrically between seller and buyer. Only the seller is exactly informed about the true product attributes. The buyer, having less information at his disposal, supposes an average product quality and is willing to pay only a corresponding market price which covers the costs of a product of average quality. In such a situation, sellers of high-quality products will be driven out of the market because their production costs are above the average cost level. Since the inferior quality product remains on the market, the supply of quality is selected adversely. Only in the case of a few products can consumers recognise environmental quality through their experience during consumption or disposal (recycling quality) of the product. In these few cases, consumers can react in repeat purchases upon the supplied product quality and adverse selection can be avoided.

- The third and last product category covers products with credence attributes. Consumer uncertainty increases if the product qualities cannot be checked before or after purchase irrespective of transaction frequency. Both the pre-costs and post-costs are high for consumers. Sellers may exploit this situation and sell low-quality products while pretending to offer high-quality ones. Hence consumers are generally sceptical of marketers' claims concerning the credence attributes of products (Ford, Smith and Swasy, 1990). Most environmental qualities of products fall into the category of credence attributes because for consumers the transaction costs of controlling the wide range of ecological impacts caused by the product are prohibitive. For example, consumers can hardly gauge the environmental impacts of a product during its production process because such information is mainly available to the producer only, i.e. such information is mainly a private good of firms. Moreover, most consumers probably do not have sufficient ecological knowledge for evaluating at least the visible environmental impacts. The individual transaction costs of evaluating and ensuring the characteristics of the products and comparing the distribution of characteristics between different sellers (Foss, 1996) are prohibitive in relation to the marginal benefits of environmentally superior products for each individual or household (Tietenberg, 1997).

Knowledge about the attributes of environmental products is distributed asymmetrically between supply and demand, primarily for goods with credence attributes and for goods with experience attributes and with a low transaction frequency. It is on account of this that a great deal of opportunistic behaviour arises and the occurrence of market failure through "adverse selection" is responsible for inefficient market allocation and possibly the missing of market opportunities (Williamson, 1985; Kaas, 1993). In his adverse selection model, Akerlof assumes that product quality cannot be influenced by the seller (of used cars) and opportunistic

behaviour does not play an important role. Instead, many environmental characteristics of products depend on the efforts and behaviour of the producer, meaning they are endogenously and not exogenously determined. Consequently, the buyer cannot observe the quality decisions of the producer. In the case of credence attributes, the consumer may never know if the desired characteristics exist or not. This circumstance is an incentive to feigning environmental quality attributes (= opportunistic behaviour), whereby the likelihood of this depends on whether the consumer is in a position to identify the levels of quality effort by different producers. However, for environmental products with credence characteristics, consumers expect a poor level of average "green" quality and the equilibrium price covers only the average costs. Thus producers with products of high environmental quality (low environmental impacts) have no chance of establishing themselves in the market. They cannot gain a quality rent, which may be the result of a separating equilibrium for high and low quality products. Moreover, the market may break down because, ultimately—as in the Akerlof model—, only the most inferior quality will be offered.

How can consumers learn something about the product quality of goods with experience characteristics which are relevant to a few environmental products? Economic models describe how consumers can learn, for example, with repeat purchase, word-of-mouth advertising and reputation. In particular, if purchase transactions are frequent, investment in reputation such as investment in cleaner production and expensive signals is economically favourable.[5] However, these economic approaches come to a dead end if credence attributes[6] and

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5 Bagwell and Riordan (1986, 1991) developed a model where consumers enter the market sequentially. Under such conditions consumers can learn from past experience. Product quality may improve if the uninformed consumer can use earlier experiences gained by himself and others (McFadden and Train, 1996). Numerous works deal with information problems regarding repeat purchases because the danger of opportunistic behaviour depends on whether or not the relationship between the seller and buyer is based on a single or a repeat purchase. With repeat purchases, the choice depends on the individual experiences of the buyer. In this situation, the reputation of the supplier is a decisive, purchase-influencing factor. Leland (1979) and Shapiro (1983) demonstrated that reputation may signal high quality. Rogerson (1983) considers the role of reputation and word-of-mouth advertising to assure product quality. Other methods which may do the same are warranties and advertising (Kihlstrom and Riordan, 1984). Reputation means that against the background of former experience (they obtain high quality status if high quality was announced) the consumer trusts the product information of the seller. The quality-bonus model by Klein and Leffler (1981) and Shapiro (1983) and the models by Kreps and Wilson (1982) and Milgrom and Roberts (1986) demonstrate the impacts of reputation on product quality (Tirole, 1997). For a repeat sale mechanism, the seller has an incentive to take quality preferences into account and the net present capital of investment in reputation (quality) is higher than net present capital of "milking" the reputation (announcing high, but selling low quality) (Milgrom and Roberts, 1986; Kihlstrom and Riordan, 1984; Shapiro, 1983; Klein and Leffler, 1981; Tirole, 1997). If buyer and seller do not co-operate frequently, then the investment in reputation depends on whether the buyers recognises quality sufficiently fast and how often they buy the product. Products like cars, washing machines, television sets, etc. might be purchased on an infrequent basis and experience is of little value. If, on the other hand, the transaction takes place regularly and the time horizon is infinitely long, the future profits of high quality products are usually bigger than the one shot cost savings of low quality (Allen, 1984). In this case, firms invest in reputation and specific assets such as logos or an expensive sign promoting the firms or the product name. The existence of specific quality attributes depends on the price bonus for quality. In market economies with free entry such a price above the marginal cost is possible if sunk costs are a barrier to entry. Shapiro (1983) interprets low introductory prices (for experience goods introductory prices induce future de-

strong information imperfections exist (Caswell and Mojduszka, 1996). The reputation models for markets for experience products are not suitable for goods with numerous environmental attributes because consumers generally cannot form a complete judgement on environmental product quality. In most cases involving environmental products, the buyer does not recall having immediately experienced any environmental product qualities, or only a very few at the most. Nor can environmental product quality be experienced through repeat purchases. Credence attributes permit opportunistic behaviour because the buyer cannot recognise the degree of truth of the statement by the seller and has no chance of verifying the product's "green" attributes through experience (Morris, 1997). Many food manufacturers, for example, advertise their products with ecological qualities (organic food, etc.), even though the raw materials may originate from conventional farming (Kaas, 1993). What must also be taken into account is the fact that the more willing consumers are to pay a price bonus, the faster low-quality sellers will enter the market. Market failure caused by situations of adverse selection is ascribable to the lack of opportunity on the part of consumers to distinguish between environmentally superior and environmentally damaging suppliers (Kaas, 1993). Producers will readily mislead consumers about the environmental impacts of their products if transaction costs and bounded rationality (Williamson, 1985) remain the barriers which effectively prevent the consumer from identifying the environmental quality of products. This danger is particularly prevalent in the case of products with credence characteristics. Where information distribution is asymmetric, all suppliers tend to ascribe environmental attributes to their products without actually offering them. The producer is not interested in producing quality and the consumer is unable to identify the quality. There are no economic separating equilibria with different prices corresponding to the range of demands between high and low quality. And there is no price bonus as a reward for high-quality, environmentally superior products.

Compared with perfect symmetrical information and different market equilibria for high and low product quality, the situation as regards asymmetrically distributed information in the context of environmental products is as follows:

- manufacturers and sellers have no motivation for offering high quality "green products",
- companies are not sufficiently interested in preventing environment risks,
- consumers cannot choose environmentally less harmful products because the relevant information for making such a choice is unavailable, and

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mand) (Tirole, 1997) as sunk costs. In our context, sunk costs may be a low sales volume at the beginning, as well as specific investments in environmental abatement and pollution control technologies. These investments must be sufficiently high to fend off opportunistic firms.

6 For further literature concerning goods and services with credence attributes, see Smallwood and Conlisk, 1979; Rogerson, 1983; Krouse, 1990; Wolinsky, 1995; Ekelund, Mixon and Ressler, 1996; Emons, 1997.

– the level of environmental externalities is higher at all stages of product life.

To sum up, markets for products with search attributes are, in general, able to produce this information relatively easily, for example, by search activities. However, environmentally superior products are dominated mainly by credence attributes. In contrast to a situation with symmetric information, the demand for, and hence also the market share of these types of products, is too low and the environmental damage is too high. As long as a situation of strictly asymmetric information exists, manufacturers are not interested in the environmental impacts of their products, adverse selection occurs and customers have no opportunity to realise their environmental preferences by choosing environmentally superior products. How should institutions be designed if we attempt to overcome this market failure by obtaining a separating market equilibrium for products with high environmental quality?

3.2 Overcoming Market Failure

The situation of asymmetric information between sellers and buyers causes serious problems for as regards market efficiency. For a single customer it is difficult to estimate and evaluate the environmental effects of different products. Since information regarding product quality attributes is of value to the consumer, one would expect the development of a market in which firms act as reviewers and offer their judgements for sale (Faulhaber and Yao, 1989). This possibility of overcoming market failure may fail if consumers are afforded public access to the review judgements. Additionally, in an ideal Arrow-Debreu-world, the consumer would be able to ensure product quality by contract, but this contractual solution to the problem of market failure would also fail because the transaction costs of obtaining the necessary information for judging contractual outcomes are prohibitive. Moreover, information about environmental product quality may in some cases of this context have the characteristics of a public good, and private production of the necessary information for judgements may therefore be inefficient. However, the sellers of high quality are interested in publishing information about the quality of their products. And, in our search for a more realistic way of overcoming the outlined dilemma we encounter ”counteracting institutions” (Akerlof, 1976; Viscusi, 1978; Gal-Or, 1989; Rosenman and Wilson, 1991) which can signal high environmental product quality.

The overall purpose of the environmental label derives from the intention to overcome market failure caused by information asymmetries. An ecolabel is a kind of "counteracting institution". That is to say, ecolabelling could be interpreted in terms of Spence (1974) as a signal for quality. Ecolabels provide information about the environmental self-restraints of the companies responsible for a higher “green” product quality. If this information is to influence consumer behaviour, it must be based on reputation or it must be a credible signal for the

buyer. In general, sellers and manufacturers have different possibilities of signalling product quality. The establishment of a product brand, for example, is conceivable. Another solution, —more interestingly in our context—is certification, which is often established for goods and services with credence characteristics (Ekelund, Mixon and Ressler, 1995). Ecolabelling is a kind of certification using a specific label to express particular product qualities. However, signalling quality by labelling products requires a reputable certification agent whom consumers consider trustworthy (Caswell and Mojduszka, 1996). Against this background the original purpose of environmental labelling programmes is, among other things, to allay consumer confusion and scepticism concerning environmental claims made by marketers. A whole deluge of environment-oriented statements, declarations, indications or signs emerges in the marketer's response to an increased environmental awareness among consumers. The potential for deception in environmental claims made by marketers and the extensive diversity of environmental terms and signs gives rise to the fear that consumers may become confused. Therefore credibility and low transaction costs for the consumer by identifying environmentally superior products are the crucial points.

For the sake of credibility, environmental labels need impartial institutions—the accreditation bodies—to certify products which conform to a high environmental standard. In general, certification establishes standards which inform the consumer about quality levels, meaning that the certifier sets up a scale of measurements corresponding to current quality levels. Certification can, therefore, be viewed as a labelling scheme whereby any seller whose quality level exceeds a certain standard is allowed to use the label (Shapiro, 1986; Viscusi, 1978; Leland, 1979). The incentives for the producer to demand certification are the rents of a separating high-quality equilibrium. However, increasing costs for screening and monitoring imply a reduced demand for such services (De and Nabar, 1991).

Certification schemes for screening and monitoring product quality based on clear environmental criteria and designed by a competent body of verifiers make ecolabelling credible for consumers and increase the reputation of the label. Under these circumstances ecolabelling reduces evaluation and comparing costs for consumers (Foss, 1996) and consumers can, therefore, discriminate between high and low quality products. What must be taken into account here, however, is the fact that such environmental labelling schemes are mainly applicable to a limited number of types of products. For a successful application, the product has to fulfil certain preconditions. In particular, the quantity of environmental attributes should be limited in order to avoid an unfeasible complexity of life cycle assessments. The product must be produced with a limited number of input factors and auxiliaries because these have their own broad range of environmental impacts. Thus, environmental labelling schemes for products with considerable and multiple environmental impacts, e.g. automobiles, are hardly likely to be established.

With the aid of environmental labelling, the credence attributes of environmental products can be turned into search attributes which are recognisable at the point of sale. To this end, general standards, standardised threshold values and ecolabelling criteria play a basic role. Complex environmental product attributes which fulfil particular standards can be reduced to a single statement of standard compliance, the ecolabel, which is visible prior to purchase. Moreover, standards provide a basis for the consistent application of ecolabel schemes and thus increase credibility. Since standards are written down, they promote objectivity and transparency, and they increase the acceptability of ecolabelling programmes if they reflect the preferences of involved parties (Ervin and Elliott, 1997).

Certification acquires credibility on the strength of expert judgements. As mentioned above, the crucial point is to change environmental (credence) attributes into verifiable characteristics. Here an accreditation body has the task of screening new entries into the label programme and controlling the incumbent firms. Being an intermediary which verifies quality, it acts as an agent for the consumer (Lizzeri, 1994; Darby and Karni, 1973). This enhances the reliability of the ecolabel, and the label becomes a product-promoting tool for the producer (Bourgeon and Coestier, 1996). A creditable certifying ecolabel needs impartial accreditation bodies, efficient control and sanction systems for new producers and incumbent producers. Only then can the consumer believe the label to be a credible barrier to entry for producers with low environmental product quality. This is the basic prerequisite for a separating equilibrium for high and low quality products. However, we must also take into account the fact that the certification (screening and monitoring) process may be incomplete because of the control costs for stochastic quality tests (Nalebuff and Scharfstein, 1987; Otway and Wynne, 1989; Mason and Sterbenz, 1994). Due to the screening and monitoring costs, information about poor quality will never be perfect. However, if the probability of a correct classification of a producer is higher than the probability of misjudgement, a separating market equilibrium may still exist (De and Nabar, 1991).

Certification is both an instrument for changing environmental credence attributes into verifiable characteristics and a method of reducing the consumer's information costs. However, not just the information costs of screening and monitoring are relevant to the problem of overcoming market failure, but also the information costs of consumers. At the point of sale consumers need condensed information about the environmental superiority of the certified product. Ecolabels can significantly reduce the information costs of consumers incurred in gathering, processing and evaluating the environmental information necessary for purchase decisions. A single sign therefore seems best able to satisfy some of the prerequisites of successful environmental labelling, i.e. the provision of utility incentives for consumers and the conveying of comprehensive environmental product information. Furthermore, a single sign avoids an "information overload" situation (Jacoby, 1984) which can be caused when limited information processing ability is confronted by large amounts of information. Moreover,

some studies have shown that consumers have only a limited comprehension of product-related environmental information (for example, see Morris, Hastak and Mazis, 1995). Therefore detailed information about the specific environmental characteristics of the product does not seem necessary. However, a single ecolabel sign conceals all underlying assumptions, methodological reductions, data failures and decisions (Wynne, 1994). For example, some consumers with a developed environmental awareness and understanding might not feel sufficiently informed by a single label in order to judge for themselves the products' attributes based on the background of their own environmental problem weightings, preferences, and damage knowledge (Scammon and Mayer, 1993). Consequently, accurate information must be made freely available, especially with regard to the underlying evaluations of the product's environmental impact.

Regarding long-term environmental and economic impacts, the environmental improvements of ecolabelling programmes depend largely on the ability of ecolabels to provide appropriate incentives for product innovations. Product-related environmental advancements can be made in many ways. The feasible set of measures encompasses, for example, an increase in the lifetime use of a product, input substitutions (e.g., less toxic materials), redesign and reformulation of products (see Shen, 1995, for example). All measures aim to reduce the use of ecological resources or diminish the quantity and damage of emissions. Environmental labels reflect only a part of the whole range of product improvements because of the limited environmental criteria which they take into account. In particular, when environmental labelling schemes focus on a single criterion (e.g., recyclability), possible environmental advancements made in respect of other environmental attributes of the product remain unrewarded. In general, environmental labelling schemes may not only channel investments in research and development towards just those products which are considered by the ecolabel scheme (Hale, 1996; Morris, 1997), but they may also attract improvement measures for product attributes which are encompassed by the environmental criteria scheme. Furthermore, ecolabel schemes are generally a 'pass-fail' system (Smith and Potter, 1996). This certification system provides fewer incentives for further environmental product improvement once a product has been awarded the ecolabel.[7] The certification body must therefore furnish constant proof as to whether adjustments of the quality criteria are necessary for further innovation.

The environmental improvement effects of ecolabelling may be uncertain or even adverse if the environmental improvements per unit, created by the redesign and reconstruction of the product, are neutralised by an increase in the amount of products sold and hence by a larger total magnitude of environmental damage. Mattoo and Singh (1994) model a situation of ad-

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7 Maxwell (1998) provides a model of a dynamic situation in which the existence of a minimum quality standard may reduce the incentive for quality improvements of products if producers anticipate the further upraising of the standard.

verse effects on the environment, where increasing demand and willingness to pay for ecolabelled products can result in increased production and supply of both ecolabelled and unlabelled products.[8] However, the number of consumers who are extremely willing to pay for environmentally superior products is relatively low because of the public good character of the natural environment.

3.3 Regulation of Environmental Labelling

3.3.1 Critical Analysis of Regulatory Requirements

As already mentioned, the accreditation body is responsible for ensuring that ecolabelled producers produce a specific level of environmental quality. The institutional system and background of the accreditation body therefore play a crucial role as regards the effectiveness of environmental labelling. We can distinguish, in an abstract dichotomy, between private and public ecolabelling systems. Governmental or private bodies grant approval based on standards for specific product qualities, and screen firms which enter the label system and control incumbent producers. The accreditation is based on agreements concerning the entrance criteria, disclosure rules and monitoring system. Certified members are charged for the screening and monitoring costs. Besides the governmental provision of an ecolabelling programme, different producers may join forces in founding an environmental labelling organisation with its own private programme. Firms might also offer services as intermediaries which review and certify product quality (Biglaiser, 1993; Lizzeri, 1994). Different accreditation bodies offering alternative ecolabelling schemes would then compete for the certification of private companies (Lizzeri, 1994) and the producers decide whether they wish to take up the certification service or not.

Firstly, let us consider whether or not private firms offering high environmental quality have the incentive to establish an ecolabel. The main incentive for creating an environmental labelling scheme is the rent for the group members achieved through higher prices (Schmutzler, 1992). This is compatible with the results of the theoretical approaches to product quality because quality rents are necessary if high quality production is to be attractive for producers. The same incentive works when several producers utilise one label for the promotion of their products. Such a co-operation can be permanent and stable, because the incentive to produce high (environmental) quality increases as the group's reputation improves (Tirole, 1996). Being able to participate in the higher rent is the incentive for remaining in the high quality group. Discipline is sustained by the threat of exclusion from the label. The label organisation must at all events defend its reputation, because if firms defect from the labelled

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8 Moraga-González and Padrón-Fumero (1997) model similar adverse effects on the level of pollution in a market caused by different instruments of environmental policy (technology subsidisation, maximum emission standards and ad valorem taxes).

quality, the demand for all labelled products will decrease. The prerequisites for the success of such a reputation scheme are well functioning internal mechanisms of quality control and the external acceptance of quality by the market.

Secondly, we must ask whether government organisations are superior to private organisations in developing ecolabelling criteria and collecting and processing information on the environmental impact of products. Regarding the environmental criteria of governmental or private ecolabel programmes, the quality of criteria schemes is determined by both the number of different environmental aspects being considered (e.g., the set of environmental damage for which threshold values are defined) and the stringency of the criteria (e.g., the relative 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 institution may install a broad set of environmental criteria with strict values in each category just as well as a government institution. Access to environmental knowledge and the internal criteria-setting procedures (especially those of the consensus-forming kind) determine the results of the criteria-setting process and hence the quality of environmental criteria schemes.

In the first place, the question of access to basic environmental knowledge (e.g., knowledge of ecology, cause-and-effect relationships) has to be separated from the question of producing specific knowledge about the products under consideration (e.g. specific amounts of releases in the environment). The results of basic environmental research are, in general, available to the public because of their public good character and the fact that their provision is state-subsidised. In this context, it seems worth noting that, for some consumer products targeted by ecolabelling programmes, scientific research and public discussion are so advanced that public access to information is afforded not only for governmental but also for private programmes with a view to deriving a broader set of environmental criteria than those already existing and to establishing a scheme of more stringent threshold levels. However, specific environmental knowledge concerning the products under consideration can involve extensive costs. This is the case, for example, when new products have to be analysed with comprehensive life cycle assessments or ecobalances (see chap. 4.2). The possibility of bearing these costs seems not so much a question of whether a governmental or private institution runs the programme. It seems to be more a question of whether consumers recognise and pay for high quality environmental products labelled after expensive environmental product evaluation. For the results of the criteria-setting process and hence for the quality of ecolabelling schemes, the internal methods and procedures of the ecolabel programmes seem more decisive. These are, in particular, the method of processing environmental knowledge and the procedure for arriving at a consensus, or the composition of the persons participating in the criteria-setting process.

Regarding the alternative accreditation bodies, there is little necessity for governmental intervention if governmental reviewing involves more or less the same costs and opportunities as private evaluators (Darby and Karni, 1973). Nevertheless, some economic models demonstrate the superiority of public labelling systems (e.g., Bourgeon and Coestier, 1996) and may give rise to some regulation tasks:

- When considering private ecolabel bodies as professional associations for certification, we have to take into account the fact that for certifying associations the right to control entry derives from the right to control certification. With entry control, ecolabel bodies may act like a monopoly, offering too few certificates and charging too high prices (Shaked and Sutton, 1981). Furthermore, since private ecolabel associations reflect the producers' interests, they choose a standard that maximises the companies' profits. Private standards for certification may be inefficiently high or low (Leland, 1979; Shapiro, 1983; Tirole, 1997). The incentive for producers to provide quality depends on the marginal willingness of consumers to pay for quality. In the case of a monopoly, the producer's decision to maximise his profit depends on the marginal willingness of the marginal consumer to pay for quality. On the other hand, for maximising consumer surplus, the quality preferences of the average consumer's marginal willingness to pay are decisive (Tirole, 1997). If the marginal willingness of the marginal consumer exceeds that of the average consumer, the product quality of the certification system is too high compared with the social optimum. Otherwise it is too low (Leland, 1979). Bourgeon and Coestier (1996) indicate results concerning the question of a private or public label institution from a social viewpoint. In the case of a publicly organised label, different models operate on the assumption that the labelling board reflects public interests and maximises social welfare. If the activities of a public management board are based on consumers' rather than on producers' interests, quality control is more intensive and the average quality level is higher compared to private labels (Leland, 1979; Bourgeon and Coestier, 1996).
- Lizzeri (1994) and Albano and Lizzeri (1997) examine further problems of private accreditation bodies. As intermediaries or middlemen (Biglaiser, 1993; Biglaiser and Friedman, 1994) the bodies are better able to develop and monitor certification criteria than consumers. Consumers trust in the judgement of accreditation bodies because the maintenance of a good reputation is important for the future profitability of the bodies (Biglaiser, 1993). Therefore intermediary bodies increase market efficiency. However, as monopolists, bodies may increase their profits by pooling firms with high and low environmental product quality, thus additionally gaining the fees of low quality producers (Lizzeri, 1994). Consequently, the discrimination between firms with high and low environmental product quality may be too weak. However, in this context, we must take into account the fact that poor

discrimination between product qualities decreases the credibility of labels and high quality producers would have an incentive to leave the label scheme.

- Additionally, certification creates a kind of network externality which may be an obstacle to sufficient private provision (Wilson, 1983; Holmström, 1984; Inman, 1987). It can be observed in some (telecommunication) network industries that the value of the network technology for the individual user increases in relation to the increasing number of users who adopt this technology. Similarly, the value of an ecolabelling scheme depends on the actual number of firms using the ecolabel. A large number of ecolabel users may contribute to the popularity of the ecolabel scheme, and this in turn is valuable for a firm's environmental advertising. However, the establishment and operation of an ecolabel programme, and the applications for it, are costly for companies. High establishing costs concentrate on one or a few companies while many gain utility from a later application. Hence individual firms may not be prepared to contribute to, or participate in, a private programme unless it is also adopted by a certain minimum number of other users. In some cases, therefore, the critical mass of users may be too small for the development of a private ecolabel scheme.

3.3.2 Regulation Capture

Irrespective of private labelling activities in some countries, governments or multinational organisations such as the European Union offer many public environmental labels. Regarding the ecolabelling institution on the one hand, the objectivity of environmental criteria setting and the balance of the involved interests might be obtained through government involvement. On the other hand, public ecolabelling programmes are bound by democratic procedural requirements which may cause costly and time-consuming decision-making and application procedures (Wynne, 1994). From this point of view, private programmes seem to be more efficient and flexible. Furthermore, public programmes may be vulnerable to the political pressures and undue influences of diverse interest groups (see West, 1995, for example). Not only politicians, but also environmental and industry pressure groups and public environmental bureaucracies are involved in the development of public ecolabels. The degree of lobbying severity depends on the transaction costs of the pressure groups, which in turn are determined by the group size and orientation of the internal interests of group members (Olson, 1965). Compared with consumers, the producers in particular are a relatively small group with relatively homogeneous interests. Here lobbying takes place if the rents are large enough to cover lobbying costs. From the economic theory of lobbying of accounting standards (Sutton, 1983; Sunder, 1988), we know that lobbying is most productive if the preferences of the decision makers are still undecided (Sutton, 1983) and a broad scope for decision-making exists. For example, since life cycle assessments are based on numerous simplifying assumptions and suffer methodological obstacles (see chap. 4.2), the evaluation of environmental

impacts and hence the setting of environmental criteria are open to manipulation and can initiate a "battle of experts" (Menell, 1996). We cannot therefore conclude that public systems are always superior because labelling policy may be distorted by the personal interests of the bureaucrats and other protagonists, such as politicians, industry and consumer organisations:

- Politicians play an active role because public environmental labels need government decisions at a national or international level. Politicians promote such ecolabel schemes because they are a means of increasing their popularity among voters with "green preferences" and moreover, without considerable cost for the public budget. However, politicians are not only agents for consumers with high environmental preferences, but also have personal preferences regarding the outcomes of ecolabelling schemes. The way their interests are directed in the process of criteria selection etc. also depends on the influence of producer pressure groups with high and low environmental quality products. The political process thus favours those pressure groups which are most willing to give politicians electoral support (Morris, 1997). Policy failure may incorporate other objectives into the labelling policy (for example, protectionism: see chap. 3.3.4) or discrimination between high and low quality producers being too weak or too strong. They benefit from the below mentioned methodological problems which are responsible for the discretionary power of the competent bodies. However, the exclusion of involved pressure groups from the process of the development of public labelling is no alternative because they have the necessary extensive knowledge about production technology and about the impacts of products on the natural environment.
- Programmes for public labelling have often been initiated by public environmental agencies and non-governmental environmental organisations (e.g., Friends of the Earth) (Morris, 1997). Environmentalist organisations represent specific public preferences for high ecological quality. Board members achieve increasing political influence when they initiate labelling programmes and participate in the public reviewing process. They share an interest in high ecological criteria with the environmental bureaucracy. Members of administrative agencies are specialists and are usually well informed about the environmental impacts of products. Thus they play an important role in the labelling process. It must be realised, however, that they are acting on their own behalf. The interests of the bureaucrats are derived from their interest in justifying themselves by permanently making rules for the labelling scheme (e.g., Sunder, 1988). Moreover, bureaucratic performance is often measured by the frequency with which initiative is taken in regulating the certification and control process. Consequently, we would expect a tendency towards an overproduction of quality criteria and monitoring activities (Sunder, 1988; Niskanen, 1994), and the result may be a time-consuming procedure for awarding ecolabels. The bureaucratic process of certification therefore increases the cost of products with high environmental quality and is

not necessarily compatible with consumer preferences and their willingness to pay for environmental product quality.

- The lobbying activities of consumer organisations and industry pressure groups may restrict the above mentioned tendencies. Usually, consumer organisations are more interested in product attributes primarily affecting the health of individuals and their private utility value. Thus ecological criteria may be less important to consumer organisations. They share these interests with producer pressure groups, who may offer lower environmental product quality than the environmentally leading firms. These producers may lower environmental product standards and the threshold levels of environmental criteria because they are interested in a pooling equilibrium with a low quality supply, which reduces the cost of quality.

Because of the influence of different interest groups, the results of the decision making processes concerning ecolabelling schemes are not foreseeable. The personal interests of the participating parties can at all events distort the original objectives of ecolabelling schemes.

3.3.3 Competition between Ecolabelling Programmes

To mitigate the aforementioned problems of regulation capture, we can envisage opportunities for competition and the free market entry for new (private) ecolabel programmes. Firstly, the theory of economic regulation indicates that public monopolies for certifying are used by producers as a barrier against competition (Stigler, 1971; Shaked and Sutton, 1981). In our context, the producers of low environmental quality goods may benefit by a pooling equilibrium and try to prevent competition from high quality producers who band together to set up their own label. Restrictive competition practices, however, become vulnerable to attack if the right for private labelling programmes exists (i.e. allowing additional certification schemes; see Shaked and Sutton, 1981) and the price bonus for environmental quality is sufficiently high. Secondly, practical use has shown that ecolabel programmes and private ecolabels from environmentally innovative producers and their associations or from environmentally conscious retail organisations create competition with the (well established) third-party ecolabel programmes (see Brian, 1997, for one example). Here, environmentally superior manufacturers determine a common product standard which they can meet relatively easily with their environmentally advanced production methods and product designs. Since government ecolabelling programmes generally give consideration to diverse social groups in their ecolabelling procedure, a consensus based procedure sets the environmental product standards in which the least environmentally advanced producers may influence the average results. The competition arising from new (private) ecolabels may intensify the credibility of programmes if, for example, the quality of the environmental criteria schemes is visibly enhanced for consumers in comparison with other ecolabels. Additionally, the parallel existence of different

ecolabelling programmes afford consumers opportunities of choice. According to their environmental preferences and willingness to pay for different environmental qualities of products, consumers can choose between different stringent ecolabelling schemes and their ecolabelled products.

However, environmentally less advanced producers may also join forces in establishing an environmental labelling programme, simulating high environmental quality with their own environmental labels. Potentially they agree on a lowest common denominator. In order to resolve problems of fraudulence with ecolabels, additional institutions (fourth parties) would be needed to investigate and compare different ecolabel programmes by observing the quality of environmental criteria schemes, the internal procedures and participants, the utilisation of environmental knowledge, the monitoring and sanction procedures of applicants' compliance, and the financing of programmes. Moreover, they could also detect undue influences of certain interest groups. The revelation of their findings could help environmentally conscious consumers to compare programmes and their ecolabelled products at the point of sale. Both, governmental or private fourth party institutions are conceivable, depending on their possibility of reviewing, verifying and qualifying ecolabel programmes completely independently of their subjects of investigation. On the one hand, regional and national government agencies possess or can be endowed with legal authority to monitor and penalise programmes with false claims. Additionally, minimum standards for the award of environmental product certificates can be set. On the other hand, private organisations, such as private test or research institutes, have the possibility of commenting on the decisions and procedural aspects of ecolabel programmes and thus scrutinising the credibility of programmes.

Furthermore, competition is also a means of preventing "lock-in" effects. In the context of environmental labelling, "lock-in" effects describe the possible path dependence if the ecolabel scheme establishes and confirms product requirements which may favour inferior technologies (Morris, 1997). If ecolabelling standards induce specific technologies and investments and if certain criteria can be reached only by the application of specified technologies, then the co-operating firms will still favour a specific technology path whether superior technological alternatives exist or not. The product variety may be reduced as well because it is limited by the possibilities afforded by the chosen technology. Labelling competition prevents the development of a situation in which only one or just a very few technologies are favoured and prevents a possible reduction in product variety because different ecolabel programmes promote different product and technology alternatives. Producers can apply for those ecolabel programmes which correspond to their environmental protection capabilities and their preferences for certain market niches.

Free competition between different ecolabels assists discrimination between high and low environmental product quality, though the transaction costs for the consumer increase because additional information regarding different ecolabel programmes have to be gathered and proc-

processed. The question arises as to whether buyers (with bounded rationality) are able to compare the schemes and their different systems (Menell, 1996). In order to ameliorate problems of comparison, the fourth parties can support consumers by establishing, for example, scoring systems for measuring the respective environmental quality of each ecolabelled product. Regarding the fourth parties, however, it is necessary to ensure that they have access to the necessary information and knowledge for the purpose of comparison and are in themselves free from undue influence.

3.3.4 Protectionism

A further question concerning the regulation of ecolabelling programmes relates to the impacts of national ecolabel programmes on international trade. It is often mentioned that ecolabel programmes, especially governmental ones, and in some cases private programmes with governmental intervention, and their specific product requirements may act as trade barriers against foreign producers to the advantage of domestic manufacturers. Several aspects of discrimination seem to favour this circumstance, even though most ecolabel programmes are voluntary and formally open to foreign companies and require no different participation conditions. Moreover, voluntary environmental labelling is, in general, approved by the General Agreement on Tariffs and Trade (GATT), thereby avoiding more severe trade-related national measures of environmental policy (Schlagenhof, 1995). The protectionism threat emerges because environmental criteria which require specific processes and production methods, the so-called PPM-related criteria (Staffin, 1996; OECD, 1994), may especially hamper foreign producers in attaining the national ecolabel. On the one hand, the comprehensive product life cycle approach for the environmental criteria scheme necessitates the inclusion of the production process and therefore criteria regarding the production process must be set. On the other hand, the required production methods, which may be common in the country where the ecolabel programme is settled, may be inappropriate or not present in the country of the foreign manufacturer. This seems particularly plausible for developing countries where specific advanced production methods and technologies may not be available. In such cases, foreign producers are compelled to import the specified technology. A similar problem arises if the ecolabel scheme considers the use of specific raw materials or input substances. In some cases, these materials might be difficult to obtain for foreign producers (UNCTAD, 1994; Rege, 1994; Shams, 1995; Vossenaar, 1997; Markandya, 1997; Chang 1997).[9]

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9 Examples are the ecolabel criteria for kitchen rolls, toilet paper, and copying paper established by the European environmental labelling scheme. The relevant environmental criteria address the production phase of the considered paper products. They consider several emissions, energy and resource use during the production process and require sustainable forest management. In particular, the criteria for copying paper considers the use of recycled paper. Foreign producers deem the production-related requirements as trade barriers. For example, Canadian and Brazilian paper and pulp producers complain about the recycled content requirements because their products have a high virgin paper content (Staffin, 1996; OECD, 1997).

Environmental labelling programmes may orientate the development of environmental criteria towards the specific environmental preferences, priorities, capacities and technologies of the country of origin of the programme (OECD, 1997). These conditions may differ from those of the producer's country. To illustrate, the programme may establish environmental criteria in respect of relatively low levels of absorbability of the local environment. Product and process alternatives which are acceptable in view of better environmental conditions in the manufacturer's country may be neglected. Furthermore, the product alternatives which are valued as environmentally superior may also depend on the national potentials of environmental infrastructure (Vossenaar, 1997). For example, criteria-setting takes into account the national possibilities of sufficient waste treatment and recycling which may differ substantially in other countries. Thus, in some cases, the criteria relating to the specific national infrastructure may be inappropriate for foreign applicants.

A more serious discrimination problem may arise from the de facto deficient transparency of the development of ecolabel schemes for foreign manufacturers. In contrast to domestic producers, they may not participate in, or influence, the development of environmental criteria and other ecolabelling standards. The result is a biased criteria-setting favouring domestic producers caused, among others things, by a lack of information about foreign manufacturers (Shams, 1995).

To mitigate the problems of potential trade effects of governmental and partly of non-governmental programmes, international agreements exist or are yet to be elaborated, such as the World Trade Organization (WTO) Agreement on Technical Barriers to Trade (TBT) (Rege, 1994; Liu, 1997; Ward, 1997) or an independent multilateral agreement (Chang, 1997). Such measures can achieve several objectives, such as the availability of information, possibility of involvement in programme development, harmonisation of standards, or mutual recognition. They attempt, in particular, to avoid PPM-related criteria for product categories where imports from foreign countries are predominant. Further improvements of the public review process during environmental labelling procedures are envisaged. Moreover, technical assistance and capacity-building efforts for ecolabelling can be granted as the first steps towards the establishment of ecolabel schemes in developing countries and countries in transition. Mutual recognition may follow, such as the recognition of testing and verification methods and bodies (UNCTAD, 1994; Vossenaar, 1997).

To sum up the results of economic analysis, we have seen that environmental labelling, irrespective of whether it is private or governmental, is a possible means of overcoming market failures caused by asymmetric information relating to the mainly credence attributes of environmentally superior products. The essential prerequisites here are reputable certification agents for screening and monitoring environmental product quality. The agents' credibility is the crucial point as regards the solution to the problem of market failure. To attain credibility,

appropriate institutional arrangements, such as expert judgements, an impartial accreditation body, efficient control and sanction systems are indispensable. We find governmental-private hybrid approaches of ecolabelling programmes in literature and practice. Institutional structures of programmes involving a well-balanced participation of governmental, semi-governmental and private parties should permit the circumvention of some of the problems arising from a purely governmental or a purely private approach (see Grodsky, 1993, for example). For instance, the participation of government agencies should endow the ecolabel programme with the desired environmental reputation and credibility and should also provide environmental knowledge and technical resources. However, it is not easy to formulate uncontroversial recommendations about the institutional programme design, because there is too little knowledge about the behaviour of the bureaucratic, political, economic, and other actors. Many questions about appropriate institutional arrangements of ecolabelling programmes are left for further research.

Competition and the free market entry for additional ecolabel programmes may contribute towards credibility because different programme suppliers may compete on credibility. Further institutions (fourth parties) also appear necessary, especially for observing the quality of environmental criteria schemes established by the different programmes, or detecting undue influences of certain involved interest groups, because ecolabelling programmes are dependent upon the knowledge and information support of the involved parties. In extreme cases, a so-called "battle of experts" can occur within the ecolabelling scheme. Moreover, the intervention of partial interests, which may divert the results of ecolabelling, are probable when methodological problems bring uncertainties and discretion in their wake. This is presented in the following sections. Within the entire structure of the ecolabelling scheme, the broad range of methodological deficits affords opportunities for manipulation by interest groups.

4 METHODOLOGICAL PROCEDURE AND PROBLEMS

A case study of the OECD (1997) concerning a selection of environmental labelling programmes demonstrates that ecolabel programmes are developed by means of similar procedures. It encompasses product group selection, environmental criteria development, public review process, adoption of final environmental criteria, application, testing and verification, and awarding the licence (the following procedural description is based on German Federal Minister for Environment, 1990; Salzhauer, 1991; OECD, 1991; US EPA, 1993a; Mödl and Hermann, 1995; Hale, 1996). This procedure for the development and application of environmental labelling schemes is assumed to be applicable to the current operation of the most of the environmental labelling programmes. The general pattern of environmental labelling

schemes can be divided into the above-mentioned parts, which can run simultaneously for different product groups. The individual parts of the environmental labelling scheme can be conducted and administrated by different institutions and competent bodies. An independent research institute, for example, can perform the life cycle assessments.

During the practical implementation of environmental labelling concepts, several methodological obstacles and limitations arise. The problems occur at nearly all stages of the environmental labelling procedure and not only show some deficits in the scientific foundation of the schemes but also jeopardise their credibility (Shams, 1995). In addition, methodological uncertainties provide a broad field for the influence of interest groups because decisions within an unstable methodological framework can be channelled in favour of special interests.

4.1 Product Category Selection

At the product category selection stage, the environmental labelling institution decides which product category or product group should be selected for the development of an environmental label scheme. The decision is often based on estimations of the ecological, market and on the trade effects resulting from the establishment of the ecolabel. Issues considered may include the potential of environmental improvement or the feasibility of establishing and operating the label. They may also include several market characteristics, such as market structure and availability of the product, potential success of the ecolabel, production structure and competition. Some ecolabelling programmes afford manufacturing or retailing companies an opportunity to propose product groups for ecolabel development. The products belonging to the product group selected are product alternatives, that is to say, functional equivalents, meaning that the products being compared fulfil similar purposes, give similar performances or render similar services. For assuring functional equivalence, functional units of the considered products are defined. A functional unit is a measure of performance which the considered product has to fulfil, for example a particular degree of coverage or protection when packaging alternatives are considered.

Methodological uncertainties begin even at the product group selection stage. The selection seems arbitrary because, on the one hand, products of a product category are often not perfect (functional) substitutes. Products usually have different attributes which fulfil particular requirements for consumers so they are rarely exact functional equivalents and they seldom provide identical services. On the other hand, products with multiple uses are assigned to only one product group (Wynne, 1994; Shams, 1995; Morris, 1997). Under such circumstances it could be the case that either vaguely comparable products are compared, or dissimilar substitutes, which may be environmentally superior, are ignored.

4.2 Development of Environmental Criteria

The development of environmental criteria is the next stage of the ecolabelling procedure. The criteria are set for the main environmental impacts relating to the product group under consideration. To identify and evaluate the most important environmental damage, the whole life cycle of the product, from resource extraction to final waste treatment, must be investigated. This can be done in several ways, ranging from intuitive estimation (Smith and Potter, 1996) to the use of comprehensive analytical tools, such as life cycle assessments. These analytical methods are crucial for the expressiveness of ecolabels, otherwise ecolabels could not take account of the main environmental impacts of the product system and would not express the environmental superiority of the awarded products. Most environmental programmes claim to use a certain type of life cycle assessment. Frequently, they use a comprehensive one with the omission of just a few aspects of the product life cycle. In some cases, a life cycle assessment approach focusing on selected parts of life cycles is used (see table 1). Life cycle assessments—sometimes referred to as ecobalances—are conducted mainly for the purpose of analysing a single product or product group, and for comparing the environmental effects of alternative product systems. They use a matrix approach of product analysis. The matrix is based on a vertical list of the stages of the product life cycle (from raw material extraction to waste treatment), and a horizontal list of the environmental impacts of the product (for further details see, for example, Curran (ed.) 1996; Orwat, 1996). The following is a brief description of the most widely recognised method of life cycle assessment (for the following methodological description see Rubik and Baumgartner, 1992; Guinée, Udo de Haes and Huppes, 1993; Guniée et al., 1993; US EPA, 1993b, 1993c, 1995; SETAC, 1993; Boguski et al., 1996; European Commission, 1997) which has now been standardised in Standard ISO 14040 of the International Organization for Standardization (ISO) (see chap. 5.4).

The life cycle assessment begins with the (1) definition of the goal and the scope (breadth and depth, regional and time references etc.) of the analysis. The latter includes, among other things, an explanation of the methodologies used, the underlying assumptions, and limitations of the analysis. At this stage, the specifications of the functional unit are important for ensuring the functional equivalency of the considered products.

The (2) inventory analysis is the data collection and calculation of material and energy flows, which are the inputs and outputs of the stages of the product life cycle. The inventory is defined within the system boundaries. The system consists of all necessary operations which perform the functional unit. The ideal examination of the product life cycle encompasses the following operations: extraction of renewable and non-renewable resources, production of intermediate and final products, trade and distribution, consumption and use, waste treatment and the different transportation phases between stages. Cut-off criteria determine how far the operations of the product life cycle, in upstream and downstream directions are investigated. The result is an inventory table, containing ideally quantitative data about, for

example, the product's raw material and energy use, various emissions released into the atmosphere, wastewater effluents, solid and hazardous waste, and other discharges into the environment. The catalogued data is, in general, described in physical terms.

During the (3) environmental impact assessment, the potential effects of the observed material and energy inputs and outputs on ecosystems, human health, and natural resources are estimated. For this purpose, current environmental knowledge is linked to each inventory item. In this way, the total contribution of the considered product to the specific environmental problem areas is analysed. Firstly, in the (3a) classification step, each entry into the inventory table is assigned to one or more environmental impact categories, such as resource depletion, pollution or human health effects, degradation of ecosystems and landscape (see especially SETAC, 1993). During the (3b) characterisation step, the impacts in each impact category are qualitatively analysed and, if possible, quantified. In some cases they are aggregated. Quantification can be achieved by the use of so-called equivalency factors which serve to compare the specific contributions of the environmental impacts to the environmental problem types. For example, the "global warming potential (GWP)" serves to compare the contribution of different green house gases to the total green house effect and use the differences to convert the emissions into a single number. In the final (3c) valuation step, the different environmental impact categories are set in relation to each other by weighting the different categories. The purposes of this valuation step are the interpretation of the previously obtained findings and, in some cases, the aggregation of impacts. A few comparison techniques include the use of environmental policy priorities, environmental targets or critical loads. In some cases, weighting factors for several environmental impacts are used to permit the aggregation of environmental impacts into a common unit, such as "eco-points". The valuation step serves in some cases as a basis for the subsequent (4) improvement analysis. If life cycle assessment is used in ecolabelling programmes, draft environmental criteria are usually derived from it and subsequently disclosed for the public review process.

Since the development of environmental criteria is based on the evaluation of environmental impacts caused by the considered product, those stages of environmental labelling schemes are vulnerable to the shortcomings of life cycle assessments (see for the drawbacks Udo de Haes, 1993, for example). When defining the product system boundaries for the environmental impact analysis, arbitrary lines of the inventory analysis must be drawn, both in vertical and horizontal directions (Rubik and Baumgartner, 1992). Ideally, the investigation has to include all material and energy inputs and outputs (i.e. mainly the environmental damage) for all stages of the product life cycle which occurred before or after the manufacturing stage of the product. However, the resulting extensive amount of material and energy data requires vertical limits to avoid unfeasible complexity. Therefore, in an initial evaluation step, the life cycle stages with the intuitively expected main environmental impacts are chosen for further analysis. Some additional omissions of subsystems of the life cycle which initially

seem minor (e.g., minor product components or minor ancillary materials) are necessary (see in particular SETAC, 1993). Furthermore, the investigation must concentrate on the main environmental impacts within the selected stages. In other words, they must focus on special substances, pollutants or energy forms (noise, radiation etc.). This specific choice sets the horizontal restrictions for the inventory analysis. Since environmental impacts which are initially omitted may become relevant when new environmental knowledge is acquired, the horizontal selection is particularly problematic. The necessary definition of analysis boundaries may lead to the neglect of important environmental effects and hence affect the accuracy of the life cycle assessment. Moreover, the results of life cycle assessments change if system boundaries are expanded or contracted (see Guinée, Udo de Haes and Huppes, 1993, for example).

Even if product system boundaries are defined, the life cycle analysis necessitates the processing of an enormous volume of data. Problems of availability, credibility, comparability, aggregation and interpretation of the environmental product data emerge. Much information concerning environmental effects comes from life cycle stages previous and subsequent to the manufacturing stage of the considered product. This information must be obtained mainly from companies, some of which may consider the data to be confidential. The problem is further aggravated by the fact that it is sometimes impossible to acquire the necessary information. On the one hand, environmental impacts on previous life cycle stages cannot be traced back, which is understandable if we consider the fact that input materials can originate from anonymous resource markets. On the other hand, it is difficult to follow the used products and their fractions on their several ways through to final waste treatment.

In addition to the availability problems, there are currently no solutions to many of the methodological problems of data calculation. For instance, the consumer's use and handling of the product largely determine the degree of environmental damage caused in the use phase of the product life cycle. However, since consumers do not behave equally and consistently, the assumptions concerning product use and the deduced average quantities of environmental effects may seem discretionary. Furthermore, production processes result in many cases in more than one useful output, but only one of them is the considered product. With co-product allocation procedures the whole energy and material use, all quantities of pollutants and other environmental damage caused by the production process is divided and apportioned to the different outputs. Allocation method are also used if common supply sources and output services are considered. It is usual to allocate on the basis of mass (SETAC, 1993). However, it is sometimes not appropriate to apply this allocation parameter (e.g., it may be better to allocate in proportion to functions or services provided by the product) (Guinée, Udo de Haes and Huppes, 1993), though methodological deficiencies still prevail otherwise when it comes to choosing the right allocation parameter.

Publicly available databases can be the solution to both the data credibility problems, where data is obtained from previous or subsequent stages of the product life cycle, and the problem of high cost and time requirements for information production, which may prove to be prohibitive. The databases provide data modules, which are averaged data of environmental impacts belonging to comparable parts of the product life cycle (e.g., averaged energy uses for different kinds of transport). Unfortunately, these data modules may not be appropriate for all kinds of product groups or suitable in obviously similar life cycle situations.

Environmental labelling programmes include forms of environmental impact assessment and therefore suffer the problems of environmental evaluation. When serious environmental impacts of the product life cycle are selected for the further development of ecolabel criteria, the decision-making body compares and ranks different environmental impacts of the product (see also UNCTAD, 1994). This comparison is based on environmental evaluation methods which are burdened with several methodological problems (see also Wynne, 1994; US EPA, 1995). In particular, the current limitations of environmental scientific knowledge are an impediment to faultless evaluation. Incompletely observed dose-response or cause-and-effect relationships between the pollutants and final environmental damage cause difficulties in recording the impact of pollutants. In particular, the synergistic, side, reciprocal, or cumulative effects of pollutants in complex ecosystems or on human health, with incomplete estimated absorptive and adaptive abilities, complicate the estimation of impacts (SRU, 1978; US EPA, 1995). It is difficult to define, for example, the contribution of diverse substances to climatic change effects. These limitations lead to uncertainties regarding environmental impacts of material and energy flows because different sets of studies may result in conflicting opinions. As long as fragmentary environmental knowledge exists there will be disagreements as to how environmental damage can be compared.

Environmental labelling schemes always compare the different environmental impacts of the product because on the one hand they select the important environmental impacts of the whole life cycle and, on the other, they aggregate the environmental impacts. All environmental inventory and assessment information is melted down into a single information sign. Aggregation includes the use of weighting factors which are based on an evaluation and comparison of environmental impacts. However, due to incomplete environmental knowledge, the suggested conversion methods are methodologically disputable.

An additional aspect of the difficulties in evaluation is the fact that the concrete evaluation of an environmental impact is closely bound up with the ecological conditions in a spatial and time context. For example, a production activity causes different damaging effects depending on whether it is happening in an ecologically intact area, in a densely populated location, or an ecologically fragile region (Portney, 1993). Therefore, environmental criteria within ecolabel schemes primarily reflect the environmental conditions and preferences of the area in which the environmental labelling programme is established. Since production proc-

esses and product designs at all stages of the product life cycle are frequently subject to innovation, there may be changes in the whole environmental impact of the considered product and so the evaluation of environmental damage is valid only for a short period of time.

In addition, the derivation of environmental criteria from the inventory and evaluation information of the life cycle assessment is disputable (Smith and Potter, 1996). Often, life cycle assessments can make only qualitative statements concerning the hazardousness of several impacts. Given the background of the aforementioned knowledge problems, the transformation of qualitative information into mostly quantitative limits of environmental criteria is often without sufficient methodological foundation. Therefore, the derivation of environmental criteria is based on subjective opinions and consensus-forming procedures between several interested parties rather than sound scientific procedures.

Since there are, in particular, several methodological gaps and uncertainties with regard to the quantification and aggregation of environmental impacts, it has so far not been possible to find a common accepted methodology and procedure of environmental impact assessment (UBA, 1995a; US EPA, 1995). Life cycle assessment should therefore be conducted on the basis of the most progressive developments made in scientific knowledge regarding ecological concerns and, especially, the cause-and-effect linkages between pollutants and the ultimate impacts on the environment. Constant refinements and improvements of life cycle assessment methodology are necessary.[10] Nearly all environmental labelling programmes more or less attempt to recognise these requirements, and therefore involve the participation of environmental experts. The composition of the expert groups differs from one ecolabel programme to the next. They are mostly composed of representatives of the interested parties, especially environmental agencies, research institutes, consumer organisations, and environmental protection organisations. However, broader participation creates problems in itself on account of the increased complexity of decision processes, inflexibility in the opposing fundamental opinions of different interest groups, or problems of mutual perception caused by threats of data manipulation (Huybrechts et al., 1996).

To sum up, it can be said that there is currently no uncontroversial method for the life cycle assessment in environmental labelling programmes. The remaining methodological deficits of life cycle assessments and the extensive cost and time requirements of conducting them necessitate the use of streamlined versions. Methodological limitations and choices, on the other hand, make the current ecolabel results vulnerable to criticism.

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10 For further research see, US EPA, 1995 and Wrisberg, N. et al. (1997).

4.3 Public Review Process, Criteria Setting, and Application

During the public review process some mechanisms of participation and consultation are generally made available to the interested groups. The circle of interested groups at this stage mostly encompasses representatives from industry (sometimes foreign producers, too), commerce, consumer associations, environmental protection organisations, research institutions and trade unions. Interested groups are afforded an opportunity of participating in the criteria-setting process. The wide availability of information (e.g., active information dissemination, official publications, press releases, contact points, or information on demand) is a prerequisite for achieving sufficient participation. It is also important that the criteria-setting institution gives due and proper consideration to the comments and criticism on criteria proposals. In most programmes, procedural guidelines help to ensure adequate hearing and proportional involvement of the many interested parties. Usually, the decision on the adoption of the final environmental criteria is made without public participation. After the first ratification of the final criteria, the ecolabel organisation must review the environmental criteria at regular intervals or when significant technological and market developments emerge. Moreover, the latest scientific findings may often lead to an adjustment of the environmental criteria, whereby it may be strengthened, weakened or even revoked. In some programmes, the aim of criteria adjustment is to keep only a small number of labelled products in the market in order to express the selectivity and environmental superiority of the awarded products.

Usually, manufacturers or importers may apply for the award of an environmental label by sending documents to the competent body. The declarations may contain a description of environmental attributes of the product, especially its composition. There may also be guarantees of compliance with the ecolabel criteria, and in some instances, compliance with other environmental standards governing production processes. The competent body examines the statements and assesses compliance with the environmental criteria. In some cases, ecolabel organisations conduct detailed product tests. Often competitors, consumers, and environmental or consumer organisations monitor the reliability of conformity with the ecolabel requirements. In some cases, the ecolabel body carries out random checks in cases of suspected non-compliance with the environmental criteria. The body imposes fines or forbids the use of the logo when non-compliance is ascertained. In some cases, the ecolabel organisation may suggest improvements to the applicant. After a successful examination, a licence agreement is signed between the ecolabel organisation and the applicant. Generally, the competent body gives permission for the use of the logo for product advertising purposes. The application fee may be a fixed amount and/or a percentage of the sales or turnover of the labelled product.

5 EXAMPLES OF ENVIRONMENTAL LABELLING SCHEMES

The purpose of the following chapter is to provide insights into the application of environmental labelling schemes. Table 1 presents an overview of some examples of international voluntary third-party ecolabelling programmes and their main characteristics. Apparently, the number of ecolabelled products and considered product categories are mainly proportionate to the age of the respective ecolabelling programme.

Table 1: International Environmental Labelling Programmes

Country	Name of Programme	Date of Creation	Short Description – ecolabelling institution – approaches of life cycle assessment – environmental criteria	Product Categories	Products
Germany	**"Blue Angel"**	1977	– government programme; partly administered by non–government organisation – use of life cycle analysis – in some cases, criteria mainly for use and disposal phase	77 [d]	4,500 [d]
Canada	**"Environmental Choice"**	1988	– private programme – initiated by government – criteria development based upon life cycle review	98 [d]	3,000 [d]
Japan	**"Eco Mark"**	1989	– government programme – matrix use of life cycle analysis	72 [c]	2,211 [c]
Nordic Countries	**"White Swan"**	1989	– government programme – multinational programme (Norway, Sweden, Finland and Iceland) – whole life cycle analysed – production related requirements included	46 [d]	>1,000 [b]
United States	**"Green Seal"**	1989	– private programme – streamlined life cycle analysis approach – criteria for a broad range of environmental aspects	86 [d]	276 [d]
Sweden	**"Bra Miliöval"**	1990	– private programme – whole life cycle considered – production related requirements included	27 [b]	695 [b]
New Zealand	**"EnvironmentalChoice"**	1990	– government programme – life cycle assessment approach	18 [d]	60 [d]
India	**"Ecomark"**	1991	– government programme – broad life cycle consideration	16 [b]	0 [b]
Austria	**"Umweltzeichen Bäume"**	1991	– government programme – life cycle assessment oriented approaches	37 [d]	160 [d]
France	**"NF–Environnement"**	1991	– government programme – detailed use of LCA – production related requirements included	5 [b]	>200 [b]
Republic of Korea	**"Ecomark"**	1992	– government programme – streamlined life cycle analysis approach – broad range of criteria, partly single attribute	34 [d]	216 [d]
Singapore	**"Green Label Singapore"**	1992	– government programme	7 [b]	0 [b]
Netherlands	**"Stichting Milieukeur"**	1992	– non-profit foundation (independent of government) – only limited use of LCA	20 [a]	32 [c]
European Union	**"European Flower"**	1992	– government programme – matrix use of LCA – production related requirements included	11 [d]	195 [d]
ROC Taiwan	**"Green Mark Programme"**	1992	– government programme – simplified techniques in life cycle assessment	26 [c]	342 [b]
Spain	**"Aenor Medioambiental"**	1993	– government programme – based on life cycle assessment – criteria for a broad range of environmental aspects	8 [d]	31 [d]
Czech Republic	**"Ekologicky"**	1994	– government programme – whole life cycle analysed	12 [b]	150 [b]
Thailand	**"The Thai Green Label"**	1994	– government programme – use of LCA	10 [c]	

Sources: OECD (1991); OECD (1997); Mödl/Hermann (1995); Erickson and Kramer-LeBlanc (1997); own inquiry.

Note: [a] 1995, [b] 1996, [c] 1997, [d] 1998.

For detailed analysis, we have selected the following programmes: the German "Blue Angel" programme is the longest existing ecolabel programme and this investigation promises to re-

veal some interesting experiences. The European Union ecolabel programme is (along with the "Nordic Swan" programme) a multinational programme with certain specific characteristics and the American "Green Seal" programme is an example of a privately established and administered programme. The environmental labelling standards of the International Organization for Standardization may influence the evolution of existing environmental labelling schemes or aid the establishment of competitive international or national ecolabelling schemes. Environmental labelling of tropical timber deals with important international aspects of ecolabelling with possible effects on the free trade.

5.1 German "Blue Angel" Environmental Labelling Scheme

5.1.1 Structure and Procedure

In 1977, the Federal Government of Germany established an environmental labelling programme, the so-called "Blue Angel" ecolabel programme, as the first third-party ecolabelling programme (for details see Neitzel, 1995; UBA, 1995b). As a government initiated and partly privately administrated programme, it involves three separate principal institutions which perform different tasks in the environmental labelling procedure: the UBA (Umweltbundesamt—German Federal Environmental Agency) as an environmental scientific body, a formal independent jury (Jury Umweltzeichen—Jury Ecolabel) for the absolutely final decisions and the RAL (Deutsches Institut für Gütesicherung und Kennzeichnung e.V.—German Institute for Quality Assurance and Labelling), a non-profit standardisation and certification organisation for the administration of the programme.

The "Blue Angel" programme features several significant elements. For example, suggestions for the establishment of criteria schemes for particular products can be submitted by anyone for consideration by the UBA. The UBA prepares, on the instructions of the jury, the draft environmental criteria using life cycle assessments or ecobalances to show all important environmental impacts of the product's life cycle. Draft criteria and additional requirements are discussed in a non-public expert hearing organised by the RAL. At this stage, the representatives of the diverse interest groups are given the opportunity to participate in the criteria-setting process. The circle of participants encompasses representatives from industry, especially the BDI (Bundesverband der deutschen Industrie—Federation of German Industries Agency), consumer organisations such as the AgV (Arbeitsgemeinschaft der Verbraucherverbände e.V.—Working Group of Consumer Organisations) and StiWa (Stiftung Warentest—Foundation for Consumer Goods Testing), other test institutes, individual environmentalists, individual experts, representatives from RAL (chair) and UBA. The results of the expert hearings constitute the recommendations for the final decisions on product groups and environmental criteria by the jury. During the application procedure, domestic as well as foreign manufacturers may apply for the ecolabel by submitting documents to the RAL. These docu-

ments should state the product's compliance with the relevant environmental criteria and offer further information, such as product composition or fulfilment of environmental law standards and safety requirements.

5.1.2 Results

It is often said that the "Blue Angel" ecolabel is based on a comprehensive approach of the life cycle assessments (UBA, 1989, for example). However, environmental assessment is in many cases focused more on the attributes of the product itself than on the production phase of the considered product group. In particular, environmental criteria sometimes exist for environmental impacts occurring during the use and disposal phase of the product and not for production-related impacts. The ecolabel programme deliberately avoids considering the production process because of the difficulties in defining a relatively environmentally sound production method (OECD, 1997). In any case, the standards laid down by environmental legislation regulate environmental damage caused by the production process (UBA, 1989).

For most products of the "Blue Angel" programme, just one or a few main environmental aspects of the product dominate the ecolabel investigation. The ecolabel for recycled paper, for example, considers mainly the percentage of recycled paper in use. Misleading information implying that the ecolabel sign stands for complete environmental superiority must be avoided. Thus the "Blue Angel" logo contains an additional declaration to the effect that the logo represents only one or a few environmental attributes (e.g., environmental label because 100 percent recycled paper, or because low-pollutant). Another problem which also affects the "Blue Angel" programme is that improvements made to environmentally labelled products in one of the aspects considered by the ecolabel sometimes lead to counteracting environmental disadvantages in other environmental aspects which have been neglected by the ecolabel criteria. For example, water recycling at "Blue Angel"-approved car washing plants produces filtration residues which are an environmental problem in themselves. In this case, wastewater reduction is considered more important than the solid waste problem. The criteria-setting body has to weigh one environmental problem against the other, even if the ecolabel concerns only one environmental attribute (UBA, 1989).

Since the start of the environmental labelling programme, the number of products included has significantly increased and, in 1998, amounted to over 4,500 products in 77 product categories. In general, the relative success of environmental labelling programmes, this being the extent to which they can cause changes in buying behaviour, largely depends on consumer awareness and consciousness of environmental issues. Consumer studies show that the majority of German consumers consider themselves to be environmentally conscious.[11] As mentioned above, environmental awareness is not automatically converted into a corre-

11 An overview of several studies is found in Hemmelskamp and Brockmann (1997).

sponding buying behaviour. Thus German consumers are often not willing to pay significantly more for environmentally superior products labelled with the "Blue Angel". In particular, producers cannot enforce higher prices in markets for manufacturing supplies, raw materials or other inputs, where commercial end-consumers are the purchasers. On the other hand, the labelling of low-pollution paints is a famous example of the positive market effects of the "Blue Angel" ecolabel. In particular, the visibility of the decisive environmental qualities of the end product in consumer markets seems to be a reason for the increasing market share gained by ecolabelled low-pollution and powder paints (from 14.1 % in 1986 to 23.5 % in 1994). In these markets it was even possible to secure higher prices for ecolabelled products (Hemmelskamp and Brockmann, 1997).

The "Blue Angel" has, from the very beginning, enjoyed a relatively high reputation among consumers. One reason may be the participation of environmental organisations and consumer associations. Moreover, the important role played by the UBA in the criteria-setting process transfers the environmental reputation of the agency to the ecolabel programme. Recently, the programme has been forfeiting some of its good reputation as regards the methodological problems of environmental labelling for paints and varnishes. Private test institutes have detected gaps in the system of environmental criteria for the product ingredients, meaning that the "Blue Angel" fails to take into account certain synthetic solvents, synthetic softening agents, and synthetic resins. Recently acquired environmental knowledge attributes particularly adverse health effects to these substances. Some privately established ecolabel schemes have been able to demonstrate their superiority as regards the quality of their ecological criteria schemes (Brian, 1997).

5.2 European Environmental Labelling Scheme

5.2.1 Structure and Procedure

The European Environmental Labelling Programme, as laid down in the Council Regulation 880/92/EEC[12], came into force in March 1992 and began its operation in 1993. Besides consumer guidance and producer incentives, the programme aims to establish a common environmental labelling programme for all Member States in order to obtain greater conformity with the creation of the Single Market in the European Union (see for critical reviews of the EU ecolabel scheme Smith and Potter, 1996; Erskine and Collins, 1996; Landmann, 1996).

The complex development and administration of the European programme involves several institutions, in particular, the DG XI (Directorate General XI—Environment, Nuclear Safety and Civil Protection of the European Commission), the competent national bodies, the

12 Council Regulation 880/92/EEC of 23 March 1992 on a Community Eco-Label award scheme, in: Official Journal of the European Communities, L 99, 11.04.1992.

Committee of Competent Bodies, the Consultation Forum composed of representatives of the major interest groups (industry, commerce, environment, consumers, and trade unions), the Regulatory Committee, the European Council of Ministers, and ad hoc working groups.

The programme's structure and procedure features some remarkable aspects which can already be found at the initial stage of product group selection. Every interested party can make suggestions for new product groups to the competent bodies of the Member States. Moreover, not only the competent bodies but also the European Commission can propose a product category. Recently, the Commission has been frequently using this option to make the application of the ecolabel scheme consistent throughout the Member States.

The European Commission organises the development of environmental criteria by conducting the necessary investigations itself or assigning one Member State as "Lead Country" for one product group. For example, Germany was the "Lead Country" for the criteria development for laundry detergents, while the European Commission is responsible for sanitary-cleaning products, detergents for dishwashers, etc. To ensure comparability and consistency in criteria development, the European Commission defines a six-phase procedure. This procedure comprises a feasibility study (estimation of the ecolabel feasibility, potential success or problems of programme realisation), a market study (e.g., considering the nature of the relevant market), environmental inventory and environmental impact assessment in a life cycle assessment, the setting of criteria, and the presentation of the draft criteria. The life cycle assessment is based on a comprehensive approach, the so-called "cradle-to-grave" approach, which is laid down in Article 1 and 5 (4) of Regulation 880/92/EEC. The methodology of the life cycle assessment should be based on the "Guidelines for the Application of Life-Cycle Assessment in the EU Eco-Label Award Scheme" prepared by the "Groupe des Sages" (European Commission, 1997). The research group attempts to develop the life cycle assessment guidelines compatible with the international life cycle assessment methodology, such as the approaches of the Society of Environmental Toxicology and Chemistry (SETAC) and the International Organization for Standardization (ISO). Thus, the procedures of life cycle assessments are similar to the one described in chap. 4.2.

During the phase of criteria development, the European Commission and the competent national bodies are extremely dependent upon the knowledge of the involved parties, especially industry, consumers, and environmental organisations. To ensure sufficient participation, the European Programme provides ad hoc working groups in the Member States and the Consultation Forum on the European level. In the Consultation Forum, national interest groups submit comments and suggestions through their Community-level representatives or European associations. The Consultation Forum adopts a formal opinion after reaching a consensus among the interest groups.

Producers and importers may apply for the European environmental label to the competent bodies of the Member States which are often the same institutions designated for national

environmental labelling programmes. Applicants must submit documents, providing all necessary test results and specifications stating the product's compliance with the ecolabel requirements. The competent bodies award the ecolabel on the basis of document verification.

5.2.2 Results and Revision of the Programme

The current situation of the European environmental labelling scheme reflects the typical pattern of development for ecolabel programmes. In the beginning, both consumers and producers show little willingness to accept the ecolabel scheme. The lack of publicity, the absence of environmental criteria for most product groups, and the lack of operational experience could be partly responsible for the cautious attitude of producers and the low recognition by consumers. Consequently, after three years of operation, the European ecolabel was awarded to not more than 24 products in 12 product categories. However, an exponential use of ecolabel schemes presents itself in cases where ecolabel programmes enhance its popularity and become means for producers' competition strategies. Recently the European ecolabel has been gaining considerable ground. In 1998, the number of awards had increased to 195 products in 11 product groups. With the proposed revision of the Regulation 880/92/EEC, the European Commission intends to streamline and simplify the ecolabel procedure in order to broaden the application of the European ecolabel still further.

The Regulation 880/92/EEC requires a revision of the Community Ecolabel programme after an operation period of five years. The European Commission, therefore, published a proposal for a revised environmental labelling scheme in December 1996 (European Commission, 1996). The need for greater consistency of different operation modes of the European ecolabel programme in the Member States was recognised as one of the necessary amendments. The solution requires procedural and methodological guidelines from the European Commission, such as a handbook for the selection of environmental criteria, the methods of life cycle assessment, the consultation of interest groups, transparency etc. To avoid possible adverse trade effects the revision of the methods must also take into account the developments of international ecolabelling standards, such as those directly concerning environmental labelling (e.g., ISO 14020, ISO 14024) and life cycle assessment procedures (i.e. ISO 14040, ISO 14041 etc.). Besides the proposals for a flexible validity period of environmental criteria and a ceiling of annual fees, other improvements of the European ecolabel include the streamlining of the ecolabelling procedures, especially the complex criteria setting process. To this end, the establishment of a privately organised European Ecolabelling Organisation (EEO) has been proposed. This organisation is intended to operate as a co-ordinating network between the competent national bodies.

In principle, the European programme has had the advantage of being based on the experience of several environmental labelling schemes which are already operating in different Member States. To avoid being accused of conducting myopic environmental impact investi-

gations, which is the case with some older ecolabel programmes, Regulation 880/92/EEC imposes a comprehensive life cycle assessment approach for the criteria-setting procedure. Nevertheless, this complex methodology gave rise to a time-consuming and inflexible ecolabelling procedure, a possible impediment for the further diffusion of the European ecolabel. The methodological obstacles of the life cycle assessment emerged during the operating phase of the European ecolabelling programme (Mitchell, 1995). In practice, the objective of the so-called "cradle to grave" approach, the comprehensive life cycle approach, turns out to be inachievable. Moreover, the realisation of the concept of "product with a reduced environmental impact during its entire life cycle", laid down in the Regulation 880/92/EEC, fails due to nonexisting methodology. However, these problems are taken into consideration in the revision of the Regulation. No solution has as yet been found for the trade-off problem between streamlined and more applicable procedures on the one hand and the assurance of the content and credibility of the ecolabel with a sufficient number of environmental criteria on the other. The revision therefore seeks to establish criteria for selected key environmental aspects of the product's life cycle which must be derived with advanced procedures and methodologies (Loprieno, 1997).

One serious criticism concerns the "pass-fail" nature of the European ecolabelling scheme (see, for example, Potter and Hinnels, 1994). Firstly, there are no further incentives for environmental innovations once manufacturers have passed the environmental criteria hurdle. Secondly, there are obstacles defining uniform environmental criteria for the whole European Community because the Regulation ignores different production technologies, market structures, environmental practices, and consumer expectations in the Member States. To achieve more flexibility for the recognition of particular circumstances in the Member States, a graded ecolabel is taken into account by the revision. Environmental scores, expressed in various numbers of "European Flower" signs, will be attributed to the selected key environmental aspect of the considered product. The visible degree of valuation should assure the credibility of the ecolabel. In addition, the European ecolabel will provide generic information on qualitative environmental criteria.

5.3 United States "Green Seal" Environmental Labelling Programme

5.3.1 Structure and Procedure

The US "Green Seal" environmental labelling programme, set up in 1988 and operating since 1990, is an example of a private ecolabelling programme. The scheme had awarded the "Green Seal Certification Mark" to around 270 products in 86 product groups in 1998. The institutional structure of the programme encompasses several private institutions. The administrative institution is a private non-profit organisation, the "US Green Seal" organisation. The staff of the "Green Seal" organisation includes environmentalists, scientists, and specialists in

public education. The Board of Directors of the "Green Seal" organisation, consisting of representatives of business, public, major environmental organisations, consumer associations and other public interest groups, is the main decision-maker. The Underwriters Laboratories Inc., a non-profit organisation, examines the products' compliance with the environmental criteria, including product tests and inspections of manufacturing plants. An Environmental Standards Board, comprising scientists and other experts, may act as an appeal board for disputes between applicants and the "Green Seal" organisation. An advisory panel of representatives from business, government, academia, and the public may, in some cases, assist in the setting of the environmental criteria.

The industry and public make the proposals for product groups, and the "Green Seal" organisation finally selects the products, considering issues such as the importance of environmental impacts, the potential for environmental improvements, and manufacturers' and public interest in an ecolabel for the considered product group. Comprehensive life cycle assessments were to be the foundation for the development of the environmental criteria or environmental standards. Recognising the extensive costs and the lack of common accepted methodologies, the "Green Seal" programme opted for a streamlined form of life cycle assessment, the environmental impact evaluation, which is the basis of the programme. The purpose of evaluation is to observe the most significant environmental impacts at different stages of the product life cycle where environmental criteria are defined. Underwriters Laboratories Inc. supports the definition of draft criteria and in some cases there is additional help from the advisory panel. During a fixed time period, the draft criteria can be reviewed and commentated on by government agencies, trade associations, manufacturers, environmental and consumer organisations, and other public interest groups. After possible revisions, the draft criteria are sent to the Environmental Standards Council of the "Green Seal's" Board of Directors, which approves the final environmental criteria. In the whole programme, special procedural guidelines aim to reach the objectives of technical accuracy, public credibility, and openness. For instance, a strict code of ethics is intended to ensure its credibility to the public. In particular, this code excludes individuals with a special financial interest in participating firms from all decision-making areas of the ecolabelling procedure.

To obtain the seal, the applicant has to demonstrate that production facilities do not violate environmental laws and regulations. The Underwriters Laboratories Inc. performs the product testing for the awarding of the Green Seal Certification Mark. Green Seal inspects the ecolabelled products annually and the environmental criteria are revised after a period of three years. The awarding fee includes, besides the individual monitoring cost, the distributed cost of the development of the environmental criteria for the suggested product group. Thus the number of applicants determines the fee level: the more applicants, the lower the individual fee (Mödl and Hermann, 1995).

One of the special features of the "Green Seal" programme is the "Green Seal's" Environmental Partners' Programme which aims to help institutions to integrate environmental aspects into their purchase strategies and decisions. The participating institutions encompass companies, government agencies, non-profit organisations, retailers, diverse associations, educational institutions, foundations and others, which are allowed to use the Green Seal Partner Mark in advertising relating to their institution. The "Green Seal" organisation selects, against payment of an annual fee, suitable products for the partner organisation with the least estimated environmental impacts. In some cases, the "Green Seal" scheme is part of public invitations to tender.

5.3.2 Results

Existing parallel to Green Seal is another ecolabelling programme, namely that of Scientific Certification Systems, Inc. (SCS). This duality of ecolabelling programmes gives rise to a competitive situation, although SCS follows different concepts and methodologies of environmental labelling. In particular, SCS issues an "Environmental Report Card" or "Certified Eco-Profile" for the considered products, which compress the findings of advanced life cycle assessment. The "Certified Eco-Profile" provides more or less detailed information about the product's environmental impacts. Up to 15 different environmental impact indicator categories summarise the observed environmental impacts in so-called "Critical Environmental Burdens" (CEBs), which are quantified in weight and energy units and represented graphically in bars of different length. Consumers must then weigh the displayed estimations of environmental damage against the background of their own knowledge and opinion. However, if the success of an environmental labelling programme is gauged by the extent to which the programme can influence buying behaviour, the "Certified Eco-Profile" concept seems less successful (Wynne, 1994). In contrast, consumers may have a limited capability and willingness to absorb, process and act upon the complex information provided by the "Eco-Profile". Finding themselves in a situation of information overload, consumers cannot compare the environmental quality of different certified products and adjust their purchase decisions (Wynne, 1994). In contrast, the "Green Seal" is a single market signal which guides consumers directly to products judged as comparatively environmentally superior and thus has a greater market effect.

5.4 ISO Environmental Labelling Standards

5.4.1 Structure

From an early stage of environmental labelling in various countries, the International Organization for Standardization (ISO) has recognised the need for harmonising international ecolabel systems. In particular, different environmental criteria and production related require-

ments seem to threaten free international trade. Product requirements reflecting particular environmental issues of the initiating country may be regarded as a trade barrier for foreign producers. To avoid disparities, ISO seeks to develop compatibility by providing a basis of standards for current and future environmental labelling schemes which are mainly prepared in ISO's Technical Committee 207 and the subcommittees (Henry, 1997). These standards are directed towards the procedures and processes of environmental labelling programmes rather than towards precise technical product requirements or uniform environmental criteria. Thus they offer common definitions and interpretations of environmental marketing and labelling terms, methodological guidelines and principles for environmental labelling procedures and for environmental labelling tools, such as life cycle assessment. Table 2 provides an overview of the relevant standards.

Table 2: ISO Standards Related to Environmental Claims and Labelling

Number		Title
ISO/DIS	14020	Environmental Labels and Declarations – **General principles**
ISO/DIS	14021	Environmental Labels and Declarations – **Self-declared Environmental Claims** – Terms and Definitions (merged with ISO 14022 (symbols) and ISO 14023 (testing and verification)
ISO/CD	14022	Environmental Labels and Declarations – Environmental Claims – Self Declarations – Symbols
ISO/CD	14023	Environmental Labelling – Self Declarations – Testing and Verification Methodologies
ISO/DIS	14024	Environmental Labels and Declarations – **Type I Environmental Labelling** – Guiding Principles and Procedures
ISO/WD	14025	Environmental Labelling – **Type III Environmental Labelling** – Guiding Principles and Procedures
ISO	14040:1997	Environmental management – **Life cycle assessment** – Principles and Framework
ISO/DIS	14041	Environmental management – **Life cycle assessment** – Goal and scope definition and inventory analysis
ISO	14042	Environmental management – **Life cycle assessment** – Impact assessment
ISO	14043	Environmental management – **Life cycle assessment** – Interpretation
ISO/FDIS	14050	Environmental management – **Vocabulary**

***Abbreviations**: DIS: Draft International Standard; FDIS: Final Draft International Standard; CD: Committee Draft; WD: Working Draft.*

ISO/DIS 14020 concerns the general principles of environmental labelling and declarations and mainly contains instructions on how to make environmental claims or establish ecolabels. The standard therefore provides some kind of behaviour rules for the manufacturer or the eco-label organisation. In particular, the information must be accurate, verifiable, relevant, and

non-deceptive. In addition, the declarations and ecolabels should be based on life cycle assessments conducted with, for example, the method of comparative assertion provided by ISO/DIS 14024. Consideration of the product life cycle should at all events be consistent with ISO 14040, the standard for life cycle assessment. In addition, the standard ISO/DIS 14020 concerns good scientific research methodologies, free access to underlying documents, consensus-finding, an appropriate programme design for avoiding bureaucracy and trade restrictions as well as a programme design for promoting innovations (see also Kuhre, 1997).

Type I environmental labelling[13], as defined by ISO, is the voluntary third-party ecolabelling scheme with a multiple-criteria approach, which is also the subject of this paper. The relevant standard ISO/DIS 14024 lays down the guidelines for agencies and manufacturers or retailer associations which operate or develop ecolabel programmes. For this purpose, the standard offers (1) general principles of environmental labelling, (2) descriptions of establishment procedures for product categories, functional characteristics of products and environmental criteria as well as (3) requirements for the certification procedure. One of the remarkable features of ISO/DIS 14024 is, for example, the fact that ecolabel programmes have to consider the whole product life cycle, especially during criteria setting (ISO/DIS 14024, clause 5.4). This necessitates the use of life cycle assessment, which should be consistent with the relevant principles of ISO 14040 (and following). The selection of product categories, environmental criteria, and product function characteristics should be carried out in consultation with the interested parties. Transparency and sufficient opportunities for comments should be afforded at all stages and for all main issues[14] in the environmental labelling procedure. The ecolabelling body should be able to provide documentation on request concerning the main issues (ISO/DIS 14024:1997, clause 7.4.3). In addition, the ecolabelling organisation must publish a report and accompanying information demonstrating the programme's conformity with the standard, the objectivity and justifiability of the environmental criteria, the verification methods, the opportunities for participation of the interested parties, and, on request, the explanation of the meaning of the ecolabel. On the other hand, ISO recognises the necessity for confidentiality for some information and certain

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13 Type II environmental labelling, covered by ISO/DIS 14021, concerns the self-declarations of environmental claims made by manufacturers, importers, distributors or retailers without passing through any third-party organisation. Frequently, only a single attribute (e.g., "no use of ozone-depleting substances") is considered. This standard defines the meaning of certain terms which are frequently used in environmental advertising, such as "recycled material", "reduced resource use", "energy-efficient", or "designed for disassembly" (for further discussion see Lathrop and Centner, 1998). Type III environmental labelling, which is the subject of ISO/WD 14025, encompasses the detailed and quantified information released by the producer in the form of an eco-profile which concerns the multiple environmental issues of the product. This information is subjected to independent verification by an ecolabelling body using preset environmental performance indices. Life cycle assessments identify the main environmental impacts of a product (see also Kuhre, 1997).

14 In ISO 14024, the main issues are product categories, product environmental criteria, product function characteristics, testing and verification methods, certification and award procedures, review period of criteria, period of validity of criteria, non-confidential evidence, funding sources, and compliance verification (ISO 14024:1997, clause 5.10).

sity for confidentiality for some information and certain data should not therefore be released without the permission of the applicant. Moreover, the programme and the sources of funding must be free from undue influence. Procedures and requirements should not be established so as to create international trade barriers and the relevant provisions and interpretations of the World Trade Organization (WTO) should be taken into account. Application and participation in the ecolabel programme must be open to all potential applicants. Applicants should undertake to comply with environmental and other relevant legislation. Furthermore, the standard requires the use of an iterative process, that is to say, one which provides for periodical reviews and amendments of product categories, environmental criteria, product function characteristics, and certification procedures.

5.4.2 Results

In general, the ISO ecolabelling standards provide, as a framework of principles and methodological approaches, guidance for the establishment of new environmental labelling programmes. New environmental labelling programmes may increase competition, which may in turn improve the quality of ecolabels in cases where quality differences are recognised and valued by consumers. Furthermore, if programmes adopt the standards, then defined procedural elements will definitely be installed and applied, and this will—in certain respects—enhance credibility. However, the installation of procedural elements has no bearing on their appropriateness or success. The standards cannot guarantee a certain environmental quality of ecolabelled products because these system-based standards regulate the ecolabelling procedures and not the environmental aspects of products. These ISO standards provide no objective means of measuring the environmental impacts of products. Whether the procedures and methods suggested by the standards actually enhance environmental product quality will depend entirely on the factual conversion of the standards, and this cannot be determined by the standards themselves. Nonetheless, the ISO 14024 standard can generate certain positive features for ecolabelling programmes. In particular, the requirement to publish a company report concerning the methods used might help outside observers to compare the quality of environmental labelling schemes. Moreover, the formal requirement of an iterative process ensures the continuing adjustment of a programme's procedures and methods to new environmental knowledge.

5.5 Environmental Labelling of Forest Products

In contrast to the ecolabelling concepts already discussed, the labelling of forest products consists purely in the certification of production methods, or, to be more precise, in the certification of certain standardised forest production and management methods. Thus forest labelling has certain economic implications, which are worthy of closer examination.

Since the mid-1980s, international trade in tropical timber has become more and more problematic. In importing countries concerns about the destruction of tropical forests and the loss of biodiversity have led to reactions of governments and non government organisations (NGOs), such as bans and import boycotts (Van Orsdol, 1992; Shams, 1995; Brockmann, Hemmelskamp and Hohmeyer, 1996). Because governmental policies and boycotts manifested certain inefficiencies, NGOs (e.g., Friends of the Earth), production companies and retailers voluntarily introduced timber labelling systems as an economic incentive instrument for differentiating between timber imported from forests managed in a sustainable manner and timber coming from unmanaged logging (Varangis et al., 1993; Michaelowa, 1997; Elliott, 1997a; Donovan, 1997). Besides the initial certification of tropical timber, more and more certification systems now embrace boreal and temperate forests.

A prerequisite for forest product labelling is the certification of the timber-extracting company by an independent auditor (in some cases the NGOs) using specific, widely accepted standards (for procedural details see Kiker and Putz, 1997, for example). In most cases, the company must implement standardised forest management practices, such as selective harvesting, definition of cutting cycles and rotation lengths, identification of conservation zones, complying biodiversity indicators, replantation and restoration, or elimination of use of chemicals. A detailed forest assessment is the basis for these practices (Heaton and Donovan, 1997). In addition, a credible and manageable inspection and verification system, the so-called chain of custody, has to be developed to keep track of the timber from the forest to processing or manufacturing, shipping and distribution, and the market. The chain of custody is an unbroken trail of accountability and therefore requires a cost-effective auditing and documentation system with, in particular, appropriate product tracking technology and log export monitoring (Groves, Miller and Donovan, 1997).

On the international level, various NGOs and standardisation organisations, such as the Forest Stewardship Council (FSC)[15] or the International Tropical Timber Organisation (ITTO) (Varangis, Braga and Takeuchi, 1993; Michaelowa, 1997; Elliott, 1997b), have developed standards for "good forest management" which provide a world-wide basis for a type of certification which is objective, transparent, consistent and widely accepted. In actual practice, forest management standards often include both performance-based and system-based standard types. The first type specifies performance measures which comprise specific quantitative requirements (e.g., cutting rates) as well as prescriptions of specific forest production methods (e.g., harvesting prohibitions in certain landscapes). The system-based approach of standardisation—adopted by the International Organization of Standardization (ISO)—offers a management system which is verbally described in structure and elements and which leaves decisions concerning performance levels and factual forest management practises to the producer. On the one hand, the application of a forest management system

15 The FSC was founded in 1993 as an non-governmental umbrella organisation for the accreditation of independent certifiers of different certifying organisations (Michaelowa, 1997).

ducer. On the one hand, the application of a forest management system does not guarantee the achievement of certain performance levels (Ervin and Elliott, 1997). On the other hand, the negligence of a rigid prescription of specific forest management techniques can be an advantage because forest management methods must undergo a permanent process of evolution, incorporating new scientific findings on "good forestry" (Simula, 1997). Moreover, the (global) application of a single silvicultural technique is often unsuitable in very different situations as regards forest species, species-specific regeneration requirements, stand histories and habitat types (Putz, 1997). System-based standards, on the other hand, may create forest management practises which are more flexible and responsive to local environmental conditions.

The economic benefits of timber labelling are controversial. On the one hand, initial inspection, repeated auditing and fees incur direct costs of certification. The greater part of the costs, the indirect costs of certification, results from the adoption and continued application of specified forest management practises and the implementation of appropriate information systems (i.e. inventories, surveys, chain of custody, etc.) (Simula, 1997; Ervin and Elliott, 1997). On the other hand, consumer surveys in Europe and the United States have indicated that the price premium for certified tropical timber, necessary for rewarding sustainably managed forest production (Van Orsdol and Kiekens, 1992), is only about 5-15% (Varangis, Braga and Takeuchi, 1993; Brockmann, Hemmelskamp and Hohmeyer, 1996; Viana, 1997). Timber certification therefore seems to be economically viable mainly in environmentally sensitive niche markets, unless reductions of the costs of forest management and certification methods are possible without loss of quality and credibility. However, one should not ignore unintended positive side effects. Certification may shorten the vertical distribution chain between timber producers and retailers by bypassing diverse trade intermediaries. Thus the timber producer and the certification organisation receive the obtained additional rents directly. In addition, certification is often closely bound up with the impartial technical advice offered by the certification company, and this can enhance efficiency in forest production (Elliott and Viana, 1997).

Since timber labelling focuses on forest production and management procedures, it is closely concerned with international free trade. Even voluntary timber labelling programmes can be of a discriminatory nature and therefore be inconsistent with the free trade principles of the WTO/GATT, especially if a country unilaterally determines the conditions for the certification of sustainable forest management practices (Schlagenhof, 1995). In some cases, the WTO/GATT identifies certain timber labelling programmes as non-tariff barriers when they are used, for example, as a condition for market access (Varangis et al., 1993). In general, explicit discrimination occurs through unequal treatment of domestic and foreign producers in consequence of differing definitions of products, criteria or participation. In timber labelling explicit discrimination is not all that significant because nearly all programmes formally

guarantee equal participation and access. Timber labelling is affected more by implicit discriminations which are very difficult to detect. The lack of information for foreign producers regarding criteria development, less transparent definitions of criteria, the high costs of participation and the tailoring of environmental criteria according to the preferences of the importing countries can be implicit discriminations not only for producers from developing countries but also for small and medium-sized enterprises from both developing and developed countries (Michaelowa, 1997; Elliott and Viana, 1997). This situation calls for the harmonisation of timber labelling programmes, which is already required by the Agreement on Technical Barriers to Trade (TBT) (Liu, 1997; Ward, 1997). The FSC has begun to solve this problem by developing national and regional standards through national working groups. Moreover, the harmonisation efforts undertaken within the compass of the standardisation work of the International Organization for Standardization (ISO) are expressly aimed at avoiding trade barriers caused by labelling programmes.

6 CONCLUSIONS

There are some economic advantages in using environmental labelling as an informational instrument of environmental policy. In particular, this instrument may stimulate a demand shift towards environmentally superior products if a number of essential prerequisites are fulfilled. The crucial problem of ensuring the credibility of environmental labelling programmes must be solved. Therefore several methodological deficits connected with the awarding of ecolabels have to be worked out. This problem can be ameliorated, for example, by the further development of life cycle assessment methods. Furthermore, ecolabelling bodies must be able to resolve the following dilemma. On the one hand, they are interested in obtaining the necessary information support from the involved interest groups. On the other hand, however, they must avoid the undue influence of those parties seeking to manipulate ecolabelling criteria and hence labelling results. Examples illustrate how existing ecolabelling programmes attempt to cope with these difficulties.

One possibility of mitigating the problems of ecolabelling is to further the competition between ecolabelling schemes with new (private) ecolabelling programmes established by producers, producer organisations or environmental organisations. An increase in programme credibility may emerge if the environmental criteria schemes become broader and more stringent compared with competing programmes. Quality improvement in the criteria schemes will occur if ecolabelling programmes seek to underline the particular environmental superiority of their ecolabelled products. Moreover, the parallel existence of different ecolabelling programmes affords both consumers and producers opportunities of choice.

However, competing ecolabelling programmes can cause consumer confusion and hence increased information costs for the consumer. As a result, consumer misperceptions can occur and consumers may then be discouraged from shifting their demand to environmentally superior products. To mitigate these problems, additional institutions (e.g., governmental agencies, research and test institutes) become necessary. They can support consumer decision-making with regard to different ecolabelling programmes and therefore they can suit the limited ability of the consumer to process all the available information. The tasks of these institutions may consist in the monitoring, observation and comparison of the activities and decisions of parallel ecolabelling programmes and in the evaluation of their respective qualities.

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