Carbon labelling, Low-carbon lifestyles, Carbon footprint mitigation and Purchase decision: Weaving through a common thread

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ABSTRACT

In recent years, governments all over the globe have been advocating 'carbon labelling' as part of their efforts to address concerns relating to global warming by enacting environmentally conscious policies and implementing additional initiatives toward achieving sustainable development. A product's carbon footprint is the sum of all of the greenhouse gases it produces during the course of its production, consumption, and disposal. The carbon labelling method provides a quantifiable measure of a product's total emission of greenhouse gases over its entire life cycle. Since the general public is the ultimate consumer of carbon-labelled goods, it becomes imperative to address the mechanism by which carbon label-aided carbon footprint mitigation strategies can pave the way to the adoption & purchase of goods that advocate low carbon lifestyles. As businesses propel more information on carbon footprint labels, they encourage environmentally responsible purchasing decisions. This qualitative paper uses exploratory research design based on secondary sources of data raging from environmental science, management and green marketing with the objective of weaving the concepts pertaining to carbon labelling, low-carbon lifestyles, carbon footprint mitigation and purchase decisions through a common thread. The conceptual paper engages a mixed approach clubbing grounded theory with conceptual framework analysis for drafting a literature-led cascaded frame. The paper is anticipated to open frontiers for environmental advocates of carbon footprint mitigation policy drafters, green strategists, eco-conscious consumers and government regulatory agencies.

Keywords: Carbon footprint, Carbon labels, Greenhouse Gas, Low-carbon lifestyles.

1. Research Objective

To unveil the conceptual mechanism by which carbon labelling assisted carbon footprint mitigating can possibly mould low carbon lifestyles and influence consumer purchase decision.

2. Introduction

Concerns about the environment have emerged as a major constraint on human progress in recent decades. Greenhouse gas pollutants are produced directly by the combustion of hydrocarbons for transportation and heating, and indirectly by the production, distribution, and consumption of a wide

range of goods and services by different entities around the world. Companies have responded to these pressures by developing goods with reduced carbon pollution across their entire life cycle, from production to shipping to disposal. Carbon footprint labeling, which shows the overall quantity of carbon pollution produced by operations or throughout the entire life cycle of goods and services, is a useful tool for explaining this consumption perspective. Putting carbon labels on items may help educate buyers about their effects on the environment in a clear and concise manner. Carbon labels display a product's carbon emission footprint give companies the opportunity to disclose information regarding the effects of their production on the ecological environment and provide guidance to customers regarding how they can make more environmentally responsible purchasing decisions. Regulators and businesses are actively contemplating how to create a useful and relevant measure to decrease greenhouse gas emissions as the public's consciousness of global warming and carbon pollution grows. As a result, many nations have adopted prevention methods to cut back on energy use. Both monetary rewards, in the form of taxation, support funds, fees, etc., and non-monetary incentives, in the form of rules, standards, and restrictions, are incorporated into these plans of action.

3.0 Literature Review

3.1 Conceptualizing Low-carbon Lifestyles

Citizens' spending habits, such as their choices in regards to food, accommodation, transportation, consumer goods, recreation, and communication, are defined by their lifestyles, which in turn influence one another and contribute to unsustainable societal trends (Akenji & Chen, 2016). In 1987, the authors of the Brundtland Report recognized the importance of lifestyle, arguing that "sustainable global development requires that those who are more affluent adopt life-styles within the planet's ecological means," specifically mentioning the utilization of energy (Brundtland, 1987). The low-carbon lifestyle is one that is focused on conserving resources, cutting back on energy consumption, releasing less carbon into the atmosphere, and fostering long-term growth and prosperity for all living things (Fang et al., 2014). Whitmarsh et al. (2011) argued that a low-carbon lifestyle is a straightforward and healthy lifestyle paradigm led by eco-centric principles, in which people are able to actively regulate their behavior in everyday interactions in order to reduce greenhouse gas emissions, conserve resources, and safeguard the ecosystem. Yang & Li in the year 2013 argued that adopting a low-carbon lifestyle necessitated a shift in one's beliefs, spending habits, and cultural outlook in order to establish an different way of living. As per the Yang and Li (2021) low-carbon lifestyles includes the following features:

1. The use of minimal amounts of energy is encouraged. This includes putting an emphasis on cutting back on energy use to reduce carbon pollution and, in particular, carbon dioxide to help relieve environmental stress and slow down global warming.

2. Encourage a lifestyle that is simple, thrifty, and economical, in order to lower the amount of carbon dioxide.

To reduce one's carbon footprint and adopt low carbon lifestyle, entities can make changes to their power and water consumption, as well as their travel choices and the types of products and services they buy (Wang et al., 2015). Transitioning from state-led governmental action to people-led social action is an important step toward a low-carbon way of living. When people adopt a low-carbon lifestyle as a collective action and put forth their best effort to make a difference, they are engaging in what is known as "social action," which is defined as an entirely voluntary, fully organized, and highly dedicated social action (Cheung & Lee, 2010; Cheung et al., 2011). In order to facilitate this transition, the government immediately needs to implement social initiatives and procedures to inculcate low-carbon lifestyle and actualize the the organic fusion of societal and governmental actions (Armstrong, 2019). Governments, private and public undertaking, and groups will need to learn what kinds of initiatives are most successful in encouraging people to make low-carbon decisions in order to

effectively engage and assist the public in making these adjustments (Wynes et al., 2018). Policy measures that encourage the adoption of a low-carbon way of living:

1)   Li et al. (2016) examined the effectiveness of various policies on consumers' propensity to invest in electric cars powered by alternative energies and discovered that favorable tax and showcase policies had the greatest influence.

2)   As discovered by Chang et al. (2019) that cost considerations played a significant part in encouraging people to adopt sustainable lifestyles.

3)   Wang et al. (2017) investigated citizens' propensity to buy new energy electronic cars using a structural equation model, and discovered that a policy of financial subsidies increases the propensity to buy across all income levels.

A crucial component in decarbonization, lifestyle adjustments have been integrated into government policies to reflect the necessity of tackling consumerism and its effects (Koide et al., 2021).

3.2 Production and Consumption factors mitigating Carbon Footprint

Extended coverage in the press of climate change, international agreements like the Kyoto Protocol, and green economic investment have all helped to familiarize consumers with the phrase carbon footprint (Gertner, 2008). A person's carbon footprint is the quantity of greenhouse emissions they contribute to the atmosphere in the form of carbon dioxide equivalents, and it is used as a gauge of their particular impact on global climate (Lyans, 2007). The majority of the world's population lives in cities, and their purchasing decisions have a disproportionately large effect on global warming. Up to 68% of the world's greenhouse gases (GHG) pollution come from urban regions (Moran et al., 2018). Heinonen et al. (2013) examined at the link among domestic consumption, urban forms and carbon emission came to the conclusion that people's spending habits and the amount of emissions they generate are not just the outcome of their own personal beliefs but also of the environment around them. For example Das & Paul, (2014) revealed that a significant portion of CO2 emissions in India are caused by household energy usage for things like heating and lighting and fueling for personally-owned motor vehicles. Residential energy usage is a significant contributor to carbon emissions around the globe, and research studies frequently provide information about the strategies implemented for reducing it (Zhang & Wang, 2017). The effects of their choices extend well beyond the boundaries of their city (Bailey et al., 2019). Many nations use prevention techniques to lower energy usage. These tactics combine non-financial impulses like rules, standards, and sanctions with financial incentives or benefits through incentives like taxation, subsidies support, and payments (Cardenas et al., 2016). Koide et al. (2021) divided the primary methods for decreasing one's carbon footprint through modification of lifestyles into three categories:

a)   Absolute reduction: implies decreasing the amount of a product or service that is utilized, such as food, the number of kilometers traveled, the amount of power used, or the amount of housing space, in addition to eliminating choices that are not sustainable.

b)   Efficiency improvement: implies reducing pollution by switching to technologies with lower levels of carbon output while maintaining the same level of consumption or utilization; this can be accomplished, for example, by making agriculture, automobiles, and dwellings more energy efficient.

c)   Modal shift: refers to the process of replacing one mode of consumption with another mode that produces less carbon dioxide while maintaining the same level of functional consumer demand.

Business organization such as Patagonia (O'Rourke and Strand 2017) and Walmart (2017) made the management of their carbon footprint a central focus of their operations and supply chain administration strategy, despite the fact that doing so could raise their costs, burden their relationships with supply chain partners, and change business practices that had been in place for a

long time**.** As per Zhi et al. (2014) government policy interventions for reducing carbon footprints can be categorized into:

1.   Demand pull policies: seeks to encourage energy reduction and savings on the consumer side in order to decrease total energy demand (Yi, 2015). Demand pull policy tools primarily aim to stimulate the energy sector and provide incentives for the advancement of green energy technology (Zhang & Wang, 2017). Demand-side policies for energy usage vary by country and area and can take the shape of a carbon taxation, feed-in tariff, cap-and-trade program.

2.   Supply-side policies: Supply-side interventions are less diverse than demand-pull measures (Zhi et al, 2014). The primary objective of supply-side policy in carbon reduction is to alter the composition of fuel blend, generally by raising the proportion of natural gas and green resources; by establishing guidelines and rules, governments generally promote the cost-effective production of energy and the measurement of domestic carbon usage (Zhang and Wang, 2017).

Table 1: Carbon labelling measures adopted by various countries

Sr No	Countries	Carbon-labelling Measures
1.	**United Kingdom**	● Beginning in 2007, businesses in the United Kingdom, involving Tesco, Boots, Coca-Cola, and 20 others manufacturing companies of 75 different kinds of products, were encouraged to use carbon labels.
2.	**Japan**	● From 2008, Japan pushed the businesses to clearly display their goods' carbon emissions on packages. This helps customers better comprehend which products have negative effects on the climate, and ultimately leads to a shift toward low-carbon alternatives.
3.	**France**	● The government of France actively encourages businesses to be concerned about their carbon impacts, and in response, the country's largest grocery chain, Casino, employs two labels to indicate eco-friendly goods and their associated CO2 emissions and the idea of food mileage to quantify carbon emissions.
4.	**China**	● People's Republic of China has released the first set of regulations for certifying low-carbon products, established a licensing system for such products, and is nearing completion of the necessary technological preparations.

(Source: Li et al., 2017)

3.3 Carbon-labeling as an influencer of consumer purchase decision

Carbon footprint is an essential metric that can be conveyed to customers through the use of carbon labels which provide carbon information in order to direct customers toward more environmentally friendly habits and decrease carbon emissions (Li et al., 2017). A product's total CO2 emissions can be reflected by using carbon labels, which take into account production, use, and disposal (Tan et al., 2014). Carbon-labelling identifies greenhouse gas pollution from a product's entire life-cycle, including basic materials, production, storing and transit, and waste disposal (Liu et al., 2016). Individual customers are now able to compute their individual carbon footprints as a result of advancements in technology that make it feasible to quantify carbon emissions across the whole supply chain and at different phases of product production (Groening et al., 2015). The purpose of carbon labels is to enable customers to make more ecologically responsible decisions in order to reduce the ecological impact of their purchasing actions and to help businesses market their goods in an environmentally beneficial manner (Cohen and Vandenbergh, 2012). Carbon footprint labels on goods would be a helpful and effective method for customers to:

1. assess their personal carbon footprints, a company's sustainable actions and

2. comparison of carbon emission throughout companies and different categories of products (Groening et al., 2015).

Carbon-labelling is one of the several members of environmental labels that share many characteristics (Liu et al., 2016). The carbon mitigation label is more popular with customers because it lessens the responsibility to recognize quantifiable emissions in a world full of information every day (Schaefer & Blanke, 2014). Carbon labels are a simple and straightforward way for businesses to inform customers how their goods affect the environment (Hartikainen et al., 2014). On the one hand, customers are able to recognize the carbon emissions statistics of products, which eliminates the information divide among businesses and consumers. On the other side, the carbon-labelling system might increase customers' knowledge of the possible influence of their purchasing habits on climate change, which, in turn, can lead to reduced use of products that produce high levels of carbon dioxide (Thogersen & Nielsen, 2016). Both environmental labels and carbon-labelling are consumer-driven processes; their efficacy is primarily determined by whether customers understand the labels' meanings and have fundamental goals of ecological and societal responsibility, resulting in conscientious and altruistic buying behaviours (Guenther et al., 2012; Bleda and Valente, 2009). As per the study conducted by Thogersen & Nilsen (2016) demonstrated that by modifying the carbon footprint labelling to look like traffic signals, evaluating:

1. Green as the colour for low greenhouse gases emissions,

2. Yellow for marginally permissible emissions, and

3. Red for emission levels with negative environmental effects, derived customers towards substantial purchases of more green food items.

The findings of study conducted by Duan et al. (2023) facilitated managers in creating more efficient marketing campaigns for carbon-labelled goods by shedding light on the attitudes and actions of potential buyers and made the following recommendations:

1. Customers can be educated about low-carbon consumption and prompted to favour carbon-labelled goods if more and more innovative situations of low-carbon consumption are created that are identifiable, interactive and, accessible.

2. Consumers' propensity to buy goods with carbon labels depends greatly on their estimations of those labels' functional worth. Companies functional value can be increased through improved production methods, lowering production costs or better quality of their offerings.

3. Given that customers' propensity to buy carbon-labelled goods changes with age, it becomes essential to tailor product development and promotion efforts to various demographic subsets.

4.0 Research Methodology

- Research Method: Qualitative

- Paper Category: Conceptual

- Research Design: Exploratory

- Research Tool Applied: Grounded Theory Approach

- Data Mining Approach: Systematic Approach

- Research Mechanism: Inductive

- Sources of Data: Secondary

5.0 Findings

- Changes in energy and water usage, modes of transportation and the kinds of goods and services purchased can all help individuals and organizations lower their carbon footprints and embrace low-carbon lifestyles.

- Literature reveals that financial benefits in the form of subsidies, tax relaxations, showcase policies and cost consideration motivates people to adopt low-carbon lifestyles.

- Lifestyles can be altered in three ways to reduce carbon emissions: (1) absolute reduction [cutting back on the consumption much of goods and services], (2) modal shift [substituting one form of consumption with other option that creates less greenhouse gases while keeping effective customer demand], and (3) efficiency improvements [implementing technologies that emits low carbon while maintaining consumer demands].

- Government policy intervention for the adoption low-carbon lifestyle is divided into two categories (a) Demand-pull policies instruments are designed to promote growth in the energy industry and offer incentives for the development of renewable energy sources and, (b) through supply-side policies governments typically encourage efficient energy output and carbon footprint tracking through the establishment of rules and standards.

- As suggested by literature carbon labels can be modelled in the form of traffic signal lights where red implies high emissions, yellow implies limited discharge and green implies minimal emissions stimulate customers to shift towards green products.

6.0 Conclusion

To address the problem of climate change on a global scale, a number of nations' governments have enacted environmental protection laws and regulations in an effort to lower their overall levels of greenhouse gas emissions. The public is becoming more worried about climate change, and governments are passing more regulations to curb emissions. As a result, businesses need to think about how they could influence customer decisions. This research identifies a number of customer categories as well as lifestyle characteristics; hence, it is necessary to establish policies that are customized to a variety of consumer groups as well as their lifestyles. Consumer-focused mitigation measures should target carbon lifestyle-related aspects by, for example, educating the public, offering monetary benefits & impediments, and giving access to optimal low-carbon product alternatives. The

findings of this study may potentially be used as a resource for governments and businesses to advance carbon labelling legislation and encourage low-carbon purchasing among customers.
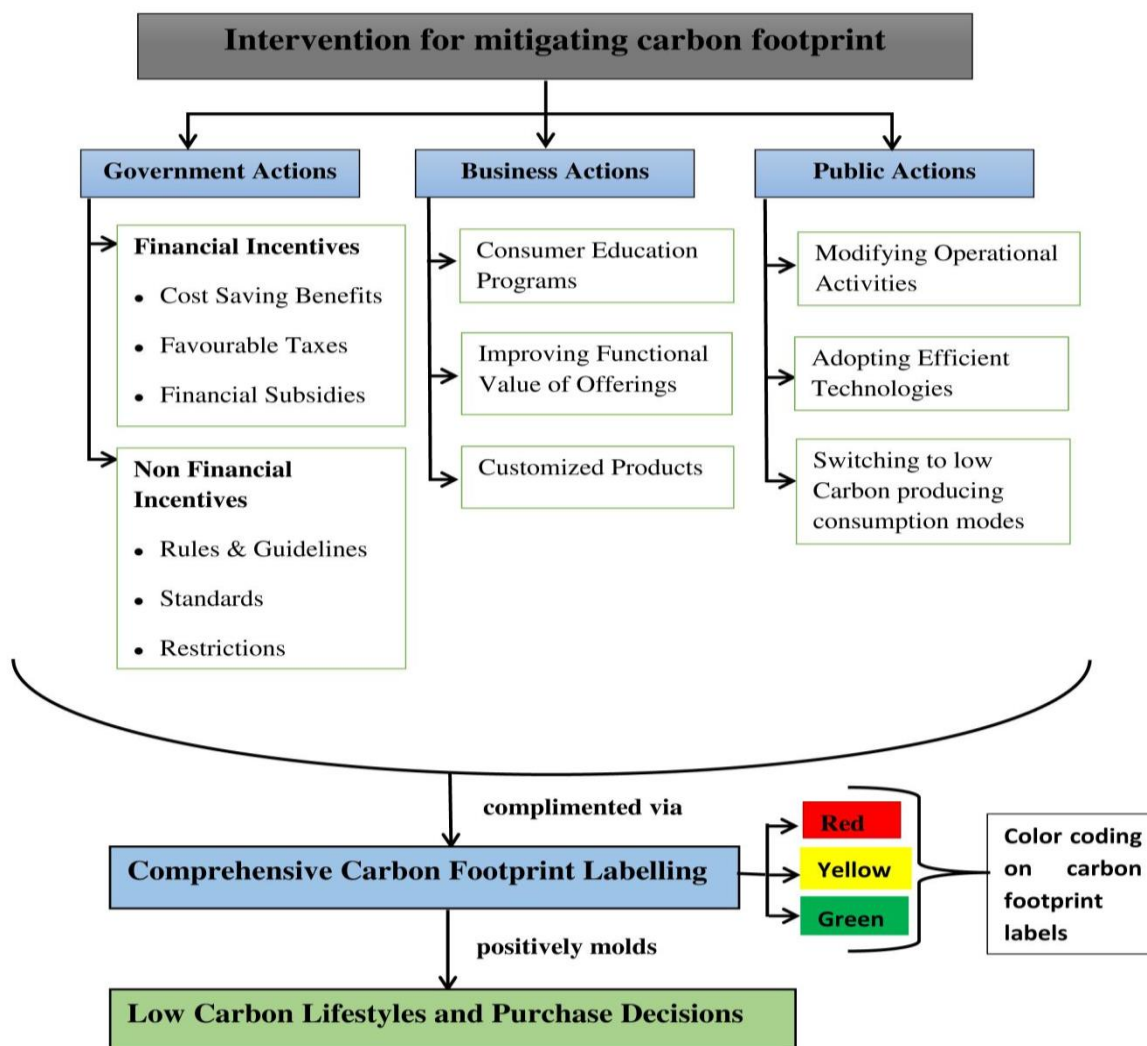

Fig 1: Framework for Carbon Labeling aided Carbon Footprint mitigation interventions for molding Low Carbon lifestyles & consumer purchase decisions.

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