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JUNIOR SECTION
EXPERIENCE SHARING

Is It Feasible to Achieve Conductive Environment for Popularisation of *Electric Vehicles* in HK?

La Salle College
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A3 design Poster

1. Data collection
2. Statistical analysis
3. Estimation
4. Discussion & Conclusion

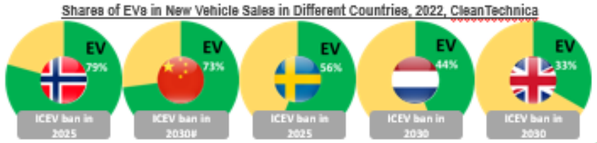
Is It Feasible to Achieve Conductive Environment for Popularisation of Electric Vehicles in HK?

By KL, JL, WG @ La Salle College

❶Introduction

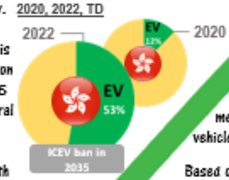
Electric Vehicles (EVs) are generally regarded as "**green**" vehicles, they are cleaner than internal combustion cars powered by diesel or petrol. Major automakers in the world are transitioning to EVs at full speed, at the same time many countries and cities around the world have stated they will ban the selling of Internal Combustion Engine Vehicles (ICEVs) in 2035 or earlier.

Shares of EVs in New Vehicle Sales in Different Countries, 2022, CleanTechnica



The HK Government is determined to improve air quality and develop Hong Kong to be a smart city. In 2021, a target of zero vehicular emissions by 2050 was announced. To reach this goal, there is another requirement to cease the new registration of fuel-propelled and hybrid private cars in 2035 or earlier. Since the Government has made several financial incentives to promote EV adoption, the shares of EV sales have increased from around 12% in 2020 to 53% by end of 2022. The growth reflects the increasing acceptance of EVs among the public. In this report, we are going to study whether this progress is feasible to achieve conductive environment for popularisation of electric vehicles in HK?

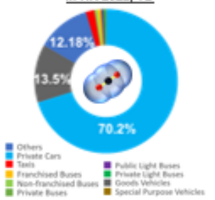
Market Share of EV New Registration in HK, 2020, 2022, TD



❷Background

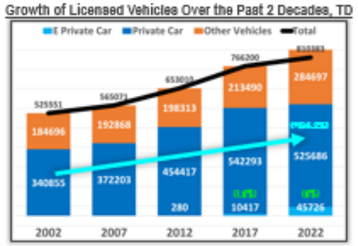
In HK, road transport is the second largest source of carbon emissions. According to the latest figures provided by TD, private cars account for 70% of vehicles, and their total carbon emissions are the highest among vehicle types. Hence, promoting the use of electric private cars can speed up the pace towards carbon neutrality.

Distribution of Registered Vehicles in HK 2022, TD



Furthermore, according to the latest 2020 air pollutant emission inventory compiled by the EPD, the road transport emissions accounted high percentage of air pollutants including total NOx, FSPs, VOCs, and CO.

Growth of Licensed Vehicles Over the Past 2 Decades, TD



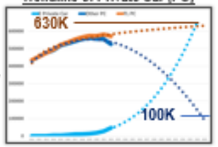
❸Trendline of Private Cars

According to the latest new registration figures provided by TD, the rapid growth of EV new registration has been recorded. The number doubled for three consecutive years. That means drivers are seemingly on board, with electric vehicles accounting for one in two new cars sold in 2022.

Based on years of transport data provided by TD, we plotted a line chart with a logarithmic trendline which R^2 value is the closest to 1. It was found that around 630K of licensed private cars will be on roads in 2035. Matching with the decline trend of petrol private cars and the rapid growth rate of electric private car, the EV proportion will increase to more than 80% within 12 years. Note that HK is one of the leading Asian cities in terms of EV adoption. However, HK is facing a lot of challenges on EV development.

Private Car New Registration, TD

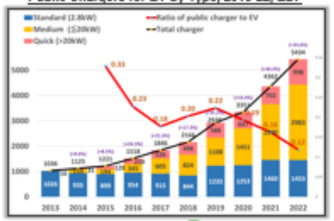
Trendline of Private Car (PC)



❹Insufficient charging facilities and outdated charging infrastructure

In HK, most private car owners are willing to buy EVs if they have charging facilities at home. However, most charging facilities are in public areas such as public parking lots and shopping malls, thus making overnight charging impractical. Inadequate charging facilities will hold back further usage of EV in HK.

Public Chargers for EV by Type, 2013-22, EDP



Furthermore, there are more than 45K licensed EVs in HK but only 5434 public chargers available in 2022, with every 8 EVs sharing with 1 public charger. Moreover, according to EPD, more than one-fourth of them are Standard chargers which provide 2.8kW charging power.

The outdated Standard chargers will become the bottleneck for EV development. Charging the battery size 50kWh takes 18 hrs in Standard charge, but 4 hrs in Medium and less than 1 hr in Quick charger. In order to meet the needs of the new generation of high-capacity batteries in EVs, it is necessary to speed up to upgrade the existing Standard chargers to Medium and Quick chargers.

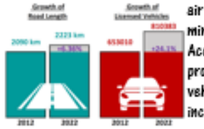
Although EV-charging at Home Subsidy Scheme is expected to subsidise the installation of charging infrastructure for more than 60 000 parking spaces, the slowly growing infrastructure cannot cope with the fast-growing sales of EV. The ratio of public chargers to EVs keep dropping from 0.22 to 0.12 after 2019.

remark: China's southernmost province of Hainan will begin a complete ban on the sale of ICEV in 2030, becoming the first Chinese province to do so.

❺Electric Vehicles vs Air quality

The growth of roads is one of the measures related to the environment. The longer the road's length, the more pollutants are produced. However, the growth of roads also helps to release traffic congestion and improve the Car Journey Speed so that excessive air pollutants emission will be minimised.

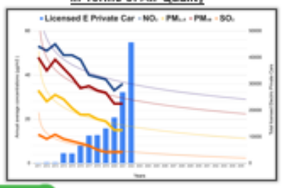
According to the latest figures provided by TD, the total number of vehicles increased by 24.1% in the past decade, however, the growth of roads in km increased by only 6.36%. This comparison helps to understand road congestion will become more serious due to the disparity. During congestion, petrol and diesel vehicles emit air pollutants continuously, whereas EVs avoid the problem. Therefore, although the situation of traffic overload may not be entirely overcome in the coming years, the goals of zero vehicular emissions and banning of new registration of ICEVs will surely help clear off the air pollution caused by traffic.



The above chart shows, EV proportion is still small, only 8% among all private cars. The 2035 goal is to phase out those fuel-propelled private cars as air pollution caused by traffic is endangering the health of Hong Kong citizens, and causing climate change. From the chart, we can see the number of licensed private cars on the roads have grown 52%, from 340 855 increased to 571 412 over the past two decades. Therefore, vehicle emissions must be controlled.

❻Future of the air quality with the impact of Electric Vehicles

Environmental Improvement in Terms of Air Quality



The roadside air quality in HK has improved significantly over the past two decades under the Government's efforts. Compared with the highest levels, the concentration of major air pollutants such as SO_2, NO_2, $PM_{2.5}$ and PM_{10} has dropped by 82%.

From the above graph predicted, the promotion of popularisation of EVs, will further help improve air quality. By reducing carbon emissions and other pollutants, EVs have a positive impact on the environment. With the advent of pure battery electric vehicles, the emission of greenhouse gases can be addressed.

❼Conclusions

In HK, numerous financial incentives, including FRT Concessions, One-for-One Replacement Scheme, Lower Vehicle Licence Fees, and $3.5 billion of EV-charging at Home Subsidy Scheme, have motivated consumers to help the government reach the 2035 goals. Based on the latest figures provided by TD, the market share of EV new registration in HK doubled in 12 months. Following the predicted growth trend, we believe the target of 2035 is achievable. However, the prediction will be affected by the Government's financial incentives as some of them will expire in 2024. Furthermore, the growth rate of charging infrastructure needs to keep up with that of EVs, so the Government should take measures to increase the availability of high-power EV charging infrastructure.

❽The Future: 2050

Achieving carbon neutrality before 2050 is one of HK's visions, and EVs will definitely be a key player towards fulfilling it. However, it is a big step from the 2035 goal as there is a bigger challenge of commercial and heavy vehicles. As seen commonly on HK roads, commercial vehicles are often parked on the roadside, increasing the difficulty of charging. Also, commercial and heavy vehicles have extra long driving hours and high energy consumption, and will surely require an extra-ordinary charging system, we look forward to seeing more new technologies to help to achieve the 2050 zero vehicular emissions goal.

Reference

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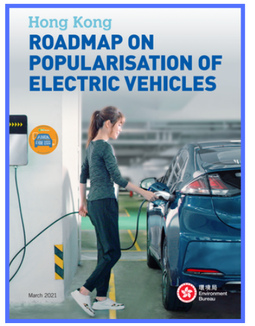
Introduction

WHY

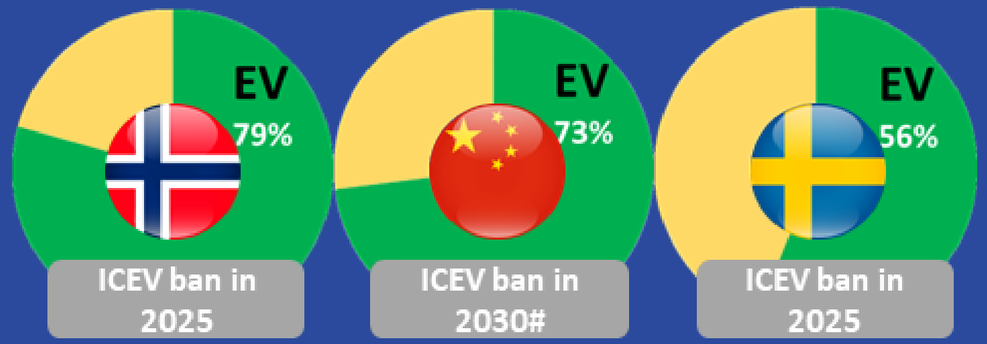
Is It Feasible to Achieve Conductive Environment for Popularisation of Electric Vehicles in HK?

REASON WE CHOSE THIS TOPIC

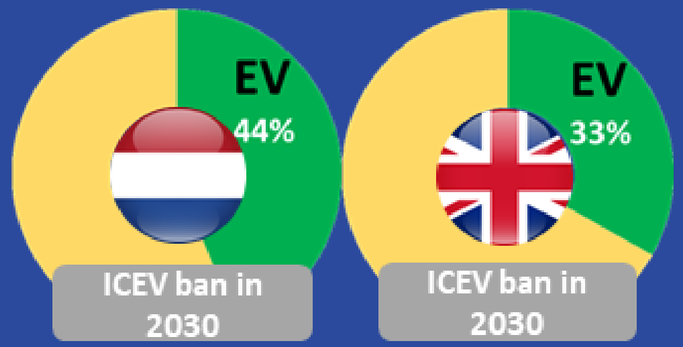
NO New FOSSIL FUEL Private Cars after 2035



WORLDWIDE

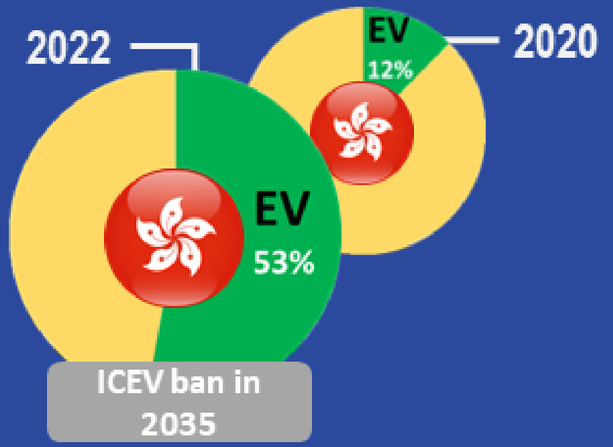


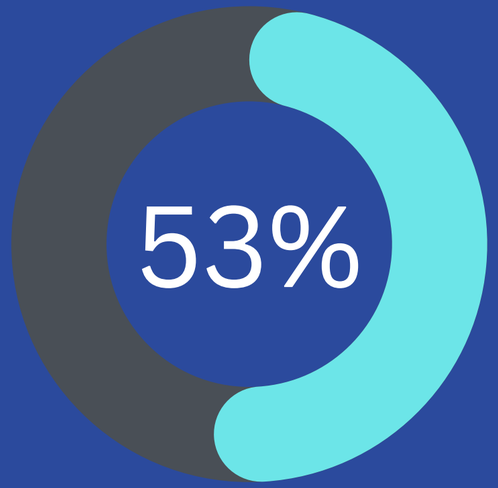
Haiman



HONG KONG

53% of new vehicle registrations in 2022 were electric.





Background

WHAT

Environmental Data

Growth of licensed Vehicles

BASIC INFORMATION RELATED TO THIS TOPIC

BASIC INFORMATION RELATED TO THIS TOPIC

Environmental

Percentage of Air Pollutant Emission from Road Transport in HK 2022, EPD

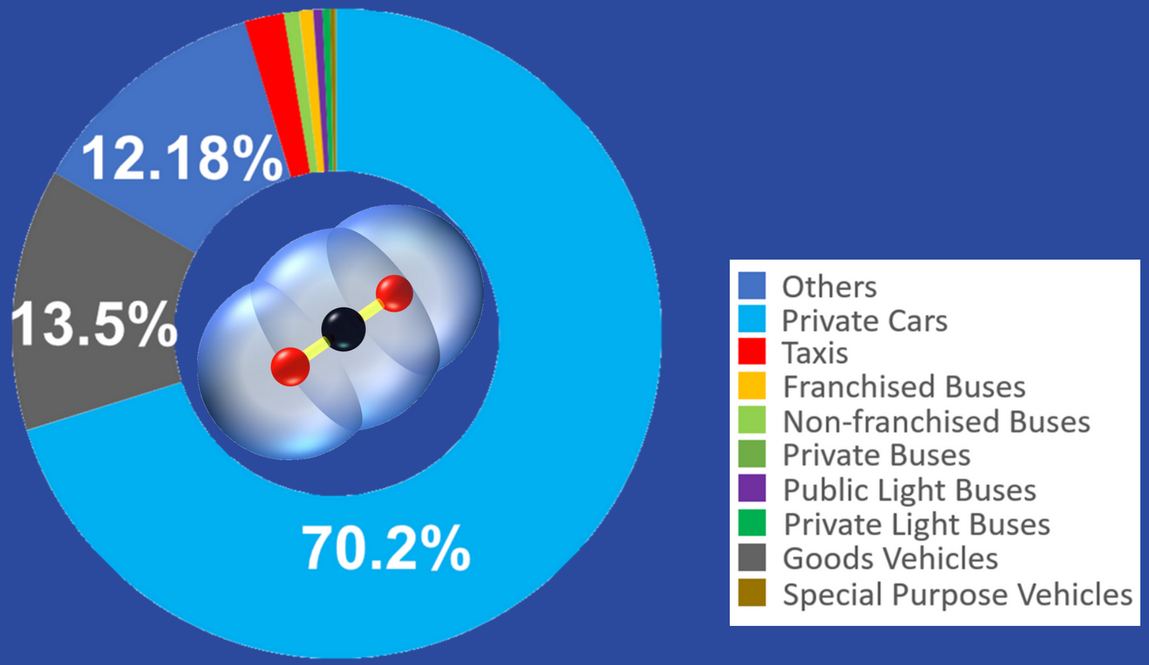
NO_x 19%

7%

VOCs 23%

CO 44%

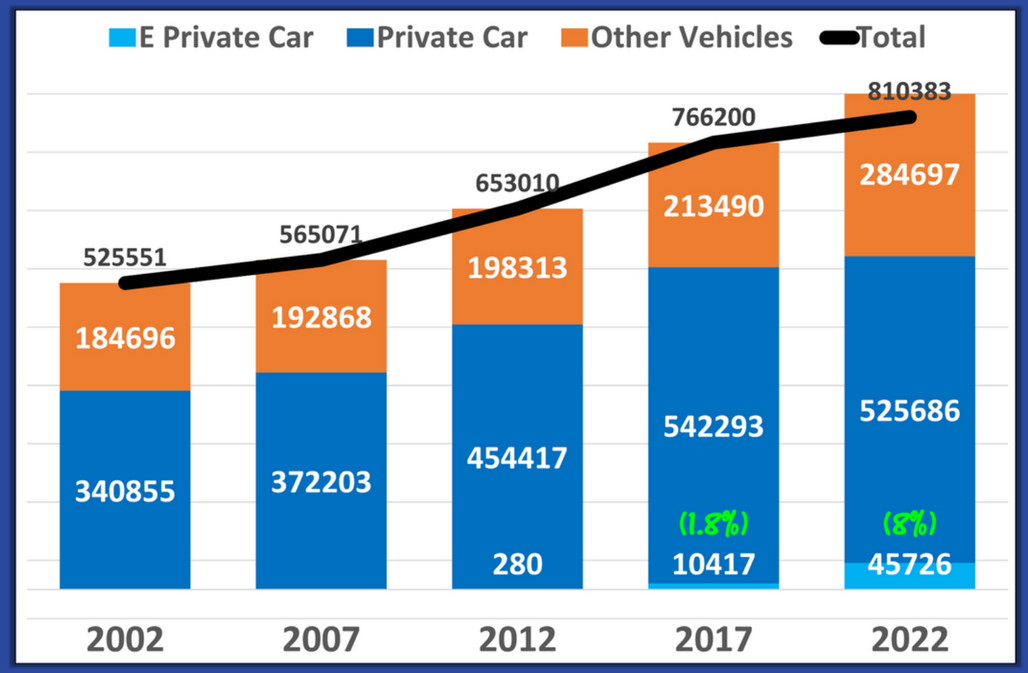
Distribution of Registered Vehicles in HK 2022, TD

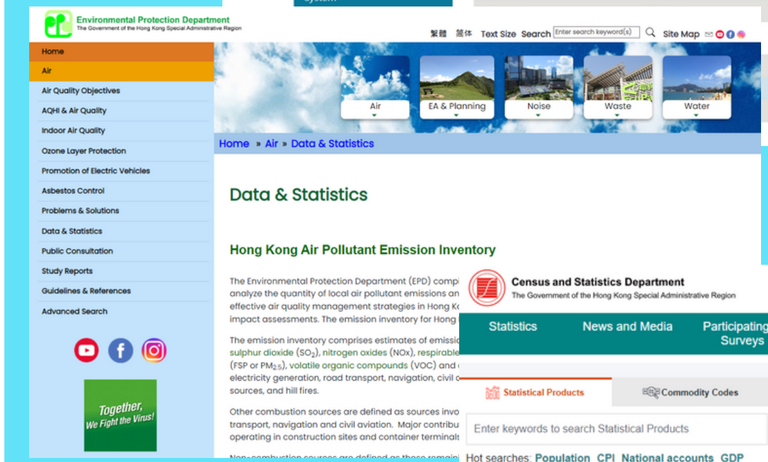


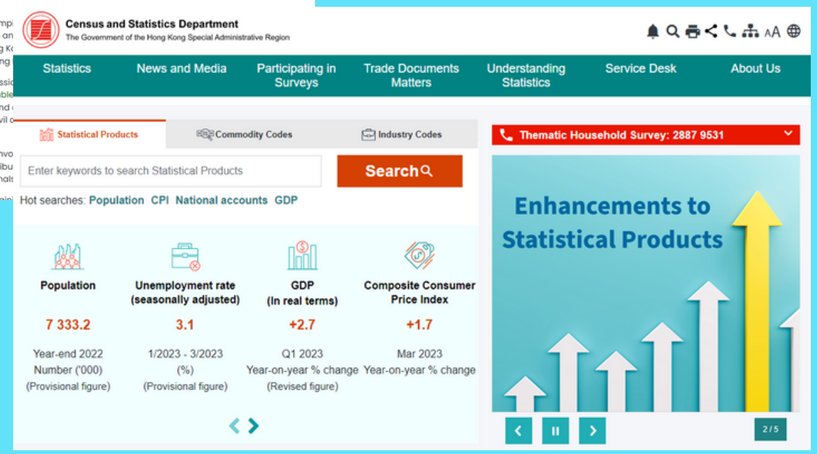
BASIC INFORMATION RELATED TO THIS TOPIC

Vehicle Trend

Growth of Licensed Vehicles
Over the Past 2 Decades, TD







Feasibility

HOW

1 Trendline of Private Cars

2 Status of Charging Facilities

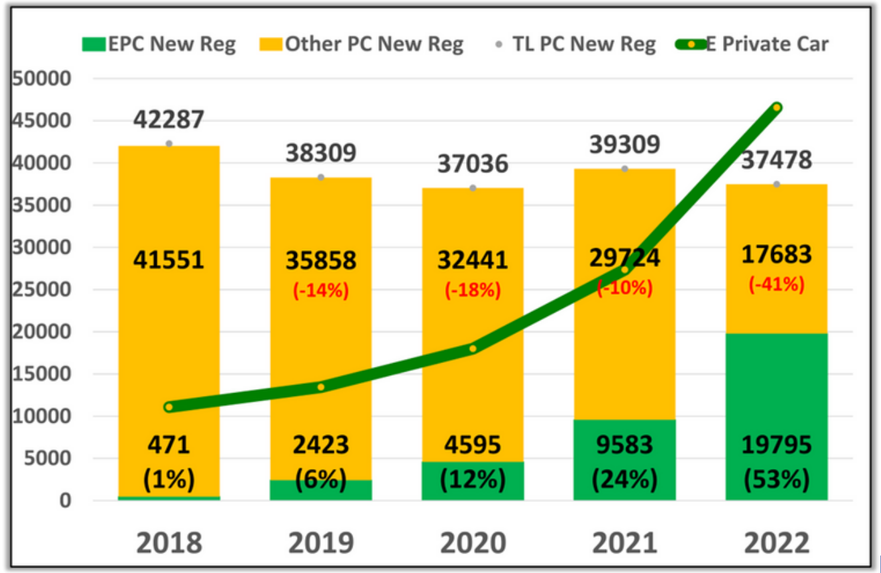
3 Air Quality from Traffic Congestion

4 Future Air Quality Prediction

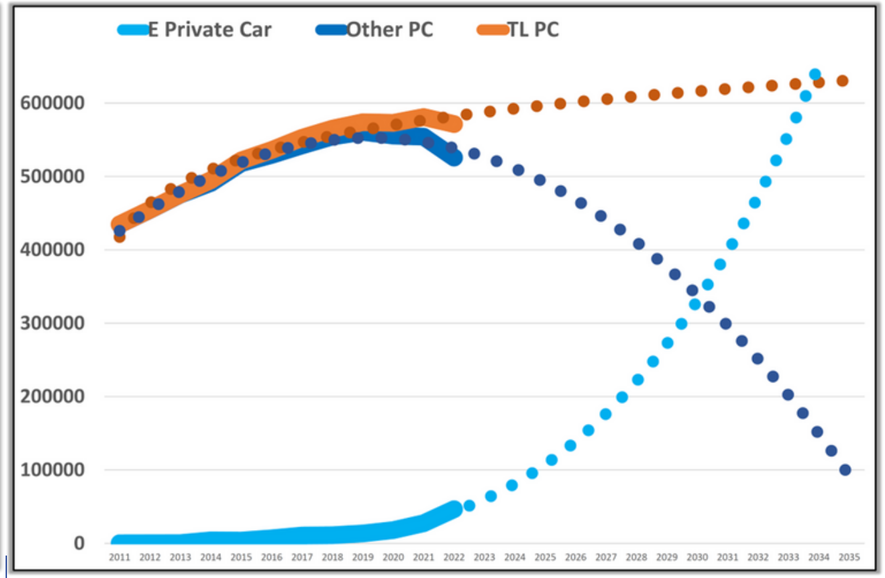
STATISTICAL ANALYSIS & ESTIMATION

STATISTICAL ANALYSIS & ESTIMATION

1 TRENDLINE OF PRIVATE CARS



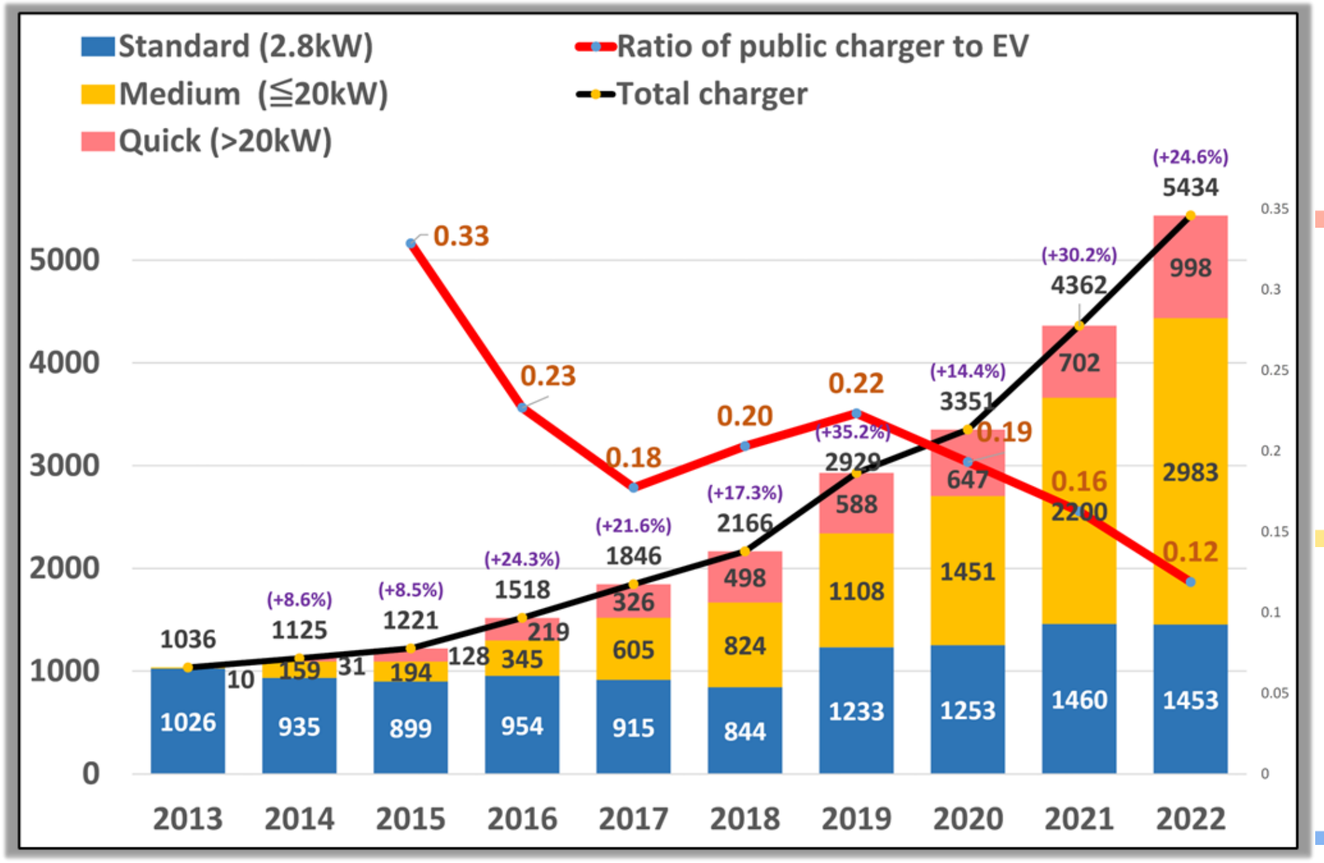
PRIVATE CAR NEW REGISTRATION, TD

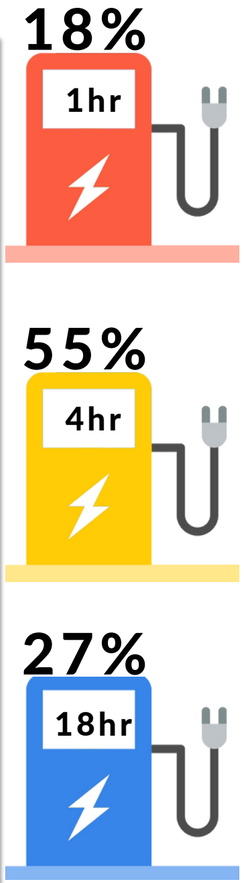


TRENDLINE OF PRIVATE CAR (PC)

STATISTICAL ANALYSIS & ESTIMATION

2 STATUS OF CHARGING FACILITIES

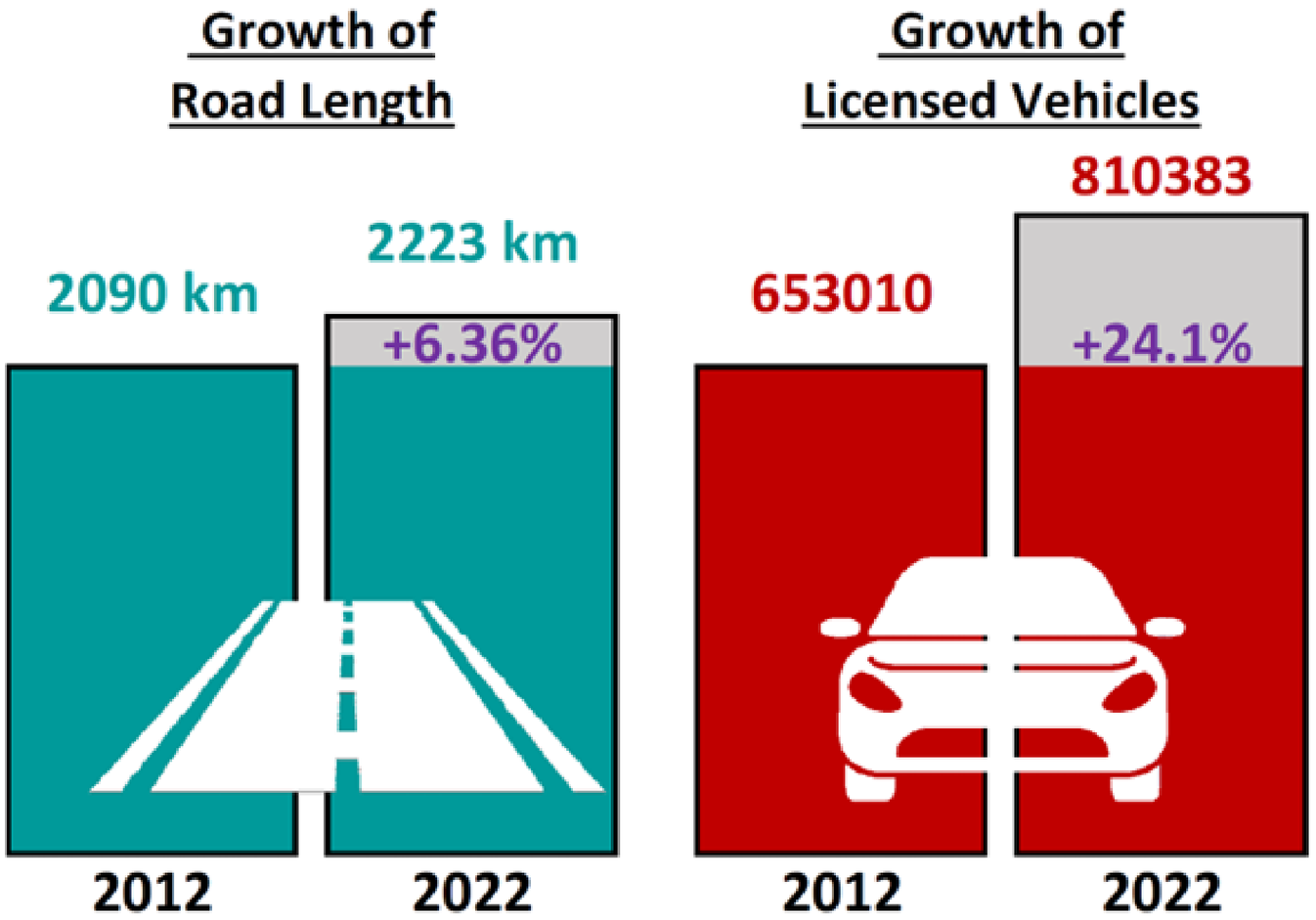




PUBLIC CHARGERS FOR EV BY TYPE, 2013-22, EPD

STATISTICAL ANALYSIS & ESTIMATION

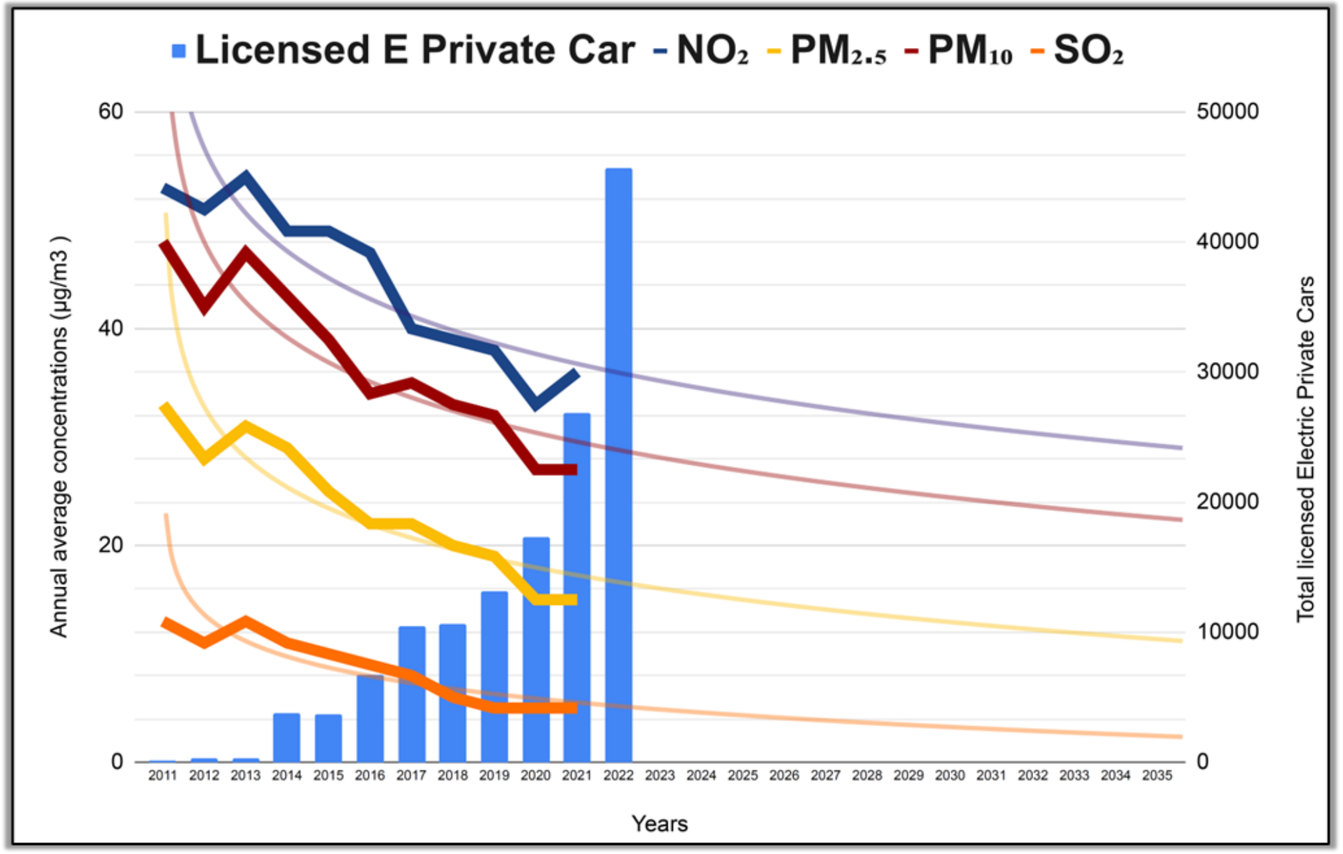
3 AIR QUALITY FROM TRAFFIC CONGESTION



THE TOTAL NUMBER OF ROAD LENGTH & VEHICLES INCREASED IN THE PAST DECADE

STATISTICAL ANALYSIS & ESTIMATION

4 FUTURE AIR QUALITY PREDICTION



ENVIRONMENTAL IMPROVEMENT IN TERM OF AIR QUALITY

Conclusions

WHICH

1 Trendline of Private Cars

2 Status of Charging Facilities

3 Air Quality from Traffic Congestion

4 Future Air Quality Prediction

Is It Feasible to Achieve Conductive Environment for Popularisation of *Electric Vehicles* in HK?

1

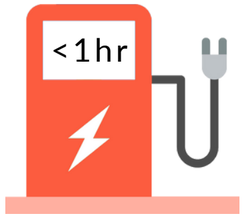
TRENDLINE OF PRIVATE CARS

Decline trend of petrol private cars and the rapid growth rate of electric private car.

2

STATUS OF CHARGING FACILITIES

The outdated Standard chargers will become the bottleneck for EV development.



3

AIR QUALITY FROM TRAFFIC CONGESTION

EVs avoid the problem of air pollutants emission even road congestion will become more serious

4

FUTURE AIR QUALITY PREDICTION

By reducing carbon emissions and other pollutants, EVs have a positive impact on the environment.

The Future

WHEN

2035 HONG KONG
2050 HONG KONG

THE GLOBAL GOAL

2050 TARGET

THE FUTURE 2050

- E-COMMERCIAL VEHCILES
- BATTERY CAPACITY INCREASES

- NEW ENERGY SOURCE
- INNOVATION TECHNOLOGY

- DEVELOPMENT OF CHARGING STATION & BATTERIES

THANK YOU

LA SALLE COLLEGE, HK