Real-World Applications of Connected Car Technologies in Disaster Response: Current Status and Future Outlook

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1. Introduction

In recent large-scale disasters, such as the Great Hanshin (Kobe) Earthquake on January 17, 1995, the Great East Japan (Tohoku) Earthquake on March 11, 2011, and the Noto Peninsula Earthquake on January 1, 2024, failures in communication networks increasingly created obstacles for resident wellness checks, first-aid activities and saving lives. For use in such cases, implementation in society is advancing using connected car technology equipped with batteries, communication functions and mobility. However, there are many other issues in introducing such measures, such as acquiring the necessary budget and personnel. As such, we introduce cases implementing connected car technology in society, summarize various issues identified from a survey conducted by municipalities, and give an overview of what information and communications systems during disaster should be like.

2. Examples Applying Connected-Car Technology during Disaster

Here we introduce the main examples of systems using connected car technology available during disaster.

(1) V-HUB

In 2018 at the Asia-Pacific Telecommunity (APT), a proposal from Japan for an "Information and Communication System using Vehicles During Disasters (Vehicle-HUB, V-HUB)" was adopted as a recommendation[1].

V-HUB uses connected-car technology such as vehicle-to-vehicle communication and vehicle-to-roadside communication during a large-scale disaster, when other communication networks are interrupted, to perform wellness checks and share disaster information. This recommendation was not for developing new technology, but to examine the needs of the various countries in Asia during disasters, and to provide a system structure and applications to support them using existing technology (Figure 1).

Figure 1: V-HUB Overview
Source: TR-1097[2], CES-0070-1[3]

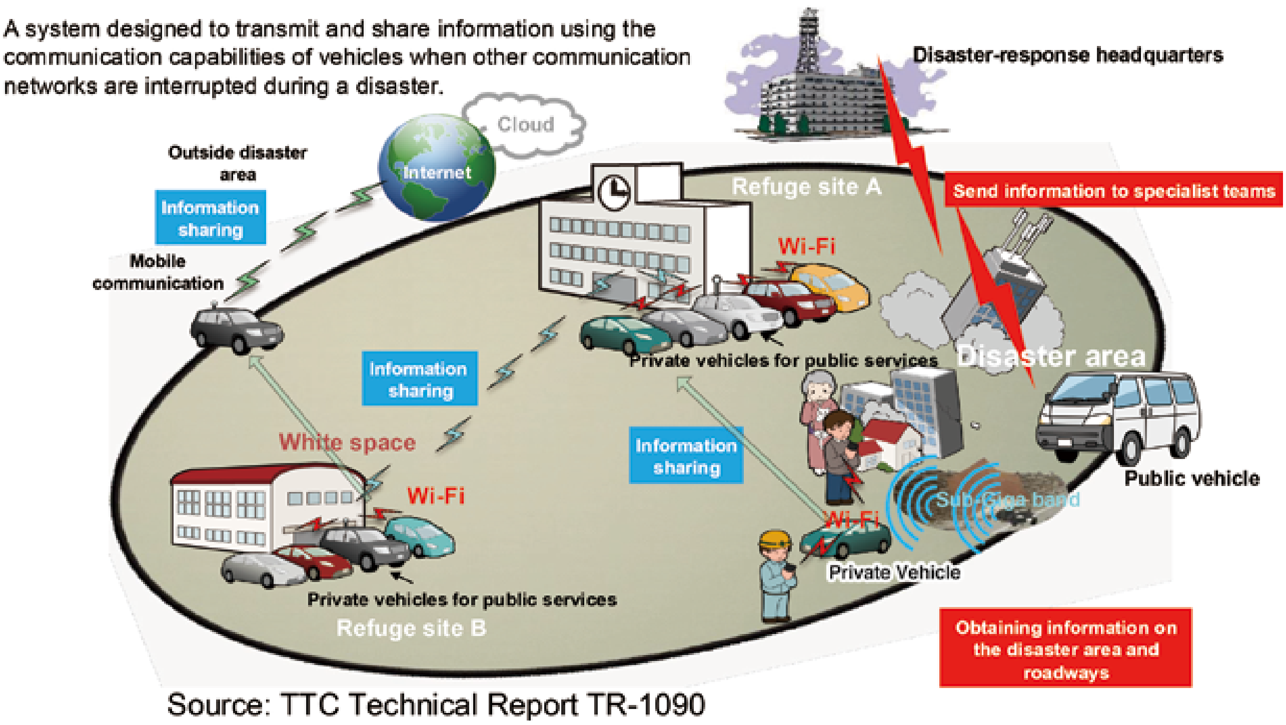
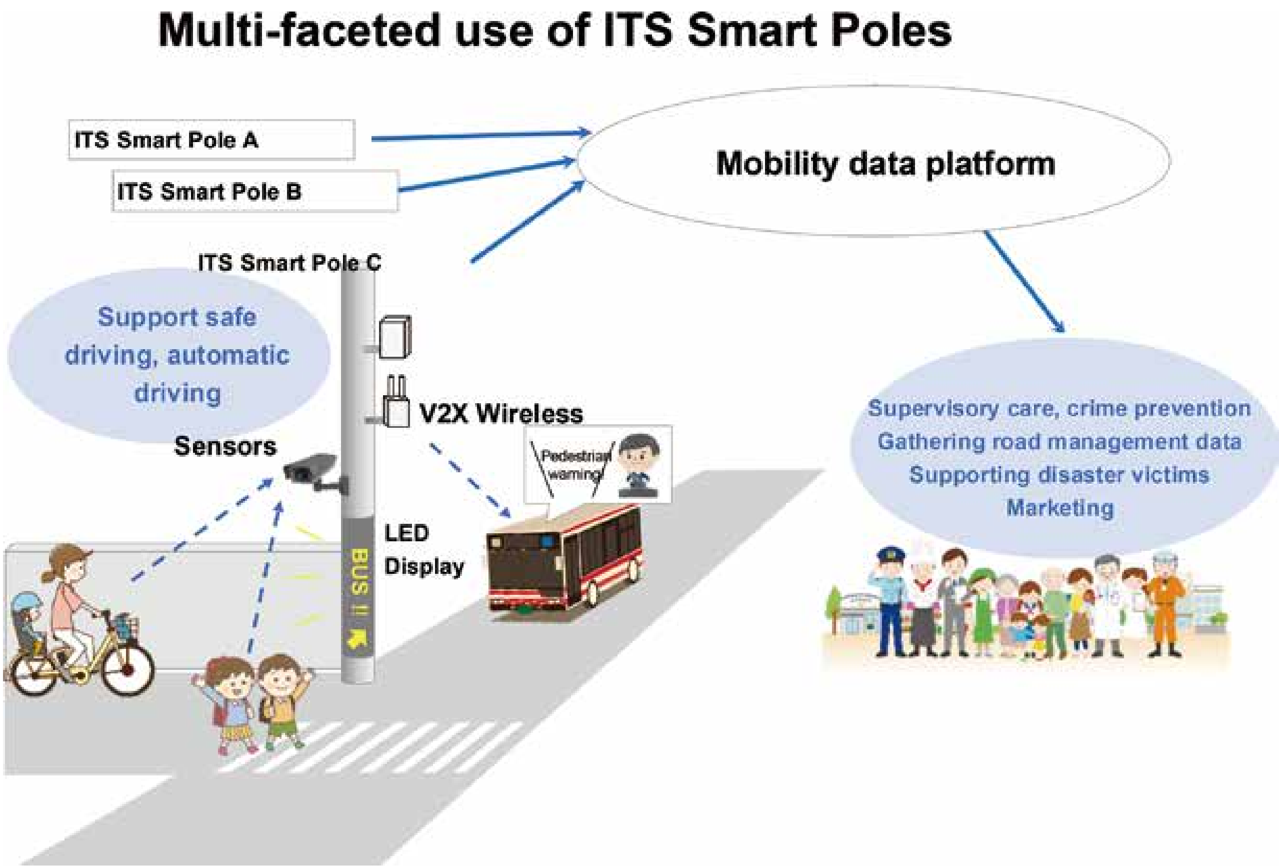


Figure 2: ITS Smart Pole multi-faceted use
Source: TR-1109[4], CES-0090-1[5]



(2) ITS Smart Pole

ITS Smart Pole is a system that supports safer and more efficient traffic by exchanging information between vehicles and infrastructure equipment installed along the roadside. During normal times it can, for example, notify if a person or bicycle is emerging from a narrow alley, and during disaster, it can share disaster information or notify of evacuation routes.

This standard is being studied and verified by the non-profit organization, ITS Japan (Figure 2).

3. Examples of Implementation in Society

Here, we introduce examples of connected car technology being implemented in society.

1) Konan City, Kochi Prefecture

The city of Konan, in Kochi Prefecture, faces risk from earthquakes along the Nankai Trough, and has long considered and implemented measures to deal with them. One measure has been to equip municipal disaster-prevention vehicles with communication devices, which can provide their location of the vehicle and share disaster information. The Konan fire department has also distributed tablet devices with communications capability to their vehicles and fire-fighting staff, to work in cooperation with fire-fighting headquarters (Smart Fire Department). The Fire Department also cooperates with the municipality and conducts frequent disaster-prevention training so that the system can work effectively. They are also sharing know-how gained in this disaster-prevention training nationally, through the DREAMS (Disaster Response and Recovery Management Systems/Services) Utilization Research Center (Figure 3).

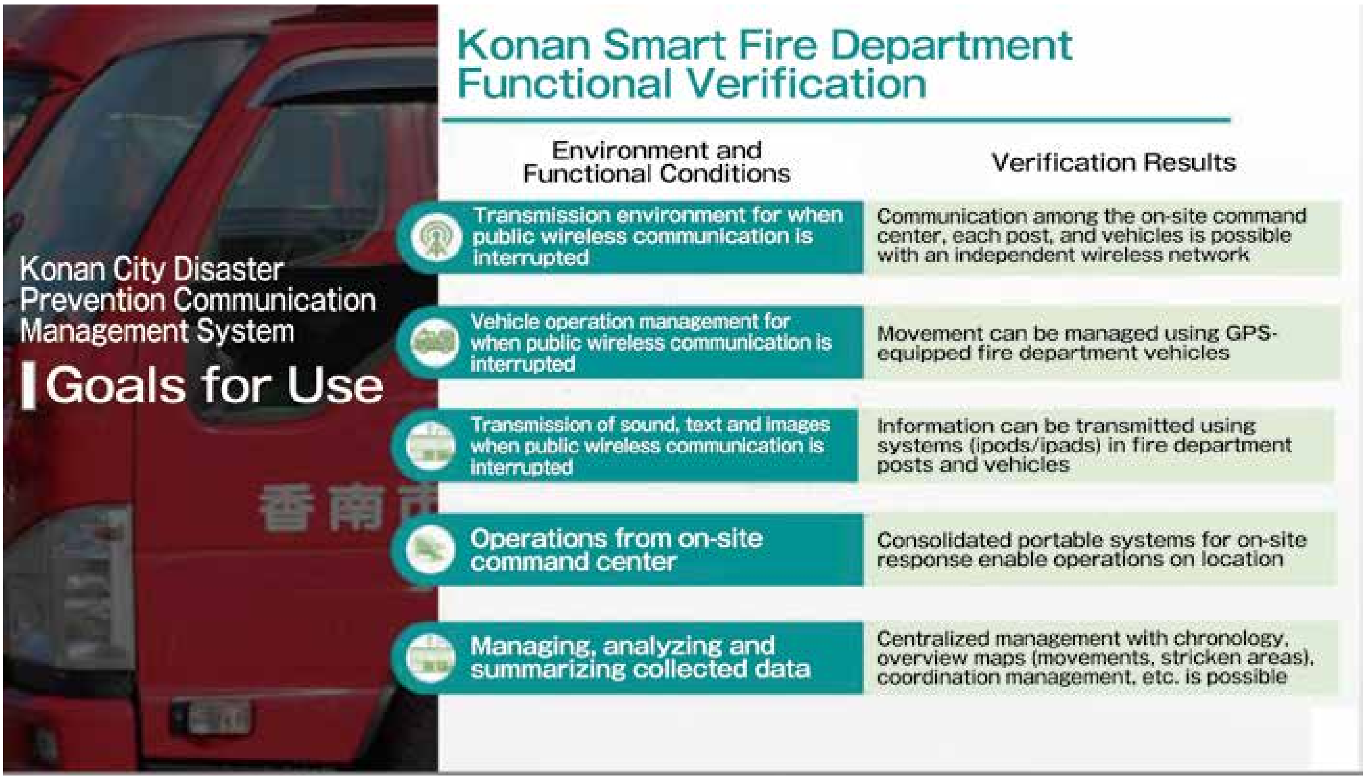
2) Toyota City, Aichi Prefecture

Toyota City in Aichi Prefecture has installed ITS Smart Poles in the city and is running trials using them for traffic-accident prevention and information sharing during disaster. Through these trials, they are collecting and analyzing traffic conditions during normal times and working to prevent traffic accidents (Figure 4).

4. Results of Municipality Survey

There are many cases of municipalities studying and implementing systems utilizing connected car technology besides those introduced in Section 3, but such implementations are still limited nationally. As such, for about two years starting in 2022,

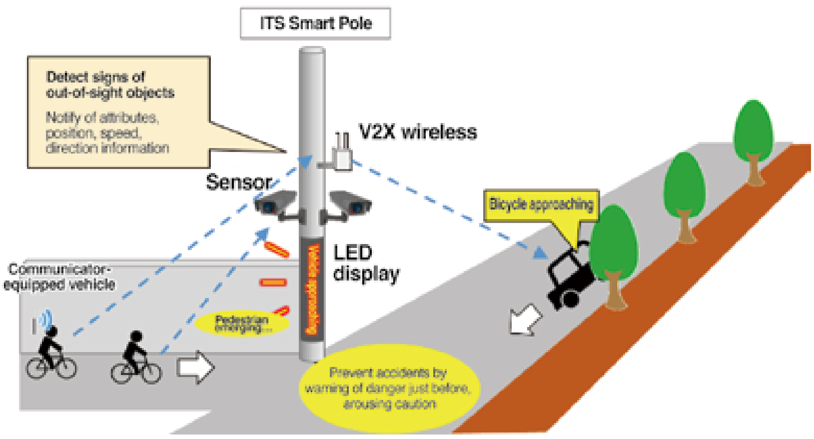
■ **Figure 3: Overview of functional verification of Smart Fire Department in Konan City, Kochi Prefecture**
Source: TR-1109[4], CES-0090-1[5]



the Telecommunication Technology Committee (TTC) and the Communications and Information Network Association of Japan (CIAJ) conducted a survey of the state of implementing recent information and communication technologies and related issues, including using vehicles during disaster, with cooperation from approximately 20 municipalities throughout Japan.

■ **Figure 4: ITS Smart Pole trials in Toyota City, Aichi Prefecture**
Source: TR-1109[4], CES-0090-1[5]

- Location: Toyota City, Aichi Prefecture
- Scope: 5 Intersections
- Method: Using infrastructure devices and V2X equipped vehicles, conducted effectiveness trials with cooperation from local high-schools and residents
- Time frame: from March, 2024



Source: Tateshina Council

In the results, approximately 60% of municipalities had plans to support evacuations, but only about 30% had evacuation plans involving vehicles (Figure 5).

Approximately half of municipalities were actively introducing information and communication systems for disaster response. Reasons for not doing so included not having the budget, not having personnel to study it, and not having the required technical knowledge (Figure 6).

5. Issues and Solutions for Introducing use of Information and Communication Systems during Disaster

There was great interest regarding information and communication systems for disaster response, and it became clear that, beyond just standardization of related technologies, creating models and linking data between systems would be essential to implementing the right technologies in the right places, with consideration for the size of the municipality and geographic requirements (Figure 7).

6. Future Prospects

Reference examples and model cases from municipalities throughout Japan are summarized in TTC standard TR-1109[4] and CIAJ standard CES-0090-1[5], based on the survey results to date. However, technologies are also changing quickly, such as expansion of satellite communication and use of new frequency bands (DR-IoT*). To implement such technologies, budgeting and cooperation with municipalities will be essential. We have organized a strategic road map for achieving this and it, along

Figure 5: State of evacuation support using vehicles during disaster
Source: TR-1109[4], CES-0090-1[5]

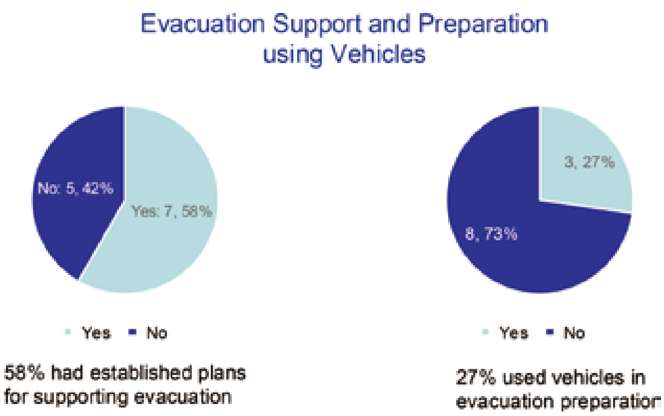


Figure 6: Reasons for not introducing information and communication systems for disaster response
Source: TR-1109[4], CES-0090-1[5]

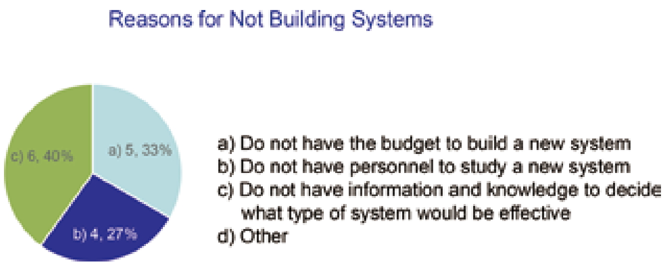


Figure 7: Information and communication system measures for disaster response
Source: TR-1109[4], CES-0090-1[5]

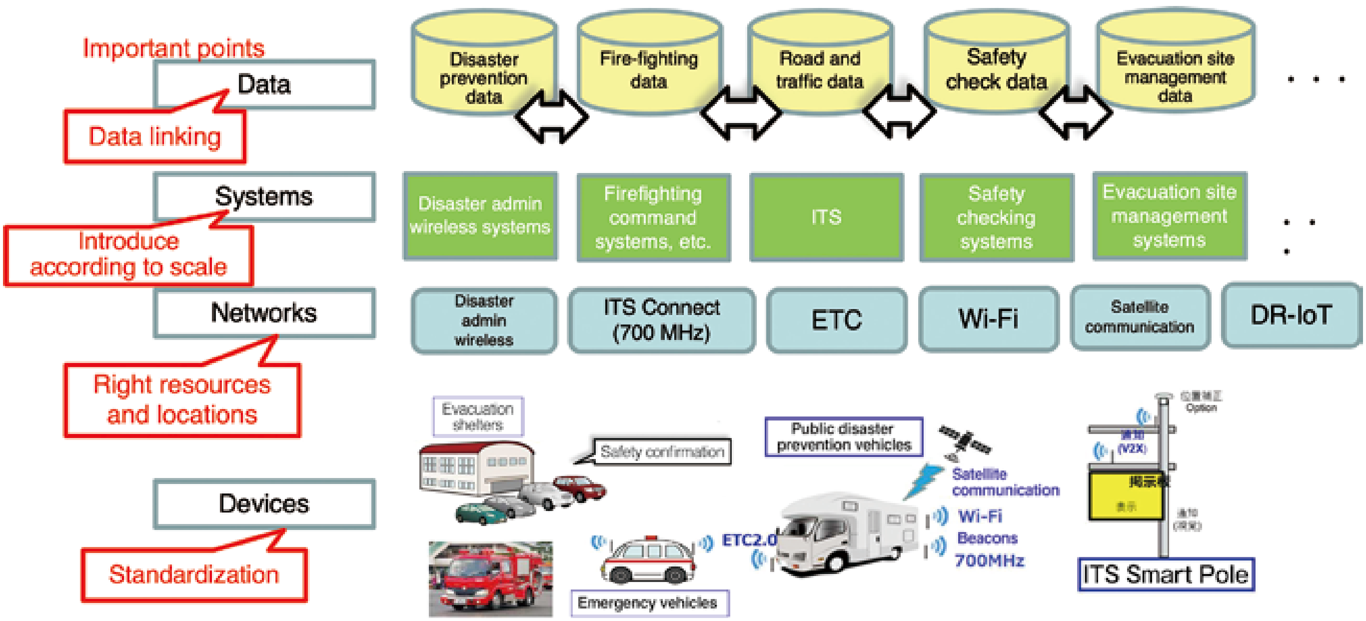
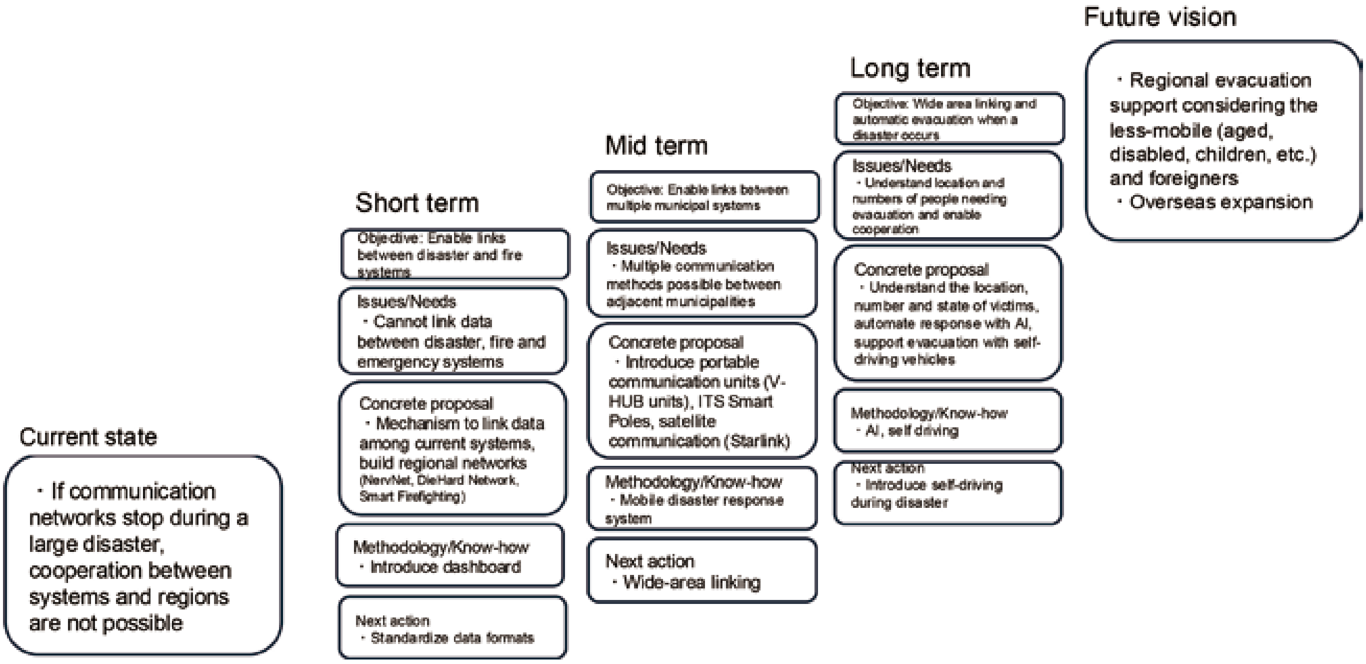


Figure 8: Prospects for information and communication system during disaster
Source: TR-1109[4], CES-0090-1[5]



with conditions in each municipality, will be needed for sharing this information and to introduce information and communication systems effectively for use during disaster (Figure 8).

7. Conclusion

The TTC Connected Car Experts Group has been proposing standards for utilizing connected car technologies during disaster, but has also been collaborating with various organizations, studying actual conditions in municipalities and participating in disaster-prevention training efforts. Results of these efforts were published in February 2025 in TTC[4] and CIAJ[5] standards, and give a view of the future of these efforts. We anticipate further progress implementing these technologies in society looking forward.

References

[1] APT/ASTAP/REC-002 (2018), "APT Recommendation on Standard Specification Information and Communication System using Vehicle during Disaster"
[2] TTC Standard TR-1097 (2022), "Guidelines for using the V-HUB Information and Communication System utilizing Vehicles During Disaster, Vehicle disaster-prevention system overview"
[3] CIAJ Standard CES-0070-1 (2022), "Guidelines for using the V-HUB Information and Communication System utilizing Vehicles During Disaster, Vehicle disaster-prevention system overview"
[4] TTC Standard TR-1109 (2025), "Guidelines for using the V-HUB Information and Communication System utilizing Vehicles During Disaster – Recent efforts for effectively linking with new initiatives including disaster prevention and fire-fighting systems"
[5] CIAJ Standard CES-0090-1 (2025), "Guidelines for using the V-HUB Information and Communication System utilizing Vehicles During Disaster – Recent efforts for effectively linking with new initiatives including disaster prevention and fire-fighting systems"

＊ DR-IoT: Abbreviation for a disaster-response IoT communication system using the V-High band.