*Proceedings of the 8th International Conference on Economics and Social Sciences (2025), ISSN 2704-6524, pp. 197-210*

**The 8th International Conference on Economics and Social Sciences**
**Exploring Global Perspectives:**
**The Future of Economics and Social Sciences**
**June 5-6, 2025**
**Bucharest University of Economic Studies, Romania**

# Electric Mobility and Organisational Dimensions in Scientific Discourse: Analysing Trends, Themes, and Emerging Perspectives (2000-2025) Through Bibliometric Analysis

Andreea-Dana DEJAN[1]

DOI: 10.24818/ICESS/2025/016

## Abstract

*Given the increasing interest in alternative fuelled vehicles powered by sustainable sources, this study aims to map the evolution of research themes and keyword usage related to electric vehicles (EVs) and electric vehicle recharging infrastructure correlation to policy-related keywords through a bibliometric analysis of scientific publications. Data were retrieved from the Scopus database, and the analysis has examined co-occurrence patterns, temporal trends, and the thematic clusters to understand how academic literature has evolved from 2000 to 2025 around the concepts of electric mobility. In addition to thematic mapping, the study highlights the geographic and institutional distribution of publications, analysing trends across countries, research institutions, and authors. The results show that the main publications driving the studies were from the energy and transportation sectors. More than half of the papers have been published in the last three years, confirming that interest around the topic has been accelerating. Furthermore, the VOSviewer analysis revealed five macro clusters: (1) Charging Infrastructure and Deployment, (2) Technology, (3) Urban Planning and Spatial Accessibility, (4) Economic Modelling and EV adoption, and (5) Sustainability. While the purpose of the paper does not evaluate external influences, it observes a gradual increase in policy-related keywords, suggesting that there is a growing academic interest in governance and organisational dimensions around the deployment of EV infrastructure and EV adoption. By providing a systematic and structured overview of the keyword dynamics and publications over time, this study contributes towards understanding which areas are gaining traction in the scientific discourse in relation to electric mobility and charging infrastructure deployment in relation to policy and public-private partnerships.*

**Keywords:** electric vehicles, charging infrastructure, public-private partnership, policy, bibliometric analysis.

[1] Bucharest University of Economic Studies, Bucharest, Romania, andreeadjn@gmail.com.

## 1. Introduction

The increasing number of EVs on both mature and emerging markets is the result of several factors including environmental policies and technological breakthroughs in terms of vehicle range. The integration of charging infrastructure planning and deployment, the role of public and private sectors and the ongoing optimisation of EV systems are now common topics across multiple research fields.

Academic interest has grown significantly in the past two decades, especially in the past five years. The focus has gradually shifted beyond the technical performance of the vehicles and technology around the field including themes such as deployment strategies, policy frameworks, and user adoption patterns. This development shows the interdisciplinary nature of electric mobility and has developed into overlapping areas of research which are not clearly delimited.

In this context, bibliometric analysis offers a structured way to understand how research themes have evolved through the years, where concentration and interest exist beyond subjects related to technology. It highlights not just institutional or geographic contributors, but also a broader perspective on how the papers are distributed.

The presented study uses bibliometric methods to analyse publications from the Scopus database between 2000 and 2025, focusing on author keyword co-occurrence and thematic clusters which have emerged by uploading the data sets into VOSviewer. The objective is to provide an overview of main research directions related to electric mobility, and in connection with infrastructure deployment, policy alignment, consumer behaviour and the involvement of public and private institutions. The paper, following the introduction, is structured in the following chapters: Literature Review, Methodology, Analysis/Results interpretation, and Conclusions.

## 2. Problem Statement

The interest in EVs as an alternative for sustainable transportation has accelerated in the past two decades, reflecting the need in climate policy, technological advancements in battery technologies, and evolving consumer behaviour. Bibliometric analysis has become a valuable method for tracing thematic developments, identifying gaps and guiding both policy and industry strategies.

Recent bibliometric reviews have analysed EV adoption trends from different perspectives, focusing mainly on technology: vehicle-to-grid (V2G), lithium-ion batteries, energy management systems. For example, Veza et al. (2024) emphasised the integration of EV technology with smart infrastructure and policies, revealing the disconnect between innovation in vehicle design, infrastructure planning and national policy. Their analysis, based on 1990-2022 Scopus data, showed how terms like “battery management”, “charging infrastructure”, and “smart charging” have become central in recent literature.

Ullah et al. (2023) has conducted a comparative bibliometric study focusing on global research activities between 2011 and 2022, identifying China, the United States, and the United Kingdom as dominant contributors to EV research in terms of publication volume and citation strength.

Kim and Park (2025) have analysed through a mix of bibliometric analysis, science mapping, and thematic clustering the knowledge structures, collaboration network, and key themes in electric vehicle research in the environment domain from 2010 to 2022 demonstrating that the research of technological progress in electric vehicles is closely tied to environmental concerns.

The present study focuses on the intersection between electric mobility, charging infrastructure and policy frameworks, and the respective connection to public-private partnerships. Moreover, earlier reviews often relied on generalised EV-related queries without normalising the key terms. The current paper shows that literature has shifted over the years to organisational and systemic dimensions from a purely technical one. This complements similar studies by incorporating multidimensional approaches that capture not only technology and environmental topics but also institutional dynamics.

## 3. Methodology

The presented paper employs a bibliometric approach to examine the evolution of scientific literature related to electric mobility, emphasising on public-private partnerships and policy dimensions. The analysis focuses on identifying trends, thematic clusters, and the geographical distribution of academic contribution in research papers.

### *3.1 Data Collection*

The dataset was gathered from the Scopus database, selected for its broad coverage of peer-reviewed scientific publications. A comprehensive search string was applied to the Title, Abstract, and Keywords (TITLE-ABS-KEY) fields, targeting papers that include references to electric vehicles and mobility, charging infrastructure, and policy or governance-related aspects.

**The search string** used was:

TITLE-ABS-KEY("electric vehicle" OR "electric mobility" OR "e-mobility") AND TITLE-ABS-KEY("charging infrastructure" OR "charging station") AND TITLE-ABS- KEY("policy" OR "governance" OR "public-private partnership")

**The query** was limited to publications in English covering the period 2000–2025. Only articles, reviews, and conference papers were selected to ensure relevance and academic rigor.

### *3.2 Data Processing*

Following the export to CSV format, the raw data was pre-processed using Microsoft Excel. Duplicate records and irrelevant entries were removed. To address variations in terminology, a custom thesaurus file was used in VOSviewer (version 1.6.20) to consolidate keywords with similar or synonymous meanings (e.g., “EVs” to “electric vehicles,” “e-mobility” to “electric mobility”). This ensured consistency in the co-occurrence analysis and improved thematic clustering.

### *3.3 Bibliometric Analysis*

The refined dataset was imported into VOSviewer (version 1.6.20) to perform a co-occurrence analysis of Author Keywords, using the full counting method. A minimum threshold of five occurrences was applied to filtering the keywords. The software generated network visualisations that allowed the identification of major thematic clusters, based on the frequency and strength of keyword co-occurrences. In total, five macro-clusters were identified.

The analysis was complemented by: **overlay visualisations**, which enabled a temporal analysis of the emerging topics, density maps, to visualise concentration areas within the literature, institutional and geographical metadata reviews, to assess the contributions for the global distribution of the papers.

For the purposes of thematic interpretation, the five clusters with the highest cumulative keyword occurrences were selected for analysis. These clusters represent both the most active and densely connected areas within the dataset and align closely with the research focus on infrastructure, technological innovation, policy dynamics, sustainability, and adoption behaviour. The selection was based on both quantitative frequency and qualitative coherence of the keyword sets within each cluster.

### *3.4 Tools Utilised*

**Scopus** has been used as the source of bibliographic records, Microsoft Excel has been used for data structuring, analysis baseline, and generating tables and charts, and VOSviewer 1.6.20 was used for network generation, cluster mapping and trend visualisation.

### *3.5 Limitations*

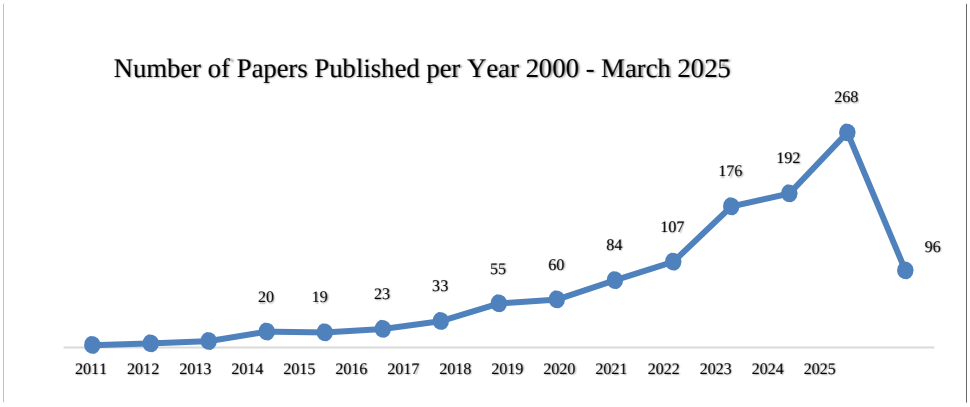
**The scope of this analysis** is restricted to publications indexed in the Scopus database. As such, it may not reflect all relevant academic papers published elsewhere. Additionally, the keyword-driven selection process may introduce bias by excluding documents that address the topic using less conventional terminology. Citation-based metrics and sentiment analysis were not included in the present scope.

# 4. Findings

## *4.1 Publication Trends Over Time*

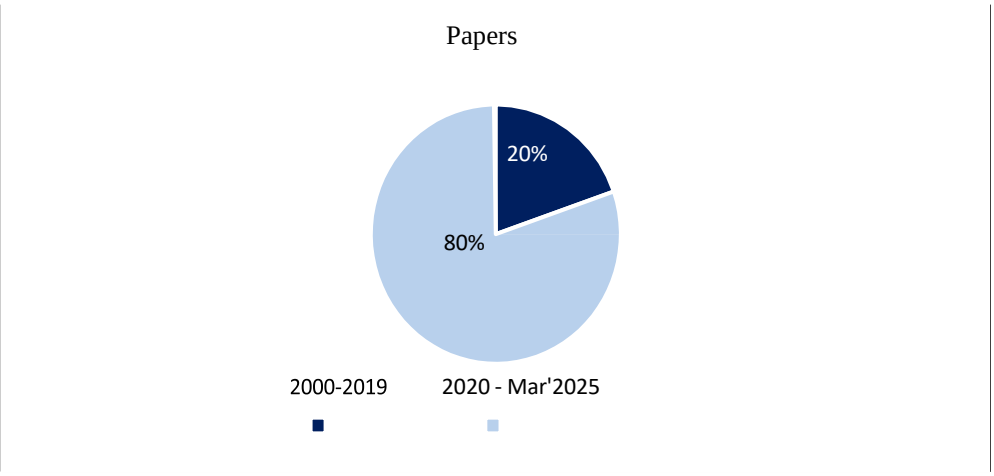
The analysis revealed a significant increase in scientific output related to electric mobility over the 2000-2025 period. While early contributions were scarce (Figure 1), interest has expanded considerably, with more than half of the publications released after 2020 (Figure 2). This trend reflects broader global attention to climate-related transportation solutions, regulatory initiatives, and infrastructure development.

**Figure 1. Scopus database export – publications per year 2000 – Mar'2025**




*Source*: Scopus Database Export.

**Figure 2. Scopus database export – publications split (%) per timeframes**

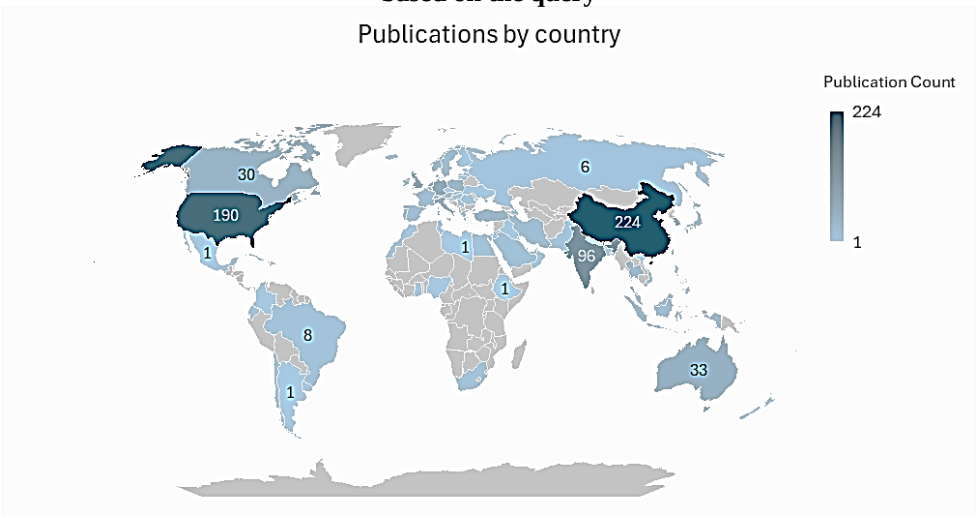



*Source*: Scopus Database Export.

## *4.2 Geographic and Institutional Distribution*

The geographical analysis of the dataset indicates that the most active contributors to the field are authors affiliated with institutions in China, the United States, and India, followed by the United Kingdom and Germany. This information was derived by extracting country names from the affiliation strings in the Scopus records, using a regular expression to isolate the final element in each entry, which typically corresponds to the country. While the Netherlands frequently appears in policy and sustainability discourse, its publications on this specific topic ranked lower in the dataset highlighting the distinction between visibility in global dialogue and the actual research output.

**Figure 3. The geographical distribution of papers from Scopus Database based on the query**




*Source*: Scopus Database Export.

Institutional mapping further highlights the role of **energy-focused research institutions and transportation planning departments**, often operating in interdisciplinary settings. Collaborative publications between academia and government agencies were also identified, particularly in policy-driven clusters (Table 1).

**Table 1. Institution ranking based on publication counts**

| Institution | Publication Count | % out of total publications |
|---|---|---|
| North China Electric Power University | 18 | 1.6% |
| University of California | 12 | 1.0% |
| Southeast University | 10 | 0.9% |
| The Hong Kong Polytechnic University | 8 | 0.7% |
| Faculty of Engineering (different) | 7 | 0.6% |

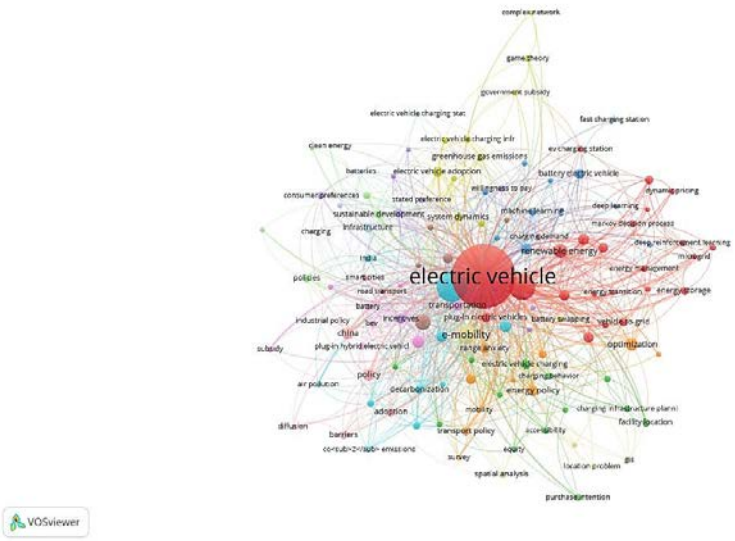
| Institution | Publication Count | % out of total publications |
|---|---|---|
| Hefei University of Technology | 6 | 0.5% |
| Beijing Jiaotong University | 6 | 0.5% |
| Beijing University of Technology | 5 | 0.4% |
| Carnegie Mellon University | 5 | 0.4% |
| Dalian Maritime University | 5 | 0.4% |

*Source*: Scopus Database Export.

## *4.3 Keyword Co-Occurrence and Thematic Clusters*

Using the co-occurrence analysis of Author Keywords in VOSviewer with a minimum threshold of five occurrences, the dataset was grouped into **five main clusters**, each representing a major thematic area within the electric mobility discourse. To understand the relationships between the key researched themes, a network visualisation was generated based on the co-occurrence of author keywords which has been normalised to better reflect the density (Figure 4).

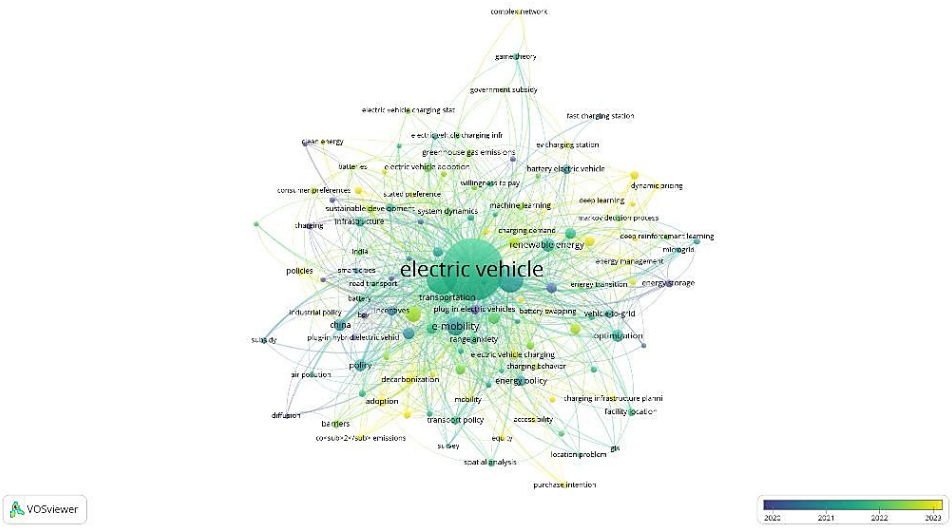
**Figure 4. VOSviewer keyword co-occurrence network (color coded by cluster)**




*Source*: VOSviewer output.

An overlay visualisation was used to track the temporal evolution of keyword occurrence. While in the bibliometric analysis the query has been from 2000 to 2025 period, the visualisation has been focused on the 2020-2025 period as 80% of the publications have occurred in this time frame (Figure 5).

**Figure 5. VOSviewer overlay visualisation (temporal evolution of terms for 2020-2025)**




*Source*: VOSviewer output.

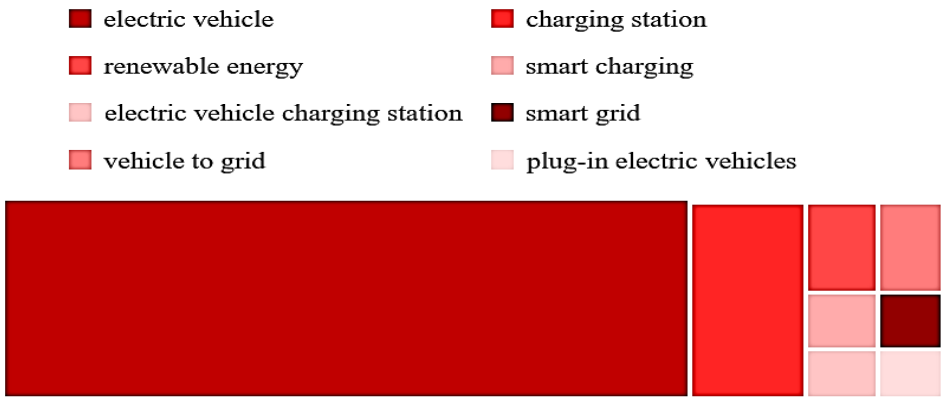
Among the total number of clusters identified, five were selected based on their high internal keyword frequency and thematic relevance to the study's objectives. These include clusters centred around charging infrastructure, technology, urban planning, sustainability, and economic modelling and adoption. The analysis in this section focuses on these clusters, as they represent the most significant groupings in literature and provide a structured approach for interpreting the evolution of electric mobility themed papers.

### *4.3.1 Charging Infrastructure and Deployment*

This cluster captures the technical and operational aspects of electric vehicle infra- structure expansion. Frequently occurring terms include: "charging station," "smart charging," "electric vehicle charging station," "vehicle-to-grid," and "energy management." These studies highlight grid interaction, optimal station positioning, and the integration of renewable energy into the charging process. Their co-occurrence underscores the role infrastructure plays in enabling electric vehicle adoption and its dependence by a reinforced and smart electricity distribution network. The pace in which EV infrastructure can be deployed and furthermore used leveraging on existing EV and charging technologies is linked to the capacity, modernisation state, and responsiveness of the main electricity grid. Within this context, under the smart grid umbrella, in specific literature, there has been observed the potential of micro-grids which can cater to the balance and demand response side of the renewable power generation sector incorporating energy storage solution and optimisations (Chen et al., 2011), and the reduction of the dependence on traditional

system operators. Furthermore, Bracco et al. (2015) expands the model by incorporating electric vehicles both as consumers and potential storage assets. These findings suggest that micro-grids may accelerate EV charging infrastructure deployment by creating a more autonomous energy ecosystem.

**Figure 6. Treemap visualisation of dominant keywords in the Charging Infrastructure Deployment cluster. The size of each block reflects the relative frequency of the keyword based on its occurrence in the dataset**




*Source*: author' processing, 2025.

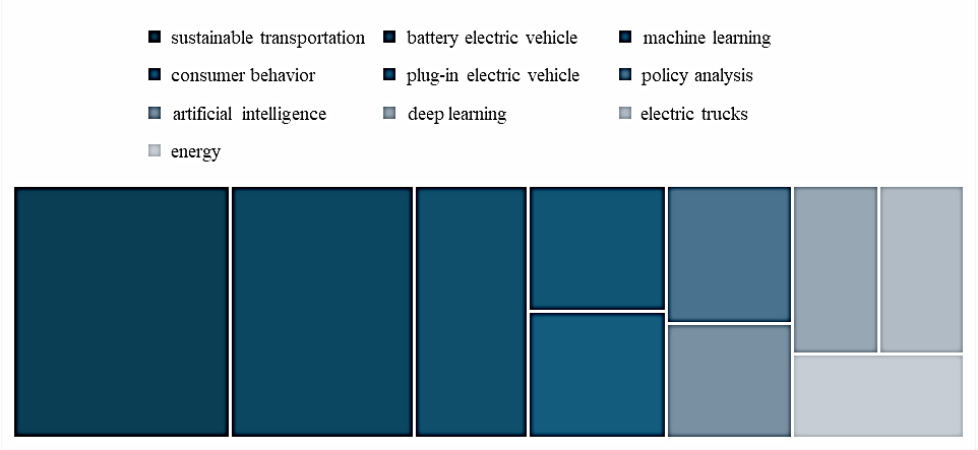
### *4.3.2 Technology*

This cluster is defined by technological advancement and performance optimisation. The main terms include: "artificial intelligence", "battery electric vehicle", "machine learning", "deep reinforcement learning", and "fast charging station".

These studies focus on innovations that enhance battery efficiency, system responsiveness, and energy storage, often overlapping with digitalisation trends in electric mobility and the possibility of using the batteries of plug in hybrids (PHEV) or EVs as storage during peak renewable energy production hours as Wu et al. (2020) describes that EVs are more flexible to control in terms of time scale and charging power, making them ideal candidates for participating in the electricity market.

In earlier works the concepts of full EVs have not yet matured, most of the papers were focusing on plug in hybrids and their impact in the operations of the energy providers and distribution system operator (Andersson et al., 2010), however Román et al. (2011) introduces both full EV concepts, the technology around it and the need for regulation.

**Figure 7. Treemap visualisation of dominant keywords in the Technology cluster. The size of each block reflects the relative frequency of the keyword based on its occurrence in the dataset**



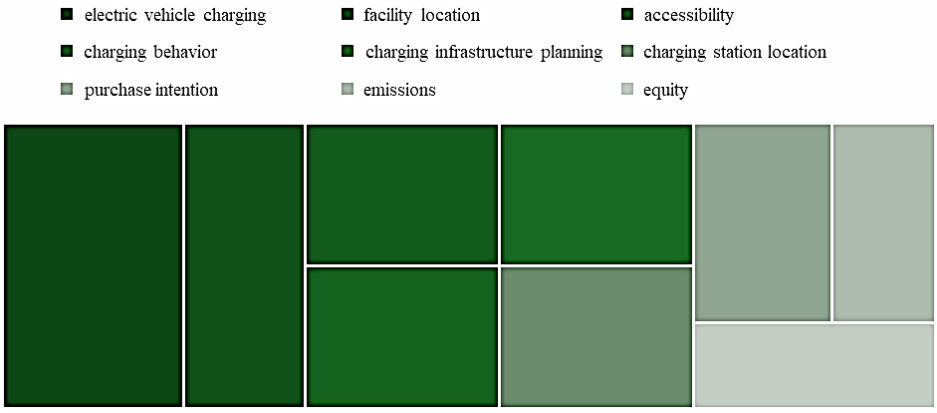

*Source*: author's processing, 2025.

### *4.3.3 Urban Planning and Spatial Accessibility*

Cluster 3 highlights the spatial and policy dimensions of EV infrastructure placement. Top keywords include: "accessibility", "charging behaviour", "public charging infrastructure", "infrastructure planning", and "spatial analysis". This theme reflects growing interest toward equity in deployment, particularly the need for inclusive access in both dense urban and underserved areas (Müller et al., 2025).

Furthermore "charging behaviour" drives business decision making when planning and choosing the locations of chargers.

**Figure 8. Treemap visualisation of dominant keywords in the Urban Planning and Spatial Accessibility cluster. The size of each block reflects the relative frequency of the keyword based on its occurrence in the dataset**



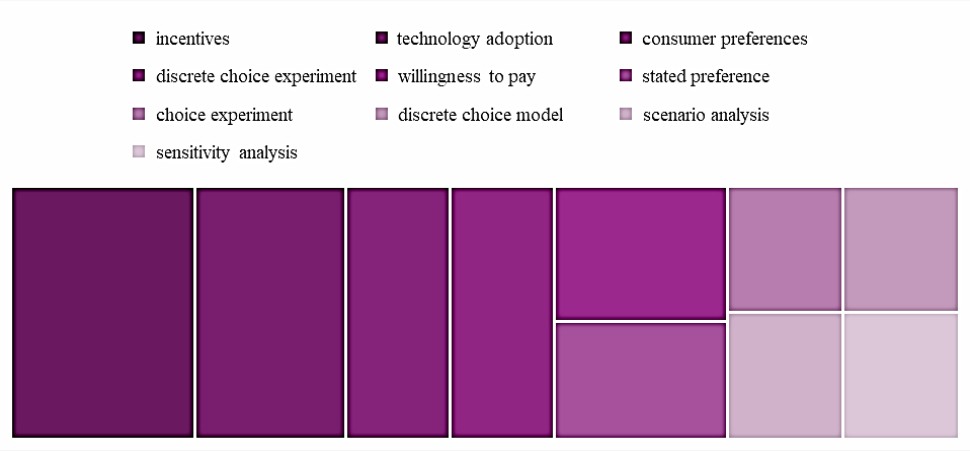

*Source*: author's processing, 2025.

### *4.3.4 Economic Modelling and EV Adoption*

This cluster includes word co-occurrence related to economic modelling based on consumer behaviour, decision science, and technology adoption. The most frequently occurring terms include: “incentives”, “technology adoption”, “consumer preferences”, “discrete choice experiment”, and “willingness to pay.”

Studies in this group utilise behavioural and quantitative modelling approaches to understand the factors influencing individual and group decisions around electric vehicle adoption and its impact on business decision making processes. Techniques such as discrete choice experiments and willingness-to-pay assessments are commonly used to measure perceived value, price sensitivity, and the impact of fiscal or non-fiscal incentives (Wang & Shi, 2024). In another example, Manash et al. (2025) have studied consumer attitudes and adoption intentions towards alternative green fuels concluding that motivators range from environmental consciousness to governmental support and social influences.

**Figure 9. Treemap visualisation of dominant keywords in Economic Modelling and EV adoption cluster. The size of each block reflects the relative frequency of the keyword based on its occurrence in the dataset**



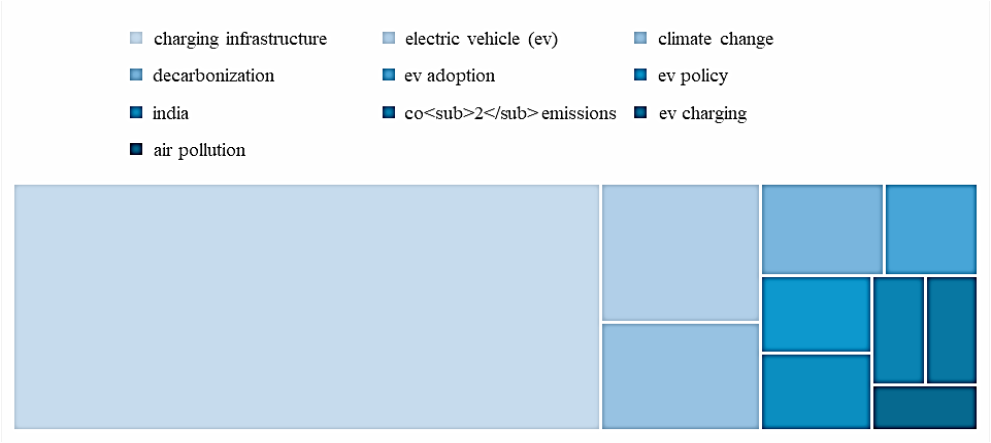

*Source:* author’s processing, 2025.

### *4.3.5 Sustainability*

This final cluster links electric mobility to environmental objectives, climate targets, and decarbonisation pathways. High-frequency terms include: “air pollution”, “climate change”, “emissions reduction”, “policy”, and “decarbonisation”.

These publications position electric vehicles as part of the sustainability macro-transitions, often co-occurring with policy, regulation, and governance-related terminology. The overlap between sustainability and policy-related keywords indicates a growing focus on the organisational and institutional frameworks required for effective infrastructure deployment (Chen & Ma, 2024).

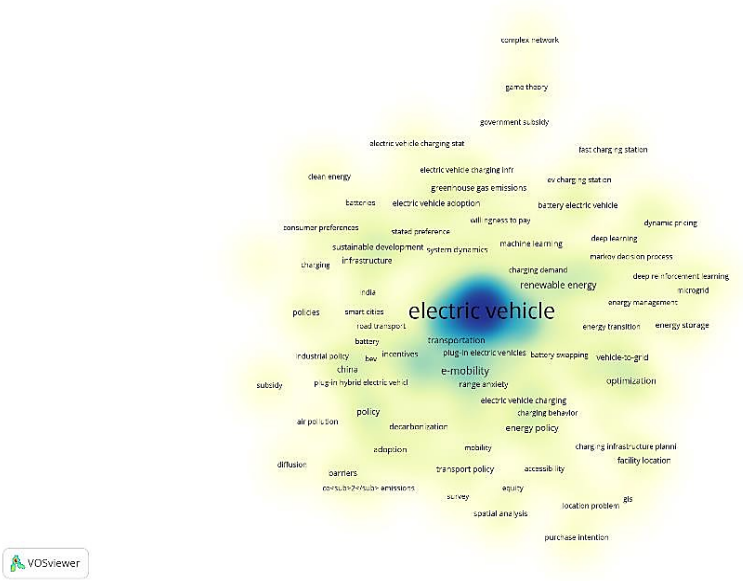
**Figure 10. Treemap visualisation of dominant keywords in the Sustainability cluster. The size of each block reflects the relative frequency of the keyword based on its occurrence in the dataset**




*Source:* author's processing, 2025.

To highlight areas of high research intensity, density visualisation of keyword usage was created (Figure 11).

**Figure 11. VOSviewer density visualisation of keyword clustering**




*Source*: VOSviewer output.

## 5. Conclusions

The presented study has explored how the scientific literature has evolved in the 2000 to 2025 period around electric mobility, focusing on charging infrastructure, EV adoption, policy, and public-private dimensions. Through the bibliometric analysis of Scopus indexed publications, the research targeted to map the thematic directions and assess the keyword co-occurrence patterns.

The findings enforce the initial premise related to the growth and diversification across multiple research streams of the academic interest in electric mobility. The five macro-clusters selected and identified (1) Charging Infrastructure and Deployment, (2) Technology, (3) Urban Planning and Spatial Accessibility, (4) Economic Modelling and EV adoption and (5) Sustainability, reflect the field's interdisciplinary expansion. Policy and governance themes appear with growing frequency in each area, suggesting that the organisational and institutional dimensions are interested in both technical and behavioural studies.

While the studies' aim has not been centred around testing hypotheses, it confirms that the words emerging are beyond engineering and environmental silos, incorporating behavioural, economic, and governance perspectives.

The analysis was based on a single database (Scopus) and limited for the 2000-2025 period and to papers written in English, which may exclude relevant work in other languages or published on other indexes. Keyword normalisation was implemented using VOSviewer's thesaurus function, but variation in terminology used by authors could affect clusterisation. Moreover, citation and funding data were not analysed, which could have offered additional insight into the impact and the agenda setting mechanisms.

The presented research could be extended in the future by integrating citation-based influences, funding source mapping to better understand the drivers and the tone of discourse. Additionally, a comparative analysis between regions and policy frameworks could find if thematic priorities have shifted according to governance models or the maturity of the markets.

Declaration of Generative AI and AI-assisted technologies in the writing process: During the preparation of this work, the author used OpenAI's ChatGPT to support the structuring of content, the refinement of language, and the generation of supporting tables based on bibliometric outputs. After using this tool, the author reviewed and edited the content as needed and takes full responsibility for the content of the publication.

## References

[1] Andersson, S.-L., Elofsson, A.K., Galus, M.D., Göransson, L., Karlsson, S., Johnsson, F., Andersson, G. (2010). Plug-in hybrid electric vehicles as regulating power providers: Case studies of Sweden and Germany. Energy Policy, 38(6), 2751-2762. https://doi.org/10.1016/j.en-pol.2010.01.006.

[2] Bracco, S., Delfino, F., Pampararo, F., Robba, M., Rossi, M. (2015). A dynamic optimization-based architecture for polygeneration microgrids with tri-generation, renewables, storage systems and electrical vehicles. Energy Conversion and Management, 96, 511-520. https://doi.org/10.1016/j.enconman.2015.03.013.

[3] Chen, C., Duan, S., Cai, T., Liu, B., Hu, G. (2011). Optimal Allocation and Economic Analysis of Energy Storage System in Microgrids. IEEE Transactions on Power Electronics, 26(10), 2762-2773. https://doi.org./10.1109/TPEL.2011.2116808.

[4] Chen, L., Ma, R. (2024). Clean energy synergy with electric vehicles: Insights into carbon footprint. Energy Strategy Reviews, 53, Article 101394. https://doi.org/10.1016/j.esr.2024.101394.

[5] Kim, M., Park, M.J. (2025). Exploring and comparing the knowledge structures, collaborations and key themes of electric vehicle research in the environment domain. International Journal of Sustainable Transportation, 19(3), 195-210. https://doi.org/10.1080/15568318.2024.2448002.

[6] Müller, W., Leyer, M., Degirmenci, K., Barros A. (2025). Designing EV charging networks from a city perspective: A conceptual analysis. Energy Policy, 182, Article 11456. https://doi.org/10.1016/j.enpol.2025.114516.

[7] Manash, R., Uttam, K., Arunangshu, G. (2025). Consumer Acceptance of Green Fuel in Indian Retail Fuel Outlets: Developing a Conceptual Model Using Behavioral Reasoning Theory (BRT). Prabandhan: Indian Journal of Management, 18(1), 63-71. https://doi.org/10.17010/pijom/2025/v18i1/174108.

[8] Román, T.G., Momber, I., Abbad, M.R., Miralles, A.S. (2011). Regulatory framework and business models for charging plug-in electric vehicles: Infrastructure, agents, and commercial relationships. Energy Policy, 39(10), 6360-6375. https://doi.org/10.1016/j.enpol.2011.07.037.

[9] Ullah, I., Safdar, M., Zheng, J., Severino, A., Jamal, A. (2023). Employing Bibliometric Analysis to Identify the Current State of the Art and Future Prospects of Electric Vehicles. Energies, 16(5), Article 2344. https://doi.org/10.3390/en16052344.

[10] Veza, I., Syaifuddin, M., Idris, M., Herawan, S.G., Yusuf, A.A., Fattah, I.M.R. (2024). Electric Vehicle (EV) Review: Bibliometric Analysis of Electric Vehicle Trend, Policy, Lithium-Ion Battery, Battery Management, Charging Infrastructure, Smart Charging, and Electric Vehicle-to-Everything (V2X). Energies, 17(15), Article 3786. https://doi.org/10.3390/en17153786.

[11] Wang, S., Shi, L. (2024). EV diffusion promotion and analysis under different charging market structure. Technological Forecasting and Social Change, 208, Article 123730. https://doi.org/10.1016/j.techfore.2024.123730.

[12] Wu, Y., Zhang, J., Ravey, A., Chrenko, D., Miraoui, A. (2020). Real-time energy management of photovoltaic-assisted electric vehicle charging station by markov decision process. Journal of Power Sources, 476, Article 228504. https://doi.org/10.1016/j.jpowsour.2020.228504.