8th International Scientific Conference EMAN 2024 – Conference Proceedings
https://doi.org/10.31410/EMAN.2024.229

The Impact of Electric Vehicles on the Environment

Anton Vorina[1]
Klementina Klepej[2]

Received: April 26, 2024
Revised: October 5, 2024
Accepted: October 7, 2024
Published: December 17, 2024

Keywords:
Electric vehicles;
Environment;
Pollution;
Carbon footprint;
Climate change

Abstract: *The article examines the environmental implications of electric vehicles, focusing on their impact on air, soil, water, climate change, and carbon footprint. The analysis draws on sources published after 2020.*

The primary goal of the research is to evaluate the positive and negative environmental effects of electric vehicles.

While electric vehicles produce zero tailpipe emissions, a broader perspective reveals a more complex picture. The manufacturing process for electric vehicles can generate up to 70% higher emissions than that of gasoline vehicles.

Despite this, sales of electric vehicles have surged in recent years. Global sales increased by 49% to 6.2 million units in the first half of 2023, representing approximately 16% of the global light vehicle market.

Electric vehicles reduce air pollution compared to traditional vehicles but do not entirely eliminate the problem. Furthermore, the electricity powering electric vehicles often comes from power plants, contributing to soil and water pollution.

To achieve a more significant climate benefit, electric vehicles generally need to be driven over 90,000 kilometers before surpassing the environmental impact of internal combustion engine vehicles.

1. INTRODUCTION

In an era characterized by growing environmental awareness, electric vehicles have emerged as a prominent symbol of sustainable transportation. As technology has advanced, these vehicles have become increasingly viable and accessible, offering a potential solution to the pressing challenges of climate change and air pollution. This article explores the environmental implications of electric vehicles, examining both their positive and negative impacts.

Data for this analysis was gathered using Google Search, Google Scholar, and OpenAI's ChatGPT.

The research addresses two primary questions:
1. What are the positive environmental effects of electric vehicles?
2. What are the negative environmental effects of electric vehicles?

2. HISTORY AND DEVELOPMENT OF ELECTRIC VEHICLES

The beginnings of electric vehicles emerged in the 1830s with Scottish inventor Robert Anderson, whose motorized carriage was built somewhere between 1832 and 1839. However, as rechargeable batteries were not yet available, it was more of a novelty than a practical

[1] Celje School of Economics, Higher Vocational College, Mariborska 2, 3000 Celje, Slovenia
[2] Celje School of Economics, Higher Vocational College, Mariborska 2, 3000 Celje, Slovenia

transportation device. Another Scot, Robert Davidson, created a prototype electric locomotive in 1837. Rechargeable batteries appeared in 1859, making the idea of electric cars more feasible. Around 1884, inventor Thomas Parker in England helped introduce electric-powered trams and produced prototypes of electric cars. By 1890, William Morrison patented an electric carriage, possibly built as early as 1887. With front-wheel drive, 4 horsepower, and a claimed top speed of 20 mph, it had 24 battery cells requiring recharging every 50 miles (Wilson, 2023).

In 1897, Walter Bersey designed and introduced a fleet of battery-powered taxis on the streets of London, while New York City had a fleet of around 60 electric taxis. By 1900, electric cars accounted for one-third of all vehicles on US roads. However, between 1920 and 1935, improved road infrastructure and cheap, readily available gasoline led to a decline in electric vehicles. Electric cars were limited to urban use due to their slow speed and limited range, and by 1935, they had nearly disappeared. In the 1960s and 1970s, gasoline prices in the US skyrocketed, sparking renewed interest in electric vehicles. In the early 1990s, the California Air Resources Board began pushing for vehicles with lower or zero emissions, such as electric cars. In response, car manufacturers began developing electric models. American electric car manufacturer Tesla Motors began working on the Tesla Roadster in 2004, which was first delivered to customers in 2008. The Tesla Roadster was the first highway-legal all-electric car and utilized lithium-ion battery cells. It was also the first to travel over 200 miles on a single charge. Global sales of fully electric cars and vans surpassed one million in September 2016. In May 2021, the UK government announced that over 500,000 ultra-low emission vehicles were on the roads across the country. The UK is at the forefront of the electric vehicle revolution, with the government committed to ending the sale of new gasoline and diesel cars by 2030 (Energy Saving Trust, 2023).

Figure 1. Electric car built by Thomas Parker, 1895
Source: Made Up in Britain, 2023

3. PRODUCTION OF ELECTRIC VEHICLES

Today's electric vehicles differ significantly from internal combustion engine vehicles with gasoline propulsion. The new breed of electric vehicles has benefited from a series of unsuccessful attempts at designing and manufacturing electric vehicles using traditional manufacturing

methods that manufacturers have been using for decades. In the past, the emphasis in electric vehicle production was on protecting the motor, but now that focus has shifted to protecting the batteries. Automotive designers and engineers are completely rethinking the design of electric vehicles and creating new manufacturing and assembly methods for their production. They now design electric vehicles from the ground up with a strong focus on aerodynamics, weight, and other energy efficiency aspects (C3 Controls, 2023).

The government has proposed a ban on the sale of new gasoline and diesel engine cars from 2030. The problem with this initiative seems to largely rely on conclusions drawn solely from one part of a car's lifecycle: what comes out of the tailpipe. Electric cars, of course, have zero tailpipe emissions, which is beneficial for the environment, especially regarding urban air quality. However, if you zoom out and look at the broader picture, including car production, the situation is very different. Ahead of the Cop26 climate conference in Glasgow in 2021, Volvo released data claiming that greenhouse gas emissions during the production of an electric car are nearly 70% higher than those of producing a gasoline car. How so? The issue lies with lithium-ion batteries, currently installed in nearly all electric vehicles: they are excessively heavy, require a massive amount of energy to produce, and are estimated to last just over 10 years. It seems like a perverse choice of hardware to lead the fight against the climate crisis (Atkinson, 2023).

A recent study published by ScienceDirect indicates that while pollution arising from the extraction and production of batteries remains the same or slightly higher than the production process of gasoline or diesel engines, increasing the efficiency of the production and infrastructure processes is crucial to reducing emissions during the production of electric vehicles. Chinese battery manufacturers produce up to 60% more CO2 during production compared to ICE engine production, but according to the report, manufacturers in the country could reduce their emissions by up to 66% by adopting American or European production techniques - China is also expected to rapidly advance in the adoption of electric vehicles as its renewable energy industry continues to grow (Lovell, 2020).

High-performance lithium-ion batteries used in electric vehicles fully charge with minimal energy loss. They are made of carbon or graphite, metal oxide, and lithium salt. These elements compose positive and negative electrodes and are combined with electrolytes to produce electric current. Once the battery reaches the end of its life, it can be recycled, with approximately 80% of components recyclable. Battery cells in electric vehicles contain lithium carbonate, nickel, manganese, and cobalt. The key component of electric vehicle batteries is lithium, and demand for this material has been high so far. This poses a problem as discovering new sources requires expertise in where lithium is located on the Earth's surface and how concentrated it is. Materials used in these batteries, such as cobalt, nickel, and lithium, are all obtained through environmentally harmful methods. Nearly 500,000 liters of water are required to extract one ton of lithium (Nichols, 2023).

Electric vehicles are much more cost-effective to maintain than gasoline-powered cars. A lithium-ion battery-powered motor does not require oil changes, part replacements, and will not have the general wear and tear a combustion engine might have over its lifetime. Instead, all the work is done by the electric car battery, making the car cheaper to maintain. The cost per kilometer for driving an electric car is generally also cheaper than that of a similar gasoline-powered model - meaning you can travel further for less money (Peugeot UK, 2024).

4. GROWTH IN ELECTRIC VEHICLE SALES

Tesla entered the electric vehicle market in 2003, but the electric vehicle market exploded only when they introduced their mass-produced Model 3 in 2017. Since then, the industry has seen a 67% jump in electric vehicle sales from 2019 to 2020. Established car manufacturers like Chevy, Ford, Toyota, and others are joining the electric vehicle game, along with newcomers like Rivian and Lucid Motors. In this crowded field, success or failure depends on how these companies tackle the unique challenges of the electric vehicle manufacturing process (White, 2023).

Electric vehicle markets are experiencing exponential growth, with sales surpassing 10 million in 2022. The share of electric vehicles in total sales more than tripled in three years, from about 4% in 2020 to 14% in 2022. The sales of electric vehicles are expected to continue growing strongly. In the first quarter, over 2.3 million electric vehicles were sold, roughly 25% more than in the same period last year. Current trends suggest that the introduction of electric vehicles could eliminate the need for 500 million liters of oil per day (Connelly, 2023).

The latest research from Canalys shows that global electric vehicle sales increased by 49% to 6.2 million units in the first half of 2023. Electric vehicles account for 16% of the global light vehicle market, a significant increase of 12.4% compared to the first half of 2022 (Canalys, 2023).

Figure 2 illustrates the growth in electric vehicle sales in China, Europe, the USA, and elsewhere in the world from 2016 to 2023. In 2016, sales were at their lowest, with around 700 thousand electric vehicles sold (300 thousand in China, 200 thousand in Europe, and 200 thousand in the USA). However, we can see that sales have been increasing year by year. In 2023, almost 14 million electric vehicles were sold (8 million in China, nearly 3.5 million in Europe, over 1.5 million in the USA, and almost 1 million elsewhere in the world).

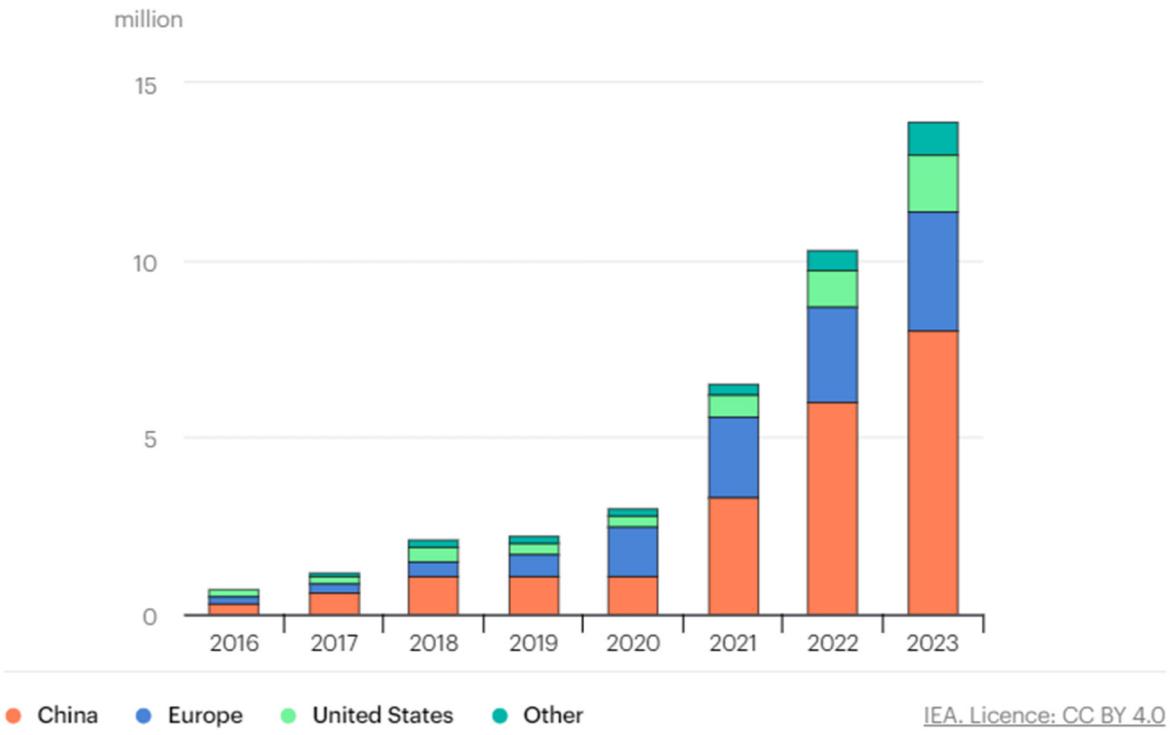


Figure 2. Display of electric vehicle sales
Source: Conelly, 2023

The transition of the automotive industry to electric vehicles is accelerating. The year 2026 is expected to be a turning point for the acceleration of electric vehicle adoption, leading the trends of automotive electrification forward. By 2030, more than one in four new passenger cars sold will be electric vehicles. Many major vehicle manufacturers worldwide have signaled the end of the internal combustion engine era as the transition to emission-free vehicles accelerates. It is expected that leading car manufacturers will represent over 70% of global electric vehicle production by 2030 (compared to 10% of all electric vehicle manufacturers in 2022). However, despite the rapidly growing choices available to electric vehicle consumers and the level of loyalty among electric vehicle buyers, the industry as a whole still needs to address consumer concerns about range, especially for those without garages or those traveling long distances. The solution lies in a collective effort involving multiple industries: the automotive industry, utilities, government, and private property owners such as shopping centers and residential developments. When these pathways converge, the trends in vehicle electrification will exponentially increase (S&P Global Mobility, 2023).

5. IMPACT OF ELECTRIC VEHICLES ON AIR QUALITY

Toxic emissions from the exhaust pipes of diesel and gasoline cars have been causing air pollution problems in European cities for decades, leading to tens of thousands of unnecessary premature deaths every year. Now, as the sale of zero-emission electric vehicles across Europe is increasing and the end of internal combustion engines is in sight, the industry is grasping at straws to keep the environment-polluting engine alive. One claim reported by many newspapers is that electric cars will worsen air quality due to emissions of particles from non-exhaust sources such as tires and brakes (Krajinska, 2021).

Overall, electric vehicles reduce air pollution levels compared to gasoline and especially diesel cars. The magnitude of this reduction depends on their weight, age, and the type of car they replace, as well as the mix of electric power. Electric vehicles do not completely eliminate the problem. Non-exhaust emissions are still significant. Electric cars eliminate NOx and PM2.5 emissions from exhaust gases and reduce brake wear particles due to regenerative braking. If heavier, they may increase tire wear and road dust pollution. Non-exhaust emissions require much more research, especially on solutions such as improved tires, solid particle filters, the role of more automated driving, and vehicle weight. The best way to reduce local air pollution is fewer vehicles on the roads (Ritchie, 2023).

6. IMPACT OF ELECTRIC VEHICLES ON LAND AND WATER

Electric vehicles can help reduce air pollution, but they can still cause contamination of land and water. This is because electric vehicles still rely on electricity, which is typically generated in power plants. These power plants use coal, natural gas, and other fossil fuels for electricity generation, which can result in emissions that contribute to soil and water pollution. Electric vehicles are powered by rechargeable batteries that contain a complex mixture of chemicals. Some of these chemicals include lithium, copper, cobalt, and nickel. While these chemicals may not be hazardous when the battery is in use, they can become harmful once the battery reaches the end of its life. Battery disposal poses a significant environmental challenge, as heavy metals and other harmful substances can leach into the soil, causing short-term and long-term damage. Another factor contributing to soil pollution from electric vehicles is the process of extracting materials needed for battery production. Extracting lithium, cobalt, and

other metals requires significant water and energy consumption. The mining process can also lead to deforestation, displacement of local communities, and other environmental hazards (Energy5, 2023).

The production of one ton of lithium (enough for ~100 car batteries) requires approximately 2 million tons of water, making battery production an extremely water-intensive practice. In light of this, the South American lithium triangle, consisting of Chile, Argentina, and Bolivia, has experienced severe water shortages due to intensive lithium extraction in the area. In Chile alone, 65% of the water in the region was used for lithium extraction. In the US state of Nevada, protests recently took place over the Lithium Americas Project due to the projected consumption of vast amounts of groundwater (Lakshmi, 2023).

In recent years, the use of lithium-ion batteries in electric vehicles has increased. Improper handling of waste batteries can lead to heavy metals contaminating the soil by leaching hazardous chemicals. Thus, anthropogenic activities are a key indicator of the increasing presence of toxic, hazardous waste in the soil due to waste from manufacturing processes and usage, which, without proper management, affects human health through the food chain due to the intake of soil pollutants into plants or food crops (Noudeng et al., 2022).

7. IMPACT OF ELECTRIC VEHICLES ON CLIMATE CHANGE

Although many electric vehicles are labeled as "zero emissions," this claim is not entirely accurate. Battery electric vehicles may not emit greenhouse gases from their tailpipes, but some emissions occur in the manufacturing and charging processes of the vehicles. Nonetheless, electric vehicles are undoubtedly less emissive than internal combustion engine vehicles. Electric vehicles will, in almost all cases during their lifetime, generate fewer carbon emissions than gasoline-powered cars. One source of emissions from electric vehicles is the production of their large lithium-ion batteries. The use of minerals, including lithium, cobalt, and nickel, which are crucial for modern electric vehicle batteries, requires the use of fossil fuels for mining these materials and heating them to high temperatures (Moseman, 2022).

Compact electric cars become more climate-friendly than internal combustion engine vehicles only after traveling 90,000 kilometers. If powered exclusively by green electricity, the threshold at which an electric car is cleaner would decrease to 65,000 kilometers. However, this is not happening in practice (Žurnal24, 2023).

Wide adoption of electric vehicles is among the measures needed to halt climate change. However, transitioning from gasoline and diesel cars will not be easy. The administration of U.S. President Joe Biden has proposed new rules to limit the emissions of steel horses, aiming to compel automakers to have electric vehicles account for two-thirds of all cars sold in the next decade. To fulfill this plan, the government will need to regulate many other aspects as well (Bloomberg Adria, 2023).

Simulations have shown that widespread adoption of electric vehicles would help limit global warming by at least two degrees Celsius. Nine countries, including the United States, have announced their intention to someday limit or ban the use of all internal combustion engines and reduce national emissions from tailpipes to zero (Yap, 2023).

8. CARBON FOOTPRINT OF ELECTRIC VEHICLES

The batteries powering electric vehicles are responsible for a significant portion of emissions during the manufacturing process. Because electric vehicles are dirtier to produce but cleaner to drive, they must meet certain mileage thresholds before the environmental benefits are realized. In the US, a typical electric vehicle must travel between 28,069 and 68,160 miles before any emission benefits are accounted for (DeSmith, 2023).

Figure 3 illustrates different sources of electrical energy that power electric vehicles. This data highlights the environmental footprint depending on the energy source used to charge the vehicles, further connecting to the carbon footprint comparison between electric and gasoline vehicles discussed in the text. The largest contributions come from natural gas (38.32%) and coal (19.85%), followed by nuclear energy (18.60%), wind (10.47%), hydroelectricity (6.14%), solar energy (4.90%), biomass (0.64%), oil (0.54%), geothermal energy (0.40%), and other fossil sources (0.15%).

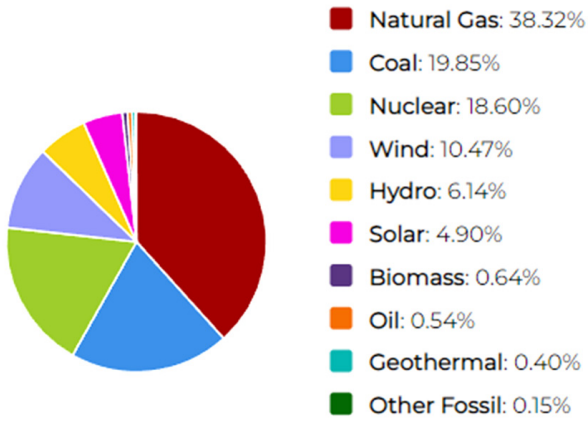


Figure 3. Sources of Electric Energy
Source: U.S. Department of Energy, 2024

Figure 4 illustrates a comparison of carbon dioxide equivalents emissions for all-electric, plug-in hybrid, hybrid, and gasoline vehicles. Gasoline vehicles have the highest emissions, followed by hybrids; plug-in hybrids and electric vehicles have significantly lower emissions. The green color represents emissions from electric vehicles, while gray represents emissions from gasoline vehicles.

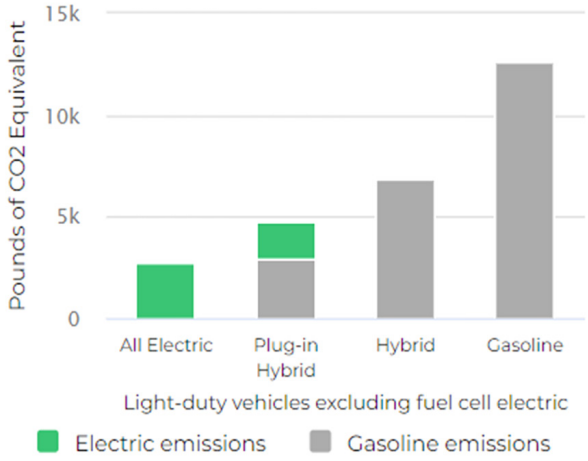
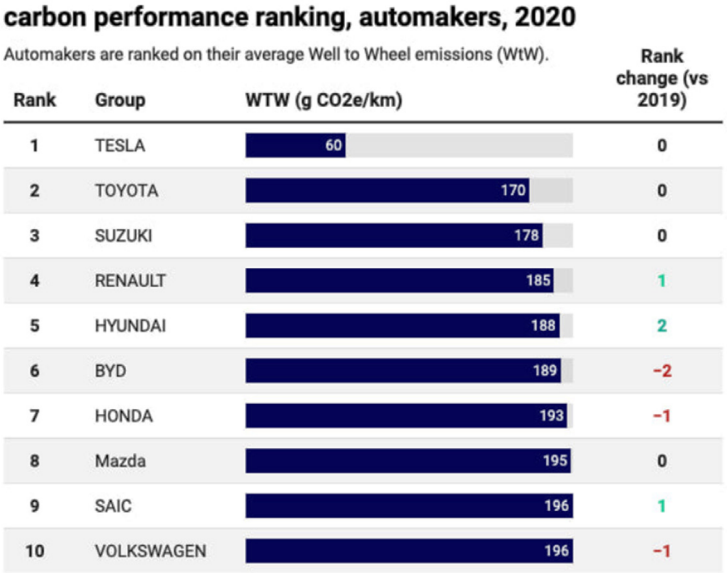


Figure 4. Annual vehicle emissions
Source: U.S. Department of Energy, 2024

For electric and hybrid vehicle models, it is often said that they are carbon neutral. However, the production of electric energy to power the car is not carbon neutral. Emissions from electricity production depend on the primary sources of energy used (e.g., fossil fuels, nuclear energy, renewable energy sources, etc.) and vary greatly between countries (Carbometrix, 2021).

Figure 5 refers to the emission levels of both electric and internal combustion engine cars, thus providing a comparative outlook on the performance of electric vehicles regarding carbon emissions. It does include electric cars, showing how their emissions, although lower, still vary based on manufacturing processes.



carbon performance ranking, automakers, 2020

Automakers are ranked on their average Well to Wheel emissions (WtW).

Rank	Group	WTW (g CO2e/km)	Rank change (vs 2019)
1	TESLA	60	0
2	TOYOTA	170	0
3	SUZUKI	178	0
4	RENAULT	185	1
5	HYUNDAI	188	2
6	BYD	189	-2
7	HONDA	193	-1
8	Mazda	195	0
9	SAIC	196	1
10	VOLKSWAGEN	196	-1

Figure 5. Automakers' emissions
Source: Carbometrix, 2021

9. ANSWERS TO RESEARCH QUESTIONS

Q: What are the positive impacts of electric vehicles on the environment?

It has been found that high-performance lithium-ion batteries used in electric vehicles charge fully with minimal energy loss. They consist of positive and negative electrodes combined with electrolytes to produce an electric current. When the battery reaches the end of its life, it can be recycled, with approximately 80% of its components being recyclable (Nichols, 2023).

The advantage of electric cars (2023) states that electric vehicles are much more cost-effective to maintain than gasoline-powered cars. A motor with a lithium-ion battery does not require oil changes, part replacements, or suffer from general wear and tear as an internal combustion engine would throughout its life. Instead, all the work is done by the electric car battery, making it cheaper to maintain. Additionally, the cost per kilometer for driving an electric car is cheaper than a similar gasoline-powered one, meaning you can travel further for less money.

Yap (2023) suggests that simulations have shown widespread adoption of electric vehicles could help limit global warming by at least two degrees Celsius. Many countries have announced their intention to eventually limit or ban the use of all internal combustion engines and reduce national emissions from exhaust pipes to zero.

Q: What are the negative impacts of electric vehicles on the environment?

According to Lovell (2020) recent studies suggest that pollution from the extraction and production of batteries for electric vehicles is equal to or even slightly higher than that from the manufacturing process of gasoline or diesel engines. Chinese battery manufacturers produce up to 60% more CO_2 during production than the production of ICE engines, but according to the report, manufacturers in the country could reduce their emissions by up to 66% if they adopted American or European production techniques.

The new study on electric cars sheds light on them (2023) explaining that compact electric vehicles are more climate-friendly than internal combustion engine vehicles only after traveling more than 90,000 kilometers. If only green electricity were used for charging, the threshold at which an electric vehicle becomes cleaner would be reduced to 65,000 kilometers. However, this is not happening in practice.

Noudeng et al. (2022) warn that improper handling of waste batteries can lead to heavy metals polluting the soil by leaching hazardous chemicals. Thus, anthropogenic activities are a key indicator of increasing toxic, hazardous waste in the soil due to waste from production processes and use, which, without proper handling, affect human health through the food chain due to the intake of soil pollutants into plants or food crops.

According to Lakshmi (2023), the production of one ton of lithium requires approximately 2 million tons of water, making battery production an extremely water-intensive practice. Chile, Argentina, and Bolivia have experienced severe water shortages due to intensive lithium extraction. In Chile alone, 65% of the water in the region was used for lithium extraction.

10. CONCLUSION

In conclusion, it can be summarized that electric vehicles have a significant impact on reducing environmental pollution and carbon footprint. However, they are not environmentally neutral as their production is associated with some environmental challenges, such as lithium and other rare metal mining, as well as strain on the electrical grid. Electric cars are believed to be more climate-friendly than internal combustion engine vehicles only after traveling over 90,000 kilometres (The new study on electric cars sheds light on them, 2023).

The government has proposed that only electric vehicles be in use by 2030, but this will not be realized in the vast majority of countries. Electric vehicles can be part of the solution to climate change, but they are not a perfect solution. Much work is still needed to reduce the environmental impact of battery production and to ensure proper handling of waste batteries.

It is important to continue research and development of sustainable solutions and take measures to reduce the negative impacts of electric vehicles on the environment.

References

Atkinson, R. (2023). I love electric vehicles – and was an early adopter. But increasingly I feel duped. *The Guardian*. Retrieved November 30, 2023, from https://www.theguardian.com/commentisfree/2023/jun/03/electric-vehicles-early-adopter-petrol-car-ev-environment-rowan-atkinson

Bloomberg Adria. (2023). *Električna vozila ne morejo rešiti podnebnih sprememb.* Retrieved January 22, 2024, from https://si.bloombergadria.com/businessweek-adria/razmisljanja/30238/elektricna-vozila-ne-morejo-resiti-podnebnih-sprememb/news

C3 Controls. (2023). *Understanding the design and manufacture of electric vehicles: New trends in technology.*. Retrieved November 3, 2023, from https://www.c3controls.com/white-paper/understanding-the-design-and-manufacture-of-electric-vehicles/

Canalys. (2023). *Global EV sales up 49% to 6.2 million units in H1 2023, with 55% of vehicles sold in Mainland China.* Retrieved November 24, 2023, from https://www.canalys.com/newsroom/global-ev-sales-h1-2023

Carbometrix. (2021). *Automakers carbon performance ranking – Part 2. (*2021). Retrieved January 15, 2024, from https://carbometrix.com/insights/automakers-carbon-performance-ranking-part-2/

Connelly, E. (2023). *Electric vehicles. International Energy Agency.* Retrieved October 27, 2023, from https://www.iea.org/energy-system/transport/electric-vehicles

DeSmith, C. (2023). *You bought an electric car. Why did your carbon footprint grow? Harvard Gazette.* Retrieved December 15, 2023, from https://news.harvard.edu/gazette/story/2023/08/when-buying-an-ev-increases-your-carbon-footprint/

Energy5. (2023). *Soil and water pollution: A look at the impacts of electric cars.* (2023). Retrieved December 1, 2023, from https://energy5.com/soil-and-water-pollution-a-look-at-the-impacts-of-electric-cars

Energy Saving Trust. (2023). *A brief history of the electric car.* Retrieved October 27, 2023, from https://energysavingtrust.org.uk/a-brief-history-of-the-electric-car/

Krajinska, A. (2021). Electric vehicles are far better than combustion engine cars when it comes to air pollution. Here's why. *Transport & Environment.* Retrieved December 1, 2023, from https://www.transportenvironment.org/discover/electric-vehicles-are-far-better-than-combustion-engine-cars-when-it-comes-to-air-pollution-heres-why/

Lakshmi, R. B. (2023). *The environmental impact of battery production for electric vehicles. Earth.org.* Retrieved December 1, 2023, from https://earth.org/environmental-impact-of-battery-production/

Lovell, J. (2020). *EVs: Are they really more efficient? Energy Council.* Retrieved December 1, 2023, from https://www.energycouncil.com.au/analysis/evs-are-they-really-more-efficient/

Made Up in Britain. (2023). *Electric car.* Retrieved February 12, 2024, from https://madeupinbritain.uk/Electric_Car

Moseman, A. (2022). Are electric vehicles definitely better for the climate than gas-powered cars? *MIT Climate Portal*. Retrieved December 15, 2023, from https://climate.mit.edu/ask-mit/are-electric-vehicles-definitely-better-climate-gas-powered-cars

Nichols, D. (2023). *How EV batteries are made. GreenCars.* Retrieved January 15, 2024, from https://www.greencars.com/greencars-101/how-ev-batteries-are-made

Noudeng, V., Van Quan, N., & Xuan, T. D. (2022). A future perspective on waste management of lithium-ion batteries for electric vehicles in Lao PDR: Current status and challenges. *International Journal of Environmental Research and Public Health,* 19(23), 16169. https://doi.org/10.3390/ijerph192316169

Peugeot UK. (2024). *The advantages of electric cars.* Retrieved February 12, 2024, from https://www.peugeot.co.uk/about-us/brand/news-articles/benefits-of-electric-cars.html

Ritchie, H. (2023). *Do electric vehicles reduce air pollution? Sustainability by Numbers.* Retrieved December 15, 2023, from https://www.sustainabilitybynumbers.com/p/electric-vehicles-air-pollution

S&P Global Mobility. (2023). *Electric vehicle trends.* Retrieved November 3, 2023, from https://www.spglobal.com/mobility/en/topic/electric-vehicle-trends.html

U.S. Department of Energy. (2024). *Alternative Fuels Data Center.* Retrieved February 12, 2024, from https://afdc.energy.gov/vehicles/electric_emissions.html

White, B. (2023). *How RōBEX accelerates your EV manufacturing process. RōBEX.* Retrieved November 24, 2023, from https://robex.us/blog/ev-manufacturing-process/

Wilson, A. K. (2023). *Worth the watt: A brief history of the electric car, 1830 to present. Car and Driver.* Retrieved January 15, 2024, from https://www.caranddriver.com/features/g43480930/history-of-electric-cars/

Yap, L. (2023). *Benefits of electric cars. GreenCars.* Retrieved February 12, 2024, from https://www.greencars.com/greencars-101/benefits-of-electric-cars

Žurnal24. (2023). *Nova študija električne avtomobile kaže v novi luči.* Retrieved January 22, 2024, from https://www.zurnal24.si/avto/iz-druge-roke/nova-studija-elektricne-avtomobile-kaze-v-novi-luci-416540