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

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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	LEVEL 1	LEVEL 2	LEVEL 3	LEVEL 4	LEVEL 5
비 자동운전 (No Automation)	운전자 지원가능 (Driver Assistance)	부문 자동운전 (Partial Automation)	조건부 자동운전 (Conditional Automation)	자율운전-운전자탑승 (High Automation)	완전 자율운전 (Full Automation)

Intelligent transportation technology (4/4)

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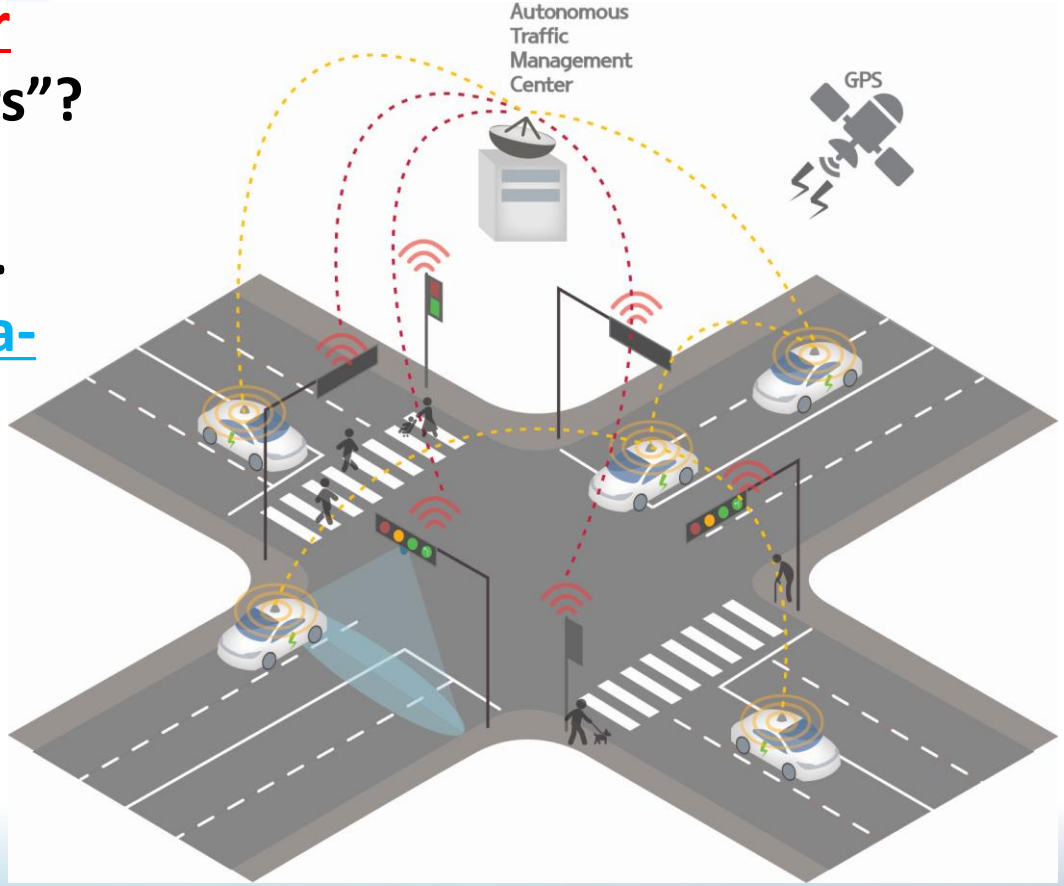
- **How to guarantee "hyper safety of autonomous cars"?**
  - **Enhancing local intelligence of car itself.**
  - **Assisted by "Smart Infra-structure"**
  - **Fully monitored and controlled by Autonomous Traffic Management Center.**



Eco-friendly transportation technology (1/8)

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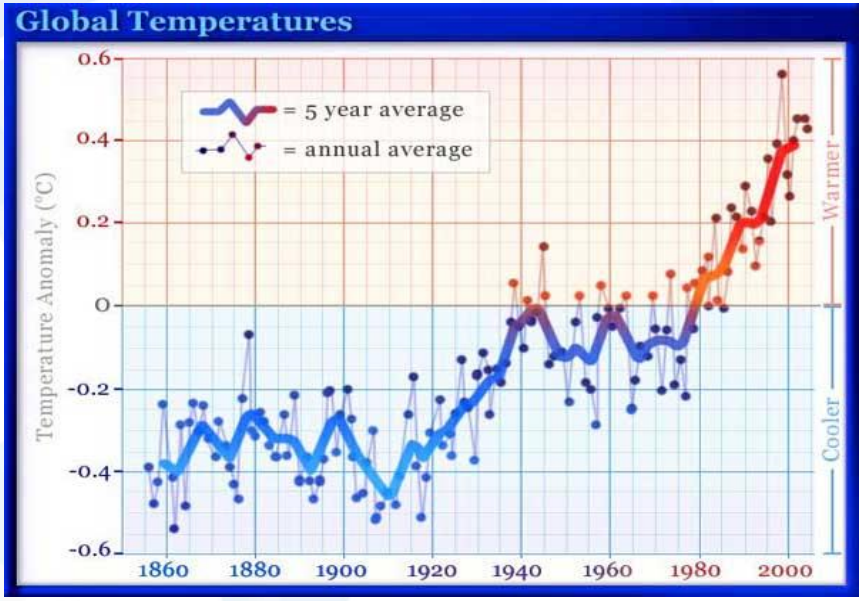
- **Environmental concerns**



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

?

Eco-friendly transportation technology (2/8)

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 **Electric Vehicles**

Eco-friendly transportation technology (4/8)

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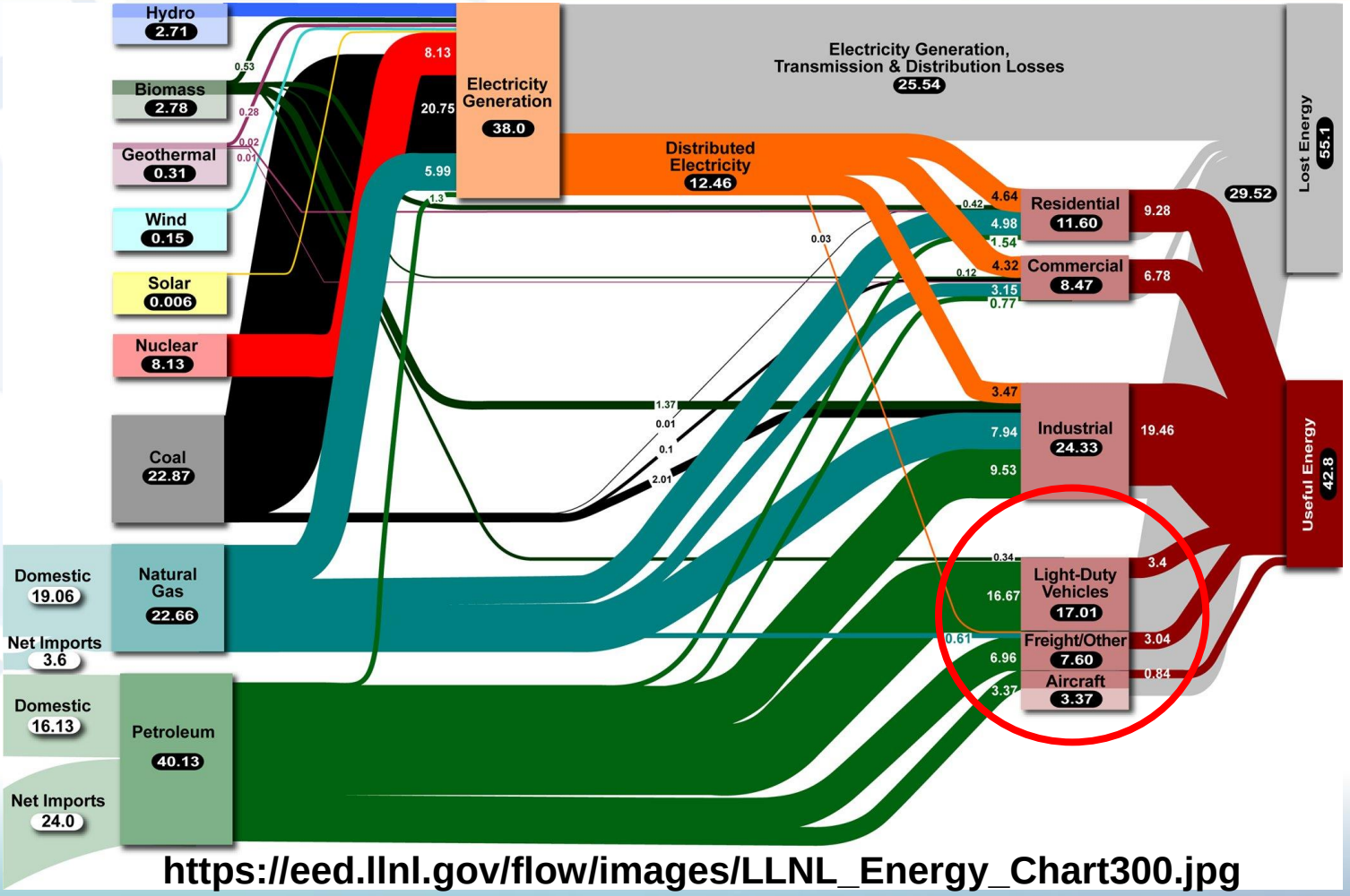
US Energy flow



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

Eco-friendly transportation technology (5/8)

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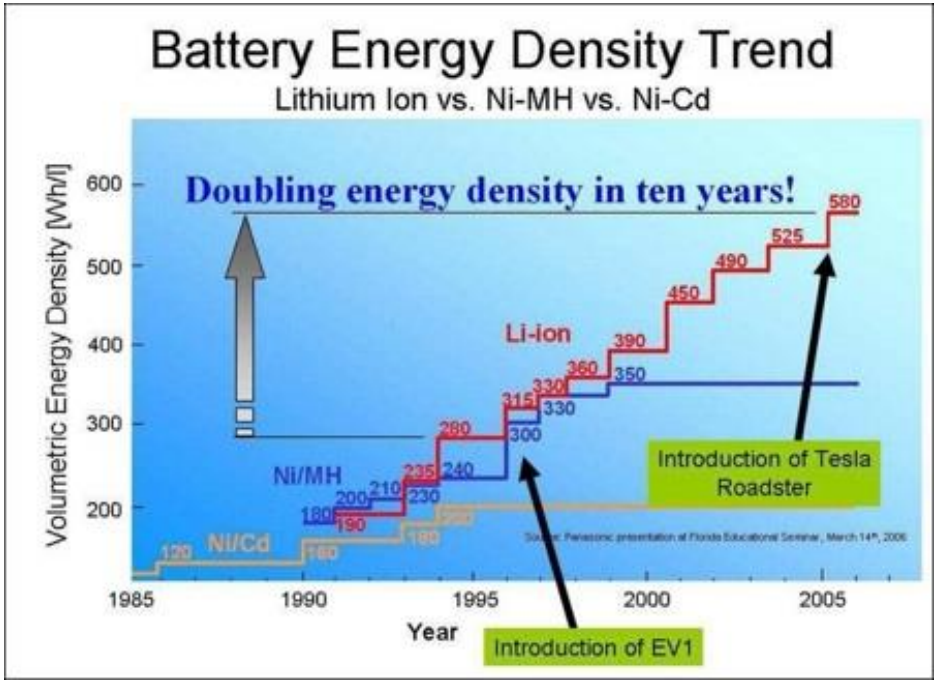
- **Battery concerns**
  - **Limitation in increasing energy density**
  - **Increasingly expensive**
  - **Safety in automotive application**



Eco-friendly transportation technology (6/8)

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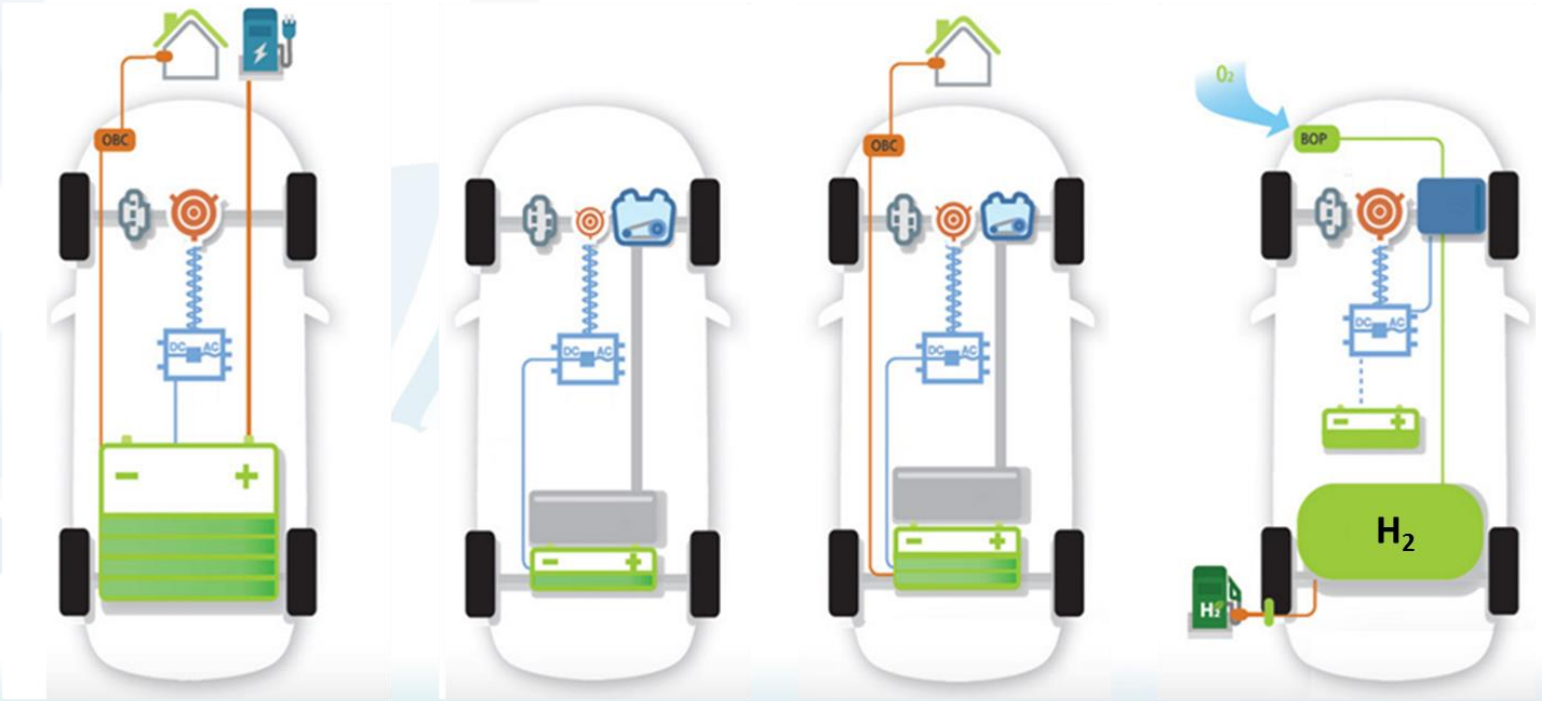

Battery EV | Hybrid EV | Plug-in HEV | Fuel Cell EV

Eco-friendly transportation technology (7/8)

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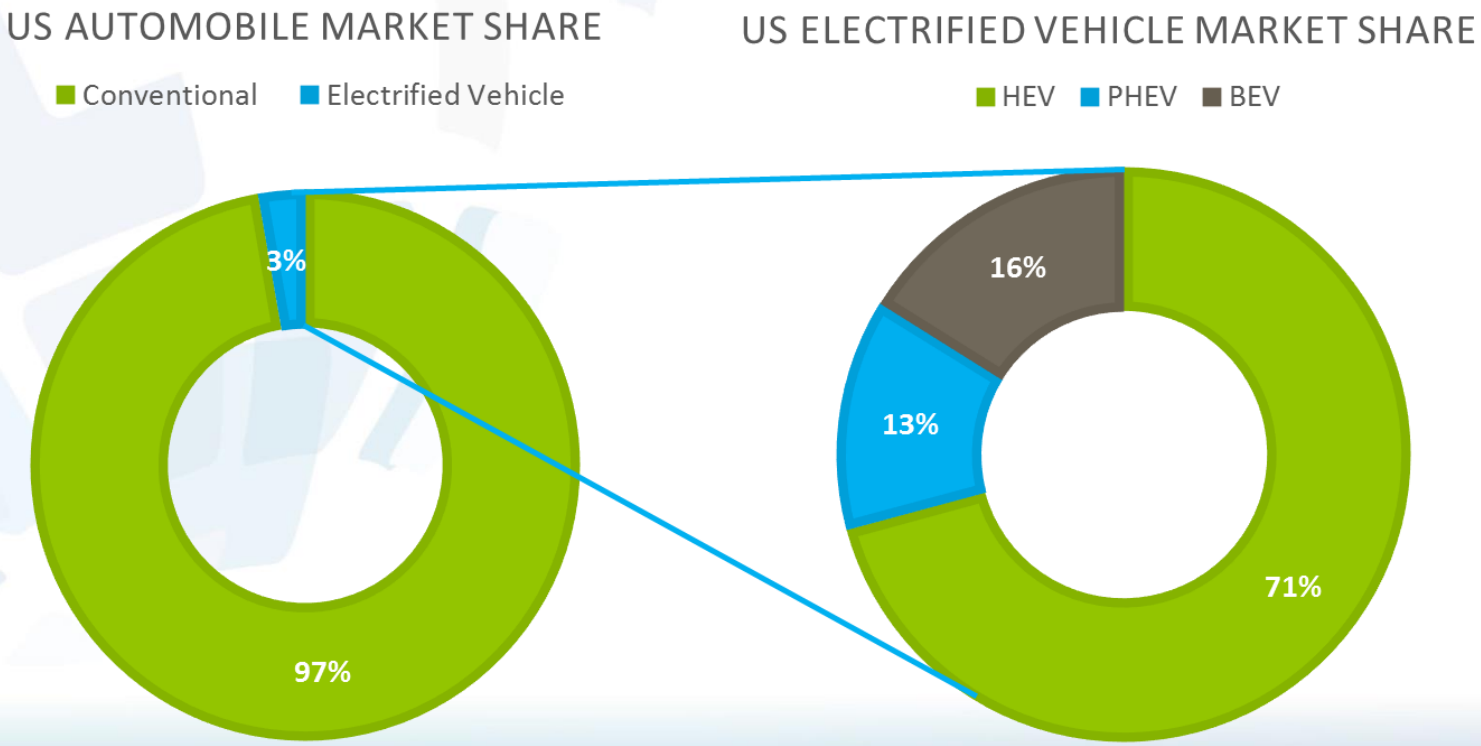
- **2016 US Electric Vehicles Market Analysis**



Eco-friendly transportation technology (8/8)

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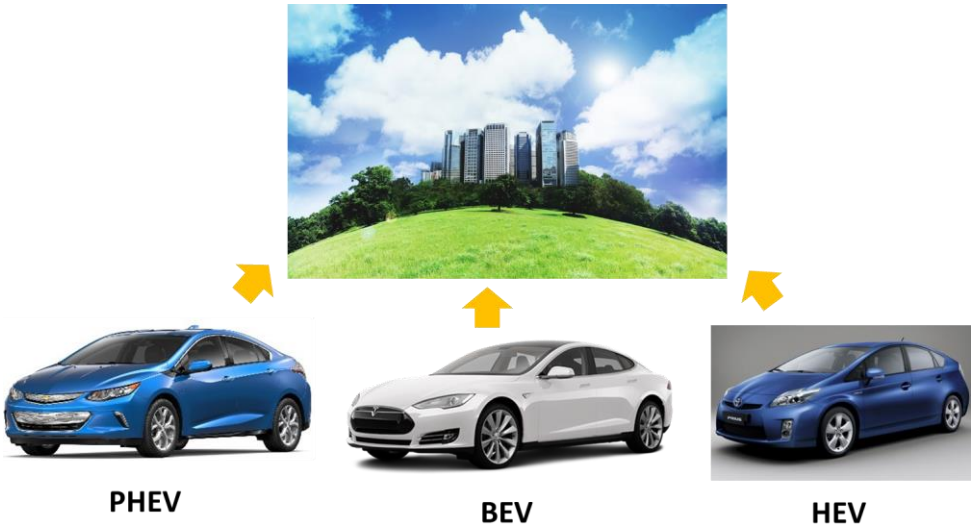
One single solution may not achieve the "green planet".

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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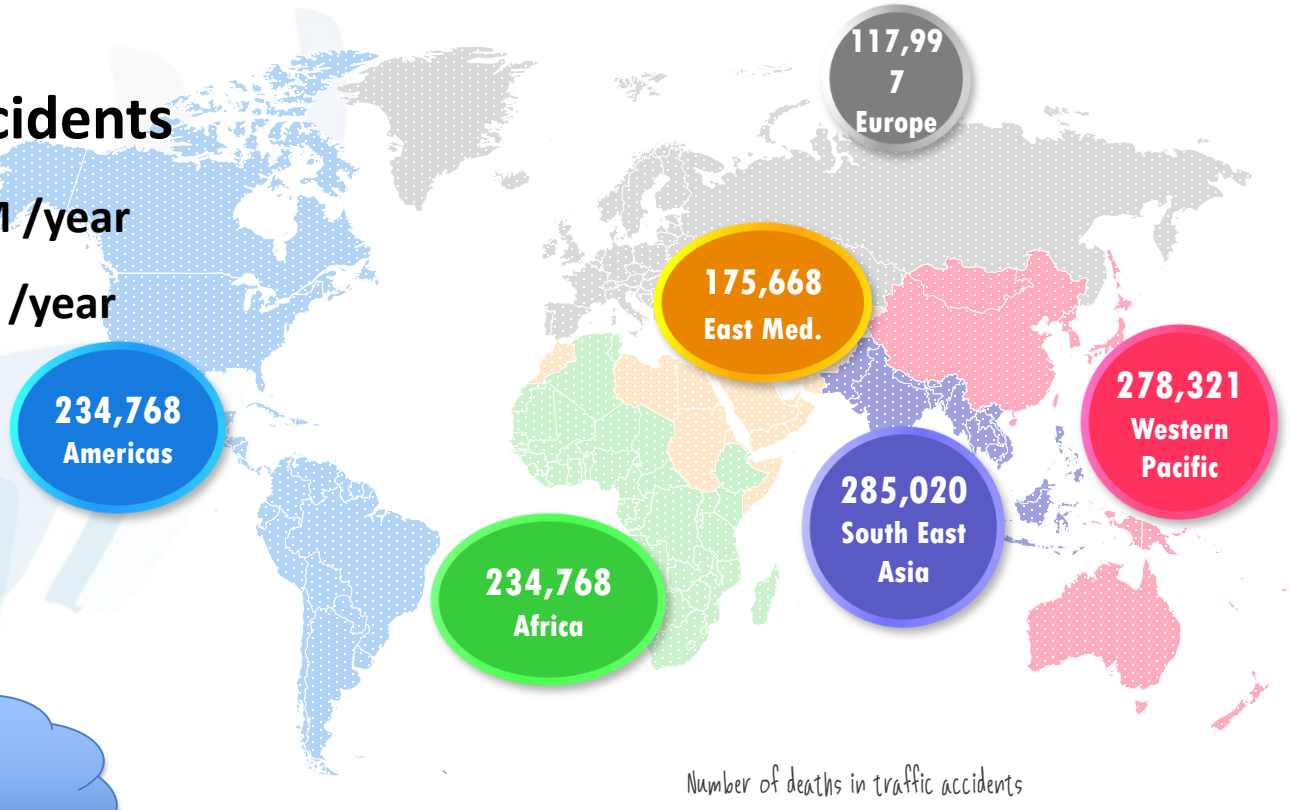
- **Road traffic accidents**
  - # of deaths: 1.25M /year
  - # of wounds: 50M /year



Number of deaths in traffic accidents

Autonomous driving!! (fully automated)

Source : Global status report on road safety, WHO, 2013

Sustainable transportation technology (2/4)

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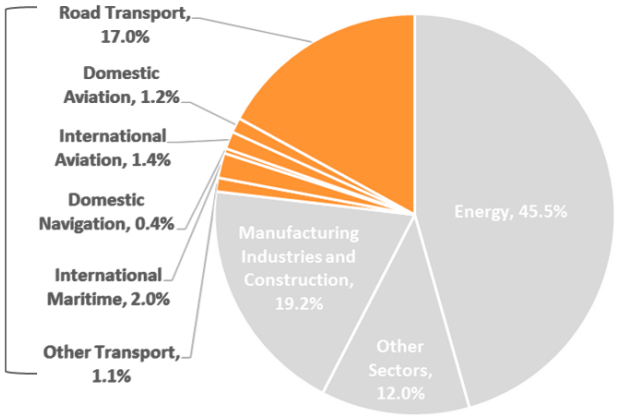
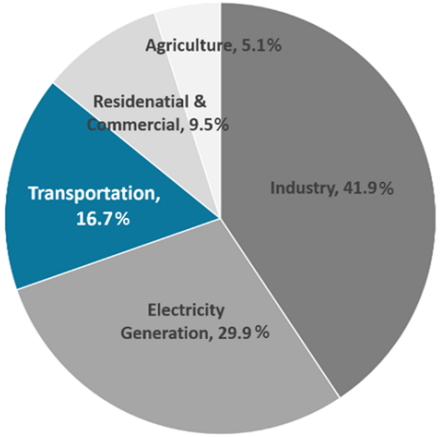
◆ CO_2 production in transport sector

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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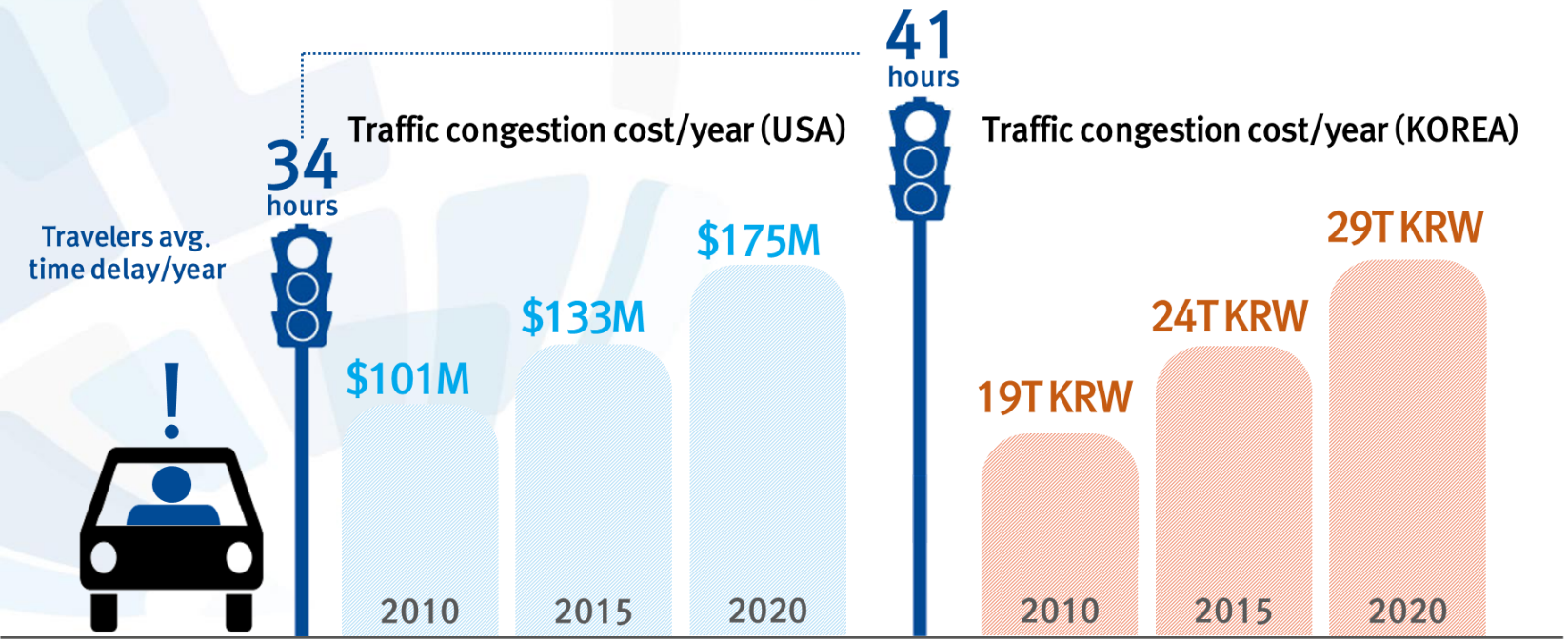
◆ Traffic congestion



Source : 2011 Urban Mobility Report, Texas Transportation Institute

Source : 한국교통연구원, 전국 교통혼잡비용 추정과 추이 분석

Sustainable transportation technology (3/4)

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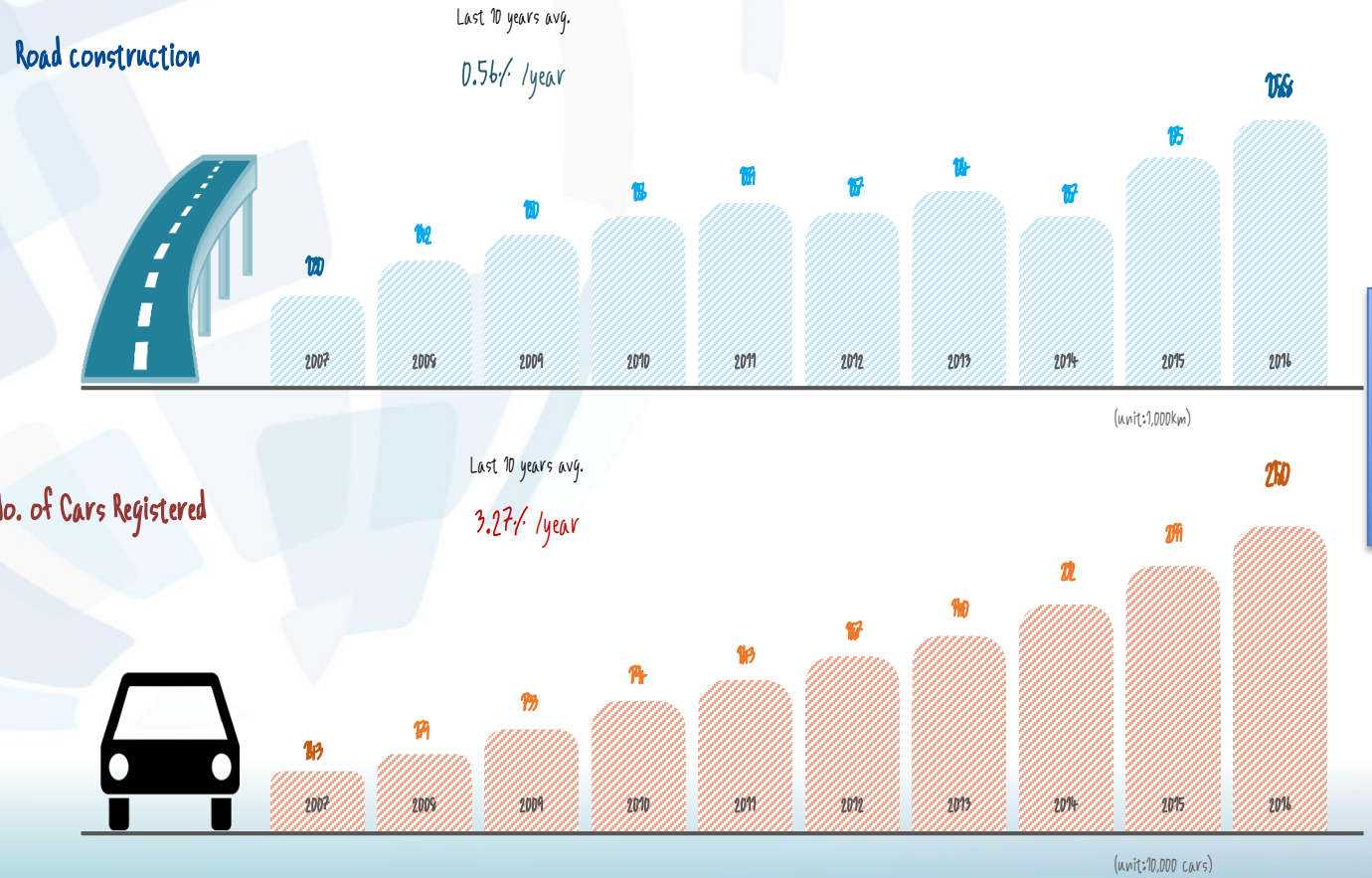
- **Why traffic congestion?**



Shared Mobility

Source: 2017 Road Construction Report, MOLIT, KOREA

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

- **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**
  - Prof. Kitae Jang for sustainable transportation
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  - Prof. In Gwun Jang for intelligent transportation

  of the CCS Graduate School of Green Transportation, KAIST.

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