

Towards a Global Approach to Automotive Fuel Economy

A car producer's viewpoint

***New energy for business:
an integrated approach
beyond the green business hype***

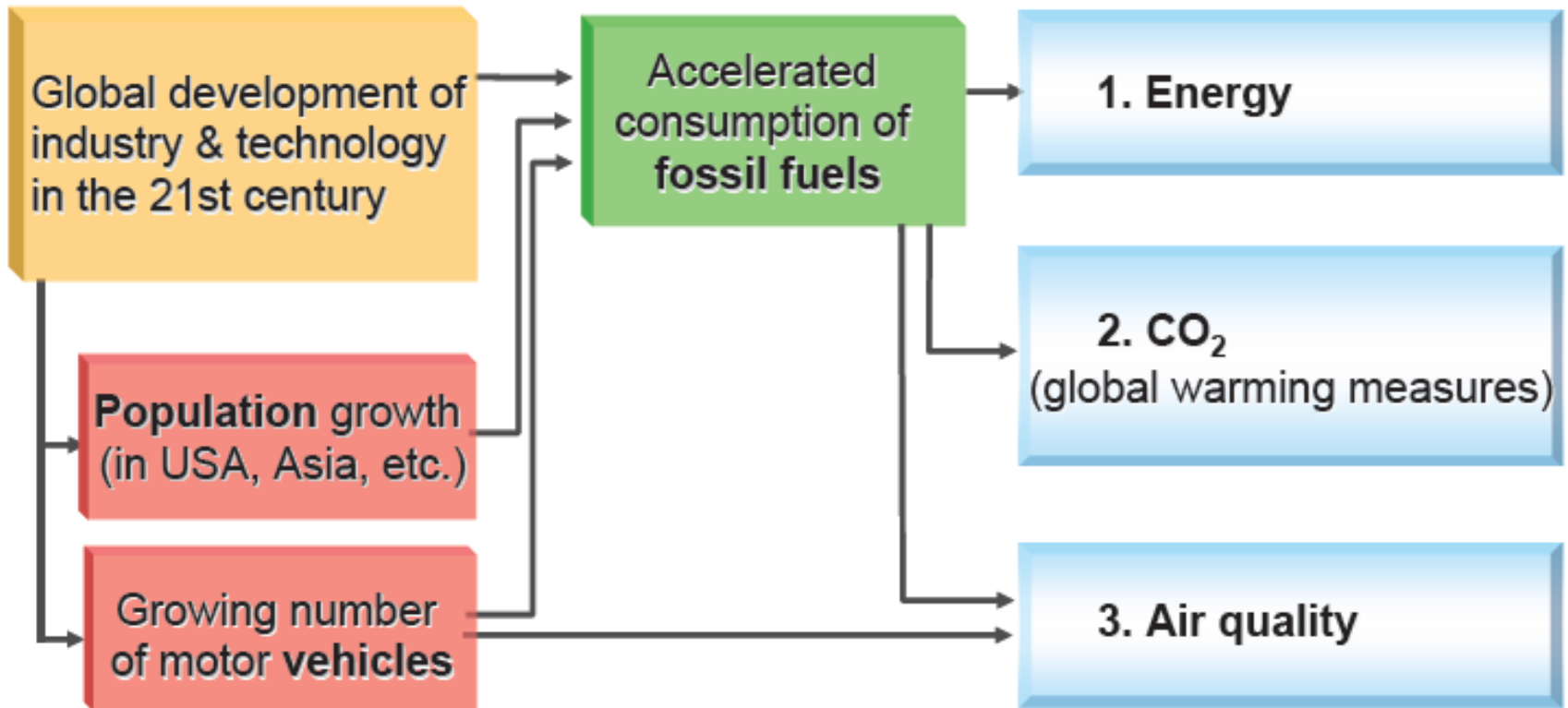
Willy Tomboy
Environmental Affairs Group
Toyota Motor Europe

2008 Symposium – Paris 15-16 May



TOYOTA

Three Major Issues



EU Commission communicated an energy & climate change package in Jan07, and proposed it to Parliament on 23Jan08

demonstrating global environmental leadership



20 % GHG reduction by **2020** (based on 1990 level)*

20 % increase of renewable energy level by **2020**

20 % energy efficiency improvements by **2020**

10 % minimum bio-fuels share in transport fuel

consumption by **2020**

CO₂ - 130/120 g/km by **2012**

Euro 6 norms

* **Up to 30% if developing countries agree on targets**

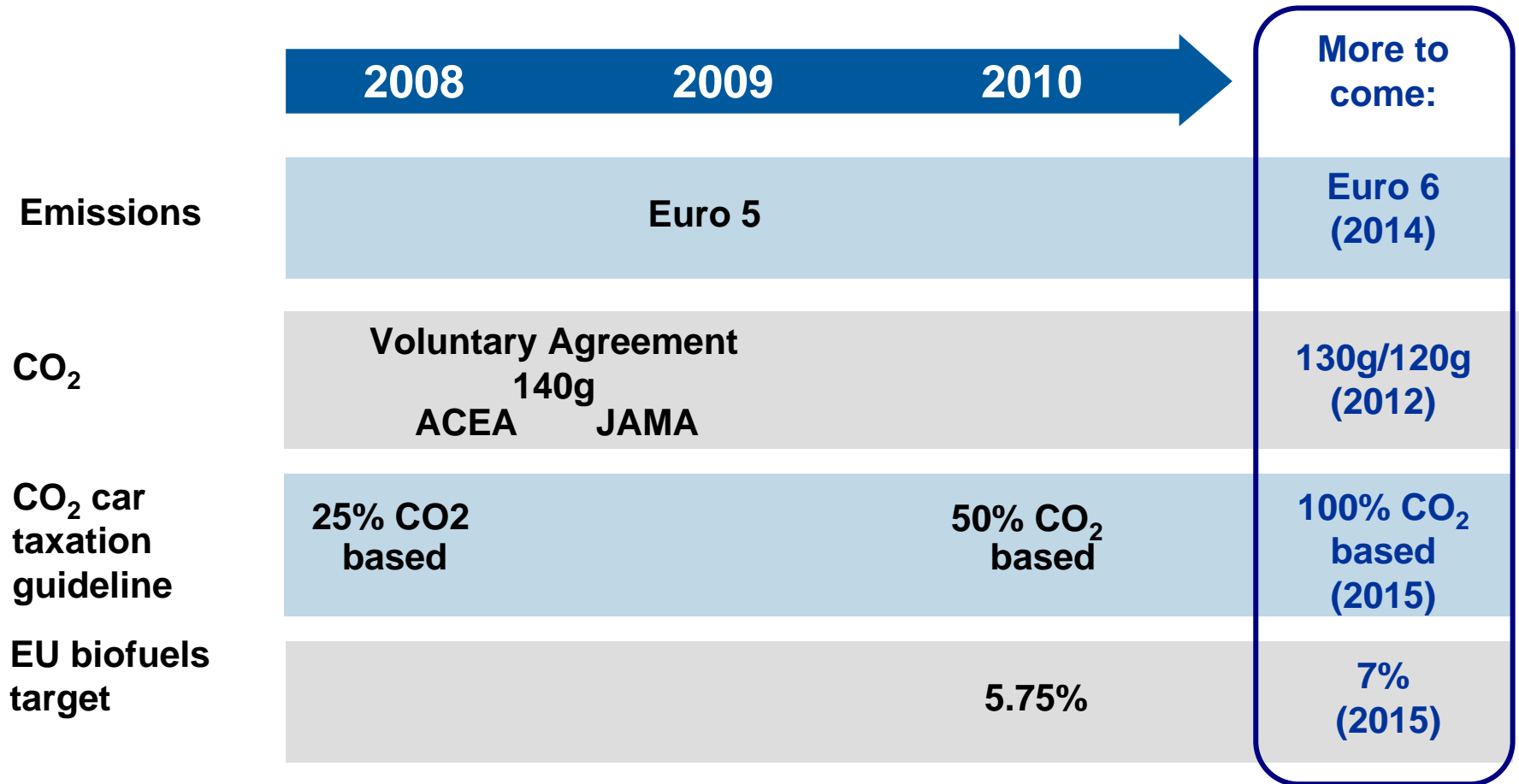
Impact on

Transport
Buildings
Equipment



Toyota/Lexus in Europe must be ready

Environmental initiatives must be underpinned by regulatory compliance

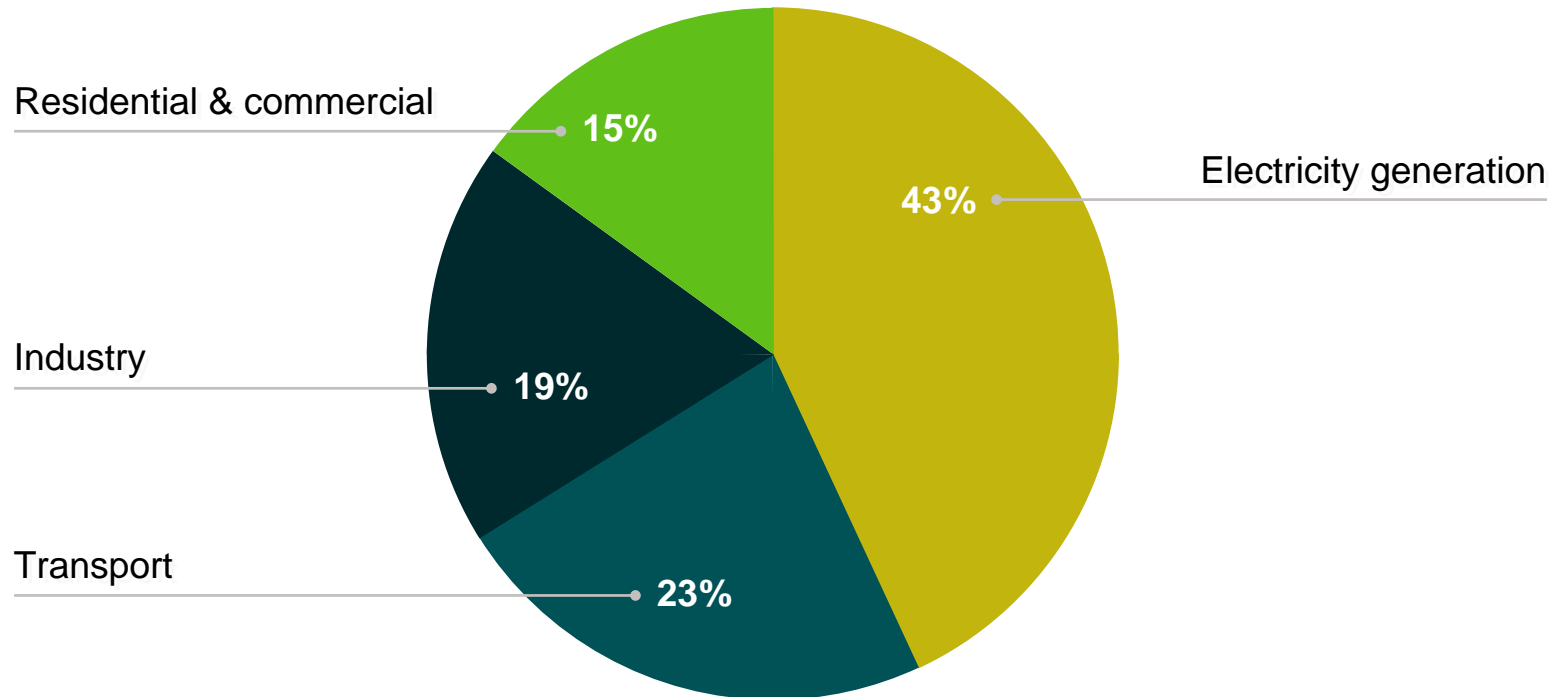


CO₂ emissions by sector

Breakdown of worldwide CO₂ emissions sources

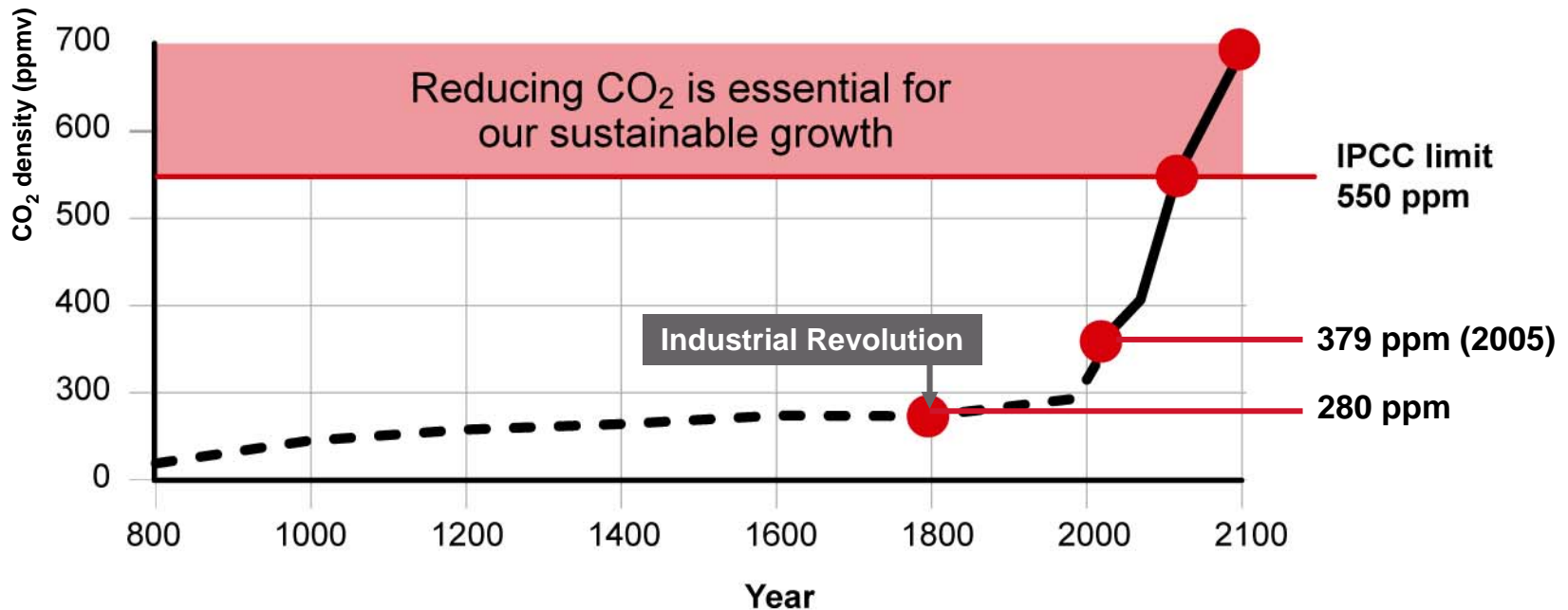
Transport accounts for 23% of all man made CO₂ emissions.

Comprehensive CO₂ constraints are needed in each sector.



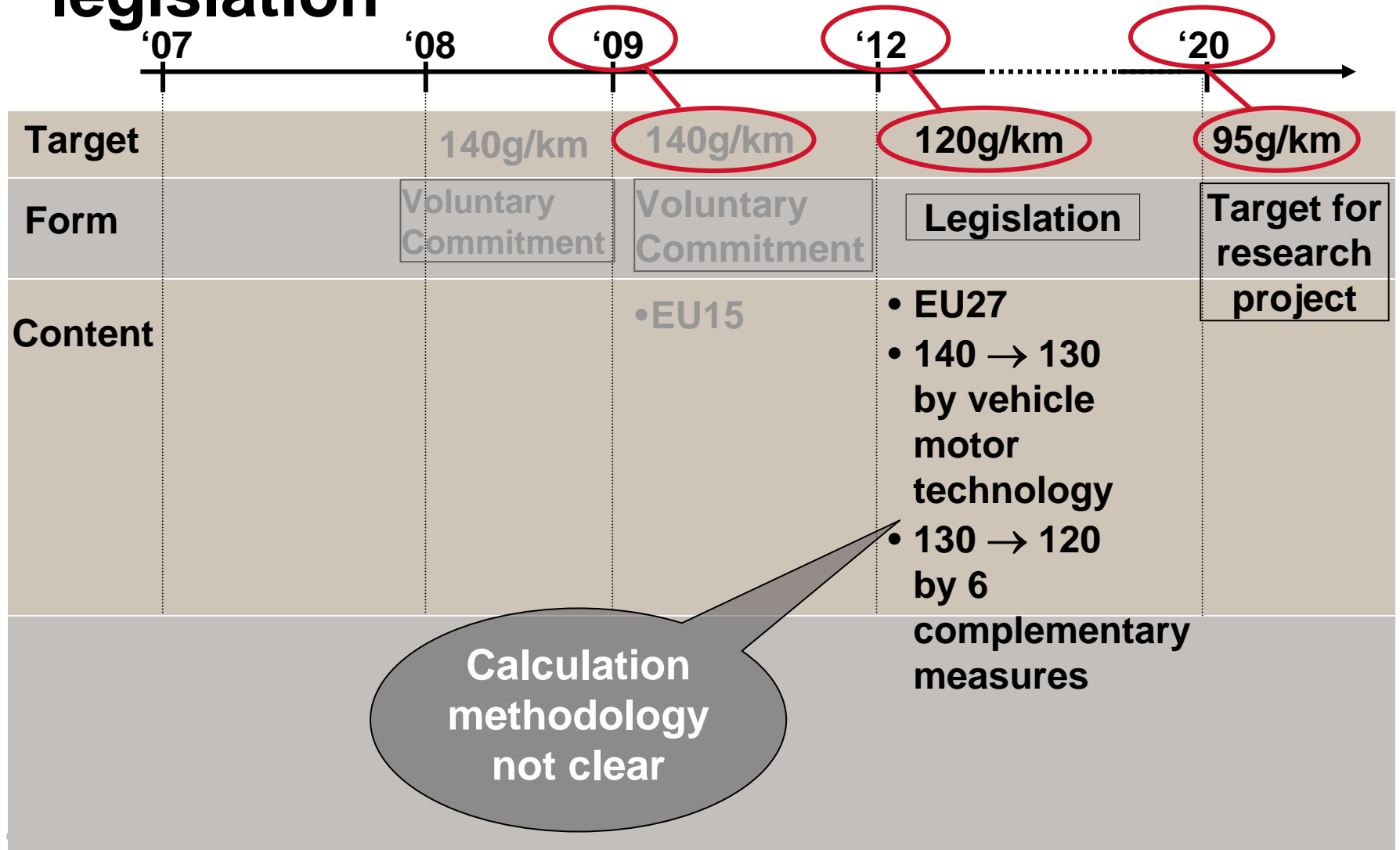
Source: IEA

CO₂ emissions increase



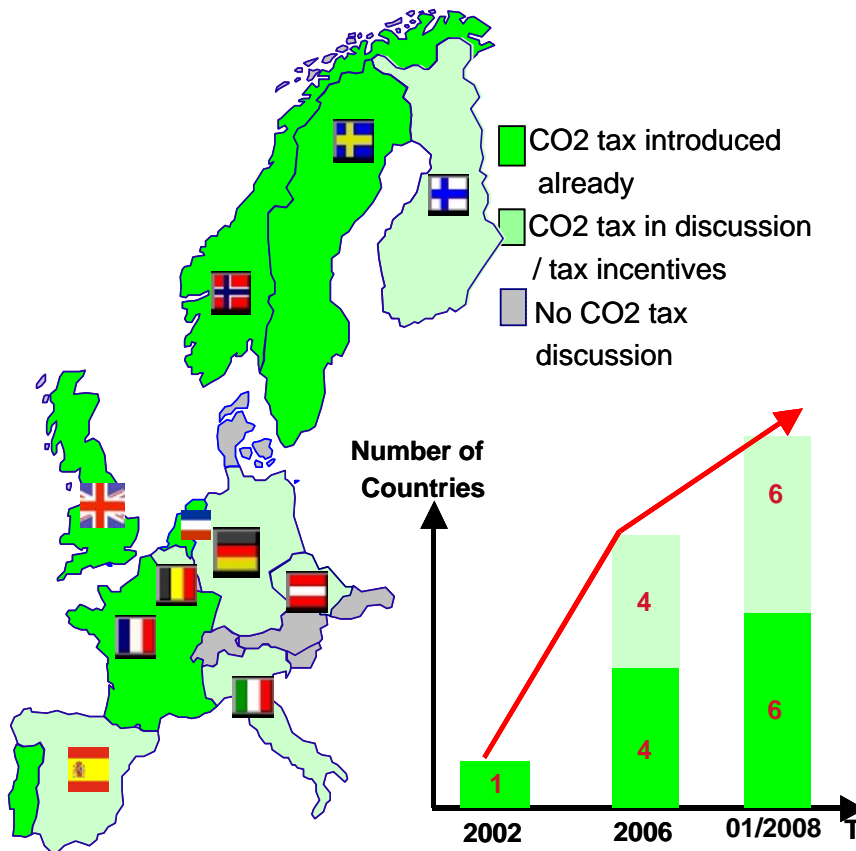
Source: IPCC report 2007

CO₂ – from voluntary commitment to legislation



CO₂ reduction part of national legislation

Example: CO₂ taxation



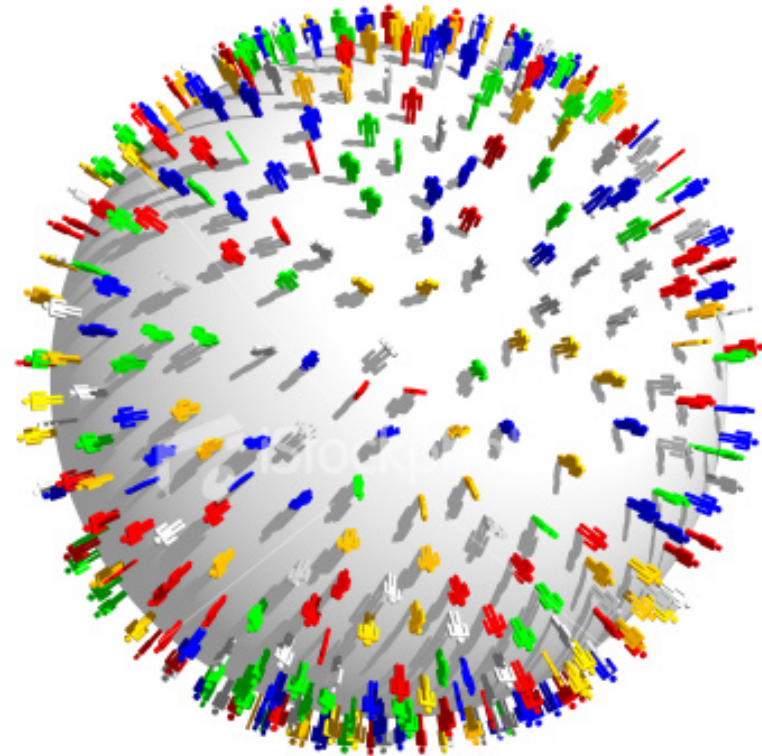
Example: CO₂ labelling

Brandstofverbruik en CO ₂ -uitstoot personenauto's		Plaats voorbehouden voor het logo van het merk (facultatieve melding)																					
Merk	X																						
Model	Y																						
Uitvoering	1,4																						
Brandstof	benzine																						
Verstelmingsbak	manuele																						
Brandstofverbruik gemeten volgens officiële testcyclus	6,2 liter/100km																						
CO₂-uitstoot gemeten volgens officiële testcyclus CO ₂ is het broeikasgas dat bij de wereldwijde klimaatverandering de belangrijkste rol speelt	148 g/km																						
Brandstofverbruik en CO₂-emissies vergeleken met het gemiddelde van alle modellen van benzinewagens (metals gemiddelde 7,4 l/100 km en 175 g/km CO ₂)																							
<table border="1"> <thead> <tr> <th>100</th> <th>130</th> <th>160</th> <th>190</th> <th>220</th> <th>250</th> <th>g/km CO₂</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>B</td> <td>C</td> <td>D</td> <td>E</td> <td>F</td> <td>G</td> </tr> <tr> <td>4,2</td> <td>5,5</td> <td>6,7</td> <td>8</td> <td>9,3</td> <td>10,5</td> <td>U/100 km</td> </tr> </tbody> </table>			100	130	160	190	220	250	g/km CO ₂	A	B	C	D	E	F	G	4,2	5,5	6,7	8	9,3	10,5	U/100 km
100	130	160	190	220	250	g/km CO ₂																	
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4,2	5,5	6,7	8	9,3	10,5	U/100 km																	
Jaar van toepassing																							
2011																							
Een gids betreffende het brandstofverbruik en de CO ₂ -uitstoot met gegevens voor alle modellen van nieuwe personenauto's is gratis verkrijgbaar in elk verkooppunt. Naast de brandstofefficiëntie van een auto zijn ook het rijgedrag en andere niet-technische factoren bepalend voor het brandstofverbruik en de CO ₂ -uitstoot van een auto. Een regelmatig en goed onderhoud van de wagen volgens de voorschriften van de constructeur bevordert ook een vermindering van het brandstofverbruik en van de CO ₂ -uitstoot.																							

Belgium

Consumer expectations changing

‘More than **two-thirds** of consumers globally believe that “*not harming the environment*” is the number one responsibility of big corporations’



Source: Corporate Social Responsibility Monitor 2007

President Watanabe's Press Conference

25 December 2007

1. **Quality** - We remain committed to the concept of 'quality is Toyota's very essence' (defect-free process completion = production lines with virtually zero defects found in plant shipment inspections)
2. **Climate** – Toyota's response to environmental issues, is pursuing sustainability in 3 areas:
 1. **Research & Development**
 1. Aim to have a hybrid model in all Toyota vehicle series
 2. Development and mass production of lithium-ion batteries
 3. Development of cellulosic ethanol produced from sugarcane & corn
 2. **Manufacturing:** sustainable plants (zero emissions, and greening)
 3. **Social Contribution:** environmental education, afforestation, desertification

Environmental leadership: core pillar of long-term stable growth

Leading Player in Greater Europe
Key Contributor to Global Toyota

Top 5 in
Greater
Europe

Core Model
Competitive-
ness

Environmental
Leader

Complete
Customer
Satisfaction

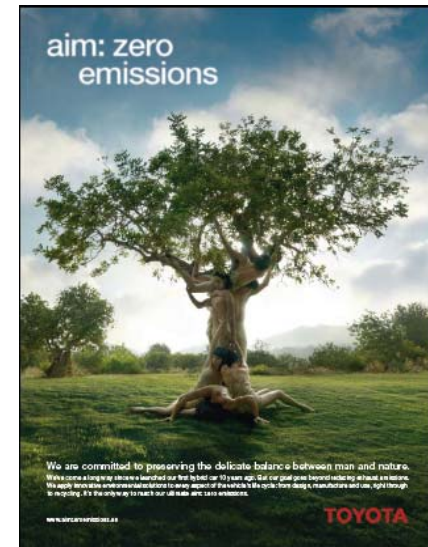
European
Corporate
Citizen

Our stance on Climate Change

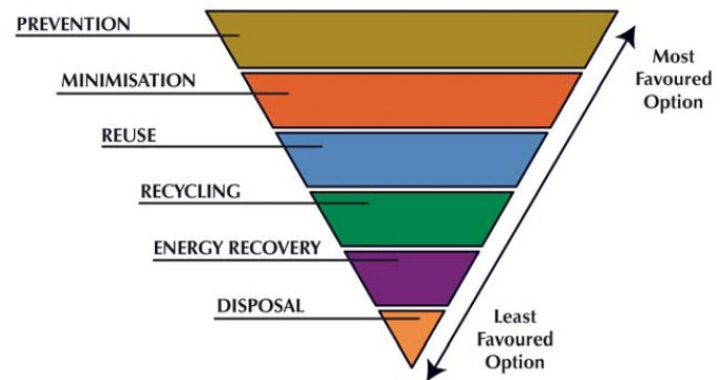
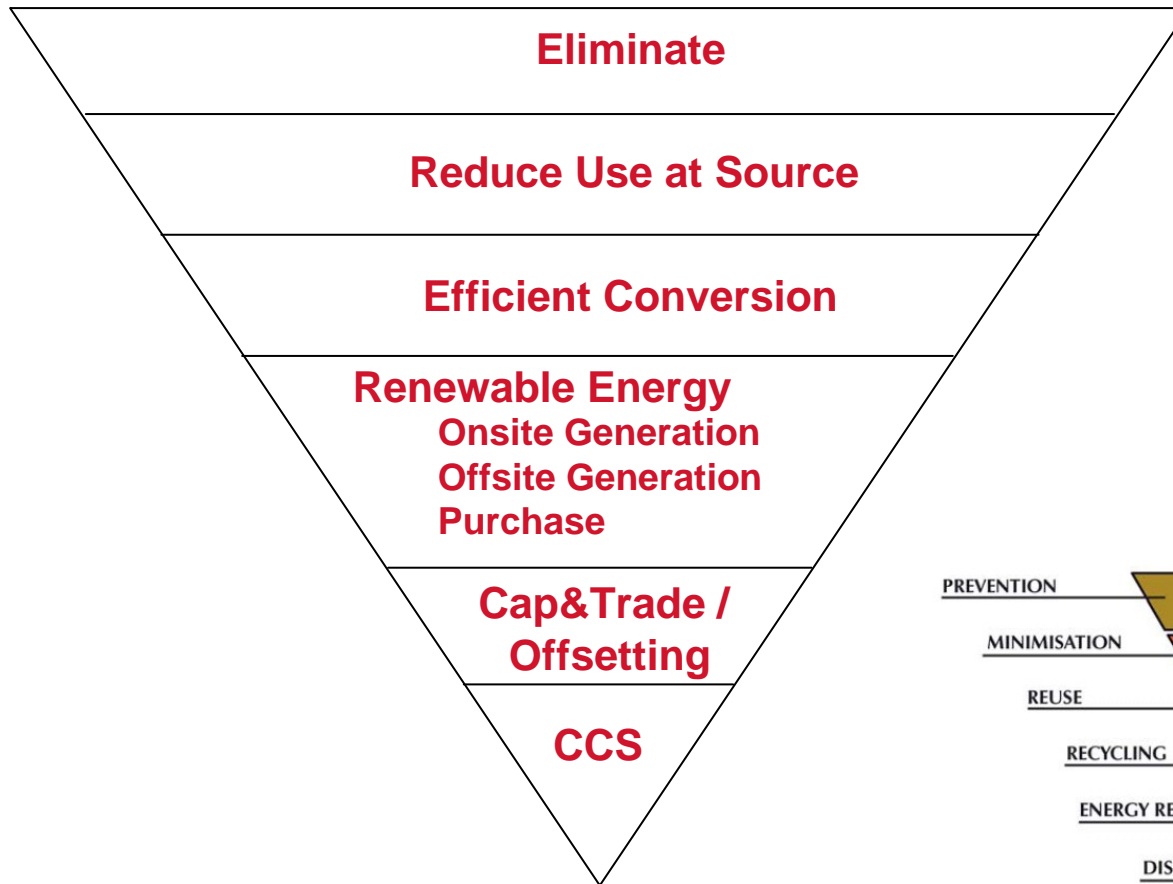
- We accept man made global warming
- We recognize importance of target-setting
- We agree actions are needed to address environmental concerns without depleting resources for future generations



Today for Tomorrow
aim: zero emissions

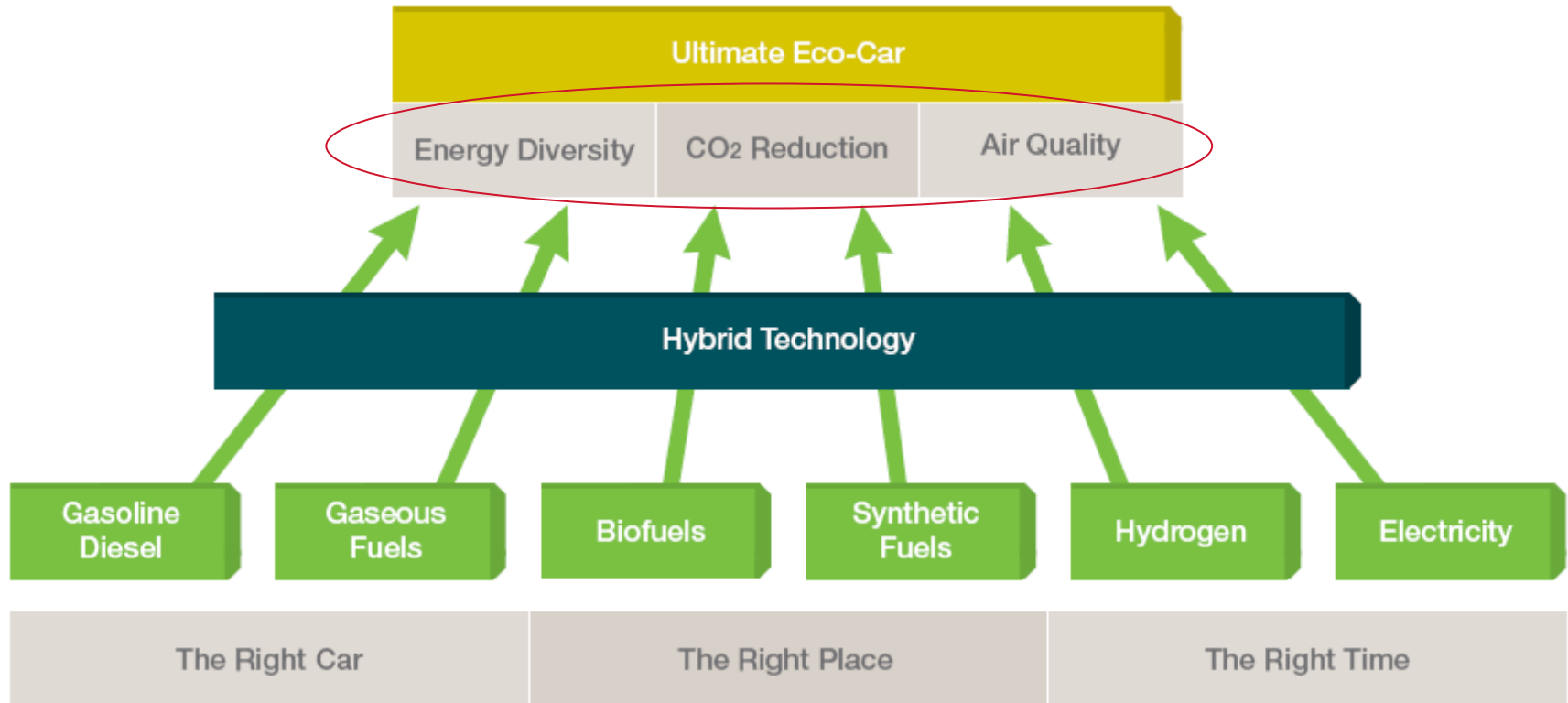


Energy / CO₂ Prioritization Strategy



Same thinking: EU Waste hierarchy

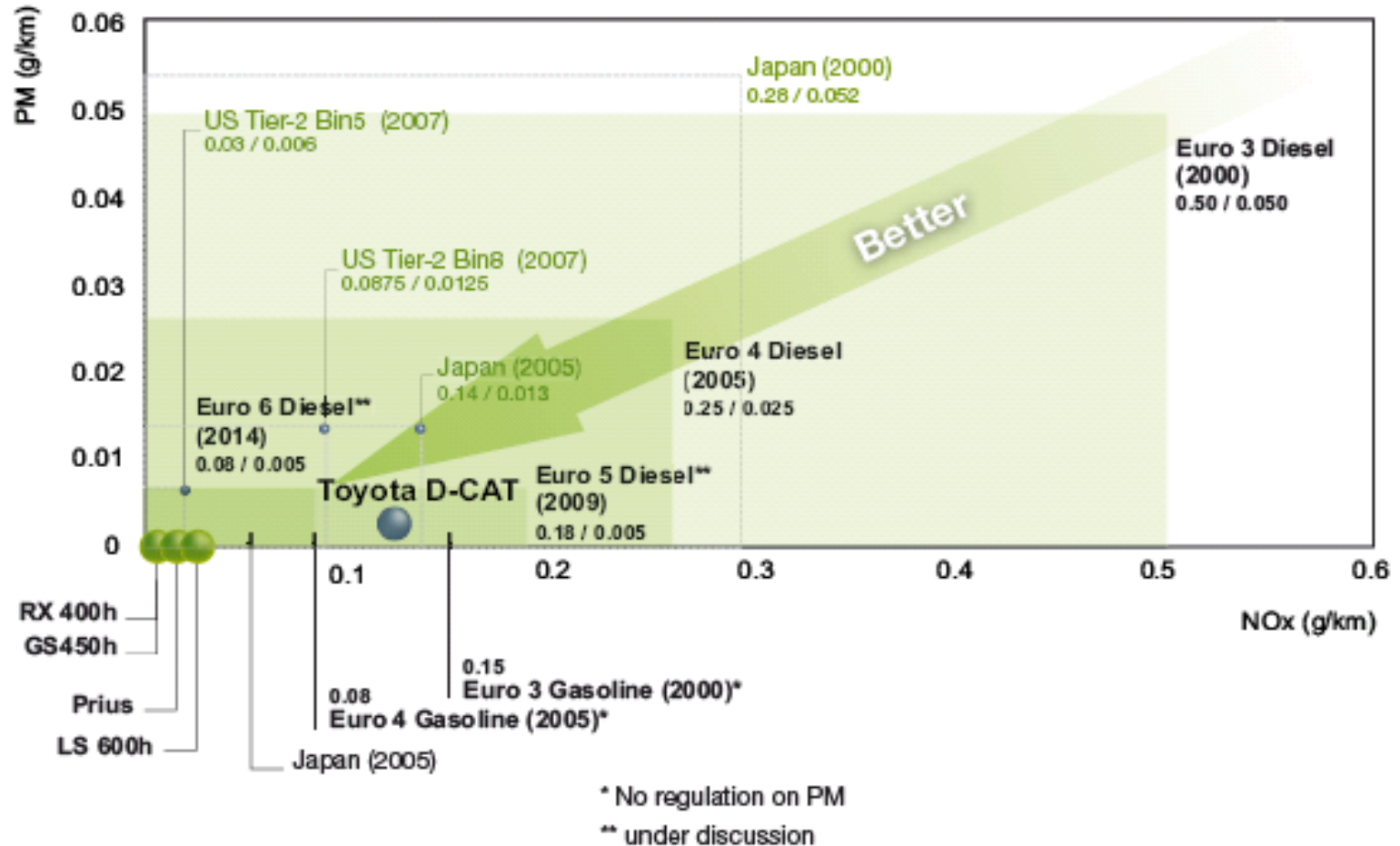
Towards the ultimate 'eco-car' with hybrid as the platform



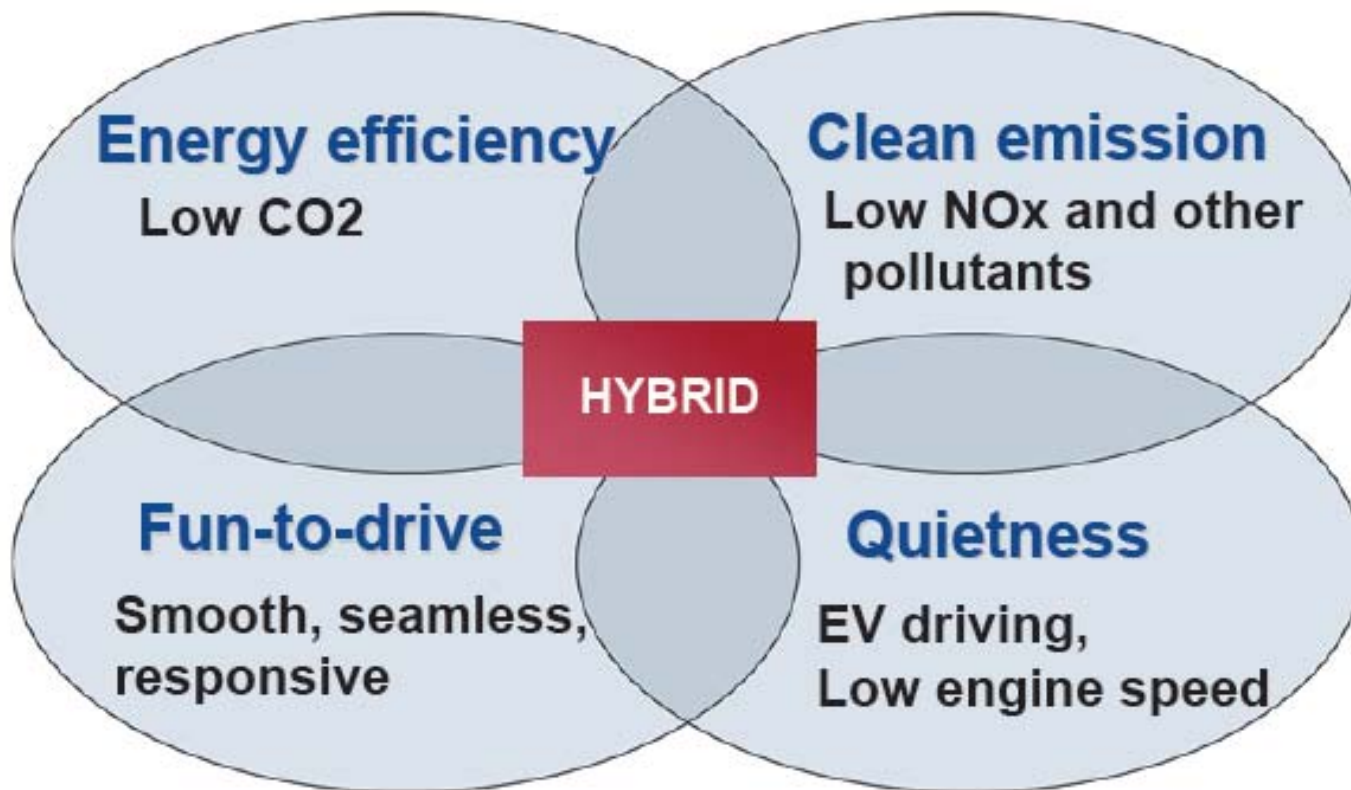
Source: Toyota Motor Europe - Sustainability Report 2007, p. 28

Progress towards low Exhaust Emissions

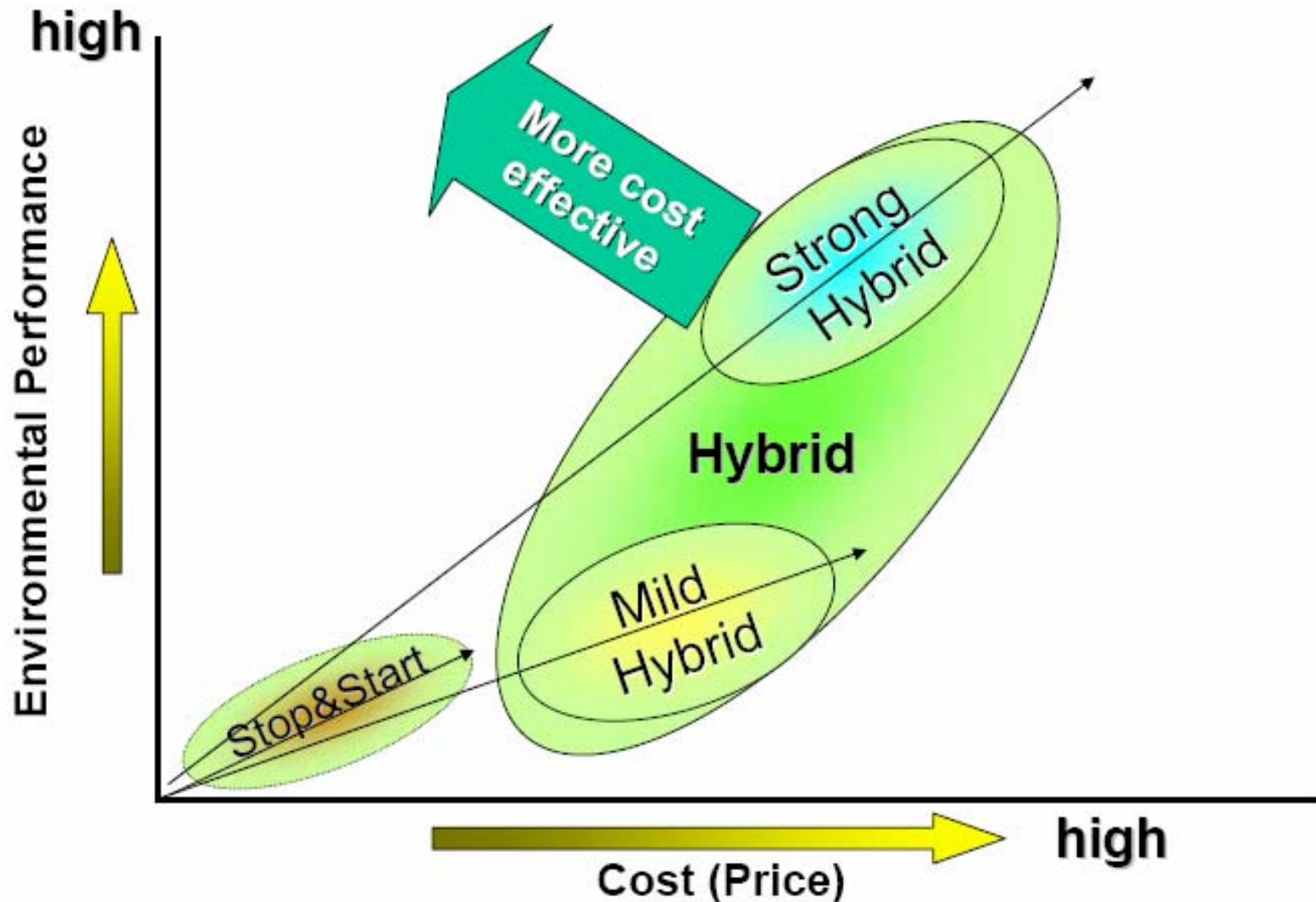
Development of Emission Standards in Europe, Japan and the USA



Hybrid Vehicle Development Targets

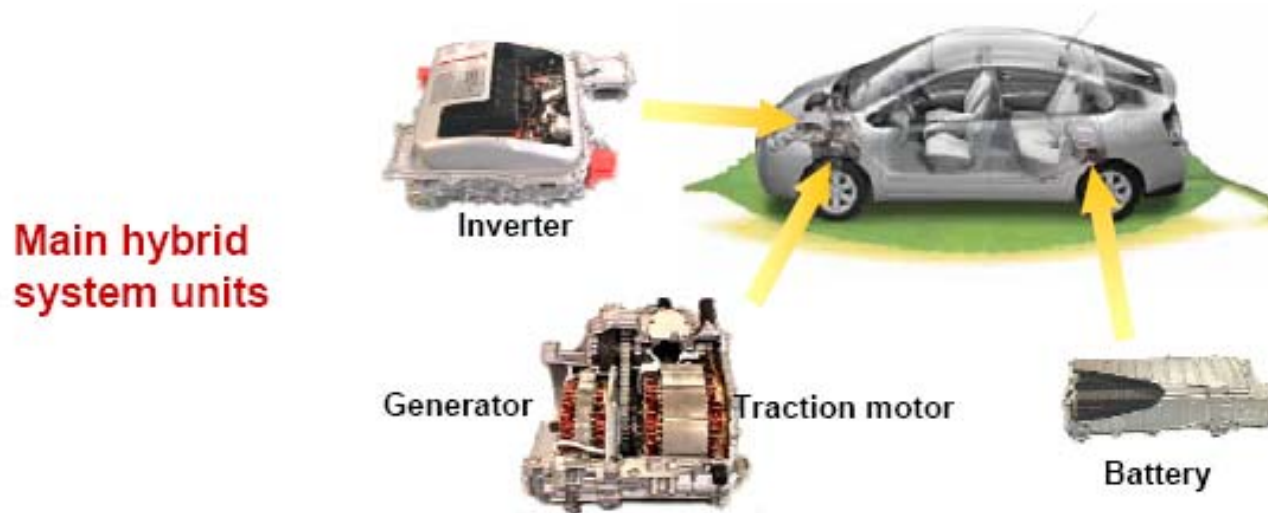


Cost versus Environmental Performance



Evolution of Hybrid Units

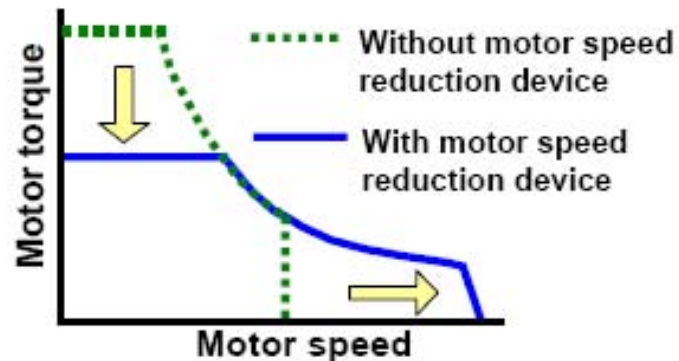
Continuous improvements (KAIZEN) and the challenge to achieve higher performance with smaller and lighter units in other words, improved output density, is a key objective for hybrid development



Motor

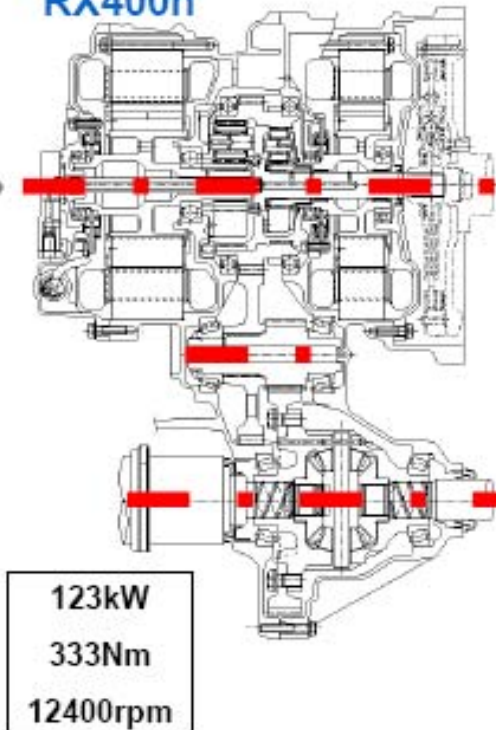
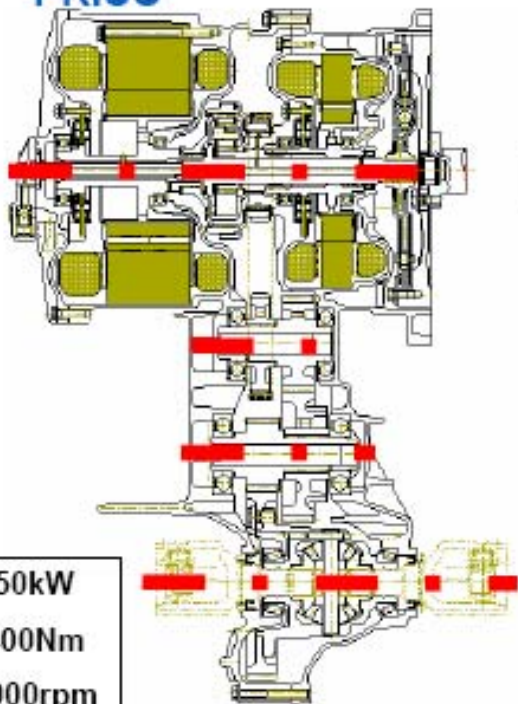
Unit for FWD vehicle

- RX400h
- Camry HV
- Estima HV



PRIUS

RX400h



**Output
increase
to 250%,
same size**

50kW
400Nm
6000rpm

123kW
333Nm
12400rpm

Inverter / Power Control Unit

'97 Prius



'03 Prius



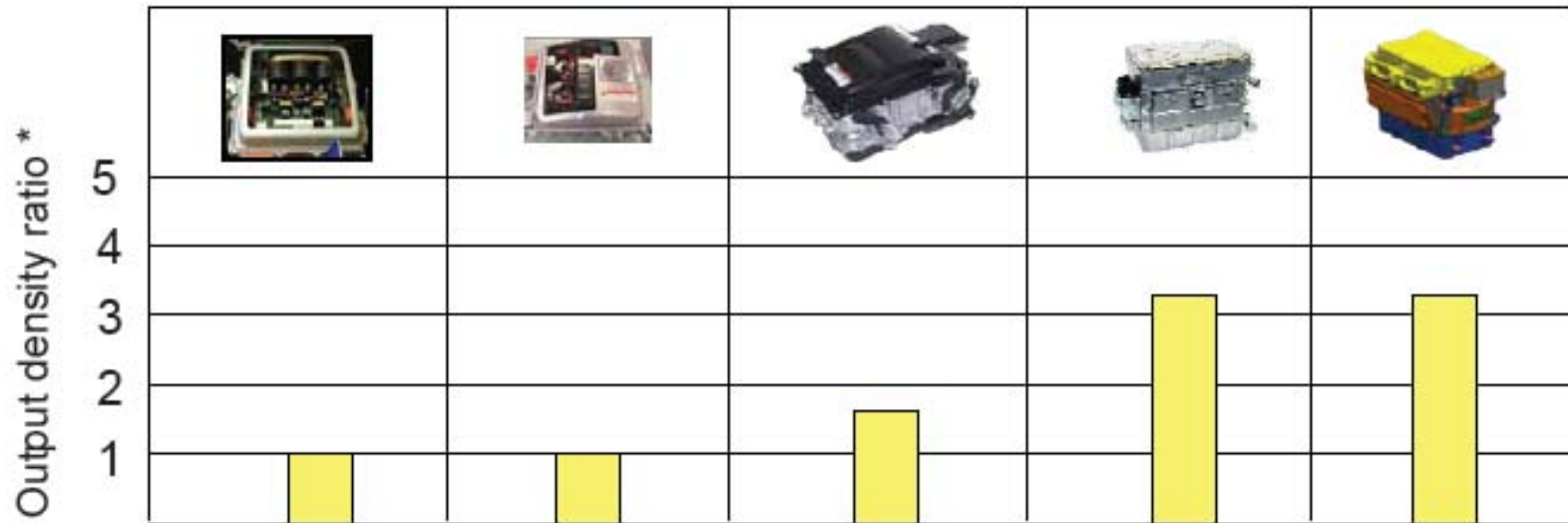
'05 RX400h



'06GS450h



'07LS600h



* Volumetric base

Inverter / Power Control Unit








GS450h vs RX400h:

Weight reduction -43%

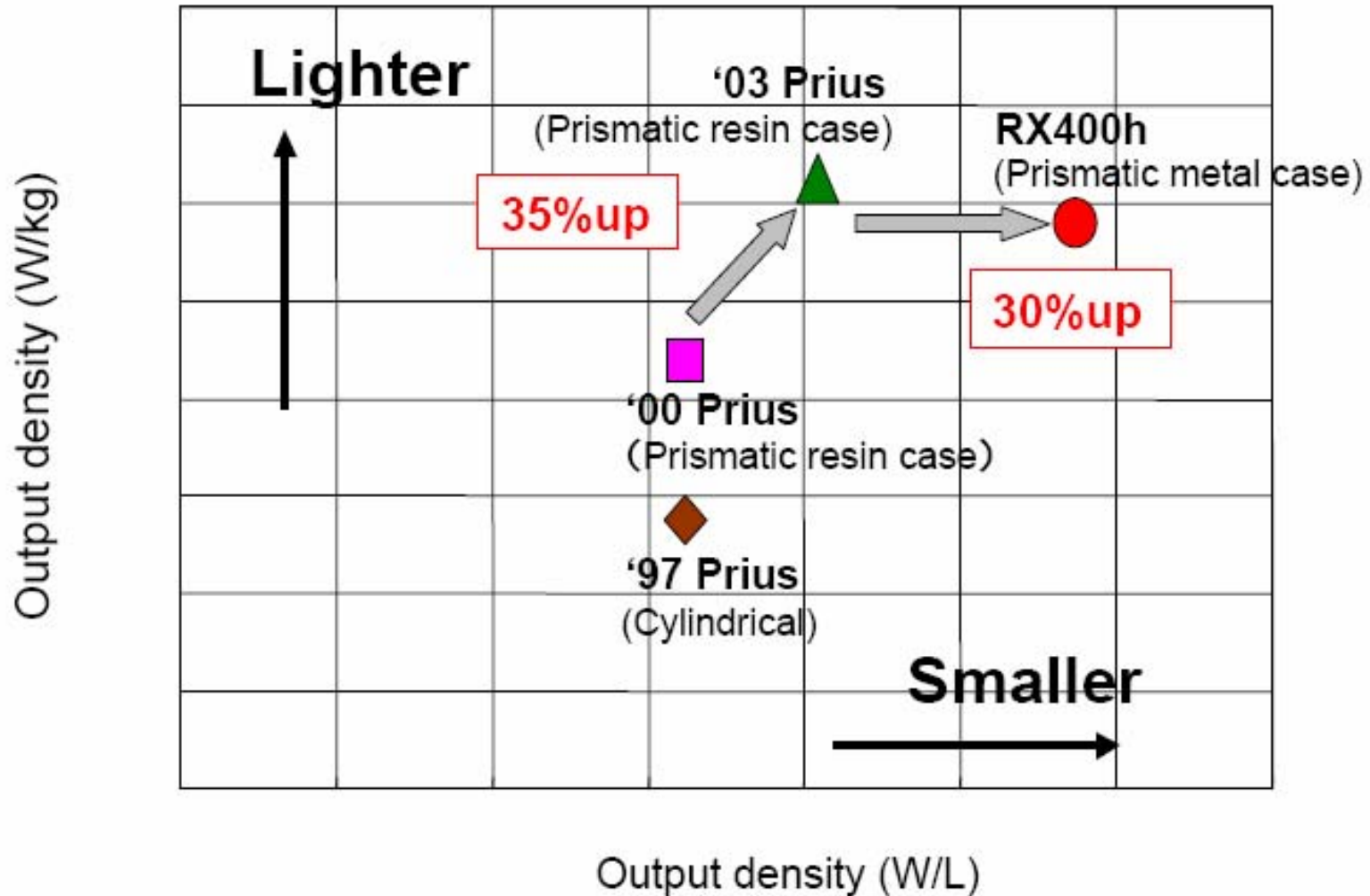
Volume reduction -63%



Battery

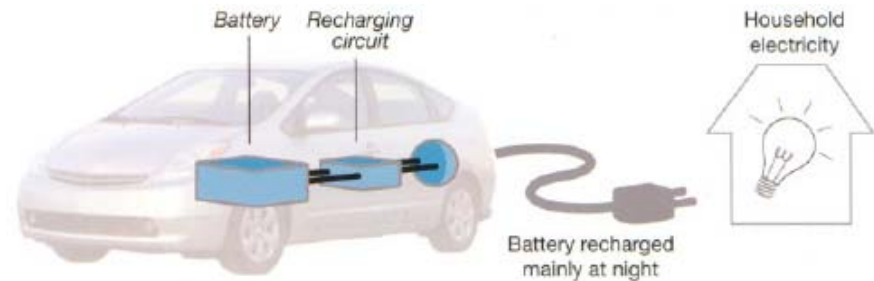
	'97	'98	'99	'00	'01	'02	'03	'04	'05	'06	'07
HV		'97 Prius			'00 Prius			'03 Prius			
Battery module	Cylindrical			Prismatic			New prismatic resin case				
											
							New prismatic metal case				
							'05 RX400h				
Battery pack											
							New				
											

Battery

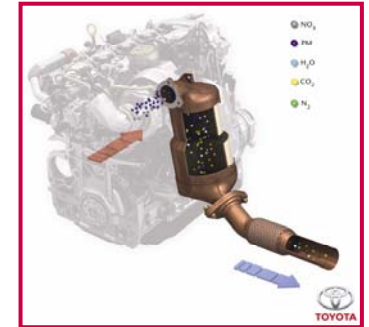
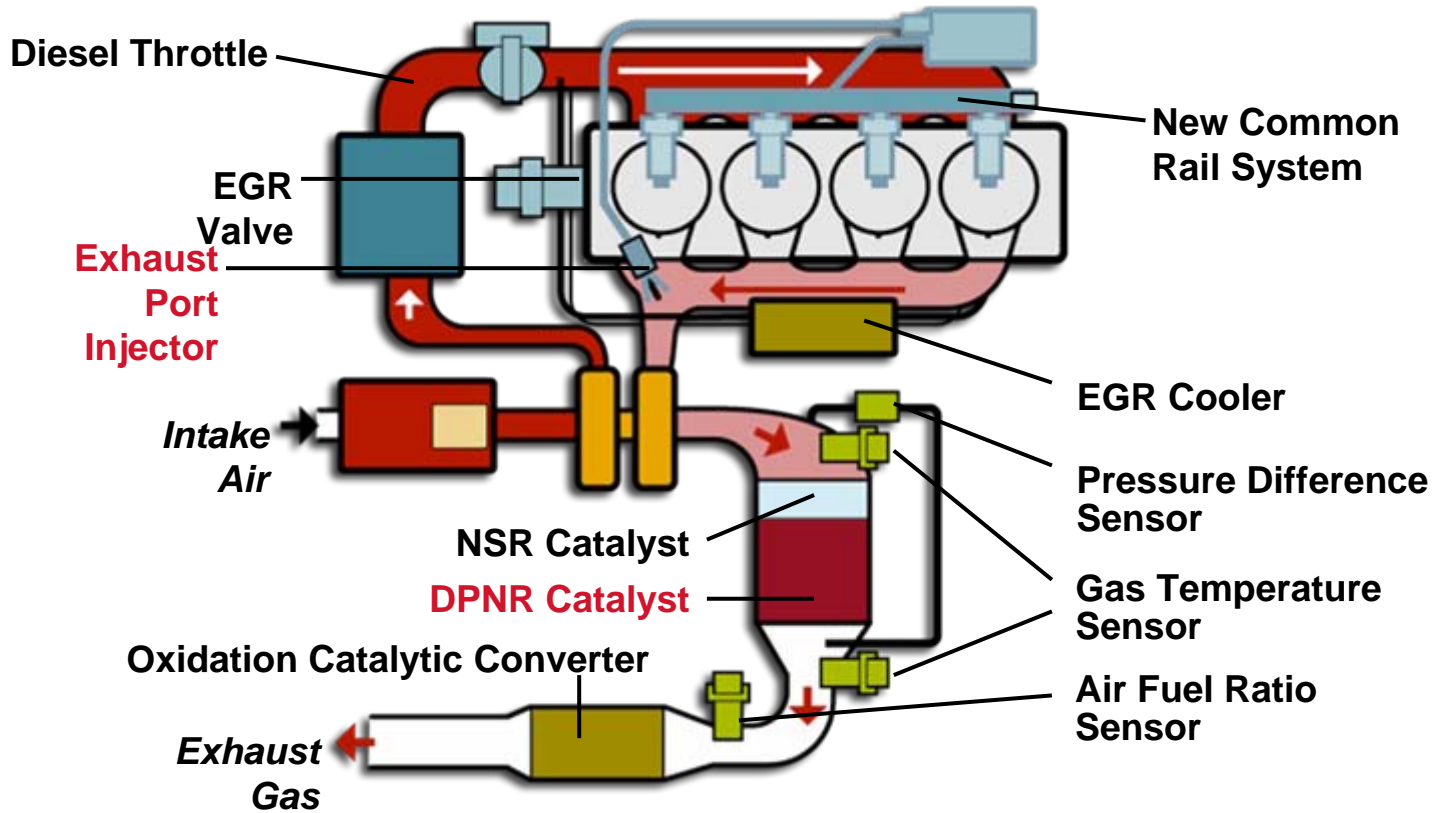


Plug-in hybrid vehicle

A petrol or diesel hybrid vehicle
with an external recharger



Toyota D-CAT

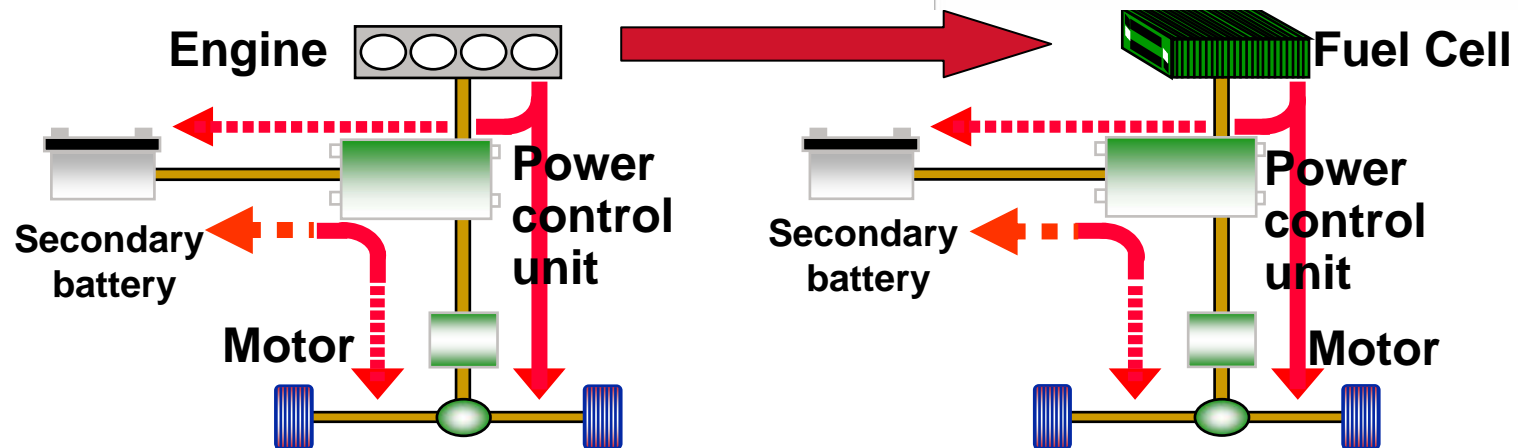


Toyota's Fuel Cell Technology

Prius



FINE-X



Challenges for fuel cell vehicles

Performance in very cold conditions



Startability test



- Achieve starting & driving under -30°C
- Range now proven at 560km on one tank

Personal Mobility for a New Traffic Environment: i-REAL

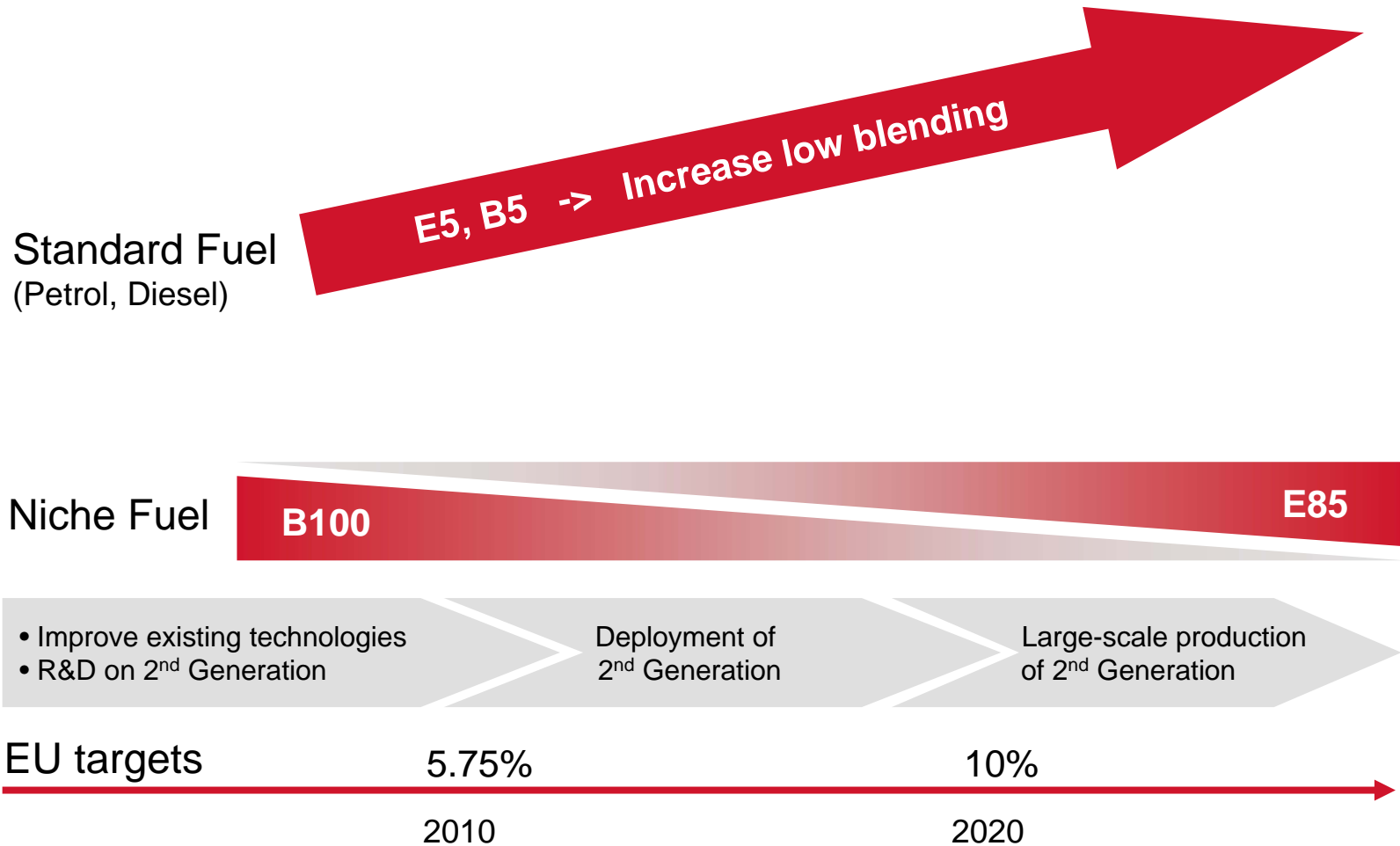


Biofuels – Toyota's stance

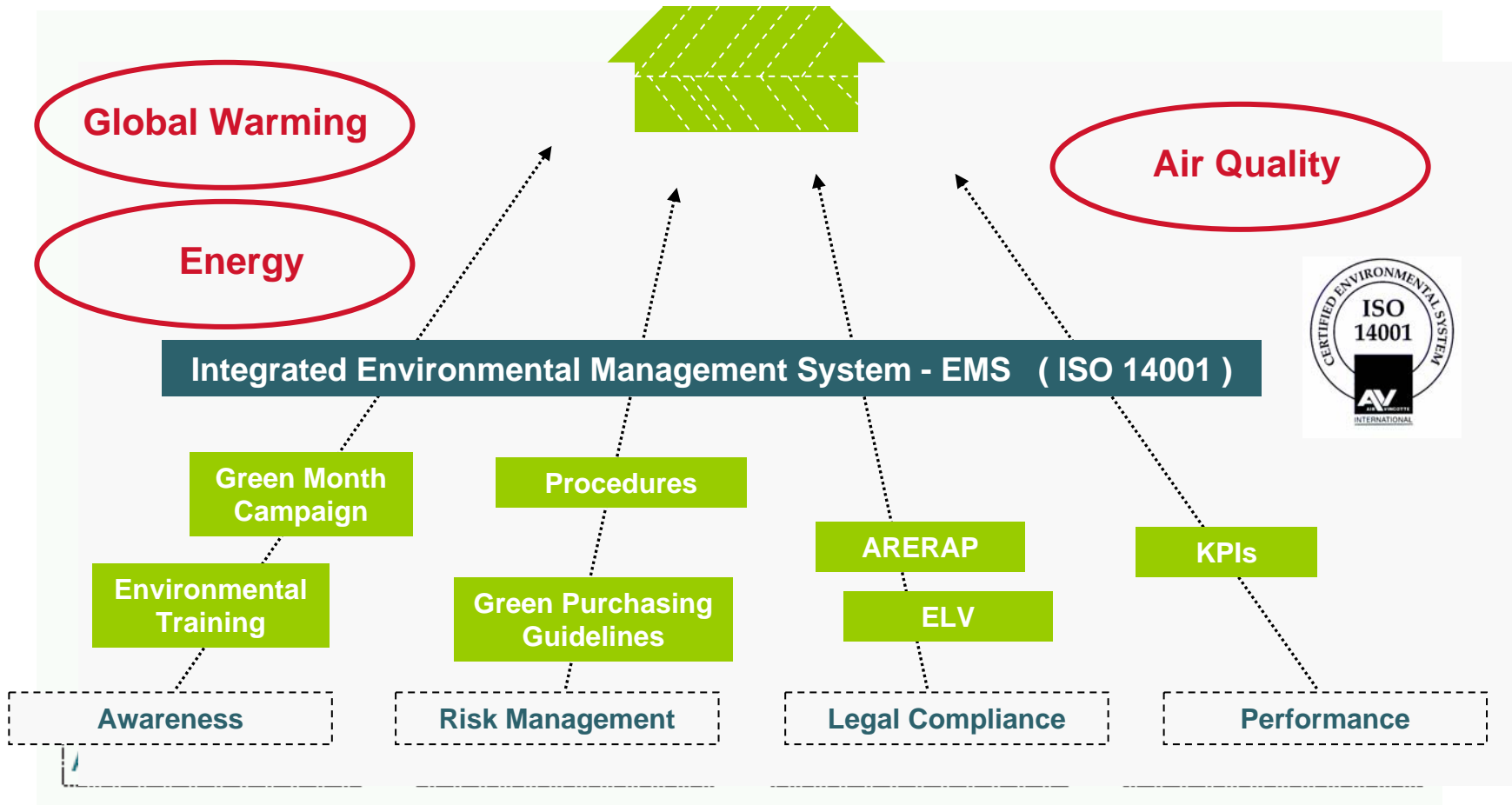


- Allow for 10% ethanol and 5% bio-diesel blending
- Need for clear consumer information and awareness to avoid confusion at the pump & possible problems
- Need for fuel quality standards on alternative fuels
- Flex Fuel Vehicles in certain markets (Brasil, USA)
- Preference is 2nd Generation: better overall CO₂ reduction

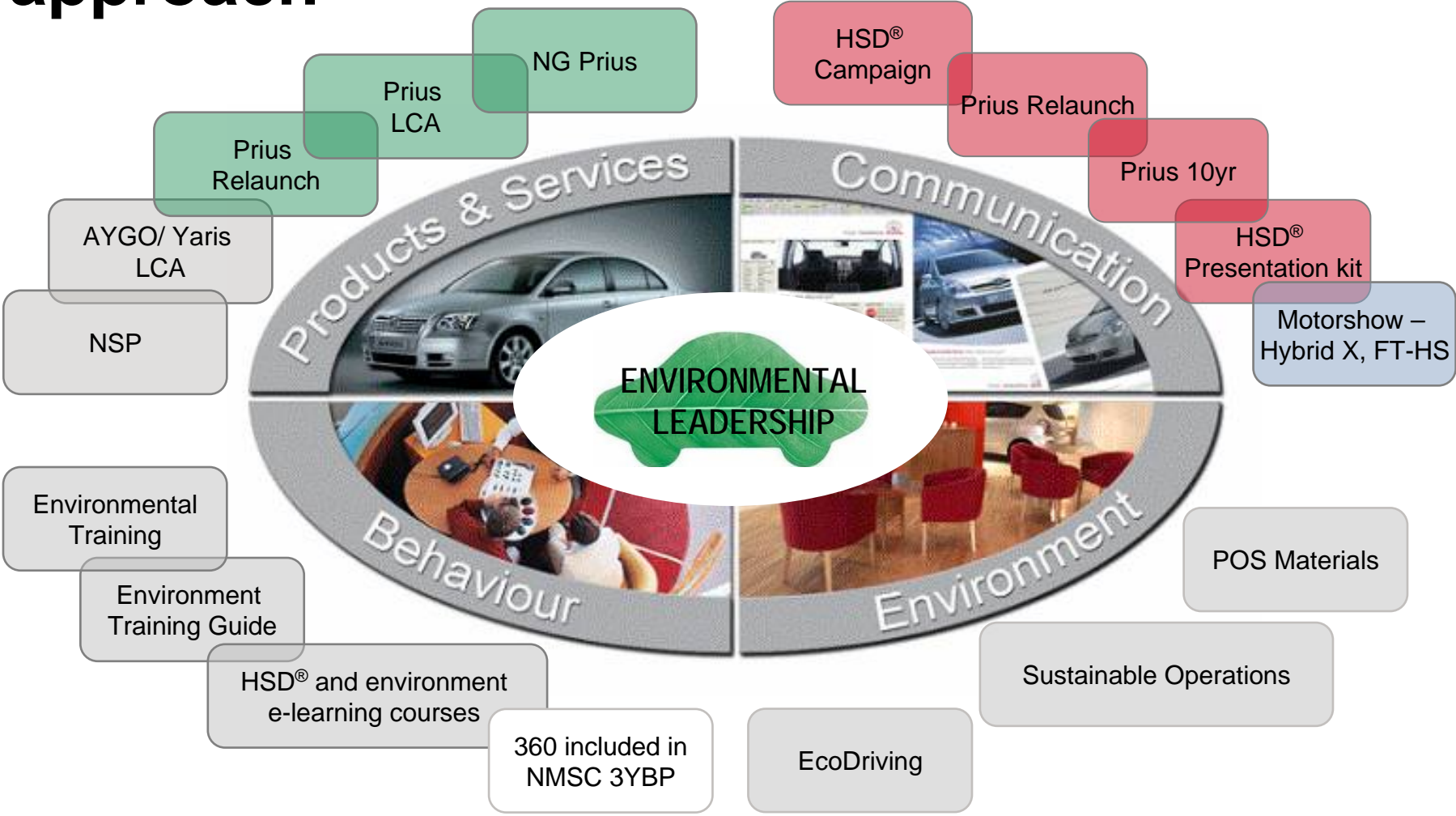
Biofuels development



Towards the Ultimate 'Eco-Company' with EMS as the platform



360° environmental actions: a holistic approach



Sustainable plants: benchmark performance

Using natural resources whilst existing in harmony with natural surroundings



Toyota Plants are 'Green, Clean, Lean

Green, Clean, Lean



Reach top level environmental performance in each country

Aim for the top level of environmental activity
(Voluntary action)

Compliance with laws
(Proactive preventive measures)



All 8 Toyota plants in Europe have ISO 14001

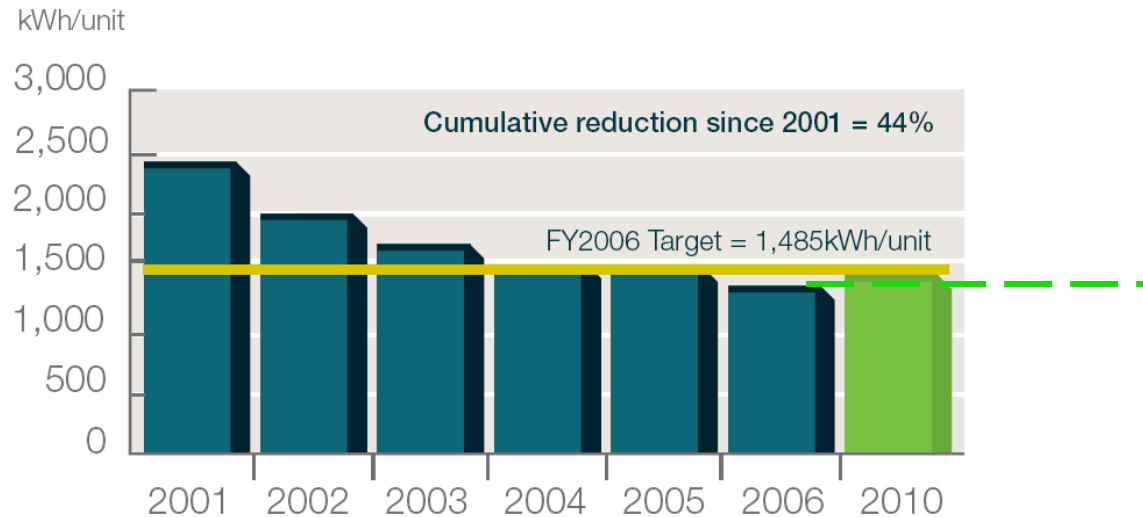
All plants have zero waste to landfill



TMUK plants in Burnaston and Deeside



Energy use per vehicle produced has been reduced by 44 % since 2001



We are currently at 1,332 kWh/car

Consolidated Data						
Fiscal Year	2001	2002	2003	2004	2005	2006
Number of Plants Included	4	5	5	5	5	7
Data (kWh/unit)	2,424	1,949	1,697	1,560	1,536	1,332

'Greening' our network of European retailers



Our retailer vision in France

Support for EcoDriving

Gear Shift Indicator (manual transmission)



Indicates gear shift point for good fuel economy drive

Eco Drive Indicator (Automatic transmission, CVT)



ECO

Indicates good fuel economy condition

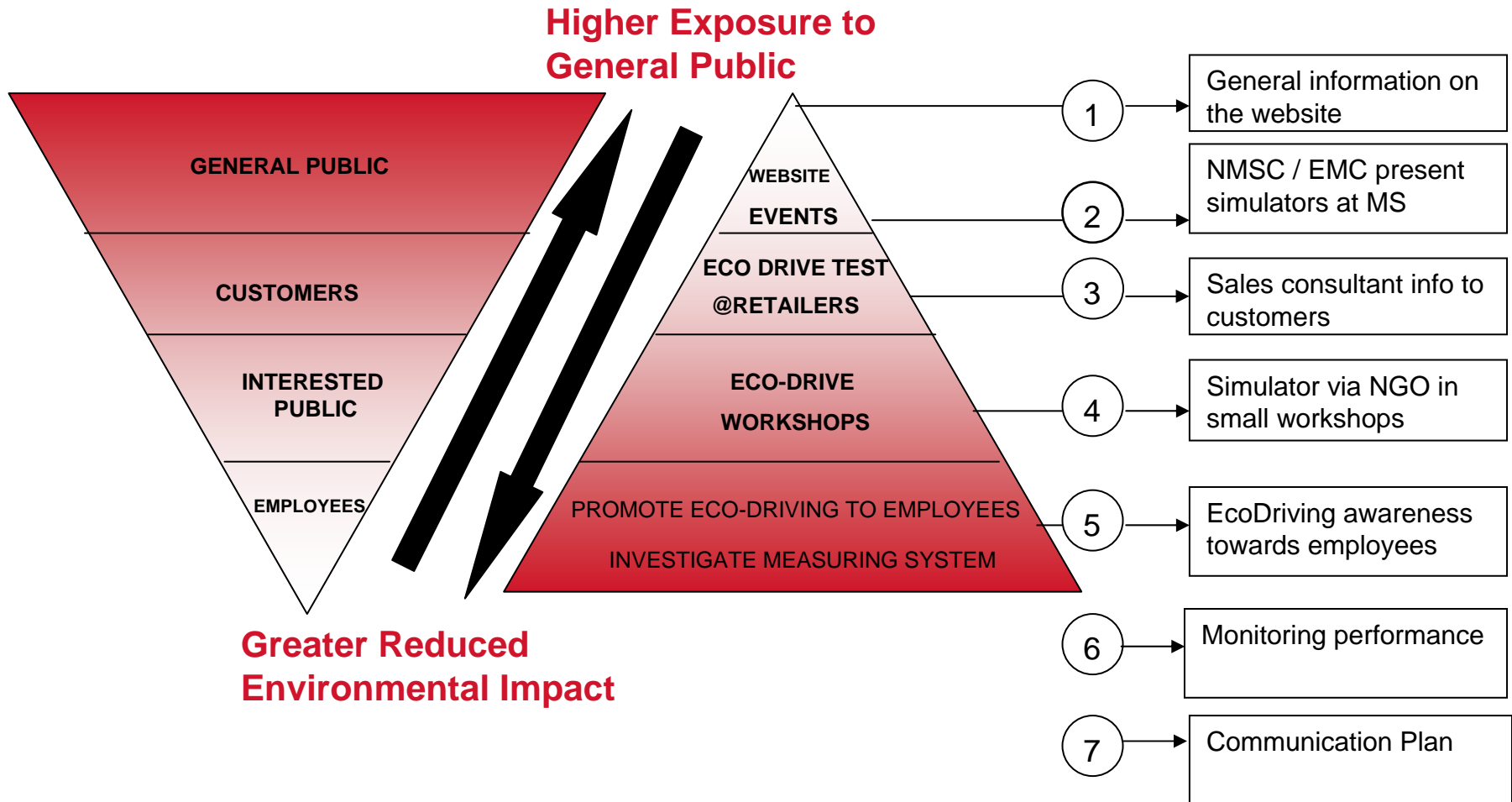
**Momentary FE
11.4km/L**

Indicates momentary fuel economy value



Driver education program

EcoDriving Strategy



Conclusion: Toyota's viewpoint

- As a responsible company we have the culture & technology to simultaneously increase sustainable mobility and reduce the environmental impact of our activities
- As a company with long-term prospectives we invest in R&D and work simultaneously on many technology options
- By strengthening co-operation amongst stakeholders and the right mind-set can we overcome the challenges of climate change

Thank you for your kind attention !

A large, leafy tree stands in a grassy field under a blue sky with scattered clouds. The trunk and lower branches of the tree are formed by several people lying on the ground and standing on their hands, creating a human-made structure that supports the natural tree. The scene is set in a rural landscape with other trees and hills in the background.

aim: zero emissions

We are committed to preserving the delicate balance between man and nature. We've come a long way since we launched our first hybrid car 10 years ago. But our goal goes beyond reducing exhaust emissions. We apply innovative environmental solutions to every aspect of the vehicle's life cycle, from design, manufacture and use, right through to recycling. It's the only way to reach our ultimate aim: zero emissions.

www.aimzeroemissions.eu

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2008 Symposium – Paris 15-16 May

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Back-up slides