



Asia-Pacific
Economic Cooperation

Advancing
Free Trade for Asia-Pacific
Prosperity

Transportation issues in future society (Post 2020)

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- **Major themes in transportation technologies**
- **Intelligent transportation technology**
- **Eco-friendly transportation technology**
- **Sustainable transportation technology**

Major themes in transportation technologies



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Future Transportation

Intelligent
Transportation
Technology

Eco-friendly
Transportation
Technology

Sustainable
Transportation
Technology

Intelligent transportation technology (1/4)



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- ◆ **“AUTONOMOUS” driving!!**
 - **Sensors** adopted such as vision camera, LiDar, Radar, GPS, and etc.
 - **Local intelligence** of car itself addressed with
 - **Artificial Intelligence (AI)**.
 - **S/W leading companies** participating such as Google, Apple, Naver etc.



[Source] http://global-autonews.com/bbs/board.php?bo_table=bd_035&wr_id=349



Misleading people in that “fully autonomous” cars are now ready to get on!

Intelligent transportation technology (2/4)



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abc NEWS (Mar 31, 2018)

- On Mar 23, **a fatal collision** in California with Tesla's Model X.
- Tesla's **Autopilot** was engaged.



ABC15 Arizona

- On Mar 18, **a fatal accident** in Arizona with an **autonomous** SUV of UBER.

Intelligent transportation technology (3/4)



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Hyper
Safety

Something Everywhere

Some functions (Levels 1~3) is being commercialized.



Everything Somewhere

Complete autonomy (Level 4~5) will be in somewhere locally controlled.

LEVEL 0



비 자동운전
(No Automation)

LEVEL 1



운전자 지원가능
(Driver Assistance)

LEVEL 2



부분 자동운전
(Partial Automation)

LEVEL 3



조건부 자동운전
(Conditional Automation)

LEVEL 4



자율운전-운전자탑승
(High Automation)

LEVEL 5



완전 자율운전
(Full Automation)

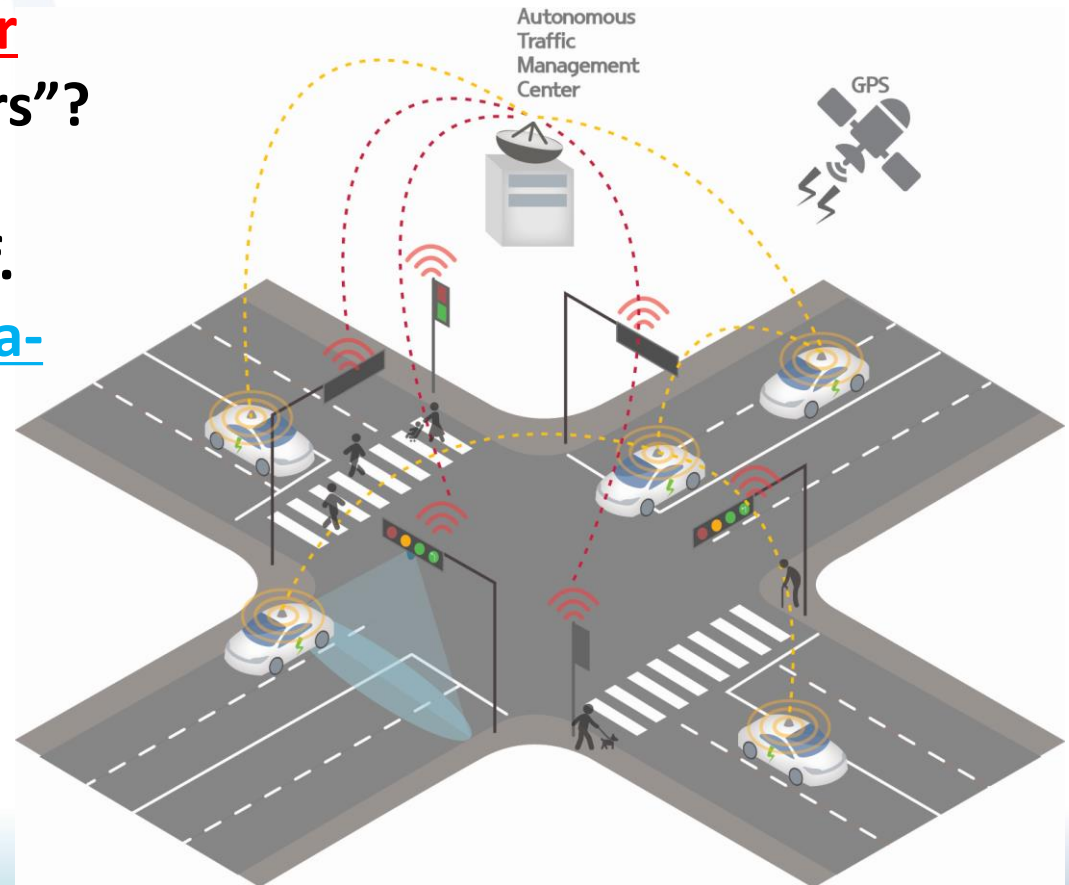
Intelligent transportation technology (4/4)



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◆ How to guarantee “hyper safety of autonomous cars”?

- Enhancing local intelligence of car itself.
- Assisted by “Smart Infrastructure”
- Fully monitored and controlled by Autonomous Traffic Management Center.

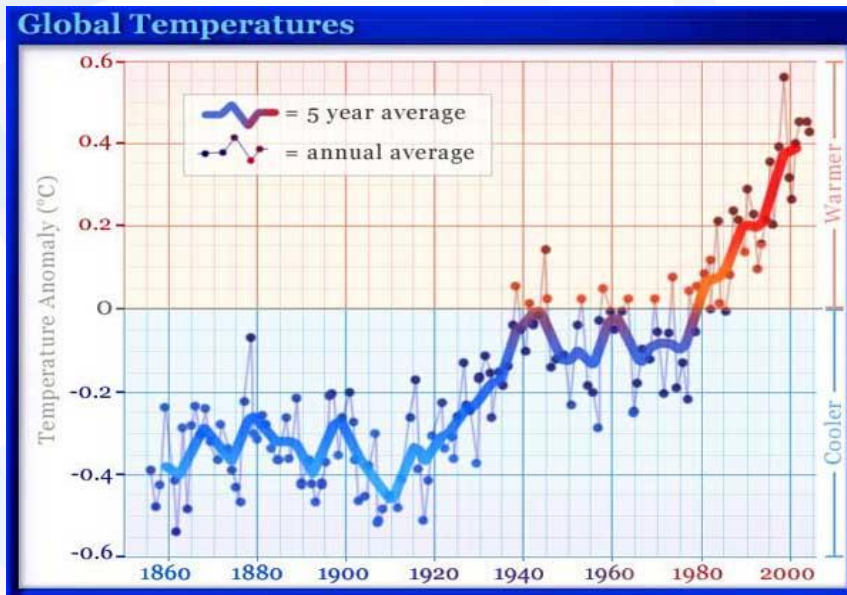


Eco-friendly transportation technology (1/8)

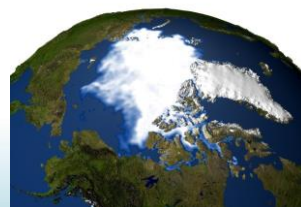
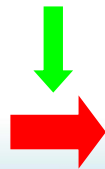


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◆ Environmental concerns



http://199.6.131.12/en/scictr/watch/climate_change/change.htm



Eco-friendly transportation technology (2/8)



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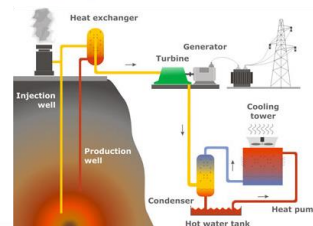
Source: https://www.rfa.org/korean/weekly_program/environment/fe-mj-01042018103039.html

Eco-friendly transportation technology (3/8)



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◆ Ideal scenario?



Renewable energy sources



LEV

i-MiEV



Fit



Leaf



Tesla



OLEV

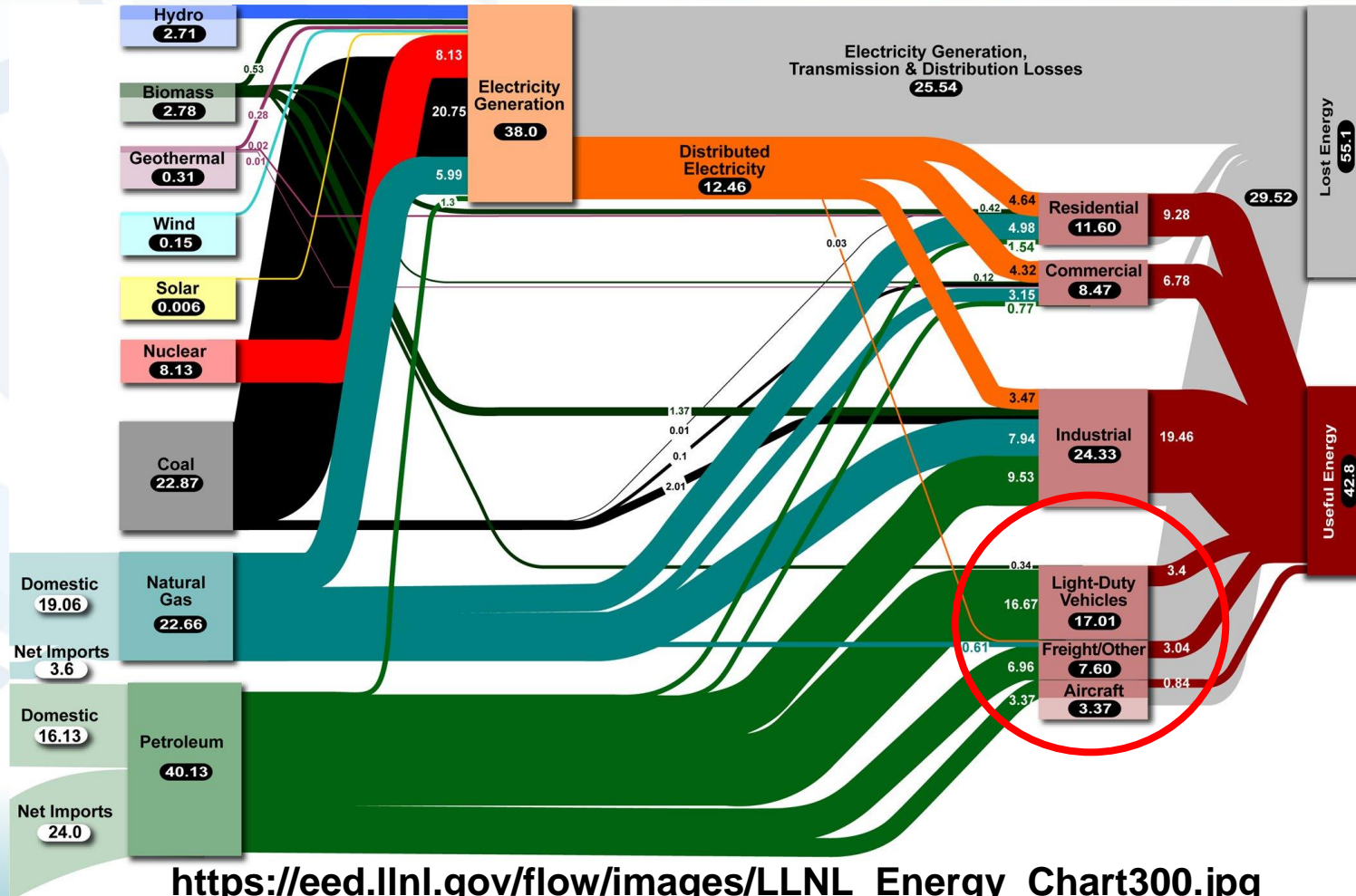
Electric Vehicles

Eco-friendly transportation technology (4/8)



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◆ US Energy flow



https://eed.llnl.gov/flow/images/LLNL_Energy_Chart300.jpg

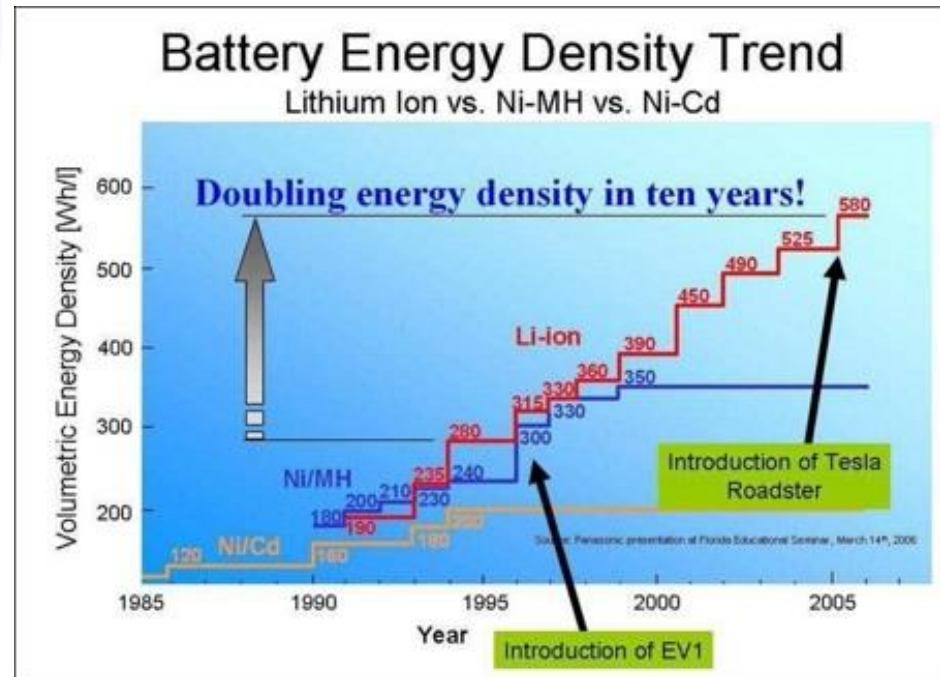
Eco-friendly transportation technology (5/8)



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◆ Battery concerns

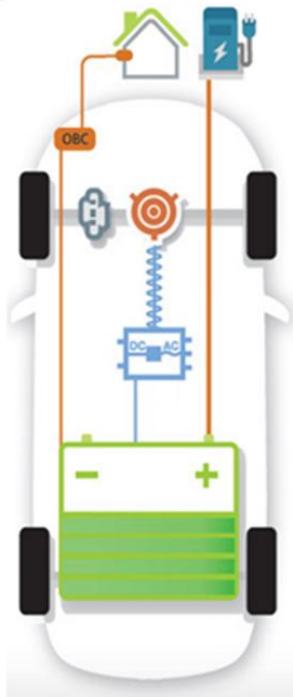
- Limitation in increasing energy density
- Increasingly expensive
- Safety in automotive application



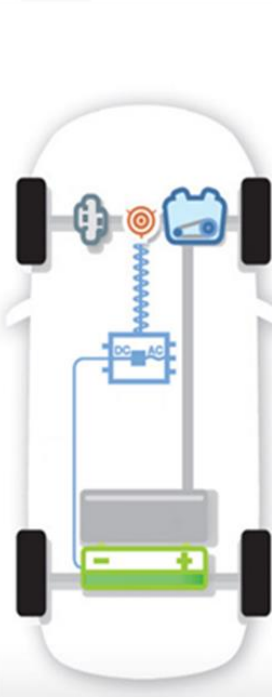
Eco-friendly transportation technology (6/8)



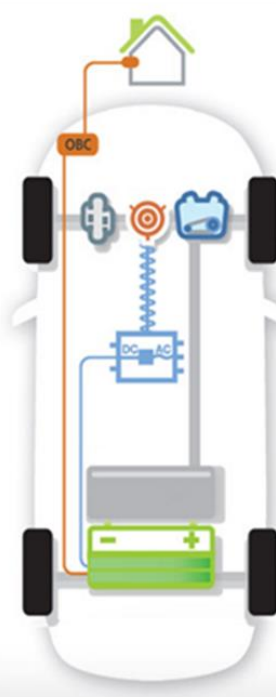
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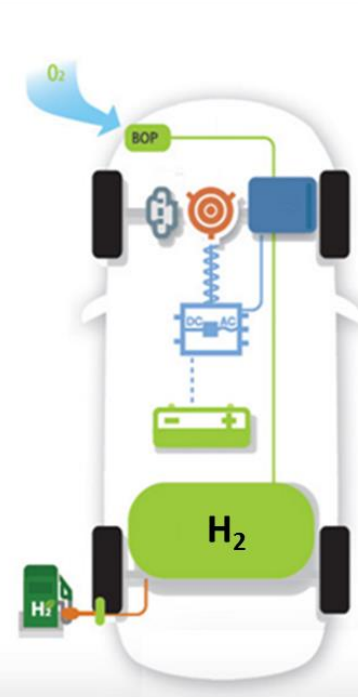
Battery EV



Hybrid EV



Plug-in HEV



Fuel Cell EV

Eco-friendly transportation technology (7/8)

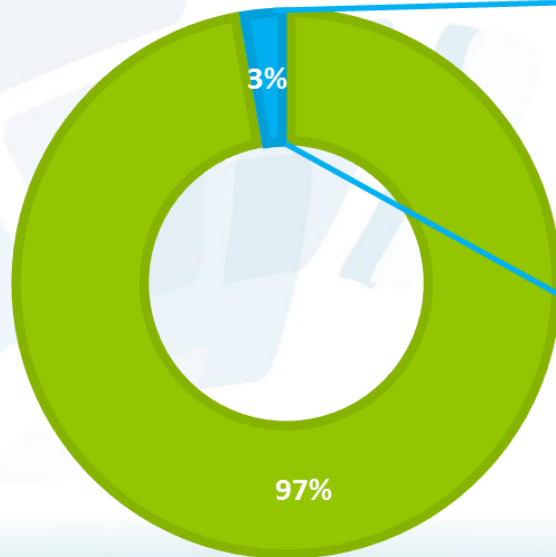


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◆ 2016 US Electric Vehicles Market Analysis

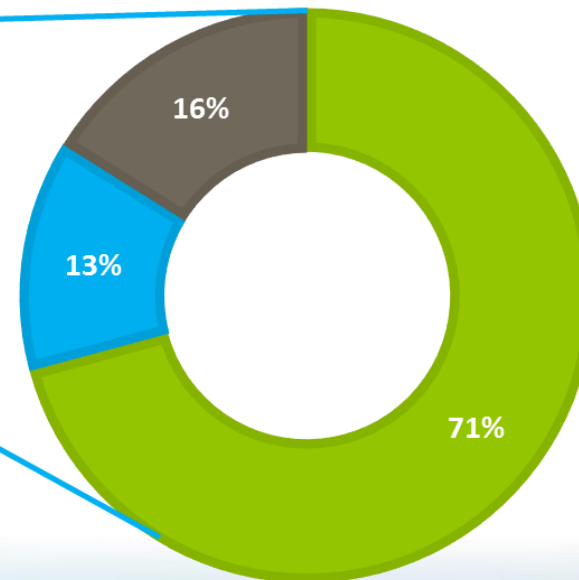
US AUTOMOBILE MARKET SHARE

■ Conventional ■ Electrified Vehicle



US ELECTRIFIED VEHICLE MARKET SHARE

■ HEV ■ PHEV ■ BEV



Eco-friendly transportation technology (8/8)

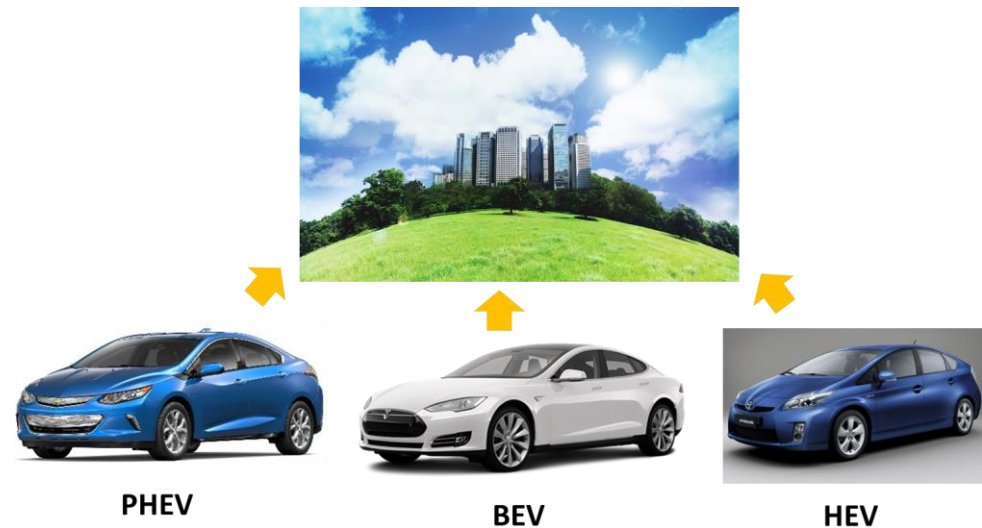


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One single solution may not achieve the “green planet”.

Various types and levels of electrification contribute to the environmental issues.

- Enhancing the **efficiency of combustion engines**
- Increasing importance of **Hybridization of engines and electric motors**
- Developing **renewable energy sources** nevertheless of cost



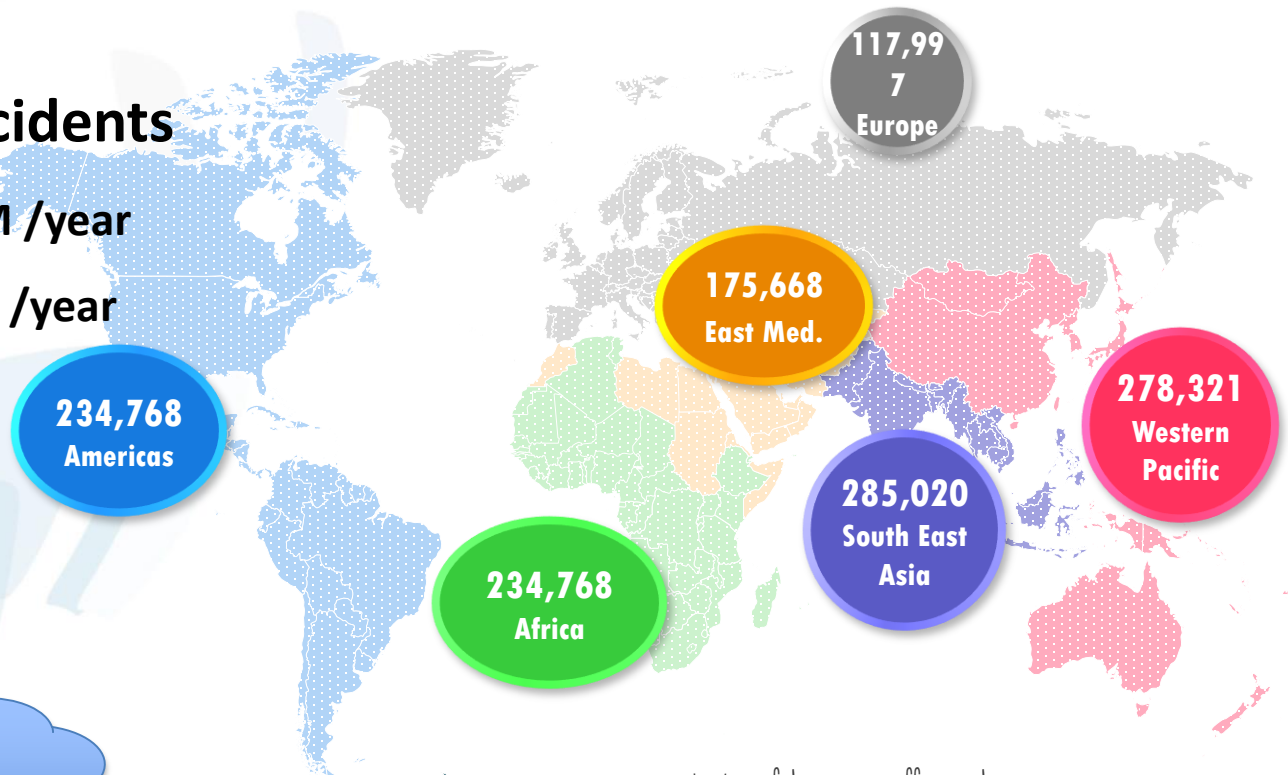
Sustainable transportation technology (1/4)



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◆ Road traffic accidents

- # of deaths: 1.25M /year
- # of wounds: 50M /year



Number of deaths in traffic accidents

Autonomous
driving!!
(fully automated)

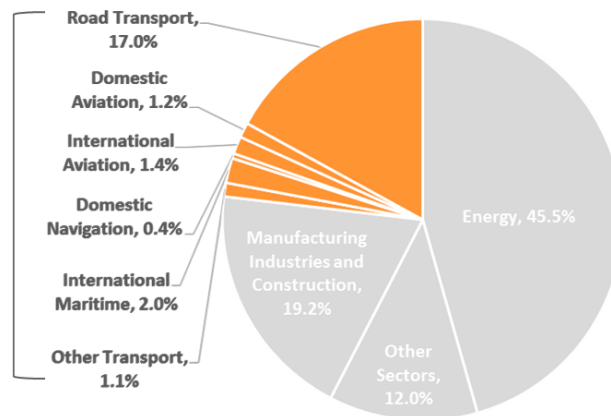
Sustainable transportation technology (2/4)



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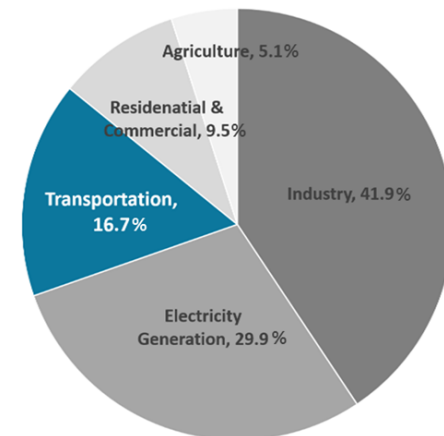
◆ CO₂ production in transport sector

**Transport:
23.3%**



Transportation's Contribution to **World GHGs**

**Transport:
16.7%**



Transportation's Contribution to **Korea GHGs**

Source : International Energy Agency, 2012

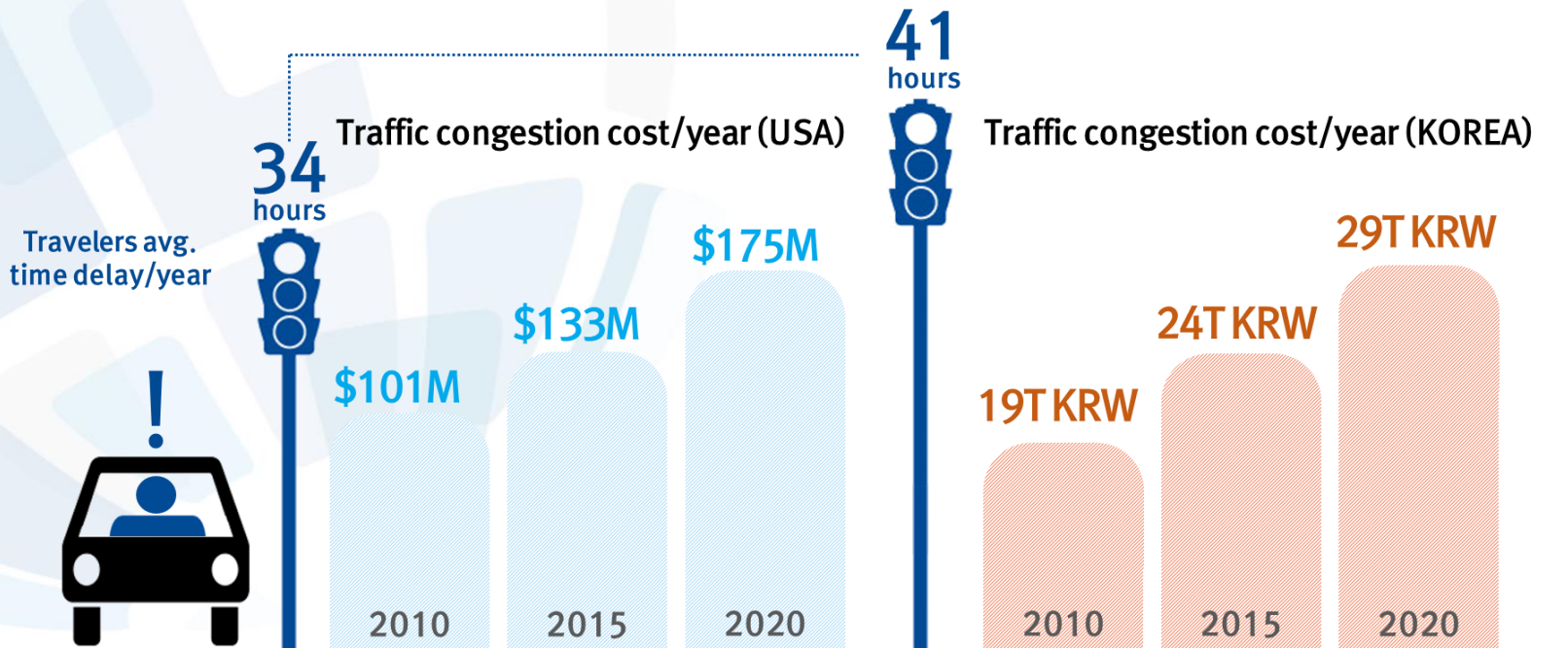
**Electrification
of vehicles**

Sustainable transportation technology (3/4)



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◆ Traffic congestion



Source : 2011 Urban Mobility Report, Texas Transportation Institute

Source : 한국교통연구원, 전국 교통혼잡비용 추정과 추이 분석

Sustainable transportation technology (3/4)



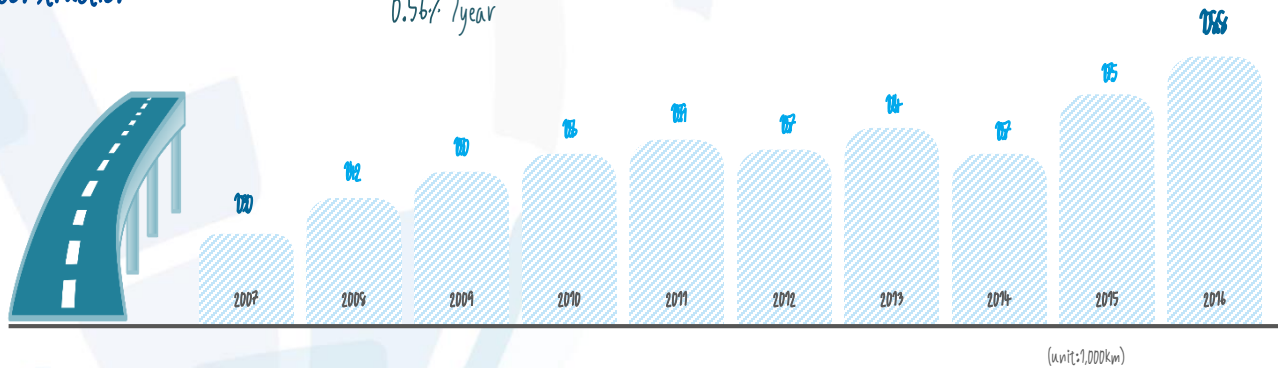
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◆ Why traffic congestion?

Road construction

Last 10 years avg.

0.56%/year

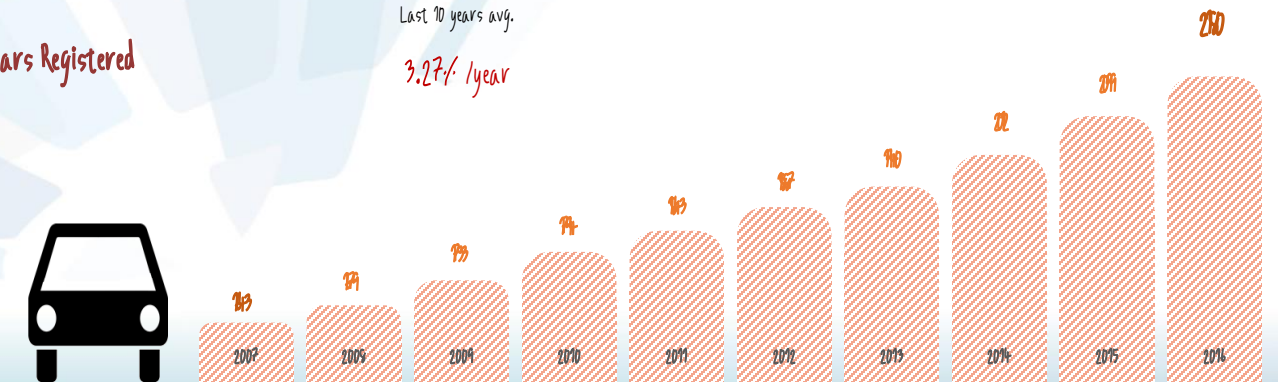


(unit: 1,000km)

No. of Cars Registered

Last 10 years avg.

3.27%/year



(unit: 10,000 cars)



Shared Mobility

Sustainable transportation technology (4/4)



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◆ Future Transport System?



The traffic system we have relied on:

- ~~Driven by Human~~ **Autonomous**
- ~~Excelled by Combustion Engine~~ **Electrified**
- ~~Owned by Person]~~ **Shared**

Remarks & Acknowledgement



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◆ **Future transportation system technologies**

- Transportation issues are highly coupled with many disciplines and policies on energy. Transportation technology needs mechanical eng., electrical eng., computer science and civil eng. as well.
- APEC may plan to promote & support systematically the regional collaborations between transportation research groups from different countries.

◆ **Special Thanks: to whom helped a lot to prepare this material**

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