

METI's effort to realizing autonomous driving

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Wave of Changes that the Automotive Industry is Facing

- The automotive industry is confronted by the changes of Connected, Autonomous, Sharing and Electric that may significantly alter the industrial structure (measures for **CASE**).
- The social significance of automated driving (AD) is high for it will reduce road accidents, ensure mobility for the elderly, etc. and resolve a shortage of drivers. It is technologically difficult and the establishment of various systems and infrastructure is necessary for its implementation. Therefore, the public and private sector must make an united approach.

Significance of AD

Safer and smoother traffic

- Reduce road accidents
- Alleviate traffic congestion
- Reduce environmental burden
- **Road fatalities in Japan**
2020: 2,839 (died within 24 hours)
→ 2,000 or less (goal) by 2025
- **90 % of road accidents are caused by the operation error of drivers**

Society with comfortable mobility for many

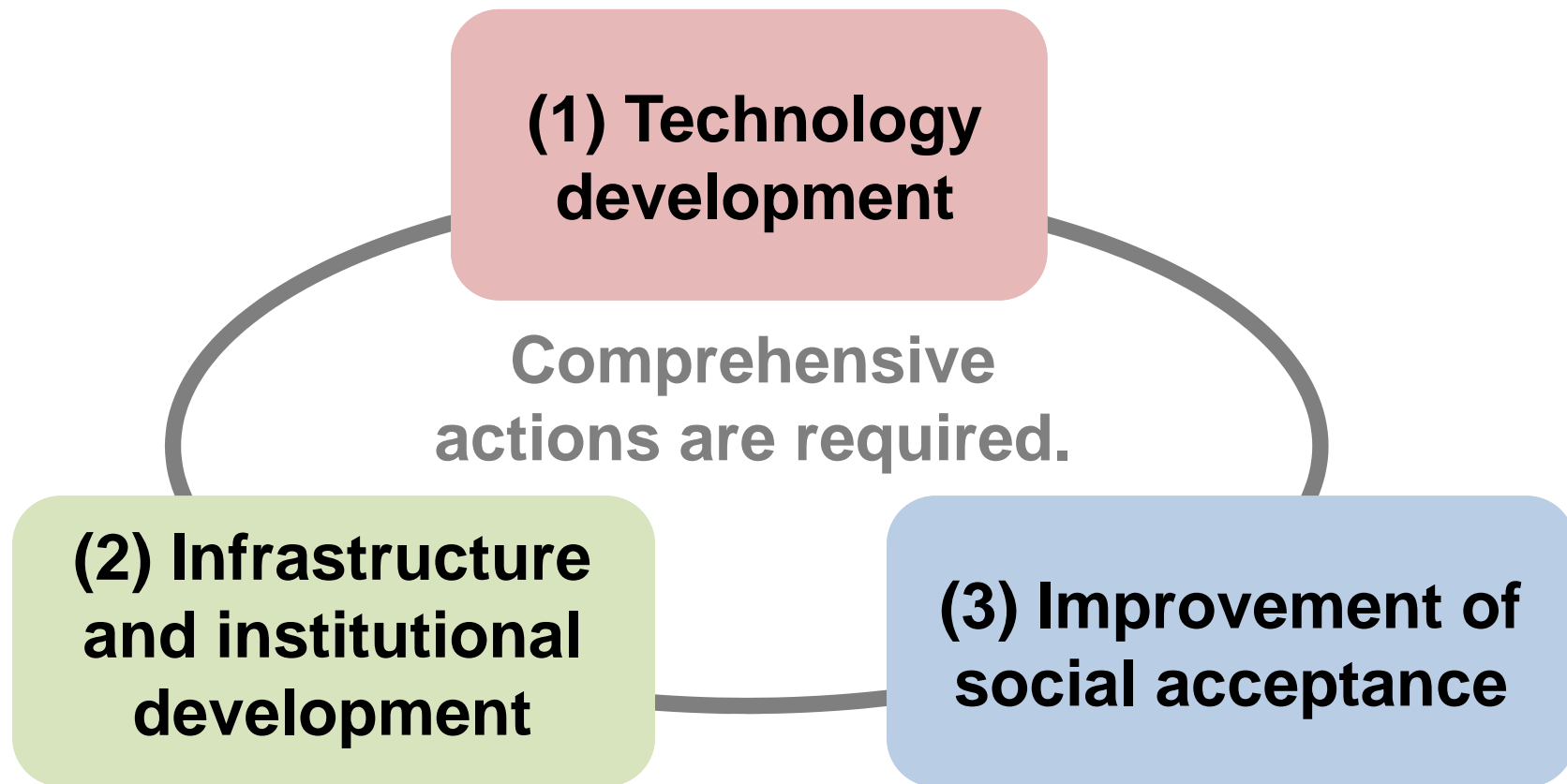
- Improve driving comfort
- Support mobility of elderly
- **Labor shortages in the logistics business**
- **Offer suitable mobility for the elderly**

Industry competitiveness, efficiency of related industries

- Enhance international competitiveness of automotive-related industries
- **Creation of new related industries**
- **Efficient transport/logistics business**

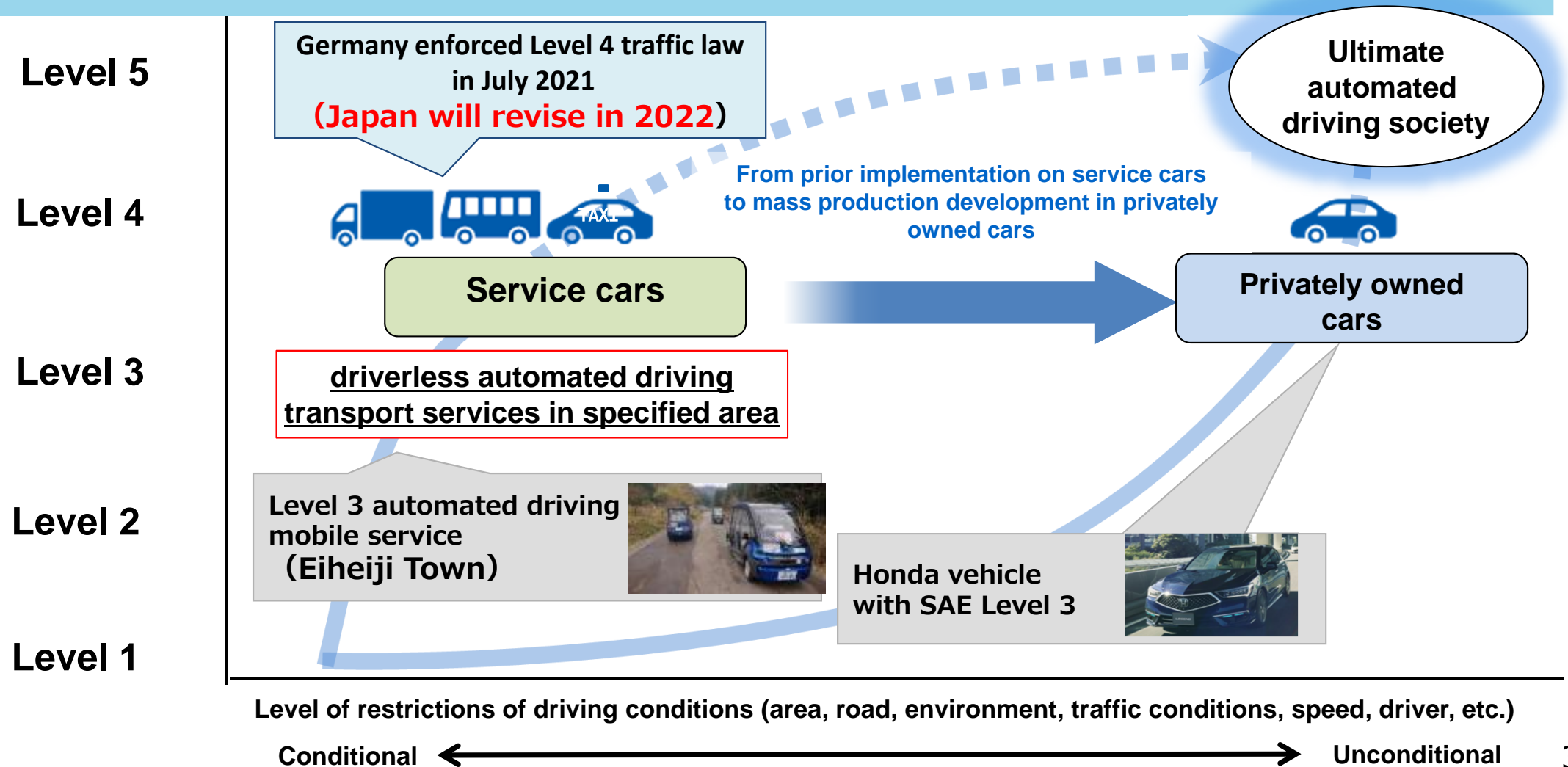
Efforts Necessary for the Realization of AD

- For realizing automated driving, it is necessary to take comprehensive actions including **(1) technology development**, **(2) infrastructure and institutional development**, and **(3) improvement of social acceptance**. We promote those measures in cooperation with presiding ministries and agencies.



Trends towards an automatic driving society implementation

- There are various turning points (elemental technology, infrastructure cooperation, safety evaluation, business model) until the realization of fully AD without conditions (SAE Level 5).
- Regarding commercial vehicles, full-scale operation of the driverless automated driving service of Level 3 started in March 2021.
- Honda released a vehicle with Level 3 automatic operation device in March 2021.



Roadmap for the Realization and Spread of Unmanned AD Services by 2025

- At last year's AD Business Study Council, a roadmap for the realization and spread of unmanned AD services by 2025 was formulated and reviewed, and that direction was reflected in the Public-Private ITS Initiative/Roadmaps 2020 and growth strategy follow-up.

(1) Beginning AD mobility services with only remote monitoring (L4) by FY2022

(3) Achieving L4 AD trucks on expressways from FY2025

Roadmap for the Realization and Spread of Unmanned AD Services

走行環境の類型	サービス形態	～2019	2020～2022	2023～2025	2026～
A 【参考】閉鎖空間 (工場・空港・港湾等の敷地内等)	低速/中速	敷地内移動・輸送サービス (実証実験)	敷か所の工場・空港等において、小型カートや(ス等)による実証実験 (作業用(高速用中)、羽田、中部空港等)	敷か所の工場等で遠隔監視のみの自動運転サービスを開始し、徐々に対象を拡大 1:Nの遠隔監視を実施	遠隔監視のみ 2025年度目録に十カ所以上の工場等で遠隔監視のみの自動運転サービスが普及し、遠隔監視におけるN数を増加
B 限定空間 (産線跡・BRT専用区間等)	低速/中速	小型モビリティ移動サービス (実証実験)	産線跡での小型カートによる1:1の遠隔操作及び監視の実施 1:Nの遠隔操作及び監視の実施	敷か所で遠隔監視のみの自動運転サービスを開始し、徐々に対象を拡大 1:Nの遠隔監視を実施	遠隔監視のみ 2025年度目録に十カ所以上の限定空間での自動運転サービスが普及し、遠隔監視におけるN数を増加
C 自動車専用空間 (高速道路・自動車専用道)	高速	トラック特種輸送サービス (実証実験)	後続車有人運転走行、後続車無しシステムの技術実証 (新東名等)	2023年度、車内保安運転手有での有人運転走行を商業化。以降、発展型として無人保安運転手有 (TOR対応のみ) での有人運転走行の開発・商業化。併せて、後続車保安運転手有の自動化を推進 路車間通信等ITSの活用による運行管理の高度化	車内保安運転手有 (一部有人) 2025年度以降に高度化された無人保安運転手有 (一部有人) の自動運転サービスが普及し、遠隔監視のみの自動運転サービスも一部実証実験に一部実証
D 交通環境整備空間 (幹線道路等)	中速	都市エリアクォーターサービス (実証実験)	敷か所において、タクシー・バスによる技術実証 (仙台、みなとみらい、北九州空港周辺等)	敷か所において、タクシー・バスによる技術実証 (仙台、みなとみらい、北九州空港周辺等)	遠隔監視のみ又は車内乗務員のみ 2025年度目録に遠隔監視のみの自動運転サービスが普及し、遠隔監視におけるN数を増加 1:Nの遠隔監視を実施 車内乗務員有の場合、車内サービスを提供
E 混在空間 (生活道路等)	低速/中速	小型モビリティ移動サービス (実証実験)	敷か所において、自動運転サービスを実施 (北台、道の駅実証等)	1:1の遠隔操作及び監視の実施 1:Nの遠隔操作及び監視の実施	遠隔監視のみ 2025年度目録に十カ所以上の混在空間での遠隔監視のみの自動運転サービスが普及し、遠隔監視におけるN数を増加

注1: 当該ロードマップは、事業者からのヒアリング結果を参考として作成。実現に向けた環境整備については、今後の技術開発等を踏まえ、各分野において適切な時期や在り方について検討し、実施する。
注2: サービス開始とは、一定の収入 (乗客からの運賃収入に限らず、自治体・民間企業等による間接的な費用負担も含む。) を得て継続的に輸送等の事業を行うことを言う。
注3: 各種型における無人自動運転サービスの実現時期は、実際の走行環境における天候や交通量の多寡など様々な条件によって異なることを認識。

無1自動運転サービス実現の早期化及びサービスエリア拡大に向けた対策の例
①地域住民との協力や合意形成 (自動運転車の走行への配慮)
②交差点・乗降所等におけるインフラの連携 (信号情報の提供、専用発着場の整備等)
③遠隔監視のみの自動運転サービスが難しい交差点・乗降所等の一部区間における遠隔監視手有の自動運転サービスとの組み合わせ

(2) There is potential for unmanned AD services (L4) to spread to more than 40 areas in various driving environments and service formats by the target FY2025

(4) In mixed spaces, linking with infrastructure to accelerate the realization of unmanned AD services and expand the available areas

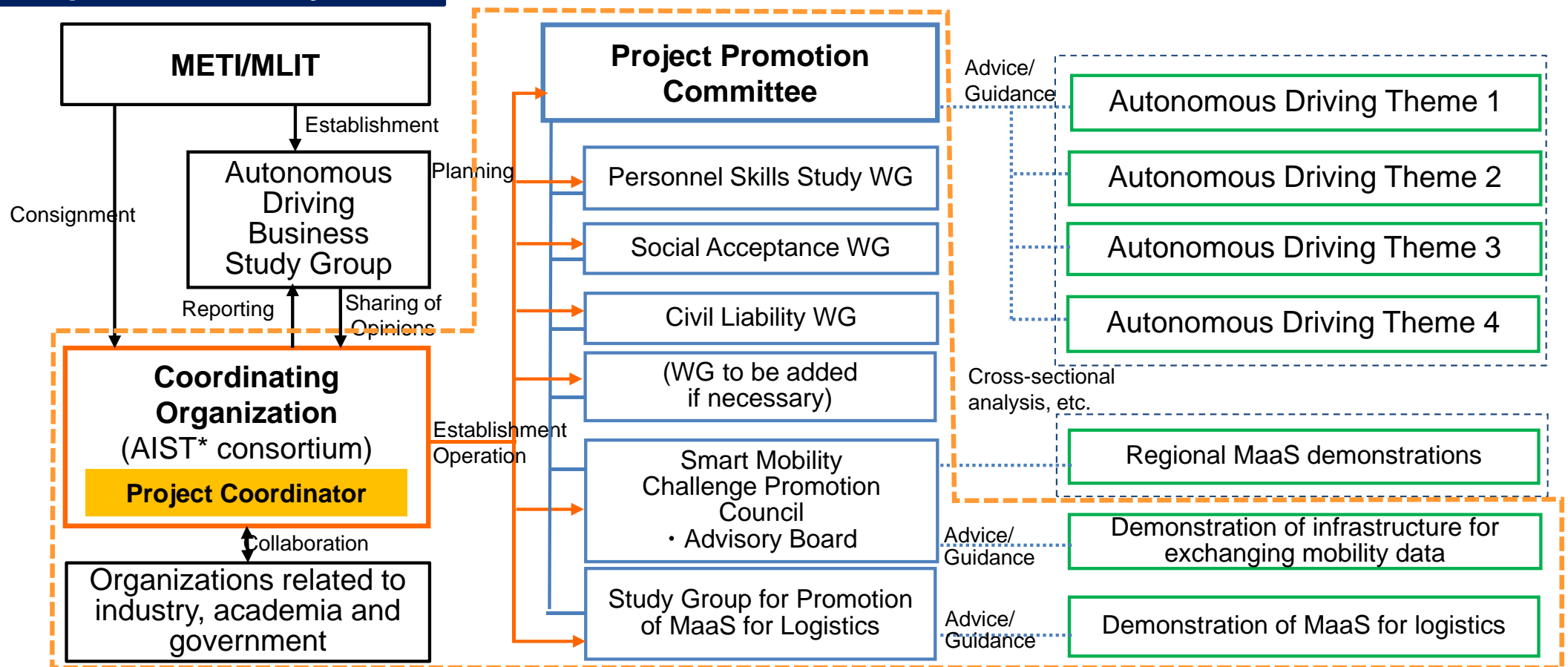
Future image of urban and transportation systems where automated driving services have been realized and spread



"RoAD to the L4" project has just been launched

- To realize and popularize advanced mobility services such as level 4 AD, the new project "**Advanced mobility service research, development and social implementation project for level 4 AD, etc. (RoAD to the L4)**" has just been launched starting in 2021 and will feature consistent initiatives including R&D, demonstration tests, and social implementation.

Implementation system



*AIST: National Institute of Advanced Industrial Science and Technology

- Matters pertaining to the Coordinating Organization
- Promotion Committee/Working groups, etc.
- Demonstration projects, etc.
- Implemented by the Coordinating Organization

"RoAD to the L4" R&D/Social Implementation Project Overview

Projects for Realization of Promotion of Driverless AD Services

• Theme 1

Demonstration of an AD Service with Remote Monitoring (L4)

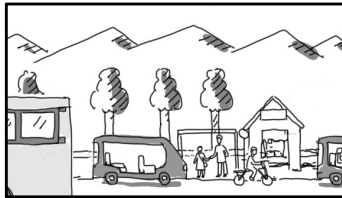
- In limited locations and vehicles with remote monitoring (L4) by FY2022



2021



2022



Area/vehicle expansion

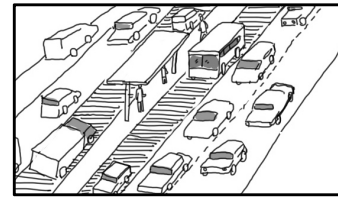
• Theme 2

Other initiatives to expand target areas and vehicle, as well as improve business viability

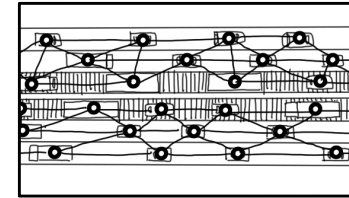
- L4 driverless AD services to diverse areas and with various type of vehicles in over 40 locations by FY2025.



~2022



~2025



Mixed environments

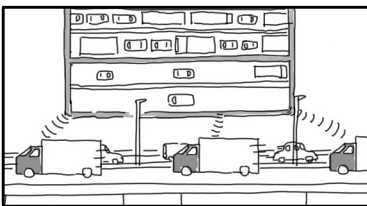
• Theme 3

Deployment of High-Performance Trucks including Platooning on Expressway

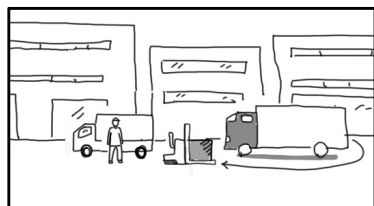
- L4 AD trucks and its platooning technology on expressway after 2025



~2022



~2025



Mixed traffic environments

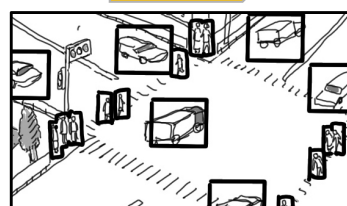
• Theme 4

Harmonization and interoperability of V2V and V2P for deployment of L4 in mixed traffic environment

- L4 AD services in mixed traffic in diverse areas using cooperative system by 2025



~2022



~2025



Theme 1. Demonstration of AD Service with Remote Monitoring (L4)

Target

- Demonstration of an AD Service on Limited Area and Vehicles with **Remote Monitoring (L4) by FY2022**
- **Establish Basic Business Models and Institutional Structure for AD Service with Remote Monitoring (L4)**

Project implementer: National Institute of Advanced Industrial Science and Technology, etc.



Approach Policy

- In limited locations such as discontinued railway sites using low-speed vehicles.
- Study the roles of remote operators and their tasks other than establishing driving technology and the commercial deployment of remotely monitored L4.

Main Activities

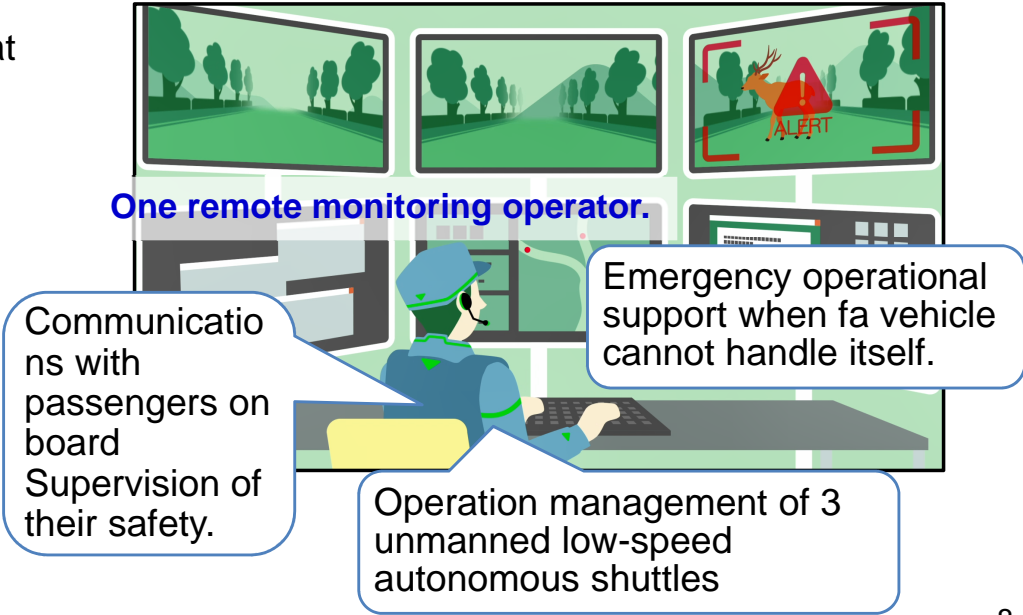
2021

- Organization of business models
- Operation, demonstration and evaluation of systems that enables remote monitoring of 3 vehicles by one person
- Demonstration and evaluation of remote operators' task
- Advancement to L4 vehicles and systems

2022

- Analysis and creation of models for the deployment of business models
- Requirements for remote operators to increase the number of vehicles monitored
- Build structures for tasks excluding driving

Remote Monitoring System



Theme 2. L4 MaaS Service Expansion for Multiple Area and Vehicle Types, and Improvement of Business Viability

Target

- Deployment of driverless AD services to diverse areas with various type of vehicles (L4) **at over 40 locations by FY2025.**
- Establish business models and infrastructure/institutional structure for the deployment of varied services.

Approach Policy

Project implementer: Nippon Koei Co., Ltd., etc.

- Promote the development of vehicles and systems with specification and functions that have appropriate safety for their ODD and operating conditions, assuming AD services in various areas and with various vehicles.
- Promote efficient rolling out of services

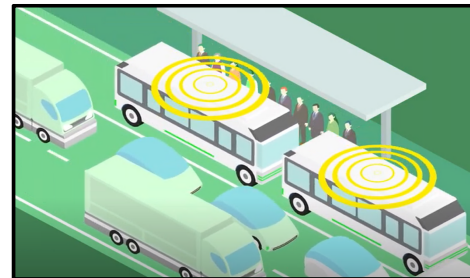


Main Activities



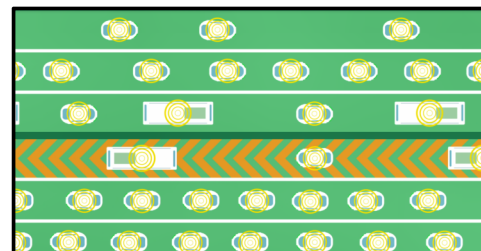
- Use cases for driverless AD services
- Study of business models
- Creation of a typology of ODD for AD services
- Sophistication and diversification of AD bus
- Advancement of remote monitoring systems
- Increase # of use cases, and business models
- Demonstration and evaluation of various driving environments and vehicles

Lane for Autonomous Vehicles



Small, medium and platooning vehicles stop at island-style bus stops to meet mobility demand at any time of the day depending on # of users and needs.

Dynamic Routing



Vehicles set their route dynamically to avoid heavy traffic and travel restrictions using traffic data exchanged with MaaS, etc.

Theme 3. Deployment of High-Performance Trucks including Platooning on Expressway

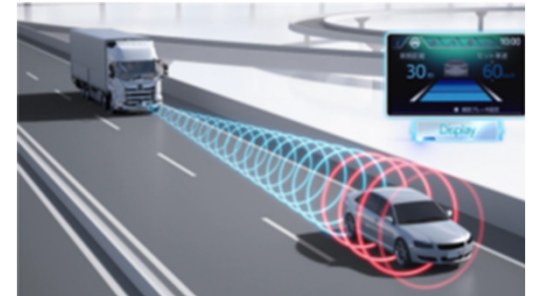
Target

- **Deploy L4 AD trucks and its platooning technology on expressway after 2025**
- **Develop not only vehicle technologies but also necessary environment such as fleet operation management systems(FMS), infrastructures and data for business implementation**

Project implementer: TOYOTA TSUSHO CORPORATION, etc.

Approach Policy

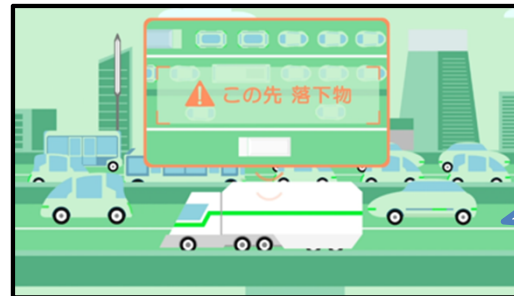
- Development of L4 AD trucks utilizing results of previous demonstration experiments of unmanned truck platooning.
- Develop FMS utilizing infrastructure data that take the needs of large vehicles.



Main Activities

- 2021**
 - Evaluation of business models
 - Development of vehicles and systems to evaluate the ODD of L4 vehicles
- ~2022**
 - Demonstration, evaluation and establishment of ODD concepts and FMS meeting characteristics of large vehicles
- ~2025**
 - Demonstration, evaluation of business models and collaborative driving of multi-brand vehicles
 - Development of systems by private companies

Branch Confluent Section of Expressways



Data of expressway traffic conditions and regulations are transmitted to L4 trucks, which adapt their travel time and route accordingly.

Main Lane of Expressways



When multiple vehicles operate on the same expressway, they communicate to each other, and system decides whether to form a platoon and when to disengage.

Theme 4. Harmonization and interoperability of V2V and V2P communication to achieve L4 in mixed traffic environment

Target

- **Achieve L4 AD services in mixed traffic in diverse areas** using cooperative system by around 2025
- Create a test bed area where the most appropriate cooperative system, which is adapted to the road environments and traffic situations, etc. may be implemented
- Support lower level of automations (L3, ADAS, etc.)

Approach Policy

Project implementer: The University of Tokyo, etc.

- Cooperative system in accordance with local characteristics based on analysis and study of regional use cases.
- Promote harmonization and standardization efforts based on domestic and international discussions and technology development



Main Activities

2021

- Use cases and business models
- Study and evaluation of cooperative system
- Study on data exchange schemes

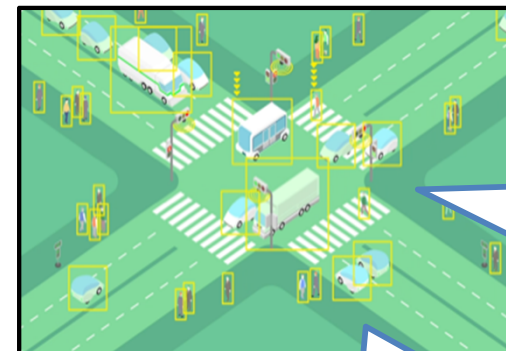
~2022

- Identifying specification of data exchange schemes
- Study on standardization and evaluation environment of cooperative system
- International trend and strategies

~2025

- Technical/service/operational/business viability demonstration
- Proposal of standardization and harmonization for cooperative system

Complicated Intersection in a Large City



AD mobility services operate safely and smoothly with data transmitted from roadside sensors and other cars.

Active Use of Big Data

Data will also be used to provide various services, e.g. information on congestion level of commercial and tourism businesses.