Low-carbon Technologies & Initiatives for Quality Road Infrastructure in Japan

SHINICHIRO NAGAO

Director for International Affairs,
Planning Division, Road Bureau,
Ministry of Land, Infrastructure, Transport and Tourism (MLIT),
JAPAN

Strategies and Action Plans for Carbon Neutrality

Based on the government/ministry's strategy, Carbon Neutrality Promotion Strategy was published in 2023 to promote decarbonization in road sector.

■: Government of Japan and MLIT
■: Road Bureau

A vision of society to be realized through road policies by 2040

2040 ROAD POLICY VISION
(Aug 2020)

Achievement of carbon neutrality by 2050 by reducing 46% of GHG emission by 2030

2050 CARBON NEUTRALITY DECLARATION
(Oct 2020)

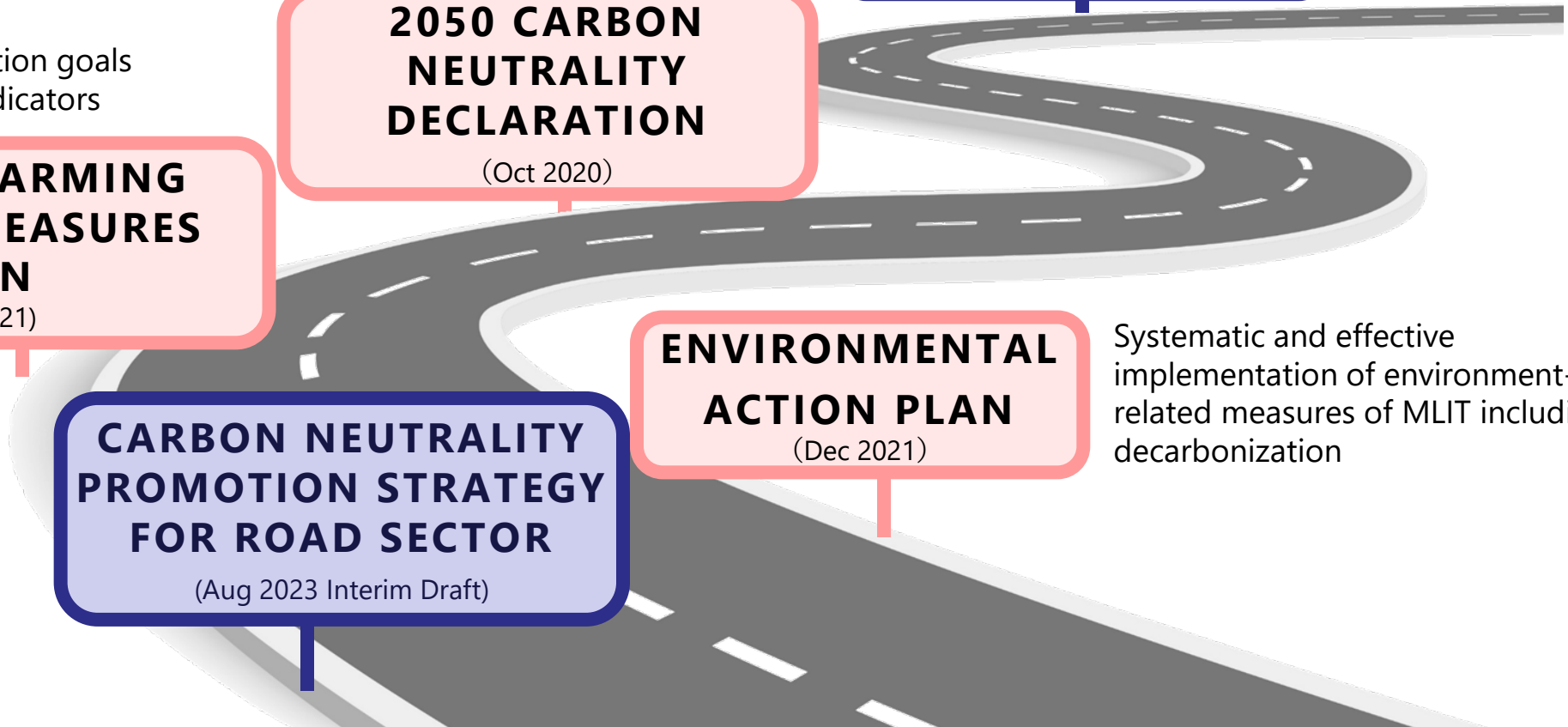
GHG emission reduction goals and its evaluation indicators

GLOBAL WARMING COUNTERMEASURES PLAN
(Oct 2021)

ENVIRONMENTAL ACTION PLAN
(Dec 2021)

Systematic and effective implementation of environment-related measures of MLIT including decarbonization

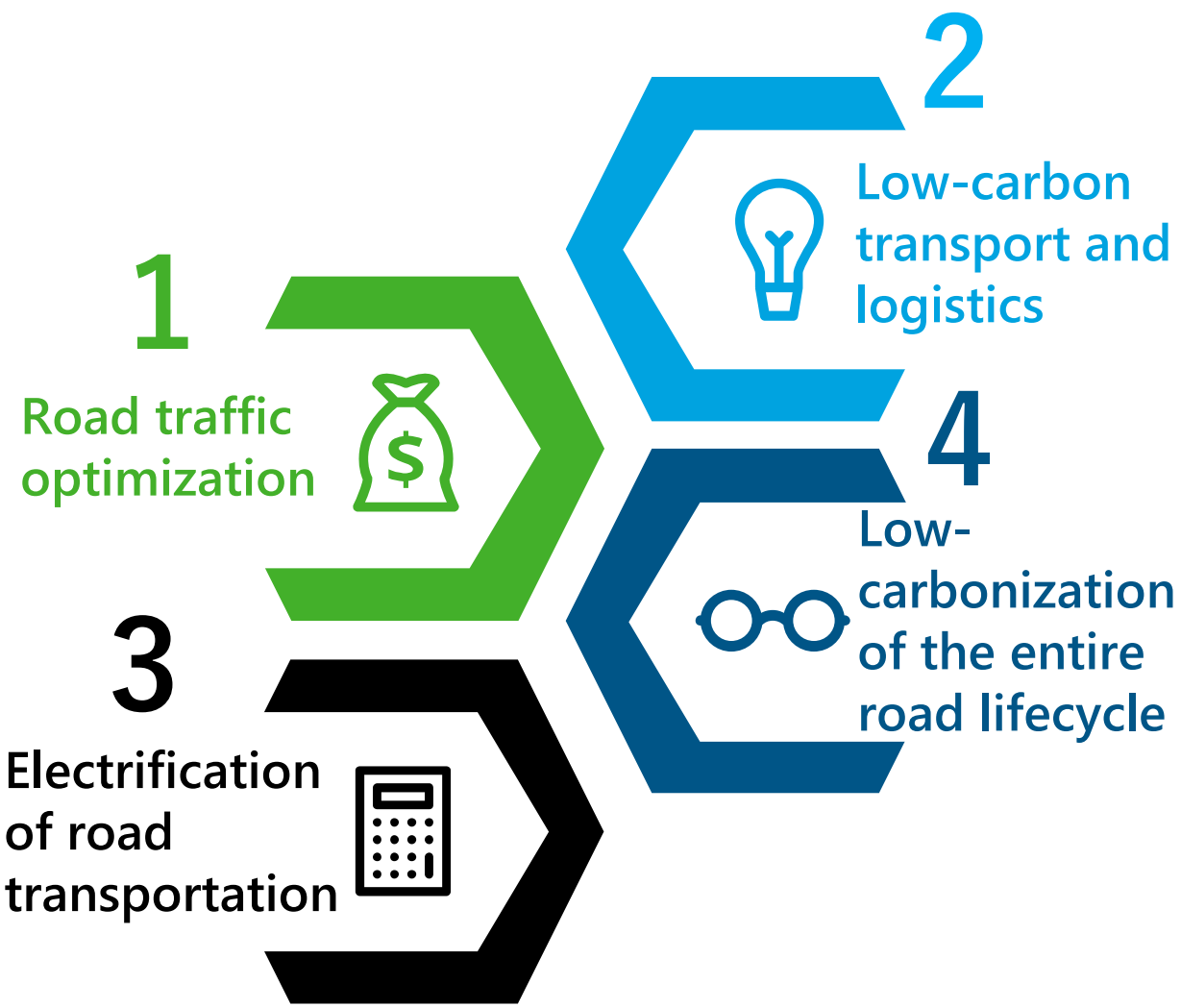
CARBON NEUTRALITY PROMOTION STRATEGY FOR ROAD SECTOR
(Aug 2023 Interim Draft)



Four pillars of Carbon Neutrality Promotion Strategy

- **Road development for efficient traffic to reduce CO2 emission**
  - ✓Road network development
  - ✓Congestion countermeasures, etc

- **Promotion of shift to EVs**
- **Promotion of use of renewable energy**
  - ✓Charging stations
  - ✓Power generation, transmission, supply, storage in road facilities, etc



- **Promote use of low-carbon transportation**
  - ✓New Mobility
  - ✓Public Transportation
  - ✓Bicycle
  - ✓Comfortable walking spaces, etc.
- **Promote development of low-carbon logistics systems**

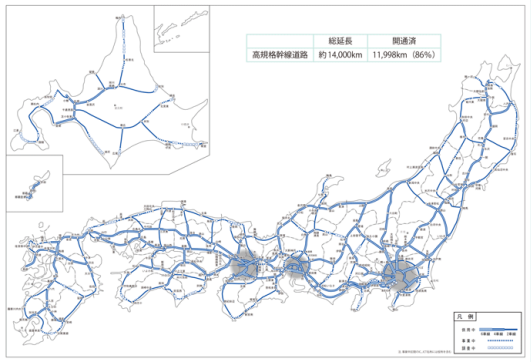
- **Reduce CO2 emissions through life cycle of the road**
  - ✓Planning
  - ✓Construction
  - ✓Operation & Maintenance

[Pillar 1] Road Traffic Optimization

Promote decarbonization through expanding road network, mitigating traffic congestion, and utilizing ICT technologies.

Road network development

- Improving and maintaining roads to improve travel speed and reduce CO2 emissions.



Network of arterial roads in Japan

Reduction of volume and speed of vehicle traffic

- TDM measures, including variable toll.

Social Experiment on Time-Zone Charges on the Tokyo Bay Aqua Line

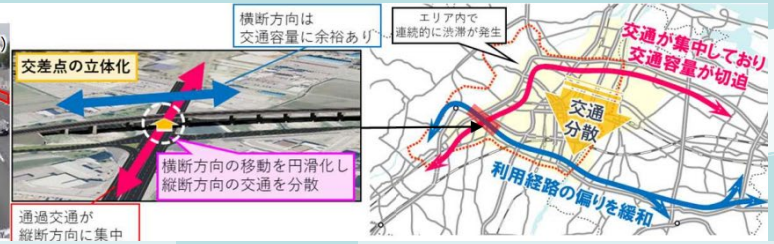
- Traffic closure and travel speed reduction on community roads.

Rising Bollard

Bottleneck countermeasures

- Bypass development, additional lane, grade separation, etc.

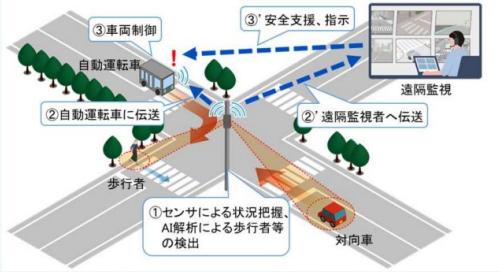
Bottleneck countermeasures (Additional lane)



Congestion countermeasures (Grade separation)

Introduction of autonomous driving

- Expand introduction of autonomous driving through pilot projects.



Pilot project for roadside sensors/cameras

- Experiment for autonomous truck on expressways.

Merging experiment on expressway

[Pillar 2] Low-carbon Transport

New Mobility

- Development of Mobility hubs, etc. to improve the environment for low-carbon mobility

Low-carbon mobility

Public Transportation

- Development of transportation hubs to connect multiple modes
- Collaboration with public transportation through MaaS

MaaS

Bicycle

- Development of passage spaces for bicycles, e-scooters, etc.

Installation of bicycle lanes

Comfortable walking space

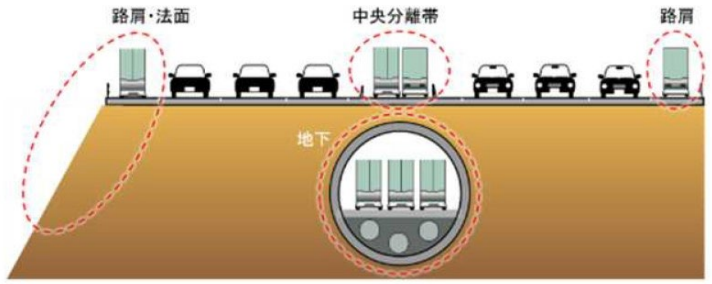
- Development of safe and comfortable passage spaces for pedestrians

Use of pedestrian space

[Pillar 2] Low-carbon Logistics

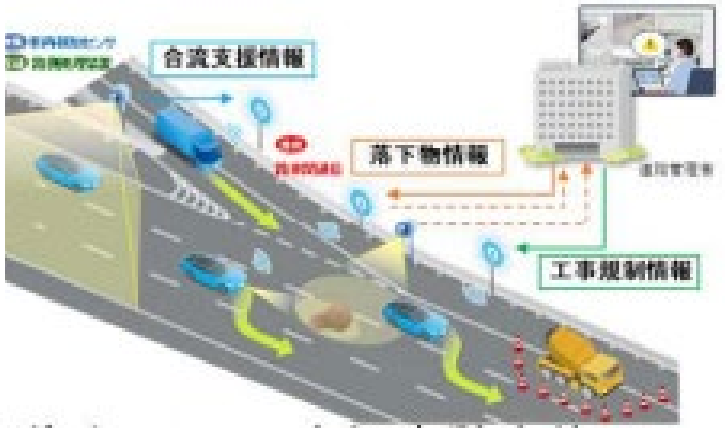
Improve volume

- Study new logistic transport system using underground/shoulder/central zone



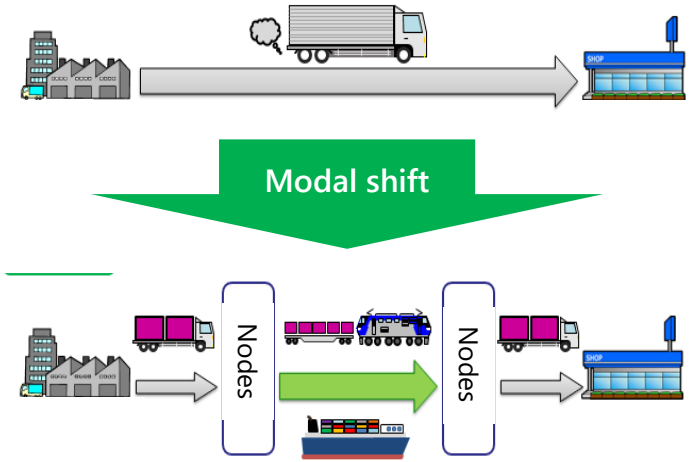
Improve efficiency

- Conduct experiments of autonomous trucks by designating lanes in the expressway



Modal shift

- Strengthen cooperation between transportation modes by development of access roads



[Pillar 4] Long-life Pavement Technology

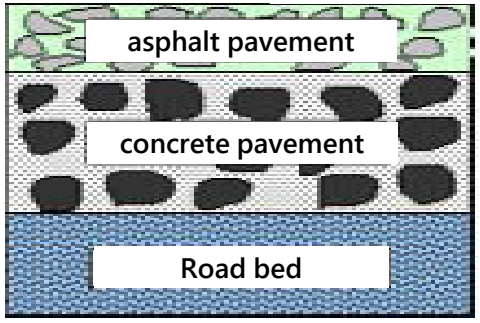
Long-life pavement technologies contribute to reduction of carbon emission by reducing maintenance frequency and traffic congestion due to pavement maintenance works.

Long-life Pavement Technology

Pavement Composition

Outline

- Pavement using asphalt mixture for the surface/base course and cement-based plates for the layer below



Features

- Structural durability of cement-based pavement enables longer life than ordinary asphalt pavement
- Lower lifecycle costs
- Asphalt pavement for surface/base course provide good runnability and easy maintenance

Source:http://www.dohkenkyo.net/pavement/meisyo/

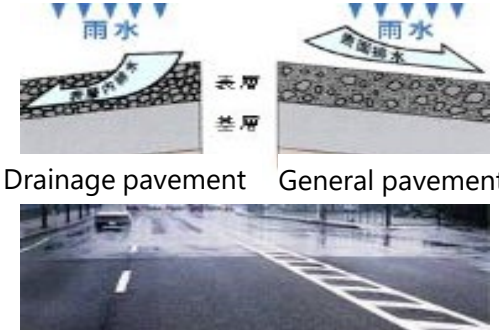
Asphalt Mixtures

Highly durable asphalt mixture

- Advantage in fluidity, water resistance, oil resistance, torsion resistance, drainage, etc., and durability

Long-life porous asphalt mixture

- Asphalt mixed with special additives to extend life of multi function pavement



Drainage pavement　General pavement

Source:http://www.dohkenkyo.net/pavement/meisyo/

Reduce carbon emission by reducing maintenace frequency

[Pillar 4] Asphalt Recycling Technology

- Asphalt pavement recycling is the widely used procedure all over Japan and the recycling rate reached the extremely high level of 99.5%.

Created based on the source:
"PWRI: Aiming to establish permanent pavement recycling technology"

[Pillar 4] Inspection Technology

- Preventive maintenance aim to extend service life of the road infrastructure.
- Certified inspection technologies are in principle applied in designated part of periodical inspection.
- Introduction of innovative inspection technologies addresses staff shortage and budget limitation.

Certified technologies (as of Jul 2023)

【Bridge/Tunnel】

Image measurement

・Bridge: 61
・Tunnel: 32

Capturing images/videos by drone

monitor deformation by laser scanning

Monitoring

・Bridge: 53
・Tunnel: 14

Fiber-optic sensor for bridge monitoring

Monitoring sensor on tunnel facility

Non-destructive inspection

・Bridge: 31
・Tunnel: 21

Acoustic Emission sensors to check PC grout filling gap

Radar to monitor deformation of tunnel lining

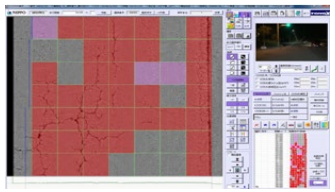
Data Collection and Communication

・3

【Pavement】

Surface measurement

・19



AI-based road surface condition analysis

Measurement of road surface condition by in-vehicle device

【Road Patrol】

Pothole detection

・5

Pavement damage detection by smartphones and dashcams

Pavement damage detection by 3D laser sensor

Thank you for your kind attention!!

For further information:
SHINICHIRO NAGAO
nagao-s2gm@mlit.go.jp