Life Cycle Zero CO₂ Emissions Challenge

Basic Concept
By Life Cycle Zero CO₂ Emissions Challenge, we mean efforts to completely eliminate CO₂ emissions not only while driving and in production, but also in the processes of materials production, disposal, and recycling of vehicles.

For instance, there are some next-generation vehicles that do achieve reduced CO₂ emissions when driven, but actually cause increased CO₂ emissions at the material and vehicle production stages. Because of this, we will further promote environmentally friendly design such as by choosing appropriate materials. In this way, we are going to pursue “ever-better cars.” For example, we will develop and expand the use of materials with lower CO₂ emissions during production and will reduce the quantity of materials and number of parts used in a vehicle. We will also adopt more recycled materials and so on for vehicle production and enhance initiatives aimed at designing vehicles for easy disassembly.

Promoting Environmental Management in Product Development (Eco-VAS)

LCA of New Models and Fully Redesigned Models in Five Vehicle Series

Purpose
The Eco-Vehicle Assessment System (Eco-VAS) is a comprehensive environmental impact assessment system that allows systematic assessment of a vehicle’s impact on the environment over the entire lifecycle from vehicle production and use to disposal stages. Toyota uses Eco-VAS to conduct lifecycle assessment (LCA) of a vehicle’s total environmental impact from the materials manufacturing, vehicle manufacturing, driving and maintenance stages through to the disposal stage.

Since the system allows targets to be set from the initial stages of development to achieve steady improvements in environmental performance, Toyota’s chief engineer sets targets and scenarios to achieve them in relation to environmental performance criteria in the planning and development stage, and then follows up at points throughout the development process to ensure that targets are steadily being met.

Progress in FY2015
Toyota conducted LCA on new models and fully redesigned models in five vehicle series (Sienta, Prius, Pixis Mega, Lexus LX, RX (200t, 450h).

LCA of the Prius

* Evaluations are based on the assumption that each vehicle travels 100,000 km over a 10-year period under the JC08 test cycle. LCA results are shown as an index.
Environmental Initiatives | Challenge 2: Life Cycle Zero CO₂ Emissions Challenge

Response to Scope 3

Scope 3 is a standard established to encourage corporations to visualize and account for indirect greenhouse gas emissions from the value chain that occur outside their own company and consolidated companies (purchased goods and services, transportation, business travel, employee commuting, use of sold products, etc.).

Comparison of the emission rates calculated according to this standard shows that the combined rate for Category 1 “Purchased goods and services” and Category 11 “Use of sold products” accounts for as much as 97 percent, while the rate for each other category is less than 1 percent.

Category 1 “Purchased goods and services” covers the manufacturing stage of the materials and parts that comprise automobiles, while Category 11 “Use of sold products” covers the driving stage of automobiles. Therefore, it is clear that parts weight reduction and material selection, as well as the development of fuel efficiency improvement and next-generation vehicle technologies are important measures that will lead to emissions reduction.

Details of the 15 Categories Specified in Scope 3 and Respective Share of Total Emissions

<table>
<thead>
<tr>
<th>Category</th>
<th>Emission rate</th>
<th>Respective Share of Total Emissions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Purchased goods and services</td>
<td>16.0%</td>
<td></td>
</tr>
<tr>
<td>2. Capital goods</td>
<td>0.9%</td>
<td></td>
</tr>
<tr>
<td>3. Fuel- and energy-related activities (not included in Scope 1 or Scope 2)</td>
<td>0.2%</td>
<td></td>
</tr>
<tr>
<td>4. Upstream transportation and distribution</td>
<td>Less than 0.1%</td>
<td></td>
</tr>
<tr>
<td>5. Waste generated in operations</td>
<td>Less than 0.1%</td>
<td></td>
</tr>
<tr>
<td>6. Business travel</td>
<td>Less than 0.1%</td>
<td></td>
</tr>
<tr>
<td>7. Employee commuting</td>
<td>0.2%</td>
<td></td>
</tr>
<tr>
<td>8. Upstream leased assets</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>9. Downstream transportation and distribution</td>
<td>Less than 0.1%</td>
<td></td>
</tr>
<tr>
<td>10. Processing of sold products</td>
<td>0.3%</td>
<td></td>
</tr>
<tr>
<td>11. Use of sold products</td>
<td>81.2%</td>
<td></td>
</tr>
<tr>
<td>12. End-of-life treatment of sold products</td>
<td>0.9%</td>
<td></td>
</tr>
<tr>
<td>13. Downstream leased assets</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>14. Franchises</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>15. Investments</td>
<td>0.1%</td>
<td></td>
</tr>
</tbody>
</table>

Note 1: Category 14 is not applicable. Category 8 is included in Scope 1 and 2, and Category 13 is included in Category 11.

Note 2: Emission rates are determined based on the FY2014 calculated values.

Pursuing Increased Transport Efficiency and Reducing CO₂ Emissions in Logistics Activities

Continue to Conduct Activities to Reduce CO₂ Emissions

In FY2015, Toyota Motor Corporation (TMC) implemented various initiatives, including activities to increase the loading efficiency of trucks, modal shifts, and ongoing fuel-efficiency improvement activities with logistics partners. Through these activities, CO₂ emissions were reduced by 6,000 tons, but changes including an increase in long-haul transportation resulted in total CO₂ emissions of 275,000 tons.

CO₂ emissions per ton-kilometer (the transport of one ton of goods over a distance of one kilometer) were 108.4 g-CO₂/tkm.

Trends in CO₂ Emissions from TMC Logistics Operations (Japan)

Note: The CO₂ conversion coefficient was calculated based on guidelines such as the "Guidelines on Disclosure of CO₂ Emissions from Transportation & Distribution (version 3.0)” issued by the Japanese Ministry of Economy, Trade and Industry and the Ministry of Land, Infrastructure, Transport and Tourism. For more information on the conversion coefficient, please visit the webpage below: [http://www.toyota-global.com/sustainability/environment/data/conversionfactor.pdf](http://www.toyota-global.com/sustainability/environment/data/conversionfactor.pdf)
Shortening Transport Distance for Vehicles to Toyota Corolla Iwate Co., Ltd. by Eliminating Routing via the Iwate Plant

Because of their small shipment volume, vehicles bound for Toyota Corolla Iwate Co., Ltd., unloaded at the Port of Sendai, used to be transported to the Iwate Plant first, formed into lots, and then sent to Toyota Corolla Iwate. In FY2015, vehicles unloaded at the Port of Sendai were sent directly to Toyota Corolla Iwate, not going through the Iwate Plant, since the number of vehicles bound for Toyota Corolla Iwate increased. This change shortened the transport distance by 55 km, from 188 km (Port of Sendai → Iwate Plant → Toyota Corolla Iwate) to 133 km (Port of Sendai → Toyota Corolla Iwate). This distance reduction succeeded in reducing annual CO₂ emissions by approximately 11 tons, from 37.3 tons to 26.4 tons.

Assessment of CO₂ Emissions and Implementation of Reduction Activities Worldwide

In FY2007, Toyota began assessing the CO₂ emissions from its overseas worksites. From FY2013, reduction targets are annually set for each country and region, and activities to reduce CO₂ emissions are being implemented based on the global guidelines. Toyota will disclose the volume of CO₂ emissions from its overseas worksites from FY2016. Toyota is currently working on investigating the methods to calculate CO₂ emissions in each country and region to improve the reporting accuracy. (Will be disclosed starting with the FY2017 report.)

Focus

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In 2013, Toyota established the Sustainable Mobility Project within The World Business Council for Sustainable Development (WBCSD), and began demonstration projects in six cities. Bangkok, where Toyota is a leading company, has received a grant from the Toyota Mobility Foundation. The objective of the initiative in Bangkok is to create a model solution for reducing traffic congestion by controlling traffic demand and improving the traffic flow, based on cooperation between industry, government, universities, and citizens.

In November 2015, a leadership forum was held, attended by executives from about 70 companies that are participating in the initiative, and efforts are underway to encourage the participation of more people. In June 2016, a full scale social experiment was implemented with 23 measures on Sathorn Road to verify the model. In the future, a roadmap for expanding the model throughout Bangkok will be created and promoted in cooperation with the Thai government.

For details on the F-Grid concept, please see page 24.

**Promoting an “Integrated Approach” to Reduce CO₂ Emissions in Road Transport Sectors**

WBCSD-led Project to Mitigate Traffic Congestion in Bangkok, Thailand: Sathorn Model

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**Measures verified in the social experiment**

- Park & Ride: Park & Ride parking lots were opened at 15 locations, and were being used by 504 people/day as of June 2016.
- Shuttle buses: Introduced in two schools; a corporate membership shuttle bus was also introduced on a trial basis.
- Flex time: Introduced at 11 companies, covering 4,410 employees.
- Development of an application that supports selection of optimum transportation mode: 3,308 application downloads.
- Measures to mitigate traffic flow bottlenecks: 18 measures were verified (at the location where the measures were most effective, the traffic flow rate improved by 13 percent and the travel speed by 27 percent).

Verification testing for traffic flow management

Kiss & Go (Parents leaving quickly after dropping their children off)

Reversible lane (a lane in which the direction of traffic flow can be changed)

**Focus**

**Close Collaboration with Suppliers on Environmental Protection Activities**

Kuozui Motors, Ltd., a manufacturing company in Taiwan, assesses its greenhouse gas emissions in line with ISO 14064-1 standards. The company has also recently acquired ISO 50001 certification and is working to improve its energy efficiency by visualizing its energy performance.

As for procurement, Kuozui Motors is promoting environmental protection activities in close collaboration with its suppliers. Major activities include holding yearly supplier meetings, setting KPIs and following up to achieve targets every month. The company is also promoting improvement activities toward the TTT30 (Team Taiwan Toyota Cost Reduction 30% during 5 years) initiative. In addition, through its Supplier Committee, the company is providing suppliers with guidance on CO₂ emissions reduction and sharing kaizen ideas and cases as well as best practices.

Besides the above, Kuozui Motors takes comprehensive procurement-related initiatives. For example, it has created a KPI form for use by its suppliers to simplify monitoring. It also participates in local government energy saving activities as part of providing guidance on CO₂ emissions reduction and invites all of its suppliers to meetings for learning new methods.