SUSTAINABLE SUPPLY CHAIN MANAGEMENT FOR EVS IN INDIA

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ABSTRACT
India is grappling with a significant surge in the number of automobiles, resulting in a considerable increase in harmful gas emissions. To address this issue, there is a growing inclination towards replacing conventional fossil-fueled motorcycles and vehicles with electric alternatives, particularly electric vehicles (EVs) that utilise sustainable resources like battery exchange systems and power charging stations. However, the progress of EV adoption in India has been relatively limited. To tackle this challenge effectively, it is crucial to develop sustainable supply chains that encompass economic, social, and environmental considerations. The research will entail a thorough analysis of existing literature, case studies, and industry reports focused on the supply chain of electric vehicle components, with specific emphasis on battery exchange systems and electric motors. It will critically examine the current challenges faced by the supply chain in India, including issues related to production, distribution, and end-of-life disposal of batteries. By understanding these challenges, the study aims to identify potential solutions and best practices from around the world that can be adapted to the Indian context. Based on a comprehensive analysis of the literature, this review aims to propose a practical and sustainable supply chain plan for electric vehicles in India. The plan will encompass recommendations for improving the production and distribution of battery exchange systems and electric motors, optimising logistics and transportation, enhancing battery recycling and disposal processes, and fostering collaboration among stakeholders in the supply chain.
Keywords: EVs, Sustainable supply chain, Triple Bottom Line, swap battery,

Introduction

India boasts the world's third-largest road network, and road travel remains a popular choice for the majority, with around sixty percent of the population relying on private or shared vehicles. However, conventional vehicles contribute significantly to climate change and air pollution. Diesel vehicles, in particular, have a severe impact on air quality compared to their gasoline counterparts. To address this issue, the government has implemented financial measures such as road tolls to discourage the use of more polluting vehicles. Additionally, green taxation policies and vehicle re-registration regulations have been put in place to encourage individuals to shift from polluting vehicles to environmentally friendly alternatives. The recent increase in oil prices has further incentivized consumers to opt for lighter and more fuel-efficient vehicles. India's "FAME" (Faster Adoption and Manufacturing of Electric Vehicles) scheme has been instrumental in promoting the production and infrastructure development of electric and hybrid vehicles. Launched in 2015, the scheme provides financial incentives to support the growth of electric mobility. The National Electric Mobility Mission Plan (NEMMP) in 2020 has also provided a vision and roadmap for the accelerated adoption and production of EVs. The plan aims to enhance energy security, provide sustainable and eco-friendly transportation, and boost the Indian automotive industry's global competitiveness.

The Indian automotive sector is dominated by motorcycles, three-wheelers, and four-wheelers, which play a crucial role in last-mile mobility. With vehicle ownership at a low rate of 22 vehicles per thousand people, motorcycle ownership in India is among the highest in the world. Although electric vehicles currently represent less than one percent of total vehicle sales, the EV market is growing rapidly and is projected to be valued at approximately INR 475 billion by 2025. Within this market, motorcycles hold the largest share at 62 percent, followed by three-wheelers and four-wheelers at 37 percent. The Indian EV market varies significantly by state, influenced by factors such as demographics, income levels, regulatory landscapes, and urbanisation. For instance, Uttar Pradesh (UP), with a lower urbanisation rate, has experienced significant adoption of electric motorcycles. Conversely, Maharashtra, with a higher urbanisation rate, has the highest penetration of electric

three-wheelers and passenger vehicles. India boasts the world's third-largest road network, and road travel remains a popular choice for the majority, with around sixty percent of the population relying on private or shared vehicles. However, conventional vehicles contribute significantly to climate change and air pollution. Diesel vehicles, in particular, have a severe impact on air quality compared to their gasoline counterparts. To address this issue, the government has implemented financial measures such as road tolls to discourage the use of more polluting vehicles. Additionally, green taxation policies and vehicle re-registration regulations have been put in place to encourage individuals to shift from polluting vehicles to environmentally friendly alternatives. The recent increase in oil prices has further incentivized consumers to opt for lighter and more fuel-efficient vehicles.

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As the Indian government continues to focus on promoting electric mobility through policies and incentives, the EV market is expected to witness significant growth in the coming years. The availability of charging infrastructure, affordability of electric vehicles, and consumer awareness are key factors that will shape the future of electric mobility in India. With concerted efforts towards developing a sustainable supply chain for key components like battery exchange systems and electric motors, India can overcome the challenges and limitations hindering the widespread adoption of EVs. This, in turn, will contribute to reducing air pollution, dependency on fossil fuels, and greenhouse gas emissions, paving the way for a cleaner and more sustainable transportation system in the country.

Sustainable Supply Chain Management (SSCM) refers to the integration of environmental, social, and economic considerations into the design, planning, execution, and monitoring of supply chain activities. It aims to minimise negative environmental and social impacts while maximising economic value throughout the supply chain. In the context of Electric Vehicles (EVs) in India, SSCM plays a crucial role in ensuring the availability of electric motors and batteries to consumers through an optimised and sustainable supply chain. The conceptual background of SSCM for EVs in India revolves around three key dimensions: environmental sustainability, social responsibility, and economic viability. Environmental sustainability: The adoption of EVs is primarily driven by their potential to reduce greenhouse gas emissions and mitigate climate change. However, the environmental sustainability of EVs goes beyond their operational benefits. It also encompasses the sustainability of the supply chain itself. This includes minimising the carbon footprint associated with the production, distribution, and disposal of EV components, such as batteries and electric motors. Key considerations include using energy-efficient manufacturing processes, optimising transportation routes to reduce emissions, and implementing effective end-of-life disposal and recycling mechanisms for EV batteries.

Social responsibility: SSCM for EVs in India must address social considerations to ensure fair and ethical practices throughout the supply chain. This includes promoting worker safety and well-being in the manufacturing and assembly processes, ensuring fair labour practices, and supporting local communities. Additionally, SSCM should focus on fostering inclusive growth by promoting job creation, skill development, and supplier diversity within the EV supply chain. This dimension also involves ensuring affordability and accessibility of EVs to different sections of the society, including low-income populations. Economic viability: While environmental and social considerations are critical, SSCM for EVs in India must also be economically viable to ensure the long-term sustainability of the supply chain. This involves optimising costs, improving operational efficiency, and reducing waste throughout the supply chain. It also includes considering the economic impact on various stakeholders, such as manufacturers, suppliers, and consumers. An economically viable SSCM for EVs aims to create a competitive advantage for Indian manufacturers, promote job creation,

and drive economic growth in the automotive sector. Overall, the conceptual background of SSCM for EVs in India emphasises the need to balance environmental sustainability, social responsibility, and economic viability. It recognizes the importance of developing an optimised and sustainable supply chain for key components like battery exchange systems and electric motors, taking into account the unique challenges and opportunities in the Indian context. By integrating these dimensions into the supply chain planning and execution, SSCM can accelerate the widespread adoption of EVs in India and contribute to a cleaner, more sustainable, and inclusive transportation system.

Literature Review

Ajzen's (1991) the Theory of Planned Behaviour (TPB) provides insights into the factors that influence individuals' intentions and behaviours, taking into account their knowledge and experiences. Consequently, even after addressing technical issues, there may still be significant challenges in altering consumer behaviours towards electric vehicles (EVs).Hale et al.,(2002) The theory demonstrates its relevance in explaining environmentally conscious purchasing decisions. Nevertheless, its effectiveness may be limited when it comes to understanding behaviours that have a significant irrational component. Swenson (2007) established an organised supply chain by implementing rational execution.

Carter and Rogers (2008) developed a framework for sustainable supply chain management (SSCM) practices and established prerequisites for their implementation, supported by relevant case studies. Additionally, a study conducted by Carter and Rogers in 2008 examined the barriers faced in implementing resilient supply chain practices within organisations. The findings of this study highlighted that the lack of dedicated management time is a major obstacle to SCCM implementation in India, surpassing the financial resources of the organisation. Pettit (2010) supply chains experience continuous disruptions and unpredictable disturbances, particularly for enterprises with complex organisational infrastructure.

Carvalho (2012) the implementation of supply chain (SC) practices in enterprises has a direct impact on daily operations, increasing frequency, stability, and commitments. A flexible supply chain is crucial for enterprises to effectively respond, mitigate vulnerabilities, and minimise the impact of negative disruptions within the organization.Egbue & Long (2012), electric vehicles (EVs) face challenges in addressing technological issues and addressing consumer behavior concerns.

Berveling & van de Riet (2012), car purchases can often stem from irrational choices, even though they may seem rational based on physical and economic needs. In fact, the decision to buy a car can sometimes be driven by status-related factors. This makes the topic globally significant, prompting various authors to conduct literature reviews on electric vehicles (EVs) in order to consolidate and systematise knowledge in this area. Beske (2014) the field of sustainable and resilient supply chain management has witnessed significant growth in the number of research studies conducted.Gil,Taiber (2014) the objective of this study is to explore potential future scenarios for vehicle charging by collecting data on dynamic wireless charging systems, aiming to overcome the significant barrier posed by stationary charging stations for consumers. Given the diverse range of perspectives covered by academics and the fragmented nature of existing knowledge, conducting a literature review is crucial in bridging identified strands and systematising the flow of knowledge in this field.

Markman, Krause (2016), economic practices within an organisation should adhere to two interconnected principles: enhancing the vitality of the economy, regulations, and environmental well-being of the organisation, while also considering multiple factors such as the environment, society, and economy in a holistic manner. Zailani (2017) in India, the automotive industry is confronted with numerous challenges due to the increasing awareness about climate change, globalisation, and modernization. These factors have prompted several critical questions in the Indian automotive sector, including: How can specific automotive companies transform their supply chain management into a sustainable one? How can the automotive industry maintain a competitive market position while ensuring the preservation of the environment and social aspects within the country? What strategies can be adopted to achieve digital transformation and enhance environmental and social performance? What effective approaches should specific automotive enterprises adopt to navigate market trends driven by foreign investors in the Indian automotive sector?

Liao et al. (2017) a study conducted on private consumer intentions analysed the factors influencing the purchase of electric vehicles (EVs), revealing a strong connection to demographic and psychological variables. The study specifically examined the impact of mobility conditions and public policies related to EVs.Adnan et al., (2017) the study places explicit emphasis on the consumer's role and does not impose geographical market limitations. Additionally, it presents a comprehensive analysis by gathering up-to-date information that previous authors have not covered, offering an advanced perspective in the research area.

Globisch et al. (2019) the primary focus of this study is to examine the economic and psychological factors that shape consumers' perspectives on public charging infrastructure for electric vehicles (EVs). The research findings shed light on a significant barrier hindering the widespread adoption of EVs, which is the limited accessibility of public charging stations. The study reveals that a considerable portion of potential users are hesitant to bear the costs of infrastructure deployment due to the perception that the benefits do not outweigh the high expenses involved. Axsen,Sovacool, 2019 this study provides a comprehensive and holistic perspective on the topic, going beyond previous literature reviews by expanding the sample size. By doing so, it offers a more robust and encompassing understanding of the subject matter. Shetty et al., (2020) mapping the critical factors that influence purchasing attitudes towards electric vehicles (EVs) and understanding their public perception is crucial. This study serves as a bridge, filling the gap identified in existing research and connecting the dots between these factors.

Significance of Study

India's EV market is one of the fastest-growing sectors globally. However, despite consumers showing an inclination towards EVs, there is still a significant reluctance to adopt them. In order to understand the reasons behind this consumer behavior, we conducted a comprehensive analysis by examining previous studies, drawing conclusions from our own insights, and exploring relevant literature. By identifying and categorising the obstacles that consumers face, we aim to contribute to the existing body of knowledge and provide recommendations to policymakers for addressing research gaps in sustainable supply chain management for EV consumers. These obstacles can be broadly classified into two groups: demand-side barriers and supply-side barriers within the EV supply chain.

Objectives of the Study

To find out the status of Electric Vehicles (EVs) supply chain management in the Indian market.
To find out challenges in establishment of sustainable supply chain management for E- Vehicles in country

Research methodology

The research takes an exploratory approach to comprehensively analyse multiple facets of electric vehicles (EVs) in India. A qualitative research methodology is utilised to conduct the study, enabling a deep and insightful examination of the subject matter. The research relies on secondary sources gathered from diverse resource hubs to ensure a robust foundation. These secondary sources encompass a range of materials, such as official literature, company websites, research reports available on government sites, and other relevant and reputable sources. By drawing upon these secondary sources, the research aims to gather comprehensive and reliable information to support its findings and conclusions. This approach allows for a thorough exploration of the current state, challenges, and potential solutions pertaining to EVs in India, contributing to a well-informed and evidence-based study.

Secondary Data Analysis

A robust and collaborative supply chain with a validated supplier network is crucial for managing risks effectively. Despite the growing demand for electric vehicles (EVs) in the Indian automobile market, the reliability of the EV supply chain remains questionable. Inconsistencies in supply and demand can undermine market sentiment and erode customer confidence. Initiatives such as Atmanirbhar Bharat (Self-Reliant India) and Make in India are driving the localization of the supply chain, helping the EV industry reduce its dependence on imports. The various components of EVs, such as batteries, chassis, motors, BMS, and power electronics, can be categorised into five to six groups. Among these, battery cells, motors, and power electronics account for a significant portion of the total cost of electric vehicles. However, the level of localization for these components remains relatively low. Battery supply, whether for electric motorcycles or three-wheelers, continues to be a critical aspect of the supply chain. Some of the major challenges impacting the electric vehicle supply chain include lithium scarcity, inadequate research and development (R&D), and technical disruptions. Therefore, it would be beneficial for India's electric vehicle supply chain ecosystem to take steps such as increasing investments in cordless R&D. For instance, notable research has recently been conducted by organisations like ISRO and DRDO in their laboratories, showcasing promising advancements.

Collaborative developments in the Sustainable supply chain

Collaborative efforts in the sustainable supply chain are driving India's initiative to achieve a more environmentally friendly supply chain. Logistics companies are proactively taking measures to reduce carbon emissions, aligning with the country's goal of achieving net-zero emissions across all sectors. To minimise fuel waste and emissions, India is implementing GPS-based toll payments at numerous tollhouses nationwide-commerce organisations are committed to utilising electric vehicles for 30% of their shipments. The government is focused on decarbonizing the transportation sector, aiming for 30% electric passenger vehicles, 70% electric

commercial vehicles, and 80% electric motorcycles and three-wheelers by 2030. The country has also made significant progress in rooftop solar installations, increasing its rooftop solar capacity to 1.3 GW in the first nine months of 2021, marking a 202% growth compared to the same period in 2020.

In promoting LNG as an alternative fuel that is cheaper and emits fewer emissions, the government plans to establish 1,000 LNG gas stations over the next three years. Urbanisation poses a challenge for the automotive industry as people have access to alternative transportation options such as rentals and ride-sharing services like Ola and Uber. Limited parking spaces in major cities have also led to delays in car purchases. The cost of buying an electric vehicle, particularly the recurring expense of battery replacements, remains a barrier to widespread adoption, especially in cost-sensitive countries like India. To overcome these challenges, EV manufacturers must collaborate with the government to develop affordable solutions. Additionally, concerns about the cost, technical aspects, and availability of charging stations hinder the adoption of EVs. While the government has introduced various incentives, the substantial upfront costs associated with infrastructure implementation need to be addressed and shared by automotive industry stakeholders.

Sustainability Practices practiced by Indian Companies

How are Indian corporations taking sustainability?

Across areas, organisations are increasingly assessing their natural effect. Different Indian medication organisation is "coaching" their colleagues and sellers concerning following property rehearses in securing and give chain. Various Indian aggregate purposes Elemental synthetic component Free (ECF) innovation, gas dying, energy and water the executives' procedures in its assembling, that has permitted it to scale back its reliance on petroleum products. New age development organisations are rehearsing "Decrease, Recycle and Reuse," which has empowered them to procure uncountable liters of water. they have accomplished a markdown of six percent in water utilisation and various other of their grounds have seen zero waste release sectors, businesses are more and more evaluating their environmental impact. Various Indian drug companies are "mentoring" their business partners and vendors concerning following property practices in acquisition and provide chain.

Challenges related to EV

Manufacturing challenges: Cumulative demand for batteries in India is estimated to be around 900-1100GWh by 2020-30. However, there are concerns that India does not have a battery manufacturing base and will rely solely on importations to encounter increasing demand. According to official statistics, our country brought in more than one billion dollars in lithium-ion batteries in two thousand twenty-one, but the spread of e-automobiles & storage of batteries in the energy segment is negligible. (Source: Drishti IAS.) www.drishtiias.com

Client's concern issues: In two thousand eighteen, it was stated that there were only six fifty Inducting stations in India. This is significantly less than neighboring charging stations that previously had more than five million indicting stations. Due to the absence of indicting stations, it is inappropriate for consumers to cover long distances.In addition, when using a personal slow charger for light work, it can take up to 12 hours to fully charge the vehicle at the owner's home. The price of a rudimentary e-vehicle is much more advanced than the typical price of a vehicle in succession on traditional fuel. Strategy Trial: EV manufacturing is an investment rigorous sector and requires long standing preparation to generate profits at the break-even point. Unskilled human resources: In the country, there is a technical shortage in manufacture of electronic devices that form mainstay of EV manufacturing, example batteries, semiconductor device & regulators. EV maintenance costs are high and higher level skills. India does not have a devoted coaching course for such skill development.Lack of availability of raw material for production within the country: Batteries are one of the most important components of electric vehicles. India doesn't have the known assets of lithium cobalt needed to produce batteries. Reliance on other nations for import of lithium-ion batteries is a barrier to complete independence in the battery manufacturing industry.

Strategies for Mitigating the Ecological Footprint of India's Rapidly Growing EV Value Chain

As India's electric vehicle (EV) value chain experiences rapid growth, it is crucial to address the associated ecological footprint. By implementing the following strategies, India can effectively counter the environmental impact and foster a sustainable EV ecosystem: Renewable Energy Transition: Transitioning the energy generation mix towards renewable sources is key to reducing the ecological footprint of EVs. India should prioritize expanding renewable energy capacity, such as solar and wind power, to power EV charging stations and manufacturing facilities. This would minimize reliance on fossil fuels and decrease greenhouse gas emissions associated with the EV value chain. Sustainable Materials and Battery Recycling: Promoting the use of sustainable materials in EV production can significantly reduce the ecological impact. India should encourage

manufacturers to adopt eco-friendly materials, such as recycled metals and low-carbon composites, while ensuring their availability at competitive prices. Additionally, establishing robust battery recycling infrastructure will help minimize the environmental impact of spent EV batteries, enabling their proper disposal or repurposing.

Efficient Supply Chain Management: Optimizing the supply chain is vital to reducing the ecological footprint of the EV value chain. India should focus on minimizing transportation distances, streamlining logistics, and adopting efficient inventory management systems. This approach can help reduce energy consumption and emissions associated with the transportation and storage of EV components and finished products.Supporting Public Transportation and Shared Mobility: Encouraging the use of public transportation and shared mobility services, especially electric ones, can have a substantial positive impact on reducing the ecological footprint. India should invest in the development of electric buses, taxis, and ride-sharing programs to promote sustainable mobility options. This would not only decrease individual vehicle ownership but also alleviate traffic congestion and associated environmental issues.Awareness and Education: Creating awareness and educating the public about the environmental benefits of EVs can drive widespread adoption and reduce the ecological footprint. India should launch information campaigns to highlight the advantages of EVs, including lower emissions and improved air quality. This can be done through various channels, such as media, educational institutions, and community outreach programs. Policy Incentives and Regulations: Implementing effective policy incentives and regulations can play a crucial role in countering the ecological footprint of the EV value chain. India should consider providing financial incentives for EV manufacturing and charging infrastructure development while imposing strict emissions standards for vehicles. Additionally, incorporating carbon pricing mechanisms can encourage EV adoption and incentivize manufacturers to reduce emissions throughout the value chain. Research and Development: Investing in research and development (R&D) efforts focused on sustainable technologies and processes can lead to innovative solutions for reducing the ecological footprint of the EV value chain. India should allocate resources to support R&D initiatives that aim to enhance battery technology, improve energy storage systems, and optimize manufacturing processes to minimize environmental impact. By implementing these strategies, India can effectively counter the ecological footprint associated with the rapidly growing EV value chain. Emphasizing sustainability, renewable energy adoption, and public awareness will contribute to building a greener and more sustainable transportation ecosystem.

How India can counter the ecological footprint of the rapidly growing EV value chain

India is currently grappling with a grave issue of pollution, particularly in New Delhi, which has been labeled as the world's most polluted city. The detrimental effects of air pollution are evident, with an alarming annual death toll of 2 million people nationwide. Research conducted by the Centre for Science and Environment, a New Delhi-based advocacy group, reveals that more than half of the particulate pollutants in the air stem from emissions originating from two-, three-, and four-wheeled vehicles. This pressing situation has necessitated the pursuit of cleaner transportation alternatives, leading to the emergence of battery-powered Electric Vehicles (EVs) as a primary solution to this crisis. EVs are renowned for their cleanliness, as they produce zero "tailpipe" emissions, thereby presenting a promising avenue for transforming mobility and mitigating the detrimental environmental impact of transportation. Recognizing the urgency of the situation, the Indian government has recently implemented progressive policies such as the Faster Adoption and Manufacturing of Hybrid and Electric Vehicles (FAME II) initiative. This policy aims to encourage the widespread adoption of EVs. As a result, investor confidence has soared, prompting a surge of start-ups operating in the electric mobility sector. These collective efforts are reshaping India's transportation landscape. Arthur D. Little (ADL), a prominent global management consultancy, has projected remarkable growth for India's EV industry, estimating sales of over 10 million units by 2030. ADL further predicts that EV adoption will surpass 30% across various vehicle classes, including two- and three-wheelers. In fact, by 2030, India is anticipated to be one of the top 10 EV markets worldwide. These developments mark a significant stride towards India's ambitious goal of achieving net-zero emissions by 2070.

In response to the growing demand for Electric Vehicles (EVs), India is taking strategic steps to establish a self-sufficient EV value chain within the country. This move aims to reduce reliance on imports, particularly in battery manufacturing, which is a critical component of EVs. Creating such infrastructure is crucial because dependence on imports exposes India to geopolitical risks, as the production capabilities and resources for batteries and e-motors are concentrated in a few select countries.In 2021, India made a significant discovery of its first lithium reserve, totaling 1,600 tons, in Karnataka. Subsequently, the government announced plans to establish a lithium refinery in Gujarat for processing battery-grade materials. Additionally, the country possesses substantial reserves of manganese and graphite, which are essential elements in battery production.

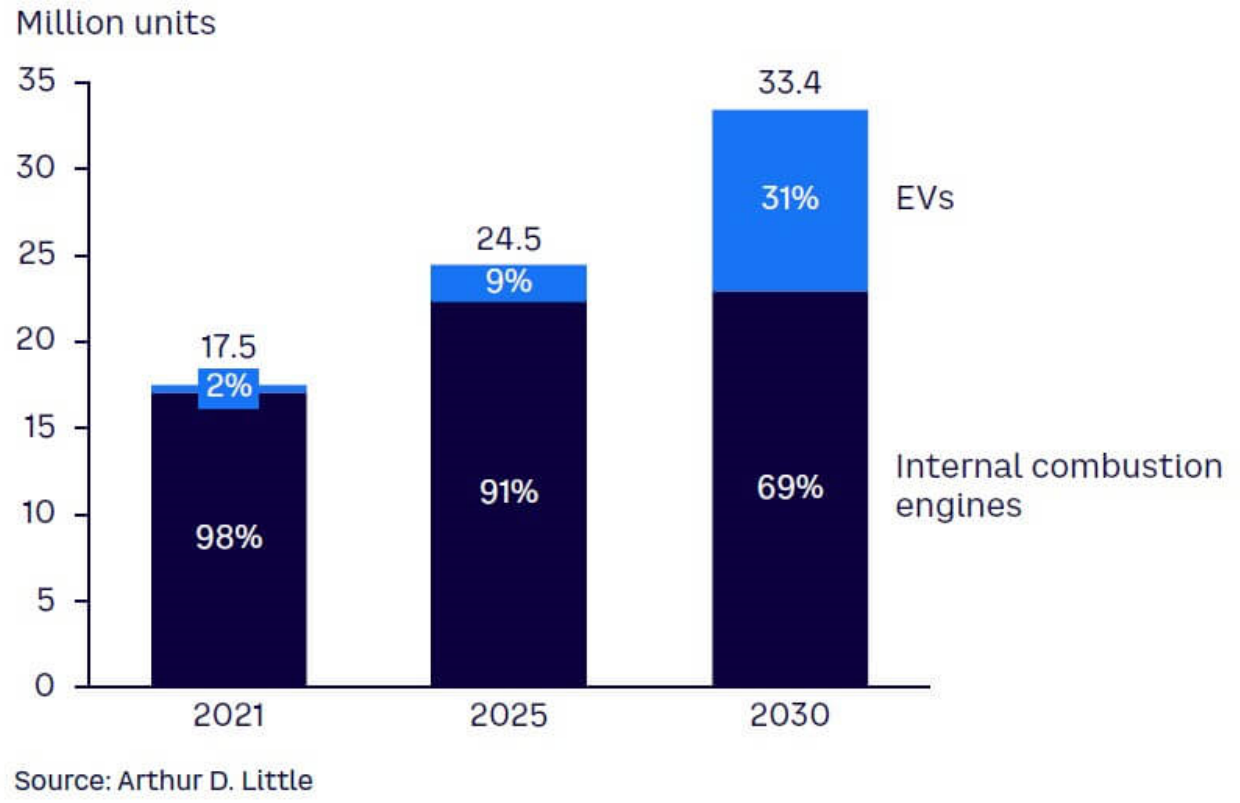

Figure 1. India's vehicle sales mix, 2021–2030

To promote the domestic manufacturing of electric vehicle (EV) batteries, the Indian government implemented the production-linked scheme (PLI) in May 2021, specifically targeting advanced chemistry cell (ACC) battery storage manufacturing. Various players, ranging from small companies like Allox to major entities like Mahindra and Ola, are already involved in establishing their battery manufacturing facilities from the ground up. Currently, the battery value chain in India primarily starts at the module and pack integration level, which offers an accessible entry point into the battery business. The EV manufacturing sector in India is well-established, with multiple incumbent Original Equipment Manufacturers (OEMs) and new entrants, particularly in the thriving electric two-wheeler market. According to Financial Express, Tata leads the market in electric passenger cars, facing competition from MG, Hyundai, and Mahindra. India is also focusing on expanding its capacity for battery recycling to ensure end-of-life sustainability.

As India advances toward electric mobility and develops its EV value chain, it is crucial to establish a strong and sustainable foundation. Other countries that have made significant progress in the EV sector have encountered environmental and social concerns associated with the entire EV value chain. Issues such as long-lasting ecological damage caused by pollution, inadequate waste management, and human rights concerns, including child labor, have highlighted the risks associated with irresponsible production of clean vehicles. In India's pursuit of electric mobility, prioritizing sustainability from the outset is crucial to prevent irreversible harm to the environment and society.Source: Maitra, B. C. (2023, January 1). Toward a sustainable value chain for electric vehicles in India | Arthur D. Little. https://www.adlittle.com/en/insights/viewpoints/toward-sustainable-value-chain-electric-vehicles-india

Findings

- Government and private forms are taking various initiatives for the sustainable development of EV systems in India. Researchers have found a few of them as written below.
- These are eco-accommodating stockrooms that utilise the board frameworks for better use of energy. With the blend of clocks, indoor regulators and checks for all types of power, gas, intensity and water, energy the board frameworks support the prescribed procedures of utilisation without unreasonable wastage. Stockrooms additionally use telemetric programming to help in controlling fuel costs, permitting organisations to utilise less fuel and slice fuel costs.
- The utilisation of electric vehicles (EVs) is a significant innovation in supportable advancement as it prompts lower ozone harming substance outflows with lesser air contamination. The worldwide electric truck

market, for example, is supposed to arrive at USD1,893.1 million by 2027.3 Much of this development is because of operations organisations subbing their current armada with greener vehicles. Besides trucks, electric bikes, three-wheelers and light business vehicles will likewise ascend.

- With rising natural worries, acquisition experts ought to be urged to rehearse green obtaining — the obtaining or buying of materials and parts, which have eco-accommodating attributes, like reusability, recyclability and nonuse of risky/hazardous synthetic substances. A prestigious operations organisation has more than once reclassified itself according to a maintainability viewpoint; from presenting the business' most memorable carbon impartial inventory network administration to turning into the principal strategies organisation to focus on a zero-emanations target.
- Further, digitization & robotization ought to add to natural manageability by upgrading asset and data effectiveness with the utilisation of Industry 4.0 innovations all through the item lifecycle. This would diminish humble, dreary assignments and empower profound perceivability into the inventory network where organisations could survey the supportability practices of their providers and sellers.

Conclusion

EV supply chain is a complicated gadget of producers and generation providers, where innumerous gamers are interrelated with every difference in multifaceted selection making. It is a vital catalyst of the Indian economy, contributing 6.4% of GDP, around 35% of producing GDP, and without delay helping over 8 million jobs (OEMs, suppliers, and dealers) and doubtlessly 30 million greater within the fee chain. The companies need to pay attention to their delivery chain, as that is a vital determinant of competitiveness. While lots of studies have been performed at the demanding situations within the EV delivery chain, it has to additionally be referred to that more recent demanding situations emerge and more recent technology are created in this area on a day by day basis, growing the opportunity of delivery chain community improvement. Catalysts for the adoption of electric vehicles in the country are the strengthening of the supply chain, the development of electric vehicle procurement, sales and testing groups. In addition, it is equally important to address customer concerns, raise awareness of EV technologies, attract a larger customer base and improve charging infrastructure through public-private partnerships.

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