Phased ITS Development in Japan

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1. Introduction

ITS in Japan started with a comprehensive plan compiled in 1996, where 9 priority areas were identified. Since then, the public and private sectors have worked together to achieve successful nationwide implementation (Figure 1). During this period, telecommunication and electronic control technologies started to develop dramatically, and we took a somewhat technology-oriented approach when applying new technologies to transportation.

We then shifted to an objective-oriented approach to deploy integrated systems such as connected vehicle systems for safe, environment friendly and convenient mobility. We call this period the 'second stage' to distinguish it from the earlier one (called the 'first stage').

Today, we need to provide ITS that contributes to enhancement of the transportation network as a foundation for solving the fundamental challenges facing our society — aging population, global warming, sustainable energy supply, and safety against natural and manmade disasters. In this way, the development and deployment of ITS in Japan and its penetration into Japanese society have evolved through various phases towards a wider perspective of transportation. Japan has hosted ITS World Congresses in Yokohama (1995), in Nagoya (2004) and in Tokyo (2013). These international events marked important milestones for us to step forward with close collaboration among government, academia and industries (Figure 2).

2. Societal challenges and transportation systems

Japanese society is rapidly ageing. It is said that by the 2050s, 40% of Japan's population will be at least 65 years old. It will no longer be practical to set a fixed age threshold above which everyone is supported by social welfare. Instead, we should pay attention to diversity of individuals, and provide them with opportunities to participate in social activities as long as their physical conditions allow. We need to balance the autonomy of people with the support they receive from their families, communities and social welfare systems. To realize such a framework, it is vital to ensure people have sufficient autonomy to move to wherever they want, whenever they like. In particular, in rural areas that are heavily dependent on personal transport, it must be easy for people to access advanced driving assist systems and financially sustainable public transportation.

Japan is also exposed to serious natural disasters. While it is not possible to stop natural disasters from happening, we have made preparations for the timely provision of information and prompt, effective transportation for rescue operations in order to minimize the impact of these disasters on humans. Having suffered the Great East Japan Earthquake, we know how vulnerable our modern society can be. The impact of this disaster spread immediately. Serious power shortages affected the entire country, and lost production led to a shortage of parts for the manufacturing sector that had a serious effect on global economic activity. On the other hand, technical innovations and changes in people's behavior showed that Japan has potential for a sustainable future.

Figure 1: Comprehensive ITS plan in Japan (1996)

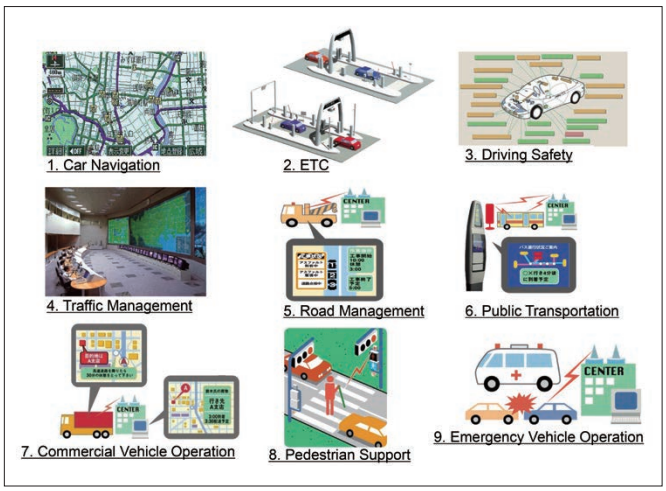


Figure 2: Deployment, and New Challenges

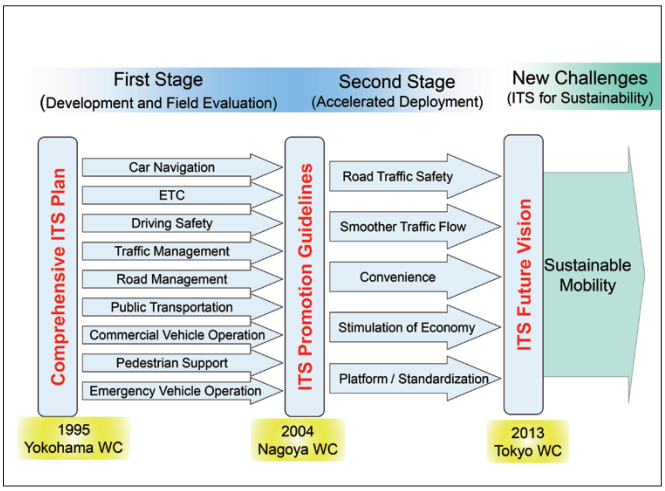
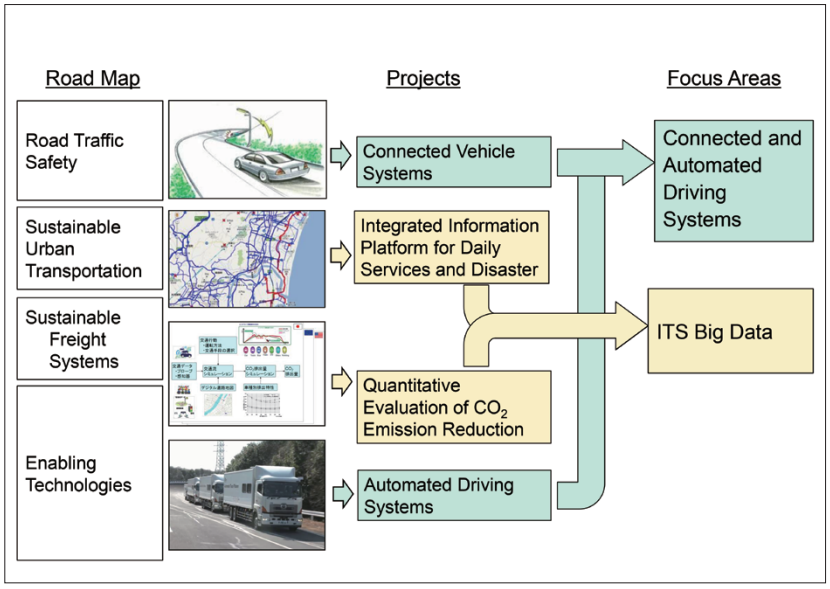


Figure 3: National ITS project



3. Technology and social change

In *Pioneering Projects for Acceleration Social Return* (2008–2012), we conducted field evaluation tests of integrated ITS systems in selected model cities under the supervision of the Council for Science and Technology Policy of Japan. This project has helped to cultivate technologies such as telecommunication, information processing and automated control. At the end of the project, we identified two major areas for further work. Those are applications of ITS Big Data in transportation, and connected/automated driving systems. (Figure 3)

We took those as the main topics at the ITS World Congress Tokyo 2013 and the following ITS World Congress in Detroit. These were also listed among Japan's national strategies, and are the subject of various new projects. We find the same topics in the European Commission's project *Horizon 2020: the Framework Programme for Research and Innovation (2014-2020)*, and in the ITS Strategic Plan (2015–2019) of the US Department of Transportation. Innovative technologies have already penetrated into our daily lives and changed society in various ways. Crowd sourcing allows huge volumes of data to be generated via high speed mobile communication. The separation of network infrastructure and mobile terminal businesses from service provision has resulted in the creation of new business opportunities for a new breed of entrepreneurs. Electrification of automobiles does not simply mean diversion of energy sources but also means that automobiles play roles balancing demand and supply in 'smart grid' systems.

When faced with the serious challenges of the Great East Japan Earthquake, we realized how important it is to have social capitals fostered over many years in local communities. The ability of people to survive and help each other has been significantly enhanced, and compensates for the lack of capacity of public authorities to rescue people in devastated areas. In addition to volunteers working on-site, it was also found that useful voluntary support for affected people could be provided from distant cities via information networks.

To design transportation systems for the next generation, it is important to take an integrated approach that incorporates both technological innovations and social implications.

4. Activities at ITS Japan

ITS Japan has focused on 1) connected and automated driving systems, 2) ITS Big Data for business opportunities and public services, 3) deployment of ITS technology for the Tokyo Olympic and Paralympic Games, and 4) international collaboration. The experience we have gathered through activities at ITS Japan, such as enhanced digital road maps and Quasi-Zenith Satellite and cooperative driving assist systems, is integrated in these areas (Figure 4). We are actively engaging in a national project on automated driving systems called the *Innovation of Automated Driving for Universal Services (SIP-adus)*.

As an application of ITS big data, we have been providing route guidance information during rescue and recovery operation from natural disasters since the Great East Japan Earthquake. Based on this experience, we are participating in disaster drills by providing a variety of related information to drivers, integrating data from both the public and private sectors. Regarding open data, since best practices are often found in municipal government level under close collaboration with local ICT service providers, we are also working with them to share experiences of those activities and to promote ITS deployment initiatives by local government agencies.

5. For the future

We are already living in an information network society, where well-informed individuals play active roles to recognize and solve social challenges and to balance benefits for individuals and public interests. Strong leadership across the boundary of industrial sectors, academic disciplines and jurisdictions is vitally important for drawing up ground designs, developing action plans and coordinating individual efforts.

Figure 4: Approaches by ITS Japan