Design a Successful Program for Voluntary Carbon Footprint Reduction

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***Abstract*— A voluntary eco-labeling program acts as "soft" policy instruments to regulate or promote climate change mitigation and carbon footprint reduction. The proper design of an eco-labeling program will likely attract more environmentally cautious companies to participate; it will also demonstrate the authoritativeness and trustfulness to consumers when choosing an eco-labeled product. Ultimately, the environmental consumer behavior will lead to higher market penetration of products with eco-labels. This paper proposes the successful design of an eco-label will: (1) set an appropriate eco-standard accepted by the industry and the participants; (2) offer various degrees of strategic benefits from the participation; (3) ultimately increase the market share of eco-labeling products; and (4) benchmark "green" (described as more environmentally friendly) quality improvement to the environment, reduce carbon footprint, and benefit the society and human beings.**

***Keywords*—** *Eco-label, sustainability, carbon footprint, voluntary program, corporate social responsibility*

1. Introduction

There have been a variety of policies and legislations identified to regulate or promote climate change mitigation and carbon footprint reduction. Examples include conventional regulations, carbon taxes, cap-and-trade programs, and innovative voluntary programs [1]. But it is notable that uniform and effective enforcement shows a great obstacle [2]. Consequently, the policy makers have been trying to utilize various non-regulatory approaches to direct industry towards more sustainable practices. Because these approaches are voluntary, they act as "soft" policy instruments, complementing the command-and-control mandates. In recent years, one voluntary approach, eco-labeling or environmental labeling or carbon labeling, has acquired significant attention [2, 3, 4]. In this paper, we simply refer to it as eco-label. According to the Global Eco-Labeling Network, eco-labeling is "a voluntary method of environmental performance certification and labeling that is practiced around the world". An eco-label is a label that "identifies overall, proven environmental preference of a product or service within a specific product or service category" [5]. In this paper, we limit our discussion to the design of eco-labeling programs to voluntarily reduce carbon footprint.

Eco-labeling programs require less time and preparation than regulatory approaches. Many industries promote eco-labeling programs partly because of the flexible, effective, and less costly nature of these programs. Eco-labeling programs are considered as alternatives or supplements to conventional regulations [1]. From a company's perspective, voluntary eco-labeling programs differentiate it from its competitors and offer it flexibility to make commitments to improve its environmental performance beyond what the law restricts. Companies expect the label to affect consumer-purchasing decision in favor of the labeled product; therefore, eco-labels are moral and economical rewards for those companies with eco-label rewarded. From the consumer's perspective, eco-labels as effective communicative instruments deliver a clear and credibly message that the environmental quality of the product is superior to other products without an eco-label. Eco-labels normally attract the already environmentally and socially aware consumers in the market, but they serve as a communication vehicle for awareness transfer to the entire market. From the policy maker's perspective, the way eco-labeling programs create incentives to the environmentally friendly products and stimulate the innovation in the market is fast, direct, and transparent. Eco-labeling is an approach through market mechanisms to prepare the way for governmental measures such as legislations.

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Eco-labeling has a wide range of applications in construction, agriculture, fashion, tourism, and consumer products [6, 7 ,8 ,9 ,2]. One success story of eco-labels is the Energy Star program that was first established by the U.S. Environmental Protection Agency (EPA) in 1992. Since 2005, the EPA and the Department of Energy (DOE) have jointly administered Energy Star. Energy Star is a program designed to reduce energy consumption, improve energy security, and reduce pollution through voluntary labeling of products and buildings that meet the highest energy efficiency standards [10]. Since it was established, Energy Star has successfully identified and promoted energy-efficient products and buildings and has been recognized as an umbrella of voluntary programs [11]. From 1993 to 2012, it is estimated that families and businesses have prevented 1,903 million metric tons of GHG emissions and saved more than $239 billion on utility bills [10].

The proper design of an eco-labeling program will likely attract more environmentally cautious companies to participate; it will also demonstrate the authoritativeness and trustfulness to consumers when choosing an eco-labeled product. Ultimately, the environmental consumer behavior will lead to higher market penetration of products with eco-labels. The successful design of an eco-label will: (1) set an appropriate eco-standard accepted by the industry and the participants; (2) offer various degrees of strategic benefits from the participation; (3) ultimately increase the market share of eco-labeling products; and (4) benchmark "green" (described as more environmentally friendly) quality improvement to the environment, reduce carbon footprint, and benefit the society and human beings.

Although the implementation of eco-labels is widespread, the literature suggests that many researchers are concerned about assessing existing eco-labels and evaluating the effectiveness and benefit of such labels [12]. There is a dearth of research in the area of theoretically layout the motivation and background of eco-labeling program design and review design policies to reduce carbon footprint effectively. In this paper, we provide a comprehensive literature review of eco-labeling programs and recommend insights and strategies to policy makers on how to successfully design an eco-labeling program.

2. An Overview of Eco-Labeling Programs

An eco-label is an indication that the labeled product is more environmentally friendly than unlabeled products [13]. Eco-labels can serve as an effective communication tool and a critical quality assurance role to express product information on environmental impacts thus promoting sustainable consumption [14]. The communication relates to the consumers' right to know also it relates to the producers' opportunities to reliably communicate their efforts.

A number of papers have explicitly defined eco-labels. Truffer, Markard, and Wustenhagen (2001) define eco-labeling as making relevant environmental information about a product available to the appropriate consumers through the product label to promote an environmental goal, cause or objective through consumer choice. Tang, Fryxell, and Chow (2004) define eco-label as a symbol that discloses on product packaging seeking to inform consumers that a particular product is significantly less harmful to the environment than its alternatives. Additionally, eco-labels are instruments aimed at communicating to potential customers how producers are engaged in the internalization of externalities that are caused by the manufacture and use of their products [15].

Ref [16] describes three types of eco-labels: single-issue voluntary labels, single-issue mandatory labels, and third-party voluntary labels. Single-issue voluntary labels, the largest class of eco-labels, are placed on the products by their manufacturers. Single-issue voluntary labels face few legal restraints if the claims are verifiable and accurate. "Recyclable" is one type of single-issue voluntary label. Single-issue mandatory labels (e.g., "flammable" and "eco-toxic") are a much smaller class and are required by law and by many national and subnational governments. Third-party voluntary labels observed as an environmental seal of approval present the overall environmental quality of the products also claim products environmentally superior to their competition [16].

According to [17], there are different types of environmental information on products based on the ISO 14000-series: Type I, II, and III programs. The monetary requirement and efforts needed to obtain three types of labeling programs are different. Type I programs are considered as multiple criteria-based, third party programs awarding labels claiming environmental preferability. They distinguish the more environmentally friendly products from less environmentally friendly ones thus posing a high standard for different kinds of products. Type II programs contain a lot of

environmental information on products in the form of self declarations and they are required to take into account life cycle considerations. Type III programs need to conduct a life cycle assessment (LCA) of the product following the ISO 14040-standards. They consist of quantified environmental data on all significant impacts of the product. The information should enable comparisons between products fulfilling the same function [17]. Another requirement of type III programs is they need to get the LCA approved and have a third party verification of the declaration.

3. Motivation Behind Voluntary Eco-Labeling Programs

The latest market trend is more consumers demand green products and their market choices are increasingly being driven by the environmental performance of the products. The trend also suggests companies face internal and external pressure to take the responsibility of their environmental consequences by designing and producing more environmentally friendly products. The environmental quality of a product is often unobservable to consumers. Voluntary eco-labeling program is an explicit way to demonstrate the environmental quality of the product. It also builds a trust-based market of products with variety of environmental quality. In voluntary eco-labeling programs, companies are offered the flexibility to participate and how much they want to engage. The policy makers have realized the voluntary eco-labeling programs may be easier to implement and enforce than explicit conventional regulations and attempted to encourage companies to take the voluntary action [1].

3.1 Consumer Demand of Eco-Friendly Products

The main text for your paragraphs should be 10pt Currently eco-labeling programs exist in large numbers and many forms at both national and international levels. Eco-labeling programs have a long history of 30 years, starting with the German Blue Angel in the late 1970's.

Unlike product quality attributes such as appearance, flavor, and durability, which are generally revealed either pre-purchase or post-purchase, environmental consequences of the production and the consumption of a product are generally unobservable. This makes the eco-labeling approach the only way for consumers to collect such information without spending extra time and efforts. Eco-labels help consumers easily identify which product lines and brands are green and switch their purchases accordingly. Increased consumers and market share are the ultimate motivation for companies to produce green products. Eventually, higher demand of green products can create a strong financial incentive for companies to green their production to capture new market initiatives, increase their market share, and perhaps realize a premium price on their eco-labeled products [18].

Consumers prefer environmental attribute in the products much like they prefer any other desirable product quality attributes in market goods. The basic idea of purchasing green products is to let consumers induce market changes by "voting" for green products with their shopping dollars [18]. In 2002, an OECD report pointed out that the rise in consumers' ecological consciousness over the past years has increased their willingness to pay for green products [19]. Another OECD report clearly categorized all consumers in OECD counties into 27% "green consumers" with high willingness-to-pay and high environmental activism, 10% "green activists" with high environmental activism but lower willingness-to-pay, 40% "latent greens", and 23% "inactive" [20].

Take the Scandinavian eco-label – Nordic Swan as an example. Nordic Swan is awarded to different brands of toilet paper for their superior environmental quality. Solid evidence given by [13] suggests that the Nordic Swan label has had a significant effect on consumers' brand choices for toilet paper. Marginal willingness to pay for the certified Swan-labeled toilet paper ranges between 13% and 18% of the price. The authors also suggest that eco-labels may be more effective on products purchased more frequently because consumers may feel that it would make a greater environmental impact.

3.2 Sustainability and Corporate Social Responsibility

The concept of sustainability was first introduced by the United Nations in 1987. Economic, environmental and social are three dimensions of sustainability. Sustainable development strives to improve the economy, environment, and society for

the current generation, without compromising the ability of future generations to meet their needs. The principles of sustainable development apply not only to governments, countries, and regions, but to businesses as well. Corporate social responsibility is a form of business behavior that leads companies to voluntarily contribute to a better society and a cleaner environment.

To protect the environment and fulfil their social responsibilities, companies have produced more new or redesigned eco-friendly products and have earned eco-labels to place on their products that highlight the product's environmental performance. One purpose of eco-labels is to educate consumers about the environmental impacts of the product's manufacture, use, and disposal, thus leading to a change in purchasing behavior and a reduction in ecological footprint [12]. Mera and Palacios (2004) explained the reasons driving companies to include an environmental factor in their management processes. The reasons include (1) legislation; (2) eco-efficiency; (3) consumers; (4) international market; (5) public tenders and purchases; (6) retailers/distributers; (7) investors; (8) financial and insurance entities; (9) competitive pressures; (10) pressure groups; (11) employees; (12) internal pressures. If there is a significant change in consumer behavior that demands of eco-friendly products increase, the ownership of eco-labels would bring companies an incentive to differentiate and market their products with an environmental characteristic. An increasing supply of these eco-friendly products may increase consumer purchases simply through greater availability without changes in individual awareness.

Moreover, companies do not want to miss any competitive advantage if their competitors participate the eco-labeling program. Therefore, they apply for an eco-label as well in order to offer the same option to their customers even if the likelihood of increasing sales is unknown. Having some eco-labeled products can eventually be the best way of pursuing competitive strategy [21, 22].

4. Eco-Labeling Program Design

In general, simple seal-of-approval labels have affected consumer behavior more than the complex information-disclosure labels. The use of information-disclosure labels is limited because of their limited marketing appeal [16] and their informative intensity. In this paper, we limit the discussion to the seal-of-approval labels, which are referred to as eco-labels.

Eco-labels have been observed in the market for many years, but using eco-labels to promote energy efficiency or sustainability is a more recent phenomenon [11]. While eco-labeling alone will not improve the environment, experience has shown that a properly designed labeling mechanism can be a significant stimulus for market transformation towards environmentally preferable products. Moreover, designing and introducing an appropriate eco-labeling program brings strategic benefits because of the costly nature of abatement technologies and efforts. The costs come from the required capital outlays and the auditing and license costs [23].

Some eco-labels are government-run programs, while some are privately administrated. The general procedure of establishing a new eco-label can be described as follows. The committee determines the category of products to be covered and the objective standard that products must meet to obtain the label. Companies can voluntarily participate the program by submitting their products for evaluation. If the product meets the predetermined standard, the company pays a licensing fee and places the eco-label on the qualified products [16]. Ref. [24] summaries this procedure as two stages: development of environmental criteria and the application. Experience from the European Union (EU) suggests the develop and administration of the eco-labeling programs involves many institutions including the Consultation Forum composed of representatives of the major interest groups from industry, commerce, environment, consumers, and trade unions.

While labeling process does seem complicated, there are a lot of detailed design issues to be addressed. One of the most challenging issues is to set one unique standard or multiple levels of standards in the labeling design. Ref. [15] points out that eco-label is a binary indicator. The concern of having a binary eco-label is the products either meet the critiria (thus get a label) or do not. Having a binary eco-label only means the company has met a minimum predetermined standard, but does not show their relative performance. To avoid this issus, designing a multi-level labeling mechanism might

be a feasible solution. Products with various green quality obtain diffferent levels of eco-label, which inform the consumers their true green quality. LEED, or Leadership in Energy and Environmental Design, is a set of rating/certification program for the design, construction, operation, and maintenance of green buildings, homes and neighborhoods (USGBC, 2014). As an innovative eco-label, LEED has four levels of certification: certified, silver, gold, platinum. Once the building projects meet the standard, they receive different levels of certification. The standard differs for each level of certification, therefore, project management personnel choose the appropriate certification to best suit their needs. Bleda and Valente (2009) develop a simulation model proved that graded eco-labeling system makes environmentally friendly products to become more competitive. As a result, companies are pushed to implement innovations aimed at reducing the environmental impact of their products. They tested two senarios: binary labels and graded labels. The simulation shows the market is dominated by products with high environemntal impacts if using binary eco-labels. On the other hand, the market seeks products with less environmental impacts when graded eco-labels are available.

5. Conclusion

An eco-labeling is a voluntary method of environmental performance certification and labeling that is practiced around the world. An eco-label is a label that identifies overall, proven environmental preference of a product or service within a specific product or service category.

In this paper, a review of the design of eco-labeling programs is provided. Voluntary eco-labeling program is an explicit way to demonstrate the environmental quality of the product. It also builds a trust-based market of products with variety of environmental quality. In voluntary eco-labeling programs, companies are offered the flexibility to participate and how much they want to engage. The policy makers have realized the voluntary eco-labeling programs may be easier to implement and enforce than explicit conventional regulations and attempted to encourage companies to take the voluntary action. The proper design of an eco-labeling program will likely attract more environmentally cautious companies to participate; it will also demonstrate the authoritativeness and trustfulness to consumers when choosing an eco-labeled product. Ultimately, the environmental consumer behavior will lead to higher market penetration of products with eco-labels. The successful design of an eco-label will: (1) set an appropriate eco-standard accepted by the industry and the participants; (2) offer various degrees of strategic benefits from the participation; (3) ultimately increase the market share of eco-labeling products; and (4) benchmark “green” (described as more environmentally friendly) quality improvement to the environment, reduce carbon footprint, and benefit the society and human beings.

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