Prius and the Environment
Although the environmental performance and fuel efficiency are the greatest elements of full hybrid vehicles, I challenged the development team to take the Prius spirit of innovation and vehicle performance to an even higher level.

To achieve this, we carefully re-analysed the balance structure between the engine and motor and improved fuel efficiency and driving performance. We also adopted a new 1.8 litre engine and strove to improve fuel efficiency even further by suppressing the engine speed when driving at high speeds. From there, we meticulously pursued performance aspects that contribute to fuel efficiency such as the aerodynamic design and power saving features of the components.

Akihiko Otsuka
Chief Engineer New Prius
Toyota Motor Corporation

The new Toyota Prius is the most advanced expression of mass sustainable mobility. Prius builds on more than 10 years of history and will remain the undisputed reference point for full hybrid technology. Beyond confirming its environmental leadership, the new Prius sets new standards in terms of status, innovation, design and driving pleasure. The third generation Prius should not be seen as a niche model to be evaluated only against specialised criteria. Continued customer approval is exemplified through the Prius’ top ranking in JD Power’s German, French and UK customer satisfaction surveys for the last two years.

The new Toyota Prius is a full hybrid, providing full customer satisfaction!

Andrea Formica
Senior Vice President
Toyota Motor Europe

How is the environmental impact of Prius measured and improved?

This document follows the complete Life Cycle Thinking for Prius, using the Life Cycle Assessment tool and employing ISO14040-series methodology throughout.

Life Cycle Thinking is a process which takes into account all resources consumed and the environmental/health pressures associated with the whole life cycle of a product; 360° approach from design through production, driving and finally recycling.

Life Cycle Assessment (LCA) is the methodology used to support Life Cycle Thinking: first by quantifying the data, and secondly by assessing the environmental/health impacts of a product through it’s whole life cycle, in order to identify environmental benefits and potential areas for improvement.

In other words, the objective is to discover how much we have improved the new generation product in comparison to the previous one. We then ensure that all the findings are integrated into new product design and development.

ISO14040-series methodology
An International Organisation for Standardisation guideline that describes the principles and framework for life cycle assessment of a vehicle’s overall environmental impact.
1. Design. What role does design play in the environmental performance of Prius? The findings from our Life Cycle Assessment process are applied at the design development stage. Every design detail is analysed to ensure the lowest possible environmental impact throughout the vehicle’s lifespan. This meticulous approach to design has led to an array of innovative features that each contribute to environmental efficiency. These include lightweight design and the conservation of resources, like the application of recyclable plastics (TSOP), recycled material and the use of ecological plastic, which Toyota developed and named from a type of bio-plastic derived from plants.

Recyclable plastics (TSOP) We recycle as many parts of our vehicles as possible. Our own specially developed recyclable plastic called Toyota Super Olefin Polymer is a thermoplastic resin which has better recyclability than any conventional reinforced composite polypropylene. TSOP is created using our groundbreaking molecular design technology based on our unique and innovative crystallisation theory.

Recycled material Toyota ecological plastic is the world’s first injection-moulded material to be derived from plants.

Energy saving technology at the use phase

Lightweight and compact As Prius includes many additional safety devices, lightweight design was applied in order to reduce the overall vehicle weight. 90% of the full hybrid drive components have been redesigned to create 20% lighter, more compact system. This results in better fuel consumption.

Material composition Based on vehicle weight.

<table>
<thead>
<tr>
<th>Steel &amp; Iron</th>
<th>Light alloys</th>
<th>Polymers</th>
</tr>
</thead>
<tbody>
<tr>
<td>65%</td>
<td>9%</td>
<td>16%</td>
</tr>
<tr>
<td>65%</td>
<td>10%</td>
<td>17%</td>
</tr>
</tbody>
</table>

Compared to comparable diesel vehicle

Comparative data sheet is in the next page. Compared to new Prius.

Conservation of resources

- Toyota Super Olefin Polymer (TSOP)
- Ecological plastic
- Recycled material
  - Including recycled sound-proofing products
2. Vehicle production. How is environmental efficiency ensured during production? The Tsutsumi Plant, which produces Prius, is striving toward sustainable manufacturing with the concept of a ‘plant that fully utilises natural resources while existing in harmony with the natural environment’. By continuously implementing new measures at Tsutsumi, the overall CO2 emissions from the production process were halved by 2006 compared to the level in 1990. Also, in order to conserve the local eco-system, in May 2008 the employees and community members planted 50,000 trees that are native to the region. The plant qualified for the Environmental Management System ISO 14001 in 1996, a standard we are extremely proud of.

<table>
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<tbody>
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<tr>
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<td>No waste to landfill</td>
</tr>
</tbody>
</table>

Environmental Management System ISO 14001

- Specifies the actual requirements for an environmental management system.

Prius Hybrid Battery specifications

<table>
<thead>
<tr>
<th>Material</th>
<th>NiMH</th>
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<tbody>
<tr>
<td>Voltage</td>
<td>201.6 V</td>
</tr>
<tr>
<td>Power</td>
<td>27 kW*</td>
</tr>
<tr>
<td>Modules per battery pack</td>
<td>28</td>
</tr>
<tr>
<td>Cells per module</td>
<td>6</td>
</tr>
<tr>
<td>Plates per cell</td>
<td>25</td>
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* 2 kW improvement over the previous Prius.


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Environmental Management System ISO 14001

- Specifies the actual requirements for an environmental management system.

Eco factory efficiency

- Tsutsumi Plant
- Waste reduction (since 2004): 21%
- Volatile Organic Compound reduction: 49%
- Water consumption reduction: 64%
- CO2 emissions reduction: 36%
- 2008: 2,000 kW photovoltaic solar panels with a rated output of 2,500 kW were installed as part of a field test project on new photovoltaic power generation technology within the New Energy and Industrial Technology Development Organisation.

Research

- Toyota Motor Corporation Battery Research Department is jointly researching materials for next generation batteries with the Japanese National Institute for Materials Science (NIMS).
3. Driving. How do we create the most environmentally advanced drive? Hybrid Synergy Drive®: lightweight compact components and refined aerodynamics have all been developed to provide groundbreaking environmental performance. The Prius ECO Drive Monitor even shows you how to maximise the efficiency of your drive.

Hybrid Synergy Drive®
The petrol engine and two electric motors are so separate, which allow Prius to comfortably deliver maximum performance and efficiency at every stage of your drive. It also means that you can drive solely on electric power — no fuel consumption or emissions. Other hybrid vehicles connect to drive, consuming unnecessary fuel in every driving situation. Uniquely, the second electric motor can independently recharge the battery at any time. A powerful and efficient 1.8 litre engine helps to minimise fuel consumption. The compact lightweight design reduces overall weight for lower friction and better performance. Toyota’s full hybrid technology allows Prius to consistently deliver maximum performance and efficiency of your drive.

Toyota’s full hybrid technology
Hybrid Synergy Drive® significantly reduces NOx and CO2 emissions while improving fuel economy. At present, there are no clean diesels that can offer all three benefits to the same extent as while also improving fuel economy. Toyota is committed to achieve these stringent recycling/recovery targets through an intense collaboration with all the partners in the treatment chains.

Hybrid Battery recycling
As Toyota highly concerned about the environment, it guarantees a solid business case for recycling Hybrid Batteries. Batteries represent a secondary ore with high valuable metal content. Its steel, copper (Cu), Ni and Co is recycled, sold back into the market and re-used for different types of applications, such as the production of stainless steel. Established pathways exist for collection, disassembly, sorting, and recycling of these metals – this is similar to the recycling flow of catalytic converters.

4. Recycling. How is recycling maximised? Toyota thinks it is vital to take a more proactive approach to recycling, geared toward the creation of a sustainable and recycling-orientated society. On that basis Toyota adopted the Toyota Recycling Vision, which sets forth long-term goals for reusing end-of-life vehicles. And Toyota is proceeding to recycle end-of-life vehicles and components as well as the implementation of easy-to-recycle design.

Note: Fuel consumption and CO2 level figures represent respective combined performance.
Life Cycle Assessment. How has Life Cycle Assessment influenced the evolution of Prius? Toyota have made a big effort to improve CO2 emissions from design, through production, driving and recycling. Prius improves fuel economy despite higher power performance.

Boundary conditions and assumptions

- From production, to driving, to recycling (including mining and transportation)
- Assumed driving distance 150,000 km (93,000 miles) (New EU Drive Cycle – NEDC)

Comparable vehicles are selected from:
- Conventional petrol (Euro 4) and diesel vehicles (Euro 5)
- Equivalent power performance

Compared to equivalent petrol and diesel vehicles:
- The CO2 emissions of Prius are 31% less
- The CO2 emissions of Prius related to the production phase are similar

The driving phase of conventionalengines types accounts for more than 75% of the life cycle CO2 emissions.

Design takes into account the reduction of environmental impact for each phase.

Sensitivity Analysis

As emissions from the material and vehicle production of Prius are similar to that of comparable diesel vehicles, the low CO2 benefits begin with the first mile of driving. By driving 150,000 km (93,000 miles) the CO2 reduction is already 31%. If you drive more, you can save more CO2 emissions.

Ratio between kilometres and CO2

Note: Comparable diesel vehicle with 150,000 km (93,000 miles) = index 1.0
To learn more about Toyota and the environment please visit our website:
www.toyota.co.uk/prius

The next giant leap forward
— Full hybrid
— A major contributor to the reduction of emissions throughout the complete vehicle life cycle
— High air quality standards:
  Euro 5 – hardly any NOx and PM levels
— CO₂ levels: from 89 g/km
— Use of carbon-neutral ecological plastic
— Use of recycled plastic material
— ≥ 95% recoverability and ≥ 85% recyclability

Whilst every effort is made to reproduce accurate information, we reserve the right to change specifications, equipment and availability without prior notice. This brochure cannot be regarded as infallible (some of the vehicles shown may not be to exact UK specification), and as such does not constitute an offer for sale of any particular vehicle or specification. Fuel consumption values quoted throughout this brochure are determined according to EC Directive 1999/100/EC. The results do not express or imply any guarantee of actual fuel consumption. For the latest specification and availability we ask that you contact your local Toyota Centre.