



Electric Vehicles Access and Opportunity

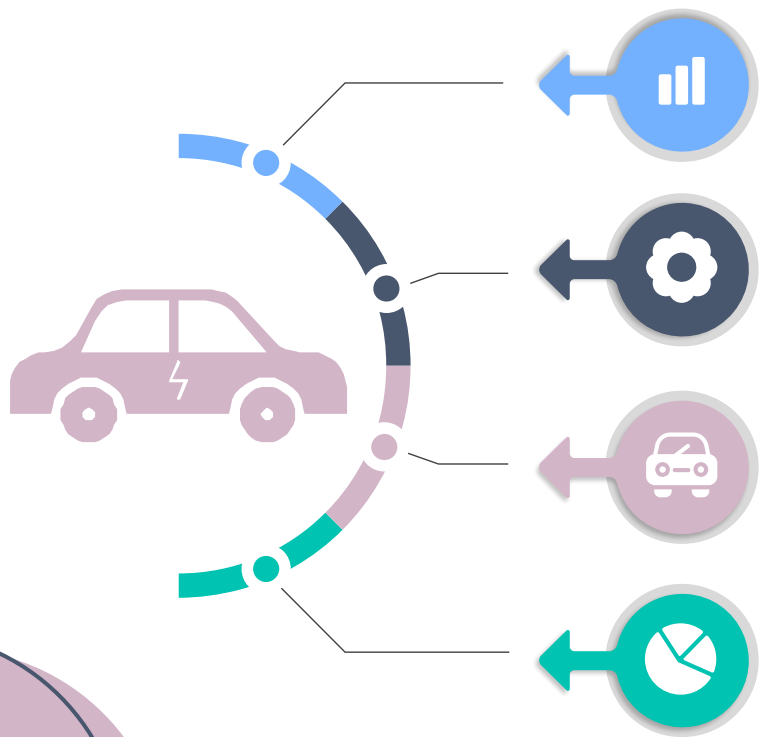
Aida Rahim, PhD
Data Scientist

Contents

- Introduction
- Background
- Problem statements
- Data description
- Data analysis
 - EV ownership
 - Used cars
 - Charging network
 - Business opportunity
- Recommendations



Introduction



EVs made up 4.8% of vehicle sales in 2020—well above 1.8% nationally

Consumer interest: reduced fueling costs, minimal maintenance, reduced carbon emissions, and rebates

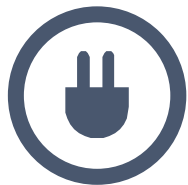
Big 3 U.S. automakers promise only zero-emission car sales by approximately 2035

Almost 100 pure electric EV models set to debut by the end of 2024



On April 16, 2021, the Washington state legislature passed the Clean Cars 2030 bill, which will require that by 2030, all new light-duty vehicles sold or registered in the state be electric, with the exception of emergency vehicles.

Problem Statements



01

Ownership and Economic Means

What is the difference in ownership growth rate and access to charging facilities between higher and lower income owners?



02

Garage Orphans

What is the difference in availability of single-family vs multi-unit housing in Seattle?



03

Charging Station Network

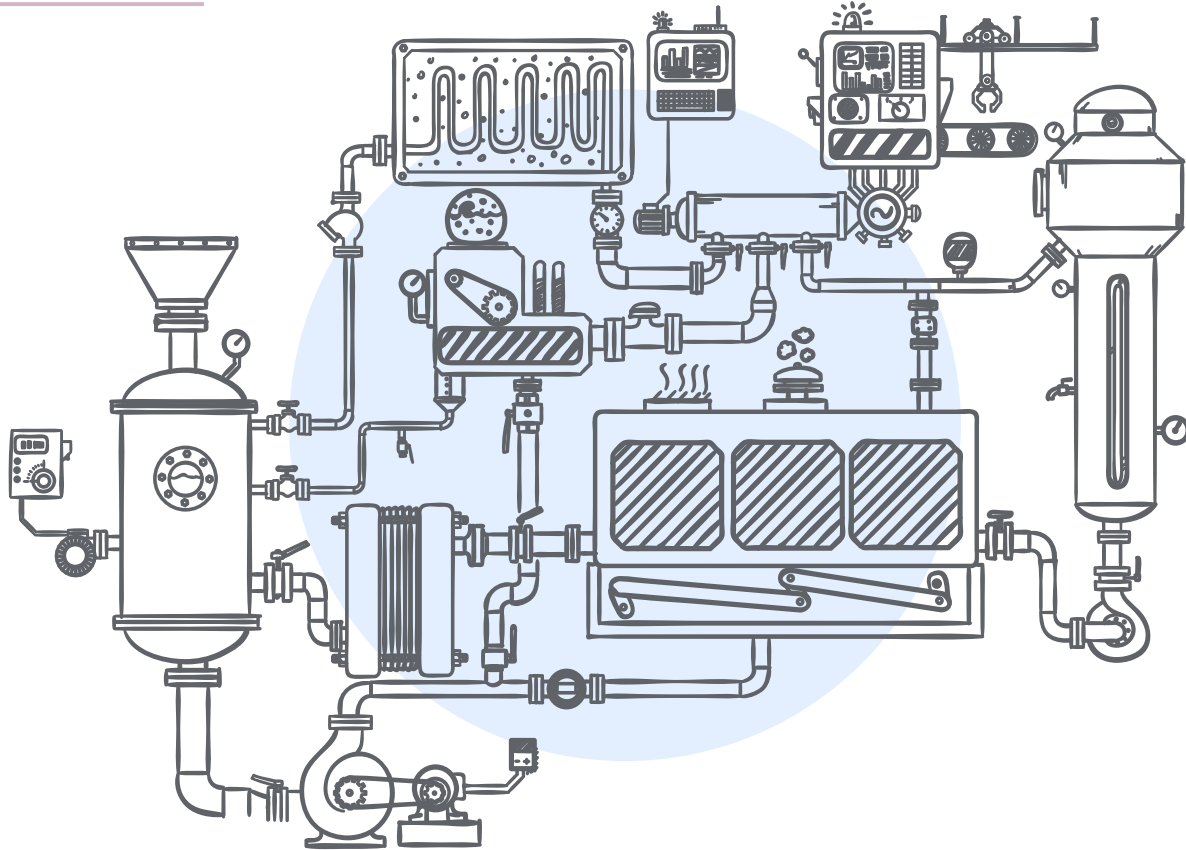
How much improvement in charging facilities is required to make long-distance drives more feasible for an EV?

Opportunities for business owners.

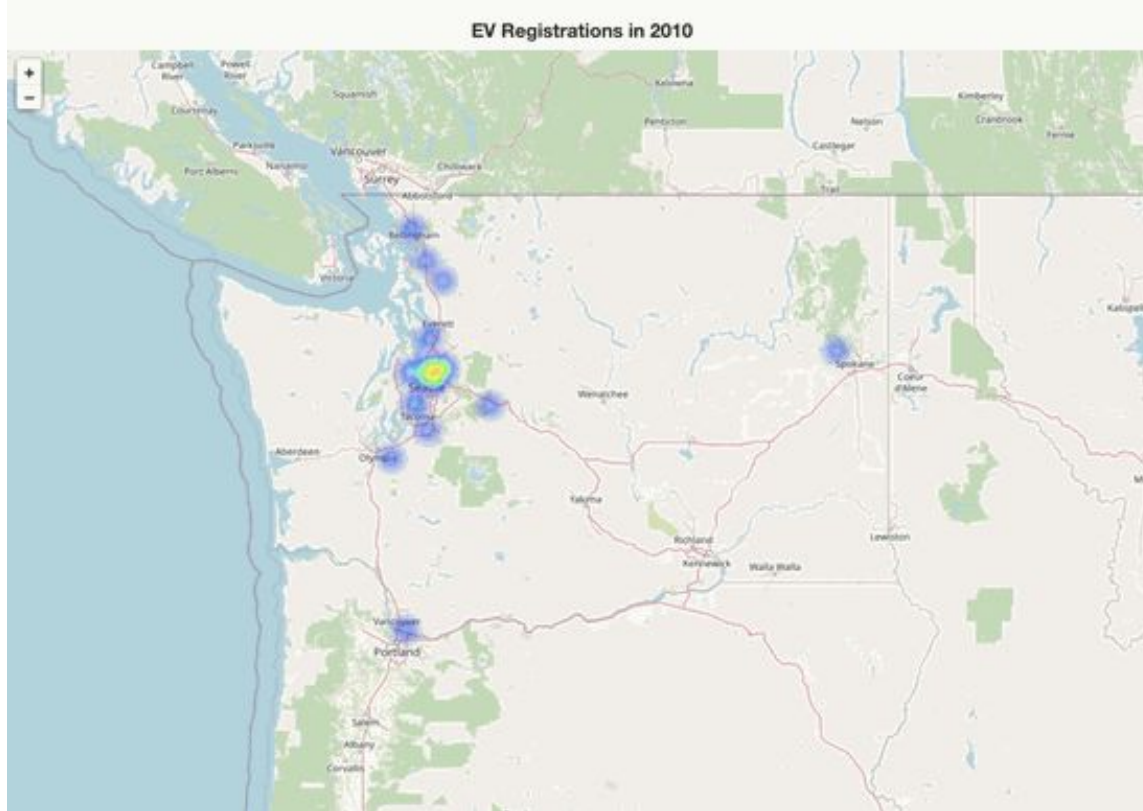
Data Description

Category	Description	Source
EV registration	Records of title activity (transactions recording changes of ownership), January 2010 through February 2021.	WA State open data portal
Population	2019 WA state population	U.S. Census Bureau
Income	2019 WA state median income	U.S. Census Bureau
Charging activity	Time series charging data from public domain stations (Palo Alto)	Palo Alto open data portal
	Time series charging data from workplace stations (JPL)	Caltech's Adaptive Charging Network project (ACN)
	Time series charging data from homes in the Midwest	National Renewable Energy Lab (NREL)
Charging station	Charging station locations in WA	U.S. Dept of Energy

Analysis

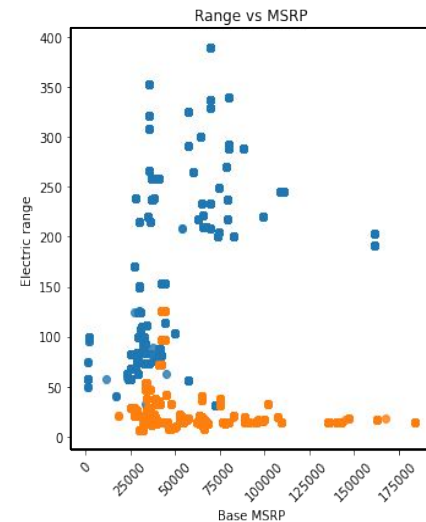
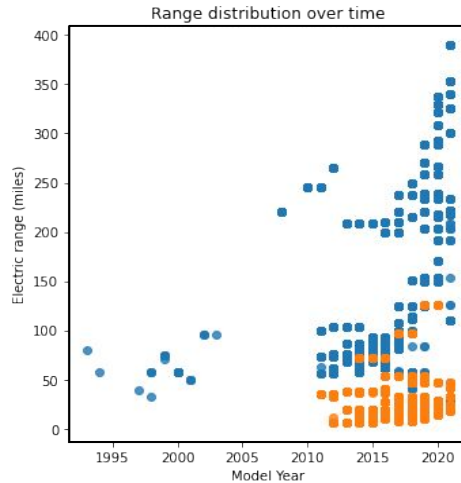
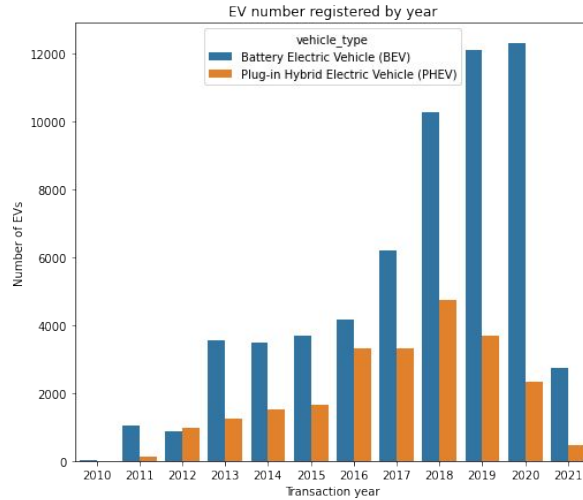


Electric Vehicle Ownership



73% of electric vehicles (EVs) in WA state are owned in zip codes with median income higher than the state median income

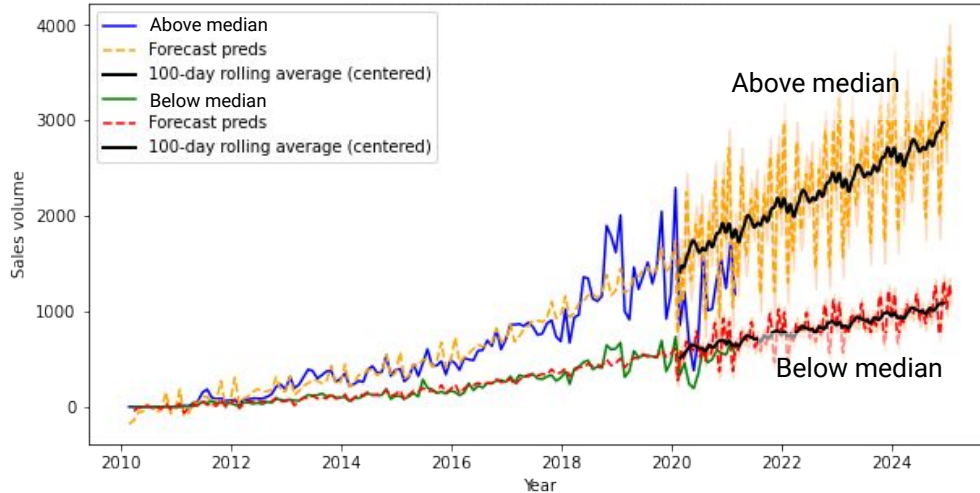
EV Overview



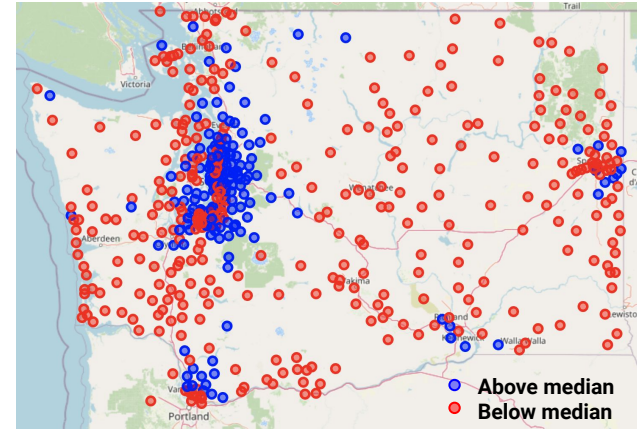
- EV registrations have been increasing over the last 10 years, with a drop in 2020
- BEV sales increase outpaces that of PHEV sales
 - BEV: battery → electric motor (Tesla, Chevy Bolt, Nissan Leaf)
 - PHEV: electric powertrain + ICE (Toyota Prius, Chevy Volt, Mitsubishi Outlander)

EV Ownership Growth Rate

Plot of sales numbers and projections

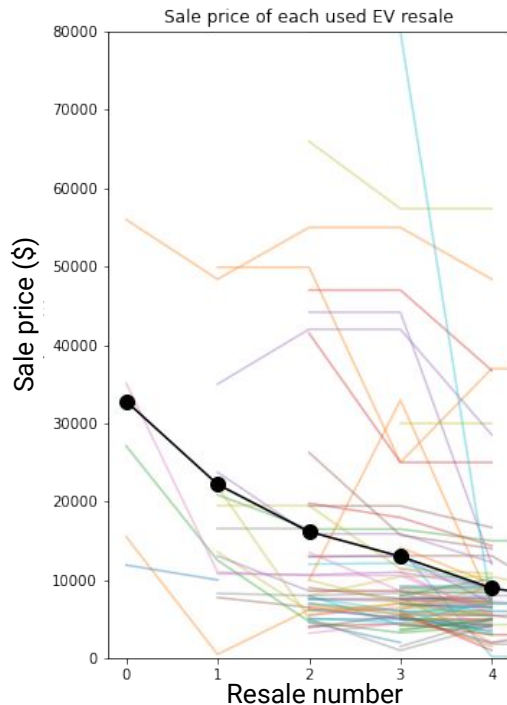
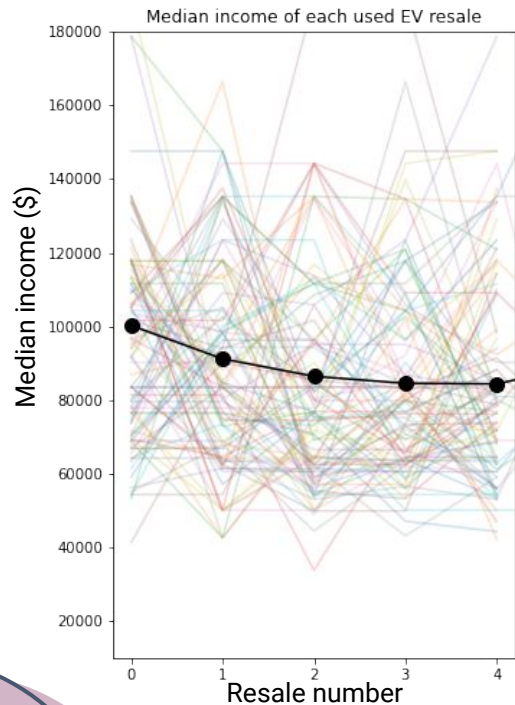


Map of EV ownership



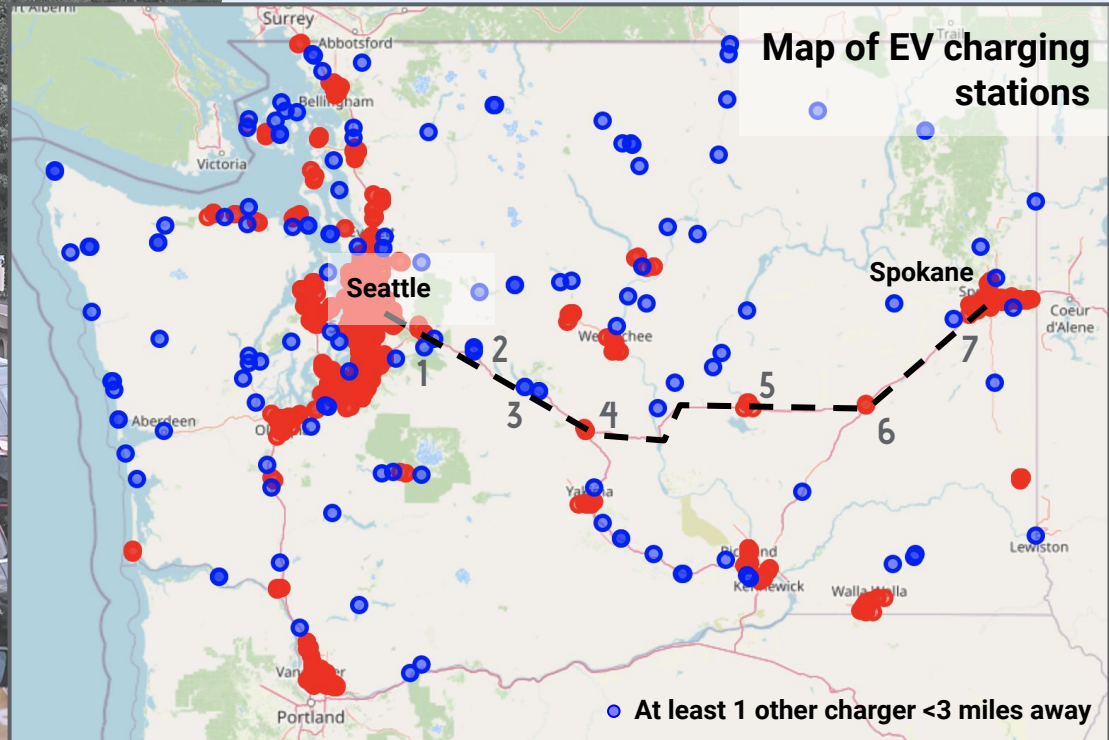
- EV median price (\$35,000) is ~1.5X the average price of a gas vehicle (\$21,000)
- 72.8% of EV registrations in WA state were carried out in zip codes with median income above the state median income
- Projected rate of sales increase for above-median income is 3X below-median income

Used Vehicles



- With each resale, the EV goes:
 - From higher to lower median income zip codes
 - From higher to lower sale price
- This bodes well for increased accessibility (price-wise).

Charging Network



The background is a light blue color. In the center is a large, solid white circle. To the left of the white circle, there is a thin, dark blue circular arc. To the right of the white circle, there are two parallel diagonal lines: a thick pink one and a thin dark blue one. Below the white circle, there is a thin, light blue circular arc.

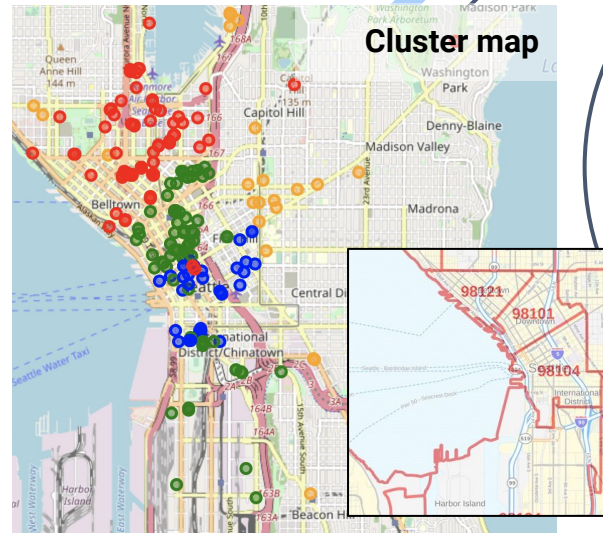
70%

Home permits since 2010
for non-single-family
homes

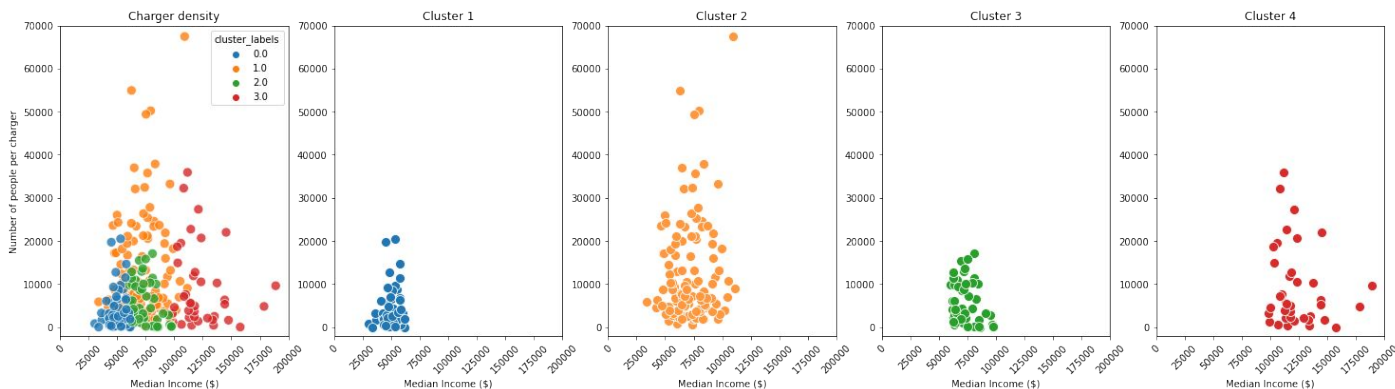
Charging Stations

K-Means Clustering

- Input: population & income by zipcode
- Output: maps geographically
- Average charger density = 12 per 10k people
 - Compared to Norway with 35 per 10k people.
- Charger density is highest in low median income area



Charger density by median income





Supporting Clean Cars 2030



Electric vehicle plugged into charger

Are you considering building a charging station at your business?

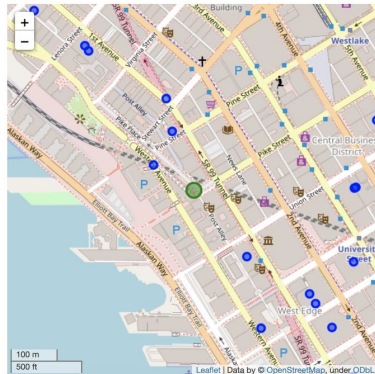
Enter your business address and we will provide information on other stations around it.

Please input your business address:

86 Pike Pl, Seattle, WA 98101

[Check now!](#)

There are more than 3 charging stations within a 0.2 mile radius.



**Business
Opportunity:**
Attract more
customers and
increase dwell time

Recommendations

- Increase incentives relative to income (currently state tax exemptions)
- Legislate charging station requirements for housing developments
- Encourage businesses to install charging stations (incentives)





Questions?



CREDITS: This presentation template was created by Slidesgo, including icons by Flaticon, and infographics & images by Freepik.