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EDITORIAL

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(Special Issue)
Dibrugarh University

Dear Readers,

It is my immense pleasure to present to you the 32nd Volume of Vanijya, an annual journal of the Department of Commerce, Dibrugarh University. The journal has, since its inception, been an open forum that encourages research-based write-ups in varied areas of commerce – ranging from Human Resource to Marketing to Finance to Banking to a host of other sub-areas and allied disciplines. It has, thereby, created space for interdisciplinary and inter-dimensional research that represents the deep penetration and growing significance of varied subjects of the commerce discipline in all walks of life. It embodies both the pure deep-rooted knowledge of commerce as well as the functional aspects of management that were born out of these pure subject areas.

This edition is a Special Issue, created in collaboration with the Centre for Management Studies, Dibrugarh University, that features some of the ingenious research ideas that were presented in the National Seminar on "Management Practices for Sustainable Development Goals" organized by the Centre earlier in 2024.

The 17 Sustainable Development Goals (SDGs), that remains the focus of all United Nations Member States, calls for urgent action by all developed and developing nations through global partnerships. India, too, has been empathetic towards the achievement of these 17 goals and 169 targets by 2030, intended at improving human well-being in the country. Commerce and Management, being the backbone of not just income and livelihood but also of larger socio-economic and human development, has a huge role to play in the attainment of these goals. Business and commercial activities have been indispensable instruments of social and economic development since the time civilization acknowledged the need to earn, build and better their existence. However, in an effort to do so, self-growth became over-bearing on inclusive and sustainable growth in certain contexts and situations. Such state of affairs may also be attributed to lacunas in foresighted and progressive management thoughts and processes. The United Nation's apt and timely response in identifying the Sustainable Development Goals for greater human well-being builds fresh hope that the damage already done can be controlled and further development can be strategically planned and executed in a way that secures prospects of a sustainable future. Businesses have a huge role to play in this respect by adopting measures aimed at reducing carbon footprint, greener management practices, proper waste management, promoting gender equality and diversity, engaging in philanthropic activities, ethical business practices and so on so forth. This necessitates more and more systematic research in varied sub-disciplines of commerce and management for ensuring efficient and effective execution of strategies aimed at attaining the stated purpose.

Acknowledging the significant contribution of the researchers in the given theme and given its greater relevance in the fields of pure Commerce as well as in Management, this edition of the journal accommodates a range of ideas, concepts, models and findings in topics inclined towards achieving sustainable development goals. Although small in number, each of the papers selected for publication in this issue is expected to give some food for thought to all stakeholders of business and the society.

Vanijya Guidelines for Paper Contributor

One hard copy of manuscripts, typed in 1.5 space with font size, 12 typed in Times New Roman and a soft copy in MS Word format should be sent to the editor before 30th of August every year along with a declaration that the paper is neither published nor has been sent for publication elsewhere. The size of the manuscript should not be more than 10000 words excluding figures, tables, footnotes, annotations, and references. For book review, the size of the write up is restricted to 1000 words. All tables should be included at the end of the paper in sequence and consecutively titled and numbered. However, an advance copy of the paper should be emailed to vanijya89@gmail.com.

Each manuscript should contain an abstract of not more than 150 words. There should be a title page containing the name of the article, name of the author/s affiliation of the author/s and address for correspondence of the author/s. The name/s of author/s should not appear in the first page or any of the pages of the manuscripts to facilitate blind review.

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Empowering Small Tea Growers for Sustainable Development: Aligning with the SDGs in Assam, India

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Abstract

Purpose of the Study

The purpose of this study is to analyze the impact of small tea growers (STGs) in Assam, India, on the Sustainable Development Goals (SDGs) set by the Food and Agriculture Organization (FAO) of the United Nations. The study aims to identify both internal and external challenges faced by STGs in achieving these SDGs, as well as policy measures and research priorities to address these challenges and promote the achievement of SDGs for STGs in Assam.

Methodology

To achieve the study's purpose, a mixed-methods approach was adopted. The study involved a review of existing literature on STGs in Assam and their impact on SDGs, as well as primary data collection through semi-structured interviews with STGs, government officials, and tea industry stakeholders. The study also involved a content analysis of government policies and initiatives related to STGs in Assam.

Findings

The findings of the study indicate that STGs in Assam have made significant contributions to achieving SDGs related to poverty alleviation, education, gender equality, responsible consumption and production, climate action, and preservation of terrestrial ecosystems. However, STGs in Assam face multiple challenges both internal and external that hinder their productivity and profitability. These challenges include unregulated growth and location drawbacks resulting in heterogeneous green leaf (GL) quality and sales, low productivity due to lack of technical, managerial, and scientific knowledge on tea cultivation and scanty use of improved technology on tea cultivation by farmers further compounds the issue, green leaf challenges for smallholder tea growers related to sales and price realization due to lack of coordination with buyers resulting in lower prices for their produce, pest attacks, labour shortages during peak plucking seasons, lower prices for GL due to high price fluctuations, low participation of women in managing tea farms due to poor economic conditions and financial exclusion, lack of awareness about government support resulting in deprivation from availing benefits from government agencies, failure in collective action among STGs due to various reasons requiring further exploration, closure of processing units operated by cooperative forms due to reasons remaining unclear, environmental problems associated with tea cultivation prior to tea cultivation resulting in land being used for food crops or traditional crops instead of bamboo plantation that had unique socio-cultural significance, erratic weather events due to climate change affecting Assam's tea-growing seasons resulting in crop loss, reduced productivity, and low income for STGs in particular.

Original Contribution

The original contribution of this study lies in its detailed analysis of the impact of STGs on SDGs in Assam and its identification of both internal and external challenges faced by STGs in achieving these SDGs. The study also provides practical policy measures and research priorities to address these challenges and promote the achievement of SDGs for STGs in Assam. The study's findings have important implications for policymakers, government officials, tea industry stakeholders, academics, and researchers working on issues related to small tea growers (STGs) in Assam. The study's recommendations for policy measures and research priorities can help to promote the achievement of SDGs for STGs in Assam while also addressing their internal and external challenges.

Keywords

Food and Agriculture Organization (FAO), Green Leaf, Government, Plantations, Tea Industry

Introduction

FAO's Strategic Framework for Achieving SDGs through Agriculture: People, Planet, Prosperity, Peace, and Partnership

The United Nations (UN) General Assembly adopted the 2030 Agenda for Sustainable Development in 2015, comprising 17 Sustainable Development Goals (SDGs) and 169 targets. These goals aim to address various global challenges, including poverty eradication (SDG 1), zero hunger (SDG 2), good health and well-being (SDG 3), quality education (SDG 4), gender equality (SDG 5), clean water and sanitation (SDG 6), affordable and clean energy (SDG 7), decent work and economic growth (SDG 8), inclusive and sustainable industrialization (SDG 9), reduced inequalities (SDG 10), sustainable cities and communities (SDG 11), responsible consumption and production (SDG 12), climate action (SDG 13), conservation of marine resources (SDG 14), sustainable use of terrestrial ecosystems (SDG 15), peaceful and inclusive societies (SDG 16), and strengthening global partnerships (SDG 17). The FAO-UN Strategic Framework 2022-31 focuses on these goals and uses specific targets to guide progress. FAO's efforts cover all the SDGs, particularly SDGs 1, 2, and 10. The SDGs are interconnected and require a holistic approach to achieve sustainable development. The FAO Strategic Framework 2022-31 emphasizes five basic principles: people, planet, prosperity, peace, and partnership ("Sustainable Development Goals: 17 Goals to Transform Our World," n.d.). Agriculture is crucial to achieving these goals as the global population continues to grow, given its central role in progress towards attaining the SDGs by 2030 (Drucker, n.d.).

STGs Sector in Assam - A Key Contributor to Achieving SDGs

The STGs[1] in Assam play a significant role in achieving the SDGs by contributing significantly to India's economy and society. With approximately 50.67% of the state's total tea production (State/Region Wise and Month Wise Tea Production Data for the Year 2023, 2023) and employing around 0.3 million labourers directly (Singh, 2020) and supporting nearly 1.5 million families through indirect employment opportunities (Singh, 2020), the STGs sector is a crucial component of Assam's economy. The sector's rapid expansion from just sixteen units in its initial year to 1,44,222 units covering an area of 80,948 ha in 2018 (Present-Status-of-Small-Scale-Tea-Cultivation-in-Assam-: Tea World - An Initiative of KKHSOU, 2018) is attributed to the promotion of entrepreneurship among the local youths and the need to replace low quantity and inferior quality green leaf production in estate sectors through tea plantation on private lands and Public Grazing Range lands (A. Gogoi, 2018). The STGs sector's contribution to India's economy is highlighted by the fact that it generates annual foreign exchange earnings of INR 30 billion (ANI, 2023). Furthermore, the establishment of Bought Leaf Factories (BLFs) in this sector creates employment opportunities for around 20-25 workers per processing plant, resulting in a significant workforce collectively employed in the sector (K. Borah, 2013). Therefore, supporting and promoting STGs can contribute significantly towards achieving SDGs related to poverty eradication, decent work and economic growth, and sustainable consumption and production patterns.

Methodology

Research Objective

The purpose of this study is to analyze the impact of STGs in Assam, India, on the SDGs set by the FAO-UN. The study aims to identify both internal and external challenges faced by STGs in achieving these SDGs, as well as policy measures and research priorities to address these challenges and promote the achievement of SDGs for STGs in Assam.

[1] The tea cultivators in India with operational land holding size less than 10.12 hectares are categorized as small tea growers (STG) (Tea Board of India - Annual Report 2020-2021, 2021).

Methodology Used

To achieve the study's purpose, a mixed-methods approach was adopted. The study involved a review of existing literature on STGs in Assam and their impact on SDGs, as well as primary data collection through semi-structured interviews with STGs, government officials, and tea industry stakeholders. The study also involved a content analysis of government policies and initiatives related to STGs in Assam. This comprehensive methodology allowed for a holistic examination of the impact of STGs on SDGs in Assam, drawing insights from both existing literature and primary data sources to provide a deeper understanding of the issue. By triangulating different sources of evidence, the study was able to capture a more nuanced picture of the situation and generate valuable insights for policymakers and stakeholders in the tea industry.

Findings

Empowering Small Tea Growers for Sustainable Development: Aligning with the SDGs in Assam

The STGs of Assam hold significant importance in achieving the SDGs. The increasing demand for tea, both domestically and globally, presents an opportunity for STGs to contribute to SDGs related to poverty eradication, food security, sustainable agriculture, gender equality, and responsible consumption and production. The various ways in which STGs in Assam are contributing to the SDGs are listed below.

Boosting Tea Production through Meeting Market Demand

The India tea market has seen substantial growth recently, reaching USD 11.1 billion by 2023, according to IMARC Group forecasts, which predict continued expansion at an annual compound growth rate (CAGR) of 3.18% from 2024 to 2032, with a projected market size of USD 14.7 billion by the end of this period. The increasing popularity of premium and packaged tea brands, as well as the expansion of online retail channels and growing awareness about tea's health benefits, are driving this market growth (Indian Tea Market Size, Share, Industry Report 2024-2032, n.d.). This presents an opportunity for STGs in Assam who can profitably invest in tea cultivation (S. K. Sharma, 2019) with limited risk (K. Hazarika & Borah, 2013). By capitalizing on this market potential, tea cultivation in small landholdings can contribute to achieving several SDGs of FAO-UN, including SDG 1 (no poverty) by providing income-generating opportunities, SDG 2 (zero hunger) by promoting food security through increased production and trade of tea, and SDG 12 (responsible consumption and production) by promoting sustainable agriculture practices and reducing waste in the tea value chain.

Infrastructure and Workforce for Sustainable Agriculture

The availability of infrastructure such as technology, processing units, and skilled workers, as well as existing markets (A. Gogoi, 2018), contributes to SDG 2 (zero hunger), SDG 8 (decent work and economic growth), and SDG 12 (responsible consumption and production). By promoting sustainable agriculture practices, creating employment opportunities, and improving access to markets for farmers, the STGs of Assam can help to reduce hunger, promote economic development, and foster environmentally-friendly production methods.

Rural Livelihoods Advancement via STG

In Assam, around 1.5 million families heavily depend on the STG sector (Singh, 2020), which presents potential employment opportunities through self-employment, family labour, commission agency (CA)[2] roles, and communication services, aligning with SDG 8 (decent work and economic growth), SDG 1 (no poverty) and SDG 10 (reduced inequalities) (Hazarika & Borah, 2013). The sector also offers accessible financial services and improved intra trade and intertrade services, contributing to SDG 9 (industry, innovation, and infrastructure) (Gogoi, 2018). The establishment of Bought Leaf Tea Factory (BLFs)[3] in this sector accounts for a quarter of Assam's total tea production (Hazarika & Borah, 2013). The abolition of the Tea Marketing Control Order and introduction of the Special Purpose Tea Fund have facilitated tea processors' sales through their preferred

[2] CAs have played a pivotal role in facilitating the STGs of Assam in providing services like marketing and transportation of GL, credit, labourers, agricultural inputs and supervision of tea gardens by charging a commission (P. Gogoi, Personal communication [Personal interview], June 28, 2023).

[3] Bought leaf tea factory means a tea factory which sources not less than two-thirds of its tea leaf requirement from other tea growers during any calendar year for the purpose of manufacture of tea (Bought Leaf Tea Factory Definition | Law Insider, n.d.)

channels and enhanced productivity in the sector, promoting responsible consumption and production in line with SDG 12 (responsible consumption and production) (Gupta, 2018).

STGs' Collectivization & SHGs: Empowering SDGs

The efforts of STGs in Assam, such as branding of GL through collectivization (Mano Raj, 2021) and the establishment of self-help groups (SHGs) (Saha, 2020), are contributing significantly to the SDGs set by the FAO-UN. These initiatives promote SDG 1 (poverty eradication), SDG 5 (gender equality), SDG 8 (economic growth), and SDG 12 (responsible consumption and production). The success of these initiatives is evident in the case of Rangagora Small Tea Growers Development Society in Tinsukia district, which sold GL from its members as well as other STGs in nearby areas at a remunerative price in 2022. The members of the SHG received training on good agricultural practices (GAP) from the processor. This collective selling approach empowered the STGs and helped them gain knowledge and information, promoting responsible consumption and production (A. Paul, Personal communication [Personal interview], May 28, 2023). Additionally, mutual ownership of manufacturing units and close relations with capital and individual landholding help STGs move upward in the value chain, providing them with an identity as rural entrepreneurs (Saha, 2020). The Rwdwmsha Tea Producer Company Limited, comprising of 69 STGs with landholding size below 1 acre, initiated a processing unit at Dimakuchi, Udalguri of Assam with financial assistance from NABARD Financial Services Limited (NABFINS) and TBI. This initiative has fetched an average price of INR 250/- per kg for orthodox tea and INR 260/- per kg for green tea in the year 2022. Apart from profit share, the company was able to give an average remunerative price of INR 25/- for per kg of GL to its member STGs in 2022 (K. Boro, Personal communication [Personal interview], July 5, 2023). These initiatives by STGs in Assam contribute significantly to the SDGs set by FAO-UN by promoting economic growth, poverty eradication, gender equality, responsible consumption and production, and empowering rural entrepreneurs.

STGs' Export Opportunities: Contributions to SDGs

The inspiring stories of Tridip Gogoi (T. Gogoi, Personal communication [Personal interview], April 24, 2023), Maddhujya Gogoi (M. Gogoi, Personal communication [Personal interview], April 24, 2023), and Rana Gogoi (R. Gogoi, Personal communication [Personal interview], April 24, 2023); three small tea farmers in Assam, India, highlight the potential for the global market to provide opportunities for specialty tea growers in the region. Despite facing challenges such as delays in infrastructure and social stigma, these farmers have persevered and innovated to succeed. Their focus on building trust with customers through ethical business practices and continuous product improvement based on feedback has led to indirect contributions to several SDGs. By expanding their customer base and increasing sales, they are SDG 8 (promoting economic growth) and SDG 1 (reducing poverty) in their communities. Additionally, by adopting natural farming practices, they are promoting SDG 12 (sustainable agriculture) and SDG 15 (preserving the environment). The growing demand for specialty tea from Assam presents a significant opportunity for small tea growers to expand globally instead of relying on intermediaries to sell their produce. However, the failure of government agencies to provide information and create awareness about available schemes for research and development activities is hindering the growth of this sector. It is crucial for the government to address this issue and support small tea growers in their efforts to expand globally. These three small tea growers in Assam, India have indirectly contributed to several SDGs by selling their products globally, demonstrating that sustainable development can be achieved through entrepreneurship and innovation in agriculture.

STGs' Organic Initiatives: Aligning with SDGs

The shift towards organic tea cultivation by STGs in Assam can contribute to the achievement of several SDGs of the FAO. The increasing demand for organic tea, particularly from European countries, provides a market for STGs who may choose to switch their cultivation methods or adopt organic farming practices for their tea crops (D. N. Saikia, 2014). This shift aligns with SDG 2 (zero hunger) and SDG 12 (responsible consumption and production), as it promotes the use of sustainable farming practices and reduces the use of chemicals in tea production. Additionally, the higher price realization and greater acceptability in the global market through organic certification of tea can provide a better income for STGs, contributing to SDG 1 (poverty eradication) (Selvaraj & Ganesh, 2017). The ability of organic STGs to increase production of GL by more than conventional STGs (M. Gogoi & Buragohain, 2019) also supports SDGs related to SDG 13 (climate action) and SDG 2 (promoting

sustainable agriculture). Overall, these developments have a positive impact on SDGs related to food security, sustainable agriculture, and poverty reduction, making organic tea cultivation a promising opportunity for STGs in Assam.

Sustainable Development through Government Initiatives for SDGs

The initiatives taken by government agencies in Assam for STGs contribute significantly to achieving the SDGs. These measures aim to enhance tea production, productivity, and quality, benefiting farmers economically and providing employment opportunities in the region (Tea Board of India - Annual Report 2020-2021, 2021). The identification of tea clusters by the Government of India for export promotion under the Agriculture Export Policy will lead to the development of export-oriented infrastructure, post-harvest processing facilities, and laboratories, boosting the tea industry and contributing to SDGs 8 and 9 ("Centre Picks Assam's Tea and Meghalaya's Turmeric Cluster for Export Promotion," 2018). The establishment of a Farmers' Producer Company (FPC) by Chaoloong Sukapha Small Tea Growers' Samittee with support from the Government of India will directly or indirectly benefit 530 artisans in the tea cluster, empowering women GL pluckers and aligning with SDGs 1 and 5 (Upadhaya, 2020). The online licensing system and auto-renewal of licenses by the Government of India for exporter licenses, tea waste licenses, and tea warehouse licenses will streamline processes for STGs, reducing bureaucratic hurdles and costs, aligning with SDGs 16 and 17 (Luthra, 2022). The Assam Bought Leaf Tea Manufacturers Association's decision to pay minimum benchmark prices for GL provided by STGs and accept only fine quality leaves ensures fair prices for produce, aligning with SDG 1 (PTI, 2021). The Assam Tea Industries Special Incentive Scheme (ATISIS) introduced by the Government of Assam aims to boost production of orthodox and specialty teas, contributing to SDG 2 (Singh, 2021a). The Assam State Action Plan for climate change between the years 2021-2030 aims to make the state more immune to changing climate, addressing climate change issues affecting small tea growers' livelihoods, aligning with SDG 13 ("Assam: Tea Production Adversely Affected by Climate Change - Sentinel Assam," 2022). Overall, these initiatives promote decent work and economic growth while addressing poverty, gender equality, climate action, and partnerships for the goals.

It is essential to continue supporting and empowering STGs to ensure their continued contribution to sustainable development in Assam and beyond.

Challenges Facing Small Tea Growers in Assam: Internal and External Constraints

The STGs of Assam encounter a variety of obstacles, both inherent to their operations and external factors, that impede their efficiency and financial success, ultimately hindering progress towards SDGs within Assam's tea industry landscape. Some of the factors that hinder their productivity and profitability are listed below.

Unregulated STG Growth and Location Drawbacks: Impact on Heterogeneous GL Quality and Sales

One of the major issues is the unregulated growth (K. Das, 2019) and location drawback (CEC India - Small Tea Growers, n.d.), as STGs are often scattered in remote areas with poor infrastructure facilities. This results in the production of heterogeneous quality GL from their farms, making it difficult to sell at competitive prices (Hazarika & Borah, 2013).

Low Productivity of STGs: Knowledge Gap and Underutilization of Technology

Another significant problem is the low productivity of STGs due to lack of technical, managerial, and scientific knowledge on tea cultivation. Additionally, scanty use of improved technology on tea cultivation by farmers further compounds the issue. This leads to lower crop yields per hectare and lower prices for their GL.

GL Challenges for STGs: Sales and Price Realization

STGs also face challenges related to GL production and price realization. They are dependent on other sources for sale of their GL, but lack coordination with buyers, resulting in lower prices for their produce (Hazarika & Borah, 2013). The lack of organization and bargaining capacity among STGs further exacerbates this issue (CEC India - Small Tea Growers, n.d.). Moreover, there is a lack of storage facilities for GL and transportation issues that force STGs to sell through agents (Mano Raj, 2020).

Obstacles Confronting STGs in Assam: Pest Infestations, Workforce Deficits, Volatile Market Prices, and Unfair Inequitable PSF

The emergence of global companies, non-availability of workers during peak plucking seasons, lower prices for GL, and high price fluctuations are other major constraints faced by STGs in Assam (A. Das & Mishra, 2019). The pest attacks, inadequate infrastructure support (Pradhan Mantri Krishi Senchai Yojana - PMKSY)[4], and multiple lockdown phases have severely impacted production in upper Assam, where half of the state's tea production comes from STGs (Kalita, 2021). The increase in cost of production due to hikes in wages and inputs and lowering of price realization in made tea prices has adversely affected income generation from their farms (Singh, 2021). The existing price sharing formula (PSF)[5] for determining the price of GL is not appropriate for STGs as either the BLFs or the STGs have no role in determining the price of CTC in auction systems of tea (S. V. Somwanshi, Personal communication [Personal interview], September 18, 2020). At many times, BLFs have violated PSF rules (Sharma & Barua, 2017).

Socio-Economic Challenges of STGs

STGs also face socio-economic issues such as poor economic conditions, financial exclusion, lack of formal education (P. Borah, 2016), felling of insecurity and helplessness due to terrorism among socially or economically strong STGs in border areas (Konwar, 2017), and low participation of women in managing tea farms (L. Devi, Personal communication [Personal interview], June 13, 2021). The non-registration of their tea gardens with Tea Board of India (TBI), land ownership-related matters (S. B. Saikia, 2019), politicization of government policies (A. Gogoi, 2018), and lack of awareness about government support (CEC India - Small Tea Growers, n.d.) have deprived STGs from availing benefits from government agencies.

Environmental Challenges of STGs

Lastly, environmental problems associated with tea cultivation prior to tea cultivation have resulted in land being used for food crops or traditional crops instead of bamboo plantation that had unique socio-cultural significance (Ganguli, 2014). Erratic weather events due to climate change have affected Assam's tea-growing seasons resulting in crop loss, reduced productivity, and low income for STGs in particular ("Climate Change Impacting Assam's Tea Production to Great Extent," 2022).

The Failure of Collective Action among STGs

The closure of the Lahdoi Tea Factory, operated by the Lahdoi Small Tea Growers Co-operative in Assam, since 2004 highlights a concerning trend of failure in collective action among STGs. Despite efforts by government agencies to establish processing units in cooperative forms, the reasons for the factory's closure remain unclear (Tea Board of India North Eastern Zonal Office - SEALED TENDER BASED AUCTION SALE NOTICE, 2015). Preliminary investigations suggest that STGs are hesitant to participate in group activities due to various reasons, which require further exploration. This lack of collective action is a significant challenge for the development of the tea industry in the region and requires urgent attention from policymakers and stakeholders (P. J. Gogoi, Personal communication [Personal interview], June 28, 2023).

Addressing these issues through targeted interventions and policy support can help STGs to increase their yields, improve the quality of their tea, and secure better prices, thereby contributing to the achievement of SDGs related to poverty eradication, gender equality, and sustainable agriculture.

[4] PMKSY is being implemented to expand cultivated area with assured irrigation, reduce wastage of water and improve water use efficiency (OPERATIONAL GUIDELINES OF PRADHAN MANTRI KRISHI SINCHAYEE YOJANA (PMKSY), 2015)

[5] The PSF designed by Tea Board of India is as follows (R. Hazarika, Personal communication [Personal interview], February 28, 2020):

*Minimum Price of Green Leaf for Current Month = (Previous Month Average Auction Price of CTC) *0.65*C*

where, C = 0.2165 is the Outturn Ratio, ⇒ 0.2165 unit of CTC is processed per unit of GL in case of Assam

Discussion

Analysis

In summary, STGs in Assam are making significant contributions to the SDGs set by the FAO-UN through various initiatives. Below is a full explanation of how each SDG is being accomplished in Assam through the efforts of STGs.

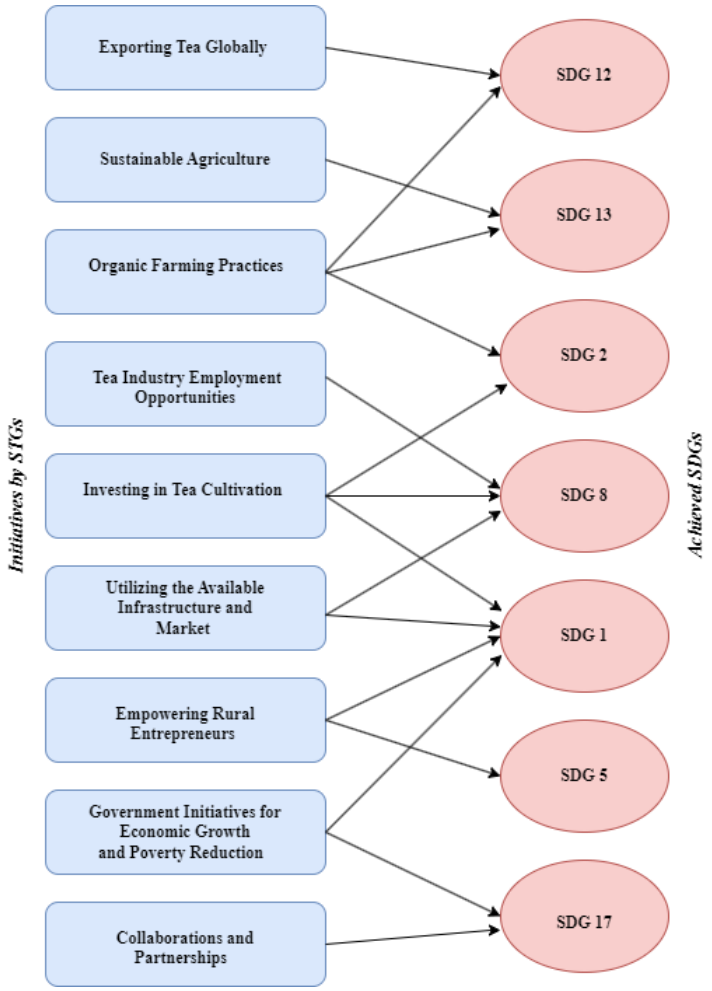
- SDG 1: Poverty Eradication. STGs in Assam enable poverty reduction by promoting tea cultivation as a low-risk source of income, thus providing employment opportunities and empowering rural communities. By investing in infrastructure, including tea processing units and marketing channels, STGs create a favourable environment for economic growth and poverty reduction.
- SDG 2: Food Security. STGs contribute to food security by promoting tea cultivation as a key agricultural activity. This not only meets the increasing demand for tea but also diversifies the region's agricultural practices. Moreover, by adopting organic farming techniques and sustainable agricultural practices, STGs ensure a reliable and healthy food supply.
- SDG 5: Gender Equality. STGs prioritize gender equality by empowering women in rural areas through self-help groups and collectivization efforts. By enabling women's participation in the tea industry, STGs ensure equal opportunities for women and challenge gender stereotypes. This contributes to women's economic empowerment and social inclusion.
- SDG 8: Decent Work and Economic Growth. STGs in Assam create employment opportunities by promoting tea cultivation and providing a workforce for the industry. By investing in infrastructure development, such as roads and irrigation systems, STGs facilitate economic growth, improve productivity, and promote the development of a sustainable tea industry.
- SDG 12: Responsible Consumption and Production. STGs in Assam actively contribute to responsible consumption and production practices by exporting tea globally instead of relying on intermediaries. Through this, they ensure fair trade practices, responsible sourcing, and adherence to quality standards. Additionally, the adoption of organic farming practices minimizes chemical use, promotes environmentally friendly practices, and supports sustainable consumption and production.
- SDG 13: Climate Action. STGs contribute to climate action by embracing organic farming techniques, reducing the use of chemicals, and adopting sustainable land management practices. Such practices mitigate environmental risks, preserve soil health, and conserve biodiversity. STGs also generate awareness about climate change and promote sustainable agricultural practices among tea cultivators.
- SDG 17: Partnerships for the Goals. STGs in Assam leverage partnerships with government agencies, NGOs, and international organizations to facilitate access to financial resources, technical expertise, and market linkages. Such collaborations strengthen the tea industry, drive innovation, and support the overall achievement of the SDGs. By fostering partnerships, STGs enhance collective efforts towards sustainable development in the region.

The concerted efforts of STGs in Assam across these SDGs demonstrate their commitment to promoting sustainable development, economic growth, gender equality, responsible production, environmental conservation, and poverty eradication.

The initiatives by STGs in contributing to SDGs can be diagrammatically represented in figure 1.

Figure 1

Mapping STGs' SDG Contributions: Visualizing Initiatives and Impact



However, STGs in Assam face several internal and external constraints that hinder their productivity and profitability, ultimately impeding progress towards SDGs within Assam's tea industry landscape.

The external challenges faced by STGs in Assam can be further classified as follows:

- *Unregulated growth and location drawbacks due to lack of proper planning and regulations.* This challenge refers to the unplanned expansion of tea estates and plantations in Assam, which has led to the depletion of natural resources, soil erosion, and deforestation. The lack of proper planning and regulation has also resulted in the location of tea estates in areas prone to floods and landslides, making it difficult for growers to cultivate tea sustainably.
- *Low GL production and price realization influenced by market dynamics.* This challenge refers to the low productivity of tea estates in Assam, which has led to a decrease in GL production. This, in turn, has resulted in low price realization for STGs, as they are unable to compete with larger tea estates that have higher production capacities. Market dynamics also play a role in this challenge, as prices for tea are determined by factors such as supply and demand, weather conditions, and global economic trends.
- *Socio-economic issues such as poor economic conditions and financial exclusion.* This challenge refers to the poor economic conditions of STGs in Assam, who often lack access to financial resources and markets. This has resulted in a lack of investment in technology and infrastructure, which has further exacerbated their productivity and price realization challenges. Financial exclusion also makes it difficult for STGs to access credit, which can further hinder their ability to invest in their businesses.

- *Environmental problems associated with tea cultivation such as climate change impacts.* This challenge refers to the environmental issues that arise from tea cultivation in Assam, such as the impact of climate change on tea production. Rising temperatures, changing rainfall patterns, and increased incidence of pests and diseases are all contributing to the decline in tea production in Assam. STGs are particularly vulnerable to these environmental challenges, as they often lack the resources to adapt to these changes.

The internal challenges faced by STGs in Assam can be further classified as follows:

- *Low productivity due to lack of knowledge and technology.* This challenge refers to the lack of knowledge and technology among STGs in Assam, which has resulted in low productivity. This is often due to a lack of access to training and resources, which can further hinder their ability to compete in the market.
- *Coordination issues with buyers leading to pricing concerns.* This challenge refers to the difficulties that small tea growers face in negotiating prices with buyers. This is often due to a lack of bargaining power, as buyers have more resources and market knowledge than small tea growers. This can result in pricing concerns, as small tea growers may be unable to receive a fair price for their tea.
- *Challenges related to workforce deficits and PSF inequity.* This challenge refers to the shortage of skilled labor in the tea industry in Assam, which has resulted in a lack of productivity and efficiency. This is often due to a lack of investment in training and development programs for tea workers, which can further exacerbate the workforce deficit. PSF inequity, which refers to the unequal distribution of funds among tea estates, also contributes to this challenge, as smaller tea estates may not receive the resources, they need to address workforce deficits.
- *Hesitation towards collective action due to lack of trust or conflicting interests.* This challenge refers to the reluctance of STGs to engage in collective action, which can further hinder their ability to address the challenges they face. This is often due to a lack of trust among growers, as well as conflicting interests that may arise from competition in the market. However, collective action can provide STGs with the resources and bargaining power they need to address the challenges they face, and should be encouraged where possible.

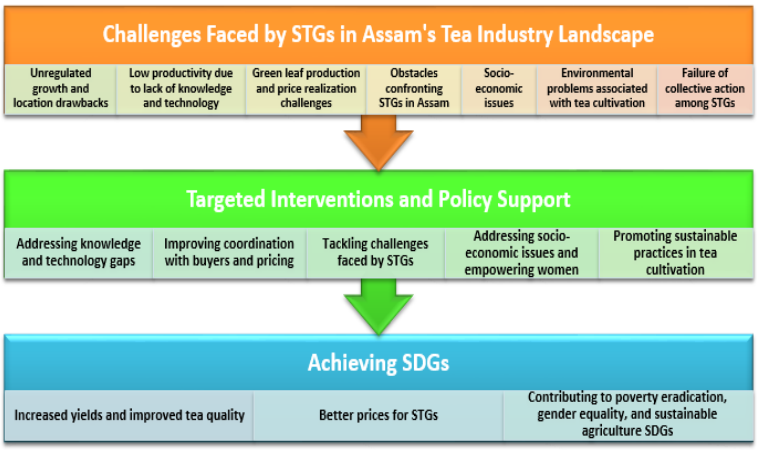
Overall, both external and internal factors contribute to the complexities faced by STGs in Assam's tea industry. Addressing these challenges will require a comprehensive approach that considers both the internal capabilities of the growers and external market conditions they operate in.

Addressing these issues through targeted interventions and policy support can help STGs to increase their yields, improve the quality of their tea, and secure better prices, thereby contributing to the achievement of SDGs related to poverty eradication, gender equality, and sustainable agriculture.

The targeted interventions and policy support aimed at achieving sustainable development by overcoming challenges faced by the STGs in Assam's tea industry landscape can be depicted as in figure 2.

Figure 2

Challenges and Interventions for STGs In Assam's Tea Industry Landscape: A Diagrammatic Representation



Based on the analysis presented, we recommend the following policy measures and research priorities to promote the achievement of the SDGs for STGs in Assam:

Policy Measures

I. Encourage the establishment of processing units in cooperative forms to promote collective action among STGs and reduce costs through economies of scale. This will also provide employment opportunities to women and youth in rural areas.
II. Introduce a fair PSF that takes into account the costs of production and ensures that STGs receive a reasonable price for their GL. This will help to address the issue of low-price realization for STGs.
III. Provide financial assistance to STGs for the adoption of sustainable agriculture practices, such as organic farming, which will not only contribute to SDG 2 (zero hunger) by increasing crop yields but also align with SDG 12 (responsible consumption and production) by promoting sustainable consumption patterns and reducing waste generation.
IV. Promote the development of export-oriented infrastructure, integrated post-harvest processing facilities, and laboratories in tea clusters to boost production, productivity, and quality of tea, which will contribute to SDGs 8 and 9.
V. Provide support for the registration of STGs with TBI and resolve land ownership-related matters to ensure that STGs can avail benefits from government agencies.
VI. Address the issue of labour shortages during peak plucking seasons by providing incentives for the recruitment of temporary workers from neighbouring areas or by promoting the use of technology for harvesting tea leaves.
VII. Address the issue of pest attacks by providing training on pest management techniques and promoting the use of bio-pesticides, which will contribute to SDG 12 (responsible consumption and production).
VIII. Address the issue of financial exclusion by promoting financial literacy among STGs and providing access to formal financial institutions, which will contribute to SDG 1 (no poverty).
IX. Address the issue of poor economic conditions by promoting entrepreneurship skills among STGs, which will contribute to SDG 8 (decent work and economic growth).
X. Address the issue of low participation of women in managing tea farms by promoting women's entrepreneurship skills and providing access to credit facilities, which will contribute to SDG 5 (gender equality).

Research Priorities

I. Conduct a detailed analysis of the reasons for the failure of collective action among STGs in Assam and suggest policy measures to address this issue.

II. Conduct a study on the impact of climate change on tea cultivation in Assam and suggest adaptation measures for STGs.
III. Conduct a study on the impact of terrorism on tea cultivation in border areas of Assam and suggest measures for addressing this issue.
IV. Conduct a study on the socio-economic status of women GL pluckers in Assam and suggest measures for empowering them economically and socially.
V. Conduct a study on the impact of pest attacks on tea cultivation in Assam and suggest measures for controlling pest populations using bio-pesticides.
VI. Conduct a study on the impact of labour shortages during peak plucking seasons on tea cultivation in Assam and suggest measures for addressing this issue through technology or temporary recruitment strategies.
VII. Conduct a study on the impact of price fluctuations on income generation from tea farms in Assam and suggest measures for stabilizing prices through collective action or government support mechanisms.

Conclusion

In summary, the analysis presented highlights both internal and external challenges faced by STG in Assam's tea industry landscape. These challenges hinder their productivity, profitability, and contribution to the SDGs. The external challenges include unregulated growth and location drawbacks, low GL production and price realization, socio-economic issues, and environmental problems associated with tea cultivation. Internal challenges include low productivity due to lack of knowledge and technology, coordination issues with buyers leading to pricing concerns, challenges related to workforce deficits and PSF inequity, and hesitation towards collective action due to lack of trust or conflicting interests. To address these challenges, policy measures such as encouraging the establishment of processing units in cooperative forms, introducing a fair PSF, providing financial assistance for sustainable agriculture practices, promoting the development of export-oriented infrastructure, addressing labour shortages, and addressing issues of financial exclusion, poor economic conditions, and low participation of women in managing tea farms are recommended. Research priorities include analyzing the reasons for the failure of collective action, the impact of climate change and terrorism on tea cultivation, the socio-economic status of women GL pluckers, the impact of pest attacks on tea cultivation, and the impact of price fluctuations on income generation from tea farms. By implementing these policy measures and addressing these research priorities, STGs in Assam's tea industry landscape can contribute more effectively to the SDGs related to poverty eradication, gender equality, and sustainable agriculture while addressing environmental concerns and promoting economic growth and social inclusion.

Acknowledgement

We would like to express our sincere gratitude to various individuals and organizations for their unwavering support and encouragement throughout our research endeavours. Their invaluable contributions have been instrumental in shaping our study on the impact of STGs in Assam on the SDGs set by FAO-UN. Their insights, suggestions, and feedback have helped us to refine our research methodology, identify relevant policy measures, and prioritize research priorities. We would also like to thank our colleagues and peers in the academic and research community for their valuable inputs and suggestions. Lastly, we would like to express our gratitude to our families and friends for their unwavering support and encouragement during our research journey.

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Global Policies and Public Attitudes towards Electric Vehicles in the Context of Sustainable Technology : A Critical Literature Review

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Abstract

Purpose

The global trend toward sustainable transport aims to achieve both economic and ecological stability. Sustainable transport promotes efficient movement that meets societal expectations while minimizing negative impacts on public health, the natural environment, the economy, and urban planning. This approach entails controlling harmful emissions from exhaust gases and transitioning from fossil fuel combustion to renewable energy sources in the long term. Industries such as transportation and automotive are expected to undertake activities to achieve the European Union (EU) or United Nations' targets for sustainable development. This highlights the importance of global cooperation and concerted efforts to achieve a sustainable future for all. The 13th climate action goal specifically targets the transport industry's role in reducing carbon dioxide (CO2) emissions. Numerous countries have started to pay attention to relevant technological research to control the emissions from automobiles, and they are trying to use technological means to do so. One of the main Research and development products to lower vehicle emissions is the new energy vehicle (NEV) or EVs. NEVs are automobiles propelled by electric motor wheels and powered by an onboard power supply. Battery electric vehicles (BEV), Plug in hybrid electric vehicles (PHEV), and Fuel cell electric vehicle (FCEV) are three different categories for NEVs based on their power sources. NEVs are touted as a key to reducing fossil fuel dependency in transportation and are crucial in emissions reduction. They benefit human health only when they significantly replace fuel vehicles and reduce PM2.5 concentration. Due to its sustainability and green technology, the review is necessary in developed and developing countries to understand EV adoption behaviour.
This study offers a conceptual framework and methodologies using bibliometric network analysis was performed on charging infrastructure of EVs. Secondly, the EVs operational characteristics were reviewed in terms of their unique characteristics and factors which influences EVs adoption.

Methodology

This study uses Bibliometric analysis to attain the objectives. VOSviewer was used to prepare a density visualization map reflecting the density of a country's total EV infrastructure collaboration.

Findings

Bibliometric Analysis

The study area of electric car charging infrastructure involves a total of 4338 authors. Setting the minimal documents and citations to 3 and 1 respectively, the network map was produced. The network visualization of the co-authorship and collaboration between countries was built with VOSviewer. Out of 91 countries, 67 meet the thresholds. It can be seen that the maximum concentration of citations is around the United States, United Kingdom and China followed by Germany, India and Italy. The United States, United Kingdom and China have the strongest correlations when it comes to co-authorship between nations because they are close by and connected by a thicker line. The United States showed the most international collaborations, with 320 between the USA and other countries with a total link strength of 193, and the United Kingdom was second with 158 collaborations and 160 total link strengths. Thirdly, China (197 links with other nations and 126 total link strength), India (90 links with other nations and 98 total link strength), Germany (175

links with other nations and 88 total link strength), and Italy (95 links with other nations and 80 total link strength).

Consumer Adoption versus Non-Adoption Behaviour for EV Usage

Consumer characteristics, EV characteristics, and EV-related policies make up the three main categories that have been developed. The three categories each have their own subcategories. Three subcategories of the term "Consumer characteristics" were identified: socio-demographic factors, psychological factors, and personal characteristics. The following subcategories are included in the category "EV characteristics": risk and benefit factors, technical characteristics, and economic factors. Three subcategories make up the category "EV-related policies": pre- and after-sales services; government policy factors; and infrastructure factors.

EV adoption Policies and Incentives in Countries with Robust Infrastructure

For both the supply and demand sides, China's government provides incentives. Incentives are provided to manufacturers to promote the production of EVs. Purchase incentives are also provided to customers to enter and dominate the market. The Chinese government sets forth restrictions on taxes and exemptions from purchases. When compared to the same period the year before, the policy dramatically increased EV sales by 162%. Accordingly, till the present scenario, China is leading in the EVs market globally. The second-largest EV market, the European Union (EU) proposed various policies, most of which are in Norway where the government offers a VAT and registration tax exemption.

Original Contribution

This study explores and presents some important characteristics and elements of EVs starting from types of EVs, charging systems, range, and charging infrastructure across the world. It also provided an overview of countries with strong policies and incentives for EV adoption. This study is expected to inspire academics to start relevant research in this important new field of study.

Keywords

Electric Vehicles, Sustainability, Bibliometric Analysis, Charging Infrastructure

Introduction

The global trend toward sustainable transport aims for economic and ecological stability, promoting efficient movement that meets societal needs while minimizing negative impacts on health, the environment, the economy, and urban planning. Industries such as transportation and automotive are expected to undertake activities to achieve the European Union (EU) or United Nations' targets for sustainable development. This highlights the importance of global cooperation and concerted efforts to achieve a sustainable future for all (Brussels, 2004). The 13th climate action goal specifically targets the transport industry's role in reducing carbon dioxide (CO_2) emissions (United Nations 17 and 13 Goals). Numerous countries have started to pay attention to relevant technological research to control the emissions from automobiles, and they are trying to use technological means to do so. One of the main research and development products to lower vehicle emissions is the new energy vehicle (NEV) or EVs (Li and Zhang, 2023). NEVs are automobiles propelled by electric motor wheels and powered by an onboard power supply. Battery electric vehicles (BEV), Plug in hybrid electric vehicles (PHEV), and Fuel cell electric vehicle (FCEV) are three different categories for NEVs based on their power sources. NEVs are touted as a key to reducing fossil fuel dependency in transportation and are crucial in emissions reduction (Global EV Outlook, 2023). They benefit human health only when they significantly replace fuel vehicles and reduce PM2.5 concentration (Qiao and Lee, 2019).

According to the International Energy Agency's (IEA) report on Global EV Outlook 2021 (Bibra et. al, 2021), the number of passenger cars and commercial vehicles on the world's roads is expected to double by 2040, from 1.2 billion to over 2.4 billion. This increase in the number of vehicles will result in a corresponding rise in the demand for fuel, which will lead to more GHG emissions and air pollution. Electric vehicles (EVs) have emerged as a strong contender among available transport alternatives. Among others, the EU and the United States have offered strategies, plans, and incentives for the introduction of EVs with varying degrees of ambition (European

Commission, 2010; Greater London Authority, 2009; IEA 2009). The IEA 2021 (U.S. Department of Energy, 2011) has predicted that energy consumption will continue to rise in all major end-use sectors worldwide. In the years 2020 to 2050, the total final consumption (TFC) will rise by about 20%. Demand for fossil fuels will decline as electricity, renewable energy, and hydrogen take over. In 2050, electricity's share will rise from 20 to 30%. With a move towards EVs, which are up to three times more energy-efficient than traditional ICE, transportation accounts for the largest decrease in energy demand. In 2050, the market for clean energy technology equipment is expected to be over 60% battery-based, according to the IEA 2021 (U.S. Department of Energy, 2011). One of the primary options to lower CO_2 emissions in the transportation sector is the use of EVs (Greater London Authority, 2009). Although there have been numerous research reviews over the years, to our knowledge, bibliometric network analysis of the operational effectiveness and charging infrastructure of EVs has not yet been understand.

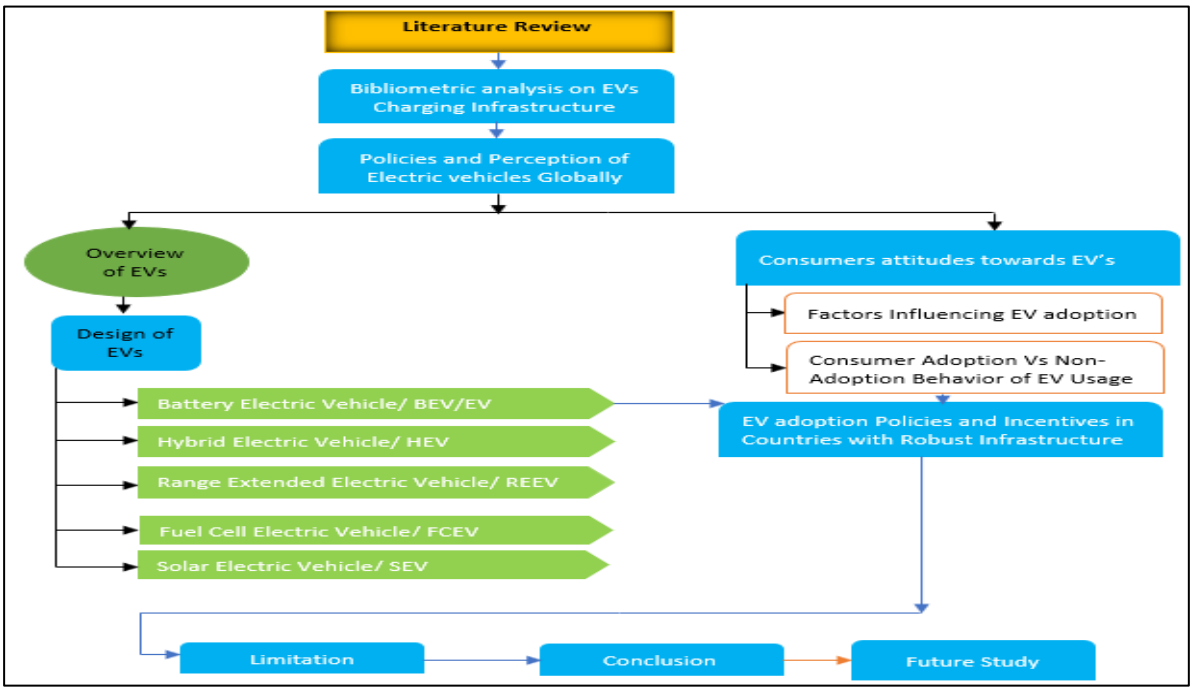
Methodology

Methodological Approaches and Conceptual Framework of EVs on Policies and Perception Studies

Due to its potential to lower greenhouse gas emissions, reduce reliance on fossil fuels, and contribute to a more sustainable transportation sector, EVs have attracted a lot of interest and appeal. This paper discusses some important characteristics and elements of EVs, starting from Bibliometric analysis, types of EVs, charging systems, range, and charging infrastructure. Also, extensively studied countries with strong policies and incentives for EV adoption. In this section, we organise our review with the methodology used to meet the purpose of present study (**Figure 1**).

Figure 1

Flow chart mentioning the review process of EVs.



Literature Review

Bibliometric Analysis

Bibliometric analysis is a statistical technique for examining outline data in particular academic fields of interest (Goyal and Kumar, 2021). The technique is used to identify the journals with the highest number of citations and greatest influence over the research area. The bibliometric analysis was scaled to evaluate EV charging infrastructure of electric car impact in terms of research produced at different levels: countries, organizations, and individuals. Bibliometric analysis such as co-authorship analysis, co-authorship network and

density visualization between countries, co-occurrence analysis network and density visualization of all keywords and co-authorship organization network was extracted from Scopus data into VOSviewer software.

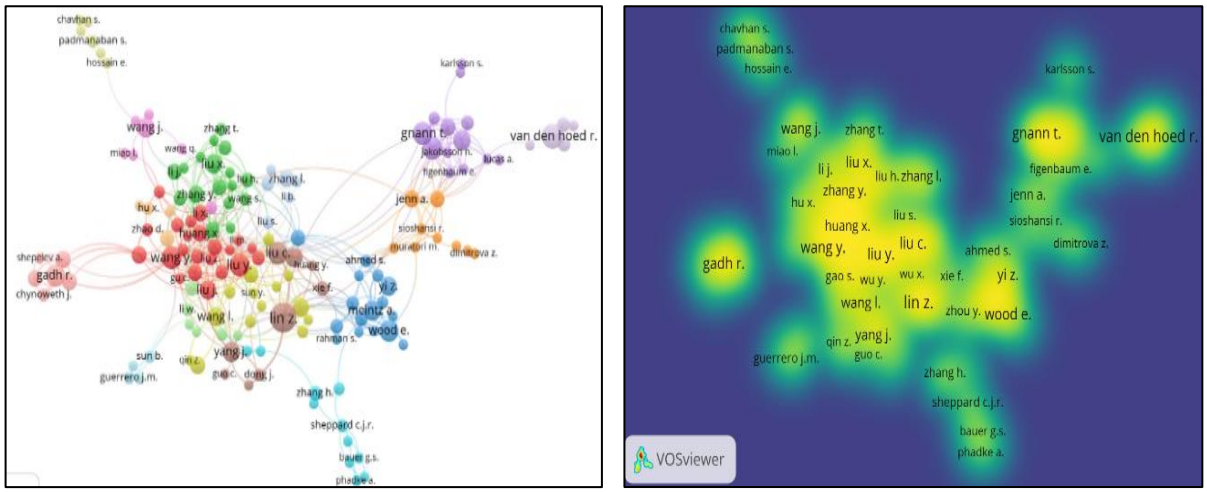
Bibliometric analysis of EV charging infrastructure published in Scopus journals during the preceding ten years (2013 to 2023) is analyst. The analysis of the past ten years' journals was motivated by the recent introduction of EVs to the market. Most research papers were published in these journals, and since it is impossible to discuss every single paper that has been published, it is preferable to comprehend the information in brief and more effectively through a map created with VOSviewer. The analysis of EV charging infrastructure is required because the availability and configuration of charging infrastructure in a country affects how consumers view EVs.

Co-authorship Analysis

The study area of EVs charging infrastructure involves a total of 4338 authors. Setting the minimum number of papers to 3 and the number of citations to 1 produced the network map (**Figure 2 (a)**). Due to a greater number of paper documents is set to 3 and also related section to same. Out of 4338 authors, 301 meets the thresholds. But some of the 301 items are not connected to each other. The largest set of connected items consists of 155 items. With a total link strength of 662, the 155 authors with the highest link strengths were further divided into 16 clusters. 16 clusters were created out of the authors who had co-authorship links. Clusters 1 and 2 each represented a network of 22 authors, Clusters 3 and 4 a network of 16 authors, Clusters 4 and 5 a network of 11 authors, Clusters 7 and 8 a network of 9 authors, Clusters 9 and 10 a network of 6 authors, Clusters 14 and 15 a network of 5 authors, and Clusters 15 and 16 a network of 4 authors each. The co-authorship density visualisation map is shown in **Figure 2 (b).**

Figure 2

Visualisation of the Frequency of Occurrence of Co-authorship Analysis



(a) Authors network visualization **(b)** Density map of co-authorship

Co-authorship network and density visualization between countries

The study area of electric car charging infrastructure involves a total of 4338 authors. Setting the minimal documents and citations to 3 and 1 respectively, the network map was produced. **Figure 3 (a)** shows the network visualization of the co-authorship and collaboration between countries. The countries that are close to one another and have thicker connecting lines between them show a significant correlation (Khudzari, 2018). As per the VOSviewer result, **Figure 3 (b)** illustrates a density visualization map reflecting the density of a country's total EV infrastructure collaboration, which was built with VOSviewer. Out of 91 countries, 67 meet the thresholds. It can be seen that the maximum concentration of citations is around the United States, United Kingdom and China followed by Germany, India and Italy. The United States, United Kingdom and China have the strongest correlations when it comes to co-authorship between nations because they are close by and connected by a thicker line. The United States showed the most international collaborations, with 320 between

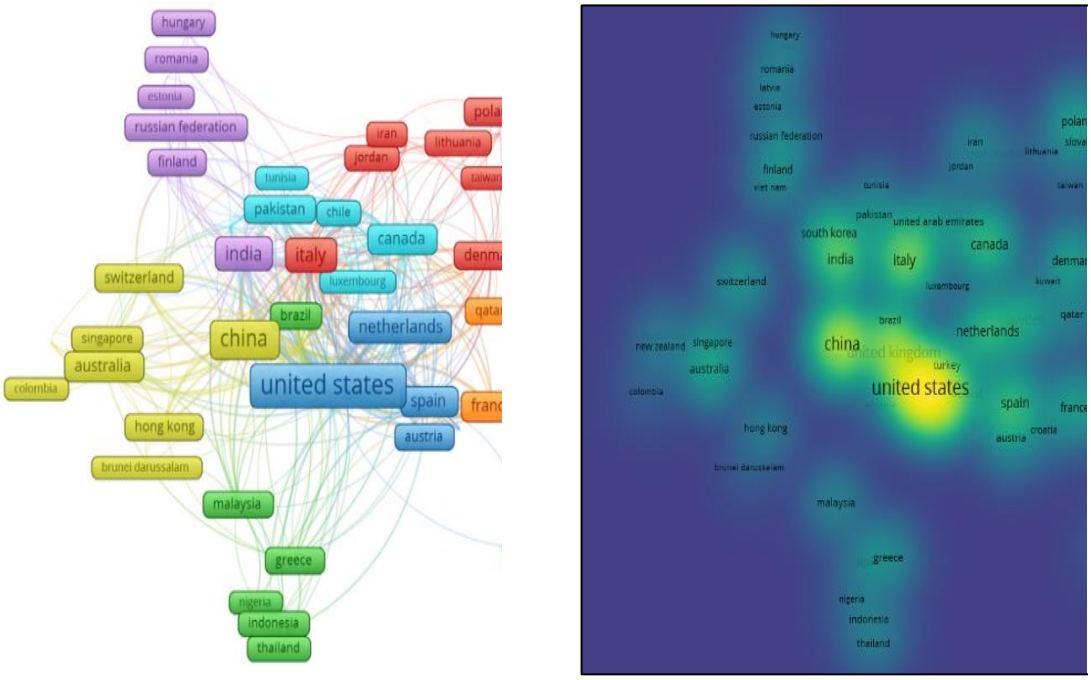
the USA and other countries with a total link strength of 193, and the United Kingdom was second with 158 collaborations and 160 total link strengths. Thirdly, China (197 links with other nations and 126 total link strength), India (90 links with other nations and 98 total link strength), Germany (175 links with other nations and 88 total link strength), and Italy (95 links with other nations and 80 total link strength). From the cluster colours, it can be observed that from Figure 3 (b) are recently active countries in the research on EVs.

Co-occurrence analysis network and density visualization of all keywords

Initially, 8667 keywords appeared on the concerned topic when analyzing the Scopus file into VOSviewer 1031 meet the threshold. The network map was created by setting the minimum keywords to 4 as higher number of papers. A total of 1031 author keywords met the threshold. The potential 1031 author keywords grouped into 8 clusters are shown in Figure 4 (a) Cluster-1 represented a network of 268 all keywords, cluster-2 200 authors, 3 consisted of 145 authors, cluster-4 of 135 authors, cluster-5 89 authors and 6 of 81 authors, cluster-7 network of 78 all keywords and cluster 8 represented a network of 35 all keywords. Figure 4 (b) is the density visualization of keywords.

Figure 3

Visualisation of the Frequency of Occurrence of Co-authorship Country Analysis

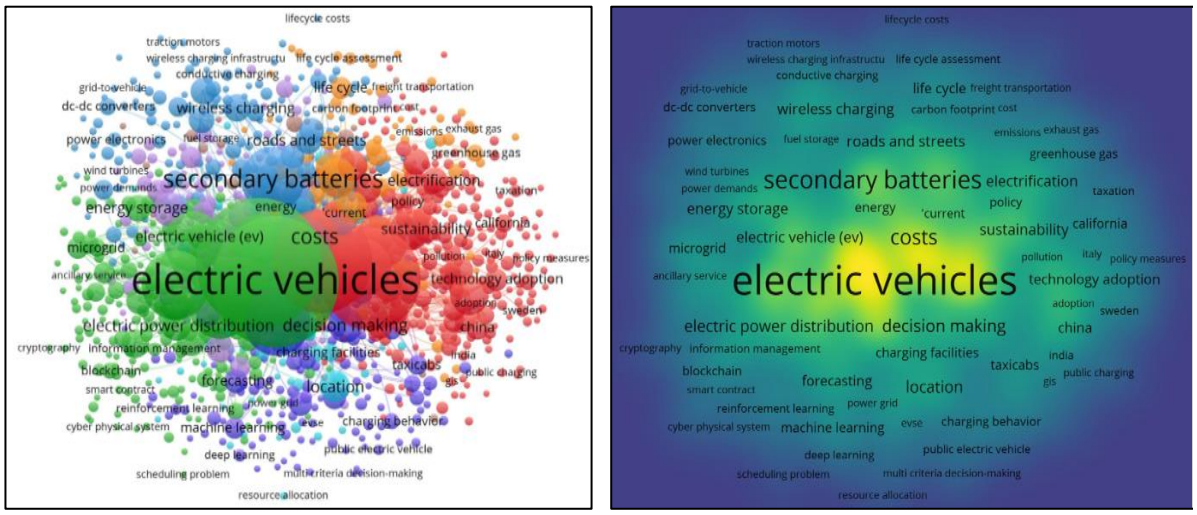


(a) Countries' Network Visualization

(b) Countries' Density Visualization

Figure 4

Visualisation of the Frequency of Occurrence of Co-occurrence Keyword Analysis



(a) Visualization network of co-occurrence of all keywords

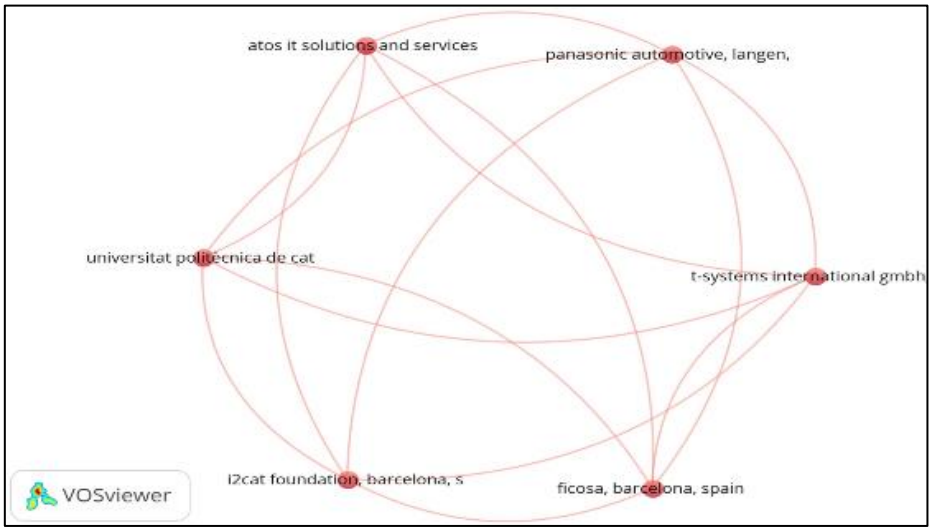
(b) Density map showing the most occurring all keywords.

Co-authorship organization network

Figure 5 shows the network map was created by setting the minimum documents to 2 and citations to 1. Out of 3115 organizations, 171 meet the thresholds. However, some of the 171 organizations are not connected to each other. The largest set of connected organization consists of 6 organizations.

Figure 5

Visualisation of the frequency of occurrence Organisation network



Consumers' attitudes towards EVs

Understanding consumer behaviour regarding the purchase of this kind of vehicle is essential for EVs to enter the market more quickly. Intentions can accurately forecast consumer behavior (Lin and Wu, 2018). The primary driver of demand for EVs is consumer purchase intent, which heavily influences market trends (Zhao et. al., 2022). The popularisation of sustainable mobility requires an understanding of the factors involved with EV purchases (Li et. al., 2017). The purpose of this study section is to advance and solidify for understanding of

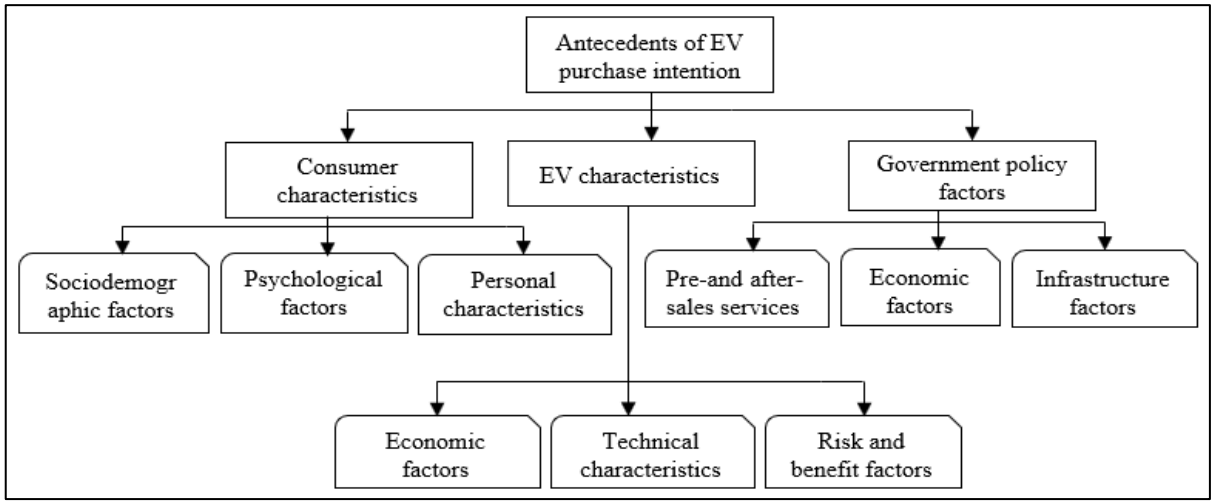
consumer behaviour with regard to EV purchase intentions. The review outlines the variables that consumers' adoption intentions for EVs over the previous eight years have been influenced by (Bryla et. al., 2023). The choice of EVs is influenced by socioeconomic factors, according to Ahmadi et al. (2015). From a sustainability standpoint, Almansour (2022) discussed the motivation for consumers to purchase EVs more frequently. On the other hand, Carley et al. (2019) discovered that the desire to purchase plug-in vehicles has increased, with technology playing a significant role (Lim et. al., 2015). Battery range (Lebeau et. al., 2016) and the infrastructure for charging turned out to be the main sources of dissatisfaction, contrary to what Chu et al. (2019) had proposed as the determinant factors: minimised operations costs and usage satisfaction. An easier-to-implement policy (Wang et. al., 2018) and government recommendations (Srivastava et. al., 2022) could encourage people to purchase EVs, according to Dong (2022). Vehicle price, financial incentives, a deficiency of charging infrastructure, along with poor air quality index (Nichols et. al., 2015), were mentioned by Abotalebi et al. (2019) and Bailey et al. (2015) as the main factors influencing consumer choice of EVs in some regions of Canada. A paradigm shift of consumer benefit appetite and willingness to buy (Nazari et. al.,2019; Junquera et. al., 2016) while dealing with new technologies.

The key promoters and drivers (Kumar et. al., 2021) for consumers' adoption intentions, according to Chhikara et al. (2021), are government investments in Research and Development, along with financial and non-financial benefits. The barriers (Krishna, 2021) were identified as poor infrastructure and ineffective handling of manufacturing costs. According to Adu-Gyamfi et al. (2022), consumer adoption intentions vary depending on the family type and gender. Government incentives (Mersky et. al., 2016) and economic incentives (Meisel and Merfeld, 2018; Falbo et. al., 2022) are just two examples of policy implications that significantly influence this adoption approach behaviour. Goel et al. (2021) discussed how consumers are being prevented from adopting EVs by governments' ambiguous policies against EVs. According to Jaiswal et al., (2021) consumer adoption intentions are influenced by government financial incentives as well as the perceived utility and usability of EVs. According to Huang et al. (2021), highly driven and educated female consumers are more willing to embrace the cutting-edge business model of EV demonstrative policy attributes, like home charging stations and vehicle licence policies for sustainable mobility. Environmentalist consumers (Salari, 2022) would benefit more from the EV, Ruoso and Ribeiro (2022), who discussed how socioeconomic factors have a big impact on consumers' adoption confidence for the vehicle. According to She et al. (2017), the factors that have slowed the adoption of EVs include safety, dependability, and battery range (2022) per charge (2020). Will et al. (2022) discussed about the need for a precise framework outlining the benefits of carbon-neutral charging services in order to support consumer interests in EV adoption.

It is evident that a considerable number of direct causes of the intention to purchase EVs were found. A classification of EV purchase intention antecedents was created to organize and clarify the results. Consumer characteristics, EV characteristics, and EV-related policies make up the three main categories that have been developed. The three categories each have their own subcategories (**Figure 6**). Three subcategories of the term "Consumer characteristics" were identified: sociodemographic factors, psychological factors, and personal characteristics. The following subcategories are included in the category "EV characteristics": risk and benefit factors, technical characteristics, and economic factors. Three subcategories make up the category "EV-related policies": pre- and after-sales services; government policy factors; and infrastructure factors (Ivanova and Moreira, 2023).

Figure 6

EVs purchase intentions are categorised based on their antecedents



EV adoption Policies and Incentives in Countries with Robust Infrastructure

For both the supply and demand sides, China's government provides incentives (Qiao and Lee, 2019). Incentives are provided to manufacturers to promote the production of EVs. Purchase incentives are also provided to customers to enter and dominate the market. The Chinese government sets forth restrictions on taxes and exemptions from purchases. When compared to the same period the year before, the policy dramatically increased EV sales by 162% (Giannopoulos and Munro, 2019). Accordingly, till the present scenario, China is leading in the EVs market globally. The second-largest EV market, the European Union (EU) proposed various policies, most of which in Norway, the government offers a VAT and registration tax exemption as well as an 80% reduction (Bjerkan, 2016). The regulation caused EV purchase costs to drop by up to 50%. The purchase subsidy program that grants $3360 for plug-in hybrid electric vehicles and $4480 for battery electric vehicles throughout the period of 2020–2024 produces the fastest results in the medium term in EU (Gómez and Thiel, 2019). By 2030, the Netherlands seeks all new cars sold to be emissions-free (Klimaatakkoord, 2019); BEVs are exempt from vehicle registration tax (which ranges from $1,108 to more than $16,627 depending on the CO_2- emission of the car) and road tax ($554–$1,663 per year for gasoline cars), but not from Value Added Tax (Ministerie, 2022). Additionally, some of The Organization for Economic Cooperation and Development (OECD) countries offer direct subsidies to promote the market adoption of EVs, including Belgium, Denmark, Spain, and Portugal (Kempton, 2014). To lessen FF dependence, tax policies based on fuel consumption are enforced in Denmark. Additionally, the government provided a 20% purchase tax exemption through 2019 (Habla, 2021). The government of Iceland exempts EV owners from purchase, VAT, and annual ownership taxes while also building out the infrastructure for charging.

Since the introduction of EVs, various organizations, including federal and state governments, as well as electric utilities in the United States, have implemented incentives to promote their adoption (Jenn et. al., 2018). As of July 2021, 47 US states provided EV incentives, such as HOV lane exemptions, cash rewards, inspection waivers, parking rewards, and discounted off-peak charging rates (Hartman and Shields, 2021). Additionally, ten states mandated EV sales under the Zero Emission Vehicle regulation, available at federal, state, and local levels (Jenn et. al., 2018). Tax rebates for EVs in South Korea are capped at 4200 USD, while subsidies for EVs are capped at 16,400 USD and $4300 USD, respectively (Rasti-Barzoki and Moon, 2021). The Indian government introduced the Faster Adoption and Manufacturing of (Hybrid &) Electric Vehicles, scheme under NEMMP to support the adoption and production of electric and hybrid vehicles in India (India Times). By 2030, the goal is to have everything powered by electricity. Under the scheme, it provides Purchase incentives, Waiver for registration fee and Tax Credit for EV Purchases. table 1 listed below the laws that various nations have enacted to encourage the use of EVs. These findings highlight the effectiveness of incentives in encouraging the adoption of EVs and promoting a transition towards sustainable transportation options.

Research indicates that Tesla, an American company, is the world's leading electric vehicle maker. However, Norway has the highest market penetration per person in 2020, with electric cars accounting for 75% of all new car sales. China has the most EVs, with a total of about 1.8 million. Among the businesses that compete

with Tesla internationally are BYD, SAIC-GM-Wuling, Volkswagen, BYD, NIO, Nissan, Hyundai, and GM. However, it is said that over 30 Electric Car Companies are present globally (History computer).

According to Global EV Outlook (2023) has revealed, the number of public charging stations worldwide is set 2.7 million in the year 2022, with more than 900,000 installed. This represents a significant 55% increase in the stock from the previous year, and it's comparable to the growth rate between 2015 and 2019. In 2022, China led the way by installing over 360,000 slow charging points, bringing the total number of slow charging stations to over 1 million. More than half of the world's public slow chargers at the end of 2022 were in China. Fast chargers, which have power ratings greater than 22 kW and lower than 350 kW, also saw an increase in installations worldwide, with 330,000 more fast chargers installed in 2022 (Global EV Outlook, 2023). It's clear that the EV industry is continuing to grow at an impressive rate, and the infrastructure needed to support it is also expanding rapidly. Accounted for the vast majority (nearly 90%) of the growth.

Figure 7

Per Public Charging Station, Light-duty EV, 2010-2022

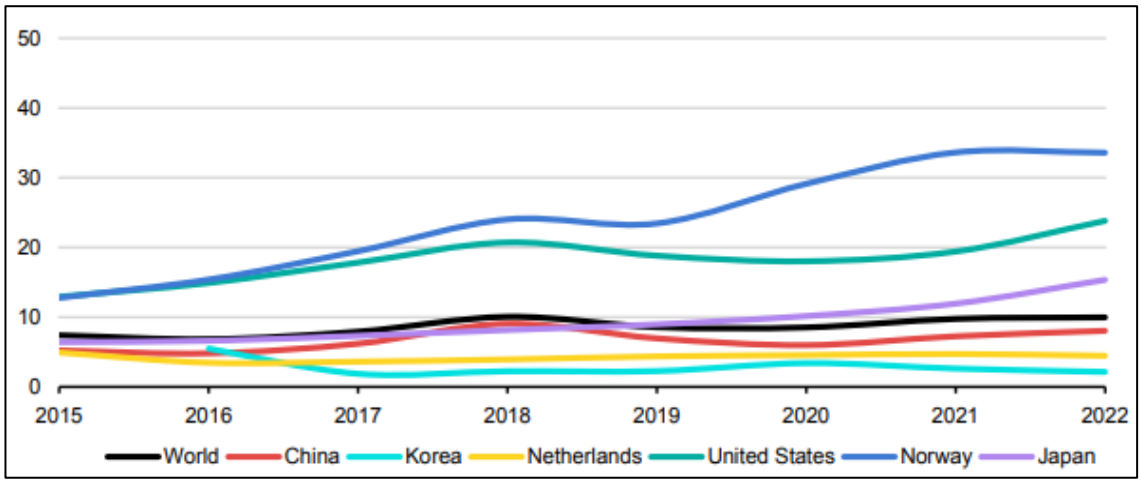


Figure 7 illustrates how countries deploy public charging stations at varying rates as the number of EVs on the road rises. As per IEA analysis (Global EV Outlook 2023), Norway is in the top followed by United States and thirdly Japan in public charging deployment. If we see the world, it is below average the rate of above three countries.

Table 1

EVs Adoption Policies implemented Globally

Location wise	Countries	Policies and Incentives		Charging infrastructure installed (Global EV Outlook 2023)
		Monetary	**Non-Monetary**	
East Asia	China	• Government subsidies • Tax exemptions on purchases and vehicle use • Insurance savings • Waivers of inspection fees, and an exemption from registration fees are just a few examples. • Infrastructure for charging construction subsidies and charging discounts	• EV-specific registration channel • EV-specific licence plates • No driving restrictions • Development of city charging • Toll-free roads and bridges • New energy vehicles • Parking benefits	Slow charger: 360000 installed in 2022 Fast Charger: total of 760000 fast chargers till date
Western Peninsula (European Union)	Norway	• VAT is exempt, purchase tax is waived, and registration tax is reduced by 80%	-	Total slow charger: Slow charger: 460000 Fast charger: 70000 on 2022, increase 55% compared to 2021. Largest fast charger stock: Germany (over 12000), France (9700) and Norway (9000)
	Denmark	• Tax exemption on registration (until 2016)	-	-
	Sweden	• Tax exemption on registration	-	
	France	• Tax exemptions on purchase • Financial incentives for building and maintaining charging infrastructure	• Standards for light-duty commercial vehicles and passenger cars' CO_2 emissions • City charging development	-
	Iceland	• Tax exemptions on purchase. Annual ownership tax and VAT	-	-
North America	Canada	• Subsidies for the purchase of EVs	• High occupancy vehicle (HOV) with no restrictions for EVs • Zero emission vehicle	-

	United States	• Incentives for EV development • Incentives for EV or electric vehicle supply equipment (EVSE) purchases	• Zero Emission Vehicle • Development of city charging • Vehicle inspections or emissions test exemptions • Drop-in electricity rates for EV charging • Unrestricted access for EVs in HOV	Fast charger: 6300 fast chargers in 2022 (total stock of fast chargers 28000 in 2022)
East Asia	South Korea	• Tax credits for EV purchases • Installation subsidies for public charging infrastructure	-	-
	Japan	• New Clean Energy Vehicle Purchase Incentive in Japan	• Japan 2030 Fuel Economy Standards	-
Middle East Countries	Turkey	• Discounts on customs fees, special taxes, and registration/renewal fees	-	-
	Jordan	• 75% exemptions on custom taxes	-	-
	United Arab Emirates	• 15% discounts on vehicle registration and renewal fees	-	-
South Asia	India	• Purchase incentives • Waiver for registration fee • Tax Credit on purchasing EV	• City charging development • A comprehensive awareness campaign that engages the general public	1700 public charging stations in operation
	Bangladesh	• Proposed financial incentives, tax holidays, reduction of VAT, purchase subsidies etc.	-	-
	Malaysia	• Limited incentives	• Selective charging point	257 charging points
Southeast Asia	Thailand	• Lowered the excise tax for EVs from 20–40% to 2–8% • Corporate income tax exemption up to 13 years. • Subsidizing charging station investment	• Tax incentives for EV charging station business	2500 operational public EV charging units, > 50% facility is of fast-charging type.
	Thailand	• Lowered the excise tax for EVs from 20–40% to 2–8% • Corporate income tax exemption up to 13 years. • Subsidizing charging station investment	• Tax incentives for EV charging station business	-

Indonesia	• Exception for Tax for luxurious goods • Annual tax = 0.2% (Jakarta case, different in each province) • Exception for a progressive tax, name transfer fee, and emission tax	• Charging station: State electricity company offices, public places such as parking area, rest area, and department stores	-
Singapore	• Vehicular emissions scheme • EV early adoption incentives • Road tax reduction	• Public charging station • Installed in housing estates	More than 1600 charging point

Source: Global EV Outlook, 2023

Conclusion

We anticipate that this study will inspire academics to start relevant research in this important new field of study. The current state of EVs globally has been explained based on literature reviews and in-depth analysis of contexts that lead to adoption, incentives and charging infrastructure. EVs will soon replace IC engine vehicles as the preferred means of lowering GHG emissions from transportation due to its tendencies. Due to rising global warming, the UN is addressing GHG concerns with the Sustainable Development Goals (SDGs). The 13th goal targets the transport industry's role in reducing carbon dioxide emissions. Since bibliometric network analysis is perform on EVs charging infrastructure. The size with keywords, countries with thicker connecting lines and close proximity to one another exhibit a significant correlation.

This review created a framework to examine attributes and traits influencing vehicle purchase decisions in both developed and developing countries. Financial and performance characteristics of the vehicle were discovered to be the most stable factors in the majority of the studies. The development and improvement of supporting infrastructure, including facilities for charging and services. Governments must first encourage consumers to adopt EVs by offering exemptions from road tolls, easy access to charging infrastructures, and tax and financial incentives (Falbo et. al., 2022) while considering energy trading and vehicle sharing (Meisel and Merfeld, 2018). Second, it's critical to spread extensive knowledge about the EV market, including the need for adequate infrastructure that considers the availability of charging stations (Bailey et. al., 2015) and understanding government policy recommendations regarding available subsidies (Krishna, 2021). EV acceptance by manufacturers relies on understanding consumer preferences, including feasibility, network effects, and willingness to pay, for successful sales (Carley et. al., 2019). Consumers' scepticism about EV performance, safety regulations, and range on a single charge will be the most significant obstacles to EV adoption (She et al., 2017). Consumers' risk-benefit perceptions are crucial for EV adoption, including overcoming high initial costs, confidence issues, adaptation needs, evolving technology, and inadequate infrastructure (Masiero et. al., 2017). Underdeveloped countries may struggle to produce e-vehicles due to high investment costs. Importing them incurs higher customs duties, and local production raises safety concerns and depends on lithium reserves. Consumer characteristics were identified viz. sociodemographic factors, psychological factors and personal characteristics affect consumer adoption. China led the global EV market surpassing 50% of the global fleet. Europe followed with 9.8 million EVs, and the U.S. with 3 million. India is in pace of production locally as well global car brand manufacturer.

To address the issue of charging infrastructure, researchers can focus on planned experiments on swappable batteries for electric vehicles.

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A Study of EREC-AIDA Framework for Estimating User Sentiment and Response towards Green Advertisement at Various Levels of Marketing over Selected Platforms

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Abstract

Purpose of the Study

The purpose of this study is to investigate the complex landscape of online user sentiment and brand emotion toward green advertisements at various marketing levels, with a focus on engagement, recommendation, endorsement and conversation (EREC). The study also looks at how businesses can raise their resource commitment to green advertising by utilizing the EREC model at various levels of AIDA.

Methodology

This study extracted extensive data from select organizations running green advertising strategies across multiple social media platforms using online web scraping techniques. The dataset included a wide variety of user-generated content, sentiment analysis, and brand emotions associated with these green advertising. Statistical techniques, particularly ANOVA, were used to identify subtle differences in user interaction across different marketing levels. Furthermore, Structural Equation Modelling has been used to reveal complex correlations between variables, providing insights into consumer sentiment and brand emotion about green advertisements. The research looks at social media platforms such as Facebook, X, Instagram, YouTube, and LinkedIn.

Findings

The research reveals intriguing patterns in user sentiment and brand emotion toward green advertisements at various marketing levels. Notably, people endorsed green marketing at the product level, demonstrating increased responsiveness and support for environmentally conscious items on Facebook and Twitter. Organizational-level green advertisements, on the other hand, received the lowest degree of interaction across all platforms, indicating a struggle in engaging with wider sustainability initiatives when compared to individual product-focused campaigns. The findings additionally demonstrate that few types of content with a high user-interactivity requirement generate a high volume of engagement at the awareness level, while pushing up for desire and interest levels. The engagement pattern tends to shift towards low interactivity and high media rich content categories on Instagram and YouTube, while Facebook retains the same pattern across all platforms. Instagram has a high efficiency ratio for product level and UGC category.

Platform-Specific Insights

The study unearthed platform-specific insights that shed light on user behaviour and sentiment toward green marketing. Facebook received the most endorsement, indicating a greater proclivity among users to support and advocate for environmentally responsible brands. However, Instagram revealed great user engagement potential but lacked significant firm-generated activity, showing a significant gap between user potential and brand activity on the site. Twitter and YouTube, on the other hand, had the highest levels of recommendation, indicating that users on these platforms are more likely to endorse and recommend green commercials.

Original Contribution

This study adds greatly to our current understanding of online user sentiment and brand reaction toward green marketing. The finding of strong customer support for product-level green commercials emphasizes the need of directing marketing efforts toward specific products with environmentally beneficial qualities. Furthermore, the study's emphasis on differences in user engagement across various marketing levels provides critical insights for marketers looking to improve sustainability messaging and engagement methods.

Practical Implication

The resulting EREC-AIDA framework for content engagement has been built in such a way that it can be used by both professionals and researchers for value analytics while making decisions about green advertisement resource allocation. The framework also serves as a guidance for the implementation of various methods for product and organizational marketing via the platforms. This research provides a comprehensive and nuanced analysis of user responses to green advertisements in the digital realm. The findings emphasize the necessity of tailoring advertising strategies to align with user preferences and behaviours across multiple platforms. Marketers can leverage these insights to optimize their green advertising strategies, fostering meaningful connections with users and contributing to a more sustainable and engaged digital marketing landscape.

Keywords

Brand Emotion, Green Marketing. Sustainable Advertisement, User Behaviour, User Endorsement, User Sentiment, Web Scrapping

Introduction

In recent years, the global paradigm shift towards environmental sustainability has significantly influenced consumer behaviour and expectations. As a result, businesses are increasingly recognizing the importance of integrating green practices into their marketing strategies to align with the growing environmental consciousness of their target audience. The emergence of digital platforms has further amplified the reach of green advertising, creating opportunities for businesses to communicate their eco-friendly initiatives to a wider audience.

This research paper delves into the realm of green advertising, specifically focusing on the engagement, recommendation, endorsement and conversation aspects of the EREC-AIDA framework, and its application across various marketing levels on selected platforms. The EREC-AIDA framework, which stands for engagement, recommendation, endorsement and conversation, serves as a comprehensive model for understanding consumer responses to advertising stimuli. By adopting this framework, we aim to scrutinize user sentiment and responses towards green advertisements, discerning the intricate dynamics at play across different marketing channels.

The study encompasses an in-depth analysis of user sentiments, attitudes, and responses towards green advertising campaigns, considering the nuances of diverse marketing platforms such as social media, traditional media, and e-commerce channels. The selected platforms represent the contemporary landscape where consumers engage with advertisements, allowing us to explore the varying impact of green advertising strategies on different audience segments.

The overall objective of the paper is to understand how users feel about green advertisements and identify factors shaping their perceptions and explore the emotional responses elicited by green advertisements and their impact on user engagement and decision-making. The study use a systematic content classification approach and uses a pre-designed sentiment measurement equation based on which the overall findings has been forwarded.

By addressing these objectives, this research aims to contribute valuable insights to the evolving field of green advertising, assisting marketers, businesses, and policymakers in developing more targeted and impactful strategies for promoting sustainability. As we navigate the dynamic landscape of consumer attitudes towards green initiatives, this study seeks to provide a nuanced understanding of the EREC-AIDA framework's applicability in gauging user sentiment and response at various levels of marketing.

Literature Review

Green Marketing and Customer Influence

Green marketing goes beyond conventional marketing approaches by emphasizing the promotion of products and services with environmental benefits. This concept has evolved over time, expanding from a focus on eco-labelling to a more comprehensive approach that includes sustainable business practices and corporate social responsibility (CSR) initiatives. A crucial element in understanding the impact of green marketing is the level of consumer awareness and perception. Research consistently shows that consumers who are environmentally conscious are more likely to favour products and services that align with their values. The perceived environmental friendliness of a product significantly influences consumer attitudes and purchasing decisions (Abdo et al., 2022). Green equity has a considerable impact on customers' overall perceptions of a hotel's marketing initiatives; nevertheless, its effect is weaker when compared to other indicators such as a

hotel's value proposition, brand image, and loyalty programs (Rosenbaum & Wong, 2015). The green image influences the linkages between experiencing quality, physical environment quality, and outcome quality (Wu et al., 2019). Customers are willing to pay a higher green price if a portion of the amount spent goes to green activities (S.W. Chan, 2013). There is a positive correlation between effective green marketing strategies and customers' purchasing patterns for green products (Devi Juwaheer et al., 2012). Green marketing mix tools positively impact green customer-based brand equity creation (Nguyen-Viet, 2022). The overall analysis of literature demonstrates that green marketing assists businesses in influencing customers and shaping perception. In addition to traditional product functioning and economic values, green marketing helps to create a new type of value.

Theme of Green Marketing

The studies conducted in the past have highlighted that green marketing concepts are centric to some specific epi centres like Product, Process or Policy. There are few more dimensions other than mentioned here. But this study decided to focus on these three dimensions as majority of the campaigns scanned for data extraction are centric to any of these themes. The variation in campaign goal aids new features and develops variation in content structure but the overall central theme tends to remain same. The top level which is the widest in terms of intent is "policy" the companies that tries to build green equity among customer generally follows this type of marketing (Chen & Lee, 2015). In these form campaigns the companies communicates the policy level efforts for designing green products and processes in the company. Researchers have suggested that "product" specific green marketing has more positive impact on customer compared to "process" focused (Xu & Jeong, 2019). The companies using green "process" are not clear about its benefits on customer influence through process-based marketing (Fernando et al., 2016). Contrary to process driven green marketing, researchers have suggested that "policy" focused green marketing efforts have significant impact on firms overall marketing performance (Choi et al., 2018). While promoting organic products, the marketers should emphasise environmental aspects and environment-friendly characteristics of these products (Eneizan et al., 2019).

RQ 1: Which Level of Green Marketing Contributes Towards Engagement and Sentiment over social media?

Green Marketing and Customer Trust

One of the pillars of successful green marketing is transparency. Consumers are increasingly demanding clear and authentic information about a company's environmental practices. Brands that openly communicate their sustainability efforts, backed by credible certifications and verifiable data, foster a sense of authenticity, contributing to enhanced consumer trust. The companies with green marketing require enormous efforts in building the trust. Research suggests that customer trust on green marketing effort is premier dependent on the green brand equity of the company (Tung & Vigneron, 2023). The companies with high level green equity tends to generate high level of trust among the customers compared to companies with questionable green equity. Other set of researchers have found that green equity of a company is based on overall brand image and green trust of the customers on the company (Ahmed et al., 2023). GREEN consumption values govern how consumers respond to advertising and public relations stimuli by influencing perceptions of green brand trust, attitudes toward green marketing communications, and green brand support, as well as purchase intentions. (Bailey et al., 2016). Customer trust positively influenced customer identification, and both trust and identification mediated the association between green marketing and repurchase intention, as well as green marketing and positive word-of-mouth (Huang et al., 2023).

Use of Social Media and Green Marketing

Companies are increasingly incorporating green practices into their operations and marketing strategies. One powerful tool that has emerged as a catalyst in this green revolution is social media. Social media platforms serve as powerful channels for disseminating information. Companies leverage these platforms to raise awareness about environmental issues, climate change, and sustainable practices. The internet is an effective channel for marketing a hotel's green initiatives directly to customers. Social media marketing has emerged as one of the most dominant forms of marketing channel in the contemporary time. Use of Instagram has significant positive impact on user regarding green awareness of companies (Šikić, 2021). Effective communication is crucial in conveying a brand's green initiatives and fostering trust. Companies need to articulate their sustainability efforts clearly, avoiding greenwashing – the deceptive exaggeration of environmental claims. Open and honest communication builds credibility, strengthening the bond between the brand and the consumer. Social media reviews and user generated contents have significant impact customers purchase decisions (Popy & Bappy, 2020). The length of a review and valence of the textual component affect

the ratings given by the consumers (Yoon et al., 2019). Consumers, all over the world, are positively evaluating the user-generated contents on social media, which is subsequently affecting their behavioural intention (Oliveira and Casais, 2019).

RQ 2: Which Social Media Platform has the efficiency rate for Green Marketing Contents?

Green Marketing and Customer Sentiment over Digital Platforms

Sentiment analysis has been part of the overall marketing analytics and intelligence research for a long now but the pace and diversity in such research exploded with use of deep learning techniques and easy accessibility of web-based tools. The sentiment analysis in general helps to detect the customers mindset and emotion at times regarding a product or brand or an event. However, the topic in the context of green marketing has more significance as, any gap arising out of claim and delivery may spark huge negative impact on brand and marketing effort of any company as earlier researchers have suggested high level precision and caution while claiming green benefits and communicating value to customer over digital media as it may lead to huge negative sentiment within a short span of time (Rajeswari et al., 2020). Green marketing has been always a concern of value-based communication or relationship build effort by the companies. Social media provides a great space for value marketing as it opens up ways for multi directional communication and providing scope for high intensity e-WOM (Hodeghatta & Sahney, 2016). Social media platforms serve as a dynamic space for showcasing sustainability efforts, receiving immediate feedback, and fostering positive sentiments among consumers (Bagherzadeh et al., 2021). Timely and transparent responses can help mitigate potential damage to brand reputation. Brands can use these platforms to raise awareness and influence consumer behaviour positively (Galiano-Coronil et al. (2023). Social media users are quick to detect insincerity, and such practices can lead to a backlash (Mukherjee et al., 2023). Green marketing's impact on customer sentiment over social media is significant in shaping brand perceptions, fostering customer loyalty, and influencing purchasing decisions (Luo et al., 2021). There are many researches in the broad spectrum of green marketing and advertising effects on customer has systematically evaluated and explained the perceived relationship between sentiment, trust and conversion. The studies suggest that positive sentiment and high intensity e-WOM tends to increase trust over a brand among online communities. And further the trust on the brand assist building purchase decisions. However, the studies don't suggest any model or framework for building trust among the online audience of the brands. The communication established by the companies for diversion goals with specific theme of green marketing in general leads to develop the sentiment and finally converts into trust (Chen & Lee, 2015). One of the down side of this approach is that it doesn't originates strategically. The absence of clear goal and pre-defined content mapping with target customers makes this approach uncontrollable if went wrong and sparks negative sentiment in the beginning of the communication journey. Hence this study intents to develop a approach of content development on the domain of green marketing considering different levels and themes. The findings of the study will contribute towards designing content develop plans and provide strategic advantages to marketers. It has been found that unfavourable customer reviews become viral instantly, resulting in noteworthy negative effects on the service providers (Hu and Kim, 2018).

RQ 3: Which form of green marketing content mix contributes towards positive sentiment?

Research Gap

The overall research gap identified from the literature review and the study forwards the following gaps:

a. There is no available framework for classifying green contents.
b. There is no framework for content development with theme related to green marketing.
c. There is no such information available on selecting theme specific social media platforms for green marketing.

Objectives of the Study

Based on the research questions and the capability of the framework used in this study, the following are the objectives of the study:

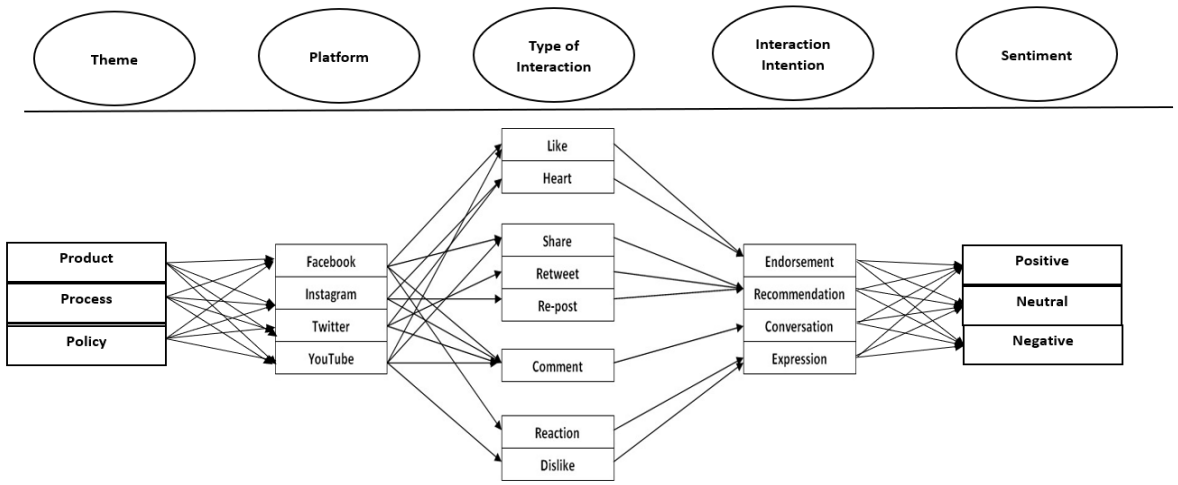
- Identify the most efficient content level for green marketing over selected social media platforms.
- Identify the most effective social media platform for green marketing contents for engagement optimization.

Theoretical Framework

The overall theoretical framework has five elements namely; Content Theme, Platform, Type of Interaction, Interaction Intent and Sentiment as illustrated with figure 1. The framework has been designed in such a way that it can help evaluating the impact of theme on specific platform and also aids in measuring the overall performance of the content. The framework also extracts the net sentiment as the literature suggest that sentiment tends to build the trust and which in turn helps in converting online audience through social media and other digital platforms.

Figure 1

Content Performance Evaluation Framework



Source: Zhang et al., 2015; Dhaoui 2014; Chu and Kim, 2011; Swani et al., 201; Alboqami et al, 2015; Hennig-Thurau et al., 2010; Liu et al., 2017

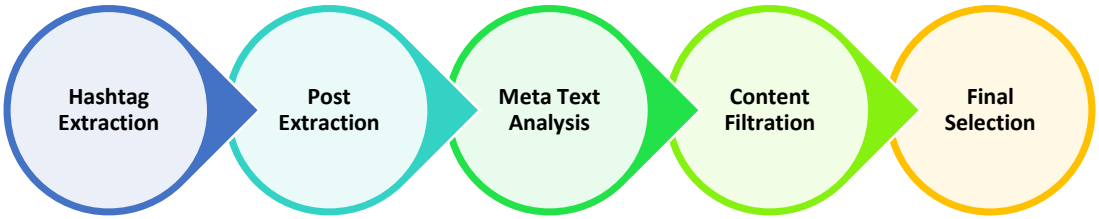
Methodology

Sampling

For the purpose of sampling four platforms namely; Facebook, Twitter, Instagram and YouTube has been selected due to accessibility and nature of the data. All the post that contains green marketing element could be the sample of the study but to have a systematic approach towards data extraction and collection a step-wise sample identification approach has been adopted.

Initially the most frequently used hashtags in green content marketing have been collected using Brand24 web extraction tool. Then the contents published with these hashtags were extracted. Further the meta description of the extracted contents was used to identify the theme and the contents having green elements were selected for data extraction. All the contents that passed through meta description similarity analysis were examined with a minimum threshold of 100 aggregate engagement were selected as sample of the study. In total 6375 post were initially short listed based on the hashtags and further filtration resulted in elimination of 2671 post leading to final sample size of 3704 content units. The overall process of sample selection has been illustrated with figure 2.

Figure 2
Sampling Frame



Data Collection

The data has been collected through web extraction tool Brand24 and SocialInsider.io. Initially the content samples were mapped using Brand24 and the finalized contents were extracted using SocialInsider.io. The data encompasses the engagement attributes and text elements of the meta description. For the purpose of sentiment analysis random number of most popular comments and social mentions were extracted and processed through MAXQDA for extracting the sentiment.

Analytical Framework

The overall analysis of the study was grouped into two broad categories; namely, descriptive and estimates. Initially, a descriptive analysis of the content theme was carried out to understand the overall pattern of engagement per platform. Further, the effect of content on engagement across the selected platforms were analyzed using content efficiency (engagement per post) and content contribution. The efficiency of the content defines its ability to generate engagement against page activity level and contribution helps in the estimating the content category's share of the overall engagement. ANOVA was then used to estimate the statistical significance of the engagement level generated by each category per platform.

Efficiency and Contribution

The study was carried out on 'post level' data per platform. This helps in understanding the level of engagement and pattern of engagement a platform produces based on the type of activity. The following equations have been used to calculate the efficiency rate and contribution rate of content theme per platform. The efficiency for each content theme for each platform was calculated separately. The following equation has been used for calculating the $C_{on}Ef$.

$$Ef_{ijp} = \frac{Content\ Engagement\ for\ category\ 'j'}{Total\ number\ of\ post\ in\ the\ category\ 'j'}, \quad \text{---------- (1)}$$

where i = content, j = category and p = platform

For Facebook (j)= Text, Image, and Video,

For Instagram (j)= Carousel, Image and Video

For Twitter (j)= Text, Image and Video

For YouTube (j)= Video

Content Contribution ($C_{on}Ct$)

The contribution for each content category was calculated for each platform separately. The contribution value for the content category explains the ability of the content category to contribute towards overall engagement by the sample within a platform. The following equation was used for determining the content contribution.

$$C_{on}Ct_{ijp} = \frac{Total\ Engagement\ by\ a\ Content\ Category}{Total\ Platform\ Engagement}, \quad \text{---------- (2)}$$

Content Sentiment

The sentiment for the content theme was analyzed based on its Net Sentiment Score (NSS). This can be calculated manually and also through online data extraction tools. However, this study used a manual equation for calculating NSS. The positive and negative Interaction per post can be extracted using Brand24 and BrandMention data extraction tools (Tom, 2022). The study also covered the Mentions and volume of social spread per post for determining the overall sentiment. Initially, the estimated volume of positive and negative sentiment was extracted and then the data was processed through the NSS equation. The NSS equation follows a very simple logic in which it estimates the overall nature of the sentiment based on the volume of positive and negative engagement.

Net Sentiment = positive conversation – negative conversation 3

The quantitative Conversion of the equation was done by assigning scores as follows; positive = 1, negative = -1, and neutral = 0. The percentage Net Sentiment for each category was calculated by dividing aggregate NSS by the total number of posts within the category.

Aggregate NSSCoTh = $\sum NSS\ for\ each\ post\ within\ a\ category$ 3

ANOVA

The study intends to identify the most effective content theme in terms of generating engagement to enhance the platform's efficiency. To understand the statistical significance of the difference in engagement level for each content theme per platform, ANOVA was carried out. The study considers content theme as independent variable as it can be decided by the publisher irrespective any other factor. The engagement has been considered as dependent variable as the study tends to assume that engagement is driven by theme.

Findings

Overall Description (Content Theme)

Table 1 illustrates the aggregate engagement and number of posts for each of the content level across the platforms. The efficiency and contributions obtained from the analysis has also been illustrated with the table. The highest volume of engagement has been obtained for Process level over Instagram which also has the high level of efficiency and contributes almost 81 percent of the total engagement over Instagram. For Facebook the high engagement has been obtained for Product and lowest for Policy. For X and YouTube high engagement has been obtained for Policy and lowest is for Product and Process respectively.

Table 1

Efficiency and Contribution

Content Theme Analysis						
		Performance			Contribution	
	Content-Type	Engagement	Post	Efficiency	Engagement	Post
Facebook	Product	265745	531	500.46	0.57	0.46
	Process	102531	402	255.05	0.22	0.35
	Policy	96357	229	420.77	0.21	0.20
Instagram	Product	224172	362	619.26	0.07	0.54
	Process	2647813	111	23854.17	0.81	0.17
	Policy	396745	196	2024.21	0.12	0.29
X	Product	101459	310	327.29	0.14	0.26
	Process	225763	367	615.16	0.56	0.31
	Policy	415678	496	838.06	0.56	0.42
YouTube	Product	336578	385	874.23	0.33	0.55
	Process	214751	241	891.08	0.21	0.34
	Policy	463520	74	6263.78	0.46	0.11

Overall Engagement

Table 2 illustrates the overall engagement volume per intent per content level for each of the platform. The overall analysis suggest that Endorsement is most common type of engagement followed by Conversation, Recommendation and Expression. It was observed for Instagram that Process dominates all the type of engagement intents by a huge margin apart from Expression. Product dominates all type of engagement intent for Facebook and however policy generates second highest engagement through Conversation and Expression. Expression intent finds its way through the Policy level contents over X, although Endorsement dominates across the levels for this platform. Recommendation is highest with Policy level content over YouTube although Product dominates all type of intent apart from Expression.

Table 2

Engagement Volume per Intent

	Content-Type	Endorsement	Recommendation	Conversation	Expression
Facebook	**Product**	87038	63741	49752	65214
	Process	43712	25743	30547	2529
	Policy	17453	5897	41025	31982
Instagram	**Product**	94217	45731	38971	45253
	Process	1748591	226374	578961	93887
	Policy	103574	87463	120034	85674
X	**Product**	49631	33571	9671	8586
	Process	139808	32781	35174	18000
	Policy	173769	58347	85731	97831
YouTube	**Product**	146327	85614	55731	48906
	Process	153761	23574	15731	21685
	Policy	202374	135796	45731	79619

Efficiency

Table 3 illustrates the efficiency per engagement intent. The average efficiency obtained for endorsement at product level is 186 followed by Recommendation at 115 and for Conversation and Expression at 65 and 75 respectively. The overall performance suggest that Facebook and Instagram generate above average efficiency with Instagram at highest whereas X and YouTube generates below average efficiency across the levels. One of the reasons is Instagram as platform has a huge gap in activity and reception which inflates the numbers when it comes to efficiency for Instagram. Instagram dominates the engagement for Process level across the platform for each of the engagement intent hence its average efficiency dominates as well. Facebook is average is the lowest when it comes to Process across the engagement intents. For Process level content Conversation is the second most type of engagement intent with YouTube as the poorest performing platform among all. The highest average is obtained for Endorsement intent for Policy level contents with YouTube generating highest volume of engagement. The pattern observed for the Policy level engagement is similar across all type of intents with YouTube dominating the engagement intents followed by Instagram. The Facebook generated lowest volume engagement across intents.

Table 3

Intent Engagement Efficiency

Endorsement	Recommendation	Conversation	Expression
163.91	120.04	93.69	122.81
108.74	64.04	75.99	6.29
76.21	25.75	179.15	139.66
260.27	126.33	107.65	125.01
15753.07	2039.41	5215.86	845.83

528.44	446.24	612.42	437.11
160.10	108.29	31.20	27.70
380.95	89.32	95.84	49.05
350.34	117.64	172.84	197.24
380.07	222.37	144.76	127.03
638.01	97.82	65.27	89.98
2734.78	1835.08	617.99	1075.93

Contribution

Table 4 illustrates the contribution from each engagement intent per content level for each of the platform. The overall contribution for X is highest through Endorsement followed by YouTube and Instagram. The highest average is also obtained for Endorsement followed by Recommendation. Close to 80 percent of the engagement is driven by Endorsement and Recommendation for X and the pattern is form all platforms if these two intents are grouped together. Lowest contribution has been obtained for X with Expression followed by Conversation. On an average Endorsement contributes 32 percent of the overall engagement across platform at Policy level followed by Conversation. The lowest contribution has been obtained for Recommendation. X dominates Policy level Endorsement whereas YouTube dominates Recommendation Facebook dominates Conversation and Expression. Although Instagram doesn't dominate any type of engagement intent at Policy level it still has lowest degree variation. The average contribution is highest with Endorsement intent at Process level followed by Conversation. Instagram and YouTube generate above average contribution through Endorsement. However, Facebook dominates Recommendation and Conversation. Instagram has lowest contribution from Recommendation and Expression. Endorsement contribution is in volume when it comes YouTube.

Table 4

Engagement Intent Contribution

Endorsement	Recommendation	Conversation	Expression
0.33	0.24	0.19	0.25
0.43	0.25	0.30	0.02
0.18	0.06	0.43	0.33
0.42	0.20	0.17	0.20
0.66	0.09	0.22	0.04
0.26	0.22	0.30	0.22
0.49	0.33	0.10	0.08
0.62	0.15	0.16	0.08
0.42	0.14	0.21	0.24
0.43	0.25	0.17	0.15
0.72	0.11	0.07	0.10
0.44	0.29	0.10	0.17

Sentiment

The sentiment heat map illustrated with table 5 shows the positive and negative sentiment concentration at content level for each of the platform. The analysis suggest that highest positive sentiment has been obtained for Product level marketing through all form of user communication within Facebook. YouTube is the only platform with high volume of negative sentiment for at Product level. The mentions and share of contents through Instagram tend have generated negative sentiment at Product level as well. The lowest heat has been observed for Process and Product level within Instagram through Conversation and YouTube through Share. X tends to have moderately positive sentiment and low negative sentiment at Product level. However, negative sentiment is high when it comes to Process level marketing. Analysis the sentiment by source of

communication it has been observed that most of the negative communication takes place through Reviews across all the platforms for each of the content level.

Table 5

Sentiment Heat Map

		Conversation		Share of Voice		Reviews	
	Content-Type	Positive	Negative	Positive	Negative	Positive	Negative
Facebook	Product						
	Process						
	Policy						
Instagram	Product						
	Process						
	Policy						
X	Product						
	Process						
	Policy						
YouTube	Product						
	Process						
	Policy						

ANOVA

The analysis suggests that there is no significant difference between engagement volume per post within Facebook at Product-Process level. Instagram engagement pattern is clearly visible through simple metrics like engagement per post which is again confirmed through ANOVA that at post level there is no significant difference in overall engagement at any of the content level. For X there is significant difference in engagement volume for Product-Policy and Process-Policy but no significant different in engagement volume per post at Product-Process level. YouTube is the only platform with highest variation in engagement across the intent type and content level. The analysis suggests that there is significant difference in engagement volume for each of the content level post over YouTube. The results have been illustrated with table 6.

TABLE 6

ANOVA

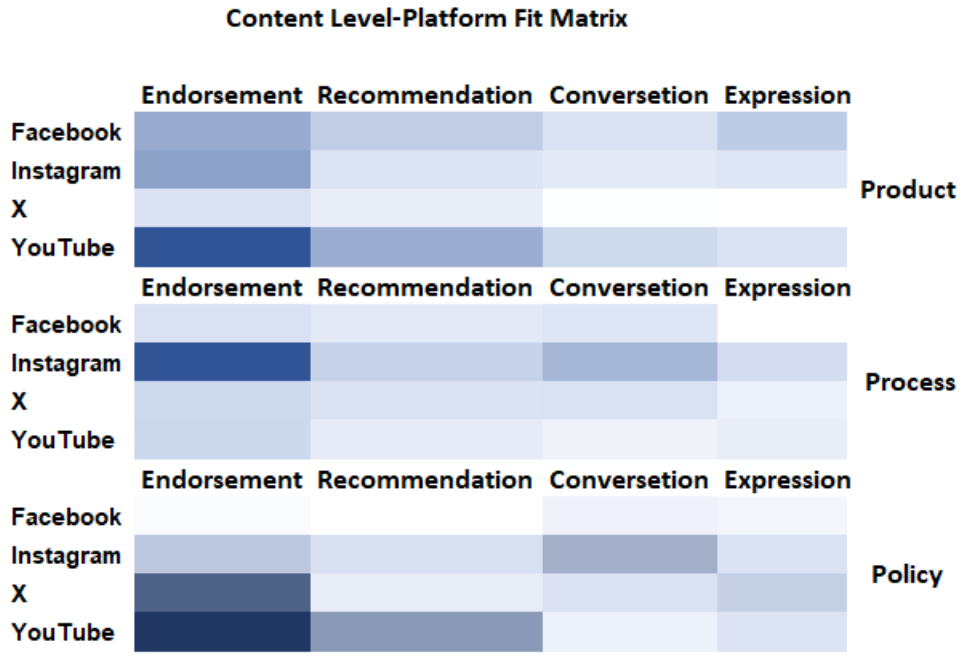
Dependent Variable: Content Engagement			
Content Type			Sig.
Facebook	Product	Process	0.997
		Policy	0.047
	Process	Product	0.997
		Policy	0
	Policy	Product	0.047
		Process	0
Instagram	Product	Process	0.976
		Policy	0.874
	Process	Product	0.976
		Policy	0.92
	Policy	Product	0.874
		Process	0.92
X	Product	Process	0.051
		Policy	0
	Process	Product	0.051
		Policy	0.023
	Policy	Product	0

		Process	0.023
Twitter	Product	Process	0
		Policy	0.136
	Process	Product	0
		Policy	0
	Policy	Product	0.136
		Process	0

Conclusion

The overall finding of the analysis suggests that the most performing platform in terms of efficiency is Instagram followed by Facebook. The activity level and engagement level gap with Instagram suggest that there is huge scope for increasing contents density. It was also observed that Instagram is the only platform having lowest variation in engagement volume when it comes to any type of engagement intent. As illustrated with the matrix the best fit has been obtained for Product level marketing is with YouTube. The strategy implantation suggest marketers should create contents which tends to generate Endorsement intent for user within YouTube through Product level contents. Facebook obtains a moderate fit for Product level marketing through any of the intents. However, priority should be given to Endorsement and Recommendation. X data clearly suggest for not generating contents with Conversation and Expression 'Perceived Action' as it has the lowest fit for product level. At Process level Instagram is the most suitable fit through Endorsement 'Perceived Action'. Endorsement and Recommendation 'Perceived Action' contents are generic fit for Process level marketing across any platform. For Policy level marketing X and YouTube are the best fit with high level of engagement driven through Endorsement. Instagram does fairly well at this level as well through Endorsement and Conversation. The best fit understanding of the data suggest YouTube should the priority platform for green content marketing at Product and Policy level whereas Instagram should be Process level marketing platform. Facebook in general doesn't appear to be a best fit for any given criteria but due to huge volume of engagement it contributes should be a platform with priority for Product. The best fit analysis also suggest Endorsement and Recommendation are top priority type of content perceived action as these two intents contributes the highest share of engagement for most of the content levels. The findings have been illustrated with figure 3.

Figure 3
Content Fit Matrix



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Micro-Mobility Solutions : Evaluating the Effectiveness of E-Rickshaws in Small-sized City

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Abstract

Purpose of the Study

Rapid urbanisation in non-industrial countries has resulted in a massive increase in demand for mobility services, putting enormous strain on urban transportation infrastructure and services. Even in cities where public transportation is available, formal public transportation services are frequently insufficient and unreliable, causing the population to rely on personal mobility options and informal public transportation services to meet their mobility needs. The economy and social development of a region are heavily influenced by the operation of the transportation infrastructure. It transports people, goods, and services to their final destination. India is urbanising, with the urban population growing at a median annual rate of roughly 3%. Para-transits mode provides flexible and dynamic transportation. India's public transportation systems are among the most heavily used in the world, serving the country's second-largest population's mobility demands. The automobile business in India is quickly developing with a yearly production of over 4.6 million vehicles, and vehicle volume is supposed to rise in future. As cities worldwide grapple with the adverse effects of air pollution, the E-Rickshaw stands out as an environmentally friendly alternative to traditional fossil fuel-based auto rickshaws. In addition to its environmental benefits, the E-Rickshaw serves as a viable alternative to traditional auto-rickshaws and cycle rickshaws, offering advantages such as low fuel costs and reduced human effort. Furthermore, the widespread adoption of E-Rickshaws contributes significantly to employment generation, particularly benefiting the Lower Income Group (LIG) of the population. The study is performed in a small-sized city in Assam, Jonai. It has been chosen because of the absence of an efficient public transportation system and the increasing demand for E-Rickshaws. The information required to meet the objectives of this study is obtained from the primary surveys and questionnaires. The objectives are to assess the role of E-Rickshaw in small-sized city, assess the trip characteristics and socio-economic status of E-Rickshaw operators (drivers) and prepare a utility map on E-Rickshaw operation in Jonai

Methodology

Traffic Volume Survey and Vehicular Occupancy Survey

Traffic volume survey is conducted to identify the prevailing mode of travel and the modal split in various locations of Jonai city based on PCU/hr. This survey is carried out through videography at each intersection and traffic volume counting is done manually from the recorded videos. Vehicular occupancy survey is to find the average number of passengers carried by each mode at each survey location of Jonai city. This also provides the revealed modal split. Survey is carried out using the roadside/windshield method in those locations of the city where the traffic volume survey has been conducted. In case of private modes of transport, the driver is counted as a passenger whereas for rest of the cases the driver/conductor/helper is considered as part of the vehicle hence not counted as passenger during occupancy survey. Both the survey is conducted during morning peak hours from 09:00 a.m. to 10:00 a.m. and evening peak hours from 05:00 PM to 06:00 PM of weekdays especially Tuesday, Wednesday and Thursday.

Operator Questionnaire Survey

To know the socio-economic status of E-Rickshaw, operator questionnaire survey is performed. This survey is conducted when E-Rickshaw operators were resting at parking stand or when they are were waiting for passengers. This questionnaire contained 21 questions.

Sampling Size

Stratified sampling technique is selected for determining the sample size of questionnaire survey for operator survey because of its feasibility of selecting data randomly from different subgroups or strata proportionately. Empirical formula given by William G. Cochran is used to determine the sample size. As per DTO (District Transport Office) number of registered E-Rickshaw in Jonai is 506. The adjusted sample size as per the equation is found out to be 219 for Jonai.

Findings

The modal split diagram which shows the percentage share of each mode to the total volume of all modes at a given place is the most important finding from the traffic volume survey. Percentage volume of E-Rickshaw in Jonai is found to 32.9% with respect to all the available modes which is higher than the Auto Rickshaw (6.62%). The E-Rickshaw is found to be an important component of transportation system in small-sized city.

According to the findings from the vehicle occupancy survey the 2-wheeler (46.3%) are the most crowded mode followed by car (19.5%), E-Rickshaw (10.9%) and auto rickshaw (6.9%) throughout the city. The percentage of passengers transported by E-Rickshaw in cities at each of the locations is observed that its utility is high in the CBDs area of the city

Original Contribution

The E-Rickshaw is found to be an important component of transportation system in Jonai. Percentage volume of E-Rickshaw in Jonai is found to 32.9% with respect to all the available modes which is higher than the Auto Rickshaw (6.62%). This indicates that paratransit operators have prepared electric vehicles for use in the urban transportation system. At the city level, the average passenger occupancy of E-Rickshaw is 1 which shows concerned to operator due to more increasing number of E-Rickshaws. Maximum number of urban passengers is being catered by 2-wheeler (46.3%) followed by car (19.5%), E-Rickshaw (10.9%) and auto rickshaw (6.9%). However, average passenger occupancy of E-Rickshaw seems to be lower due to a higher percentage of operators using E-Rickshaws compared to other paratransit modes also some location has lower passenger occupancy, implying that average passenger occupancy is lower. From the utility map of E-Rickshaw services in Jonai, it is concluded that their utility decreases on moving away from the CBD area of the city with the highest volume being in between Nepali Road Point to Secondary Point.

The socio-economic condition of E-Rickshaw operators is generally below the poverty level. The majority of operators are between the ages of 31 to 40. Higher number of illiterate operators are found in cities of Jonai. The majority of their residences are situated in Kutcha houses (81.5%). Daily average income of operator is found to 458 INR (Indian National Rupee) which is reasonable and the majority of their operations are done in shared mode. The main mode of paratransit in the city of Jonai is the E-Rickshaw in the urban area, which covers the gap in people's demands for short distance rides; nonetheless, there is no proper paratransit in this city.

Keywords

E-Rickshaw, Utility, Modal split, Questionnaire Survey, Traffic volume Survey

Introduction

Rapid urbanization in non-industrial nations has prompted a phenomenal expansion sought in demand for mobility services, which placed tremendous pressure on urban transport infrastructure and services. Even in cities where public transit is available, formal public transit services are often inadequate and unreliable, giving rise to the dependence on personal mobility and informal public transit services for meeting their mobility needs (Shimazaki and Rahman, 1996). The performance of transportation system to a large extend influences the economy and social advancement of an area. It provides mobility to people, goods and services to their destination. It has linkages with different areas of improvement and for a maintainable advancement of any area, its traffic and transportation system should be adequately addressed. India's public transport systems are among the most vigorously utilized modes in the world, fulfilling transportation needs of world’s second largest population (Mishra and Mishra, 2018).

`India is urbanizing and its urban population is growing at a high rate. With global pollution levels rising in recent years, India now has seven of the world's 10 most polluted cities. India suffers from severe air pollution, long health ailments and related deaths, particularly in urban areas (Reddy and Sharma, 2012). With the elements of contamination and expanded traffic as a top priority, the most ideal way to patch up the cart is to foster a more effective plan that will be controlled by a non-polluting energy source, which can be achieved with an electric powered vehicle. In urban areas, E-rickshaws (figure 1), an alternative to autorickshaws, can take the role of traditional paratransit. The introduction of E-Rickshaws in metro cities to medium and small-sized cities will meet the transportation needs of users in smaller communities and provide sustainable options for cycle rickshaw Pedalers. Recent Indian government policies such as the National Electric Mobility Mission Plan, which includes various schemes such as demand-side incentives to facilitate the acquisition of electric vehicles, promoting R&D, charging infrastructure, FAME, and others, highlight the need for alternative energy transportation (India Times, 2022). This will boost E-Rickshaw sales because they will be more affordable, environmentally friendly, and accessible to assure last-mile connectivity. E-Rickshaws are rapidly gaining in popularity. E-Rickshaws, for instance, are available near metro stations, malls, schools, colleges, and universities. They're utilised to transport people around an area. But such availability may be just few in numbers in case of both small cum medium-sized cities where the scenario of travel behaviour and the role of E-rickshaw may be different from the larger cities.

Figure 1

E- Rickshaw on the roads of Jonai

In addition to its environmental benefits, the E-Rickshaw serves as a viable alternative to traditional auto-rickshaws and cycle rickshaws, offering advantages such as low fuel costs and reduced human effort (Nambiar et. al., 2019). Furthermore, the widespread adoption of E-Rickshaws contributes significantly to employment generation, particularly benefiting the Lower Income Group (LIG) of the population. This 4-seater vehicle works on DC motor ranging from 650 to 1400 watts, equipped with 4 Li-ion/lead acid battery of 12V connected in series (Majumdar and Jash, 2015). The following objectives are laid for this study- 1) To assess the role of E-Rickshaw in small-sized city. 2) To assess the trip characteristics and socio-economic status of E-Rickshaw operators (drivers) and 3) To prepare a utility map on E-Rickshaw operation.

The subsequent section of the paper is structured as follows: Section 2 presents a literature review, which discusses the operational and socio-economic aspect of users (passengers) are reviewed. Section 3 describes the importance of the case study area. Section 4 explains the survey and data collection methods. Section 5 is the findings. Finally, section 6 concludes by discussing the outcomes, constraints, and directions for future research.

Literature Review

In recent years, with rapid urbanization, economic growth and increase in income cum the standard of living in urban areas, there has been a significant rise in count of private vehicles. Over the concerns to pollution, it required an innovative mobility solution across the country. According to Roy (2016), a study conducted in West Bengal's Barddhaman Town highlighted the value of E-Rickshaws as a paratransit in urban development and pinpointed issues as well as opportunities for growth in the future. With the use of questionnaires, this was accomplished through in-person conversations with drivers, passengers, and pedestrians. Majumdar and Jash (2015) conducted research on E-rickshaws in West Bengal and produced a thorough report outlining the benefits and drawbacks of this alternate form of public transport in the area. The paper has revealed through a variety of conducted surveys that the E-rickshaw has the potential to reduce carbon emissions and improve the environment by using the least amount of energy compared to other motorised public transportation modes. Kokate et al. (2019), present the study of past present and future of E-Rickshaw. It analyses that being a potential bearing mode of transport of present and future E-Rickshaw is the best contender and it has started making its mark in the Indian transport system. Rana et al. (2013), discuss from the field survey to secondary sources which is analyse and explore the E-Rickshaws play an important part in urban mobility. They determined the energy consumption rate of E-Rickshaws found the urban income and employment generation of operators and concluded that battery-powered auto-rickshaw (E-Rickshaw) offers cheaper travel costs, greater comfort, and a reasonable travel pace, making it a popular means of urban transportation. It also creates employment opportunities for LIG in small towns and significantly minimizes migration. A study conducted on E-Rickshaws in the nation's capital, Delhi, by Singh (2014), demonstrated the role of battery-operated E-Rickshaws in urban employment, income generation, etc., and recommended technical parameters to the E-Rickshaw industry for improvement in manufacturing policy, since most the study's key findings were related to poor safety issues.

Singh et al. (2020) gives an account of the introduction of E-Rickshaw in Delhi (NCR) their impact on sustainability and challenging issues for e-mobility. The paper also considers whether the use of E-rickshaws as part of Delhi's public transportation system is a responsible innovation. The survey papers show that this product is socially acceptable, economically viable, and environmentally sustainable in the area.

Malik, et al. (2018), study carried out the success of India's rickshaw industry in terms of innovation and entrepreneurship, as well as how a technology-led intervention in the rickshaw market allowed for a new product to uplift rickshaw pullers from poverty while maintaining environmental consciousness and economic development. Also, discuss the effects of switching from man-pulled rickshaws to E-Rickshaws. The survey is performed on 100 E-rickshaw pullers from Delhi region. According to these findings, their earnings have improved by up to 400 % after introduction of E-Rickshaws with an average income of 600 ₹ per day (INR), however, concerns the quality of E-Rickshaws, similar study was carried out by Sarkar (2021). Mishra and Mishra (2018) assess the role of public transportation in Allahabad, Uttar Pradesh and measures that public transportation plays an important role in income and employment generation of the urban poor. According to the study, financing availability for vehicle purchases, particularly for E-Rickshaws, may be assured, and new employment and income opportunities can be generated while promoting relatively green transportation.

Ansari and Sinha (2020) study the comparative analysis of service quality of intermediate public transport (IPT) modes specifically auto-rickshaws and E-Rickshaws over users' perception in Patna. Both the IPT modes and are highly satisfied with the cleanliness and travel time and concern both types of IPT modes on security, convenience, and safety of female users, especially during night hours. According to the researcher, findings will be valuable for policymakers, as well as the construction and upgrading of transportation structures in mid-sized cities. Pramanik and Rahman (2019) carried out a study on the operational characteristics of paratransit, mainly the E-rickshaws, operating in a medium-sized city of Bangladesh. This paper finds sufficient data to acknowledge the importance of E-Rickshaws which helpful for the policymakers to identify the importance of E-Rickshaws and for promoting e-mobility.

The conclusion drawn from the concise overview of the literature on E-rickshaws and related areas is that these paratransit vehicles are prevalent in many Indian cities. E-rickshaws are well-suited for providing last-mile connectivity, filling the gap between major transportation hubs and final destinations. They can navigate through narrow and congested urban streets, reaching areas that may be challenging for larger vehicles. Few studies have been conducted to illustrate the role of E-Rickshaws in urban movability, particularly in medium-

sized cities where studies on their versatility have not been completed. A major portion of the research works mainly focused on its importance, performance and operational characteristics. There are few studies on the socio-economic impact of E-Rickshaw operators. As per the review, no research work is found on identifying the utility of E-rickshaws in small-sized city in India.

Case Study Area

Jonai is in the easternmost sub-division of Dhemaji district, Assam about 554 km from the state capital, Dispur (Guwahati). It is a small-sized city of Assam state in India. Covering a total Geographical area of 1111.81 km^2, it is bounded by Arunachal Pradesh in the north, Lali & Brahmaputra River in the south, Sipiya river & Sadiya Subdivision of Tinsukia district in the east and Simen River in the west. The Sub-division comprises with one Development Block named by Murkong Selek Tribal Development Block. According to 2011 census of India, total Jonai population is 1,69,898 people are living in this Block and with an urban population of 50,503 a literacy rate of 82.81% (District Census, 2011).

Paratransit Modes in Jonai

Three major paratransit are operating in Jonai urban area namely E-Rickshaw, Auto-rickshaw and Tata magic. The highest number of paratransit operating is E-Rickshaw along with Autorickshaw and Tata magic has replaced the gap between the demand and supply of urban mobility. The non-availability of public transport and small-town areas makes E-Rickshaw one of the suitable modes and also of their minimal speed which passengers are used as their vehicle as easily accessible in the road and also low fares for office purposes, recreational purposes, school/college trips, work trip or any other domestic purpose. Jonai is a medium densely populated urban area; the city is not well planned and is growing vastly.

Methodology

This section accomplishes the strategy used to meet the purpose behind the current study. The main objective is to assess the socioeconomic status of the E-Rickshaw operator. The details of study location, types of survey and data collection are shown in Figure 2. The study is conducted in a selected location of Jonai as follows:

1) SFS School Point
2) Rangkop Point
3) Higher Secondary School Point
4) M.G Road Centre Point
5) Primary Civil Hospital Road Point
6) Nepali Road Point and
7) NH 515 Ruksin Point

Traffic Volume Survey and Vehicular Occupancy Survey

In this, the traffic volume survey is conducted to identify the prevailing mode of travel and the modal split in various locations of Jonai based on PCU/hr. This survey is carried out through videography at each intersection and traffic volume counting is done manually from the recorded videos. However, weekends or festive days are not considered to avoid abnormal traffic data. The traffic volume is counted separately for each road of the intersection and summed up to get the total volume of the intersection. Since Indian traffic flow is a mixed one, the traffic volume is expressed in terms of Passenger car unit (PCU) per hour and the PCU equivalency factors are taken as per Indian Road Congress (IRC): 106-1990 guidelines for capacity of urban roads in Plain areas (Guidelines, 1990). The PCU value of E-Rickshaw is not defined yet by the IRC. In Indian conditions, the traffic is heterogeneous traffic, and each class of vehicle moves more or less at the same speed in the city. Considering this fact, a linear interpolation of the average rectangular projected areas of all the vehicles is carried out with respective vehicles PCU's and accordingly, the PCU of E-Rickshaw is adopted as 0.963 for percentage composition of vehicle to 5% and 1.57 for percentage composition of the vehicle more than 10% to meet the purpose of the present study.

Vehicular occupancy survey is conducted to find the average number of passengers carried by each mode at each survey location of Jonai. This also provides the revealed modal split. Survey is carried out using

the roadside/windshield method in those locations of the city where the traffic volume survey has been conducted. In case of private modes of transport, the driver is counted as a passenger whereas for rest of the cases the driver/conductor/helper is considered as part of the vehicle and hence not counted as passenger during occupancy survey.

Both the survey is conducted during morning peak hours from 09:00 AM to 10:00 AM and evening peak hours from 05:00 PM to 06:00 PM of weekdays especially Tuesday, Wednesday and Thursday.

Operator Questionnaire Survey

This survey is performed to know the socio-economic status and trip characteristics of E-Rickshaw operators collecting questionnaire survey. Survey is conducted when E-Rickshaw operators were resting at parking stands or when they are were waiting for passengers (Ahmed and Bisht, 2019). This questionnaire contained 21 questions. Question 1 to 5 deals with the basic questions with the respondents like age, gender, family size, earners and dependent in family, educational qualification. Question 6 to 9 deals about trips per day made by vehicle, working hours per day of operator, daily turnover in rupees, maintenance cost per month, Question 10 to 12 are about vehicular ownership, vehicle engine type i.e., motorized type, mode of vehicle purchase by operator if owned by operator. Question 13 about monthly electricity bill, Question 14 is about whether operator having valid driving license or not. Question 15 is about the type of parking like on street or off street. Question 16 and 17 deals about the resident type of operator whether original or migrated and the residential status type of operator whether kutcha or pucca house. Question 18 deals with job type whether E-Rickshaw is his permanent job or part time job. Question 19 is about the operation of the vehicles whether it is under any union or independent. Question 20 is about whether route is flexible or fixed or both. Question 21 is about trips performed if it is on shared mode, hired mode or both.

Sample Size

For the present study, stratified sampling technique is selected for determining the sample size of questionnaire survey for trip makers and operator survey because of its feasibility of selecting data randomly from different subgroups or strata proportionately. Empirical formula given by William G. Cochran is used to determine the sample size (Cochran, 1977).

$$\text{Sample size, } n_0 = \frac{z^2 p(1-p)}{e^2} \quad (1)$$

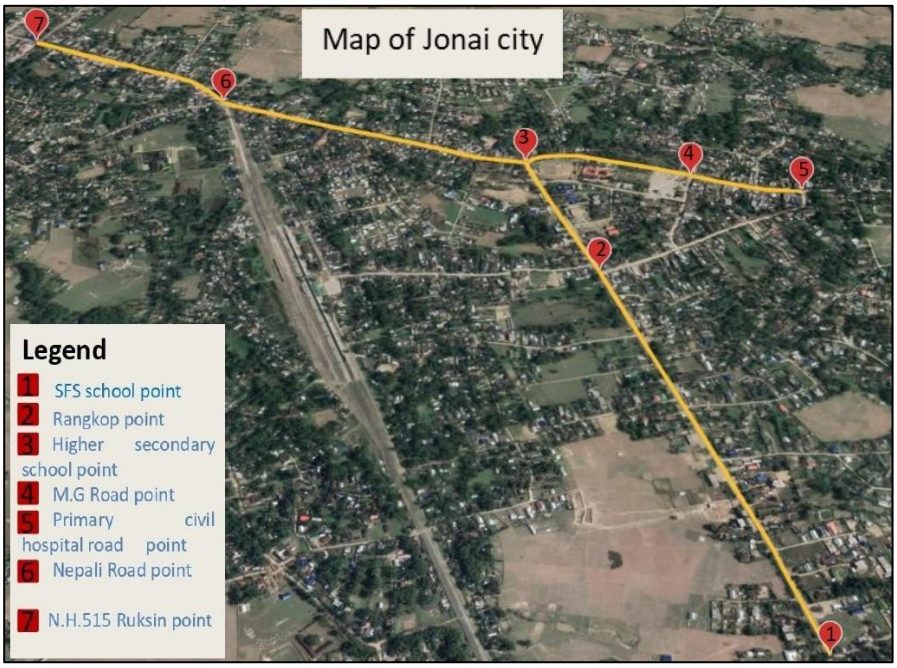
Where, n_0= sample size; z = confidence level (z is 1.96 for 95% confidence interval); p = estimated proportion of an attribute that is present in the population (adopted as 0.5 in this study); e = desired margin of precision (adopted as 5% in this study)

As per the above equation the sample size is found to be 384.16

$$\text{adjusted sample size } n_0 = \frac{sample\ size}{1+\frac{sample\ size-1}{population\ size}} \quad (2)$$

As per the District Transport Office (DTO) number of registered E-Rickshaws in Jonai is 506. The adjusted sample size as per **Equation (2)** found to be 219.

Figure 2
Selected Study Location – Jonai City



Findings

Analysis of Traffic volume Survey

Traffic volume survey is conducted to determine the modal split at each of the survey locations. The survey's raw traffic data is in the form of vehicles per hour, which is converted to PCU/hr by multiplied with the respective PCU values of the various modes. This is done to consider the complexity due to varying static and dynamic characteristics of different modes. table 1 shows the hourly traffic volume in PCU/hr both location-wise and mode-wise.

Table 1
Hourly traffic Volume in PCU/hr at Different Locations

Survey Location	Bicycle	2-Wheeler	E-Rickshaw	Auto Rickshaw	Car	Taxi (Sum, Magic, Winger, Force Cruiser)	Bus	Total Volume in PCU/hr
SFS School Point	27	244	121	66	162	57	9	686
Rangkop Point	69	405	399	99	211	47	0	1230
Secondary Point	95	538	603	129	243	42	5	1655
M.G. Road Point	68	466	599	72	120	16	0	1341
Old Civil Hospital Road Point	65	266	212	70	79	7	0	699
Nepali Road Point	114	645	625	72	231	60	0	1747
Ruksin Point	79	498	280	63	262	82	3	1267
Total Volume in Mode wise PCU/hr	517	3062	2839	571	1308	311	17	8625

The variations in the volumes of all the modes at each location are showed in the bar diagrams that follow, starting with figure 3 to figure 9.

Figure 3
Percentage Volume of each Mode at SFS School Point

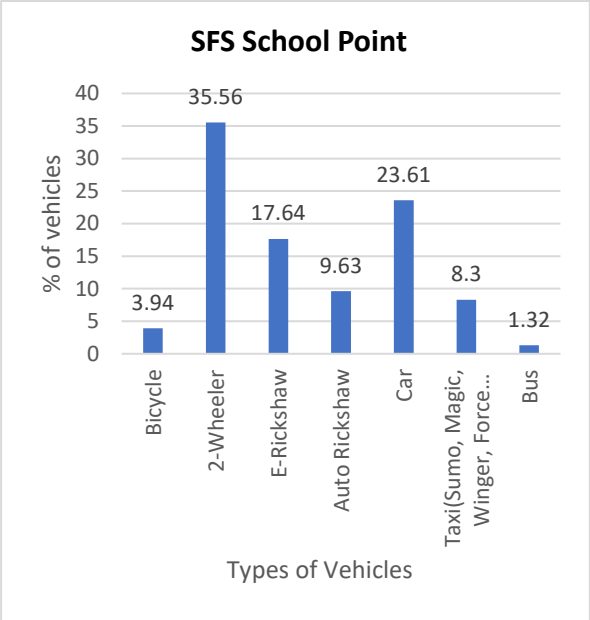


Figure 4
Percentage Volume of each Mode at Rangkop Point

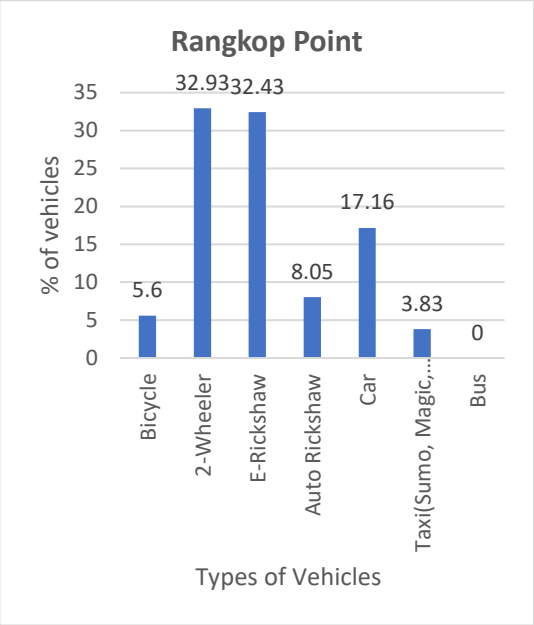


Figure 5
Percentage Volume of each Mode at Secondary Point

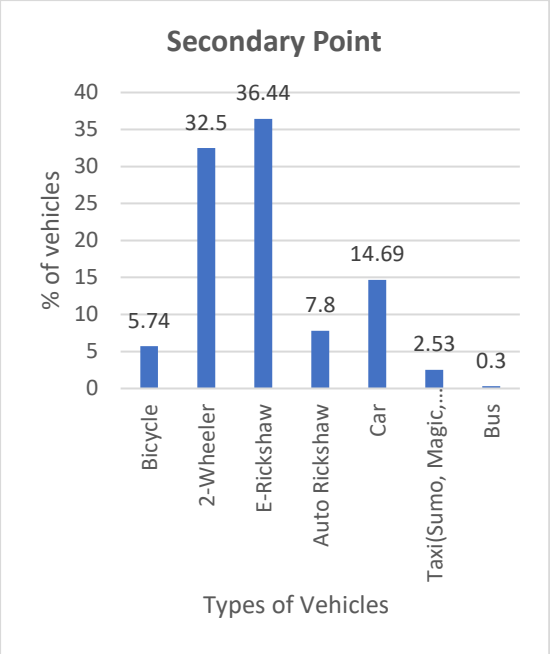


Figure 6
Percentage Volume of each Mode at MG Road Point

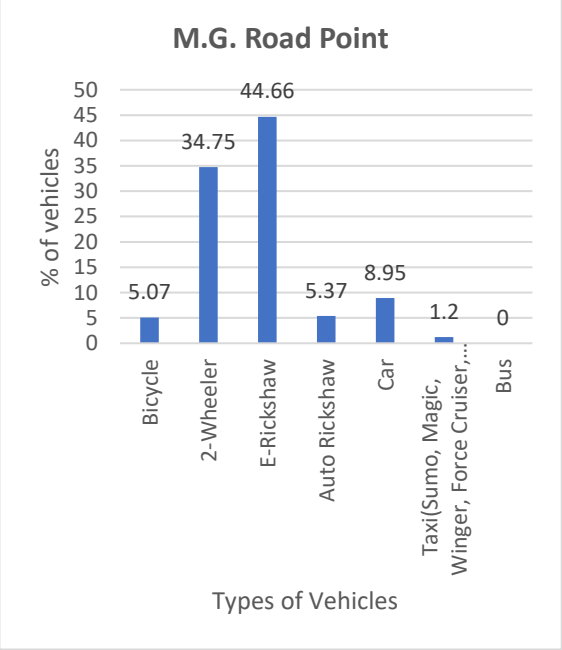


Figure 7
Percentage Volume of each Mode at Old Civil Hospital Road Point

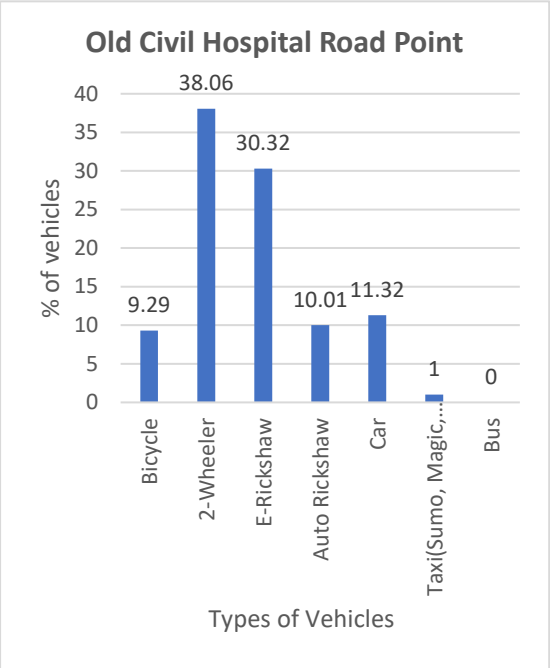


Figure 8
Percentage Volume of each Mode at Neplai Road Point

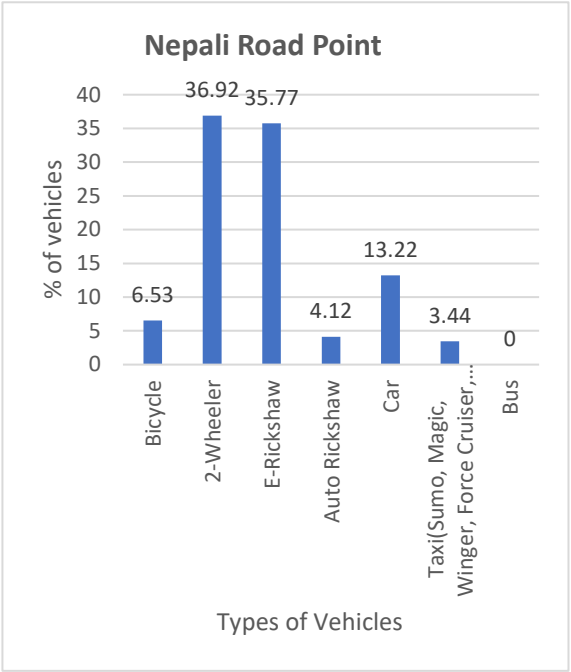
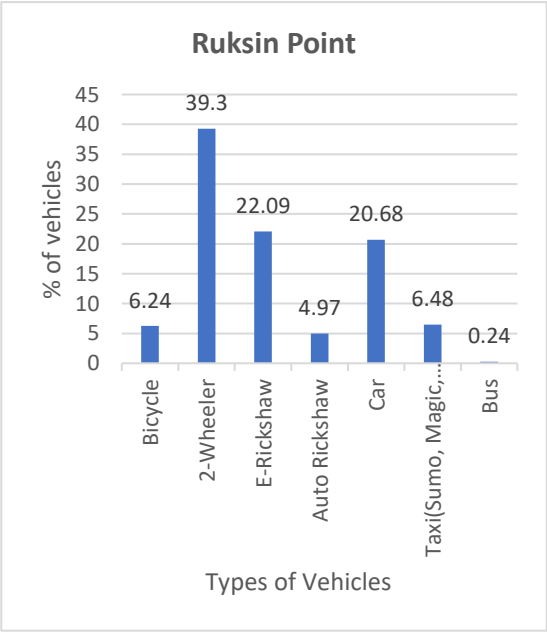


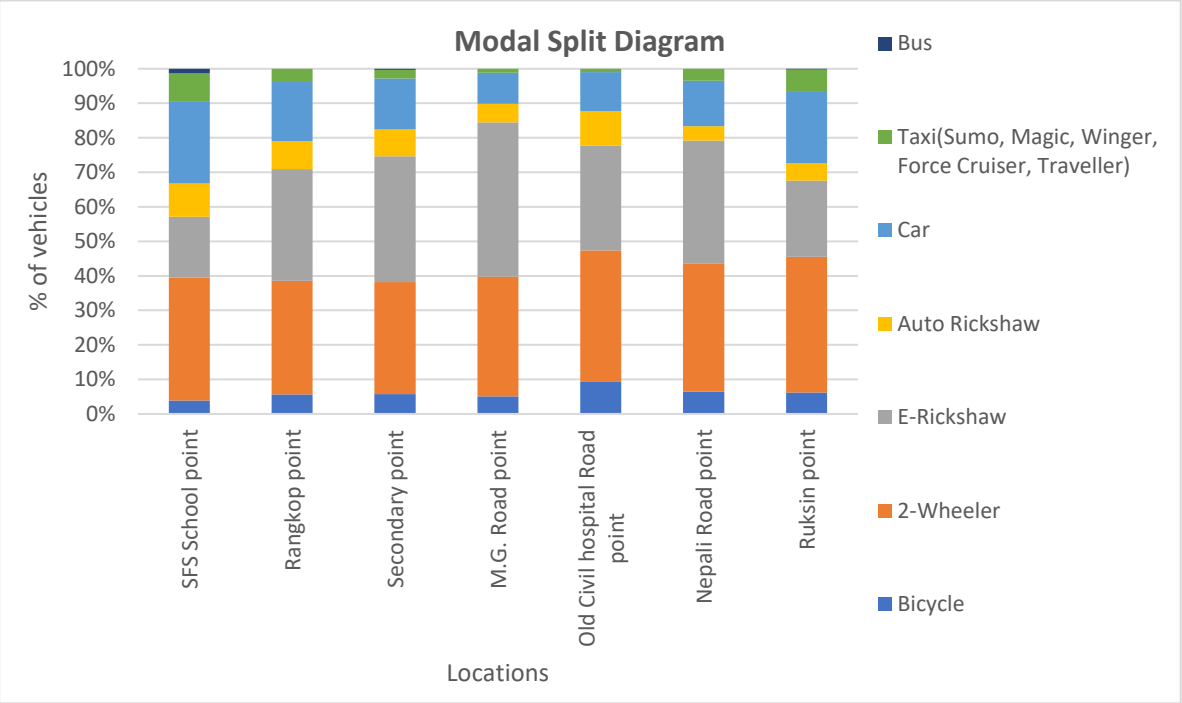
Figure 9
Percentage Volume of each Mode at Ruksin Point



The modal split diagram, which shows the percentage share of each mode in relation to the total volume of all modes at a particular location, is the most important finding from the traffic volume survey. The modal split diagram for different intersections of Jonai is shown in figure 10. From modal split the average volume of E-Rickshaw is found out with respect to the total volume of traffic. The highest vehicle volume and second most voluminous mode on the highways of Jonai are determined from the modal split diagram. The average volume of E-Rickshaw in Jonai is found to 32.91%, which is proved to be high.

Figure 10

Modal Split Diagram



Analysis of Vehicular Occupancy Survey

The average number of passengers carried by each mode at different survey locations is the data acquired from the vehicular occupancy survey. A total of 7 locations are surveyed during the weekdays of Tuesdays, Wednesdays and Thursdays at peak hours. Mode wise average passengers for each city is calculated by dividing the total number of passengers carried by the number of vehicles of the relevant mode surveyed at that site by the total number of passengers carried by the mode. table 2 and table 3 shows the mode wise average number of passengers for city and location wise respectively.

According to the findings from the vehicular occupancy survey, the 2-wheelers (46.3%) are the most crowded mode followed by cars (19.5%), E-Rickshaws (10.9%), bicycles (8.7%), auto rickshaws (6.9%), taxi (6.4%) and buses (1.3%) throughout the whole city. figure 11 shows the percentage share of urban passengers carried by the modes in Jonai. This is obtained by multiplying the average passenger occupancy of a particular mode at a particular location with the traffic volume data of that location to determine the urban passengers carried by that mode. Similarly, the number of passengers carried by all the modes at all the surveyed locations is being calculated. The data for all the locations is being summed up and the percentage share of urban passengers carried by each mode at the city level is determined. This gives the revealed modal utility. figure 12 represents the percentage of passengers transported by E-Rickshaw in cities at each of the locations and it is observed that its utility is high in the CBD area of the city. Moreover, percentage share of urban passengers carried by E-Rickshaw at each of the locations is observed that its utility is high in the CBD area of the city. Table 4 shows the percentage share of urban passengers share by all modes which is revealed modal utility obtained from the traffic volume survey and vehicular occupancy survey.

Table 2

Mode Wise Average Passengers for City

Survey Location	Bicycle	2-Wheeler	E-Rickshaw	Auto Rickshaw	Car	Taxi (Sumo, Magic, Winger, Force)	Bus
SFS School Point	66	476	70	145	365	210	105
Rangkop Point	138	743	147	195	333	140	0
Secondary Point	189	964	285	147	418	62	20
M.G. Road Point	135	789	210	69	192	19	0
Old Civil Hospital Road Point	129	462	136	131	155	33	0
Nepali Road Point	228	1214	346	59	461	156	0
Ruksin Point	157	858	95	60	402	133	22
Total Passengers Carried Mode wise	1042	5506	1289	806	2326	753	147
Total Number of Vehicles Surveyed	1042	4081	1807	474	1308	311	7
Average Number of Passengers Carried	1	1.35	0.72	1.7	1.78	2.43	21

Table 3

Mode Wise Average Passengers for Each Location

Survey Location	Bicycle	2-Wheeler	E-Rickshaw	Auto Rickshaw	Car	Taxi (Sumo, Magic, Winger, Force)	Bus
SFS School Point	1	1.46	0.91	2.74	2.25	3.68	26.25
Rangkop Point	1	1.38	0.58	2.37	1.57	2.97	0
Secondary Point	1	1.34	0.75	1.37	1.72	1.47	10
M.G. Road Point	1	1.27	0.56	1.15	1.6	1.18	0
Old Civil Hospital Road Point	1	1.3	1.1	2.25	1.96	4.13	0
Nepali Road Point	1	1.41	0.87	0.99	2	2.6	0
Ruksin Point	1	1.29	0.54	1.15	1.53	1.64	22

Figure 11
Percentage Share of Passengers Carried by each Mode

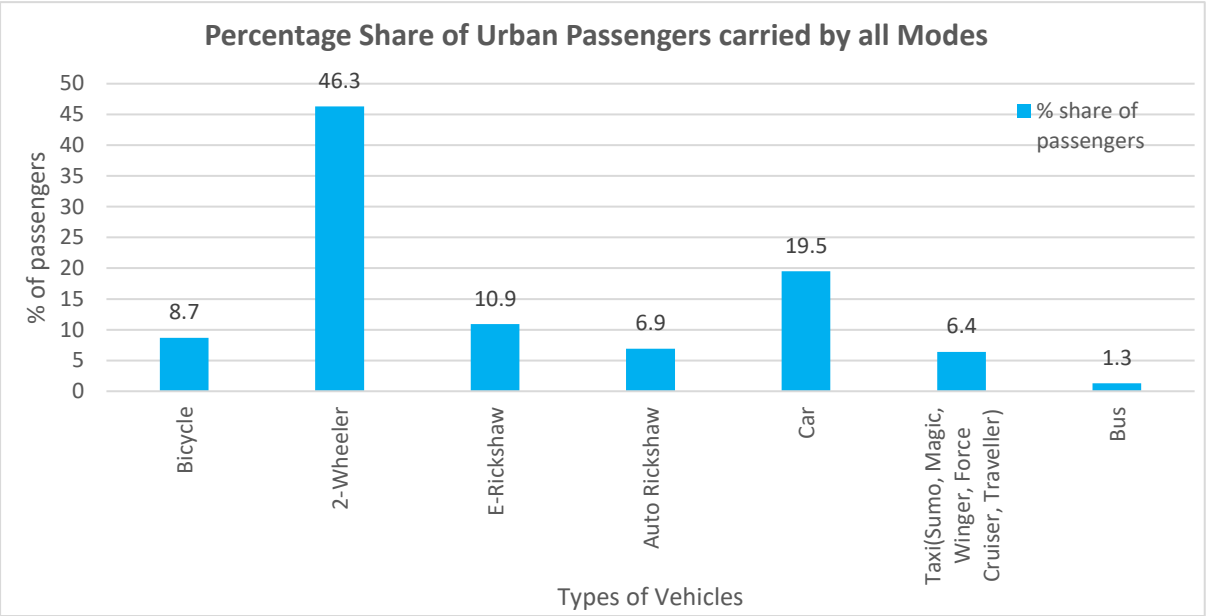


Figure 12
Location wise share of urban passengers carried by E-Rickshaw

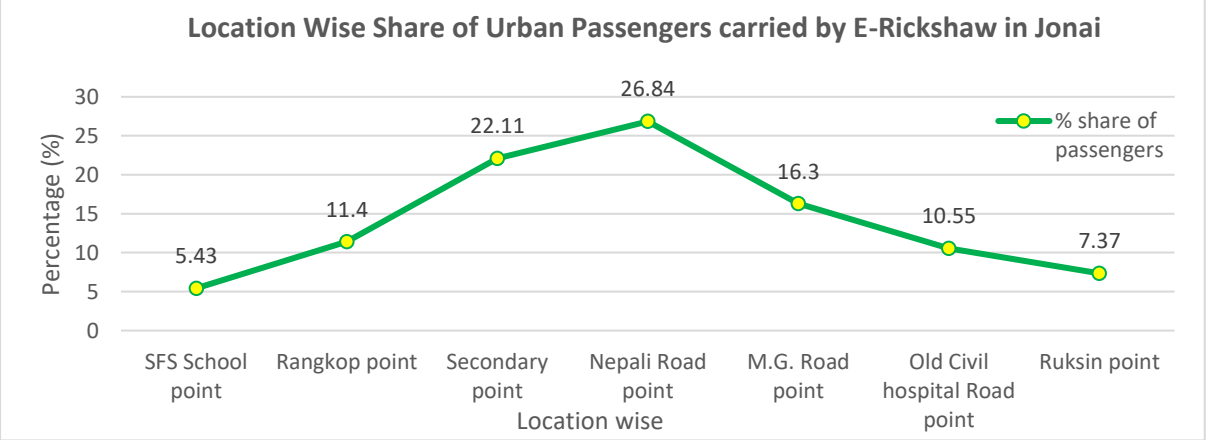


Table 4
Revealed Modal of Jonai

Mode	Revealed Modal Utility (%)
Bicycle	8.7
2-Wheeler	46.3
E-Rickshaw	10.9
Auto Rickshaw	6.9
Car	19.5
Taxi (Sumo, Magic, Winger & Force Cruiser)	6.4
Bus	1.3

Analysis of E-Rickshaw Operator Survey

The analysis of this survey is done for a better understanding of the socio-economic impact of E-Rickshaw operators. This survey was carried out while E-Rickshaw drivers were resting at a parking lot or waiting for passengers. There were 21 questions in this survey but for the percentage term, 15 parameters are considered (table 5).

Age Group: Among the respondents, about 40.7% are under-age group of 31-40 followed by 35.2% and 18.5% are 21 to 30 and 41 to 50. Of the total respondents only 1.9% are under 20 and table 5 shows that a greater number of age groups and a lower age group are operating E-rickshaw. There are no female operators are found and all are male operators.

Educational Qualification: About 48.1% are found to be illiterate who operate E-Rickshaws at the highest number followed by 20.3% and 16.7% are matriculated and under matric. From table 5 it is evident that most of the less qualified are E-Rickshaw operators compared to graduation and no post-graduation are found E-Rickshaw operators.

Family Size: About 22.2% of the respondents have household size of 4 persons. The average household size is found to be 4.9.

Trips per day: About 40.7% of the operators has responded 16 to 20 trips per day. The average number of trips per day is found to 22.5.

Working Hours per day: It is evident from table 5**,** 29.6% operate 8 hours and above. The average working hours per day is found to be 6.6 hours.

Daily Turnover: About 66.6% operator income a daily 300 to 400 ₹ (INR). The average daily turnover is found to be 457.5 rupees.

Maintenance cost per month: Of 40.7% responded that 501 to 1000 ₹ (INR) cost basic maintenance per month. Which is very less and there affects many factors like vehicle type i.e., new vehicle or older vehicle based on this maintenance cost factor may vary.

Monthly Electricity Bill: About 16.6% the two types of bills is found at 501 to 600 and 901 to 1000 rupees from the total respondents. The average monthly electricity bill is found to be 876.2.

Vehicle Ownership: It is evident from table 5 that 85.4% have own vehicle ownership from total respondents i.e., we can clearly mention that majority of E-Rickshaw operators purchase their own vehicle.

Vehicle Purchase: The factor that depends on vehicle ownership is based on vehicle purchase type such as by cash, loan or second-hand purchase (cash). From table 5 evident that 64.8% of operator purchase through cash and remaining 35.2% of 22.2% by loan and 13% by secondhand purchase.

Driving License Status: There is about 85.2% have no valid driving license all are self-learning operators and the remaining only 14.8% have valid driving licenses. In a small city like Jonai is a concern about the E-Rickshaw operators due to no valid driving license.

Residential Type: Almost 83.3% of E-Rickshaw operators resides originally in urban area and 16.6% have migrated to urban areas.

Residential Status: From table 5 it is evident that 81.5% of the operators have Kutcha houses and the remaining only 18.5% have Pucca houses. Therefore, we can clearly mention that the residential status of E-Rickshaw operators is very poor.

E-Rickshaw Driving: Almost 92.6% respond that they drive an E-Rickshaw as a Permanent job and only 7.4% respond as part-time. Therefore, as per data we can clearly mention that the E-rickshaw operators are dependent on this service for family income also they are the sole earners of the family.

Mode of Operation: It is found that 44.5 % mode of operation is on shared mode, the remaining 54.5% of 31.5% operate on both hired and shared mode and 24% on hired mode. Therefore, we can mention that most of the E-Rickshaw operator's mode of operation is shared mode.

Table 5

Comparative Analysis on Socio-economic Status of E-Rickshaw Operator

Parameters	Range	Percentage Respondents (%)
Age Group	Under 20	1.9
	21-30	**35.2**
	31-40	**40.7**
	41-50	18.5
	51-60	3.7
Educational Qualification	**Illiterate**	**48.1**
	High School	5.5
	Under Matric	16.7
	Matriculate	20.3
	Graduate	9.4
	Postgraduate	0
Family Size	Average Household Size	**4.9**
Trips per day	Average Trips per day	**22.5**
Working Hours per day	Average Working Hours per day	**6.6**
Daily Turnover in Rupees	300-400	**66.6**
	401-500	22.3
	501-600	1.8
	601-700	**5.6**
	701-800	3.7
	801 and above	**-**
Maintenance Cost per Month	Average Maintenance Cost per Month	**1529 ₹**
Monthly Electricity Bill	Average Monthly Electricity Bill	**876.2 ₹**
Vehicle Ownership	Own	**85.4**
	on Lease	14.6
Vehicle Purchase	Cash	**64.8**
	Loan	**22.2**

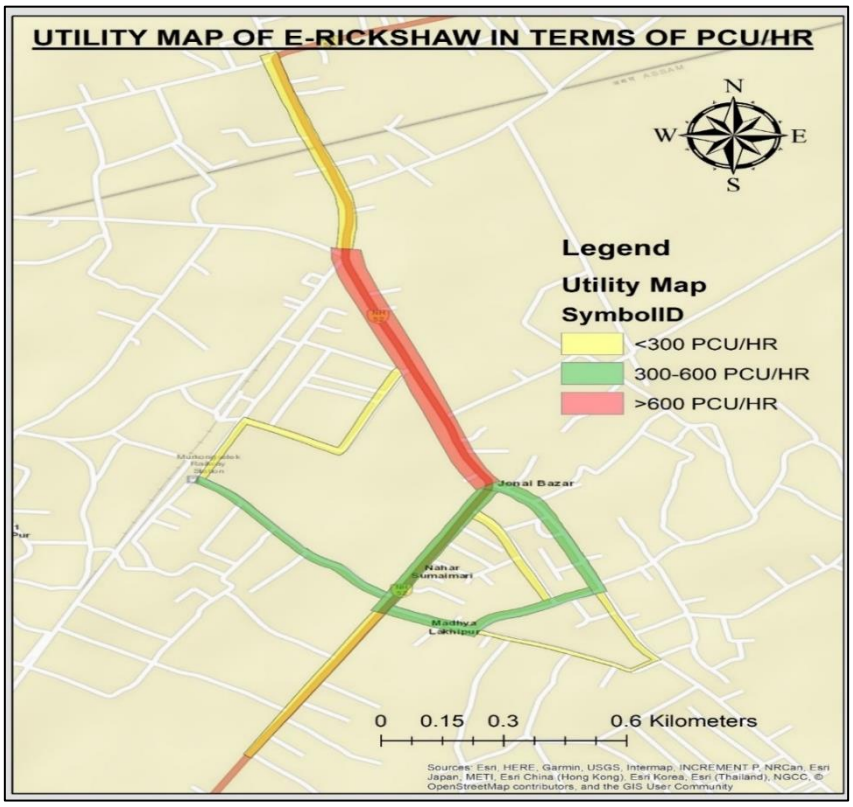
	Second hand purchase(cash)	13
Driving Licence Status	Have valid driving licence	**14.8**
	Self-learning	**85.2**
Residential Type	Original	**83.3**
	Migrated	16.6
Residential Status	Kutcha House	**81.5**
	Pucca House	18.5
E-Rickshaw Driving	Permanent Job	**92.6**
	Part time Job	7.4
Mode of Operation	On Hired Mode	24
	Shared Mode	**44.5**
	Both (hired and shared mode)	**31.5**

Utility Map of E-Rickshaw in Jonai

Utility is defined as the state of being usefulness, beneficial, benefits to the users from service or goods. In contrast to transportation utility refers to performance of vehicles for several functions that is used by the public. In case of utility map an attempt is being made to split up urban area of Jonai into different zones depending on their extent of usage of E-Rickshaw. Utility map shows the areas of operation and the level of usage of E-Rickshaw in the city. The data for drawing the utility map of E-Rickshaw is obtained from the traffic volume survey. For preparation of utility map, Geographic Information System (GIS) i.e., ArcGIS 10.7.1 version software is used to load the base map of Jonai to ensure reliable mapping. The utility map in terms of average hourly volume of E-Rickshaw is then drawn over the base map with a scale of 1 cm = 100 PCU/hr. Figure 13 shows the utility map of E-Rickshaw in terms of PCU/hr, legends symbol showing the maximum operation is red, lesser operation as yellow and in-between the operation represents as green.

Figure 13

Utility map of E-Rickshaw in terms of PCU/hr



Conclusion

The E-Rickshaw is found to be an important component of transportation system in small-sized city. The percentage volume of E-Rickshaw in Jonai is found to 32.9% with respect to all the available modes which is higher than the auto rickshaw (6.62%). This indicates that paratransit operators have prepared electric vehicles for use in the urban transportation system. At the city level, the average passenger occupancy of E-Rickshaw is 1 (approx.) which shows concerned to operator due to more increasing number of E-Rickshaws. A maximum number of urban passengers is being catered by 2-wheelers (46.3%) followed by cars (19.5%), E-Rickshaws (10.9%) and auto rickshaws (6.9%). However, the average passenger occupancy of E-Rickshaws seems to be lower due to a higher percentage of operators using E-Rickshaws compared to other paratransit modes also some location has lower passenger occupancy, implying that average passenger occupancy is lower. From the utility map of E-Rickshaw services in Jonai, it is concluded that their utility decreases on moving away from the CBD area of the city with the highest volume being between Nepali road point to Secondary point.

Almost 92.6% respond that they drive E-Rickshaw as a permanent job and only 7.4% respond as part-time. Therefore, as per the data we can mention that the E-rickshaw operators are dependent on this service for family income also they are the sole earner of the family. The socio-economic condition of E-Rickshaw operators is generally below the poverty level. Most operators are between the ages of 31 to 40. A higher number of illiterate operators (48.1%) are found. However, there is a concerned that most operators don't have driving licenses (85.2%). Obtaining a valid driver's license for operators requires taking the appropriate steps. Also, most of E-Rickshaw is seems to be on street parking. Most of their residences are situated in Kutcha houses (81.5%). The daily average income of operator is found to be 458 ₹ INR which is reasonable, and most of their operations are done in shared mode. From the study, it is evident that the socio-economic status of E-Rickshaw operators is generally belongs to LIG and they are the sole earner of the family. The main mode of paratransit in the city of Jonai is the E-Rickshaw in the urban area, which covers the gap in people's demands for short-distance

rides; nonetheless, there is no proper paratransit in this city. Implementing suitable strategies in this vehicle can create environmentally effective urban corridors for short-mile connectivity and employment opportunities. Proper and authorized stands must be provided for E-Rickshaws near shopping malls, railway stations, and other important places to avoid traffic congestion.

As per the operator's feedback, passengers have expressed their concerns about traveling in E-rickshaws due to the vehicle's lightweight structure. Unlike cars, E-Rickshaws have not been designed to withstand crashes. Therefore, future research initiatives may focus on the design of E-Rickshaws.

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'Occupational Stress - Boon or a Bane?' A Study over Oil Refinery Employees in Assam

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Abstract

Purpose of the Study

In today's fast-paced world, each person is faced with important goals and targets to achieve, and the obstacles that they face while achieving those goals result in stress. Even while pursuing their formal jobs, people face stress because of different organizational and work-related factors, which is termed occupational stress. Oil refineries are an important sector in any economy, contributing to overall economic growth and development. The oil refinery employees have to perform important and risky jobs to keep the organization running. From the literature review, it was found that a limited amount of research has been conducted on occupational stress in the refinery sector. The present study is an attempt to dig into the aspect of occupational stress in oil refineries in Assam.

Methodology

The study is descriptive in nature, and data has been collected from the employees of oil refineries in Assam using a structured questionnaire. The sampling method used in the study is a simple random sampling method. The parameters included in the study have been derived from the Occupational Stress Index, given by A. K. Srivastava and A. P. Singh in 1981. The data for the present study is analysed using SPSS software.

Findings

The study aims to find out the occupational stress among oil refinery employees in the state of Assam. The findings are derived on the basis of 12 parameters of the Occupational Stress Index using a five-point Likert scale.

Original Contribution

The study has contributed towards analysing the occupational stress of oil refinery employees in Assam along with the parameters that contribute to occupational stress.

Keywords

Formal Job, Occupational Stress Index, Parameters of Stress, Refinery Sector, Work-related Factors

Introduction

When an individual is faced with a requirement that they consider important, it can create pressure and lead to stress. It's crucial to note that the demand should be meaningful and significant to the person, and fulfilling it should be an essential condition to the person. In 1936, Selye also defined stress as "a dynamic activity wherein an individual is confronted with an opportunity, constraint or demand" (Tilottama, 2017). In 1976, Lazarus defined stress as "Stress occurs when there are demands on the person, which taxes or exceeds his adjustive resources" (Burman & Goswami, 2018).

Occupational stress is a widespread issue affecting individuals across various industries in today's fast-paced world. Jamal in 2005, defined occupational stress as an individual's response to a stressful work environment (Maharani & Tamara, 2023). Factors such as the nature of the work, challenging tasks, high workloads, and tight deadlines contribute to this stress. Additionally, organizational elements like rigid hierarchies, lack of opportunities for growth, poor communication, and other factors can also influence

workplace stress. Strict management, low pay, peer pressure, role conflict, position ambiguity, lack of involvement in decision-making, technical issues, and long work hours are some common organizational stressors (Vaishnavi, 2016). The unique traits of an individual and their coping strategies also influence how stressed they are at work. Workload, inadequate resources, management style, and instability are some of the main causes of stress. (Kushwaha, 2014).

Employees need to be attentive, committed, and knowledgeable about their work environment due to the demands placed on them by the workplace and ongoing environmental changes and advancements. When a person can't handle the responsibilities of the workplace, they often experience fear, frustration, anxiety, uneasiness, and sadness. This can lead to stress over a longer period of time. Occupational stress occurs when work pressures and psychological experiences lead to physical and mental health changes, either short- or long-term (Zhang, et al., 2024). Workers under stress often become distracted from their work, resulting in low productivity and job discontent. Selye in 1987, predicted that more than three billion workers will be facing significant challenges at their jobs, with stress being the primary factor affecting their productivity and performance (Nawaz & Ansari, 2017). Consequences of stress include physiological decline, psychological imbalances such as anxiety, irritability, dread, helplessness, sadness, and loss of confidence (Bheemaiah & Venkataiah, 2022).

The nature of work in contemporary organizations has changed dramatically over the last few decades. In developing nations like India, the liberalization, privatization, and globalization that followed the New Economic Policy of 1991 have significantly impacted the organizational work culture. Workplace stress has become a widespread issue faced by businesses worldwide. Organizations are implementing various activities and tactics to eliminate employee stress. Employers are also promoting strategies to help workers manage the stress and anxiety associated with their jobs and workplace. In the era of digitisation, businesses are utilizing technology to detect stress and other stress-related issues in their employees and to suggest strategies for reducing stress. Technologies to detect occupational stress in work settings are being invented to detect the source and origin of stress (Naegelin, et al., 2023). Additionally, technology will be able to generate personalized coping mechanisms and strategies to assist individuals in managing their stress and leading fulfilling lives.

Stress is basically of two types: eustress and distress. Eustress is a type of stress that motivates someone to put in extra effort and work hard to achieve their goals. In some cases, eustress is beneficial and necessary for people and organizations to accomplish their goals. Workplace pressure has become a common factor for employees in all industries; a certain level of anxiety, when managed, is necessary to accomplish goals (G.Balamurugan, M.S.Lavanya, & D.Sindu, 2019). In times of hardship, excessive stress can surpass a person's tolerance threshold and have detrimental effects on both the individual and their job. This type of stress is termed as distress. In this scenario, stress becomes an obstacle to personal development and that of associated stakeholders. There is a point at which pressure becomes hazardous and dangerous to the individual and their output (Kushwaha, 2014). Often it is unknown to the individual experiencing stress that when optimum stress level surpasses the limit and result to a prolonged stress symptom (Dubey & Haneef, 2015).

Due to this, it is now crucial for businesses to develop plans and procedures to address employee stress. Stress after a certain point may lead to various adverse effects like affecting the physical and psychological health of the employees, and also affecting other job areas like job performance, job satisfaction, motivation and commitment. It is therefore, necessary for the establishments to implement concrete stress management initiatives helping the employees to understand their source of stress and come up with strategies to make the employee cope up with his stress and gradually reduce his stress. Administration should furnish employees with programmes and approaches like yoga, recreational exercises, self-reflection and practices to control their work pressure and to manage their job stress (G. Balamurugan, M.S.Lavanya, & D.Sindu, 2019). Organizations that implement relevant and appropriate stress management programs can significantly reduce employee job stress. These tactics will boost employee confidence by conveying to workers that their employers care about their issues and are making every effort to support them. Additionally, an employee experiencing stress should also try to employ specific coping mechanisms to help manage their concerns and alleviate some of their own

tension. Assessing the scope of the problem is crucial when developing stress management programs, ensuring that the strategy is tailored to effectively alleviate stress and individual stressor (Veda & Roy, 2020).

The energy sector relies heavily on oil refineries, which involve demanding work that can lead to workplace stress. This study aims to understand the prevalence of workplace stress among non-executive employees in oil refineries in Assam. The study will focus on Numaligarh Refinery Limited and Guwahati Refinery as the two chosen refineries for the research.

Objectives of the Study

The study is conducted with certain objectives, based on which data is collected and analysed. The objectives of the study include:

1. To investigate the level of workplace stress experienced by workers in oil refineries in Assam.
2. To study the factors that contribute to workplace stress among workers in Assam's oil refineries.
3. To examine the level of occupational stress for each variable among workers in oil refineries in Assam.
4. To determine whether gender, age, marital status, and nature of family of the workers affect the level of work-related stress experienced by them.

Literature Review

(Bresic, et al., 2007) The study found that the majority of workers, whether in labs, offices, or oil fields, are stressed out. Stressful interactions with coworkers, disagreements with other employees, low expectations from coworkers, and unresolved issues were identified as sources of stress among office workers. For oil field workers, tight schedules and challenging working conditions were found to be major sources of stress. The researchers suggested that in order to improve workplace health and safety, workers should receive training to improve their communication abilities and to implement preventive and safety measures. (Kumar & Singh, 2011) The study showed that there is an inverse relationship between occupational stress and job performance. It found that IT workers are performing well in their organizations even though they experience moderate degree of stress related to their roles. (S.Joyce & R.Mahesh, 2013) Based on the survey, it was found that the majority of employees working in oil companies experience stress. However, the way each employee perceives a specific stress factor varies depending on their job. The researchers suggest improving the physical work environment and finding healthy and productive ways to resolve conflicts as strategies to reduce stress. (Lim, 2013) In her research, she found a positive correlation between the psychological well-being of call centre workers and occupational stress in the Philippines. The primary cause of the high stress levels experienced by employees is role overload. The author recommends that businesses allocate sufficient funds and implement targeted strategies to reduce workplace stress. (Habibi, Dehghan, Safari, Mahaki, & Hassanzadeh, 2014) The study found that a majority of refinery employees working in the office, operations, or maintenance reported feeling stressed. The specific stressors varied depending on the workplace. Interestingly, the study found no significant association between stress and age, nor between the job capacity index and age. The study revealed that physical demands were the most common stressor among maintenance workers, and this was negatively associated with the work ability index. The main source of stress for operational staff was interpersonal interactions. The researchers suggested providing communication skills training and creating a safe working environment to reduce stress and enhance workers' performance. (Gupta, 2015) indicated that staff in private sector banks are facing high levels of stress. It was found that senior managers in private banks experience more stress than assistant managers due to factors such as role overload, position ambiguity, role conflict, political pressure, impotence, personal responsibility, and lack of engagement. The study suggests that professional stress leads to physiological and psychological difficulties, and may also contribute to employee turnover and absenteeism. (Vincey & Pugalenthi, 2016) depicts in their study that school teachers in Thiruvallur district are facing moderate level of stress which tends to influence the attitude of the teachers towards their profession. (Natarajan & M.Punitha, 2017) Their study revealed that occupational stress and role overload are prevalent in organizations. The study concluded that stress should not persist for an extended period of time, and that businesses should take precautions to ensure that stress does not exceed a specific threshold. Organizations

should address the issues that cause employee stress, as well as potential sources of future job stress. According to the study, private sector employees in Coimbatore experience moderate levels of job stress, and their socioeconomic characteristics also influence their level of workplace stress. (Safarpour, Sabzevari, & Delpisheh, 2018) According to the study, there is an inverse relationship between job satisfaction and occupational stress, as well as job performance and occupational stress among Iranian hospital nurses. The study found that nurses experience moderate levels of job stress, moderate levels of job satisfaction, and high levels of job performance. The study revealed no relationship between job performance and job happiness. Workload, lack of time, and a lack of organizational support are all factors that contribute to nurses' high levels of stress. The nature of their work is the aspect that provides them with most job pleasure. The characteristics that contribute to nurses' strong job performance are good communication and healthy interpersonal relationships. (Faraji, Karimi, & Azizi, 2019) Occupational stress among CCU nurses is significant, primarily due to the sensitive condition of CCUs and the workload. Interestingly, there was no variation in the mean level of occupational stress across demographic characteristics such as gender, age, job experience, and academic degree. (Bharti & Ahmad, 2020) stated that the doctors working in Darbhanga Medical College and Hospital are experiencing moderate level of occupational stress. (Yazdi, et al., 2023) mentioned in the study that emergency medical staff experience high levels of occupational stress. The study found a strong association between occupational stress and demographic characteristics such as age, marital status, educational level, and number of work hours.

Methodology

The current study is mainly descriptive and focuses on the non-executive category of workers at the Guwahati Refinery and Numaligarh Refinery Limited, two of Assam's oil refineries. The data for this study was obtained through simple random sampling using a structured questionnaire. The total population of the study is 1018 people, with 436 non-executive staff at Numaligarh Refinery and 582 at Guwahati Refinery. The study's sample size consists of 113 participants, representing approximately 11% of the entire population. 42 non-executive employees from Numaligarh Refinery and 71 non-executive employees from Guwahati Refinery were chosen as sample respondents for the study. The study also aims to understand the connection between biological characteristics of a person and work-related stress, taking into account the respondents' age, gender, marital status, and family structure.

The structured Occupational Stress Index, created in 1981 by Dr A. P. Singh and Dr A. K. Srivastava, is used to gather data on occupational stress for the present study. The index consists of 12 variables used to measure the level of stress experienced by workers. Data is collected using a five-point Likert scale, with responses rated as Strongly Agree, Agree, Uncertain, Disagree, and Strongly Disagree. The Occupational Stress Index includes 18 falsely keyed items as well as some true keyed ones. The scoring for true-keyed items is as follows: 5 for "Strongly Agree," 4 for "Agree," 3 for "Uncertain," 2 for "Disagree," and 1 for "Strongly Disagree." On the other hand, false-keyed items are scored as 1 for "Strongly Agree," 2 for "Agree," 3 for "Uncertain," 4 for "Disagree," and 5 for "Strongly Disagree." The data for this study was analysed using SPSS software, which involved utilizing descriptive statistics such as percentage, mean, standard deviation, frequency percentile, independent sample t-test, and ANOVA.

Analysis and Interpretation

The data collected is analysed and interpreted using various statistical techniques using the software SPSS. The analysis and interpretation of the collected data is shown below according to the objectives of the study.

Table 1

Demographic Profile of Respondents

Variables	Particulars	Number of Respondents	Percentage of Respondents
Gender	Male	103	91.15
	Female	10	8.85
Age	21 to 30 years	25	22.1
	31 to 40 years	43	38.1
	41 to 50 years	25	22.1
	51 to 60 years	20	17.7
Marital Status	Married	84	74.3
	Unmarried	29	25.7
Family Type	Joint	27	23.9
	Nuclear	86	76.1

Table 1 gives a detailed analysis of the respondent's demographics considered for the study. The above table shows that, it can be observed that majority i.e., 91.15% of the respondents are male and the rest are female. The table depicts that most of the respondents are in the age group of 31 to 40 years, followed by employees who are in the age group of 41 to 50 years. The major part i.e., 74.3% of the respondents are married and the rest being unmarried. 76.1% of the respondents belong to nuclear families and the remaining come from joint families.

Table 2

Level of Occupational Stress (Objective 1)

Variable	Mean	Standard Deviation	High Stress	Moderate Stress	Low Stress
Occupational stress	2.758	.380	(2.758+.380=3.138) Scores falling above or equal to 3.138	(2.758+.380=3.138) and (2.758-.380=2.387) Scores falling between 3.138 and 2.387	(2.758-.380=2.387) Scores falling below or equal to 2.387

Table 2 indicates that the level of occupational stress among employees at the selected oil refineries is moderate (2.758). The data exhibits a normal distribution, with skewness and kurtosis values of 0.481 and 1.445, respectively

Table 3

Number of Responses in each Level of Occupational Stress

Occupational stress	Respondents	Percentage
Low level of stress	28	24.78
Moderate level of stress	56	49.56
High level of stress	29	25.66
Total	113	100

The data in table 3 indicates that 24.78% of employees are experiencing low stress, 49.56% are facing moderate stress, and 25.66% are dealing with high stress. Consequently, it is evident that the majority of employees at the two selected refineries are experiencing moderate levels of occupational stress.

Table 4

Mean of the Variables of Occupational Stress (Objective 2)

Variables of Occupational Stress Index	Mean	Standard Deviation
Role Overload	2.98	.620
Role Ambiguity	2.53	.692
Role Conflict	2.72	.618
Group / Political Pressure	2.67	.778
Person Responsibility	3.23	.749
Under Participation	2.81	.767
Powerlessness	2.94	.737
Poor Peer Relations	2.40	.643
Intrinsic Impoverishments	2.63	.736
Status	2.33	.748
Strenuous Working Condition	2.73	.611
Unprofitability	3.09	.792

Table 4 indicates the mean score of all the variables of the Occupational Stress Index. The table depicts that the mean score for person responsibility (3.23) has the greatest influence on job stress among respondents. On the other hand, the mean score for status (2.33) is the lowest, suggesting that the respondent's status has the least impact on their occupational stress. The variable unprofitability has the second highest mean score (3.09), followed by role overload (2.98), powerlessness (2.94), under-participation (2.81), strenuous working conditions (2.73), role conflict (2.72), group pressure (2.67), intrinsic impoverishment (2.63), role ambiguity (2.53), poor peer relationships (2.40), and lastly, status (2.33). This indicates the descending order of the variables responsible for occupational stress among non-executive personnel working in Assam's two refineries.

Table 5

Level of Occupational Stress in the Variables of Occupational Stress Index (Objective 3)

Variables of OSI	Number and Percentage of Respondents across three Percentile of Stress Levels		
	Low stress	Medium Stress	High Stress
Role overload	27 (23.9%)	49 (43.36%)	37 (32.74%)
Role ambiguity	17 (15.04%)	60 (53.09%)	36 (31.85%)
Role conflict	25 (22.12%)	43 (38.05%)	45 (39.82%)
Group/political pressure	27 (23.89%)	57 (50.44%)	29 (25.67%)
Person responsibility	18 (15.93%)	58 (51.33%)	37 (32.74%)
Under participation	23 (20.35%)	51 (45.13%)	39 (34.51%)
Powerlessness	15 (13.27%)	55 (48.67%)	43 (38.05%)
Poor peer relations	21 (18.58%)	55 (48.67%)	37 (32.74%)
Intrinsic impoverishments	11 (9.73%)	60 (53.10%)	42 (37.17%)
Status	19 (16.81%)	64 (56.64%)	30 (26.55%)
Strenuous working condition	18 (15.93%)	50 (44.25%)	45 (39.82%)
Unprofitability	17 (15.04%)	50 (44.25%)	46 (40.71%)

Table 5 indicates that respondents are experiencing medium levels of stress for most of the variables on the occupational stress index. They reported medium stress levels for the variable's role overload, role ambiguity, group/political pressure, person responsibility, under involvement, powerlessness, poor peer relationships, intrinsic impoverishments, status, difficult working conditions, and unprofitability. Only in one criterion, role conflict, are respondents experiencing high levels of stress.

Table 6

Significant Difference of Job Stress based on Gender of Employees (Objective 4)

Dimension	Male		Female		t value	Significance
	Mean	St Deviation	Mean	St Deviation		
Total stress	2.76	.392	2.733	.239	.214	.228

Based on table 6, the p-value is .228, which exceeds the predetermined significance threshold of .05 ($p > .05$). This indicates that there is no statistically significant difference in the average level of job stress between male and female employees. In other words, both male and female employees experience similar levels of job stress. The mean value suggests that male employees experience slightly more stress (mean value 2.76 vs. 2.733 for female employees).

Table 7

Significant difference of Job Stress based on the Age of Employees (Objective 4)

Dimension	Age of the Employees								Sig.
	21 to 30		31 to 40		41 to 50		51 to 60		
	Mean	St Deviation	Mean	St Deviation	Mean	St Deviation	Mean	St Deviation	
Total Stress	2.778	.448	2.630	.370	2.879	.316	2.855	.319	.030

From table 7, it can be seen that the significant value is .030, which is less than the predetermined significant level .05 ($p<.05$), which suggests there is statistically significant mean difference in the job stress among the various age groups. This shows that there is a statistically significant difference in job stress among the different age group of employees.

Table 8

ANOVA Multiple Comparisons (Objective 4)

Years of Age	Years of Age	Significance Level
21 to 30	31 to 40	.388
	41 to 50	.768
	51 to 60	.899
31 to 40	41 to 50	.042
	51 to 60	.117
41 to 50	51 to 60	.996

From table 8, it is seen that There is no statistically significant difference in job stress between the age group 21 to 30 years and 31 to 40 years of age, where the significant value is greater than the predetermined significant level (0.388>0.05). Also, there is no significant mean difference in job stress between the age groups

21 to 30 and 41 to 50 years, where the significant value is greater than the predetermined significant level (0.768>0.05). Similarly, in the age group 21 to 30 and 51 to 60 years significant value is greater than the significance threshold (0.899>0.05), suggesting no significant difference in job stress. In the age groups, 31 to 40 and 51 to 60 years also, the significant value is greater (0.117>0.05), highlighting that there is no significant difference in job stress of the employees based on the demographic variable age. Likewise, for the age group, 41 to 50 and 51 to 60 years (0.996>0.05), job stress is not affected by age of the respondents. However, statistically significant difference was found in job stress between the age group 31 to 40 and 41 to 50 years, where the significant value is less than the predetermined significant level (0.042<0.05).

Table 9

Significant Difference of Job Stress based on Marital Status of Employees (Objective 4)

Dimension	Married		Unmarried		t value	Significance
	Mean	St Deviation	Mean	St Deviation		
Total Stress	2.75	.371	2.76	.412	-.068	.805

Table 9 indicates that the significance value is 0.805, which is greater than the specified threshold of 0.05 (p > 0.05). This suggests that there is no statistically significant difference in mean job stress based on respondents' marital status. This shows that the job stress experienced by married employees is not significantly different from that of single employees. The mean value indicates that unmarried employees experience slightly more stress (2.76 compared to 2.75 for married employees).

Table 10

Significant Difference of Job Stress based on Nature of Family of Employees (Objective 4)

Dimension	Joint		Nuclear		t value	Significance
	Mean	St Deviation	Mean	St Deviation		
Total stress	2.73	.382	2.76	.381	-.430	.496

Table 10 indicates a significant value of .496, which is higher than the specified threshold of .05 (p > .05). This suggests that there is no statistically significant difference in mean job stress based on the type of respondents' families. The data demonstrates that respondents from joint families have similar levels of occupational stress to those from nuclear households. The mean values show that respondents from nuclear families experience slightly more stress (mean value 2.76 vs. 2.73 for joint households).

Findings

The findings for the objectives of the study derived from statistical analysis and interpretation are listed below:

- The occupational stress of the non-executive employees working in the two selected refineries of Assam is of moderate level as 49.56% of the respondents are facing moderate level of stress. The majority of the non-executive employees of the two selected refineries are facing moderate level of stress, followed by high level and then low level of stress. More than 75% of the respondents, responded that they rate their performance as per the expectation of the organisation and the administration. So, it can be concluded that the employees stress in not bringing any adverse effect on their performance and it can be regarded as eustress, which helped to induce the performance and productivity of the respondents.
- The variable contributing maximum to the job stress of the employees is person responsibility, followed by unprofitability, role overload, powerlessness, under participation, strenuous working condition, role

conflict, group pressure, intrinsic impoverishment, role ambiguity, poor peer relation and status. Thus, when an employee bears the great responsibility for the productivity and performance of other employees in the organisation along with his own performance, it creates stress for the person. And in the present study person responsibility is the prominent factor contributing to job stress of the oil refinery employees. Also, status is the least contributing factor to job stress for non-executive oil refinery employees.

- The study revealed that respondents experienced moderate stress levels in 11 out of 12 categories of the Occupational Stress Index, with only one indicator (role conflict) indicating severe occupational stress.
- Additionally, the study found no significant statistical difference in job stress between males and females. However, the mean values of job stress for male and female employees suggest that male employees experience slightly more job stress than female employees.
- Furthermore, there was a statistically significant difference in job stress levels among respondents aged 31 to 40 and 41 to 50 years of age, with the age group 41 to 50 experiencing the most stress.
- The study revealed that there is no significant difference in occupational stress among employees based on marital status. However, the average value indicates that unmarried employees experience slightly more anxiety than married employees.
- Additionally, the study found no statistically significant variance in job stress among employees from combined or nuclear families. Nevertheless, the average outcome suggests that employees from nuclear families are slightly more anxious than those from joint families.

Conclusion

The study implies that job stress is moderately prevalent in the two selected oil refineries for the study because of various work-related factors. The study highlights that job stress is not influenced by demographic characteristics of an individual like gender, marital status and nature of the family, except age. Stress management initiatives are necessary for achieving sustainable management goals creating a holistic culture of well-being in the organisation through employee development and empowerment. Establishments may introduce individual stress control techniques like relaxation procedures, biofeedback and psychological restructuring, by empowering individuals to bring behavioural and cognitive control of their stress and improve their ability to cope with work related stress (Patel, 2013). If stress helps to boost up the effort and activities of a person to achieve desired goals, then stress can be regarded as a boon, but if stress becomes an obstacle in achieving desired objective by a person and brings negative adverse consequences then stress is regarded as a bane. In the present study, since majority of the respondents are performing as per expectations, therefore in this case stress can be considered as a boon for the organisations. Hans Selye mentioned in 1950 that an increase in pressure will improve performance and productivity up to a certain point, beyond which negative effects will follow (Kushwaha, 2014). When organisations address the work-related factors contributing to job stress, it enhances the sustainable management goals and ethical business practices of the organisation leading to broader positive impacts on environment and society at large.

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Sustainable Entrepreneurship Among Food Processing Units with Special Reference to Social Dimension

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Abstract

Purpose of the Study

As an emerging area of entrepreneurship, Sustainable entrepreneurship (SE) is a buzz word in the business world. This form of entrepreneurship brings together conventional entrepreneurship and sustainability development. It combines the elements of entrepreneurship and sustainability thereby covering all the three dimensions viz the social, economic and environmental dimension within its scope. Integration of sustainable orientation in business practices contribute towards social and environmental well-being. Food processing being one of the largest industries in the state, exploring the awareness level of food processing units with regards to sustainable practices is very significant. Along with this finding out what are the practices followed by such businesses considering the social dimension of sustainability needs focus of researchers.

The study aims to investigate the status of awareness about sustainable entrepreneurial practices among the registered Food Processing Units in Jorhat district of Assam. It shall also give an insight into the practices of such units with regards to social dimension of Sustainable Entrepreneurship.

Methodology

The study is descriptive in nature. Both primary and secondary sources of data are used in the study. Primary data are collected from 33 Food processing units registered as MSMEs operating in Jorhat district of Assam. Secondary data are collected from journals, books and websites. Interview schedules are used to collect the data. The collected data is then analysed using SPSS. Descriptive statistics are used as tools of analysis and histograms and pie charts are used to present the results.

Findings

The findings of the study are based on the information collected from the respondents. It shall reveal whether the food processing units in operating in Jorhat district are aware about sustainable business practices and how do they contribute towards the social dimension of Sustainable entrepreneurship.

Original Contribution

This study contributes towards the existing body of knowledge about sustainable entrepreneurship by revealing the knowledge of businesses in this regard. By discovering the practices that food processing units adopt considering the social aspect of sustainability, the study shall enable enterprises from other sectors to explore new ways of integrating sustainability in business activities. Further explorations on how continuation of such practices can be maintained by business units and underlying factors for adoption of such practices can be delved into by researchers and academicians.

Keywords

Jorhat, MSME, Sustainability, Food processing units, Awareness

Introduction

As an emerging area of Entrepreneurship, Sustainable entrepreneurship (SE) is a buzz word in the business world. This form of entrepreneurship brings together conventional entrepreneurship and sustainability development. It combines the elements of entrepreneurship and sustainability thereby covering all the three dimensions viz the social, economic and environmental dimension within its scope. Sustainable entrepreneurship draws on the long-standing concept of creative destruction in entrepreneurship research.

Therefore, this form is the driving force for the establishment of a holistic and sustainable economic–environmental–social system. It can be referred to the blend of three types of entrepreneurships namely- Conventional Entrepreneurship, Social Entrepreneurship and Environmental Entrepreneurship.

Being a significant part of the society, the consequences of business practices on the economy, environment and society is substantial in nature. Integration of sustainable orientation in business practices contribute towards social and environmental well-being along with ensuring long term survival in the economy. The introduction and approval of SDGs in the 2030 Development Agenda by the United Nation in 2015, have attracted organisations towards adopting business practices in the same path. A large number of businesses including international organisations, NGOs, multinational companies and even the government of different countries have started to reflect their initiatives towards sustainability in the form of published reports. Such include both voluntary and statutory disclosures. However, the business world consists of several elements and understanding or tagging the awareness/ contribution of business towards sustainability only on the basis of such reports is ambiguous and may not provide complete picture of the business world. The MSMEs are a significant element in the business world and they rarely publish such reports. A study attempting to understand their awareness status regarding integration of sustainability orientation in business practices need to be taken into account.

Among the various industries to which an MSME belong, Food processing is one of the largest industries in the state of Assam. The primary activity of these units is to transform agricultural product into consumable food. This industry is known to reduce the agricultural waste and ensure hygiene. The sector has significant contribution to the country's economy due to high output generation (Pavaskar, 2021) and creation of employment opportunities for the rural poor lessening the burden on agriculture sector (Acharya et al., 2013). The present study focuses on exploring the awareness level of food processing units with regards to sustainable business practices considering the Jorhat district of Assam. The close relationship of this sector with the socio-economic conditions also calls for understanding how they attempt to align their actions towards the social dimensions of sustainability. As such, this study is an attempt to provide insight into the practices followed by food processing units considering the social dimension of sustainability needs focus of researchers.

Thus, the main objectives of the study are:

- To investigate the awareness status of Food processing Units (Registered MSMEs), with special reference to Jorhat district, regarding sustainable entrepreneurial practices.
- To find out how these enterprises contribute towards social dimensions of sustainability indicated by employment and community & Local people.

This study shall contribute towards the existing body of knowledge about sustainable entrepreneurship by revealing the knowledge of businesses with regards to attention towards the concept of sustainability. It is a preliminary study throwing light on the perception of entrepreneurs of food processing enterprises about sustainable business practices. By discovering the practices that food processing units adopt considering the social aspect of sustainability, the study may enable enterprises from other sectors to explore new ways of integrating sustainability in business activities. The lack of knowledge about the extent to which business enterprises prioritize and understand sustainability issues, related to their business decisions, makes this study unique.

Literature review

Sustainable Entrepreneurship

Sustainable Entrepreneurship integrates economic, social and environmental goals in an enterprise. Balancing organisational efforts to all these areas may truly become sustainable enterprises(Nedjoua et al., 2017). Sustainability driven enterprises are based on the intersection of three established concepts of entrepreneurship i.e. socially, economically and ecologically driven entrepreneurship (Schlange,2009). The process of identifying, transforming and exploiting opportunities to produce goods and services along with economic, environmental and social well-being can be called sustainable entrepreneurship (Mupfasoni, Kessler, & Lans, 2018). The concept of Sustainable Entrepreneurship as presented in some of the leading Entrepreneurship journals is forwarded below:

Table 1
Definition of Sustainable Entrepreneurship

Name of the Author	Points stressed out in the respective definition
(Cohen & Winn, 2007)	• An examination that involves discovering, exploiting and creating opportunities, • converting them into future goods and services, • person responsible for the conversion process and, • the consequences involved which may be economic, social, physiological and environmental in nature.
(Dean & McMullen, 2007)	• A process that emphasizes on discovering and exploiting economic opportunities, • market failures which draw away from sustainability may be the source of such opportunities.
(Hockerts & Wustenhagen, 2010)	• Involves discovering and exploiting economic opportunities, by generating market disequilibria, • that promotes moulding a particular sector into a more sustainable state, both environmentally and socially.
(Pacheco et al., 2010)	• Involves discovering, exploiting, creating and evaluating opportunities for creating future goods and services, • while maintaining consistency with the goals of sustainable development.

Source: Author's Elaboration

Sustainable entrepreneurs can be distinguished by their endeavours of considering different aspects of environmental, economic and social sustainability (Tilley & Parrish, 2006). A comprehensive economic, social and environmental system can be developed only with the adoption of sustainable entrepreneurship. The entrepreneurial behaviour of such entrepreneurs guarantees multi-dimensional well-being of the enterprise (Shepherd & Patzelt, 2011). Conceptually Sustainable entrepreneurship is a sub- form of Entrepreneurship, which focuses on specific value sets (Schlange, 2006). Sustainable entrepreneurship provides a holistic approach for organizational strategic development(Katsikis & Kyrgidou, 2007). It is focused on generating a business opportunity based on the identification of individual and group talents required to interact with and adapt to natural resources in a productive way. (Buysse & Verbeke, 2003; Klewitz & Hansen, 2011). The promotion of this concept can be done only by analysing the components and characteristics of sustainable entrepreneurship through different lenses and directions, only then the development of sustainable innovative solutions shall be possible (Hockerts & Wüstenhagen, 2010).

Sustainable Orientation in Business Practices

A sustainable economy can be achieved only with the implementation of sustainable entrepreneurial practices (Shepherd & Patzelt, 2011). Sustainable decisions are value integrated and emphasized on social facets (Martin & Schouten, 2014). Cognitive factors pertaining to economic, social and environmental goals are required to be balanced to take such decisions and create sustainable solutions (Muñoz and Dimov 2015). Sustainability oriented activities fall within the area of intersection of the three dimensions i.e, economic, environmental and social. Undertaking such activities shall enable firms to have economic benefits as well as have a positive influence in the environment and the society (Carter & Rogers, 2008)·(Bertoneche & van der Lugt, 2012) presented a business model based on sustainability initiatives linked to financial strength and performance. Sustainable orientation of a business is a booster for innovation followed by increase in sales and capturing more of the market share. (Savitz & Weber, 2006) stressing on the significance of assessing the performance of a business entity considering the sustainability aspect, the author suggested that one of the prime areas of integrating sustainability is the business strategy adopted by the enterprise.

Social Dimensions of Sustainable Entrepreneurship

Business is an integral part of the society. The various groups a business is linked to, are elements of the same ecosystem. Understanding how a business contributes towards the social aspect is crucial for ensuring long term survival. Entrepreneurs play a vital role in providing non-economic benefits to the society (Shepherd & Patzelt, 2011). Small businesses are less inclined towards economic gains as compared to large organizations. This provides them the scope to have the freedom to act as socially responsible units (Burton and Goldsby, 2009). A business managing its activities considering the stakeholders needs in compliance to their own value system reflect social sustainability(Iyigun,2013). As forwarded by (Elkington,1997), the social dimension covers all forms of human capital. Thus, stakeholders are considered to be the protagonist of the social dimension of sustainable entrepreneurship. Recent studies draw a distinction between external and internal social values of a business while measuring sustainability(Tarnanidis et al., 2017). Several authors have presented and explored the wide variety of indicators to understand the social dimension. Active participation and contribution to community development, routing donations and facilitating the disbursement of knowledge and education are ways in which a business can contribute towards the society(Jordão et al., 2018). Another crucial indication can be the promotion of local products and developing local societies by creating employment opportunities in the concerned region (Burton and Goldsby, 2009). Indicators like social resources, cultural diversity, equal opportunities, voluntary community activities are also significant indicators of social contribution(Spangenberg & Omann, 2006). One of the most acceptable and prominent sustainability performance indicators are the Global Reporting Index. The GRI provides a comprehensive framework to measure social issues related to sustainability (Warhurst, 2002).

As a unique area of research Sustainable Entrepreneurship has received the attention of researchers in the recent years. On the basis of the available literatures and knowledge of the researcher, it can be stated that most of the studies done in this area relate to the establishment of the concept of sustainable entrepreneurship, its dimensions, the interlinkages between the dimensions, the relationship between sustainable orientation and entrepreneurial orientation, drivers behind sustainable orientation and development of sustainable business models. Some studies have also highlighted the integration of sustainability issues in large organization in the form of CSR, the interlinkages between sustainable entrepreneurship and SDG 2030 and the mapping of work done in this area of research through bibliometric analysis. Recognising that small businesses are one of the primary components of the society at large, understanding their awareness level regarding sustainability issues lacks focus of the researchers. The way and extent to which these enterprises put effort to integrate sustainability, with regards to social dimension, in their day-to-day activities is yet to be explored. Therefore, in this light this study attempts to make a contribution to the existing body of knowledge on sustainable entrepreneurship by exploring sustainability in food processing enterprises. The same might facilitate understanding how entrepreneurial actions can reap benefits for the society.

Methodology

This study initiated with a comprehensive process of literature review in the area of interest examining the available articles and contents in the area of sustainable entrepreneurship, to understand the gap in research conducted in this area. Following this, a descriptive research approach was followed to explore the awareness status of Food processing enterprises regarding sustainable practices and their actions in relevance to the social dimension of SE. As mentioned in the above section, the study considers two indicators of social dimension namely: employment and community& local people. These indicators have been selected from Global Reporting Index 2016. GRI 2016 presents a wide variety of aspects related to employment practices and community & indigenous people like employment, diversity& equal opportunity, Training & Education, Non-discrimination, Local communities, Indigenous people, etc. All these aspects have been considered and unified resulting in two categories. The data collection tool was developed based on these categories.

The study is based on both primary and secondary data. A semi structured interview schedule was prepared to collect the data. Bi-lingual approach was adopted in the process of data collection to ensure inclusive and higher response. The schedule consisted of 3 sections, the first section included questions pertaining to personal information of the respondent like name, age, educational qualification. The second section included questions seeking business profile of the respondents like age of the business, annual income, description of the business, current number of employees, MSME classification etc. The last section of the schedule includes 8 questions which are intended to provide an insight into the awareness status of the units regarding sustainable practices and their contribution towards the selected sections of the social dimension. Among them, two were in question answer format and the remaining stressed on the frequency of practices adopted. Employment practices consisted of three variables EP1, EP2 and EP3 and practices related to Community and local people

were represented by three separate variables viz. CLPP1, CLPP2 and CLP3. Secondary data are collected from journals, books and websites.

Food processing units registered as MSMEs in Jorhat district has been covered in the study as Jorhat is the second largest business hub in Assam, the first being Guwahati. As such, the population of the study are the food processing enterprises registered as MSME's in the Jorhat district, which commenced business during the period 2015-16 to 2019-20. The registration details have been acquired from the District Industries and Commerce Centre, Jorhat. The total number of food processing units set up during the above-mentioned period was found to be 80, 50% of the population was taken as the sample size. As such, 40 units were selected randomly, however data could be collected only from 33 units for the study resulting in a sample size of 33 units. The collected data has been analysed using SPSS. Descriptive statistics including frequency, percentages, mean scores and standard deviation are used as tools of analysis and histograms and pie charts are used to present the findings of the study. The mean score interpretation technique developed and used for the study is as follows:

Table 2
Mean Score Interpretation

Mean Score	Contribution level
1.00 – 1.66	Low
1,67 – 2.33	Moderate
2.37 - 3.00	High

Source: Author's Own elaboration

Research Findings

The findings of the study have been divided into four sections. The first two sections deal with the basic information about the entrepreneurs and profile of the business. The third section shows the awareness status of the food processing units under consideration with regards to sustainable practices and the last section highlights the way in which such enterprises contribute towards social dimensions.

Profile of the Entrepreneurs

The basic profile of the entrepreneur provides information regarding the background of the entrepreneurs or business owners.

Table 3
Profile of the Entrepreneur

(in percentage)

	Male	Female	31 to 40 years	41 to 50 years	51 years & above	Under-matriculate	Matriculate	Under-graduate	Graduate
Gender of the Respondents	54.5	45.5							
Age of the Respondents			54.5	36.4	9.1	-	-	-	-
Educational Status			-	-	-	15.2	21.2	33.3	30.3

Source: Field Survey

Table 3 shows the profile of the entrepreneurs of food processing units considered in the study. Maximum respondents were male, however the difference between male and female owners is not much substantial. 54.5% of the respondents fall in the age group of 31 to 40 years and a very few of them belonged to

the age group of 51 years and above. With respect to educational status, majority of the respondents, i.e. 33.3% were found to be under-graduates and 30.3 % were found to be graduates. Few respondents 15.2%, stated to be under matriculate. This might be an indication that entrepreneurs in food processing industry in Jorhat district possess an average level of educational qualification.

Profile of the Business Units

The food processing units in the study area were found to be engaged in various ways of food processing like producing bakery items, fruit wine, snacks, ice-cream, spices, pickle manufacturing etc. An overview of the profile of these units have been presented below:

Table 4

Profile of the Units

Age of the Business	**Frequency**	**Percent**
less than 5 years	23	69.7
more than 5 years	10	30.3
Total	33	100
Annual Income of the Business	**Frequency**	**Percent**
below 1,00,000	17	51.5
1,00,000 to 5,00,000	8	24.2
5,00,000 to 10,00,000	5	15.2
10,00,000 & above	3	9.1
Total	33	100
Current Number of Employees	**Frequency**	**Percent**
1-5 nos.	20	60.6
6-10 nos.	12	36.4
More than 15 nos.	1	3
Total	33	100
Business Classification	**Frequency**	**Percent**
Micro	30	90.9
Small	3	9.1
Total	33	100

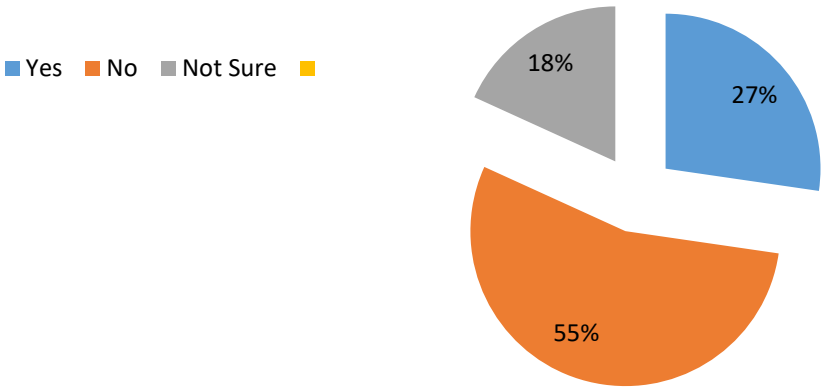
Source: Filed Survey

The above analysis represents the profile of the food processing units surveyed by the researcher. As shown in Table 4, maximum number of enterprises has been in the business for less than 5 years. 30.3% of the units has been in the business of food processing for more than 5 years. In case of income level, only 9.1% of the respondents fall in the high-income bracket of 10, 00, 000 above. Maximum respondents stated to have an annual income range below 1, 00, 000. In case of number of employees currently employed in the business 60.6% said that 1-5 number of people are working under them. Only 1 unit was found to employee more than 15 number of employees. It was found that 90.9% of the units considered for the study belonged to Micro category of enterprise and 9.1% of the units were small enterprises, none of the enterprises fell in the medium category of MSMEs'.

Awareness Status of the Units

This section highlights the awareness status of the food processing units with regards to the term sustainable entrepreneurial practices and their perception about the meaning of the term. The survey was conducted using bi-lingual interview schedules to ensure relevant and reliable responses from the respondents.

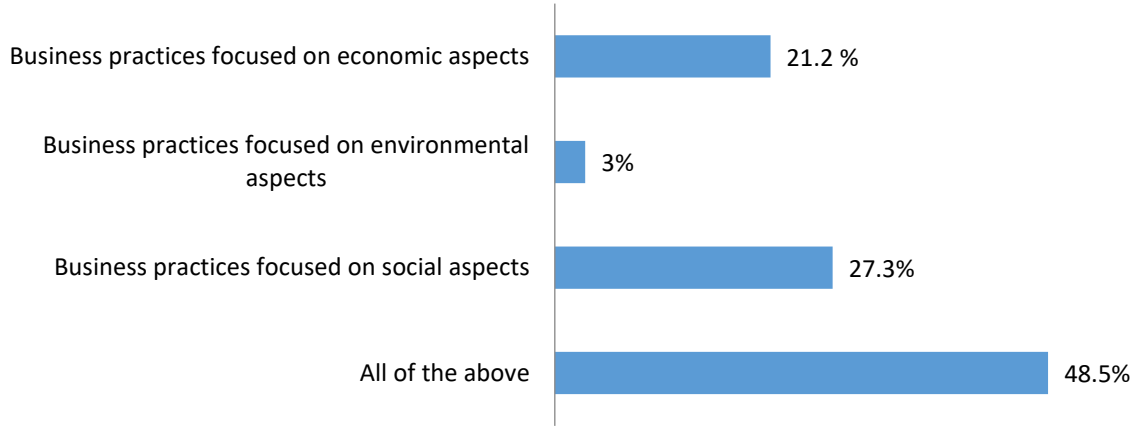
Figure 1
Heard the Term Sustainable Entrepreneurial Practices



Source: Field Survey

It has been found that as represented in Figure 1, 54.5% i.e. majority of the respondents stated that they have not heard the term sustainable entrepreneurial practices. 18.2% said that they are not sure about whether they have heard the term before or not and only 27.3% said that they have heard the term in their day-to-day life.

Figure 2
Undestanding of the Term Sustainable Entrepreneurial Practices



Source: Field Survey

The study revealed that most of the food processing unit entrepreneurs, 48.5% opined that sustainable entrepreneurial practices may mean focusing on all the three dimensions of sustainable entrepreneurship namely: economic, environmental and social as depicted by Figure 2. It has been found that next to the most comprehensive and true meaning of sustainable entrepreneurial practices, 27.3% respondents believed that such practices may refer to business practices focused on social aspects followed by 21.2% who perceived the concept of sustainable practices relate to only environmental aspects.

Food processing units in Jorhat district of Assam are found to be mostly unaware about the precise term 'Sustainable entrepreneurial practice'; however, their perception about the terminology about being business practices focusing on the three dimensions – economic, environmental and social, may be an indication about

the fact that they actually understand the importance of all the three dimensions and their relationship with business operations. It can be said that, food processing enterprises are not aware about the term 'sustainable entrepreneurial practices' but they do recognize that business practices should be focused on all the three dimensions. A fact worth mentioning is that enterprises who agreed to have heard the term revealed that they have come across it while having attending training programme oraganised by District Industries a& Commerce Centre, Jorhat. Among all the three dimensions, social dimension was found to be perceived as the sole meaning of sustainable entrepreneurial practices followed by economic and environmental dimensions as most of the respondents chose 'Business practices focused on social practices' next to 'all of the above' option.

Contribution to Social Dimension

To understand the practices adopted by the food processing units, the frequency with which the concerned practices were integrated in business activities have been stressed in the study. The table below represents information regarding such practices:

Table 5

Frequency Distribution of Practices

(in percentages)

Indicator	Variable	Practices	Often	Sometimes	Never
Employment Practices	EP1	Involvement in socially inclusive employment policies	63.6	36.4	-
	EP2	Allowing staff or provide them opportunity to participate in various events/programmes (related to professional/skill development)	36.4	36.4	27.3
	EP3	Demonstrating/ Showing willingness to address staff remuneration issues, congenial workplace condition issues, safety and security issues, etc.	27.3	69.7	3
Practices related to Community & Local People	CLPP1	Involvement in providing free technical assistance/ other specialized assistance to local community or projects	12.1	30.3	57.6
	CLPP2	Involvement in activities like Sponsoring or donating funds for social events	36.4	39.4	24.2
	CLPP3	Involvement in activities like Sponsoring or donating funds for community activities	15.2	42.4	42.4

Source: Field survey

Table 5 demonstrates the frequency with which the food processing units considered in the study undertake their activities relating to employment and community & indigenous people. In case of employment practice EP1, the findings depict that maximum number of respondents 63.6% tend to adopt socially inclusive employment policies regularly and 36.4% of the respondents opined that they try to adopt inclusivity in employment 'Sometimes'. Among the respondents, minority i.e. 27.3% said that they do not allow their employees to participate in events related to professional and skill development whereas 36.4% opted for each 'often' and 'sometimes' respectively while responding to this question. With regard to engaging in conversations relating to staff remuneration issues, congenial workplace conditions, safety and security issues, etc. represented by EP3, 69.7% responded that they sometimes try to engage in such practices and 27.3% stated that they are always open with their employees to engage in such conversations. Among all, EP1 is the most commonly adopted employment practice adopted by the enterprises and EP 2 though integrated in business practices, is found to have higher 'never' practiced responses as compared to the other two variables.

Table 5 also shows that, in case of CLPP1 57.6% of the respondents said they have never involved in providing free technical assistance/ other specialized assistance to local community or projects. Only 12.1% agreed to be regularly involved in such activities. 36.4% and 39.4% of the respondents stated that they involve in donating for indigenous and social events 'often' and 'sometimes' respectively. While forwarding donations for community activities CLPP3, only 15.2% said that they tend to involve in such activities, whereas 42.4% said

to have never been engaged in community development activities and another 42.4% opined that they sometimes try to involve in the said activities.

Table 6
Descriptive Statistics for the Selected Indicators

	N	Minimum	Maximum	Mean	Std. Deviation
EP Mean	33	1.67	3.00	2.3232	.40384
CLP Mean	33	1.00	2.67	1.7980	.49258

Source: Field Survey

Table 6 represents the mean score for Employment practices and Community & Local people. As the mean scores for both the indicators being 2.3232 and 1.7980 falls within the range of 1.67 – 2.33, therefore, food processing units considered in the study contribute moderately to concerned indicators of social dimensions. However, the degree of contribution in relevance to employment practices is higher than that of community & local people.

Contribution of food processing units towards the social dimension of sustainability, in the Jorhat district of Assam is moderate irrespective of the fact that most of the enterprises have been operating for a period of less than 5 years and the annual income of maximum enterprises is below ₹1,00,000. The units considered in the study seems to give more relevance to employment practices as compared to involvement in wellbeing activities of community and local people. Adopting inclusive employment practices and engage in conversations / activities revolving around fair wages and pay, suitable working conditions, safety and security is their way of maintaining good relationship with the employees and ensuring lower rate of labour turnover. Such practices also enable them to be a part of agents of social welfare. With respect to community and local people, it has been found that the food processing units in Jorhat tend to involve themselves in social events and celebrations as and when possible. However, when it comes to providing free assistance technical or otherwise to the local people of the community, units are quite reluctant to engage themselves in such practices. This might be due to their concerns in relation to the market competition and product innovations. Also, enterprises fail to contribute substantially towards community activities like donating to schools, hospitals, contributing to relief camps, road construction etc.

Conclusion

Sustainable entrepreneurship is a multi-dimensional concept entailing all the three dimensions- economic, social and environmental. These dimensions are interlinked and intertwined in a way which makes the concept complex for business model integration. However, this concept is extremely vital for organisations of all levels, size and sector for long term growth, development and existence. The goal of this paper was to investigate the awareness status of Food processing unit with special reference to Jorhat district. Despite having an average level of education, the current scenario as discovered by this research shows that the concept of sustainability is still unknown among the food processing units in definable terms. However, the units are aware about the significance of economic, social and environmental aspects being related to their business activities. Inclusion of sustainability concepts at all levels of education might be a way to enhance the recognition and acceptance of sustainability issues. The study also revealed that units are more concerned and engaged in adopting sustainable employment practices as compared to engaging in community wellbeing. The contribution of the food processing units in Jorhat district towards the social dimension is average corresponding to the limited resources with which they work. It is worth mentioning that units are more inclined towards donating practices rather than providing free technical assistance/ training to the local people. They prefer spending financial resources to sharing knowledge in their area of work. The same goes in case of employment practices, entrepreneurs in the food processing sector seems to be less concerned about enhancing the knowledge and skills of the employees. Underlying reason behind low adoption of such practices may be their way of avoiding market competition and labour turnover.

The present study was created as a part of a larger project involving understanding the awareness level of MSMEs in Jorhat district with respect to all the three dimensions of sustainable entrepreneurship and the contribution made by these units to these dimensions. Limitations attached to the study revolve around the sample size and its representativeness, increasing the sample size may add varying effects to some extent. Further explorations on how continuation of such practices can be maintained by business units irrespective of barriers in the business world and underlying factors for adoption of such practices can be delved into by

researchers and academicians. Studies investigating ways in which business units can substantiate their share of contributions towards sustainability can be also probed into in future research studies.

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Women in Micro Food Processing Sector : A Way to Sustainable Economy

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Abstract

Purpose of the Study

In the dynamic landscape of economic development, the role of women in the micro food processing enterprise can be considered as pivotal for fostering economic growth. The scope is particularly immense for Assam and other north eastern states given the region's diverse food practices and abundance of raw materials. As per Ministry of Food Processing Industries, there are around 25 lakh unorganized entrepreneurs involved in the food processing activities in India. Out of them 66% are located in rural area and 65% are women. It is also to be noted that food processing sector is one of the important segments of the Indian economy in terms of its contribution to GDP, employment and investment. However, in the context of Assam, no significant study is done as far as women entrepreneurs involved in micro food processing sector is concerned. As such this study attempts to explore the challenges and opportunities of women entrepreneurs involved in micro food processing businesses as well as to examine the reach of the targeted government policies and schemes.

The research aims to understand the different challenges and opportunities of women entrepreneurs involved in the micro food processing sector as well as initiatives taken by the government to facilitate and support entrepreneurship development.

Methodology

This research is based on the women micro food processing enterprises of Dimoria and Chandrapur Community Development Blocks under Kamrup (Metro) district of Assam. Kamrup (Metro) is chosen as the broad field of the study considering its strategic geopolitical location making it a hub for trade and commerce particularly in the North East India. The research features a sample size of 68 women entrepreneurs who were carefully chosen who own, manage, or actively operate businesses in micro food processing sector. The respondents were selected in such a manner so that they include diverse profiles and experiences in this particular business. Both primary and secondary data are used in the study. The primary data are collected through interview method by using interview schedule, consisting of both open-ended and close-ended questions, as a tool. Secondary data on government initiatives, policies, and support frameworks for women entrepreneurs in the micro food processing sector are also incorporated in the study. Further academic research articles focusing on women entrepreneurs in the micro food processing sector, offering theoretical perspectives and empirical findings are also encompassed.

Findings

The study highlights that insufficient access to financial resources inhibits the growth and sustainability of women-led micro food processing businesses. Most women led food processing enterprises confront technical limitations that hinder the growth of their businesses. They often encounter obstacles related to market access, distribution, and competition. Most women entrepreneurs were motivated to start their enterprises for financial reasons. Most women entrepreneurs also do not have specific marketing strategies to reach a larger market. A significant finding of the research throws light on the limited support of banking institutions for women entrepreneurs. A number of schemes such as PMFME, PMEGP, AIF, CGTMSE etc. are implemented by the government to foster growth of micro food processing entrepreneurs. However, owing to lack of awareness, lack of support from financial institutions and minimal involvement of key stakeholders such as line departments, NGOs and public representatives the reach of the schemes is still limited amongst the mass population.

Original Contribution

Although a lot of studies were made in this topic yet this current study will contribute to the existing body of knowledge because as per available database, nobody has made a detailed survey on the aforesaid subject in this particular geographical area. A study made on this geographical area will give us the idea how the women entrepreneurship is developing in the micro food processing sector in the economically less progressive rural areas of Kamrup (M) district.

Keywords

Government Policies, Kamrup, Schemes, Sustainable Development, Women Entrepreneurs

Introduction

Micro food processing, a sector predominantly characterized by small-scale enterprises, holds immense potential to contribute to the economic well-being of communities while simultaneously addressing issues related to food security and employment generation. This research delves into the significant yet often overlooked dimension of women's participation in the micro food processing industry, analyzing its potential on fostering a sustainable economy.

India, with its diverse food culture, has witnessed a surge in the micro food processing sector, representing a crucial addition in the agricultural value chain. Assam, situated in the northeastern part of the country, contributes significantly to this narrative, given its rich agricultural heritage and the prevalence of traditional food practices. Recognizing the unique challenges and opportunities within this state is imperative for formulating targeted policies that can empower women engaged in micro food processing activities.

Empowering women in the micro food processing industry aligns with broader goals of sustainable development, as it not only enhances the economic status of women but also contributes to the overall resilience of local economies. This research endeavors to explore the various dimensions of women's participation in micro food processing in Kamrup (M), unravelling the socio-economic implications and shedding light on the potential pathways for building a sustainable and inclusive economy. By understanding the challenges faced by women entrepreneurs in this sector and identifying supportive measures, policymakers can foster an environment conducive to the empowerment of women in micro food processing, thus catalyzing sustainable economic growth.

Research Objectives

The present study is based on the following research objectives:

a) To discuss specific challenges faced by women in the micro food processing sector.
b) To explore potential opportunities for empowering women entrepreneurs in the sector.
c) To discuss initiatives, policies, or practices that can contribute to overcoming challenges faced by women entrepreneurs in the micro food processing sector.

Methodology

Area of Study

This study is based in the Kamrup (M) district of Assam with a specific focus on the women entrepreneurs of Chandrapur and Dimoria block. Kamrup (M) being the hub of trade and commerce in Assam as well as in the North Eastern states is chosen as the broad area of study with an aim to explore various opportunities and challenges of women entrepreneurs involved in micro food processing enterprise. This study also tries to discuss the initiatives taken by the government to foster entrepreneurship amidst women particularly in the food processing sector.

Population

The sample of the study are the women entrepreneurs belonging to the Chandrapur and Dimoria development blocks of Kamrup (M) district. More specifically, this study includes the women entrepreneurs whose key role is to own, manage and actively run their business in micro food processing enterprise.

Sampling Technique and Size

Considering the objectives of the present study, purposive sampling method is used. Using the purposive sampling method, primary data is collected from 68 women entrepreneurs involved in the micro food processing business.

Tools of Data Collection

- The primary data is collected with the help of interview method by using interview schedule as a tool that consisted of close ended questions to gain quantitative insight as well as open ended questions to gain qualitative insight. The questions were focused to gather demographic statuses of the entrepreneurs along with details on the socio-economic status. Furthermore, the tool attempted to investigate their businesses with insight on the turnover, finances, technology adoption as well as challenges of marketing and branding their products. In addition to the aforesaid particulars, the interview schedule also incorporated questions to assess the awareness and utilization of various government schemes and programs.
- For the secondary information, data has been extracted from various government schemes and policies which are support framework for women in micro food processing enterprises, offered by the Government of India as well as Government of Assam. Further academic research papers, articles and journals were also reviewed that aligns with the context of the present study.

Research Approach

This research adhered to the triangulation approach by using both qualitative and quantitative methods of data collection. It was done to construe the collected data to present a holistic understanding of the challenges and opportunities for women entrepreneurs in the micro food processing sector.

Literature Review

Many researchers in the past have intricately studied the challenges and opportunities related to women led micro food processing enterprises and highlighted major concerns as well as avenues to limit them. In this context, the following existing literature can be mentioned:

Shah et al. (2022) revealed in their study that age significantly influences the ability of women entrepreneurs to navigate challenges, particularly affecting technological advancements. Despite women's resilience during the pandemic, the study highlights a drawback in the limited awareness of government facilities that failed to reach them.

Kapinga and Montereo (2017) delve into socio-cultural challenges faced by women entrepreneurs in food processing in Iringa, Tanzania. Their study highlights the problems encountered and strategies employed, such as forming economic groups and entrepreneurship clubs, fostering collaboration and work harmony among women involved in processing.

Rajendhiran and Devi (2016) analysed women entrepreneurship in agro-food processing in Salem, focusing on MSME policies, challenges faced by women, and government assistance. The study emphasizes the increasing interest of women in modern activities and calls for a multi-faceted approach to motivate their involvement in small-scale industries, integrating them into industrial development processes.

Dhekale (2016) assesses women entreprenesurship in India, highlighting challenges and opportunities in rural areas and the impact on women's empowerment through micro-entrepreneurship and Self-Help Groups (SHGs). The study underscores the historical oppression of women in India and suggests that economic, cultural,

and social improvements are crucial for women's success, emphasizing the role of SHGs in enhancing women's control over resources and addressing various challenges faced by female businesses in the country.

Kumar (2015) in his study, “A Study on women entrepreneurs in India” focuses on the status of the women entrepreneurs of India giving emphasizes on the various problems of the women entrepreneurs, the schemes implemented by the government to uplift the women entrepreneurs and their role in the economy. The study further revealed that the social thinking needs to be changed to motivate more women to join the entrepreneurship force and contribute to nation building.

Pirakatheeswari (2015) emphasizes in her study on the "Problems and Prospects of Women Entrepreneurs in India in the era of Globalization" that the right support from family, community, and the government is essential for women entrepreneurs to contribute to nation-building. The study categorizes women entrepreneurs based on their establishment and financial status, highlighting the need for appropriate societal and familial support to help them succeed in their business endeavors.

Dangi and Ritika (2014), in their study, “Women Entrepreneurship and Growth and Performance of MSMEs in India” emphasizes on the dominating role played by the MSME in the economic growth of the country as they are considered as the second largest source of income after agriculture. This study also throws light on the various measures and initiatives taken by the government towards creating a supportive entrepreneurship environment.

Sugaraj and Salve (2014) in their study “A Study of Women Entrepreneurship and Their Problems in the Development in Western Maharashtra” focus on the women entrepreneurs’ participation in small businesses. Participation of women in small business has increased resulting in entrepreneurship development. Also, the study showed that women are more involved in micro enterprises and seek the support of government and financial institutions for their all-round growth.

Goyal and Yadav (2014) provide a comprehensive overview of challenges faced by women entrepreneurs in a developing country, emphasizing the persistent perception of women as homemakers and the lack of recognition in non-traditional sectors. The study advocates for addressing institutional gaps, promoting access to economic opportunities, and fostering the skills necessary for women entrepreneurs to succeed, key factors in enhancing their current situation.

Sharma (2013) identifies factors hindering women entrepreneurs' performance and outlines steps taken by the Indian Government to promote women's employment through various schemes. The study highlights both pull factors, such as dissatisfaction with jobs and family responsibilities, and push factors, like entrepreneurial drive and desire for independence, that influence women entrepreneurship, emphasizing the role of family support and networks.

Singh and Raina (2013) highlight the crucial role of Micro, Small, and Medium Enterprises (MSMEs) in development and job creation, categorizing women entrepreneurs into "chance," "forced," and "created" categories. The study identifies barriers such as financial constraints, male-dominated competition, and family obligations limiting the success of women entrepreneurs, advocating for policies to increase women's participation in entrepreneurship and the promotion of entrepreneurial networks.

Sharma et al. (2012) emphasizes the challenges and opportunities for rural women entrepreneurs, highlighting the empowering role of Micro Entrepreneurship in generating income while managing domestic responsibilities, underscoring the competence of rural women for success if their full potential is utilized.

Palaniappan et al. (2012) explores entrepreneurial development among women in Erode District, emphasizing motivational factors, socio-economic backgrounds, and existing qualities, revealing that women entrepreneurs are breaking constraints and succeeding, while underlining the significance of education and awareness for their entrepreneurial development.

Singh et al. (2012) address challenges faced by rural women entrepreneurs in Himachal Pradesh, highlighting the crucial role of Self-Help Groups (SHGs) in their empowerment, with a focus on government initiatives since 1954. The study advocates for governmental initiatives to enhance the economic and social status of women based on the significant contribution of women entrepreneurs to development, noting a 1.11% ownership of small-scale units by women in Assam.

Sujata Mukherjee (2009) explores the challenges faced by women in business and underscores the catalytic role of NGOs in fostering women entrepreneurship by addressing issues like gender-based discrimination, lack of credit support, and business-life balance, thus contributing to economic development.

Samani (2008) focuses on women entrepreneurs in food processing in Gujarat, highlighting their expertise and unique skills, while discussing their knowledge, attitudes, practices, and challenges, revealing that a majority of women entrepreneurs are Hindus, with around 65% belonging to nuclear families, and only a small number having formal training.

Pharm and Sritharan (2013) examine the challenges faced by women entrepreneurs in rural areas, highlighting that women engage in business to showcase creativity and success, not just for survival, and identify factors such as socio-cultural barriers, market-oriented risks, motivational factors, and lack of awareness hindering women's entrepreneurial growth.

Kaushik (2013) emphasizes the challenges faced by women entrepreneurs, revealing that a small number seek financial assistance from institutions due to low literacy rates, while highlighting the impact of limited time investment in businesses due to lack of family support and family obligations.

Kurbah (2007) explores the role of women entrepreneurs in the economic development of Meghalaya, noting that Khasi women's access to education and family support has made them equally enterprising and successful as men, with Khasi culture seen as a significant factor. The study suggests that providing higher education and skill development training to women entrepreneurs can enhance productivity and promote innovativeness.

Barroga et al. (2019) stress the significance of technological innovation adoption in micro, small, and medium food processing enterprises (MSMFEs), highlighting the influence of personal demographics, organizational characteristics, and market type on innovation uptake, with recommendations for targeted efforts by the Department of Science and Technology (DOST) towards micro enterprises led by male owners with higher education, aiming to enhance innovation potential through additional measures and improved guidelines, suggesting further research expansion for a comprehensive analysis.

Thaddeus (2012) emphasizes that entrepreneurship and innovation in Nigeria are gaining momentum, but sustained growth requires government policies addressing infrastructure decay and financial access issues, particularly through establishing micro-financing banks for soft loans. The study underscores the role of Nigerian entrepreneurs in driving technical progress and economic growth, yet acknowledges persistent challenges, including inadequate power supply and obstacles hindering innovation and technical progress.

Findings and Discussion

Challenges Faced by Women in the Micro Food Processing Enterprise

During the study it was found that the women led micro food processing enterprises face number of issues ranging from insufficient access to financial resources, technical limitation, market access, distribution, marketing strategies that limit the growth and sustainability of the businesses. These challenges identified during the study are discussed below:

Financial Limitation

Kumar et. al. (2021) in their study highlighted that limited access to finance is a major constraint that hinder the growth prospect of entrepreneurs even though there are specific schemes and policies curated specifically for the entrepreneurs. The present study clearly aligns with the findings of Kumar et. al considering the fact majority of women led micro food processing entrepreneurs considered lack of capital as their biggest challenge during data collection.

Table 1

Challenges Faced by Women Micro Food Processing Enterprises

Sl. No.	Challenges Faced by Women Micro Food Processing Enterprises	No. of Respondents
1	Lack of Capital	38
2	Lack of Family Support and Motivation	1
3	Lack of Govt. Support	13
4	Lack of Support from Banks	16
	Grand Total	**68**

As evident from Table 1, maximum number of respondents considered lack of capital as the most limiting factor followed by lack of support from bank, lack of govt. support and lack of family support and motivation. Here it may be observed that lack of capital as a limiting factor may put forward a number of propositions. The problem of lack of capital can be attributed directly to lack of institutional support from government and banking institutions. Here it may be mentioned that lending activities by banks to MSME's fall into the priority sector as mandated by the government. However, banks are often apprehensive about providing loans considering different factors such as past history of being bank defaulter, poor CIBIL score, lack of marketing opportunities, lack of right documentation etc. Mrs. Kalita (a respondent) during the field study narrated that *"I am involved in pickle making activities since the last 6 years. To expand my business, I desperately needed a slicer and dryer machine. To purchase them, I wanted capital and thereby approached my bank branch seeking a loan. However, the branch manager rejected my loan application citing lack of marketing opportunities as the reason. I have now decided to stop my food processing business*." Many aspiring entrepreneurs such as Mrs. Kalita often get dismayed and frustrated with the banking institutions. This can be attributed to factors such as lack of awareness on healthy financial practices, lack of training & technical know-how, lack of awareness about institutional help available from govt. department and agencies. Accessibility to banks particularly from the perspective of the rural women entrepreneurs appear as another serious concern. During the study and as evident from the following table, it was also found that out of total 68 respondents, 65 entrepreneurs found banks as not accessible posing a big question about the goodwill and intention of banks in supporting local women entrepreneurs.

Table 2

Accessibility to Bank Accounts

Sl. No.	Whether Bank are Accessible	No. of Respondent (frequency)
1	Accessible	1
2	Accessible but challenging	1
3	Depends on the Applicant	1
4	Not Accessible	65
	Grand Total	**68**

Since the number of the response for the financial institution being inaccessible was alarmingly high further investigation was done to understand how they meet their financial requirements. It was informed they would seek help from external entities, friend and family where they end up paying a higher rate of interest.

Lack of Awareness and Technical Skills

The micro food processing sector requires technical efficiency for its growth. This starts with the relevant awareness to initiate the business which includes understanding the geography, knowing the available opportunities to foster their businesses, resources and raw material availability, understanding the market and

its competition, suitable skillset, food safety standards and hygiene to name a few. However, during the study it was found that the respondents are not well versed or equipped with these required knowledge and skills. In this context the role of government can be considered instrumental in bridging the gap between the benefits of government schemes and the potential entrepreneurs. This proposition is supported by the findings of Tambunam (2017) who in his study mentioned how government plays a key role to initiate training programs for capacity building. In the present study an attempt to understand the effectiveness of government policies and schemes in providing opportunities to women entrepreneurs particularly in their capacity building and training is made and the findings are presented using Table 3.

Table 3

Effectiveness of Government Policies

Sl. No.	Effectiveness of Government Policies	No. of Respondents (Frequency)
1	Moderately Effective	14
2	Not Effective	25
3	Slightly Effective	29
	Grand Total	**68**

The findings from the table clearly highlights that the government policies and schemes have failed to bridge the gap between the need and opportunities of women entrepreneurs. The government since the last decade have devised number of policies and implemented enterprise promotion schemes particularly in the food sector such as PMEGP, PMFME, AIF yet the benefits of the same have failed to reach the potential and aspiring entrepreneurs.

Barriers in accessing markets:

Marketing and Branding strategies plays a significant role in the growth of any enterprise. Without proper marketing avenues, the businesses fail to find consumers leading to business loss and increase in financial liability. During the present study, the respondents were asked to mention their marketing strategies. The following table highlights their responses:

Table 4

Marketing Strategies

Sl. No.	Marketing Strategies	No. of Respondents (Frequency)
1	Asrlms	16
2	No specific strategies	32
3	Social media	6
4	Through family and friends	14
	Grand Total	**68**

Table 4 highlights that a lion's share of the women entrepreneurs does not have any specific strategies to market their products. Considering the importance of marketing in business, the statistics is very concerning. The respondents also stated how they are reaching their consumers only with the help of the ASRLMS and there was no other means available. Those who have devised some form of marketing strategies, it was found traditional and mostly orthodox. It was further found that most of the respondents did not have any specific strategy to reach consumers, some relied on the family and friends, and only 6 respondents were actually aware that they can use social media as a platform to market their products apart from the selling the products through friends and family or with the help of the 'Asomi' brand of Assam State Rural Livelihood Mission (ASRLM). Many entrepreneurs are discovering that they're producing similar products, which ultimately splits the existing

consumer base. Because they often have comparable market reach, their businesses aren't experiencing significant growth and have remained stagnant for quite some time.

Societal Expectations

Sonwane (2018) in her research stated, "Society puts pressure on women to feel guilty if they succeed, as if success has come by overlooking family". This statement is still relevant at this day and age. While conducting the survey most of the respondents pointed out that there is certain untold barrier of fulfilling their duties as a mother, wife, daughter in law, a daughter and the list goes on. It was because they are conditioned or the society is conditioned in such a way to understand and believe that the first priority of a woman, especially who are married, is to take care of the home and family. This can be clearly seen in the data provided in table 5, wherein household chores are one of the major obstacles for which they were not able to devote required amount of time towards their businesses.

Table 5

Obstacles Faced by Women Entrepreneurs

Sl. No.	Obstacles Faced by Women Entrepreneurs	Number of Respondents (Frequency)
1	Common Products	12
2	Lack of managerial skills	2
3	Lack of support from family	2
4	Lack of technical know-how	2
5	Lack of time owing to household chores	15
6	Limited market opportunities	3
7	Household Chores	24
8	Price of Products	8
	Grand Total	**68**

Opportunities for Micro Food Processing Enterprise

In the current scenario, Government Schemes, policies, programmes etc. are designed to cater the financial need of the micro enterprises that is believed to curtail the capital constraint and facilitate sustainable growth as well as uplift entrepreneurship. These schemes have become the harbinger of newer opportunities encouraging self-reliance. A few of these are discussed below:

- Pradhan Mantri Formalization of Micro Enterprise (PMFME) is a scheme implemented by the Ministry of Food Processing Industry (MoFPI) in relation to promote formalization and growth within the micro food processing enterprises. The salient features of the scheme are credit linked subsidy, seed capital for Self-Help Groups (SHG), capacity building, branding and marketing to name a few. They have also come up with incubation centers to provide training and skill upgradation so that the entrepreneurs can delve into deeper know how of the technicalities.
- Prime Minister's Employment Generation Programme (PMEGP), Credit Guarantee Trust fund for Micro and Small Enterprise (CGTSME), Interest Subsidy Eligibility Certificate (ISEC) are the programmes developed by the Ministry of Micro Small and Medium Enterprise. These schemes are made to provide financial aid to entrepreneurs in the micro and small enterprise as well as to medium scale enterprise. However, these schemes are not limited to food processing sector.
- Swami Vivekananda Assam Youth Empowerment Scheme (SVAYEM) was introduced to provide financial support to the youth of Assam income enhancement to traditional artisans ensuring sustainable growth. Its prime objective was to generate employment opportunities by helping set up new ventures and grow the existing ones.

- Chief minister's Atma Nirbhar Asom Abhijan is a visionary initiative to inspire and enable unemployed youth to become self-dependent. The initiative includes training programs, financial aid as well as market access to meet the goal of required resources, supervision and sustenance in this vision.

In addition to the schemes and policies SHGs are playing a crucial role in the life of an women entrepreneur through aspects that are personal as well as professional. A study done by Dhekale (2016) reflected that the involvement of SHGs has enabled women to gain greater control over material possession, intellectual resources and decision making in a home, community, society and so on.

We are of no stranger to the influence of social media. It is one of the biggest and most effective tools, as it helps reach a larger number of people in a short duration of time. Adhering to such platforms can definitely help the entrepreneurs reach their target customers. In this study, respondents who used social media to reach their customers have seen better financial jump.

It is evident that the government has devised a number of schemes such as PMFME, PMEGP, AIF, CGTMSE etc. are implemented by the government to foster growth of micro food processing entrepreneurs. However, owing to lack of awareness, lack of support from financial institutions and minimal involvement of key stakeholders such as line departments, NGOs and public representatives the reach of the schemes is still limited amongst the mass population. There is a need of targeted interventions and training programs aimed at enhancing marketing and branding skills for women entrepreneurs. Initiatives that provide guidance on engaging with machine vendors and optimizing raw material sourcing can also contribute to overcoming market access barriers. Collaborative platforms and networking events that facilitate knowledge exchange and skill development in these specific areas can empower women entrepreneurs to navigate market challenges and foster business growth. Along with that, addressing gender bias requires a holistic approach that encompasses awareness, education, and societal transformation, as evidenced by the ongoing strides made by women entrepreneurs in this sector.

Conclusion

Empowering women entrepreneurs in Kamrup (M) district requires a refinement and a collaborative approach. The approach can include continual dynamic awareness campaigns aiming to tackle the hurdles in accessing the existing government initiatives. Further awareness of societal stereotypes and highlighting the contributions of women entrepreneurs can create a more supportive ecosystem so the women entrepreneurs can raise the bar of their success benchmark. Initiating mentorship programs focusing on connecting experienced entrepreneurs with aspiring women can also provide valuable guidance and support particularly in the marketing and branding aspect. Collaborative efforts involving government bodies, non-governmental organizations (NGOs), and the private sector can further amplify the impact of interventions through resource-sharing and joint initiatives. A continuous and dynamic awareness strategy is to be calculated by the government to enhance these enterprises financially, technically and all other aspects. This study particularly reflected how the respondents are self-induced to run their business even with very little help and fundamental knowledge to manage and operate. However, in absence of an eco-system that supports women entrepreneurs, achieving sustainable development and advance sustainable development goals will be very challenging. To create an equitable and inclusive economic scenario, it is imperative to identify the limiting factors that hinder women from accessing resources and opportunities particularly in the food processing sector. To ensure sustainable economic growth and realization of SDGs such as gender equality, decent work, reduced inequality, rooted societal must be entrenched and a culture of gender equality within the entrepreneurial sector must be promoted. In order to facilitate social progress and inclusive development, women need to be empowered in the micro food processing sector in a way that goes beyond mere economic empowerment and all tools, opportunities and resources must be aligned to make them more vibrant, resilient and successful.

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