Nissan’s Approach for CO2 Reduction

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May 27, 2010
Global Warming and Energy Issues

- CO₂ reduction and less dependence on fossil oil are urgent issues

Decline of sea ice

Desertification

Dependency ‘Middle East oil’

Transportation on ‘oil’


Source: OECD/IEA Energy Balances of OECD Countries 2008
Long Term Goal for reducing CO₂

To reduce CO₂ emissions from all new vehicles by 90%:
- Short & mid term: Internal Combustion Engine (ICE) improvement
- Long term: Electric vehicle expansion
  Renewable energy utilization

![Graph showing CO₂ emissions reduction over time with a target of 450 ppm by 2050.](image-url)
Technology target toward 2015

Target value* for technology development

- 40% reduction of CO₂ emission in 2015

*Target value for technology development from 2005

Concept of CO₂ reduction

- Approaches from Vehicle, Driver, Traffic (Triple layered approach)

![Diagram showing CO₂ reduction targets for Traffic, Driver, and Vehicles: -10% for Traffic, -30% for Vehicles]
Triple Layered Approach

- **Reduce Congestions**
- **Support eco-driving**
- **Engine/TM, Bio-fuel, Electric powertrain**

Integrated approach with other sectors

Traffic

Driver

Vehicle

Eco. Meter
Eco-driving Advice

Clean Diesel
High-efficient Engine
Li-ion battery
Triple Layered Approach

- Approach through ‘Vehicle’

- Reduce Congestions

- Integrated approach with other sectors

- Support eco-driving

- Eco. Meter
  Eco-driving Advice

- Engine/TM, Bio-fuel, Electric powertrain

  - Clean Diesel
  - High-efficient Engine
  - Li-ion battery
Vehicle Technologies for CO2 Reduction

Evolution of engines/TM

- DIG (Direct inj.)
- VVEL (Valve Control)
- Clean Diesel
- CVT
- Aero dyn. / Light weight

Electric powertrain

- FCV (X-Trail)
- EV (Pivo2)
- Compact Li-ion Battery
- HEV (Altima)

Bio-fuels

- Bio Ethanol Vehicle
Triple Layered Approach

- Approach through ‘Driver’

Reduce Congestions

Integrated approach with other sectors

- Support eco-driving

Eco. Meter
Eco-driving Advice

- Engine/TM, Bio-fuel, Electric powertrain
  
Clean Diesel
High-efficient Engine
LI-ion battery
Potential of Eco-driving support

- Fuel consumption varies a lot among drivers.
- Help reduce CO2 by shifting drivers from ‘drive with lower efficiency’ to ‘drive with higher efficiency’

Example: Compact car in Japan

![Graph showing fuel economy distribution and eco-driving support]

Better (drive w/high efficiency)  |  Worse (drive w/low efficiency)

Fuel Economy  |  Eco-driving

4.0 6.0 8.0 10.0 12.0 14.0 16.0 18.0 (km/L)
# Eco-Driver Supports

- **Improving driver’s behavior ➤ Effort for wider adoption**

<table>
<thead>
<tr>
<th>Inform</th>
<th>Eco-meter</th>
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<tbody>
<tr>
<td><strong>Motivate</strong></td>
<td>Eco-driving advice (EMS*)</td>
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<tr>
<td><strong>Haptic Inform</strong></td>
<td>ECO Pedal</td>
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</tbody>
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*EMS: Eco-driving Management System*
Effect of Eco-driving Advice System

- Approx. 18% improvement in fuel consumption

![Bar chart showing comparison of fuel consumption before and after using eco-driving advice system. The chart indicates a noticeable increase in fuel efficiency post-advice.]
Triple Layered Approach

- Approach through ‘Traffic’

**Reduce Congestions**

Integrated approach with other sectors

- Support eco-driving
  - Eco. Meter
  - Eco-driving Advice

- Engine/TM, Bio-fuel, Electric powertrain
  - Clean Diesel
  - High-efficient Engine
  - Li-ion battery
Dynamic Route Guidance System (DRGS)

- Inform Driver the fastest route using probe car data
- Started locally in Yokohama “SKY project” (Jun/06), intending to go nationwide and global.
Results in improvement by DRGS

- 20% Travel time reduction / 17% CO2 reduction ※

※ Test Result (During Rush hours in Yokohama City in August 2007)
EV Technology Concept

“Clean Energy and Mobility”
Nissan LEAF

- Introduce in FY 2010 in US, JPN, EU, and mass marketed in FY 2012

- Seating capacity : 4-5 adults
- Cruising range : over 160km (US LA4 mode)
- Electric motor : 80kW, 280Nm
- Battery : 24kWh Li-ion
Global Partnership

- Around 50 partnership announced all over the world

* ) As of the end of February, 2010