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Major Changes in Transportation - the future leans towards electric & shared

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Electromobility and Resiliency PIC

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The future of transportation is anyone’s guess

Here’s mine…

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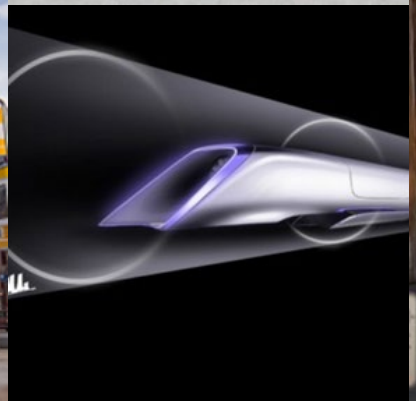
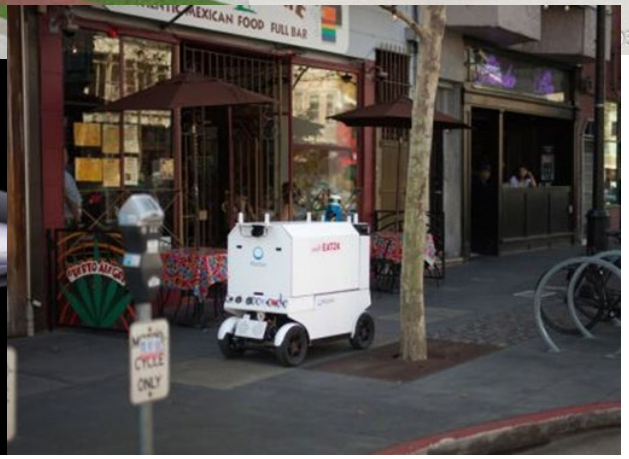
Vision


car rental
mobility point
cycle center
bikesharing
e-carsharing
ridesharing


www.postauto.ch




MEXICAN FOOD
FULL BAR

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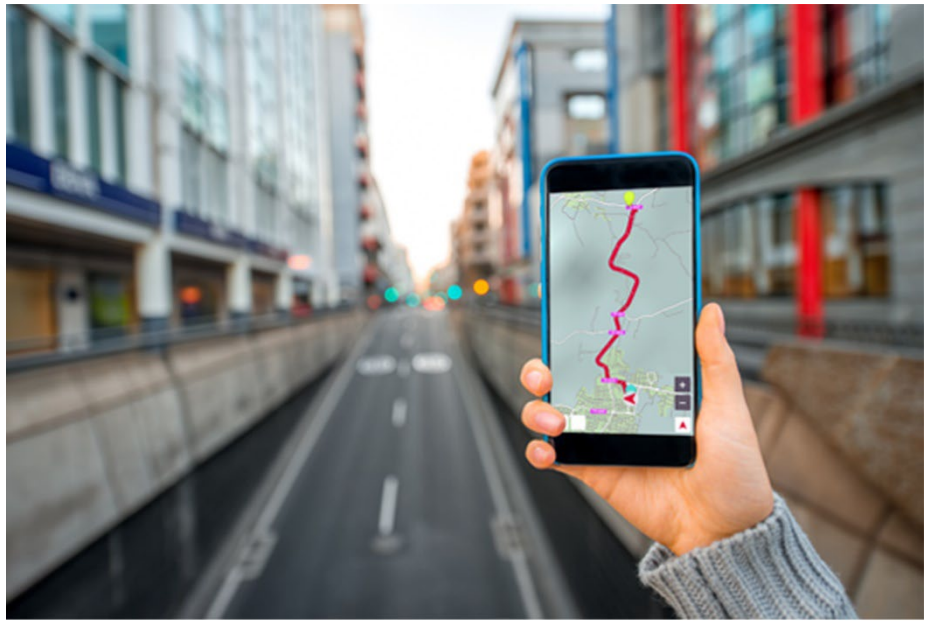
Disruptive Transportation Technologies

1. Cost-effective Energy Storage
2. Smart sensors
3. Accessible data/data analytics



Overview

1. Background
2. Electromobility
3. Shared Mobility
4. Conclusion

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Walking

Horses


COLUMBIA GROCERY CO.
ALASKA OUTFITTERS
908 YUKON SUPPLY CO. 908

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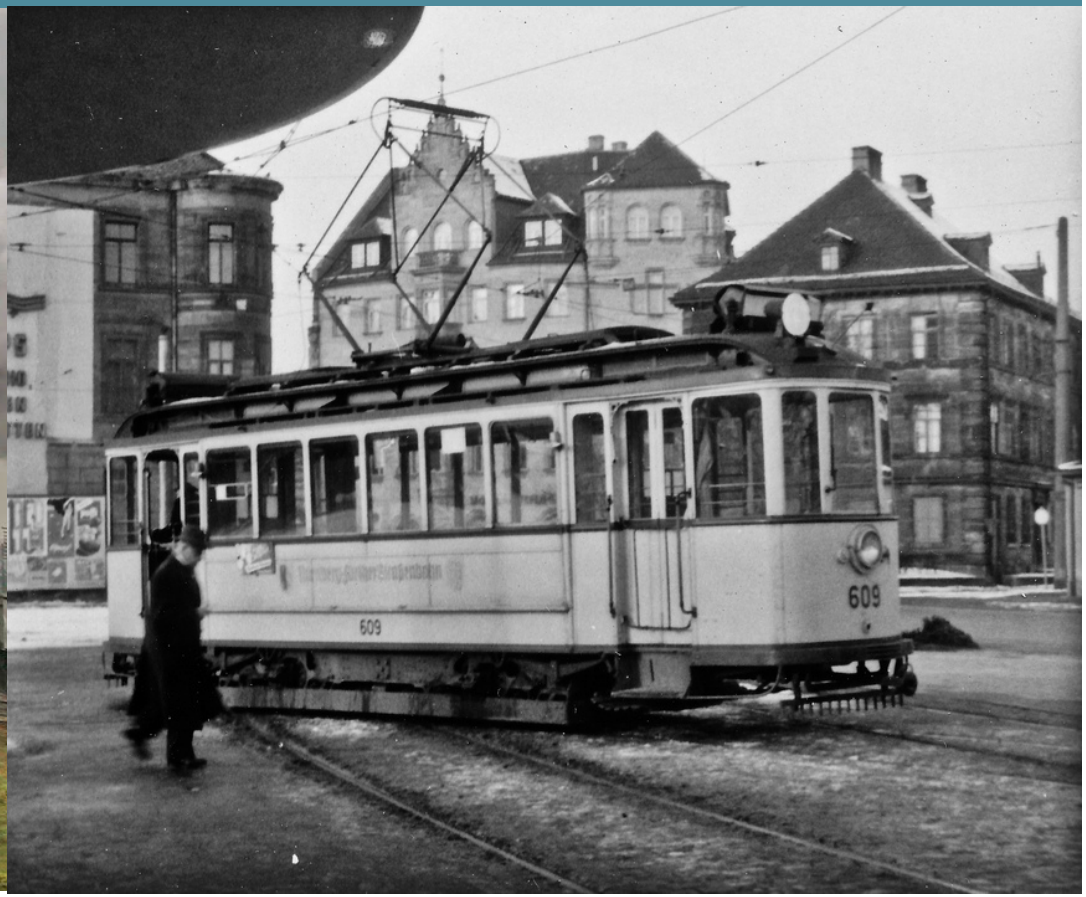
Steam Locomotives & Electric Trolleys



Cars & Airplanes

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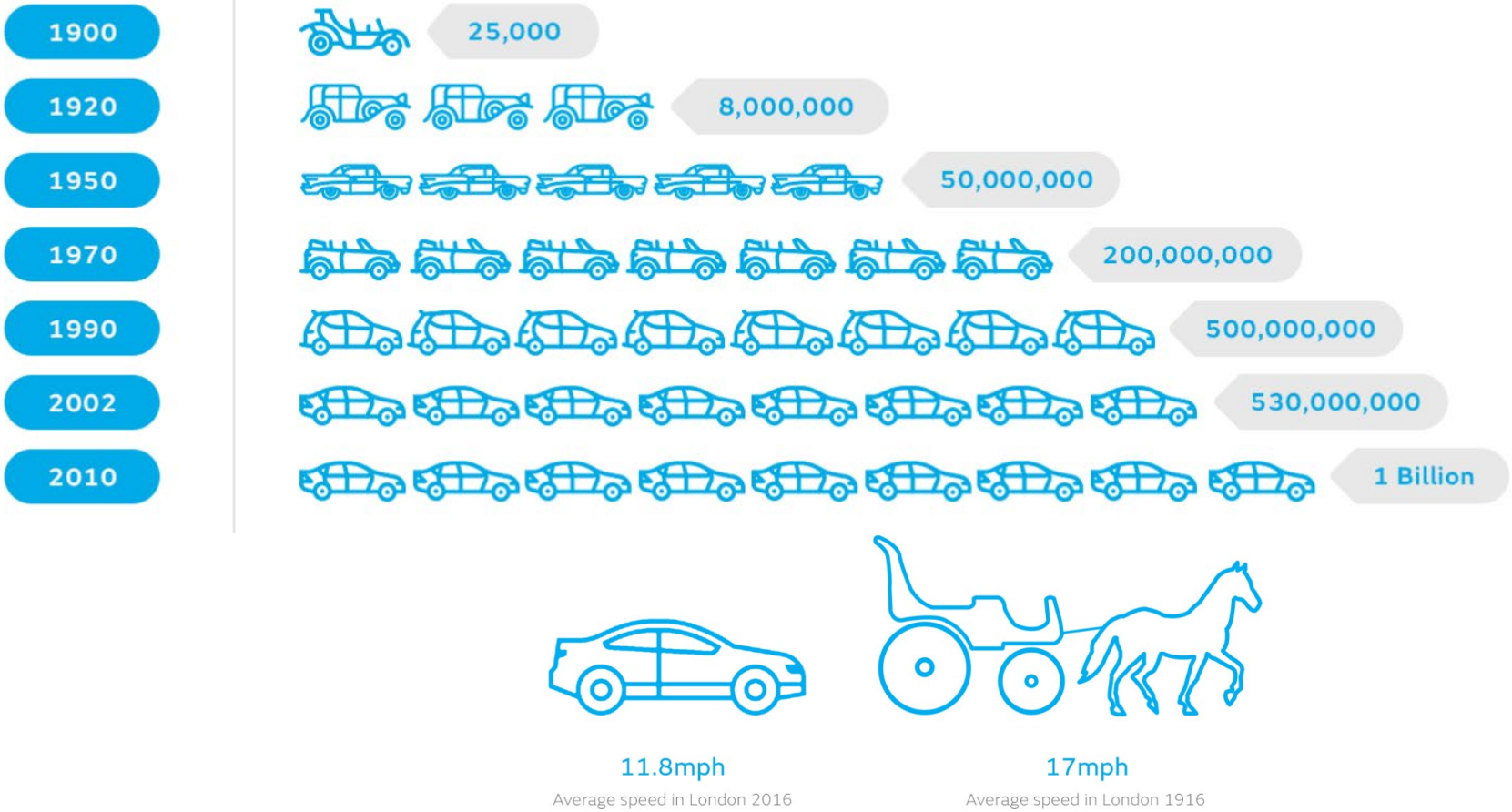
Cars rule the world?



Impacts

Safety
- 33,561 highway deaths in 2012
- 5.615 million crashes in 2012
- Leading cause of death for ages 4, 11-27

Mobility
- 5.5 billion hours of travel delay
- $121 billion cost of urban congestion

Environment
- 2.9 billion gallons of wasted fuel
- 56 billion lbs of additional CO_2

Data Sources:
Traffic Safety Facts: 2012 Data, National Highway Traffic Safety Administration (Nov 2013)
2011 Annual Urban Mobility Report, Texas Transportation Institute (Feb 2013)

Note: Over 35,000 highway in 2015

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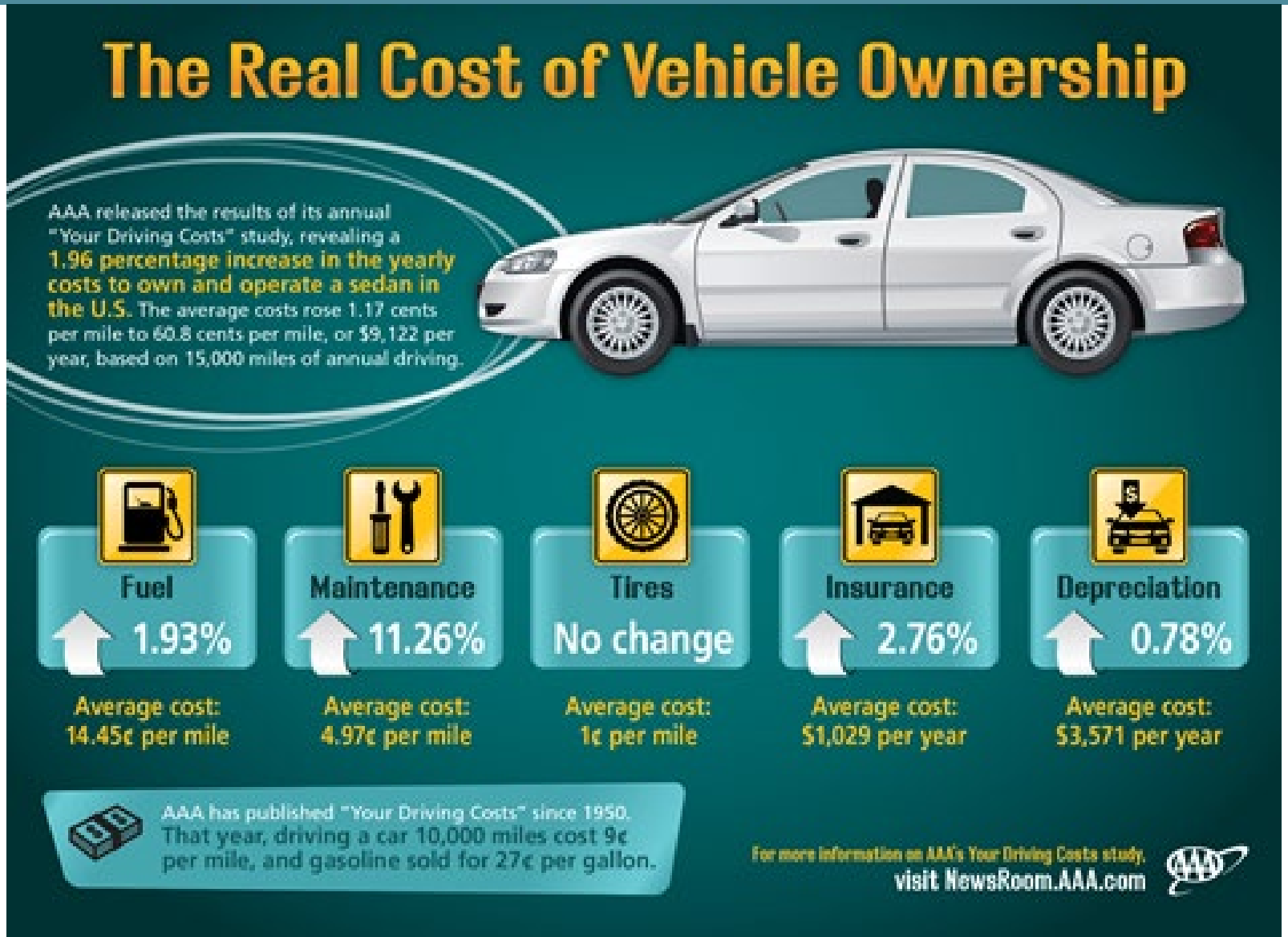
Financial Costs



Outline

1. Background
2. **Shared Mobility**
3. Electromobility
4. Conclusion

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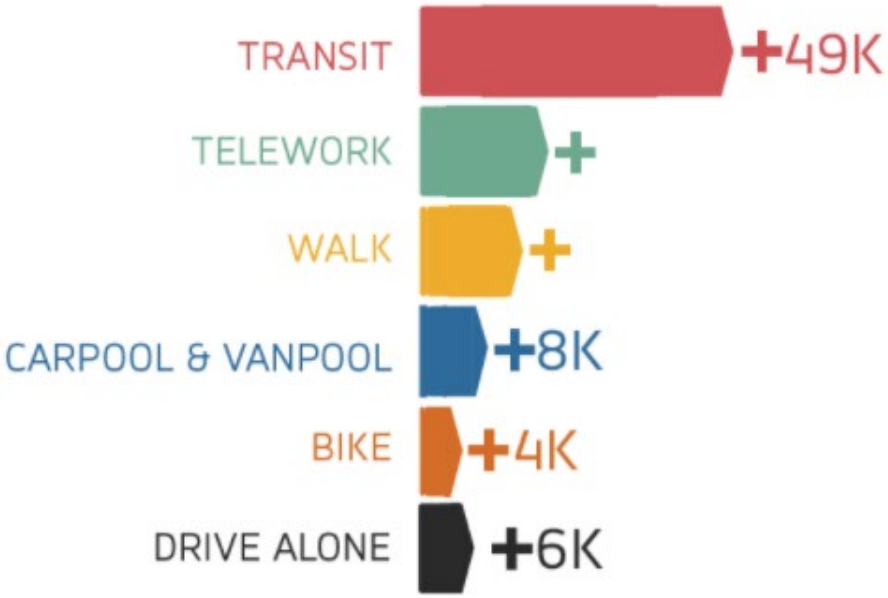
Outline

1. Background
2. **Shared Mobility**
   - **MaaS**
   - **Micromobility**
3. Electromobility
4. Conclusion

Mode Shift

Daily Commuters Added 2010 to 2019

From 2010 to 2019, center city drive alone commutes increased by approximately 6,000 while all other modes grew by approximately 82,000 commutes.



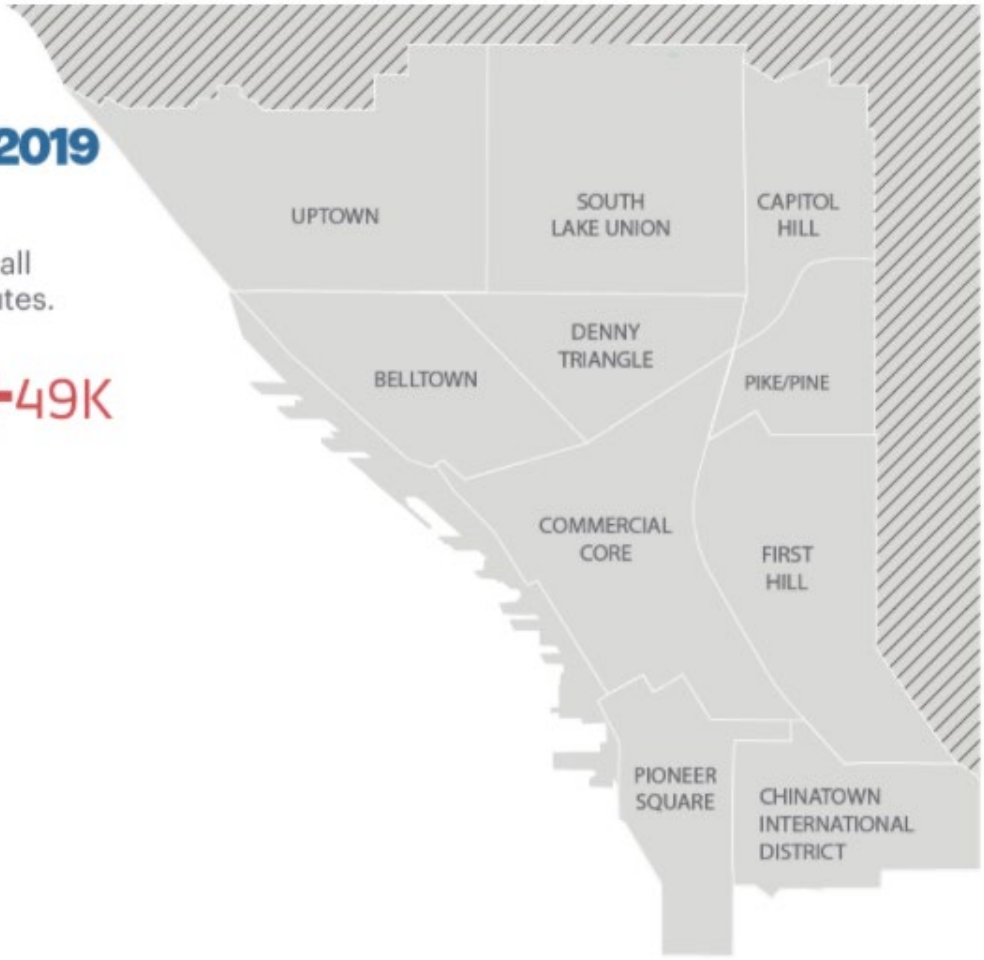
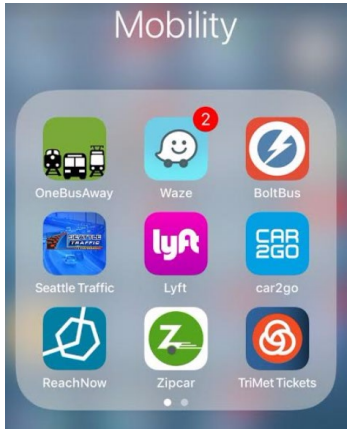
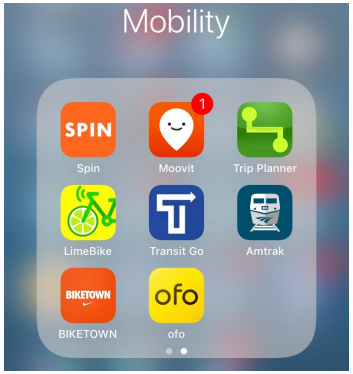


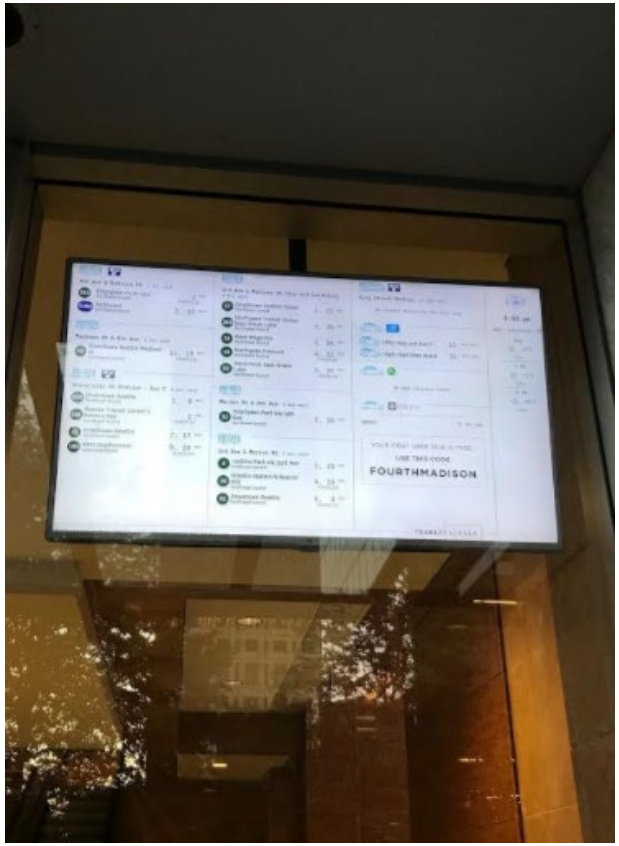
Illustration of survey area. Detailed map avalable in full report.

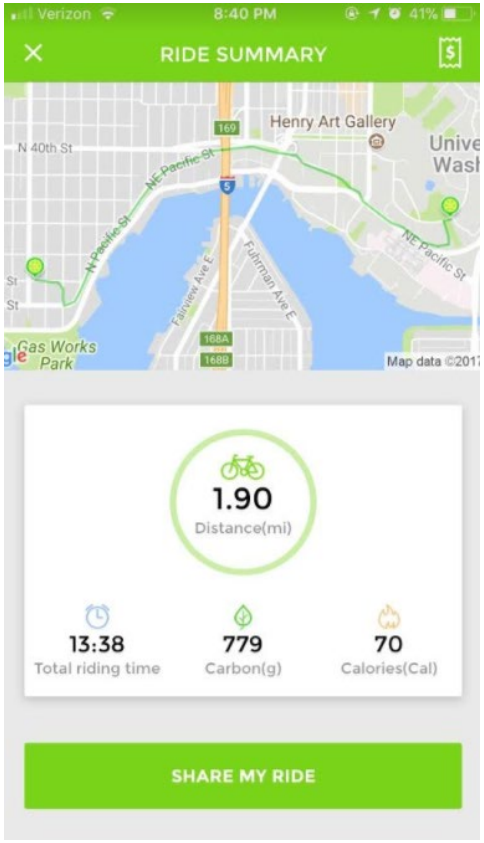
commute seattle

Transport/Mobility as a Service (TaaS/MaaS)

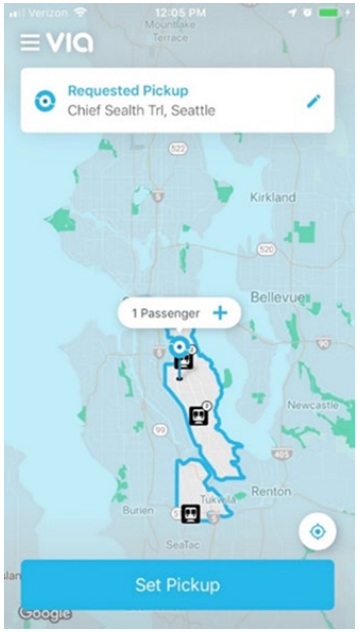








Car Share & Microtransit



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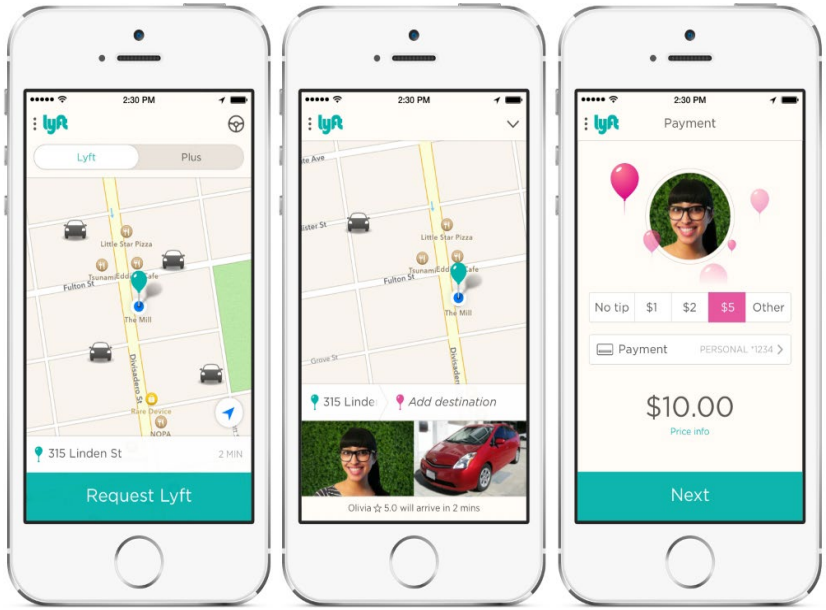
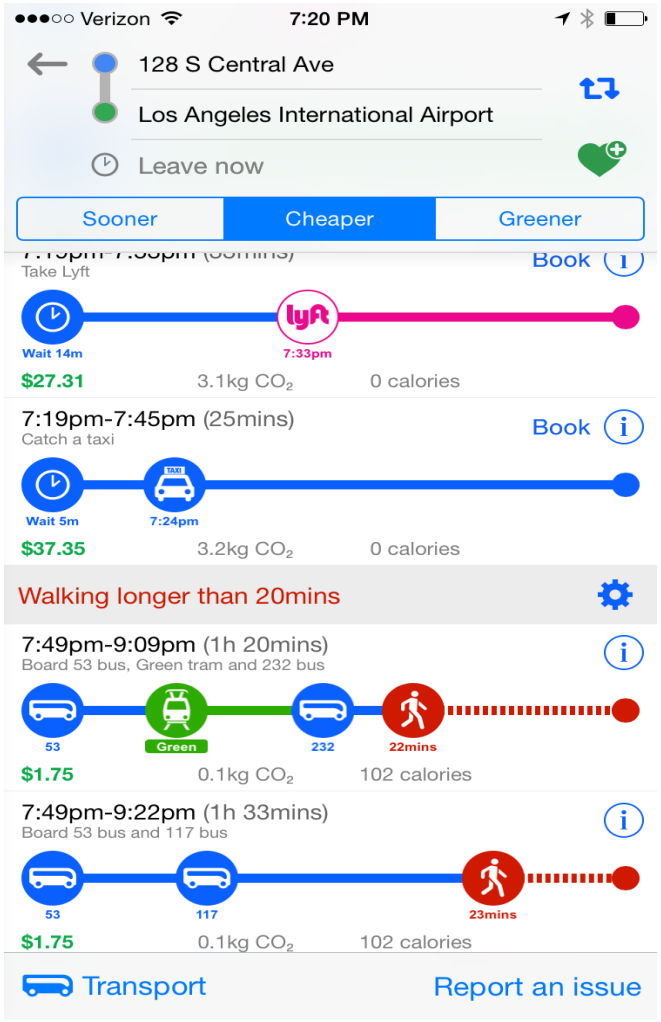
Ride Hailing

UBER

lyft





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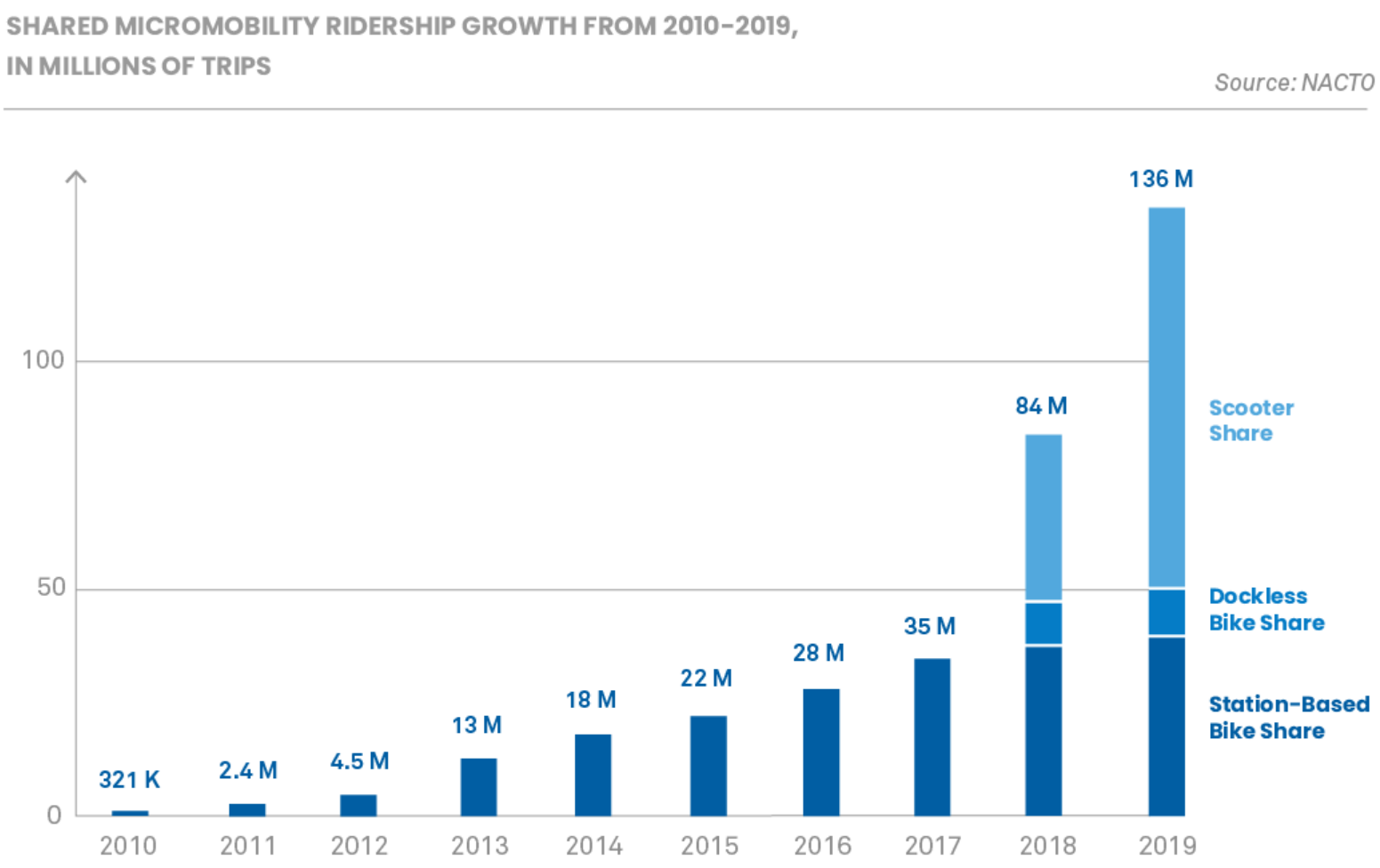
Bike Share

Electric scooter share

Lime-S electric scooters

Bird electric scooters

Micromobility



Source: https://nacto.org/shared-micromobility-2019/

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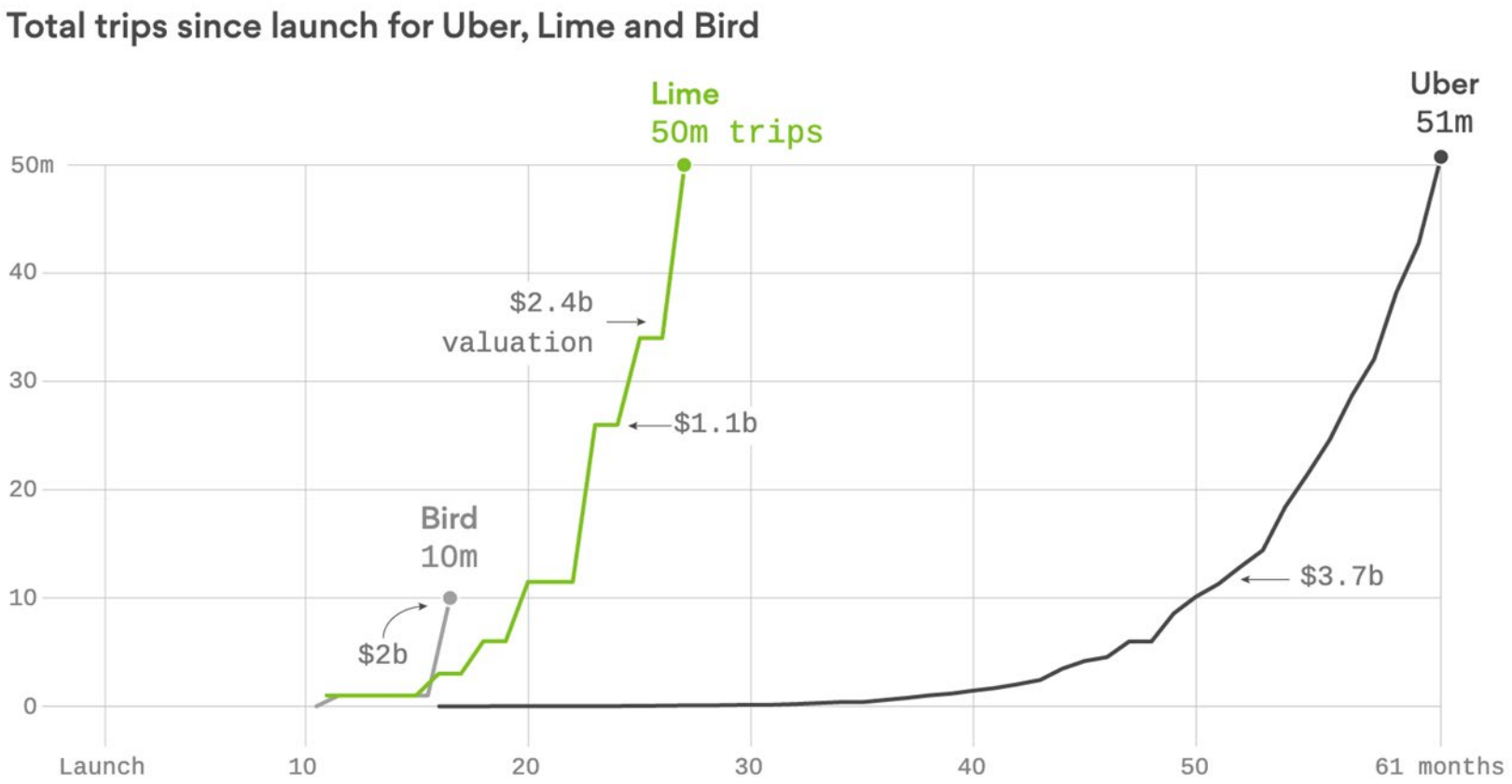
Micromobility vs. Ridehailing



Data: Axios research; Chart: Naema Ahmed/Axios

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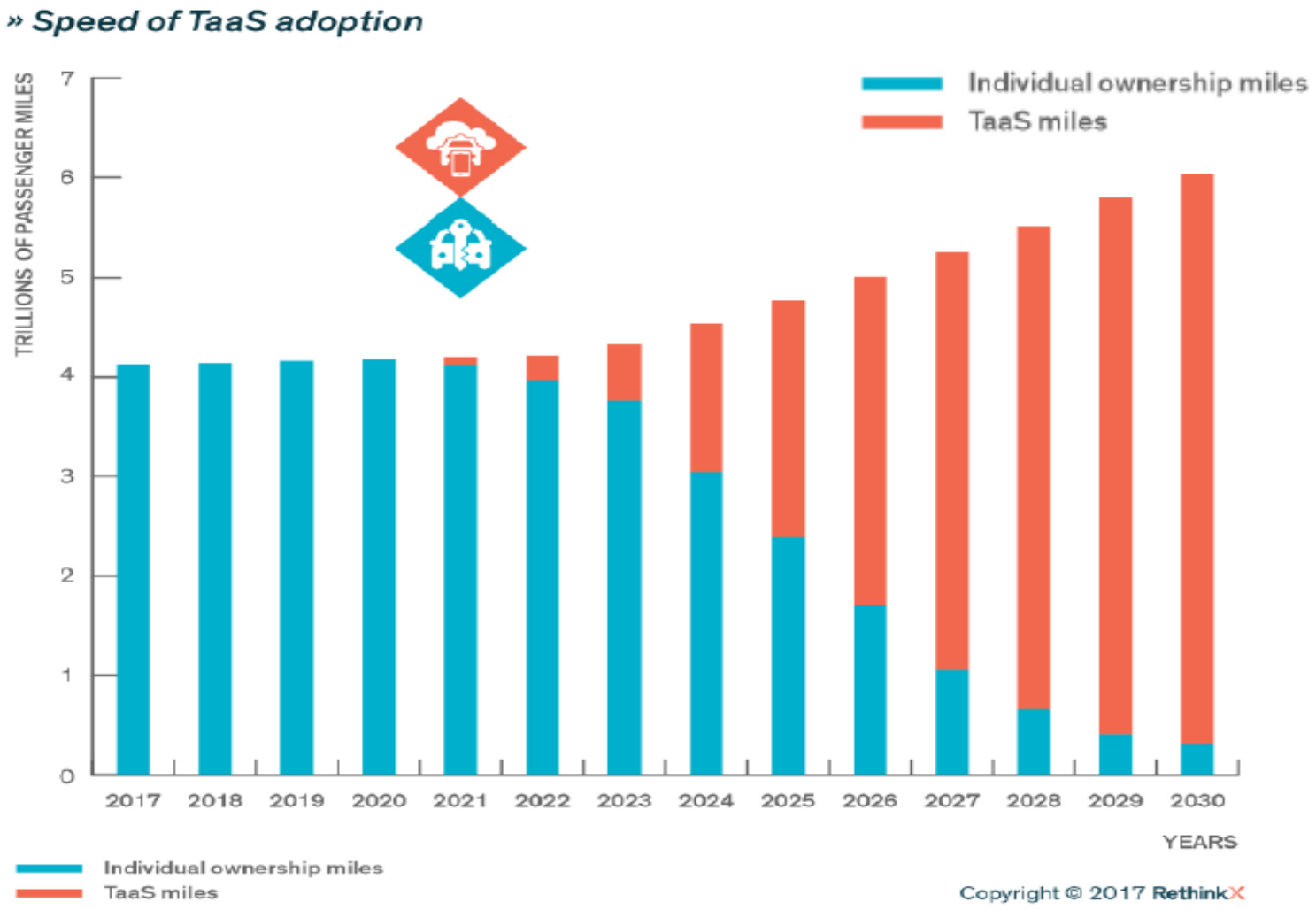
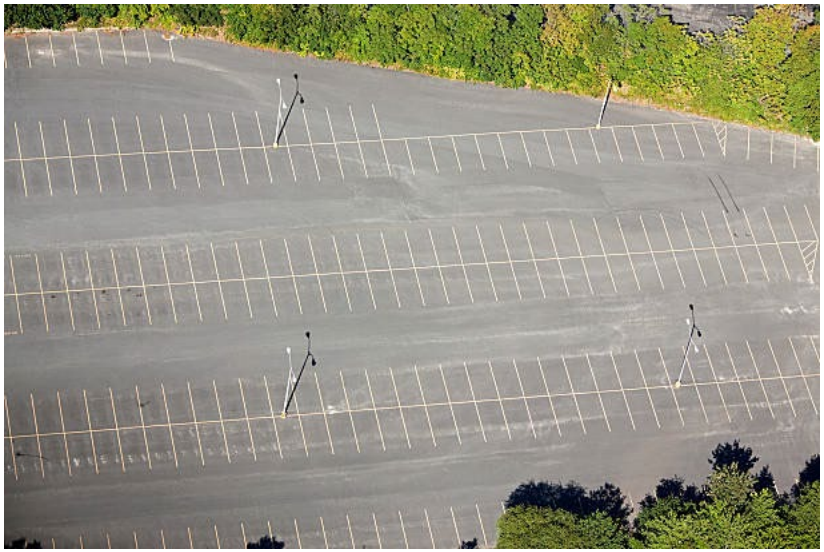
Transition Timeframe



Reduced parking demand?



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Reduced transit demand?

Pick-up & Drop-off Zones

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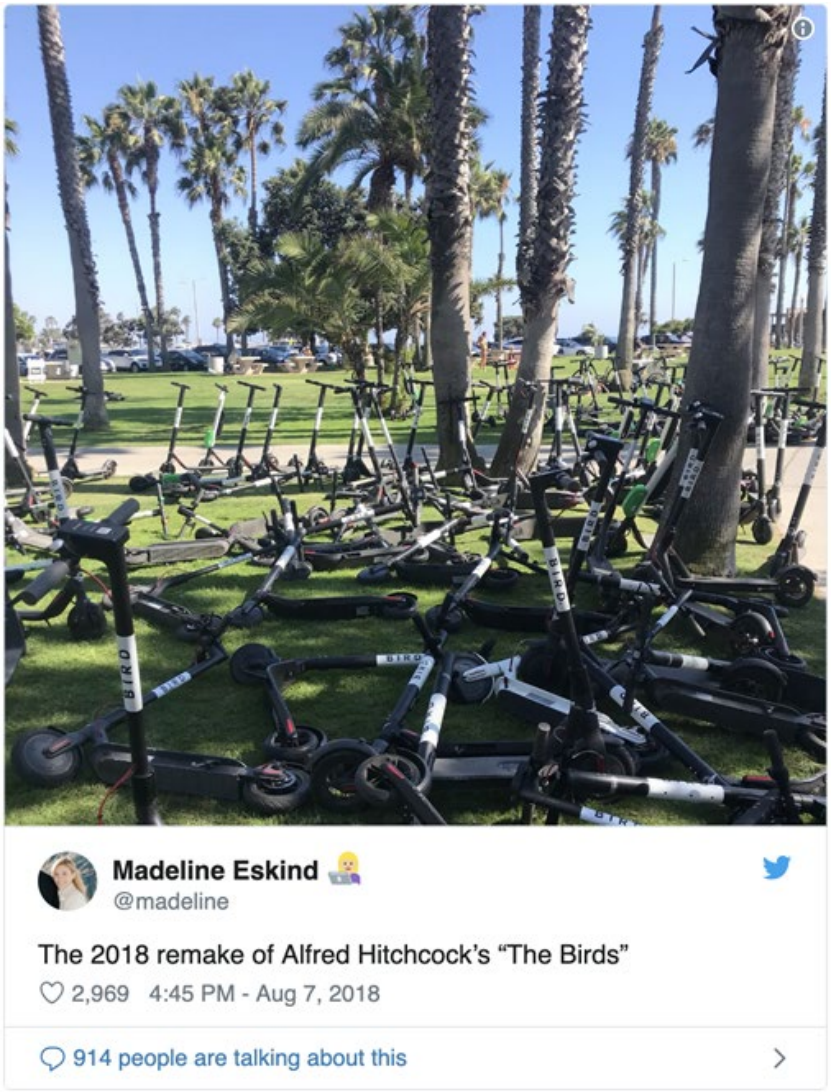
“The Birds”?



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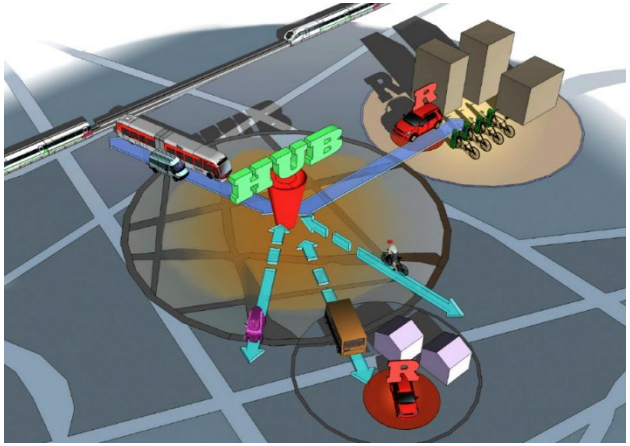
Mobility Hubs



Overview

1. Background
2. Shared Mobility
3. **Electromobility**
4. Conclusion

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Energy Storage

Lithium Ion Batteries

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Battery Electric Vehicle (BEV)

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EVs

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Electric Pickup trucks

F-150 Lightning

Battery Electric Bus

Medium/Heavy Duty Vehicles

XL Hybrids Ford F-150 upfit

Workhorse E-GEN step van

Thomas Built C2 Jouley

Proterra EV bus

Source: Puget Sound Clear Air Agency

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Electric Motorcycles

E-motorcycles

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Electric Bicycles

E-bikes

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Microcycles

PRODUCT	BRAND/MODEL	RANGE	TOP SPEED	WEIGHT	PRICE
Segway	Segway miniPRO	14 miles	10 mph	28 lbs.	$ 600
E-Unicycle	Uno Bolt	25 miles	22 mph	45 lbs.	$ 1,500
Scooterboard	InMotion Technology	7.5 miles	15.5 mph	22 lbs.	$ 700
E-Unicycle	Onewheel+	7 miles	19 mph	24.5 lbs.	$ 1,500
E-Skateboard	Boostedboard (2nd Gen.) Dual+	7 miles	22 mph	15 lbs.	$ 1,500
Hoverboard	EpikGo Classic	12.5 miles	12 mph	20 lbs.	$ 600
E-Unicycle	Solowheel Xtreme	10 miles	14 mph	26 lbs.	$ 1,800

EV charging infrastructure

Residential

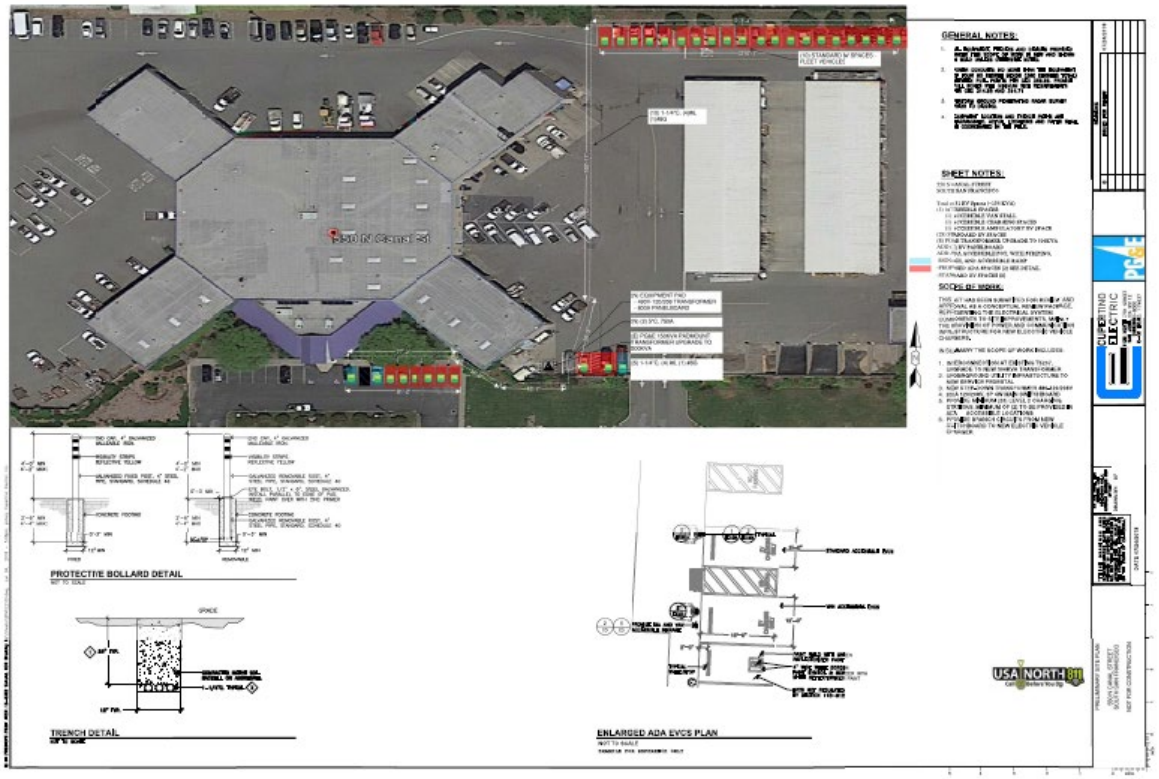
Workplace

Fleet

Public

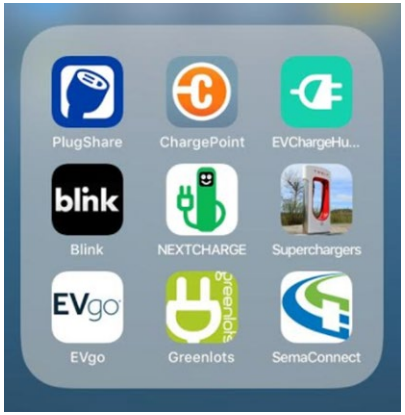
EV charging infrastructure

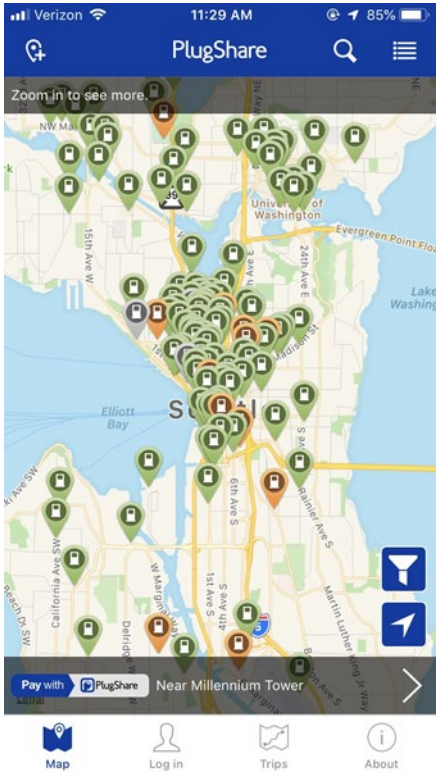
Charging Categories: *Fleet*



EV charging infrastructure

Charging Categories: *Public*





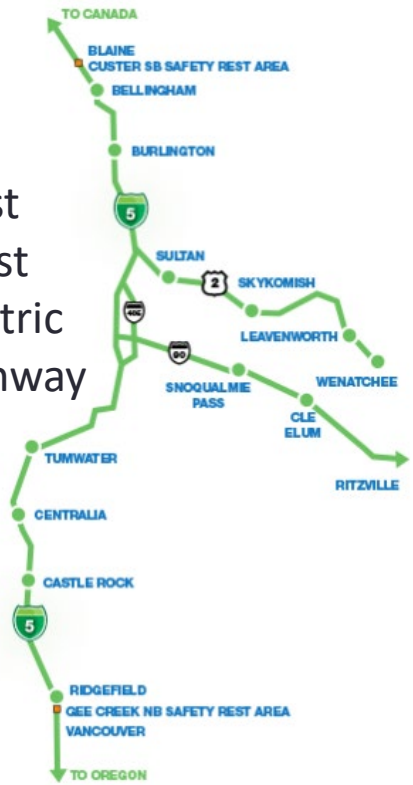
Commercial

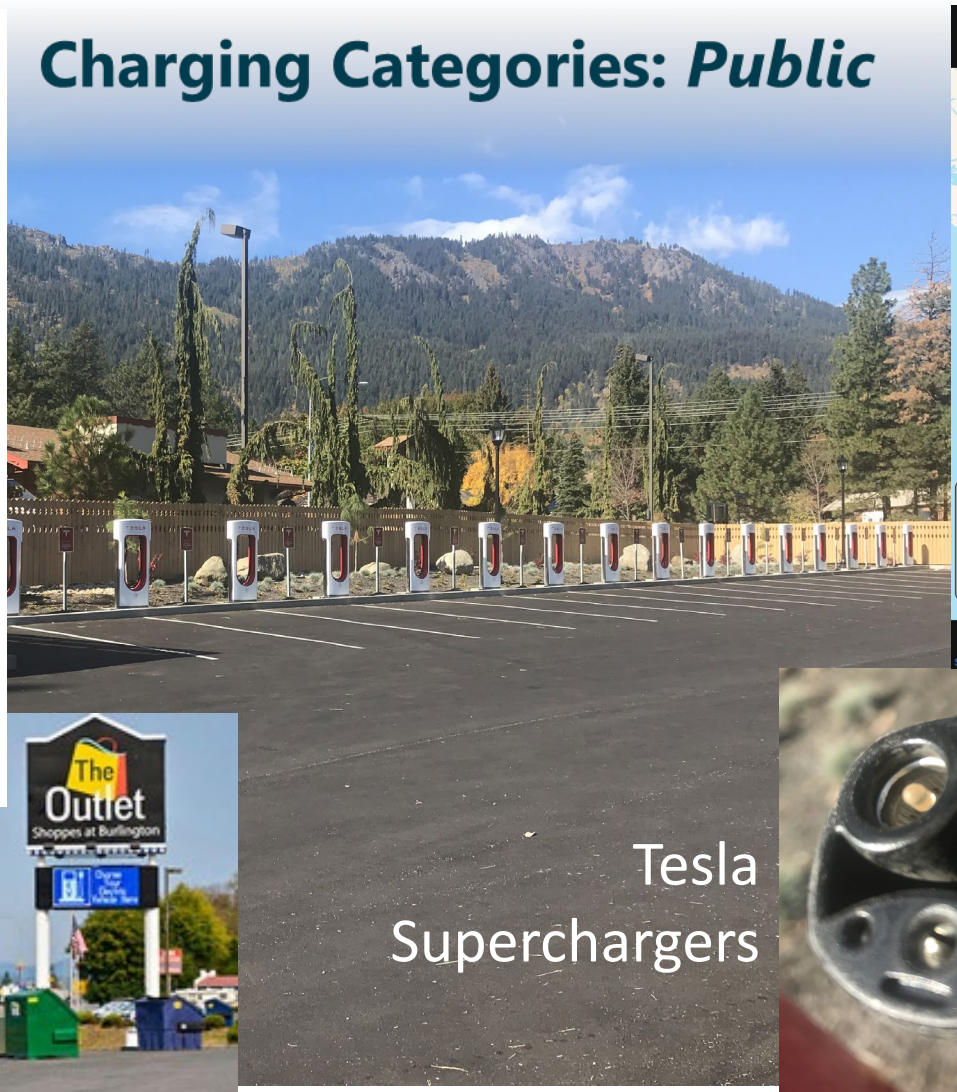
Destination

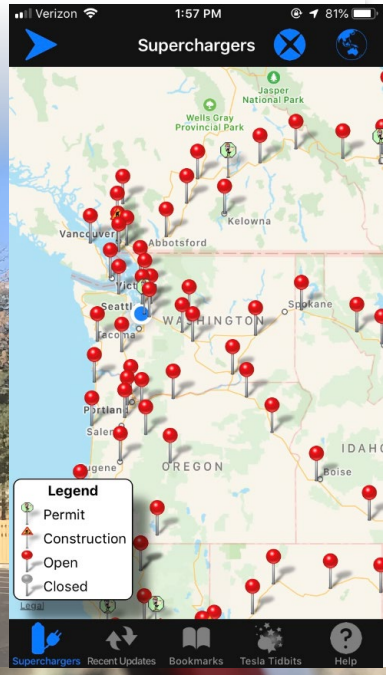
Right-of-way

EV charging infrastructure

West Coast Electric Highway







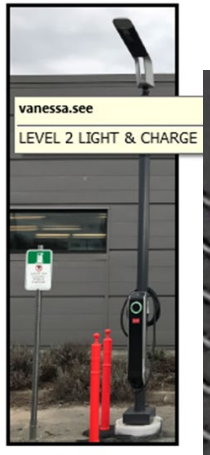
Tesla Superchargers

EV charging infrastructure

Charging Categories: *Shared Mobility*

DC FAST CHARGER

PRISM PAYMENT KIOSK



LEVEL 2 LIGHT & CHARGE

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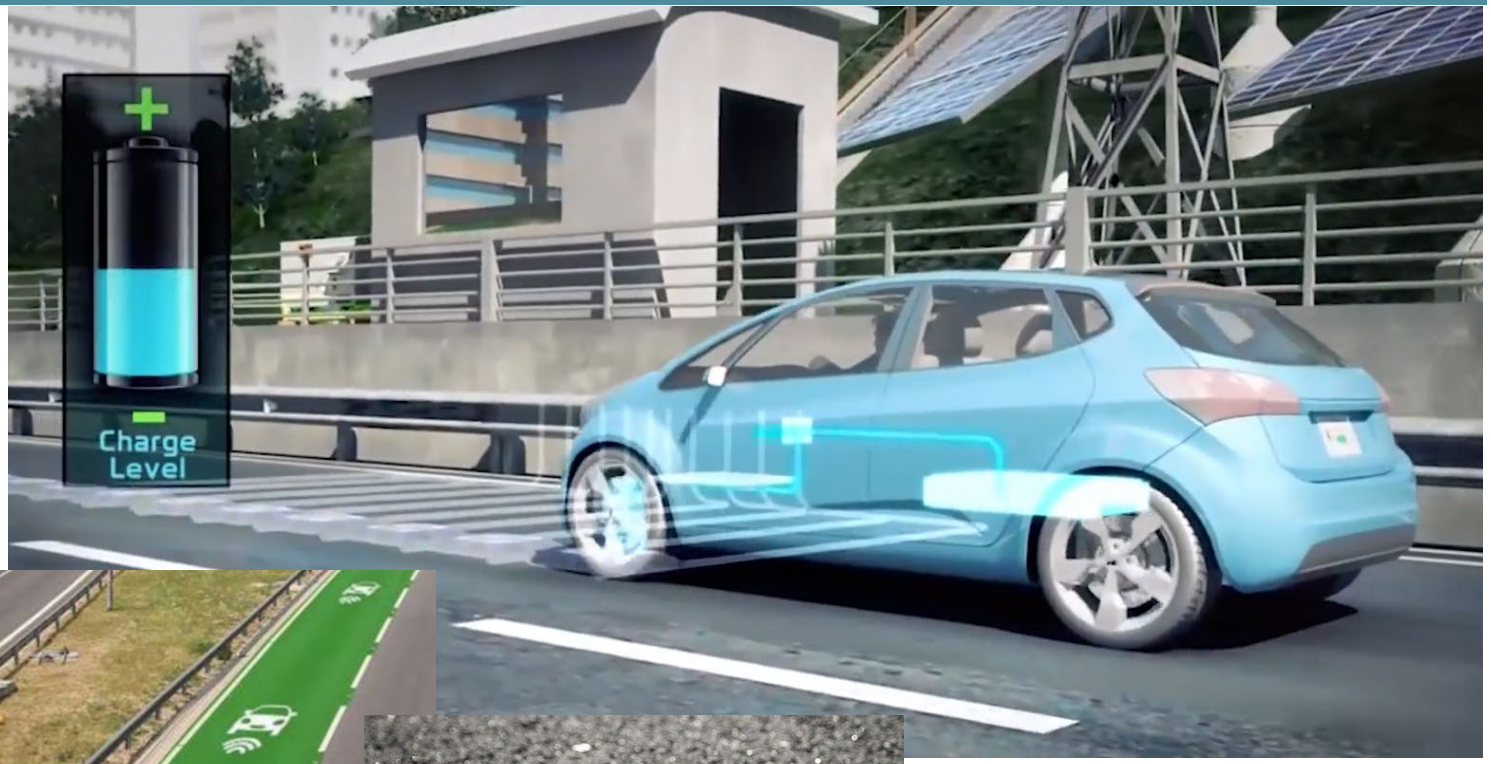
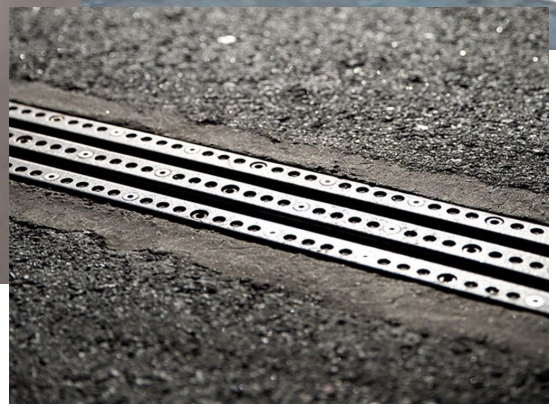
Dynamic Inductive Vehicle Charging





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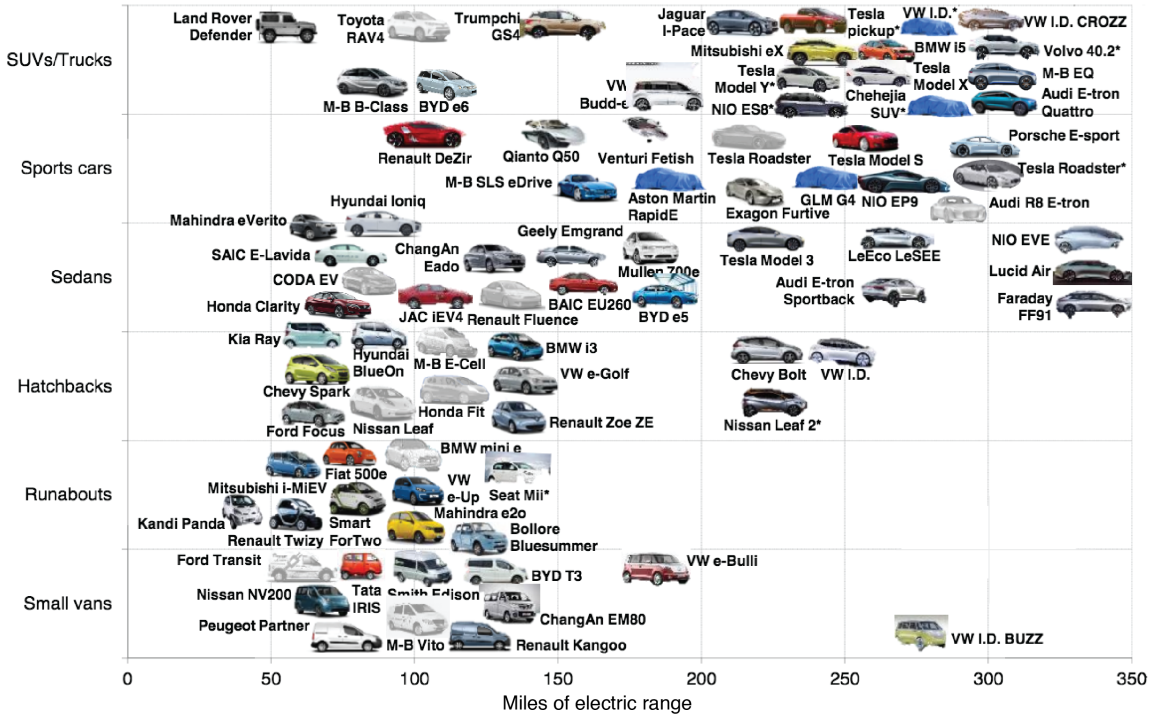
More Electric Vehicles with more range

EV Range and Buyer Choice

Models by style and range available through 2020



Source: https://i.redditmedia.com/5tehvhm0F-i_XCOag7ojZeWSCrd2KHFE6YTWC2NQsJg.png?s=2a353cffdd3c128a26f40c01c9e16641

Outline

1. Background
2. Electrification
3. Shared Mobility
4. **Conclusion**

Adoption timeframe

1900: Easter Parade on Fifth Avenue, New York – Can you spot the car?

1913: Easter Parade on Fifth Avenue, New York – Can you spot the horse-drawn carriage?

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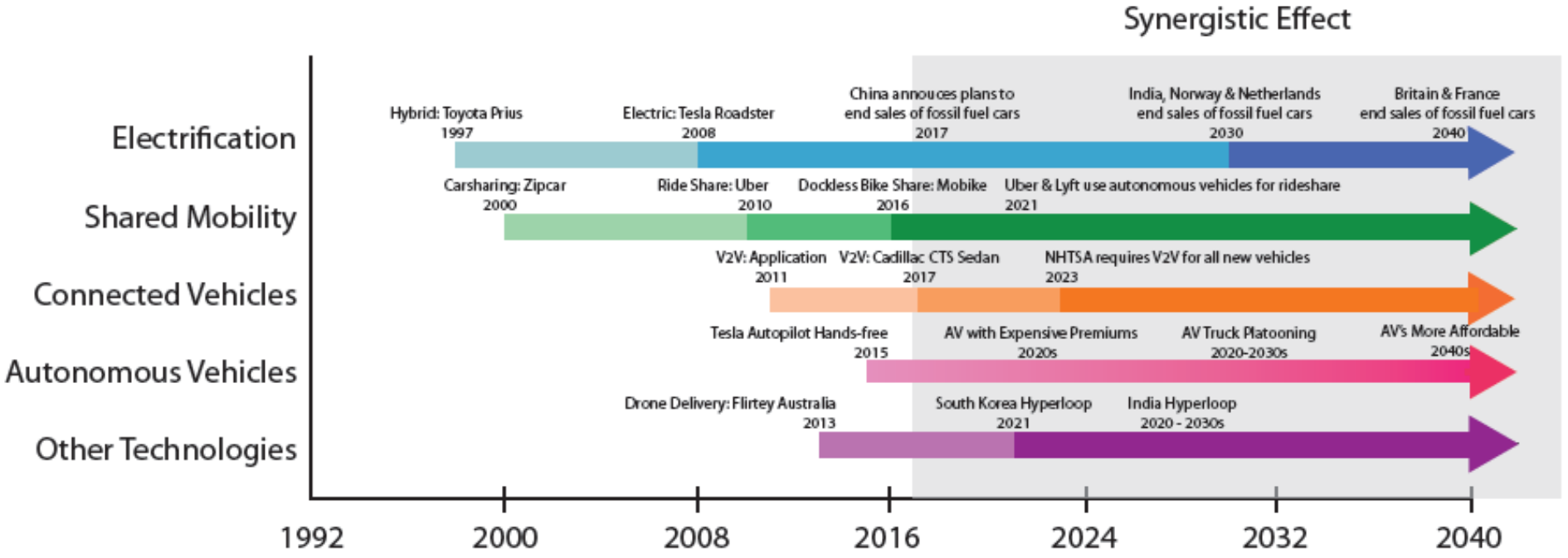
Adoption timeframe



Conclusions

1. **Propulsion**
2. **Vehicle Ownership**
3. **Intermodal & Multimodal**
4. **Revenue Disruption**
5. **Recommendations**

Conclusions

"General Motors believes the future is all-electric. We are far along in our plan to lead the way to that future world." - Mark Reuss, head of product, GM

1. Propulsion:

- Electricity will dominate traction power.
- Initiate by regulations, sustained by economics.
- New technology will eliminate range anxiety.
- Petroleum & automotive industries disrupted.
- Significant environmental benefits.

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Conclusions

2. Vehicle ownership:

- Personal vehicle ownership will decline, replaced by autonomous mobility as a service (MaaS).
- Individual car ownership will be limited to older generations, rural and exurban residents and to automobile hobbyists.

Conclusions

3. Multimodal & Intermodal:

- Multiple travel modes per trip in urban areas.
- More walking, bicycling, motor-assisted “microcycles”
- More ride-hailing & car sharing
- New modes like E-VTOL & Hyperloop
- Fewer drive-alone trips, but VMT might grow(?)
- Intercity MaaS to compete with air, rail and bus
- Rural areas will change more slowly than cities/suburbs.

Conclusions

4. Public vs. private transportation:

- Private/public transportation to blend.
- Autonomous Maas will disrupt public transit as it has to the taxi industry.
- Local transit routes with infrequent service will decline.
- Transit to partner with commercial MaaS providers for transit-dependent populations & connections.
- Competition for curb space with ride hailing vehicles.

Conclusions

5. Revenue disruption:

- Road user fees to replace gas taxes.
- Cities need to replace revenue from reduced violations, parking and taxes.

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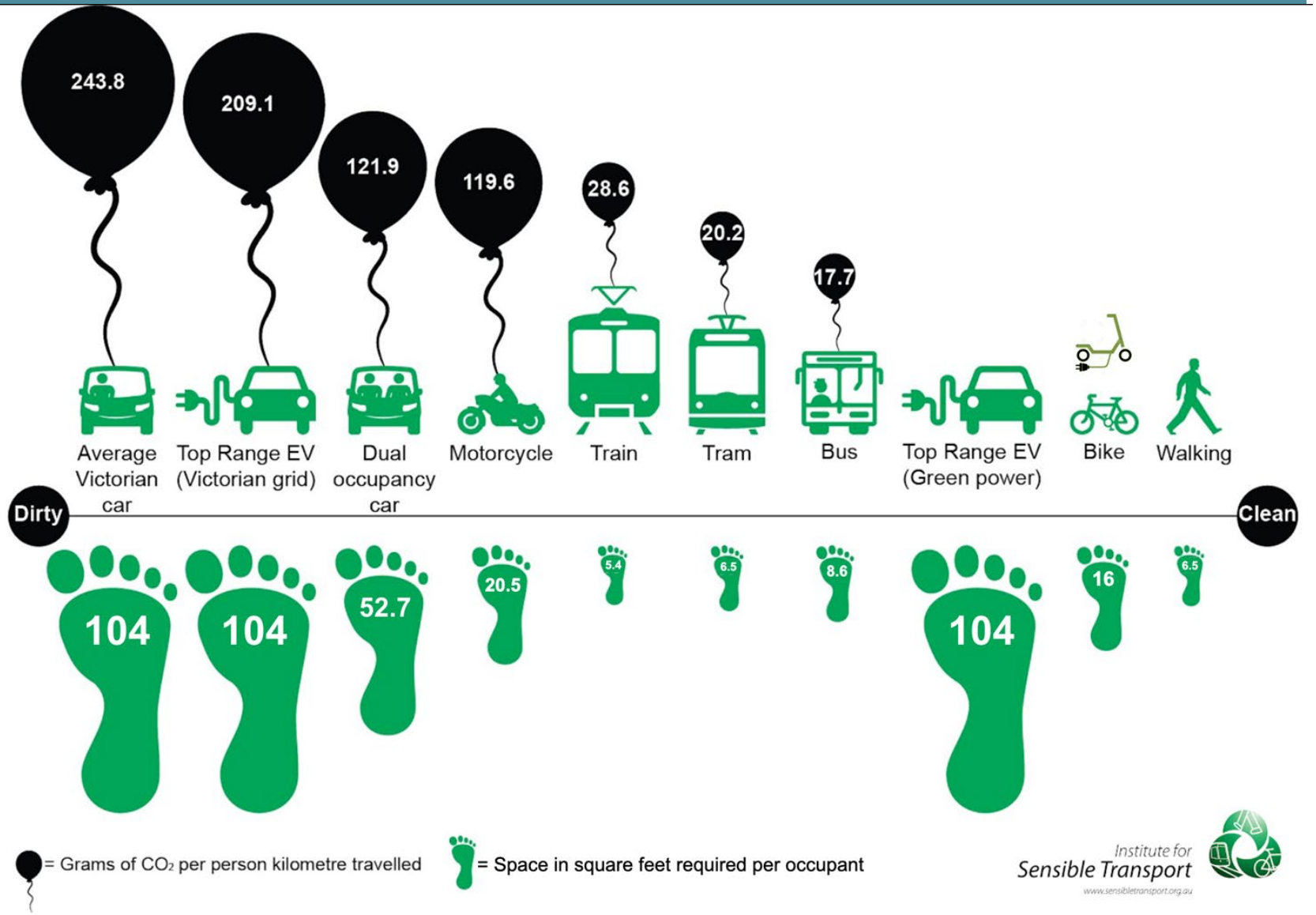
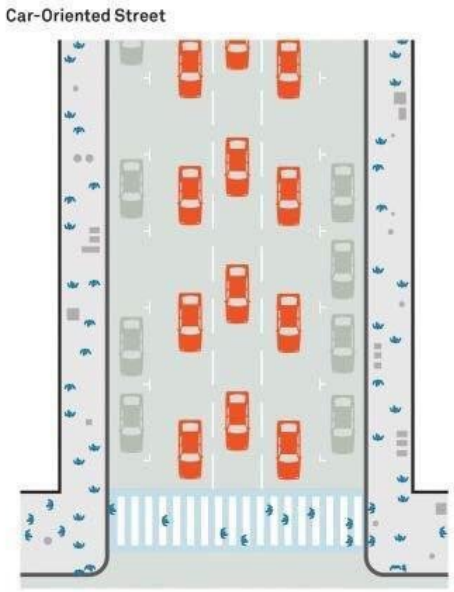
Physical and Carbon Footprint per Transport Mode



Recommendations

1. Design Multimodal Streets

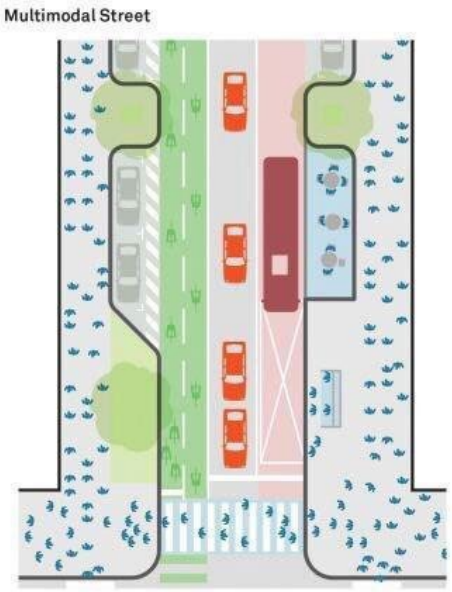
- Eliminate on-street parking
- Expand sidewalks
- Include EVSE infrastructure
- Prioritize curb space for shared mobility use
- Add bicycle & microcycle facilities



Hourly Capacity of a Car-Oriented Street

4,500/h	x2	9,000 people/h
1,100/h	x3	3,300 people/h
0	x2	0 people/h

Total capacity: 12,300 people/h



Hourly Capacity of a Multimodal Street

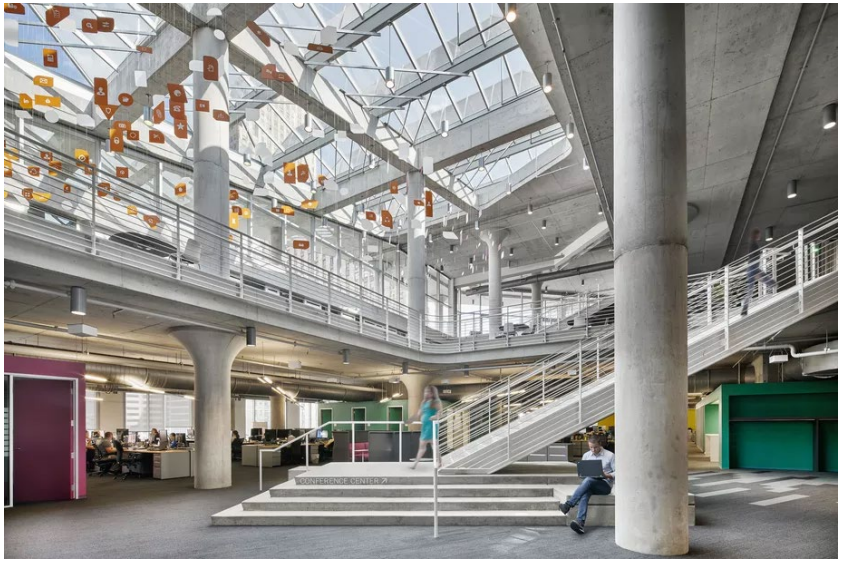
8,000/h	x2	16,000 people/h
7,000/h	x1	7,000 people/h
6,000/h	x1	6,000 people/h
1,100/h	x1	1,100 people/h
0	x1	0 people

Total capacity: 30,100 people/h[29]

Recommendations

2. Reconsider Parking

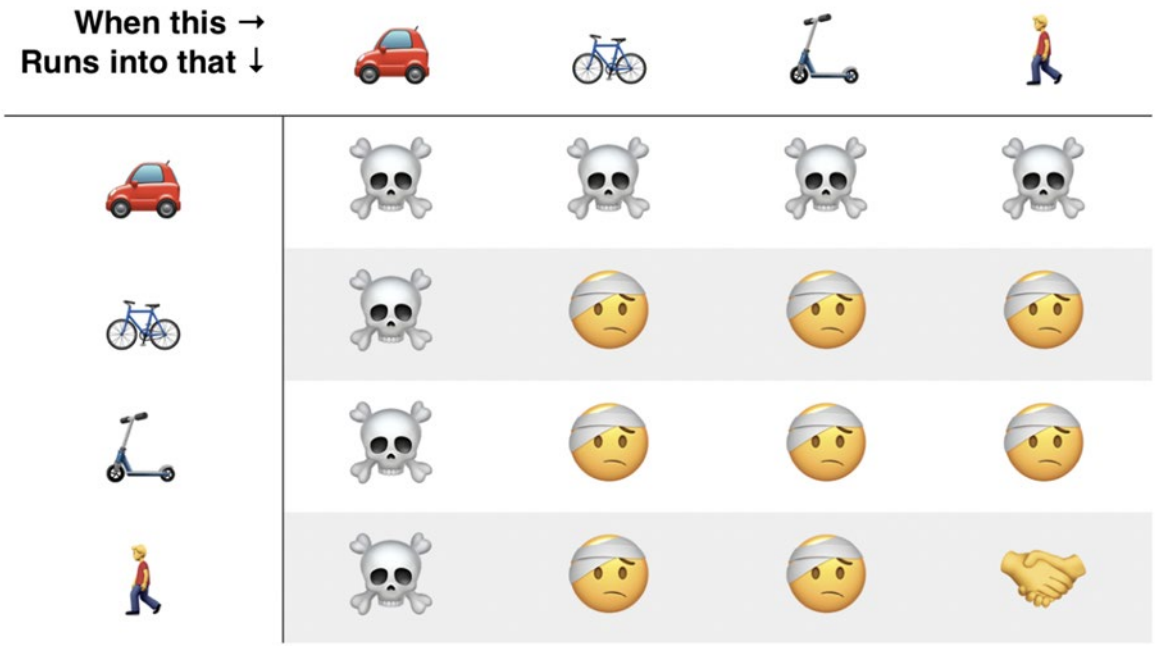
- Eliminate parking requirements for new development
- Pre-purpose future structured parking by planning the conversion of new parking structures for housing and employment
- Re-purpose existing parking facilities for new uses like EV charging, TNC layover and product distribution
- Include pick-up & drop-off facilities



Recommendations

3. Facilitate Micromobility

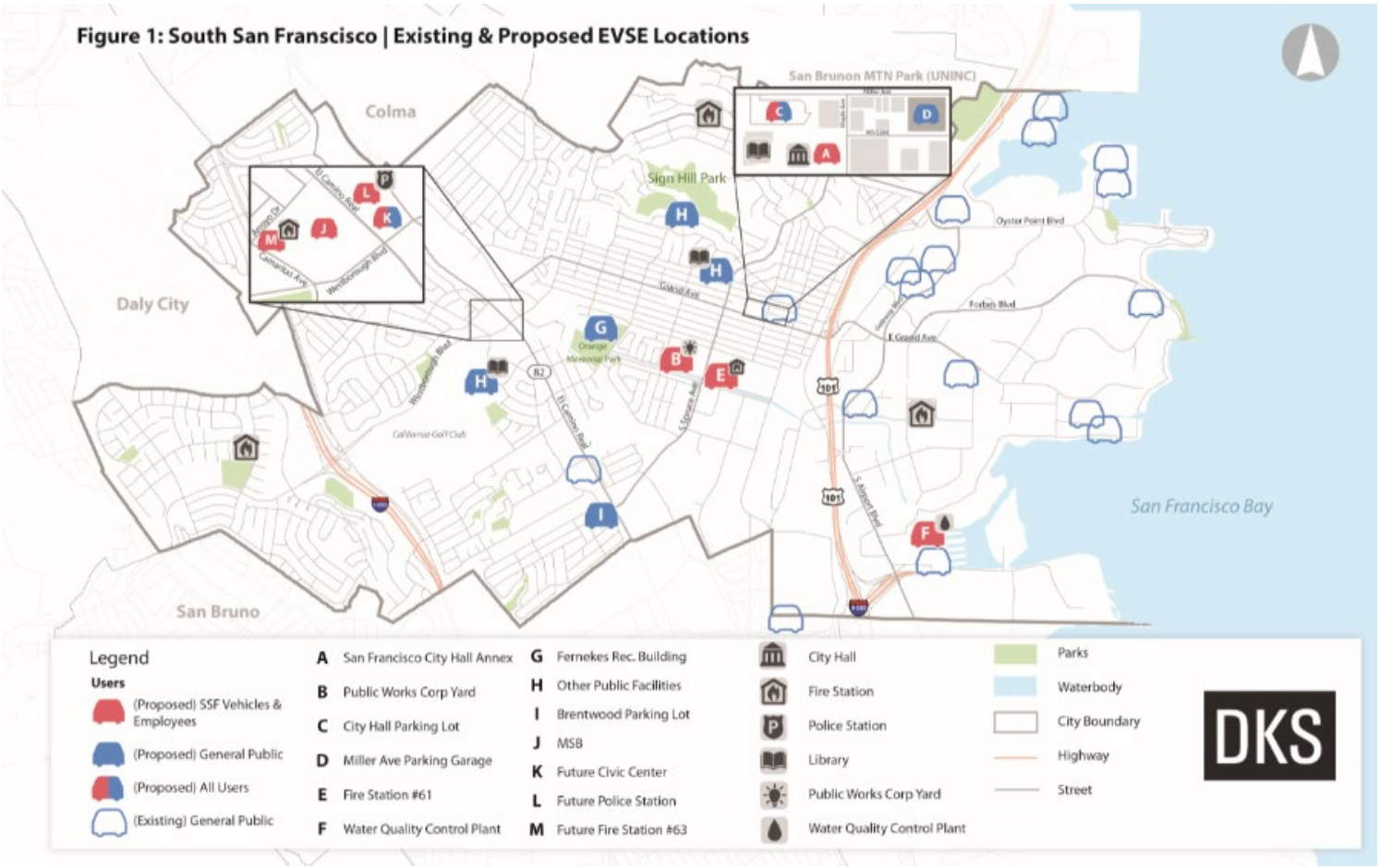
- Create safe space on our streets for bikes and scooters.
- Build connected and ubiquitous protected bike lanes
- Deploy more scooter and bike parking, and lots of it



Recommendations

4. Facilitate Electromobility

- Masterplan EVSE infrastructure
- Require EVSE for new construction



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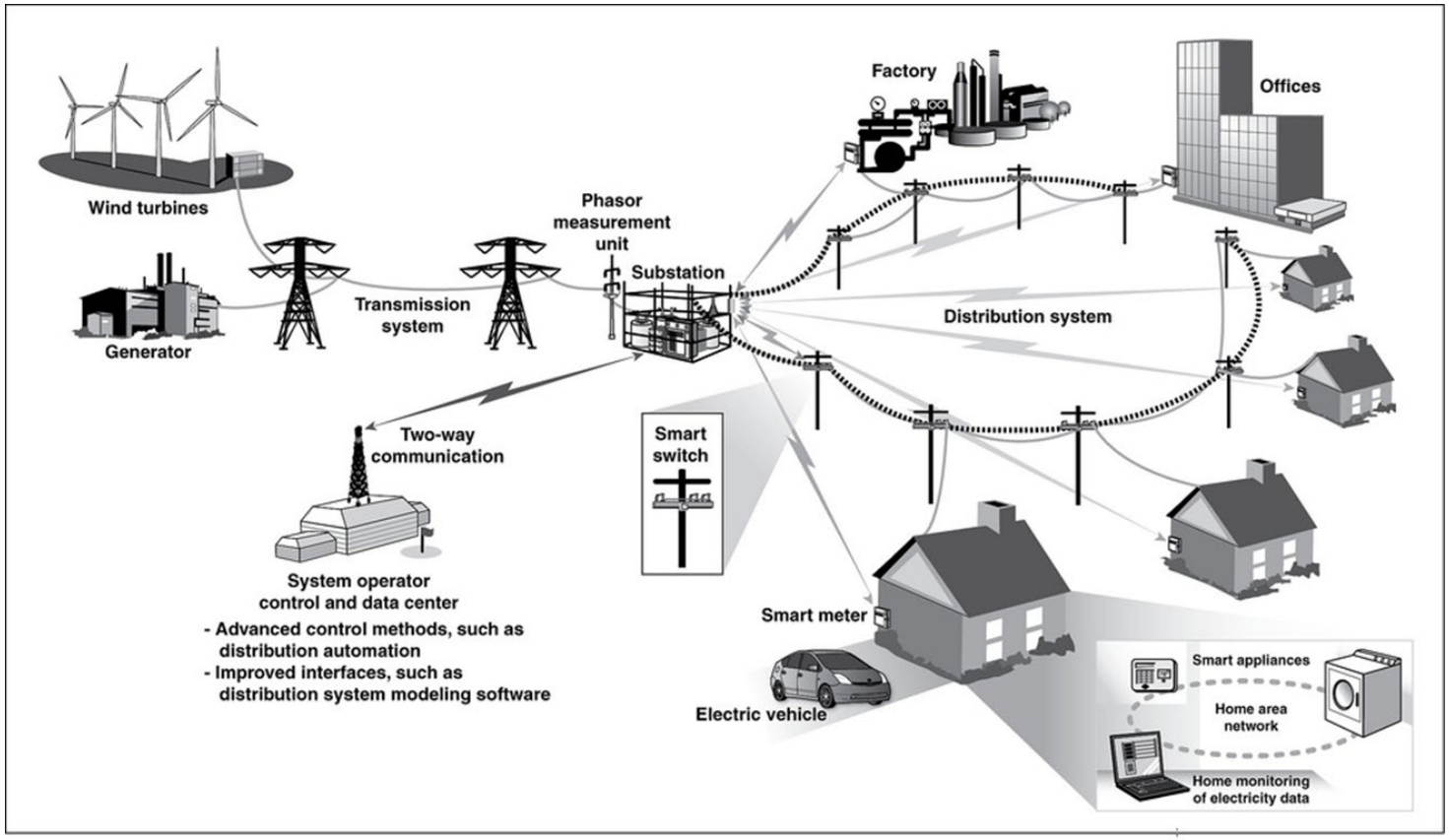
Recommendations

5. Develop Smart Grid

- Bi-Directional EV Charging
- Distributed Energy (Solar, Wind)
- Energy Storage



Source: GAO analysis.

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