https://doi.org/10.38104/vadyba.2025.1.08

Vadyba
Journal of Management
2025, № 1 (41)
ISSN 1648-7974

A BIBLIOMETRIC ANALYSIS OF E-MOBILITY RESEARCH IN THE EU WITHIN THE CONTEXT OF GREEN POLICY FRAMEWORKS

Răzvan-Octavian Giurcă[1]
[1]*Bucharest University of Economic Studies, Romania*

Abstract
With the major concerns such as air pollution, global warming, and the depletion of global petroleum resources, the automobile industry has redirected its attention towards electric mobility. In this context, the European Union's policies on sustainable mobility have rapidly evolved over recent times, with a strong emphasis on electric vehicles adoption. Consequently, the academic research in the field emerged rapidly as publications on specific topics have started to accumulate in the past two decades, with most of the research focusing on challenges and opportunities of the adoption, legislation, policies and drivers' barriers. Even though the field witnessed growing interest, the effects of the development on the scientific literature was not yet documented extensively. As of this, this research highlights the most recent strategic milestones of the EU on e-mobility and quantifies academic evolution of electric mobility development in the European Union between 2011, the year of European Commission's first strategic document covering electromobility, to 2024. For this objective, a bibliometric analysis was conducted for the mentioned period using the renowned Scopus database. The analysis validates that the most publications in this field were completed after the accelerating of the framework by the European Commission, starting with 2011. Over 80% of the academic documents were published in this timeframe. A direct correlation between the European Green Deal moment and the re-acceleration of the trend which started one year earlier, could not be made, however, the findings shown that the period between 2018-2022 accounted for the highest number of publications, registering a 31% increase compared to previous years. At the same time, through the keywords density map, the analysis found the following clusters in regards of Electric Mobility development in the European Union: public transport, sustainable mobility, infrastructure, electrification, market development & energy efficiency, recycling, renewable energy, air pollution and environment, sustainable transport and city logistics. With these findings based on the most recent data available, the study could provide objective indications of the evolution, trends and linkages of the academic research in the European Union area with a topic that is key for European Commission's plans for 2030 and 2050 goals respectively.
KEY WORDS: Electric mobility; Research trends analysis; Energy; European Union policies; Sustainable Development.
JEL classification: Q56, L52, L62.

Introduction

Reducing greenhouse gas emissions is a key component of all sustainability initiatives around the globe. Since the transport sector is a major contributor to greenhouse gas emissions, it requires significant transformations and adaptions to the current reality. (Maas 2022). In numbers, transport is responsible for almost 25% of greenhouse gas emissions in Europe and it is the main cause of air pollution categorized harmful by the World Health Organization. (Pietrzak & Pietrzak 2020). As of this, the main focus of the recent EU policies is to reduce these harmful emissions to 0 by 2050. This should be done through a series of gradual changes in consumption habits and the adoption of more sustainable solutions for its population. Based on the advancements in the field of automotive and other mobility providing solutions in the recent times, electromobility has become one of the key concepts that make it viable for the Net-Zero end goal to be achieved. According to Falchetta & Michel (2021), coupled with other low emissions electricity mix, EVs (electric vehicles) are an important decarbonization driver. Yet, to achieve large-scale adoption, an adequate infrastructure is required to be developed.

Due to its novelty, the field of academic research about electric mobility and its development is relatively young. Consequently, branches of research are emerging rapidly as publications on specific topics have started to accumulate in the past two decade (Fava, & Favero 2023). Most of the research focused on challenges and opportunities of the adoption, legislation, policies, drivers' barriers.

Bekiaris et al. (2017) underlined the importance of e-mobility (which is the similarly used term for electromobility) through a legislative perspective. At the same time, Rietmann & Lieven (2019) looked at the influence of policies supporting electric vehicles in 20 countries from around the globe, highlighting different kind of initiatives that promote the implementation and adoption of electric mobility.

In the academic world, even though the field witnessed growing interest, the effects of the development on the scientific literature was not yet documented extensively. (Haghani et al. 2023).

Building on this fact, this research proposes to specifically determine the scientific quantitative evolution of the electric mobility development topic in the European Union in recent years. The reason why EU was chosen is that the framework policies evolved exponentially in the region, therefore the study looked to see if the academic research followed the trend.

On the same logic, the period between 2011 and 2024 was chosen for the analysis, starting with the same year of the first strategic document of the European Commission with an emphasis on the e-mobility – the 2011 White Paper – "Roadmap to a Single European Transport Area - towards a competitive and resource-efficient transport system" to present, with possible inflection points on the road such as the European Green Deal moment. A detailed look and history of the published acts, policies and strategies of the European Commission on the topic of

electromobility in the mentioned period will be presented in detail in the Literature review chapter.

To achieve the objective of the study, a bibliometric analysis will be conducted and detailed in the Research Methodology part of the article. This methodology allows identification of trends, synthesis, analysis and even critical evaluation of the topic. It is practiced for both "mature" areas of research but also for newer, growing areas of interest to especially identify trends (Le et al. 2019).

Through this approach, the quantitative side of interest on the field could be revealed, mapping and clustering the results with the milestones of policies identified at the European Union level.

It remains to be seen if the most scientific research was conducted in the recent times. A similarity in evolution and trend with the above-mentioned events is still to be validated with this study.

With these findings, the study could provide objective indications of the evolution, trends and linkages of the academic research in the EU with a topic that is key for European Commission's plans for 2030 and 2050 goals respectively, based on the most recent data available on both sides.

Literature review

Considering the major concerns such as air pollution, global warming, and the depletion of global petroleum resources, the automobile industry has redirected its attention towards the adoption of electric mobility. In the past decades, significant advancements in the field of automotive research and development have been achieved, which have enabled the potential for scaling electric mobility adoption. An electric vehicle (EV) is powered by an electric motor instead of an internal combustion engine that undergoes combustion of a fuel and gas mixture to produce energy. Electric vehicles (EVs) offer a seamless and rapid acceleration while minimizing the emission of atmospheric pollutants. (Maheswari et al. 2022). Besides conventional passenger cars, E-mobility technology can be applied to various types of transportation, such as shipping, heavy duty trucks or trains, but it requires a specific infrastructure like charging points, which at the same type requires network grid connectivity and electric energy supply. (Filho & Kotter 2015). European Union has been at the forefront of these advancements in terms of policies. Starting from 2035, registration of new conventional internal combustion engine vehicles will be prohibited in the region. The main reason is that the internal combustion engines are a significant source of carbon emissions and pollution that negatively contribute to the climate changes (Sanguesa et al. 2021).

The change is happening due to the rising costs of fuels and materials and the growing concerns of the harmful emissions such as carbon dioxide emissions. For this reason, the EVs are becoming increasingly popular across the continent, with many manufacturers now offering their well-established car models also in electric variants while at the same time completely stopping production for other models with internal combustion type of propulsion only. (Menyhart 2024).

The history of electric vehicles (EVs) goes back to 1831, when the Scottish inventor Robert Anderson built the world's first electric car. More exactly, it was a carriage put into motion by an electric motor. Then, at the middle of the century, between 1834 and 1840, Thomas Davenport from Vermont, United States, constructed another prototype of an EV, at the same time with Sibrandus Stratingh Groningen who designed an electric vehicle using the Volta Cell in 1835. In the second part of the century, various inventors such as Gaston Planté, Zénobe Gramme or Radcliff Word build different variants of electric vehicles or components for the use of EVs (Guarnieri 2012).

At the start of the century, Ferdinand Porsche designed its first electric car. The motors were powered by electricity by an internal combustion generator. This resulted in a very heavy vehicle, weighing 1.8 tons but with very good performance, accelerating up to 60 km/h. It was the concept that later evolved into hybrid. That model of Porsche was rather an exception. The average electric vehicle of that time reaching speeds of around 32 km/h. Later, the EVs fell into disfavour with the mass production of the Ford T from 1908 to 1912. With this model, the gasoline powered cars became widely available and affordable (Maciuk et al. 2024). In the next decades, the occasional returns to electric mobility happened primarily due to shortages rather than innovations, including during the Second World War or during the global oil crisis in 1973 (Burton, 2013). Globally, it was only after 1990 when the attitude towards environmental pollution shifted and so do interest in such solutions like electric vehicles attracted renowned enthusiasm (Maciuk et al. 2024).

As stated, there is a long history on the electric vehicles' advancements before 2010s, but for Europe, the strategic vision that incorporated the electric mobility as a sustainable development pillar started taking shape around the last decade. As Kaup et al. (2021) mentions, the first strategic document that approaches the subject was the 2011 White Paper – "Roadmap to a Single European Transport Area - towards a competitive and resource-efficient transport system". The European Commission raised the need to reduce the number of internal combustion running vehicles in half by 2030 and completely phase them out by 2050. At the same time, the document mentions the called "green transport corridors", an initiative aiming to switch the transport to cleaner solutions such as trains or ships.

In 2013, the Commission re-stated, this time with an emphasis on the economic supply side, mentioning that the Europe is heavily depended on oil imports to fuel its transport system which in the long run is also environmentally unsustainable. According to the "Clean power for transport: a European alternative fuels strategy" act (2013), the imports dependency must be replaced by alternative fuels and with the necessary infrastructure. To centralize the programs for alternative fuels and infrastructure investments and to link road transport to modern fuels, the European Commission issued Regulation 1315/201, which aimed to introduce alternative fuels in the strategically important core network of TEN-T by 2030" (Kaup et al. 2021).

Following this, the directive 2014/94/EU of the European Parliament and of the Council was issued in October 2014, on the deployment of alternative fuels infrastructure. It introduced the minimum requirements for the infrastructure extension to the countries of the EU and besides gas and hydrogen refuelling, the minimum technical specifications of charging electric vehicles. The act established the base for the development and implementation of the national policy frameworks of the Member States, mentioning that the national frameworks should be facilitated by the Commission by means of exchanges of information and best practices between the Member States (Official Journal of the European Union 2014).

In 2016, the European Commission introduced the Strategy for low-emission mobility. At the time, the transport in the EU was still dependent on oil for roughly 94% of its energy needs. Through this strategy, the Commission looked to accelerate the use of low-emission energy. With this occasion, the commission looked to facilitate better synergies between the energy and the transport system, such as addressing challenges of distribution of electricity at peak times to foster easier charging for EVs.

As promoted in this strategy act, the Member States were required to implement common standards for electric mobility, such as including a common charging plug for the electric vehicles, roll-out infrastructure for these alternative fuels, while the Commission committed to develop a methodology for easier price comparison of electricity and the other alternative fuels (European Commission 2016). As the ground was established, the end of the second decade of 2000s got the European Union ready to define and launch its most ambitious Sustainability act, the European Green Deal. It built on the commitment to achieving climate neutrality by 2050, delivering on the promises made by EU countries in the Paris Agreement. As of this, the European Green Deal is the EU's strategy for reaching the 2050 goal, launched by the Commission in December 2019. It consists of a package of policy initiatives from various fields: climate, environment, energy, transport, industry, agriculture and sustainable finance, all heavily linked together, underlining the need of a cross-sectorial approach, with all relevant areas contributing to the end goal of climate neutrality (Council of the European Union 2024).

For Szpilko & Ejdys (2022) the principal aim of the European Green Deal is to prioritize the benefits of sustainability for the European Union citizens as the main reason for all the policies developed further. The authors mention 8 major fields of European Green Deal Strategy's interest: "Increasing EU's Climate ambition for 2030 and 2050, supplying clean, affordable and secure energy, mobilizing industry for a clean and circular economy, building and renovating in a way that is energy- and resource-efficient, a zero-pollution ambition for a toxic-free environment, preserving and restoring ecosystems and biodiversity, "from farm to fork" — a fair, healthy and environmentally friendly food system and accelerating the shift to sustainable and smart mobility".

On the last-mentioned topic, the European Commission has put another strategy in place immediately after the Green Deal adoption in 2019. The new act, named Sustainable and smart mobility strategy was adopted and introduced an action plan listing 82 initiatives to keep the development on track. By this, the Commission aims to achieve at least 30 million zero-emission cars on its roads by 2030 and automated mobility should also be deployed at large scale. For the end goal of 2050 it is expected that nearly all cars, vans buses and trucks to be zero-emission. It was stated that this will be achieved by strengthening the actual rules, new legislation and support & guidance measures (European Parliament, 2020). As a baseline for the Smart and Sustainable Mobility Strategy, the electric vehicles adoption is aimed to be accelerated through various measures such as financial incentives, purchase subsidies, tax breaks, all these to encourage consumers to buy EVs along with extensive charging infrastructure developments, investments in research for battery-life improvements, charging speed and recyclability. This set of measures is close to the ones classified by Wang et al. (2017) who considers three main categories: financial incentive policy measures, information provision policy measures and convenience policy measures. Out of those, the author's research finds that convenience policy measures are the most important policy measures to promote EV.

For the daily life of citizens, those policies bring significant changes. According to Kiviluoto et al. (2022), changing the environment of people without an immediate result may trigger resistance. It becomes critical to involve the citizens in the decision-making of climate policies to ensure acceptance (Wamsler & Bristow 2022) and at the same time take the proper and balanced financial incentives to boost adoption. Though, according to the European Commission (2024), based on a large survey with over 19.000 participants conducted by the European Alternative Fuels Observatory in twelve countries of the EU, the Europeans are generally positive towards EVs. Over 57% of the respondents that do not yet own an electric car are considering a change in the future. The respondents understand and highlight the cost efficiency and climate benefits of the EVs, but price remains the major obstacle in switching decision.

Similar to the expansion of policies in the European Union on the electromobility topic, the recent years witnessed a rapid expansion in terms of sales. From 2017 to 2019, or before the Green Deal, the sales annual growth rate averaged to 40%. After the COVID-19 pandemic, the sales recovered. According to (Khaleel et al. 2023), overall, the electric vehicles sales in Europe continued to rise due to the contraction in the conventional combustion engines market. The growth in EV sales after 2020 was extraordinary mainly thanks to the rapid adjustments of corporate strategies of the manufactures to their standards adopted in 2019 which had an important influence on the production and sales between 2020 and 2024 period (International Energy Agency 2023). The policies are expected to harden, in line with the optimism of the consumers and the outlook for Electric Mobility is encouraging and positive for the expectations of the policy makers at the EU level. According to the International Energy Agency's Global EV Outlook (2024), the global electric vehicle pool is expected to grow twelve times by 2035, while Europe remains one of the most advanced EV markets under stated policies.

On the other side of the outlook highlighted above, electric vehicles market also has its limitations in terms of adoption which are worth mentioning. According to Menyhart (2024), the market share remains relatively low in Europe, around 16%. Between the factors, he mentions the high price, the battery capacity issues, the lengthy charging times, the limited range and the still insufficient infrastructure in terms of charging capabilities. The author finds the last-mentioned factor as crucial for electric vehicles adoption. Progress have been made around the region but the availability of charging points for EVs is still a challenge in many European countries.

As evidenced above, the electric mobility development in the European Union over the past 14 years accelerated through a series of policies and frameworks with milestones in 2011 (the White Paper – "Roadmap to a Single European Transport Area - towards a competitive and resource-efficient transport system), 2013 (Clean power for transport: a European alternative fuels strategy), 2014 (directive 2014/94/EU of the European Parliament and of the Council), 2016 (the Strategy for low-emission mobility), 2019 (The European Green Deal) and in 2020 (Sustainable Mobility Strategy). The adoption in terms of sales kept the similar positive trend.

In terms of scientific adoption, even though the field witnessed growing interest, the effects of the development on the scientific literature was not yet documented extensively. Several publications on EVs have emerged mainly on the topics of consumer preferences, adoption, incentives, business models, charging infrastructure, connection grids or environmental impacts (Haghani et al. 2023). The similar authors, Haghani et al. (2023) conducted a computational review and their analysis suggest four categories of topics of interest regarding EVs in the recent years: charging infrastructure, EV adoption, thermal management systems and routing problems. In their findings, hybrid EV proves to have been a dominant keyword, but it is noted that it is on a declining trend in the recent years. At the same time, their research highlights that adoption, with an extended emphasis on early adopters, and market development are some of the growing research clusters, expecting to continue to grow in line with the challenges to reach 100% EV penetration in the markets. Education and awareness are required about the benefits of electric vehicles in reducing greenhouse gas emissions and combating climate change.

Debnath et al. (2021) approached another angle in computational analysis to cluster the electric vehicles topic on social media using mixed-method application of social network analysis and machine learning-based topic modelling algorithm for the public posts. Their approach was location based, with a focus on the United States. They found out that political, economic, and legal posts had dense clusters on the technology policy of EVs, and also tax and credit framework politics.

Szpilko & Ejdys (2022) were the ones who conducted a systematic literature review on the Green Deal, identifying topics and classifying their compatibility with the Green Deal areas mentioned in the official strategic document. Their bibliometric analysis identified eight thematic clusters which were linked to the eight areas of the European Green Deal strategy. One of the identified clusters was Mobility - linked to the Accelerating the shift to sustainable and smart mobility focus on the Green Deal policies.

On a global level, Soto et al. (2024) analysed the use of EVs as a viable alternative to reduce the carbon footprint. They query looked for the documents that addressed the electric vehicles and their effect on carbon footprint reduction between 2010 and 2021, in renowned databases such as Scopus, Web of Science, Science Direct and ProQuest. Their findings highlighted that the United States were leading the scientific work on the field, with over 300 documents. From the four EV types identified (pure electric, plug-in hybrid electric, plug-in hybrid and hybrid), the most researched type of EVs are the pure electric ones, these also being viable alternatives for carbon footprint reduction, by an average of 91%. In another global level analysis, Hassan et al. (2024) looked at the EV adoption and environmental sustainability from 2014 to 2024. They used Scopus database and recorded 121 documents that matched their criteria. The results showed an upward trajectory of publications in the field, especially after 2019, with the United States and China as the top contributing countries. On the other side, their analysis shown that the developing countries are underrepresented.

Another comprehensive bibliometric analysis on EVs was conducted by Veza et al. (2024) looking at the following dimensions of the topic: electric vehicles trends, policies, batteries materials and battery management, charging infrastructure smart charging. Together with those, electric vehicle-to-everything (V2X) concept was addressed. According to Noor-A-Rahim et al. (2022), V2X consists of actual and future EVs capabilities of connecting with grids, infrastructure and networks, mainly expected for future 6G networks. For example, electric vehicles to grid (V2G) allows the vehicle to contribute back to the power electricity grid when it is not used (İnci et al., 2022) and according to Elagin et al. (2020), if a vehicle connects with networks or data centres it is referred as vehicle-to-network (V2N). Based on the mentioned areas, Veza et al. (2024) recorded documents between 1990 and 2022 and their analysis also shown increased interest and exponential growth of the publications in recent years. With their applied query, China was the highest ranked country by publications on EV research in general, achieving high levels of proficiency across the field, but with special focus on the lithium-ion batteries. At the same time, the United States ranked highest in the specific keyword of "charging infrastructure". The European countries which made it to the top 10 of publications were the United Kingdom, Germany, Italy and France. Based on their findings, the authors conclude that, the success of Electric Vehicles and their ongoing expansion relies on cohesive integration of EV policies, cutting-edge battery technologies, charging infrastructures, and V2X communication.

In another angle of research on the topic, Tolani et al. (2023) conducted a systematic review on the Emergence of Sustainable Mobility for Global Ecology, preforming a bibliometric analysis on the concept of sustainable mobility and the emerging role of EVs. In the authors conclusions, the sustainable behavior and mobility adoption is rather a personal decision but one moderated by policies. Conscious sustainable behavior is believed to

be the proper way forward for the society in general. At the same time, innovation and emerging technological initiatives like Circular Economy for recycling and repurposing EVs might be the answers for sustainable mobility initiatives.

While previous research analysed various instances of the scientific interest in the field of electric vehicles globally or historically, this research proposes to specifically determine the scientific quantitative evolution of the electric mobility development topic in Europe, in the recent years, starting with the context of the strategic emphasis put by the EU regulators on E-Mobility: From 2011 White Paper – "Roadmap to a Single European Transport Area - towards a competitive and resource-efficient transport system to present, with a bibliometric analysis approach detailed in the further sections.

Research methodology

The purpose of this research is to quantitatively evaluate the academic research evolution on the topic of Electric Mobility development in the European Union in the recent years.

The objective is to find out whether the topic did receive a similar attention in the recent years equal to the emphasis that has been put by the European Union policies and like the sales evolution of this new automotive category. At the same time, it looks to find out what are the main topics of interest and exploration in regards of Electric Mobility development in the existing literature. It analyses the period starting from 2011, the year of the first strategic document of the EU in the modern era - 2011 White Paper – "Roadmap to a Single European Transport Area - towards a competitive and resource-efficient transport system" to present, mapping the Green Deal as a possible point of inflection on this proposed timeframe.

The author's assumption is that the most scientific research was conducted in the recent times, expecting a similarity in evolution and trend with the above-mentioned events in the field of Electric Mobility in the European area.

For this, the article would like to answer the following three research questions:

1. How many scientific articles were written in the chosen timeframe dedicated to the European Union's advancement in the E-Mobility field and how did the trend evolve?
2. Did the Green Deal moment have an impact on this evolution, and to which extend?
3. What were the categories of topics addressed and what is the trend of study?

Research Methods

For this objective, a bibliometric analysis will be used to quantify the literature on the E-Mobility development in the European space. This methodology is often used for the identification of trends, synthesis, analysis and critical evaluation of the scientific work on the topic (Le et al. 2019). It allows identifying the state and the trends in the desired research field, like Niñerola et al. (2019) conducted, with a detailed outcome, ranging from the number of publications in the defined timeframe to the construction of rankings of the actual authors, journals, research units and geographical regions It is practiced for both "mature" areas of research but also for newer, growing areas of interest to especially identify trends (Le et al. 2019). According to de Oliveira et al. (2019), bibliometric analysis can be a valuable tool to plan future research strategies and highlight directions in scientific developments while Donthu et al. (2021) mention that bibliometric analysis aid researchers, institutions, and policymakers identify urgent research areas, quantify the impact of academic work, and comprehend the contributions of individuals, institutions or nations in a specific domain.

A specific design for systematic literature reviews was proposed by Tranfield et al. (2003). based on three stages: planning, conducting and reporting of the results. The mentioned design is followed in this study.

The bibliometric analysis conducted was completed in 7 steps. The initial step of the analysis consisted in choosing the proper database for our purpose, the second step implied starting the search process and selecting the relevant documents by keywords. The third step focused on applying the filtering criteria (timeframe and type of document). In the fourth step, the data was extracted, while in the fifth step the duplicates were removed. The final two steps consisted in analysis of the results (sixth step) and the clustering of data (seventh step).

The whole scheme of the bibliometric analysis methodology used to achieve the purpose of this research is shown and detailed in the Figure 1 below.

To carry out the analysis we chose the renowned Scopus multidisciplinary database from Elsevier. Each year, the Journals published in Scopus are quality reviewed based on four numerical criteria's: h-Index, CiteScore, SJR (SCImago Journal Rank) and SNIP (source normalized impact per paper). The listings in Scopus meet the requirements for peer review quality by degree-accreditation boards around the globe. As of 2024, Scopus holds over 94 million records (Elsevier 2024).

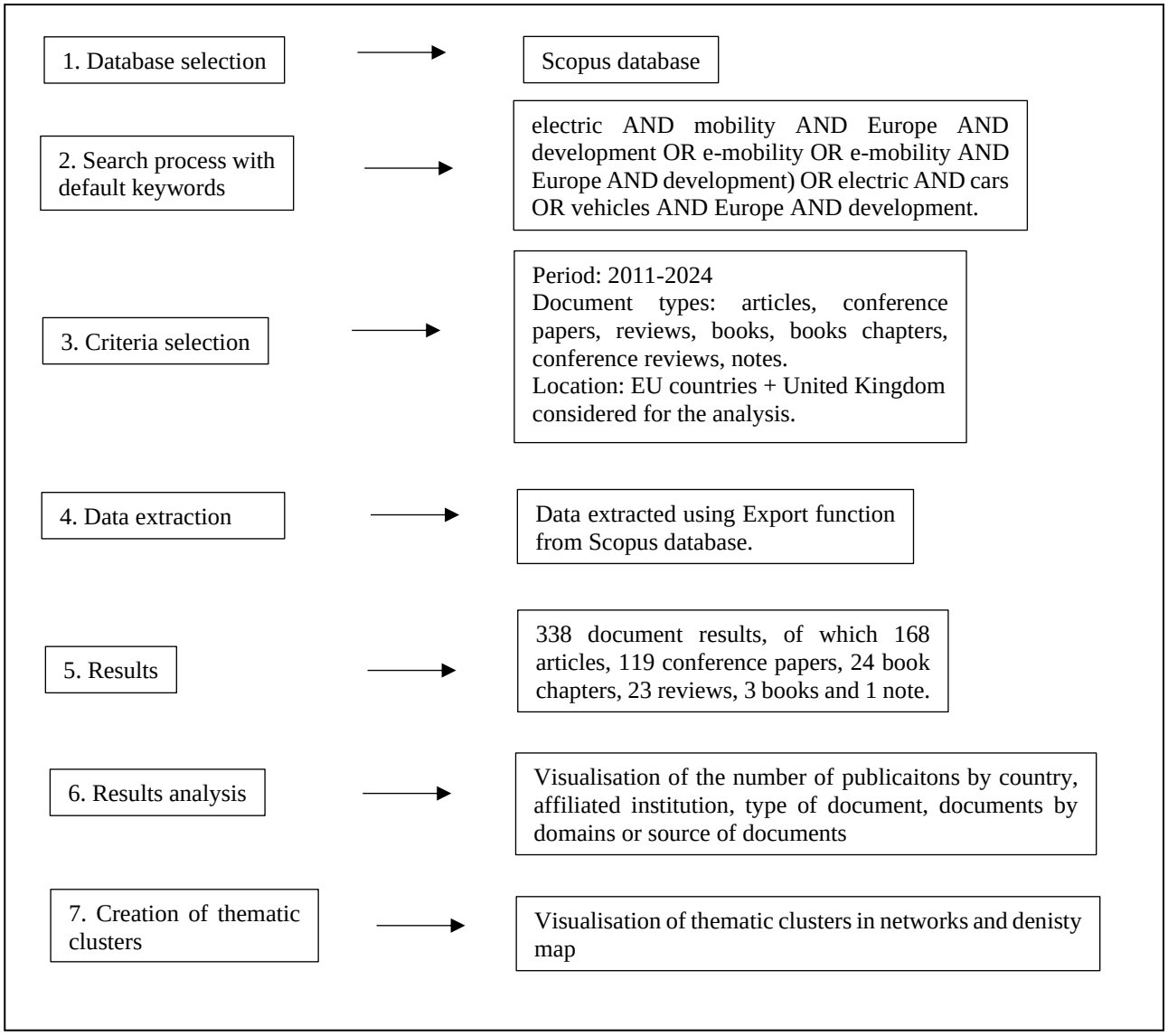

Fig 1. Seven-step bibliometric workflow—From database selection to keyword-cluster visualisation, this flow chart summarises the procedure that generated all subsequent results. *Source:* adapted from Maas (2022), p.5 and Szpilko & Ejdys (2022), p. 15

In the second step, the search process started by adding the main keywords of research in the "Search Document" section of the Scopus platform, with the following query function that includes the synonym terms used for electric mobility (emobility, e-mobility, electric vehicles and electric cars): "(ALL (electric AND mobility AND europe AND development) OR ALL (emobility OR e-mobility AND Europe AND development) OR ALL (electric AND cars OR vehicles AND europe AND development))", with "Search within" filter for "All fields" applied.

The initial search returned 41.932 documents, with the following results in terms of document types: 23.683 articles, 7.153 conference papers, 5.554 reviews, 2.923 boots, 2.320 book chapters, 104 editorials, 65 notes, 58 short surveys, 31 retraced, 26 conference reviews, 7 letters, 6 data papers and 1 erratum.

In the third step of the analysis, to increase the accuracy and relevance of the data returned, a second search was needed and conducted, keeping the same keywords but reducing the document types in focus by changing the "Search within" field to "Article title, Abstract, Keywords" and resulting the following search query function applied: "(TITLE-ABS-KEY (electric AND mobility AND europe AND development) OR TITLE-ABS-KEY (emobility OR e-mobility AND Europe AND development) OR TITLE-ABS-KEY (electric AND cars OR vehicles AND europe AND development))". With this filtering in place, 659 documents were found, spread by type as follows: 302 articles, 242 conference papers, 43 reviews, 33 book chapters, 24 conference reviews, 7 notes and 4 books.

The timeframe starting from 2011 to present (31st of August 2024 – date of data gathering by the author) was added in filters. The updated query function "(TITLE-ABS-KEY (electric AND mobility AND Europe AND development) OR TITLE-ABS-KEY (emobility OR e-mobility AND Europe AND development) OR TITLE-ABS-KEY (electric AND cars OR vehicles AND europe AND development)) AND PUBYEAR > 2010 AND PUBYEAR < 2025 " returned 471 documents, of which 217 articles, 165 conference papers, 33 book chapters, 30 reviews, 18 conference reviews, 4 books and 3 notes.

Next, location and language were two other parameters or filters added to the query search function. The "County/Territory" filter was set to "Limit to" existing EU countries from the list shown with the last-mentioned uery applied. At the same time, "Language" filter was limited to the EU members states official languages.

Because Brexit - United Kingdom's exit from the European Union area happened on 1st of February 2020, the United Kingdom was kept in the analysis. No other limits were applied to "Author name", "Subject area", "Document type", "Source title", "Publication stage", "Keyword", "Affiliation", "Funding sponsor", "Source type" and "Open access" filters, as the rest of the criteria returned were considered relevant for the purpose of the study. We considered this as the final query of the bibliometric analysis, registering 338 document results, of which 168 articles, 119 conference papers, 24 book chapters, 23 reviews, 3 books and 1 note.

For comparison purposes, an additional search was conducted using the similar query formula except the "Year" filtering. It considered all scientific documents to present and resulted in 422 findings.

Following the fourth and fifth step of the bibliometric analysis plan, the quantitative data resulted was then extracted using the "Analyse results" and "Export" functions of the Scopus database. The analysis of data was done using the similar modules of the Scopus database website and with VOSviewer software. The results and clustering of data is detailed in the next section of the article.

Results & discussion

The purpose of this research is to quantitatively evaluate the academic research evolution on the topic of Electric Mobility development in

The number of publications (documents in Scopus terminology) recorded between 2011 to 2024 had a generally positive growing trajectory, as presented in the Figure 2.

Inflection points were observed in the years after 2011, 2013 and 2018. Linking to the milestones presented in the literature review chapter on E-mobility development in EU, in 2011 the European Commission issued the first strategic document that approaches the subject of E-mobility - the White Paper – "Roadmap to a Single European Transport Area - towards a competitive and resource-efficient transport system" and in 2013 - the "Clean power for transport: a European alternative fuels strategy" act was published. Even though the European

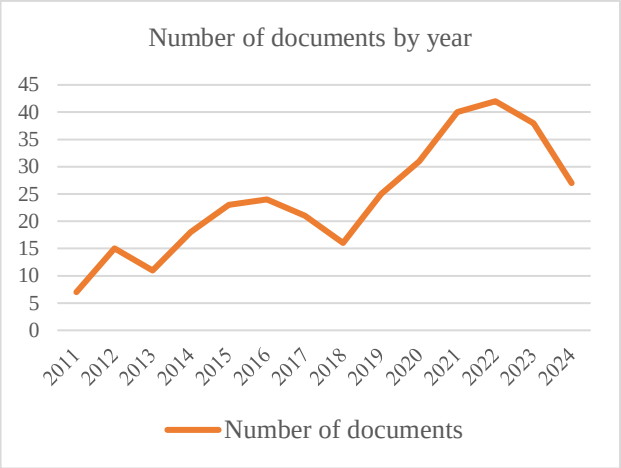

Fig. 2 . Annual EU e-mobility publications, 2011–2024 — Output climbs steeply after 2011, peaks in 2021-2022, then slips in 2023-2024. Source: author's work based on Scopus database retrieved data.

Commission introduced the Strategy for low-emission mobility in 2016, we see a drop in number of documents published, with the trend re-accelerating in 2018, a year before the European Green Deal was launched. A direct correlation between the year of re-acceleration of the trend (2018) and the year when European Green Deal was launched (2019) is not observed, however the number of documents on the subject was the highest between 2018 and 2022. The recent period between 2022 and 2024 marked another leg down in the number of publications. Forces likely to explain the pause could be that the topic maturity is beginning to curb novelty. After a decade of rapid expansion, key topics may be well-explored, yielding fewer novel studies. Bibliometric mappings presented in the literature review show that once-dominant themes such as "hybrid EV" now attract far fewer new papers, signalling that foundational questions have been largely settled (Haghani et al., 2023). Another explanation might be that funding and policy priorities have also moved on, with the geopolitical and energy crises of 2022–2023 also potentially redirected attention toward urgent energy security issues, subtly shifting focus away from academic publishing on e-mobility. It is also plausible that electric mobility moved from a nascent research topic toward the mainstream implementation.

Comparing the number of publications before and after the European Green Deal moment, there were 135 publications between 2011 and 2018 (8 years) and 178 publications between 2020 and 2024 (less than 5 years), registering a 31,8% increase. The year of European Green Deal announcement (2019) was excluded from the comparison.

At the same time, the search process conducted allowed analysing the situation of documents published before and after 2011. Out of 422 documents that matched the query search function without "Year" filtering, 80% (338) publications were registered in the 2011-2024 period, showing an exceptional increase of interest in the field after 2011 moment, the year of EU Commission's first strategic act.

Out of the 338 publications registered in the period of interest of the study, the covering majority (168) were articles, 119 were conference papers, followed by 24 book chapters, 23 reviews, 3 books and 1 note. The spread by percentage out of total is presented in the Figure 3.

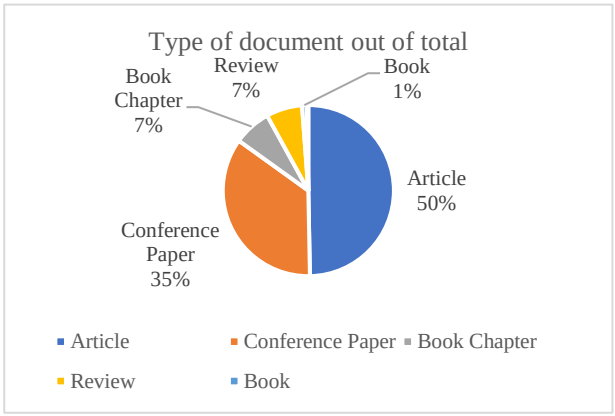

Fig 3. Document types in EU e-mobility research, 2011 – 2024 — Journal articles (50 %) and conference papers (35 %) dominate, whereas books and chapters comprise only a small fraction. Source: author's work based on Scopus database retrieved data.

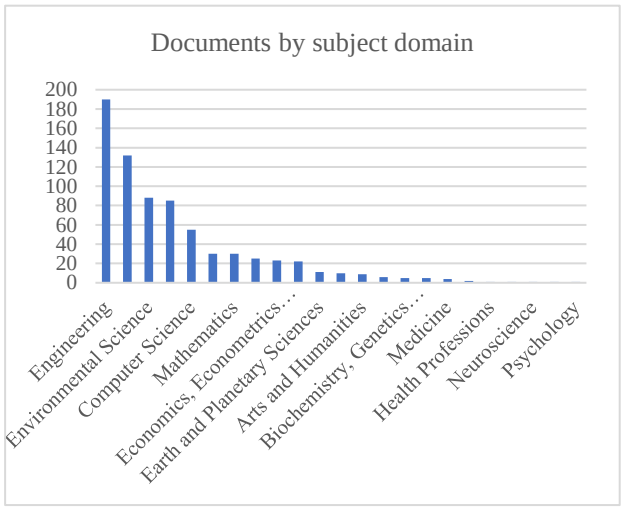

Fig. 4. Engineering and Environmental Science together account for well over half of all documents, underscoring the technology- and sustainability-centred focus of the field. Source: author's work based on Scopus database retrieved data.

The analysis of data based on the subject domain is present in the Figure 4. Engineering covered 190 publications (25.8%), followed by Energy with 132 publications (17.9%), Environmental Science with 88 publications (11.9%). Social Science with 85 publications (11.5%), Computer Science with 55 publications (7.5%) were the main domains highlighted by the research. Business Management and Accounting and Mathematics with 30 publications (4.1%) each, Physics and Astrology with 25 publications (3.4%), Economics, Econometrics and Finance with 23 publications (3.1%), or Material Science with 22 publications (3%). The other fields of study had less than 11 publications each, accounting for 54 publications in total or 7.4% from total as percentage.

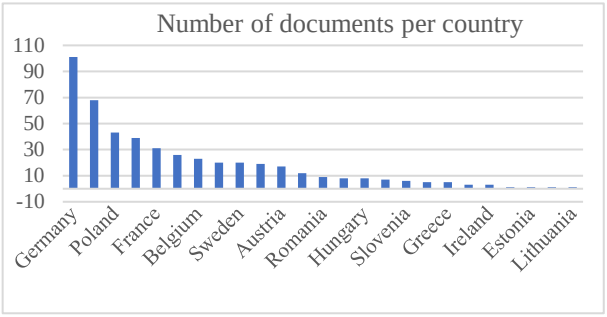

Fig. 5. National contributions to EU e-mobility writtings, 2011–2024 - Germany, Italy and Poland lead, whereas most Eastern-member states produce fewer than 10 papers, revealing a persistent West–East research gap. Source: author's work based on Scopus database retrieved data.

In terms of Country of origin, as presented in the Figure 5., the most documents were written in Germany 101, followed by Italy – 68. Other countries which registered publications had below 50 documents: Poland – 43, United Kingdom – 39, France – 31, Spain – 26, Belgium 23, Netherlands and Sweden – 20 each, Portugal – 19, Austria 17, Denmark 12, Romania – 9, Czech Republic – 8, Hungary – 7, Slovakia – 6, Slovenia - 6, Croatia and Greece – 5 each, Bulgaria and Ireland with 3 and Cyprus, Estonia, Latvia and Lithuania with 1 each. Data shows that between 2011 and 2024, An uneven distribution of research output among EU countries is evident. A few Western European countries account for the bulk of publications, while many Eastern members contribute relatively little. For example, Germany – home to a robust automotive industry – leads by a large margin in e-mobility publications. This dominance can be attributed to Germany's extensive R&D investment and its status as an automobile innovation hub. Similarly, Italy and other Western countries produce high output, benefiting from stronger research funding and active participation in EU-wide projects. By contrast, numerous Central and Eastern European countries have published only a handful of papers on e-mobility. This imbalance may reflect broader disparities in research capacity. Eurostat's R&D 2023 data show that Sweden, Belgium, Austria and Germany each spent more than 3 % of GDP on R & D, whereas Romania, or Hungary spend about 1 % (Eurostat, 2024).

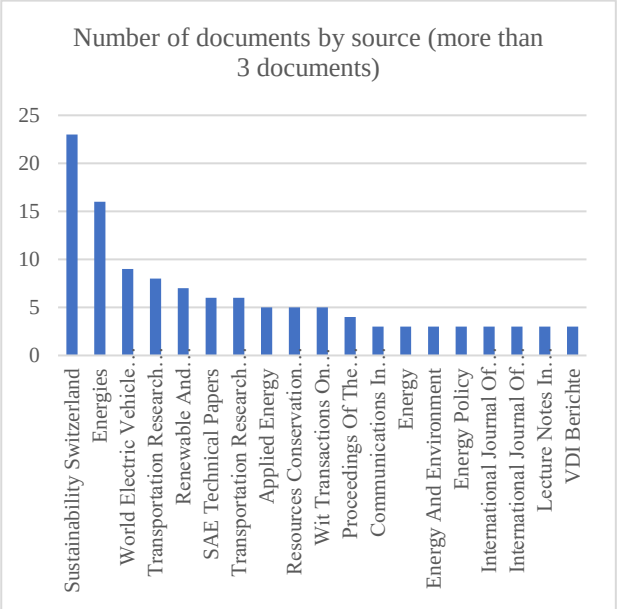

Fig. 6. Sustainability and Energies dominate the output, whereas all other journals publish fewer than ten e-mobility studies each.Source: author's work based on Scopus database retrieved data.

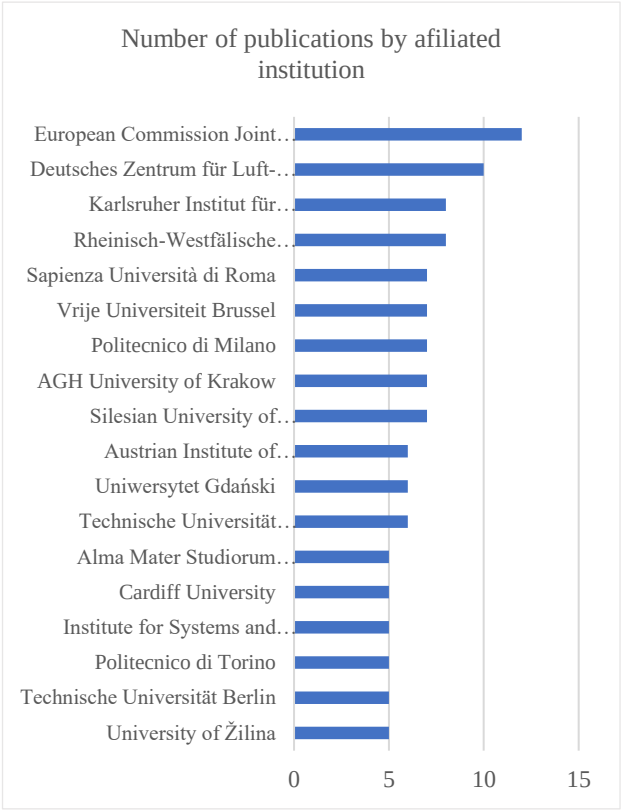

Fig. 7. Top institutional contributors — The EC's Joint Research Centre and Germany's DLR lead output, with several German and Italian universities close behind.Source: author's work based on Scopus database retrieved data.

The journals with the most publications about Electric Mobility development in the European Union was Sustainability Switzerland with 23 publications, followed by Energies with 16 publications, World Electric Vehicle Journal with 9 publications, Transportation Research Part D Transport and Environment with 8 publications, Renewable and Sustainable Energy Reviews 7 publications, SAE Technical Papers with 6 publications. The rest of the publishing sources with more than 3 publications are detailed in the Figure 6.

Comparing by the number of publications by affiliated institution (Figure 7), we observe that European Commission Joint Research Centre had the most affiliations, 12, followed by the German institutions:

Deutsches Zentrum für Luft- und Raumfahrt DLR with 10, Karlsruher Institut für Technologie and Rheinisch-Westfälische Technische Hochschule Aachen with 8 records. The top of affiliations with over 5 recordings is completed with institutes, universities and other institutions from Italy, Poland, Slovakia, Austria and Wales (United Kingdom). institutions from Italy, Poland, Slovakia, Austria and Wales (United Kingdom).

As part of the bibliometric analysis, the most used author's keywords on the topic of electric mobility development in the European were extracted based on the similar Scopus database dataset described in the Research and Methodology chapter. The analysis was conducted using VOSviewer software developed by Nees Jan van Eck and Ludo Waltman at Leiden University's Centre for Science and Technology Studies. VOSviewer is a software tool for constructing and visualizing bibliometric networks. These networks may for instance include journals, researchers, or individual publications (Centre for Science and Technology Studies 2024). According to Vargas et al. (2022), VOS viewer is the predominantly used software for bibliometric analysis type. The tool allows great visualization and can load and export types of information from various sources (Moral-Muñoz et al. 2020).

In this regard, a co-occurrence type of analysis was done, using a full-counting method, with index keywords as unit of analysis. The total keywords available in the dataset accounted for 1064 recordings. This set contained synonyms or similar terms (transport, transportation, electric mobility, e-mobility, electric vehicle, electric vehicles,).

To remove duplicates and standardize, a Thesaurus file was organized and applied to the dataset. At the end, the initial keywords used for starting the search process were also removed, along with the keywords considered irrelevant for our purpose. Minimum number of occurrences of a keyword was set to 3, similar to the approach used by Szpilko & Ejdys (2022). The final file before generating the cluster contained 49 items that meet the threshold: biofuels, decarbonization, electricity, electrification, emissions, energy efficiency, passenger cars, road transport, automotive industry, battery electric vehicle, electric propulsion, fuel cell, hydrogen, sustainable mobility, urban mobility, city logistics, electric bus, hybrid electric vehicles, sustainable transport, sustainable transportation, transport policy, market development, renewable energies, smart grids, smart metering, smart meters, air pollution, circular economy, lithium-ion batteries, recycling, sustainable development, fast charging, power system, renewable energy, smart

charging, vehicle-to-grid, energy, mobility, smart cities, smart mobility, alternative fuels, charging infrastructure, infrastructure, batteries, environment, sustainability, capacity, public transport, travel time. Those accounted for 103 links and a total link strength of 134, as presented in the Figure 8 below.

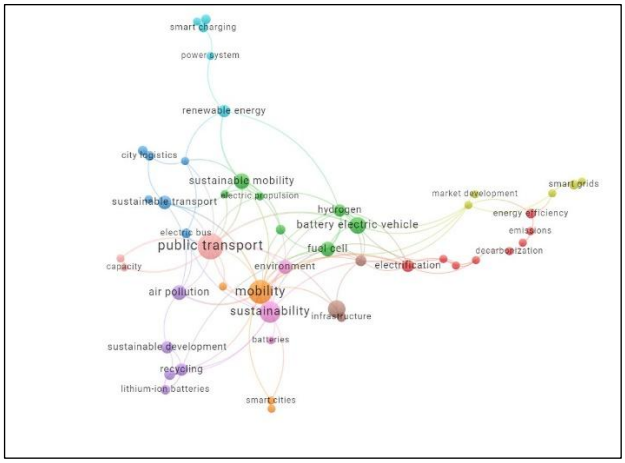

Fig. 8. Keyword co-occurrence clusters in EU e-mobility research — Nine distinct thematic groups emerge, with 'public transport' and 'sustainable mobility' forming the densest nodes. Source: author's work using VOSviewer software based on Scopus database data.

The larger the circle in Figure 8., the greater the number of occurrences of a specific keyword. The most occurrences appeared for public transport (21), followed by mobility (17), sustainability (15), charging infrastructure (11), battery electric vehicle (10) and sustainable mobility (9). The bibliometric analysis allowed identifying the main clusters of subjects of interest in regards of electric vehicles development in the European Union between 2011 and 2024. This can be observed based on the Clusters Density Visualization map presented in Figure 9. Public transport (blue), sustainable mobility (brown), infrastructure (rose), market development & energy efficiency (red), electrification (purple), renewable energy, recycling (light blue), air pollution and environment (orange), renewable energy (green), sustainable transport and city logistics (yellow) and "battery electric vehicle" cluster at the intersection of sustainable mobility, electrification, and environment.

For public transport, most of the topics addressed in the academic research were related to alternative fuels, electrification of urban bus fleets and the historic evolution of low-emission public transport across Europe. Case studies of various cities, regions or countries that integrated electrification for their public transport are also presented extensively.

As for the sustainable mobility cluster, the academic discussion in the selected period approached specific policies for EV adoption across EU countries and the role of incentives and solutions for sustainable economic growth in the context of CO2 emissions reduction. The infrastructure cluster, as mentioned did mainly approach the charging infrastructure developments state, optimizations and further needs in this regard that would facilitate the reduction in emissions over the long term.

As for the market development & energy efficiency cluster, the documents are mainly discussing about batteries life cycle, batteries recycling, and efficiency in design. For air pollution and environment, the topics addressed converge around the similar ones listed above for the other clusters. The reason being is that air pollution

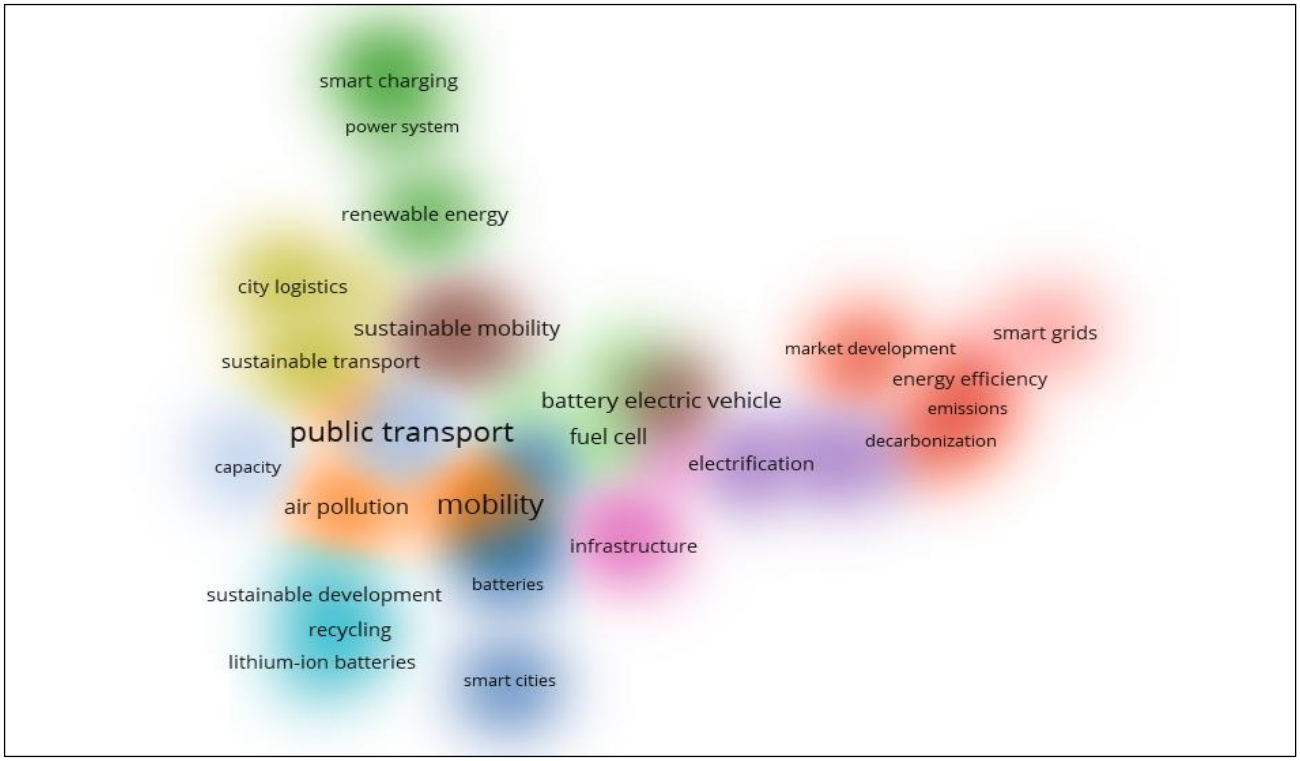

Fig. 9. Clusters Density map of EU e-mobility studies. Source: author's work using VOSviewer software based on Scopus database data

problem is a general reason and start of discussion in all scientific publications on electric mobility development.

Renewable energy is another cluster heavily linked to the other topics, based on the keywords analysis conducted. For example, the articles on the subject touch areas such as smart grids, charging integrated platforms and the impact of electric vehicles on a future renewable energy-based power system in Europe. Again, various use cases from different regions across Europe are presented.

In terms of sustainable transport and city logistics, the topics are partially familiar with the ones found for public transport.

Schemes for supporting sustainable transportation in cities are addressed, consumer preferences on the electric mobility or their willingness for adherence to alternative fuels in general, or the costs of indirect carbon emissions of e-mobility. Taking about batteries, the last observed cluster in our analysis, it touched areas such as patents, recyclability and cost effectiveness of various solutions.

Conclusions

To summarize the findings of this analysis, the objective and the research questions posed in the Research Methodology chapter are addressed below. The purpose of this research was to quantitatively evaluate the academic research evolution on the topic of Electric Mobility development in Europe, in the context of the recent policies of the European Union. Validating the relevance of the selected period for study, the bibliometric analysis showed that 80% of the existing literature on the field was published after 2011, the similar year when the European Commission published the White Paper – "Roadmap to a Single European Transport Area - towards a competitive and resource-efficient transport system", its first strategic document that addressed the E-Mobility topic.

The first research question asked how many scientific articles were written in the chosen timeframe dedicated to the topic and how did the trend evolve. In exact numbers, the search query found 338 documents published and indexed in Scopus database between 2011 and 2024, with a generally positive growing trajectory along the years, as presented in the Figure 2 of the Results Discussions chapter.

The second question looked to find and quantify whether the European Green Deal moment - December 2019, had an impact to the scientific interest evolution in the field and if yes, to which extend. Our analysis showed that inflection points were observed in the years after 2011, 2013 and 2018 (Figure 2.. Linking those points to the milestones presented in the literature review chapter, besides the 2011 moment mentioned above, in 2013 - the "Clean power for transport: a European alternative fuels strategy" act was published by the European Commission. Even though the institution introduced the Strategy for low-emission mobility in 2016, the analysis showed a drop in number of documents published at that time, with the trend re-accelerating in 2018, a year before the European Green Deal was launched. A direct correlation between the year of re-acceleration of the trend (2018) and the year when European Green Deal was launched (2019) could not be made, however, the number of documents on the subject was the highest between 2018 and 2022. As stated in the Results Discussion chapter, the recent period between 2022 and 2024 marked another leg down in the number of publications. This dip in publication activity might reflect the field's gradual maturation. After a decade of rapid growth, many central questions may already be well explored, leaving fewer obvious gaps for novel studies. Bibliometric snapshots, for example, suggest that topics once at the forefront—such as "hybrid EVs"—now draw far less attention, implying that foundational issues could be largely clarified (Haghani et al., 2023). Policy and funding priorities may also be shifting. The geopolitical and energy turbulence of 2022–2023 appears to have steered resources toward urgent energy-security agendas, potentially nudging e-mobility lower on the research docket.

At the same time, the bibliometric evidence points to a clear West–East divide in EU e-mobility writtings. A handful of Western countries dominate the literature, while most Eastern members contribute only modestly.

Germany—buoyed by a strong automotive sector and high R &D spending—publishes the most by a substantial margin, and Italy and several other Western economies also post high output thanks to generous funding and active involvement in EU framework programmes. Central and Eastern European states, by contrast, typically add just a few papers to the corpus. This pattern mirrors wider discrepancies in research capacity: 2023 Eurostat data indicate that Sweden, Belgium, Austria and Germany each invested more than 3 % of GDP in R &D, whereas Romania and Hungary devoted roughly 1 % (Eurostat, 2024).

Another assumption was that the most scientific research was conducted in the very recent years, expecting a similarity in evolution and trend with the above-mentioned events in the field of Electric Mobility in the European area. Specifically, we chose the European Green Deal as the before and after point of analysis and found that in the first 8 years of the analysis there were 135 publications (between 2011 and 2018), compared to 178 publications between 2020 and 2024 (less than 5 years), registering a 31,8% increase.

The third research question looked to identify the trend of study in the field and the topics addressed. It was answered using the co-occurrence and density vision maps analysis generated from VOSviewer software based on the similar dataset exported from Scopus database. Out of 1064 words inserted, 49 were had more than 3 occurrences and strong links with the other Author's keywords. As seen in the Figure 8., the most occurrences appeared for public transport (21), followed by mobility (17), sustainability (15), charging infrastructure (11), battery electric vehicle (10) and sustainable mobility (9). Adding the density map from Figure 9. we could identify the following major keywords based areas of interest in regards of Electric Mobility development in the EU: public transport (blue), sustainable mobility (brown), infrastructure (rose), market development & energy efficiency (red), electrification (purple), renewable energy, recycling (light blue), air pollution and environment (orange), renewable energy (green), sustainable transport and city logistics (yellow) and "battery electric vehicle" cluster at the intersection of sustainable mobility, electrification, and environment.

Our analysis confirms some of the findings of Haghani et al. (2023) who through their general computational review on EV also found charging infrastructure as a main cluster and market development as a growing cluster. At the same time, their analysis found hybrid EV as a dominant keyword (though on a declining trend) which did not materialize in our bibliometric analysis.

The "mobility" cluster found to be linked and compatible with the European Green Deal strategic statements found by Szpilko & Ejdys (2022) in their systematic literature review and bibliometric analysis was also highlighted by our analysis. In their study, mobility was mostly linked to the accelerating the shift to sustainable and smart mobility. Those connections were also found by our analysis but the closes links in our case were to public transport, air pollution and environment, infrastructure (charging), or sustainable development.

Compared to Debnath et al. (2021)'s social network analysis and machine learning modelling algorithm on social media posts from the United States in regard to EVs, our findings were different. Their analysis found that political, economic, and legal posts on the technology policy of EVs in US had dense clusters. Besides the region chosen for the analysis, the differences come from the fact that they looked to the general population's reaction, rather than the academic world's contribution to the field, which was our focus in this study.

In conclusion, our analysis validates that the most publications in this field of study were completed after the accelerating of the framework by the European Commission, starting with 2011. A direct correlation between the European Green Deal moment and the re-acceleration of the trend which started one year earlier, could not be made, however, the period between 2018-2022 registered the highest number of publications compared to previous years. Our identified clusters of keywords in regards of Electric Mobility development in the European Union were centred on public transport, sustainable mobility, infrastructure, electrification, market development & energy efficiency, recycling, renewable energy, air pollution and environment, sustainable transport and city logistics.

Limiting factors of this study should be mentioned. First, the data was retrieved solely from Scopus database, while being extensive, publications indexed elsewhere were not included. Similarly, the document selection criteria (e.g. the specific query terms, the focus on EU-affiliated research, and the 2011–2024 timeframe) could be other limiting factors. Even with a carefully formulated search strategy, there is a risk that certain pertinent publications or emerging topics were not captured, especially if they fell outside the chosen filters. Since bibliometric results are highly sensitive to the keywords used in the search, keyword sensitivity and standardization is another limiting factor. Although the query was designed to encompass known synonyms, complete standardization is challenging. Broad set of terms were added (e.g., "electric mobility," "e-mobility,") but inconsistencies in terminology remain a concern.

The analysis predominantly covers publications in the languages from the EU. This language focus may underrepresent research published in other languages. Those contributions would be largely absent from our study due to the language and indexing bias.

In addition, electric mobility is a very wide and growing field of research, subject to permanent developments which requires similar constant updates also in the academic world. The presented analysis proposes to offer a basic framework for further possible analysis.

Acknowledgements

This paper was co-financed by The Bucharest University of Economic Studies during the PhD program.

A less elaborated version on this topic has been presented at the 15th Edition of the International Conference - The Future of Europe, on October 24-25, 2024, organized by Faculty of International Business and Economics from Bucharest University of Economic Studies, Romania.

References

Bekiaris, E., Tsami, M., & Panou, M. (Jan. 2017). A "Greening Mobility" framework towards sustainability. Transportation Research Procedia 24C. 3rd Conference on Sustainable Urban Mobility, 3rd CSUM 2016, 26 – 27 May 2016, Volos, Greece, pp. 131–136. http://dx.doi.org/10.1016/j.trpro.2017.05.078

Burton, N. (2013). History of electric cars. Crowood.

Debnath, R., Bardhan, R., Reiner, D. M., & Miller, J. R. (2021). Political, economic, social, technological, legal and environmental dimensions of electric vehicle adoption in the United States:A social-media interaction analysis. Renewable and Sustainable Energy Reviews, 152, 111707. pp. 2-8. https://doi.org/10.1016/j.rser.2021.111707

de Oliveira, O. J., da Silva, F. F., Juliani, F., Barbosa, L. C. F. M., & Nunhes, T. V. (2019). Bibliometric method for mapping the state-of-the-art and identifying research gaps and trends in literature: An essential instrument to support the development of scientific projects. In Scientometrics recent advances. IntechOpen. https://doi.org/10.5772/intechopen.85856

Donthu, N., Kumar, S., Mukherjee, D., Pandey, N., & Lim, W. M. (2021). How to conduct a bibliometric analysis: An overview and guidelines. Journal of business research, 133, 285-296. https://doi.org/10.1016/j.jbusres.2021.04.070

Elagin, V., Spirkina, A., Buinevich, M., & Vladyko, A. (2020). Technological aspects of blockchain application for vehicle-to-network. Information, 11(10), 465. p. 2. https://doi.org/10.3390/info11100465

Falchetta, G., & Noussan, M. (2021). Electric vehicle charging network in Europe: An accessibility and deployment trends analysis. Transportation Research Part D: Transport and Environment, 94, 102813. p. 15. https://doi.org/10.1016/j.trd.2021.102813

Fava, V. & Favero, G. (2023). From Transport History to History of Sustainable Mobility. In: Cabigiosu, A., Lanzini, P. (Eds.) The Green Transition of the Automotive Industry pp 45–66. Palgrave Macmillan, Cham. https://doi.org/10.1007/978-3-031-37200-1_3

Filho, W., & Kotter, R. (Eds.). (2015). E-Mobility in Europe: Trends and good practice. Springer. p. 4

Guarnieri, M. (2012, September). Looking back to electric cars [Conference Proceedings]. 3rd Region-8 IEEE HISTory of Electro Technology CONference: The Origins of Electrotechnologies, HISTELCON, Pavia, Italy. https://doi.org/10.1109/HISTELCON.2012.6487583

Haghani, M., Sprei, F., Kazemzadeh, K., Shahhoseini, Z., & Aghaei, J. (2023). Trends in electric vehicles research. Transportation research part D: transport and environment, 123, 103881. pp. 1-19. https://doi.org/10.1016/j.trd.2023.103881

Hassan, A., Mahmoud, M.A., Al-Sharafi, M.A., Ibrahim, M., Iahad, N.A., Gunasekaran, S.S. (2024). Bibliometric Analysis of Electric Vehicle Adoption and Environmental Sustainability Research (2014–2024): Trends and Implications. In: Al-Sharafi, M.A., Al-Emran, M., Tan, G.WH., Ooi, KB. (eds) Current and Future Trends on Intelligent Technology Adoption. Studies in Computational Intelligence, vol 1161. Springer, Cham. pp. 43-58. https://doi.org/10.1007/978-3-031-61463-7_3

İnci, M., Savrun, M. M., & Çelik, Ö. (2022). Integrating electric vehicles as virtual power plants: A comprehensive review on vehicle-to-grid (V2G) concepts, interface topologies, marketing and future prospects. Journal of Energy Storage, 55, 105579. https://doi.org/10.1016/j.est.2022.105579

Kaup, M., Slaczka, W., Wiktorowska-Jasik, A., Sęk, J., & Lewicki, W. (2021, November). Electromobility As an Element of The European Green Deal Assessment of the Level of Development and Deployment of Charging Stations [Conference Paper]. 38th International Business Information Management Association (IBIMA) Conference 23-24 November 2021, Seville, Spain. p. 3939.

Kiviluoto, K., Tapio, P., Tuominen, A., Lyytimäki, J., Ahokas, I., Silonsaari, J., & Schwanen, T. (2022). Towards sustainable mobility–Transformative scenarios for 2034. Transportation Research Interdisciplinary Perspectives, 16, 100690. p. 9. https://doi.org/10.1016/j.trip.2022.100690

Khaleel, M., Ahmed, A., & Alsharif, A. (2023). Technology challenges and trends of electric motor and drive in electric vehicle. Int. J. Electr. Eng. and Sustain., pp. 41-48.

Le, H, Dao, Q., Pham, V., Tran, D., & Del Giudice, M. (2019). Global trend of open innovation research: A bibliometric analysis. Cogent Business & Management, 6(1). p. 4. https://doi.org/10.1080/23311975.2019.1633808

Maas, B (2022). Literature Review of Mobility as a Service. Sustainability 14(14), 8962. pp. 1-5. https://doi.org/10.3390/su14148962

Maciuk,K., Santos, C., Kulesza, L., Gawlik, A., Orzel, A., Jakubiak, M., Bajdor, P, Pytel, S., Specht, M., Krzykowska-Piotrowska, K., Nistor, S.,Wengel, Y., & Apollo, M.(2024). An Analysis of Engine Type Trends in Passenger Cars: Are We Ready for a Green Deal?. Transport and Telecommunication Journal, 25(2) 113-135. p. 116. https://doi.org/10.2478/ttj-2024-0009

Maheswari, K.L., Kavitha, S., & Kathiresh, M. (2022). Introduction to Electric Vehicles and Hybrid Electric Vehicles. In: Kathiresh, M., Kanagachidambaresan, G.R., & Williamson, S.S. (Eds.) E-Mobility (pp 1–29). Switzerland: EAI/Springer Innovations in Communication and Computing. Springer, Cham. https://doi.org/10.1007/978-3-030-85424-9_1

Menyhart, J. (2024). Overview of Sustainable Mobility: The Role of Electric Vehicles in Energy Communities. World Electric Vehicle Journal, 15(6), 275. https://doi.org/10.3390/wevj15060275

Moral-Muñoz, J. A., Herrera-Viedma, E., Santisteban-Espejo, A., & Cobo, M. J. (2020). Software tools for conducting bibliometric analysis in science: An up-to-date review. Profesional de la Información, 29(1). https://doi.org/10.3145/epi.2020.ene.03

Niñerola, A., Sánchez-Rebull, M., & Hernández-Lara, A. (2019). Tourism research on sustainability: A bibliometric analysis. Sustainability, 11(5), 1377. https://doi.org/10.3390/su11051377

Noor-A-Rahim, M., Liu, Z., Lee, H., Khyam, M. O., He, J., Pesch, D. & Poor, H. V. (2022, June). 6G for vehicle-to-everything (V2X) communications: Enabling technologies, challenges, and opportunities. Proceedings of the IEEE, 110(6), 712-734. https://doi.org/10.1109/JPROC.2022.3173031

Pietrzak, K., & Pietrzak, O. (2020). Environmental effects of electromobility in a sustainable urban public transport. Sustainability, 12(3), 1052. p. 6. https://doi.org/10.3390/su12031052

Rietmann, N., & Lieven, T. (2019). A comparison of policy measures promoting electric vehicles in 20 countries. The Governance of Smart Transportation Systems: Towards New Organizational Structures for the Development of Shared, Automated, Electric and Integrated Mobility, pp. 125-145.

Sanguesa, J. A., Torres-Sanz, V., Garrido, P., Martinez, F. J., & Marquez-Barja, J. M. (2021). A review on electric vehicles: Technologies and challenges. Smart Cities, 4(1), 372-404. https://doi.org/10.3390/smartcities4010022

Soto, S., Olivera, C. & Farfan, E. (2024, July), Bibliometric Analysis of the Use of Electric Vehicles as a Carbon Footprint Reduction Alternative [Conference Proceedings]. 22nd LACCEI International Multi-Conference for Engineering, Education, and Technology: Sustainable Engineering for a Diverse, Equitable, and Inclusive Future at the Service of Education, Research, and Industry for a Society 5.0. Hybrid Event, San Jose – Costa Rica. pp. 1-8.

Szpilko, D., & Ejdys, J. (2022). European Green Deal–research directions. a systematic literature review. Ekonomia i Środowisko, 2(81). pp. 10-32. http://dx.doi.org/10.34659/eis.2022.81.2.455

Tolani, K., Manohar, S., Jhamb, D., & Mittal, A. (2023, December). A systematic literature review on sustainable development: Emergence of sustainable mobility for global ecology. In AIP Conference Proceedings (Vol. 2916, No. 1). AIP Publishing. https://doi.org/10.1063/5.0177442

Tranfield, D., Denyer, D., & Smart, P. (2003). Towards a methodology for developing evidence-informed management knowledge by means of systematic review. British journal of management, 14(3), 207-222. p. 214. https://doi.org/10.1111/1467-8551.00375

Vargas, A. C., Espinoza-Mina, M., Alvarez, D. L., & Espinosa, J. N. (2022). Bibliometric Software: The Most Commonly Used in Research. In ICAI Workshops (pp. 47-65).

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), 3786. pp. 2-38. https://doi.org/10.3390/en17153786

Wamsler, C., & Bristow, J. (2022). At the intersection of mind and climate change: integrating inner dimensions of climate change into policymaking and practice. Climatic Change, 173(1), 1-22. https://doi.org/10.1007/s10584-022-03398-9

Wang, S., Li, J., & Zhao, D. (2017). The impact of policy measures on consumer intention to adopt electric vehicles: Evidence from China. Transportation Research Part A: Policy and Practice, 105, 14-26. pp 15-19. https://doi.org/10.1016/j.tra.2017.08.013

RECEIVED: 10 November 2024 ACCEPTED: 15 December 2024 PUBLISHED: 20 March 2025

Răzvan-Octavian Giurcă is currently a PhD student in his 2nd year at the Doctoral School of International Business and Economics from Bucharest University of Economic Studies in Romania. He is focusing his research on the Sustainability policies aroud the globe and their impact on the energy sector. Before that, he completed a program at Kellogg School of Management, Northwestern University, specializing in Business Analytics and Decision Making with Data. Răzvan hold a Master's Degree in Business Management and Communication and a Bachelor's Degree in Communication and Public Relations from the National University of Political Studies and Public Administration (SNSPA) from Bucharest, Romania. So far he particiated and presented with accepted papers at the the 15th edition of the International Conference "The Future of Europe" on 24-25 October 2024 in Bucharest, Romania and at the The 19th International Conference on Business Excellence: Leading Change in Disruptive Times, that also took place in Bucharest, Romania. In his professional activity, he is a Project Manager responsible for Digital & Loyalty at OMV Petrom, the largest integrated energy company in South-East Europe. He is strongly passionate about marketing, innovation and technology, international relations, geopolitics and financial markets. You can reach him at giurcarazvan23@stud.ase.ro, or via phone at +40 733991305. He is based in Bucharest, Romania.