

CHAPTER I

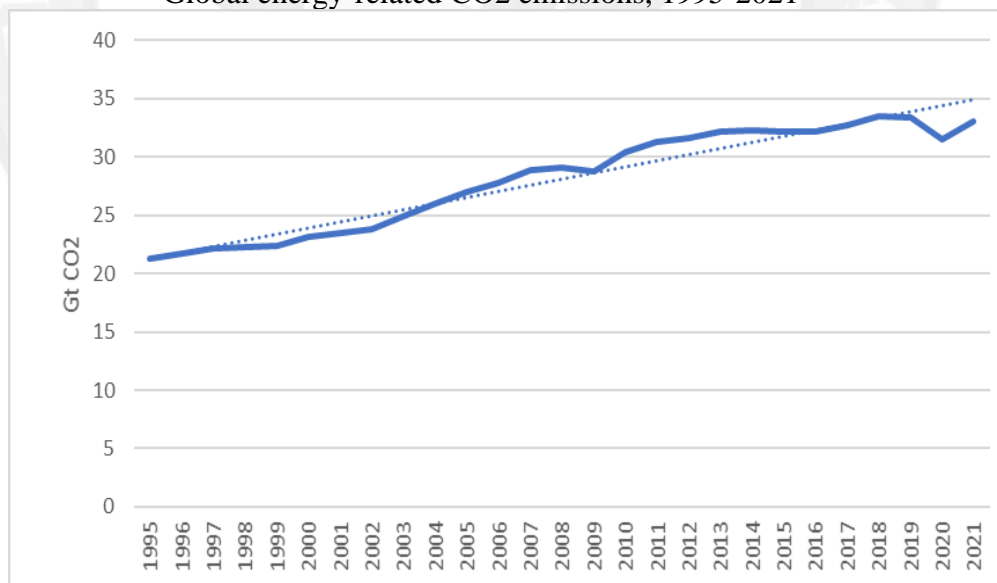
INTRODUCTION

This research consists of research background, research problem, research objective, significance of study, and research outline.

1.1 Research Background

Global warming, climate change, and deterioration of air quality caused by serious environmental problems such as fine dust, greenhouse gas emissions, air pollution, and energy shortages pose a serious physical and economic threat to mankind and affect the ecosystem. (IPCC, 2012 & Moon, 2019).

Figure 1.1
Global energy-related CO₂ emissions, 1995-2021



Source: IEA.org, 2021

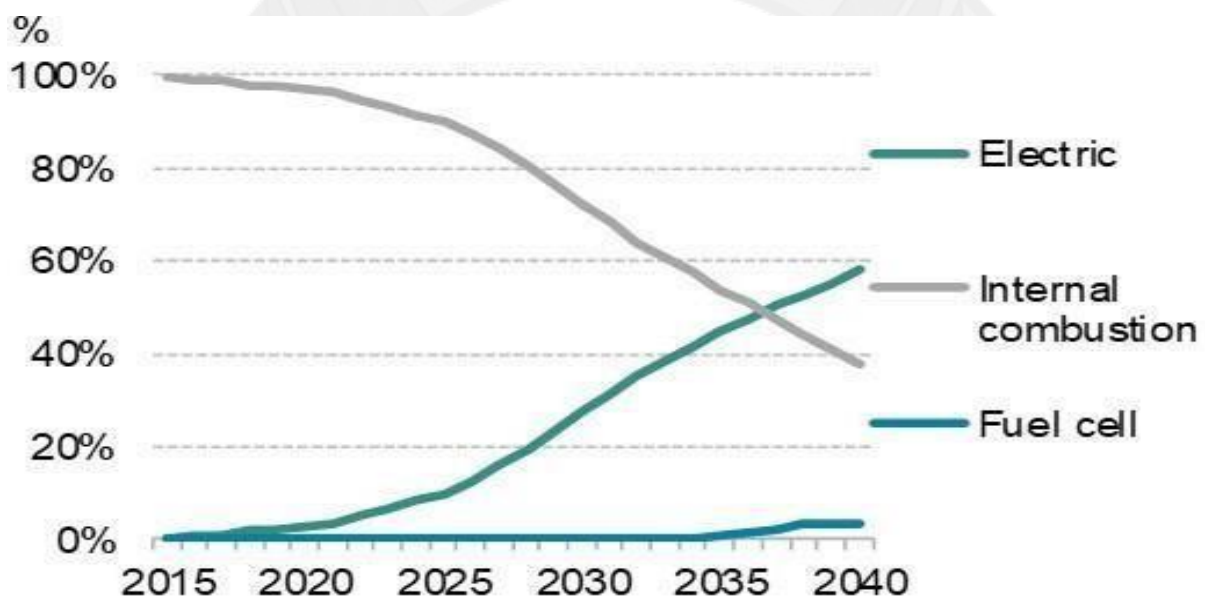
Global CO₂ emissions decreased by 5.8%, or almost 2 Gt of CO₂, in 2020, the largest decrease in history and almost five times the decrease in 2009 after the

global financial crisis. CO₂ emissions fell more dramatically than energy demand in 2020, as the pandemic hit demand for oil and coal more than other energy sources, while renewables increased. Despite the decline in 2020, global energy-related CO₂ emissions remained at 31.5 Gt, helping CO₂ reach its highest average annual concentration in the atmosphere of 412.5 ppm in 2020, about 50% more than when the industrial revolution began. In 2021, global energy-related CO₂ emissions are expected to rise again, increasing by 4.8% as demand for coal, oil, and gas recovers with the economy. The increase of more than 1,500 Mt of CO₂ would be the largest single increase since the carbon-intensive economic recovery from the global financial crisis more than a decade ago, leaving global emissions in 2021 around 400 Mt of CO₂, or 1.2 % below 2019 peak. (IEA, Global Energy Review, 2021).

Climate change and pollution such as air are in the news. It is a phenomenon that is currently affecting daily life by attacking the world. Estimates show a significant increase in the number of deaths causing air pollution from 4.2 million in 2014 to 7 million in 2018 (Osseiran & Lindmeier, 2018). The transportation sector accounts for 14% of the total emissions of air pollutants. (Ko et al., 2017). In detail, 28% of air pollutant emissions are emitted through transportation in the United States (EPA) and Europe (EEA) 27% (The Korea Transport Institute, 2018). The reduction in air pollutant emissions has been a constant issue over the past decade, with internal combustion engine vehicles operated by fossil fuels affected by related laws regulating air pollutant emissions (Kim, 2011). Alternative fuel vehicles have the potential to limit the emission of air pollutants from vehicles

without significantly changing the current mobility (White & Sintov, 2017). Alternative fuel vehicles are vehicles that use fuels without traditional petroleum fuel (volatile or diesel fuel) and can be driven by technology that powers electric vehicles, hybrid electric vehicles, hydrogen vehicles, solar power, bioethanol, etc., unlike conventional vehicles.

Figure 1.2
Global share of Total annual passenger vehicle sales

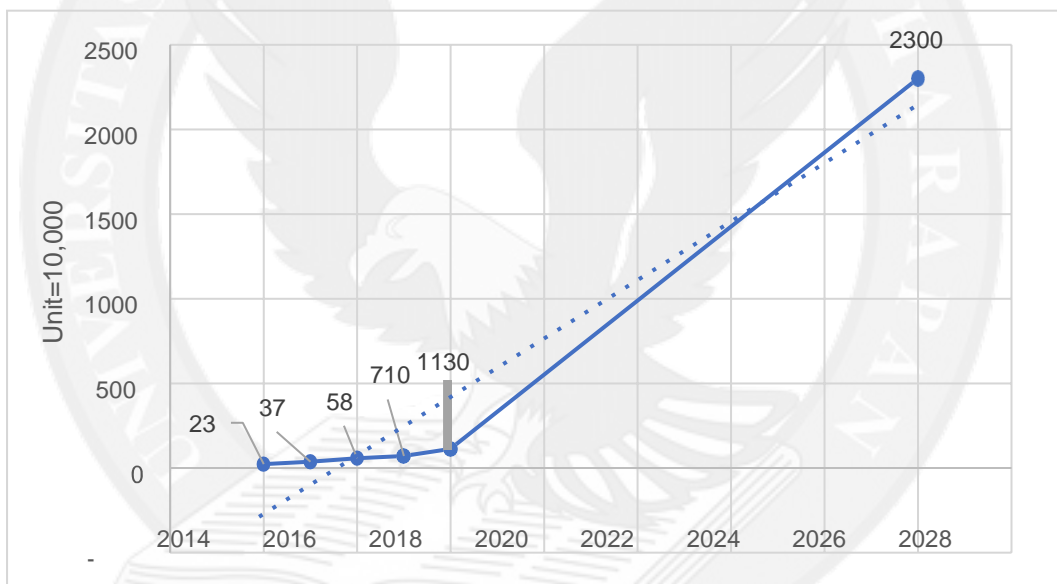


Source: BNEF.com (The Bloomberg New Energy Finance), 2020

As mentioned above, existing internal combustion engine vehicles have been pointed out as the main culprit of environmental pollution caused by exhaust gas emissions (Moon, 2019) Technology has been developed by many countries, businesses, and scientists to solve problems such as fine dust, greenhouse gas emissions, air pollution, and energy shortages worldwide. Among them, electric vehicles were in higher demand from the public than other alternative fuels, and in 2036, the sales rate of electric vehicles is expected

to reverse the sales rate of internal combustion engines. (Figure 1.2). Additionally, the outlook for the penetration rate of electric vehicles is also hopeful. According to the report "2019 Electric Vehicle Outlook 2019" released by Bloomberg NEF, more than 2 million electric vehicles were sold in 2018, 10 million in 2025, 28 million in 2030, and 56 million in 2040. In other words, 57% of passenger cars sold in 2040 and more than 30% of passenger cars worldwide are expected to be electric cars.

Figure 1.3
Global Electric Vehicle Sales 2014-2030



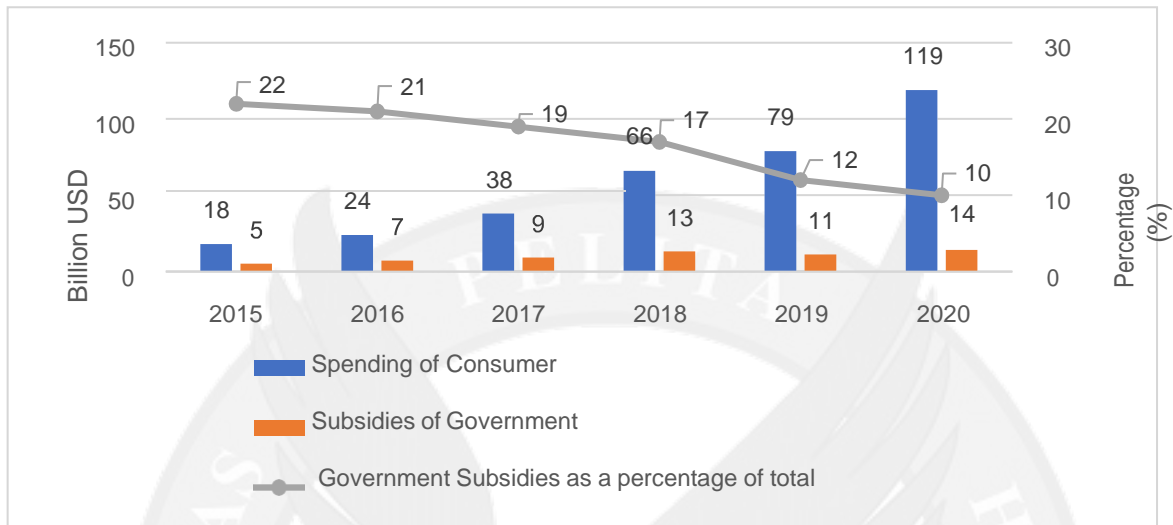
Source: IEA.org, 2020

Noted: The sales in 2030 is forecasted by IEA.

Based on report under same topics from other institution which is IEA (International Energy Agency), This institution also forecasted that the future of electric vehicle will be increased rapidly under implementation of sustainable development scenario (IEA, Global EV outlook & Figure 1.3).

Figure 1.4

Global Consumers and Governments Spending on Electric Vehicle 2015-2020

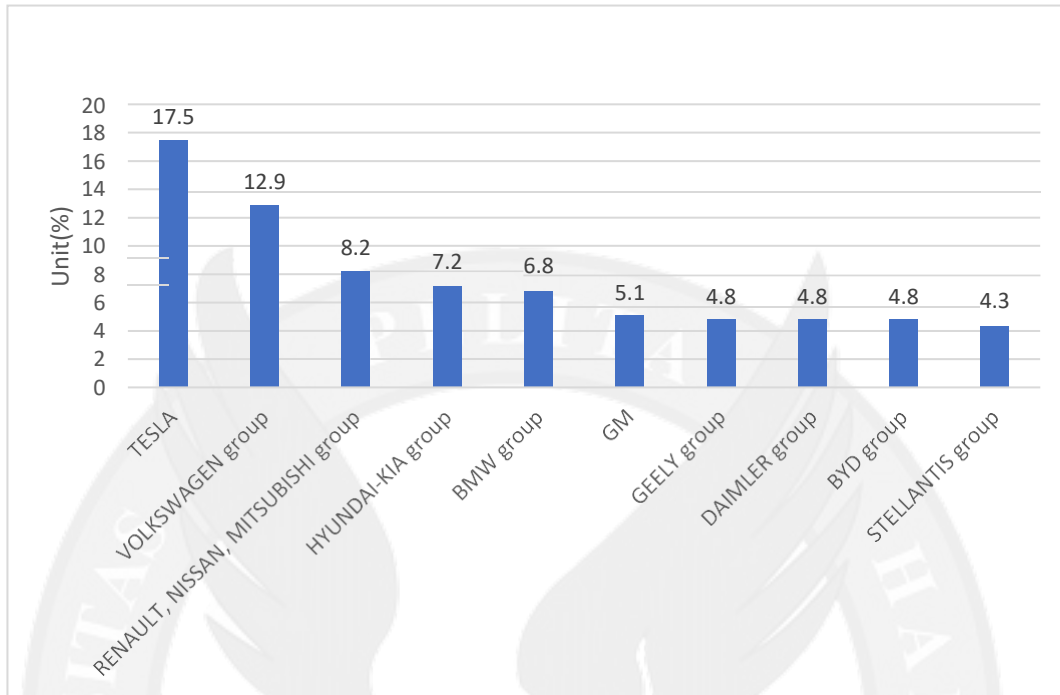


Source: IEA.org, 2021

As mentioned above, existing internal combustion engine vehicles have been pointed out as the main culprit of environmental pollution caused by exhaust gas emissions (Moon, 2019), Technology has been developed by many countries, businesses, and scientists to solve problems such as fine dust, greenhouse gas emissions, air pollution, and energy shortages worldwide. There were alternative fuel vehicles released by many companies to solve the existing problem, but among them, the most notable vehicle was the electric-powered type called EV, which was purchased the most by the public (Figure 1.2), The purchase of EV vehicles will increase unimaginably steeply due to regulations on internal combustion engine cars around the world (Norway: Ban the sale of fossil fuel vehicles until 2025, China: suspension of producing internal combustion vehicle until 2035, and Japan: Out of the gasoline car market from Japan until 2030) and subsidies from each country to induce electric vehicle purchases (Figure 1.4 & IEA Global EV outlook).

Figure 1.5

Global EV market share 2020



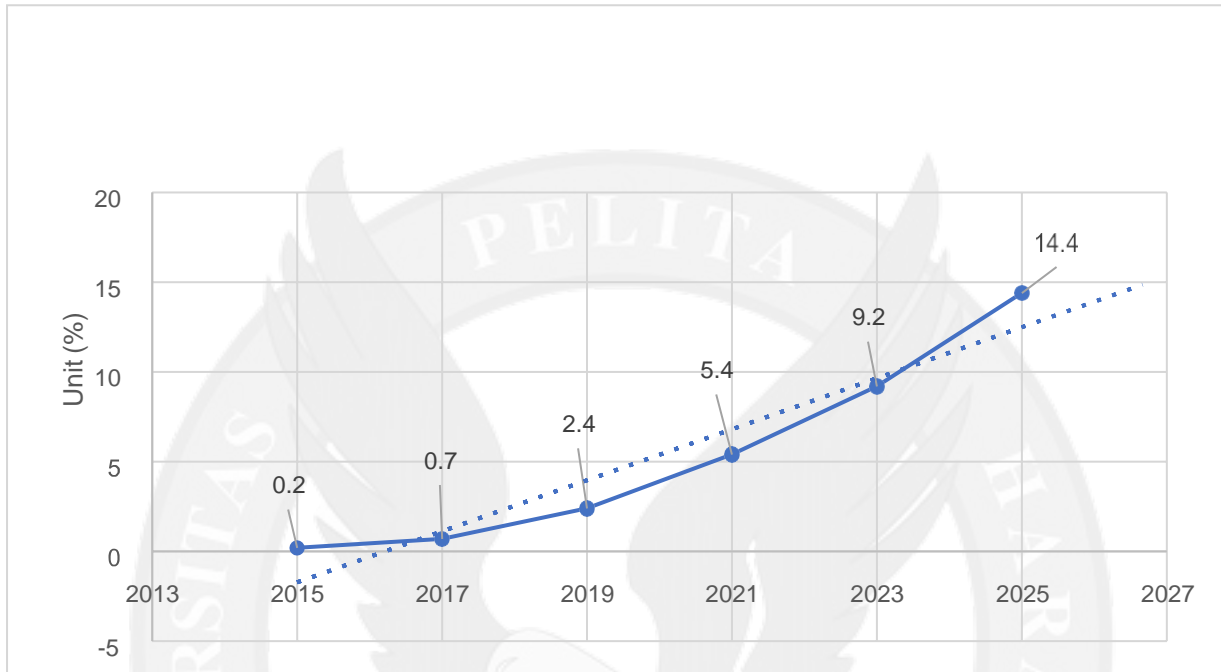
Source: SNE research from Maeil Business.co.kr, 2021

According to MOTIE (Ministry of Trade, Industry and Energy of South Korea) report of Lee (2020), With EV purchases expected to increase worldwide, the electric vehicle market is also classified as one of the major industries in the future. Following this trend, world-class vehicle companies or even startups that have newly entered the electric vehicle business to commercialize electric vehicles are entering the electric vehicle business. According to The Maeil Business Newspaper (2021), As of 2020, Volkswagen Group, Renault-Nisan-Mitsubishi Alliance, Hyundai-Kia Group, and BMW have the potential to overtake market leader Tesla. Tesla, which used to occupy the electric vehicle market, also has released various electric vehicle models in the existing market, so it does not know how long it will remain the No. 1 market share (The Maeil Business Newspaper,

2021).

Figure 1.6

Status and prospects of electric vehicles of South Korea



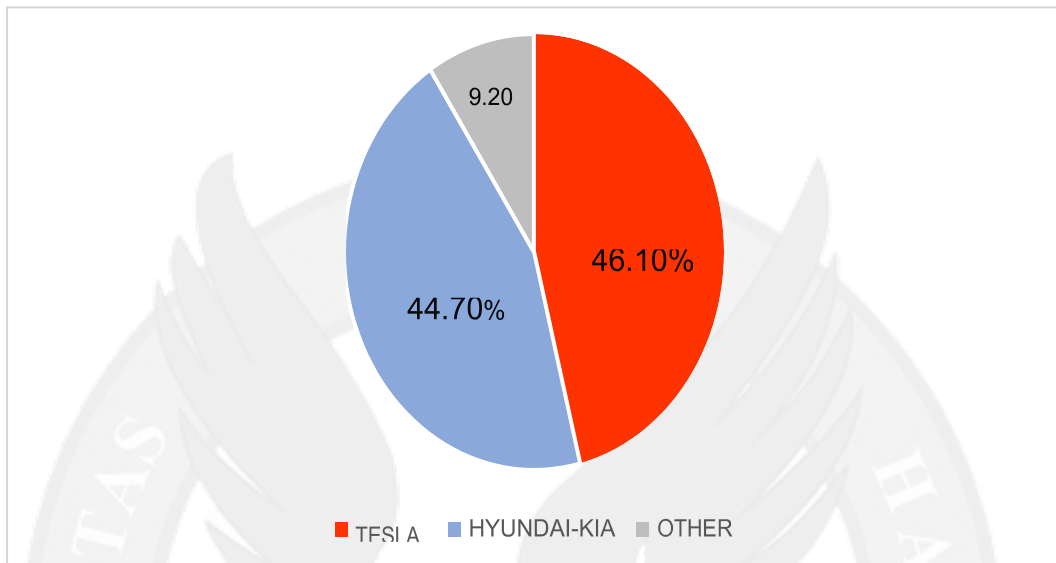
Source: Hyundai-motor group.com, 2019

According to Article from Hyundai-Motor group (2019), In line with the global trend, Korea was also able to form and scale electric vehicles within a short period of time because of increased accessibility to consumers in terms of cost through policy support such as tax benefits and subsidies. Currently, electric vehicles are more expensive than equivalent internal combustion locomotives, but the actual purchase price has been lowered through subsidies, providing conditions for them to compete with internal combustion locomotives. The size of subsidies for electric vehicles is on the decline, but it is still a factor that makes electric vehicle purchases attractive. Looking at the standards, the number of subsidies for electric vehicles this year is up to 19 million won (different by electric vehicle model and

local government), which is not a small amount.

Figure 1.7

Market share of EV in South Korea 2018 – 2021 (Q2)



Source: jmagazine.joins.com, 2021

Amid the continued growth of the Korean electric vehicle industry, Tesla and Hyundai-Kia is competing for the Korean electric vehicle market. As stated above, Tesla and Hyundai- Kia, which have the top 2 largest share in the existing Korean electric vehicle market. Hyundai- Kia was expected to reverse their market share of Tesla electric vehicles, but Tesla had a slightly higher market share than Hyundai-Kia. (The JoongAng, 2020).

However, despite such a bright outlook for electric vehicles, the issue of electric vehicles has been raised in various ways. The problems are - (1) High possibility of fire: Currently, lithium-ion batteries, which are used as power for electric vehicles, are sensitive to temperature and pose a risk of explosion when exposed to sunlight at high temperatures and for a long time. It takes as much as seven hours to extinguish the fire in the electric car. The fire that broke out in

Houston, Texas, on April 17 was also an electric vehicle equipped with a lithium-ion battery. According to the interview, "When the fire seemed to have gone out, flames erupted from the floor and flames spread again. In the end, it took eight firefighters seven hours to extinguish the fire in the electric car alone, and 106,000 liters of water were used" and he said, "It's 100 times more than when the fire was extinguished by an internal combustion engine." (The Energy Newspaper, 2021 & Automobile Korea Report, 2021) (2) Shortage of charging station: Compared to the proportion of electric vehicles, charging stations are far short. Looking at the growth rate of charging stations in Korea, the growth rate of electric vehicles in Korea was 4.3 times compared to 2017, but the growth rate of charging stations was 3.6 times. Currently, there are 50.1 chargers per 100 electric vehicles. As of August 2020, announced by the Korea Automobile Research Institute, the number of chargers per 100 electric vehicles was 318.5 in the UK, 230.4 in Germany, 185.3 in the US, 153.1 in Japan, and 50.1 in Korea. Electric vehicles have a shorter maximum mileage when fully charged than internal combustion locomotives. If you use other electronic products in the car, such as air conditioners, the car's battery wears out faster. There is not much mileage left, but if you cannot charge it in advance, there are not as many charging stations as gas stations, thus there is a risk of being discharged on the road. When discharged, it becomes impossible to drive as if the cell phone battery was running out, and the only way is to tow it. For this reason, many point out that charging-related infrastructure is a social problem to be solved. (Automobile Korea Report, 2021). (3) Illegal parking in the electric vehicle charging area: In some cases, cars with general internal combustion engines are illegally parked in parking

spaces provided to charge electric vehicles. In this case, electric vehicle owners are in a situation where charging is essential, but they cannot be charged due to illegal parking. In a very urgent situation with almost no battery, in case of the above case, the battery cannot be charged, and the electric vehicle is discharged on the spot (Automobile Korea Report, 2021). (4) Each company has different charging standards for electric cars: Tesla (AC5, AC7), which is competing in the Korean market, and Hyundai- Kia (DC combo Type 1) have different charging standards, which is a problem. In fact, on Korean highways, Hyundai-Kia's charging standards are registered as Korean standard technology, so consumers who purchase Tesla cannot charge on the highway or they would like to charge electric vehicle, they need to buy charge converter (The Chosun Newspaper, 2021). (5) Battery performance in winter: Experimental results show that driving distance is reduced by 20-30% than usual due to poor battery performance in winter. According to the results of field experiments on winter mileage released by the Hyundai Marine & Fire Insurance group, electric vehicles have an average of 24% less fuel efficiency than urban driving when driving on highways. A survey of 150 electric vehicle drivers also found that mileage decreased by an average of 33% at minus temperatures. Electric Vehicle has many critical problems. But the demand of purchasing is incrementally increasing in South Korea (Article from Hyundai-Motor group, 2019).

This research has two significant contributions to the literature way. First, the previous research has referred literature such as articles, journals, and thesis

about TPB theory, Research Model, Hypothesis, and Electric Vehicles to research for examining the impact towards Purchase Intention from 3 independent variables which consist of Attitude, Subjective Norm, Perceived Behavioral Control for describing social situation which can be described that the demand of purchasing EV is increasing despite various and critical issues in EV. Second, this research focused to examine the characteristics of the industry of Electric Vehicles in South Korea by using TPB model. Therefore, the purpose of this paper is to research about the impact of attitude, subjective norm, and perceived behavioral control into purchase intention of Tesla and Hyundai-Kia Electric Vehicle in Seoul metropolitan area, South Korea.

1.2 Research Problem

As the background above, Using Electric vehicles is one of the solutions to go green. Hence, the government is providing various policies such as tax cutting and applying subsidies to encourage Korean people to buy electric vehicles. Although the issue of electric vehicles has been raised in various ways, the demand for EV keeps increasing in South Korea. Therefore, it is interesting to research how much consumer consciousness has on the environment that encourage purchase intention of green products.

Therefore, the research questions are:

- Does Attitude have a positive impact towards to Purchase Intention for Tesla and Hyundai-Kia Electric Vehicle?
- Does Subjective Norms have a positive impact towards Purchase

Intention for Tesla and Hyundai-Kia Electric Vehicle?

- Does Perceived Behavior Control have a positive impact towards Purchase Intention for Tesla and Hyundai-Kia Electric Vehicle?

1.3 Research Objectives

- To examine if Attitude has a positive impact towards Purchase Intention for Tesla and Hyundai-Kia Electric Vehicle.
- To examine if Subjective Norm has a positive impact towards Purchase Intention for Tesla and Hyundai-Kia Electric Vehicle.
- To examine if Perceived Behavioral Control has a positive impact towards Purchase Intention for Tesla and Hyundai-Kia Electric Vehicle.

1.4 Significance of The Research

The significance of this research is:

- For Researcher/Individuals

For Researcher and Individuals, this research might be useful and be used as one of reference or provide influenced information regarding purchase intention of Electric Car by the mentioned independent variables in this research.

- For Academics

For Academics, it hopes that will be used as reference or related information of forthcoming research under similar topic or filed.

- For Corporates/ Institutions

For Corporates/ Institutions, this research hope to provide relevant information such as secondary source or data analysis model which help to corporate/ institution that have an interest in the Electric Vehicle market or industry.

1.5 Research Outline

Chapter I : Introduction

This chapter presents the research background, research outline, research objectives, research contributions, research limitations, and the research outlines.

Chapter II : Literature Review

The second chapter presents all the theories, previous studies, and the research model.

Chapter III : Research Methodology

The third chapter presents the types of the research, the types of study, the study settings, data collection methods, times, units of analysis, and the pre-test results.

Chapter IV : Research Findings

The fourth chapter presents the research findings including reliability and validity of data, and the figures of the research about the research model and hypotheses testing.

Chapter V : Conclusion and Recommendations

This last chapter will conclude the findings with implication of the research, research contribution and suggestions for future studies.