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Building Regional Supply Chain Resilience in The EV Industry: The Case of India's Kanpur EV Manufacturing Park

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Abstract
The electric vehicle (EV) industry globally faces frequent supply chain disruptions due to raw material shortages, geopolitical tensions, and heavy reliance on imported components. In response, regional manufacturing clusters are emerging as effective strategies to enhance supply chain resilience. India's Kanpur EV Manufacturing Park, with an investment of ₹700 crore[1], exemplifies this approach by integrating EV component production, dedicated SME clusters, and strategic logistics infrastructure linked to India's Dedicated Freight Corridor (DFC). Using a qualitative analysis based entirely on secondary data sources, including industry reports, government publications, and reputable academic analyses, this paper evaluates the structural design, resilience strategies, and expected outcomes of the Kanpur initiative. It also briefly compares similar EV supply chain developments in Saudi Arabia and the UAE to underline shared strategic approaches. The findings indicate regionalized manufacturing ecosystems significantly mitigate supply chain vulnerabilities, reduce external dependencies, and stimulate local economic growth. This paper concludes by highlighting best practices applicable to other regions aiming for enhanced EV industry resilience.
Keywords: *Electric Vehicles, Supply Chain Resilience, Regional Manufacturing, Kanpur EV Park, Strategic Sourcing.*

1. Introduction
The global shift toward electric vehicles (EVs) is accelerating rapidly, driven by governmental policies, environmental concerns, and consumer preferences for sustainable transportation. However, this rapid growth simultaneously exposes significant vulnerabilities within the global EV supply chain. Key risks include severe shortages of essential components such as lithium-ion batteries, rare-earth materials, and semiconductors. These risks are further exacerbated by geopolitical tensions, dependency on concentrated global supply sources, and logistical complexities. Consequently, resilience strategies, including the establishment of regional manufacturing hubs, have become a critical priority worldwide. The recent establishment of India's Kanpur EV Manufacturing Park exemplifies this strategy, aiming to create a localized, resilient EV supply chain infrastructure.

1.1. Global Supply Chain Disruptions in the EV Industry
Supply chain disruptions have become frequent and costly occurrences within the global EV industry. Semiconductors, essential for EV control systems[2], faced significant shortages starting from 2021, triggered by heightened demand across multiple industries and exacerbated by the COVID-19 pandemic (McKinsey, 2023). Similarly, critical battery materials such as lithium, cobalt, and nickel are concentrated in politically unstable regions, leading to periodic supply uncertainties and price fluctuations[3] (Bain & Company, 2023). The geopolitical rivalry, notably between the U.S. and China, introduces trade restrictions and export bans that severely affect global sourcing strategies. For example, China's export controls[5] on rare-earth minerals have repeatedly strained international supply chains, causing production delays and increased costs for global EV manufacturers (Reuters,2025). Such repeated disruptions underscore the urgent necessity of restructuring

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supply chains to enhance their resilience and stability through regional manufacturing and sourcing strategies.

1.2. Emergence and Importance of Regional EV Manufacturing Clusters

In response to persistent global supply chain vulnerabilities, regional EV manufacturing clusters have emerged as strategic responses globally. These clusters, by definition, are geographically concentrated manufacturing hubs that integrate multiple suppliers, manufacturers, research facilities, and logistics infrastructure. Countries like India, Saudi Arabia, and the UAE are increasingly adopting this regionalized strategy to mitigate external dependencies and enhance operational resilience[6][7][8]. Regional manufacturing clusters offer substantial advantages, including reduced lead times, improved logistics efficiency, economies of scale, and better control over supply chain variables. India's Kanpur EV Manufacturing Park specifically reflects this approach by establishing an integrated ecosystem comprising EV component manufacturers, battery production facilities, and logistics support infrastructure. Moreover, these clusters significantly contribute to regional economic growth, technological innovation, and employment creation, thus making them vital strategic tools for sustainable industrial development and supply chain stability.

2. Method

The paper employs a qualitative research method entirely based on secondary data. A systematic approach was followed to collect, analyze, and interpret the available data to ensure accuracy and reliability. The sources include governmental publications, reputable industry reports (McKinsey, Bain), established media outlets, and academic journals.[9][10] Table 1 below provides a concise overview of the key data sources utilized in this research.

3. Results and Discussion

3.1. Kanpur EV Manufacturing Park: Structure and Objectives

The Kanpur EV Manufacturing Park, announced in June 2025 by the Uttar Pradesh government, represents a robust strategy to enhance supply chain resilience for the EV industry. Covering approximately 500 acres, this public-private partnership initiative involves a substantial investment of ₹700 crore aimed explicitly at developing an integrated ecosystem for EV manufacturing[1] (Times of India, 2025).

Table 1 Summary of Secondary Data Sources Used in the Study

Data Source Type	Example Sources	Data Extracted
Official	Indian Ministry of Heavy Industries, Saudi Vision 2030, UAE MOIAT	Policies, incentives, infrastructure details
Industry Reports	McKinsey, Bain, Deloitte	EV trends, strategy insights
Media	Reuters, Times of India, Financial Times	News, investments, updates
Academic	Int. J. of Logistics; Annals of Ops Research	Frameworks, research insights

The park will accommodate manufacturing facilities for electric motors, battery cells, battery packs, chassis, and charging infrastructure, promoting vertical integration across the EV supply chain. Critically, the initiative also features a dedicated research and development center, aimed at promoting indigenous innovation and technological advancement in EV technologies, thereby reducing reliance on imported intellectual property.

3.2. Role of SME Clusters in Enhancing Resilience

Central to the resilience strategy of the Kanpur EV Park is the dedicated Small and Medium Enterprises (SME) cluster. This approach strategically lowers entry barriers for smaller suppliers, encouraging broader participation and diversification of the local supplier base. Such clusters enhance supply chain redundancy and flexibility, key elements of resilience, particularly critical when global disruptions impact single-source suppliers. By enabling SMEs to co-locate with large

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manufacturers, the park is expected to foster significant employment generation and regional economic revitalization, reflecting best practices from established automotive clusters worldwide.

3.3. Strategic Logistic Integration via Dedicated Freight Corridor (DFC)

A unique resilience feature of the Kanpur initiative is its strategic positioning adjacent to India's Dedicated Freight Corridor (DFC). The DFC, a modern high-speed rail freight corridor, significantly improves logistics efficiency, drastically cutting transportation costs and delivery times[4] (DFCCIL, 2024). The Kanpur EV Park's integration with the DFC allows seamless import and export of components and finished vehicles, providing reliable and cost-effective logistics solutions that minimize transit delays, enhance market responsiveness, and significantly reduce the impact of potential global disruptions.

3.4. Comparative Insights from Middle Eastern Initiatives

Comparable strategies for EV supply chain resilience are evident in Middle Eastern initiatives, notably Saudi Arabia and the UAE. Saudi Arabia's ambitious collaboration with Lucid Motors in King Abdullah Economic City (KAEC) exemplifies similar vertical integration strategies, backed by robust government procurement guarantees[5] (Reuters, 2025). Additionally, Saudi investments into battery material refining and battery cell manufacturing reflect strategies aligned with Kanpur's vertical integration objectives. In the UAE, the Al Damani EV factory by M Glory in Dubai Industrial City mirrors India's Kanpur Park by focusing on regional EV manufacturing and advanced logistics integration. Both the Saudi and UAE examples illustrate successful strategies such as international technology partnerships, substantial government support, and leveraging strategic locations to enhance resilience.[8]

Conclusion

The analysis clearly indicates that India's Kanpur EV Manufacturing Park initiative significantly contributes to building regional supply chain resilience. By integrating manufacturing, dedicated SME clusters, strategic logistics via the Dedicated Freight Corridor, and robust policy frameworks, the Kanpur project provides a replicable model to mitigate global disruptions within the EV industry[9]. Comparative insights from similar initiatives in the Middle East further validate the effectiveness of these strategic resilience measures. Governments and industry stakeholders aiming to fortify their EV supply chains should thus consider regionalized manufacturing ecosystems as essential strategic investments[10], shown in Figure 1.

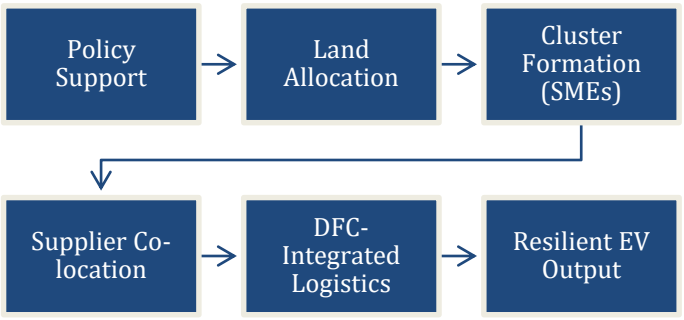

Figure 1 Strategic Flow of Supply Chain Resilience Development at Kanpur EV Manufacturing Park

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