

# Rational Approach for CO<sub>2</sub> Reduction in Transportation Sector

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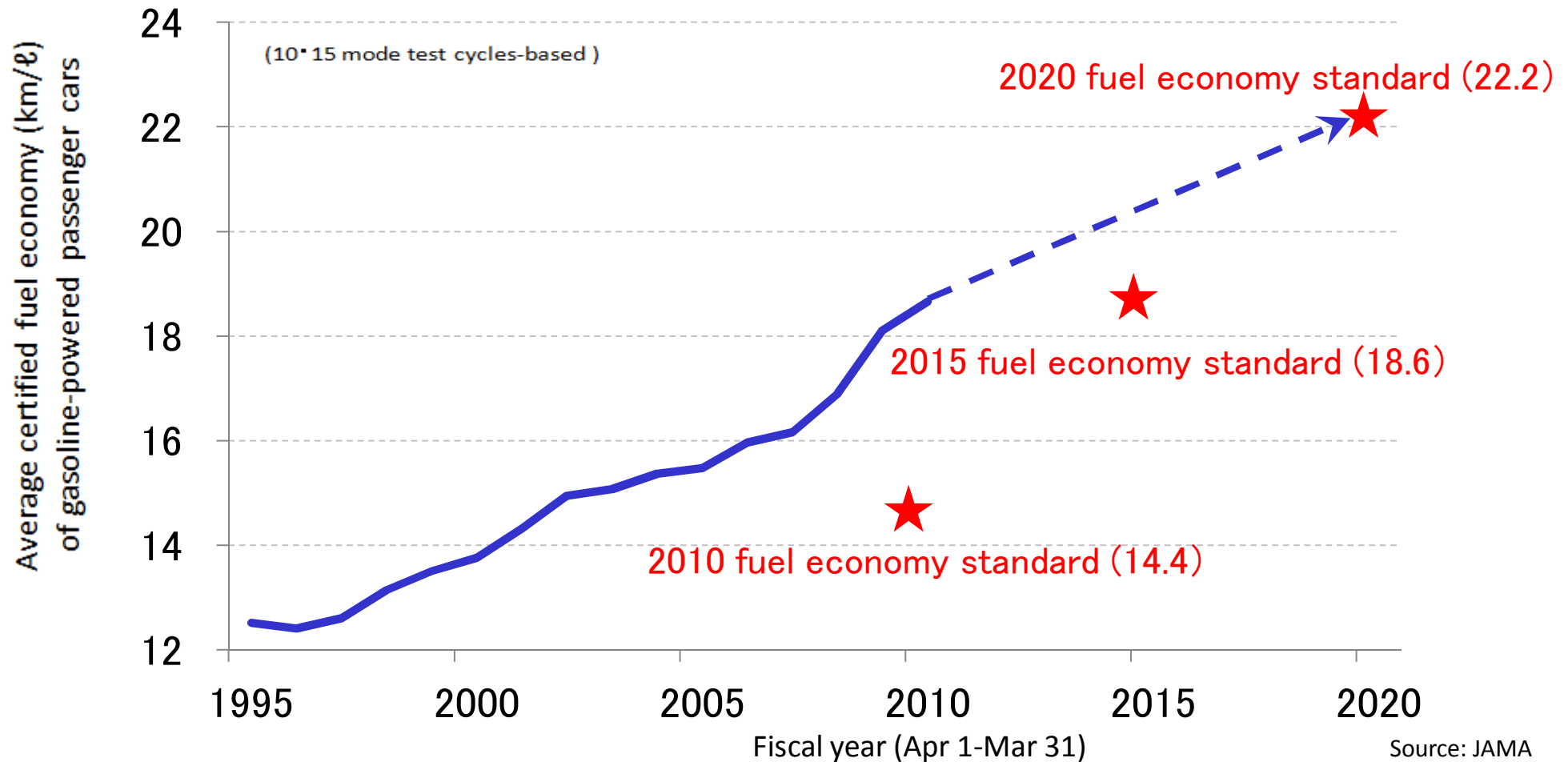
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# 1. Improving Vehicle Fuel Economy

## 1-1. Improving Passenger Car Fuel Economy

- Fuel economy of passenger car has been dramatically improved.
- Japan's automakers will continue to work hard in the effort to meet future fuel economy standard with various fuel economy improving technologies and next generation vehicles.



## 1-2. Vehicle Technologies for Increased Fuel Economy

- Certified as well as on-road vehicle fuel economy has increased as a result of continuous technological progress.

### Improved engine economy

- Improved thermal economy:
- Direct injection
  - Variable mechanisms (variable cylinder activation, VVT&L, etc.)
- Reduction of friction loss:
- Reduction of piston and piston ring friction loss
  - Low-viscosity lubricating oil

### Reduced aerodynamic drag

- Improved body configuration

### Reduced vehicle weight

- Expanded use of lightweight materials
- Improved body structure



### Other

- Electric power steering
- Idling prevention (stop-start)
- Hybridization

### Improved drivetrain performance

- Expansion of lock-up area
- Expanded number of transmission gears
- Continuously variable transmission

### Reduced rolling resistance

- Low rolling-resistance tires

## **2. Status of Alternative-Energy/ Next-Generation Vehicle Use**

## 2-1. Alternative-Energy/Next-Generation Vehicles

- Alternative-energy/next-generation vehicles provide an effective means of reducing CO<sub>2</sub> emissions.
- As such, these vehicles are highly promising in terms of achieving low-carbon road transport and promoting energy conservation.
- The automakers are therefore accelerating their development of these vehicles.



Flex-fuel vehicles  
(gasoline/ethanol)



Electric vehicles



Hybrid vehicles



Fuel cell vehicles



Natural gas vehicles



Plug-in hybrid vehicles



Clean diesel vehicles

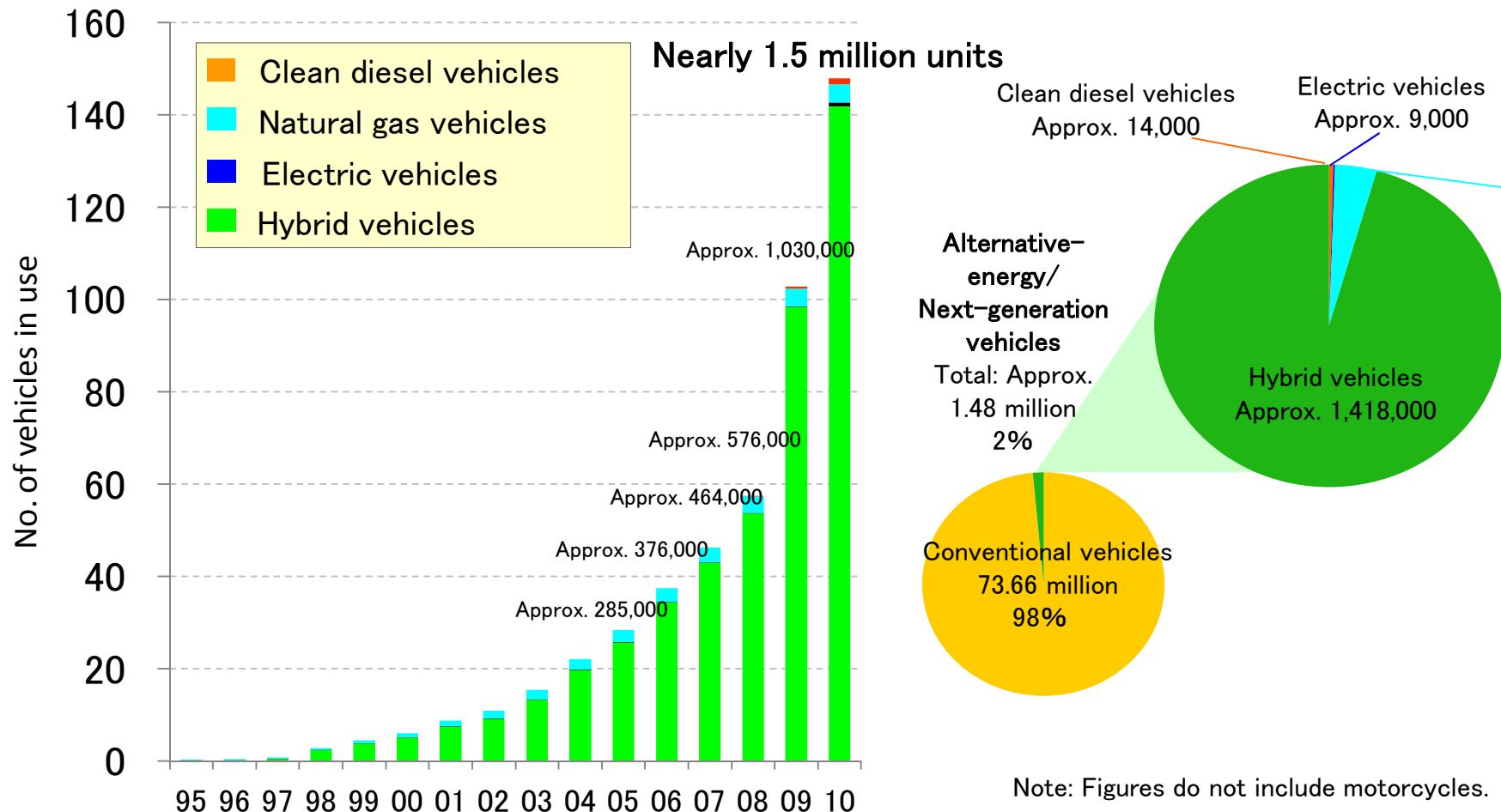


Hydrogen vehicles

## 2-2. Current Status of Alternative-Energy/Next-Generation Vehicle Use

- Currently there are about 1.5 million alternative-energy/next-generation vehicles in use in Japan, accounting for only 2% of all the motor vehicles on the road in Japan today.
- Various measures are needed to promote their widespread use in the years ahead.

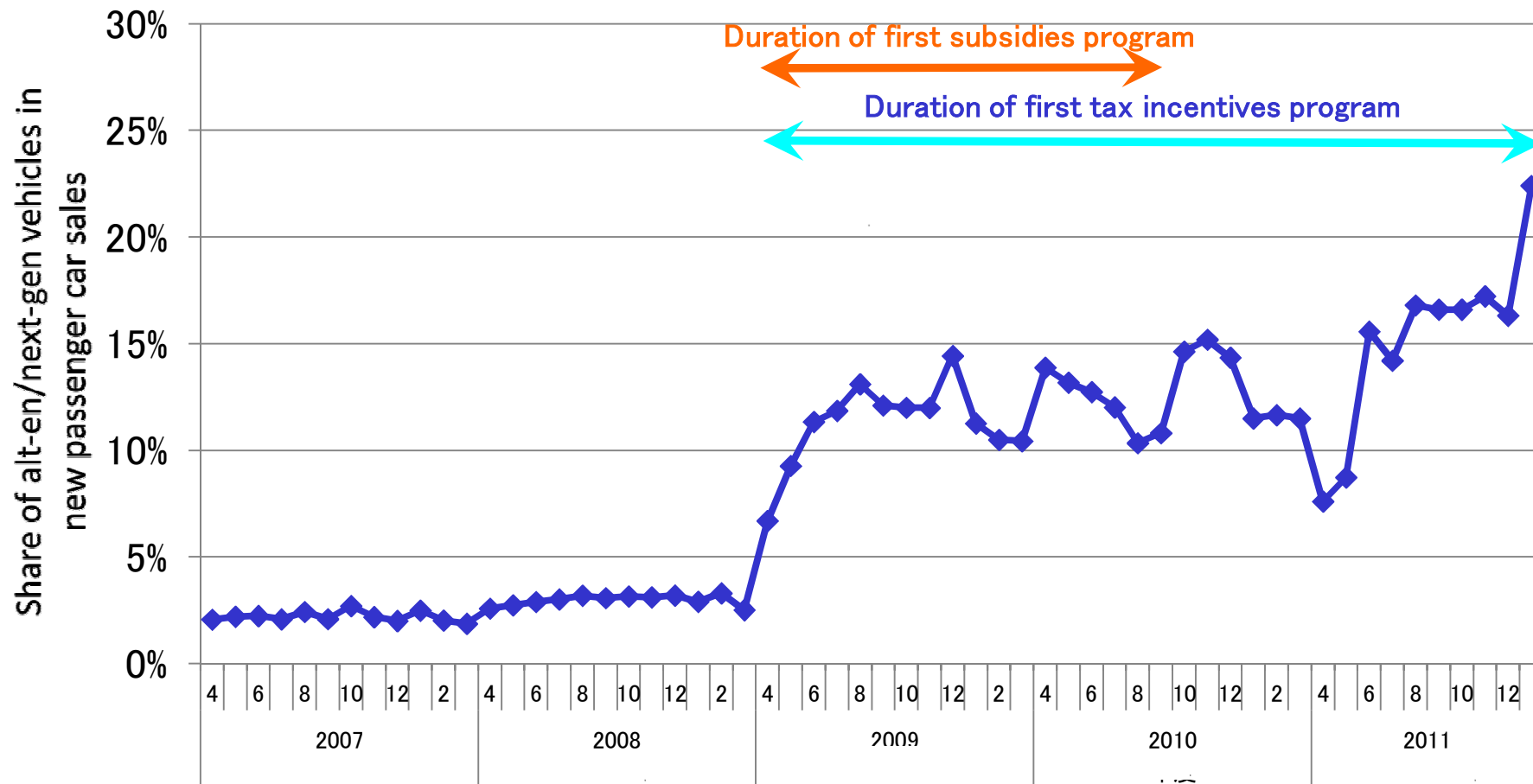
(x 10,000 units)





## 2-3. Impact of Government Eco-Friendly Vehicle Purchasing Incentives on Sales of Alternative-Energy/Next-Generation Passenger Cars

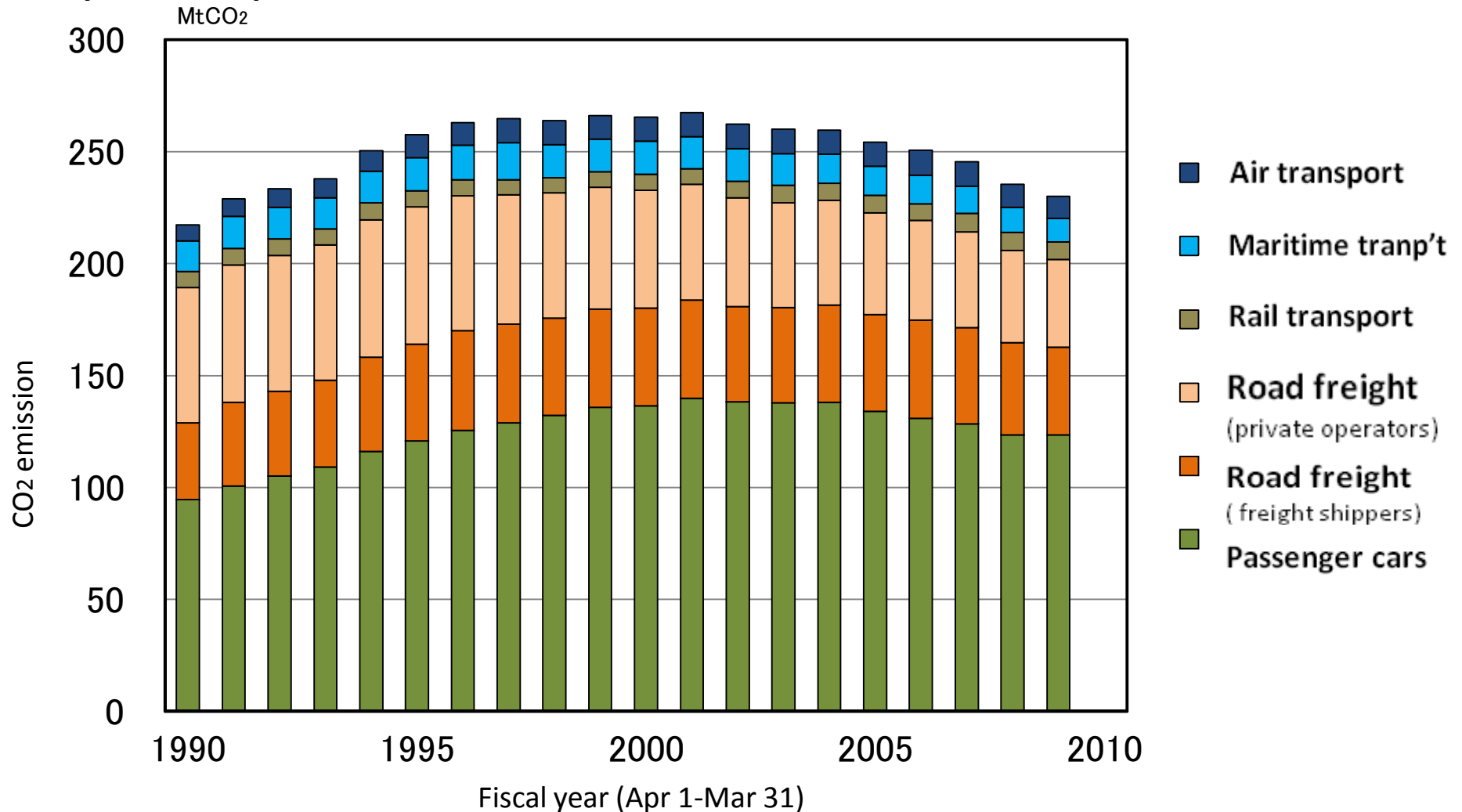
- Sales of alternative-energy/next-generation vehicles expanded to a roughly 15% average share of the new passenger car market as a result of the Japanese government's original purchasing subsidies and tax incentive programs. These programs are scheduled to resume in 2012.



### **3. Reducing CO<sub>2</sub> Emissions through the Integrated Approach**

## 3-1. Trends in CO<sub>2</sub> Emission in Japan's Transport Sector

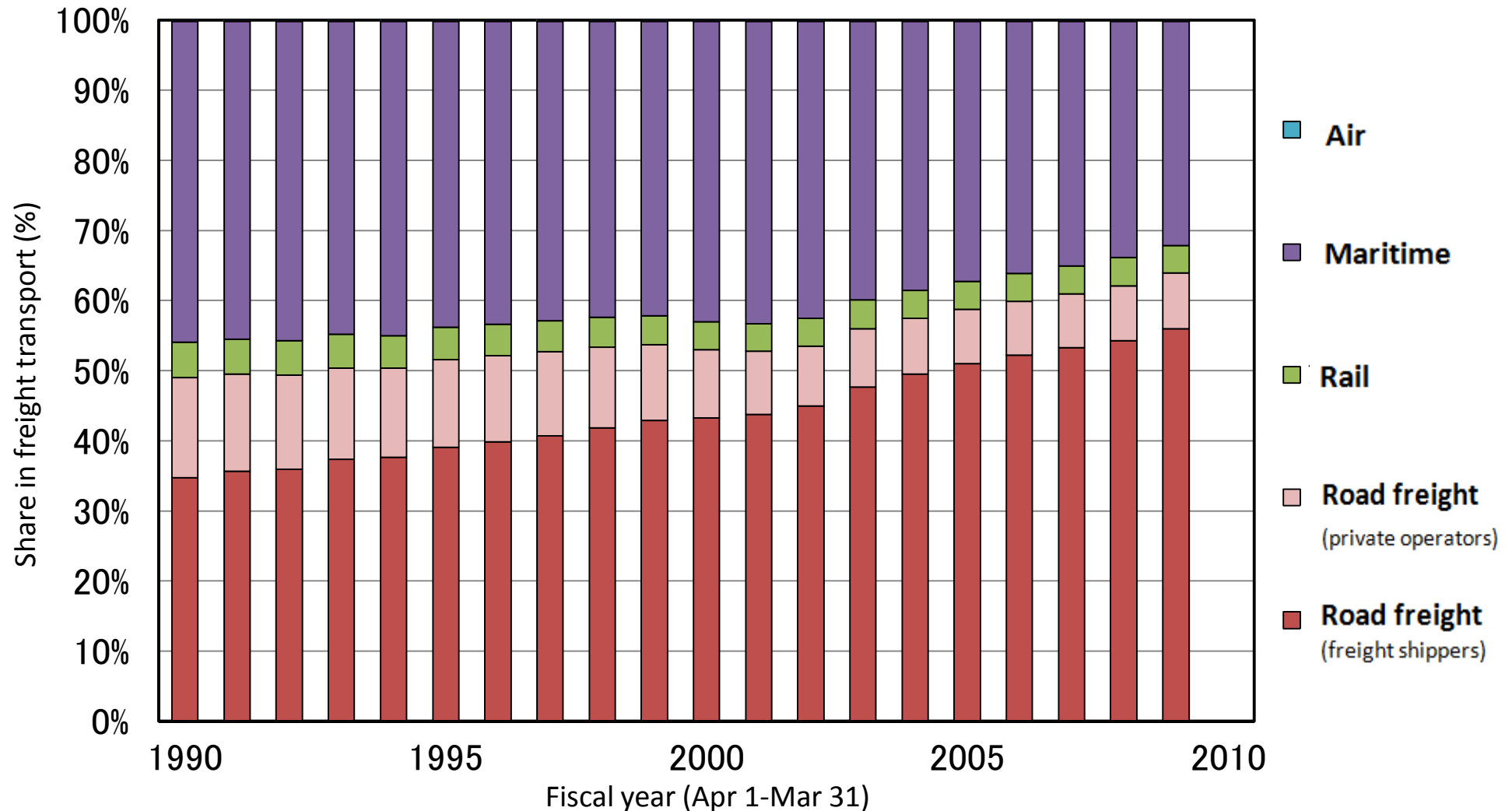
- Passenger cars and trucks have shown the most marked declines in CO<sub>2</sub> emissions in Japan's transport sector.



Source: Proceedings of the 28<sup>th</sup> Conference on Energy, Economy, and the Environment (Tokyo, Jan. 2012)

## 3-2. Breakdown of Japan's Freight Transport Sector by Mode

- Truck use has expanded in the road freight segment in response to diversification in freight transport.



Source: Proceedings of the 28<sup>th</sup> Conference on Energy, Economy, and the Environment (Tokyo, Jan. 2012)

### 3.3 Trends in Truck CO2 Emissions

- Greater economy in freight transport has contributed significantly to CO2 reduction in the transport sector, and more improvements in transport economy are projected.

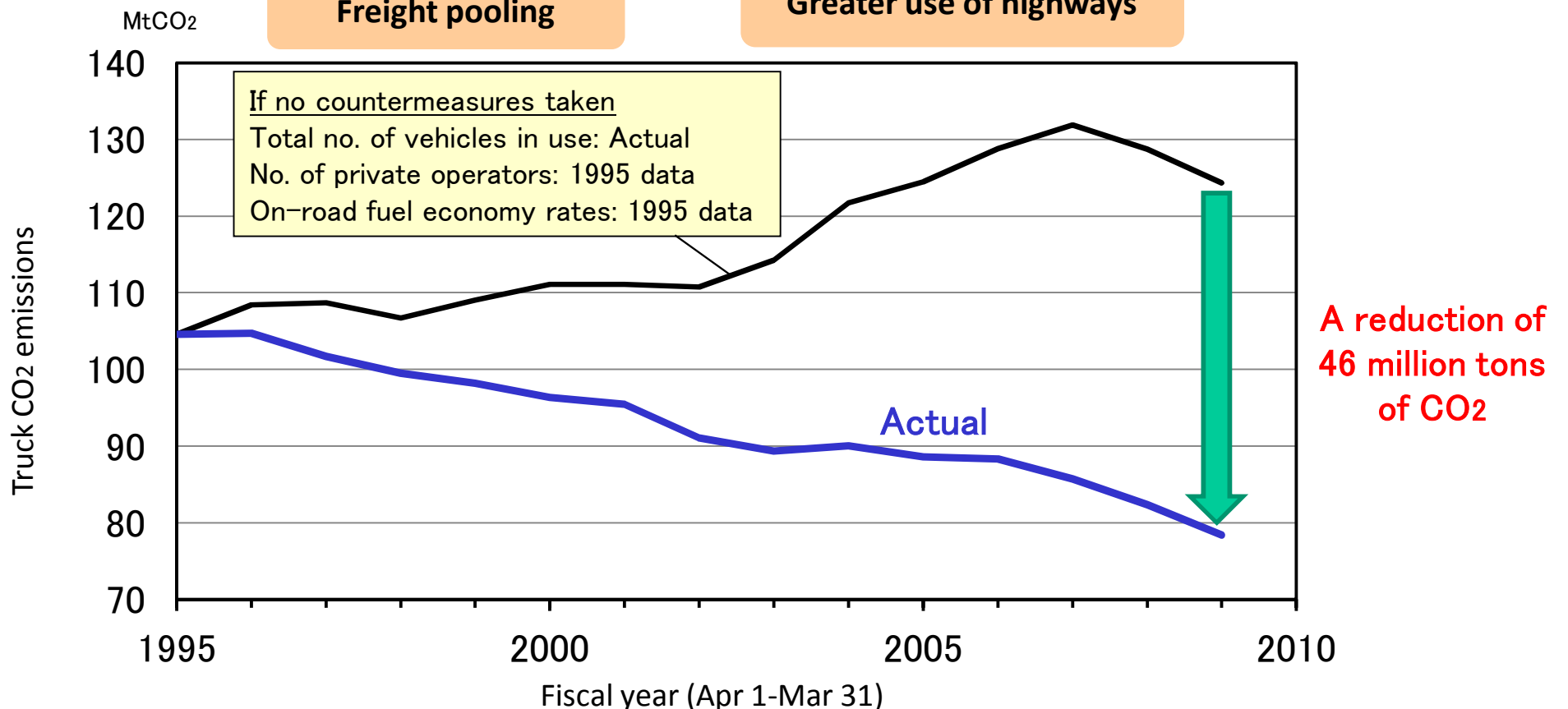
Shift from private operators to commercial freight shippers

Use of ecodrive support tools

Higher loading rates

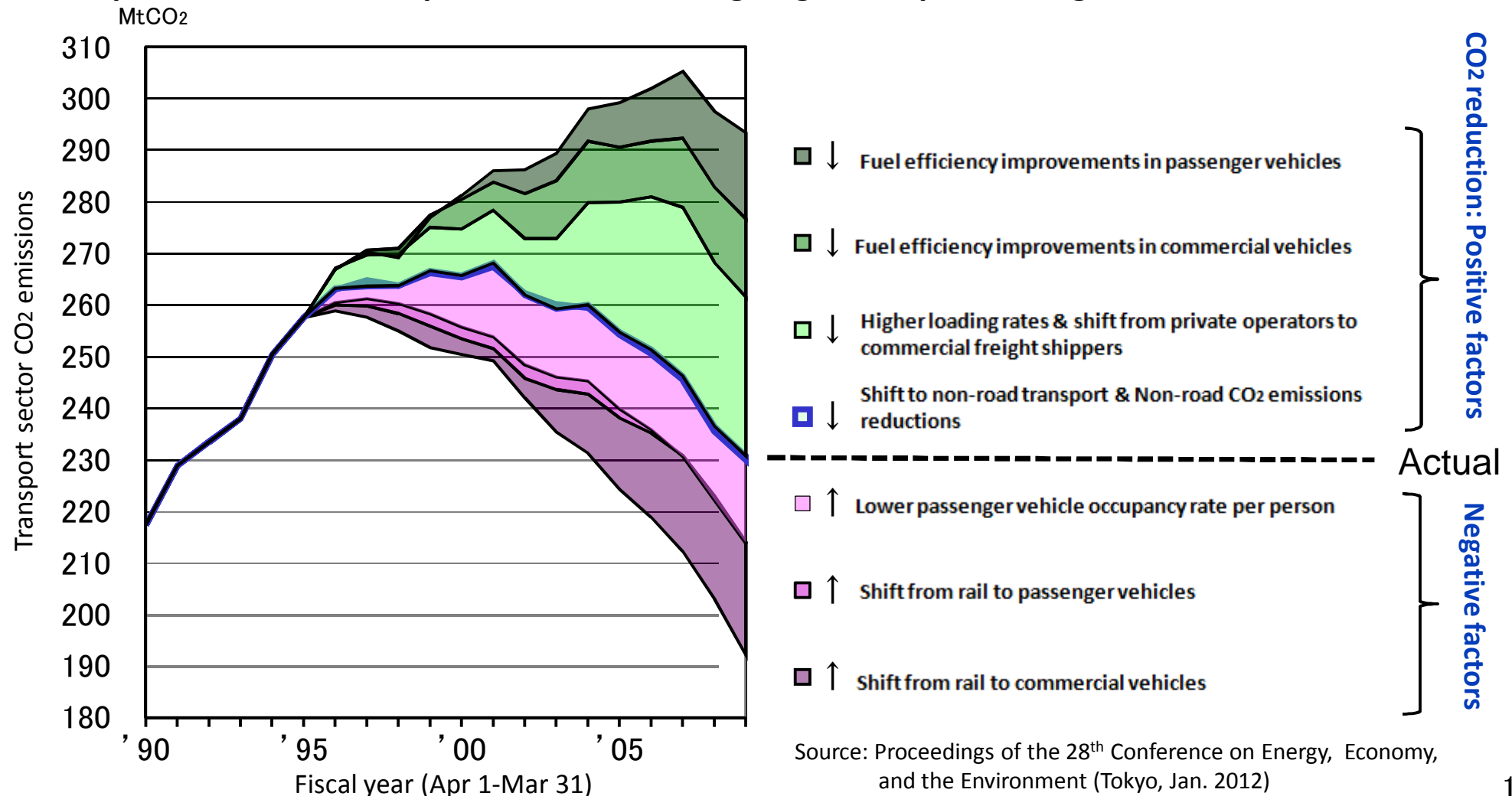
Freight pooling

Greater use of highways



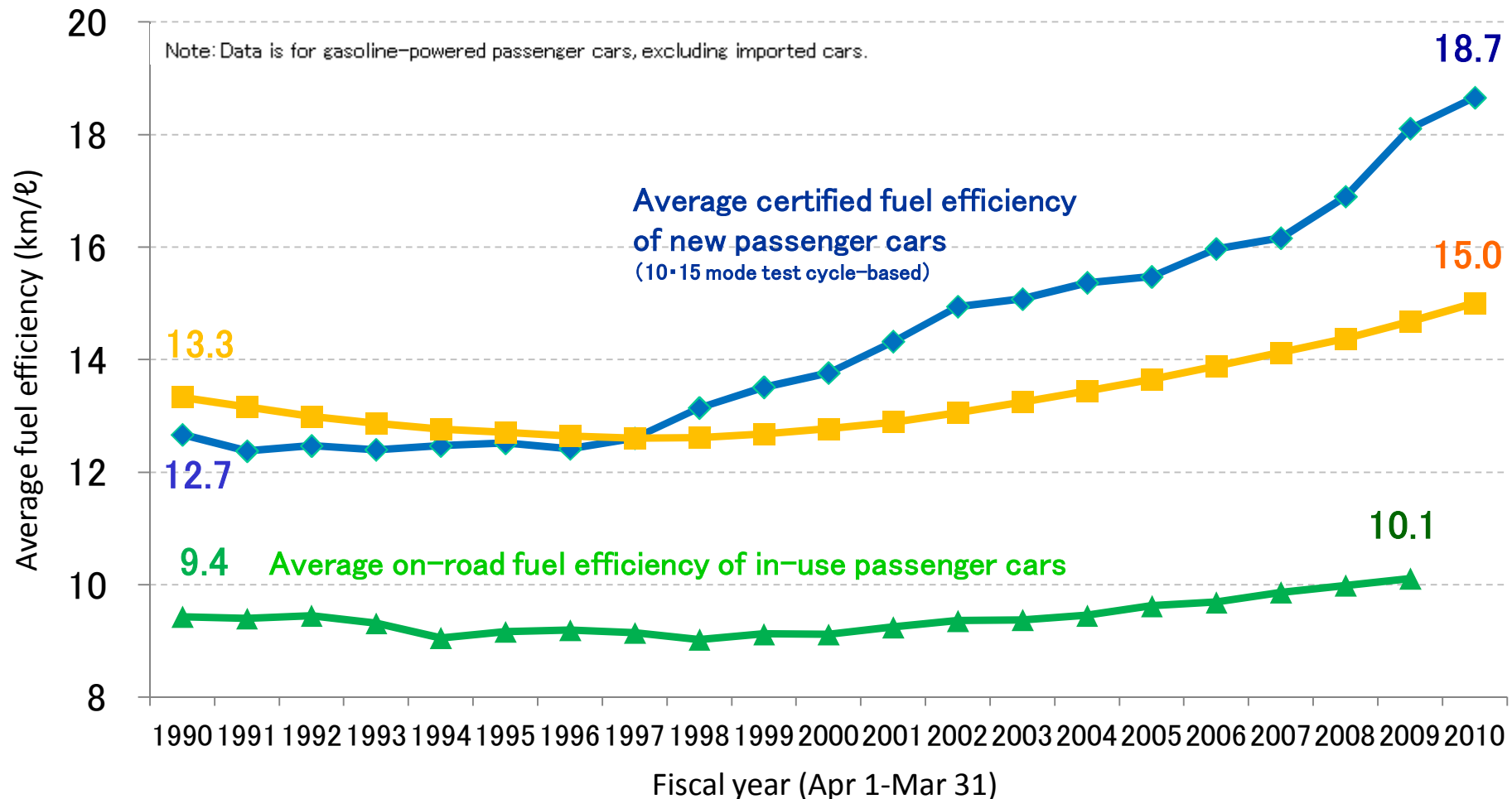
### 3-4. Factors Contributing to CO2 Emission Levels in the Transport Sector

- **Modal shifts in transport as well as pooling and higher loading rates in freight transport, among other factors, have contributed to the significant reductions achieved in Japan's transport sector over the past decade, outweighing the impact of negative factors.**



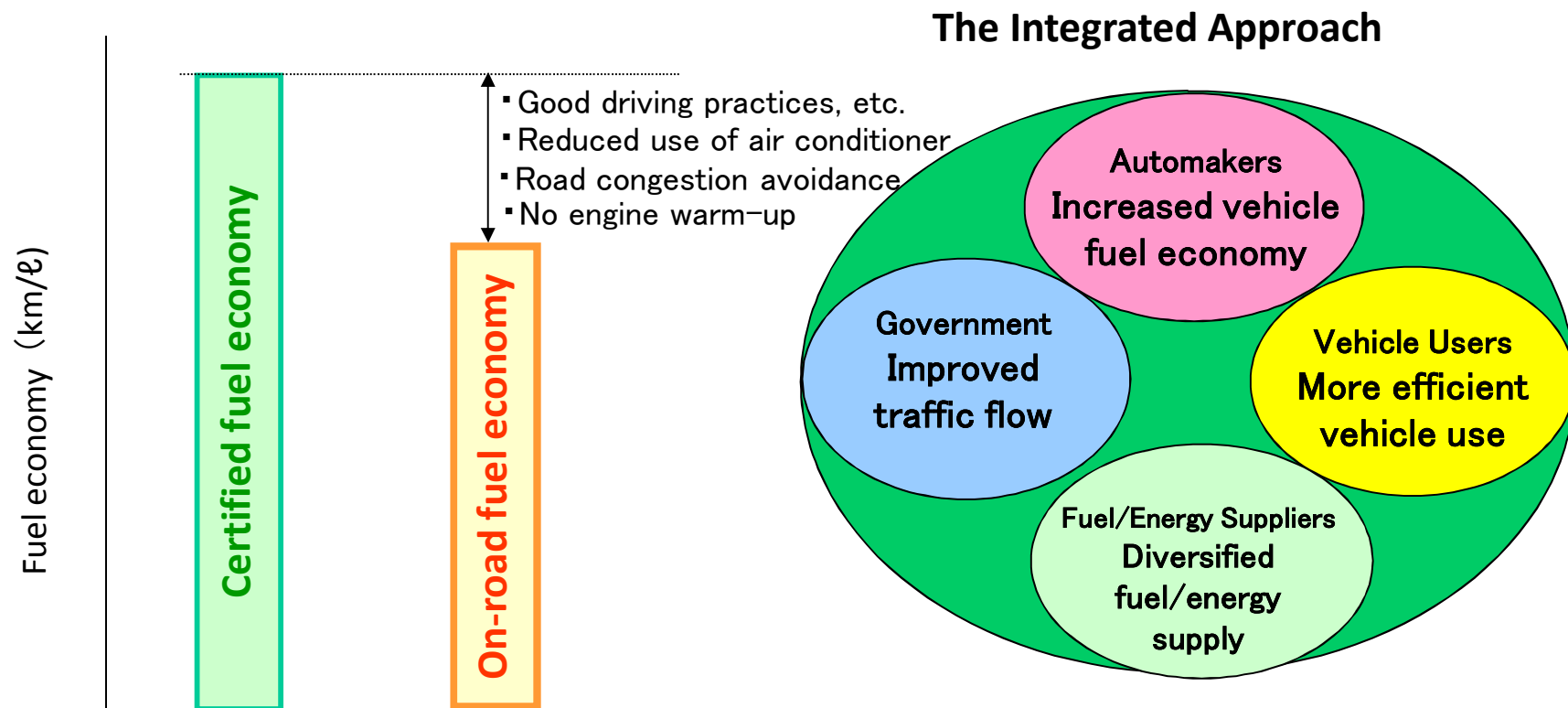
## 3-5. Trends in the Average Fuel Economy of Passenger Cars

- On-road fuel economy is roughly 30% lower than certified fuel economy.



## 3-6. Increasing On-Road Fuel Economy through the Integrated Approach

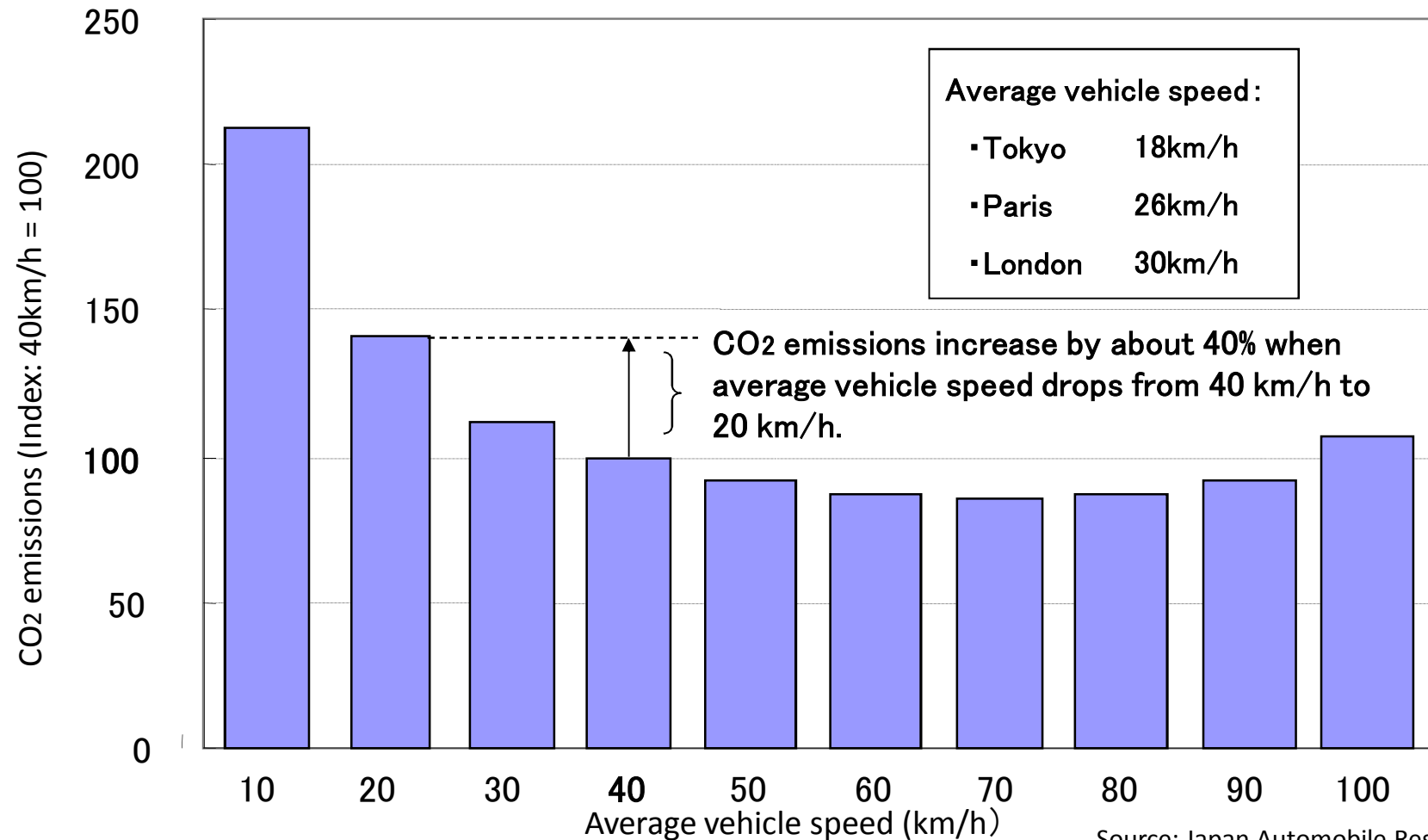
- CO<sub>2</sub> reduction in road transport requires measures in the four areas indicated below and cooperative efforts on the part of all the stakeholders concerned, including vehicle manufacturers, energy providers, governments, and vehicle users.
- To increase on-road fuel economy, improved traffic flow (congestion mitigation) and the more efficient use of vehicles, for example through ecodriving, are necessary.





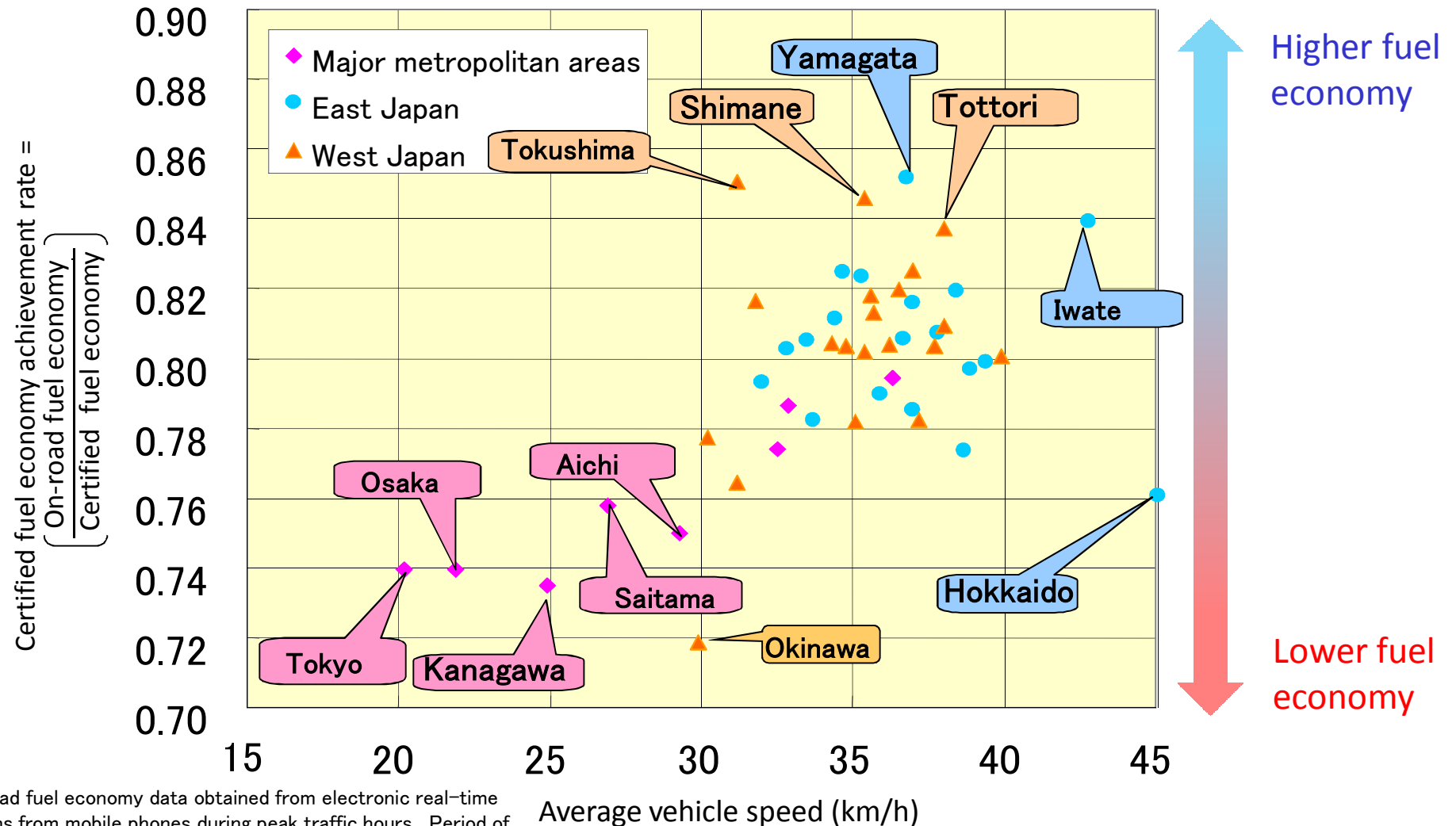
## 3-7. Improving Traffic Flow

- Congestion mitigation is achieved through such measures as road network development and ITS applications.
- Improved road traffic flow enables increased vehicle speed and increased fuel economy, and thus contributes to CO<sub>2</sub> reduction.



## 3-8. Road Congestion's Impact on Fuel Economy: A Case Study (Japan)

- Road congestion in metropolitan areas adversely impacts fuel economy, as shown here.



Note: On-road fuel economy data obtained from electronic real-time transmissions from mobile phones during peak traffic hours. Period of study: August 2000 through March 2011; No. of vehicles: 2.47 million.

## 3-9. Increasing On-Road Fuel economy through Ecodriving

- On-road CO2 emissions are estimated to decrease by roughly 10%\* with the adoption of ecodriving. The practice of ecodriving as well as awareness of its benefits are, however, still limited.
  - \*Workshop on Ecodriving, International Energy Agency (2007)
- The success of ecodriving promotional efforts requires initiatives at both the public and private level.
- Ecodriving could be taught in driver-education courses for drivers of all vehicles, including professional fleet drivers.
- Japan’s automakers are urging the Japanese government to actively promote the practice of ecodriving. Similar to “Cool Biz”.
- Further public-private promotional efforts are needed.

Ten ecodriving tips (as promoted in Japan): (1) Accelerate gently; (2) Maintain a steady speed; (3) Slow down by releasing the accelerator; (4) Limit the use of your air conditioner; (5) Don’t idle your engine; (6) Don’t warm up your engine before starting off; (7) Know your itinerary; (8) Check your tire pressure regularly; (9) Reduce your load; (10) Respect parking regulations.

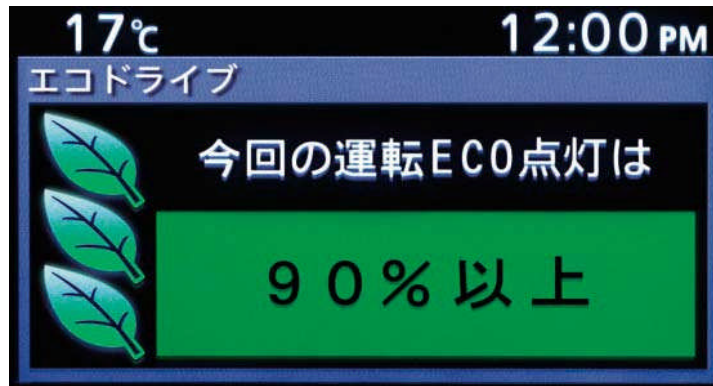
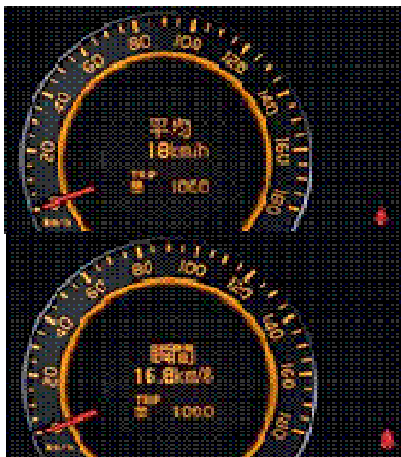
**エコドライブ 10のすすめ**

- 1 ふんわりアクセル「eスタート」**  
やさしい加速を心がけましょう。  
急発進の慣性より少し遅やかに加速する(最初の0.5秒で時速20km/hが設定です)だけで11%の燃費改善が期待できます。やさしいアクセル操作は安全運転にもつながります。発進にアクセルを踏んで、車速10km/hまで加速して運転しましょう。
- 2 加減速の少ない運転**  
車速の急激な変化は燃費を悪くし、立派な燃費削減につながります。車速の急激な変化は燃費を悪くし、立派な燃費削減につながります。車速の急激な変化は燃費を悪くし、立派な燃費削減につながります。
- 3 早めのアクセルオフ**  
エンジンブレーキを積極的に使ってみましょう。  
エンジンブレーキを使うと、燃料の消費が抑えられます(燃料カット)ので、燃費改善効果が期待できます。車速が下がったから、早めにアクセルから足を離して、エンジンブレーキで減速しましょう。また減速したり、減速を下る時にはエンジンブレーキを活用しましょう。
- 4 エアコンの使用を控えめに**  
暑い季節は、早めに涼しい場所へ移動するようにしましょう。  
暑い季節は、早めに涼しい場所へ移動するようにしましょう。暑い季節は、早めに涼しい場所へ移動するようにしましょう。
- 5 アイドリングストップ**  
燃費をアイドリングを止めましょう。  
10分間のアイドリング(ニュートラルレンジ、エアコンOFFの状態で、130cc程度の燃料を消費します)。持ち合わせの燃料を減らすための燃費削減にはアイドリングを止めましょう。1-2分間のアイドリングでも燃費は約10%悪くなります。
- 6 暖機運転は適切に**  
エンジンかけるとすぐに走りましょう。  
暖機運転は適切に。エンジンかけるとすぐに走りましょう。暖機運転は適切に。エンジンかけるとすぐに走りましょう。
- 7 道路交通情報の活用**  
目的地までの最短ルートを確認しましょう。  
目的地までの最短ルートを確認しましょう。目的地までの最短ルートを確認しましょう。
- 8 タイヤの空気圧を定期的にチェック**  
タイヤの空気圧を定期的にチェックしましょう。  
タイヤの空気圧を定期的にチェックしましょう。タイヤの空気圧を定期的にチェックしましょう。
- 9 不要な荷物は積まずに走行**  
不要な荷物は積まずに走行しましょう。  
不要な荷物は積まずに走行しましょう。不要な荷物は積まずに走行しましょう。
- 10 駐車場所に注意**  
空いている駐車スペースを探しましょう。  
空いている駐車スペースを探しましょう。空いている駐車スペースを探しましょう。

http://www.jama.or.jp JAMA 日本自動車工業会

### 3-10. Onboard Equipment for Ecodriving

- The use of digital tachographs in trucks is now widespread in Japan, and 75% of newly registered passenger cars are equipped with ecodriving devices such as fuel-economy gauges and navigator-aided, real-time on-screen displays of fuel economy performance. Samples of such devices for passenger cars are shown here.



## 3-11. The Need for Data Collection in Optimizing Traffic Flow & Vehicle Use

- **A common database should be established for the purpose of collecting wide-ranging data from multiple road traffic-related and road user sources.**

### Public sector-sourced data

- Traffic volume data (via monitoring), road traffic data from sensors, uplink data from ITS optical beacons, road congestion monitoring
- Road transport statistics, national energy statistics, data from road transport surveys, etc.
- Odometer data (collected at time of mandatory vehicle inspections)

### Private sector-sourced data

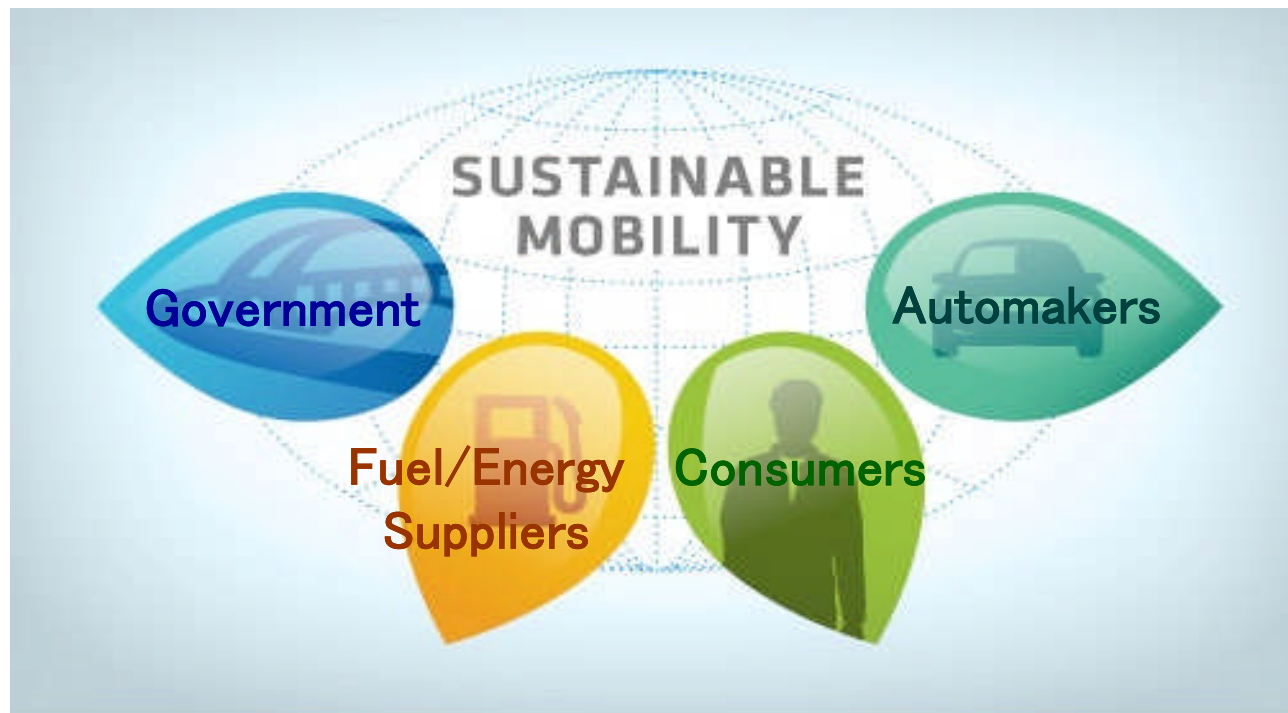
- |                          |  |
|--------------------------|--|
| ▪ Vehicle manufacturers: | On-road data obtained from demonstration vehicles      |
| ▪ Taxi operators:        | Job allocation data, GPS data                          |
| ▪ Bus operators:         | Vehicle distribution data, vehicle route data          |
| ▪ Fleet operators:       | Tachograph data, vehicle route and load data, GPS data |
| ▪ Highway operators:     | Electronic toll collection data                        |



- **This would enable the government and other public-sector players to carry out data analysis and response formulation/implementation in order to evaluate the impact of traffic flow-related and other measures on CO2 reduction and then follow up accordingly.**
- **Data should be available online (including the aggregate total of odometer data).**

## 3-12. Promoting the Integrated Approach

- JAMA actively promotes the adoption of the integrated approach in cooperation with ACEA (the European Automobile Manufacturers Association) and the U.S.A.'s Auto Alliance.



ACEA  
European Automobile  
Manufacturers Association



Japan Automobile  
Manufacturers Association



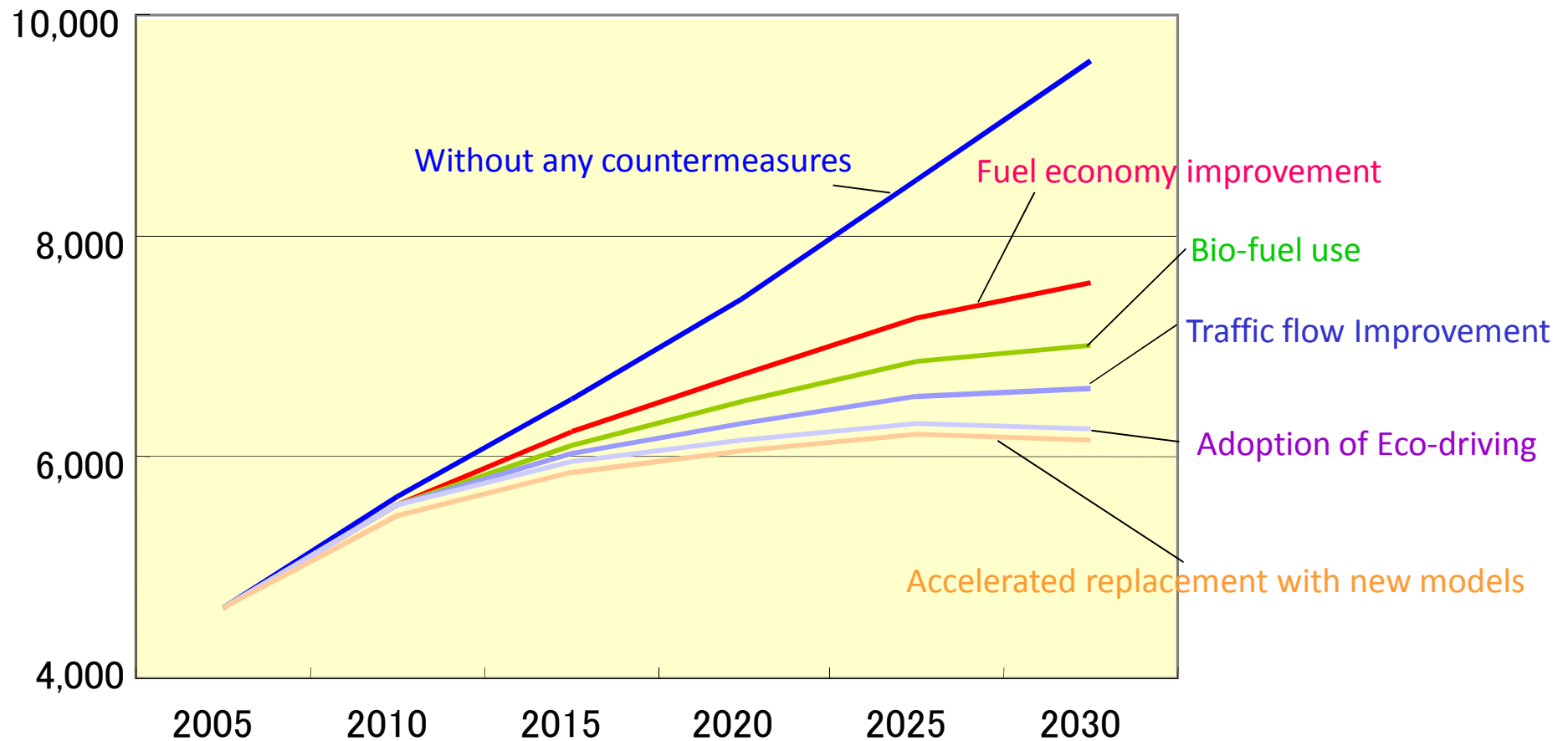
Alliance of Automobile  
Manufacturers (United States)

### 3-13. Projected Impact of Adopting the Integrated Approach

#### CO<sub>2</sub> Emissions Reduction in the Global Road Transport Sector

(M-t CO<sub>2</sub>)

Assuming the adoption of all measures recommended under the integrated approach



## 4. Concluding Remarks



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- **To achieve significant reductions in CO2 emissions in road transport, the integrated approach initiative must be implemented to increase vehicle fuel economy, improve traffic flow, diversify fuel/energy supply, and make more efficient use of vehicles. Stakeholders throughout the road transport sector, including vehicle manufacturers, government, fuel suppliers and vehicle users, must work cooperatively towards those ends.**
- **Japan's automakers work hard to increase vehicle fuel economy through the advancement of the necessary technologies and through the development and supply of alternative-energy/next-generation vehicles. JAMA also actively promote infrastructural improvements for road congestion mitigation, the implementation of ITS technologies, and the adoption of ecodriving in cooperation with government.**

**Thank you.**

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