Challenge 2
Life Cycle Zero CO$_2$
Emissions Challenge
Life Cycle Zero CO₂ Emissions Challenge

Scope of Life Cycle Zero CO₂ Emissions Challenge

Life cycle of a vehicle

- **Production**
  - Material production
  - In-house parts production
  - Purchased parts production

- **Use**
  - Vehicle production
  - Fuel production
  - Driving
  - New Vehicle Zero CO₂ Emissions

- **Disposal**
  - Disposal/Recycling
  - Procurement/Logistics

Life Cycle Zero CO₂ Emissions Challenge by promoting activities for Challenges 1 and 3, and with support from stakeholders.
Reduce CO₂ emissions by 25% or more over the entire vehicle life cycle compared to 2013 levels by promoting activities for the milestones of Challenges 1 and 3, and with support from stakeholders such as suppliers, energy providers, infrastructure developers, governments and customers.
Implementing approaches from both technological development and value-chain collaboration
CAMRY launched in 2017

● Realized reduction of the life cycle CO₂ emissions

The powertrain and platform were totally renewed based on the TNGA.

CAMRY (old)

CAMRY (new)

Reduced CO₂ emissions in driving by new powertrain and lightweight

0 0.5 1.0

Production Use Use Disposal
(Fuel production) (Driving)

Powertrain: compact size, lightweight and highly efficient
Body: lightweight and highly rigid

Continuing successful reduction of the life cycle CO₂ emissions in new models of all the vehicle types since 2004
MIRAI launched in 2014

Increasing CO₂ emissions in production

Gasoline vehicles of the same class

Hybrid vehicles of the same class

MIRAI

0

0.5

1.0

Production (Fuel production) Use Use Disposal

Increasing CO₂ emissions by electrification parts

Some electrification parts

Motor

Power control unit

Battery

FC stack

High-pressure hydrogen tank

Reduction of CO₂ emissions in production of electrification parts is important
Promoting development of CO₂ emissions reducing technology

- Develop and more use of low CO₂ material
- Reduce material use
- Reduce number of parts
- Increase the use of recycled materials

Enhanced management in development process

- Set prioritized management parts.
- Set CO₂ reduction target at development planning
- Implement PDCA management

CO₂ emissions during material production

<table>
<thead>
<tr>
<th>Vehicle materials</th>
<th>Steel</th>
<th>Aluminum</th>
<th>Aluminum</th>
<th>Carbon fiber</th>
<th>Platinum</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
<td>10</td>
<td>20</td>
<td>30</td>
<td>6,000</td>
</tr>
</tbody>
</table>

New materials and recycling materials CO₂ per mass

| Aluminum (New) | 2     | 4       | 6       | 8     | 10     |
| Aluminum (Recycled) | 0     | 2,000   | 4,000   | 6,000 | 10,000 |

Promoting eco-friendly design with focus on CO₂ emissions
[Value chain collaboration] Past Promotion and Future Tasks

**Procurement**
- Revision of the Toyota Green Purchasing Guidelines (2016)
- Establishment of the Environmental Activity Awards (since 2017)

**Logistics**
- Joint operation freight ‘TOYOTA LONGPASS EXPRESS’ with Japan Freight Railway
- Cross-industry joint operation freight with Sagawa Express (since 2017)

**Sales**
- Issue of the global environmental hoshin in the sales and service (2016)
- Promotion of CO₂ reduction activities at dealers by sharing good practices such as renewable energy and introducing an award system

Globally accelerating the approach with closer communications with each other in addition to the past approach
A Japanese partnership (the Kanagawa Prefectural Government, the municipal governments of the cities of Yokohama and Kawasaki, Iwatani Corporation, Toshiba Corporation, Toyota Industries Corporation, Toyota Turbine and Systems, Inc., and Japan Environment Systems Co., Ltd., Toyota Motor Corporation) operate the project. A system has been created for using electricity generated at the Yokohama City Wind Power Plant to electrolyze water to create low-carbon hydrogen. The hydrogen will be transported to a fruit and vegetable market, a factory, and warehouses.

Aichi Low-carbon Hydrogen Supply Chain Promotion Association

Kansai International Airport “KIX Project”

Domestic case “Keihin Project”

Yokohama City Wind Power Plant

Production/Utilization of Low-carbon hydrogen

Electricity flow

Hydrogen flow

Production

Storage

Transport

Utilization

Water electrolysis system

Hydrogen Storage tank

Fuel cell forklifts

Fuel Cell Energy Inc. and Toyota are building a fuel-cell power generation plant in California.

Aiming at commercialization by enhancing collaboration with global communities
For achieving Sustainable Society

Life Cycle Zero CO₂ Emissions Challenge

Achieving the life cycle Zero CO₂ emissions with various stakeholders

Customer, Dealers, Suppliers, Research institutes, Investors, Government, Energy, Infrastructure organization

TOYOTA