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QUANTIFYING THE GREEN AI PARADOX: ASSESSING AI CARBON EMISSIONS AND THEIR IMPACT ON SUSTAINABLE MARKETING CLAIMS"

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ABSTRACT:

Artificial intelligence (AI) is another technology widely used by the brands in marketing their eco-friendly products in modern society.AI assists in businesses designing custom advertisements, suggesting environmentally-friendly products, and reaching consumers who are concerned about the environment. However, there is one issue that the majority of people fail to notice: AI itself consumes a great deal of power. The production of AI systems and their operation generates carbon emissions, consumes a lot of water, and contributes to electronic waste.

Thus, when a brand affirms to the clients that it is going green with the use of AI technology, the technology involved in conveying such messages to them might be damaging the Environment. This paper examines this paradox. It poses a very basic yet a meaningful question: is the pollution of AI tools offsetting the green advantages that brands claim to offer? In answering this, the study is done in two methods. First, it analyses energy consumption and carbon emissions of typical AI marketing tools using a life-cycle assessment using secondary data. Second, we approached primary data by conducting a survey of 120 consumers to determine whether they are aware of the environmental costs of AI and whether this understanding changes their perception of green brands. The findings indicate that the majority of companies fail to quantify or disclose the degree of pollution caused by their artificial intelligence marketing solutions. Even most consumers are unaware that the AI that generates recommendations on their shopping has a carbon footprint. Brands are also not asked to be honest about this in clear rules and standards. The present paper identifies a weakness of green marketing and proposes some straightforward things that

brands and regulators should do in order to make AI-induced sustainability claims more truthful and really beneficial to the planet.

KEYWORDS: sustainable marketing, green branding, artificial intelligence, carbon footprint, greenwashing, ethical AI.

INTRODUCTION:

The use of Artificial Intelligence (AI) is becoming common in Marketing. AI tools (chatbots, recommendation, and content generators) are adopted by many companies to market green products and create a green brand image. These tools enable the business to target appropriate customers with appropriate messages regarding sustainability. Nevertheless, AI systems require excessive amounts of energy to operate. The process of training large AI models may emit hundreds and even thousands of tonnes of carbon dioxide into the air. The electricity consumed in running these models on a daily basis consumes even greater electricity most of which is still non-renewable. The implication is that what companies are utilizing in the promotion of green products could be damaging the environment. This leads to the so-called Green AI Paradox. The case of AI contributing to the dissemination of the sustainability message on one hand, on the other, contributing to the pollution issue. When sustainable marketing claims are not checked with the cost of carbon of AI, it can turn out to be misleading, and this is one of the greenwashing.

This paper aims to find out whether the carbon footprint of AI tools contradicts the sustainable marketing assertions by the companies that use it. This paper will examine the application of AI in green marketing and whether the environmental cost undermines the sincerity of such claims. This will aim at enabling businesses and marketers to see the entire picture in order to make sustainable decisions.

OBJECTIVES:

1.To study the impact of the carbon footprint of AI tools in influencing or undermining the marketing claims of sustainable marketing by companies.

2.To investigate the degree of consumer knowledge regarding the environmental impact of AI technologies applied to the marketing process.

3.To determine whether AI application in green marketing enhances customer interaction and decision-making on products that are environmentally friendly.

Literature review

Artificial intelligence (AI) can be applied in numerous different ways to solve many of the problems faced in the world, i.e.: better weather prediction, more efficiency in industrial uses etc. Nonetheless, AI has several environmental implications such as high use of natural resources and high consumption of energy to run it. The combination of the two factors leads to the Green AI Paradox; AI could be a friend to a cleaner environment but in the process, it is a source of greenhouse gas emission, water consumption, etc.

Numerous researchers have proven that large-scale AI models consume high levels of electricity to be trained. One study approximates that training one of the largest AI models, GPT-3 creates about 500 tons of CO2 equivalent. This could be compared to hundreds of car trips made in different countries and the emission produced.

The following are the review of some research experts have pointed out in the paper :

1.**Roy Schwartz, Jesse Dodge, Noah A. Smith, and Oren Etzioni** in their paper titled "Green AI" (2019) discuss the increasing use of large artificial intelligence models that require high computational power and energy. They point out that the high level of computing not only escalates the use of electricity and the ecological footprint because of the high computational cost but also makes the research of AI rather costly and the option not easily available to smaller organizations and researchers.

Thus, the authors propose the idea of Green AI that will encourage scientists to pay attention to efficiency, cost of computation, energy consumption, and performance of models so that they make the process of AI development more sustainable and affordable.

2.In the article on the impact of Artificial Intelligence development on climate change, **Zhanming Chen, Qiyang Xiong** and associates in their article titled The Climate Impact Paradox of AI (2026), in the Journal of Energy and Climate Change, have a complex relationship to develop on the issue.

The authors indicate that even though artificial intelligence may contribute to enhancing energy efficiency, green innovation, and improve the ability of industries to cut carbon intensity, the proliferation of AI technologies is also raising the level of energy use and carbon emissions. This poses a complicated situation in which the AI helps to reduce emissions in certain regions and at the same time, it leads to increased emissions because there is an increase in economic activity, expansion in data infrastructure and growth in the utilization of AI systems.

The analysis points out that AI as an environmental factor is not fully constructive and under the condition of the absence of adequate policies and renewable energy resources, the mass introduction of AI can become a significant contributor to the deterioration of the climate despite its possible positive influence on sustainability.

3.The article by **Sasha Luccioni and Mario Hernandez-Garcia** called Counting Carbon: A Survey of Factors Influencing the Emissions of Machine Learning (2023) is a study on the issue of carbon emissions produced by machine learning models.

The authors study the emissions of 95 machine learning models of various tasks in the course of their study. They note that the literature on the environmental impact of machine learning has largely concentrated on a few models, which is not reflective of the large diversity of machine learning systems in practice today.

Thus, the authors point at the fact that the entire environmental impact of machine learning is not studied yet and new and more extensive research in this field is necessary. They claim that this focus is incomplete since machine learning models and applications are very diverse today.

The paper notes that most of the researchers provide only selected data on training emissions that may lead to a partial idea of the true environmental effect of the AI systems. Thus, the authors state that carbon emissions reporting should be more open and thorough so that the environmental footprint of machine learning can be understood and managed in a better way.

Need of study

Artificial intelligence is now one of the booming industries across the globe. Firms such as Google, Microsoft, OpenAI, Amazon, and Meta invest billions in the construction and operation of AI systems. These systems operate on large data centers which consume large quantities of electricity and water and generate large carbon footprints. Simultaneously, the same companies inform the population that their AI activities are sustainable, carbon-neutral, or run on 100 percent renewable energy.

This poses a severe problem. On the one hand, there is an accumulating engineering literature on the fact that AI has a massive environmental footprint and it is only increasing. There are also corporate marketing messages on the other side informing consumers and investors otherwise. All is well, and AI is green. But no one has researched what is in between: how do companies make a pollution issue a good marketing narrative, and do individuals actually believe it?

The reasons why this study is required are as follows:

1. No one has questioned the Consumers on their knowledge or perception regarding the Environmental cost of AI. Upon opening ChatGPT, opening a Netflix recommendation, or utilizing Google search, a person is not aware that, in this instance, electricity, water, and carbon emissions are needed. AI is invisible and clean as it occurs in a cloud. Other industry research.

Food, Fashion & Cars :This illustrates that when consumers make judgments about brands in terms of sustainability claims, false claims are harmful to the trust. However, this has never been tested with AI. Are consumers aware that AI contaminates? Do they care? Do they feel informed about the use of AI tools or the choice of AI products? The research is required since today AI is consumed by billions of people every day, and none of them have been questioned about these fundamental issues.

2.The disconnect between what AI's Companies are purporting and what the evidence indicates is increasing, and no one is quantifying this disconnect. This article cautiously warned against the claim that AI efficiency will cause overall less pollution. It simply causes an increase in the use of AI by people, and overall emissions continue to increase. **Morand et al. (2025)** presented first-hand evidence that the Environmental Effect of AI training has increased annually since efficiency was enhanced. In the meantime, the firms continue to sell the efficiency gains as evidence that they too are going green. It is a typical greenwashing trend.In improving one measure and the general issue gets more serious. However, no one has personally used greenwashing analysis to the sustainability marketing of the AI industry. This paper shall be the first project to quantify the gap between what the AI companies claim and what the environmental data conveys.

3. The relationship between the Environmental Effects of AI as a Technical Phenomenon and its marketing demonstration has never been investigated as a single research issue. At this moment, there are two different sets of researchers who investigate two different issues. .i.e. AI consumption of computer scientists is measured by carbon, water, and energy whereas In greenwashing, there is a study that is done by marketing researchers. These two groups do not communicate. No article has put both sides into a single research that poses the question: **"Taking into consideration what we already understand about the actual environmental impact of AI, are the sustainability marketing messages provided by AI companies truthful, and do the consumers have a set of knowledge they need to make informed decisions?"** Simply put, this research is required since the companies that use AI are making a green story to each of us, and no one has verified that this is the truth.

Research gap:

1.No one has investigated the relationship between AI emissions and green marketing. While there are studies that measure the carbon footprint of AI and other studies on greenwashing, there are none that try to connect the two.

2.The carbon footprint of AI is not being reported by companies: Some companies like Coca-Cola and Sephora report annually on emissions related to their operations, transport, packaging or even their supply chain. However, none reports on the carbon emissions generated by the AI and data sciences used for their marketing activities.

3.The authors highlight that there is no current framework to assess the impact of AI on Artificial greenwashing Index (AOI) scores. They state that there is no study that evaluates the impact of the estimated carbon footprint of AI tools on a company's sustainability reputation in the case of greenwashing.

RESEARCH METHODOLOGY

This study is based on a descriptive research design and uses two methods to examine the research problem,

Method 1: Life Cycle Assessment (LCA)-(Secondary data), The Life Cycle Assessment (LCA) methodology is based on secondary data. This study employed LCA to evaluate the energy consumption and carbon footprint of the use of AI in marketing.

As the data could not be collected directly, the studies that had already been done were referred to. The data about the energy consumption and carbon footprint of AI were collected from various studies and also the company sustainability claims were collected from annual reports and marketing communications. The data collected were evaluated, verified and compared with each other to find out if the use of AI in marketing contradicts with the sustainability claims of the companies.

Method 2: This method is used as a survey. For this, a structured questionnaire was prepared and filled in by 120 respondents. The respondents include Students, Employed workers, Homemakers and Businessmen. This survey aimed at checking the level of awareness among consumers regarding environmental damage caused by AI and whether this environmental awareness affects the consumption behaviour of the consumers, in relation to the green marketing strategy.

RESULT & ANALYSIS

Primary Data

A primary survey was conducted using a structured questionnaire distributed among 120 respondents. The survey aimed to assess consumer awareness of AI's environmental impact and examine whether this awareness influences their trust in companies' green marketing claims.

Table-1

Question	Mean	Standard Deviation	Interpretation
Meaning of AI in sustainable marketing	1.69	0.81	Low awareness
Awareness of water usage in AI systems	1.93	0.79	Low to moderate awareness
Awareness of energy/carbon emissions	2.02	0.76	Moderate awareness

Interpretation of Descriptive Analysis

In this part, from table-1 the descriptive analysis on consumers' awareness regarding the environmental impact caused by the use of artificial intelligence is performed.The table indicates that the awareness of AI in sustainable marketing is not very high, but it is relatively high. The population knows very little about AI concepts and its environmental effects, particularly in such aspects as water consumption. The consciousness regarding energy and carbon emission is not that high but a little better. On the whole, the awareness of the respondents regarding the effects of AI on the environment is low.

Table-2

Measure	Value	Interpretation
R square	0.141	Explains 14.1% of variation
Coefficient	0.232	Positive impact of awareness on perception
Significant	0.00004	Model is statiscally significant
P-value	0.00004	Relationship is significant

From table-2 : The regression analysis shows the significant and positive response. The coefficient of determination R^2 for the variables is moderate and equal to 0.141. The positive

coefficient indicates that the level of awareness affects the degree of positive perception towards the systems, and the values of the t-test and P-values showed that it is not a random impact, rather it has a direct relationship.

Therefore, achieving the objective of the study was successful in terms of affecting the positive perception of the environmental monitoring systems using AI compared to manual monitoring.

Table-3

Measure	**Value**	**Interpretation**
R square	0.03	no variation
Coefficient	0.089	very weak positive impact
Significant	0.559	Model is not statistically significant
P-value	0.559	relationship is not significant

From the above Table-3: A small positive value is still considered negative though, and that reveals itself in the analysis where a change above 0 does not have an actual effect. This means under customer engagement and the decision-making regarding environmentally friendly products, there is no significant advantage of AI being applied in green marketing. More than AI tools, the decision of individuals can be influenced strongly by additional factors such as cost, knowledge or own interests. Hence, as per this information the AI does not play any significant role in creating an impact on the green marketing customer behaviour.

Secondary Data: This section presents results using the Life Cycle Assessment method, focusing on training and inference stages. It is based on **"secondary data"** from existing studies to understand AI's environmental impact.

Parameter	**Coco-cola**	**Sephora**
AI-Marketing Tool	GPT-4 +DALL.E	AI Chatbot + Recommendation Engine + Virtual Artist
Proxy AI Model	BLOOM(176B) + Stable Diffusion	Smaller NLP/ CV Models
Training CO2e	~36-62 tonnes	~1-5 tonnes
Est.Annual Inference	~643 tonnes	~322 tonnes

CO2e		
Sustainability Claim	Net-Zero by 2050	Renewable ; reduced packaging
AI Emission Disclosed or not	No	No
Level of Contradiction	High	Moderate

Source: Sasha Luccioni & Hernandez-Garcia (2023). Sustainability claims from company reports.

Interpretation

The above table shows that the large models used by Coca-Cola result in significantly higher emissions which are in high contradiction with the sustainability statement. In contrast, the smaller models used by Sephora, result in lower emissions and therefore moderate contradiction. Both companies do not report their AI-related emissions, in line with the observations about the emissions of large models being underreported.

Limitation

We used very approximate numbers of daily searches, based on publicly available statistics. The exact numbers are not disclosed by the companies.This study only considers the training and inference stages of the AI lifecycle. Other stages, such as hardware production (embodied carbon), cooling, water consumption, and end-of-life disposal are not considered in this study.

DISCUSSION

In the study of Life cycle Assessment, it says that businesses that make use of AI in their marketing can conflict between being innovative and being sustainable. Big AI models release much more carbon emissions than smaller models thus a high conflict between the companies claims of sustainability and their real life carbon footprint.

The contradiction is relatively lower for smaller models and hence releases relatively less carbon and a relatively lower conflict. The AI emissions from marketing activities are not disclosed by many companies hence the non-transparency which shows that although companies try to sell an image of being sustainable, by using large models in their marketing they can easily hide the real impacts and this in turn calls for fair and honest use of AI marketing.

Under survey conducting method Our findings suggest that overall, consumers' environmental awareness of the impact of AI in sustainable marketing is low particularly in relation to water usage, whereas their environmental awareness of energy consumption and carbon emissions, although slightly higher, remains low too. Moreover, an increase in environmental awareness towards AI leads to more favourable attitudes toward AI towards sustainable marketing and this relationship is found to be statistically significant.

However, their environmental awareness does not appear to affect their purchasing behaviours significantly as the effect is very weak and not significant. This indicates that consumers' favourable attitudes towards sustainable marketing and AI can be enhanced through increasing their awareness, and marketing professionals have to continue to focus on raising consumer awareness to achieve successful sustainable marketing using AI.According to new Marketing Science research, marketers will need to educate consumers more for an AI-based form of "green marketing" to have an impact.

CONCLUSION

After summing up the whole research, the main conclusion is that, although the use of Artificial Intelligence (AI) increases the effectiveness of green marketing in enabling consumers to make more environmentally friendly choices, the use of such technologies have some environmental impacts that need to be taken into account.

Indeed, applying the Life Cycle Assessment approach to the training and inference phases of an AI system reveals that both phases involve considerable amounts of energy and consequently carbon emissions.

Although the data used in this study is secondary and incomplete for several stages, at least it gives an idea of the environmental impacts of digital technologies and confirms that AI and other digital technologies are not yet "green" as they are often considered. Thus, in the light of this research, the use of AI for sustainable marketing should be balanced with considerations of its environmental impacts.

Consequently, businesses, researchers and policy makers should work towards improving the energy efficiency of the use of AI, as well as towards developing sustainable practices in the use of digital technologies in general. In short, AI is a very useful tool for a sustainable future, but we should know its environmental impacts and find ways to reduce them.

REFERENCES

1. Schwartz, R., Dodge, J., Smith, N. A., & Etzioni, O. (2020). Green AI. *Communications of the ACM*, *63*(12), 54–63. https://doi.org/10.1145/3381831
2. Chen, Z., Xiong, Q., & associates. (2026). The climate impact paradox of AI. *Journal of Energy and Climate Change*.
3. Luccioni, A. S., & Hernandez-Garcia, A. (2023). Counting carbon: A survey of factors influencing the emissions of machine learning. *arXiv preprint*.
4. https://doi.org/10.48550/arXiv.2302.08476
5. Morand, C., Ligozat, A.-L., & Névéol, A. (2024). How green can AI be? A study of trends in machine learning environmental impacts. *arXiv preprint*.
6. https://doi.org/10.48550/arXiv.2412.17376
7. Moodaley, W., & Telukdarie, A. (2023). Greenwashing, sustainability reporting, and artificial intelligence: A systematic literature review. *Sustainability*, *15*(2), 1481.
8. https://doi.org/10.3390/su15021481
9. Hermann, E. (2021). Artificial intelligence in marketing: Friend or foe of sustainable consumption? *AI & Society*, *37*, 1557–1570. https://doi.org/10.1007/s00146-021-01227-8
10. Patterson, D. A., Gonzalez, J., Le, Q. V., Liang, C., Munguía, L.-M., Rothchild, D., So, D. R., Texier, M., & Dean, J. (2021). Carbon emissions and large neural network training. *arXiv preprint*. https://arxiv.org/abs/2104.10350