



Road Bureau, Ministry of Land, Infrastructure, Transport and Tourism

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### Policies for WISENET 2050

This booklet was prepared by the Road Bureau of the Ministry of Land, Infrastructure, Transport and Tourism in response to the interim report "The High Standard Road Network (October 31, 2023)" of the National Highway Committee, and provides its contents, data and case studies, as well as related policies. We will continue to make improvements based on your comments and suggestions.



It is also based on the content of the future vision in the Basic Policy Subcommittee's proposal, "In 2040, the landscape of roads will change. https://www.mlit.go.jp/road/vision/

Cover Painting: "Lively Town," the winner of the Minister of Land, Infrastructure, Transport and Tourism Prize in the 2022 National Land and Transportation Drawing and Painting Contest

Picture on the back cover: "Yoshino River Bridge of Light (17-span curved-string underpass type Warren truss bridge),"

a work that won the Minister of Land, Infrastructure, Transport and Tourism Prize in the "Picture Contest on National Land and Transportation" for fiscal 2008.

# **Pressing concerns for** economic growth and national land security

Japan's international economic position declines compared to other Asian countries



|  |    | Year 2000            |      | Year 2020      |      | Year 2050     | (trillion dollars) |
|--|----|----------------------|------|----------------|------|---------------|--------------------|
| (purchasing power parity)                                      | 1. | <b>United States</b> | 13.7 | China          | 23.5 | China         | 54.8               |
|  | 2. | Japan                | 4.7  | United States  | 19.3 | India         | 33.4               |
| Source: Economic Outlook No 109 -                              | 3. | China                | 4.5  | India          | 8.4  | United States | 32.1               |
| projections  | 4. | Germany              | 3.3  | Japan          | 5.1  | Indonesia     | 9.8                |
| GDP is measured in purchasing power<br>parity in U.S. dollars. | 5. | India                | 2.7  | Germany        | 3.9  | Japan         | 6.1                |
|  | 6. | France               | 2.3  | Russia         | 3.7  | Turkey        | 5.9                |
|  | 7. | Italy                | 2.3  | Indonesia      | 3.2  | Germany       | 5.4                |
|  | 8. | United Kingdom       | 2.1  | Brazil         | 2.9  | Brazil        | 5.2                |
|  | 9. | Russia               | 2    | France         | 2.7  | Russia        | 4.9                |
|  | 10 | . Brazil             | 2    | United Kingdom | 2.7  | Mexico        | 4.6                |
|  |    |                      |      |                |      |               |                    |

Sou

GDF pari

In 2050, the total population will decrease to approximately 100 million, and the elderly population will increase to approximately 40 million.



Self-sufficiency: Food<sup>\*1</sup> 38% Energy<sup>\*2</sup> 13%

1 Calorie base 2 Oil. natural gas. nuclear power. renewable energy. etc.

# Fragile land and disaster risks

The Japanese archipelago is long and narrow from north to south, with mountain ranges running through. Disasters occur frequently.



\*Non-resettable land (mountainous areas, etc.): Mountainous areas at an elevation of 500 m or higher and areas where the current land use is forest, wetlands, etc., which are unsuitable for residential use even if developed. Resettable land : Areas other than nonresettable land.

Rainfall **twice** the world average is concentrated in the rainy and typhoon seasons

World Typhoon Occurrence (1851-2006)



Assumed distribution of seismic intensity of Nankai Trough Earthquake (Land side case)



Source: Central Disaster Management Council, Nankai Trough Mega Earthquake Countermeasures Study Working Group Final Report Assumed distribution of seismic intensity for island earthquake under the Tokyo metropolitan area (Earthquake directly under



Source: Central Disaster Management Council, Final Report of the Working Group for the Study of Countermeasures against Earthquakes directly under the Tokyo Metropolitan Area

0.25% of the world's land mass is subject to 20% of the world's major earthquakes





Source: Central Disaster Management Council

Worldwide distribution of epicenters of M6.0 and higher and of plate boundaries



Note) From 2011 to 2020 Source: Established by Japan Meteorological Agency based on the epicenter data od the United States Geological Survey

Assumed distribution of seismic intensity of huge earthquakes along the Kuril Trench



Source: Central Disaster Management Council, Cour Mega Earthquakes along the Japan Trench and the Kuril Islands Trench Study Working Group

# Contribution to sustainable development

Enjoying services and combining values through mobility are key elements for improving quality of life, and ensuring safe, effective and resilient mobility is important for sustainable development. On the other hand, social and environmental challenges such as emissions from the transportation sector, traffic incidents, adverse impact on nature, congestion and crowding are arising, and we will address these challenges in the road sector to simultaneously achieve carbon neutrality, nature positive and circular economy.



# **Current Status and Problem Identification**

## Levels of service for intercity connectivity vary widely by region.



## Traffic congestion causes time loss and significant economic loss

**40%** of time is lost

6.1 billion person-hours per year, or about 3.7 million person Equivalent to 1.3% of Japan's total CO2 emissions



Travel speeds are significantly lower than free-flow speed



average of all roads expressway

\*Subject: Expressways and general roads (prefectural roads and above) (2021), Uncongested speed: Free running speed (top 10% tile speed)

## Tackling the Logistics Crisis

Amid labor shortages in logistics, there is concern about a structural logistics crisis, including the "2024 problem," in which freight transportation capacity will fall short due to newly introduced labor hour restrictions and other factors.

<Impact on logistics due to working hour regulations in the motor vehicle transportation business>



# WISENET2050

WISENET\* is the world's smartest, safest, and most sustainable infrastructure network system in 2050. We will develop policies to realize this vision, and contribute to problem-solving and value creation in the new era.

WISENET: World-class Infrastructure with 3S (Smart, Safe, Sustainable) Empowered NETwork



## Key Points of the WISENET

## O Seamless network development

We transform into a road administration that meets service levels and strives for seamless service.

## O Transformation into a multifunctional space through technological development

We contribute to problem-solving and value creation by fully utilizing the road network that runs throughout the country.

## Requirements

- Supporting economic growth and logistics enhancement
- Improving connectivity between transportation modes
- Creating an automated driving society
- Advanced and complex functions that go beyond the limits of the road sector
- Delivering essential network for regional security
- Promoting "tourism-based country"
- Supporting low-carbon and sustainable road transportation

To fulfill the role required of high-standard roads in the future, we will develop policies that go beyond the existing framework.



| D.D.P. |
|--------|
|        |

We will develop network, focusing on new ideas such as passenger car exclusive and logistics exclusive.

| Functional<br>Class | Customary<br>Combinati | y Level of S<br>ion of Cont | ervice for S<br>ext and Te | Level of<br>Service | General Operating<br>Conditions |                       |             |
|---------------------|------------------------|-----------------------------|----------------------------|---------------------|---------------------------------|-----------------------|-------------|
|                     | Rural                  | Rural                       | Rural<br>Mountain<br>ous   | Suburban,           | (LOS)                           |                       |             |
|                     | Level                  | Rolling                     |                            | Urban,              | A                               | Free flow             |             |
|                     |                        | -                           |                            | Urban               | В                               | Reasonably free flow  |             |
|                     |                        |                             |                            | Core, and           |                                 |                       |             |
|                     |                        |                             |                            | Rural               | Rural                           | С                     | Stable flow |
|                     |                        |                             |                            | Town                | D                               | Approaching unstable  |             |
| Freeway             | В                      | В                           | С                          | C or D              |                                 | flow                  |             |
| ,<br>Arterial       | В                      | В                           | C                          | C or D              | E                               | Unstable flow         |             |
| Artenar             | U                      | U                           | C                          | COLD                | F                               | Forced or breakdown   |             |
| Collector           | С                      | С                           | D                          | D                   |                                 | flow                  |             |
| Local               | D                      | D                           | D                          | D                   | Source: Gree                    | en Book (AASHTO 2016) |             |

AASHTO (American Association of State Highway Officials) Technical Standards 2018 (Green Book) 6

# Performance management

We will improve the overall service of the high-quality road network through data-driven performance management of temporal and spatial unevenness of traffic demand and congestion, facilitating efficient and effective implementation of anti-bottleneck measures.

- O To efficiently and effectively improve required services, we adopt data-driven approach to evaluate service levels.
- Free flow speed (potential performance)
- Actual average speed (actual performance)
- Rate of detours when the shortest time route is not available(redundancy)
- Risk of road closure



- O We will analyze the mechanism of poor performance based on "by time, by location, and by direction" data.
- O We will develop necessary standards and flexibly implement new measures such as localized and area-based congestion countermeasures, 2+1 lane conversions by adding continuous or intermittent lanes to existing two-lane roads, and the introduction of roundabouts that help reduce adverse environmental impacts.



Roundabout(Stavanger, Norway)

## Collaboration with the demand side



2+1 lanes (E39 Norway)

Collaboration with the demand side is also important to maximize the potential of infrastructure and use it wisely. We will promote TDM, including collaboration with local communities and toll charging approach.

## U.S. I-66 Dynamic Pricing System

 To reduce congestion on weekday mornings and evenings, toll rates fluctuate in every 6minute to ensure traveling speed at 72 km/h. (Free of charge for ridesharing vehicles)



Photo by Mike Grinnell

## Singapore Congestion Charging

- Charge incoming vehicles to reduce congestion
  in the city center
- Toll rates are adjusted every 3 months based on speed levels



Source: Singapore Transport Authority data

# Transformation from a road for automobiles to a multifunctional space supporting diverse values Auto-Flow Road

We aim to create an automated logistics road (Auto-Flow Road) as a new logistics system that utilizes road space without requiring human labor.

To respond to the logistics crisis and promote low carbon emissions, we will explore the realization of a clean logistics system with new technologies, referring to practices in other countries.

## Switzerland CST

Planned underground logistics system deploying automated carts in tunnels between major cities.



Source: Cargo Sous Terrain's website

## **Electricity highway**

In light of the demand for wide-area power transmission for renewable energy, we will promote the accommodation of road networks.



Jote 1) Prepared from "Offshore Wind Power Installation Potential" data (as of May 2023) from REPOS (Renewable Energy ortfolic System (REPOS) (Ministry of the Environment)). Jote 2) Prepared from "Potential and Distribution of Photovoltaic Power Generation Considering Effective Use of National and" of tent of tor Ow Carton Sciency Startegies A National Institute of Science and Technology Policy March 2022), and "Off tent of tor Carton Sciency Startegies A National Institute of Science and Technology Policy March 2022), National Backbone Linkage Grid)" (website of the Federation of Electric Power Comanies of Japan). Davez: Kansai Electric Power Tansmission and Betribution PI (Power calbe statched to the Advahi Kalvye Bridge)

## MAGWAY, United Kingdom

Planned fully automated logistics system using low-cost linear motors.



Source: Materials provided by Magway

## Flood control

Government.

We will promote the use of road networks for flood control to adressfrequent torrential rains.



# Supporting economic growth and logistics

To strengthen international competitiveness, we will build a resilient logistics network, including ring roads in three metropolitan areas and the trans-island axis connecting the Sea of Japan and the Pacific Ocean.



Japan 270 U.S. 124 Europe 47 China 73

transported from local production areas to large cities.

## We will develop logistics support initiatives, including the enhancement of networks around logistics hubs, freight rail stations, airports, sea ports, and the development of relay transport hubs.

Ensure smooth access between rail freight stations and truck hubs to achieve modal combinations.

Promote the improvement of the driving environment for double-trailer trucks and the development of relay transportation bases to cope with the logistics crisis.



Double-trailer truck reduces co2 emissions by about 40%

# **Delivering essential network for regional security**

Learning from the Sanriku Coastal Highway, we will position high-standard roads as an "essential network for regional security," which is indispensable for maintaining the population in rural areas amidst population decline and the risk of large-scale disasters, and we will aim for earliest delivery. Considering the new populated areas created by the high-standard roads, we support the formation of areas that go beyond the conventional concept of regions and blocks.



Sanriku Coastal Road (Yamada Town, Iwate Prefecture)

## Creation of a new area through the development of high-standard roads

The base population connected by the highstandard road will create a new area beyond the existing region.



#### Source: Census (R2)

#### Sanriku Coastal Road Improvement Effects

The Sanriku Coastal Highway, which was developed after the Great East Japan Earthquake, was fully opened to traffic 10 years after the start of the project, connecting Sendai and Hachinohe with a high-standard road of approximately 360 km in length.

The road forms the backbone of the region, increasing the number of people interacting with each other by shortening the time required for transportation, as well as having a variety of indirect effects such as the location of many businesses, disaster resilience, and low carbon emissions.



Source: "Restoring a Prosperous and Vibrant Tohoku" Association for Social Capital Improvement in Tohoku (Representative: Tohoku Economic Federation)

# Improving connections between transportation modes

For carbon neutrality and labor savings, we will strengthen our partnerships with sea and rail transportation to achieve optimal modal combinations.



Through the development and management of a centralized public transportation hub (Expressway Bus Terminal), we will promote the creation of a future space that is peoplecentric and connected to a variety of mobility systems, such as MaaS and automated driving.



High-standard road connecting airport and city center (Matsuyama Outer Ring Road)



Image of Expressway Bus Terminal development (Shinagawa Station Transportation Terminal)

\*The development of the surrounding area is an image, and the details of the development have not been determined. As the intermediate station of the Linear Central Shinkansen Line will serve as an important hub for the new area, we will consider a network that corresponds to the new regional structure.



# Promoting "tourism-based country"

We will improve access to gateway airports, sea ports, and tourist destinations to increase the attractiveness of tourism resources.



Improvement of access to tourist resources through the development of the Kita-Kanto Road

We will analyze data on destinations where over-tourism is an issue and promote measures such as traffic congestion mitigation in cooperation with local communities, both in terms of hardware and software.



\*Created from ETC2.0 probe information (FY2021) for general roads (general national roads, major regional roads, and general prefectural roads) on a 5 km mesh. \*Analysis of speed reduction compares average travel speed on weekdays in October with average travel speed on Saturdays and Sundays during GW, SW and the year. The locations related to tourist attractions are selected based on the Tourism Resource Ledger (Japan Transportation Agency), etc., taking into account the relationship with major tourist attractions, traffic conditions, etc



Traffic congestion at tourist attractions



Understanding and guiding traffic congestion through data analysis



Promote introduction of shared bicycles (Sapporo City)



Visitors to Japan

Review of toll discounts

# Creating of an automated driving society

We aim for the early realization and social implementation of automated driving through the digitalization of roads and a high degree of coordination between roads and vehicles. Starting with the New Tomei Expressway in FY2024, we will extend the pilot project to the Tohoku Expressway and other expressways in FY2025 and beyond, to roll out nationwide in the future.



Automated driving with vehicle and road coordination



Detection of falling objects by sensors Providing information via Roadside-to-Vehicle Communication



Exclusive travel lane for automated vehicles

## San Francisco (U.S.A. )



# Beijing (China)

Development and commercialization of unmanned automated cabs

China

Upgrading highways with digital twin technology that contributes to automated driving



roadside sensor



Automatic detection of stopped vehicles



Digital Twin Technology

## Supporting low-carbon and sustainable road transportation

Based on the four pillars of the "Carbon Neutrality Promotion Strategy," we will low-carbon and sustainable road transportation by creating an environment for the spread of next-generation vehicles, promoting high-standard roads, and improving performance based on data-driven approach.



Comparison of speeds on Sanriku Coastal Road and Route 45

To promote the use of next-generation vehicles such as electric vehicles and fuel cell vehicles, we will increase the number of fast chargers, especially at SA/PAs, roadside stations, and other locations where charging demand is high.



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Quick charger at SA (Enakyo SA)

# **Enhancing hub functions**

At the transportation hubs, we aim to create a base to accelerate regional development and tourism and promote the creation of a vibrant community, disaster prevention functions, and the enhancement of transfer functions including automated vehicles.

For SA/PAs and other facilities directly connected to high-standard roads, we will promote advanced use of land by consolidating multiple functions and utilizing overhead space based on the scarcity of locations.



Michi-no-Eki "Echizen Ono Arashima no Sato" (Fukui Prefecture) Arashima Marche



Mobility Hub Image (NEXCO East Japan)

## Express Bus Terminal, U.S.A.

Bus terminal directly connected to the expressway (3rd floor above ground) and subway station (2nd floor below ground) via a connecting passageway for advanced use (San Francisco Transbay Transit Center)



To improve disaster preparedness, movable containers capable of providing services such as rest and regional development will be installed at "disaster prevention roadside stations" and other such facilities, and in the event of a disaster, will be transported to the disaster area for widearea utilization.



Michi-no-Eki "Inawashiro" (Fukushima Prefecture) Demonstration of "high value-added container" installation



Next-generation core logistics facility directly connected to an expressway IC (image of the completed facility) Source: Mitsubishi Estate Co.

# Logistics hub, directly connected to expressway, France

A comprehensive market directly connected to a railroad station and expressway and close to an airport. Total area: 234 ha, volume handled: 3.08 million tons, turnover: 1 billion  $\in$  (2022) (Rangis market)



# Improving convenience of high-standard roads

To direct traffic to high-standard roads, we will shorten IC intervals by using smart IC and expand ETC exclusive network. From the perspective of decarbonization, we will also consider free-flow ETC systems that are being introduced in other countries.

## Austria Heavy Vehicle Charge

Main line gantry (DSRC) and on-board equipment to track mileage and billing



on-board device road toll system)

## **Norway Autopass**

Electronic billing by DSRC antenna and CCTV camera



## Reallocating road space

It is important to consider a series of drastic reallocations of street space in the urban area, including sidewalks, bicycle lanes, bus lanes, and space for high activity, including lane reductions. This will occur in conjunction with the development of high-standard roads. such as ring roads in regional cities.



Integration with pole-free and urban development (Minamiuonuma City, Niigata Prefecture)

## Prague, Czech Republic

To reduce the influx of private cars into the city center, along with phased billing, improved the environment for bicycle and public transportation use in the city center.

**Oslo, Norway** 

Introduced LRT and turned the city block into a transit mall to develop pedestrian-centered spaces.





Bicvcle lane



Bus and cab lanes





Prague Old Town Square area (Pedestrian street) 16

# Establishing sustainable maintenance cycle

We will build quality-assured infrastructure, introduce innovative technologies, and ensure a system that includes engineering training to establish a sustainable maintenance cycle to maintain the network under severe environment.



Expressway renewal (Sonohara Bridge, Chuo Expressway)



CCTV surveillance

# **Achieving Nature Positive**

We aim to create road networks and road spaces by taking into consideration the surrounding environment and landscape to contribute to the prevention of global warming and heat island effects, as well as the preservation of biodiversity.

Ohashi "Green" Junction (Metropolitan Expressway)



Creation of space that contributes to the prevention of global warming, heat island countermeasures, and biodiversity by utilizing upper space in conjunction with junction development in urban areas.

## Ecosystem-friendly road maintenance

From the perspective of preventing the fragmentation of animal habitats and preserving plant growth environments, we will promote the development of ecologically friendly roads.

Green Standing Road" Daini Keihan Road



We aim to create roads that are in harmony with the surrounding environment, such as rich "green roads" and "scenic roads", developed as a road with consideration for the environment and landscape.



















## WISENET 2050 and Policy Collection Please send us your comments.

If you have any comments regarding Policies for WISENET 2050, please send them to us at the following e-mail address. We will continue to improve our website based on your comments and suggestions.



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