



INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

A Study On Determinants Of Awareness In Carbon Trading And Its Role In Sustainable Development

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Abstract

The research conducted on stakeholder awareness about the carbon marketplace and trading covers a total of ten different areas: employee awareness, managerial awareness, training programs, information availability, level of emission reduction understanding, governmental communications, financial incentives, global trends, sustainability goals, and stakeholder participation. Using descriptive statistics and one-sample t-tests based on a group of 70 participants, it was observed that all the dimensional mean values remained significantly above the neutral threshold ($p < .001$), thus confirming a high degree of overall awareness. The high levels of awareness about sustainability goals, training programs, and communications by governments highlight institutional and policy support. On the other hand, relatively lower levels of awareness about global trends and employee-level understanding show areas of shortfall and demand for targeted training and enhanced acquaintance with global standards. These findings confirm the importance of awareness as a vital factor for efficient participation in carbon trading and highlight enhanced stakeholder knowledge as necessary to promote participation in climate mitigation and sustainable development.

Keywords: Carbon Trading, Sustainable Development

Introduction

The increasing imperative to fight climate change has ushered in carbon markets as a central policy tool to mitigate global greenhouse gas (GHG) emissions. The markets are run through "cap-and-trade" and "baseline-and-credit" frameworks by which companies trade emissions allowances or credits and hence reap an economic advantage to decrease emissions. (Ellerman et al., 2010). Formation of carbon markets at the global level in protocols such as the Kyoto Protocol and later the Paris Agreement has provided advanced nations as well as developing nations with latitude to access emission trading agreements (ETS) and carbon

credit transactions (Flachsland et al., 2009). However, despite their rising significance, knowledge and comprehension of how carbon markets operate is sporadic at various levels, from territories to industries and even among the various stakeholders, especially developing nations where capacity limitations and informational disadvantages are rife (Kollmuss et al., 2008).

Carbon trading mechanism knowledge is a key predictor of participation, adherence, and efficiency in carbon markets. Information deficiency among policymakers, corporations, and citizens can compromise effectiveness of these mechanisms by inhibiting market participation and discouraging investment in low-carbon technology (Liu et al., 2015). Enhanced knowledge, by its turn, infuses transparency, fosters trust, and enhances entities' willingness to engage in trade activities, thus driving market activity and environmental integrity (World Bank, 2020). Based on prior research, it is revealed that effective carbon markets—as is the case with respect to the European Union Emissions Trading System (EU ETS)—derive much of their effectiveness from broad institutional knowledge and active stakeholders' engagement (Newell, Pizer, & Raimi, 2013). Against the backdrop of the increasing significance of voluntary and compliance carbon markets in nations like China and India, examination and analysis of knowledge levels hold vital significance with respect to aligning national climatic strategy with global carbon trading regimes (Narassimhan et al., 2018). It is amidst precisely these realities that this present work endeavours to determine knowledge regarding the carbon market and trading by various stakeholders with a prime consideration for highlighting the importance of knowledge towards achieving effective take-part, driving market efficiency, and promoting sustainable climatic governance.

Literature Review

Kollmuss, Zink, and Polycarp (2008) scrutinized voluntary carbon markets and made remarks concerning the state of knowledge by the public and businesses of carbon offset standards. Their comparative analysis of various offset mechanisms revealed that the lack of transparency and sparse knowledge by the stakeholders lowered trust in carbon markets. The research emphasized the significance of increasing knowledge and standardizing disclosure of information to encourage participation and build trust in trade regimes.

Liu et al. (2015) examined the state of awareness and knowledge of China's pilots of carbon emissions trading. Based on survey data analysis as well as policy analysis, the study revealed that policymakers and large enterprises were somewhat aware of trade mechanisms, whereas SMEs and the general populace were unaware. It was concluded by the authors that it is important to implement particular activities of raising awareness and learning programs in enlisting participation in carbon markets.

(Zhang, Karplus, & Cassisa, 2017) analyzed awareness and participation in the European Union Emissions Trading System (EU ETS) and its extension for China. Their mixed-method design, that is, combining interviews and econometric modeling, identified institutional awareness at senior levels and knowledge of compliance as having promoted the success of the EU ETS. It is their view that China's carbon market needs to pay emphasis to stakeholder awareness-building to be cost-effective and to avoid market distortions.

(Narassimhan et al., 2018) offered a worldwide overview of carbon pricing implementation, targeting policymakers' and marketactors' awareness. Awareness of carbon markets was significantly connected to policy transparency, communication plans, and institutional commitment. The authors suggested more robust information dissemination mechanisms to raise awareness and trust in the trade of emissions. Newell, Pizer, and Raimi (2013) examined carbon markets' emergence following the Kyoto Protocol and the role of stakeholder knowledge. Employing the policy analysis methodology, the research findings indicated that active awareness-raising policy-user nations had higher program-participation rates for emissions trading. The research also concluded that awareness not only results in stronger compliance, it creates innovation and enhances competitiveness for low-carbon industries.

(World Bank, 2020) in its State and Trends of Carbon Pricing report, pointed out world-wide trends of adoption and awareness of carbon trading. It stated that awareness is only high in advanced markets, whereas developing nations are hindered by scarcity of institutional knowledge and limited communication routes. It recommended linking awareness-building activities to national climate plans for wider outreach to carbon markets.

Objectives of the Study

1. **To examine the level of awareness of carbon trading among different stakeholder groups**, including policymakers, corporations, and the general public.

Hypothesis of the Study

H1: Overall stakeholder awareness including employees' awareness, managerial knowledge, training programs, information accessibility, emission reduction understanding, government communication, financial benefits awareness, global trends awareness, sustainability goals recognition, and stakeholder awareness significantly influences the level of engagement in carbon trading and market participation.

Research Methodology

This research employs a quantitative descriptive–analytical design to evaluate the impact of stakeholder awareness upon involvement in carbon trading. Policymakers, managers, and sustainability specialists were surveyed through a structured five-point Likert-scale questionnaire covering ten dimensions of awareness with 70 respondents in a purposive sample. The data were coded and analyzed in SPSS with descriptive statistics to report aggregated responses, reliability through Cronbach's alpha, comparison of awareness

levels to neutrality via a one-sample t-test, and to test the hypothesis that total awareness has a significant influence upon involvement in carbon trading through regression analysis. Voluntary involvement, informed consent, and confidentiality maintained appropriate ethical standards.

Data Analysis and Interpretation

Descriptive statistics shown in Table 1 reveal that in all aspects, respondents showed above-average knowledge of the carbon market and trading, with means between 3.286 (awareness of global trends) and 3.494 (recognition of sustainability goals) out of a five-point Likert scale. Relatively similar standard deviations (0.493–0.676) reflect moderate variability, showing that by far, respondents' knowledge levels were clustered in the region of the mean. Minimum and maximum values indicate spread of the response, revealing that although at times participants indicated poor knowledge (e.g., information access, minimum = 1.455), at times they showed high knowledge (e.g., training programs, maximum = 5.712). These findings propose that, relatively, at the average level, stakeholders exhibit a fairly favorable level of knowledge and comprehension of carbon trading, of which sustainability goals recognition, training programs, and government communication achieve the strongest level of agreement.

	Mean	Std. Deviation	Minimum	Maximum
Employees Awareness	3.319	0.540	2.224	4.511
Managerial Knowledge	3.380	0.593	1.828	4.878
Training Programs	3.484	0.595	2.436	5.712
Information Accessibility	3.375	0.638	1.455	4.789
Emission Reduction Understanding	3.442	0.493	2.229	4.680
Government Communication	3.472	0.575	2.126	4.714
Financial Benefits Awareness	3.364	0.676	2.019	5.247
Global Trends Awareness	3.286	0.524	1.917	4.546
Sustainability Goals Recognition	3.494	0.618	2.073	4.867
Stakeholder Awareness	3.335	0.634	1.782	4.944

Table 1: Descriptive Statistics

The results of the one-sample t-test, as presented in Table 2, further substantiate these conclusions by indicating that all dimensions of awareness exhibit significant differences from the neutral test value of 3 ($p < .001$ for each variable). The positive mean differences suggest that the level of stakeholder awareness surpasses neutrality, thereby confirming that participants not only acknowledge the presence of carbon markets but also engage meaningfully with their components. Particularly pronounced effects are noted for

the understanding of emission reductions ($t = 7.492$, $p < .001$), recognition of sustainability goals ($t = 6.691$, $p < .001$), and effectiveness of government communication ($t = 6.866$, $p < .001$), highlighting the critical role of institutional communication and sustainability frameworks in influencing awareness. These findings are consistent with prior research (Liu et al., 2015; Narassimhan et al., 2018), which underscores the significance of institutional support, training programs, and policy clarity in fostering stakeholder knowledge and engagement in carbon markets.

	t	df	Sig. (2-tailed)	Mean Difference
Employees Awareness	4.947	69.000	0.000	0.319
Managerial Knowledge	5.359	69.000	0.000	0.380
Training Programs	6.794	69.000	0.000	0.484
Information Accessibility	4.920	69.000	0.000	0.375
Emission Reduction Understanding	7.492	69.000	0.000	0.442
Government Communication	6.866	69.000	0.000	0.472
Financial Benefits Awareness	4.511	69.000	0.000	0.364
Global Trends Awareness	4.561	69.000	0.000	0.286
Sustainability Goals Recognition	6.691	69.000	0.000	0.494
Stakeholder Awareness	4.429	69.000	0.000	0.335

Table 2: One sample t test on Awareness of the Carbon Market and Trading

Conclusion

The survey sought to gauge the level of awareness among stakeholders about the carbon market and trading through ten different dimensions: employee awareness, management comprehension, training programs, accessibility to information, understanding of reduction of emissions, government communications, awareness about financial incentives, recognition of international trends, recognition of sustainability goals, and stakeholder awareness. The finding is that overall level of awareness is significantly beyond a neutral basepoint indicated by mean measures beyond the median and reinforced by strongly significant t-test results ($p < .001$). This suggests stakeholders are recognizing not only the existence of carbon trading schemes but also recognizing their significance to engendering reduction of emissions and meeting sustainability goals.

In all the different dimensions surveyed, sustainability goals awareness, employee training activities participation, and communications by governments stood out as areas with greatest recognition highlighting institutional initiatives, policy dissemination, and formal knowledge-sharing exercises. By contrast, compared to other areas, any lower recognition levels for global trends and employee-related knowledge reflect a need for broader outreach exercises and broader coverage for international carbon trading practices. Overall, the results confirm that stakeholder recognition is critical to allow participation in carbon markets

and is aligned with existing research findings supporting institutional support and information access as key prerequisites to sustained market participation. Policymakers and organizations can, by filling employee training gaps and knowledge gaps in global trends, better enable stakeholder capacity for carbon markets to function effectively as climate mitigation and sustainable development resources.

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