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Global Electric Vehicle Policies: A comprehensive Systematic Review and Bibliometric Analysis

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ABSTRACT

Background – The demand for green technology is essential and serves as a solution to the issue of climate change. Consequently, countries worldwide are transitioning towards electric vehicles (EVs) and implementing appealing EV policies to encourage consumers and to boost industrial adoption.

Aim – This systematic review attempts to figure out manuscripts that have systematically reviewed methodology, policies, and variables investigated during the past 24 years to determine the effectiveness of a policy. Despite the presence of multiple studies concerning specific subjects, a complete analysis of the EV policy and methodologies with the academic achievement has not yet been accomplished. To fill this vacuum, this study analyses 710 publications on EV policy that were published in SCOPUS between the years 2000 and 2024.

Methods –This article is the outcome of systematic literature review (SLR) and thorough bibliometric analysis. The study includes the aspects related to EV policy and identified publications used for bibliometric analysis and SLR. R (Biblioshiny), VOS Viewer and Excel software are utilized as tools for content and network analysis.

Outcome and results - This study identified a limited number of methodologies applicable for the ex-ante or ex-post evaluation of policy implementation, especially. Policymakers and researchers need a variety of evaluation methods. This area will address many future research recommendations.

Implications - Proposes opportunities for future study, including methodologies that assess the effectiveness of EV policies as well as those that specifically examine individual policies with variety of incentives offered by the government over the period

Keywords : EV Adoption, Incentives, Bibliometric, EV Policy.

1. INTRODUCTION:

Public policy encompasses a series of actions undertaken by governments to achieve economic and social objectives, ultimately aiming to improve the overall well-being of their citizens. policymakers propose several kinds of measures them are the EV policies that help fuel the transition towards less emissions from cars (Peters, 2021). Policymakers design public incentive policies to promote the adoption of innovative technologies that support environmental sustainability. Such incentives include purchase subsidies, rebates, tax credits, registration fee exemptions, and loan waivers. Such policies are made for the amount of people to be able to purchase new technology that is good for the planet. These benefits are buying incentives, rebates, income taxes, no fees for registration and no interest on loan for the EVs. These things exist so that consumers can buy fuel alternative vehicles and sources of energy that save power by renewable sources (DeShazo et al., 2017). Governments to often spend a lot of money on newly forming businesses, and with money incentives, this goes a long way for those who make the products as well as those who buy them, especially in tech-based markets such as EVs(Sun et al., 2019). As EVs become more and more advanced, a lot more research about EVs has been made in the past few years. This research looks at differences in how countries buy in EVs. Researchers say in Indonesia nudges like tax offers without subsidies cannot have the same effect in encouraging people to buying EVs or building charging infrastructure (Wangsa et al., 2023). In addition, the value of free things depends on enough funding being present (Aasness & Odeck, 2023; Jenn et al., 2013).

In the case of Oslo, even with offering "free" EV parking, EV tolls and bus lane privileges, opinions are different on

the value of the EV discounts. More traditional users are more likely to oppose the EV discounts than those who drive EVs While in more immediate ways, control by authorities and monetary favors like ones received from purchasing the EV, buying it without paying a sales tax or setting limits on what type of vehicle someone can buy have all encouraged EVs to be more used (Liu et al., 2023). So either ways, whatever favors, assistance from charging in the vehicle, and showcasing those EVs used, mean that EV use is more prevalent when including the chargers themselves, making it more likely to be bought as part of public supply, and more general fluctuation of gasoline prices (Xue et al., 2021). Additionally, different levels of income have shown a positive impact on EV adoption, while changes in GDP further align with the outcomes of these policies (Alali et al., 2022). So from a technical stance, favoring implementation policies encourages research and the production of the non-creative patent, although the impact on the level of moderately novel patents produced can be considered marginal. The financial help from the government has a backbone effect on several different limits inside the EV grouping (Wu et al., 2023). An inverse U-shaped relationship exists between government policy support and the level of technological innovation in EVs, highlighting the nuanced effects of such interventions (Cao et al., 2024). Given the diversity in the design and implementation of EV policies globally, it is crucial to conduct an in-depth review of existing studies and methodologies. A comprehensive review of EV policies necessitates a systematic examination of existing literature to derive meaningful insights. (Grant & Booth, 2009). Among the various approaches available for analysing the research domain, bibliometric analysis has emerged as a critical method. This approach, combined with SLR, provides a robust framework for evaluating the breadth and depth of the domain. Together, bibliometric analysis and SLR serve as valuable tools to achieve a structured and detailed understanding of EV policy research, facilitating the identification of trends, gaps, and actionable insights (Hossain, 2020; Liberati et al., 2009). Bibliometrics is a scientific examination of information with a quantitative perspective (Broadus, 1987; Cancino et al., 2017; Chen & Xiao, 2016). Furthermore, this makes it possible to analyse vast amounts of data that researchers may have missed during their decision-making process (Daim et al., 2006) and analyze the latest breakthroughs and trends in the research topic (Hossain, 2020). Bibliometrics is a technique used to identify and analyse popular themes, the most important journals that publish in a certain field, influential authors, (Bouyssou & Marchant, 2010, 2011) and the countries where there is a high volume of publications and citations (Daim et al., 2006; Rey-Martí et al., 2016).

Table 1 Review Studies on EV Policy

Purpose	Methodology	Key Highlights	References	
Review the policies countries may adopt to boost the EV market.	Review Policies of different countries	Financial incentives, technology assistance, and charging infrastructure on EV adoption in different nations	(Zhang et al., 2014)	
To evaluate the main measures to encourage the use of electromobility within the EU28	Comprehensive Review	Industrial and Financial incentives are the most effective measures to promote EVs	(Cansino et al., 2018)	
To evaluate the monetary and non-monetary incentives effect on EVs sales	Literature Review	The effect of Incentives varies among regions road infrastructure, travel habit, consumer preferences,	(Hardman, 2019)	

		and other local factors		

Policymakers worldwide have adopted various policy approaches. Certain regions depend on demand centric policies, whereas other areas implement supply centric policies (Aubertin et al., 2024). **Table 1** shows the review studies conducted to examine EV policies. The existing literature offers a smaller number of publications which provide an in-depth analysis of the policies, or the analytical methodology implemented. The growing body of research in various fields highlights the necessity of quantitative study to establish a holistic framework, identify significant trends, and determine future research directions. Therefore, this paper intends to perform a bibliometric analysis and SLR to elucidate the scientific performance and science mapping of EV policies from the existing literature that will provide support and guidance for policymakers by providing information on implemented policies and improvements in policy design. Our study examines the following research questions through the use of a thorough SLR and a comprehensive bibliometric analysis.

Research Questions

RQ.1 What are the main academic areas in the field of EV policy when taking into consideration authors, publications, nations and institutions?

RQ.2 What are the emerging themes in the field of EV policy?

RQ.3 What kind of policies were evaluated with the methodologies used in EV policy analysis?

RQ.4 What are the potential opportunities for future research in the context of EV policy?

2. Materials and Methods for manuscript selection

The data was gathered using a systematic research technique that followed the PRISMA framework, which describes the necessary phases for conducting a literature review. The identification criteria are essential for the entire process of determining the area of study, formulating a strategy of proceeding, and later developing a guidance. This guidance establishes various components, encompassing the search keywords and databases to be employed, applying exclusion criteria, the categories of articles to be considered, and the defined research timeframe (Saldanha et al., 2016; Tripathy et al., 2024).

Table 2 Search Criteria for EV policy

Database	**Scopus**
Time frame	2000-2024
Keywords and Boolean operators	"Electric Vehicle Policy" OR "Incentive Policy" OR "Incentive*" OR "Electric Vehicle Incentive*"
2 Search Term	"Electric Vehicle*" OR "New Energy Vehicle*"
Subject Area	Social Science, Economics, Finance, Econometrics, Business Management and Accounting, and Multidisciplinary
Document Type	Articles and Review
Language	English
Tools	R(Biblioshiny), VOS Viewer and Excel
Research Methodology	Bibliometrics Analysis and Preferred Reporting Items for Systematic Reviews and Meta Analysis (PRISMA)

The search method applied for the EV policy presented in **Table 2**. The search generated a total of 719 publications, and the data retrieval process was carried out on March 1, 2025. Following a thorough evaluation of the "Title" and "Abstract" sections, this study identified 710 publications that satisfied the study criteria and were then included for bibliometric analysis. This study contains articles that fulfill the study objectives, such as evaluating policies using methodologies employed in EV policy analysis, after thoroughly reading the abstract, 545 papers were excluded. To achieve this objective, the study incorporates a total of 71 publications were selected from a pool of 710 bibliometric documents demonstrated in **Figure 1**. The objective of this study is to perform a SLR. Only manuscripts that specifically addressed policy elements related to EV were included in this analysis. Specifically, the topics of interest include the policy related to the EV industry, EV infrastructure, EV markets, and the rate at which consumers are adopting EVs.

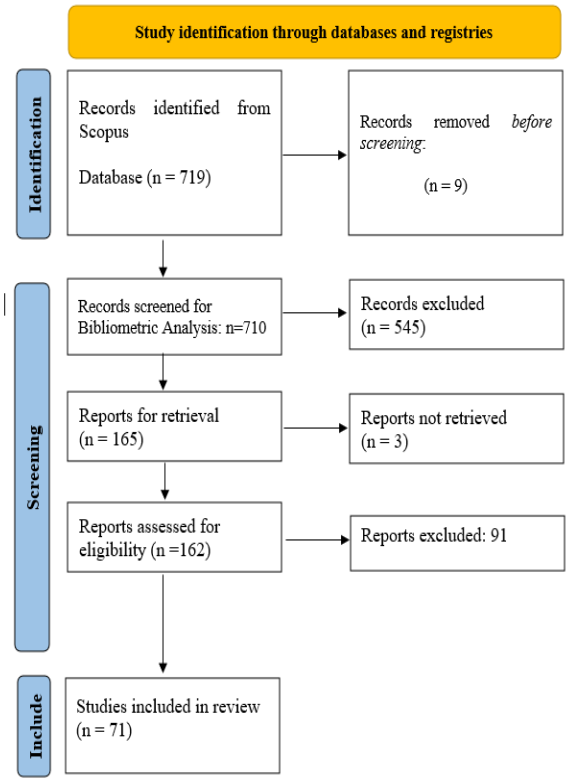

Figure 1 PRISMA Flow Chart

3. Bibliometric Analysis

Bibliometric study applies quantitative methods to analyse the intellectual, social, and conceptual relationships among scientific elements such as publications, authors, keywords, sources, institutions, and nations. This approach provides a comprehensive overview of discipline, identifies knowledge deficiencies, inspires new research concepts, and assesses scholarly contributions. Well-conducted bibliometric research lays a strong foundation for the innovative and significant advancement of a field (Öztürk et al., 2024). The below section reflects the sequence of articles around the two decades, adding the most influential countries, affiliations, authors and journals. Further it includes thematic evaluation and co-occurrence analysis to capture the trend in this field.

3.1 Chronological sequence of Articles

The articles published in this dataset show a clear increasing trend, marked by a substantial rise in academic work in the past decade. **Figure 2** illustrates the EV policy trajectory based on total Articles, average citation (AC), and total citations (TC) using a selection of articles for the specified time frame.

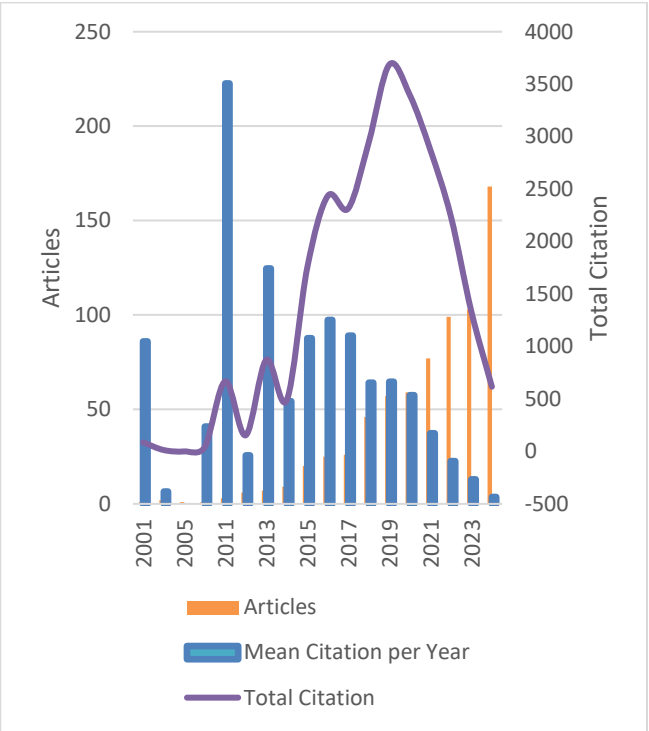

Figure 2 Chronological sequence of Articles

Analysis of the Article's trend lines reveals that the presence of EV policy literature during the initial period is rather low, remaining in single digits. However, there has been a notable increase in the topic as several governments have begun implementing their own EV policies, reaching their peak in 2024. The findings indicate that the Articles began an upward trend in 2014, while the TC trajectory did not show any consistent growing pattern throughout time and started declining in 2020. One possible reason for this temporal difference is that the increase in the quantity of EV Policy publications was specific to certain countries or regions, and these publications were not closely aligned with their related publications. Thorough investigation of the AC of articles, it is evident that there was a significant increase in 2011 and exhibits an oscillating pattern from 2001 to 2024.

3.2 Most Noteworthy Authors and Journals

The objective of prioritizing the authors and journals is to recognize the most influential contributions over the years, so facilitating an understanding of the foundational developments in this discipline. **Table 3** presents the journals and authors' scientific output in the domain of EV policy worldwide; however, the quantity of scientific production alone does not adequately indicate research quality. To evaluate the scientific influence and contribution, the manuscript provides an extensive investigation that includes citations H-index, G-index, M-index and Publisher associated to academic literature originated by journals and authors. The H-index is a statistic used to assess the research output and influence of an individual author, which is determined by their citation count (Hirsch, 2005). The G-index assigns greater

importance to highly cited articles and indicates the highest number for which the top g articles together receive g2 or more citations (Egghe, 2006). The M-index quantifies the mean citations received by each paper within the h-core (Bornmann et al., 2008; Tripathy et al., 2024). The top 10 journal account for more the 50% of articles published in these with holding more the 12000 TC. The leading journal is "SUSTAINABILITY (SWITZERLAND)" began publishing in 2014 and has the highest number of published papers and TC (1041). The journal "TRANSPORTATION RESEARCH PART D: TRANSPORT AND ENVIRONMENT" had a total of 50 published papers and a total of 2863 citations began publishing in 2012. Simultaneously, the source impact of the mentioned entity is demonstrated by its highest H-index (27) and G-index (50) in relation to EV policy. This is followed by the "JOURNAL OF CLEANER PRODUCTION" that began publishing in 2014 and "TRANSPORTATION RESEARCH PART A: POLICY AND PRACTICE" began publishing in 2001, which have observed substantial growth in their publications over the years.

Table 3 Most Noteworthy Journals

Journals	Number of Publications	H-Index	G-index	M-index		Publisher
SUSTAINABILITY (SWITZERLAND)	52	21	30	1.909	1041	MDPI
TRANSPORTATION RESEARCH PART D: TRANSPORT AND ENVIRONMENT	50	27	50	2.077	2863	Elsevier
JOURNAL OF CLEANER PRODUCTION	45	24	45	2.182	2795	Elsevier
TRANSPORTATION RESEARCH PART A: POLICY AND PRACTICE	38	27	38	1.125	2711	Elsevier
TRANSPORT POLICY	23	13	23	1.182	870	Elsevier
ENERGY ECONOMICS	12	9	12	0.75	497	Elsevier
SUSTAINABLE CITIES AND SOCIETY	12	10	12	1.429	486	Elsevier
ENERGY RESEARCH AND SOCIAL SCIENCE	12	9	12	1	427	Elsevier
CASE STUDIES ON TRANSPORT POLICY	12	7	12	1.167	199	Elsevier
INTERNATIONAL JOURNAL OF SUSTAINABLE TRANSPORTATION	11	6	11	1	154	Taylor & Francis
TRANSPORTATION RESEARCH PART C: EMERGING TECHNOLOGIES	9	6	9	0.667	245	Elsevier
RESEARCH IN TRANSPORTATION ECONOMICS	9	7	9	0.7	226	Elsevier
ELECTRICITY JOURNAL	8	5	8	0.385	221	Elsevier

FRONTIERS IN ENERGY RESEARCH	8	3	5	0.75	33	Frontiers
TECHNOLOGICAL FORECASTING AND SOCIAL CHANGE	7	7	7	0.538	415	Elsevier
TRANSPORTATION RESEARCH INTERDISCIPLINARY PERSPECTIVES	7	5	7	1	118	Elsevier
RESOURCES, CONSERVATION AND RECYCLING	6	6	6	0.857	486	Elsevier
JOURNAL OF ENVIRONMENTAL ECONOMICS AND MANAGEMENT	5	5	5	0.357	745	Elsevier
TRANSPORTATION RESEARCH PART E: LOGISTICS AND TRANSPORTATION REVIEW	5	5	5	0.556	227	Elsevier
EUROPEAN TRANSPORT RESEARCH REVIEW	5	5	5	0.5	200	Springer

Table 4 Most Noteworthy Authors

Authors	Number of Publications	H-Index	G-index	M-index	Total Citations	Affiliation
YUN WANG	8	4	8	0.4	287	Dalian University of Technology, China
YINGQI LIU	7	5	7	0.385	394	Beijing Jiaotong University, China
JONN AXSEN	6	6	6	0.6	289	Simon Fraser University, Canada
SHANYONG WANG	5	4	5	0.5	647	University of Science and Technology of China
JUN LI	5	4	5	0.5	509	University of Science and Technology of China
FIGENBAUM E	5	5	5	0.5	323	Institute of Transport Economics, Oslo
SUN X	5	4	5	0.667	300	Dalian University of Technology, China
THIEL C	5	5	5	0.455	208	European Commission Joint Research Centre, Belgium
YUYU LI	5	3	5	1	26	Chongqing Normal University, China
WANG J	4	4	4	0.571	511	University of Science and Technology of China

NING WANG	4	4	4	0.5	469	Tongji University, Shanghai, China
XIANG ZHANG	4	4	4	0.364	428	Beijing Institution of Technology, Beijing
LIEVEN THEO	4	3	4	0.3	308	University of St. Gallen, Switzerland
XIAOZHENG HE	4	4	4	0.667	256	Rensselaer Polytechnic Institution, US
GIL TAL	4	3	4	0.5	222	Institute of Transportation Studies, US
ROMEO DANIELIS	4	4	4	0.571	140	Universita Degli Studi Di Trieste, Italy
XINYU LI	4	4	4	0.667	136	Anhui University of Finance and Economics, China
SHANJUN LI	4	3	4	0.75	96	Cornell University, US
SANYA CARLEY	3	3	3	0.25	573	University of Pennsylvania, US
FRANCES SPREI	3	3	3	0.333	536	Chalmers University of Technology, Sweden

Note: Journals and Authors are sorted based on the quantity of their articles.

The most active authors who have published the highest number of studies on EV policy shown in **Table 4**. The top 20 authors mention above with the YUN WANG from Dalian University of Technology, China is the most productive author with the maximum number of published papers (8), TC of 287 and start publishing in 2015 related to EV adoption policies, Research and Development in Green innovation etc. The YINGQI LIU Beijing Jiaotong University, China has total 7 papers, which have collectively received 394 citations started in 2012 capture wide domain such as EV Industry, Economic output, innovative techniques, environmental issues etc. Subsequently, the JONN AXSEN from Simon Fraser University, Canada had a cumulative count of 6 papers published, along with a total of 289 citations started in 2015 having the expertise in public policy domain, technology advancement, sustainable transportation etc. and has the highest H-index (6) and G-index (6) in regard to the given entity. Additionally, SHANYONG WANG from University of Science and Technology of China has authored 5 published papers and has received the highest 647 citations started in 2017 having the specialization in energy economics, sustainable consumption and production, environmental accounting etc.

Table 5 Most Productive Country

Country	Publications	Total Citation
CHINA	392	3622
USA	286	4116
INDIA	72	360
CANADA	68	628
GERMANY	62	727
ITALY	60	356
UK	59	555
AUSTRALIA	52	534
NORWAY	46	815
INDONESIA	44	118

Table 6 Most Productive Institutions

Affiliation	Country	Publications
TSINGHUA UNIVERSITY	CHINA	27
UNIVERSITY OF CALIFORNIA	US	25
TIANJIN UNIVERSITY	CHINA	18
MCMASTER UNIVERSITY	CANADA	14
TONGJI UNIVERSITY	CHINA	14
CHINA UNIVERSITY OF GEOSCIENCES	CHINA	13
UNIVERSIDADE DE LISBOA	PURTUGAL	13
UNIVERSITAS INDONESIA	INDONESIA	12
CARNEGIE MELLON UNIVERSITY	US	11
NORTH CHINA ELECTRIC POWER UNIVERSITY	CHINA	11

The focus on interest and the willingness to share with the global community highlight the specific topic to be integrated into the existing body of literature, enriching the academic realm and expanding knowledge across nations and affiliations. The database contains 56 countries that generate articles relevant to EV policies, **Table 5 and 6** illustrates the leading countries and various affiliations operating in this domain. China emerges as the top country with a total of 392 publications and 3622 citations. The United States follows significantly with 286 publications and 4116 citations. India has 72 publications and 360 citations, while Canada has 68 publications and 628 citations, and so forth. The variations in productivity among countries may be associated to various factors, serving as grants received from governments, universities, research institutes and infrastructure, and the academic culture's attitude towards investigating the field of EVs policy. The findings indicate that the leading universities in the study are Tsinghua University of China, which published 27 papers on EV policy, University of California, US, which published 25 articles, Tianjin University, China, which published 18 papers, and McMaster University, Canada, which published 14 papers. Universities are demonstrating their commitment to research and development by actively promoting the study of transitioning into the automobile industry using EVs with the help of government.

3.3 Thematic Evolution

Three time periods (2001 to 2015, 2016 to 2020 and 2021 to 2024) are shown in **Figure 3** to analyse trends over time. The first period covers 2001 to 2015. It focuses on early concerns regarding the environmental impact of transportation, the development of EVs, regional studies (particularly those centered on China), and the adoption of new technologies. From 2016 to 2020, new themes were introduced, resulting in a more varied and specialized range of topics. These themes encompassed a broader spectrum, including economic barriers, charging infrastructure, energy efficiency, purchase intention, adoption, and the impact of government policies and subsidies. During the most recent phase from 2021 to 2024, the themes have become increasingly specialized and centered around policy. Emerging themes such as climate policy, energy flexibility, and decarbonization indicate a move towards more comprehensive climate plans and broader environmental objectives.

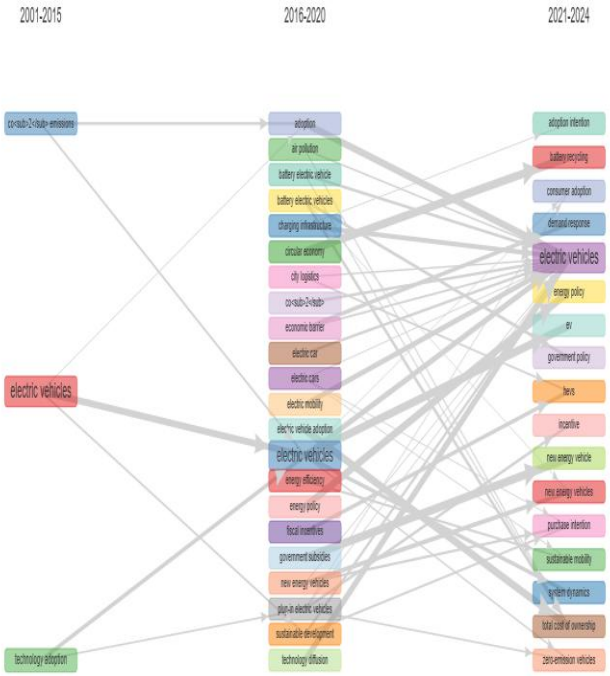

Figure. 3 Thematic Evolution

3.4 Co-occurrence of Keywords

The presence of keywords together indicates the existence of closely related terms within specific clusters demonstrated in **Figure 4**. What is the frequency of the keywords used by authors appearing together in the EV policy articles of this study? By examining the pattern of the words several immediate observations may be made regarding its fundamental properties. After applying a minimum occurrence criterion of five, the keyword filtration resulted in a final count of 61 keywords. The keywords are categorized into 8 distinct clusters. The closely associated terms are displayed more prominently in shades of green and red. The most notable keywords are "electric vehicles," "incentives," "charging infrastructure," and "Policy" and they also have substantial interconnections. Therefore, the presence of keywords assists in offering a concise overview and prompt insight for future research in the field of EV policy.

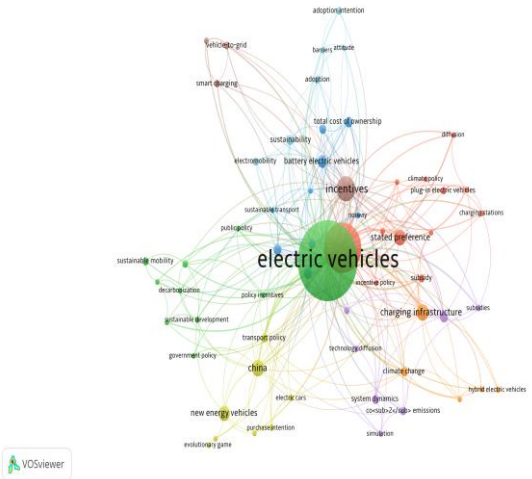

Figure 4 Co-occurrence Analysis

4. SLR Findings

The government provides multiple EV policies to assist the growth in the EV industry and to increase the demand in the market mentioned in **Table 7**. The government provides a range of financial and non-financial incentives to consumers to increase demand for EVs.

Table 7 Variety of EV Policies

Policies	Variables	Incentives
Demand Side Policy	Financial Incentives	Purchase Subsidy or Rebates Tax Exemption Toll exemption Free Parking Registration Tax Exemption VAT exemption License Fee Exemption Status quo Rebate Discount on charging rates Congestion Charge Exemption Income tax deduction Home charging infrastructure Circulation tax exemption Free Charging facility
	Non-Financial Perks	Driving Restrictions Restriction on Conventional vehicles Bus Lane Access Dedicated license plates Charging Density
Supply Side Policy	Infrastructure Grants	Investment in Charging Infrastructure Grants for renewable energy and power plants
	Industrial Investments	Reduce Company Tax

		Research and Development grants Special treatment for EV production Concession on Import of Raw materials and equipment

4.1 Methodologies used for understanding the EV policy with different aspects

This section presents a synthesis of various methodologies utilized in EV policy analysis, as outlined in **Table A1** (Appendix) and **Figure 5**.

4.1.1 Econometric Analysis: This research considers the variations across different regions, reflecting regional heterogeneity (Shao, 2024). The policy represents multiple initiative such as purchase subsidies, purchase restrictions, driving privileges, monetary incentives, privilege subsidies, parking benefits, population density, demonstration incentives, charging incentives and infrastructure development, (Liu et al., 2021; Liu et al., 2023; Yao et al., 2022) and grants for innovation in the research and development activities of EV companies (Cao et al., 2024; Wu et al., 2023).

4.1.2 Quantitative Analysis: It measures phenomena to determine causal linkages and variable associations. The analysis involves a deductive research paradigm that begins with data gathering, then analyses, and concludes with evidence. Also, assumes phenomena can be quantified, allowing researchers to find patterns, investigate links, and validate results (Gunter, 2013; Watson, 2015). A significant number of studies have focused on doing quantitative analyses to examine the relationship among respondent heterogeneity and policy preferences with other socio-demographic variables to purchase an EV (Jia & Chen, 2023). The majority of studies examine various factors influencing the EV adoption intention, such as financial incentives, federal tax credits, rebates on energy bills, toll tax exemptions, public parking exemption, access to bus lanes, non-financial incentives, (Aasness & Odeck, 2023; Gong et al., 2020; Jenn et al., 2020) attitude, subjective norms, novelty seeking, and product cognition. Factors to consider include the time it takes to recharge and the range achievable on a single charge, the availability of charging stations, (Truong, 2023; Wong et al., 2023) advancements in technology, environmental concern, public awareness of environmental issues, (Mpoi et al., 2023) the perceived usefulness, the perceived convenience of use, and the perceived risks associated with the EVs. The variables of interest include travel patterns, demographic features, city of residence, car ownership, gender, and presence of children within the family (Ma et al., 2019). These variables can be analysed using various theoretical frameworks (Jaiswal et al., 2021; Zhang et al., 2022).

4.1.3 Qualitative Analysis: The implementation of an effective public recharger network, along with the implementation of suitable laws and regulations, is essential for encouraging the adoption of EVs (Broadbent et al., 2018). Additionally, a comprehensive approach that combines both economic and symbolic incentives, as well as addressing technical and practical aspects, is necessary (Ingeborgrud & Ryghaug, 2019). It is important to consider the perceived impact of various incentives to maximize their effectiveness (Santos & Davies, 2020). The significance is in avoiding the assumption that BEVs are a uniform technology when formulating policies (Ingeborgrud & Ryghaug, 2019).

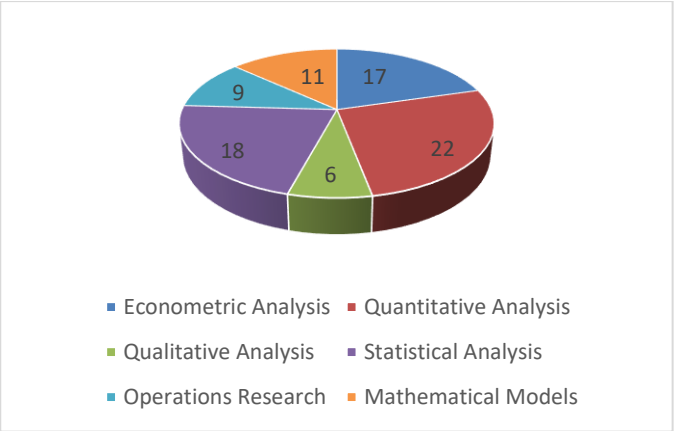

Figure 5. Methodologies utilized for assessing the effectiveness of EV Policy

4.1.4 Statistical Analysis: This approach facilitates the execution of a well-structured study, ensuring the generation of valid and reliable results (Ali & Bhaskar, 2016; Ott & Longnecker, 2010). As the National policies on PEVs (Plug-in Electric Vehicles) diverge significantly in terms of their level of support for both the development and diffusion of this technology (Wesseling, 2016). Estimates can significantly differ depending on the province and vehicle class and may be notably higher for certain categories (Aasness & Odeck, 2015; Azarafshar & Vermeulen, 2020). However, these hosting facilities may find themselves in a situation known as a prisoner's dilemma, when investing in a charging station reduces their long-term profits (Arlt & Astier, 2023).

4.1.5 Operations Research: To illustrate the gradual development of incentives and policies over time, it is important to consider the interactions between the worldwide surroundings, national governance networks, systems, and niches (Alogdianakis & Dimitriou, 2023; Figenbaum, 2017). Examine the long-term impact on the adoption of PEVs by studying government expenditure, public endorsement, policy simplicity, and a "transformational signal," which refers to a policy's capacity to inspire credibility and investment in transitioning to PEVs (Guo et al., 2021; Melton et al., 2020). Financial incentives is essential when the progress of EV technology is falling behind (Setiawan et al., 2022).

4.1.6 Mathematical Models: The majority of mathematical models are utilized to develop a cost-effective strategy for designing charging infrastructure and government support policy that will encourage the adoption of EVs (Fang et al., 2020; Vidyattama et al.,

2024). These models are used to evaluate the impacts of four basic policies: subsidies, dual credit policy, restrictions on fuel-powered vehicles, and the construction of charging stations (Jiao et al., 2022; Neshat et al., 2023). A simulation analysis was conducted to study the impact of consumer and manufacturer subsidies on emerging industries (Sun et al., 2019). Additionally, it compares two EV policies, namely an EV subsidy and an infrastructure for charging subsidy, in various market structures (Feng et al., 2023; Shao et al., 2023). The most effective scheme to promote the use of electric trucks is implementing tax incentives and subsidies, while simultaneously eliminating petroleum subsidies (Wangsa et al., 2023).

5. Conclusion

The growing demand for green technology has positioned EV policies as a critical factor in addressing climate change and promoting sustainable transportation. This study systematically reviewed 519 publications from SCOPUS (2000–2023) and out of these 71 publications were studied thoroughly to analyse methodologies, policy frameworks, and variables used in EV policy assessment. The findings highlight that despite substantial research on consumer-side incentives, there remains a lack of comprehensive evaluation methods that assess policy effectiveness both ex-ante and ex-post. The review further reveals variability in global EV policies, necessitating a comparative framework for evaluating the long-term sustainability and economic implications of subsidies, tax incentives, and infrastructure development.

Potential Opportunities

Policy assessments through fact-based ways to know what real effect EV rules have on the ground, not just on paper, and how they work together with different rules to have an impact on both people to buy EVs and factories to take new technology. In Supply-Side Incentives & Industrial Transition there can be review on how much cost there is to make an EV, how well they can run, and if making them for the long run is useful. To investigate how new EV companies and the present ones that are making cars have grown in relation to e-mobility. To analysis the related infrastructure has grown in relation to the number of stations for charging, batteries being exchanged, how the system is linked to the larger electrical grid, and the way in which the vehicle and the grid work together. This study looks at many parts such as EV regulations, to help keep their use working well for a long time. Policy creators need to use proof-based policy making that fits the different work, the sense of value for each person, and environment goals. Future study should include fact-based rule evaluations, how different companies utilize new business models, and environment saving plans. Only when such ideas are used can EV rules be used a lot, bring money, and help meet global climate needs.

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